APPENDICES

A. COMMENT LETTERS

LETTER 1

United States Department of the Interior

BUREAU OF RECLAMATION
Central Valley Operations Office
3310 El Camino Avenue, Suite 300
Sacramento, California 95821

IN REPLY
REFER TO:

CVO-100
WTR-1.10

JAN 15 2008

Ms. Delores Brown
Chief, Office of Environmental Compliance
California Department of Water Resources
P O Box 942836
Sacramento, CA 94236-0001

Subject: Bureau of Reclamation Comments on Draft Monterey Agreement EIR

The Bureau of Reclamation has reviewed the "Draft Environmental Impact Report for the Monterey Amendment to the State Water Project Contracts, (Including the Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement (Monterey Plus)" (Draft EIR). Reclamation has serious concerns regarding the adequacy of the analysis of how the Monterey Amendments has and will affect the operational aspects of the Central Valley Project-State Water Project (CVP-SWP) water system and the common water supply relationship between the two projects under the Coordinated Operations Agreement (COA).

Page ES-1 of the Draft Environmental Impact Report (EIR) executive summary contains a section labeled "Potential Areas of Controversy and Concern." Listed in this section is the following bullet item:

- "Potential effects of the proposed project on operation of the U.S. Bureau of Reclamation's Central Valley Project, deliveries to CVP contractors and existing water rights holders must be analyzed." 1-1

This item is correctly listed as a "Potential Area of Controversy and Concern" because of the fundamental water supply sharing between the CVP and SWP to meet common water right permit conditions and the COA elements to address how either water project affects the delivery capabilities of the other project. Unfortunately, the Draft EIR has not analyzed how the Monterey Amendment provisions influence the delivery capabilities of the CVP, nor how the Monterey Amendment provisions influence the common water supply that both the CVP and SWP rely upon.

Monterey Amendment Elements That Potentially Affect the COA

Section 4 of the Draft EIR attempts to identify the generalized changes that were made to SWP contracts per the Monterey Amendments:

- Resolve conflicts and disputes among SWP contractors regarding water allocation and financial responsibilities for SWP operations;
- Restructure and clarify procedures for SWP water allocation and delivery during times of shortage and surplus;
- Reduce financial pressures on agricultural contractors in times of drought and supply reductions;
- Adjust the financial rate structure of the SWP to more closely match revenue needs;
- Facilitate water management practices and water transfers that improve reliability and flexibility of the SWP water supplies in conjunction with local supplies;
- Resolve legal and institutional issues related to storage of SWP water in Kern County groundwater basins, and in other areas.

Draft EIR, at pg. 4-1.

The last two bullet items address the addition of contractual capabilities to store SWP water outside of the SWP storage facilities listed in the 1986 COA agreement. This is a significant change to SWP capabilities that was not contemplated in the 1986 list of facilities. Storing SWP water outside of designated SWP storage facilities is effectively analogous to increasing SWP storage capabilities and should be subject to COA review under COA Articles 5, 14, 16, and potentially Article 6.[1]

1-1 (con't.)

The effect of increased SWP capability is the reason that CVP operations and capabilities are listed in the "Potential Areas of Controversy and Concern." The Draft EIR only attempts to address how Reclamation's use of Joint Point of Diversion capabilities may be affected - it fails to address the potential impacts caused by the addition of storage facilities to the SWP, and does not consider the potential mitigation needed to address this additional storage.

Section 7.1.1.2 of the Draft EIR acknowledges that the analysis performed for the document does not address how the increased water management practices (i.e., increased storage capabilities for SWP contractors to store SWP developed water supplies) have influenced SWP operations, Delta water dynamics, or upstream river operations of the CVP and SWP. Reclamation's area of concern regarding the Monterey Amendments has always been and consistently been focused on the COA implications of:

1-2

- Contractual allowance for SWP water to be stored in non-SWP facilities that are not recognized in the COA framework; and
- Increasing the effective storage capabilities of the SWP system without COA review.

[1] Article 5 is the list of facilities used in the COA to convey or store water in the CVP or SWP as of 1986. Article 6 designates the sharing formula for the common water supply towards meeting common water right commitments. Article 14 provides for a periodic (every fifth year) review of the operation of both projects, and Article 16 covers the addition of new facilities by either the CVP or SWP.

It is Reclamation's view that the Draft EIR has not addressed these fundamental issues and therefore is inadequate to answer the "potential area of concern" regarding CVP operations and delivery. It is also Reclamation's view that the Draft EIR has not addressed how the increased water management flexibility capabilities provided by the Monterey Amendments has influenced the common water supply that affects all aspects of CVP and SWP operations, including river flow management changes. The Draft EIR seems to conclude that the Monterey amendments provisions only have the potential to reduce surplus Delta outflow conditions and not affect upstream reservoir operations. This is not Reclamation's view concerning how increased SWP storage capabilities south of the Delta can and will affect CVP-SWP operations at each major facility component.

1-2 (con't.)

Reclamation appreciates your consideration of these comments, and asks that the Draft EIR include an analysis of the impacts to COA and CVP operations and delivery caused by the increase in effective storage facilities for the SWP before the final version of this document is published. Please contact me at (916) 979-2199 if you have any questions.

Sincerely,

Ronald Milligan

Ronald Milligan
Operations Manager

cc: MP-100
MP-400
MP-700

LETTER 2

ALAMEDA COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT

100 NORTH CANYONS PARKWAY, LIVERMORE, CA 94551-9486 PHONE (925) 454-5000

January 11, 2008

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
901 P Street
Sacramento, CA 95814

Subject: ***Comments on Draft EIR for Monterey Amendment to the State Water Project Contracts and Associated Actions***

Dear Ms. Brown:

This letter is submitted by Zone 7 Water Agency (Zone 7), a public agency that contracts with the State of California, through the Department of Water Resources (Department), for water supplies from the State Water Project (SWP), and whose customers pay for, benefit from and rely on the water supplies provided by the SWP. Zone 7 provides flood protection, groundwater management and water supply within a 425 square mile watershed in eastern Alameda County in the Bay Area. We serve a population of nearly 200,000 people in the cities of Livermore, Pleasanton and Dublin. The Livermore-Amador Valley is a crossroads, providing irrigation water from the State Water Project for approximately 5,000 acres of agriculture (including a $200 million per year viticulture industry), while also serving drinking water to the area which serves as a gateway to Silicon Valley (which is dominated by the high tech industry). Currently, in an average hydrologic year 75-80% of Zone 7's annual water supply is imported via the State Water Project (SWP).

The Department has prepared the Draft Environmental Impact Report on the Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement (Monterey Plus DEIR). The Monterey Plus DEIR re-evaluates the environmental effects of the Monterey Amendments, which have been in operation for over a decade. 2-1

The Monterey Amendment amended the 1960s-era SWP contracts between the Department and each of the 29 public agencies that contract with it for SWP supplies. The Monterey Amendment, implemented in 1996, updated a number of contract provisions to reflect the change in real-world conditions that had occurred by that time, and incorporated opportunities for modern, more progressive water management. The Monterey Amendment accomplished a number of significant things, including:

- **Settled dispute over allocations** – The amended water allocation provisions eliminate the agriculture-first shortage requirement for contract water supplies (i.e., Table A water) as well as the agricultural priority to surplus water, and instead require that all water be allocated in proportion to contractors' contract amounts. In exchange, the agricultural contractors agreed to permanently retire a portion of their contract amounts and permanently transfer an additional portion to urban contractors.

- **Gave contractors more flexibility in managing limited SWP supplies** – The amended water management provisions promote contractor banking of water in underground water storage during wet periods for their later use during dry times, and improve contractor opportunities to get more beneficial use out of existing SWP facilities.

- **Increased rate stability and funding for local investment in water management programs** – The amended financial provisions use contractor money originally committed for additional SWP facilities to instead help contractors stabilize their water rates and increase their funding for local development of water conservation, water recycling, conjunctive use, and other water management programs.

The added flexibility provided by the Monterey Amendment has allowed the SWP contractors to weather the most recent drought without enduring the substantial hardships of the drought of the early 1990s, despite increased water demands that have occurred since that time and increasing pressures on SWP operations.

The Monterey Plus DEIR includes an exhaustive analysis of the environmental effects of the Monterey Amendment and Settlement Agreement. Zone 7 feels that the Monterey Plus DEIR, which was drafted with the advisory collaboration of DWR, the State Water Contractors, Planning and Conservation League, Citizens Planning Association of Santa Barbara, and Plumas County Flood Control and Water Conservation District, adequately describes the environmental effects of the Amendment. The analysis in the DEIR shows that:

2-1 (con't.)

- There have been no significant environmental impacts resulting from the Monterey Amendment from 1996 through today.

- Moving into the future, environmental impacts from the Monterey Amendment in almost all resource categories are at less-than-significant levels. Those few areas where potentially significant impacts were identified are for a provision analyzed under a worst-case scenario that is unlikely to ever occur, or for certain future projects that would all be subject to additional, project-level CEQA review.

Zone 7 supported implementation of the Monterey Amendment in 1996, and supports its continued implementation into the future. Zone 7 commends the Department for having prepared this thorough and significant document.

Sincerely,

G.F. Duerig
General Manager

LETTER 3

ALAMEDA COUNTY WATER DISTRICT

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ROBERT SHAVER
Engineering Manager
WALTER L. WADLOW
Operations Manager

January 10, 2008

Ms. Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
901 P Street
Sacramento, CA 95814

Dear Ms. Brown:

This letter is submitted by Alameda County Water District (ACWD), a public agency that contracts with the State of California, through the Department of Water Resources (Department), for water supplies from the State Water Project (SWP), and whose customers pay for and benefit from the water supplies provided by the SWP.

The Department has prepared the Draft Environmental Impact Report on the Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement (Monterey Plus DEIR). The Monterey Plus DEIR re-evaluates the environmental effects of the Monterey Amendments, which have been in operation for over a decade.

The Monterey Amendment amended the 1960s-era SWP contracts between the Department and each of the 29 public agencies that contract with it for SWP supplies, including ACWD. The Monterey Amendment, implemented in 1996, updated a number of contract provisions to reflect the change in real-world conditions that had occurred by that time, and incorporated opportunities for modern, more progressive water management. The Monterey Amendment accomplished a number of significant things, including: 3-1

- **Settled dispute over allocations** – The amended water allocation provisions eliminate the agriculture-first shortage requirement for contract water supplies (i.e., Table A water) as well as the agricultural priority to surplus water, and instead require that all water be allocated in proportion to contractors' contract amounts. In exchange, the agricultural contractors agreed to permanently retire a portion of their contract amounts and permanently transfer an additional portion to urban contractors.

- **Gave contractors more flexibility in managing limited SWP supplies** – The amended water management provisions promote contractor banking of water in underground water storage during wet periods for their later use during dry times, and improve contractor opportunities to get more beneficial use out of existing SWP facilities.

- **Increased rate stability and funding for local investment in water management programs** – The amended financial provisions use contractor money originally committed for additional SWP facilities to instead help contractors stabilize their water rates and increase their funding for local development of water conservation, water recycling, conjunctive use, and other water management programs.

The added flexibility provided by the Monterey Amendment has allowed the SWP contractors to weather the most recent drought without enduring the substantial hardships of the drought of the early 1990s, despite increased water demands that have occurred since that time and increasing pressures on SWP operations.

The Monterey Plus DEIR includes an exhaustive analysis of the environmental effects of the Monterey Amendment and Settlement Agreement. ACWD feels that the Monterey Plus DEIR, which was drafted with the advisory collaboration of DWR, the State Water Contractors, Planning and Conservation League, Citizens Planning Association of Santa Barbara, and Plumas County Flood Control and Water Conservation District, adequately describes the environmental effects of the Amendment. The analysis in the DEIR shows that:

- There have been no significant environmental impacts resulting from the Monterey Amendment from 1996 through today.

- Moving into the future, environmental impacts from the Monterey Amendment in almost all resource categories are at less-than-significant levels. Those few areas where potentially significant impacts were identified are for a provision analyzed under a worst-case scenario that is unlikely to ever occur, or for certain future projects that would all be subject to additional, project-level CEQA review.

ACWD supported implementation of the Monterey Amendment in 1996, and supports its continued implementation into the future. ACWD commends the Department for having prepared this thorough and significant document.

3-1 (con't.)

Sincerely,

Paul Piraino
General Manager

EC:bbm

LETTER 4

CASTAIC LAKE WATER AGENCY

January 11, 2008

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
901 P Street
Sacramento, CA 95814

DELORES

Dear ~~Ms. Brown~~:

This letter is submitted by Castaic Lake Water Agency (CLWA), a special act district that contracts with the State of California, through the Department of Water Resources (Department), for water supplies from the State Water Project (SWP). CLWA's customers pay for and benefit from the water supplies provided by the SWP (Castaic Lake Water Agency Law, Wat. Code-App. §103-1, *et seq.*). CLWA is mandated by the Legislature to purchase and deliver sufficient supplies of SWP water to serve the needs of its customers in the Santa Clarita Valley (Cal. Wat. Code-App. § 103-15).

The Department has prepared the Draft EIR on the Monterey Amendment to the SWP Water Supply Contracts, which is entitled "Draft Environmental Impact Report on the Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement" (Monterey Plus DEIR). The Monterey Plus DEIR re-evaluates the environmental effects of the Monterey Amendments, which have been in operation for over a decade.

In 1996, the Monterey Amendment amended the 1960s-era SWP contracts between the Department and each of the 29 public agencies (Contractors) that contract for SWP supplies. The Monterey Amendment updated a number of SWP contract provisions to address assumptions and changes in conditions that had occurred since the 1960's. The Monterey Amendment also incorporated opportunities for modern, more progressive water management. Among its significant accomplishments were:

- **Settled disputes over SWP water allocations** – The amended water allocation provisions eliminated the agriculture-first shortage requirements for contract water supplies (i.e., Table A water) as well as the agricultural priority to surplus water, and instead required the allocation of shortages in proportion to Contractors' contract amounts. In exchange, the agricultural Contractors agreed to permanently retire a portion of their contract amounts and permanently transfer an additional portion to urban Contractors.

- **Gave contractors more flexibility in managing limited SWP supplies** – The amended water management provisions promote Contractor storage of

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GENERAL COUNSEL
McCORMICK, KIDMAN & BEHRENS, LLP

SECRETARY
APRIL JACOBS

4-1

water in underground water storage banks during wet periods for later use during dry times, and improved Contractor opportunities for greater beneficial use from SWP facilities.

- **Increased rate stability and funding for local investment in water management programs** – The amended financial provisions use Contractor money originally committed for additional SWP facilities and instead use it to assist Contractors in stabilizing their water rates and increasing their funding for local development of water conservation, water recycling, conjunctive use, and other water management programs.

The added flexibility provided by the Monterey Amendment has allowed the SWP Contractors to weather the most recent drought without enduring the substantial hardships of the drought of the early 1990s, despite increased water demands occurring since that time and increasing pressures on SWP operations.

The Monterey Plus DEIR includes an exhaustive analysis of the environmental effects of the Monterey Amendment and Settlement Agreement. The Monterey Plus DEIR was drafted with the advice and collaboration from a wide range of affected interest represented by the Department, the State Water Contractors, the Planning and Conservation League, the Citizens Planning Association of Santa Barbara, and Plumas County Flood Control and Water Conservation District. The Monterey Plus DEIR adequately describes the environmental effects of the Monterey Amendment. The analysis in the Monterey Plus DEIR shows that:

- There have been no significant environmental impacts resulting from the Monterey Amendment from 1996 through the present.

- With limited exceptions, future environmental impacts from the Monterey Amendment are also at less-than-significant levels. Those few resource categories where potentially significant impacts have been identified involve either a provision analyzed under a worst-case scenario that is unlikely to occur, or involve certain future projects that will be subject to additional, project-level CEQA review.

In the interest of ensuring the Monterey Plus DEIR is complete in all respects, CLWA submits the following comments that are specifically directed to issues related to the Kern-Castaic Transfer. That 1999 permanent transfer of 41,000 AFY of SWP Table A amount from Kern County Water Agency (KCWA) and its member unit, Wheeler Ridge Maricopa Water Storage District (WRMWSD), to CLWA is included as part of the Monterey Amendment's aggregate pre-approved permanent 130,000 AFY SWP Table A transfers (Attachments 1 and 2). Several events and legal decisions related to the Kern-Castaic Transfer have taken place since the signing of the Monterey Settlement Agreement. CLWA provides the following information concerning these events and legal decision for incorporation into the Final EIR.

4-1 (con't.)

4-2

I. Kern-Castaic Transfer EIR Litigation

CLWA's original EIR prepared in connection with the Kern-Castaic Transfer was challenged in 1999 by Friends of the Santa Clara River (Friends) in the Los Angeles County Superior Court (*Friends of the Santa Clara River v. Castaic Lake Water Agency* [LASC Case Number BS 056954] ["Friends Action"]). On appeal, the Second Appellate District held that since the EIR tiered off the Monterey Amendment EIR that was later decertified, CLWA would also have to decertify its EIR as well and prepare a revised EIR. CLWA, however, was not enjoined from using any water that is part of the Kern-Castaic Transfer (*Friends of the Santa Clara River v. Castaic Lake Water Agency* ("*Friends I*") (2002) 95 Cal.App.4th 1373, 1387-1388) (Attachment 3).

Friends then appealed the trial court's refusal upon remand to enjoin CLWA's use of the transfer water. The determination that CLWA was not enjoined from using any water that is part of the Kern-Castaic Transfer was upheld by the same division of the Second Appellate District in an unpublished decision (*Friends of the Santa Clara River v. Castaic Lake Water Agency* (2003) 2003 Cal.App. Unpub. LEXIS 11239) (Attachment 4).

Under the jurisdiction of the Los Angeles County Superior Court in the Friends Action, CLWA prepared and circulated a revised Draft EIR for the Kern-Castaic Transfer, received and responded to public comments regarding the revised Draft EIR, and held two separate public hearings concerning the revised Draft EIR. CLWA approved the revised EIR for the Kern-Castaic Transfer on December 22, 2004 (2004 EIR) and lodged the 2004 EIR with the Los Angeles Superior Court as part of its Return to the Preemptory Writ of Mandate in the Friends Action (CLWA Resolution Certifying Final 2004 EIR and CLWA Return to Peremptory Writ of Mandate – Attachments 5 and 6). Thereafter, the Friends Action was dismissed with prejudice – that is, permanently (Attachment 7).

In January 2005, two new challenges to CLWA's environmental review (i.e., the revised Draft EIR) for the Transfer were filed in the Ventura County Superior Court by the Planning and Conservation League (PCL) and the California Water Impact Network (CWIN); these cases were consolidated and transferred to Los Angeles County Superior Court (*Planning and Conservation League v. Castaic Lake Water Agency* [LASC Case No. BS 098724) (PCL Action). As part of its ruling on the demurrers, the trial court noted that the Kern-Castaic Transfer is valid and that principles of collateral estoppel barred petitioners from re-raising issues resolved by the Second Appellate District with respect to the original EIR for the Transfer (Trial Court's Rulings on Demurrers and Motion for Legal Determination – Attachments 8 and 9).

On May 22, 2007, a final Statement of Decision was filed by the trial court in the PCL Action. It included a determination that the Kern-Castaic Transfer is valid and cannot

4-2 (con't.)

be terminated or unwound. The trial court, however, also found one defect in the 2004 EIR and ordered CLWA to correct the defect and report back to the court. The defect did not relate to the environmental conclusions reached in the 2004 EIR; rather CLWA is required to better establish the basis for selecting three alternative scenarios covered in the 2004 EIR (Attachment10). As a result, judgment was entered against CLWA and another Peremptory Writ of Mandate issued directing CLWA to set aside its certification of the 2004 EIR (Attachment 11). The Writ, however, specifically stated that it did not call for CLWA to set aside the Transfer (Attachment 12).

On July 9, 2007, PCL and CWIN appealed the Judgment in the PCL Action (Attachment 13.) Cross-appeals have since been filed by CLWA and two of the real parties (Attachments 14 and 15).

II. Other Court Decisions Recognizing the Finality of the Kern-Castaic Transfer

The trial court in the PCL Action was neither the first court nor the only court to recognize that the Kern-Castaic Transfer is final, permanent and not subject to rescission.

A. In *Santa Clarita Organization for Planning the Environment v. County of Los Angeles* (*SCOPE II*) (2007) 157 Cal. App. 4th 149, the Second Appellate Court upheld the trial court's denial of the County of Los Angeles recertification, after remand and revision, of an EIR for West Creek development in the Santa Clarita Valley (Slip Op., p. 27). (Attachment 16). In evaluating the certainty of the Kern-Castaic Transfer using the four principles set forth by the California Supreme Court in *Vineyard*, the Court of Appeal concluded that the transfer is permanent and final, and that with or without the Monterey Amendment, the Transfer can legally occur and will continue to exist (Slip Op. p. 18-25). Although the SCOPE II decision does not address the other permanent SWP Table A transfers in Attachment E to the Monterey Settlement Agreement, the decision's rationale supports similar conclusions for each of those transfers.

B. In *Sierra Club v. City of Santa Clarita (* LASC Case No. BS098722), the trial court rejected Sierra Club's challenge to the EIR for the Riverpark development in Santa Clarita (Attachment 17). In the trial court's August 14, 2006 Statement of Decision, it concluded that substantial evidence supported the City's conclusion that the Kern-Castaic Transfer was final, permanent and not subject to rescission.

C. In *California Water Impact Network v. Castaic Lake Water Agency* (LASC Case No. BS 103295), the trial court rejected CWIN's and Friend's challenge to CLWA's 2005 Urban Water Management Plan (Attachment 18). In its August 3, 2007 Statement of Decision, the trial

4-2 (con't.)

court concluded that substantial evidence supported the determination that "the Kern-Castaic Transfer remains a valid and reliable water source" (Attachment 17, p. 12-13). The trial court identified this evidence as including (1) the Kern-Castaic Transfer was completed in 1999, and DWR has allocated and annually delivered the water in accordance with the completed transfer; (2) the Court of Appeal held that the only defect in the 1999 EIR was that it tiered from the Monterey Agreement EIR, which was later decertified (*Friends I, supra,* 95 Cal. App. 4th at p. 1387); (3) the defect has been remedied by the preparation of a revised EIR that did not tier from the Monterey Agreement EIR; (4) the Monterey Amendments settlement agreement expressly authorizes the operation of the SWP in accordance with the Monterey Amendments, which facilitated the Kern-Castaic Transfer; (5) the Court of Appeal refused to enjoin the Kern-Castaic Transfer, and instead required preparation of a revised EIR; and (6) the Kern-Castaic Transfer contracts remain in full force and effect, and no court has ever questioned their validity or enjoined the use of this portion of CLWA's SWP Table A Amount (*Ibid.*).

D. In *Santa Clarita Oak Conservancy v. City of Santa Clarita* (LASC Case No. BS 084677), environmental groups challenged a return EIR for the Gate-King Industrial Park Project. In its Statement of Decision, the trial court upheld the sufficiency of the return EIR, and determined that substantial evidence supported the City's conclusion that the Kern-Castaic Transfer was permanent and would continue to exist with or without the Monterey Amendment (Attachment 19). It identified this evidence as including (1) the 41,000 AFY Kern-Castaic Transfer being completed and implemented in 1999, (2) CLWA paying approximately $47 million for the additional SWP Table A Amount, (3) these monies having been delivered, and the sales prices having been financed through CLWA by tax-exempt certificates of participation, (4) DWR having increased CLWA's SWP Table A Amount and delivered or made available to CLWA the 95,200 AFY (which includes the 41,000 AFY transfer amount) because it was a permanent transfer/reallocation of SWP Table A Amount between SWP contractors, (5) DWR listing the 41,000 AFY as part of CLWA's allocation in its published Notices to State Water Project Contractors, (6) DWR treating the transfer as permanent and final, (7) DWR not objecting to CLWA preparing its own EIR for the Kern-Castaic Transfer, and (8) DWR expressly allocating the 41,000 AFY as part of CLWA's annual SWP Table A Amount in DWR's 2005 SWP Delivery Reliability Report (Attachment 18, p. 15-16).

4-2 (con't.)

III. Conclusion

In summary, CLWA notes that it supported implementation of the Monterey Amendment in 1996, and that it supports its continued implementation into the future. CLWA also commends the Department for having prepared this thorough and significant document. Thank you for the opportunity to comment on the Draft EIR. If you have any questions, please contact me at (661) 513-1239.

4-3

Sincerely,

Dan Masnada
General Manager

Attachments

AGREEMENT TO PURCHASE
WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT
STATE WATER PROJECT ENTITLEMENT TO WATER

WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT, a public entity ("Wheeler Ridge") and **CASTAIC LAKE WATER AGENCY**, a public entity ("Castaic") hereby agree as follows:

ARTICLE 1. DEFINITIONS.

When used in this contract, the following terms shall have the meanings hereinafter set forth:

1.01 "CEQA" means the California Environmental Quality Act, Public Resources Code Section 21000 et seq.

1.02 "Closing Date" means the date within two weeks after the date on which all applicable conditions precedent are completed to Castaic's and Wheeler Ridge's satisfaction or waived.

1.03 "DWR" means the Department of Water Resources, State of California.

1.04 "Effective Date" means the date this Agreement becomes effective which shall occur when it is last executed by both parties.

1.05 "Firm Water" means that State Water Project water designated in Table A of the Kern/State Water Contract to be made available to the Kern County Water Agency by DWR. Wheeler Ridge's allocation of firm water is specified in Table 1 of the Wheeler Ridge/Kern Contract.

1.06 "Incremental Capacity" means capacity beyond reach 10 of the California Aqueduct.

1.07 "Kern/State Water Contract" means the contract between Kern County Water Agency and the State of California dated November 15, 1963 and all amendments thereto.

1.08 "Monterey Agreement" means the agreement between the Department of Water Resources and the State Water Project contractors outlining principles for amendments to the State Water Project contracts as agreed to on December 1, 1994, and as implemented through contract amendments with the SWP Contractors, the amendment to the Kern/State Water Contract being dated December 13, 1995, and the Castaic/State Water Contract being dated December 11, 1996.

1.09 "Purchase Price" means the price to be paid by Castaic for State Water Project Entitlement and capacity in the California Aqueduct in various quantities from the beginning of the California Aqueduct to Reaches 14 through 16 of the California Aqueduct all as set forth in Exhibit A.

The parties agree that the basis of the purchase price is $1000 per acre-foot for the transferred entitlement including conveyance capacity from the beginning of the California Aqueduct through Reach 10 of the California Aqueduct. For Incremental Capacity through Reaches 14, 15 and 16, the parties agree to an incremental charge of $25 per acre-foot per Reach beyond Reach 10. The total unit price for the transferred entitlement by Reach is as follows:

	Unit Price
Reach 14 (Includes 14A, 14B and 14C)	$1100/AF
Reach 15	$1125/AF
Reach 16	$1150/AF

1.10 "Transferred Entitlement" means the entitlement to the delivery of Firm Water from the State Water Project being transferred to Castaic pursuant to this Agreement including rights to delivery capacity in the State Water Project facilities within the California Aqueduct as set forth in Exhibit A.

1.11 "Wheeler Ridge/Kern Contract" means the contract between Wheeler Ridge and Kern County Water Agency dated May 8, 1970, and all amendments thereto.

1.12 "Wheeler Ridge Water Entitlements" means Wheeler Ridge's current entitlements to the delivery of Firm Water from the State Water Project, including Wheeler Ridge's rights to delivery capacity in State Water Project facilities within the California Aqueduct in Reach 14, 15 and 16 as such facilities are described in the Wheeler Ridge/Kern Contract.

ARTICLE 2. GENERAL.

2.01. The Kern County Water Agency ("Kern") and the State of California, acting through DWR, previously entered into the Kern/State Water Contract for the acquisition and delivery of water to Kern.

2.02. Subsequently, Wheeler Ridge and Kern entered into the Wheeler Ridge/Kern Contract for the acquisition and delivery to Wheeler Ridge of a portion of the water delivered to Kern under the Kern/State Water Contract.

2.03. The Wheeler Ridge/Kern Contract gives to Wheeler Ridge a contract entitlement for therein defined Firm Water, to be provided from Kern's State Water Project entitlements. Wheeler Ridge currently has a Firm Water entitlement of 238,088 acre feet per annum.

2.04. The Wheeler Ridge/Kern Contract in Articles 25 and 28 thereof provides for assignment by Wheeler Ridge of all or a portion of its Firm Water to successors and assigns of Wheeler Ridge subject to approval of such assignment by Kern, which shall not be arbitrarily, capriciously or unreasonably refused, and Article 31

as amended December 13, 1995, specifically provides for permanent transfers of contract entitlement, subject to certain procedures therein specified.

2.05. Kern has agreed as a condition of the Monterey Agreement to facilitate the transfer of up to 130,000 acre feet of its member units State Water Project entitlement to out of County entities.

2.06. Wheeler Ridge has entered into water service contracts with various of its landowners providing for delivery of water made available under the Wheeler Ridge/Kern Contract, and various landowners which have entered into such Water Service Contracts with Wheeler Ridge wish to forego the right to use and permanently relinquish all or a part of the entitlement available under such Water Service Contracts.

2.07. Castaic desires to acquire, and Wheeler Ridge desires to sell, in perpetuity, a portion of the Wheeler Ridge Water Entitlements, in the quantity specified in Article 3.01 of this Agreement.

2.08. Wheeler Ridge has reviewed and approved as a responsible agency, the environmental document for its action contemplated in this Agreement, in compliance with CEQA, which through approval of that certain "Final Environmental Impact Statement – Transfer of State Water Project entitlement from Belridge Water Storage District, Lost Hills Water District, and Wheeler Ridge-Maricopa Water Storage District." (SCH#98021041) on June 23, 1998, has been completed. Castaic has reviewed and certified as a lead agency the environmental document for its action contemplated in this Agreement in compliance with CEQA, which through approval of that certain "Final Environmental Impact Report – Castaic Lake Water Agency – Supplemental State Water Project Entitlement" (SCH #98041127) on March 29, 1999, has been completed. This transaction is proceeding on the express and mutual assumption and understanding of the parties hereto that both parties have complied with environmental review obligations as required by law and that all other parties having such obligations have likewise complied with law, or will do so before the

closing date. In the event either or both of the parties are determined not to have complied, then each party shall take all necessary steps to promptly produce environmental documents which are in compliance with law.

2.09. This transaction is proceeding on the express and mutual assumption and understanding of the parties hereto that all rights of first refusal of third parties pursuant to the Monterey Agreement have been waived or not exercised by the respective parties holding such rights, and that any such rights of first refusal within Wheeler Ridge have been waived or not exercised.

ARTICLE 3. PURCHASE AND PAYMENT TERMS.

3.01. Purchase and Sale. At the closing, and upon satisfaction or waiver of all conditions to its performance, Wheeler Ridge hereby sells to Castaic and Castaic acquires, in perpetuity, 41,000 acre feet per annum of Wheeler Ridge Water Entitlements at the Purchase Price.

3.02. Payment. Payment of the Purchase Price shall be made as follows:.

Castaic shall, upon approval of the Wheeler Ridge Water Entitlements transfer by the Department of Water Resources and Kern County Water Agency, and to the reasonable satisfaction of Castaic, pay the Purchase Price to Wheeler Ridge, upon execution of transfer documentation to the reasonable satisfaction of Castaic.

3.03 Additional Payment for 1999 Water Charges and Use of Water.

Castaic shall, upon approval of the Wheeler Ridge Water Entitlement transfer by the Department of Water Resources and Kern County Water agency, pay to Wheeler Ridge the 1999 State Water Project obligation associated with the Transferred Entitlement as set forth in Exhibit B. Said payment shall include the Delta Water charge, Transportation Capital and OMP&R charges and the Water Revenue Bond Surcharge as charged to the Kern County Water Agency by the Department of Water Resources for the Transferred Entitlement. During 1999,

Wheeler Ridge shall have full use of the 41,000 acre-feet of Transferred Entitlement.

3.04 Future Annual SWP Costs of Transferred Entitlement. All costs associated with the Transferred Entitlement shall be assumed by and paid by Castaic commencing January 1, 2000.

DWR and KCWA will be requested to make the appropriate adjustments in components of the "proportionate use factors" used to calculate cost shares of SWP transportation facilities, consistent with this Agreement, to assure the cost allocation intent of this Agreement is implemented.

In conjunction with the transfer of 41,000 acre-feet of SWP entitlement, Castaic will be transferred a proportionate share of Wheeler Ridge's share of capacity through Reach 13 of the California Aqueduct. The shares of capacity in Reaches 14 through 16 are set forth in Exhibit A.

ARTICLE 4. DWR COMPLIANCE

4.01. Transfer. The Transfer contemplated by this Agreement shall be subject to all of the terms and conditions contained in Article 53 of the December 13, 1995, Amendment 17 of the Water Supply Contract between the State of California Department of Water Resources and Kern. The parties hereto shall execute such documents and assume such obligations as specified therein with respect to this transfer. Castaic shall assume a proportionate share of the Annual obligations of Wheeler Ridge specified in Article 15 of the Wheeler Ridge/Kern Contract based on the proportion that the Wheeler Ridge Water Entitlements transferred under the Wheeler Ridge/Kern Contract, including a proportional share of the fixed State Water Project costs, as described in Article 3.04.

4.02. Point of Delivery. The points of delivery of the transferred Wheeler Ridge Water Entitlements shall be from Reaches 14, 15 and 16 of the California Aqueduct as shown in Exhibit A and Castaic shall bear all costs of delivery to the Castaic

Service Area. Actual physical delivery of water will be subject to schedules approved by DWR.

ARTICLE 5. CONDITIONS PRECEDENT

5.01 Castaic Conditions Precedent. Castaic's obligation to purchase hereunder is subject to satisfaction or express written waiver by Castaic of each of the following conditions precedent. Failure of any of the following conditions to be met to the satisfaction of or waived by Castaic shall entitle Castaic to terminate this Agreement. Castaic shall timely communicate such failure to Wheeler Ridge. The following conditions precedent apply:

(a) Final written approval of Kern County Water Agency of the transfer of Wheeler Ridge Water Entitlements as contemplated herein, which shall be deemed evidenced by execution of the Wheeler Ridge/Kern contract as attached hereto as Exhibit C hereof;

(b) Final written approval of DWR to the transfer of Wheeler Ridge Water Entitlements as contemplated herein, including written assurance by DWR that the water which is the subject of this transfer will continue to be delivered into the California Aqueduct, up to the delivery points of Castaic, which shall be deemed evidenced by DWR execution of the Kern/State Water Contract and the Castaic/State Water Contract amendments as attached hereto in Exhibits D and E hereof;

(c) Execution and implementation of all necessary contract amendments and cancellations by owners of land within Wheeler Ridge representing Contract Amounts of Water of 41,000 acre-feet for the water transfer hereunder;

(d) Execution of amendments consistent with the terms of this Agreement of the Wheeler Ridge/Kern Contract, the Kern/State Water Contract and the Castaic/State Water Contract;

(e) There are no material, adverse changes to the representations and warranties made by Wheeler Ridge in Article 8.02;

(f) Delivery by Wheeler Ridge of an opinion of its legal counsel addressed to Castaic that this Agreement has been duly authorized, executed and delivered by Wheeler Ridge and constitutes the valid and binding obligation of Wheeler Ridge enforceable against Wheeler Ridge in accordance with its terms, subject to the effect of any bankruptcy, insolvency, reorganization, moratorium or other laws or judicial decisions affecting the enforcement of creditors' right generally, including but not limited to the effect of statutory and other laws or judicial decisions regarding fraudulent conveyances or transfers and preferential transfers and that presently there is no litigation in which Wheeler Ridge is a party which in any way affects Wheeler Ridge's ability to complete the transfer of the Transferred Entitlement.

5.02 Wheeler Ridge Conditions Precedent. Wheeler Ridge's obligation to sell hereunder is subject to satisfaction or express written waiver by Wheeler Ridge of each of the following conditions precedent. Failure of any of the following conditions to be satisfied or waived by Wheeler Ridge shall entitle Wheeler Ridge to terminate this Agreement. Wheeler Ridge shall timely communicate such failure to Castaic. The following conditions precedent apply:

(a) Documentation by Castaic of its financial ability to meet the payment obligations under the terms of this agreement;

(b) Payment of the sum(s) by Castaic herein provided;

(c) Final written approval of Kern County Water Agency of the transfer of Wheeler Ridge Water Entitlements as contemplated herein;

(d) Final written approval of DWR to the transfer of Wheeler Ridge Water Entitlements as contemplated herein, including written assurance by DWR

that the water which is the subject of this transfer will continue to be delivered into the California Aqueduct, up to the delivery points of Castaic;

(e) Execution and implementation of all necessary contract amendments and cancellations by owners of land within Wheeler Ridge representing Contract Amounts of Water of 41,000 acre-feet for the water transfer hereunder;

(f) Execution of amendments consistent with the terms of this Agreement of the Wheeler Ridge/Kern Contract, the Kern/State Water Contract and the Castaic/State Water Contract; and

(g) There are no material, adverse changes to the representations and warranties made by Castaic in Article 8.02.

ARTICLE 6. COSTS.

All costs associated with the environmental review of the action contemplated in this Agreement shall be allocated between the parties as follows:

(a) All costs associated with the review of the contemplated action within Wheeler Ridge or Kern County, including the costs of any lawsuit brought by any interest challenging Wheeler Ridge's Environmental Review, shall be borne by Wheeler Ridge.

(b) All costs associated with the review of the environmental impacts of the contemplated action within Castaic, including the costs of any lawsuit brought by any interest challenging Castaic's Environmental Review, and impacts associated with conveyance of water to Castaic shall be borne by Castaic; and

(c) In the event that any costs do not reasonably fall within categories (a) or (b) of this paragraph, then Wheeler Ridge and Castaic shall share such

costs equally. In the event that the parties cannot agree how to allocate such costs, they shall submit the issue to an impartial arbitrator agreed to by both parties. The decision of the arbitrator as to the allocation of costs shall be final, non-appealable and binding on the parties.

ARTICLE 7. CLOSING COVENANTS

7.01. Concurrent with Close of the sale, the following shall be accomplished:

(a) Wheeler Ridge shall obtain execution of all necessary contract amendments and cancellations by owners of land within Wheeler Ridge representing Contract Amounts of Water of 41,000 acre-feet for the water transfer hereunder pursuant to Article 5.01(c), and as further described in Article 5.02(e) wherein said landowners shall waive any and all claims to the Wheeler Ridge Water Entitlements herein described or to any water rights resulting therefrom, and shall covenant not to initiate any legal action as to any use or entitlement; and

(b) Castaic shall pay or cause to be paid to Wheeler Ridge the purchase price.

7.02. In no event shall the sale close later than April 1, 1999, and if not closed by that date, this Agreement shall terminate.

ARTICLE 8. MISCELLANEOUS.

8.01. As-Is. Subject to the representations and warranties set forth in Article 8.02, Castaic represents and warrants that Castaic is purchasing the Wheeler Ridge Water Entitlements, "As-Is", with respect to the quality of the water transferred under this Agreement and the physical availability of water arising from political, environmental, climatological, physical condition of the aqueduct, and hydrologic conditions.

8.02. Representations and Warranties. The parties, as indicated hereinbelow, hereto represent and warrant that as of the date of this Agreement and as of the date of transfer:

(a) Wheeler Ridge represents and warrants that it is the legal owner of the Wheeler Ridge Water Entitlements with full authority to transfer such entitlements;

(b) Wheeler Ridge represents and warrants that its entry into this Agreement does not create or result in the breach of any other agreement to which Wheeler Ridge is a party or to which Wheeler Ridge is otherwise subject or bound; Castaic represents and warrants that its entry into this Agreement does not create or result in the breach of any other agreement to which Castaic is a party or to which Castaic is otherwise subject or bound;

(c) Wheeler Ridge represents and warrants that title to the Wheeler Ridge Water Entitlements is held free and clear of any liens, encumbrances, or rights of any other party, other than obligations of the State Water Project and obligations to bond holders related to construction of its distribution system which will be fully funded and paid through funds provided to Wheeler-Ridge upon closing, and Wheeler Ridge shall maintain the Wheeler Ridge Water Entitlements free and clear of any such claims and assume full responsibility therefor;

(d) Wheeler Ridge represents and warrants that the execution and delivery of this Agreement by Wheeler Ridge has been validly authorized by all requisite action on the part of Wheeler Ridge; Castaic represents and warrants that the execution and delivery of this Agreement by Castaic has been validly authorized by all requisite action on the part of Castaic;

(e) Wheeler Ridge represents and warrants that other than *Planning and Conservation League v. Department of Water Resources, et al.*, Sacramento County Superior Court Case No. 95 CS 03216, there currently

breach of or default under any applicable law or administrative rule or regulation of the State, or of any department, division, agency or instrumentality thereof, or under any applicable court or administrative decree or order, or under any loan agreement, note, bond, resolution, indenture, contract, agreement or other instrument to which Wheeler Ridge is a party or is otherwise subject or bound; Castaic represents and warrants that compliance by Castaic with the provisions of this Agreement will not conflict with or constitute a breach of or default under any applicable law or administrative rule or regulation of the State, or of any department, division, agency or instrumentality thereof, or under any applicable court or administrative decree or order, or under any loan agreement, note, bond, resolution, indenture, contract, agreement or other instrument to which Castaic is a party or is otherwise subject or bound.

8.03. Covenants. Wheeler Ridge and Castaic covenant and agree as follows:

(a) The representations and warranties included or provided for in this Agreement or in any Schedule or certificate or other document delivered pursuant to this Agreement shall survive the Closing Date for a period of twenty (20) years, or such shorter period as may be required by law.

(b) The parties shall cooperate with each other, and, will from time to time, execute, acknowledge and deliver, or cause to be executed, acknowledged and delivered, such further instruments, including documents of transfer, certifications and opinions as may reasonably be required for carrying out the intention of or facilitating the performance of this Agreement and as will facilitate Castaic's issuance of any notes, bonds, or other obligations to finance payment of the Purchase Price.

8.04. Finders. Castaic and Wheeler Ridge represent to each other that neither has dealt with any finder, agent, broker or person with respect to this transaction and no other finder, agent, broker or other person is entitled to the payment of a fee, commission or other compensation with respect thereto. Wheeler Ridge hereby agrees to indemnify and hold Castaic harmless from all loss and liability

including, without limitation, costs and attorneys' fees in the event any claim is made which is contrary to such representation. Castaic hereby agrees to indemnify and hold Wheeler Ridge harmless from all loss and liability including, without limitation, costs and attorneys' fees in the event any claim is made which is contrary to such representation.

8.05. Interpretation. This Agreement has been executed in California and California law shall apply to this Agreement. The captions of paragraphs used in this Agreement are for convenience only. The provisions hereof shall be binding upon and inure to the benefit of the successors and assigns of Wheeler Ridge and Castaic. Any amendment or modification of this Agreement must be in writing, signed by Wheeler Ridge and Castaic. This Agreement contains the entire agreement of the parties hereto and supersedes any prior written or oral agreements. All oral or written representations, agreements, arrangements or understandings relating to the subject matter are fully expressed herein. The parties agree and acknowledge that this Agreement has been mutually reviewed by counsel for the two parties and that the provisions of Civil Code §1654 shall not apply to the interpretation of this Agreement.

8.06 Time of Essence. Time is of the essence of this Agreement.

8.07. Attorneys' Fees. In the event any party to this Agreement brings any legal or equitable proceedings for enforcement of any of the terms or conditions of this Agreement, or any alleged disputes, breaches, defaults or misrepresentations in connection with any provision of this Agreement, the prevailing party in such action, or the nondismissing party where the dismissal occurs other than by reason of a settlement, shall be entitled to recover its reasonable costs and expenses, including, without limitation, reasonable attorneys' fees and costs of defense paid or incurred in good faith. The "prevailing party," for purposes of this Agreement, shall be deemed to be that party who obtains substantially the result sought, whether by settlement, dismissal or judgment or as determined by the court, arbitrator or mediator to whom the dispute is submitted.

8.08. Additional Documents. From time to time, each party shall execute and deliver such instruments of transfer and other documents as may be reasonably required to carry out the purpose and intent of this Agreement.

8.09. Assignment. This Agreement may be assigned by Castaic upon written consent of Wheeler Ridge.

8.10. Dependency and Survival of Provisions. The respective warranties, representations, covenants, agreements, obligations and undertakings of each party hereunder shall be construed as dependent upon and given in consideration of those of the other party and shall survive the completion of the transfer for the period prescribed in Section 8.03(a). No waiver by either party on any provision hereto shall be deemed a waiver of any other provision hereof or of any subsequent breach by either party of the same or any other provision.

8.11. Notices. All notices, approvals, consents or other documents required or permitted under this Agreement shall be in writing, and, except as otherwise provided herein, shall be effective upon personal delivery or three (3) days after deposit in the United States mails, registered and not certified mail, with first-class postage fully prepaid, addressed as follows:

Wheeler Ridge: Wheeler Ridge-Maricopa Water Storage District
P. O. Box 9429
Bakersfield, CA 93389-9429
Attention: Engineer-Manager

With a copy to: Ernest A. Conant, Esq.
The Law Offices of Young Wooldridge
1800 30th Street, 4th Floor
Bakersfield, CA 93301

Castaic Lake:	Castaic Lake Water Agency 27234 Bouquet Canyon Road Santa Clarita, CA 91350 Attention: General Manager
With a copy to:	Robert H. Clark, Esq. 27066 Jarana Court Valencia, CA 91354-2231

or to such other addresses as either party shall, from time to time, specify in the manner provided herein.

8.12. Venue. The parties agree that, in any action to interpret or enforce this Agreement, venue shall be improper in the counties of Kern or Los Angeles.

8.13. Counterparts. This Agreement may be executed in one or more counterparts, each of which shall be deemed as original, but all of which together shall constitute one and the same Agreement

IN WITNESS WHEREOF, Wheeler Ridge and Castaic, by execution of counterparts hereof, have approved this Agreement. This Agreement shall become effective upon its execution by Wheeler Ridge and Castaic.

Dated: March 31, 1999

WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT

By: _____
Its President, Board of Directors

By: _____
Its Secretary, Board of Directors

CASTAIC LAKE WATER AGENCY

By: _____
Its President, Board of Directors

By: _____
Its Secretary, Board of Directors
Asst

EXHIBIT "A"
WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT
STATE WATER PROJECT ENTITLEMENT TO WATER

California Aqueduct Reach	Current Wheeler Ridge-Maricopa Entitlement To and Through Reach Acre-Feet	Current Wheeler Ridge-Maricopa Capacity In Reach (cfs)	Transferred Entitlement To and Through Reach (Ac. Ft.)	Transferred Entitlement In Reach (Ac. Ft.)	Transferred Capacity in Reach (cfs)	Unit Price ($/AF)	Purchase Price
14A	238,088	699.0	41,000	16,317	120.4	1100	17,948,700
14B	197,988	619.0	24,683	12,519	77.2	1100	13,770,900
14C	113,188	424.0	12,164	2,617	45.6	1100	2,878,700
15A	80,788	320.0	9,547	3,571	37.8	1125	4,017,375
16A	40,624	168.0	5,976	5,976	24.7	1150	6,872,400
Total				41,000			45,488,075

c\wrm\docs\Agreement to Purchase WRM - Castaic Exh A

EXHIBIT "A"

EXHIBIT B

Castaic Lake Water Agency
Obligation for 1999 Water Costs

Reach	Delta Water Charge	Transportation Charge: Capital Component	Transportation Charge: Minimum OMP&R Component	Water Revenue Bond Surcharge	Total
14A	$ 386,000	$176,700	$ 204,900	$106,000	$873,600
14B	296,200	147,200	161,700	84,700	689,800
14C	61,900	29,500	34,500	17,300	143,200
15	84,500	44,700	62,100	26,900	218,200
16	141,400	113,600	114,800	48,900	418,700
Total	**$ 970,000**	**$511,700**	**$578,000**	**$ 283,800**	**$2,343,500**

LETTER 4

TABLE 1
WHITEWATER RIDGE-MARICOPA WATER STORAGE DISTRICT

Entitlements for deliveries from the California Aqueduct in thousands of acre-feet

Year	Reach 14A* Contract Entitlement	Reach 14A* Surplus	Reach 14A* Total	Reach 14B* Contract Entitlement	Reach 14B* Surplus	Reach 14B* Total	Reach 14C* Contract Entitlement	Reach 14C* Surplus	Reach 14C* Total	Reach 15* Contract Entitlement	Reach 15* Surplus	Reach 15* Total	Reach 16* Contract Entitlement	Reach 16* Surplus	Reach 16* Total	(1) TOTAL ENTITLEMENTS Total Contract Entitlement	(2) TOTAL ENTITLEMENTS Surplus	(3) TOTAL ENTITLEMENTS Former Table 1 Entitlement (Col 1+2)	(4) Annual Obligation In % of Total State Charges
1964	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1965	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1966	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1967	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1968	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1969	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1970	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
1971	2 100	6 000	8 100	4 700	13 100	17 800	2 300	6,200	8 500	0 900	2,400	3,300	-	0 100	0 100	10 000	27 800	37 800	10 8713
1972	6 600	5 500	12 100	14 600	11 800	26 400	7 000	5,700	12,700	14 800	12 900	26,900	1 100	1,000	2 100	44 100	36 100	80 200	17 1610
1973	8 600	8 200	16,800	18 000	17 300	35 300	8 700	8 300	17 000	18 500	17,700	36 200	1 400	1 400	2 800	55 200	52 900	108 100	20,7593
1974	11 700	22 000	33 700	15 500	30 400	46 100	7 400	14 500	21 900	13 700	31,100	45 800	1,200	2 400	3,600	51,000	100 600	151 600	26,5376
1975	12 300	22 500	34 800	16 400	33 200	51 600	9,400	16 800	26 200	17,100	34,000	48 100	1,200	2,400	3 600	58 400	105,900	164 300	27 1810
1976	14 300	22 700	37 000	22 800	35 600	58 400	10 900	17 000	27,900	19 900	31,200	51,100	1 500	2,400	3,900	69,400	106 900	176 300	28 6431
1977	16 500	22 000	38 500	26 100	34 600	60 700	12 600	16 500	29,100	22 900	30,300	53,200	3 900	6 100	8,900	81 900	108 500	190 400	25 8870
1978	17 300	20 100	37 400	27 300	31 800	59 100	15 100	17 600	32 700	24 000	27 800	51 800	10 700	12 400	23 100	94 400	109 700	204 100	23 9768
1979	19 200	19 900	39,100	30 400	31 300	61 700	16 700	17 400	34,100	26 500	29 400	57 900	11,800	12 300	24,100	108 500	110,300	218 900	23 4767
1980	21,000	19 200	40 200	34 200	33 800	68 200	18 400	16 700	35 100	31,200	28,300	58 500	12,900	11,800	24 800	119 700	108 100	228 800	23 8326
1981	23 200	18 400	41 600	42 500	33 600	76 100	20 300	16 100	36 400	34 400	27,200	61,600	14,400	11 300	25,700	134,800	106 600	241 400	23 0521
1982	24 100	16 900	41 000	46 900	32 800	79,700	21 100	14,800	35,900	35 700	25 000	60,700	26 900	14,700	35 600	148,700	104 200	252 900	22 7347
1983	26 800	15 200	41 800	54 100	31,200	85,300	23,200	13,300	36 500	39 300	22 600	61,800	23 100	13 200	36 300	166 300	93 400	261 700	23 3158
1984	27 900	14 000	41,900	56 700	28,700	85 400	24 300	12 200	36 500	41,100	20 800	61,900	31,000	15 600	46 600	181 000	91 308	272 308	22 9927
1985	31 900	13 600	45 700	60 600	26 200	86 800	25 900	11,100	37 000	43 900	18 900	62 800	33 400	14 300	47,700	195,700	84 300	280 000	23 6998
1986	33 700	12 300	45 500	65 700	24 300	90 000	26 800	10 000	36 800	45 700	16,800	62 500	39 200	14,400	53,600	210 800	77 800	288 400	23 7085
1987	35 400	10 700	46 100	71 100	21 500	92 600	28 700	8 800	37 300	48,700	14 700	63 400	42 500	12,700	55 200	226,400	68 200	294 600	23 7092
1988	37 200	8 900	46 100	78 600	18 900	97,500	30 100	7,200	37 300	51,200	12 100	63,300	35,165	8 376	43 541	232 265	55 476	287 741	21,9637
1989	38 500	7 400	45 900	81 500	15 800	97 300	31 200	6 000	37 200	52 800	10,300	63 100	38,840	7 577	46,417	242 840	47 077	289 917	22 0568
1990	40 100	6 000	46 100	84 800	12 800	97 600	32 400	4 900	37,300	55 000	8 300	63 300	40 624	5 146	46 770	252 924	38 146	291 070	21 4784
1991	40 100	6 000	46 100	84 800	12 800	97 600	32 400	4 900	37 300	55 000	8 300	63 300	40 624	5 146	46 770	252 924	38 146	291 070	22 3761
1992	40 100	6 000	46 100	84 800	12 800	97 600	32 400	4 900	37,300	55 000	8 300	63,300	40 624	5 146	46 770	252,924	38 146	291 070	22 3761
1993	40 100	6 000	46 100	84 800	12 800	97 600	32 400	4 900	37,300	55 000	8,300	63 300	40 624	5 146	46,770	252 924	38 146	291 070	22 3761
1994	40 100	6 000	46 100	84 800	12 800	97 600	32 400	4 900	37 300	55 000	8 300	63 300	40 624	5 146	46,770	252 924	38 146	291 070	22 3761
1995	40 100	6 000	46 100	84 800	12 800	97 600	32 400	4 900	37,300	55 000	8,300	63 300	40 624	5 146	46 770	252 924	38 146	291 070	22 3761
1996	40 100	6 000	46 100	84 800	12 800	97 600	32 400	4 900	37 300	40 164	6 061	46 225	40 624	5 146	46,770	238,088	35 907	273 995	21 0198
1997	40 100	6 000	46 100	84 800	12 800	97,600	32 400	4 900	37 300	40,164	6,061	46 225	40,624	6 146	46,770	238,088	35 907	273 995	21 0218
1998	40 100	6 000	46,100	84 800	12 800	97 600	32 400	4 900	37,300	40 164	6 061	46 225	40 624	6 146	46,770	238,088	35 907	273 995	21,0197
1999	23 783	4 298	28 081	72 261	12 800	85 081	29,783	4 900	34 683	36 593	6,061	42 654	34 648	6,146	40,794	197 068	34 205	231 293	17 1701
2014	23 783	4 298	28 081	72 261	12 800	85 081	29 783	4,900	34 683	36 593	6 061	42 654	34,648	6 146	40,794	197 068	34 205	231 293	17 1701
2015	23 783	4 298	28 081	72 261	12 800	85 081	29 783	4,900	34,683	36 593	6 061	42 654	34,648	6 146	40,794	197,068	34 205	231 293	17 2408
2016	23 783	4 298	28 081	72 261	12,800	85 081	29 783	4 900	34 683	36 593	6 061	42 654	34 648	6 146	40,794	197,068	34 205	231 293	17 3178
2017	23 783	4 298	28 081	72 261	12 800	85 081	29 783	4 900	34 683	36 593	6 061	42 654	34 648	6 146	40,794	197,068	34 205	231 293	17 4011
2018	23 783	4 298	28 081	72 261	12 800	85 081	29 783	4 900	34 683	36 593	6 061	42 654	34 648	6 146	40,794	197 068	34 205	231 293	17 4737
2019	23 783	4 298	28 081	72 261	12 800	85 081	29 783	4 900	34 683	36 593	6 061	42 654	34 648	6 146	40 794	197 068	34,205	231 293	17 5000
2020	23 783	4 298	28 081	72 261	12 800	85 081	29 783	4 900	34 683	36,593	6 061	42,654	34 648	6,146	40 794	197,068	34 205	231 293	18 5202
2021	23 783	4 298	28 081	72 261	12 800	85 081	29 783	4 900	34 683	36,593	6 061	42,654	34 648	6,146	40,794	197 068	34 205	231 293	18 5322
2022	23 783	4 298	28 081	72 261	12 800	85 081	29 783	4 900	34 683	36 593	6 061	42,654	34 648	6,146	40,794	197,068	34 205	231 293	18 5364
2023	23 783	4 298	28 081	72 261	12 800	85 081	29 783	4 900	34 683	36 593	6 061	42 654	34,648	6 146	40,794	197,068	34 205	231 293	18 5364
2024	23 783	4 298	28 081	72 261	12 800	85 081	29 783	4 900	34 683	36 593	6 061	42 654	34 648	6 146	40 794	197,068	34 205	231 293	18 5397
2025	23 783	4 298	28 081	72 261	12 800	85 081	29 783	4,900	34 683	36 593	6 061	42 654	34 648	6 146	40 794	197 068	34,205	231 293	18 5439
2026	23 783	4 298	28 081	72 261	12 800	85 081	29 783	4 900	34 683	36 593	6 061	42,654	34 648	6 146	40,794	197,068	34 205	231 293	18 5447
2027-2039	23 783	4 298	28 081	72 261	12 800	85 081	29 783	4 900	34 683	36 593	6 061	42,654	34,648	6 146	40 794	197,068	34 205	231 293	18 5455

* As designated in Bulletin 132 85

1 Per Contract WWRWSD (Table 1, Amd 8)

Revised 03/1/90 to match WWRWSD as of 01/31/90 (Table A)

001175

041723

2/25/99 Kern County Water Agency State Contract Administration

Adjustment of Capacity for Entitlement Transfers

A. Original Contract Capacity - Wheeler Ridge-Maricopa WSD

(1) Reach	(2) Contract Firm Entitlement (AF)	(3) Maximum Annual Delivery (AF)	(4) Mainline Monthly Delivery (AF)	(5) Mainline Capacity (CFS)	(6) Excess Capacity (CFS)	(7) Total Capacity (CFS)	(8) Maximum Monthly Delivery (AF)	(9) Mainline (1) Monthly Peaking (%)	(10) Total Monthly Peaking (%)
13B	-	263,200	47,358	785	-	785	47,360	17.99%	17.99%
14A	40,100	263,200	46,633	773	-	773	46,635	17.72%	17.72%
14B	84,800	223,100	40,178	666	32	698	42,110	18.01%	18.87%
14C	32,400	138,300	24,915	413	104	517	31,190	18.02%	22.55%
15	55,000	105,900	19,063	316	104	420	25,340	18.00%	23.93%
16	50,900	50,900	9,170	152	59	211	12,730	18.02%	25.01%
	263,200								

B. Transfer to Improvement District No. 4 (11,830 AF in Reach 16)
WRMWSD Amendment #2

(1) Reach	(2) Contract Firm Entitlement (AF)	(3) Maximum Annual Delivery (AF)	(4) Mainline Monthly Delivery (AF)	(5) Mainline Capacity (CFS)	(6) Excess (3) Capacity (CFS)	(7) Total Capacity (CFS)	(8) Maximum Monthly Delivery (AF)	(9) Mainline (1) Monthly Peaking (%)	(10) Total Monthly Peaking (%)
13B	-	11,830	2,129	35	-	35	2,129	17.99%	17.99%
14A	-	11,830	2,096	35	-	35	2,098	17.72%	17.72%
14B	-	11,830	2,130	35	2	37	2,251	18.01%	18.87%
14C	-	11,830	2,131	35	9	44	2,674	18.02%	22.55%
15	-	11,830	2,130	35	12	47	2,853	18.00%	23.93%
16	11,830	11,830	2,131	35	14	49	2,975	18.02%	25.01%
	11,830								

C. Remaining Capacity After Transfer to Improvement District No. 4 (11,830 AF in Reach 16)
WRMWSD Amendment #2

(1) Reach	(2) Contract Firm Entitlement (AF)	(3) Maximum Annual Delivery (AF)	(4) Mainline Monthly Delivery (AF)	(5) Mainline Capacity (CFS)	(6) Excess (3) Capacity (CFS)	(7) Total Capacity (CFS)	(8) Maximum Monthly Delivery (AF)	(9) Mainline (1) Monthly Peaking (%)	(10) Total Monthly Peaking (%)
13B	-	251,370	*45,229*	750	-	750	45,231	17.99%	17.99%
14A	40,100	251,370	*44,537*	738	-	738	44,539	17.72%	17.72%
14B	84,800	211,270	*38,048*	631	30	661	39,859	18.01%	18.87%
14C	32,400	126,470	*22,784*	378	95	473	28,516	18.02%	22.55%
15	55,000	94,070	*16,934*	281	92	373	22,487	18.00%	23.93%
16	39,070	39,070	*7,039*	117	45	162	9,754	18.02%	25.01%
	251,370								

Note: Column 4 was incorrectly shown in WRM Amendment #2 as max monthly delivery (Column 8).
This error was corrected in WRM's Amendment #3.

2/25/99 Kern County Water Agency State Contract Administration

Adjustment of Capacity for Entitlement Transfers

D. Amended Transfer to Improvement District No. 4 (10,276 AF in Reach 16)
This corrects an error originally computed for WRMWSD Amendment #2; fixed in Amendment #3

(1) Reach	(2) Contract Firm Entitlement (AF)	(3) Maximum Annual Delivery (AF)	(4) Mainline Monthly Delivery (AF)	(5) Mainline Capacity (CFS)	(6) Excess Capacity (CFS) (3)	(7) Total Capacity (CFS)	(8) Maximum Monthly Delivery (AF)	(9) Mainline (1) Monthly Peaking (%)	(10) Total Monthly Peaking (%)
13B	-	10,276	1,849	31	-	31	1,849	17.99%	17.99%
14A	-	10,276	1,821	30	-	30	1,821	17.72%	17.72%
14B	-	10,276	1,851	31	1	32	1,940	18.01%	18.87%
14C	-	10,276	1,851	31	8	38	2,317	18.02%	22.55%
15	-	10,276	1,850	31	10	41	2,459	18.00%	23.93%
16	10,276	10,276	1,851	31	12	43	2,570	18.02%	25.01%
	10,276								

E. Remaining Capacity After Amended Transfer to Improvement District No. 4 (10,276 AF in Reach 16)
This corrects an error originally computed for WRMWSD Amendment #2; fixed in Amendment #3

(1) Reach	(2) Contract Firm Entitlement (AF)	(3) Maximum Annual Delivery (AF)	(4) Mainline Monthly Delivery (AF)	(5) Mainline Capacity (CFS)	(6) Excess Capacity (CFS) (3)	(7) Total Capacity (CFS)	(8) Maximum Monthly Delivery (AF)	(9) Mainline (1) Monthly Peaking (%)	(10) Total Monthly Peaking (%)
13B	-	252,924	45,509	754	-	754	45,511	17.99%	17.99%
14A	40,100	252,924	44,812	743	-	743	44,814	17.72%	17.72%
14B	84,800	212,824	38,327	635	31	666	40,171	18.01%	18.87%
14C	32,400	128,024	23,064	382	96	479	28,873	18.02%	22.55%
15	55,000	95,624	17,214	285	94	379	22,882	18.00%	23.93%
16	40,624	40,624	7,318	121	47	168	10,160	18.02%	25.01%
	252,924								

F. Transfer to Tejon-Castac WD (4,021 AF in Reach 15)
WRMWSD Amendment #3

(1) Reach	(2) Contract Firm Entitlement (AF)	(3) Maximum Annual Delivery (AF)	(4) Mainline Monthly Delivery (AF)	(5) Mainline Capacity (CFS)	(6) Excess Capacity (CFS)	(7) Total Capacity (CFS)	(8) Maximum Monthly Delivery (AF)	(9) Mainline (1) Monthly Peaking (%)	(10) Total Monthly Peaking (%)
13B	-	4,021	723	12	-	12	723	17.99%	17.99%
14A	-	4,021	712	12	-	12	712	17.72%	17.72%
14B	-	4,021	724	12	1	13	759	18.01%	18.87%
14C	-	4,021	724	12	3	15	907	18.02%	22.55%
15	4,021	4,021	724	12	4	16	961	18.00%	23.93%
16	-	-	-	-	-	-	-	18.02%	25.01%
	4,021								

2/25/99 Kern County Water Agency State Contract Administration

Adjustment of Capacity for Entitlement Transfers

G. Remaining Capacity After Transfer to Tejon-Castac WD (4,021 AF in Reach 15)

WRMWSD Amendment #3

(1) Reach	(2) Contract Firm Entitlement (AF)	(3) Maximum Annual Delivery (AF)	(4) Mainline Monthly Delivery (AF)	(5) Mainline Capacity (CFS)	(6) Excess Capacity (CFS)	(7) Total Capacity (CFS)	(8) Maximum Monthly Delivery (AF)	(9) Mainline (1) Monthly Peaking (%)	(10) Total Monthly Peaking (%)
13B	-	248,903	44,785	742	-	742	44,787	17.99%	17.99%
14A	40,100	248,903	44,100	731	-	731	44,102	17.72%	17.72%
14B	84,800	208,803	37,603	623	30	653	39,412	18.01%	18.87%
14C	32,400	124,003	22,339	370	93	464	27,967	18.02%	22.55%
15	50,979	91,603	16,490	273	90	363	21,919	18.00%	23.93%
16	40,624	40,624	7,318	121	47	168	10,160	18.02%	25.01%
	248,903								

H. Entitlement Relinquished for KWB (10,815 AF in Reach 15)

WRMWSD Amendment #4

(1) Reach	(2) Contract Firm Entitlement (AF)	(3) Maximum Annual Delivery (AF)	(4) Mainline Monthly Delivery (AF)	(5) Mainline Capacity (CFS)	(6) Excess Capacity (CFS)	(7) Total Capacity (CFS)	(8) Maximum Monthly Delivery (AF)	(9) Mainline (1) Monthly Peaking (%)	(10) Total Monthly Peaking (%)
13B	-	10,815	1,946	32	-	32	1,946	17.99%	17.99%
14A	-	10,815	1,916	32	-	32	1,916	17.72%	17.72%
14B	-	10,815	1,948	32	-	32	1,948	18.01%	18.87%
14C	-	10,815	1,948	32	-	32	1,948	18.02%	22.55%
15	10,815	10,815	1,947	32	-	32	1,947	18.00%	23.93%
16	-	-	-	-	-	-	-	18.02%	25.01%
	10,815								

I. Remaining Capacity After Entitlement Relinquished for KWB (10,815 AF in Reach 15)

WRMWSD Amendment #4

(1) Reach	(2) Contract Firm Entitlement (AF)	(3) Maximum Annual Delivery (AF)	(4) Mainline Monthly Delivery (AF)	(5) Mainline Capacity (CFS)	(6) Excess Capacity (CFS)	(7) Total Capacity (CFS)	(8) Maximum Monthly Delivery (AF)	(9) Mainline (1) Monthly Peaking (%)	(10) Total Monthly Peaking (%)
13B	-	238,088	42,839	710	-	710	42,840	17.99%	17.99%
14A	40,100	238,088	42,184	699	-	699	42,186	17.72%	17.72%
14B	84,800	197,988	35,655	591	30	621	37,465	18.01%	18.87%
14C	32,400	113,188	20,391	338	93	431	26,019	18.02%	22.55%
15	40,164	80,788	14,543	241	90	331	19,972	18.00%	23.93%
16	40,624	40,624	7,318	121	47	168	10,160	18.02%	25.01%
	238,088								

Note: WRM Amendment #4 had incorrect capacities and max monthly deliveries. Apparently the error in Amendment #2 caused the error in Amendment #4.

12/29/99 Kern County Water Agency State Contract Administration

Adjustment of Capacity for Entitlement Transfers

J. Amended Contract Capacity - Capacity Exchange with Tejon-Castac WD (3,121 AF)
WRMWSD Amendment #5 (TJCWD water moved out of Reach 15)

(1) Reach	(2) Contract Firm Entitlement (AF)	(3) Maximum Annual Delivery (AF)	(4) Mainline Monthly Delivery (AF)	(5) Mainline Capacity (CFS)	(6) Excess Capacity (CFS)	(7) Total Capacity (CFS)	(8) Maximum Monthly Delivery (AF)	(9) Mainline (1) Monthly Peaking (%)	(10) Total Monthly Peaking (%)
13B	-	3,121	562	9	-	9	562	17.99%	17.99%
14A	-	3,121	553	9	-	9	553	17.72%	17.72%
14B	-	3,121	562	9	1	10	622	18.01%	18.97%
14C	-	3,121	562	9	3	12	743	18.02%	22.55%
15	3,121	3,121	562	9	4	13	803	18.00%	23.93%
16	-		-	-	-	-	-	18.02%	25.01%
	3,121								

K. Amended Contract Capacity - Capacity Exchange with Tejon-Castac WD (3,121 AF)
WRMWSD Amendment #5 (TJCWD water moved to Reach 16)

(1) Reach	(2) Contract Firm Entitlement (AF)	(3) Maximum Annual Delivery (AF)	(4) Mainline Monthly Delivery (AF)	(5) Mainline Capacity (CFS)	(6) Excess Capacity (CFS)	(7) Total Capacity (CFS)	(8) Maximum Monthly Delivery (AF)	(9) Mainline (1) Monthly Peaking (%)	(10) Total Monthly Peaking (%)
13B	-	3,121	562	9	-	9	562	17.99%	17.99%
14A	-	3,121	553	9	-	9	553	17.72%	17.72%
14B	-	3,121	562	9	1	10	622	18.01%	19.94%
14C	-	3,121	562	9	3	12	743	18.02%	23.81%
15	-	3,121	562	9	4	13	803	18.00%	25.73%
16	3,121	3,121	562	9	4	13	780	18.02%	25.01%
	3,121								

L. Remaining Capacity After Capacity Exchange with Tejon-Castac WD (3,121 AF)
WRMWSD Amendment #5

(1) Reach	(2) Contract Firm Entitlement (AF)	(3) Maximum Annual Delivery (AF)	(4) Mainline Monthly Delivery (AF)	(5) Mainline Capacity (CFS)	(6) Excess Capacity (CFS)	(7) Total Capacity (CFS)	(8) Maximum Monthly Delivery (AF)	(9) Mainline (1) Monthly Peaking (%)	(10) Total Monthly Peaking (%)
13B	-	238,088	42,839	710	-	710	42,840	17.99%	17.99%
14A	40,100	238,088	42,184	699	-	699	42,186	17.72%	17.72%
14B	84,800	197,988	35,655	591	30	621	37,465	18.01%	18.92%
14C	32,400	113,188	20,391	338	93	431	26,019	18.02%	22.99%
15	43,285	80,788	14,543	241	90	331	19,972	18.00%	24.72%
16	37,503	37,503	6,756	112	43	155	9,380	18.02%	25.01%
	238,088								

2/25/99 Kern County Water Agency State Contract Administration

Adjustment of Capacity for Entitlement Transfers

M. Transfer to Castaic Lake Water Agency (41,000 AF)
WRMWSD Amendment #6

(1) Reach	(2) Contract Firm Entitlement (AF)	(3) Maximum Annual Delivery (AF)	(4) Mainline Monthly Delivery (AF)	(5) Mainline Capacity (CFS)	(6) Excess Capacity (CFS)	(7) Total Capacity (CFS)	(8) Maximum Monthly Delivery (AF)	(9) Mainline Monthly Peaking (%)	(10) Total Monthly Peaking (%)
13B	-	41,000	7,377	122	-	122	7,377	17.99%	17.99%
14A	16,317	41,000	7,284	120	-	120	7,284	17.72%	17.72%
14B	12,519	24,683	4,445	74	4	77	4,670	18.01%	18.92%
14C	2,617	12,164	2,191	36	10	46	2,796	18.02%	22.99%
15	3,571	9,547	1,719	28	11	39	2,360	18.00%	24.72%
16	5,976	5,976	1,077	18	7	25	1,494	18.02%	25.01%
	41,000								

N. Remaining Capacity After Transfer to Castaic Lake WA (41,000 AF)
WRMWSD Amendment #6

(1) Reach	(2) Contract Firm Entitlement (AF)	(3) Maximum Annual Delivery (AF)	(4) Mainline Monthly Delivery (AF)	(5) Mainline Capacity (CFS)	(6) Excess Capacity (CFS)	(7) Total Capacity (CFS)	(8) Maximum Monthly Delivery (AF)	(9) Mainline Monthly Peaking (%) (1)	(10) Total Monthly Peaking (%)
13B	-	197,088	35,462	588	-	588	35,463	17.99%	17.99%
14A	23,783	197,088	34,919	579	-	579	34,921	17.72%	17.72%
14B	72,281	173,305	31,210	517	26	544	32,794	18.01%	18.92%
14C	29,783	101,024	18,200	302	83	385	23,223	18.02%	22.99%
15	39,714	71,241	12,824	213	79	292	17,612	18.00%	24.72%
16	31,527	31,527	5,680	94	37	131	7,885	18.02%	25.01%
	197,088								

(1) Monthly peaking % = Col 5 / (Col 3 / 60.33 af/mo).
(2) CFS = Col 5 / 60.33 af/mo.
(3) Reduced proportionately to mainline cfs reduction.
(4) Excess capacity retained by WRMWSD.

LETTER 4

[illegible] Maricopa WSD
6A (14A)
Entitlement

Year	TABLE ENTITLEMENT Firm (AF)	Option (AF)	Surplus (AF)	Total (AF)	AGENCY PRICING Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	STATE PRICING Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	MULTIPLIER Total ($1,000)	CONTRACT PERCENT Basic (%)	Option (%)	Total (%)	Joint Support (%)
64																									
65																									
66																									
67																									
68																					2,174.00				
69																					2,851.00				
70																					3,754.00				
71	6 900	1 200	6 000	8 100	8.40	29.60	65.80	93.70	8.30	24.58	8.30	11.57	12.60	16.90	18.10	47.60	14.05	14.06	3.02	5.94	4,564.00	1.4055	0.6458	2.0513	(96.8487)
72	4 800	1 800	5 500	12,100	44.90	38.10	51.20	133.90	9.30	21.17	8.30	11.07	114.80	43.00	14.30	171.90	23.87	23.87	2.60	14.21	3,761.00	1.6640	0.6613	2.3259	22.1059
73	6 100	2 600	8 200	16 800	56.70	48.00	76.30	181.00	9.30	19.20	9.30	10.77	145.10	59.50	20.80	225.40	23.79	23.79	2.54	13.42	6,254.00	2.1261	0.7673	2.8934	19.0983
74	6 200	5 000	22 000	33 200	57.70	86.40	204.00	347.70	9.30	17.00	9.30	10.47	182.80	151.50	82.90	407.20	30.29	30.29	2.88	12.11	6,784.00	3.8665	1.2588	5.1253	13.5505
75	7 100	5 200	22 500	34 800	65.80	88.40	220.50	378.50	9.60	17.00	9.60	10.84	197.00	144.30	84.60	405.90	27.75	27.75	2.87	11.66	7,311.00	3.9682	1.2091	5.1773	6.7504
76	8 600	5,500	22 700	37,000	86.20	94.40	222.50	403.10	9.60	17.10	9.80	10.89	215.20	134.50	72.00	421.70	24.48	24.46	3.17	11.40	8,125.00	3.8003	1.1621	4.9624	4.4107
77	10 700	5 800	22 000	38 500	104.90	99.90	215.60	420.40	9.80	17.22	9.80	10.92	241.70	131.00	73.50	446.20	22.58	22.58	3.34	11.59	8,957.00	3.5803	1.1160	4.6963	5.1822
78	11 700	5 600	20 100	37 400	114.70	106.00	197.00	419.70	9.80	19.28	9.80	11.22	277.20	132.70	68.70	478.60	23.69	23.69	3.42	12.06	10,777.00	2.8913	1.0021	3.8934	12.3067
79	13 300	5 900	19 900	39 100	136.30	113.70	195.00	439.00	9.80	19.27	9.80	11.23	310.20	137.60	78.00	517.80	23.32	23.32	3.52	13.24	11,859.00	2.7817	0.9720	3.7537	15.2162
80	15 000	6 000	19 200	40 200	154.50	115.90	197.80	468.20	10.30	19.32	10.30	11.65	345.30	139.10	64.90	552.30	23.02	23.02	3.59	13.74	12,641.00	2.7862	0.9169	3.7031	15.2272
81	17 000	6 700	18 400	41 600	175.10	119.50	189.50	484.10	10.30	19.27	10.30	11.64	384.00	140.10	66.20	590.30	22.59	22.59	3.60	14.19	13,648.00	2.6730	0.8761	3.5491	17.9909
82	17 900	6 200	16 900	41 000	184.40	119.50	174.10	478.00	10.30	19.27	10.30	11.68	399.70	138.40	61.00	599.10	22.33	22.33	3.61	14.61	14,598.00	2.4578	0.8191	3.2769	20.2137
83	20 300	6 300	15 200	41 800	229.40	121.10	171.80	522.30	11.30	19.22	11.30	12.50	445.20	138.20	54.90	638.30	21.93	21.93	3.61	15.27	15,647.00	2.5632	0.7740	3.3372	18.1733
84	21 600	6 300	14 000	41 900	244.10	121.20	154.20	573.50	11.30	19.24	11.30	12.48	489.20	138.80	50.70	658.70	21.72	21.72	3.62	15.67	16,627.00	2.4194	0.7289	3.1483	20.2832
85	25 000	6 900	13 800	45 700	307.50	131.40	169.70	608.60	12.30	19.05	12.30	13.32	537.80	140.40	49.80	736.00	21.51	21.51	3.61	16.11	17,563.00	2.7171	0.7482	3.4653	17.3098
86	26 400	6 800	12 300	45 500	324.70	126.70	151.30	602.70	12.30	18.83	12.30	13.25	551.50	142.10	39.00	732.60	20.89	20.89	3.17	16.10	18,043.00	2.6384	0.7021	3.3405	17.7314
87	28 500	6,900	10 700	46 100	364.60	128.10	137.00	629.50	12.80	18.56	12.80	13.66	590.00	142.80	33.60	766.40	20.70	20.70	3.14	16.62	18,953.00	2.6467	0.6759	3.3726	17.8105
88	30 300	5 900	9 900	46 100	387.80	128.10	113.90	629.80	12.80	18.58	12.80	13.66	621.80	141.60	27.70	791.10	20.52	20.52	3.11	17.16	19,796.00	2.5337	0.6471	3.1808	20.3893
89	31 800	6 900	7 400	45,900	420.30	127.90	98.40	646.60	13.30	18.54	13.30	14.09	648.20	141.10	23.20	810.50	20.45	20.45	3.13	17.66	20,461.00	2.5351	0.6251	3.1602	20.2221
90	33 200	6 900	6 000	46 100	441.60	127.90	71.80	640.30	13.30	18.64	13.30	14.08	674.00	140.10	0.40	814.50	20.30	20.30	3.07	17.87	21,083.00	2.4731	0.6066	3.0797	20.7824
91	33 200	6 900	6 000	46 100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	21,137.00	2.6155	0.6052	3.2207	18.4226
92	33 200	6 900	6 000	46,100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	21,131.00	2.6156	0.6053	3.2209	18.4226
93	33 200	6 900	6 000	46,100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	21,130.00	2.6157	0.6053	3.2210	18.4226
94	33 200	6 900	6 000	46 100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	21,129.00	2.6158	0.6053	3.2211	18.4226
95	33 200	6 900	6 000	46,100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	21,129.00	2.6156	0.6053	3.2211	18.4226
96	33 200	6 900	6 000	46,100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	21,129.00	2.6158	0.6053	3.2211	18.4226
97	33 200	6 900	6 000	46,100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	21,127.00	2.6161	0.6054	3.2215	18.4226
98	33 200	6 900	6 000	46,100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	21,127.00	2.6161	0.6054	3.2215	18.4226
99	33 200	6 900	6,000	46 100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	21,127.00	2.6161	0.6054	3.2215	18.4226
14	33 200	6 900	6 000	46,100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	21,127.00	2.6161	0.6054	3.2215	18.4226
15	33 200	6 900	6 000	46 100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	21,042.00	2.6267	0.6078	3.2345	18.4226
16	33 200	6 900	6 000	46 100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	20,954.00	2.6377	0.6104	3.2481	18.4226
17	33 200	6 900	6 000	46 100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	20,848.00	2.6511	0.6135	3.2646	18.4226
18	33 200	6 900	6 000	46 100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	20,761.00	2.6622	0.6161	3.2783	18.4226
19	33 200	6 900	6 000	46 100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	20,730.00	2.6662	0.6170	3.2832	18.4226
20	33 200	6 900	6 000	46,100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	20,706.00	2.6693	0.6177	3.2870	18.4226
21	33 200	6 900	6 000	46 100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	20,697.00	2.6711	0.6181	3.2892	18.4226
22	33 200	6 900	6 000	46 100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	20,687.00	2.6717	0.6183	3.2900	18.4226
23	33 200	6 900	6 000	46 100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	20,687.00	2.6717	0.6183	3.2900	18.4226
24	33 200	6 900	6 000	46 100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	20,683.00	2.6722	0.6184	3.2906	18.4226
25	33 200	6 900	6 000	46 100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	20,678.00	2.6729	0.6185	3.2914	18.4226
26	33 200	6 900	6 000	46 100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	20,677.00	2.6730	0.6186	3.2916	18.4226
39	33 200	6 900	6 000	46 100	468.10	127.90	84.60	680.60	14.10	18.54	14.10	14.76	675.30	140.30	18.70	834.30	20.34	20.34	3.11	18.10	20,676.00	2.6731	0.6186	3.2917	18.4226

File: Contract\[illegible]

001181

LETTER 4

Ridge Maricopa WSD
18 (14R)
ntitlement

TABLE 1 ENTITLEMENT				AGENCY PRICING								STATE PRICING								MULTIPLIER	CONTRACT PERCENT			ZHR
Firm (AF)	Option (AF)	Surplus (AF)	Total (AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Total ($1,000)	Basic (%)	Option (%)	Total (%)	Support (%)
																				-				-
																				-				
																				-				
																				-				
																				2,124.00				
																				2,951.00				
																				3,754.00				
2,000	2,700	13,100	17,800	19.60	68.60	128.40	216.60	9.80	25.41	9.60	12.17	29.28	39.40	39.60	108.20	14.60	14.60	3.02	6.06	4,568.00	3.7399	1.5018	4.7417	[illegible]
10,600	4,000	11,800	26,400	103.90	48.70	115.60	308.20	9.80	22.18	9.60	11.87	304.90	115.00	30.70	450.60	28.76	28.76	2.60	17.07	5,761.00	3.8101	1.5397	5.3498	31.6073
12,700	5,300	17,300	35,300	124.50	107.90	169.50	401.90	9.80	20.38	9.80	11.38	317.90	132.70	43.90	494.50	25.03	25.03	2.54	14.01	6,254.00	4.6995	1.7247	6.4242	18.7260
8,600	6,900	30,800	46,100	84.30	134.70	299.90	518.90	9.80	19.82	9.80	11.26	257.70	206.80	87.50	552.00	29.97	29.97	2.86	11.97	6,784.00	5.6633	1.9856	7.6489	5.9964
10,600	7,800	33,200	51,600	109.20	148.80	347.00	600.00	10.30	19.08	10.30	11.63	302.20	222.40	95.30	619.90	28.51	28.51	2.87	12.01	7,311.00	6.1715	2.0353	8.2068	3.2107
14,000	4,800	35,600	54,400	144.20	167.20	364.70	676.10	10.30	19.00	10.30	11.61	376.70	236.80	117.00	726.40	26.91	26.91	3.17	12.44	8,123.00	6.2895	2.0584	8.3479	6.6497
17,000	9,100	34,600	60,700	175.10	173.70	358.40	705.20	10.30	19.09	10.30	11.62	423.60	226.80	115.60	766.00	24.92	24.92	3.34	12.62	8,952.00	5.9372	1.9403	7.8775	7.9373
19,400	8,900	31,800	59,100	199.50	188.00	327.50	705.00	10.30	21.12	10.30	11.93	474.90	279.70	108.80	863.40	25.81	25.81	3.42	13.76	10,777.00	4.7973	1.7445	6.5418	13.3268
21,100	9,300	31,300	61,700	217.30	196.30	322.40	738.00	10.30	21.11	10.30	11.93	532.60	234.70	110.20	877.50	25.24	25.24	3.52	16.22	11,698.00	4.6136	1.6761	6.2917	16.1254
25,800	10,400	33,000	69,200	278.60	218.90	354.10	851.90	10.80	20.66	10.80	12.31	637.80	257.10	118.50	1,013.40	24.72	24.72	3.59	14.64	12,641.00	5.0233	1.7158	6.7391	15.9365
31,100	11,400	33,600	76,100	335.80	235.30	362.90	934.10	10.80	20.64	10.80	12.27	740.80	271.50	121.00	1,133.30	23.82	23.82	3.60	14.89	13,640.00	5.1732	1.7251	6.8983	17.5770
34,900	12,000	32,800	79,700	376.90	245.30	354.20	977.40	10.80	20.53	10.80	12.28	815.80	280.40	118.40	1,214.40	23.37	23.37	3.61	15.24	14,590.00	5.0110	1.6861	6.6991	19.5158
41,400	12,700	31,200	85,300	448.50	259.10	368.20	1,115.80	11.80	20.40	11.80	13.08	951.00	291.70	112.60	1,355.30	22.97	22.97	3.61	15.89	15,647.00	5.4752	1.6559	7.1311	17.6714
43,900	12,800	28,700	85,400	518.00	261.10	338.70	1,117.80	11.80	20.40	11.80	13.09	1,000.50	291.70	103.90	1,396.10	22.79	22.79	3.62	16.35	16,627.00	5.1525	1.5703	6.7226	19.9341
47,600	13,000	26,200	86,800	609.30	264.60	335.40	1,209.30	12.80	20.35	12.80	13.93	1,070.00	292.20	94.60	1,456.80	22.48	22.48	3.61	16.78	17,563.00	5.3789	1.5066	6.8855	18.9893
52,200	13,500	24,300	90,000	668.20	267.40	311.00	1,246.60	12.80	19.81	12.80	13.85	1,137.40	294.20	77.00	1,508.60	21.79	21.79	3.17	16.76	18,045.00	5.4264	1.4819	6.9003	17.3671
57,200	13,900	21,500	92,600	760.80	274.10	286.00	1,320.90	13.30	19.72	13.30	14.26	1,232.70	299.50	67.50	1,599.70	21.55	21.55	3.14	17.29	18,953.00	5.5231	1.4462	6.9693	17.4283
64,000	14,600	18,900	97,500	851.20	288.20	251.40	1,388.80	13.30	19.80	13.30	14.24	1,363.00	311.90	58.40	1,737.70	21.36	21.36	3.11	17.82	19,796.00	5.5698	1.4457	7.0155	20.6781
66,900	14,600	15,800	97,300	923.20	286.50	210.00	1,427.70	13.80	19.62	13.30	14.67	1,423.00	310.50	49.50	1,783.00	21.27	21.27	3.13	18.32	20,481.00	5.5774	1.4002	6.9776	19.9271
70,100	14,700	12,800	97,600	967.40	287.20	176.60	1,431.20	13.80	19.54	13.80	14.66	1,481.20	310.60	0.90	1,792.70	21.13	21.13	0.07	18.37	21,063.00	5.4262	1.3622	6.7684	20.1851
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	21,132.00	5.7278	1.3619	7.0897	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	21,131.00	5.7281	1.3620	7.0901	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	21,130.00	5.7283	1.3620	7.0903	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	21,129.00	5.7286	1.3621	7.0907	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	21,129.00	5.7286	1.3621	7.0907	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	21,129.00	5.7286	1.3621	7.0907	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	21,127.00	5.7292	1.3622	7.0914	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	21,127.00	5.7292	1.3622	7.0914	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	21,127.00	5.7292	1.3622	7.0914	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	21,127.00	5.7292	1.3622	7.0914	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	21,042.00	5.7523	1.3677	7.1200	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	20,954.00	5.7765	1.3735	7.1500	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	20,848.00	5.8058	1.3805	7.1863	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	20,761.00	5.8302	1.3863	7.2165	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	20,730.00	5.8389	1.3883	7.2272	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	20,708.00	5.8456	1.3899	7.2355	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	20,692.00	5.8496	1.3909	7.2405	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	20,687.00	5.8510	1.3912	7.2422	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	20,687.00	5.8510	1.3912	7.2422	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	20,681.00	5.8531	1.3915	7.2438	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	20,678.00	5.8536	1.3916	7.2454	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	20,677.00	5.8538	1.3919	7.2457	18.3542
70,100	14,700	12,800	97,600	1,023.50	287.80	186.90	1,498.20	14.60	19.58	14.60	15.35	1,484.00	311.20	39.80	1,835.00	21.17	21.17	3.11	18.80	20,676.00	5.8541	1.3920	7.2461	18.3542

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[illegible] WSD
4C (14C)
Entitlement

TABLE 1 ENTITLEMENT / AGENCY PRICING / STATE PRICING / MULTIPLIER / CONTRACT PERCENT / ZOR

	TABLE 1 ENTITLEMENT				AGENCY PRICING								STATE PRICING								MULTIPLIER	CONTRACT PERCENT			ZOR
	Firm [AF]	Option [AF]	Surplus [AF]	Total [AF]	Firm [$1,000]	Option [$1,000]	Surplus [$1,000]	Total [$1,000]	Firm [$/AF]	Option [$/AF]	Surplus [$/AF]	Average [$/AF]	Firm [$1,000]	Option [$1,000]	Surplus [$1,000]	Total [$1,000]	Firm [$/AF]	Option [$/AF]	Surplus [$/AF]	Average [$/AF]	Total [$1,000]	Basic [%]	Option [%]	Total [%]	Support [%]
64																					-				-
65																					-				-
66																					-				-
67																					-				-
68																					2,174.00				-
69																					2,951.00				-
70																					3,754.00				-
71	1 000	1 300	6 200	8 500	10.30	30.50	63.90	104.70	10.31	23.46	10.31	12.32	13.30	17.20	18.70	49.20	13.26	13.26	3.02	5.78	4,560.00	1.6243	0.6677	2.2920	########
72	5 100	1 900	8 700	17 700	52.50	39.50	84.70	150.70	10.30	20.79	10.30	11.87	143.90	53.60	14.80	212.30	28.21	28.21	2.60	16.77	5,761.00	1.9302	0.6856	2.6158	29.0155
73	6 100	2 800	9 300	17 000	62.80	49.70	85.50	198.00	10.30	19.12	10.30	11.65	177.40	75.60	21.10	274.10	29.08	29.08	2.54	16.17	6,258.00	2.3705	0.7944	3.1649	27.7636
74	4 100	3 300	14 500	21 900	42.20	61.30	149.40	252.90	10.30	18.58	10.30	11.55	119.80	96.50	41.50	257.80	29.23	29.23	2.86	11.77	6,784.00	2.8243	0.9036	3.7279	1.9007
75	5 400	4 000	16 800	26 200	58.30	72.00	181.40	311.70	10.80	18.00	10.80	11.90	151.50	117.20	43.20	311.90	28.05	28.05	2.87	11.90	7,311.00	3.2766	0.9846	4.2634	0.0841
76	6 700	4 200	17 000	27 900	72.40	76.50	183.60	332.50	10.80	18.21	10.80	11.92	181.20	113.60	53.90	348.70	27.04	27.04	3.17	12.50	8,123.00	3.1515	0.9418	4.0933	4.6458
77	8 200	4 400	16 500	29 100	88.60	80.50	178.20	347.30	10.80	18.30	10.80	11.93	213.00	114.30	55.10	382.40	25.97	25.97	3.34	13.14	8,952.00	2.9803	0.8992	3.8795	9.1789
78	10 200	4 900	17 600	32 700	110.20	98.00	190.10	398.30	10.80	20.00	10.80	12.18	277.00	133.10	68.20	478.30	27.16	27.16	3.42	14.38	10,777.00	2.7865	0.9093	3.6958	15.3094
79	11 600	5 100	17 400	34 100	125.30	102.00	187.90	415.20	10.80	20.00	10.80	12.18	308.80	135.00	61.20	505.00	26.62	26.62	3.52	14.83	11,696.00	2.6774	0.8719	3.5493	17.9122
80	13 100	5 300	16 700	35 100	148.00	106.00	188.70	442.70	11.30	20.00	11.30	12.61	343.70	139.10	60.00	542.80	26.24	26.24	3.59	15.46	12,641.00	2.6636	0.9385	3.6021	18.4414
81	14 800	5 500	16 100	36 400	147.20	109.70	201.90	458.80	11.30	19.95	11.30	12.60	381.40	141.70	58.00	581.10	25.77	25.77	3.60	15.96	13,640.00	2.5594	0.8043	3.3637	21.0463
82	15 700	5 400	14 800	35 900	177.40	107.90	167.20	452.40	11.30	19.98	11.30	12.60	393.90	135.50	53.40	582.80	25.09	25.09	3.61	16.23	14,590.00	2.3619	0.7389	3.1008	22.3747
83	17 700	5 600	13 300	36 500	217.70	109.80	163.60	491.10	12.30	19.98	12.30	13.45	426.70	132.80	48.00	607.30	24.11	24.11	3.61	16.64	15,647.00	2.4369	0.7017	3.1386	18.1315
84	18 800	5 500	12 200	36 500	231.20	109.90	150.10	491.10	12.30	19.98	12.30	13.45	443.70	129.80	44.20	617.70	23.60	23.60	3.62	16.97	16,627.00	2.2933	0.6604	2.9537	20.4954
85	20 300	5 600	11 100	37 000	270.00	111.50	147.60	529.10	13.30	19.91	13.30	14.30	473.60	130.60	40.10	644.30	23.33	23.33	3.61	17.41	17,563.00	2.3777	0.6349	3.0126	17.6799
86	21 300	5 500	10 000	36 800	283.30	107.20	133.00	523.50	13.30	19.49	13.30	14.23	481.60	124.40	31.70	637.70	22.61	22.61	3.17	17.33	18,045.00	2.3070	0.5941	2.9011	17.9081
87	23 100	5 600	8 600	37 300	318.80	106.70	118.70	546.20	13.80	19.41	13.80	14.64	516.50	125.20	27.00	668.70	22.36	22.36	3.14	17.93	18,953.00	2.3063	0.5735	2.8810	18.3191
88	24 500	5 600	7 200	37 300	338.10	108.60	99.40	546.10	13.80	19.39	13.80	14.64	542.40	124.00	22.40	688.80	22.14	22.14	3.11	18.47	19,796.00	2.2100	0.5466	2.7566	20.7177
89	25 600	5 600	6 000	37 200	366.10	108.70	85.80	560.60	14.30	19.41	14.30	15.07	564.70	123.50	18.80	707.00	22.06	22.06	3.13	19.05	20,461.00	2.2086	0.5313	2.7399	20.7072
90	26 800	5 600	4 900	37 300	383.20	108.30	70.10	561.60	14.30	19.34	14.30	15.06	586.70	122.60	0.30	709.60	21.89	21.89	0.07	19.02	21,063.00	2.1501	0.5137	2.6638	20.9568
91	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	21,132.00	2.2653	0.5139	2.7792	19.0712
92	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	21,131.00	2.2654	0.5139	2.7793	19.0712
93	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	21,130.00	2.2655	0.5140	2.7795	19.0712
94	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	21,129.00	2.2656	0.5140	2.7796	19.0712
95	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	21,129.00	2.2656	0.5140	2.7796	19.0712
96	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	21,129.00	2.2656	0.5140	2.7796	19.0712
97	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	21,127.00	2.2658	0.5140	2.7798	19.0712
98	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	21,127.00	2.2658	0.5140	2.7798	19.0712
1999	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	21,127.00	2.2658	0.5140	2.7798	19.0712
2014	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	21,127.00	2.2658	0.5140	2.7798	19.0712
2015	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	21,042.00	2.2750	0.5161	2.7911	19.0712
2016	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	20,954.00	2.2845	0.5183	2.8028	19.0712
2017	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	20,848.00	2.2961	0.5209	2.8170	19.0712
2018	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	20,361.00	2.3058	0.5231	2.8289	19.0712
2019	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	20,130.00	2.3092	0.5239	2.8331	19.0712
2020	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	20,106.00	2.3119	0.5245	2.8364	19.0712
2021	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	20,692.00	2.3135	0.5248	2.8383	19.0712
2022	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	20,687.00	2.3140	0.5250	2.8390	19.0712
2023	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	20,687.00	2.3140	0.5250	2.8390	19.0712
2024	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	20,683.00	2.3145	0.5251	2.8396	19.0712
2025	26 800	5 600	4 000	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	20,678.00	2.3150	0.5252	2.8402	19.0712
2026	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	20,677.00	2.3151	0.5252	2.8403	19.0712
2039	26 800	5 600	4 900	37 300	404.70	108.60	74.00	587.30	15.10	19.39	15.10	15.75	587.70	122.80	15.20	725.70	21.93	21.93	3.11	19.46	20,676.00	2.3157	0.5252	2.8404	19.0712

File: [illegible]

Ridge Standpipe WSD
15(15)
Entitlement

	TABLE 1 ENTITLEMENT				AGENCY PRICING								STATE PRICING								MULTIPLIER	CONTRACT PERCENT			2001
	Firm (AF)	Option (AF)	Surplus (AF)	Total (AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Total ($1,000)	Base (%)	Option (%)	Total (%)	Support (%)
64																					-				-
65																					-				-
66																					-				-
67																					2 124 00				-
68																					2,951 00				-
69																					3 734 00				-
70																					-				-
71	0 400	8 500	2 400	3 300	4 60	27 40	27 30	59 30	11 39	54 80	11 39	17 97	- 13 20	15 20	7 20	34 60	30 44	30 44	3 02	16 48	4 566 00	- 0 6983	0 5998	1 2981	[redacted]
72	10 800	4 000	12 100	26 900	123 10	83 40	137 90	344 40	11 40	20 85	11 40	12 80	389 80	144 40	31 50	565 70	36 09	36 09	2 60	21 03	5,761 00	4 5305	1 4477	5 9782	39 1197
73	13 100	5 400	17 700	36 200	149 30	984,70	201 60	455 80	11 40	89 39	11 40	12 59	381 70	157 40	45,00	584 10	29 14	29 14	2 54	16 14	6 256 00	5 6172	1 6736	7 2858	25 9654
74	8 700	7 000	31 100	46 800	103 50	932 50	370 10	606 10	11 90	16 93	11 90	12 95	267 60	215 50	88 90	572 20	30 78	30 78	2 86	12 23	6 786 00	6 9811	1 9531	8 9342	15 92451
75	9 900	7 200	31 000	48,100	117 80	135 30	389 80	627 00	11 90	18 79	11 90	12 93	272 40	196 10	89 00	559 50	27 52	27 52	2 87	11 83	7 311 00	8 6571	1 8506	8 5077	[redacted]
76	12 200	7 700	31 700	51 100	145 20	145 80	371 30	662 30	11 90	18 94	11 90	12 96	319 00	201 40	98 90	619 30	26 15	26 15	3 12	12 12	8 123 00	6 3585	1 7949	8 1534	(8 94331
77	14 900	8 000	30 300	53 200	177 30	152 10	369 60	699 00	11,90	19 01	11 90	12 97	376 80	207 30	101 20	685 30	25 29	25 29	3 34	12 79	8,952 00	6 0087	1 6991	7 7078	(1 42581
78	16 200	7 800	27 800	51 800	192 80	184 20	336 80	687 80	11 90	21 05	11 90	13 28	431 20	207 60	95 90	733 90	26 62	26 62	3 42	14 17	10,777 00	4 8585	1 5736	6 3871	6 2815
79	19 800	8 700	29 400	57 900	235 60	181 80	369 90	787 30	11 90	20 90	11 90	13 25	539 40	228 20	103 50	851 10	26 23	26 23	3 52	14 70	11,698 00	5 0051	1 5541	6 5592	9 8461
80	22 200	9 600	28 300	59 500	275 30	188 10	356 90	854 30	12 40	20 90	12,40	13 69	574 80	233 60	101 60	909 40	25 89	25 89	3 59	15 28	12 641 00	4 7544	1 4701	6 1745	13 6213
81	25 100	9 300	27 200	61 600	311 20	193 70	337 30	842 20	12 40	20 83	12 40	13 67	640 60	237 30	97 90	975 80	25 52	25 52	3 80	15 84	13 640 00	4 3852	1 3029	5 6881	16 7389
82	28 600	9 700	25 000	63 700	329 80	190 10	318 60	829 90	12 40	20 89	12 40	13 67	670 90	279 50	90 30	990 70	25 27	25 27	3 61	16 32	14 590 00	4 4961	1 2399	5 7360	15 1270
83	30 600	9 300	23 500	63 400	402 00	194 00	301 50	897 50	13 40	20 86	13 40	14 52	745 20	231 80	81 20	1 057 40	24 84	24 84	3 61	17 15	15 647 00	4 4961	1 2399	5 7360	15 1270
84	31 800	9 300	20 800	61 900	426 40	194 10	278 70	899 90	13 40	20 87	13 40	14 52	782 60	228 90	75 30	1 086 80	24 61	24 61	3 62	17 56	15 627 00	4 2389	1 1674	5 4063	17 2891
85	34 500	9 400	18 900	62 800	496 80	195 60	272 20	964 60	14 40	20 83	14 40	15 36	838 00	228 30	68 20	1 134 50	24 29	24 29	3 61	18 07	17 563 00	4 3785	1 1148	5 4933	14 9581
86	36 300	9 400	16 800	62 500	522 70	194 50	241 90	959 10	14 40	20 37	14 40	15 30	855 30	221 50	53 30	1,130 00	23 56	23 56	3 17	16 68	18 045 00	4 7372	1 0612	5 2984	15 3894
87	39 200	9 500	14 700	63 400	584 60	193 00	215 00	992 60	14 90	20 32	14,90	15 79	913 00	221 30	46 20	1 180 50	23 29	23 29	3 14	16 62	18 853 00	4 2373	1 0163	5 2556	15 8265
88	41 800	9 600	12 100	63 300	619 80	194 60	180 30	994 70	14 90	20 27	14 90	15 71	959 30	221 40	37 60	1,218 30	23 06	23 06	3 11	19 25	19 796 00	4 0417	0 9810	5 0247	98 3534
89	43 300	9 500	10 300	63 100	666 80	193 00	158 60	1,018 40	15 40	20,32	15 46	16 14	993 70	218 00	32 20	1,243 90	22 95	22 95	3 13	19 71	20,481 00	4 0340	0 9433	4 9773	98 1285
90	45 500	9 500	8 300	63 300	700 70	192 40	127,60	1,020 90	15 40	20 25	15 46	16 13	1,036 50	216 40	8 60	1 253 50	22 78	22 78	3 07	19 80	21,083 00	3 9297	0 9126	4 8423	98 3560
91	45 500	9 500	8 300	63 300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16 82	1,038 30	216 80	25 80	1 280 90	22 82	22 82	3 11	20 24	21,932 00	4 1246	0 9174	5 0370	16 9022
92	45 500	9 500	8 300	63 300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16 82	1,038 30	216 80	25 80	1,280 90	22 82	22 82	3 11	20 24	21,131 00	4 1247	0 9174	5 0371	16 9022
93	45 500	9 500	8 300	63 300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16 82	1,038 30	216 80	25 80	1,280 90	22 82	22 82	3 11	20 24	21,130 00	4 1249	0 9174	5 0373	16 9022
94	45 500	9 500	8 300	63 300	737,10	192 80	134 50	1,064 40	16 20	20 29	16 20	16 82	1,038 30	216 80	25 80	1,280 90	22 82	22 82	3 11	20 24	21,129 00	4 1251	0 9125	5 0376	16 9022
95	45 500	9 500	8 300	63 300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16 82	1,038 30	216 80	25 80	1 280 90	22 82	22 82	3 11	20 24	21,129 00	4 1251	0 9125	5 0376	16 9022
96	45 500	9 500	8 300	63 300	737,10	192,80	134 50	1,064,40	16 20	20 29	16 20	16 82	1,038 30	216 80	25 80	1 280 90	22 82	22 82	3 11	20 24	21,129 00	4 1251	0 9125	5 0376	16 9022
97	45 500	9 500	8 300	63 300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16 82	1,038 30	216 80	25 80	1 280 90	22 82	22 82	3 11	20 24	21,127 00	4 1255	0 9126	5 0381	16 9022
98	45 500	9 500	8 300	63 300	737,10	192 80	134 50	1,064 40	16 20	20 29	16 20	16,82	1,038,30	216,80	25 80	1 280 90	22 82	22 82	3,11	20 24	21,127 00	4 1255	0 9126	5 0381	16 9022
99	45 500	9 500	8 300	63 300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16,82	1,038 30	216,80	25 80	1,280 90	22 82	22 82	3,11	20 24	21,127 00	4 1255	0 9126	5 0381	16 9022
14	45 500	9 500	8 300	63 300	737,10	192,80	134,50	1,064,40	16,20	20 29	16 20	16,82	1,038 30	216 80	25 80	1 280 90	22 82	22 82	3,11	20 24	21,127 00	4 1255	0 9126	5 0381	16 9022
15	45 500	9 500	8 300	63 300	737 10	192,80	134 50	1,064 40	16 20	20 29	16 20	16,82	1,038 30	216,80	25 80	1,280 90	22 82	22 82	3 11	20 24	21,042 00	4 1429	0 9163	5 0585	16 9022
16	45 500	9 600	8 300	63 300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16,82	1,038 30	216 80	25 80	1 280 90	22 82	22 82	3,11	20 24	20,954 00	4 1598	0 9201	5 0797	16 9022
17	45 500	9 500	8 300	63 300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16,82	1,038,30	216,80	25 80	1,280 90	22 82	22 82	3,11	20 24	20,848 00	4 1807	0 9248	5 1055	16 9022
18	45 500	9 500	8 300	63 300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16,82	1,038 30	216,80	25 80	1 280 90	22 82	22 82	3,11	20 24	20,761 00	4 1983	0 9287	5 1270	16 9022
19	45 500	9 500	8 300	63 300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16,82	1,038 30	216 80	25 80	1 280 90	22 82	22 82	3 11	20 24	20,730 00	4 2045	0 9301	5 1346	16 9022
20	45 500	9 500	8 300	63 300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16,82	1,038 30	216 80	25 80	1 280 90	22 82	22 82	3,11	20 24	20,706 00	4 2094	0 9311	5 1405	16 9022
21	45 500	9 600	8 300	63 300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16,82	1,038 30	216 80	25 80	1 280 90	22 82	22 82	3 11	20 24	20,692 00	4 2123	0 9318	5 1441	16 9022
22	45 500	9 500	8 300	63,300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16,82	1,038 30	216 80	25 80	1,280 90	22 82	22 82	3,11	20 24	20,687 00	4 2133	0 9320	5 1453	16 9022
23	45 500	9 500	8 300	63 300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16,82	1,038 30	216 80	25 80	1,280 90	22 82	22 82	3 11	20 24	20,687 00	4 2133	0 9320	5 1453	16 9022
24	45 500	9 500	8 300	63 300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16,82	1,038 30	216 80	25 80	1,280 90	22 82	22 82	3 11	20 24	20,683 00	4 2141	0 9322	5 1463	16 9022
25	45 500	9 500	8 300	63 300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16,82	1,038 30	216 80	25 80	1,280 90	22 82	22 82	3 11	20 24	20,678 00	4 2151	0 9324	5 1475	16 9022
26	45 500	9 500	8 300	63 300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16,82	1,038 30	216 80	25 80	1 280 90	22 82	22 82	3 11	20 24	20,677 00	4 2153	0 9324	5 1477	16 9022
27	45 500	9 500	8 300	63 300	737 10	192 80	134 50	1,064 40	16 20	20 29	16 20	16,82	1,038 30	216 80	25 80	1,280 90	22 82	22 82	3 11	20 24	20,676 00	4 2155	0 9325	5 1480	16 9022

LETTER 4

001184

041732

	TABLE 1 ENTITLEMENT				AGENCY PRICING								STATE PRICING								MULTIPLIER	CONTRACT PERCENT			ZONE
	Firm (AF)	Option (AF)	Surplus (AF)	Total (AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Total ($1,000)	Basic (%)	Option (%)	Total (%)	Support (%)
70																									
71																									
72																									
73																									
74																					2,124.00				
75																					2,951.00				
76																					3,754.00				
77			0.100	0.100	-	21.00	1.30	22.30	13.00	-	13.00	223.00	-	-	0.30	0.30			3.02	3.00	6.568.00	0.0285	0.4597	0.4882	
78	0.800	0.300	1.000	2.100	10.60	26.60	13.30	52.50	13.26	95.33	13.28	25.00	20.06	7.80	2.60	31.20	26.00	26.00	2.60	14.86	5,761.00	0.4149	0.4964	0.9113	
79	1.000	0.400	1.400	2.800	13.30	30.10	18.60	62.00	13.29	75.25	13.29	22.14	21.50	8.60	3.60	33.70	21.50	21.50	2.56	12.04	6,256.00	0.5099	0.4811	0.9910	
80	0.600	0.800	2.400	3.800	8.00	34.80	31.90	74.70	13.30	58.00	13.30	20.75	17.40	17.40	6.90	41.10	29.00	29.00	2.88	13.58	6,784.00	0.5881	0.5130	1.1011	
81	0.700	0.500	2.400	3.600	9.70	32.20	33.10	75.00	13.81	64.40	13.81	20.83	18.90	13.40	6.90	39.10	26.82	26.83	2.82	10.86	7,311.00	0.5854	0.4404	1.0258	
82	0.900	0.600	2.400	3.900	12.49	34.60	33.10	80.10	13.39	57.67	13.79	20.54	20.86	13.80	7.60	42.26	23.07	23.07	3.17	10.82	8,193.00	0.5801	0.4760	0.9961	
83	2.500	1.300	5.100	8.900	34.50	49.60	70.40	154.50	13.80	38.15	13.88	17.36	32.80	17.00	17.00	66.60	13.05	13.05	3.34	7.46	8,952.00	1.1318	0.5541	1.7259	
84	7.200	3.500	17.400	28.100	99.40	183.00	171.10	373.50	13.80	29.43	13.80	16.17	89.30	39.70	42.40	145.40	9.63	9.63	3.42	6.29	10,777.00	2.5108	0.9557	3.4657	
85	8.200	3.900	12.300	24.100	113.20	105.80	169.70	388.70	13.80	29.39	13.80	16.13	322.40	141.60	43.30	507.30	39.32	39.32	3.52	21.05	11,696.00	2.6184	0.9014	3.3228	23.3787
86	9.200	3.700	11.900	24.800	131.80	108.80	170.20	410.40	14.30	29.35	14.30	16.55	307.70	123.80	42.70	474.20	33.45	33.45	3.58	19.12	12,841.00	2.7875	0.8591	3.2466	23.4547
87	10.500	3.900	11.300	25.700	150.20	113.30	161.60	425.10	14.30	29.05	14.30	16.54	331.70	129.20	40.70	496.60	31.59	31.59	3.60	19.28	13,640.00	2.8858	0.8386	3.1185	14.2252
88	15.600	5.300	14.700	35.600	223.10	145.90	210.70	579.70	14.30	27.53	14.30	16.27	472.50	168.50	53.10	694.10	30.29	30.29	3.61	19.27	19.590.00	2.9698	1.0060	3.9858	15.5808
89	17.600	5.500	13.200	36.300	269.30	150.80	202.60	622.10	15.30	27.42	15.30	17.14	519.20	162.30	47.70	729.20	29.50	29.50	3.61	20.09	15.647.00	3.0121	0.9616	3.9758	14.8673
90	24.600	7.900	15.600	48.600	367.20	185.60	236.70	791.70	15.30	26.54	15.30	18.99	687.60	200.60	56.50	944.70	28.65	28.65	3.62	20.27	16.827.00	3.6461	1.1175	4.7618	16.1956
91	28.200	7.200	14.300	47.700	427.10	190.40	233.10	850.60	15.30	26.44	15.30	17.83	742.00	203.90	51.60	997.50	28.32	28.32	3.61	20.91	17,563.00	3.7590	1.0841	4.8431	14.7268
92	31.100	8.100	14.400	53.600	506.90	207.60	234.10	948.20	16.30	25.63	16.30	17.71	855.90	222.90	45.60	1,124.40	27.52	27.52	3.62	20.94	18.045.00	4.1087	1.1505	5.2602	15.5816
93	34.100	8.400	12.700	55.200	572.90	214.40	213.40	1,000.70	16.80	25.52	16.80	18.13	927.50	228.50	39.90	1,195.90	27.20	27.20	3.64	21.68	18,952.00	4.1487	1.1312	5.2799	16.3225
94	36.200	8.300	10.600	55.100	606.20	211.60	176.10	993.80	16.80	25.52	16.80	18.11	974.90	223.50	33.00	1,231.40	26.93	26.93	3.61	22.35	19,796.00	3.9718	1.0699	5.0417	18.9459
95	40.000	8.700	9.500	58.200	692.00	221.20	164.40	1,077.60	17.30	25.43	17.30	18.52	1,072.90	233.30	29.70	1,335.80	26.82	26.82	3.63	22.95	20,469.00	4.1870	1.0811	5.2681	19.3292
96	42.100	8.800	7.700	58.600	728.30	222.90	133.20	1,084.40	17.30	25.33	17.30	18.51	1,128.70	234.30	0.50	1,355.50	26.82	26.82	0.02	23.13	21,083.00	4.0854	1.0512	5.1426	20.0000
97	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	21,132.00	4.2694	1.0567	5.3261	18.5531
98	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	21,131.00	4.2684	1.0567	5.3253	18.5531
99	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	21,130.00	4.2678	1.0566	5.3246	18.5531
100	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	21,129.00	4.2669	1.0566	5.3237	18.5531
101	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	21,129.00	4.2669	1.0566	5.3237	18.5531
102	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	21,129.00	4.2669	1.0566	5.3237	18.5531
103	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	21,127.00	4.2673	1.0569	5.3242	18.5531
104	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	21,127.00	4.2658	1.0568	5.3219	18.5531
105	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	21,127.00	4.2658	1.0568	5.3219	18.5531
106	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	21,127.00	4.2658	1.0569	5.3219	18.5531
107	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	21,042.00	4.2633	1.0612	5.3245	18.5531
108	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	20,934.00	4.3012	1.0657	5.3669	18.5531
109	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	20,948.00	4.3260	1.0711	5.3971	18.5531
110	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	20,761.00	4.3449	1.0738	5.4186	18.5531
111	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	20,730.00	4.3478	1.0772	5.4250	18.5531
112	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	20,706.00	5.3529	1.0784	6.4313	18.5531
113	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	20,692.00	5.3556	1.0792	6.4348	18.5531
114	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	20,687.00	5.3568	1.0794	6.4363	18.5531
115	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	20,687.00	5.3568	1.0794	6.4363	18.5531
116	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	20,683.00	5.3577	1.0796	6.4373	18.5531
117	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	20,678.00	5.3587	1.0799	6.4386	18.5531
118	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	20,677.00	5.3591	1.0799	6.4390	18.5531
119	42.100	8.800	7.700	58.600	762.00	223.30	139.40	1,124.70	18.10	25.38	18.10	19.19	1,122.40	234.60	23.90	1,380.90	26.66	26.66	3.11	23.58	20,676.00	5.3592	1.0800	6.4392	18.5531

LETTER 4

001185

041733

... Ridge Maricopa WSD
... 18 (18)
... to IDA (Amendment #2) from Reach 16

	ENTITLEMENT TRANSFERRED				AGENCY PRICING							
	Firm (AF)	Option (AF)	Surplus (AF)	Total (AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)
1964												
1965												
1966												
1967												
1968												
1969												
1970												
1971												
1972												
1973												
1974												
1975												
1976												
1977												
1978												
1979												
1980												
1981												
1982												
1983												
1984												
1985												
1986												
1987												
1988	(7 594)	(1 741)	(2 224)	(11 559)	(127 60)	(44 40)	(17 40)	(209 40)	16 80	25 52	16 80	18 11
1989	(8 099)	(1 761)	(1 923)	(11 783)	(140 10)	(44 80)	(33 30)	(218 20)	17 30	25 43	17.30	18 52
1990	(8 499)	(1 777)	(1 554)	(11 830)	(147 00)	(45 00)	(28 90)	(218 90)	17 30	25 33	17.30	18 51
1991	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28 10)	(227 00)	18 10	25 38	18 10	19 19
1992	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28 10)	(227 00)	18 10	25 38	18 10	19 19
1993	(8 499)	(1 777)	(1 554)	(11 830)	(153.80)	(45.10)	(28 10)	(227 00)	18 10	25 38	18 10	19 19
1994	(8 499)	(1,777)	(1 554)	(11 830)	(153 80)	(45 10)	(28 10)	(227 00)	18 10	25 38	18 10	19 19
1995	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28.10)	(227 00)	18 10	25 38	18 10	19.19
1996	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28 10)	(227 00)	18 10	25 38	18 10	19 19
1997	(8 499)	(1 777)	(1 554)	(11.830)	(153 80)	(45 10)	(28 10)	(227 00)	18 10	25 38	18 10	19 19
1998	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28.10)	(227 00)	18 10	25 38	18.10	19 19
1999	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28.10)	(227 00)	18 10	25 38	18 10	19 19
[illegible]	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28 10)	(227 00)	18.10	25 38	18 10	19 19
2015	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28 10)	(227 00)	18.10	25 38	18 10	19 19
2016	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28 10)	(227 00)	18 10	25 38	18 10	19 19
2017	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28.10)	(227 00)	18 10	25 38	18.10	19 19
2018	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28 10)	(227 00)	18 10	25 38	18 10	19 19
2019	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28 10)	(227 00)	18 10	25 38	18 10	19 19
2020	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28 10)	(227 00)	18 10	25 38	18 10	19 19
2021	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28 10)	(227 00)	18 10	25 38	18 10	19 19
2022	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28 10)	(227 00)	18 10	25 38	18 10	19 19
2023	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28 10)	(227 00)	18 10	25 38	18 10	19 19
2024	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28 10)	(227 00)	18 10	25 38	18 10	19 19
2025	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28.10)	(227 00)	18 10	25 38	18 10	19 19
2026	(8 499)	(1 777)	(1 554)	(11 830)	(153 80)	(45 10)	(28 10)	(227 00)	18.10	25 38	18 10	19 19
2035	(8 479)	(1 777)	(1.554)	(11 830)	(153 80)	(45.10)	(28 10)	(227 00)	18.10	25 38	18 10	19 19

	STATE PRICING								MULTIPLIER	CONTRACT PERCENT			FOR
	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Total ($/AF)	Total ($1,000)	Basic (%)	Option (%)	Total (%)	Support (%)
1964													
1965													
1966													
1967													
1968									2 124 00				
1969									2 951 00				
1970									3 754 00				
1971									4,566.00				
1972									5,761 00				
1973									6 256 00				
1974									6,784 00				
1975									7,311 00				
1976									8 123 00				
1977									8 952 00				
1978									10 777 00				
1979									11 698 00				
1980									12 641 00				
1981									13 640 00				
1982									14 390 00				
1983									15 647 00				
1984									16 827 00				
1985									17 563 00				
1986									18 045 00				
1987									16 953 00				
1988	(208 50)	(48 90)	(6 90)	(258 30)	26 93	26 93	3 11	22 35	19 796 00	(0 8333)	(0 2243)	(1 0576)	18 9315
1989	(217 30)	(47 20)	(6 00)	(270 40)	26 82	26 82	3 73	22 95	20 461 00	(0 8473)	(0 2190)	(1 0663)	19 3047
1990	(226 20)	(47.30)	(0 10)	(273 60)	26 62	26 62	0 07	23 13	21 083 00	(0 8250)	(0 2134)	(1 0384)	19 9027
1991	(228 80)	(47 40)	(4 80)	(278 80)	26 66	26 66	3 10	23 56	21,132 00	(0 8612)	(0 2134)	(1 0746)	18 5796
1992	(226 60)	(47 40)	(4 80)	(278 80)	26 66	26 66	3 11	23 56	21,131 00	(0 8612)	(0 2134)	(1 0746)	18 5796
1993	(226 60)	(47.40)	(4 80)	(278 80)	26 66	26 66	3 11	23 56	21,130 00	(0 8612)	(0 2134)	(1 0746)	18 5796
1994	(226.60)	(47 40)	(4 80)	(278 80)	26 66	26 66	3 11	23 56	21,129 00	(0 8611)	(0 2135)	(1 0746)	18 5796
1995	(226 60)	(47 40)	(4 80)	(278 80)	26 66	26 66	3 11	23 56	21,129 00	(0 8611)	(0 2135)	(1 0746)	18 5796
1996	(226 60)	(47 40)	(4 80)	(278 80)	26 66	26 66	3.11	23 56	21,129 00	(0 8611)	(0 2135)	(1 0746)	18 5796
1997	(226 60)	(47.40)	(4 80)	(278.80)	26 66	26 66	3 11	23 56	21,127 00	(0 8612)	(0 2135)	(1 0747)	18 5796
1998	(226 60)	(47.40)	(4 80)	(278.80)	26 66	26 66	3.11	23 56	21,127 00	(0 8611)	(0 2135)	(1 0746)	18 5796
1999	(226.60)	(47.40)	(4 80)	(278 80)	26 66	26 66	3 11	23 56	21,127 00	(0 8611)	(0 2135)	(1 0746)	18 5796
[illegible]	(226.60)	(47.40)	(4 80)	(278 80)	26 66	26 66	3 11	23 56	21,127 00	(0 8611)	(0 2135)	(1 0746)	18 5796
2015	(226.60)	(47 40)	(4 80)	(278 80)	26 66	26 66	3 11	23 56	21,042 00	(0 8647)	(0 2143)	(1 0790)	18 5796
2016	(226.60)	(47 40)	(4 80)	(278.80)	26 66	26 66	3 11	23 56	20 951 00	(0 8684)	(0 2152)	(1 0836)	18 5796
2017	(226.60)	(47 40)	(4 80)	(278 80)	26 66	26 66	3 11	23 56	20 848 00	(0 8755)	(0 2163)	(1 0918)	18 5796
2018	(226 60)	(47 40)	(4 80)	(278 80)	26 66	26 66	3 11	23 56	20 761 00	(0 8764)	(0 2177)	(1 0938)	18 5796
2019	(226 60)	(47 40)	(4 80)	(278 80)	26 66	26 66	3 11	23 56	20 730 00	(0 8777)	(0 2176)	(1 0953)	18 5796
2020	(226 60)	(47 40)	(4 80)	(278 80)	26 66	26 66	3 11	23.56	20 706 00	(0 8787)	(0 2179)	(1 0965)	18 5796
2021	(226 60)	(47.40)	(4 80)	(278 80)	26 66	26 66	3 11	23 56	20,697 00	(0 8793)	(0 2180)	(1 0973)	18 5796
2022	(226 60)	(47 40)	(4 80)	(278 80)	26 66	26 66	3 11	23 56	20 687 00	(0 8796)	(0 2180)	(1 0976)	18 5796
2023	(226 60)	(47 40)	(4 80)	(278 80)	26.66	26 66	3.11	23 56	20,687 00	(0 8796)	(0 2180)	(1 0976)	18 5796
2024	(226.60)	(47 40)	(4 80)	(278 80)	26 66	26 66	3 11	23 56	20 683 00	(0 8797)	(0 2181)	(1 0978)	18 5796
2025	(226 60)	(47.40)	(4 80)	(278 80)	26 66	26 66	3 11	23 56	20 678 00	(0 8799)	(0 2181)	(1 0980)	18 5796
2026	(226 60)	(47 40)	(4 80)	(278 80)	26 66	26 66	3 11	23 56	20,677 00	(0 8800)	(0 2181)	(1 0981)	18 5796
2035	(226 60)	(47 40)	(4 80)	(278 80)	26 66	26 66	3 11	23 56	20 676 00	(0 8800)	(0 2181)	(1 0981)	18 5796

001186

File Contract WRMWSD...

- Ridge Marketing WSD
15 (16)
r to Talon Cassec WD (Amendment #3) Item Reach 15

	ENTITLEMENT TRANSFERRED				AGENCY PRICING								STATE PRICING								MULTIPLIER	CONTRACT PERCENT			ZOO
	Firm (AF)	Option (AF)	Surplus (AF)	Total (AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Total ($/AF)	Total ($1,000)	Basic (%)	Option (%)	Total (%)	Support (%)
164																					-				-
165																					-				-
166																					-				-
167																					2,124 00				-
168																					2 951 00				-
169																					3 754 00				-
170																					4,568 00				-
171																					5,761 00				-
172																					6,256 00				-
173																					6 784 00				-
174																					7,311 00				-
175																					8,173 00				-
176																					8,952 00				-
177																					10,777 00				-
178																					11 638 00				-
179																					12 641 00				-
180																					13 640 00				-
181																					14 590 00				-
182																					15 647 00				-
183																					16 627 00				-
184																					17 563 00				-
185																					18 045 00				-
186																					18 953 00				-
187																					19 796 00				-
188																					20,461 00				-
189																					21 043 00				-
190																					21,132 00				-
191																					21,131 00				-
192																					21,130 00				-
193																					21,129 00				-
194																					21 129 00				-
195																					-				-
196	(3 326)	(0 695)	(0 607)	(4 628)	(53 90)	(14 10)	(9 80)	(77 80)	16 20	20.29	16 20	16 82	(75 90)	(15 90)	(1 90)	(93 70)	22 82	22 82	3 11	20 24	21,129 00	(0 3015)	(0 0667)	(0 3682)	16 9691
197	(3 326)	(0 695)	(0 607)	(4 628)	(53 90)	(14 10)	(9 80)	(77 80)	16 20	20 29	16 20	16 82	(75 90)	(15 90)	(1 90)	(93 70)	22 82	22 82	3 11	20 24	21,127 00	(0 3015)	(0 0667)	(0 3682)	16 9691
198	(3 326)	(0 695)	(0 607)	(4 628)	(53 90)	(14 10)	(9 80)	(77 80)	16 20	20 29	16 20	16 82	(75 90)	(15 90)	(1 90)	(93 70)	22 82	22 82	3 11	20 24	21,127 00	(0 3015)	(0 0667)	(0 3682)	16 9691
199	(3 326)	(0 695)	(0 607)	(4 628)	(53 90)	(14 10)	(9 80)	(77 80)	16 20	20 29	16 20	16 82	(75 90)	(15 90)	(1 90)	(93 70)	22 82	22 82	3 11	20 24	21 127 00	(0 3015)	(0 0667)	(0 3682)	16 9691
114	(3 326)	(0 695)	(0 607)	(4 628)	(53 90)	(14 10)	(9 80)	(77 80)	16 20	20 29	16 20	16 82	(75 90)	(15 90)	(1 90)	(93 70)	22 82	22 82	3 11	20 24	21,042 00	(0 3027)	(0 0670)	(0 3697)	16 9691
15	(3 326)	(0 695)	(0 607)	(4 628)	(53 90)	(14 10)	(9 80)	(77 80)	16 20	20 29	16 20	16 82	(75 90)	(15 90)	(1 90)	(93 70)	22 82	22 82	3 11	20 24	20,954 00	(0 3040)	(0 0673)	(0 3713)	16 9691
116	(3 326)	(0 695)	(0 607)	(4 628)	(53 90)	(14 10)	(9 80)	(77 80)	16 20	20 29	16 20	16 82	(75 90)	(15 90)	(1 90)	(93 70)	22 82	22 82	3 11	20 24	20,848 00	(0 3055)	(0 0676)	(0 3731)	16 9691
17	(3 326)	(0 695)	(0 607)	(4 628)	(53 90)	(14 10)	(9 80)	(77 80)	16 20	20 29	16 20	16 82	(75 90)	(15 90)	(1 90)	(93 70)	22 82	22 82	3 11	20 24	20,784 00	(0 3068)	(0 0679)	(0 3747)	16 9691
118	(3 326)	(0 695)	(0 607)	(4 628)	(53 90)	(14 10)	(9 80)	(77 80)	16 20	20 29	16 20	16 82	(75 90)	(15 90)	(1 90)	(93 70)	22 82	22 82	3 11	20 24	20,738 00	(0 3077)	(0 0680)	(0 3753)	16 9691
119	(3 326)	(0 695)	(0 607)	(4 628)	(53 90)	(14 10)	(9 80)	(77 80)	16 20	20 29	16 20	16 82	(75 90)	(15 90)	(1 90)	(93 70)	22 82	22 82	3 11	20 24	20,706 00	(0 3076)	(0 0681)	(0 3757)	16 9691
120	(3 326)	(0 695)	(0 607)	(4 628)	(53 90)	(14 10)	(9 80)	(77 80)	16 20	20 29	16 20	16 82	(75 90)	(15 90)	(1 90)	(93 70)	22 82	22 82	3 11	20 24	20,692 00	(0 3078)	(0 0681)	(0 3759)	16 9691
21	(3 326)	(0 695)	(0 607)	(4 628)	(53 90)	(14 10)	(9 80)	(77 80)	16 20	20 29	16 20	16 82	(75 90)	(15 90)	(1 90)	(93 70)	22 82	22 82	3 11	20 24	20,687 00	(0 3079)	(0 0682)	(0 3761)	16 9691
122	(3 326)	(0 695)	(0 607)	(4 628)	(53 90)	(14 10)	(9 80)	(77 80)	16 20	20 29	16 20	16 82	(75 90)	(15 90)	(1 90)	(93 70)	22 82	22 82	3 11	20 24	20 687 00	(0 3079)	(0 0682)	(0 3761)	16 9691
123	(3 326)	(0 695)	(0 607)	(4 628)	(53 90)	(14 10)	(9 80)	(77 80)	16 20	20 29	16 20	16 82	(75 90)	(15 90)	(1 90)	(93 70)	22 82	22 82	3 11	20 24	20,683 00	(0 3080)	(0 0682)	(0 3762)	16 9691
24	(3 326)	(0 695)	(0 607)	(4 628)	(53 90)	(14 10)	(9 80)	(77 80)	16 20	20 29	16 20	16 82	(75 90)	(15 90)	(1 90)	(93 70)	22 82	22 82	3 11	20 24	20 678 00	(0 3081)	(0 0682)	(0 3763)	16 9691
125	(3 326)	(0 695)	(0 607)	(4 628)	(53 90)	(14 10)	(9 80)	(77 80)	16 20	20 29	16 20	16 82	(75 90)	(15 90)	(1 90)	(93 70)	22 82	22 82	3 11	20 24	20,677 00	(0 3081)	(0 0682)	(0 3763)	16 9691
126	(3 326)	(0 695)	(0 607)	(4 628)	(53 90)	(14 10)	(9 80)	(77 80)	16 20	20 29	16 20	16 82	(75 90)	(15 90)	(1 90)	(93 70)	22 82	22 82	3 11	20 24	20 676 00	(0 3081)	(0 0682)	(0 3763)	16 9691

File Number (WHMWS Letter)

001187

041735

LETTER 4

Kern Water Bank

5(15)

Proposed for Participation in Kern Water Bank (Amendment #4) from Reach 15

	ENTITLEMENT TRANSFERRED				AGENCY PRICING								STATE PRICING								MULTIPLIER	CONTRACT PERCENT			ZCH
	Firm (AF)	Option (AF)	Surplus (AF)	Total (AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Total ($/AF)	Total ($1,000)	Basic (%)	Option (%)	Total (%)	Support (%)
164																					-				
165																					-				
166																					-				
167																					2,124.00				
168																					2,951.00				
169																					3,756.00				
170																					4,568.00				
171																					5,761.00				
172																					6,758.00				
173																					6,764.00				
174																					7,391.00				
175																					8,123.00				
176																					8,952.00				
177																					10,777.00				
178																					11,648.00				
179																					12,641.00				
180																					13,640.00				
181																					14,590.00				
182																					15,647.00				
183																					16,827.00				
184																					17,563.00				
185																					18,045.00				
186																					18,953.00				
187																					19,795.00				
188																					20,467.00				
189																					21,083.00				
190																					21,632.00				
191																					21,831.00				
192																					21,930.00				
193																					21,929.00				
194																					21,929.00				
195																					21,929.00				
196	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	21,129.00	(0.8117)	(0.1784)	(0.9901)	16.9512
197	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	21,127.00	(0.8118)	(0.1784)	(0.9902)	16.9512
198	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	21,127.00	(0.8119)	(0.1784)	(0.9902)	16.9512
199	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	21,127.00	(0.8118)	(0.1784)	(0.9902)	16.9512
200	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	21,127.00	(0.8118)	(0.1784)	(0.9902)	16.9512
201	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	21,042.00	(0.8150)	(0.1792)	(0.9942)	16.9512
202	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	20,954.00	(0.8185)	(0.1799)	(0.9984)	16.9512
203	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	20,846.00	(0.8226)	(0.1808)	(1.0034)	16.9512
204	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	20,761.00	(0.8261)	(0.1816)	(1.0077)	16.9512
205	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	20,730.00	(0.8273)	(0.1819)	(1.0092)	16.9512
206	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	20,706.00	(0.8283)	(0.1821)	(1.0104)	16.9512
207	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	20,692.00	(0.8288)	(0.1822)	(1.0110)	16.9512
208	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	20,687.00	(0.8290)	(0.1822)	(1.0112)	16.9512
209	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	20,687.00	(0.8290)	(0.1822)	(1.0112)	16.9512
210	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	20,683.00	(0.8292)	(0.1823)	(1.0115)	16.9512
211	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	20,678.00	(0.8294)	(0.1823)	(1.0117)	16.9512
212	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	20,677.00	(0.8294)	(0.1823)	(1.0117)	16.9512
213	(8,957)	(1,858)	(1,632)	(12,447)	(145.10)	(37.70)	(26.40)	(209.20)	16.20	20.29	16.20	16.82	(204.40)	(42.40)	(5.50)	(251.90)	22.82	22.82	3.11	20.24	20,676.00	(0.8295)	(0.1823)	(1.0118)	16.9512

001188

041736

LETTER 4

Ridge Maricopa WSD
1(15)
to Tejon Castac WD Entitlement from Reach 15 to Reach 16 (Amendment #5)

	ENTITLEMENT TRANSFERRED				AGENCY PRICING								STATE PRICING								MULTIPLIER	CONTRACT PERCENT			ZOB
	Firm (AF)	Option (AF)	Surplus (AF)	Total (AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Total ($/AF)	Total ($1,000)	Basic (%)	Option (%)	Total (%)	Support (%)
64																									
65																									
66																									
67																					2,124.00				
68																					2,951.00				
69																					3,754.00				
70																					4,548.00				
71																					5,761.00				
72																					6,256.00				
73																					6,784.00				
74																					7,311.00				
75																					8,123.00				
76																					8,952.00				
77																					10,777.00				
78																					11,698.00				
79																					12,641.00				
80																					13,640.00				
81																					14,590.00				
82																					15,647.00				
83																					16,627.00				
84																					17,563.00				
85																					18,045.00				
86																					18,953.00				
87																					19,796.00				
88																					20,461.00				
89																					21,083.00				
90																					21,132.00				
91																					21,131.00				
92																					21,130.00				
93																					21,129.00				
94																					21,129.00				
95																					21,129.00				
96																					21,127.00				
97																					21,127.00				
[illegible]	2.582	0.539	0.471	3.592	41.80	10.90	7.60	60.30	16.20	20.29	16.20	16.82	58.90	12.30	1.50	72.70	22.82	22.82	3.11	20.24	21,127.00	0.2338	0.0516	0.2854	17.0564
14	2.582	0.539	0.471	3.592	41.80	10.90	7.60	60.30	16.20	20.29	16.20	16.82	58.90	12.30	1.50	72.70	22.82	22.82	3.11	20.24	21,127.00	0.2338	0.0516	0.2854	17.0564
15	2.582	0.539	0.471	3.592	41.80	10.90	7.60	60.30	16.20	20.29	16.20	16.82	58.90	12.30	1.50	72.70	22.82	22.82	3.11	20.24	21,012.00	0.2348	0.0518	0.2866	17.0564
16	2.582	0.539	0.471	3.592	41.80	10.90	7.60	60.30	16.20	20.29	16.20	16.82	58.90	12.30	1.50	72.70	22.82	22.82	3.11	20.24	20,954.00	0.2358	0.0520	0.2878	17.0564
17	2.582	0.539	0.471	3.592	41.80	10.90	7.60	60.30	16.20	20.29	16.20	16.82	58.90	12.30	1.50	72.70	22.82	22.82	3.11	20.24	20,848.00	0.2370	0.0523	0.2893	17.0564
18	2.582	0.539	0.471	3.592	41.80	10.90	7.60	60.30	16.20	20.29	16.20	16.82	58.90	12.30	1.50	72.70	22.82	22.82	3.11	20.24	20,761.00	0.2379	0.0525	0.2904	17.0564
19	2.582	0.539	0.471	3.592	41.80	10.90	7.60	60.30	16.20	20.29	16.20	16.82	58.90	12.30	1.50	72.70	22.82	22.82	3.11	20.24	20,730.00	0.2383	0.0526	0.2908	17.0564
20	2.582	0.539	0.471	3.592	41.80	10.90	7.60	60.30	16.20	20.29	16.20	16.82	58.90	12.30	1.50	72.70	22.82	22.82	3.11	20.24	20,706.00	0.2386	0.0526	0.2912	17.0564
21	2.582	0.539	0.471	3.592	41.80	10.90	7.60	60.30	16.20	20.29	16.20	16.82	58.90	12.30	1.50	72.70	22.82	22.82	3.11	20.24	20,692.00	0.2387	0.0527	0.2914	17.0564
22	2.582	0.539	0.471	3.592	41.80	10.90	7.60	60.30	16.20	20.29	16.20	16.82	58.90	12.30	1.50	72.70	22.82	22.82	3.11	20.24	20,687.00	0.2388	0.0527	0.2915	17.0564
23	2.582	0.539	0.471	3.592	41.80	10.90	7.60	60.30	16.20	20.29	16.20	16.82	58.90	12.30	1.50	72.70	22.82	22.82	3.11	20.24	20,687.00	0.2388	0.0527	0.2915	17.0564
24	2.582	0.539	0.471	3.592	41.80	10.90	7.60	60.30	16.20	20.29	16.20	16.82	58.90	12.30	1.50	72.70	22.82	22.82	3.11	20.24	20,683.00	0.2388	0.0527	0.2916	17.0564
25	2.582	0.539	0.471	3.592	41.80	10.90	7.60	60.30	16.20	20.29	16.20	16.82	58.90	12.30	1.50	72.70	22.82	22.82	3.11	20.24	20,678.00	0.2389	0.0527	0.2916	17.0564
26	2.582	0.539	0.471	3.592	41.80	10.90	7.60	60.30	16.20	20.29	16.20	16.82	58.90	12.30	1.50	72.70	22.82	22.82	3.11	20.24	20,677.00	0.2389	0.0527	0.2916	17.0564
[illegible]	2.582	0.539	0.471	3.592	41.80	10.90	7.60	60.30	16.20	20.29	16.20	16.82	58.90	12.30	1.50	72.70	22.82	22.82	3.11	20.24	20,676.00	0.2389	0.0527	0.2916	17.0564

LETTER 4

Ridge Markups WSD
5 (16)
le Tejon Castac WD Lab... from Reach 15 to Reach 16 (Amendment #5)

	TABLE 1 ENTITLEMENT				AGENCY PRICING								STATE PRICING								MULTIPLIER	CONTRACT PERCENT			ZOB
	Firm (AF)	Option (AF)	Surplus (AF)	Total (AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Total ($1,000)	Basic (%)	Option (%)	Total (%)	Support (%)
4																					-				-
5																					-				-
6																					-				-
7																					-				-
8																					2,124.00				-
9																					2,951.00				-
10																					3,754.00				-
11																					4,568.00				-
12																					5,761.00				-
13																					6,256.00				-
14																					6,784.00				-
15																					7,311.00				-
16																					8,123.00				-
17																					8,952.00				-
18																					10,777.00				-
19																					11,698.00				-
[illegible]																					12,641.00				-
[illegible]																					13,640.00				-
[illegible]																					14,590.00				-
[illegible]																					15,647.00				-
[illegible]																					16,627.00				-
[illegible]																					17,563.00				-
[illegible]																					18,045.00				-
[illegible]																					18,953.00				-
[illegible]																					19,796.00				-
[illegible]																					20,481.00				-
[illegible]																					21,083.00				-
[illegible]																					21,132.00				-
[illegible]																					21,131.00				-
[illegible]																					21,130.00				-
[illegible]																					21,129.00				-
[illegible]																					21,129.00				-
[illegible]																					21,129.00				-
[illegible]																					21,127.00				-
[illegible]																					21,127.00				-
[illegible]	(7,582)	(0,539)	(0,471)	(3,592)	(46.70)	(13.70)	(8.50)	(68.90)	18.10	25.38	18.10	19.10	(68.80)	(14.40)	(1.50)	(84.70)	26.66	26.66	3.11	23.58	21,127.00	(0.2613)	(0.0648)	(0.3261)	18.6541
[illegible]	(7,582)	(0,539)	(0,471)	(3,592)	(46.70)	(13.70)	(8.50)	(68.90)	18.10	25.38	18.10	19.10	(68.80)	(14.40)	(1.50)	(84.70)	26.66	26.66	3.11	23.58	21,127.00	(0.2613)	(0.0648)	(0.3261)	18.6541
[illegible]	(7,582)	(0,539)	(0,471)	(3,592)	(46.70)	(13.70)	(8.50)	(68.90)	18.10	25.38	18.10	19.10	(68.80)	(14.40)	(1.50)	(84.70)	26.66	26.66	3.11	23.58	21,042.00	(0.2623)	(0.0651)	(0.3274)	18.6541
[illegible]	(7,582)	(0,539)	(0,471)	(3,592)	(46.70)	(13.70)	(8.50)	(68.90)	18.10	25.38	18.10	19.10	(68.80)	(14.40)	(1.50)	(84.70)	26.66	26.66	3.11	23.58	20,954.00	(0.2634)	(0.0654)	(0.3288)	18.6541
[illegible]	(7,582)	(0,539)	(0,471)	(3,592)	(46.70)	(13.70)	(8.50)	(68.90)	18.10	25.38	18.10	19.10	(68.80)	(14.40)	(1.50)	(84.70)	26.66	26.66	3.11	23.58	20,846.00	(0.2648)	(0.0657)	(0.3305)	18.6541
[illegible]	(7,582)	(0,539)	(0,471)	(3,592)	(46.70)	(13.70)	(8.50)	(68.90)	18.10	25.38	18.10	19.10	(68.80)	(14.40)	(1.50)	(84.70)	26.66	26.66	3.11	23.58	20,761.00	(0.2659)	(0.0660)	(0.3319)	18.6541
[illegible]	(7,582)	(0,539)	(0,471)	(3,592)	(46.70)	(13.70)	(8.50)	(68.90)	18.10	25.38	18.10	19.10	(68.80)	(14.40)	(1.50)	(84.70)	26.66	26.66	3.11	23.58	20,738.00	(0.2663)	(0.0661)	(0.3324)	18.6541
[illegible]	(7,582)	(0,539)	(0,471)	(3,592)	(46.70)	(13.70)	(8.50)	(68.90)	18.10	25.38	18.10	19.10	(68.80)	(14.40)	(1.50)	(84.70)	26.66	26.66	3.11	23.58	20,706.00	(0.2666)	(0.0662)	(0.3328)	18.6541
[illegible]	(7,582)	(0,539)	(0,471)	(3,592)	(46.70)	(13.70)	(8.50)	(68.90)	18.10	25.38	18.10	19.10	(68.80)	(14.40)	(1.50)	(84.70)	26.66	26.66	3.11	23.58	20,692.00	(0.2668)	(0.0662)	(0.3330)	18.6541
[illegible]	(7,582)	(0,539)	(0,471)	(3,592)	(46.70)	(13.70)	(8.50)	(68.90)	18.10	25.38	18.10	19.10	(68.80)	(14.40)	(1.50)	(84.70)	26.66	26.66	3.11	23.58	20,687.00	(0.2668)	(0.0662)	(0.3330)	18.6541
[illegible]	(7,582)	(0,539)	(0,471)	(3,592)	(46.70)	(13.70)	(8.50)	(68.90)	18.10	25.38	18.10	19.10	(68.80)	(14.40)	(1.50)	(84.70)	26.66	26.66	3.11	23.58	20,687.00	(0.2668)	(0.0662)	(0.3330)	18.6541
[illegible]	(7,582)	(0,539)	(0,471)	(3,592)	(46.70)	(13.70)	(8.50)	(68.90)	18.10	25.38	18.10	19.10	(68.80)	(14.40)	(1.50)	(84.70)	26.66	26.66	3.11	23.58	20,683.00	(0.2669)	(0.0662)	(0.3331)	18.6541
[illegible]	(7,582)	(0,539)	(0,471)	(3,592)	(46.70)	(13.70)	(8.50)	(68.90)	18.10	25.38	18.10	19.10	(68.80)	(14.40)	(1.50)	(84.70)	26.66	26.66	3.11	23.58	20,678.00	(0.2670)	(0.0663)	(0.3333)	18.6541
[illegible]	(7,582)	(0,539)	(0,471)	(3,592)	(46.70)	(13.70)	(8.50)	(68.90)	18.10	25.38	18.10	19.10	(68.80)	(14.40)	(1.50)	(84.70)	26.66	26.66	3.11	23.58	20,677.00	(0.2670)	(0.0663)	(0.3333)	18.6541
[illegible]	(7,582)	(0,539)	(0,471)	(3,592)	(46.70)	(13.70)	(8.50)	(68.90)	18.10	25.38	18.10	19.10	(68.80)	(14.40)	(1.50)	(84.70)	26.66	26.66	3.11	23.58	20,676.00	(0.2670)	(0.0663)	(0.3333)	18.6541

File: Contract WRMWSDater5 2

Ridge [illegible] WSI)
[illegible] 1A (14A)
[illegible] to Castaic Lake WA (Amendment #6)

Computed as 9,417 AF / 33,200 AF * 6,000 AF = 1,702 AF. This is the proportion of Basic Firm ent. in R14A to be sold to total Basic Firm ent. in R14A times 6,000 AF (ent. of Surplus in R14A)

	TABLE 1 ENTITLEMENT				AGENCY PRICING								STATE PRICING								MULTIPLIER	CONTRACT PERCENT			ZCO
	Firm (AF)	Option (AF)	Surplus (AF)	Total (AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Total ($1,000)	Basic (%)	Option (%)	Total (%)	Support (%)
1964																									
1965																					-				-
1966																					-				-
1967																					-				-
1968																					2,124.00				-
1969																					2,951.00				-
1970																					3,754.00				-
1971																					4,568.00				-
1972																					5,761.00				-
1973																					6,256.00				-
1974																					6,784.00				-
1975																					7,311.00				-
1976																					8,123.00				-
1977																					8,952.00				-
1978																					10,777.00				-
1979																					11,698.00				-
1980																					12,645.00				-
1981																					13,640.00				-
1982																					14,590.00				-
1983																					15,647.00				-
1984																					16,627.00				-
1985																					17,563.00				-
1986																					18,045.00				-
1987																					18,953.00				-
1988																					19,796.00				-
1989																					20,469.00				-
1990																					21,083.00				-
1991																					21,137.00				-
1992																					21,131.00				-
1993																					21,130.00				-
1994																					21,129.00				-
1995																					21,129.00				-
1996																					21,129.00				-
1997																					21,127.00				-
1998																					21,127.00				-
1999	(9,417)	(6,900)	(1,702)	(18,019)	(132.80)	(127.90)	(24.00)	(284.70)	14.10	18.64	14.10	15.80	(191.50)	(140.30)	(5.30)	(337.10)	20.34	20.34	3.11	18.71	21,127.00	(0.7422)	(0.6054)	(1.3476)	15.5443
2000	(9,417)	(6,900)	(1,702)	(18,019)	(132.80)	(127.90)	(24.00)	(284.70)	14.10	18.54	14.10	15.80	(191.50)	(140.30)	(5.30)	(337.10)	20.34	20.34	3.11	18.71	21,127.00	(0.7422)	(0.6054)	(1.3476)	15.5443
2001	(9,417)	(6,900)	(1,702)	(18,019)	(132.80)	(127.90)	(24.00)	(284.70)	14.10	18.54	14.10	15.80	(191.50)	(140.30)	(5.30)	(337.10)	20.34	20.34	3.11	18.71	21,042.00	(0.7452)	(0.6078)	(1.3530)	15.5443
2002	(9,417)	(6,900)	(1,702)	(18,019)	(132.80)	(127.90)	(24.00)	(284.70)	14.10	18.54	14.10	15.80	(191.50)	(140.30)	(5.30)	(337.10)	20.34	20.34	3.11	18.71	20,954.00	(0.7483)	(0.6104)	(1.3587)	15.5443
2003	(9,417)	(6,900)	(1,702)	(18,019)	(132.80)	(127.90)	(24.00)	(284.70)	14.10	18.54	14.10	15.80	(191.50)	(140.30)	(5.30)	(337.10)	20.34	20.34	3.11	18.71	20,848.00	(0.7521)	(0.6135)	(1.3656)	15.5443
2004	(9,417)	(6,900)	(1,702)	(18,019)	(132.80)	(127.90)	(24.00)	(284.70)	14.10	18.54	14.10	15.80	(191.50)	(140.30)	(5.30)	(337.10)	20.34	20.34	3.11	18.71	20,761.00	(0.7553)	(0.6161)	(1.3714)	15.5443
2005	(9,417)	(6,900)	(1,702)	(18,019)	(132.80)	(127.90)	(24.00)	(284.70)	14.10	18.54	14.10	15.80	(191.50)	(140.30)	(5.30)	(337.10)	20.34	20.34	3.11	18.71	20,730.00	(0.7564)	(0.6170)	(1.3734)	15.5443
2006	(9,417)	(6,900)	(1,702)	(18,019)	(132.80)	(127.90)	(24.00)	(284.70)	14.10	18.54	14.10	15.80	(191.50)	(140.30)	(5.30)	(337.10)	20.34	20.34	3.11	18.71	20,708.00	(0.7573)	(0.6177)	(1.3750)	15.5443
2007	(9,417)	(6,900)	(1,702)	(18,019)	(132.80)	(127.90)	(24.00)	(284.70)	14.10	18.54	14.10	15.80	(191.50)	(140.30)	(5.30)	(337.10)	20.34	20.34	3.11	18.71	20,692.00	(0.7578)	(0.6181)	(1.3759)	15.5443
2008	(9,417)	(6,900)	(1,702)	(18,019)	(132.80)	(127.90)	(24.00)	(284.70)	14.10	18.54	14.10	15.80	(191.50)	(140.30)	(5.30)	(337.10)	20.34	20.34	3.11	18.71	20,687.00	(0.7580)	(0.6183)	(1.3763)	15.5443
2009	(9,417)	(6,900)	(1,702)	(18,019)	(132.80)	(127.90)	(24.00)	(284.70)	14.10	18.54	14.10	15.80	(191.50)	(140.30)	(5.30)	(337.10)	20.34	20.34	3.11	18.71	20,687.00	(0.7580)	(0.6183)	(1.3763)	15.5443
2010	(9,417)	(6,900)	(1,702)	(18,019)	(132.80)	(127.90)	(24.00)	(284.70)	14.10	18.54	14.10	15.80	(191.50)	(140.30)	(5.30)	(337.10)	20.34	20.34	3.11	18.71	20,683.00	(0.7581)	(0.6184)	(1.3765)	15.5443
2011	(9,417)	(6,900)	(1,702)	(18,019)	(132.80)	(127.90)	(24.00)	(284.70)	14.10	18.54	14.10	15.80	(191.50)	(140.30)	(5.30)	(337.10)	20.34	20.34	3.11	18.71	20,678.00	(0.7583)	(0.6185)	(1.3768)	15.5443
2012	(9,417)	(6,900)	(1,702)	(18,019)	(132.80)	(127.90)	(24.00)	(284.70)	14.10	18.54	14.10	15.80	(191.50)	(140.30)	(5.30)	(337.10)	20.34	20.34	3.11	18.71	20,677.00	(0.7583)	(0.6186)	(1.3769)	15.5443
2013	(9,417)	(6,900)	(1,702)	(18,019)	(132.80)	(127.90)	(24.00)	(284.70)	14.10	18.54	14.10	15.80	(191.50)	(140.30)	(5.30)	(337.10)	20.34	20.34	3.11	18.71	20,676.00	(0.7584)	(0.6186)	(1.3770)	15.5443

Ridge Mariposa WSD
48 (148)
to Castaic Lake WA (Amendment #6)

	TABLE 1 ENTITLEMENT				AGENCY PRICING								STATE PRICING								MULTIPLIER	CONTRACT PERCENT			70%
	Firm (AF)	Option (AF)	Surplus (AF)	Total (AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Total ($1,000)	Basic (%)	Option (%)	Total (%)	Support (%)
[illegible]																					-				-
[illegible]																					-				-
[illegible]																					-				-
[illegible]																					-				-
[illegible]																					2,124.00				-
[illegible]																					2,951.00				-
[illegible]																					3,754.00				-
[illegible]																					4,568.00	-	-	-	-
[illegible]																					5,761.00	-	-	-	-
[illegible]																					6,256.00	-	-	-	-
[illegible]																					6,784.00	-	-	-	-
[illegible]																					7,311.00	-	-	-	-
[illegible]																					8,123.00	-	-	-	-
[illegible]																					8,957.00	-	-	-	-
[illegible]																					10,777.00	-	-	-	-
[illegible]																					11,698.00	-	-	-	-
[illegible]																					12,641.00	-	-	-	-
[illegible]																					13,640.00	-	-	-	-
[illegible]																					14,590.00	-	-	-	-
[illegible]																					15,647.00	-	-	-	-
[illegible]																					16,627.00	-	-	-	-
[illegible]																					17,563.00	-	-	-	-
[illegible]																					18,045.00	-	-	-	-
[illegible]																					18,853.00	-	-	-	-
[illegible]																					19,796.00	-	-	-	-
[illegible]																					20,461.00	-	-	-	-
[illegible]																					21,083.00	-	-	-	-
[illegible]																					21,132.00	-	-	-	-
[illegible]																					21,131.00	-	-	-	-
[illegible]																					21,130.00	-	-	-	-
[illegible]																					21,129.00	-	-	-	-
[illegible]																					21,129.00	-	-	-	-
[illegible]																					21,129.00	-	-	-	-
[illegible]																					21,127.00	-	-	-	-
[illegible]																					21,127.00	-	-	-	-
[illegible]		(12,519)		(12,519)	-	(245.10)	-	(245.10)	14.60	19.58	14.60	19.58	-	(265.00)	-	(265.00)	21.17	21.17	3.11	21.17	21,127.00	-	(1.1601)	(1.1601)	7.5094
[illegible]		(12,519)		(12,519)	-	(245.10)	-	(245.10)	14.60	19.58	14.60	19.58	-	(265.00)	-	(265.00)	21.17	21.17	3.11	21.17	21,127.00	-	(1.1601)	(1.1601)	7.5094
[illegible]		(12,519)		(12,519)	-	(245.10)	-	(245.10)	14.60	19.58	14.60	19.58	-	(265.00)	-	(265.00)	21.17	21.17	3.11	21.17	21,042.00	-	(1.1646)	(1.1646)	7.5094
[illegible]		(12,519)		(12,519)	-	(245.10)	-	(245.10)	14.60	19.58	14.60	19.58	-	(265.00)	-	(265.00)	21.17	21.17	3.11	21.17	20,954.00	-	(1.1697)	(1.1697)	7.5094
[illegible]		(12,519)		(12,519)	-	(245.10)	-	(245.10)	14.60	19.58	14.60	19.58	-	(265.00)	-	(265.00)	21.17	21.17	3.11	21.17	20,848.00	-	(1.1757)	(1.1757)	7.5094
[illegible]		(12,519)		(12,519)	-	(245.10)	-	(245.10)	14.60	19.58	14.60	19.58	-	(265.00)	-	(265.00)	21.17	21.17	3.11	21.17	20,761.00	-	(1.1806)	(1.1806)	7.5094
[illegible]		(12,519)		(12,519)	-	(245.10)	-	(245.10)	14.60	19.58	14.60	19.58	-	(265.00)	-	(265.00)	21.17	21.17	3.11	21.17	20,730.00	-	(1.1823)	(1.1823)	7.5094
[illegible]		(12,519)		(12,519)	-	(245.10)	-	(245.10)	14.60	19.58	14.60	19.58	-	(265.00)	-	(265.00)	21.17	21.17	3.11	21.17	20,706.00	-	(1.1837)	(1.1837)	7.5094
[illegible]		(12,519)		(12,519)	-	(245.10)	-	(245.10)	14.60	19.58	14.60	19.58	-	(265.00)	-	(265.00)	21.17	21.17	3.11	21.17	20,697.00	-	(1.1845)	(1.1845)	7.5094
[illegible]		(12,519)		(12,519)	-	(245.10)	-	(245.10)	14.60	19.58	14.60	19.58	-	(265.00)	-	(265.00)	21.17	21.17	3.11	21.17	20,687.00	-	(1.1848)	(1.1848)	7.5094
[illegible]		(12,519)		(12,519)	-	(245.10)	-	(245.10)	14.60	19.58	14.60	19.58	-	(265.00)	-	(265.00)	21.17	21.17	3.11	21.17	20,687.00	-	(1.1848)	(1.1848)	7.5094
[illegible]		(12,519)		(12,519)	-	(245.10)	-	(245.10)	14.60	19.58	14.60	19.58	-	(265.00)	-	(265.00)	21.17	21.17	3.11	21.17	20,683.00	-	(1.1850)	(1.1850)	7.5094
[illegible]		(12,519)		(12,519)	-	(245.10)	-	(245.10)	14.60	19.58	14.60	19.58	-	(265.00)	-	(265.00)	21.17	21.17	3.11	21.17	20,678.00	-	(1.1853)	(1.1853)	7.5094
[illegible]		(12,519)		(12,519)	-	(245.10)	-	(245.10)	14.60	19.58	14.60	19.58	-	(265.00)	-	(265.00)	21.17	21.17	3.11	21.17	20,677.00	-	(1.1854)	(1.1854)	7.5094
[illegible]		(12,519)		(12,519)	-	(245.10)	-	(245.10)	14.60	19.58	14.60	19.58	-	(265.00)	-	(265.00)	21.17	21.17	3.11	21.17	20,678.00	-	(1.1854)	(1.1854)	7.5094

File Contract\WRMWS\Mer6 7

Phase Maricopa WSD
IC (140)
to Castaic Lake WA (Amendment #6)

TABLE 1 ENTITLEMENT				AGENCY PRICING								STATE PRICING								MULTIPLIER	CONTRACT PERCENT			ZOB
Firm (AF)	Option (AF)	Surplus (AF)	Total (AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Total ($1,000)	Basic (%)	Option (%)	Total (%)	Support (%)
																				-				-
																				-				-
																				-				-
																				2,124.00				-
																				2,931.00				-
																				3,754.00				-
																				4,588.00	-	-	-	-
																				5,761.00	-	-	-	-
																				6,256.00	-	-	-	-
																				6,784.00	-	-	-	-
																				7,315.00	-	-	-	-
																				8,123.00	-	-	-	-
																				8,952.00	-	-	-	-
																				10,777.00	-	-	-	-
																				11,698.00	-	-	-	-
																				12,641.00	-	-	-	-
																				13,840.00	-	-	-	-
																				14,590.00	-	-	-	-
																				15,647.00	-	-	-	-
																				16,627.00	-	-	-	-
																				17,563.00	-	-	-	-
																				18,045.00	-	-	-	-
																				18,953.00	-	-	-	-
																				19,796.00	-	-	-	-
																				20,461.00	-	-	-	-
																				21,083.00	-	-	-	-
																				21,132.00	-	-	-	-
																				21,131.00	-	-	-	-
																				21,130.00	-	-	-	-
																				21,129.00	-	-	-	-
																				21,129.00	-	-	-	-
																				21,129.00	-	-	-	-
																				21,127.00	-	-	-	-
																				21,127.00	-	-	-	-
	(2,617)		(2,617)	-	(50.70)	-	(50.70)	15.10	19.38	15.10	19.37	-	(57.40)	-	(57.40)	21.93	21.93	3.11	21.93	21,127.00	-	(0.2400)	(0.2400)	11.6725
	(2,617)		(2,617)	-	(50.70)	-	(50.70)	15.10	19.39	15.10	19.37	-	(57.40)	-	(57.40)	21.93	21.93	3.11	21.93	21,127.00	-	(0.2400)	(0.2400)	11.6725
	(2,617)		(2,617)	-	(50.70)	-	(50.70)	15.10	19.39	15.10	19.37	-	(57.40)	-	(57.40)	21.93	21.93	3.11	21.93	21,042.00	-	(0.2409)	(0.2409)	11.6725
	(2,617)		(2,617)	-	(50.70)	-	(50.70)	15.10	19.39	15.10	19.37	-	(57.40)	-	(57.40)	21.93	21.93	3.11	21.93	20,954.00	-	(0.2420)	(0.2420)	11.6725
	(2,617)		(2,617)	-	(50.70)	-	(50.70)	15.10	19.39	15.10	19.37	-	(57.40)	-	(57.40)	21.93	21.93	3.11	21.93	20,846.00	-	(0.2432)	(0.2432)	11.6725
	(2,617)		(2,617)	-	(50.70)	-	(50.70)	15.10	19.39	15.10	19.37	-	(57.40)	-	(57.40)	21.93	21.93	3.11	21.93	20,761.00	-	(0.2442)	(0.2442)	11.6725
	(2,617)		(2,617)	-	(50.70)	-	(50.70)	15.10	19.39	15.10	19.37	-	(57.40)	-	(57.40)	21.93	21.93	3.11	21.93	20,730.00	-	(0.2446)	(0.2446)	11.6725
	(2,617)		(2,617)	-	(50.70)	-	(50.70)	15.10	19.39	15.10	19.37	-	(57.40)	-	(57.40)	21.93	21.93	3.11	21.93	20,706.00	-	(0.2449)	(0.2449)	11.6725
	(2,617)		(2,617)	-	(50.70)	-	(50.70)	15.10	19.39	15.10	19.37	-	(57.40)	-	(57.40)	21.93	21.93	3.11	21.93	20,692.00	-	(0.2450)	(0.2450)	11.6725
	(2,617)		(2,617)	-	(50.70)	-	(50.70)	15.10	19.39	15.10	19.37	-	(57.40)	-	(57.40)	21.93	21.93	3.11	21.93	20,687.00	-	(0.2451)	(0.2451)	11.6725
	(2,617)		(2,617)	-	(50.70)	-	(50.70)	15.10	19.39	15.10	19.37	-	(57.40)	-	(57.40)	21.93	21.93	3.11	21.93	20,687.00	-	(0.2451)	(0.2451)	11.6725
	(2,617)		(2,617)	-	(50.70)	-	(50.70)	15.10	19.39	15.10	19.37	-	(57.40)	-	(57.40)	21.93	21.93	3.11	21.93	20,683.00	-	(0.2451)	(0.2451)	11.6725
	(2,617)		(2,617)	-	(50.70)	-	(50.70)	15.10	19.39	15.10	19.37	-	(57.40)	-	(57.40)	21.93	21.93	3.11	21.93	20,678.00	-	(0.2452)	(0.2452)	11.6725
	(2,617)		(2,617)	-	(50.70)	-	(50.70)	15.10	19.39	15.10	19.37	-	(57.40)	-	(57.40)	21.93	21.93	3.11	21.93	20,677.00	-	(0.2452)	(0.2452)	11.6725
	(2,617)		(2,617)	-	(50.70)	-	(50.70)	15.10	19.39	15.10	19.37	-	(57.40)	-	(57.40)	21.93	21.93	3.11	21.93	20,676.00	-	(0.2452)	(0.2452)	11.6725

File Contract WRMWD.Table 6.3

Ridge Meadows WSD
5 (15)
to Coastal Lake WA (An 15)

TABLE 1 ENTITLEMENT				AGENCY PRICING								STATE PRICING								MULTIPLIER	CONTRACT PERCENT			2010
Firm (AF)	Option (AF)	Surplus (AF)	Total (AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Total ($1,000)	Basic (%)	Option (%)	Total (%)	Support (%)
																				-				-
																				-				-
																				-				-
																				2,174.00				-
																				2,954.00				-
																				3,754.00				-
																				4,568.00	-	-	-	-
																				5,761.00	-	-	-	-
																				6,256.00	-	-	-	-
																				6,784.00	-	-	-	-
																				7,311.00	-	-	-	-
																				8,123.00	-	-	-	-
																				8,952.00	-	-	-	-
																				10,777.00	-	-	-	-
																				11,818.00	-	-	-	-
																				12,631.00	-	-	-	-
																				13,640.00	-	-	-	-
																				14,590.00	-	-	-	-
																				15,647.00	-	-	-	-
																				16,627.00	-	-	-	-
																				17,563.00	-	-	-	-
																				18,615.00	-	-	-	-
																				18,953.00	-	-	-	-
																				19,796.00	-	-	-	-
																				20,461.00	-	-	-	-
																				21,063.00	-	-	-	-
																				21,132.00	-	-	-	-
																				21,131.00	-	-	-	-
																				21,130.00	-	-	-	-
																				21,129.00	-	-	-	-
																				21,129.00	-	-	-	-
																				21,129.00	-	-	-	-
																				21,128.00	-	-	-	-
																				21,127.00	-	-	-	-
	(3,571)		(3,571)	-	(72.50)	-	(72.50)	18.20	20.29	18.20	20.30	-	(81.50)	-	(81.50)	22.82	22.82	3.11	22.82	21,127.00	-	(0.3432)	(0.3432)	11.0429
	(3,571)		(3,571)	-	(72.50)	-	(72.50)	18.20	20.29	18.20	20.30	-	(81.50)	-	(81.50)	22.82	22.82	3.11	22.82	21,127.00	-	(0.3432)	(0.3432)	11.0429
	(3,571)		(3,571)	-	(72.50)	-	(72.50)	18.20	20.29	18.20	20.30	-	(81.50)	-	(81.50)	22.82	22.82	3.11	22.82	21,042.00	-	(0.3415)	(0.3415)	11.0429
	(3,571)		(3,571)	-	(72.50)	-	(72.50)	18.20	20.29	18.20	20.30	-	(81.50)	-	(81.50)	22.82	22.82	3.11	22.82	20,956.00	-	(0.3460)	(0.3460)	11.0429
	(3,571)		(3,571)	-	(72.50)	-	(72.50)	18.20	20.29	18.20	20.30	-	(81.50)	-	(81.50)	22.82	22.82	3.11	22.82	20,848.00	-	(0.3478)	(0.3478)	11.0429
	(3,571)		(3,571)	-	(72.50)	-	(72.50)	18.20	20.29	18.20	20.30	-	(81.50)	-	(81.50)	22.82	22.82	3.11	22.82	20,791.00	-	(0.3492)	(0.3492)	11.0429
	(3,571)		(3,571)	-	(72.50)	-	(72.50)	18.20	20.29	18.20	20.30	-	(81.50)	-	(81.50)	22.82	22.82	3.11	22.82	20,730.00	-	(0.3497)	(0.3497)	11.0429
	(3,571)		(3,571)	-	(72.50)	-	(72.50)	18.20	20.29	18.20	20.30	-	(81.50)	-	(81.50)	22.82	22.82	3.11	22.82	20,706.00	-	(0.3501)	(0.3501)	11.0429
	(3,571)		(3,571)	-	(72.50)	-	(72.50)	18.20	20.29	18.20	20.30	-	(81.50)	-	(81.50)	22.82	22.82	3.11	22.82	20,697.00	-	(0.3504)	(0.3504)	11.0429
	(3,571)		(3,571)	-	(72.50)	-	(72.50)	18.20	20.29	18.20	20.30	-	(81.50)	-	(81.50)	22.82	22.82	3.11	22.82	20,687.00	-	(0.3505)	(0.3505)	11.0429
	(3,571)		(3,571)	-	(72.50)	-	(72.50)	18.20	20.29	18.20	20.30	-	(81.50)	-	(81.50)	22.82	22.82	3.11	22.82	20,683.00	-	(0.3505)	(0.3505)	11.0429
	(3,571)		(3,571)	-	(72.50)	-	(72.50)	18.20	20.29	18.20	20.30	-	(81.50)	-	(81.50)	22.82	22.82	3.11	22.82	20,678.00	-	(0.3506)	(0.3506)	11.0429
	(3,571)		(3,571)	-	(72.50)	-	(72.50)	18.20	20.29	18.20	20.30	-	(81.50)	-	(81.50)	22.82	22.82	3.11	22.82	20,677.00	-	(0.3506)	(0.3506)	11.0429
	(3,571)		(3,571)	-	(72.50)	-	(72.50)	18.20	20.29	18.20	20.30	-	(81.50)	-	(81.50)	22.82	22.82	3.11	22.82	20,676.00	-	(0.3506)	(0.3506)	11.0429

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File: Contract WRIMW2.Updated 6

11

041742

Ridge Maricopa WSD
.8 (15)
to Castaic Lake WA (Amendment #8)

	TABLE 1 ENTITLEMENT				AGENCY PRICING								STATE PRICING								MULTIPLIER	CONTRACT PERCENT			ZOB
	Firm (AF)	Option (AF)	Surplus (AF)	Total (AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Average ($/AF)	Total ($1,000)	Basic (%)	Option (%)	Total (%)	Support (%)
04																					-				-
05																					-				-
06																					-				-
07																					-				-
08																					2,124.00				-
09																					2,951.00		-		-
10																					3,754.00				-
11																					4,566.00	-	-	-	-
12																					5,761.00	-	-	-	-
13																					6,256.00	-	-	-	-
14																					6,784.00	-	-	-	-
15																					7,311.00	-	-	-	-
16																					8,123.00	-	-	-	-
17																					8,952.00	-	-	-	-
18																					10,777.00	-	-	-	-
19																					11,658.00	-	-	-	-
20																					12,641.00	-	-	-	-
21																					13,646.00	-	-	-	-
22																					14,390.00	-	-	-	-
23																					15,647.00	-	-	-	-
24																					16,677.00	-	-	-	-
25																					17,563.00	-	-	-	-
26																					18,645.00	-	-	-	-
27																					18,953.00	-	-	-	-
28																					19,795.00	-	-	-	-
29																					20,461.00	-	-	-	-
30																					21,063.00	-	-	-	-
31																					21,132.00	-	-	-	-
32																					21,131.00	-	-	-	-
33																					21,130.00	-	-	-	-
34																					21,129.00	-	-	-	-
35																					21,129.00	-	-	-	-
36																					21,129.00	-	-	-	-
37																					21,127.00	-	-	-	-
38																					21,127.00	-	-	-	-
39		(5,976)		(5,976)	-	(151.70)	-	(151.70)	18.10	25.38	18.10	25.38	-	(159.30)	-	(159.30)	26.66	26.66	3.11	26.66	21,127.00	-	(0.7180)	(0.7180)	4.7709
40		(5,976)		(5,976)	-	(151.70)	-	(151.70)	18.10	25.38	18.10	25.38	-	(159.30)	-	(159.30)	26.66	26.66	3.11	26.66	21,127.00	-	(0.7180)	(0.7180)	4.7709
41		(5,976)		(5,976)	-	(151.70)	-	(151.70)	18.10	25.38	18.10	25.38	-	(159.30)	-	(159.30)	26.66	26.66	3.11	26.66	21,042.00	-	(0.7209)	(0.7209)	4.7709
42		(5,976)		(5,976)	-	(151.70)	-	(151.70)	18.10	25.38	18.10	25.38	-	(159.30)	-	(159.30)	26.66	26.66	3.11	26.66	20,954.00	-	(0.7240)	(0.7240)	4.7709
43		(5,976)		(5,976)	-	(151.70)	-	(151.70)	18.10	25.38	18.10	25.38	-	(159.30)	-	(159.30)	26.66	26.66	3.11	26.66	20,848.00	-	(0.7276)	(0.7276)	4.7709
44		(5,976)		(5,976)	-	(151.70)	-	(151.70)	18.10	25.38	18.10	25.38	-	(159.30)	-	(159.30)	26.66	26.66	3.11	26.66	20,761.00	-	(0.7307)	(0.7307)	4.7709
45		(5,976)		(5,976)	-	(151.70)	-	(151.70)	18.10	25.38	18.10	25.38	-	(159.30)	-	(159.30)	26.66	26.66	3.11	26.66	20,730.00	-	(0.7318)	(0.7318)	4.7709
46		(5,976)		(5,976)	-	(151.70)	-	(151.70)	18.10	25.38	18.10	25.38	-	(159.30)	-	(159.30)	26.66	26.66	3.11	26.66	20,708.00	-	(0.7328)	(0.7328)	4.7709
47		(5,976)		(5,976)	-	(151.70)	-	(151.70)	18.10	25.38	18.10	25.38	-	(159.30)	-	(159.30)	26.66	26.66	3.11	26.66	20,692.00	-	(0.7331)	(0.7331)	4.7709
48		(5,976)		(5,976)	-	(151.70)	-	(151.70)	18.10	25.38	18.10	25.38	-	(159.30)	-	(159.30)	26.66	26.66	3.11	26.66	20,687.00	-	(0.7333)	(0.7333)	4.7709
49		(5,976)		(5,976)	-	(151.70)	-	(151.70)	18.10	25.38	18.10	25.38	-	(159.30)	-	(159.30)	26.66	26.66	3.11	26.66	20,687.00	-	(0.7333)	(0.7333)	4.7709
50		(5,976)		(5,976)	-	(151.70)	-	(151.70)	18.10	25.38	18.10	25.38	-	(159.30)	-	(159.30)	26.66	26.66	3.11	26.66	20,683.00	-	(0.7335)	(0.7335)	4.7709
51		(5,976)		(5,976)	-	(151.70)	-	(151.70)	18.10	25.38	18.10	25.38	-	(159.30)	-	(159.30)	26.66	26.66	3.11	26.66	20,679.00	-	(0.7336)	(0.7336)	4.7709
52		(5,976)		(5,976)	-	(151.70)	-	(151.70)	18.10	25.38	18.10	25.38	-	(159.30)	-	(159.30)	26.66	26.66	3.11	26.66	20,677.00	-	(0.7337)	(0.7337)	4.7709
53		(5,976)		(5,976)	-	(151.70)	-	(151.70)	18.10	25.38	18.10	25.38	-	(159.30)	-	(159.30)	26.66	26.66	3.11	26.66	20,676.00	-	(0.7337)	(0.7337)	4.7709

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Ridge Maricopa WSC
Reaches

	TOTAL ENTITLEMENT				TOTAL AGENCY PRICING								TOTAL STATE PRICING								MULTIPLIER	CONTRACT PERCENT			ZOH
	Firm (AF)	Option (AF)	Surplus (AF)	Total (AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Total ($/AF)	Firm ($1,000)	Option ($1,000)	Surplus ($1,000)	Total ($1,000)	Firm ($/AF)	Option ($/AF)	Surplus ($/AF)	Total ($/AF)	Total ($1,000)	Basic (%)	Option (%)	Total (%)	Support (%)
1964																					-		-	-	-
1965																					-	-	-	-	-
1966																					-	-	-	-	-
1967																					-	-	-	-	-
1968																					2,124.00	-	-	-	-
1969																					2,951.00	-	-	-	-
1970																					3,754.00	-	-	-	-
1971	4,300	5,700	27,800	37,800	42.90	177.00	276.70	496.60	9.90	31.05	9.95	13.14	67.30	88.70	83.90	239.90	15.65	15.56	3.02	6.35	4,560.00	6.9965	3.3748	10.8713	(107.0079)
1972	32,100	17,000	34,100	83,200	334.70	278.30	376.70	989.70	10.43	23.18	10.43	12.34	974.00	363.80	93.90	1,431.70	30.34	30.32	2.60	17.85	5,761.00	12.3503	4.8307	17.1810	30.8724
1973	38,000	18,200	52,900	108,100	400.60	340.40	551.70	1,290.70	10.43	21.01	10.43	12.01	1,043.60	433.80	134.40	1,611.80	28.74	26.76	2.54	14.91	8,258.00	15.3182	5.1411	20.7593	13.4755
1974	28,200	22,600	100,800	151,600	295.70	410.70	1,055.90	1,800.30	10.49	19.68	10.50	11.88	850.50	687.70	287.70	1,825.90	30.16	30.16	2.86	12.04	6,784.00	19.9233	6.6141	26.5374	1.4020
1975	33,700	24,700	105,900	164,300	344.60	476.70	1,145.90	1,967.20	10.82	19.30	10.82	12.09	941.90	690.40	304.00	1,936.30	27.95	27.95	2.87	11.79	7,311.00	20.6608	6.5202	27.1810	(2.6287)
1976	42,600	26,800	108,900	178,300	460.40	518.60	1,177.20	2,156.10	10.81	19.35	10.81	12.09	1,112.90	700.10	345.30	2,158.30	26.12	26.12	3.17	12.10	8,123.00	20.1599	6.3832	26.5431	8.1019
1977	53,300	28,600	108,500	190,400	580.40	555.80	1,181.20	2,317.40	10.89	19.43	10.89	12.17	1,287.70	691.40	362.40	2,341.50	24.16	24.17	3.34	12.30	8,952.00	19.6783	6.2087	25.8870	1.0293
1978	63,700	30,700	109,700	204,100	700.60	661.20	1,216.60	2,584.30	11.09	21.54	11.09	12.66	1,579.60	736.60	375.20	2,641.90	24.01	24.00	3.42	12.94	10,777.00	17.8436	6.1351	23.9789	7.1691
1979	74,000	32,600	110,300	216,900	821.78	696.40	1,224.90	2,746.20	11.10	21.48	11.11	12.66	1,893.40	877.80	388.20	3,259.50	25.94	26.93	3.52	15.03	11,598.00	17.4962	5.9805	23.4767	15.7478
1980	85,300	34,400	109,100	228,800	970.00	735.50	1,284.80	2,987.60	11.58	21.38	11.58	13.06	2,209.30	891.10	391.70	3,492.10	25.90	25.90	3.59	15.26	12,849.00	17.8143	5.0183	22.8326	14.4496
1981	96,500	38,300	106,600	241,400	1,139.60	771.50	1,233.20	3,144.30	11.57	21.35	11.57	13.03	2,478.60	913.80	383.60	3,776.10	25.18	25.17	3.60	15.64	13,640.00	17.3959	5.6562	23.0521	16.7315
1982	110,700	38,000	104,200	252,900	1,291.80	809.40	1,215.70	3,316.90	11.67	21.31	11.67	13.12	2,752.60	944.30	376.20	4,073.10	24.87	24.85	3.61	16.11	14,590.00	17.1857	5.5490	22.7347	16.5657
1983	127,000	39,300	85,400	251,700	1,606.90	834.80	1,207.10	3,648.80	12.65	21.24	12.65	13.94	3,087.30	855.80	314.40	4,387.50	24.31	24.32	3.61	16.77	15,647.00	17.8835	5.3353	23.2188	16.8365
1984	140,100	40,900	91,300	272,300	1,781.60	872.00	1,164.40	3,823.00	12.75	21.32	12.75	14.04	3,393.60	907.90	330.40	4,782.00	24.15	24.15	3.62	17.27	15,627.00	17.7482	5.2445	22.9927	16.6942
1985	153,800	42,100	84,300	280,200	2,110.70	853.70	1,158.00	4,162.40	13.76	21.23	13.74	14.87	3,661.40	1,003.40	304.30	4,969.10	23.84	23.83	3.61	17.75	17,563.00	18.6112	5.0886	23.6998	18.2343
1986	167,300	43,300	77,800	288,400	2,305.80	900.40	1,071.90	4,278.10	13.78	20.79	13.78	14.83	3,881.60	1,005.10	246.60	5,133.30	23.20	23.21	3.17	17.80	18,045.00	18.7187	4.9898	23.7085	16.6596
1987	187,100	44,300	63,200	294,600	2,601.40	918.30	974.10	4,493.80	14.29	20.73	14.28	15.25	4,179.70	1,017.30	214.20	5,411.20	22.95	22.96	3.14	18.37	18,953.00	18.8641	4.8451	23.7092	16.9537
1988	189,008	43,259	55,476	287,743	2,677.50	884.90	785.70	4,348.10	14.17	20.46	14.16	15.11	4,260.90	975.80	172.30	5,409.00	22.54	22.55	3.11	18.80	19,796.00	17.4537	4.4100	21.8637	19.6136
1989	199,301	43,539	47,077	289,917	2,928.30	892.50	691.90	4,512.70	14.69	20.50	14.70	15.57	4,463.20	879.20	147.40	5,489.80	22.49	22.49	3.13	18.35	20,451.00	17.6948	4.3620	22.0568	19.5560
1990	209,201	43,723	38,146	291,070	3,074.20	883.70	580.60	4,538.50	14.69	20.44	14.70	15.59	4,672.90	878.70	2.60	5,552.20	22.34	22.34	0.07	19.42	21,083.00	17.2395	4.2389	21.4784	19.6806
1991	209,201	43,723	38,146	291,070	3,241.60	895.30	591.30	4,728.20	15.50	20.48	15.50	16.24	4,781.10	878.30	118.60	5,778.00	22.38	22.37	3.11	19.85	21,132.00	18.1414	4.2367	22.3781	18.1649
1992	209,201	43,723	38,146	291,070	3,241.60	895.30	591.30	4,728.20	15.50	20.48	15.50	16.24	4,781.10	878.30	118.60	5,778.00	22.38	22.37	3.11	19.85	21,131.00	18.1412	4.2369	22.3781	18.1649
1993	209,201	43,723	38,146	291,070	3,241.60	895.30	591.30	4,728.20	15.50	20.48	15.50	16.24	4,781.10	878.30	118.60	5,778.00	22.38	22.37	3.11	19.85	21,130.00	18.1410	4.2371	22.3781	18.1649
1994	209,201	43,723	38,146	291,070	3,241.60	895.30	591.30	4,728.20	15.50	20.48	15.50	16.24	4,781.10	878.30	118.60	5,778.00	22.38	22.37	3.11	19.85	21,129.00	18.1409	4.2372	22.3781	18.1649
1995	209,201	43,723	38,146	291,070	3,241.60	895.30	591.30	4,728.20	15.50	20.48	15.50	16.24	4,781.10	878.30	118.60	5,778.00	22.38	22.37	3.11	19.85	21,129.00	18.1409	4.2372	22.3781	18.1649
1996	196,918	41,170	35,907	273,995	3,042.60	843.50	555.10	4,441.20	15.45	20.49	15.46	16.21	4,400.80	920.00	111.60	5,432.40	22.35	22.35	3.11	19.83	21,129.00	17.0277	3.9921	21.0198	18.2461
1997	196,918	41,170	35,907	273,995	3,042.60	843.50	555.10	4,441.20	15.45	20.49	15.46	16.21	4,400.80	920.00	111.60	5,432.40	22.35	22.35	3.11	19.83	21,127.00	17.0294	3.9925	21.0219	18.2461
1998	196,918	41,170	35,907	273,995	3,042.60	843.50	555.10	4,441.20	15.45	20.49	15.46	16.21	4,400.80	920.00	111.60	5,432.40	22.35	22.35	3.11	19.83	21,127.00	17.0272	3.9925	21.0197	18.2461
1999	187,501	9,587	34,205	231,293	2,904.90	192.80	530.20	3,627.90	15.49	20.11	15.50	15.69	4,199.40	214.40	106.30	4,520.10	22.40	22.36	3.11	19.54	21,127.00	16.2575	0.9126	17.1701	19.7365
2014	187,501	9,587	34,205	231,293	2,904.90	192.80	530.20	3,627.90	15.49	20.11	15.50	15.69	4,199.40	214.40	106.30	4,520.10	22.40	22.36	3.11	19.54	21,127.00	16.2575	0.9126	17.1701	19.7385
2015	187,501	9,587	34,205	231,293	2,904.90	192.80	530.20	3,627.90	15.49	20.11	15.50	15.69	4,199.40	214.40	106.30	4,520.10	22.40	22.36	3.11	19.54	21,042.00	16.2942	0.9164	17.2106	19.7385
2016	187,501	9,587	34,205	231,293	2,904.90	192.80	530.20	3,627.90	15.49	20.11	15.50	15.69	4,199.40	214.40	106.30	4,520.10	22.40	22.36	3.11	19.54	20,954.00	16.3927	0.9201	17.3126	19.7385
2017	187,501	9,587	34,205	231,293	2,904.90	192.80	530.20	3,627.90	15.49	20.11	15.50	15.69	4,199.40	214.40	106.30	4,520.10	22.40	22.36	3.11	19.54	20,848.00	16.4762	0.9249	17.4011	19.7385
2018	187,501	9,587	34,205	231,293	2,904.90	192.80	530.20	3,627.90	15.49	20.11	15.50	15.69	4,199.40	214.40	106.30	4,520.10	22.40	22.36	3.11	19.54	20,761.00	16.5449	0.9288	17.4737	19.7385
2019	187,501	9,587	34,205	231,293	2,904.90	192.80	530.20	3,627.90	15.49	20.11	15.50	15.69	4,199.40	214.40	106.30	4,520.10	22.40	22.36	3.11	19.54	20,730.00	16.5699	0.9301	17.5000	19.7385
2020	187,501	9,587	34,205	231,293	2,904.90	192.80	530.20	3,627.90	15.49	20.11	15.50	15.69	4,199.40	214.40	106.30	4,520.10	22.40	22.36	3.11	19.54	20,706.00	17.5892	0.9310	18.5202	19.7385
2021	187,501	9,587	34,205	231,293	2,904.90	192.80	530.20	3,627.90	15.49	20.11	15.50	15.69	4,199.40	214.40	106.30	4,520.10	22.40	22.36	3.11	19.54	20,692.00	17.6003	0.9319	18.5322	19.7385
2022	187,501	9,587	34,205	231,293	2,904.90	192.80	530.20	3,627.90	15.49	20.11	15.50	15.69	4,199.40	214.40	106.30	4,520.10	22.40	22.36	3.11	19.54	20,687.00	17.6044	0.9320	18.5364	19.7385
2023	187,501	9,587	34,205	231,293	2,904.90	192.80	530.20	3,627.90	15.49	20.11	15.50	15.69	4,199.40	214.40	106.30	4,520.10	22.40	22.36	3.11	19.54	20,687.00	17.6044	0.9320	18.5364	19.7385
2024	187,501	9,587	34,205	231,293	2,904.90	192.80	530.20	3,627.90	15.49	20.11	15.50	15.69	4,199.40	214.40	106.30	4,520.10	22.40	22.36	3.11	19.54	20,683.00	17.6075	0.9322	18.5397	19.7385
2025	187,501	9,587	34,205	231,293	2,904.90	192.80	530.20	3,627.90	15.49	20.11	15.50	15.69	4,199.40	214.40	106.30	4,520.10	22.40	22.36	3.11	19.54	20,678.00	17.6118	0.9324	18.5439	19.7385
2026	187,501	9,587	34,205	231,293	2,904.90	192.80	530.20	3,627.90	15.49	20.11	15.50	15.69	4,199.40	214.40	106.30	4,520.10	22.40	22.36	3.11	19.54	20,677.00	17.6124	0.9323	18.5447	19.7385
2039	187,501	9,587	34,205	231,293	2,904.90	192.80	530.20	3,627.90	15.49	20.11	15.50	15.69	4,199.40	214.40	106.30	4,520.10	22.40	22.36	3.11	19.54	20,676.00	17.6130	0.9326	18.5456	19.7385

File: Contract WRMWSC[Total]

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LETTER 4

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CLWA

STATE OF CALIFORNIA
THE RESOURCES AGENCY
DEPARTMENT OF WATER RESOURCES

AMENDMENT NO. 18 TO THE WATER SUPPLY CONTRACT
BETWEEN
THE STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES
AND
CASTAIC LAKE WATER AGENCY

THIS AMENDMENT to the Water Supply Contract is made this 31st day of March, 1999, pursuant to the provisions of the California Water Resources Development Bond Act, the Central Valley Project Act, and other applicable laws of the State of California, between the State of California, acting by and through its Department of Water Resources, herein referred to as the "State," and Castaic Lake Water Agency, herein referred to as the "Agency."

RECITALS:

A. The State and the Agency have entered into and subsequently amended a Water Supply Contract (the "Water Supply Contract") providing that the State will supply certain quantities of water to the Agency, and providing that the Agency shall make certain payments to the State, and setting forth the terms and conditions of such supply and such payment.

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B. The contractors and the State have amended the Water Supply Contracts to implement provisions of the Monterey Agreement (the "Monterey Amendment").

C. Among other things, Article 53 of the Water Supply Contract provides for the permanent transfer of up to 130,000 acre-feet of agricultural entitlement water to urban agencies.

D. The Agency and the Wheeler Ridge-Maricopa Water Storage District have entered into an Agreement to Purchase Wheeler Ridge-Maricopa Water Storage District State Water Project Entitlement to Water executed as of this date to provide for the sale by Kern County Water Agency, herein referred to as "KCWA", on behalf of Wheeler Ridge-Maricopa to the Agency of 41,000 acre-feet per year of KCWA's annual entitlement that has been allocated to Wheeler Ridge-Maricopa by KCWA under the contract between Wheeler Ridge-Maricopa and KCWA dated January 8, 1970 and all amendments thereto.

E. The State and Agency wish to set forth their agreement as to such matters as (i) the 41,000 acre-feet per year increase in the Agency's annual entitlement, (ii) the transfer of related transportation repayment obligations, and (iii) the revision of proportionate use of facilities factors set forth in the Water Supply Contract.

F. The State and KCWA are simultaneously with the execution and delivery of this Amendment, entering into Amendment No. 28 to KCWA's Water Supply Contract between KCWA and the State in order to reflect (i) the transfer of Table A Entitlement described herein, (ii) the transfer of related transportation repayment obligations, and (iii) the revision of proportionate use of facilities factors.

G. This Amendment is permitted by the terms of the Water Supply Contract, and except as amended herein, the provisions of the Water Supply Contract will remain in full force and effect.

NOW, THEREFORE, it is mutually agreed that the following changes are hereby made to the Agency's Water Supply Contract:

1. Article 53(j) is added to read:

(j) In accordance with Article 53(a) the Agency is increasing its Table A annual entitlements by 41,000 acre-feet beginning in year 2000 and each succeeding year thereafter for the term of the contract through a sale from Kern County Water Agency of 41,000 acre-feet of the 130,000 acre-feet made available to Urban Contractors. As a result of this sale, Table A as designated in Article 6(b) is amended as follows:

TABLE A

ANNUAL ENTITLEMENTS
CASTAIC LAKE WATER AGENCY
(Acre-feet)

Year		
1	(1968)	3,700
2	(1969)	5,000
3	(1970)	5,700
4	(1971)	6,700
5	(1972)	8,936
6	(1973)	12,400
7	(1974)	15,400
8	(1975)	18,200
9	(1976)	21,200
10	(1977)	24,100
11	(1978)	24,762
12	(1979)	28,000
13	(1980)	30,400
14	(1981)	32,800
15	(1982)	34,800
16	(1983)	37,300
17	(1984)	39,600
18	(1985)	41,800
19	(1986)	43,600
20	(1987)	45,600
21	(1988)	48,000
22	(1989)	50,100
23	(1990)	52,000
24	(1991)	54,200
25	(1992)	54,200
26	(1993)	54,200
27	(1994)	54,200
28	(1995)	54,200
29	(1996)	54,200
30	(1997)	54,200
31	(1998)	54,200
32	(1999)	54,200
~~33~~	~~(2000)~~	~~54,200~~
33	(2000)	**95,200**
And each succeeding year thereafter, for the term of this contract as an annual entitlement:		~~54,200~~ **95,200**

The following apply to this sale:

(1) Increases in the Agency's Delta Water and Transportation Charges and Water System Revenue Bond Surcharge resulting from the increase in the Agency's annual entitlements for 2000 and each year thereafter shall commence January 1, 2000, and be identified by the State and included in its annual Statement of Charges to the Agency.

(2) All future adjustments in charges and credits of past costs associated with the 41,000 acre-feet of annual entitlement (or applicable portion thereof) and the related transportation capacity in Reaches 1 through 16A of the California Aqueduct shall be attributable to the Agency as if the Agency's annual entitlement and the related transportation capacity had been increased by the 41,000 acre-feet of annual entitlement purchased from the KCWA in years prior to January 1, 2000.

(3) For cost allocation and repayment purposes, Exhibit A attached hereto shows entitlement and capacity amounts for each aqueduct reach in which the Agency participates. These redetermined values shall be used to derive the proportionate use of facilities factors as set forth in Table B as designated in Article 24(b). The capacity amounts shown in Exhibit A are estimated values. Actual values will be used by the State in implementing the terms of this Amendment and in redetermination of Table B of this Water Supply Contract under Article 28.

2. Article 12(c)(1) which defines the limits on the instantaneous rate of flow to the Agency from Castaic Lake based on peaking factors, is modified to delete "ninety-nine (99)" and replace it with "one hundred fifty (150)."

3. This Amendment is contingent upon the effectiveness of Water Supply Contract Amendment No. 28, between the State and the KCWA. If either amendment ceases to be effective, the State may identify the date on which the contract amendments shall be deemed inoperative, for the purpose of assuring timely repayment of contract obligations and orderly administration of the long-term water supply contracts.

4. The Agency agrees to indemnify, defend, and hold harmless the State and any of its officers, agents, or employees from any liability, expenses, defense costs, attorney fees, claims, actions, liens and lawsuits of any kind arising from or related to any and all actions implementing this Amendment and associated agreements.

IN WITNESS WHEREOF, the parties hereto have executed this Amendment on the date first above written.

Approved as to legal form
and sufficiency:

for Chief Counsel
Department of Water Resources

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

for Stephen L. Kashiwada
Director

ATTEST:

Robert H. Clark
Signature

Ass't Secretary
Title

CASTAIC LAKE WATER AGENCY

William Pierpont
Signature

President, Board of Directors
Title

AMENDMENT NO. 18
EXHIBIT A

CASTAIC LAKE WATER AGENCY
ANNUAL ENTITLEMENT AND CAPACITY VALUES FOR EACH REACH FOR COST ALLOCATION AND REPAYMENT ONLY

The values related to this transfer are estimated to be as follows:

California Aqueduct [1]	Before Transfer		Entitlement Transferred from KCWA (AF) (3)	Capacity Transferred from KCWA (cfs) (4)	Additional Capacity Required (cfs) (5)	After Transfer	
	Annual Entitlement (AF) (1)	Capacity (cfs) (2)				Total Annual Entitlement (AF) (6)	Total Capacity (2)+(4)+(5) (cfs) (7)
Reach 1	54,200	95	41,000	122	0	95,200	217
Reach 2A	54,200	95	41,000	122	0	95,200	217
Reach 2B	54,200	95	41,000	122	0	95,200	217
Reach 3	54,200	95	41,000	122	0	95,200	217
Reach 4	54,200	95	41,000	122	0	95,200	217
Reach 5	54,200	95	41,000	122	0	95,200	217
Reach 6	54,200	95	41,000	122	0	95,200	217
Reach 7	54,200	95	41,000	122	0	95,200	217
Reach 8C	54,200	95	41,000	122	0	95,200	217
Reach 8D	54,200	95	41,000	122	0	95,200	217
Reach 9	54,200	75	41,000	122	0	95,200	197
Reach 10A	54,200	75	41,000	122	0	95,200	197
Reach 11B	54,200	75	41,000	122	0	95,200	197
Reach 12D	54,200	75	41,000	122	0	95,200	197
Reach 12E	54,200	75	41,000	122	0	95,200	197
Reach 13B	54,200	75	41,000	122	0	95,200	197
Reach 14A	54,200	75	41,000	120	0	95,200	195
Reach 14B	54,200	75	41,000	77	0	95,200	152
Reach 14C	54,200	75	41,000	46	11	95,200	132
Reach 15A	54,200	75	41,000	39	18	95,200	132
Reach 16A	54,200	75	41,000	25	32	95,200	132
Reach 17E	54,200	75	41,000	0	57	95,200	132
Reach 17F	54,200	75	41,000	0	57	95,200	132
West Branch							
Reach 29A	54,200	75	41,000	0	57	95,200	132
Reach 29F	54,200	75	41,000	0	57	95,200	132
Reach 29G	54,200	75	41,000	0	57	95,200	132
Reach 29H /2/	54,200	--	41,000	0	--	95,200	--
Reach 29J	54,200	75	41,000	0	57	95,200	132
Reach 30 /2/	54,200	--	41,000	0	--	95,200	--

[1] These numbers apply to the reaches as set forth in Bulletin 132, Figure B-4, "Repayment Reaches and Descriptions."

[2] Aqueduct capacity in cfs is not applicable to Pyramid Lake (Reach 29H) and Castaic Lake (Reach 30). The maximum instantaneous flow rate for deliveries to the Agency from Castaic Lake is 150 cfs.

LETTER 4

7 of 7 DOCUMENTS

FRIENDS OF THE SANTA CLARA RIVER, Plaintiff and Appellant, v. CASTAIC LAKE WATER AGENCY, Defendant and Respondent.

No. B145283.

COURT OF APPEAL OF CALIFORNIA, SECOND APPELLATE DISTRICT, DIVISION FOUR

95 Cal. App. 4th 1373; 116 Cal. Rptr. 2d 54; 2002 Cal. App. LEXIS 300; 2002 Cal. Daily Op. Service 1246; 2002 Daily Journal DAR 1477

January 10, 2002, Decided

SUBSEQUENT HISTORY: [***1] The Publication Status of this Document has been Changed by the Court from Unpublished to Published February 6, 2002.

Review Denied April 17, 2002, Reported at: *2002 Cal. LEXIS 2774.*

PRIOR HISTORY: APPEAL from a judgment of the Superior Court of Los Angeles County. No. BS05694. David P. Yaffe, Judge.

DISPOSITION: Reversed.

LexisNexis(R) Headnotes

SUMMARY: CALIFORNIA OFFICIAL REPORTS SUMMARY

A nonprofit environmental group filed a petition for a writ of mandate challenging a water agency's certification of an environmental impact report (EIR) as inadequate under the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.). The project analyzed in defendant's EIR was its purchase of entitlement to 41,000 acre-feet per year of state water from a water storage district. Defendant's EIR was tiered on an earlier EIR, which had been prepared in conjunction with a statewide agreement that equalized allocations of entitlements to water from the state water project between agricultural and urban contractors. The trial court entered judgment denying plaintiff's petition. (Superior Court of Los Angeles County, No. BS05694, David P. Yaffe, Judge.)

The Court of Appeal reversed, directing the trial court to issue a writ of mandate vacating the certification of defendant's EIR, and ordering the trial court to retain jurisdiction until defendant certified an EIR complying with CEQA. The court held that decertification of defendant's EIR was required, since another appellate court had found that the previous EIR, on which defendant's EIR was tiered, was inadequate and had decertified it. Pub. Resources Code, § 21094, subd. (a), authorizes tiering when the previous EIR has been certified. Defendant's EIR had a defect, since the previous EIR had been decertified. The court further held that defendant's tiering on the decertified EIR was prejudicial error, since defendant had not in its EIR addressed the environmental effects of its project absent the protections for agricultural contractors provided for in the statewide agreement that had been the subject of the decertified EIR. (Opinion by Vogel (C. S.), P. J., with Hastings and Curry, JJ., concurring.)

HEADNOTES: CALIFORNIA OFFICIAL REPORTS HEADNOTES

Classified to California Digest of Official Reports

(1a) (1b) Pollution and Conservation Laws § 2.3--California Environmental Quality Act--Environmental Impact Reports--Tiering--Effect of Decertification of Previous EIR. --The trial court erred in denying a nonprofit environmental group's mandamus challenge to a water agency's environmental impact report (EIR) on the ground it was inadequate under the California Environmental Quality Act (CEQA) (*Pub.*

Resources Code, § 21000 et seq.). The project analyzed in defendant's EIR was its purchase of entitlement to 41,000 acre-feet per year of state water from a water storage district. Defendant's EIR was tiered on an earlier EIR, which had been prepared in conjunction with a statewide agreement that equalized allocations of entitlements to water from the state water project between agricultural and urban contractors. Decertification of defendant's EIR was required, since an appellate court had found that the previous EIR, on which defendant's EIR was tiered, was inadequate and had decertified it. *Pub. Resources Code, § 21094*, subd. (a), authorizes tiering when the previous EIR has been certified. Hence, defendant's EIR had a defect, since the previous EIR had been decertified. In addition, defendant's tiering on the decertified EIR was prejudicial error, since defendant had not in its EIR addressed the environmental effects of its project absent the protections for agricultural contractors provided for in the statewide agreement that had been the subject of the decertified EIR.

[See *4 Witkin, Summary of Cal. Law (9th ed. 1987) Real Property, § 59* et seq.]

(2) Pollution and Conservation Laws § 2.3--California Environmental Quality Act--Environmental Impact Reports--Tiering. --The tiering provisions (*Pub. Resources Code, § § 21068.5, 21093, 21094*) of the California Environmental Quality Act (*Pub. Resources Code, § 21000* et seq.) enable a public agency to incorporate by reference and utilize a prior environmental impact report. Tiering is favored by the Legislature to streamline the regulatory process and avoid wasteful duplication of effort. Under CEQA Guidelines, the later EIR should state that the lead agency is using the tiering concept and that it is being tiered with the earlier EIR.

COUNSEL: Brandt-Hawley & Zoia and Susan Brandt-Hawley for Plaintiff and Appellant.

Robert H. Clark; Kane, Ballmer & Berkman and R. Bruce Tepper, Jr., for Defendant and Respondent.

JUDGES: Opinion by Vogel (C. S.), P. J., with Hastings and Curry, JJ., concurring.

OPINIONBY: C.S. VOGEL

OPINION: [*1375] [55]**

VOGEL (C. S.), P. J.

INTRODUCTION

In 1995, the California State Department of Water Resources (DWR) and water contractors of the State Water Project (SWP) reached a historic agreement, known as the Monterey Agreement, changing the allocations between agricultural and urban contractors of entitlements to SWP water. A major component of the Monterey Agreement was the transfer of entitlements up to 130,000 acre-feet per year from agricultural contractors to urban contractors, on a willing buyer-willing **[***2]** seller basis. Pursuant to the Monterey Agreement, respondent Castaic Lake Water Agency (respondent) purchased from the Kern County Water Agency (KCWA) and its member district the Wheeler Ridge-Maricopa Water Storage District (WRMWSD) entitlement to 41,000 acre-feet per year of SWP water.

Respondent approved this transfer after certifying a project environmental impact report (EIR) pursuant to the California Environmental Quality Act (CEQA), *Public Resources Code section 21000* et seq. n1 In the present case appellant Friends of the Santa Clara River (appellant), a nonprofit California corporation, challenges the sufficiency of respondent's EIR.

n1 All further statutory references are to the Public Resources Code unless otherwise indicated. All references to "Guidelines" are to the CEQA regulations in title 14, California Code of Regulations.

Previously, the Central Coast Water Authority (CCWA) as lead agency prepared an EIR on the environmental effects statewide of implementing **[***3]** the Monterey Agreement (the Monterey Agreement EIR). Then the Belridge Water Storage District, one of the member districts of KCWA, as lead agency prepared an EIR on the environmental effects in Kern County of selling up to 130,000 acre-feet of SWP entitlements to then unidentified purchasers (the Belridge EIR). Then respondent's EIR "tiered" on the Monterey Agreement EIR and the Belridge EIR.

Appellant unsuccessfully petitioned the trial court in the present case for a writ of mandate compelling respondent to set aside the certification of respondent's EIR and approval of this project, on various grounds of alleged failure to comply with CEQA. Appellant appealed the judgment denying its petition for a writ of mandate.

While the present appeal was pending, the Court of Appeal for the Third Appellate District found the Monterey Agreement EIR inadequate and ordered it decertified. (*Planning & Conservation League v. Department of* **[*1376]** *Water Resources (2000) 83 Cal.*

App. 4th 892 [100 Cal. Rptr. 2d 173], review den. Dec. 13, 2000, hereafter cited as *PCL.*) We conclude this requires decertifying respondent's tiered EIR.

FACTUAL AND PROCEDURAL BACKGROUND [***4]

The Monterey Agreement

The SWP was constructed in the 1960's. It is a complex system of reservoirs, dams, power plants, pumping plants, canals, and aqueducts for storage and delivery of water. DWR manages the SWP. DWR has contracts with water contractors to deliver [**56] water to the contractors. Each such contract sets forth a maximum annual entitlement. DWR has historically delivered less water than the entitlements. The reliability of delivery is approximately 50 percent of entitlements.

Before the Monterey Agreement, shortfalls in deliveries due to prolonged droughts and other factors led to friction among the contractors over obtaining the available SWP water. Urban and agricultural contractors each believed the other was receiving preferential treatment. This friction was exacerbated by a provision in the SWP contracts that in years when shortfalls occurred, required agricultural contractors to incur the first delivery cutbacks. n2 Because contractors pay certain fixed costs to finance the SWP regardless of actual deliveries, agricultural contractors suffered severe delivery reductions with little relief from their financial obligations. Litigation was threatened. [***5] DWR, agricultural and urban water contractors met and negotiated the Monterey Agreement to avoid litigation and to increase the reliability of supply to all contractors. (*PCL, supra, 83 Cal. App. 4th at pp. 901-902.)*

n2 Under article 18(a) of then existing contracts, deliveries to agricultural contractors were reduced by 50 percent in any one year or a total of 100 percent in seven consecutive years, before deliveries were reduced to other contractors. (*PCL, supra, 83 Cal. App. 4th at p. 899.)*

Under the Monterey Agreement, all future allocations of SWP water are based on entitlements; when supply is insufficient to meet requests, deliveries to all contractors will be reduced in proportion to their entitlements; no longer will agricultural contractors be required to absorb the first reductions. This increases the reliability of supply to agricultural contractors.

Inferably in return, under the Monterey Agreement, agricultural contractors "will make available for permanent [***6] transfer to Urban Contractors on a willing buyer-willing seller basis 130,000 acre-feet of annual entitlements, [*1377] with [KCWA] being responsible for any portion of this amount not made available by other Ag Contractors." This will allow urban contractors to obtain additional entitlements, thereby slightly increasing their overall deliveries even in times of shortage.

In addition, the Kern Fan Element, a property acquired by DWR for water banking, will be transferred to agricultural contractors, 45,000 acre-feet of agricultural contractors' entitlements will be retired, and various operational changes will be made to improve efficiency and flexibility of the system.

The Monterey Agreement EIR

The parties to the Monterey Agreement determined that its implementation could have potential environmental consequences and therefore an EIR was required. They designated CCWA, one of the SWP contractors, as lead agency to prepare the Monterey Agreement EIR. CCWA prepared the draft and final EIR's on implementation of the Monterey Agreement in May and October 1995.

The introduction to the draft Monterey Agreement EIR stated it is a "program" EIR. Reiterating the criteria [***7] for a program EIR found in Guideline section 15168, it stated: "The purpose of a Program EIR is to document a series of actions so related that they can be characterized as one project. The actions may be related in one or more of the following ways: by geographical proximity; as logical parts in a chain of contemplated actions; in connection with the issuance of rules, regulations, plans, or [**57] other general criteria to govern the conduct of a continuing program; or as individual activities carried out under the same authorizing statutory or regulatory authority and having generally similar environmental effects that can be mitigated in similar ways. The proposal to implement the Monterey Agreement fulfills both the second and third criteria above, i.e., logical parts in a chain of contemplated actions, and a series of actions related to the issuance of rules, regulations, plans, and other general criteria to govern the conduct of a continuing program." Again reiterating matter in Guideline 15168, it stated the advantages of a program EIR are that it may: "provide an occasion for a more exhaustive consideration of effects and alternatives than would be practical in an EIR [***8] on an individual action; ensure consideration of cumulative actions that might be slighted in a case-by-case analysis; avoid duplicative reconsideration of basic policy considerations; allow the Lead Agency to consider broad policy alternatives and program-wide mitigation measures at an early time when the agency has greater flexibility to deal with basic problems or cumulative impacts; and allow reduction in paperwork." [*1378]

The Monterey Agreement EIR identified five major components of the Monterey Agreement with potential environmental effects: (1) revision of the methodology used to allocate water among contractors, (2) retirement of 45,000 acre-feet of agricultural entitlement, (3) transfer by sale between willing sellers and willing buyers of 130,000 acre-feet of entitlements from agricultural to urban contractors, (4) changes in the Kern Fan Element of the Kern Water Bank, and (5) changes in the manner Castaic Lake and Lake Perris terminal reservoirs may be operated. In general, the Monterey Agreement EIR determined the environmental effects that were capable of quantification at that time were negligible.

With regard to the change in the method of allocating entitlements, **[***9]** it summarized, "Changes in the method of allocating water become relevant only in years when demand exceeds available supply. During such years, following enactment of the principles contained in the Monterey Agreement, shortages will be shared proportionately by all contractors rather than be borne primarily by Agricultural Contractors as is the current practice. Thus, during future deficit years Agricultural Contractors can anticipate larger deliveries of water and Urban Contractors can expect smaller quantities of water than would have been the case in the past. These changes bring about a decrease in the variability of supplies delivered to Agricultural Contractors while increasing slightly that for the Urban Contractors. [P] Added reliability of deliveries to Agricultural Contractors could increase the continuity of agricultural activities in these service areas. Added variability of water deliveries to Urban Contractors can, however, be offset by their acquisition of additional entitlement offered for sale by Agricultural Contractors as outlined below, and through other measures included in the program for increased water management flexibility."

With regard to the transfers **[***10]** of entitlements, it summarized: "The transfer of 130,000 AF of water entitlement from Agricultural Contractors to Urban Contractors and non-SWP Contractors has the potential to affect activities and land use patterns in those jurisdictions both relinquishing and acquiring the entitlement. Effects in those areas relinquishing water entitlement are likely to be centered on agricultural practices while those in areas acquiring water entitlement may relate to growth accommodation. The location of **[**58]** the eventual sellers and buyers of water entitlements is not known at this time." "SWP operations would not be adversely affected by the shift in deliveries among Contractors."

Belridge EIR

In contemplation of the transfer of up to 130,000 acre-feet of SWP entitlements from KCWA pursuant to the Monterey Agreement, the Belridge **[*1379]** Water Storage District as lead agency prepared a draft and final EIR in April and June of 1998 evaluating the effects in Kern County of such transfers. It evaluated the effects on the Belridge Water Storage District, the Lost Hills Water District, and the WRMWSD (all member districts of KCWA) of their transfer of SWP entitlements to yet undetermined **[***11]** purchasers.

The Belridge EIR repeatedly described the project being studied as a transfer of up to 130,000 acre-feet of entitlements *under the Monterey Agreement.* It stated: "The entitlement transfer would occur under the Monterey Agreement. . . . The benefits and impacts of the Monterey Agreement were evaluated in a separate environmental impact report [the Monterey Agreement EIR] which is discussed below and incorporated into this report by reference. However, to understand the potential benefits and impacts of the entitlement transfer, conditions that existed prior to the Monterey Agreement and after the Monterey Agreement are discussed."

The Belridge EIR then summarized how deliveries of SWP water differ before and after the Monterey Agreement. It also summarized in detail the Monterey Agreement EIR, which it incorporated by reference.

The Belridge EIR repeatedly stressed that under the changes made by the Monterey Agreement in allocating water during periods of shortage, agricultural contractors would not disproportionately suffer reduced deliveries, and therefore would enjoy increased reliability of deliveries even in times of shortage.

These assumptions enabled **[***12]** the Belridge EIR to conclude that the transfer of up to 130,000 acre-feet of entitlements from the member districts would not adversely affect at all the irrigated agricultural lands therein, because relinquishment of the entitlements would be compensated, on an average annual basis, by the increased reliability of SWP deliveries pursuant to the Monterey Agreement.

Respondent's EIR

The EIR in dispute in the present case is the EIR prepared by respondent in February 1999 on the proposed transfer to respondent of 41,000 acre-feet per year of SWP entitlement from KCWA and its member district WRMWSD.

The introduction section of respondent's EIR expressly stated, "*This EIR is a Project EIR that tiers from*" (1) a prior 1988 EIR by respondent, "Capital Program and Water Plan Including Acquisition of Supplemental Water and **[*1380]** of a Proposed Second Plant Site", (2) the Monterey Agreement EIR, and (3) the

Belridge EIR. It stated the proposed transfer "is an example of the individual projects envisioned in the Monterey Agreement and evaluated on a programmatic basis in the Monterey Agreement EIR."

This introduction stated that "As a result of the recently adopted Monterey **[***13]** Agreement, [respondent] has the opportunity to purchase additional SWP entitlement beyond its current entitlement. The opportunity to acquire additional entitlement under the terms of the Monterey Agreement disappears when the subject entitlement (130,000 AFY) is transferred **[**59]** to [respondent] or other entities. A summary of the Monterey Agreement is presented below, and a more complete discussion of the SWP is included in the Monterey Agreement FEIR." A separate section of the introduction described "the Monterey Agreement/Amendment and its anticipated effect on historic water deliveries." After summarizing the major provisions of the Monterey Agreement, it concluded, "The Monterey Agreement has three primary objectives: (1) to increase the reliability of all SWP Contractors' water supplies; (2) to stabilize the rate structure to improve the financial viability of the SWP; and (3) to increase water management flexibility for all SWP Contractors. A permanent transfer of agricultural entitlement to an area with urban development potential such as that analyzed in this document is one of the ways that these objectives are intended to be met."

Respondent's EIR also discussed **[***14]** the Belridge EIR. It stated, "An independent EIR evaluating the environmental impacts of the sale of SWP entitlement within Kern County was completed by Belridge Water Storage District in June 1998. Issues identified in that EIR are not evaluated further in this EIR. Appropriate sections of the Belridge EIR . . . are incorporated herein." It added that the proposed transfer would not significantly decrease water deliveries or irrigated acreage within KCWA or WRMWSD because, with implementation of the Monterey Agreement, "SWP deliveries to agricultural users will not be subject to absorbing the initial deficiencies during droughts and other unreliable delivery scenarios." The project description section acknowledged that this proposed transfer, "assuming it proceeds under the Monterey Agreement, will fulfill part of [KCWA's] commitment [under the Monterey Agreement to transfer up to 130,000 acre feet of entitlements to urban contractors]."

A commenter on respondent's draft EIR, Santa Clarita Organization for Planning the Environment, commented that the draft EIR was deficient in failing to analyze impacts on land in Kern County or on Castaic Lake as a terminal reservoir of the **[***15]** SWP. Respondent responded that those impacts had **[*1381]** already been evaluated in the Belridge EIR and the Monterey Agreement EIR and therefore were not required to be addressed in respondent's EIR.

Despite these numerous references relying on the Monterey Agreement and the Monterey Agreement EIR, respondent's EIR also asserted the proposed transfer of SWP entitlements could take place without the Monterey Agreement, under pre-Monterey Agreement contract law, with the consent of all parties and DWR. It acknowledged that the Monterey Agreement EIR was challenged in the *PCL* case, had been upheld by the Sacramento Superior Court, but was still challenged in the appeal then pending.

A comment from the Environmental Defense Center on the proposed final EIR complained that the EIR expressly tiers on the Monterey Agreement EIR, the status of which was questionable because it was in litigation in the Court of Appeal for the Third Appellate District; it also asserted the Belridge EIR was inappropriate for tiering. Respondent's consultant replied, "The proposed FEIR identifies that the proposed project may proceed either under the provisions of the Monterey Agreement or under the **[***16]** terms of the Kern County Water Agency Contract before it was modified by the Monterey Amendment . . . . The proposed final EIR identified the referenced litigation and Superior Court ruling . . . . [P] The EIR does not **[**60]** tier from the Belridge . . . EIR but incorporates appropriate sections by reference. . . . The inclusion of the reference to the Belridge 1998 EIR [as having been tiered on, as distinguished from having been incorporated by reference] is an error."

On the present appeal respondent admits that its EIR tiers on the Monterey Agreement EIR. Respondent states its EIR incorporates by reference the Belridge EIR.

Trial Proceedings in the Present Case

Appellant Friends of Santa Clara River filed a petition for a writ of mandate compelling respondent to set aside respondent's certification of its EIR and approval of the project, primarily on the ground respondent failed to comply with CEQA. Appellant alleged various defects in the EIR and respondent's findings. The alleged defects did not involve the Monterey Agreement EIR or the then pending *PCL* appeal. The trial court denied appellant's petition, finding that the EIR was adequate and that appellant's **[***17]** other contentions lacked merit. Appellant appealed from the judgment denying the petition. **[*1382]**

The PCL Case

In September 2000, after the trial court's judgment in the present case, the Court of Appeal for the Third Appellate District held the Monterey Agreement EIR prepared by CCWA was inadequate. (*PCL, supra, 83*

Cal. App. 4th 892.) The Court of Appeal found two major defects. (1) The DWR, not CCWA, should have prepared the report as the lead agency; DWR has a statewide perspective and expertise on how allocation of water to another part of the state has implications for distribution throughout the system. *(83 Cal. App. 4th at pp. 903-907.)* (2) The EIR did not adequately address the alternative of "no project"; it should have addressed the environmental implications of invoking article 18(b) of existing contracts, under which entitlements would be permanently reduced to reflect actual delivery patterns. *(83 Cal. App. 4th at pp. 908-920.)* The court commented, "Perhaps the deficiencies in the EIR relate to the provincial experience of the lead agency, a topic we addressed earlier. We conclude the EIR failed to meet the most **[***18]** important purpose of CEQA, to fully inform the decision makers and the public of the environmental impacts of the choices before them. A new EIR must, therefore, be drafted. [P] In view of our earlier conclusion that DWR must serve as lead agency under CEQA, we need not, as we ordinarily would, address the other alleged deficiencies in this EIR. (*Pub. Resources Code, § 21005*, subd. (c).) We need not hypothesize on the remaining issues because DWR, with its expertise on the statewide impacts of water transfers, may choose to address those issues in a completely different and more comprehensive manner." *(83 Cal. App. 4th at p. 920.)*

The Court of Appeal reversed the judgment of the Sacramento Superior Court and remanded with directions to "issue a writ of mandate vacating the certification of the EIR," to "consider such orders it deems appropriate under *Public Resources Code section 21168.9*, subdivision (a)" and to "retain jurisdiction over this action until DWR certifies an EIR in accordance with CEQA standards and procedures that meets the substantive requirements of CEQA." (*PCL, supra, 83 Cal. App. 4th at p. 926.)* **[***19]** It noted, "We earlier declined to stay implementation of the Monterey amendments and transfer of the Kern Fan Element. Consequently, the project was permitted to proceed pending **[**61]** disposition of this appeal. The record does not reflect the current status of the project and, in the absence of such information, we shall issue no orders concerning further implementation of the project. The trial court, acting under the authority provided by *Public Resources Code section 21168.9*, is the more appropriate forum to consider and rule upon requests to enjoin all or portions of the project pending completion of administrative and judicial proceedings necessitated by our opinion." (*Id. at p. 926, fn. 16.)* **[*1383]**

Expanded Issue on This Appeal

(1a) In its appellant's opening brief on the present appeal, appellant reasserted various arguments that appellant had unsuccessfully raised below concerning respondent's EIR and findings. Appellant's opening brief added, cursorily, that the decision in the *PCL* appeal, during pendency of this appeal, "completely shattered" respondent's EIR that was tiered on the EIR decertified in the **[***20]** *PCL* decision. Appellant more fully developed this argument in its appellant's reply brief. We requested and received supplemental briefs from the parties on this issue.

LEGAL BACKGROUND: TIERING OF EIR'S

(2) Tiering "means the coverage of general matters and environmental effects in an environmental impact report prepared for a policy, plan, program or ordinance followed by narrower or site-specific environmental impact reports which incorporate by reference the discussion in any prior environmental impact report and which concentrate on the environmental effects which (a) are capable of being mitigated, or (b) were not analyzed as significant effects on the environment in the prior environmental impact report." (§ § 21068.5; Guidelines, § 15152, 15385.)

Tiering is favored by the Legislature to streamline the regulatory process and avoid wasteful duplication of effort. (*Stanislaus Natural Heritage Project v. County of Stanislaus (1996) 48 Cal. App. 4th 182, 197-198 [55 Cal. Rptr. 2d 625];* **[***21]** § § 21093, 21094; Guideline, § 15152, subd. (b).) "To achieve this purpose, environmental impact reports shall be tiered whenever feasible, as determined by the lead agency." (§ 21093, subd. (b).) "Where a prior environmental impact report has been prepared *and certified* for a program, plan, policy, or ordinance, the lead agency for a later project that meets the requirements of this section shall examine significant effects of the later project upon the environment by using a tiered environmental impact report . . . ." (§ 21094, subd. (a), italics added.) "All public agencies which propose to carry out or approve the later project may utilize the prior environmental impact report and the environmental impact report on the later project to fulfill the requirements of Section 21081 [which concerns findings necessary in order to approve a project if significant environmental effects have been identified]. [P] When tiering is used pursuant to this section, an environmental impact report prepared for a later project shall refer to the prior environmental impact report and state where a copy of the prior environmental impact report may be examined." (§ 21094, subds. (d), (e). **[***22]**) "The later EIR . . . should state that the lead agency is using the tiering **[*1384]** concept and that it is being tiered with the earlier EIR." (Guideline, § 15152, subd. (g).)

DISCUSSION

(1b) Respondent's EIR expressly tiered on the Monterey Agreement EIR. Section 21094, subdivision (a) authorizes tiering where the previous EIR was certified. As a result of the *PCL* decision, the Monterey Agreement EIR is no longer certified. **[**62]** Respondent's EIR therefore has a defect. The question presented for us is whether that error was prejudicial. (§ 21005, subd. (b).)

Respondent contends that although its EIR tiered on the Monterey Agreement EIR, it did not expressly or specifically incorporate any substantive analysis from specific portions of the Monterey Agreement EIR. But respondent's reliance on the Monterey Agreement EIR is implicit in the concept of tiering, even without express reference to portions of the prior EIR's analysis. The express statement that respondent's EIR tiers on the prior EIR may be treated as an admission that respondent relied upon and needed to rely upon **[***23]** the Monterey Agreement EIR. (Guideline, § 15152, subd. (g).)

Aside from a few cursory statements that the present transfer could legally be accomplished under pre-Monterey Agreement contracts, a point we discuss later, respondent's EIR repeatedly referenced this project's part of the overall scheme envisioned by the Monterey Agreement. It stated this EIR was a project EIR tiered on the Monterey Agreement EIR, and that the project may be viewed as one of the projects "evaluated on a programmatic basis in the Monterey Agreement EIR."

Respondent's EIR also expressly tiered on, or at least expressly incorporated and relied upon, the analysis in the Belridge EIR. Respondent's EIR acknowledged that the transfer would not affect irrigated lands in Kern County because of the increased reliability of deliveries to agricultural contractors under the Monterey Agreement, and that the present transfer would fulfill part of KCWA's commitment in the Monterey Agreement. The Belridge EIR, on which respondent relied, repeatedly stated that the potential transfers of up to 130,000 acre-feet would be made pursuant to the Monterey Agreement and would have no significant effect on the irrigated lands, **[***24]** due to the increased reliability of deliveries under the Monterey Agreement. Respondent's reliance on the Belridge EIR illustrates respondent's implied acknowledgement that the transfer in this case is part of an overall larger scheme, analyzed on a programmatic basis in the Monterey Agreement EIR. The *PCL* decision also emphasizes the importance of the statewide perspective in analyzing the implications of water entitlement transfers for the state **[*1385]** and SWP as a whole. We therefore find unpersuasive respondent's present argument that respondent did not rely on the Monterey Agreement EIR.

At oral argument respondent offered a variant of this contention. According to respondent: "the project" being analyzed in respondent's EIR was only the transfer of 41,000 acre-feet of entitlements from WRMWSD to respondent; respondent was only required, therefore, to analyze the environmental effects of that narrow project; respondent adequately evaluated the local environmental effects of the subject transfer; respondent was not *required* to analyze the effects of the transfer on irrigated lands in Kern County or on the SWP upstream from Kern County, and to any extent respondent **[***25]** relied on the Belridge EIR and Monterey Agreement EIR to do so, this was surplusage; therefore the tiering on the Monterey Agreement EIR was harmless and does not require setting aside respondent's EIR that was otherwise adequate, viewed as a stand-alone document evaluating the local environmental impacts of this specific project. Appellant answers that respondent was required to review "the whole of the project." (Guideline, § 15378, subd. (a) [" 'Project' means the whole of an action."].)

[63]** Respondent's argument is not persuasive. The purpose of an EIR is to inform the public and the decision makers of the environmental effects of a project. Implicit in respondent's argument is an innuendo the public and decision makers in respondent's service area do not care about the upstream effects of this project. But in any event, this case does not squarely present that issue. This is not a case where (1) respondent neglectfully failed or deliberately refused to evaluate "upstream" environmental effects and (2) appellant challenged such an EIR as inadequate based on its failure to review upstream effects. Rather, respondent's EIR assumed the public and decision makers would **[***26]** want to know (1) that this project implements the Monterey Agreement, the environmental effects of which were analyzed in the Monterey Agreement EIR and found to be negligible, and (2) that the environmental effects in Kern County were studied in the Belridge EIR and found to be insignificant because of the increased reliability of water deliveries to agricultural contractors under the Monterey Agreement. The *PCL* decision undermined those premises by decertifying the Monterey Agreement EIR.

Respondent next contends the tiering on the Monterey Agreement EIR was not crucial because respondent and KCWA could legally have accomplished the transfer of entitlements under SWP contract law existing prior to the Monterey Agreement. Respondent cites the following portions of its EIR: section 1.3 of the introduction stated, "The SWP entitlement transfer analyzed in this document may proceed either under the provisions of the **[*1386]** Monterey Amendment n3 to KCWA water supply agreement with the DWR (Contract), or under the provisions of KCWA's Contract

before it was modified by the Monterey Amendment," and again, "The entitlement transfer that is the subject of this EIR is of the type [***27] that falls within the provisions of the Monterey Amendment. However, this water transfer could occur without the Monterey Amendment with the consent of all affected parties." The project description section included, "This water transfer is expected to be subject to the conditions of the Monterey Amendment, but is not necessarily dependent upon the Monterey Amendment. With the cooperation of the participating agencies and the California Department of Water Resources (DWR), the transfer could occur in the absence of the Monterey Amendment." Finally, in response to comments from the Environmental Defense Center that tiering on the Monterey Agreement EIR was questionable in light of the *PCL* litigation, respondent's consultant stated, "The proposed FEIR identifies that the proposed project may proceed either under the provisions of the Monterey Agreement or under the terms of the Kern County Water Agency Contract before it was modified by the Monterey Amendment."

n3 By the Monterey "Amendment" respondent's EIR meant amendment of the SWP contracts between DWR and the approving contractors, to implement the principles of the Monterey Agreement.

[***28]

These assertions are based on article 41, a standard provision of state water contracts, stating that "No assignment or transfer of this contract or any part hereof, rights hereunder, or interest herein by the Agency shall be valid unless and until it is approved by the State and made subject to such reasonable terms and conditions as the State may impose."

Respondent's argument is based on a straw man. The issue in this case is not the legal authority of KCWA to sell and of respondent to buy SWP water entitlements, but rather the adequacy of the [**64] evaluation of the environmental effects of doing so. The Belridge EIR evaluated those effects in Kern County pursuant to the Monterey Agreement, concluding that selling the entitlements would not have an effect on irrigated lands because, on average, it would be compensated by the increased reliability of deliveries to agricultural contractors under the Monterey Agreement. Neither the Monterey Agreement EIR, nor the Belridge EIR, nor respondent's EIR evaluated the environmental effects on the seller's irrigated lands of selling the entitlements under pre-Monterey-Agreement conditions, with agricultural contractors subject to [***29] the first and severest reductions in times of shortage.

Respondent contends this shortcoming is alleviated by the inclusion of discussions in the Belridge EIR and respondent's EIR of a "no project [*1387] alternative." This is incorrect. The no project alternative in the Belridge EIR was: not selling the entitlements. The no project alternative in respondent's EIR was: not buying the entitlements. Neither addressed the environmental effects of transferring the entitlements without the protections for agricultural contractors in the Monterey Agreement.

We conclude respondent's tiering on the now decertified Monterey Agreement EIR was prejudicial error. The judgment must be reversed because the certification of respondent's EIR must be vacated, based on the *PCL*/tiering problem. The question arises whether we should address the *other* alleged defects that were litigated below and raised in appellant's opening brief. We asked the parties to address whether these issues were moot if the judgment were reversed based on the *PCL*/tiering problem. Both parties remind us of section 21005, subdivision (c), which provides, "It is further the intent of the Legislature that any [***30] court, which finds, or, in the process of reviewing a previous court finding, finds, that a public agency has taken an action without compliance with this division, shall specifically address each of the alleged grounds for noncompliance." A treatise states, "This language, which courts may not treat as mandatory, is apparently intended to avoid situations in which a court, presented with numerous theories as to why a respondent agency purportedly violated CEQA, chooses to issue a writ based solely on one or a handful of theories, leaving the parties to wonder whether or not the unaddressed theories had merit. In such situations, where the respondent agency must conduct a second CEQA process to cure the problems identified by the court, the agency often does not know whether to modify its environmental document (or findings) to address concerns raised by the petitioners but ignored by the court." (Remy et al., Guide to the California Environmental Quality Act (10th ed. 1999) Judicial Review, pp. 646-647.)

Section 21005, subdivision (c) thus requires only that *if we find* other respects in which the EIR was defective we should describe them for the guidance of the parties. We have [***31] examined all of appellant's other contentions and find them to be *without merit.* If the *PCL*/tiering problem had not arisen, we would have affirmed the judgment. Section 21005, subdivision (c) does not require us to lengthen this opinion by addressing in detail why we *reject* appellant's other contentions. Appellant's supplemental reply brief so concedes: "The court's discussion of all aspects of CEQA noncompliance is respectfully requested, while areas of compliance are not required to be addressed."

This suggests that respondent may be able to cure the *PCL* problem by awaiting action by the DWR complying with the *PCL* decision, then issuing **[*1388]** a subsequent EIR, supplement to EIR, or addendum to EIR (Guidelines, § § 15162, 15163, **[**65]** 15164) tiering upon a newly certified Monterey Agreement EIR. Appellant itself so suggests.

Like the court in *PCL, supra, 83 Cal. App. 4th at page 926* and footnote 16, we leave to the trial court's discretion whether to enjoin all or portions of respondent's project pending completion of an adequate EIR. The trial court is in a better position than this court to determine factually the current status **[***32]** of the *PCL* litigation or of a new Monterey Agreement EIR.

DISPOSITION

The judgment is reversed. The trial court shall issue a writ of mandate vacating the certification of the EIR, shall retain jurisdiction until respondent certifies an EIR complying with CEQA consistent with the views expressed in this opinion, and shall consider such orders it deems appropriate under section 21168.9. The parties shall bear their own costs on appeal.

Hastings, J., and Curry, J., concurred.

Respondent's petition for review by the Supreme Court was denied April 17, 2002. Baxter, J., was of the opinion that the petition should be granted.

LETTER 4

5 of 6 DOCUMENTS

FRIENDS OF THE SANTA CLARA RIVER, Plaintiff and Appellant, v. CASTAIC LAKE WATER AGENCY, Defendant and Respondent.

B164027

COURT OF APPEAL OF CALIFORNIA, SECOND APPELLATE DISTRICT, DIVISION FOUR

2003 Cal. App. Unpub. LEXIS 11239

December 1, 2003, Filed

NOTICE: [*1] NOT TO BE PUBLISHED IN OFFICIAL REPORTS CALIFORNIA RULES OF COURT, RULE 977(a), PROHIBITS COURTS AND PARTIES FROM CITING OR RELYING ON OPINIONS NOT CERTIFIED FOR PUBLICATION OR ORDERED PUBLISHED, EXCEPT AS SPECIFIED BY RULE 977(B). THIS OPINION HAS NOT BEEN CERTIFIED FOR PUBLICATION OR ORDERED PUBLISHED FOR THE PURPOSES OF RULE 977.

PRIOR HISTORY: APPEAL from a judgment of the Superior Court of Los Angeles County. Los Angeles County Super. Ct. No. BS056954. David P. Yaffe, Judge.

DISPOSITION: Affirmed.

COUNSEL: Law Office of Alyse M. Lazar and Alyse M. Lazar for Plaintiff and Appellant.

Rossmann and Moore, Antonio Rossmann and Roger B. Moore for Amici Curiae Planning and Conservation League and Citizens Planning Association of Santa Barbara County, Inc., in support of Plaintiff and Appellant.

Horvitz & Levy, Barry R. Levy, William N. Hancock; R. Bruce Tepper; and McCormick, Kidman & Behrens, Russell G. Behrens, H.L. (Mike) McCormick and David D. Boyer for Defendant and Respondent.

JUDGES: VOGEL (C.S.), P.J. We concur: HASTINGS, J. CURRY, J.

OPINIONBY: VOGEL

OPINION:

INTRODUCTION

This is the second time this case has been before us. On the first appeal we directed the trial court to issue a writ of [*2] mandate to set aside certification of respondent Castaic Lake Water Agency's Environmental Impact Report (EIR) because the EIR had been tiered upon a prior EIR that had been found to be infirm by an intervening appellate decision. Upon remand, respondent and appellant Friends of the Santa Clara River agreed a writ of mandate should issue to decertify the EIR but disagreed about whether the trial court should also enjoin the project pending certification of a new EIR. After consideration of documentary evidence and the presentation of written and oral arguments, the trial court rejected appellant's request for an injunction without prejudice to entertaining a renewed request founded on an adequate showing of entitlement to relief. This appeal follows entry of judgment in October 2002.

Appellant attacks the trial court's denial of its request for an injunction on two separate grounds. Appellant first contends the trial court's denial was in derogation of the directions contained in our earlier decision. The contention lacks merit. The clear and unambiguous dispositional language in our opinion granted the trial court the authority to deny in toto the request for an injunction. Appellant [*3] next contends the trial court erred on the merits in denying its request. Based upon the record, we find the trial court did not abuse its discretion in implicitly finding appellant had

failed to carry its burden of establishing the predicates for injunctive relief. We therefore affirm the judgment.

FACTUAL AND PROCEDURAL BACKGROUND

Respondent purchased from the Kern County Water Agency entitlement to 41,000 acre-feet per year of water. The purchase followed consummation of the Monterey Agreement which changed the allocation between agricultural and urban contractors of entitlements to State Water Project (SWP) water. Respondent approved this purchase after first certifying an EIR. This EIR was "tiered" upon an earlier EIR approving the Monterey Agreement. n1 The Legislature favors tiering to streamline the regulatory process and to avoid unnecessary duplication of effort.

> n1 Tiering "means the coverage of general matters and environmental effects in an environmental impact report prepared for a policy, plan, program or ordinance followed by narrower or site-specific environmental impact reports which incorporate by reference the discussion in any prior environmental impact report and which concentrate on the environmental effects which (a) are capable of being mitigated, or (b) were not analyzed as significant effects on the environment in the prior environmental impact report." (*Pub. Res. Code, § 21068.5.*)b

[*4]

Appellant filed a petition for a writ of mandate in the superior court to compel respondent to set aside its certification of the EIR for the purchase of 41,000 acre-feet per year of SWP water. Appellant advanced various grounds in support of its petition. The superior court denied the petition. Appellant appealed the adverse judgment to this court.

While that appeal was pending, our colleagues in the Third Appellate District concluded the EIR prepared for the Monterey Agreement was inadequate and therefore ordered it decertified. (*Planning & Conservation League v. Department of Water Resources (2000) 83 Cal.App.4th 892,* review den. (*PCL*).)

We therefore concluded that in the appeal presented to us *PCL* required decertification of respondent's EIR because it had been tiered on the now-decertified EIR for the Monterey Agreement. (*Friends of the Santa Clara River v. Castaic Lake Water Agency (2002) 95 Cal.App.4th 1373, 1383-1388,* review den. (*Friends I.*) We, however, rejected all of appellant's other challenges to respondent's EIR, finding "them to be *without merit.*" (*Id. at p. 1387.)* We noted: "Respondent may be able **[*5]** to cure the *PCL* problem by awaiting action by the [Department of Water Resources] complying with the *PCL* decision, then issuing a subsequent EIR, supplement to EIR, or addendum to EIR [citations] tiering upon a newly certified Monterey Agreement EIR." (*Id. at pp. 1387-1388.)*

In regard to further action in the trial court we wrote: "We leave to the trial court's discretion whether to enjoin all or portions of respondent's project pending completion of an adequate EIR. The trial court is in a better position than this court to determine factually the current status of the *PCL* litigation or of a new Monterey Agreement EIR." (*Id. at p. 1388.)*

The dispositional paragraph of our decision read, in relevant part: "The judgment is reversed. The trial court shall issue a writ of mandate vacating the certification of the EIR, shall retain jurisdiction until respondent certifies an EIR complying with CEQA consistent with the views expressed in this opinion, and shall consider such orders it deems appropriate under [*Public Resources Code] section 21168.9.*" (*Id. at p. 1388.)*

Upon remand, the parties **[*6]** agreed the trial court was required to issue a writ of mandate to decertify respondent's EIR. The bone of contention was whether the trial court should also enjoin respondent from proceeding with the project, e.g., the transferring of the entitlement to the 41,000 acre-feet of water per year, pending completion of the new EIR.

Appellant argued: "To allow [respondent] to use any portion of its unstudied 41,000 afy [acre feet per year] entitlement before the EIR analysis is complete will result in **new permanent water connections** that will not be able to be reversed. Once houses are in and the faucets are on, there is no way to turn back. Without the proven need for this water to serve existing users, there is no equitable justification for allowing the use of any portion of the 41,000 afy entitlement in the face of its clear consistency with CEQA policies against pre-approved projects. A fair EIR process requires that project approval not be up and running as a foregone conclusion."

The evidentiary support for this argument is found in a declaration executed in August 2002 by appellant's counsel. The declaration sought to establish respondent would have sufficient water **[*7]** from other sources to supply its existing customers without use of the entitlement. From these factual allegations, appellant argued any use by respondent of the entitlement would necessarily be for new customers and therefore subject to being enjoined. The declaration referenced several

attached documents and included allegations grounded upon information and belief. In pertinent part it averred:

> "I am informed that [respondent] has utilized at most 3674 af [acre feet] of the subject 41,000 afy [acre feet per year] water transfer during the past year. Attached is a true copy of CLWA Production Report for 2000, 2001, and half of 2002, and also a DWR Notice to State Water Project Contractors dated May 2002. The reports speak for themselves, and reflect CLWA's use of State Water Project entitlements to its various purveyors. The allocation of SWP water was 65% in the last year, and *petitioner is informed and believes that CLWA expects an even larger allocation in the coming fiscal year to as much as 90%.* The report shows that water use is measured yearly from June to June. It is undisputed that CLWA has a 54,200 afy entitlement to SWP water that is not under any [*8] legal cloud and clearly available for use, aside from the 41,000 afy that is the subject of this litigation. Based on a 65% delivery of SWP water, CLWA's allocation of its undisputed 54,200 afy totals 35,230 af. The report reflects use of 38,974 af from June 2001 until June 2002; which appears to be only 3674 af more than can be supplied from the 54,200 afy entitlement. It thus appears that CLWA *may have utilized* 3674 af of its allocation from the subject 41,000 af entitlement in the past year. If the SWP allocations increase to 75% or greater, *as is apparently expected,* by doing the math it appears that the 41,000 af water transfer is not needed for existing customers of the CLWA water purveyors while the supplemental environmental review is pending." (Italics added.)

Appellant therefore sought an order enjoining respondent "from any and all use of the 41,000 afy water transfer under the current approvals."

In addition, appellant's counsel averred she had communicated with counsel in the *PCL* case and that as of August 22, 2002, "the *PCL* case remand has not yet been settled or otherwise resolved, and that the Monterey Agreement Implementation Draft EIR to [*9] be prepared by the Department of Water Resources (DWR) as required by the *PCL* decision has not yet been published." As for the status of respondent's EIR, the declaration averred that respondent's attorney had informed her "that the agency has not yet published its Draft Supplemental EIR in response to [the Court of Appeal's decision], but that it intends to prepare the EIR itself rather than await the new DWR Monterey Agreement Implementation EIR."

In opposition, respondent asked the trial court to "**issue an order allowing the Transfer of Entitlement to remain intact pending completion of a new EIR.**" In particular, respondent urged that the entitlement was "necessary to satisfy current existing and projected near-term water demand"; that a "decision to set aside the Transfer of Entitlement would cause immediate irreparable harm to the Agency and the water consumers"; and that the Transfer "has been in effect for more than three years, and there is no evidence that the Transfer has resulted in any new or increased significant adverse environmental effects."

Respondent's opposition was supported by a detailed eight-page declaration from Dan Masnada, respondent's general [*10] manager. Masnada averred that respondent had already retained consultants to prepare a new EIR and they planned to complete the process by March 2003. A portion of Masnada's declaration directly refuted the allegations made by appellant's counsel about respondent's projected water supply. In pertinent part, Masnada averred:

> "[Counsel's] declaration states that 'CLWA expects an even larger allocation made by DWR in the coming fiscal year to as much as 90%.' . . . *There is no factual basis for this statement.* There have been no indications that CLWA's SWP allocation made by DWR in the coming year will be anywhere near 90%. To the contrary, based on discussions with DWR Operations Control Office Personnel it is likely that the initial 2003 SWP allocation on December 1, 2002 will be approximately 20%, as it was last year. If dry conditions occur next year, the final SWP allocation for 2003 could remain as low as 20%.
>
> [Counsel's] Declaration also states that the CLWA Production Report 'shows that water use is measured yearly from June to June.' . . . This is incorrect. While annual water use can be measured from July to June, available SWP water supply is [*11] characterized on a calendar year

> basis because DWR allocates it on a calendar year basis. *[Her] accounting of water deliveries is flawed.* She has utilized an approach that understates CLWA's current level of demand and projected deliveries to the retail purveyors during 2002. As discussed above, and shown in Exhibit A, CLWA's Final 2001 SWP allocation was 39%. Without the 41,000 AF in 2001, CLWA would have experienced a shortfall of 14,218 AF."

Appellant's reply to respondent's opposition did not include any additional declaration(s). Instead, its reply asserted respondent's "factual information" was "confusingly presented and misleading" and that a portion of Masnada's opinion about SWP allocations for 2003 was "complete conjecture and speculation."

After a hearing in which the parties presented argument and responded to questions from the bench, the trial court issued a writ of mandate ordering respondent to set aside its certification of the 1999 EIR and to certify a new EIR consistent with our opinion in *Friends I.* The trial court rejected appellant's request to enjoin any use of the water entitlement. It ruled: "Petitioner [appellant herein] requests that **[*12]** the Court also prohibit respondent from using any of the 41,000 acre feet of additional water allotted to it from the subject State Water Project. Petitioner contends that the said water will be used to approve new development that will not be able to be reversed if a Final Environmental Impact Report is not certified. Respondent contends that such a prohibition would prevent it from meeting the existing water needs in the area it services. *Both contentions appear to be speculative at this time. Respondent will not be prohibited from using the water to which it is entitled, but petitioner may renew its application for such prohibition based upon evidence of the actual use of such additional water for purposes it considers improper.*" (Italics added.)

This appeal follows. n2

> n2 In July 2002, we denied respondent's motion to dismiss the appeal because denial of a *pendente lite* injunction is appealable pursuant to *Code of Civil Procedure section 904.1*, subdivision (a)(6).

[*13] DISCUSSION

A. THE DIRECTIVE IN *FRIENDS I*

Appellant first contends the trial court misconstrued our directive in *Friends I.* Appellant's position is that our decision gave the trial court the power to enjoin either all or part of the project pending certification of a new EIR but that it did not give it the power to decide, as it did in the proceedings it conducted following remand, not to enjoin any part of the project. Appellant relies upon the following language we now italicize from *Friends I*: "Like the court in *PCL, supra, 83 Cal.App.4th at page 926* and footnote 16, we leave to the trial court's discretion whether to enjoin *all or portions* of respondent's project pending completion of an adequate EIR." (*Friends I, supra, 95 Cal.App.4th 1373, 1388,* italics added.) From that language, appellant argues "the Superior Court was not vested with the discretion to issue no injunction, but only with [the] discretion to issue a full or partial injunction."

Appellant's argument lacks merit because it ignores the clear dispositional language of our opinion which gave the trial court the authority to deny in toto **[*14]** a request for injunctive relief.

"Where a reviewing court has remanded a matter to the trial court with directions '. . . the trial court . . . is bound to specifically carry out the instructions of the reviewing court. . . . Any material variance from the explicit directions of the reviewing court is unauthorized and void.'" (*Coffee-Rich, Inc. v. Fielder (1975) 48 Cal. App. 3d 990, 998, 122 Cal. Rptr. 302.)*

The appellate court's directions are determined by "looking first to the dispositional language of the opinion--the language which constitutes the remittitur directions." (*Frankel v. Four Star International, Inc. (1980) 104 Cal. App. 3d 897, 902, 163 Cal. Rptr. 902.) Only if* the dispositional language is ambiguous and in need of interpretation will that language "be interpreted in light of the reasoning and holdings found in the body of the opinion. [Citations.]" (*Lesny Development Co. v. Kendall (1985) 164 Cal. App. 3d 1010, 1021, 210 Cal. Rptr. 890.)*

As set forth earlier, the pertinent portion of the dispositional language in *Friends I* read: "The judgment is reversed. The trial court shall issue a writ of mandate **[*15]** vacating the certification of the EIR, shall retain jurisdiction until respondent certifies an EIR complying with CEQA consistent with the views expressed in this opinion, *and shall consider such orders it deems appropriate under section 21168.9.*" (*Friends I, supra, 95 Cal.App.4th 1373, 1388,* italics added.) The statutory provision referenced--*Public Resources Code section 21168.9*--is lengthy and set forth in toto below in footnote 3. n3 The definitive construction of that statute

is found in our Supreme Court's opinion in *Laurel Heights Improvement Assn. v. Regents of University of California (1988) 47 Cal.3d 376, 253 Cal. Rptr. 426, 764 P.2d 278.* It concluded that the statute permits but does not require a court to enjoin a project while a new EIR is prepared. *(Id. at pp. 423-425.)* In deciding whether injunctive relief is appropriate, a court is to rely upon "traditional equitable principles." *(Id. at p. 423.)* Given this long-standing construction of section 21168.9, n4 it is clear our dispositional language granted the trial court the option to decline to grant any injunctive relief **[*16]** after it properly considered the pertinent equities. Appellant's argument that the trial court failed to follow our directions by declining to grant equitable relief is therefore without merit.

n3 **The statute provides:**

"(a) If a court finds, as a result of a trial, hearing, or remand from an appellate court, that any determination, finding, or decision of a public agency has been made without compliance with this division, the court shall enter an order that includes one or more of the following:

"(1) A mandate that the determination, finding, or decision be voided by the public agency, in whole or in part.

"(2) If the court finds that a specific project activity or activities will prejudice the consideration or implementation of particular mitigation measures or alternatives to the project, a mandate that the public agency and any real parties in interest suspend any or all specific project activity or activities, pursuant to the determination, finding, or decision, that could result in an adverse change or alteration to the physical environment, until the public agency has taken any actions that may be necessary to bring the determination, finding, or decision into compliance with this division.

"(3) A mandate that the public agency take specific action as may be necessary to bring the determination, finding, or decision into compliance with this division.

"(b) Any order pursuant to subdivision (a) shall include only those mandates which are necessary to achieve compliance with this division and only those specific project activities in noncompliance with this division. The order shall be made by the issuance of a peremptory writ of mandate specifying what action by the public agency is necessary to comply with this division. However, the order shall be limited to that portion of a determination, finding, or decision or the specific project activity or activities found to be in noncompliance only if a court finds that (1) the portion or specific project activity or activities are severable, (2) severance will not prejudice complete and full compliance with this division, and (3) the court has not found the remainder of the project to be in noncompliance with this division. The trial court shall retain jurisdiction over the public agency's proceedings by way of a return to the peremptory writ until the court has determined that the public agency has complied with this division.

"(c) Nothing in this section authorizes a court to direct any public agency to exercise its discretion in any particular way. Except as expressly provided in this section, nothing in this section is intended to limit the equitable powers of the court."

I

[*17]

n4 See also *City of Santee v. County of San Diego (1989) 214 Cal. App. 3d 1438, 1456, 263 Cal. Rptr. 340* ["Section 21168.9, as construed by the Supreme Court in *Laurel Heights,* merely grants a reviewing court the authority to stay all activity or use of a project until an agency

certifies a proper EIR; it does not require it to do so. [Citation.] The court in *Laurel Heights* relied upon traditional equitable principles in deciding that injunctive relief there was not appropriate."].

!

In any event, appellant engages in a crabbed interpretation of one phrase in our opinion to argue the trial court had no discretion to deny a request for injunctive relief. The sentence in which the phrase is found began with a specific reference to the *PCL* opinion: its dispositional language found at page 926, including footnote 16. That language included the same direction found in our dispositional language: the direction the trial court shall make any such orders it deems appropriate under section 21168.9. Footnote 16 read: "We earlier declined to stay implementation of the **[*18]** Monterey amendments and transfer of the Kern Fan Element. Consequently, the project was permitted to proceed pending disposition of this appeal. The record does not reflect the current status of the project and, in the absence of such information, we shall issue no orders concerning further implementation of the project. The trial court, acting under the authority provided by *Public Resources Code section 21168.9*, is the more appropriate forum to consider and rule upon requests *to enjoin all or portions of the project pending* the completion of administrative and judicial proceedings necessitated by our opinion." (*PCL, supra, 83 Cal.App.4th 892, fn. 16 at p. 926,* italics added.) Just as the *PCL* court did not intend to limit the trial court's authority by requiring it to enjoin at least a portion of the project, neither did we. We, as did the *PCL* court, were simply describing the types of requests that might be made, e.g., requests for a partial or full injunction. We did not intend to divest the trial court of its power to deny a request for injunctive relief if it either concluded that the moving party had failed to establish **[*19]** the predicates for relief or that, given the equities, relief was not required.

B. DENIAL OF INJUNCTIVE RELIEF

Appellant next contends: "The Superior Court's decision regarding injunctive relief was an abuse of discretion, because there is no factual basis to support the decision." (Bold omitted.) We disagree.

A decision to grant or deny a request for injunctive relief rests within the trial court's discretion. Its order will not be reversed on appeal unless an abuse of discretion is shown. It is, of course, the appellant's burden to establish an abuse of discretion. (*Cohen v. Board of Supervisors (1985) 40 Cal.3d 277, 286, 219 Cal. Rptr. 467, 707 P.2d 840.)* "A trial court will be found to have abused its discretion only when it has exceeded the bounds of reason or contravened the uncontradicted evidence. [Citation.]" (*Lubavitch Congregation v. City of Long Beach (1990) 217 Cal. App. 3d 1388, 1391.)*

It was appellant's burden as moving party in the trial court to establish the predicates for injunctive relief. In particular, *Public Resources Code section 21168.9*, subdivision (a)(2) requires the court **[*20]** to first find that a "specific project activity . . . will prejudice the consideration or implementation of particular mitigation measures or alternatives to the project" and that such activities "could result in an adverse change or alteration to the physical environment" before an injunction will issue. The trial court found appellant's claim of irreparable harm--new permanent water connections that will not be able to be reversed--to be speculative. In other words, it concluded appellant had failed to discharge its burden of proof. n5 However, it specifically left open the opportunity for appellant to renew its claim "based upon evidence of the actual use of such additional water for purposes it considers improper."

n5 To a certain extent, appellant relies upon four documents not presented to the trial court to support its contention of abuse of discretion. Three of those documents were prepared after the trial court entered judgment in October 2002. Each document is a portion of a report prepared for respondent. Prior to the submission of briefing, we granted appellant's request to take judicial notice of these documents.

Appellant wants to use this information to show respondent is improperly representing to third parties it is entitled to the 41,000 acre-feet per year of water. Appellant argues this is proof of the irreparable harm it is suffering because the trial court declined to enjoin respondent.

Our prior grant of appellant's motion for judicial notice does not require us to consider these documents. "Although a reviewing court may take judicial notice of matters not before the trial court, . . . the reviewing court need not give effect to such evidence. 'Having taken judicial notice of such a matter, the reviewing court may or may not apply it in the particular case on appeal. The effect to be given to matters judicially noticed on appeal, where the question has not been raised below, depends on factors that are not evidentiary in character.' [Citation.]" (*Doers v. Golden Gate Bridge etc. Dist. (1979) 23 Cal.3d 180, 184, fn. 1, 151 Cal. Rptr. 837, 588 P.2d 1261.)*

In this instance, given that (1) these documents essentially constitute "new evidence" in support of appellant's request for injunctive relief and (2) the trial court explicitly anticipated appellant would renew its request before it, we decline to consider the documents on this appeal.

If appellant wishes to renew a request for injunctive relief, it can bring these documents to the trial court's attention.

J

[*21]

Distilled to its essence, appellant's present position is nothing more than an argument the trial court was required to credit the allegations in its counsel's declaration which allegedly supported its request for injunctive relief. That is, appellant would have us find that no reasonable judge could have found its evidentiary showing insufficient. We cannot make that finding.

The evidence on this issue was conflicting. As set forth above, Masnada's declaration directly contradicted some of the allegations made by appellant's counsel. Given the (purported) deficiencies Masnada pointed out in counsel's declaration, the fact that much of counsel's declaration was based upon information and belief, and appellant's failure to file a reply declaration addressing those points with its reply memorandum, the trial court was well within its discretion to conclude that *at that point in time* appellant had failed to make the requisite showing.

Appellant argues such a conclusion is insupportable because the trial court also found respondent's trial court contention to be speculative. Not so. Appellant is conflating two distinct points respondent made in the trial court. First, based upon **[*22]** a claim of irreparable harm, respondent had affirmatively sought an order that the transfer of entitlement remain in effect until the new EIR was completed. Second, respondent refuted the factual allegations about its water sources contained in the declaration executed by appellant's counsel. The trial court's finding of speculation was directed at the first point: respondent's claim it would suffer irreparable harm if the trial court denied its request for an order that the transfer remain in effect until the EIR was completed. The finding of speculation was not directed at the second point: respondent's discrete refutations of appellant's allegations. The trial court could reasonably find respondent had failed to meet its burden to establish the predicate for the relief it sought but could also reasonably find that the portions of Masnada's declaration set forth above were sufficient to show appellant's claim for relief was likewise subject to serious question and therefore grounded in speculation. We therefore reject appellant's claim that "respondent's entire argument that there was no abuse of discretion is incorrectly based on evidence that the lower court determined was mere **[*23]** speculation, not fact." n6 (Fn. omitted.)

n6 Appellant cites to various comments the court made as well as questions it posed during the hearing as proof that the court grounded its decision either in facts unsupported by the evidence or on legal principles inapplicable to the case. This approach is in error. A contextual reading of the transcript of the hearing indicates the court's questions and comments were intended to gather information, to focus the parties' arguments, and to test the strength of the parties' respective positions. The "bottom line" is whether the trial court abused its discretion in finding appellant had failed to discharge its burden to establish the predicates for injunctive relief. As explained above, the court did not so abuse its discretion.

Lastly, we address an argument raised in the amici brief jointly filed by the Planning and Conservation League and the Citizens Planning Association of Santa Barbara County, Inc. in support of appellant. Amici are two of the environmental organizations **[*24]** that were the prevailing parties in *PCL, supra, 83 Cal.App.4th 892.* Amici first inform us that in May 2003--seven months after the trial court entered judgment in this matter--the superior court in Sacramento approved a settlement agreement entered into by the parties in the *PCL* case. Pursuant to that agreement, work has commenced on a new EIR in regard to the Monterey Agreement and related issues. The settlement agreement recognizes that the transfer underlying this lawsuit is "'subject to pending litigation in the Los Angeles Superior Court following remand from the Second District Court of Appeal'"; that "'jurisdiction with respect to that litigation should remain in the [Los Angeles Superior Court]'"; and that "'nothing in this settlement agreement is intended to predispose the remedies or other actions that may occur in that pending litigation.'"

Amici argue the trial court abused its discretion in denying appellant's request for injunctive relief because the court ignored "the specific directions of *Friends I*" that its determination on interim relief should be based upon the status of the *PCL* litigation and the new statewide EIR to be prepared **[*25]** for the Monterey Agreement. n7 As support for that proposition, Amici cites us to the last two paragraphs of our opinion in

Friends I. There, after concluding that other than the *PCL*/tiering issue all of appellant's complaints about the EIR were meritless, we wrote: "This suggests that respondent may be able to cure the *PCL* problem by awaiting action by the DWR complying with the *PCL* decision, then issuing a subsequent EIR, supplement to EIR, or addendum to EIR [citations] tiering upon a newly certified Monterey Agreement EIR. Appellant itself so suggests. [P] Like the court in *PCL, supra, 83 Cal.App.4th at page 926* and footnote 16, we leave to the trial court's discretion whether to enjoin all or portions of respondent's project pending completion of an adequate EIR. The trial court is in a better position than this court to determine factually the current status of the *PCL* litigation or of a new Monterey Agreement EIR." (*Friends I, supra, 95 Cal.App.4th 1373, 1387-1388.)*

n7 Appellant raised this point in the trial court and its opening brief.

[*26]

Amici misapprehend our directions to the trial court. As explained above, those directions are found in the dispositional language of our opinion. That language directed the trial court, inter alia, to "consider such orders it deems appropriate under [*Public Resources Code] section 21168.9*." (*Ibid.*) That section grants the trial court broad powers to fashion equitable relief. (See fn. 3, *ante*, and accompanying text at pp. 10-12.) Amici's argument that the exercise of said discretion was to be based upon the status of either the *PCL* litigation or the new EIR for the Monterey Agreement is at odds with the clear dispositional language we employed. The two paragraphs in our opinion upon which amici rely were merely suggestions as to how respondent could proceed and a statement that in exercising its discretion whether to grant equitable relief pending completion of a new EIR for this project, the trial court could ascertain, and if it so chose, rely upon the status of the *PCL* litigation and new Monterey Agreement EIR.

In any event, the parties' papers in the trial court informed it of what was then the current status of both the *PCL* **[*27]** litigation and the new Monterey Agreement EIR and the issue was discussed at the hearing. Nothing in the record suggests the court did not consider those facts in rendering its decision, a decision that was properly framed by the specific prayers for relief each party advanced in the trial court. To a large extent, amici's position is nothing more than an attempt to reargue the motion and to do so based upon events that occurred after judgment was rendered. Because the *PCL* litigation settled *after* the trial court entered its judgment, that settlement and the status of the preparation of the new Monterey Agreement EIR are matters that can be brought to the attention of the trial court if appellant seeks to renew its request for injunctive relief. Lastly, in order to forestall any unnecessary future litigation, we hasten to add that nothing stated in this opinion is to be construed to be an indication as to how the trial court should rule in any further proceeding(s) on any specific issue(s).

DISPOSITION

The judgment is affirmed.

VOGEL (C.S.), P.J.

We concur:

HASTINGS, J.

CURRY, J.

RESOLUTION NO. 2354

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE CASTAIC LAKE WATER AGENCY: (1) CERTIFYING THE FINAL ENVIRONMENTAL IMPACT REPORT FOR A SUPPLEMENTAL WATER PROJECT TRANSFER OF 41,000 ACRE-FEET OF STATE WATER PROJECT TABLE A AMOUNT; (2) ADOPTING FINDINGS, A MITIGATION MONITORING PROGRAM AND A STATEMENT OF OVERRIDING CONSIDERATIONS; AND (3) APPROVING THE PROJECT

WHEREAS, the Castaic Lake Water Agency ("CLWA") was formed and established by the California State Legislature in 1962 for the principal purpose of providing imported Northern California water for use within and adjacent to the Santa Clarita Valley; and

WHEREAS, CLWA has adopted the following mission statement: "A public agency providing reliable, quality water at a reasonable cost to the Santa Clarita Valley."

WHEREAS, CLWA, a State Water Project ("SWP") contractor, entered into a Water Supply Contract with the California Department of Water Resources ("DWR") in 1963, which contract continues as currently amended; and

WHEREAS, CLWA in April 1988 certified a programmatic environmental impact report for its capital program to provide water and related capital infrastructure for the Santa Clarita Valley through the year 2010, pursuant to then adopted planning horizons under the general plans of the planning agencies within CLWA's service area; and

WHEREAS, since completion of that 1988 CLWA capital program environmental impact report by CLWA, the applicable planning agencies have not increased the projected year 2010 population above the 270,000 persons set forth in that report for the end of the year 2010 general planning period; and

WHEREAS, in 1995, the Monterey Agreement principles were implemented through an amendment to the Water Supply Contracts between the California Department of Water Resources ("DWR") and the State Water Project ("SWP") contractors, to become effective in August 1996, which amendment became known as the "Monterey Amendment"; and

WHEREAS, in addition to statutory and other policies of the State of California, the Monterey Amendment promotes water transfers to facilitate the beneficial use of water throughout the State, including transfers from agricultural to urban water agencies in the amount of 130,000 acre feet; and

WHEREAS, in 1995, a program Environmental Impact Report analyzing the environmental impacts of the Monterey Amendment ("Monterey Amendment Program EIR") was certified; and

WHEREAS, on March 29, 1999, CLWA certified a prior Environmental Impact Report to consider a project involving the proposed transfer of 41,000 acre feet of SWP Table A Amount from Kern County Water Agency ("KCWA"), and specifically from the Wheeler Ridge-Maricopa Water Storage District ("WRMWSD") within KCWA, to CLWA; and

WHEREAS, in 2000, the California Court of Appeal, Third Appellate District reversed the Sacramento County Superior Court in *Planning & Conservation League v. Department of Water Resources* ("*PCL*," Sacramento County Superior Court Case No. 95CS03216) and found that DWR must prepare a new Monterey EIR; and

WHEREAS, in 2002 the California Court of Appeal, Second Appellate District, Fourth Division, and the Los Angeles County Superior Court in *Friends of the Santa Clara River v. Castaic Lake Water Agency* ("*Friends*," Los Angeles Superior Court Case No. BS056954) ordered CLWA to decertify its prior Environmental Impact Report for its project, based solely on a finding that the prior CLWA Environmental Impact Report had tiered from the Monterey Amendment Program EIR, which had been decertified while *Friends* was on appeal, and ordered that the Los Angeles County Superior Court was to retain jurisdiction until CLWA certified a new Environmental Impact Report complying with CEQA; and

WHEREAS, the CLWA Board of Directors decertified CLWA's prior Environmental Impact Report for its project on November 27, 2002; and

WHEREAS, the Sacramento County Superior Court in *PCL* approved a May 5, 2003 Settlement Agreement ("Monterey Amendment Settlement Agreement"), executed by CLWA and other SWP contractors, which provides that the Monterey Amendment remains in operation during the preparation of a new environmental impact report for the Monterey Amendment and further provides that the Los Angeles County Superior Court in *Friends* has exclusive jurisdiction over the litigation in *Friends* and states "that nothing in this Settlement Agreement is intended to predispose the remedies or other action that may occur in [the *Friends*] pending litigation" ; and

WHEREAS, in January 2003, CLWA issued a Notice of Preparation of a Draft Environmental Impact Report ("EIR") for a "Project," described therein as the transfer of 41,000 acre feet of SWP Table A amount from KCWA, and its member district WRMWSD, to CLWA through existing SWP facilities, and SWP contractual rights to use that water;

WHEREAS, CLWA in June 2004, by and through Science Applications International Corporation ("SAIC"), prepared and circulated a new Draft Project EIR (State

Clearinghouse No. 1998041127) to comply with the order of the Los Angeles County Superior Court in *Friends*; and

WHEREAS, the EIR considers environmental impacts of the Project based on pre-Monterey Amendment conditions, both with and without implementation of Article 18 (b) of the Water Supply Contracts, and post-Monterey Amendment conditions; and

WHEREAS, the EIR only tiers off CLWA's 1988 capital program EIR and does not tier off the prior 1995 Monterey Amendment Program EIR or any other EIR; and

WHEREAS, the EIR does not rely upon CLWA's 2000 Urban Water Management Plan; and

WHEREAS, the EIR considers environmental impacts of the Project to both the service areas of CLWA and WRMWSD, including indirect impacts within CLWA, and to affected portions of the SWP; and

WHEREAS, WRMWSD does not require the 41,000 acre-feet Table A Amount transferred for its internal needs, has rising groundwater levels, and can acquire additional supplemental water, if needed, at less expense than fixed SWP costs for the Project transferred Table A Amount;

WHEREAS, the EIR uses DWR statistical computer models to determine the portion of the 41,000 acre-feet Table A amount reliably available to analyze Project environmental impacts, consistent with the Monterey Amendment Settlement Agreement provisions applicable to the new Monterey Amendment EIR;

WHEREAS, the EIR considers and analyzes multiple Project alternatives; and

WHEREAS, CLWA gave notice of the Draft EIR in compliance with law and circulated the Draft EIR to interested persons for a 60-day public comment period commencing on June 16, 2004 and ending on August 16, 2004; and

WHEREAS, CLWA held a public hearing on July 28, 2004, to receive comments on the Draft EIR; and

WHEREAS, CLWA received public comments on the Draft EIR during the comment period; and

WHEREAS, on November 24, 2004, CLWA, by and through its staff, legal counsel and SAIC, prepared and circulated to the CLWA Board of Directors ("Board") and to those submitting comments a proposed two volume "Final EIR", Volume One consisting of the Draft EIR, and Volume Two consisting of comments, responses to comments and insignificant and non-substantive changes to the text of the Draft EIR; and

WHEREAS, on November 24, 2004, at least 10 days before certification of the Final EIR, CLWA provided all public agencies that commented on the Draft EIR with a written public response to their comments and notice of a public hearing to be held on December 8, 2004;

WHEREAS, on December 8, 2004, CLWA held an additional noticed public hearing on the Project to receive statements on the responses to comments as part of CLWA's decisional process concerning the Project; and

WHEREAS, pursuant to Public Resources Code section 21092.5, the December 8, 2004 public hearing did not constitute an extension of the public comment period, and no responses are required under that section to statements made at that hearing because the hearing was scheduled after the close of the public comment period; and

WHEREAS, on December 8, 2004, CLWA's Board deferred until December 22, 2004 all consideration related to certification of the proposed Final EIR and approval of the Project; and

WHEREAS, CLWA's Board, on December 22, 2004, pursuant to the publicly noticed agenda for its regularly scheduled public meeting, with SAIC and CLWA staff and legal counsel present, met to consider certification of the proposed Final EIR, adoption of findings, a statement of overriding considerations and a mitigation and monitoring program, and approval of the Project; and

WHEREAS, CLWA's Board has carefully, thoroughly and independently reviewed the proposed Final EIR, including all public comments and responses thereto; and

WHEREAS, CLWA's Board has considered all of the information presented to it as set forth above and this Resolution and action taken hereby is a result of the Board's independent judgment and analysis.

NOW, THEREFORE, BE IT RESOLVED by this Board of Directors of the Castaic Lake Water Agency that it hereby makes the following findings and determinations:

1. The Board certifies that the Final EIR, attached as Exhibit "A": (a) was presented to the Board and that the Board reviewed and considered the information contained therein prior to approving the Project; (b) reflects the Board's independent judgment and analysis; (c) has been completed consistent with CEQA; and (d) shall constitute the final EIR for the Project;

2. The Board adopts the Findings, attached as Exhibit "B," and determines that the record for the Project contains substantial evidence in support of those Findings.

3. The Board adopts the Statement of Overriding Considerations, attached as Exhibit "C," and determines that the record for the Project contains substantial evidence in support of the Statement.

4. The Board adopts the Mitigation and Monitoring Program, attached as Exhibit "D."

5. The Board approves the Project as being in the best interests of CLWA and the public by augmenting and firming up water supplies, and by facilitating the beneficial use of water throughout the State.

6. The Board directs CLWA's General Manager to execute all documents required to carry out and implement the Project and to cause to be filed a Notice of Determination of CLWA's approval of the Project.

7. The Board designates its Secretary, Marcia Ward, as Custodian of the record of the proceedings upon which its decision is based and specifies the location of that record as CLWA's administrative offices at 27234 Bouquet Canyon Road, Santa Clarita, CA 91350

EXHIBIT "A"

FINAL EIR
(Attached hereto)

EXHIBIT "B"

FINDINGS
(Attached hereto)

EXHIBIT "C"

STATEMENT OF OVERRIDING CONSIDERATIONS
(Attached hereto)

EXHIBIT "D"

MITIGATION AND MONITORING PROGRAM
(Attached hereto)

I, the undersigned, hereby certify: That I am the duly appointed and acting Secretary of the Castaic Lake Water Agency, and that at a regular meeting of the Board of Directors of said Agency held on Wednesday December 22, 2004, the foregoing Resolution No. 2354 was duly and regularly adopted by said Board, and that said resolution has not been rescinded or amended since the date of its adoption, and that it is now in full force and effect.

DATED: December 22, 2004

Marcia Ward
Marcia Ward, Secretary

EXHIBIT "B"

FINDINGS

FINAL ENVIRONMENTAL IMPACT REPORT

GENERAL CEQA FINDINGS

A. No significant direct impacts will occur as a result of the Project in any of the three geographic areas evaluated in the Final EIR. The additional water supply provided by the Project, however, will remove an obstacle to growth within the CLWA service area, and significant, indirect, growth-related impacts to all environmental resources within that service area could result from Project implementation.

B. Concern has been expressed by some members of the public that the potential long term effect of global warming upon the SWP water supplies could result in less water being delivered to CLWA under the Project than the supply figures used in the EIR. CLWA has considered this issue carefully and has concluded that, if SWP water supplies were reduced, in the long term, due to global warming or any other cause, the result would be that the worst case analysis in the EIR for the indirect, growth-related impacts of the Project are over-stated to some degree. In that event, the actual indirect, growth-related impacts of the Project upon environmental resources would be less than those analyzed in the EIR and would be included within the range of potential impacts projected by the EIR.

C. During the public comment period, members of the public expressed their belief that the Final EIR should not (or, as some assert, could not) be certified until after the Department of Water Resources (DWR) certifies a new Environmental Impact Report for the Monterey Amendment. CLWA has considered these comments and the Master Response to Comments incorporated into the Final EIR. CLWA is satisfied that the Master Response to these comments adequately addresses the position stated by the commenters for the following reasons:

1. The litigation pertaining to the Monterey Amendment Program EIR originated in Sacramento County Superior Court and DWR's new Environmental Impact Report for the Monterey Amendment is being prepared under the jurisdiction and supervision of that Court. The litigation that gave rise to the preparation of the Project EIR arose in the Los Angeles County Superior Court and this Final EIR is being prepared under the jurisdiction and supervision of that same Court. The Sacramento Superior Court has no jurisdiction over the Project Final EIR.

2. CLWA is not required to await preparation of DWR's new Monterey Amendment Environmental Impact Report or tier off that document. CEQA does not require a lead agency for a project to await preparation of a programmatic Environmental Impact Report where the lead agency has sufficient information upon which to base environmental analysis of a specific project that may be included in the programmatic Environmental Impact Report's analysis at some future date.

3. The Court of Appeal in the litigation pertaining to the original EIR for the project did not require CLWA to prepare a new EIR that tiers off, or awaits certification, of DWR's new Monterey Amendment Environmental Impact Report.. Rather, CLWA is under the supervision of the Los Angeles Superior Court in preparing the Project EIR.

4. The Court of Appeal in the challenge to the Monterey Amendment Program Environmental Impact Report (Monterey Amendment Program EIR Challenge), on Page 3 of its Order approving the Monterey Amendment Settlement Agreement, stated that, "until DWR files its return in compliance with the Peremptory Writ of Mandate and this Court orders discharge of the Writ of Mandate, the administration and operation of the State Water Project and the Kern Water Bank Lands shall be conducted pursuant to the Monterey Amendments to the State Water Contracts . . . and the other terms and conditions of the Settlement Agreement."

D. During the public comment period, members of the public expressed their belief that CLWA was not the proper lead agency for preparation of the Project EIR. CLWA has considered this comment, as well as the Master Response to Comments, and concludes that CLWA must be the lead agency for the preparation of the Project EIR for the following reasons:

1. Under the doctrine of the law of the case, CLWA is the proper lead agency for the Project EIR. The Court of Appeal found no substantive defect in CLWA's prior Environmental Impact Report, only a legal defect resulting from tiering off the Monterey Amendment Program Environmental Impact Report that, subsequent to certification of the prior project Environmental Impact Report, was ordered de-certified.

2. The Court of Appeal ordered CLWA to act as the lead agency when it stated: "The trial court shall . . . retain jurisdiction until respondent certifies an EIR complying with CEQA . . . ."

3. CLWA has principal responsibility to approve and carry out the Project. Under CEQA, the agency with this primary responsibility must be the lead agency, even though part of the project may be located and have impacts within the jurisdiction of another public agency.

4. Under Public Resources section 21152, CLWA must be the lead agency because it is the local agency undertaking the Project. CLWA is the major proponent of the Project and has assumed the primary task of implementing the SWP water supply contract amendment for the Project.

5. CLWA must be the lead agency because it cannot delegate its responsibility over its SWP contract rights to another body. CLWA has primary responsibility for purchasing, obtaining delivery of, arranging storage of, and using the SWP water provided under the contract amendment that is the Project.

6. Some commenters have applied the Court of Appeal's decision in *Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892 (Monterey Amendment Program EIR Challenge) to the preparation of the Project EIR, arguing that CLWA is an improper lead agency for the Project EIR because the Court of Appeal found DWR to be the only proper lead agency for the Monterey Amendment Program Environmental Impact Report. There is an important distinction between the Environmental Impact Report at issue in the Monterey Amendment Program EIR Challenge and the Project EIR – the Monterey Amendment Program Environmental Impact Report analyzed the impacts of major amendments to all SWP contracts, the conveyance of state-owned property, and changes in the operation of the SWP project that had statewide impacts. The Court of Appeal determined that for a project of that magnitude, DWR was the only suitable lead agency. The subject Project is significantly different from the Monterey Amendment. The subject Project is a simple transfer of Table A Amount from one SWP contractor to another. It has no statewide impacts; its impacts are site specific to the transferor and the transferee with some minimal impacts on SWP facilities.

E. Some members of the public who have commented on the Project EIR have suggested that the Monterey Amendment Settlement Agreement precludes CLWA from proceeding with the Project EIR and with the Project. CLWA disagrees. The Monterey Amendment Settlement Agreement states on Page 12: "The Parties [to the settlement agreement] agree that jurisdiction with

respect to that litigation [*Friends of the Santa Clara River v. Castaic Lake Water Agency* (2002) 95 Cal.App.4th 1373] should remain with that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation." The new Monterey Amendment Environmental Impact Report will include the Project water transfer in its larger evaluation of the environmental impacts of all permanent Table A Amount transfers described in the Monterey Amendment.

F. Comments on the EIR included references to "paper water," an issue of concern to the Court of Appeal in the Monterey Amendment Program EIR Challenge. The "paper water" issue is not relevant to the Project because the Project is intended to firm up and supplement existing CLWA water supplies. CLWA uses DWR's supply reliability figures in projecting how much water the Project has the capability of yielding for CLWA customers. If the actual SWP water deliveries are less than DWR's reliability figures project, the growth-related impacts of the Project, analyzed in the EIR, will be less than anticipated. To stabilize its future supplies, CLWA banks water for future use in times of shortage. Finally, the Project EIR cautions planners and developers that historical SWP water delivery rates are no guaranty of future delivery rates. Many factors can affect the amount and reliability of water supplies. The Project EIR acknowledges this but conducts a "worst case" analysis of growth-related impacts based upon historical deliveries.

G. The Project EIR uses two baseline conditions to perform the environmental impact analysis because there have been two Notices of Preparation for the Project (one for the de-certified Environmental Impact Report and one for the present EIR) and because the water transfer analyzed in the Project EIR has occurred and CLWA has been operating with the Project in place since certification of the original Environmental Impact Report. The use of two baselines enabled CLWA to compare the pre-Project condition with the current condition (with the Project in operation) and the current condition with the condition existing immediately prior to preparation of the current EIR. In this way, the broadest range of potential impacts was addressed.

H. The current EIR also addresses potential Project impacts with and without the implementation of the Monterey Amendment, thereby providing to the decision makers and the public a broad range of environmental impact analysis and responding to the Court of Appeal's order that the Monterey Amendment Program Environmental Impact Report be de-certified. In short, the Project EIR does not tier off any other Environmental Impact Report other than the 1988 Capital Program Environmental Impact Report. The Project EIR is a stand-alone document with regard to the Monterey Amendment.

I. CLWA has worked closely with DWR in the preparation of the Project EIR to ensure that the facts, assumptions and analysis included in the Project EIR are accurate, to utilize DWR models, to coordinate the analysis in the Project EIR

with the analysis that DWR is undertaking in its preparation of the new Monterey Amendment Environmental Impact Report, and to avoid inconsistencies between the Project EIR and the new Monterey Amendment Environmental Impact Report. DWR's comments on the contents of the Project EIR have been positive and have confirmed that completion of the Project EIR will not prejudice DWR's completion of its new Monterey Amendment Environmental Impact Report.

J. During preparation of the Project EIR, the Urban Water Management Plan for CLWA's service area was declared to be invalid. Although CLWA is in the process of updating the Urban Water Management Plan, the update process will take considerable time and effort; it cannot be completed prior to certification of the Project EIR. The Project EIR does not rely upon CLWA's 2000 Urban Water Management Plan, so the invalidation of that Plan has no impact on CLWA's consideration of the environmental analysis included in the Project EIR.

K. Some commenters to the Draft Project EIR raised issues concerning CLWA's use of DWR modeling programs to project the amount of water that CLWA might expect to be delivered from the Project. CLWA used the information yielded by DWR's models to project indirect impacts of the Project related to growth and to identify and analyze cumulative impacts of the Project. CLWA used DWR statistical computer models to determine the portion of the 41,000 acre feet Table A Amount reliably available to analyze Project environmental impacts for two (2) reasons: (1) use of DWR modeling is consistent with the Monterey Settlement Agreement provisions applicable to the new Monterey Amendment Environmental Impact Report; and (2) DWR has greater resources and experience than CLWA in formulating SWP reliability models, so CLWA considered DWR's modeling programs to be superior to any that CLWA could economically and efficiently formulate for the Project.

L. Concern was expressed during the public comment period that the existing SWP facilities were insufficient to transport the Project water deliveries to CLWA and would cause potential conflicts with delivery demands by Metropolitan Water District. Although Metropolitan Water District has substantial demand for SWP water (and the largest Table A Amount among urban SWP contractors), the majority of SWP deliveries to Metropolitan Water District proceed through the East Branch of the California Aqueduct, not the West Branch through which CLWA receives its deliveries. The West Branch has more than adequate capacity to accommodate water deliveries from the Project and has been doing so since 1999, when the Project first was implemented.

M. Members of the public have opined that the Project will result in potentially significant impacts on agricultural lands in WRMWSD. CLWA staff and the EIR writers conducted extensive research and analysis, working closely with

WRMWSD staff, to describe how WRMWSD and its customers propose to offset their transfer of expensive SWP water with alternative, less expensive sources. The result is the determination that no fallowing of productive agricultural lands will occur as a result of the Project. The fallowing that will occur will be part of routine agricultural practices, as has occurred in the past. WRMWSD and its customers have several sources of water supply available that they propose to use in lieu of the Project water, including but not limited to groundwater (groundwater levels have been increasing steadily in WRMWSD's service area), groundwater banking, and surplus water. In short, WRMWSD has assured CLWA that the Project water is an expensive source that can be replaced with more economical water, thereby ensuring long term agricultural viability.

PROJECT SPECIFIC CEQA FINDINGS

A. Findings Concerning Indirect and Cumulative Impacts of the Project -- Aesthetic/Visual Resources

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential aesthetic changes could occur within the CLWA service area as an indirect growth-related and cumulative significant impact of the Project, including changes to the visual characteristics of the area through the development of open space and further urbanization of hillside and natural areas. Scenic vistas could be impacted, glare from night lighting could increase, and a "confused urban image" could result from potential haphazard development. This impact is identified in the Final EIR, Vol. I, pages 4-3 and 6-41.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could substantially reduce this impact by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the draft EIR. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA. However, depending upon the magnitude, location, and design of future development, the impact may not be mitigable to less than significant, as stated on pages 4-3 and 6-41 of the Final EIR, Vol. I.

2. Findings.

CLWA finds this impact to be significant and unavoidable; the measures referenced above, if implemented successfully by the applicable land use agencies, will substantially reduce this impact, but not to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction; and that those land use agencies can and should implement those measures. This impact is overridden by benefits of the proposed Project, as set forth in the Statement of Overriding Considerations. The alternatives identified in the final EIR are unacceptable for the reasons set forth in Finding P.

B. <u>Findings Concerning Indirect and Cumulative Impacts of the Project -- Agricultural Resources</u>

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which the information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential conversion of agriculture lands to non-agricultural uses or changes in agricultural zoning by local jurisdictions to allow a higher density or intensity of development could occur within CLWA as an indirect growth related and cumulative significant impact of the Project. This impact is identified in the Final EIR, Vol. I, pages 4-7, 4-8 and 6-42.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles and the County of Ventura, both of which are required by law to comply with CEQA. The County of Los Angeles and the County of Ventura could reduce this impact to less than significant by implementing their existing General and Area Plan policies, including those of the Piru Area Plan, identified at Table 4.2-1 of the Final EIR, Vol. I, since these plans contain measures to preserve and protect agricultural land, as noted on pages 4-8 and 6-42 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction; and that those land use agencies can and should implement those measures.

C. Findings Concerning Indirect and Cumulative Impacts of the Project -- Air Quality

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about

new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential air quality changes could occur within the CLWA service area as an indirect growth related and cumulatively significant impact of the Project, including increased air pollutant emissions for which the South Coast Air Basin does not currently meet federal or state standards, toxic emissions from industrial development, increased vehicle mobile emissions, and fugitive dust emissions from construction. This impact is identified in the Final EIR, Vol. I, pages 4-8 and 6-42.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could substantially reduce this impact by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA. However, depending on the magnitude of future development, the impact may not be fully mitigable to less than significant, as stated on pages 4-8 and 6-42 of the Final EIR, Vol. I.

2. Findings.

CLWA finds this impact to be significant and unavoidable; the measures referenced above, if implemented successfully by those land use agencies will substantially reduce this impact, but not to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures. This impact is overridden by Project benefits as set forth in the Statement of Overriding Considerations. The alternatives identified in the final EIR are unacceptable for the reasons set forth in Finding P.

D. Findings Concerning Indirect and Cumulative Impacts of the Project -- Biological Resources

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval

process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential changes to biological resources could occur with the CLWA service area as an indirect growth related and cumulative significant impact of the Project, including loss, degradation, or fragmentation of habitats, which may result in local native plant and wildlife populations, including sensitive species being reduced in size and made vulnerable to local extinction. Additionally, non-native species could compete with native species, and established wildlife corridors and nurseries could be disrupted. Pollutant levels could increase and cause harm to sensitive habitat and species. This impact is identified in the Final EIR, Vol. I, pages 4-9, 6-42 and 6-43.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could substantially reduce this impact by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA. Also other regulatory agencies such as the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and the California Department of Fish and Game may impose permit conditions that reduce any significant impact. However, depending on the magnitude of future development, the impact may not be fully mitigable to less than significant, as stated on pages 4-9 and 6-43 of the Final EIR, Vol. I.

2. Findings.

CLWA finds this impact to be significant and unavoidable; the measures referenced above, if implemented successfully by those land use and regulatory agencies will substantially reduce this impact, but not to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies and regulatory agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures. This impact is overridden by Project benefits as set forth in the Statement of Overriding Considerations. The alternatives identified in the final EIR are unacceptable for the reasons set forth in Finding P.

E. Findings Concerning Indirect and Cumulative Impacts of the Project -- Cultural Resources

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential disturbance of human remains, archaeological, historical, and paleontological resources by excavation and grading activities associated with future development could occur within CLWA as an indirect growth related and cumulative significant impact of the Project. This impact is identified in the Final EIR, Vol. I, pages 4-9, 4-10 and 6-43.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could reduce this impact to less than significant by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I, since the policies contain measures for either avoiding impacts to such resources or providing adequate documentation of the resources, as noted on pages 4-10 and 6-43 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA.

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's

responsibility or jurisdiction, and that those land use agencies can and should implement those measures.

F. Findings Concerning Indirect and Cumulative Impacts of the Project--Geology and Soils

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential geologic hazards could occur within CLWA as an indirect growth related and cumulative significant impact of the Project, including fault rupture, seismically induced ground failure, and seiches, as well as permanent changes in topography, loss of topsoil and removal of unique geologic features. This impact is identified in the Final EIR, Vol. I, pages 4-10, 4-11, 6-43 and 6-44.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could reduce this impact to less than significant by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I, since the policies contain adequate measure to avoid or reduce such impact, as noted on pages 4-11 and 6-44 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA.

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to

a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures.

G. Findings Concerning Indirect and Cumulative Impacts of the Project -- Hazards and Hazardous Materials

1. Facts.

a. With regard to direct impacts, CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" to address CLWA's handling, storing, and using hazardous materials in water treatment according to all state and federal regulations. This Project will not result in any new construction related to water treatment, including no expansion of any currently existing treatment facilities, nor will it result in any other direct significant impacts. In April 2003, CLWA certified the Final EIR for expansion and upgrade of the Earl Schmidt Filtration Plant (ESRP), which fully evaluated and addressed the issues of hazards and hazardous materials associated with the increase in raw water treatment resulting from growth, including any need for mitigation. Consequently, CLWA need not adopt a separate mitigation and monitoring program for purposes of ensuring that when engaged in water treatment, CLWA handles, stores and uses hazardous materials according to state and federal regulations.

b. With regard to indirect impacts, CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

c. A potential increase in hazards and hazardous materials could occur within CLWA as an indirect growth related and cumulative significant impact of the Project, including required removal or remediation of contaminated soils, increase in the use, transport and disposal of hazardous materials, impairment of emergency response or evacuation plans, and increased exposure to wildland fires. This impact is identified in the Final EIR, Vol. I, pages 4-11, 6-44 and 6-45.

d. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could reduce this impact to less than significant by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I, since the policies contain adequate measures to avoid or reduce such impacts, as noted on pages 4-11, 4-12 and 6-45 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA.

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures.

H. Findings Concerning Indirect and Cumulative Impacts of the Project -- Land Use and Planning

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential division of a community, building in sensitive areas such as hillside management areas, open space areas and sensitive wildlife habitat areas, or conflict with adopted land use plans could occur within CLWA as an indirect growth

related and cumulative significant impact of the Project. This impact is identified in the Final EIR, Vol. I, pages 4-12 and 6-45.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could reduce this impact to less than significant by implementing their existing General and Area Plan policies identified in Table 4.2-1 of the Final EIR, Vol. I, since the policies contain adequate measures to avoid or reduce such impacts, as noted on pages 4-12 and 6-45 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA.

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures.

I. Findings Concerning Indirect and Cumulative Impacts of the Project -- Population and Housing

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. A potential increase of 106,700 persons and 35,600 housing units could occur within CLWA as an indirect growth related and cumulative significant impact of the Project. This impact is identified in the Final EIR, Vol. I, pages 4-13 and 6-45.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could reduce this impact to less than significant by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I, since the policies contain adequate measures to avoid or reduce such impacts, as noted on pages 4-13 and 6-45 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA,

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures.

J. Findings Concerning Indirect and Cumulative Impacts of the Project -- Public Services

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. A potential increased demand for police and fire services, including staffing, facilities and equipment, decreased response times and fire flows, and construction of new schools and libraries could occur within CLWA as an indirect growth related and cumulative significant impact of the Project. This impact is identified in the Final EIR, Vol. I, pages 4-13, 4-14 and 6-46.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could reduce this impact to less than significant by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I, since the policies contain adequate measures to avoid or reduce such impacts, as stated on pages 4-14 and 6-46 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA.

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures.

K. Findings Concerning Indirect and Cumulative Impacts of the Project -- Recreational Resources

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about

new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential increased demand for recreational resources, such as parks and trails and other recreation areas, could occur within CLWA as an indirect growth related and cumulative significant impact of the Project, exacerbating existing shortfalls in local parkland that may outpace the ability of public agencies to provide these resources. This impact is identified in the Final EIR, Vol. I, pages 4-14, 6-46 and 6-47.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could reduce this impact to less than significant by utilizing the Quimby Act and by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I, since the policies contain adequate measure to avoid or reduce such impact, as noted on pages 4-14, 4-15 and 6-47 of the Final EIR, Vol. I. The Quimby Act (Gov. Code § 66477), as part of the Subdivision Map Act, gives a city or county the authority to impose as a condition to subdivision map approval the dedication of land, the payment of fees, or a combination of both for park and recreational purposes to accommodate the increased burden on recreational facilities as a result of the population projected to inhabit the subdivision. Specific mechanisms for implementing the referenced General and Area Plan policies would be determined in the course of project-specific environmental review required by CEQA.

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures.

L. Findings Concerning Indirect and Cumulative Impacts of the Project -- Transportation and Circulation

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development

projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential increases in traffic, deterioration in the level of service, the need for new or altered roads, highways, parking facilities and transportation systems, and the alteration of present patterns of circulation could occur within CLWA as an indirect growth related and cumulative significant impact of the Project. This impact is identified in the Final EIR, Vol. I, pages 4-15 and 6-47.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could substantially reduce this impact by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA. However, due to the delay between the time improvements are needed and the time they can be provided, the impact may not be fully mitigable to less than significant, as stated on pages 4-15 and 6-47 of the Final EIR, Vol. I.

2. Findings.

CLWA finds this impact to be significant and unavoidable; the measures referenced above, if implemented successfully by those land use agencies will substantially reduce this impact, but not to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures. This impact is overridden by Project benefits as set forth in the Statement of Overriding Considerations. The alternatives identified in the final EIR are unacceptable for the reasons set forth in Finding P.

M. Findings Concerning Indirect and Cumulative Impacts of the Project -- Utilities and Service Systems

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential increased demand for solid waste disposal services, and potential increased need for potable water treatment facilities could occur within CLWA as an indirect growth related and cumulative significant impact of the Project. This impact is identified in the Final EIR, Vol. I, pages 4-16, 4-17, 6-47 and 6-48.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could substantially reduce this impact by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA. However, because impacts to solid waste disposal may not be avoidable unless additional landfill capacity is approved and constructed, the impact may not be fully mitigable to less than significant, as stated on pages 4-17 and 6-48 of the Final EIR, Vol. I.

2. Findings.

CLWA finds this impact to be significant and unavoidable as to solid waste disposal; the measures referenced above, if implemented successfully by those land use agencies will substantially reduce this impact, but not to a level of insignificance for solid waste disposal. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures. This impact is overridden by Project benefits as set forth in the Statement of Overriding Considerations. The alternatives identified in the final EIR are unacceptable for the reasons set forth in Finding P.

N. Findings Concerning Indirect and Cumulative Impacts of the Project -- Water Resources

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential changes to water resources could occur within the CLWA service area as an indirect growth related and cumulative significant impact of the Project. Increased demand on local groundwater resources during periods of reduced SWP deliveries could result in substantial depletions on a short-term basis in dry hydrologic years. The impermeable surface areas resulting from development could result in alteration of surface flows, reduction of aquifer recharge and increased amount and rate of stormwater runoff, increased flooding and peak flow rates that could result in substantial erosion or siltation. This impact is identified in the Final EIR, Vol. I, pages 4-17, 4-18, 6-48 and 6-49.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could reduce this impact to less than significant by [complying with insert the applicable statutes re water supply for new projects] and by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I, as noted on pages 4-18 and 6-49 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA. Additionally, compliance with the LARWQCB Water Quality Control Plan [Basin Plan] for the Coastal Watersheds of Los Angeles and Ventura Counties, as amended, also would reduce significant and less than significant impacts.

2. **Findings.**

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures.

O. **Findings Concerning Cumulative Impacts of the Project upon Air Quality Associated with SWP and Associated Facilities**

1. **Facts.**

a. The Project's direct impact to air quality, although less than significant, would contribute to the significant air quality impacts from the CALFED project and the San Luis Reservoir Low Point Project. This cumulative impact is identified in the Final EIR, Vol. I, page 6-40.

b. The CALFED agencies could substantially reduce this cumulative impact by implementing CALFED program mitigation measures listed on page 6-40 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA. Although an EIR has not yet been published for the San Luis Low Point Improvement Project, based on a preliminary analysis of the impacts, similar measures to those listed for the CALFED project could be implemented to reduce significant impacts.

2. **Findings.**

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by CALFED agencies and/or by agencies within the CALFED program will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those agencies, not within CLWA's responsibility or jurisdiction, and that those use agencies can and should implement those measures.

P. **Findings Concerning Alternatives to the Project.**

Because an EIR must identify ways to mitigate or avoid the significant effects that a project may have on the environment, it must discuss alternatives to the project that would feasibly attain most of the basic objectives of the project, but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives.

1. **Facts.**

a. Alternative 1, No Project. Under the No Project Alternative, CLWA would not acquire the additional Table A Amount or acquire the associated contractual rights for delivery of water associated with the transfer. The demand for high quality surface water is expected to increase throughout all of southern California as a result of continued growth, and local planning agency documents project continuing growth in the CLWA service area. Without the Project, the contract right to the Table A Amount that is the subject of the Project could be transferred to other portions of urbanized California. The amount, timing, and location of such a transfer are highly speculative, however, and this scenario is not considered further. Two hypothetical scenarios have been carried forward for detailed analysis that are intended to define a reasonable range of possible actions that could occur under the No Project Alternative. The discussion provided below under the Moratorium Scenario and Build-Out Scenario includes projects in the County of Los Angeles Development Monitoring System (DMS) which includes: pending projects (not yet approved); approved projects (subdivisions that have been granted an approved tentative tract map that is not yet recorded or expired); and recorded projects (subdivisions that have recorded a final tract map but are not yet built).

Moratorium Scenario

Under the Moratorium Scenario, a moratorium on new development would be implemented. This assumes that the local retail water purveyors within the CLWA service area who purchase SWP water from CLWA decide that there is insufficient water to issue "will serve" letters to supply new development and that local land use agencies respond by imposing a moratorium on new development in the CLWA service area.

The 1998 DMS included 15,973 housing units (8,588 approved, 2,292 recorded, and 5,093 pending). The 2002 DMS included 33,113 housing units (13,586 approved, 9,915 recorded, and 9,612 pending). These housing units would not be built under this scenario. Assuming three persons per household, this amount of development would result in a population of approximately 49,510 persons, using the 1998 DMS, and 99,339 persons, using the 2002 DMS.

The Project was undertaken to serve some existing demand (users). Under the No Project Alternative, some additional groundwater production wells may be required to serve existing demand that would have been met by the Table A Amount transfer, particularly at times of low deliveries from the SWP. Treatment at the wellhead likely would be needed, depending upon local groundwater characteristics. New underground distribution pipelines also may be required. Electric pumps would be used as needed.

Build-Out Scenario

Under the Build-Out Scenario, approved and recorded projects listed in the DMS for the Santa Clarita Valley would be developed, notwithstanding the potential shortfall in reliable water supply. Based on the DMS from both 1998 and 2002, the number of housing units in approved and recorded DMS projects considered under this scenario (10,880 and 23,500 units, respectively) is less than the number of housing units that could

be supported by the Project given an average year water supply of 34,400 AF (35,600 units). The population associated with the development identified in the 1998 DMS would be 32,640 persons; the population associated with the 2002 DMS development would be 70,500 persons. In comparison, the population that could be served by the Project would be 106,700 persons.

Under this scenario, existing demand currently met by the Table A Amount transfer and the increased water demand from approved and recorded projects allowed to be constructed would rely on existing water supplies (including local groundwater resources) that are currently not used for urban purposes. Treatment at the wellhead likely would be needed, depending upon local groundwater characteristics. New underground distribution pipelines also may be required. Electric pumps would be used as needed.

b. Alternative 2, Increased Extractions from the Saugus Formation (Increased Groundwater Extractions). Under this alternative, an average of 34,400 AFY would be extracted from the Saugus Formation and delivered to users in the CLWA service area in lieu of the water anticipated from the transfer of SWP Table A Amount. This amount would be above what is currently extracted or presently planned for extraction. The extraction would be accomplished by increased use of existing wells and by the installation of 15 additional wells, pumps, and wellhead treatment facilities. Existing or new distribution facilities such as pipelines and pumping stations would be used to transport this water to existing and planned treated water distribution facilities.

c. Alternative 3, Exchange Desalinated Water for SWP Water (Desalination/Exchange). This alternative comprises two primary components in lieu of the Project: (1) CLWA would contribute a portion of the funds needed by another agency to develop a seawater desalination facility along the southern California coast; and (2) an average of 34,400 AFY of desalinated water produced by this facility would be exchanged with CLWA for SWP water. A likely partner in such an arrangement would be The Metropolitan Water District of Southern California (Metropolitan). If both parties agreed, CLWA would enter into a contract with Metropolitan indicating that a portion of Metropolitan's annual SWP Table A Amount would be delivered to Castaic Lake for use by CLWA in exchange for CLWA's contribution to a desalination facility to be constructed by Metropolitan. CLWA would treat and distribute this SWP water in existing CLWA facilities, and Metropolitan would use water from the desalination facility in lieu of the SWP water exchanged with CLWA.

Assuming a 50 percent recovery rate, a plant capacity of approximately 61 mgd would be required to produce an average of 34,400 AFY. Depending on the extent of ancillary facilities included at the site, a site of at least 2 acres could be required. In addition to the desalting plant, the coastal facility would likely include new electrical power conveyance and control equipment, ocean water intake and brine disposal structures, and a treated water pumping plant. Total site area could be up to 5 acres. Depending on site location, additional pipelines and related pumping facilities may be required to convey the desalinated water a short distance to the existing Metropolitan distribution facilities.

d. Alternative 4, Transfer of a Smaller Table A Amount (Smaller Table A Amount). Under this alternative, CLWA would acquire a smaller amount of SWP Table A Amount than under the Project. A transfer of approximately 20,000 AF of SWP Table A Amount was analyzed because it is the approximate mid-point between the amount that would be transferred under the Project and the No Project Alternative. Existing facilities would be used, as described for the Project.

Since the demand for high quality surface water is expected to increase in southern California as a result of anticipated growth, the remaining SWP Table A Amount (21,000 AF) could be transferred to other (unidentified) portions of urbanized southern California. The Table A Amount not acquired by CLWA would likely be acquired by other agencies with growing urban water demands. However, the timing, amount, and location of the transfer(s) as well as the associated impacts are speculative and are not evaluated under this alternative.

e. Alternative 5, Transfer of a Larger Table A Amount (Larger Table A Amount). Under this alternative, CLWA would acquire a larger SWP Table A Amount than under the Project. Such an alternative would require the use of a larger proportion of the SWP facilities and capacities than described for the Project, and would attempt to reduce or avoid the effects of reductions in SWP supplies (during periods of drought) on local groundwater resources. In order to provide an analysis of impacts of a transfer greater than the Project (transfer of 41,000 AF of Table A Amount), a transfer of approximately 60,000 AF of SWP Table A Amount was established for this alternative. This Table A Amount is potentially available from other KCWA member units who have expressed interest in reducing their Table A Amount and have completed CEQA analysis of the sale of this contract right (e.g., Belridge Water Storage District, Berrenda Mesa Water District, and Lost Hills Water District). Existing facilities would be used, as described for the Project.

2. Findings Regarding Alternatives to the Project.

a. Alternative 1, No Project. CLWA finds that Alternative 1, the No Project Alternative, is infeasible and less desirable than the Project and rejects this alternative for the following reasons:

- This alternative would not augment CLWA's water supply and therefore would not meet any of the Project objectives.
- Each scenario would reduce or avoid the significant indirect (growth-related) impacts of the Project in the CLWA service area, but these impacts could occur in another area if projected growth were re-located elsewhere.
- Each scenario would result in greater direct impacts than the Project because new groundwater wells, treatment facilities, and associated pipelines would be required to offset the lack of adequate SWP water needed to accommodate existing demand and planned growth.
- Each scenario could result in significant unavoidable impacts to groundwater supply and groundwater quality.
- This alternative could result in considerable economic and social impacts to residential, commercial, industrial, and public/governmental users in the

CLWA service area if water deliveries were cut back or rationing occurred. Reduced deliveries could affect the ability of public and private property owners to water lawns, parks, golf courses, landscaping, and open space areas and could result in vegetated areas dying off with resulting economic loss. Businesses that use high volumes of water may be forced to cut back production or close. A moratorium on new development would result in overcrowding and a delay or failure to meet County of Los Angeles and City of Santa Clarita General Plan population, housing, and job projections for which local governments have planned and/or constructed infrastructure and expended funds. A moratorium on new development would have potential economic consequences related to increased costs of housing in an already expensive southern California housing market, and developers with approved or recorded and unbuilt projects may experience economic loss if projects are delayed or cannot be completed. In addition, businesses considering relocating or expanding in the CLWA service area may be reluctant to invest capital because of uncertainties related to water supplies, lack of affordable housing for employees and stagnant local markets for goods and services. Alternative locations for siting or expanding businesses outside the service area would become more attractive. This could in some cases result in increased commuting, resulting in greater traffic, air emissions and energy use.

b. Alternative 2, Increased Groundwater Extractions. CLWA finds that Alternative 2, the Increased Groundwater Extractions Alternative, is less desirable than the Project and rejects this alternative for the following reasons:

- It would not adequately augment CLWA's water supply for its customers and therefore would not meet most of the Project objectives.
- It would not meet the Project objective to import water from outside the CLWA service area, to reduce dependence upon local water supplies.
- It would result in the same indirect impacts as the Project and thus would not reduce or avoid the Project's significant growth-related impacts.
- It would result in greater direct impacts to many environmental resources because new groundwater wells, treatment facilities, and pipelines would have to be constructed.
- It would result in a significant, unavoidable impact to groundwater supply, whereas the Project would result in a beneficial impact to groundwater supply through recharge.
- It would exceed the average annual yield of the groundwater basins, whereas the Project would allow the groundwater basins to store some of the average annual yield for use in dry years.

c. Alternative 3, Desalination/Exchange. CLWA finds that Alternative 3, the Desalination/Exchange Alternative, is less desirable than the Project and rejects this alternative for the following reasons:

- This alternative would result in the same indirect impacts as the Project and thus would not reduce or avoid the Project's significant growth-related impacts.
- It would result in greater direct impacts to many environmental resources from the construction and operation of a new desalination plant.
- This alternative would augment CLWA's water supply since desalinated water would be exchanged with another water agency's SWP Table A Amount, which would be conveyed to existing CLWA facilities, and therefore would meet the Project objectives.
- This alternative would be significantly more costly than the Project.

d. Alternative 4, Smaller Table A Amount. CLWA finds that Alternative 4, the Smaller Table A Amount Alternative, is less desirable than the Supplemental Water Project and rejects this alternative for the following reason:

- Although this alternative would reduce the potentially significant indirect impacts of the Project and would result in similar or lessened direct impacts, it would not meet one of the two Project objectives, which is to "Augment CLWA's SWP Table A Amount to meet water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area."
- This alternative would not provide adequate water to meet projected demand.

e. Alternative 5, Larger Table A Amount. CLWA finds that Alternative 5, the Larger Table A Amount Alternative, is less desirable than the Supplemental Water Project and rejects this alternative for the following reasons:

- This alternative would meet the Project objectives, but would result in similar or greater direct impacts and would provide more water for more growth that could increase the significant indirect impacts of the Project.

f. Environmentally Superior Alternative. The Project is the environmentally superior alternative that meets the Project objectives. The No Project Alternative would have direct environmental impacts substantially greater than the Project and would not meet Project objectives.

g. Other Table A Amount Uses. At least one comment to the Project EIR suggested that the Alternatives analysis in the EIR should include alternative uses of the Table A Amount water transferred by the Project for other purposes and in other locations, including for environmental purposes. CLWA could not approve consideration of this alternative in the Project EIR for two principal reasons: (i) it accomplishes none of the Project objectives and would leave CLWA without the supplemental water supply that it needs to meet present demand and to provide for some future demand; and (ii) any such alternative more properly should be suggested to DWR for consideration as it prepares the new Monterey Amendment EIR, not to CLWA. This is not a viable alternative to the Project.

GENERAL FINDINGS

A. CLWA has adopted the following mission statement: "A public agency providing reliable, quality water at a reasonable cost to the Santa Clarita Valley." The Project provides a valuable source of supplemental water that will allow CLWA to continue to implement its mission statement. As such, it is an integral part of CLWA's long-term water supply planning program. A portion of the water provided under the Project already is in use by CLWA customers to meet existing demand. The remainder has been secured to meet some of the demand projected by local planning agencies as part of their General Plans.

B. Some members of the public have stated that CLWA is acting improperly by considering the Monterey Amendment and the Project to be in effect, suggesting that the Project water transfer is in jeopardy. CLWA considers this position to be invalid for two reasons:

1. The Monterey Amendment Settlement Agreement provides that "the Parties [to the Settlement Agreement] will jointly request that the Superior Court enter an order approving this Settlement Agreement, and an order, pursuant to California Public Resources Code Section 21168.9, authorizing on an interim basis the administration and operation of the SWP and the Kern Water Bank in accordance with the Monterey Amendments . . . ." The Sacramento Superior Court has entered such an order and the SWP continues to operate in accordance with the Monterey Amendment, which includes the provision under which the Project was implemented.

2. Notwithstanding two requests from the petitioners in the "*Friends*" case (one request having been made to the Court of Appeal and the other to the Superior Court), both courts declined to set aside the Project or to order suspension or termination of its operation pending completion of the Project EIR. CLWA's preparation of the Project EIR, its adoption of these Findings, the Statement of Overriding Consideration, the Mitigation and Monitoring Program and the Resolution based upon these Findings and the Statement of Overriding Considerations are steps required by, and conducted under the supervision of, the Superior Court to bring the Project into compliance with CEQA and to render the Resolution final. The Monterey Amendment settlement agreement provides at Page 11 that DWR's new Monterey Amendment Program EIR will include analysis of the Project as part of the overall analysis of the environmental impacts of completed Table A Amount permanent transfers.

C. CLWA's water supply from the SWP allows CLWA's customers, who are water retailers, to conjunctively use the SWP supplies and their local groundwater supplies, to the extent each retailer has access to groundwater. Conjunctive use programs acknowledge that reliance on only one water supply in certain circumstances can result in delivery shortages. By expanding the range of water supply sources, a water supplier increases the long term reliability of its supply. For example, when climactic or other conditions reduce the local water supplies, the water purveyor can turn to its SWP deliveries to replace (in whole or in part) the local supplies, "resting" the groundwater basins and allowing them to recharge. In other years, when reduced SWP supplies available from Northern California result in SWP delivery shortages, Southern California water agencies can rely on local groundwater or other local supplies as a back-up to the SWP supply. Having this flexibility available enhances a water purveyor's overall supply reliability and reduces the need to cut back deliveries to customers. The SWP supplies also provide a safeguard against long-term overdraft of local groundwater basins.

D. Deliveries of SWP water are not assured. In years when DWR is unable to deliver the full amounts requested by CLWA and the SWP contractors, DWR allocates available SWP water to the contractors in proportion to their respective Table A Amounts. By implementing the Project, not only does CLWA increase its deliveries in good supply years, it also increases its proportionate deliveries in short supply years.

E. Project opponents point to the Project as being growth inducing because it removes one obstacle to growth. The Project EIR acknowledges the indirect Project impacts from growth. The positive aspect of removing this obstacle to growth is that local planning agencies have prepared their planning documents with the objective of building out their plan areas in a manner that meets the needs of their communities. People must live somewhere and businesses must be located to meet the needs of the local population. Although the Project doesn't meet all of the projected demand, it provides some part of the water needed for the anticipated growth.

F. The population of California, particularly Southern California, continues to grow at a remarkable rate. CLWA's service area is a popular site for housing for people who work in the Los Angeles area. Los Angeles County's Development Monitoring System (DMS) attempts to track all pending, approved, and recorded development projects within the City of Santa Clarita and the unincorporated area of Los Angeles County, and the City of Santa Clarita also maintains its own separate records in addition to the DMS. To the extent possible, CLWA's mission includes meeting the needs of the projected population within CLWA's service area, taking into account the DMS and City of Santa Clarita information.

G. CLWA paid $48 Million for the Project, financing the acquisition of 41,000 acre feet per year of Table A Amount through the sale of tax exempt obligation bonds. This money already has been paid to Wheeler Ridge-Maricopa Water Service District and CLWA has been servicing the bonds since the initial transfer in 1999. In addition, CLWA has paid to DWR a fixed annual cost for this Table A Amount of approximately $6.8 Million. CLWA has a substantial investment in the Project, the cost of which is being borne by current water users.

EXHIBIT "C"

STATEMENT OF OVERRIDING CONSIDERATIONS

FINAL ENVIRONMENTAL IMPACT REPORT

The Board of Directors of the Castaic Lake Water Agency ("CLWA") adopts and makes this Statement of Overriding Considerations concerning the proposed Project's unavoidable significant impacts[1] to explain why the proposed Project's benefits override and outweigh the unavoidable significant impacts of the Project.

The proposed Project will bring substantial benefits to CLWA, including increased water supply reliability to meet current demand within the CLWA service area and increased overall water supply to serve a portion of the growth within CLWA through 2025 as projected by one regional agency, as specifically described in the Southern California Association of Governments' ("SCAG") currently adopted demographic forecasts for the Santa Clarita Valley area, and as described in adopted General and Specific Plans of local land use agencies (See Final EIR, Vol. I, pp. 5-7 and 5-11.)

Without the Project, permanent damage could occur to groundwater resources within CLWA's service area. Specifically, without the provision of an additional water supply for CLWA, existing use could overstress groundwater supplies in dry years and increase the potential for perchlorate contamination to spread, causing a significant local groundwater quality impact. Without the provision of an additional supply for CLWA, projected growth could not be accommodated within the parameters of existing environmental requirements, as the current groundwater sources in their present state could not meet the likely demands of this projected growth. (See Final EIR, Vol. I, pp 3.15-15 through 3.15-22, 7-10 and 7-11.) In addition, the failure to provide adequate water supplies to accommodate and meet the County of Los Angeles' and City of Santa Clarita's General Plan population, housing, and employment projections, for which local governments have already planned and/or constructed infrastructure, would have devastating consequences to the area's economy. These consequences include potential over-crowding in existing housing, increased costs of housing in an already expensive Southern California housing market, and economic loss to developers with approved or recorded but un-built projects, due to delay or an inability to obtain approval for completion. Furthermore, businesses considering relocating or expanding in the CLWA area may be reluctant to invest capital because of uncertainties related to water supplies, lack of adequate and affordable housing for employees, and stagnant local markets for goods and services. (See Final EIR, Vol. I, pp. 7-4 and 7-5.)

[1] Those unavoidable environmental impacts are indirect impacts to aesthetics, air quality, biological resources, transportation and circulation systems, and utilities and services, resulting from potential growth utilizing the Project water.

In contrast, the Project's provision of supplemental water supplies to accommodate much of the growth projected in adopted plans of local jurisdictions within CLWA would increase the provision of jobs and housing in the area. The additional housing and jobs will facilitate the regional housing and employment goals established by SCAG. The Project will mitigate the projected water shortage of one-million acre-feet in the year 2020 identified as an environmental impact by SCAG in its 1989 EIR for its Growth Management Plan. Attainment of regional housing and employment goals will help fulfill State policies to ameliorate a serious State housing shortage. (See Health and Safety Code § 51003(a).) The alternatives to the proposed Project considered in the Final EIR are not expected to result in substantially reduced environmental impacts when compared to the proposed Project, taking into consideration the Project objectives and the most feasible means to accomplish those objectives. Additional water supply for CLWA from sources other than a State Water Project transfer would be less reliable, more costly and/or more difficult to deliver.

The CLWA Board of Directors finds that the proposed Project's unavoidable significant impacts are acceptable in light of the Project's benefits as set forth herein. Each benefit set forth below constitutes an overriding consideration applicable to each and every identified unavoidable significant impact, warranting approval of the Project, independent of the other benefits, despite each and every unavoidable impact:

1. Increase the reliability of CLWA's current supply to meet existing demand.
2. Avoid the use of groundwater within CLWA in amounts beyond conservative estimates of operational yield to meet existing demand in dry years, as well as in future years.
3. Meet a portion of the water need for currently approved and pending housing development projects within CLWA.
4. Mitigate the projected water shortage identified as a significant impact by SCAG in its 1989 EIR for its Growth Management Plan.
5. Meet a portion of the water need for growth projected in the General and Specific Plans by local land use agencies.
6. Provide some of the water supply for new housing needed to foster economic growth, increase jobs and increase local tax revenue.
7. Facilitate the availability of new housing to meet regional goals for housing and to further State policies to ameliorate a serious housing shortage.
8. Provide additional water supply that is calculated to provide as nearly as possible the supply needed to meet projected water demand for the next 20 years.
9. Provide additional water to CLWA that will be more reliable, easy to deliver and economical as compared to alternative sources.

EXHIBIT "D"

MITIGATION AND MONITORING PROGRAM

FINAL ENVIRONMENTAL IMPACT REPORT

Mitigation measures identified in the Final EIR would avoid or substantially lessen some of the potentially significant indirect impacts of the Project that might be caused by development, as found by CLWA in the Specific Project CEQA Findings A-O (Exhibit "B").

Because CLWA is a water wholesaler (and retailer with respect to portions of its service area), other government jurisdictions, and not CLWA, have the authority and responsibility to place conditions upon approval of such proposals, which conditions would avoid or substantially lessen significant potential indirect environmental effects identified in the Final EIR, including those mitigation measures identified in the Final EIR and referenced in Specific Project CEQA Findings A-O (Exhibit "B").

Thus, CLWA's Mitigation Monitoring Program consists of CLWA monitoring of applications and environmental review for development projects that are submitted to CLWA by the developers in the process of obtaining service connections for those projects, of CLWA recommendations to land use agencies that they apply appropriate conditions of development project approval, and of regular CLWA reporting to its Board. Such CLWA monitoring and reporting is already in place and operating at this time pursuant to CLWA's development impact fee procedure, which procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the land use agencies. CLWA regularly prepares and presents to its Board a Quarterly Water Supply Status Report and a biannual Data Document, each of which summarize water service connection data for the applicable time period.

FRIENDS VS. CASTAIC
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LOS ANGELES
SUPERIOR COURT

SUPERIOR COURT OF THE STATE OF CALIFORNIA

OF THE COUNTY OF LOS ANGELES

FRIENDS OF THE SANTA CLARA RIVER, Petitioner, vs. CASTAIC LAKE WATER AGENCY, Respondent.	CASE NO.: BS 056954 Honorable David P. Yaffe **RETURN TO PEREMPTORY WRIT OF MANDATE** [CCP §1108]

TO: ALL PARTIES AND TO THEIR COUNSEL OF RECORD:

Respondent, Castaic Lake Water Agency, hereby makes the following Return to the Peremptory Writ of Mandate, issued by this Court on November 1, 2002, in the following particulars:

1. On December 22, 2004, the Board of Directors of Castaic Lake Water Agency adopted Resolution 2354, which: (1) Certified the Environmental Impact Report for the Supplemental Project Transfer of 41,000 acre-feet of State Water Project Table A Amount (the "Project"); (2) Adapted Findings, a Mitigation Monitoring Program and a Statement of Overriding Considerations, and (3) Approved the Project. A copy of Resolution No. 2354 is attached hereto as Exhibit 1.

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SUPERIOR COURT OF THE STATE OF CALIFORNIA

OF THE COUNTY OF LOS ANGELES

FRIENDS OF THE SANTA CLARA RIVER, Petitioner, vs. CASTAIC LAKE WATER AGENCY, Respondent.	CASE NO.: BS 056954 Honorable David P. Yaffe **RETURN TO PEREMPTORY WRIT OF MANDATE** [CCP §1108]

TO: ALL PARTIES AND TO THEIR COUNSEL OF RECORD:

Respondent, Castaic Lake Water Agency, hereby makes the following Return to the Peremptory Writ of Mandate, issued by this Court on November 1, 2002, in the following particulars:

1. On December 22, 2004, the Board of Directors of Castaic Lake Water Agency adopted Resolution 2354, which: (1) Certified the Environmental Impact Report for the Supplemental Project Transfer of 41,000 acre-feet of State Water Project Table A Amount (the "Project"); (2) Adapted Findings, a Mitigation Monitoring Program and a Statement of Overriding Considerations, and (3) Approved the Project. A copy of Resolution No. 2354 is attached hereto as Exhibit 1.

2. The Amended Notice of Completion of Draft Environmental Impact Report, dated June 17, 2004, is attached hereto as Exhibit 2.

3. The Draft Environmental Impact Report, dated June 2004, is attached hereto as Exhibit 3.

4. The Final Environmental Impact Report, dated December 2004, is attached hereto as Exhibit 4.

5. The Notice of Determination for the State Clearinghouse, dated December 23, 2004, is attached hereto as Exhibit 5.

6. The Notice of Determination for Sacramento County, dated December 23, 2004, is attached hereto as Exhibit 6.

7. The Notice of Determination for Los Angeles County, dated December 23, 2004, is attached hereto as Exhibit 7.

8. The Notice of Determination for Ventura County, dated December 23, 2004, is attached hereto as Exhibit 8.

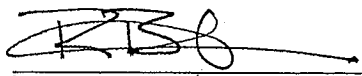
9. The Notice of Determination for Kern County, dated December 27, 2004, is attached hereto as Exhibit 9.

WHEREFORE, Respondent, Castaic Lake Water Agency, hereby prays for the Writ of Mandate to be discharged in full.

Dated: December 30, 2004

McCORMICK, KIDMAN & BEHRENS,
GENERAL COUNSEL

R. BRUCE TEPPER, SPECIAL COUNSEL



R. Bruce Tepper
Attorney for Defendant and Respondent
CASTAIC LAKE WATER AGENCY

LETTER 4

CLWA RETURN TO WRIT

EXHIBIT NO. 1

RESOLUTION NO. 2354

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE CASTAIC LAKE WATER AGENCY: (1) CERTIFYING THE FINAL ENVIRONMENTAL IMPACT REPORT FOR A SUPPLEMENTAL WATER PROJECT TRANSFER OF 41,000 ACRE-FEET OF STATE WATER PROJECT TABLE A AMOUNT; (2) ADOPTING FINDINGS, A MITIGATION MONITORING PROGRAM AND A STATEMENT OF OVERRIDING CONSIDERATIONS; AND (3) APPROVING THE PROJECT

WHEREAS, the Castaic Lake Water Agency ("CLWA") was formed and established by the California State Legislature in 1962 for the principal purpose of providing imported Northern California water for use within and adjacent to the Santa Clarita Valley; and

WHEREAS, CLWA has adopted the following mission statement: "A public agency providing reliable, quality water at a reasonable cost to the Santa Clarita Valley."

WHEREAS, CLWA, a State Water Project ("SWP") contractor, entered into a Water Supply Contract with the California Department of Water Resources ("DWR") in 1963, which contract continues as currently amended; and

WHEREAS, CLWA in April 1988 certified a programmatic environmental impact report for its capital program to provide water and related capital infrastructure for the Santa Clarita Valley through the year 2010, pursuant to then adopted planning horizons under the general plans of the planning agencies within CLWA's service area; and

WHEREAS, since completion of that 1988 CLWA capital program environmental impact report by CLWA, the applicable planning agencies have not increased the projected year 2010 population above the 270,000 persons set forth in that report for the end of the year 2010 general planning period; and

WHEREAS, in 1995, the Monterey Agreement principles were implemented through an amendment to the Water Supply Contracts between the California Department of Water Resources ("DWR") and the State Water Project ("SWP") contractors, to become effective in August 1996, which amendment became known as the "Monterey Amendment"; and

WHEREAS, in addition to statutory and other policies of the State of California, the Monterey Amendment promotes water transfers to facilitate the beneficial use of water throughout the State, including transfers from agricultural to urban water agencies in the amount of 130,000 acre feet; and

WHEREAS, in 1995, a program Environmental Impact Report analyzing the environmental impacts of the Monterey Amendment ("Monterey Amendment Program EIR") was certified; and

WHEREAS, on March 29, 1999, CLWA certified a prior Environmental Impact Report to consider a project involving the proposed transfer of 41,000 acre feet of SWP Table A Amount from Kern County Water Agency ("KCWA"), and specifically from the Wheeler Ridge-Maricopa Water Storage District ("WRMWSD") within KCWA, to CLWA; and

WHEREAS, in 2000, the California Court of Appeal, Third Appellate District reversed the Sacramento County Superior Court in *Planning & Conservation League v. Department of Water Resources* ("*PCL*," Sacramento County Superior Court Case No. 95CS03216) and found that DWR must prepare a new Monterey EIR; and

WHEREAS, in 2002 the California Court of Appeal, Second Appellate District, Fourth Division, and the Los Angeles County Superior Court in *Friends of the Santa Clara River v. Castaic Lake Water Agency* ("*Friends*," Los Angeles Superior Court Case No. BS056954) ordered CLWA to decertify its prior Environmental Impact Report for its project, based solely on a finding that the prior CLWA Environmental Impact Report had tiered from the Monterey Amendment Program EIR, which had been decertified while *Friends* was on appeal, and ordered that the Los Angeles County Superior Court was to retain jurisdiction until CLWA certified a new Environmental Impact Report complying with CEQA; and

WHEREAS, the CLWA Board of Directors decertified CLWA's prior Environmental Impact Report for its project on November 27, 2002; and

WHEREAS, the Sacramento County Superior Court in *PCL* approved a May 5, 2003 Settlement Agreement ("Monterey Amendment Settlement Agreement"), executed by CLWA and other SWP contractors, which provides that the Monterey Amendment remains in operation during the preparation of a new environmental impact report for the Monterey Amendment and further provides that the Los Angeles County Superior Court in *Friends* has exclusive jurisdiction over the litigation in *Friends* and states "that nothing in this Settlement Agreement is intended to predispose the remedies or other action that may occur in [the *Friends*] pending litigation" ; and

WHEREAS, in January 2003, CLWA issued a Notice of Preparation of a Draft Environmental Impact Report ("EIR") for a "Project," described therein as the transfer of 41,000 acre feet of SWP Table A amount from KCWA, and its member district WRMWSD, to CLWA through existing SWP facilities, and SWP contractual rights to use that water;

WHEREAS, CLWA in June 2004, by and through Science Applications International Corporation ("SAIC"), prepared and circulated a new Draft Project EIR (State

Clearinghouse No. 1998041127) to comply with the order of the Los Angeles County Superior Court in *Friends*; and

WHEREAS, the EIR considers environmental impacts of the Project based on pre-Monterey Amendment conditions, both with and without implementation of Article 18 (b) of the Water Supply Contracts, and post-Monterey Amendment conditions; and

WHEREAS, the EIR only tiers off CLWA's 1988 capital program EIR and does not tier off the prior 1995 Monterey Amendment Program EIR or any other EIR; and

WHEREAS, the EIR does not rely upon CLWA's 2000 Urban Water Management Plan; and

WHEREAS, the EIR considers environmental impacts of the Project to both the service areas of CLWA and WRMWSD, including indirect impacts within CLWA, and to affected portions of the SWP; and

WHEREAS, WRMWSD does not require the 41,000 acre-feet Table A Amount transferred for its internal needs, has rising groundwater levels, and can acquire additional supplemental water, if needed, at less expense than fixed SWP costs for the Project transferred Table A Amount;

WHEREAS, the EIR uses DWR statistical computer models to determine the portion of the 41,000 acre-feet Table A amount reliably available to analyze Project environmental impacts, consistent with the Monterey Amendment Settlement Agreement provisions applicable to the new Monterey Amendment EIR;

WHEREAS, the EIR considers and analyzes multiple Project alternatives; and

WHEREAS, CLWA gave notice of the Draft EIR in compliance with law and circulated the Draft EIR to interested persons for a 60-day public comment period commencing on June 16, 2004 and ending on August 16, 2004; and

WHEREAS, CLWA held a public hearing on July 28, 2004, to receive comments on the Draft EIR; and

WHEREAS, CLWA received public comments on the Draft EIR during the comment period; and

WHEREAS, on November 24, 2004, CLWA, by and through its staff, legal counsel and SAIC, prepared and circulated to the CLWA Board of Directors ("Board") and to those submitting comments a proposed two volume "Final EIR", Volume One consisting of the Draft EIR, and Volume Two consisting of comments, responses to comments and insignificant and non-substantive changes to the text of the Draft EIR; and

WHEREAS, on November 24, 2004, at least 10 days before certification of the Final EIR, CLWA provided all public agencies that commented on the Draft EIR with a written public response to their comments and notice of a public hearing to be held on December 8, 2004;

WHEREAS, on December 8, 2004, CLWA held an additional noticed public hearing on the Project to receive statements on the responses to comments as part of CLWA's decisional process concerning the Project; and

WHEREAS, pursuant to Public Resources Code section 21092.5, the December 8, 2004 public hearing did not constitute an extension of the public comment period, and no responses are required under that section to statements made at that hearing because the hearing was scheduled after the close of the public comment period; and

WHEREAS, on December 8, 2004, CLWA's Board deferred until December 22, 2004 all consideration related to certification of the proposed Final EIR and approval of the Project; and

WHEREAS, CLWA's Board, on December 22, 2004, pursuant to the publicly noticed agenda for its regularly scheduled public meeting, with SAIC and CLWA staff and legal counsel present, met to consider certification of the proposed Final EIR, adoption of findings, a statement of overriding considerations and a mitigation and monitoring program, and approval of the Project; and

WHEREAS, CLWA's Board has carefully, thoroughly and independently reviewed the proposed Final EIR, including all public comments and responses thereto; and

WHEREAS, CLWA's Board has considered all of the information presented to it as set forth above and this Resolution and action taken hereby is a result of the Board's independent judgment and analysis.

NOW, THEREFORE, BE IT RESOLVED by this Board of Directors of the Castaic Lake Water Agency that it hereby makes the following findings and determinations:

1. The Board certifies that the Final EIR, attached as Exhibit "A": (a) was presented to the Board and that the Board reviewed and considered the information contained therein prior to approving the Project; (b) reflects the Board's independent judgment and analysis; (c) has been completed consistent with CEQA; and (d) shall constitute the final EIR for the Project;

2. The Board adopts the Findings, attached as Exhibit "B," and determines that the record for the Project contains substantial evidence in support of those Findings.

3. The Board adopts the Statement of Overriding Considerations, attached as Exhibit "C," and determines that the record for the Project contains substantial evidence in support of the Statement.

4. The Board adopts the Mitigation and Monitoring Program, attached as Exhibit "D."

5. The Board approves the Project as being in the best interests of CLWA and the public by augmenting and firming up water supplies, and by facilitating the beneficial use of water throughout the State.

6. The Board directs CLWA's General Manager to execute all documents required to carry out and implement the Project and to cause to be filed a Notice of Determination of CLWA's approval of the Project.

7. The Board designates its Secretary, Marcia Ward, as Custodian of the record of the proceedings upon which its decision is based and specifies the location of that record as CLWA's administrative offices at 27234 Bouquet Canyon Road, Santa Clarita, CA 91350

EXHIBIT "A"

FINAL EIR
(Attached hereto)

EXHIBIT "B"

FINDINGS
(Attached hereto)

EXHIBIT "C"

STATEMENT OF OVERRIDING CONSIDERATIONS
(Attached hereto)

EXHIBIT "D"

MITIGATION AND MONITORING PROGRAM
(Attached hereto)

I, the undersigned, hereby certify: That I am the duly appointed and acting Secretary of the Castaic Lake Water Agency, and that at a regular meeting of the Board of Directors of said Agency held on Wednesday December 22, 2004, the foregoing Resolution No. 2354 was duly and regularly adopted by said Board, and that said resolution has not been rescinded or amended since the date of its adoption, and that it is now in full force and effect.

DATED: December 22, 2004

Marcia Ward
Marcia Ward, Secretary

EXHIBIT "B"

FINDINGS

FINAL ENVIRONMENTAL IMPACT REPORT

GENERAL CEQA FINDINGS

A. No significant direct impacts will occur as a result of the Project in any of the three geographic areas evaluated in the Final EIR. The additional water supply provided by the Project, however, will remove an obstacle to growth within the CLWA service area, and significant, indirect, growth-related impacts to all environmental resources within that service area could result from Project implementation.

B. Concern has been expressed by some members of the public that the potential long term effect of global warming upon the SWP water supplies could result in less water being delivered to CLWA under the Project than the supply figures used in the EIR. CLWA has considered this issue carefully and has concluded that, if SWP water supplies were reduced, in the long term, due to global warming or any other cause, the result would be that the worst case analysis in the EIR for the indirect, growth-related impacts of the Project are over-stated to some degree. In that event, the actual indirect, growth-related impacts of the Project upon environmental resources would be less than those analyzed in the EIR and would be included within the range of potential impacts projected by the EIR.

C. During the public comment period, members of the public expressed their belief that the Final EIR should not (or, as some assert, could not) be certified until after the Department of Water Resources (DWR) certifies a new Environmental Impact Report for the Monterey Amendment. CLWA has considered these comments and the Master Response to Comments incorporated into the Final EIR. CLWA is satisfied that the Master Response to these comments adequately addresses the position stated by the commenters for the following reasons:

1. The litigation pertaining to the Monterey Amendment Program EIR originated in Sacramento County Superior Court and DWR's new Environmental Impact Report for the Monterey Amendment is being prepared under the jurisdiction and supervision of that Court. The litigation that gave rise to the preparation of the Project EIR arose in the Los Angeles County Superior Court and this Final EIR is being prepared under the jurisdiction and supervision of that same Court. The Sacramento Superior Court has no jurisdiction over the Project Final EIR.

2. CLWA is not required to await preparation of DWR's new Monterey Amendment Environmental Impact Report or tier off that document. CEQA does not require a lead agency for a project to await preparation of a programmatic Environmental Impact Report where the lead agency has sufficient information upon which to base environmental analysis of a specific project that may be included in the programmatic Environmental Impact Report's analysis at some future date.

3. The Court of Appeal in the litigation pertaining to the original EIR for the project did not require CLWA to prepare a new EIR that tiers off, or awaits certification, of DWR's new Monterey Amendment Environmental Impact Report.. Rather, CLWA is under the supervision of the Los Angeles Superior Court in preparing the Project EIR.

4. The Court of Appeal in the challenge to the Monterey Amendment Program Environmental Impact Report (Monterey Amendment Program EIR Challenge), on Page 3 of its Order approving the Monterey Amendment Settlement Agreement, stated that, "until DWR files its return in compliance with the Peremptory Writ of Mandate and this Court orders discharge of the Writ of Mandate, the administration and operation of the State Water Project and the Kern Water Bank Lands shall be conducted pursuant to the Monterey Amendments to the State Water Contracts . . . and the other terms and conditions of the Settlement Agreement."

D. During the public comment period, members of the public expressed their belief that CLWA was not the proper lead agency for preparation of the Project EIR. CLWA has considered this comment, as well as the Master Response to Comments, and concludes that CLWA must be the lead agency for the preparation of the Project EIR for the following reasons:

1. Under the doctrine of the law of the case, CLWA is the proper lead agency for the Project EIR. The Court of Appeal found no substantive defect in CLWA's prior Environmental Impact Report, only a legal defect resulting from tiering off the Monterey Amendment Program Environmental Impact Report that, subsequent to certification of the prior project Environmental Impact Report, was ordered de-certified.

2. The Court of Appeal ordered CLWA to act as the lead agency when it stated: "The trial court shall . . . retain jurisdiction until respondent certifies an EIR complying with CEQA . . . ."

3. CLWA has principal responsibility to approve and carry out the Project. Under CEQA, the agency with this primary responsibility must be the lead agency, even though part of the project may be located and have impacts within the jurisdiction of another public agency.

4. Under Public Resources section 21152, CLWA must be the lead agency because it is the local agency undertaking the Project. CLWA is the major proponent of the Project and has assumed the primary task of implementing the SWP water supply contract amendment for the Project.

5. CLWA must be the lead agency because it cannot delegate its responsibility over its SWP contract rights to another body. CLWA has primary responsibility for purchasing, obtaining delivery of, arranging storage of, and using the SWP water provided under the contract amendment that is the Project.

6. Some commenters have applied the Court of Appeal's decision in *Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892 (Monterey Amendment Program EIR Challenge) to the preparation of the Project EIR, arguing that CLWA is an improper lead agency for the Project EIR because the Court of Appeal found DWR to be the only proper lead agency for the Monterey Amendment Program Environmental Impact Report. There is an important distinction between the Environmental Impact Report at issue in the Monterey Amendment Program EIR Challenge and the Project EIR – the Monterey Amendment Program Environmental Impact Report analyzed the impacts of major amendments to all SWP contracts, the conveyance of state-owned property, and changes in the operation of the SWP project that had statewide impacts. The Court of Appeal determined that for a project of that magnitude, DWR was the only suitable lead agency. The subject Project is significantly different from the Monterey Amendment. The subject Project is a simple transfer of Table A Amount from one SWP contractor to another. It has no statewide impacts; its impacts are site specific to the transferor and the transferee with some minimal impacts on SWP facilities.

E. Some members of the public who have commented on the Project EIR have suggested that the Monterey Amendment Settlement Agreement precludes CLWA from proceeding with the Project EIR and with the Project. CLWA disagrees. The Monterey Amendment Settlement Agreement states on Page 12: "The Parties [to the settlement agreement] agree that jurisdiction with

respect to that litigation [*Friends of the Santa Clara River v. Castaic Lake Water Agency* (2002) 95 Cal.App.4th 1373] should remain with that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation." The new Monterey Amendment Environmental Impact Report will include the Project water transfer in its larger evaluation of the environmental impacts of all permanent Table A Amount transfers described in the Monterey Amendment.

F. Comments on the EIR included references to "paper water," an issue of concern to the Court of Appeal in the Monterey Amendment Program EIR Challenge. The "paper water" issue is not relevant to the Project because the Project is intended to firm up and supplement existing CLWA water supplies. CLWA uses DWR's supply reliability figures in projecting how much water the Project has the capability of yielding for CLWA customers. If the actual SWP water deliveries are less than DWR's reliability figures project, the growth-related impacts of the Project, analyzed in the EIR, will be less than anticipated. To stabilize its future supplies, CLWA banks water for future use in times of shortage. Finally, the Project EIR cautions planners and developers that historical SWP water delivery rates are no guaranty of future delivery rates. Many factors can affect the amount and reliability of water supplies. The Project EIR acknowledges this but conducts a "worst case" analysis of growth-related impacts based upon historical deliveries.

G. The Project EIR uses two baseline conditions to perform the environmental impact analysis because there have been two Notices of Preparation for the Project (one for the de-certified Environmental Impact Report and one for the present EIR) and because the water transfer analyzed in the Project EIR has occurred and CLWA has been operating with the Project in place since certification of the original Environmental Impact Report. The use of two baselines enabled CLWA to compare the pre-Project condition with the current condition (with the Project in operation) and the current condition with the condition existing immediately prior to preparation of the current EIR. In this way, the broadest range of potential impacts was addressed.

H. The current EIR also addresses potential Project impacts with and without the implementation of the Monterey Amendment, thereby providing to the decision makers and the public a broad range of environmental impact analysis and responding to the Court of Appeal's order that the Monterey Amendment Program Environmental Impact Report be de-certified. In short, the Project EIR does not tier off any other Environmental Impact Report other than the 1988 Capital Program Environmental Impact Report. The Project EIR is a stand-alone document with regard to the Monterey Amendment.

I. CLWA has worked closely with DWR in the preparation of the Project EIR to ensure that the facts, assumptions and analysis included in the Project EIR are accurate, to utilize DWR models, to coordinate the analysis in the Project EIR

with the analysis that DWR is undertaking in its preparation of the new Monterey Amendment Environmental Impact Report, and to avoid inconsistencies between the Project EIR and the new Monterey Amendment Environmental Impact Report. DWR's comments on the contents of the Project EIR have been positive and have confirmed that completion of the Project EIR will not prejudice DWR's completion of its new Monterey Amendment Environmental Impact Report.

J. During preparation of the Project EIR, the Urban Water Management Plan for CLWA's service area was declared to be invalid. Although CLWA is in the process of updating the Urban Water Management Plan, the update process will take considerable time and effort; it cannot be completed prior to certification of the Project EIR. The Project EIR does not rely upon CLWA's 2000 Urban Water Management Plan, so the invalidation of that Plan has no impact on CLWA's consideration of the environmental analysis included in the Project EIR.

K. Some commenters to the Draft Project EIR raised issues concerning CLWA's use of DWR modeling programs to project the amount of water that CLWA might expect to be delivered from the Project. CLWA used the information yielded by DWR's models to project indirect impacts of the Project related to growth and to identify and analyze cumulative impacts of the Project. CLWA used DWR statistical computer models to determine the portion of the 41,000 acre feet Table A Amount reliably available to analyze Project environmental impacts for two (2) reasons: (1) use of DWR modeling is consistent with the Monterey Settlement Agreement provisions applicable to the new Monterey Amendment Environmental Impact Report; and (2) DWR has greater resources and experience than CLWA in formulating SWP reliability models, so CLWA considered DWR's modeling programs to be superior to any that CLWA could economically and efficiently formulate for the Project.

L. Concern was expressed during the public comment period that the existing SWP facilities were insufficient to transport the Project water deliveries to CLWA and would cause potential conflicts with delivery demands by Metropolitan Water District. Although Metropolitan Water District has substantial demand for SWP water (and the largest Table A Amount among urban SWP contractors), the majority of SWP deliveries to Metropolitan Water District proceed through the East Branch of the California Aqueduct, not the West Branch through which CLWA receives its deliveries. The West Branch has more than adequate capacity to accommodate water deliveries from the Project and has been doing so since 1999, when the Project first was implemented.

M. Members of the public have opined that the Project will result in potentially significant impacts on agricultural lands in WRMWSD. CLWA staff and the EIR writers conducted extensive research and analysis, working closely with

WRMWSD staff, to describe how WRMWSD and its customers propose to offset their transfer of expensive SWP water with alternative, less expensive sources. The result is the determination that no fallowing of productive agricultural lands will occur as a result of the Project. The fallowing that will occur will be part of routine agricultural practices, as has occurred in the past. WRMWSD and its customers have several sources of water supply available that they propose to use in lieu of the Project water, including but not limited to groundwater (groundwater levels have been increasing steadily in WRMWSD's service area), groundwater banking, and surplus water. In short, WRMWSD has assured CLWA that the Project water is an expensive source that can be replaced with more economical water, thereby ensuring long term agricultural viability.

PROJECT SPECIFIC CEQA FINDINGS

A. Findings Concerning Indirect and Cumulative Impacts of the Project -- Aesthetic/Visual Resources

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential aesthetic changes could occur within the CLWA service area as an indirect growth-related and cumulative significant impact of the Project, including changes to the visual characteristics of the area through the development of open space and further urbanization of hillside and natural areas. Scenic vistas could be impacted, glare from night lighting could increase, and a "confused urban image" could result from potential haphazard development. This impact is identified in the Final EIR, Vol. I, pages 4-3 and 6-41.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could substantially reduce this impact by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the draft EIR. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA. However, depending upon the magnitude, location, and design of future development, the impact may not be mitigable to less than significant, as stated on pages 4-3 and 6-41 of the Final EIR, Vol. I.

2. Findings.

CLWA finds this impact to be significant and unavoidable; the measures referenced above, if implemented successfully by the applicable land use agencies, will substantially reduce this impact, but not to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction; and that those land use agencies can and should implement those measures. This impact is overridden by benefits of the proposed Project, as set forth in the Statement of Overriding Considerations. The alternatives identified in the final EIR are unacceptable for the reasons set forth in Finding P.

B. <u>Findings Concerning Indirect and Cumulative Impacts of the Project -- Agricultural Resources</u>

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which the information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential conversion of agriculture lands to non-agricultural uses or changes in agricultural zoning by local jurisdictions to allow a higher density or intensity of development could occur within CLWA as an indirect growth related and cumulative significant impact of the Project. This impact is identified in the Final EIR, Vol. I, pages 4-7, 4-8 and 6-42.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles and the County of Ventura, both of which are required by law to comply with CEQA. The County of Los Angeles and the County of Ventura could reduce this impact to less than significant by implementing their existing General and Area Plan policies, including those of the Piru Area Plan, identified at Table 4.2-1 of the Final EIR, Vol. I, since these plans contain measures to preserve and protect agricultural land, as noted on pages 4-8 and 6-42 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction; and that those land use agencies can and should implement those measures.

C. Findings Concerning Indirect and Cumulative Impacts of the Project -- Air Quality

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about

new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential air quality changes could occur within the CLWA service area as an indirect growth related and cumulatively significant impact of the Project, including increased air pollutant emissions for which the South Coast Air Basin does not currently meet federal or state standards, toxic emissions from industrial development, increased vehicle mobile emissions, and fugitive dust emissions from construction. This impact is identified in the Final EIR, Vol. I, pages 4-8 and 6-42.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could substantially reduce this impact by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA. However, depending on the magnitude of future development, the impact may not be fully mitigable to less than significant, as stated on pages 4-8 and 6-42 of the Final EIR, Vol. I.

2. Findings.

CLWA finds this impact to be significant and unavoidable; the measures referenced above, if implemented successfully by those land use agencies will substantially reduce this impact, but not to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures. This impact is overridden by Project benefits as set forth in the Statement of Overriding Considerations. The alternatives identified in the final EIR are unacceptable for the reasons set forth in Finding P.

D. Findings Concerning Indirect and Cumulative Impacts of the Project -- Biological Resources

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval

process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential changes to biological resources could occur with the CLWA service area as an indirect growth related and cumulative significant impact of the Project, including loss, degradation, or fragmentation of habitats, which may result in local native plant and wildlife populations, including sensitive species being reduced in size and made vulnerable to local extinction. Additionally, non-native species could compete with native species, and established wildlife corridors and nurseries could be disrupted. Pollutant levels could increase and cause harm to sensitive habitat and species. This impact is identified in the Final EIR, Vol. I, pages 4-9, 6-42 and 6-43.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could substantially reduce this impact by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA. Also other regulatory agencies such as the U.S. Army Corps of Engineers, the U.S. Fish and Wildlife Service, and the California Department of Fish and Game may impose permit conditions that reduce any significant impact. However, depending on the magnitude of future development, the impact may not be fully mitigable to less than significant, as stated on pages 4-9 and 6-43 of the Final EIR, Vol. I.

2. Findings.

CLWA finds this impact to be significant and unavoidable; the measures referenced above, if implemented successfully by those land use and regulatory agencies will substantially reduce this impact, but not to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies and regulatory agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures. This impact is overridden by Project benefits as set forth in the Statement of Overriding Considerations. The alternatives identified in the final EIR are unacceptable for the reasons set forth in Finding P.

E. Findings Concerning Indirect and Cumulative Impacts of the Project -- Cultural Resources

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential disturbance of human remains, archaeological, historical, and paleontological resources by excavation and grading activities associated with future development could occur within CLWA as an indirect growth related and cumulative significant impact of the Project. This impact is identified in the Final EIR, Vol. I, pages 4-9, 4-10 and 6-43.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could reduce this impact to less than significant by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I, since the policies contain measures for either avoiding impacts to such resources or providing adequate documentation of the resources, as noted on pages 4-10 and 6-43 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA.

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's

responsibility or jurisdiction, and that those land use agencies can and should implement those measures.

F. Findings Concerning Indirect and Cumulative Impacts of the Project--Geology and Soils

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential geologic hazards could occur within CLWA as an indirect growth related and cumulative significant impact of the Project, including fault rupture, seismically induced ground failure, and seiches, as well as permanent changes in topography, loss of topsoil and removal of unique geologic features. This impact is identified in the Final EIR, Vol. I, pages 4-10, 4-11, 6-43 and 6-44.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could reduce this impact to less than significant by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I, since the policies contain adequate measure to avoid or reduce such impact, as noted on pages 4-11 and 6-44 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA.

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to

a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures.

G. Findings Concerning Indirect and Cumulative Impacts of the Project -- Hazards and Hazardous Materials

1. Facts.

a. With regard to direct impacts, CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" to address CLWA's handling, storing, and using hazardous materials in water treatment according to all state and federal regulations. This Project will not result in any new construction related to water treatment, including no expansion of any currently existing treatment facilities, nor will it result in any other direct significant impacts. In April 2003, CLWA certified the Final EIR for expansion and upgrade of the Earl Schmidt Filtration Plant (ESRP), which fully evaluated and addressed the issues of hazards and hazardous materials associated with the increase in raw water treatment resulting from growth, including any need for mitigation. Consequently, CLWA need not adopt a separate mitigation and monitoring program for purposes of ensuring that when engaged in water treatment, CLWA handles, stores and uses hazardous materials according to state and federal regulations.

b. With regard to indirect impacts, CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

c. A potential increase in hazards and hazardous materials could occur within CLWA as an indirect growth related and cumulative significant impact of the Project, including required removal or remediation of contaminated soils, increase in the use, transport and disposal of hazardous materials, impairment of emergency response or evacuation plans, and increased exposure to wildland fires. This impact is identified in the Final EIR, Vol. I, pages 4-11, 6-44 and 6-45.

d. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could reduce this impact to less than significant by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I, since the policies contain adequate measures to avoid or reduce such impacts, as noted on pages 4-11, 4-12 and 6-45 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA.

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures.

H. Findings Concerning Indirect and Cumulative Impacts of the Project -- Land Use and Planning

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential division of a community, building in sensitive areas such as hillside management areas, open space areas and sensitive wildlife habitat areas, or conflict with adopted land use plans could occur within CLWA as an indirect growth

related and cumulative significant impact of the Project. This impact is identified in the Final EIR, Vol. I, pages 4-12 and 6-45.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could reduce this impact to less than significant by implementing their existing General and Area Plan policies identified in Table 4.2-1 of the Final EIR, Vol. I, since the policies contain adequate measures to avoid or reduce such impacts, as noted on pages 4-12 and 6-45 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA.

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures.

I. Findings Concerning Indirect and Cumulative Impacts of the Project -- Population and Housing

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. A potential increase of 106,700 persons and 35,600 housing units could occur within CLWA as an indirect growth related and cumulative significant impact of the Project. This impact is identified in the Final EIR, Vol. I, pages 4-13 and 6-45.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could reduce this impact to less than significant by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I, since the policies contain adequate measures to avoid or reduce such impacts, as noted on pages 4-13 and 6-45 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA,

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures.

J. Findings Concerning Indirect and Cumulative Impacts of the Project -- Public Services

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. A potential increased demand for police and fire services, including staffing, facilities and equipment, decreased response times and fire flows, and construction of new schools and libraries could occur within CLWA as an indirect growth related and cumulative significant impact of the Project. This impact is identified in the Final EIR, Vol. I, pages 4-13, 4-14 and 6-46.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could reduce this impact to less than significant by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I, since the policies contain adequate measures to avoid or reduce such impacts, as stated on pages 4-14 and 6-46 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA.

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures.

K. Findings Concerning Indirect and Cumulative Impacts of the Project -- Recreational Resources

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about

new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential increased demand for recreational resources, such as parks and trails and other recreation areas, could occur within CLWA as an indirect growth related and cumulative significant impact of the Project, exacerbating existing shortfalls in local parkland that may outpace the ability of public agencies to provide these resources. This impact is identified in the Final EIR, Vol. I, pages 4-14, 6-46 and 6-47.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could reduce this impact to less than significant by utilizing the Quimby Act and by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I, since the policies contain adequate measure to avoid or reduce such impact, as noted on pages 4-14, 4-15 and 6-47 of the Final EIR, Vol. I. The Quimby Act (Gov. Code § 66477), as part of the Subdivision Map Act, gives a city or county the authority to impose as a condition to subdivision map approval the dedication of land, the payment of fees, or a combination of both for park and recreational purposes to accommodate the increased burden on recreational facilities as a result of the population projected to inhabit the subdivision. Specific mechanisms for implementing the referenced General and Area Plan policies would be determined in the course of project-specific environmental review required by CEQA.

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures.

L. Findings Concerning Indirect and Cumulative Impacts of the Project -- Transportation and Circulation

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development

projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential increases in traffic, deterioration in the level of service, the need for new or altered roads, highways, parking facilities and transportation systems, and the alteration of present patterns of circulation could occur within CLWA as an indirect growth related and cumulative significant impact of the Project. This impact is identified in the Final EIR, Vol. I, pages 4-15 and 6-47.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could substantially reduce this impact by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA. However, due to the delay between the time improvements are needed and the time they can be provided, the impact may not be fully mitigable to less than significant, as stated on pages 4-15 and 6-47 of the Final EIR, Vol. I.

2. Findings.

CLWA finds this impact to be significant and unavoidable; the measures referenced above, if implemented successfully by those land use agencies will substantially reduce this impact, but not to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures. This impact is overridden by Project benefits as set forth in the Statement of Overriding Considerations. The alternatives identified in the final EIR are unacceptable for the reasons set forth in Finding P.

M. Findings Concerning Indirect and Cumulative Impacts of the Project -- Utilities and Service Systems

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential increased demand for solid waste disposal services, and potential increased need for potable water treatment facilities could occur within CLWA as an indirect growth related and cumulative significant impact of the Project. This impact is identified in the Final EIR, Vol. I, pages 4-16, 4-17, 6-47 and 6-48.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could substantially reduce this impact by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA. However, because impacts to solid waste disposal may not be avoidable unless additional landfill capacity is approved and constructed, the impact may not be fully mitigable to less than significant, as stated on pages 4-17 and 6-48 of the Final EIR, Vol. I.

2. Findings.

CLWA finds this impact to be significant and unavoidable as to solid waste disposal; the measures referenced above, if implemented successfully by those land use agencies will substantially reduce this impact, but not to a level of insignificance for solid waste disposal. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures. This impact is overridden by Project benefits as set forth in the Statement of Overriding Considerations. The alternatives identified in the final EIR are unacceptable for the reasons set forth in Finding P.

N. Findings Concerning Indirect and Cumulative Impacts of the Project -- Water Resources

1. Facts.

a. CLWA's March 29, 1999 Resolution No. 2040, certifying the prior EIR for this Project, adopted a "mitigation and monitoring program" that contemplated obtaining reports from the Counties of Los Angeles and Ventura and the City of Santa Clarita regarding their implementation of mitigation measures applicable to development projects. However, environmental information, including mitigation measures, applicable to each new development project is available to and used by CLWA when the project proponent obtains a CLWA service connection as a part of the land use approval process with those counties and city. Therefore, CLWA already has access to and uses the information that would have been provided under the prior 1999 "mitigation and monitoring program". For that reason, a mitigation and monitoring program is adopted as part of this approval of the Project in which information necessary to implement such a monitoring program will be gathered through CLWA's developer impact fee procedure in place and operating at this time. The developer impact fee procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the city and counties named above.

b. Potential changes to water resources could occur within the CLWA service area as an indirect growth related and cumulative significant impact of the Project. Increased demand on local groundwater resources during periods of reduced SWP deliveries could result in substantial depletions on a short-term basis in dry hydrologic years. The impermeable surface areas resulting from development could result in alteration of surface flows, reduction of aquifer recharge and increased amount and rate of stormwater runoff, increased flooding and peak flow rates that could result in substantial erosion or siltation. This impact is identified in the Final EIR, Vol. I, pages 4-17, 4-18, 6-48 and 6-49.

c. CLWA has no authority to regulate development projects within its service area, so mitigation of this potential impact is outside CLWA's control. This authority and responsibility is held by the local agencies within CLWA's service area: The County of Los Angeles, County of Ventura, and City of Santa Clarita, all of which are required by law to comply with CEQA. The County of Los Angeles, County of Ventura, and City of Santa Clarita could reduce this impact to less than significant by [complying with insert the applicable statutes re water supply for new projects] and by implementing their existing General and Area Plan policies identified at Table 4.2-1 of the Final EIR, Vol. I, as noted on pages 4-18 and 6-49 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA. Additionally, compliance with the LARWQCB Water Quality Control Plan [Basin Plan] for the Coastal Watersheds of Los Angeles and Ventura Counties, as amended, also would reduce significant and less than significant impacts.

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by those land use agencies will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those land use agencies, not within CLWA's responsibility or jurisdiction, and that those land use agencies can and should implement those measures.

O. Findings Concerning Cumulative Impacts of the Project upon Air Quality Associated with SWP and Associated Facilities

1. Facts.

a. The Project's direct impact to air quality, although less than significant, would contribute to the significant air quality impacts from the CALFED project and the San Luis Reservoir Low Point Project. This cumulative impact is identified in the Final EIR, Vol. I, page 6-40.

b. The CALFED agencies could substantially reduce this cumulative impact by implementing CALFED program mitigation measures listed on page 6-40 of the Final EIR, Vol. I. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review required by CEQA. Although an EIR has not yet been published for the San Luis Low Point Improvement Project, based on a preliminary analysis of the impacts, similar measures to those listed for the CALFED project could be implemented to reduce significant impacts.

2. Findings.

CLWA finds this impact to be significant and avoidable; the measures referenced above, if implemented successfully by CALFED agencies and/or by agencies within the CALFED program will reduce this impact to a level of insignificance. CLWA also finds that such measures are within the responsibility and jurisdiction of those agencies, not within CLWA's responsibility or jurisdiction, and that those use agencies can and should implement those measures.

P. Findings Concerning Alternatives to the Project.

Because an EIR must identify ways to mitigate or avoid the significant effects that a project may have on the environment, it must discuss alternatives to the project that would feasibly attain most of the basic objectives of the project, but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives.

1. Facts.

a. Alternative 1, No Project. Under the No Project Alternative, CLWA would not acquire the additional Table A Amount or acquire the associated contractual rights for delivery of water associated with the transfer. The demand for high quality surface water is expected to increase throughout all of southern California as a result of continued growth, and local planning agency documents project continuing growth in the CLWA service area. Without the Project, the contract right to the Table A Amount that is the subject of the Project could be transferred to other portions of urbanized California. The amount, timing, and location of such a transfer are highly speculative, however, and this scenario is not considered further. Two hypothetical scenarios have been carried forward for detailed analysis that are intended to define a reasonable range of possible actions that could occur under the No Project Alternative. The discussion provided below under the Moratorium Scenario and Build-Out Scenario includes projects in the County of Los Angeles Development Monitoring System (DMS) which includes: pending projects (not yet approved); approved projects (subdivisions that have been granted an approved tentative tract map that is not yet recorded or expired); and recorded projects (subdivisions that have recorded a final tract map but are not yet built).

Moratorium Scenario

Under the Moratorium Scenario, a moratorium on new development would be implemented. This assumes that the local retail water purveyors within the CLWA service area who purchase SWP water from CLWA decide that there is insufficient water to issue "will serve" letters to supply new development and that local land use agencies respond by imposing a moratorium on new development in the CLWA service area.

The 1998 DMS included 15,973 housing units (8,588 approved, 2,292 recorded, and 5,093 pending). The 2002 DMS included 33,113 housing units (13,586 approved, 9,915 recorded, and 9,612 pending). These housing units would not be built under this scenario. Assuming three persons per household, this amount of development would result in a population of approximately 49,510 persons, using the 1998 DMS, and 99,339 persons, using the 2002 DMS.

The Project was undertaken to serve some existing demand (users). Under the No Project Alternative, some additional groundwater production wells may be required to serve existing demand that would have been met by the Table A Amount transfer, particularly at times of low deliveries from the SWP. Treatment at the wellhead likely would be needed, depending upon local groundwater characteristics. New underground distribution pipelines also may be required. Electric pumps would be used as needed.

Build-Out Scenario

Under the Build-Out Scenario, approved and recorded projects listed in the DMS for the Santa Clarita Valley would be developed, notwithstanding the potential shortfall in reliable water supply. Based on the DMS from both 1998 and 2002, the number of housing units in approved and recorded DMS projects considered under this scenario (10,880 and 23,500 units, respectively) is less than the number of housing units that could

be supported by the Project given an average year water supply of 34,400 AF (35,600 units). The population associated with the development identified in the 1998 DMS would be 32,640 persons; the population associated with the 2002 DMS development would be 70,500 persons. In comparison, the population that could be served by the Project would be 106,700 persons.

Under this scenario, existing demand currently met by the Table A Amount transfer and the increased water demand from approved and recorded projects allowed to be constructed would rely on existing water supplies (including local groundwater resources) that are currently not used for urban purposes. Treatment at the wellhead likely would be needed, depending upon local groundwater characteristics. New underground distribution pipelines also may be required. Electric pumps would be used as needed.

b. Alternative 2, Increased Extractions from the Saugus Formation (Increased Groundwater Extractions). Under this alternative, an average of 34,400 AFY would be extracted from the Saugus Formation and delivered to users in the CLWA service area in lieu of the water anticipated from the transfer of SWP Table A Amount. This amount would be above what is currently extracted or presently planned for extraction. The extraction would be accomplished by increased use of existing wells and by the installation of 15 additional wells, pumps, and wellhead treatment facilities. Existing or new distribution facilities such as pipelines and pumping stations would be used to transport this water to existing and planned treated water distribution facilities.

c. Alternative 3, Exchange Desalinated Water for SWP Water (Desalination/Exchange). This alternative comprises two primary components in lieu of the Project: (1) CLWA would contribute a portion of the funds needed by another agency to develop a seawater desalination facility along the southern California coast; and (2) an average of 34,400 AFY of desalinated water produced by this facility would be exchanged with CLWA for SWP water. A likely partner in such an arrangement would be The Metropolitan Water District of Southern California (Metropolitan). If both parties agreed, CLWA would enter into a contract with Metropolitan indicating that a portion of Metropolitan's annual SWP Table A Amount would be delivered to Castaic Lake for use by CLWA in exchange for CLWA's contribution to a desalination facility to be constructed by Metropolitan. CLWA would treat and distribute this SWP water in existing CLWA facilities, and Metropolitan would use water from the desalination facility in lieu of the SWP water exchanged with CLWA.

Assuming a 50 percent recovery rate, a plant capacity of approximately 61 mgd would be required to produce an average of 34,400 AFY. Depending on the extent of ancillary facilities included at the site, a site of at least 2 acres could be required. In addition to the desalting plant, the coastal facility would likely include new electrical power conveyance and control equipment, ocean water intake and brine disposal structures, and a treated water pumping plant. Total site area could be up to 5 acres. Depending on site location, additional pipelines and related pumping facilities may be required to convey the desalinated water a short distance to the existing Metropolitan distribution facilities.

d. Alternative 4, Transfer of a Smaller Table A Amount (Smaller Table A Amount). Under this alternative, CLWA would acquire a smaller amount of SWP Table A Amount than under the Project. A transfer of approximately 20,000 AF of SWP Table A Amount was analyzed because it is the approximate mid-point between the amount that would be transferred under the Project and the No Project Alternative. Existing facilities would be used, as described for the Project.

Since the demand for high quality surface water is expected to increase in southern California as a result of anticipated growth, the remaining SWP Table A Amount (21,000 AF) could be transferred to other (unidentified) portions of urbanized southern California. The Table A Amount not acquired by CLWA would likely be acquired by other agencies with growing urban water demands. However, the timing, amount, and location of the transfer(s) as well as the associated impacts are speculative and are not evaluated under this alternative.

e. Alternative 5, Transfer of a Larger Table A Amount (Larger Table A Amount). Under this alternative, CLWA would acquire a larger SWP Table A Amount than under the Project. Such an alternative would require the use of a larger proportion of the SWP facilities and capacities than described for the Project, and would attempt to reduce or avoid the effects of reductions in SWP supplies (during periods of drought) on local groundwater resources. In order to provide an analysis of impacts of a transfer greater than the Project (transfer of 41,000 AF of Table A Amount), a transfer of approximately 60,000 AF of SWP Table A Amount was established for this alternative. This Table A Amount is potentially available from other KCWA member units who have expressed interest in reducing their Table A Amount and have completed CEQA analysis of the sale of this contract right (e.g., Belridge Water Storage District, Berrenda Mesa Water District, and Lost Hills Water District). Existing facilities would be used, as described for the Project.

2. Findings Regarding Alternatives to the Project.

a. Alternative 1, No Project. CLWA finds that Alternative 1, the No Project Alternative, is infeasible and less desirable than the Project and rejects this alternative for the following reasons:

- This alternative would not augment CLWA's water supply and therefore would not meet any of the Project objectives.
- Each scenario would reduce or avoid the significant indirect (growth-related) impacts of the Project in the CLWA service area, but these impacts could occur in another area if projected growth were re-located elsewhere.
- Each scenario would result in greater direct impacts than the Project because new groundwater wells, treatment facilities, and associated pipelines would be required to offset the lack of adequate SWP water needed to accommodate existing demand and planned growth.
- Each scenario could result in significant unavoidable impacts to groundwater supply and groundwater quality.
- This alternative could result in considerable economic and social impacts to residential, commercial, industrial, and public/governmental users in the

CLWA service area if water deliveries were cut back or rationing occurred. Reduced deliveries could affect the ability of public and private property owners to water lawns, parks, golf courses, landscaping, and open space areas and could result in vegetated areas dying off with resulting economic loss. Businesses that use high volumes of water may be forced to cut back production or close. A moratorium on new development would result in overcrowding and a delay or failure to meet County of Los Angeles and City of Santa Clarita General Plan population, housing, and job projections for which local governments have planned and/or constructed infrastructure and expended funds. A moratorium on new development would have potential economic consequences related to increased costs of housing in an already expensive southern California housing market, and developers with approved or recorded and unbuilt projects may experience economic loss if projects are delayed or cannot be completed. In addition, businesses considering relocating or expanding in the CLWA service area may be reluctant to invest capital because of uncertainties related to water supplies, lack of affordable housing for employees and stagnant local markets for goods and services. Alternative locations for siting or expanding businesses outside the service area would become more attractive. This could in some cases result in increased commuting, resulting in greater traffic, air emissions and energy use.

b. Alternative 2, Increased Groundwater Extractions. CLWA finds that Alternative 2, the Increased Groundwater Extractions Alternative, is less desirable than the Project and rejects this alternative for the following reasons:

- It would not adequately augment CLWA's water supply for its customers and therefore would not meet most of the Project objectives.
- It would not meet the Project objective to import water from outside the CLWA service area, to reduce dependence upon local water supplies.
- It would result in the same indirect impacts as the Project and thus would not reduce or avoid the Project's significant growth-related impacts.
- It would result in greater direct impacts to many environmental resources because new groundwater wells, treatment facilities, and pipelines would have to be constructed.
- It would result in a significant, unavoidable impact to groundwater supply, whereas the Project would result in a beneficial impact to groundwater supply through recharge.
- It would exceed the average annual yield of the groundwater basins, whereas the Project would allow the groundwater basins to store some of the average annual yield for use in dry years.

c. Alternative 3, Desalination/Exchange. CLWA finds that Alternative 3, the Desalination/Exchange Alternative, is less desirable than the Project and rejects this alternative for the following reasons:

- This alternative would result in the same indirect impacts as the Project and thus would not reduce or avoid the Project's significant growth-related impacts.
- It would result in greater direct impacts to many environmental resources from the construction and operation of a new desalination plant.
- This alternative would augment CLWA's water supply since desalinated water would be exchanged with another water agency's SWP Table A Amount, which would be conveyed to existing CLWA facilities, and therefore would meet the Project objectives.
- This alternative would be significantly more costly than the Project.

d. Alternative 4, Smaller Table A Amount. CLWA finds that Alternative 4, the Smaller Table A Amount Alternative, is less desirable than the Supplemental Water Project and rejects this alternative for the following reason:

- Although this alternative would reduce the potentially significant indirect impacts of the Project and would result in similar or lessened direct impacts, it would not meet one of the two Project objectives, which is to "Augment CLWA's SWP Table A Amount to meet water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area."
- This alternative would not provide adequate water to meet projected demand.

e. Alternative 5, Larger Table A Amount. CLWA finds that Alternative 5, the Larger Table A Amount Alternative, is less desirable than the Supplemental Water Project and rejects this alternative for the following reasons:

- This alternative would meet the Project objectives, but would result in similar or greater direct impacts and would provide more water for more growth that could increase the significant indirect impacts of the Project.

f. Environmentally Superior Alternative. The Project is the environmentally superior alternative that meets the Project objectives. The No Project Alternative would have direct environmental impacts substantially greater than the Project and would not meet Project objectives.

g. Other Table A Amount Uses. At least one comment to the Project EIR suggested that the Alternatives analysis in the EIR should include alternative uses of the Table A Amount water transferred by the Project for other purposes and in other locations, including for environmental purposes. CLWA could not approve consideration of this alternative in the Project EIR for two principal reasons: (i) it accomplishes none of the Project objectives and would leave CLWA without the supplemental water supply that it needs to meet present demand and to provide for some future demand; and (ii) any such alternative more properly should be suggested to DWR for consideration as it prepares the new Monterey Amendment EIR, not to CLWA. This is not a viable alternative to the Project.

GENERAL FINDINGS

A. CLWA has adopted the following mission statement: "A public agency providing reliable, quality water at a reasonable cost to the Santa Clarita Valley." The Project provides a valuable source of supplemental water that will allow CLWA to continue to implement its mission statement. As such, it is an integral part of CLWA's long-term water supply planning program. A portion of the water provided under the Project already is in use by CLWA customers to meet existing demand. The remainder has been secured to meet some of the demand projected by local planning agencies as part of their General Plans.

B. Some members of the public have stated that CLWA is acting improperly by considering the Monterey Amendment and the Project to be in effect, suggesting that the Project water transfer is in jeopardy. CLWA considers this position to be invalid for two reasons:

1. The Monterey Amendment Settlement Agreement provides that "the Parties [to the Settlement Agreement] will jointly request that the Superior Court enter an order approving this Settlement Agreement, and an order, pursuant to California Public Resources Code Section 21168.9, authorizing on an interim basis the administration and operation of the SWP and the Kern Water Bank in accordance with the Monterey Amendments . . . ." The Sacramento Superior Court has entered such an order and the SWP continues to operate in accordance with the Monterey Amendment, which includes the provision under which the Project was implemented.

2. Notwithstanding two requests from the petitioners in the "*Friends*" case (one request having been made to the Court of Appeal and the other to the Superior Court), both courts declined to set aside the Project or to order suspension or termination of its operation pending completion of the Project EIR. CLWA's preparation of the Project EIR, its adoption of these Findings, the Statement of Overriding Consideration, the Mitigation and Monitoring Program and the Resolution based upon these Findings and the Statement of Overriding Considerations are steps required by, and conducted under the supervision of, the Superior Court to bring the Project into compliance with CEQA and to render the Resolution final. The Monterey Amendment settlement agreement provides at Page 11 that DWR's new Monterey Amendment Program EIR will include analysis of the Project as part of the overall analysis of the environmental impacts of completed Table A Amount permanent transfers.

C. CLWA's water supply from the SWP allows CLWA's customers, who are water retailers, to conjunctively use the SWP supplies and their local groundwater supplies, to the extent each retailer has access to groundwater. Conjunctive use programs acknowledge that reliance on only one water supply in certain circumstances can result in delivery shortages. By expanding the range of water supply sources, a water supplier increases the long term reliability of its supply. For example, when climactic or other conditions reduce the local water supplies, the water purveyor can turn to its SWP deliveries to replace (in whole or in part) the local supplies, "resting" the groundwater basins and allowing them to recharge. In other years, when reduced SWP supplies available from Northern California result in SWP delivery shortages, Southern California water agencies can rely on local groundwater or other local supplies as a back-up to the SWP supply. Having this flexibility available enhances a water purveyor's overall supply reliability and reduces the need to cut back deliveries to customers. The SWP supplies also provide a safeguard against long-term overdraft of local groundwater basins.

D. Deliveries of SWP water are not assured. In years when DWR is unable to deliver the full amounts requested by CLWA and the SWP contractors, DWR allocates available SWP water to the contractors in proportion to their respective Table A Amounts. By implementing the Project, not only does CLWA increase its deliveries in good supply years, it also increases its proportionate deliveries in short supply years.

E. Project opponents point to the Project as being growth inducing because it removes one obstacle to growth. The Project EIR acknowledges the indirect Project impacts from growth. The positive aspect of removing this obstacle to growth is that local planning agencies have prepared their planning documents with the objective of building out their plan areas in a manner that meets the needs of their communities. People must live somewhere and businesses must be located to meet the needs of the local population. Although the Project doesn't meet all of the projected demand, it provides some part of the water needed for the anticipated growth.

F. The population of California, particularly Southern California, continues to grow at a remarkable rate. CLWA's service area is a popular site for housing for people who work in the Los Angeles area. Los Angeles County's Development Monitoring System (DMS) attempts to track all pending, approved, and recorded development projects within the City of Santa Clarita and the unincorporated area of Los Angeles County, and the City of Santa Clarita also maintains its own separate records in addition to the DMS. To the extent possible, CLWA's mission includes meeting the needs of the projected population within CLWA's service area, taking into account the DMS and City of Santa Clarita information.

G. CLWA paid $48 Million for the Project, financing the acquisition of 41,000 acre feet per year of Table A Amount through the sale of tax exempt obligation bonds. This money already has been paid to Wheeler Ridge-Maricopa Water Service District and CLWA has been servicing the bonds since the initial transfer in 1999. In addition, CLWA has paid to DWR a fixed annual cost for this Table A Amount of approximately $6.8 Million. CLWA has a substantial investment in the Project, the cost of which is being borne by current water users.

EXHIBIT "C"

STATEMENT OF OVERRIDING CONSIDERATIONS

FINAL ENVIRONMENTAL IMPACT REPORT

The Board of Directors of the Castaic Lake Water Agency ("CLWA") adopts and makes this Statement of Overriding Considerations concerning the proposed Project's unavoidable significant impacts[1] to explain why the proposed Project's benefits override and outweigh the unavoidable significant impacts of the Project.

The proposed Project will bring substantial benefits to CLWA, including increased water supply reliability to meet current demand within the CLWA service area and increased overall water supply to serve a portion of the growth within CLWA through 2025 as projected by one regional agency, as specifically described in the Southern California Association of Governments' ("SCAG") currently adopted demographic forecasts for the Santa Clarita Valley area, and as described in adopted General and Specific Plans of local land use agencies (See Final EIR, Vol. I, pp. 5-7 and 5-11.)

Without the Project, permanent damage could occur to groundwater resources within CLWA's service area. Specifically, without the provision of an additional water supply for CLWA, existing use could overstress groundwater supplies in dry years and increase the potential for perchlorate contamination to spread, causing a significant local groundwater quality impact. Without the provision of an additional supply for CLWA, projected growth could not be accommodated within the parameters of existing environmental requirements, as the current groundwater sources in their present state could not meet the likely demands of this projected growth. (See Final EIR, Vol. I, pp 3.15-15 through 3.15-22, 7-10 and 7-11.) In addition, the failure to provide adequate water supplies to accommodate and meet the County of Los Angeles' and City of Santa Clarita's General Plan population, housing, and employment projections, for which local governments have already planned and/or constructed infrastructure, would have devastating consequences to the area's economy. These consequences include potential over-crowding in existing housing, increased costs of housing in an already expensive Southern California housing market, and economic loss to developers with approved or recorded but un-built projects, due to delay or an inability to obtain approval for completion. Furthermore, businesses considering relocating or expanding in the CLWA area may be reluctant to invest capital because of uncertainties related to water supplies, lack of adequate and affordable housing for employees, and stagnant local markets for goods and services. (See Final EIR, Vol. I, pp. 7-4 and 7-5.)

[1] Those unavoidable environmental impacts are indirect impacts to aesthetics, air quality, biological resources, transportation and circulation systems, and utilities and services, resulting from potential growth utilizing the Project water.

In contrast, the Project's provision of supplemental water supplies to accommodate much of the growth projected in adopted plans of local jurisdictions within CLWA would increase the provision of jobs and housing in the area. The additional housing and jobs will facilitate the regional housing and employment goals established by SCAG. The Project will mitigate the projected water shortage of one-million acre-feet in the year 2020 identified as an environmental impact by SCAG in its 1989 EIR for its Growth Management Plan. Attainment of regional housing and employment goals will help fulfill State policies to ameliorate a serious State housing shortage. (See Health and Safety Code § 51003(a).) The alternatives to the proposed Project considered in the Final EIR are not expected to result in substantially reduced environmental impacts when compared to the proposed Project, taking into consideration the Project objectives and the most feasible means to accomplish those objectives. Additional water supply for CLWA from sources other than a State Water Project transfer would be less reliable, more costly and/or more difficult to deliver.

The CLWA Board of Directors finds that the proposed Project's unavoidable significant impacts are acceptable in light of the Project's benefits as set forth herein. Each benefit set forth below constitutes an overriding consideration applicable to each and every identified unavoidable significant impact, warranting approval of the Project, independent of the other benefits, despite each and every unavoidable impact:

1. Increase the reliability of CLWA's current supply to meet existing demand.
2. Avoid the use of groundwater within CLWA in amounts beyond conservative estimates of operational yield to meet existing demand in dry years, as well as in future years.
3. Meet a portion of the water need for currently approved and pending housing development projects within CLWA.
4. Mitigate the projected water shortage identified as a significant impact by SCAG in its 1989 EIR for its Growth Management Plan.
5. Meet a portion of the water need for growth projected in the General and Specific Plans by local land use agencies.
6. Provide some of the water supply for new housing needed to foster economic growth, increase jobs and increase local tax revenue.
7. Facilitate the availability of new housing to meet regional goals for housing and to further State policies to ameliorate a serious housing shortage.
8. Provide additional water supply that is calculated to provide as nearly as possible the supply needed to meet projected water demand for the next 20 years.
9. Provide additional water to CLWA that will be more reliable, easy to deliver and economical as compared to alternative sources.

EXHIBIT "D"

MITIGATION AND MONITORING PROGRAM

FINAL ENVIRONMENTAL IMPACT REPORT

Mitigation measures identified in the Final EIR would avoid or substantially lessen some of the potentially significant indirect impacts of the Project that might be caused by development, as found by CLWA in the Specific Project CEQA Findings A-O (Exhibit "B").

Because CLWA is a water wholesaler (and retailer with respect to portions of its service area), other government jurisdictions, and not CLWA, have the authority and responsibility to place conditions upon approval of such proposals, which conditions would avoid or substantially lessen significant potential indirect environmental effects identified in the Final EIR, including those mitigation measures identified in the Final EIR and referenced in Specific Project CEQA Findings A-O (Exhibit "B").

Thus, CLWA's Mitigation Monitoring Program consists of CLWA monitoring of applications and environmental review for development projects that are submitted to CLWA by the developers in the process of obtaining service connections for those projects, of CLWA recommendations to land use agencies that they apply appropriate conditions of development project approval, and of regular CLWA reporting to its Board. Such CLWA monitoring and reporting is already in place and operating at this time pursuant to CLWA's development impact fee procedure, which procedure obtains data about new service connections directly from developers in lieu of obtaining reports from the land use agencies. CLWA regularly prepares and presents to its Board a Quarterly Water Supply Status Report and a biannual Data Document, each of which summarize water service connection data for the applicable time period.

LETTER 4

CLWA RETURN TO WRIT

EXHIBIT NO. 2

LETTER 4

Amended Notice of Completion of Draft Environmental Impact Report

State Clearinghouse
'90 Tenth Street
Sacramento, CA 95812-3044

Project Title:
Castaic Lake Water Agency Supplemental Water Project Transfer of 41,000 Acre-Feet of Table A Amount, State Clearinghouse Number 1998041127

Lead Agency:
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350
Contact: Dan Masnada, General Manager

The original Notice of Completion of Draft Environmental Impact Report referenced above was filed with the State Clearinghouse on June 17, 2004. It is incorporated in full herein by reference and is amended as follows:

Review Period:
The review period originally identified as June 17 through July 31, 2004 has been extended to August 16, 2004. During this 60-day public review period of the Draft EIR, the public has the opportunity to review the document and make written comments. Please send all written comments to the address listed below, on or before August 16, 2004.

A public meeting will be held to receive comments on the Draft EIR on July 28, 2004 at 7:00 P.M. at the CLWA offices located at 27234 Bouquet Canyon Road, Santa Clarita, CA.

Paper copies of the Draft EIR are available for review or purchase at the address listed below, along with a list of other locations where the Draft EIR and documents referenced in the Draft EIR will be available for public review. The Draft EIR also is available from CLWA in an electronic format on CD.

Direct Written Comments to:
Mary Lou Cotton
Water Resources Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350
(661) 297-1600

June 17, 2004

General Manager
Castaic Lake Water Agency

LETTER 4

Notice of Completion of Draft Environmental Impact Report

State Clearinghouse
1400 Tenth Street
Sacramento, CA 95812-3044

Project Title:
Castaic Lake Water Agency Supplemental Water Project Transfer of 41,000 Acre-Feet of Table A Amount, State Clearinghouse Number 1998041127

Project Location - Specific:
The Project would use existing State Water Project (SWP) facilities located between the southern Delta facilities and Castaic Lake; these facilities include the SWP's southern Delta facilities (Clifton Court Forebay, the Banks Pumping Plant, and Bethany Reservoir); the San Luis Reservoir facilities (San Luis Reservoir, O'Neil Forebay, and the Gianelli Pumping-Generating Plant); and the California Aqueduct from the southern Delta to Castaic Lake, including pumping plants, a power plant, and storage facilities along the Aqueduct (Buena Vista, Teerink, Chrisman, Edmonston, and Oso pumping plants, Warne power plant, and Quail, Pyramid and Castaic lakes). These facilities are located in Alameda, Contra Costa, Fresno, Kern, Kings, Los Angeles, Merced, San Joaquin, and Stanislaus counties. The Project also could affect environmental resources located in the Castaic Lake Water Agency (CLWA) and Wheeler Ridge-Maricopa Water Storage District (WRMWSD) service areas. The CLWA service area is located in northern Los Angeles and eastern Ventura counties. The WRMWSD is located in the southern extent of the San Joaquin Valley in Kern County.

Description of Project:
The Project is the transfer of an existing 41,000 AF of SWP Table A Amount from the Kern County Water Agency (KCWA) and its member unit in Kern County, WRMWSD, to CLWA. The Project also includes the use of SWP facilities from Northern California to Los Angeles County for the delivery of SWP water to the CLWA service area, and the use of his water within the CLWA service area. The Project water is transported from certain points of origin in the SWP system to the CLWA intake south of Castaic Lake via existing SWP facilities. The points of origin and delivery are identified in the 41,000 AF Transfer Agreement, which addressed the transfer of 41,000 AF of SWP Table A Amount from KCWA and its member unit, WRMWSD, to CLWA, and the Point of Delivery Agreement between DWR, KCWA, and CLWA.

The 41,000 AF Transfer Agreement and the Point of Delivery Agreement were evaluated previously in the Supplemental Water Project Final EIR prepared by CLWA in 1999. The transfer of SWP Table A Amount that is the subject of the present EIR was contractually completed in 1999, and imported water supply associated with the transfer became available for use by CLWA starting in January 2000.

The Second Appellate Court, Fourth Division and the Superior Court of Los Angeles ordered that this EIR be decertified in January 2002 (*Friends of the Santa Clara River v. Castaic Lake Water Agency* (2002) 95 Cal. App. 3d 1373 [*Friends*]) because it tiered from the Monterey Agreement Program EIR, which was itself decertified as a result of an appellate court decision issued while *Friends* was on appeal. "All other contentions" concerning the legal adequacy of the Supplemental Water Project EIR were found to be "without merit." The Court of Appeal specifically ordered the Trial Court to "issue a writ of mandate vacating the certification of the EIR," and to "retain jurisdiction until [CLWA] certifies an EIR complying with CEQA," and "consider such orders it deems appropriate under section 21168.9 [of the Public Resources Code]." The CLWA Board of Directors decertified CLWA's Supplemental Water Project Final EIR on November 27, 2002.

In September 2002, the Trial Court was requested to prohibit CLWA from using the 41,000 AF in any manner. Trial Court refused to enjoin the performance of the 41,000 AF Transfer Agreement, maintained its jurisdiction over the matter, and authorized CLWA to utilize "any of the 41,000 AFY [acre-feet per year]," albeit, with certain limitations:

> Respondent [CLWA] will not be prohibited from using the water to which it is entitled, but petitioner may renew its application for such prohibition based upon evidence of the actual use of such additional water for purposes it considers improper.

The above Order was issued without prejudice to a renewed request by the Petitioner for an injunction on all of portions of CLWA's project pending completion of the EIR[1]. The present EIR is being prepared in accordance with the decisions of the Second Appellate Court, Fourth Division and the Superior Court of Los Angeles (Superior Court Case No. BS05694).

KCWA, WRMWSD, CLWA, and DWR previously approved the various contract amendments on the basis of the 1999 Supplemental Water Project Final EIR and other environmental analyses and documentation.

The Project currently is being implemented by an amendment to the SWP water supply contracts of CLWA and KCWA. The Project is to authorize CLWA to use the 41,000 AF of water from the SWP Table A Amount for water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area.

The Project does not include the construction of any additional SWP facilities or new facilities in the CLWA, KCWA, or WRMWSD service areas.

Purpose and Need:

The portion of the CLWA service area that is located within the unincorporated and incorporated portions of Los Angeles County is experiencing substantial growth in population and urbanization. This trend is expected to continue based on development that already has been approved by the County of Los Angeles and the City of Santa Clarita and development that is projected in local adopted plans. Pursuant to the provisions of its SWP Water Supply Contract, CLWA has over time acquired a right to delivery of SWP water at an amount necessary to reasonably supply the Agency's increasing demand. The Project is an action by CLWA to maintain the water supply needed to meet water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area.

Specific Project objectives are as follows:

- Augment CLWA's SWP Table A Amount to meet water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area.
- Provide a means of delivery for the augmented water supplies.

Significant Effects of the Project:

No significant direct impacts would occur in any of the three geographic areas evaluated. Very minor, less than significant impacts to aesthetic/visual resources, cultural resources, and geology and soils would occur at San Luis Reservoir due to the slight seasonal change in the timing of water delivered from the reservoir. Imperceptible or very minor, less than significant impacts to water quality in the Delta could result in some years due to a minor change in the timing of Delta diversions. However, these changes would fall well within the range of historical and future anticipated SWP diversions from the Delta. Other changes associated with the SWP are less than significant impacts from increased electrical power demand and air emissions from the generation of electrical power to move water from WRMWSD to the CLWA service area.

The only impact to WRMWSD is a less than significant impact to groundwater quality from the minor reduction of SWP Table A supply that has been replaced by other water management actions. Under some extreme conditions this could result in increased reliance on other water sources and groundwater. Increased use of other water and groundwater would result in higher TDS water used and recharged to local groundwater.

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[1] Petitioners appealed the Remand Order issued by the Superior Court in this case. The Court of Appeal affirmed the trial court's order (refusing the request for an injunction) on December 1, 2003.

The additional water supply provided by the Project would remove an obstacle to growth, and significant, indirect, growth-related impacts to all environmental resources could result from Project implementation. Compliance with the adopted plans and policies of local jurisdictions would reduce all of these impacts to less than significant, with the possible exception of five resources: aesthetics, air quality, biological resources, transportation/traffic, and utilities/service systems (solid waste disposal). Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review, as required under CEQA.

No significant cumulative impacts resulting from the Project were identified for the SWP and associated facilities or the WRMWSD. Significant cumulative Project impacts in the CLWA service area would be as described under indirect impacts, and the same mitigation measures would apply. Impacts to aesthetics, air quality, biological resources, transportation/traffic, and utilities/service systems (solid waste disposal) could be unavoidable.

Lead Agency:
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350
Contact: Dan Masnada, General Manager

Review Period:
June 17 through July 31, 2004. During this 45-day public review period of the Draft EIR, the public has the opportunity to review the document and make written comments. Please send all written comments to the address listed below, on or before July 31, 2004.

A public meeting will be held to receive comments on the Draft EIR on July 28, 2004 at 7:00 P.M. at the CLWA offices located at 27234 Bouquet Canyon Road, Santa Clarita, CA.

Paper copies of the Draft EIR are available for review or purchase at the address listed below, along with a list of other locations where the Draft EIR and documents referenced in the Draft EIR will be available for public review. The Draft EIR also is available from CLWA in an electronic format on CD.

Direct Written Comments to:
Mary Lou Cotton
Water Resources Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350
(661) 297-1600

CLWA RETURN TO WRIT

EXHIBIT NO. 3

LETTER 4

DRAFT

Environmental Impact Report

California State Clearinghouse No. 1998041127

Castaic Lake Water Agency

Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount

CASTAIC LAKE WATER AGENCY

June 2004

LETTER 4

LETTER 4

DRAFT

Environmental Impact Report

California State Clearinghouse No. 1998041127

Castaic Lake Water Agency

Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount

CASTAIC LAKE WATER AGENCY

Prepared for:
Castaic Lake Water Agency
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PREFACE

This Environmental Impact Report (EIR) evaluates the potential environmental impacts of the transfer of an existing 41,000 acre-feet (AF) of State Water Project (SWP) Table A Amount[1] from a SWP contractor (the Kern County Water Agency [KCWA]) and its member unit in Kern County (the Wheeler Ridge-Maricopa Water Storage District [WRMWSD]), to the Castaic Lake Water Agency (CLWA), another SWP contractor located in Los Angeles and Ventura counties. This EIR also evaluates the use of SWP facilities from northern California to Los Angeles County for the delivery of SWP water to the CLWA service area, and use of this water within the CLWA service area. These actions are referred to as "the Project" in subsequent sections of this EIR.

The Project is intended to meet water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area. CLWA is not a land use agency and has no control over where and when growth will occur within its service area. To the extent that land use decision-makers utilize or rely on this EIR to predict future CLWA water supplies, they are cautioned that although CLWA will implement all feasible measures to firm up its water supplies (and CLWA's retail purveyors may implement conjunctive use programs using SWP and groundwater supplies to increase the reliability of deliveries to their customers), past water deliveries are not a guarantee of future delivery rates. Rather than repeat this advice to decision-makers in each section of the EIR, the reader is requested to keep this advice in mind when reading the information about the availability and reliability of water supplies wherever such information appears. Information regarding water supplies is presented throughout this document as it relates to the CLWA service area (section 1.3.1), the Project description (section 2.3), the environmental setting (section 3.0), and growth-inducing effects and growth-related impacts (Chapter 4). To facilitate your reading of this EIR, it is suggested that the reader refer to section 10.0, "List of Acronyms and Glossary of Terms." The acronyms used in this EIR are defined the first time they are used in the text.

The transfer of SWP Table A Amount that is the subject of the present EIR was contractually completed in 1999, and imported water supply associated with the transfer became available for use by CLWA starting in January 2000 (refer to the discussion under Related Environmental Documentation for additional detail).

CLWA is the lead agency for preparation of the EIR and thus will evaluate, and if appropriate, certify this EIR, make CEQA findings, and approve the Project. CLWA has the principal responsibility for carrying out and implementing the Project because 1) a substantial portion of

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1 "Table A" is a term used in SWP Water Supply Contracts. The "Table A Amount" is the annual maximum amount of water to which an SWP Contractor has a contract right to request delivery, and is specified in Table A of each Contractor's Water Supply Contract. (Prior to the Settlement Agreement arising out of a legal challenge to the Monterey Amendment to the State Water Project contracts, the Table A Amount was referred to as "entitlement.") The amount of water actually available for delivery in any year may be an amount less than the Contractor's Table A Amount due to a number of factors, including hydrologic conditions. The parallel term used in the member unit contract between KCWA and WRMWSD is "Contract Entitlement" (sometimes referred to as "Table 1 Entitlement"). For the sake of brevity, in this EIR the term "Table A Amount" refers to the Table A Amount in the SWP Water Supply Contracts, or "Annual Entitlement" prior to the Monterey Amendment; where the term is used in connection with WRMWSD, it refers to the Table 1 Entitlement under its member unit contract with KCWA.

the Project occurs within CLWA's jurisdiction and substantially affects CLWA; 2) CLWA has been the lead proponent of the Project and has assumed the primary task of effectuating the SWP water supply contract amendment; 3) CLWA has the expertise to implement the Project; and 4) the Project, although requiring the use of SWP facilities, would involve transfers only between three agencies (CLWA, KCWA, and WRMWSD) within a limited geographic area and does not implicate the entire statewide water rights or supply framework.

The California Department of Water Resources (DWR), KCWA, and WRMWSD are considered to be responsible agencies. Responsible agencies are public agencies other than the lead agency that have responsibility for carrying out or approving a project (CEQA Guidelines section 15381).

EXECUTIVE SUMMARY

PROJECT DESCRIPTION

Project Location

The Project would use existing SWP facilities located between the southern Delta facilities and Castaic Lake; these facilities include the SWP's southern Delta facilities (Clifton Court Forebay, the Banks Pumping Plant, and Bethany Reservoir); the San Luis Reservoir facilities (San Luis Reservoir, O'Neil Forebay, and the Gianelli Pumping-Generating Plant); and the California Aqueduct from the southern Delta to Castaic Lake, including pumping plants, a power plant, and storage facilities along the Aqueduct (Buena Vista, Teerink, Chrisman, Edmonston, and Oso pumping plants, Warne power plant, and Quail, Pyramid and Castaic lakes). These facilities are located in Alameda, Contra Costa, Fresno, Kern, Kings, Los Angeles, Merced, San Joaquin, and Stanislaus counties. The Project also could affect environmental resources located in the CLWA and WRMWSD service areas. The CLWA service area is located in northern Los Angeles and eastern Ventura counties. The WRMWSD is located in the southern extent of the San Joaquin Valley in Kern County.

Project Objectives

The portion of the CLWA service area that is located within the unincorporated and incorporated portions of Los Angeles County is experiencing substantial growth in population and urbanization. This trend is expected to continue based on development that already has been approved by the County of Los Angeles and the City of Santa Clarita and development that is projected in local adopted plans. (Considerably less growth is occurring in or is anticipated to occur in the portion of the service area that is in Ventura County since this area is designated for agricultural or open space uses in the general plan, and the Ventura County Save Open-Space and Agricultural Resources [SOAR] Initiative requires a vote of the people for most changes to the general plan policies and land use designations regarding open space, agricultural, and rural lands.) Pursuant to the provisions of its SWP Water Supply Contract, CLWA has over time acquired a right to delivery of SWP water at an amount necessary to reasonably supply the Agency's increasing demand. The Project is an action by CLWA to maintain the water supply needed to meet water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area.

Specific Project objectives are as follows:

- Augment CLWA's SWP Table A Amount to meet water demands of existing users and some future anticipated growth.
- Provide a means of delivery for the augmented water supplies.

Description of the Project

The Project is the transfer of an existing 41,000 AF of SWP Table A Amount from KCWA and its member unit in Kern County, WRMWSD, to CLWA. The Project also includes the use of SWP

facilities from northern California to Los Angeles County for the delivery of SWP water to the CLWA service area, and use of this water within the CLWA service area. The Project water is transported from certain points of origin in the SWP system to the CLWA intake south of Castaic Lake via existing SWP facilities. The points of origin and delivery are identified in the 41,000 AF Transfer Agreement and the Point of Delivery Agreement. These and other documents referenced in this EIR are available for public inspection at the CLWA offices at 27234 Bouquet Canyon Road, Santa Clarita, CA 91350, (661) 297-1600.

The Project currently is being implemented by an amendment to the SWP water supply contracts of CLWA and KCWA executed in 1999. The Project is to authorize CLWA to use water delivered from the 41,000 AF of SWP Table A Amount for water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area. As described in detail in section 3.15 and Appendix D, the annual allocations of SWP water made by DWR are based on that year's hydrologic conditions, the amount of water in storage in the SWP system, and Contractors' requests for SWP supplies. Thus, the actual amount of water available for delivery to CLWA as a result of the 41,000 AF transfer would vary from year to year. (Section 3-0 outlines the assumptions used in the environmental impact analysis regarding the amount of water that would be delivered for use by CLWA.) Water would be requested by CLWA as needed to meet the demands of its service area, and as discussed in section 1.3.1, the transfer of Table A Amount would be one of a number of projects implemented by CLWA (e.g., infrastructure improvements, groundwater banking programs, increased recycling and conservation, and expanded use of local groundwater sources) to increase water reliability. Those projects that are considered reasonably foreseeable and for which sufficient information is available are included in the cumulative impacts analysis contained in section 6.3.3.1 of this EIR.

The Project does not include the construction of any additional SWP facilities or new facilities in the CLWA, KCWA, or WRMWSD service areas.

Permits and Other Approvals to Implement the Project

The amendment to the SWP water supply contract was approved by CLWA and DWR in 1999. Associated amendments to water supply and delivery contracts have been approved by KCWA and WRMWSD. WRMWSD is the KCWA member unit providing this Table A Amount. No permits or other approvals would be required other than the certification of this EIR.

RELATED ENVIRONMENTAL DOCUMENTATION

Supplemental Water Project EIR

The transfer of 41,000 AF of SWP Table A Amount between CLWA, KCWA, and WRMWSD (41,000 AF Transfer Agreement) and the Point of Delivery Agreement between DWR, KCWA, and CLWA were evaluated previously in the Supplemental Water Project Final EIR (CLWA 1999).

The Second Appellate Court, Fourth Division and the Superior Court of Los Angeles ordered that this EIR be decertified in January 2002 (*Friends of the Santa Clara River v. Castaic Lake Water Agency* (2002) 95 Cal. App. 3d 1373 [*Friends*]) because it tiered from the Monterey Agreement Program EIR, which was itself decertified as a result of an appellate court decision issued while

Friends was on appeal. "All other contentions" concerning the legal adequacy of the Supplemental Water Project EIR were found to be "without merit." The Court of Appeal specifically ordered the Trial Court to "issue a writ of mandate vacating the certification of the EIR," and to "retain jurisdiction until [CLWA] certifies an EIR complying with CEQA," and "consider such orders it deems appropriate under section 21168.9 [of the Public Resources Code]." The CLWA Board of Directors decertified CLWA's Supplemental Water Project Final EIR on November 27, 2002.

In September 2002, the Trial Court was requested to prohibit CLWA from using the 41,000 AF in any manner. Trial Court refused to enjoin the performance of the 41,000 AF Transfer Agreement, maintained its jurisdiction over the matter, and authorized CLWA to utilize "any of the 41,000 AFY [acre-feet per year]," albeit, with certain limitations:

> Respondent [CLWA] will not be prohibited from using the water to which it is entitled, but petitioner may renew its application for such prohibition based upon evidence of the actual use of such additional water for purposes it considers improper.

The above Order was issued without prejudice to a renewed request by the Petitioner for an injunction on all portions of CLWA's project pending completion of the EIR[1]. The present EIR is being prepared in accordance with the decisions of the Second Appellate Court, Fourth Division and the Superior Court of Los Angeles (Superior Court Case No. BS05694).

KCWA, WRMWSD, CLWA, and DWR previously approved the various contract amendments on the basis of the 1999 Supplemental Water Project Final EIR and other environmental analyses and documentation.

Monterey Amendment Program EIR

During the 1990s, disagreements arose between DWR, Agricultural Contractors, and municipal and industrial (M&I) Contractors about how available SWP supplies should be allocated. The SWP Contractors and DWR agreed to negotiate a settlement of their differences and develop a new approach to managing SWP resources through a major overhaul of the Water Supply Contracts. After a series of exhaustive negotiating sessions, an agreement was reached in December 1994 in Monterey, California on a set of principles, known as the "Monterey Agreement." The Monterey Agreement principles were implemented through an amendment to the Water Supply Contracts between DWR and the SWP Contractors, which became known as the "Monterey Amendment." The term "Monterey Amendment" is used in subsequent sections of this EIR. The Monterey Amendment was approved in 1995 and went into effect in August 1996.

A Program EIR analyzing the environmental impacts of the Monterey Amendment (Monterey Agreement EIR) was prepared and certified by the Central Coast Water Authority (CCWA) in 1995. In late 1995, a lawsuit was filed by the Planning and Conservation League (PCL), Plumas County Water Conservation and Flood Control District (Plumas County), and Citizens

1 Petitioners appealed the Remand Order issued by the Superior Court in this case. The Court of Appeal affirmed the Trial Court's order (refusing the request for an injunction) on December 1, 2003.

Planning Association of Santa Barbara County (CPA) (collectively referred to as the "plaintiffs") challenging the EIR. The plaintiffs argued that the environmental impact analysis prepared was inadequate because CCWA was not a proper lead agency and the EIR analysis did not reflect the inability of the SWP to deliver full Contract amounts to Contractors, even though they held contractual "entitlements" to those supplies. In 2000, the California State Court of Appeal (Third District) found that a new EIR must be prepared. That litigation is referred to as the PCL Litigation in this EIR.[2]

Discussions to mediate a settlement began in 2001 and were finalized in May 2003.[3] All parties to the litigation have signed the Settlement Agreement. The Settlement Agreement calls for DWR to prepare a new EIR pursuant to CEQA (a Notice of Preparation [NOP] was issued by DWR on January 24, 2003),[4] while the Monterey Amendment's provisions remain in operation. Pursuant to the Settlement Agreement, the parties are now administering the preparation of a new EIR, which is expected to be completed in approximately two years. The new EIR will evaluate the potential environmental impacts of changes to SWP operations incorporated in the Monterey Amendment and the Settlement Agreement. The Settlement Agreement also calls for DWR to produce a biennial SWP Delivery Reliability Report. The SWP Delivery Reliability Report - 2002 was issued in May 2003 (DWR 2003b). The Settlement Agreement did not change the substance of the Monterey Amendment, but addressed the process by which the new Monterey Amendment EIR will be prepared.

It should be noted at this point that the Settlement Agreement concerning the PCL Litigation creates a specific exclusion for this Project from any prohibitions against transfers of State Water Project Table A Amounts by the Settlement Agreement. The exclusion states:

> With respect to Section III(c)(4)(b) regarding the Kern-Castaic Transfer, the Parties recognize that such water transfer is subject to pending litigation in the Los Angeles County Superior Court following remand from the Second District Court of Appeal (See Friends of the Santa Clara River v. Castaic Lake Water Agency 95 Cal.App.4th 1373, 116 Cal.Rptr.2d 54 (2002); review denied, April 17, 2002). The Parties agree that jurisdiction with respect to that litigation should remain in that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation.

The order on remand from the appellate court in the Friend case specifically ordered the Trial Court "to retain jurisdiction until [CLWA] certifies an EIR complying with CEQA" and "consider such orders it deems appropriate under section 21168.9 [of the Public Resources Code]." This EIR thus remains under the jurisdiction of the Superior Court until the EIR is certified by CLWA.

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2 *Planning and Conservation League, et al. v. Department of Water Resources* (2000) 83 Cal. App. 4th 892.

3 In May 2003, the settlement agreement among the plaintiffs, DWR, and the SWP Contractors (referred to herein as the "Settlement Agreement") was executed and approved by the State Attorney General's office. On May 20, 2003 the Settlement Agreement was approved by the Sacramento Superior Court.

4 The NOP is entitled Notice of Preparation of Environmental Impact Report for the Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Other Contract Amendments and Associated Actions as part of a Proposed Settlement Agreement in Planning and Conservation League v. Department of Water Resources.

Capital Program and Water Plan, including Acquisition of Supplemental Water and of a Proposed Second Plant Site, EIR

In 1988, CLWA completed the Capital Program and Water Plan, including Acquisition of Supplemental Water and of a Proposed Second Plant Site, Final EIR (Capital Program EIR) (CLWA 1988), which evaluated the potential environmental impacts of the proposed Capital Improvements Program, including the acquisition of supplemental water, and the construction of a new treatment plant and facilities improvements. The Capital Program EIR evaluated a proposal for CLWA to obtain additional SWP Table A Amount of up to 37,800 AF to supplement the 1988 SWP Table A Amount of 41,500 AF. This EIR assumed that deliveries from the new SWP Table A Amount would become 100 percent reliable before 2010. It also identified a total water demand of 120,000 AFY to support a population of 270,000 persons in the year 2010. The implementation of reasonable conservation measures and recycling was projected to reduce net demand to 106,300 AFY, an approximately 11 percent reduction. The Project evaluated in the present EIR was programmatically evaluated in the Capital Program EIR (CLWA 1988).

ENVIRONMENTAL SETTING

CEQA Guidelines section 15125 directs that an EIR must include a description of the physical environmental conditions in the vicinity of the Project as they exist at the time the NOP is published. This environmental setting will normally constitute the baseline physical conditions by which the lead agency determines whether an impact is significant. This Project was previously analyzed in the 1999 Supplemental Water Project Final EIR (CLWA 1999); the 41,000 AF Transfer Agreements were duly executed, and the Project was implemented. Solely relying on the description of physical conditions that existed at the time that the NOP for the present EIR was published (January 2003) would fail to capture any changes to the pre-Project conditions that may have resulted from the ongoing implementation of the 41,000 AF Transfer Agreement. Thus, this EIR's description of the Project's environmental setting includes information from the general timeframe when the January 2003 NOP was issued (referred to as current or present conditions), as well as information describing the environmental setting as it existed when the NOP for the 1999 Supplemental Water Project Final EIR was published (April 1998).

SUMMARY OF SIGNIFICANT IMPACTS AND MITIGATION MEASURES

Table ES-1 summarizes the direct and indirect impacts of the Project, mitigation measures for significant impacts, and the residual impacts that would occur after the implementation of mitigation measures. No significant direct impacts would occur in any of the three geographic areas evaluated. Very minor, less than significant impacts to aesthetic/visual resources, cultural resources, and geology and soils would occur at San Luis Reservoir due to the slight seasonal change in the timing of water delivered from the reservoir. Imperceptible or very minor, less than significant impacts to water quality in the Delta could result in some years due to a minor change in the timing of Delta diversions. However, these changes would fall well within the range of historical and future anticipated SWP diversions from the Delta. Other changes associated with the SWP are less than significant impacts from increased electrical power demand and air emissions from the generation of electrical power to move water from WRMWSD to the CLWA service area.

The only impact to WRMWSD is a less than significant impact to groundwater quality from the minor reduction of SWP Table A supply that has been replaced by other water management actions. Under some extreme conditions this could result in increased reliance on other water sources and groundwater. Increased use of other water and groundwater would result in higher TDS water used and recharged to local groundwater.

The additional water supply provided by the Project would remove an obstacle to growth, and significant, indirect, growth-related impacts to all environmental resources could result from Project implementation. Compliance with the adopted plans and policies of local jurisdictions would reduce all of these impacts to less than significant, with the possible exception of five resources: aesthetics, air quality, biological resources, transportation/traffic, and utilities/service systems (solid waste disposal). Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review, as required under CEQA.

CUMULATIVE IMPACTS

No significant cumulative impacts resulting from the Project were identified for the SWP and associated facilities or the WRMWSD. Significant cumulative Project impacts in the CLWA service area would be as described under indirect impacts, and the same mitigation measures would apply. Impacts to aesthetics, air quality, biological resources, transportation/traffic, and utilities/service systems (solid waste disposal) could be unavoidable.

ALTERNATIVES TO THE PROJECT

Five alternatives were carried forward for detailed analysis.

Alternative 1, No Project Alternative

Under the No Project Alternative, CLWA would not acquire the additional Table A Amount or acquire the associated contractual rights for delivery of water associated with the transfer. The demand for high quality surface water is expected to increase throughout all of southern California as a result of continued growth, and local planning agency documents project continuing growth in the CLWA service area. The contract right to the Table A Amount that is the subject of the Project could be acquired and transferred to other portions of urbanized California. The amount, timing, and location of such a transfer are highly speculative, however, and this scenario is not considered further. Two hypothetical scenarios have been carried forward for detailed analysis that are intended to define a reasonable range of possible actions that could occur under this alternative. Actions relating to future land development are not under the control of CLWA, however, and could vary depending upon the actions of agencies with land use planning and permitting authority.

Scenario 1 –Moratorium on New Development, Existing Users Subject to Delivery Cutbacks (Moratorium Scenario)

In the absence of the Project, under this scenario, a moratorium on new development would be implemented. This assumes that the local retail water purveyors[5] within the CLWA service area decide that there is insufficient water to issue "will serve" letters to supply development and that local land use agencies respond by imposing a moratorium on new development in the CLWA service area.

Under this scenario, development that had already been approved or recorded but not yet built in the Santa Clarita Valley would not be built, nor would pending (unapproved) development. (Approved projects are subdivisions that have been granted an approved tentative tract map that is not yet recorded or has expired; recorded projects are subdivisions that have recorded a final tract map but are not yet built.) The 1998 DMS included 15,973 housing units (8,588 approved, 2,292 recorded, and 5,093 pending). The 2002 DMS included 33,113 housing units (13,586 approved, 9,915 recorded, and 9,612 pending). Assuming 3.1 persons per household, this amount of development would result in a population of approximately 49,510 persons, using the 1998 DMS, and 102,640 persons, using the 2002 DMS. In comparison, the Project could support approximately 35,600 housing units given an average year water supply, which would house approximately 106,700 persons. Thus, the amount of development and associated population that could be allowed under this scenario would be less than could occur under the Project.

Some additional groundwater production wells might be required to serve existing demand that would have been met by the 41,000 AF transfer. Treatment at the wellhead likely would be needed, depending upon local groundwater characteristics. New underground distribution pipelines also may be required. Electric pumps would be used as needed.

Scenario 2 –Build-Out of Recorded and Approved Projects in DMS (Build-Out Scenario)

Under the Build-Out Scenario, approved and recorded projects listed in the DMS for the Santa Clarita Valley would be developed, notwithstanding the potential shortfall in reliable water supply. Based on the DMS from both 1998 and 2002, the number of housing units in approved and recorded DMS projects considered under this scenario (10,880 and 23,500 units, respectively) is less than the number of housing units that could be supported by the Project given an average year water supply of 34,400 AF (35,600 units). The population associated with the development identified in the 1998 DMS would be about 33,730 persons; the population associated with the 2002 DMS development would be about 72,850 persons. In comparison, the population that could be served by the Project would be about 106,700 persons. Thus, the amount of development and associated population that could be allowed under this scenario would be less than could occur under the Project.

Under this scenario, existing demand currently met by the 41,000 AF transfer and the increased water demand from new development would rely on existing water supplies (principally local groundwater resources) that are currently not used for urban purposes. Treatment at the

5 The CLWA Act refers to "retail water distributors," although the term "retail water purveyors" also is commonly used. For purposes of this report, the terms are synonymous.

wellhead likely would be needed, depending upon local groundwater characteristics. New underground distribution pipelines also may be required. Electric pumps would be used as needed.

Alternative 2, Increased Extractions from the Saugus Formation (Increased Groundwater Extractions)

Under this alternative, in lieu of the Project, up to 41,000 AFY would be extracted from the Saugus Formation and delivered to users in the CLWA service area. The extraction would be accomplished by increased use of existing wells and by the installation of 15 additional wells, pumps, and wellhead treatment facilities. Existing or new distribution facilities such as pipelines and pumping stations would be used to transport this water to existing and planned treated water distribution facilities. Pumps and treatment facilities would use electrical power. Wherever possible, distribution facilities would be placed in public rights-of-way, including streets, utility, and railroad corridors. Disturbed areas would be restored to their former appearance once construction was completed. It is estimated that approximately 40 acres would be disturbed by the new facilities, which would be constructed and operated either by CLWA, individual purveyors, or other parties. A detailed geohydrologic investigation would be necessary prior to drilling on a site-by-site basis.

Until contaminant remediation is completed, existing, localized perchlorate contamination in a small part of the Saugus Formation would limit potential well locations. Field studies and groundwater modeling activities are in progress to evaluate how best to hydraulically contain the portion of the aquifer system where production wells have been shut down, while simultaneously preventing perchlorate movement to currently unimpacted areas. The field studies have included the installation and sampling of monitoring wells at multiple depths and locations on and around the Whittaker-Bermite site, the most likely source of perchlorate; water level monitoring in these wells; aquifer testing of two unimpacted water supply wells; and groundwater velocity testing in alluvial monitoring wells located between the site and the Santa Clara River. These studies have helped the water purveyors and the Whittaker Corporation further refine the current understanding of groundwater flow patterns in specific areas on and near the site (such as along the Holser Fault). This information has been incorporated into a regional groundwater flow model that has been developed by the purveyors and whose calibration and construction was recently reviewed and approved by the California Department of Toxic Substances Control (DTSC). The model is being used to identify a pumping scheme that would meet the objectives of restoring the lost water supply from the impacted wells (with wellhead treatment) while simultaneously containing perchlorate and hydraulically limiting its movement downgradient to unimpacted wells and other portions of the aquifer system where new water supply wells might be constructed. The modeling analysis accounts not only for the pumping of impacted wells, but also (a) the 2000 Urban Water Management Plan's (UWMP) pumping plan for unimpacted wells throughout the Santa Clarita Valley and (b) the significant year-to-year variation in local hydrology (especially groundwater recharge) that occurs in the Valley (CH2MHill 2004). The modeling simulations will be used to guide selection of a final pumping plan for the impacted Alluvial Aquifer well and the impacted Saugus Formation wells. The selection of a final pumping plan will be made jointly by the purveyors and the Whittaker Corporation, with regulatory oversight and permitting performed by the California Department of Health Services (CA DHS) with technical support from the DTSC.

There are numerous wells in the Saugus Formation, other than the wells that were voluntarily shut down due to perchlorate contamination. Additionally, other Saugus wells are planned for construction, including those included in CLWA's Capital Improvements Program. If operated continuously during the year, the wells not subject to perchlorate contamination have the capability to produce approximately 21,000 AFY (personal communication, L. Takaichi 2004). However, a more realistic production capability is 15,000 AFY due to periodic shutdown for maintenance, monitoring, or storage limitations (personal communication, L. Takaichi 2004). The current groundwater production capability from the Saugus Formation is estimated to be 5,000 AFY during normal years but could reach 15,000 AFY during dry periods or other periods of need (personal communication, L. Takaichi 2004). These capabilities will increase as additional production wells in the Saugus Formation are completed and a response action to perchlorate contamination is implemented.

Alternative 3, Exchange Desalinated Water for SWP Water (Desalination/Exchange)

This alternative comprises two primary components in lieu of the Project: (1) CLWA would contribute a portion of the funds needed by another agency to develop a seawater desalination facility along the southern California coast; and (2) up to 41,000 AFY of desalinated water produced by this facility would be exchanged with CLWA for SWP water. A likely partner in such an arrangement would be The Metropolitan Water District of Southern California (Metropolitan). If both parties agreed, CLWA would enter into a contract with Metropolitan indicating that a portion of Metropolitan's annual SWP Table A Amount would be delivered to Castaic Lake for use by CLWA in exchange for CLWA's contribution to a desalination facility to be constructed by Metropolitan. CLWA would treat and distribute this SWP water in existing CLWA facilities, and Metropolitan would use water from the desalination facility in lieu of the SWP water exchanged with CLWA.

Assuming a 50 percent recovery rate, a plant capacity of approximately 73 mgd would be required to produce 41,000 AFY. Depending on the extent of ancillary facilities included at the site, a site of at least 2 acres could be required. In addition to the desalting plant, the coastal facility would likely include new electrical power conveyance and control equipment, ocean water intake and brine disposal structures, and a treated water pumping plant. Total site area could be up to 5 acres. Depending on site location, additional pipelines and related pumping facilities may be required to convey the desalinated water a short distance to the existing Metropolitan distribution facilities.

Alternative 4, Transfer of a Smaller Table A Amount (Smaller Table A Amount)

Under this alternative, CLWA would acquire a smaller amount of SWP Table A Amount than under the Project. A transfer of approximately 20,000 AF of SWP Table A Amount was analyzed since it is the approximate mid-point between the amount that would be transferred under the Project and the No Project Alternative. Existing facilities would be used, as described for the Project.

Since the demand for high quality surface water is expected to increase in southern California as a result of anticipated growth, the remaining SWP Table A Amount (21,000 AF) could be acquired and transferred to other (unidentified) portions of urbanized southern California. The Table A Amount not acquired by CLWA would likely be acquired by other agencies with

growing urban water demands. However, the timing, amount, and location of the transfer(s) as well as the associated impacts are speculative and are not evaluated under this alternative.

Alternative 5, Transfer of a Larger Table A Amount (Larger Table A Amount)

Under this alternative, CLWA would acquire a larger SWP Table A Amount than under the Project. Such an alternative would require the use of a larger proportion of the SWP facilities and capacities than described for the Project, and would attempt to reduce or avoid the effects of reductions in SWP supplies (during periods of drought) on local groundwater resources. In order to provide an analysis of impacts of a transfer greater than the Project (transfer of 41,000 AF of Table A Amount), a transfer of approximately 60,000 AF of SWP Table A Amount was established for this alternative. This Table A Amount is potentially available from other KCWA member units who have expressed interest in reducing their Table A Amount and have completed CEQA analysis of the sale of this contract right (e.g., Belridge Water Storage District, Berrenda Mesa Water District, and Lost Hills Water District [BWSD 1998; BMWD 1996]). Existing facilities would be used, as described for the Project.

Environmentally Superior Alternative

Scenarios 1 and 2 of Alternative 1, the No Project Alternative, would reduce or avoid the significant indirect (growth-related) impacts of the Project, but each would result in greater direct impacts since new groundwater wells, treatment facilities, and associated pipelines would be required. Additionally, each of these scenarios could result in significant unavoidable impacts to groundwater supply and groundwater quality. This alternative would not augment CLWA's water supply and therefore would not meet the Project objectives. Since the direct impacts of the No Project Alternative would be substantially greater than the Project and since it would not meet Project objectives, this alternative is not considered environmentally superior.

Alternative 2, the Increased Groundwater Extractions Alternative, would result in the same indirect impacts as the Project and thus would not reduce or avoid the Project's significant growth-related impacts. It would result in greater direct impacts to many environmental resources because new groundwater wells, treatment facilities, and pipelines would have to be constructed. It also would result in a significant, unavoidable impact to groundwater supply, whereas the Project would result in a beneficial impact to groundwater supply through recharge. This alternative would not augment CLWA's water supply and therefore would not meet the Project objectives. Because the direct impacts of the Increased Groundwater Extractions Alternative would be substantially greater than the Project and since it would not meet Project objectives, this alternative is not considered environmentally superior.

Alternative 3, the Desalination/Exchange Alternative, would result in the same indirect impacts as the Project and thus would not reduce or avoid the Project's significant growth-related impacts. It would result in greater direct impacts to many environmental resources from the construction and operation of a new desalination plant and pipeline. This alternative would augment CLWA's water supply since desalinated water would be exchanged with another water agency's SWP Table A Amount, which would be conveyed to existing CLWA facilities, and therefore would meet the Project objectives. Because the direct impacts of the

Desalination/Exchange Alternative would be substantially greater than the Project, however, this alternative is not considered environmentally superior.

Alternative 4, the Smaller Table A Amount Alternative, would reduce the potentially significant indirect impacts of the Project and would result in similar or lessened direct impacts, as well. This alternative would not meet one of the two Project objectives, however, which is to "Augment CLWA's SWP Table A Amount to meet water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area." Thus, while this alternative would result in lessened direct and indirect impacts, it does not meet an important basic Project objective[6] and is not considered the environmentally superior alternative.

Alternative 5, the Larger Table A Amount Alternative, would increase the significant indirect impacts of the Project and would result in similar or greater direct impacts, as well. It would meet the Project objectives but would result in greater environmental impacts than the Project and is not considered environmentally superior.

The Project is identified as the environmentally superior alternative that meets Project objectives.

AREAS OF KNOWN CONTROVERSY

The previous EIR on the Project was decertified because it tiered from the Monterey Agreement Program EIR, which was itself decertified as a result of an appellate court decision. The present EIR does not tier from this or any other EIR, and examines environmental impacts that would occur with and without the change in water allocation criteria implemented as part of the Monterey Amendment. Although the Monterey Amendment continues in operation under the Settlement Agreement, this EIR evaluates a reasonable worst-case scenario of SWP operations without the Monterey Amendment.

The potential for growth inducement as a result of the increased water supply to the CLWA service area is an area of known controversy.

The availability of local water supplies has been the subject of some controversy in the Santa Clarita Valley over the last few years. The water suppliers' consulting engineers recently calculated the availability of local groundwater at 50,000 AFY (Slade 2002) based on updated studies prepared using reasonable, accepted engineering and scientific practices (perchlorate remediation measures and recycled water use were considered in these studies). Some Santa Clarita Valley residents have questioned the conclusions of these studies and claim that only about 32,000 AFY of water is available based on conclusions in an earlier report published in 1986 (Slade 1986). They also claim that water from the Saugus Formation should not be calculated as available on a long-term basis until the perchlorate contamination in a small part of this formation is fully contained or remediated. CLWA, CLWA Santa Clarita Water Division, Newhall County Water District, and Valencia Water Company have received $8 million as reimbursement for litigation costs and studies to determine the cleanup plan for the

6 Under CEQA Guidelines 15126.6, an EIR must describe a range of reasonable alternatives that would feasibly attain most of the basic objectives of the proposed project but would avoid or substantially lessen significant impacts of the project.

perchlorate. CLWA and the retail purveyors are presently identifying the method of cleanup and the costs of cleanup to be paid by the insurance companies of Whitaker Bermite and related parties. It is anticipated the cleanup should be in place by 2006.

UNRESOLVED ISSUES

No unresolved environmental issues have been identified.

Table ES-1. Summary of the Project's Environmental Impacts and Mitigation Measures

(Page 1 of 8)

Environmental Resource	*Location*	*Direct Impacts*	*Indirect Impacts*	*Mitigation Measures*	*Residual Impacts*
Aesthetic/ Visual Resources	SWP	**Less than significant.** Slight decrease in water stored in San Luis Reservoir from December through June.	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: Less than significant. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential changes to the visual characteristics and resources from development of open space and further urbanization of hillside and natural areas. Potential increase in the amount of night lighting and unwanted glare in presently undeveloped areas. (Growth-related impact)	DIRECT: None required. INDIRECT: Reduced by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Significant unavoidable adverse impacts.
Agricultural Resources	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential conversion of agriculture lands to non-agricultural uses or for changes in agricultural zoning by local jurisdictions in order to allow a higher density or intensity of development. (Growth-related impact)	DIRECT: None required. INDIRECT: Reduced by local governments implementing the policies of the County of Los Angeles, County of Ventura, and the Piru general and area plan.	DIRECT: None. INDIRECT: Less than significant.
Air Quality	SWP	**Less than significant.** Increased air emissions from the generation of additional electrical power to move water from WRMWSD to CLWA.	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: Less than significant. INDIRECT: None.

Table ES-1. Summary of the Project's Environmental Impacts and Mitigation Measures

(Page 2 of 8)

Environmental Resource	*Location*	*Direct Impacts*	*Indirect Impacts*	*Mitigation Measures*	*Residual Impacts*
Air Quality (continued)	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential increase in air pollutant emissions from transportation and development. (Growth-related impact)	DIRECT: None required. INDIRECT: Reduced by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans. Additionally, reduced by compliance with SCAQMD plans.	DIRECT: None. INDIRECT: Significant unavoidable adverse impact.
Biological Resources	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Conversion and degradation of habitat; reduction/local extinction of local native plant and wildlife populations; including sensitive species; introduction of invasive non-native species; disruption of established wildlife corridors and native wildlife nursery sites; impacts on sensitive fish and amphibian populations due to wastewater discharge and polluted runoff; conflicts with local policies and ordinances protecting biological resources. (Growth-related impact)	DIRECT: None required. INDIRECT: Reduced by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans. State and federal regulatory agencies permit conditions may reduce significant impacts.	DIRECT: None. INDIRECT: Significant unavoidable impact.

Table ES-1. Summary of the Project's Environmental Impacts and Mitigation Measures

(Page 3 of 8)

Environmental Resource	*Location*	*Direct Impacts*	*Indirect Impacts*	*Mitigation Measures*	*Residual Impacts*
Cultural Resources	SWP	**Less than significant.** Potential exposure of submerged cultural resources in San Luis Reservoir from December through June.	**No impact.**	DIRECT None required. INDIRECT: None required.	DIRECT: Less than significant. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential disturbance of human remains, archaeological, historical, and paleontological resources by excavation and grading activities associated with future development. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Less than significant.
Geology and Soils	SWP	**Less than significant.** Slight increase in soil exposed to wind and water erosion at San Luis Reservoir from December through June.	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: Less than significant. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential from: geologic hazards, including fault rupture, seismically induced ground failure, and seiches, as well as causing permanent changes in topography, loss of topsoil, and removal of unique geologic features. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Less than significant.
Hazards and Hazardous Materials	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.

Table ES-1. Summary of the Project's Environmental Impacts and Mitigation Measures

(Page 4 of 8)

Environmental Resource	*Location*	*Direct Impacts*	*Indirect Impacts*	*Mitigation Measures*	*Residual Impacts*
Hazards and Hazardous Materials (continued)	CLWA	**Less than significant.** Incremental increase in use of hazardous materials to treat transferred water.	**Significant.** Previously contaminated sites may require the removal or remediation of soils before development. Potential increase in transport, use, and disposal of hazardous materials, along with increased risks of hazardous substance releases. Potential impairment of emergency response plans or emergency evacuation plans. Increased public exposure to wildland fires. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: Less than significant. INDIRECT: Less than significant.
Land Use and Planning	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential to division of a community or conflict with adopted land use plans. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Less than significant.
Noise	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential short-term increases from construction and grading activities, increase in traffic-related emissions and changes in land uses. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Less than significant.

Table ES-1. Summary of the Project's Environmental Impacts and Mitigation Measures
(Page 5 of 8)

Environmental Resource	*Location*	*Direct Impacts*	*Indirect Impacts*	*Mitigation Measures*	*Residual Impacts*
Population and Housing	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: Less than significant.
	CLWA	**No impact.**	**Significant.** Potential increase in population and housing. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Less than significant.
Public Services	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential increase in demand for public facilities and services. (police, fire, schools, and library services). (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Less than significant.
Recreation	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.

Table ES-1. Summary of the Project's Environmental Impacts and Mitigation Measures

(Page 6 of 8)

Environmental Resource	*Location*	*Direct Impacts*	*Indirect Impacts*	*Mitigation Measures*	*Residual Impacts*
Recreation (continued)	CLWA	**No impact.**	**Significant.** Potential increase in demand for recreational resources. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Less than significant.
Transportation/Traffic	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential increase in traffic and the need for new or altered roads, highways, and transportation systems in the Santa Clarita Valley. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Significant unavoidable adverse impacts from increased vehicle trips due to growth in the Santa Clarita Valley.
Utilities and Service Systems	SWP	**Less than significant.** Additional electricity required to convey water to CLWA.	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: Less than significant. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.

Table ES-1. Summary of the Project's Environmental Impacts and Mitigation Measures

(Page 7 of 8)

Environmental Resource	*Location*	*Direct Impacts*	*Indirect Impacts*	*Mitigation Measures*	*Residual Impacts*
Utilities and Service Systems (continued)	CLWA	**Less than significant.** Additional demand for water treatment and electrical power to treat and distribute the transferred water within the CLWA service area.	**Less than significant.** Potential increase wastewater generation and demand for wastewater treatment; potential need for new storm water drainage facilities or the expansion of existing facilities. (Growth-related impact) **Significant.** Potential increased demand for solid waste disposal services; potential increased need for potable water treatment facilities. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans. Impacts to solid waste disposal may not be avoidable unless additional landfill capacity is approved and constructed.	DIRECT: None. INDIRECT: Significant unavoidable adverse impact related to increased demand for solid waste disposal services.
Water Resources	SWP	**Less than significant.** Imperceptible or minor change in water quality in the Delta due to minor changes in timing of Delta diversions in some years. However, these changes would fall well within the range of historical and future anticipated SWP diversions from the Delta.	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.

Table ES-1. Summary of the Project's Environmental Impacts and Mitigation Measures

(Page 8 of 8)

Environmental Resource	*Location*	*Direct Impacts*	*Indirect Impacts*	*Mitigation Measures*	*Residual Impacts*
Water Resources (continued)	WRMWSD	**Less than significant.** Minor reduction of SWP Table A supply that has been replaced by other water management actions. Under some extreme conditions this could result in increased reliance on other water sources and groundwater. Increased use of other water and groundwater would result in higher TDS water used and recharged to local groundwater.	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**Beneficial impact.** Increased imported water supply to meet anticipated demands. Increased SWP supply would replace water that could have otherwise been pumped from groundwater.	**Significant.** Potential increased demand on local groundwater resources during periods of reduced SWP deliveries could result in substantial short-term stressing of groundwater supplies. Potential alteration of surface flows, reduction of aquifer recharge and increased amount and rate of stormwater runoff. Increased flooding and peak flow rates could result in substantial erosion or siltation on- or off-site. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Less than significant.

1.0 INTRODUCTION

1.1 PURPOSE OF AND INTENDED USES OF THIS ENVIRONMENTAL IMPACT REPORT

This Environmental Impact Report (EIR) evaluates the potential environmental impacts of the transfer of an existing 41,000 acre-feet (AF) of State Water Project (SWP) Table A Amount[1] from a SWP contractor (the Kern County Water Agency [KCWA]) and its member unit in Kern County (the Wheeler Ridge-Maricopa Water Storage District [WRMWSD]), to the Castaic Lake Water Agency (CLWA), another SWP contractor located in Los Angeles and Ventura counties. This EIR also evaluates the use of SWP facilities from northern California to Los Angeles County for the delivery of SWP water to the CLWA service area, and use of this water within the CLWA service area. These actions are referred to as "the Project" in subsequent sections of this EIR.

The Project is intended to meet water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area. CLWA is not a land use agency and has no control over where and when growth will occur within its service area. To the extent that land use decision-makers utilize or rely on this EIR to predict future CLWA water supplies, they are cautioned that although CLWA will implement all feasible measures to firm up its water supplies (and CLWA's retail purveyors may implement conjunctive use programs using SWP and groundwater supplies to increase the reliability of deliveries to their customers), past water deliveries are not a guarantee of future delivery rates. Rather than repeat this advice to decision-makers in each section of the EIR, the reader is requested to keep this advice in mind when reading the information about the availability and reliability of water supplies wherever such information appears. Information regarding water supplies is presented throughout this document as it relates to the CLWA service area (section 1.3.1), the Project description (section 2.3), the environmental setting (section 3.0), and growth-inducing effects and growth-related impacts (Chapter 4). To facilitate your reading of this EIR, it is suggested that the reader refer to section 10.0, "List of Acronyms and Glossary of Terms." The acronyms used in this EIR are defined the first time they are used in the text. The California Environmental Quality Act (CEQA) requires preparation of an EIR when an agency action is believed to have a potential for significant impacts to the environment. An EIR is "a public document used by the governmental agency to analyze the significant environmental effects of a proposed project, to identify alternatives, and to disclose possible ways to reduce or avoid the possible environmental damage" (Title 14, California Code of Regulations [CCR], section 15002). An EIR serves as an informational document for decision-makers and the general public alike. This is a Project EIR addressing actions that were anticipated and

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1 "Table A" is a term used in SWP Water Supply Contracts. The "Table A Amount" is the annual maximum amount of water to which an SWP Contractor has a contract right to request delivery, and is specified in Table A of each Contractor's Water Supply Contract. (Prior to the Settlement Agreement arising out of a legal challenge to the Monterey Amendment to the State Water Project contracts, the Table A Amount was referred to as "entitlement.") The amount of water actually available for delivery in any year may be an amount less than the Contractor's Table A Amount due to a number of factors, including hydrologic conditions. The parallel term used in the member unit contract between KCWA and WRMWSD is "Contract Entitlement" (sometimes referred to as "Table 1 Entitlement"). For the sake of brevity, in this EIR the term "Table A Amount" refers to the Table A Amount in the SWP Water Supply Contracts, or "Annual Entitlement" prior to the Monterey Amendment; where the term is used in connection with WRMWSD, it refers to the Table 1 Entitlement under its member unit contract with KCWA.

programmatically evaluated in the certified Capital Program and Water Plan, including Acquisition of Supplemental Water and of a Proposed Second Plant Site Final EIR (Capital Program EIR) (CLWA 1988), described below in section 1.2.4.

CLWA is the lead agency for preparation of the EIR and thus will evaluate, and if appropriate, certify this EIR, make CEQA findings, and approve the Project. CLWA has the principal responsibility for carrying out and implementing the Project because 1) a substantial portion of the Project occurs within CLWA's jurisdiction and substantially affects CLWA; 2) CLWA has been the lead proponent of the Project and has assumed the primary task of effectuating the SWP water supply contract amendment; 3) CLWA has the expertise to implement the Project; and 4) the Project, although requiring the use of SWP facilities, would involve transfers only between three agencies (CLWA, KCWA, and WRMWSD) within a limited geographic area and does not implicate the entire statewide water rights or supply framework. All documents referenced in this EIR are available for public inspection at the CLWA offices at 27234 Bouquet Canyon Road, Santa Clarita, CA 91350, (661) 297-1600.

The California Department of Water Resources (DWR), KCWA, and WRMWSD are considered to be responsible agencies. Responsible agencies are public agencies other than the lead agency that have responsibility for carrying out or approving a project (CEQA Guidelines section 15381).

1.2 RELATED ENVIRONMENTAL DOCUMENTATION

1.2.1 Supplemental Water Project EIR

The transfer of 41,000 AF of SWP Table A Amount from KCWA and its member unit, WRMWSD, to CLWA (41,000 AF Transfer Agreement) and the Point of Delivery Agreement between DWR, KCWA, and CLWA were evaluated previously in the Supplemental Water Project Final EIR (CLWA 1999). The transfer of SWP Table A Amount that is the subject of the present EIR was contractually completed in 1999, and imported water supply associated with the transfer became available for use by CLWA starting in January 2000.

The Second Appellate Court, Fourth Division and the Superior Court of Los Angeles ordered that this EIR be decertified in January 2002 (*Friends of the Santa Clara River v. Castaic Lake Water Agency* (2002) 95 Cal. App. 3d 1373 [*Friends*]) because it tiered from the Monterey Agreement Program EIR, which was itself decertified as a result of an appellate court decision issued while *Friends* was on appeal (refer to section 1.2.3 for a discussion of the Monterey Agreement EIR). "All other contentions" concerning the legal adequacy of the Supplemental Water Project EIR were found to be "without merit." The Court of Appeal specifically ordered the Trial Court to "issue a writ of mandate vacating the certification of the EIR," and to "retain jurisdiction until [CLWA] certifies an EIR complying with CEQA," and "consider such orders it deems appropriate under section 21168.9 [of the Public Resources Code]." The CLWA Board of Directors decertified CLWA's Supplemental Water Project Final EIR on November 27, 2002.

In September 2002, the Trial Court was requested to prohibit CLWA from using the 41,000 AF in any manner. Trial Court refused to enjoin the performance of the 41,000 AF Transfer Agreement, maintained its jurisdiction over the matter, and authorized CLWA to utilize "any of the 41,000 AFY [acre-feet per year]," albeit, with certain limitations:

> Respondent [CLWA] will not be prohibited from using the water to which it is entitled, but petitioner may renew its application for such prohibition based upon evidence of the actual use of such additional water for purposes it considers improper.

The above Order was issued without prejudice to a renewed request by the Petitioner for an injunction on all of portions of CLWA's project pending completion of the EIR[2]. The present EIR is being prepared in accordance with the decisions of the Second Appellate Court, Fourth Division and the Superior Court of Los Angeles (Superior Court Case No. BS05694).

KCWA, WRMWSD, CLWA, and DWR previously approved the various contract amendments on the basis of the 1999 Supplemental Water Project Final EIR and other environmental analyses and documentation.

1.2.2 Monterey Amendment Program EIR

During the 1990s, disagreements arose between DWR, Agricultural Contractors, and municipal and industrial (M&I) Contractors about how available SWP supplies should be allocated. The SWP Contractors and DWR agreed to negotiate a settlement of their differences and develop a new approach to managing SWP resources through a major overhaul of the Water Supply Contracts. After a series of exhaustive negotiating sessions, an agreement was reached in December 1994 in Monterey, California on a set of principles, known as the "Monterey Agreement." The Monterey Agreement principles were implemented through an amendment to the Water Supply Contracts between DWR and the SWP Contractors, which became known as the "Monterey Amendment." The term "Monterey Amendment" is used in subsequent sections of this EIR. The Monterey Amendment was approved in 1995 and went into effect in August 1996. A summary of the provisions of the Monterey Amendment is provided in section 1.4.2.

A Program EIR analyzing the environmental impacts of the Monterey Amendment (Monterey Agreement EIR) was prepared and certified by the Central Coast Water Authority (CCWA) in 1995. In late 1995, a lawsuit was filed by the Planning and Conservation League (PCL), Plumas County Water Conservation and Flood Control District (Plumas County), and Citizens Planning Association of Santa Barbara County (CPA) (collectively referred to as the "plaintiffs") challenging the EIR. The plaintiffs argued that the environmental impact analysis prepared was inadequate because CCWA was not a proper lead agency and the EIR analysis did not reflect the inability of the SWP to deliver full Contract amounts to Contractors, even though they held contractual "entitlements" to those supplies. In 2000, the California State Court of Appeal (Third District) found that a new EIR must be prepared. That litigation is referred to as the PCL Litigation in this EIR.[3]

2 Petitioners appealed the Remand Order issued by the Superior Court in this case. The Court of Appeal affirmed the trial court's order (refusing the request for an injunction) on December 1, 2003.

3 *Planning and Conservation League, et al. v. Department of Water Resources* (2000) 83 Cal. App. 4th 892.

Discussions to mediate a settlement began in 2001 and were finalized in May 2003.[4] All parties to the litigation have signed the Settlement Agreement. The Settlement Agreement calls for DWR to prepare a new EIR pursuant to CEQA (a Notice of Preparation [NOP] was issued by DWR on January 24, 2003),[5] while the Monterey Amendment's provisions remain in operation. Pursuant to the Settlement Agreement, the parties are now administering the preparation of a new EIR, which is expected to be completed in approximately two years. The new EIR will evaluate the potential environmental impacts of changes to SWP operations incorporated in the Monterey Amendment and the Settlement Agreement. The Settlement Agreement also calls for DWR to produce a biennial SWP Delivery Reliability Report. The SWP Delivery Reliability Report - 2002 was issued in May 2003 (DWR 2003b) (see section 1.3.2). The Settlement Agreement did not change the substance of the Monterey Amendment, but addressed the process by which the new Monterey Amendment EIR will be prepared.

It should be noted at this point that the Settlement Agreement concerning the PCL Litigation creates a specific exclusion for this Project from any prohibitions against transfers of State Water Project Table A Amounts by the Settlement Agreement. The exclusion states:

> With respect to Section III(C)(4)(b) regarding the Kern-Castaic Transfer, the Parties recognize that such water transfer is subject to pending litigation in the Los Angeles County Superior Court following remand from the Second District Court of Appeal (*See Friends of the Santa Clara River v. Castaic Lake Water Agency 95 Cal.App.4th 1373, 116 Cal.Rptr.2d 54 (2002); review denied, April 17, 2002*). The Parties agree that jurisdiction with respect to that litigation should remain in that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation.

The order on remand from the appellate court in the Friend case specifically ordered the Trial Court "to retain jurisdiction until [CLWA] certifies an EIR complying with CEQA" and "consider such orders it deems appropriate under section 21168.9 [of the Public Resources Code]." This EIR thus remains under the jurisdiction of the Superior Court until the EIR is certified by CLWA.

1.2.3 Capital Program and Water Plan, including Acquisition of Supplemental Water and of a Proposed Second Plant Site, EIR

In 1988, CLWA completed the Capital Program and Water Plan, including Acquisition of Supplemental Water and of a Proposed Second Plant Site, Final EIR (Capital Program EIR) (CLWA 1988), which evaluated the potential environmental impacts of the proposed Capital Improvements Program, including the acquisition of supplemental water, and the construction of a new treatment plant and facilities improvements. The Capital Program EIR evaluated a proposal for CLWA to obtain additional SWP Table A Amount of up to 37,800 AF to supplement the 1988 SWP Table A Amount of 41,500 AF. This EIR assumed that deliveries

4 In May 2003, the settlement agreement among the plaintiffs, DWR, and the SWP Contractors (referred to herein as the "Settlement Agreement") was executed and approved by the State Attorney General's office. On May 20, 2003 the Settlement Agreement was approved by the Sacramento Superior Court.

5 The NOP is entitled Notice of Preparation of Environmental Impact Report for the Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Other Contract Amendments and Associated Actions as part of a Proposed Settlement Agreement in Planning and Conservation League v. Department of Water Resources.

from the new SWP Table A Amount would become 100 percent reliable before 2010. It also identified a total water demand of 120,000 AFY to support a population of 270,000 persons in the year 2010. The implementation of reasonable conservation measures and recycling was projected to reduce net demand to 106,300 AFY, an approximately 11 percent reduction. The Project evaluated in the present EIR was programmatically evaluated in the Capital Program EIR (CLWA 1988).

1.3 WATER AGENCIES AND DISTRICTS INVOLVED IN THE WATER TRANSFER

1.3.1 Castaic Lake Water Agency

The CLWA service area comprises approximately 195 square miles (124,800 acres) in Los Angeles and Ventura counties, as shown on Figure 1.2-1. CLWA serves the incorporated and unincorporated areas in, or adjacent to, the Santa Clarita Valley. Most of this area, including the incorporated cities, is within the geographic boundaries of Los Angeles County, but it also extends into a small portion of eastern Ventura County. The service area includes largely urban areas, such as the City of Santa Clarita, other smaller communities, and rural areas. The West Branch of the California Aqueduct terminates at Castaic Lake, in the northern portion of the service area.

CLWA, a water wholesaler, was created by the California Legislature in 1962 through passage of the "Castaic Lake Water Agency Law." At the time, its principal purpose was contracting with the State of California, through DWR, to acquire and distribute SWP water to its four local retail water purveyors: CLWA's Santa Clarita Water Division, Los Angeles County Waterworks District No. 36, Newhall County Water District, and Valencia Water Company. Subsequent legislation broadened CLWA's purpose, which now includes, but is not limited to, the following:

- acquire water from the state;
- distribute such water wholesale through a transmission system to be acquired or constructed by CLWA;
- reclaim (recycle) water;
- sell water at retail within certain boundaries; and
- exercise other related powers.

Adequate planning for, and the procurement of, a reliable water supply is a fundamental function of the CLWA. CLWA obtains its water supply for wholesale purposes principally from the SWP and has a Water Supply Contract with DWR for 95,200 AF of SWP Table A Amount. The transfer of 41,000 AF of this 95,200 AF to CLWA is, however, the subject of this EIR. Therefore, for the purposes of evaluating the environmental impacts of the Project, CLWA is assumed to have 54,200 AF of SWP Table A Amount. This represents the pre-Project baseline situation.

CLWA has evaluated the long-term water needs (water demand) within its service area based on applicable county and city plans and has compared these needs against existing and potential water supplies. CLWA prepared the Capital Improvements Program in 1988, and in

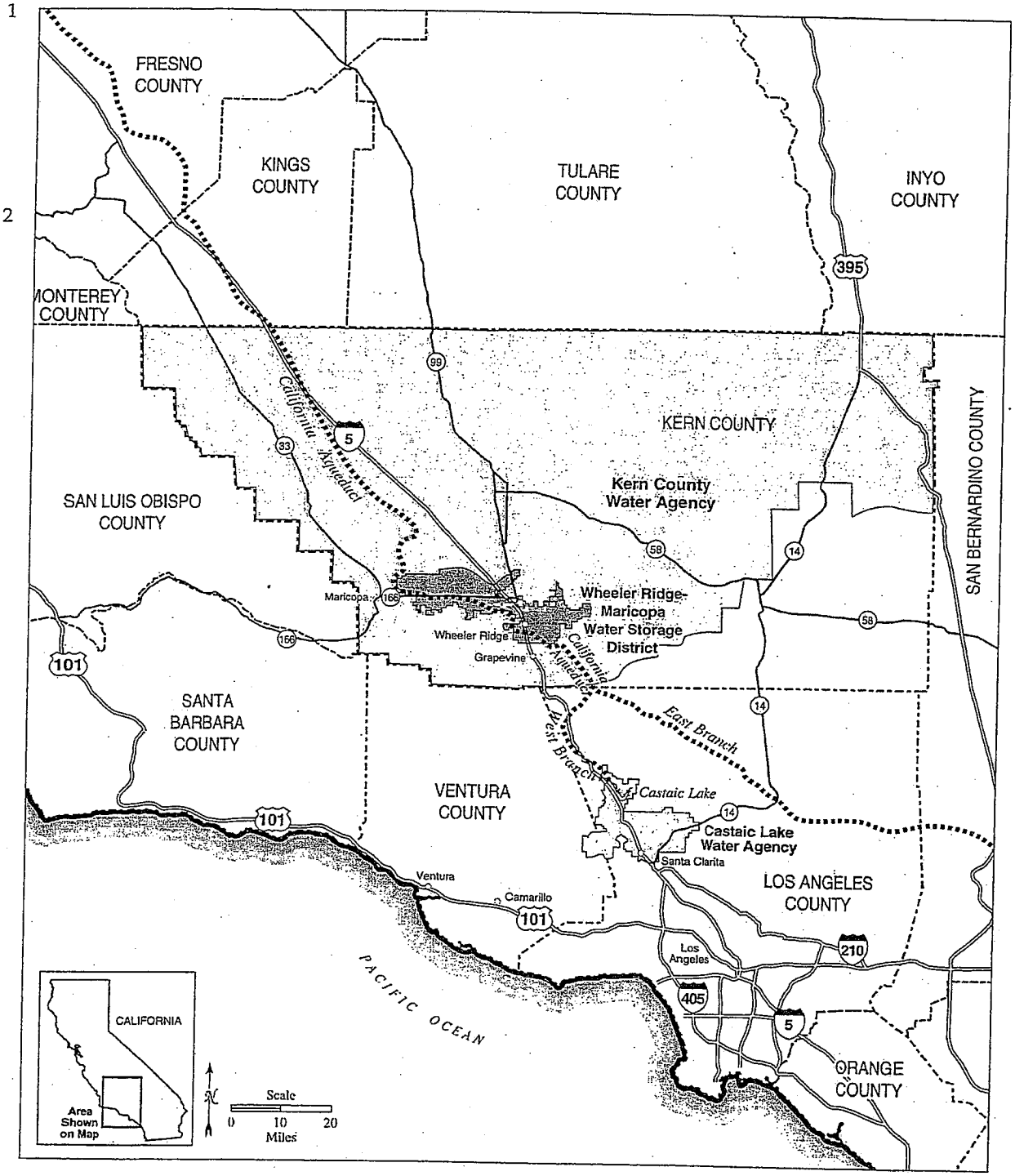

Figure 1.2-1. Regional Setting Including Kern County Water Agency, Wheeler Ridge-Maricopa Water Storage District, and Castaic Lake Water Agency

2000 published the 2000 Urban Water Management Plan (UWMP) to address water supply and demand issues. (The UWMP was challenged in the Superior Court of Kern County and a judgment was entered in July 2003 upholding the UWMP in all respects. The petitioners in that case have appealed the judgment. The UWMP is and remains a valid document as of the time of the preparation of this EIR. The UWMP is scheduled for update in 2005.) The Capital Improvements Program and UWMP address reclamation (recycling) options, supplemental supply, and physical improvements. Based on projected demands (and despite potential savings from conservation programs, reclamation of existing water supplies for irrigation, and expanded use of local groundwater sources), supplemental water sources appear to be needed. Water banking also appears to be needed to improve overall reliability of the water supply, particularly during periods of drought.

The availability of local water supplies has been the subject of some controversy in the Santa Clarita Valley over the last few years. The water suppliers' consulting engineers recently calculated the availability of local groundwater at 50,000 AFY (Slade 2002) based on updated studies prepared using reasonable, accepted engineering and scientific practices (perchlorate remediation measures and recycled water use were considered in these studies). Some Santa Clarita Valley residents have questioned the conclusions of these studies and claim that only about 32,000 AFY of water is available based on conclusions in an earlier report published in 1986 (Slade 1986). They also claim that water from the Saugus Formation should not be calculated as available on a long-term basis until the perchlorate contamination in a small part of this formation is fully contained or remediated. CLWA, CLWA Santa Clarita Water Division, Newhall County Water District, and Valencia Water Company have received $8 million as reimbursement for litigation costs and studies to determine the cleanup plan for the perchlorate. CLWA and the retail purveyors are presently identifying the method of cleanup and the costs of cleanup to be paid by the insurance companies of Whitaker Bermite and related parties. It is anticipated the cleanup should be in place by 2006.

Planning for an adequate water supply to meet demands requires consideration of the reliability of SWP supplies, because history and statistical analysis indicate that the full contracted Table A Amount will not be available for delivery to the SWP Contractors in some years. While CLWA's contract with DWR sets the specific maximum of CLWA's SWP Table A Amount, the amount of SWP water actually available for delivery to CLWA and the other SWP Contractor agencies varies from year to year depending on hydrology, the amount of water in storage, the operational constraints and requirements imposed by regulatory agencies to meet environmental water needs, the amount of water requested by other SWP Contractors, climatic conditions, and other factors. The amount of Table A Amount water delivered to CLWA, and all other SWP Contractors is based on the requests for delivery and the amount of water available.

1.3.2 Kern County Water Agency and the Wheeler Ridge-Maricopa Water Storage District

KCWA, a water wholesaler, was created by the California Legislature in 1961 to secure and supply adequate water to its local member units in Kern County. KCWA includes most of Kern County, an area of approximately 8,160 square miles or 5.22 million acres (refer to Figure 1.2-1). KCWA's Water Supply Contract was 1,087,730 AF of SWP Table A Amount in 1998, but was reduced to 1,000,949 AF in 2003 because KCWA had completed several Table A transfers with

other SWP Contractors consistent with the terms of the Monterey Amendment since early 1999, including the 41,000 AF transferred to CLWA that is the subject of this EIR. Therefore, for the purposes of evaluating the environmental impacts of the Project, KCWA is assumed to have 1,087,730 AF of SWP Table A Amount, its SWP Table A Amount in 1998 (DWR 2001a).

WRMWSD, a retail water purveyor, was formed in 1959 by an election of landowners as provided by Division 14 of the California Water Code. The district contains approximately 228 square miles (146,000 acres) and is located in the southern end of the San Joaquin Valley in Kern County as shown in Figure 1.2-1. The district mostly occupies the valley floor and smooth sloping foothill lands at the southern apex of the San Joaquin Valley between the Coast Mountain Range to the west and the Tehachapi Mountain Range to the east. Lands within the district are used predominantly for agricultural purposes, although small areas of industrial development and the unincorporated community of Lakeview are within the district, along with the town site of Wheeler Ridge. The California Aqueduct traverses the district for approximately 34 miles, and the Teerink, Chrisman, and Edmonston pumping plants are all in, or within one mile of, the district.

WRMWSD obtains SWP water through a contract with KCWA. WRMWSD's contract is currently for 197,088 AF of SWP Table A Amount through KCWA; however, in 1998, prior to the implementation of the Project, WRMWSD's contract was for 238,088 AF of SWP Table A Amount. Therefore, for the purposes of evaluating the environmental impacts of the Project, WRMWSD is assumed to have 238,088 AF of Table A Amount. This represents the pre-Project baseline situation.

WRMWSD obtains its water supplies from the SWP, other surface water sources, and groundwater sources, and delivers water to agricultural and industrial users within the district. WRMWSD also participates in a variety of other water management activities, including groundwater banking programs outside of the district and other in-lieu and direct groundwater recharge programs[6] within the district. WRMWSD's distribution system consists of a series of pipelines, pumping plants, canals and related facilities that deliver surface water from 16 separate turnouts on the California Aqueduct to approximately 72,000 acres of lands with long term water service contracts.

Some of the landowners within the district have executed long-term contracts with WRMWSD for the delivery of surface water, including SWP water, by the WRMWSD distribution system. These lands are collectively referred to as "contract lands," and rely mainly on surface water to meet water demands. Approximately 49 percent of the lands in the WRMWSD hold contracts for surface water. Lands in WRMWSD that do not hold long-term contracts for surface water, or "non-contract lands," rely mainly on groundwater supplies to meet water demands. Surface water, including SWP water when available, can be delivered to certain non-contract lands within WRMWSD (generally those that historically have held contracts) via the existing WRMWSD distribution system.

6 In-lieu groundwater recharge is the process of recharging groundwater supplies by substituting surface water for groundwater that would otherwise be extracted and used. Direct groundwater recharge is the process of recharging groundwater supplies by the percolation of surface water supplies into the groundwater basin, most commonly done through the use of groundwater recharge ponds.

1.3.3 Department of Water Resources

DWR operates the SWP and is responsible for overall water planning for the state of California. This agency has long-term water supply contracts for water service from the SWP with 29 local agencies for about 4.2 million acre-feet (MAF) annually. DWR's State Water Project Analysis Office is responsible for negotiating and administering water contracts and acts as a contractor liaison with long-term SWP Contactors for water deliveries and special projects.

1.4 OVERVIEW OF SWP FACILITIES AND WATER SUPPLY CONTRACTS

This section is intended to provide the reader with an overview of the SWP facilities and Water Supply Contracts (Water Supply Contracts or Contracts) related to the Project to facilitate review of the project description and environmental impact analyses. A more detailed description is included in Appendix D.

1.4.1 SWP Facilities

The SWP is a large water supply, storage, and distribution system authorized by an act of the California State Legislature in 1959. In 1960, California voters approved a $1.75 billion bond issue to begin building SWP facilities. Today, the SWP includes 28 storage facilities, reservoirs and lakes; 20 pumping plants; six pumping-generating plants and hydroelectric power plants; and about 660 miles of aqueducts and pipelines. These facilities are further described in section 3.15, Water Resources. Figure 1.3-1 provides an overview of SWP facilities.

The primary water source for the SWP is the drainage of the Feather River, a tributary of the Sacramento River. Runoff released from Oroville Dam in Butte County flows down natural channels to the Sacramento-San Joaquin River Delta (Delta), where some of the water is pumped through the North Bay Aqueduct to Napa and Solano counties. In the southern Delta, water is pumped from the Clifton Court Forebay by the Harvey O. Banks Delta Pumping Plant (Banks Pumping Plant) into the 444-mile-long, Governor Edmund G. Brown California Aqueduct (California Aqueduct).

The California Aqueduct conveys water to the primarily agricultural users in the San Joaquin Valley and the primarily urban regions of the San Francisco Bay Area, the Central Coast, and southern California. From the California Aqueduct, water is diverted into the South Bay Aqueduct for delivery to Contractors in Alameda and Santa Clara counties. Further downstream, water is delivered directly from the California Aqueduct to Contractors in the central and southern San Joaquin Valley, including WRMWSD and the other member units of the KCWA. Near Kettleman City, water is diverted into the SWP Coastal Branch Aqueduct, which carries water to San Luis Obispo and Santa Barbara counties and the northwestern portion of KCWA. The water is transported along the west side of the San Joaquin Valley through a series of four pumping plants before reaching the Edmonston Pumping Plant. This plant lifts the SWP water 1,926 feet over the Tehachapi Mountain Range. Water intended for use in southern California is conveyed through the West Branch to Castaic Lake and through the East Branch to Lake Perris, which are referred to as terminal reservoirs for the SWP.

The original plan for the SWP included constructing additional water storage facilities as Contractor demands increased, however, essentially no new construction of additional SWP storage facilities has occurred since the initial SWP facilities were completed. Although future

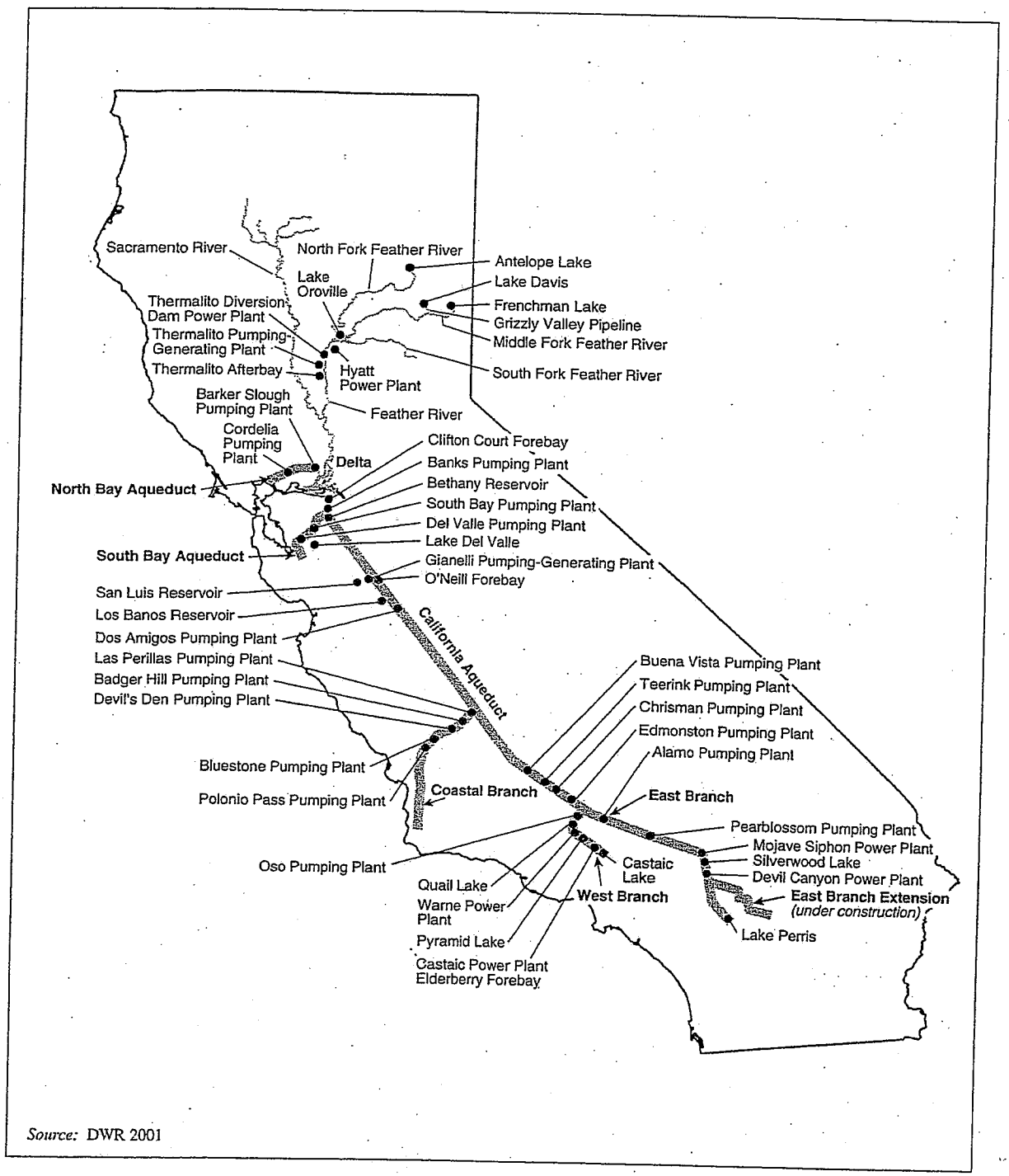

Figure 1.3-1. Primary SWP Facilities

construction or other actions can improve the quantity and reliability of SWP supplies (e.g., the CALFED Bay-Delta Program, the Napa Accord, and the South Delta Improvement Program), these actions entail their own environmental reviews, potential litigation delays, and multi-year construction period, therefore, it is likely to take many years before any additional storage and/or conveyance facilities that improve SWP reliability are operational. The reliability of SWP supplies will not likely improve in the foreseeable future.

1.4.2 SWP Water Supply Contracts

Overview

In 1960, DWR began executing individual Water Supply Contracts with public agencies throughout the State of California for financing and constructing SWP facilities designed to deliver water to each public agency. ("SWP Contractors" or "Contractors" collectively refer to the public agencies that hold SWP Water Supply Contracts with DWR.) Each Water Supply Contract identifies a Table A Amount, the annual maximum amount of water to which an SWP Contractor has a contract right. The Table A Amount is specified as either "agricultural" or "municipal and industrial" (M&I). Of CLWA's 54,200 AF of Table A Amount, 41,500 AF is designated as an M&I Table A Amount and 12,700 AF is an agricultural Table A Amount. WRMWSD's entire Table A Amount is an agricultural Table A Amount.

Each Contractor annually submits a request to DWR for water delivery in the following year, in any amount up to the Contractor's Table A Amount. The Water Supply Contracts provide that in a year when DWR is unable to deliver total Contractor requests, deliveries to all Contractors will be reduced so that total deliveries equal total available supply for that year. While SWP Contractors currently (2003) hold Table A Amounts totaling approximately 4.173 MAF, the amount of water actually requested by Contractors is less than that due to a number of M&I Contractors whose demands have not yet increased to their full Table A Amount. Even at these lower current demands, however, the SWP cannot meet all water delivery requests in some years due to operational and environmental constraints. Given existing SWP facilities, operational conditions, and Contractor demands, the SWP can deliver an annual average of approximately 2.96 MAF (DWR 2003b). As Contractor demands increase, the SWP is currently projected to be able to deliver an average of about 3.1 MAF (DWR 2003b).

Under the original Water Supply Contracts, the Agricultural Contractors agreed in years of shortage (i.e., when SWP supplies were insufficient to meet Contractors' requests) to first accept a certain amount of reduction in deliveries (the "initial agricultural reduction" before any remaining reduction was shared proportionately between the Agricultural and M&I Contractors. In exchange, the Agricultural Contractors received, among other favorable terms, a priority for "surplus" SWP supplies when available (i.e., SWP supplies that could be delivered in excess of Table A requests, generally available in wetter hydrologic years and/or in the early years of the SWP when demands were still low). Under the original plan for the SWP, which involved the construction of additional water storage facilities as Contractor demands increased, shortages in SWP supplies were anticipated to occur relatively infrequently and in small enough magnitudes that only Agricultural Contractors were expected to incur shortages. In the early 1990s, however, a multi-year drought coupled with increased SWP operational constraints and environmental water requirements due to the listing of several fish species as endangered or threatened, resulted in several years when SWP supplies fell below

Contractors' requests for deliveries. The initial agricultural provision in the Water Supply Contracts resulted in Agricultural Contractors receiving only half their requested supply in 1990 and no water in 1991, while the M&I Contractors received all of their requested supply in 1990 and 30 percent of their requests in 1991. Because Contractors pay their proportionate share of fixed project costs regardless of how much water is delivered, plus variable costs based on the amount of water delivered, Agricultural Contractors underwent severe delivery reductions but received little financial relief from their fixed project cost obligations. This situation led to increasing disagreements between DWR, the Agricultural Contractors, and the M&I Contractors about how available supplies should be allocated.

The Monterey Amendment

In 1994-1995, the SWP Contractors and the DWR agreed to negotiate a settlement of their differences and develop a new approach to managing SWP resources through a major overhaul of the Water Supply Contracts, known as the Monterey Amendment. The provisions of the Monterey Amendment are summarized below. Additional detail regarding the relationship between the Monterey Amendment and the Project is included in section 3.15.2.2 and Appendix D.

Allocation of SWP Water Supplies

- New method for allocation of all water supplies in proportion to each Contractor's contract amount (Table A Amounts).
- Elimination of the initial supply reduction to Agricultural Contractors in years of shortage (modification of Article 18(a) of the Water Supply Contracts).
- Replacement of certain categories of water with a single category of Article 21 water[7] allocated on the basis of Table A amounts and delivered at the same power rate as Table A Amounts.
- Elimination of the permanent shortage provision (Article 18(b) of the Water Supply Contracts).

Transfer of Table A Amounts and Land

- The permanent retirement of 45,000 AF of Table A Amount by Agricultural Contractors.
- Make 130,000 acre-feet of agricultural Table A Amounts available for permanent sale to M&I Contractors.[8]
- Transfer of the Kern Fan Element property to local control.

7 Water that DWR makes available when water and capacity are available in excess of SWP storage needs and Table A supplies. This water is only available for limited time periods, generally only in the winter or early spring when Contractors' demands are low, and only under specific conditions that do not occur on an annual basis. This type of water is identified in Article 21 of the Water Supply Contracts. It is the same as, but replaced, unscheduled surplus water as part of the Monterey Amendment. Additionally, Article 21 water was defined under the Monterey Amendment as "interruptible water," but it is more commonly referred to as "Article 21 water." For purposes of the present EIR, the term "Article 21 water" is being used; however, both terms are presented in the water resources glossary in Chapter 3.15.

8 The 41,000 AF transfer associated with the Project represents a portion of the 130,000 AF transfer that the Agricultural Contractors agreed to make available for permanent transfer in the Monterey Amendment.

Water Management Provisions

- Enable voluntary water marketing, groundwater banking, and more effective use of existing SWP facilities.
- Explicitly provide for groundwater or surface storage of SWP water outside Contractor's service area for later use within its service area.
- Expand Contractor rights to store water in San Luis Reservoir when storage space is available.
- Specify Contractor rights to flexible storage in terminal reservoir facilities.
- Clarify terms for transport of non-SWP water in SWP facilities for Contractors.
- Create a Turnback Pool for the annual sale to interested Contractors of SWP supplies allocated to other Contractors but unneeded by them.

Financial Restructuring

- Use SWP funds to establish an SWP operating reserve.
- Establish a program of water rate management which, when SWP cash flow permits, provides for a credit in charges to M&I Contractors, as well as Agricultural Contractor trust funds for rate management.

The Monterey Amendment Litigation

In 1996, a lawsuit regarding the role of the DWR as the CEQA lead agency, among other issues, was filed (*Planning and Conservation League, et. al. vs. Department of Water Resources and Central Coast Water Authority*). Following Superior and Appellate Court decisions ordering the Monterey Agreement EIR to be decertified, mediation discussions were conducted. In July 2002, the discussions resulted in a statement of principles for the settlement of the litigation. In May 2003, the settlement agreement among the plaintiffs, DWR, and the SWP Contractors (referred to herein as the "Settlement Agreement") was executed and approved by the State Attorney General's office and by the Sacramento Superior Court. While complex, the key components applicable to this EIR are presented below:

- Continue operation under Monterey Amendment provisions.
- Establish a watershed forum for Plumas County to pursue watershed restoration and provide for amending Plumas County's Water Supply Contract regarding shortages.
- Amend and clarify SWP Water Supply Contracts to substitute in certain instances "Table A Amount" for "entitlement."
- Implement new procedures for disclosure of SWP delivery capabilities.
- Issue guidelines on permanent Table A Amount transfers.
- Establish procedures for public participation in certain Water Supply Contracts amendment negotiations.
- Provided certain funding to the plaintiffs for multiple purposes, including watershed restoration.

1.5 PUBLIC INVOLVEMENT PROCESS

The original decision to prepare an EIR for the Project was made following the completion of an Initial Study, which was filed with the California State Clearinghouse and distributed to interested parties on April 21, 1998. Comments on the April 1998 NOP and Initial Study were received from State agencies, regional and local governmental agencies, regional authorities, and non-governmental organizations. The comments received on the April 1998 NOP and Initial Study were considered by CLWA and helped refine the scope of the 1999 Supplemental Water Project EIR.

Subsequent to the court ordered decertification of the 1999 Supplemental Water Project EIR, a second NOP and Initial Study were distributed to the California State Clearinghouse and other potentially interested parties on January 22, 2003. Comments on the January 2003 NOP were received from State agencies, regional and local governmental agencies, regional authorities, and non-governmental organizations. The comments received on the January 2003 NOP were considered by CLWA and helped refine the scope of analysis of the present EIR. A copy of the January 2003 NOP and Initial Study and comment letters received are provided in Appendix A.

1.6 EIR ORGANIZATION

The Project is described in Chapter 2 of this EIR; the affected environment, environmental impacts of the Project, and mitigation measures for potentially significant impacts are described in Chapter 3 for each resource considered; growth inducement and growth-related impacts and mitigation measures are discussed in Chapter 4; consistency with adopted plans and policies is addressed in Chapter 5; cumulative impacts of the Project in combination with other projects are addressed in Chapter 6; Project alternatives, including alternatives eliminated from consideration, the No Project Alternative, and the Environmentally Superior Alternative, are considered in Chapter 7. The remaining sections include references; persons, agencies, and organizations consulted; acronyms and a glossary of technical terms; and a list of preparers. Appendix A contains the January 2003 NOP and letters received in response to the NOP. Appendix B contains Biological Resources data on sensitive species. Appendix C contains a study conducted by Northwest Economic Associates (NEA) study to determine the potential effects of the Project on agricultural operations in the WRMWSD (NEA 2003). Appendix D contains the Water Resources Technical Appendix, including a description of the operations modeling studies used and analyses performed in support of this EIR, a summary of the results of these analyses, and related information.

2.0 PROJECT DESCRIPTION

2.1 PROJECT LOCATION

The Project would use existing SWP facilities located between the southern Delta facilities and Castaic Lake; these facilities include the SWP's southern Delta facilities (Clifton Court Forebay, the Banks Pumping Plant, and Bethany Reservoir); the San Luis Reservoir facilities (San Luis Reservoir, O'Neil Forebay, and the Gianelli Pumping-Generating Plant); and the California Aqueduct from the southern Delta to Castaic Lake, including pumping plants, a power plant, and storage facilities along the Aqueduct (Buena Vista, Teerink, Chrisman, Edmonston, and Oso pumping plants, Warne power plant, and Quail, Pyramid and Castaic lakes). These facilities are located in Alameda, Contra Costa, Fresno, Kern, Kings, Los Angeles, Merced, San Joaquin, and Stanislaus counties. Figure 1.3-1 shows the location of the primary SWP facilities. The Project also could affect environmental resources located in the CLWA and WRMWSD service areas. The CLWA service area is located in northern Los Angeles and eastern Ventura counties. The WRMWSD is located in the southern extent of the San Joaquin Valley in Kern County. The locations of CLWA and WRMWSD are shown on Figure 1.2-1.

2.2 PROJECT OBJECTIVES

The portion of the CLWA service area that is located within the unincorporated and incorporated portions of Los Angeles County is experiencing substantial growth in population and urbanization. This trend is expected to continue based on development that already has been approved by the County of Los Angeles and the City of Santa Clarita and development that is projected in local adopted plans. Pursuant to the provisions of its SWP Water Supply Contract, CLWA has over time acquired a right to delivery of SWP water at an amount necessary to reasonably supply the Agency's increasing demand. The Project is an action by CLWA to maintain the water supply needed to meet water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area.

Specific Project objectives are as follows:

- Augment CLWA's SWP Table A Amount to meet water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area.
- Provide a means of delivery for the augmented water supplies.

2.3 DESCRIPTION OF THE PROJECT

The Project is the transfer of an existing 41,000 AF of SWP Table A Amount from KCWA and its member unit in Kern County, WRMWSD, to CLWA. The Project also includes the use of SWP facilities from northern California to Los Angeles County for the delivery of SWP water to the CLWA service area, and the use of his water within the CLWA service area. The Project water is transported from certain points of origin in the SWP system to the CLWA intake south of Castaic Lake via existing SWP facilities. The points of origin and delivery are identified in the 41,000 AF Transfer Agreement and the Point of Delivery Agreement (see section 1.2.1).

The Project currently is being implemented by an amendment to the SWP water supply contracts of CLWA and KCWA. The Project is to authorize CLWA to use water delivered from the 41,000 AF of SWP Table A Amount for water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area. As described in detail in section 3.15 and Appendix D, the annual allocations of SWP water made by DWR are based on that year's hydrologic conditions, the amount of water in storage in the SWP system, and Contractors' requests for SWP supplies. Thus, the actual amount of water available for delivery to CLWA as a result of the 41,000 AF transfer would vary from year to year. (Section 3-0 outlines the assumptions used in the environmental impact analysis regarding the amount of water that would be delivered for use by CLWA.) Water would be requested by CLWA as needed to meet the demands of its service area, and as discussed in section 1.3.1, the transfer of Table A Amount would be one of a number of projects implemented by CLWA (e.g., infrastructure improvements, groundwater banking programs, increased recycling and conservation, and expanded use of local groundwater sources) to increase water reliability. Those projects that are considered reasonably foreseeable and for which sufficient information is available are included in the cumulative impacts analysis contained in section 6.3.3.1 of this EIR.

The Project does not include the construction of any additional SWP facilities or new facilities in the CLWA, KCWA, or WRMWSD service areas.

2.4 PERMITS AND OTHER APPROVALS TO IMPLEMENT THE PROJECT

The amendment to the SWP water supply contract has been approved by CLWA and DWR. Associated amendments to water supply and delivery contracts have been approved by KCWA and WRMWSD. WRMWSD is the KCWA member unit providing this Table A Amount. No permits or other approvals would be required other than the certification of this EIR.

3.0 ENVIRONMENTAL SETTING, PROJECT IMPACTS, AND MITIGATION MEASURES

This chapter describes the environmental resources that could be affected by the Project, potential direct and indirect impacts to these resources, and mitigation measures that would minimize these impacts. (Growth-related indirect impacts are addressed in detail in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.) Direct impacts are those that are caused by and immediately related to the Project. Indirect impacts are not immediately related to the Project, but are reasonably foreseeable changes in the environment caused by the direct impacts (CEQA Guidelines section 15358). The facilities and geographic areas evaluated are the SWP (including the Delta, California Aqueduct, San Luis Reservoir, Castaic Lake, and associated pumping facilities); the WRMWSD, and the CLWA service area.

This section provides an overview of the general approach used to define the environmental setting for each resource and methods used to identify fundamental Project impacts that affect multiple resources. It also summarizes the physical changes that would result from the Project.

ENVIRONMENTAL SETTING

CEQA Guidelines section 15125 directs that an EIR must include a description of the physical environmental conditions in the vicinity of the Project as they exist at the time the NOP is published. This environmental setting will normally constitute the baseline physical conditions by which the lead agency determines whether an impact is significant. This Project was previously analyzed in the 1999 Supplemental Water Project Final EIR (CLWA 1999); the 41,000 AF Transfer Agreements were thereafter duly executed, and the Project was implemented. Solely relying on the description of physical conditions that existed at the time that the NOP for the present EIR was published (January 2003) would fail to capture any changes to the original conditions that may have resulted from the ongoing implementation of the 41,000 AF Transfer Agreement. Thus, this EIR's description of the Project's environmental setting includes information from the general timeframe when the January 2003 NOP was issued (referred to as current or present conditions), as well as information describing the environmental setting as it existed when the NOP for the 1999 Supplemental Water Project Final EIR was published (April 1998).

Table 3.0-1 describes the key substantive changes in the environmental setting, if any, that occurred between 1998 and the present for each environmental resource analyzed in this EIR. The description of the environmental setting approximates as closely as reasonable the conditions that were present when the NOPs for both EIRs were published. In some cases, however, information is not available for these exact timeframes, so the best available data was used. The 2000 Census, for example, is the most accurate source of information regarding current population and housing in the Project areas, and 2000 data are the most current available for Important Farmland. In other cases, particularly when there was a notable change that occurred after the 2003 NOP was issued (e.g., the adoption of new air quality management plans affecting the WRMWSD and CLWA service area), this more current information was included.

1 **Table 3.0-1. Key Differences between the 1998 and Current Environmental Setting**

Resource	*SWP*	*WRMWSD*	*CLWA*
Aesthetic Resources	No substantial difference, although increased land development (urban and agricultural) has occurred both in the San Joaquin Valley and in the area west of Castaic Lake.	Generally the same, although a minor amount of development has occurred along Interstate 5.	Development has continued to change the aesthetic character of the Santa Clarita Valley from a more rural to more urban landscape.
Agricultural Resources	No difference.	Non-Irrigated Farmland decreased by approximately 59 percent; Urban and Built-up Land decreased by approximately 13 percent; both Prime Farmland and Other Land decreased by less than 1 percent. The acreage of other farmland categories increased: Farmland of Statewide Importance (+7 percent), Unique Farmland (+less than 1 percent), Irrigated Farmland (+7 percent), and Grazing Land (+13 percent).	1,731 acres were converted from agricultural use to urban use.
Air Quality	Same as described for WRMWSD and CLWA.	In 2001, the EPA reclassified the SJVAB O3 nonattainment designation from serious to severe. The total fugitive dust emissions within the SJVAB decreased substantially between 1995 and 2002, but the relative contributions of these sources to the total PM10 levels in the region did not change substantially. The 2003 PM10 Plan was adopted in 2003 and contains a Draft Concept Conservation Management Practice Program (CMP Program) for the San Joaquin Valley to regulate fugitive dust emissions from on-field activities.	The federal and state standards for CO within the SCAB were met as of the end of 2002, and the SCAQMD will request reclassification as attainment for CO in the next few years. The 2003 AQMP was adopted, which (1) updates the demonstration of attainment with the national standards for O3 and PM10; (2) replaces the 1997 attainment demonstration for the national CO standard and provides a basis for a future maintenance plan for this pollutant; and (3) updates the maintenance plan for the national NO2 standard that the SCAB has attained since 1992.

2

Table 3.0-1. Key Differences between the 1998 and Current Environmental Setting (continued)

Resource	*SWP*	*WRMWSD*	*CLWA*
Biological Resources	No substantial difference.	The Buena Vista Lake shrew's federal status has increased from species of concern to federally endangered. HCP development has begun for ranch lands within the San Joaquin Valley.	Growth has resulted in the conversion of habitat to urban uses. The San Fernando Valley spineflower was added to the state endangered list in 2001, and the Arroyo toad status was increased from federally threatened to federally endangered. Los Angeles County is updating SEA designations.
Cultural Resources	No substantial difference.	No substantial difference.	No substantial difference.
Geology, Soils, and Minerals	No substantial difference.	No substantial difference.	No substantial difference.
Hazards and Hazardous Materials	No substantial difference.	No substantial difference.	Since 1998, continued growth and development in the area have increased the amount of hazardous materials/wastes that are produced and transported around the region.
Land Use and Planning	No substantial difference.	Slight decrease in the amount of farmed area in the district and slight increase in the amount of fallowed land. Overall, no substantial change in land uses.	Continued urban development in the service area has resulted in the conversion of rural and open spaces to urban areas.
Noise	No substantial difference.	No substantial difference.	Ambient noise levels likely have increased in some portions of the service area since development has increased between 1998 and the present.
Population and Housing	No substantial difference.	Minor population and housing increase (total increase of approximately 370 people from 1990 to 2000; 129 more housing units).	Population and housing increase (total increase of approximately 40,450 people in the City of Santa Clarita from 1990 to 2000; 12,313 more housing units).
Public Services	No substantial difference.	No substantial difference, although a minor population increase occurred, thus increasing the demand for services.	Demand likely increased since the population increased between 1998 and the present. In the Santa Clarita Valley, five elementary schools and two high schools have been built since 1998. In addition, the overall amount of library space per square foot increased approximately 20 percent.
Recreation	No substantial difference.	No substantial difference.	No substantial difference, although demand for recreational resources has increased since population has increased.

Table 3.0-1. Key Differences between the 1998 and Current Environmental Setting (continued)

Resource	*SWP*	*WRMWSD*	*CLWA*
Transportation and Traffic	No substantial difference.	No substantial difference; the minor population increase in a rural area would cause minor changes to transportation and traffic.	In general, traffic volumes increased between 1998 and the present since the population increased during this period.
Utilities and Service Systems	An approximate doubling of SWP water delivered to CLWA from 1998 to 2002 resulted in an approximate doubling of electricity use from 1998 to 2002.	No substantial difference, although a minor population increase occurred, thus increasing the demand for services.	Demand likely increased since the population increased between 1998 and the present. Chiquita Canyon Landfill expansion was approved (23.0 million ton expansion). In 1998, the facility had a remaining capacity of approximately 1 million tons. Plans are being developed to expand the Sunshine Landfill's capacity to 90 million tons. The Valencia Water Reclamation Plant is undergoing expansion and will increase from 12.6 mgd to 21.6 mgd in 2004.
Water Resources	Total Table A deliveries fluctuated, ranging from a low of 1,546,740 AF in 2001 to a high of 3,714,230 AF in 2003. SWP Table A Amounts were transferred among SWP Contractors, including MWD to Coachella Valley Water Authority – 35,000 AF; Belridge Water Storage District to Zone 7 – 2,219 AF; and Tulare Lake Basin Water Storage District to Zone 7 – 400 AF. The PCL litigation challenging the Monterey Amendment was settled and essentially leaves these amendments in place (see sections 1.2.2 and 1.4.2 for a more complete description).	Water supplies generally the same, although WRMWSD has increased participation in other, more cost effective, water management options. In 1998, such water management activities could have supplied WRMWSD with an additional 59,500 AFY, and 106,000 AFY in 2002. WRMWSD's contract with KCWA from SWP water was 197,088 AF in 2002. WRMWSD's contract with KCWA was 238,088 AF of "firm supply" in 1998.	Water supply sources generally the same, although CLWA's SWP Table A Amount was increased by 41,000 AF due to the Project. In 1998, CLWA's average year SWP supply was estimated to be 46,500 AF based on available DWR model analysis. CLWA's average year SWP supply now is estimated to be 68,300 AF based on new DWR model results and Project implementation. In 1998, the total water demand in 2010 was projected to be approximately 106,300 AF. Future demand now is expected to be approximately 82,400 AF in 2010 and 102,500 AF by 2020.

Table 3.0-1. Key Differences between the 1998 and Current Environmental Setting (continued)

Resource	*SWP*	*WRMWSD*	*CLWA*
Water Resources (continued)			Based on deliveries, municipal water demands in the CLWA service area were approximately 48,870 AF in 1998 and approximately 68,230 AF in 2002. In 2002, the LARWQCB developed a tentative resolution for the chloride TMDL and a nutrient TMDL is being developed for the Santa Clara River. Additional reaches of the Santa Clara River were listed as impaired for chloride, nutrient, and coliform. Perchlorate was discovered in one additional Alluvial groundwater well in the eastern part of the basin. The CA DHS lowered the Action Level for perchlorate in drinking water from 18 ppb to 4ppb. The EPA revised MCLs for total trihalomethanes and arsenic.

KEY METHODOLOGICAL APPROACHES

Project impacts to all resources are driven by the amount of water transferred from WRMWSD to the CLWA service area and the timing of this delivery. This section provides an overview of the methods used to model the SWP water supply that would be available under different hydrologic conditions, defines two alternative SWP water allocation scenarios used in the impact analysis, and describes how indirect population and housing impacts were defined. More detailed information regarding the hydrologic modeling and SWP water allocation scenarios is included in section 3.15, Water Resources, and Appendix D.

Hydrologic Modeling

The amount of SWP water available for delivery is evaluated using computer simulations that predict SWP operations under various hydrologic conditions, facility constraints, and configurations.

1998 Environmental Setting

For the 1998 environmental setting, the amount of SWP water supply that would have been available for use by CLWA given the 41,000 AF Transfer was assessed using results from DWR's planning model, DWRSIM, because this is the modeling tool that was available during 1998. The two model studies used in this analysis simulated SWP and CVP operations and were conducted by DWR in 1998 for the CALFED Bay-Delta Program EIS/EIR (CALFED 2000). The models show the capability of the SWP to meet the assumed SWP demand given a range of hydrologic conditions and given an assumed set of physical facilities and operating constraints.

The two DWRSIM studies both assume the use of SWP facilities and operating constraints that were present in 1998. One study uses 1998 estimates of existing Contractor demands and upstream land and water use, and the other uses 2020 projections for both Contractor demands and upstream land and water use.

Current Environmental Setting

Since 1998, the modeling tool DWR uses to simulate operations has evolved (first to CALSIM I, and more recently to CALSIM II). However, while the modeling tool itself has changed, the criteria used in the models to simulate SWP operations have not changed significantly. DWR has completed a recent assessment of SWP reliability in its SWP Delivery Reliability Report (2003b), based on CALSIM II, but the results of these new studies are comparable to the results of the older DWRSIM studies (see Appendix D for a comparison of these model study results). Results from the CALSIM II studies from DWR's SWP Delivery Reliability Report were used for determining estimates of SWP water supplies for the current environmental setting since this is the modeling tool that is currently in use. CALSIM II is based on estimated 2001 SWP demand, which is higher than the 1998 demand due to increased M&I Contractor demands.

Environmental Impact Analysis

The environmental impact analysis was conducted using DWRSIM because at the time the analysis was begun in early 2002, CALSIM I was undergoing revision and a decision was made to use the established DWRSIM model. Once CALSIM II was finalized, results from this model were compared with those of DWRSIM (refer to section 3.15 and Appendix D). The estimates of SWP supplies associated with the 41,000 AF of Table A Amount based on CALSIM II are somewhat lower than the amounts under the DWRSIM studies for the comparable allocation scenario, particularly under "existing" conditions. These differences were considered and found not to result in changes to the environmental impact determinations in this EIR. Direct impacts would remain less than significant regardless of the modeling tool used, and indirect impacts from growth-related development would remain significant. No new environmental impacts would occur.

SWP Water Supply Allocation Scenarios

This EIR considers the impacts of the Project both with and without the change in water allocation criteria implemented as part of the Monterey Amendment. Under the original SWP Water Supply Contract terms, before the Monterey Amendment was executed, Contractors could, with the consent of DWR, permanently transfer Table A Amount (then called "entitlement") to other Contractors. The Project therefore could be authorized under Article 41 of CLWA's original Water Supply Contract with DWR or under terms added to CLWA's contract as part of the Monterey Amendment (Article 53). Both contract terms allow for the transfer of Table A Amount between SWP Contractors. Under the Monterey Amendment, Agricultural Contractors committed, on a willing buyer-willing seller basis, to make available 130,000 AF of Table A Amount for permanent transfer to M&I Contractors. The transfer of Table A Amount that is the subject of this EIR was implemented under this permanent transfer provision of the Monterey Amendment, although the transfer could also be implemented under

Article 41 of CLWA's original Water Supply Contract. Additional detail regarding the Monterey Amendment scenarios is provided in section 3.15.

Population and Housing Impacts, Allocation of Project Water to Existing and Future Users

Population and housing would be affected only in the CLWA service area. Based on urban water consumption of approximately 61,000 AF in the service area in 2000 (SCVWP 2001) (the first year in which the 41,000 AF of Table A Amount became available for use by CLWA) and a service area population of approximately 190,000 persons (based on U.S. Census 2000 data), it was determined that 1 AF serves approximately 3.1 persons annually (190,000 persons/61,000 AF per year = 3.1 persons per AF per year). This planning factor represents the water needed for both residential and non-residential urban uses associated with this population.

As shown in Table 3.0-2, the Project would be able to serve a population of between 28,000 and 106,700 persons. The number would vary depending upon hydrologic conditions, and the assumptions used by local government decision-makers when approving new development projects. Assuming an average year supply, the Project could provide an additional 34,400 AF of SWP water to the CLWA service area. (This level of population demand could not be accommodated, however, without additional projects or programs to "firm up" the year to year reliability of the water supply, for example, groundwater banking programs). With a single dry year supply of approximately 9,200 AF, the Project could serve approximately 28,500 persons. Assuming a multiple dry year period water supply, the Project would provide approximately 18,100 AF and could serve approximately 56,200 persons. Using the assumptions outlined above, it is expected that the Project could serve between about 9,000 and 36,000 additional housing units (using the 3.1 persons per housing unit factor included in the Los Angeles County General Plan). (See section 3.15 for a discussion of the water supply analysis.)

Table 3.0-2. Population and Housing that Could Be Supported by the Project within the CLWA Service Area[1]

SWP Demand Conditions	*Water Supply (AF)*	*Persons[2]*	*Housing Units[3]*
Average Year	34,400	106,700	35,600
Single Dry Year	9,200	28,500	9,500
Multiple Dry Year	18,100	56,200	18,700

Note: Numbers rounded to nearest 100.
1. Based on DWRSIM results as identified in section 3.15. Assumes existing (1998) SWP demand conditions and that DWR continues to allocate available SWP supplies based on the With Monterey Amendment allocation methodology (refer to section 3.15).
2. Persons based on urban water consumption of approximately 61,000 AF in the CLWA service area in 2000 and a population of approximately 190,000 persons, whereby 1 AF serves approximately 3.1 persons annually.
3. Based on a 3.0 persons per housing unit factor.

The amount of existing versus new population that could be served by the transfer of the 41,000 AF of Table A Amount is dependent upon the availability of SWP water, which can vary from year to year. During 2000, the first year that Project water would have been available, water from the Project was not required to serve the demand because 90 percent of CLWA's 54,200 AF of SWP allocation was available. The SWP demand during that year was 32,579 AF (SCVWP

2003), which is well under the 48,780 AF that would have been available in that year had the transfer not occurred (i.e., 54,200 AF of Table A Amount x 90 percent allocation for that year). During 2002, however, Project water would have been required to meet the existing demand, which was 41,768 AF (SCVWP 2003). In that year, the SWP allocation was 70 percent; thus, only 37,940 AF of SWP would have been available to meet the demand, or 3,828 AF less than the supply that would have been available without the Project. If the SWP allocation had been lower in either of these years, more Project water would have been required to meet the existing demand.

For subsequent analyses in this EIR, an average year supply is assumed because it represents the most typical conditions and also is a worst-case scenario in terms of the indirect impacts resulting from population growth. Thus, for purposes of this analysis, it is assumed that the Project could serve 106,700 new persons and 35,600 new housing units.

SUMMARY OF OPERATIONAL AND PHYSICAL CHANGES RESULTING FROM THE PROJECT

The Project would use existing SWP facilities for transfer, storage, and delivery of the 41,000 AF Table A Amount to CLWA instead of WRMWSD. This change in point of delivery would allow water associated with the 41,000 AF Table A Amount to be transported further along the California Aqueduct than if the water were delivered to WRMWSD. Water would continue to be diverted for export in the facilities in the Delta under existing water quality and operational criteria. All or a portion of the water would be temporarily stored in San Luis Reservoir, consistent with DWR's current operation of the reservoir. Conveyance to CLWA would require pumping the water through the SWP's Teerink, Chrisman, Edmonston, and Oso pumping plants (transport to WRMWSD also requires pumping a portion of the water through the Teerink and Chrisman pumping plants). Delivered water associated with the transferred Table A Amount would flow through both Quail and Pyramid lakes (both lie along the California Aqueduct between the WRMWSD and CLWA turnouts). Consistent with current and historic operations, the delivered water would be diverted from Castaic Lake by CLWA during the same general timeframe as the water is delivered to the lake by DWR. The Project would comply with and not materially change the existing operating criteria[1] of the SWP and associated facilities.

The Project would not require the construction of any new facilities. WRMWSD would use its existing water distribution system to implement the Project and new construction or improvements to these facilities would not be needed. WRMWSD would implement the Project in accordance with its existing operational procedures. Based on capacity assumptions discussed in section 4.2.14 Utilities/Service Systems, CLWA has capacity in its local water facilities to transport and treat the water delivered as a result of the Project, in accordance with existing operational procedures and water quality requirements. This EIR addresses changes in local treatment and transport facilities that would result from the combined impacts of the

1 The operating criteria of the SWP are the rules and regulations under which DWR operates SWP facilities. Operating criteria include, although are not limited to, the SWP Water Supply Contracts, environmental regulations and operating criteria for diversions from the Delta, operations of Oroville and San Luis reservoirs, and criteria for terminal reservoirs such as Castaic Lake.

Project and other reasonably foreseeable projects in the Santa Clarita Valley in Chapter 6.0, Cumulative Impacts.

State Water Project and Associated Facilities

The Project's changes to the SWP and associated facilities would result from (1) the change in timing of the delivery of water associated with the 41,000 AF of Table A Amount, and (2) the change in the amount of water transported to the CLWA turnout. Under the Project, the 41,000 AF Table A Amount would be used for urban rather than agricultural purposes. While the same total amount of water associated with the 41,000 AF of Table A would be available to CLWA as would have been available to WRMWSD, the difference between agriculture and urban patterns of use during the year would result in a net reduction in water deliveries in May through September, and a net increase in deliveries during the remaining months of the year (October through April). In addition, since the CLWA turnout is located downstream of the WRMWSD turnouts, the Project would require the transport of water this additional distance through the California Aqueduct.

The Delta

Since the Project would be implemented in accordance with the existing operating criteria for the SWP, including the operating criteria that govern water withdrawals from the Delta (e.g., in 1998, Water Right Order 95-6 and currently, the State Water Resources Control Board [SWRCB] Water Right Decision 1641 [Decision 1641]), the total amount of SWP water that could be diverted from the Delta would not change as a result of the Project. Because the Project would not change the total amount of SWP supply available for delivery to Contractors, there would be no change in the total amount of water diverted from the Delta. A change in the timing of deliveries for urban rather than agricultural purposes would result in changes in storage at San Luis Reservoir. These storage changes at San Luis Reservoir could result in some years in a change in the timing of the filling of the reservoir, which in turn could result in minor changes in the timing of Delta diversions. However, these changes would fall well within the range of historical and future anticipated SWP diversions from the Delta. Because of the small magnitude of the change in the timing of deliveries, any change in timing of Delta diversions that did occur would be minor and likely not detectable.

California Aqueduct

Implementation of the Project and the delivery of water associated with the transfer could result in some years in minor changes in the timing of the diversion of water from the Delta. However, these changes would fall well within the range of historical and future anticipated SWP diversions from the Delta. If these minor timing changes in Delta diversions occurred, there would be corresponding minor changes in the timing of water transported within the Aqueduct from the Delta to San Luis Reservoir. The Project also would result in a minor change in the timing of water transported in the Aqueduct between San Luis Reservoir and the WRMWSD turnouts due to the change in use of the water (urban rather than agricultural use) and the associated shift in the timing of delivery. Within these reaches of the Aqueduct, a slight increase in the amount of water transported would occur from October to April, and a slight decrease in the amount of water transported would occur during the remainder of the year.

CLWA has entered an agreement with The Metropolitan Water District of Southern California (MWD) to accommodate the use of capacity in the California Aqueduct by CLWA when the capacity of MWD is not needed for its purposes.

The Project would increase CLWA's Table A Amount and would increase the amount of water transported in the Aqueduct from the WRMWSD turnouts to the CLWA turnout. This increase in the amount of water transported within these reaches of the Aqueduct would be relatively minor, but would slightly increase the flow (velocity) in the California Aqueduct and may result in a minor change in the water level within the non-pipeline portions of the Aqueduct. The Project would require additional electricity to pump the water through SWP facilities, the cost of which would be paid by CLWA per the terms of CLWA's Water Supply Contract.

San Luis Reservoir

Water diverted from the Delta that is not immediately delivered to Contractors is stored in San Luis Reservoir. San Luis Reservoir is generally filled during the high runoff months of the winter and early spring, and the stored water is then used to meet Contractor demands during the higher demand months in the summer and fall to supplement the more limited diversions from the Delta during that period. The Project would result in a slight increase in the amount of water stored at San Luis Reservoir from July through November, and a slight decrease in the amount of water stored during the remainder of the year (December through June) due to the net change in the timing of deliveries during the year resulting from the 41,000 AF transfer. These changes would be minor and would remain well within the historic range of reservoir operations.

Castaic Lake and Other SWP Reservoirs

The Project would result in additional water being transported through the West Branch through Quail Lake and Pyramid Lake to CLWA's turnout at Castaic Lake, but would not result in a material change in the overall volume of water stored in these three lakes. In general, DWR operates these reservoirs to regulate water deliveries, to help meet summer peak deliveries, and to provide an emergency water supply in case of a major supply system outage. From 1990 to 2000, SWP deliveries to CLWA from Castaic Lake have averaged approximately 6 percent of the total SWP water delivered from the lake. DWR's operation of these lakes (Quail, Pyramid, and Castaic) generally would not change with the Project, although the Project would result in additional water transported through these lakes in about the same months the water is delivered to CLWA.

Wheeler Ridge-Maricopa Water Storage District

The Project would reduce WRMWSD's total Table A Amount by 41,000 AF, reducing the total amount of SWP water that WRMWSD could obtain in any one year. In addition, since Article 21[2] water is allocated based in part on a Contractor's Table A Amount, the Project could reduce the amount of Article 21 water WRMWSD could obtain when Contractors' requests for Article

2 Water that DWR makes available when water and capacity are available in excess of SWP storage needs and Table A supplies. This water is only available for limited time periods, generally only in the winter or early spring when Contractors' demands are low, and only under specific conditions that do not occur on an annual basis.

21 water are greater than the amount available. The 41,000 AF, a portion of WRMWSD's original Table A Amount, became unnecessary to WRMWSD as a result of other more economical water supplies becoming available to WRMWSD (e.g., diversification of water sources; see section 3.2 and Appendix C).

Water users within the WRMWSD have substantial flexibility in managing agricultural land uses, and therefore, water demand, from year to year. A variety of factors, including the cost and availability of different water sources, anticipated crop market value, anticipated or existing crop subsidies, and other factors (such as labor cost, regulation of the use of certain chemicals, etc.) are considered in the decision whether and when to plant certain crops. WRMWSD participates in water management actions, including direct and in-lieu groundwater recharge within the district (e.g., district owned and operated wells and the delivery of surface water to non-contract lands) and groundwater banking outside of the district (e.g., Kern Water Bank and the Pioneer and Berrenda Mesa projects). These water management activities are intended to supply WRMWSD (or for in-lieu groundwater recharge, landowners within the district) with additional water when SWP supplies are insufficient to meet demands, such as during dry periods.

Castaic Lake Water Agency

The Project would increase CLWA's Table A Amount by 41,000 AF. This would allow CLWA to order and receive delivery of up to an additional 41,000 AF of Table A water. This additional Table A Amount would meet water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area. In addition, since Article 21[2] water is allocated based, in part, on a Contractor's Table A Amount, the Project could increase the amount of Article 21 water CLWA could obtain when Contractors' requests for Article 21 water are greater than the amount available. Estimated population and housing units that could be served by the Project are described above.

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3.1 AESTHETIC/VISUAL RESOURCES

Visual resources consist of the natural and manmade features that give a particular environment its aesthetic qualities. These features may be natural appearing or modified by human activities. Visual resources also have a social setting, which includes public values, goals, awareness, and concern regarding visual quality. The areas considered to have the greatest visual sensitivity are typically along scenic highways and wilderness or other natural areas. The primary areas of concern generally are associated with changes to prominent topographic features, changes in the character of an area with high visual sensitivity, removal of vegetation, or blockage of public views of a visually sensitive landscape.

3.1.1 Environmental Setting

3.1.1.1 *State Water Project and Associated Facilities*

California Aqueduct

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP. In some areas, the 444-mile California Aqueduct is an open, concrete-lined canal that is flush with the ground surface. In others, particularly where it crosses mountains, water is transported in enclosed pipes. Water conveyed in the California Aqueduct passes through a series of pumping plants and storage reservoirs, as shown on Figure 1.3-1.

From the southern Delta facilities to the Tehachapi Mountain Range, the California Aqueduct passes through undeveloped lands and agricultural operations that contribute to the rural character of the San Joaquin Valley. The foothill areas and associated Coast Mountain Range to the west and Sierra Nevada Mountain Range to the east provide a dramatic backdrop for the valley. These foothill and mountain ranges areas can be viewed throughout the valley due to the relatively flat plains and vast open space. Between the Tehachapi Mountain Range and the SWP terminal reservoir at Castaic Lake, the area is characterized by varied topography and numerous canyons and waterways.

San Luis Reservoir

San Luis Reservoir is located within the foothills of the Coast Mountain Range, near Los Banos. Lands surrounding the reservoir complex are generally undeveloped, and the overall character of the area is rural. The primary development in the area is associated with the San Luis Reservoir State Recreation Area, which surrounds the reservoir, and contains two developed and two primitive campgrounds, five boat ramps, and an extensive day-use area at the O'Neill Forebay. The reservoir and surrounding recreation area are visually sensitive.

Castaic Lake

Castaic Lake is located in the northern portion of the Santa Clarita valley at the confluence of Elizabeth and Castaic canyons. Urban development has primarily taken place south and east of the lake but has also occurred west of the lake during the last 10 years. The remainder of the surrounding area is generally undeveloped. The backdrop of prominent hills in the western portion of the lake contributes to the scenic qualities of the area. The 8,000-acre Castaic Lake

Recreation State Area is developed with two boat launch ramps, picnic facilities, 60 developed campsites, and a day-use area. The lake and surrounding recreation area are visually sensitive.

3.1.1.2 *Wheeler Ridge-Maricopa Water Storage District*

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP. Kern County designates most of the county as having a visual rating of Class II, meaning that the area is "excellent visual space" (Kern County 1994). The foothills provide a dramatic backdrop for the area and can be clearly viewed throughout the county due to the flat plains and vast open space. The undeveloped lands and agricultural operations contribute to the rural character typical of the San Joaquin Valley. Although the net farmed area slowly declined from 1998 to 2001, there have been no significant changes in agricultural land use from 1998 to 2003 (personal communication, B. Taube 2003).

3.1.1.3 *Castaic Lake Water Agency*

The mountainous ridgelines of the Angeles National Forest and the Los Padres National Forest provide a visual backdrop for much of Santa Clarita Valley. Much of the area has been developed, primarily with residential and commercial uses. Open spaces still exist, particularly in the mountains. The Santa Clara River traverses the valley and is another important visual element, although it is an ephemeral stream in the CLWA service area. Other areas providing local visual identity include Bouquet Canyon, Castaic Creek, San Francisquito Canyon, Newhall Creek, Placerita Canyon, Sand Canyon, and the South Fork of the Santa Clara River. Freeways and roadways such as Interstate 5, State Route 14, and State Route 126 provide view corridors through the Santa Clarita Valley and into western Ventura County. Considerable development has occurred in the Santa Clarita Valley since 1998, which has affected the aesthetic character of the CLWA service area by furthering the transition from a more rural to an urban landscape.

3.1.2 Potential Impacts of the Project

3.1.2.1 *Significance Criteria*

The criteria used to determine the significance of impacts to visual resources are based on Appendix G of the State CEQA Guidelines. The Project would have a significant environmental impact if it would:

- have a substantial adverse effect on a scenic vista;
- substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway;
- substantially degrade the existing visual character or quality of the site and its surroundings; or
- create a new source of substantial light or glare that would adversely affect day or nighttime views in the area.

3.1.2.2 *Environmental Impacts*

3.1.2.2.1 *State Water Project and Associated Facilities*

DIRECT IMPACTS

Implementation of the Project would not require new construction or the modification of existing SWP facilities, nor would it change the operating criteria of these facilities. The proposed transfer would result in a slight increase in the amount of water transported in the California Aqueduct to Castaic Lake, but this would not affect aesthetic resources. As described in section 3.0, minor seasonal changes in the volume of water stored in San Luis Reservoir would result from Project implementation. The average volume of water stored would decrease slightly from December through June, but the change would be minor and the resulting elevations would fall within the range of fluctuations present under both current and historic operations. This impact would be less than significant because it would not adversely affect scenic vistas, damage scenic resources, or substantially degrade the existing visual character or quality of the Project area. The amount of water stored in Castaic Lake would not change as a result of the Project; thus, no impacts would occur. No new sources of light or glare would be developed under the Project.

INDIRECT IMPACTS

No indirect impacts would occur.

3.1.2.2.2 *Wheeler Ridge-Maricopa Water Storage District*

DIRECT IMPACTS

Transferring 41,000 AF of Table A Amount to CLWA would not require new construction or the modification of existing WRMWSD water distribution facilities, nor would it change the current operation of these facilities. Since no construction or operational changes would occur, implementation of the Project would not adversely affect scenic vistas, damage scenic resources, substantially degrade the existing visual character or quality of the project area, or create a new source of substantial light or glare.

INDIRECT IMPACTS

No indirect impacts would occur.

3.1.2.2.3 *Castaic Lake Water Agency*

DIRECT IMPACTS

Implementation of the Project would not require the construction of new CLWA facilities or modification of existing CLWA facilities. Transferring an additional 41,000 AF of Table A Amount through existing facilities for use within the service area would not affect aesthetic resources. Thus, implementation of the Project would not impact scenic vistas, damage scenic resources, substantially degrade the existing visual character or quality of the Project area, or create a new source of substantial light or glare.

INDIRECT IMPACTS

Potential aesthetic impacts from growth that could occur as an indirect impact of the Project are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.1.3 Mitigation Measures

3.1.3.1 State Water Project and Associated Facilities

No direct or indirect significant impacts to aesthetic resources were identified; therefore, no mitigation measures are required.

3.1.3.2 Wheeler Ridge-Maricopa Water Storage District

No direct or indirect significant impacts to aesthetic resources were identified; therefore, no mitigation measures are required.

3.1.3.3 Castaic Lake Water Agency

No direct significant impacts to aesthetic resources were identified; therefore, no mitigation measures are required. Mitigation measures for indirect impacts are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.1.4 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts would occur in relationship to the SWP and associated facilities or within the WRMWSD, nor would any such direct impacts occur within the CLWA service area. Indirect impacts in this service area, including significant unavoidable adverse impacts, are addressed in Chapter 4, Growth Inducement and Growth-Related Impacts.

3.2 AGRICULTURAL RESOURCES

The State of California has the largest food and agriculture economy in the nation, and agricultural lands in the state are among the most productive (California Agricultural Statistics Service 2003). The state has led the nation in agricultural production for more than 50 years (California Agricultural Statistics Service 2003). Because of increasing land values and the state's expanding population, the State of California has initiated a variety of programs, such as the Farmland Mapping and Monitoring Program (FMMP) and the California Land Conservation Act of 1965, to preserve agricultural lands and prevent or reduce conversion of these lands to non-agricultural uses.

The State of California Department of Conservation (Department of Conservation) FMMP categorizes and maps Important Farmlands, including those defined as Prime, Unique, and Statewide Importance. Counties may, at their discretion, establish criteria for the designation of Farmland of Local Importance. These terms are defined in Table 3.2-1. Farmland Mapping and Monitoring data are available biennially; the most recent data available are from calendar year 2000.

The California Land Conservation Act of 1965, commonly referred to as the Williamson Act, established the state's primary program for the retention of private land in agriculture and open space use. The Williamson Act is a voluntary, locally administered program that offers reduced property taxes on lands that have enforceable restrictions on their use via contracts between individual land owners and local governments.

Cities and counties in California are responsible for regulating land uses in their jurisdictions in part through establishing zoning districts that specify allowable uses. For purposes of this analysis, it is assumed that land in agricultural use is zoned for this purpose.

3.2.1 Environmental Setting

3.2.1.1 State Water Project and Associated Facilities

SWP facilities are not located on land used for agricultural purposes, although they are generally located in areas containing or adjacent to large amounts of agricultural lands.

3.2.1.2 Wheeler Ridge-Maricopa Water Storage District

NEA conducted a study to determine the potential effects of the Project on agricultural operations in the WRMWSD (NEA 2003). This section and section 3.2.2.2.2 are based, in part, on the NEA study, with additional references noted. The NEA study is provided as Appendix C.

Cropping Patterns and Agricultural Operations

This section provides a general description of the cropping patterns and agricultural operations in the WRMWSD. Although this information is not directly related to the CEQA significance criteria, the overall understanding of agricultural operations and cropping patterns provides a basis for understanding agricultural land use trends within the district.

1

Table 3.2-1. Definitions for Important Farmland Categories

Farmland Category	*Definition*
Prime Farmland	Land that has the best combination of physical and chemical characteristics for the production of crops. It has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops when treated and managed, including water management, according to current farming methods. Prime Farmland must have been used for the production of irrigated crops at some time during the two update cycles prior to the mapping date.
Farmland of Statewide Importance	This land is similar to Prime Farmland but with minor shortcomings, such as greater slopes or less ability to hold and store moisture. Farmland of Statewide Importance must have been used for the production of irrigated crops at some time during the two update cycles prior to the mapping date.
Unique Farmland	This is land of lesser quality soils used for the production of specific high economic value crops at some time during the two update cycles prior to the mapping date. It has the special combination of soil quality, location, growing season, and moisture supply needed to produce sustained high quality or high yields of a specific crop when treated and managed according to current farming methods. Unique farmland is usually irrigated, but may include nonirrigated orchards or vineyards as found in some climatic zones in California. Examples of crops on Unique Farmland include oranges, olives, avocados, rice, grapes, and cut flowers. This category does not include publicly owned lands for which there is an adopted policy preventing agricultural use.
Farmland of Local Importance	This is land of importance to the local agricultural economy and is determined by each county's Board of Supervisors and local advisory committees. Examples of this type of land could include dairies, dryland farming, aquaculture, and uncultivated areas with soils qualifying for Prime Farmland and Farmland of Statewide Importance.
Interim Farmland (Irrigated and Non-Irrigated Farmland)	Interim Farmland is a designation used for farmed areas lacking modern soil survey information and for which there is expressed local concern on the status of farmland. Interim Farmland is designated as either Irrigated or Non-Irrigated Farmland. Irrigated Farmlands are lands with a developed irrigation water supply that is dependable and of adequate quality and that have been used for irrigated agricultural production at some time during the four years prior to the mapping date. Non-Irrigated Farmlands are lands on which agricultural commodities are produced on a continuing or cyclical basis utilizing stored soil moisture.
Grazing Land	Grazing land is land on which the existing vegetation, whether grown naturally or through management, is suitable for grazing or browsing of livestock.
Urban and Built-up Land	This is used for residential, industrial, commercial, construction, institutional, and public administrative purposes; railroad yards; cemeteries; airports; golf courses; sanitary landfills; sewage treatment plants; water control structures; and other development purposes.
Other Land	Other land is that which is not included in any of the other mapping categories. The following types of land are generally included: low-density rural development; brush, timber, and other lands not suitable for livestock grazing; government lands not available for agricultural use; roads systems for freeway interchanges; vacant and nonagricultural land larger than 40 acres in size and surrounded on all sides by urban development; confined livestock facilities of 10 or more acres; strip mines and borrow and gravel pits; a variety of other rural land uses.
Water	Water areas with an extent of at least 40 acres.

Note: None of these categories includes publicly owned lands for which there is an adopted policy preventing agricultural use.

Source: Department of Conservation, no date.

Most of the lands in the district are cultivated agricultural areas. The cropping patterns, net amount of farmed lands, fallowed lands, and total cultivated lands within the district from 1990 to 2001 are provided in Table 3.2-2. The net acres cultivated with certain crops, such as deciduous fruits and pomegranates remained relatively constant during this period, while the net acres cultivated with other crops, such as vineyards, deciduous nuts, and citrus have increased gradually. The number of acres cultivated with annual crops, such as cotton, sugar beets, grains, green feeds, and mixed produce varied considerably over the time period. Overall, within the district there has been an increase in the cultivated acres of permanent crops (such as tree crops, vineyards, etc.) and a general decrease in annual crops (such as cotton, grains, green feeds, etc.).

The amount of fallowed land in the district peaked in 1991 during drought conditions, with over 51,500 acres fallowed. Due to the severe drought throughout the State and the then-existing SWP contract provisions (Without Monterey Amendment), WRMWSD did not receive SWP water in 1991. At that time, the district was not participating in other water management actions, but was able to deliver over 55,000 AF of surface water from purchases and exchanges. The WRMWSD (like all contractors) was not relieved from paying the fixed costs on its SWP Table A Amount in 1991, even though WRMWSD and other agricultural contractors received no water. This proved to be a substantial financial hardship for the district and those who farmed the contract lands. In 1991 and subsequent years, some farmers within the contract lands were not able to recover financially from the 1991 drought and sold their lands, were foreclosed on, or cancelled part or all of their surface water contract with WRMWSD.

Due in part to the 1991 drought, WRMWSD began to participate in other more economical water management actions that could supply the district with water in addition to SWP supplies. By 2001, these consisted of groundwater wells developed by WRMWSD in 1992 and additional wells acquired by WRMWSD after this time; participation in the Kern Water Bank beginning in 1995; the Pioneer Project initiated in 1997; and the Berrenda Mesa Project initiated in 1999. In 2001, these other water management actions could supply WRMWSD with over 88,000 AF, not including additional water that may be available from exchanges and purchases similar to those that occurred in 1991.

From 1991 to 1998, the amount of fallowed land in the district decreased by over 34,000 acres, and from 1998 to 2001, the amount of fallowed land increased by over 11,000 acres (an overall net change of approximately 22,000 acres). This increase in fallowing since 1998 appears to be related to crop markets and prices (NEA 2003). Fallowing is a regular part of the cropping patterns in WRMWSD, with an average of about 27,830 acres fallowed annually from 1990 to 2001. Farmers fallow land for both agronomic reasons (e.g., fallowing as part of crop rotations and for pest and disease control) and for economic reasons (e.g., market conditions, or prices for the crops typically grown on the land to be fallowed, and the cost and availability of various production inputs, including water). Agricultural water users have substantial flexibility in managing their lands, and therefore water use, from year to year. A variety of factors, including the cost and availability of different water sources, the anticipated crop market value, anticipated or existing crop subsidies, and other factors (such as labor cost, regulation of the use of certain chemicals, etc.) are considered in the determination to plant certain crops by farmers.

1

Table 3.2-2. Cropping Patterns within the WRMWSD Service Area from 1990 to 2001
(all values in net acres)

Crop Group	*1990*	*1991*	*1992*	*1993*	*1994*	*1995*	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*Average*	*Max*	*Min*
Cotton	38,071	16,192	24,621	31,063	33,369	36,795	34,702	32,369	24,953	20,781	22,109	16,204	27,602	38,071	16,192
Sugar Beets	723	746	825	689	370	409	151	0	181	0	0	0	341	825	0
Grains[1]	2,692	3,450	9,859	8,162	3,739	9,530	11,804	8,203	15,586	12,260	9,496	9,308	8,674	15,586	2,692
Green Feeds	1,836	1,146	1,206	1,442	1,514	2,002	1,737	2,923	2,938	3,340	2,933	2,924	2,162	3,340	1,146
Mixed Produce[2]	19,504	17,471	17,035	15,775	17,450	17,406	18,735	20,332	18,398	21,737	19,239	15,487	18,214	21,737	15,487
Vineyard	10,719	9,883	9,633	9,708	9,778	10,774	12,547	14,222	15,315	15,745	17,387	17,701	12,784	17,701	9,633
Deciduous Nuts	6,865	6,900	6,900	7,022	7,399	7,255	7,640	7,624	8,198	8,381	8,509	8,369	7,589	8,509	6,865
Deciduous Fruits	2,074	2,102	2,013	2,008	2,060	2,066	2,154	2,205	2,104	1,989	2,058	1,928	2,063	2,205	1,928
Citrus	6,212	6,231	6,675	6,932	7,241	7,471	7,870	8,482	9,011	9,737	11,123	12,030	8,251	12,030	6,212
Jojoba	646	82	199	0	0	0	0	0	0	0	0	0	77	646	0
Pomegranates	243	243	351	351	351	351	351	351	338	377	377	377	338	377	243
Eucalyptus	10	10	14	14	6	6	19	19	19	19	19	19	15	19	6
Total Cropped	**89,595**	**64,456**	**79,331**	**83,166**	**83,277**	**94,065**	**97,710**	**96,730**	**97,041**	**94,366**	**93,249**	**84,348**	**88,111**	**97,710**	**64,456**
- Double Cropped	5,314	4,085	3,525	4,510	4,233	4,663	5,092	5,441	2,542	3,155	2,622	1,541	3,894	5,441	1,541
= Net Farmed	**84,281**	**60,371**	**75,806**	**78,656**	**79,044**	**89,402**	**92,618**	**91,289**	**94,499**	**91,211**	**90,628**	**82,807**	**84,218**	**94,499**	**60,371**
+ Fallow Lands	27,588	51,620	36,031	33,189	32,980	22,523	19,584	20,949	17,649	20,855	21,660	29,291	27,827	51,620	17,649
= Total Cultivated Acres	**111,869**	**111,991**	**111,837**	**111,845**	**112,024**	**111,925**	**112,202**	**112,238**	**112,148**	**112,066**	**112,288**	**112,098**	**112,044**	**112,288**	**111,837**
+ Miscellaneous Lands[3]	6,840	6,847	6,839	6,843	6,849	6,841	6,859	6,860	6,856	6,850	6,864	6,853	6,850	6,864	6,839
+ Deferred Lands	1,659	1,659	1,659	1,659	1,659	1,659	1,659	0	0	0	0	0	968	1,659	0
+ Other Lands[4]	668	738	880	968	919	1,073	1,098	1,129	1,183	1,270	1,361	1,257	1,045	1,361	668
+ Native Vegetation	25,626	25,428	25,405	25,305	25,169	25,122	24,802	26,393	26,434	26,434	26,434	26,739	25,774	26,739	24,802
Total District	**146,662**	**146,662**	**146,620**	**146,620**	**146,620**	**146,620**	**146,620**	**146,620**	**146,621**	**146,620**	**146,947**	**146,947**	**146,682**	**146,947**	**146,620**

Source: Wheeler Ridge-Maricopa Water Storage District
1. Includes irrigated and dry farmed.
2. Includes melons.
3. Consist of developed by non-farmed areas within cultivated lands such as farm roads, farmsteads, and reservoirs.
4. Other lands consists of airstrips, cotton gins, tank farms, utility years, etc.

The net farmed area within the district declined sharply in 1991, although it recovered to the 1990 level by 1995. During the period between 1990 and 2001, the net farmed area peaked in 1998, and slowly declined from 1998 to 2001. Overall, the total cultivated acres, miscellaneous lands (non-farmed areas within cultivated lands such as farm roads, farmsteads, and reservoirs), other lands (non-cultivated lands), and native vegetation areas within the district have remained relatively constant throughout this time period, indicating that substantial land use changes have not occurred within the district.

Important Farmland Trends

The amount of Important Farmland and other lands in WRMWSD in 1998 and 2000 is shown in Table 3.2-3 (more recent data is not available). From 1998 to 2000, the amount of Non-Irrigated Farmland, Urban and Built-up Land, Prime Farmland, and Other Land decreased by approximately 59 percent and 13 percent, respectively for Non-Irrigated Farmland and Urban and Built-Up Land, and less than 1 percent for both Prime Farmland and Other Land. Over the same time period, the amount of Farmland of Statewide Importance, Unique Farmland, Irrigated Farmland, and Grazing Land increased, approximately 7 percent, less than 1 percent, 7 percent, and 13 percent, respectively. These changes in mapping categories from 1998 to 2000 (both increases and decreases) represent 1 percent or less of the total district lands.

Table 3.2-3. Important Farmland and Other Lands in WRMWSD, 1998 and 2000
(negative numbers in parenthesis)

Category	*1998 (acres)*	*2000 (acres)*	*Difference 1998 to 2000 (acres)*
Prime Farmland	6,992	6,978	(14)
Farmland of Statewide Importance	510	552	42
Unique Farmland	1,867	1,883	16
Irrigated Farmland	99,957	100,048	91
Non-Irrigated Farmland	1,854	244	(1,610)
Grazing Land	26,562	28,162	1,600
Urban and Built-up Land	527	484	(43)
Other Land	11,683	11,601	(82)
Total*	**149,952**	**149,952**	--

Source: California Division of Land Resource Protection, Farmland Mapping and Monitoring Program, 2002.
* The total is slightly greater than the current area of the WRMWSD due to mapping accuracies.

In 2000, Prime, Unique, and Farmland of Statewide Importance represented approximately 6.3 percent of the total district area, and Irrigated Farmlands represented approximately 66.7 percent of the total district area.

Williamson Act Trends

The amount of land enrolled in Williamson Act contracts in Kern County in 1998 and 2001 is provided in Table 3.2-4, the most recent data available. The State of California has electronic geo-referenced data for lands enrolled in Williamson Act contracts for some counties, although not Kern County (personal communication, J. Nordstrom 2003). Because data are not readily available for use in determining the amount of land within WRMWSD enrolled in Williamson Act contracts, data for Kern County are used. Although precise sub-county trends cannot be extrapolated from county-wide data, the available data on changes in the amount of Important Farmland suggests that changes are from one type of agriculture to another (farming to grazing) as opposed to changes from agriculture to non-agriculture use. This supports the likelihood of similar trends in Williamson Act enrollments in WRMWSD as occurred in Kern County. From 1998 to 2001, the amount of land enrolled in Williamson Act contracts in Kern County increased by about 36,119 acres, or by approximately 2.1 percent.

Table 3.2-4. Lands Under Williamson Act Contracts in Kern County, 1998 and 2001

Year	*Land Enrolled (acres)*
1998	1,683,744
2001	1,719,863

Source: California Department of Conservation, 2003.

Agricultural Zoning Trends

A review of zoning designations for the parcels that were the source of water for the transfer of the 41,000 AF of Table A Amount to CLWA showed that all were zoned for agricultural use and that no zoning changes occurred between 1998 and the present.

3.2.1.3 Castaic Lake Water Agency

Agricultural and grazing areas within the CLWA service area are located primarily in the western portion of the service area along the State Route 126 corridor and adjacent hills in both Los Angeles and Ventura counties. Over 90 percent of the CLWA service area has been inventoried and mapped by the State's FMMP. The amount of Important Farmland and other lands in the CLWA service area in both 1998 and 2000 is shown in Table 3.2-5. As noted, the amount of Urban and Built-up land increased by 1,731 acres during this period, while the amount of agricultural land decreased (a decrease of 1,034 acres of Important Farmland and Grazing Land combined).

Most of the CLWA service area is located in Los Angeles County, which does not participate in the Williamson Act program. Ventura County does participate in this program and had approximately 122,875 acres of Williamson Act contracts lands in 1998 and 123,781 in 2001 (California Department of Conservation 2002 and 2003).

Table 3.2-5. Important Farmland and Other Lands in the CLWA Service Area, 1998 and 2000
(negative numbers in parenthesis)

Category	*1998 (acres)*	*2000 (acres)*	*Difference (acres)*
Prime Farmland	2,765	2,444	(321)
Farmland of Statewide Importance	825	767	(58)
Unique Farmland	410	404	(6)
Farmland of Local Importance	645	619	(26)
Grazing Land	50,836	50,213	(623)
Urban and Built-up Land	22,569	24,300	1,731
Other Land	34,444	33,747	(697)
Water Area	2,175	2,175	0
Total	**114,669**	**114,669**	--

Source: California Division of Land Resource Protection, Farmland Mapping and Monitoring Program, 2002.

In 1998, Ventura County passed the Save Open-Space and Agricultural Resources (SOAR) Initiative in order to "ensure that Agricultural, Open Space and Rural lands are not prematurely or unnecessarily converted to other more intensive development uses." The initiative requires a popular vote for changes to the County's General Plan policies and land use designations regarding open space, agricultural, and rural lands in unincorporated areas, with certain exceptions. Lands within the Piru community, for instance, may be re-designated by the Board of Supervisors without a public vote, due to its urban nature.

3.2.2 Potential Impacts of the Project

3.2.2.1 *Significance Criteria*

The criteria listed below are based on Appendix G of the State CEQA Guidelines. The Project would have a significant impact on agriculture if it would:

- convert a substantial portion of the available Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Important Farmland), as shown on the maps prepared pursuant to the FMMP of the California Resources Agency, to non-agricultural use;
- conflict with existing zoning for agricultural use or a Williamson Act contract; or
- involve other changes in the existing environment, which, due to their location or nature, could individually or cumulatively result in substantial loss of Important Farmland to nonagricultural use or a loss of agricultural productivity.

3.2.2.2 *Environmental Impacts*

3.2.2.2.1 *State Water Project and Associated Facilities*

DIRECT IMPACTS

The Project would use existing SWP facilities, which are not located on agricultural lands. Since these facilities would be operated in accordance with existing operating criteria, using existing facilities to transfer water associated with the Project would not affect adjacent agricultural resources. Use of the SWP facilities would not convert Important Farmland to non-agricultural use, conflict with existing zoning for agricultural use or a Williamson Act contract, or involve other changes that could result in the conversion of Farmland to non-agricultural use.

INDIRECT IMPACTS

No indirect impacts to agricultural resources would occur.

3.2.2.2.2 *Wheeler Ridge-Maricopa Water Storage District*

DIRECT IMPACTS

Under the Project, up to 41,000 AF of SWP Table A Amount that could have been delivered to WRMWSD on an annual basis could be delivered to CLWA instead. This action would not require the construction of new water distribution facilities or modification of existing facilities. The 41,000 AF Transfer Project is excess to the WRMWSD needs and does not involve water that would have otherwise been used by WRMWSD. Thus, no direct losses of Important Farmland or conflicts with existing zoning or Williamson Act contracts from construction would occur.

INDIRECT IMPACTS

No indirect impacts to agricultural resources in WRMWSD would occur. As described in section 3.15, if the Project were implemented, in years of average or greater than average SWP deliveries, water associated with the 41,000 AF Table A Amount would be in excess of WRMWSD's demands. In these years, the Project would not result in changes to agricultural practices (e.g., cropping patterns or land fallowing) within the district since sufficient surface water would be available to meet demands without the use of the 41,000 AF Table A Amount.

As described above, WRMWSD has implemented other water management actions, including a variety of groundwater banking projects (e.g., participation in the Pioneer and Berrenda Mesa projects, participation in the Kern Water Bank, and other groundwater banking projects), which have diversified its water sources and resulted in lower water costs (when total costs are considered). Overall, this diversification of water sources has allowed and will continue to allow WRMWSD to provide surface water within the district when SWP deliveries alone are not sufficient to meet demands. This diversification also has resulted in lower overall water costs (when total costs are considered), in years when SWP deliveries are lower than average (refer to section 3.15). In years of less than average SWP deliveries, therefore, the Project would not result in changes to agricultural practices (e.g., cropping patterns or additional land fallowing)

within the district since sufficient, low-cost water would be available to meet demands without the use of the 41,000 AF Table A Amount.

Since no changes to agricultural practices would result from Project implementation, it would not result in the conversion of Important Farmland to non-agricultural use, conflict with existing zoning for agricultural use or a Williamson Act contract, or involve other changes that could result in the conversion of Farmland to non-agricultural use.

3.2.2.2.3 *Castaic Lake Water Agency*

DIRECT IMPACTS

Implementation of the Project would not require the construction of new CLWA facilities or modification of existing CLWA facilities. Conveying additional water through existing facilities for use within the service area would not directly affect agricultural resources and therefore would not result in the conversion of Important Farmland to non-agricultural use, conflict with existing zoning for agricultural use or a Williamson Act contract, or involve other changes that could result in conversion of Farmland, to non-agricultural use.

INDIRECT IMPACTS

Potential impacts to Important Farmlands in the CLWA service area from new development that would occur as an indirect impact of the Project are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.2.3 Mitigation Measures

3.2.3.1 *State Water Project and Associated Facilities*

No significant direct or indirect impacts to agricultural resources would occur; therefore, no mitigation measures are required.

3.2.3.2 *Wheeler Ridge-Maricopa Water Storage District*

No significant direct or indirect impacts to agricultural resources would occur; therefore, no mitigation measures are required.

3.2.3.3 *Castaic Lake Water Agency*

No significant direct impacts to agricultural resources would occur; therefore, no mitigation measures are required. Mitigation measures for indirect impacts are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.2.4 Significant Unavoidable Impacts

No significant direct or indirect unavoidable impacts on agricultural resources would result from the Project.

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3.3 AIR QUALITY

Air quality at a given location can be described by the concentration of various pollutants in the atmosphere. Units of concentration are generally expressed in parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). The significance of a pollutant concentration is determined by comparing the concentration to an appropriate federal and/or state ambient air quality standard. The standards represent the allowable atmospheric concentrations at which the public health and welfare are protected and include a reasonable margin of safety to protect the more sensitive individuals in the population. National standards, established by the EPA, are termed the National Ambient Air Quality Standards (NAAQS). The NAAQS represent maximum acceptable concentrations that may not be exceeded more than once per year, except the annual standards, which may never be exceeded. The state standards, established by the California Air Resources Board (ARB), are termed the California Ambient Air Quality Standards (CAAQS). The CAAQS represent maximum acceptable pollutant concentrations that are not to be equaled or exceeded. The NAAQS and CAAQS are presented in Table 3.3-1.

Air quality regulations were first promulgated with the federal Clean Air Act of 1969 (CAA). This act established the NAAQS and delegated the enforcement of air pollution control regulations to the states. In California, the ARB is responsible for enforcing air pollution regulations. The ARB has in turn delegated the responsibility of regulating stationary emission sources to local air agencies. In areas that exceed the NAAQS, the CAA requires preparation of a State Implementation Plan (SIP), detailing how the state will attain the standards within mandated time frames. The CAA identifies emission reduction goals and compliance dates based upon the severity of the ambient air quality standard violation within a region.

The California Clean Air Act of 1988, as amended in 1992 (CCAA), outlines a program to attain the CAAQS for ozone (O_3), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and carbon monoxide (CO) by the earliest practical date. Since the CAAQS are more stringent than the NAAQS, emissions reductions beyond what would be required to show attainment of the NAAQS are required.

Identifying the Region of Influence (ROI) for air quality requires knowledge of the types of pollutants being emitted, emission rates of pollutant sources, the source proximity to other pollutant sources, and meteorological conditions. The ROI for inert pollutants (pollutants other than O_3 and its precursors) is generally limited to a few miles downwind from a source. Thus, the ROI for emissions of inert pollutants from Project construction sources, for example, would occur in proximity to construction sites and along road systems used by on-road construction traffic. The ROI for O_3 can extend much farther downwind than for inert pollutants. Ozone is a secondary pollutant formed in the atmosphere by photochemical reactions of previously emitted pollutants, or precursors. Ozone precursors are mainly the reactive organic gases portion of volatile organic compounds and nitrogen oxides. In the presence of solar radiation, the maximum effect of reactive organic gases and nitrogen oxide emissions on O_3 levels usually occurs several hours after they are emitted and many miles from the source. Therefore, the ROI for O_3 generally extends much farther downwind than for inert pollutants.

1 **Table 3.3-1. California and National Ambient Air Quality Standards**

Pollutant	*Averaging Time*	*California Standards* [a,c]	----*National Standards* [b]----	
			Primary [c,d]	*Secondary* [c,e]
Ozone (O_3)	1-hour	0.09 ppm (180 $\mu g/m^3$)	0.12 ppm (235 $\mu g/m^3$)	Same as primary
	8-hour	—	0.08 ppm (157 $\mu g/m^3$)	Same as primary
Carbon monoxide (CO)	8-hour	9.0 ppm (10 mg/m^3)	9 ppm (10 mg/m^3)	—
	1-hour	20 ppm (23 mg/m^3)	35 ppm (40 mg/m^3)	—
Nitrogen dioxide (NO_2)	Annual	—	0.053 ppm (100 $\mu g/m^3$)	Same as primary
	1-hour	0.25 ppm (470 $\mu g/m^3$)	—	—
Sulfur dioxide (SO_2)	Annual	—	0.03 ppm (80 $\mu g/m^3$)	—
	24-hour	0.04 ppm (105 $\mu g/m^3$)	0.14 ppm (365 $\mu g/m^3$)	—
	3-hour	—	—	0.5 ppm (1,300 $\mu g/m^3$)
	1-hour	0.25 ppm (655 $\mu g/m^3$)	—	—
Respirable Particulate Matter (PM_{10})	Annual	20 $\mu g/m^3$ [f]	50 $\mu g/m^3$ [g]	Same as primary
	24-hour	50 $\mu g/m^3$	150 $\mu g/m^3$	Same as primary
Fine Particulate Matter ($PM_{2.5}$)	Annual	12 $\mu g/m^3$ [h]	15 $\mu g/m^3$ [i]	Same as primary
	24-hour	—	65 $\mu g/m^3$ [j]	Same as primary
Lead	30-day	1.5 $\mu g/m^3$	—	—
	Quarterly	—	1.5 $\mu g/m^3$	Same as primary
Hydrogen sulfide	1-hour	0.03 ppm (42 $\mu g/m^3$)	—	—
Sulfates	24-hour	25 $\mu g/m^3$	—	—
Visibility reducing particles [k]	8-hour (10 AM to 6 PM PST)	In sufficient amount to produce an extinction coefficient of 0.23 per kilometer due to particles when the relative humidity is less than 70%.	—	—

Source: (APCD 2002; ARB 2002)

Notes:

a. California standards for O_3, CO, SO_2 (1 hour), NO_2, PM_{10}, $PM_{2.5}$, and visibility reducing particles, are values that are not to be exceeded. The standards for SO_2 (24-hour), sulfates, lead, hydrogen sulfide, and vinyl chloride standards are not to be equaled or exceeded.

b. National standards, other than O3 and those based on annual averages, are not to be exceeded more than once a year. The O3 standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above the standard is equal to or less than one.

c. Concentration expressed first in units in which it was promulgated. Equivalent units given in parenthesis are based on a reference temperature of 25°C and a reference pressure of 760 mm of mercury.(1,013.2 millibars). All measurements of air quality are to be corrected to a reference temperature of 25°C and a reference pressure of 760 mm of mercury; ppm in this table refers to ppm by volume, or micromoles of pollutant per mole of gas.

d. National Primary Standards: The levels of air quality necessary, with an adequate margin of safety to protect the public health.

e. National Secondary Standards: The levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant.

f. Measured as an arithmetic mean. New standard promulgated by ARB on June 20, 2002.

g. Measured as an arithmetic mean.

h. New standard promulgated by ARB on June 20, 2002.

i. Three-year average.

j. Three-year average of 95th percentile measurements.

k. This standard is intended to limit the frequency and severity of visibility impairment due to regional haze and is equivalent to a 10-mile nominal visual range when relative humidity is less than 70 percent.

The EPA designates all areas of the United States as having air quality better than (attainment) or worse than (nonattainment) the NAAQS. The criteria for nonattainment designation varies by pollutant; for example, an area is in nonattainment for O3 if its NAAQS has been exceeded more than three discontinuous times in three years, and an area is in nonattainment for any other pollutant if its NAAQS generally has been exceeded more than once per year. The ARB also designates areas of the state as either in attainment or nonattainment of the CAAQS. An area is in nonattainment if the CAAQS has been exceeded more than once in three years.

The pollutants of primary concern considered in this analysis include reactive organic compounds (ROC), O3, CO, NO2, and particulate matter less than 10 microns in diameter (PM10).

3.3.1 Environmental Setting

The Project region occurs predominately within the San Joaquin Valley Air Basin (SJVAB) and South Coast Air Basin (SCAB)[1]. As shown on Figure 3.3-1, the Project region occurs within the jurisdictions of the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) and the South Coast Air Quality Management District (SCAQMD). The SJUVAPCD jurisdiction includes the portion of Kern County west of a north-south line roughly 10 miles west of the town of Tehachapi, and all or a portion of Tulare, Kings, Fresno, Madera, Merced, Stanislaus, and San Joaquin counties. The SCAB consists of the non-desert portions of Los Angeles, Riverside, and San Bernardino counties and all of Orange County.

3.3.1.1 State Water Project and Associated Facilities

Climate

Within the San Joaquin Valley, the climate is similar to that described in section 3.3.1.2 below for KCWA and WRMWSD. Within northern Los Angeles County and the Castaic Lake area, the climate is similar to that described in section 3.3.1.3 below for CLWA.

Baseline Air Quality

The California Aqueduct and associated facilities of concern predominately occur within the SJVAB and SCAB. Baseline air quality within these regions is described below in sections 3.3.1.2 and 3.3.1.3, respectively.

Local Regulations

SJVUAPCD regulations are described in section 3.3.1.2 below. SCAQMD regulations are described in section 3.3.1.3 below.

1 Although some SWP facilities lie outside of the SJVAB and SCAB, implementation of the Project would not affect the operation of these facilities or air quality within these areas. Also, the eastern portions of Kern County lie within the Mojave Desert Air Basin under the jurisdiction of the Kern County Air Pollution Control District. Implementation of the Project would not result in changes that would affect air quality within the Mojave Desert Air Basin.

1

Source: DWR 2001

Figure 3.3-1. Boundaries of the San Joaquin Valley Unified Air Pollution Control District, and the South Coast Air Quality Management District and Adjacent Districts

3.3.1.2 *Wheeler Ridge-Maricopa Water Storage District*

Climate

The climate within the southern San Joaquin valley is classified as Mediterranean, and is characterized by dry, hot summers and mild, semi-arid winters. Average daily maximum temperatures within the WRMWSD range from 85 to over 100 degrees Fahrenheit (°F) in the summer and 50 to 60°F in the winter. The area is classified as a hot desert, where precipitation is less than half the potential evaporation. The rainy season typically occurs between November and April and produces as little as 5 inches of precipitation per year in the northwest portion of the district and about 18 inches per year in the mountainous regions to the east. Winds prevail from the northwest due to a semi-permanent high-pressure cell located off the Pacific Coast. During the colder months of the year, winds prevail from the south and southeast due to the presence of polar storms and topographical effects. Average wind speed is about 6 miles per hour, but extreme wind speeds can reach 60 to 80 miles per hour.

Baseline Air Quality

The district is located in the southernmost region of the SJVAB, which includes the western half of Kern County. Mountain ranges encompass the district on its western, southern, and eastern sides. This topography, combined with the prevailing wind patterns, inhibits dispersion and leads to an accumulation of pollutants in the region. Prevailing northwest winds also transport pollutants from the northern reaches of the SJVAB to the region and increase air pollutant concentrations in the area.

The Kern County portion of the SJVAB is presently in nonattainment of the NAAQS and CAAQS for PM_{10} and O_3. In November 2001, the EPA reclassified the SJVAB O_3 nonattainment designation from serious to severe. The SJVAB is currently in serious nonattainment for PM_{10} (SJVUAPCD 2002).

The main sources of PM_{10} within the SJVAB include wood and agricultural waste burning and fugitive dust. Fugitive dust is a major source of PM_{10} and results from (1) the operation of vehicles on paved and unpaved roads, (2) various agricultural operations, such as tilling, harvesting, and planting, and (3) windblown dust from disturbed ground areas. Geologic dust generated from dry, erodible soils is the primary component of PM_{10} exceedances during the fall. In 1995, road dust, farming operations, fugitive windblown dust, and waste disposal and burning produced about 85 percent (approximately 39, 24, 12, and 5 percent, respectively) of the PM_{10} in the SJVAB (ARB 1997). While the total emissions within the SJVAB decreased substantially between 1995 and 2002, the relative contributions of these sources to the total PM_{10} levels in the region did not change substantially during this period (SJVUAPCD 2002).

Concentrations of photochemical smog, or O_3, are highest during the warmer months of the year and coincide with the season of maximum insolation. Inert pollutant concentrations (pollutants other than O_3) tend to be the greatest during the winter months and are a product of light wind conditions and surface-based temperature inversions that are common during that time of year. These conditions tend to inhibit the dispersion of pollutants. The main sources of

O3 precursor emissions (ROC and NOx) within the SJVAB include gasoline-powered on-road vehicles, solvent usage, and farm operations (SJVUAPCD 2002).

Local Regulations

The SJUVAPCD is responsible for regulating stationary sources of emissions within the SJVAB and has developed rules and air quality attainment plans designed to reduce emissions to a level that will bring the region into attainment of the O3 and PM10 ambient air quality standards. The SJVUAPCD originally adopted its 1991 Air Quality Attainment Plan and 1994 Ozone Attainment Demonstration Plan to bring the region into attainment of the state and national O3 standards, respectively (SJVUAPCD 1994). The SJVUAPCD has subsequently amended these plans to show progress towards attaining the O3 standards. Due to the inability of the region to attain the national O3, the SJVUAPCD proposes to request the EPA to reclassify the SJVAB O3 nonattainment designation from severe to extreme to allow for additional time to attain this standard (SJVUAPCD 2003a). As part of this proposal, the SJVUAPCD would adopt an Extreme Ozone Attainment Demonstration Plan by May 2004 and then submit this plan to the EPA for their approval.

The SJVUAPCD originally adopted its 1991 Moderate Area PM10 Plan (Moderate Plan) and the 1994 Serious Area PM10 Plan (Serious Plan) to bring the region into attainment of the national PM10 standard. The latest version of the PM10 attainment plan is the 2003 PM10 Plan (SJVUAPCD 2003b). Through this attainment planning process, the SJVUAPCD has developed Regulation VIII to reduce ambient concentrations of PM10 from fugitive dust (SJVUAPCD 2004). The 2003 PM10 Plan also contains a Draft Concept Conservation Management Practice Program (CMP Program) for the San Joaquin Valley to regulate fugitive dust emissions from on-field activities (tilling, harvesting, land preparation, fallowing, etc.). These on-field activities are currently not regulated by the SJVUAPCD. The CMP Program would apply to a number of "source categories" including windblown dust from on-field activities. Under the CMP Program, at the beginning of a year, farmers would be required to select a minimum of one control measure relating to windblown dust for the coming year. The specific measures are not identified in the Draft CMP Program; however, the practices to reduce fugitive dust emissions would fall into several broad categories including: practices that reduce or eliminate the need to disturb the soil; practices that protect the soil from wind erosion; equipment modifications to physically produce less PM10; applying water or dust suppressants in off-field high traffic areas; reducing speeds or access on unpaved roads; and actions that reduce pesticide application.

3.3.1.3 Castaic Lake Water Agency

Climate

The climate in the CLWA service area is classified as Mediterranean, characterized by dry, hot summers and mild, semi-arid winters. Summer temperatures can reach as high as 110°F; winters are cooler, and winter temperatures can dip as low as 20°F. Average rainfall is about 18 inches per year in the flat areas and about 27 inches in the mountains. The region is subject to wide variations in annual precipitation.

Baseline Air Quality

The CLWA service area is located in the Santa Clarita Valley, which is in the northwestern portion of the SCAB. With regard to the NAAQS, the area of SCAB that encompasses the Project area is presently in "extreme" nonattainment for O_3 and "serious" nonattainment for CO and PM_{10}. With regard to the CAAQS, the SCAB is presently in "extreme" nonattainment for O_3, "severe" nonattainment for CO, and nonattainment for PM_{10}. These conditions were present in 1998; the key difference between 1998 and the present is that the federal and state standards for CO within the basin were met as of the end of 2002, and the SCAQMD will request reclassification as attainment for CO in the next few years (SCAQMD 2003).

Local Regulations

The SCAQMD is responsible for regulating emission sources within the SCAB. The SCAQMD has developed the 2003 Air Quality Management Plan (2003 AQMP) to bring the region into attainment of the state and national ambient air quality standards. Through this attainment planning process, the SCAQMD develops rules to regulate stationary sources of air pollution in the SCAB. The 2003 AQMP (1) updates the demonstration of attainment with the national standards for O_3 and PM_{10} (the 1999 Revised O_3 Plan and 1997 AQMP, respectively), (2) replaces the 1997 attainment demonstration for the national CO standard and provides a basis for a future maintenance plan for this pollutant, and (3) updates the maintenance plan for the national NO_2 standard that the SCAB has attained since 1992 (SCAQMD 2003).

3.3.2 Potential Impacts of the Project

3.3.2.1 *Significance Criteria*

The criteria used to define the significance of an air quality impact are based on the Appendix G of the State CEQA Guidelines. An impact would be significant if air pollutant emissions would:

- conflict with or obstruct implementation of an applicable air quality plan;
- violate any air quality standard or contribute substantially to an existing or projected ambient air quality violation;
- result in a cumulatively considerable net increase of any criteria pollutant for which the project region is in nonattainment under an applicable federal or state ambient air quality standard (including releasing emissions that exceed quantitative thresholds for ozone precursors);
- expose sensitive receptors to substantial pollutant concentrations; or
- create objectionable odors affecting a substantial number of people.

3.3.2.2 *Environmental Impacts*

3.3.2.2.1 *State Water Project and Associated Facilities*

DIRECT IMPACTS

Implementation of the Project would not require new construction or the modification of existing SWP facilities; nor would it change the operating criteria of these facilities or materially change their operation. The transfer would increase the amount of water transported in the California Aqueduct between the WRMWSD and CLWA turnouts. As discussed in section 3.14, Utilities and Service Systems, this action would increase the use of electrical power to operate water pumps and would change the timing of power usage.

Electrical power used by the SWP is obtained from SWP hydroelectric generating plants, the Reid Gardner Power Plant in Nevada, and other power producers in the Western U.S. (DWR 2002). These existing sources would provide the electrical power demands of the Project and therefore they would preclude the need to develop new power sources. The annual amount of electricity needed by the Project for pumping at the four SWP pumping plants located within or between WRMWSD and the CLWA service area (Teerink, Chrisman, Edmonston, and Oso) is estimated to be 140,000 MWh (see Utilities and Service Systems section 3.14.2.2). The air quality impacts associated with the generation of this power would depend upon the specific electrical generation source. For example, air emissions due to power generation could range from almost zero to some finite amount, depending upon whether the generation source was hydroelectric or fossil fuel-fired. Any existing fossil fuel-fired power plant that provides electricity for the Project would have to comply with all ambient air quality standards and applicable air permit conditions, such as emission offsets. Therefore, air quality impacts due to the generation of electrical power for the Project would be less than significant.

The SWP pumping plants are powered by electricity and their operation creates minimal air emissions. Therefore, implementation of the Project would have a less than significant impact to air quality as a result of increased pumping at these plants.

As described in section 3.0, minor seasonal changes in the average volume of water stored in San Luis Reservoir would result from Project implementation. The average volume of stored water would decrease slightly from December through June and would slightly increase the rest of the year. The amount of water stored in the reservoir already fluctuates, and the changes resulting from the Project would fall within the range of fluctuations present under both current and historic operations. Therefore, the Project would not produce fugitive dust emissions from exposed shorelines that differ from historic levels, and impacts would be less than significant. The volume of water stored at Castaic Lake would not change as a result of the Project, and air quality would not be affected.

No odors would be generated as a result of Project actions.

In summary, the Project would not (1) conflict with or obstruct implementation of an applicable air quality plan; (2) violate any air quality standard or contribute substantially to an existing or projected ambient air quality violation; (3) result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is in nonattainment under an applicable

federal or state ambient air quality standard; (4) expose sensitive receptors to substantial pollutant concentrations; (5) or create objectionable odors affecting a substantial number of people. The Project would have less than significant impacts on air quality resources as a result of actions in the SWP and associated facilities.

INDIRECT IMPACTS

No indirect air quality impacts would occur.

3.3.2.2.2 Wheeler Ridge-Maricopa Water Storage District

DIRECT IMPACTS

Implementation of the Project would not require new construction or the modification of existing WRMWSD water distribution facilities, nor would it change the current operation of these facilities. Therefore no direct air quality impacts would occur.

INDIRECT IMPACTS

As noted in section 3.2, the Project would not change agricultural practices (e.g., cropping patterns or land fallowing) in the WRMWSD and thus and would not affect the generation of fugitive dust emissions (PM_{10}) or other air emissions in the district.

3.3.2.2.3 Castaic Lake Water Agency

DIRECT IMPACTS

Implementation of the Project would not require the construction of new CLWA facilities or the modification of existing CLWA facilities. Transferring an additional 41,000 AF of water through existing facilities for use within the service area would not directly affect air quality. The Project would not conflict with or obstruct implementation of an applicable air quality plan; violate any air quality standard or contribute substantially to an existing or projected ambient air quality violation; result in a cumulatively considerable net increase of any criteria pollutant for which the Project region is in nonattainment under an applicable federal or state ambient air quality standard; expose sensitive receptors to substantial pollutant concentrations; or create objectionable odors affecting a substantial number of people.

INDIRECT IMPACTS

Potential impacts from population growth that could occur as an indirect impact of the Project are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.3.3 Mitigation Measures

3.3.3.1 State Water Project and Associated Facilities

No direct or indirect significant impacts to air quality would occur; therefore no mitigation measures are required.

3.3.3.2 Wheeler Ridge-Maricopa Water Storage District

No direct or indirect significant impacts to air quality would occur; therefore no mitigation measures are required.

3.3.3.3 Castaic Lake Water Agency

No direct significant impacts to air quality would occur; therefore no mitigation measures are required. Mitigation measures for indirect impacts are addressed in Chapter 4, Growth Inducement and Growth-Related Impacts.

3.3.4 Significant Unavoidable Impacts

No direct or indirect significant unavoidable impacts would result from the Project, with the exception of potential indirect impacts within the CLWA service area. These are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.4 BIOLOGICAL RESOURCES

3.4.1 Environmental Setting

3.4.1.1 State Water Project and Associated Facilities

Vegetation and Wildlife

CALIFORNIA AQUEDUCT AND ASSOCIATED FACILITIES

The California Aqueduct begins in the southern Delta near the city of Tracy. Historically, the Delta region was dominated by approximately 400,000 acres of tidal marshland, although extensive land reclamation for agricultural purposes in the late 1800s and early to mid 1900s have reduced the tidal marshland area to an estimated 18,000 acres in 1985 (CALFED 1999). Within the Delta region, agricultural lands now occupy approximately 72 percent of the total land area, with grassland and ruderal (disturbed), open-water, wetland, and riparian habitats occupying the majority of the remaining area (CALFED 1999). Grassland and ruderal habitats, although typically small in size, provide relatively high wildlife value within the region (CALFED 1999). Riparian scrub and woodland habitats with the Delta region typically occur on channel islands, on levees, and along unmaintained creeks, waterways and tributary channels (CALFED 1999). Seasonal fresh water and nontidal freshwater wetlands and marshes including vernal pools and flooded agricultural areas provide important habitat for migratory waterfowl, and shorebird populations (CALFED 1999). Tidal fresh water and brackish water emergent marsh habitat also provides important habitat for migratory waterfowl and shorebird population and supports a variety of special status species. Open water habitat within the Delta region consists of both deep water and shallow water areas. Deep-water areas tend to be unvegetated, while shallow water areas typically support a variety of aquatic plant species and provide resting and foraging habitat for water birds (CALFED 1999). Open water areas within the Delta region provide habitat for over 120 species of fish.

The California Aqueduct originates in the south Delta at Clifton Court Forebay (located 10 miles northwest of the city of Tracy). The forebay provides storage and regulation capability for pumping by the Banks Pumping Plant. The water pumped at Banks Pumping Plant must pass through the John E. Skinner Delta Fish Protective Facility where fish are separated from the water before the water is transported down the Aqueduct. SWP diversions at the Delta are currently governed by the State Water Resources Control Board's Water Right Decision 1641 (described in more detail in section 3.15 and Appendix D), which specifies criteria for which DWR must follow in SWP Delta operations. These criteria are intended to protect biological resources within the Delta.

South of the SWP facilities in the Delta, the California Aqueduct traverses the west side of the San Joaquin Valley to the Tehachapi Mountain Range in the southern end of the valley. The dominant land use within the San Joaquin Valley is agricultural and agricultural related uses. The Aqueduct within the San Joaquin Valley is a concrete lined canal with a few short segments of enclosed pipe. Biological resources within the Aqueduct, therefore, are limited to common fish species, mostly introduced, and a variety of invertebrate species that may occupy the water

column. Other upland species and birds may utilize the Aqueduct in some locations for drinking water or to forage for fish and invertebrates.

California Aqueduct from Tehachapi Mountain Range to Castaic Lake. At the southern end of the San Joaquin Valley, the open canal structure of the Aqueduct changes to enclosed pipes, which traverse the Tehachapi Mountains in a southerly direction to Pyramid Lake and eventually empty water into the Castaic Lake reservoir. No biological resources are associated with the piped portion of the Aqueduct.

SAN LUIS RESERVOIR

San Luis Reservoir was constructed as a storage reservoir for the federal CVP and the California SWP. The water arrives through the California Aqueduct and the Delta-Mendota Canal, and is pumped from the O'Neil Forebay into the main reservoir during the winter and spring. The reservoir supports a large variety of fish and wildlife species both within the water column and in the areas surrounding the reservoir.

The dominant shoreline vegetation of the reservoir is grassland, making up approximately 70 percent of the shoreline (USBR 1997). Grassland vegetation community is characterized by the dominance of annual or perennial grasses. The remaining 30 percent of the shoreline vegetation consists of montane hardwood (USBR 1997). Montane hardwood consists of a well-defined tree layer composed predominately of broadleaved hardwood tree species, poorly developed shrub layer, and sparse herb layer (USBR 1997). A variety of reptiles, birds and mammals are typically associated with grassland and montane hardwood habitats. San Luis Reservoir supports a small number of diving and dabbling ducks (USBR 1997).

Approximately 55 percent of the shoreline vegetation of the O'Neil Forebay is grassland (USBR 1997). The forebay supports more than 200,000 wintering waterbirds, including American coot (*Fulica americana*) (dominant species), northern pintail (*Anas acuta*), ruddy duck (*Oxyura jamaicensis*), and American widgeon (*Anas americana*) (USBR 1997). O'Neil Forebay is one of the three most important wintering areas in California for the Barrow's goldeneye (*Bucephala islandica*) (USBR 1997).

The San Luis Reservoir complex is important recreational fishery area. Fish typically caught at the San Luis Reservoir complex include striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), catfish (*Ictalurus* sp.), bluegill (*Lepomis machrochirus*) and crappie (*Pomoxis* sp.) (DWR 2001c).

CASTAIC LAKE

Castaic Lake is a terminal water storage facility for the SWP located in the northern portion of the Santa Clarita valley at the confluence of Castaic Creek and Elizabeth Lake Canyon Creek. Adjacent to the lake, vegetation consists of dry upland scrub and chaparral communities on the steep slopes above the water. The steep banks along almost the entire parameter of the lake and fluctuating water levels prevent the establishment of shoreline vegetation, and therefore, there is minimal shoreline and aquatic vegetation associated with the lake. Scattered willows (*Salix* sp.) and mulefat (*Baccharis salicifolia*) exist in areas with more gradually sloped banks. The

banks of Castaic Lagoon, located immediately below Castaic Dam, are less steep than the banks of the lake and water levels in the lagoon are kept relatively constant.

Native wildlife associated with, and adjacent to, Castaic Lake includes both terrestrial and aquatic species. The arid hills surrounding the lake support species adapted to the hot, dry conditions, such as the western fence lizard (*Sceloporus occidentalis*), side-blotched lizard (*Uta stansburiana*), San Diego horned lizard (*Phrynosoma coronatum blainvillei*), western rattlesnake (*Crotalus viridis*), gopher snake (*Pituophis melanoleucus*), black-tailed jackrabbit (*Lepus californicus*), deer mouse (*Peromyscus maniculatus*), mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), and bobcat (*Lynx rufus*). Species more directly associated with the lake include osprey (*Pandion haliaetus*), bald eagle (*Haliaeetus leucocephalus*), which both occasionally winter at the lake, and a variety of species of waterfowl and fish.

Castaic Lake is an important recreational fishing lake, and is known for its trophy-sized largemouth bass. Other fish species include striped bass, bluegill, crappie, channel catfish (*Ictalurus punctatus*), white catfish (*Ictalurus catus*), and threadfin shad (*Dorosoma petenense*). Hatchery raised rainbow trout (*Oncorhynchus mykiss* sp.) are also stocked annually.

Special Status Species

Numerous adopted Habitat Conservation Plans (HCPs) and Natural Community Conservation Plans (NCCPs) exist within the Delta region, the San Joaquin Valley and other areas traversed by, or containing SWP facilities. Sensitive plant communities and special status plant and animal species in the Delta region, San Joaquin Valley and associated with the California Aqueduct are described in detail in the CALFED Bay-Delta Program Environmental Impact Statement (EIS)/EIR (CALFED 1999), and the Central Valley Project Improvement Act Draft Programmatic EIS (USBR 1997). These documents are available from the CALFED Bay-Delta Authority, 650 Capitol Mall, 5th Floor, Sacramento, California 95814, and the U.S. Bureau of Reclamation, 2800 Cottage Way, Sacramento California 95825-1898.

CALIFORNIA AQUEDUCT AND ASSOCIATED FACILITIES

The Delta region supports many sensitive plant communities as well as dozens of special status plant and animal species. The San Joaquin Valley also supports a large number of special status plant and wildlife species with the largest number occurring in grassland and valley foothill woodland habitats (CALFED 1999). No vegetation persists within the Aqueduct, limiting habitat to the water column. Some sensitive species occurring in the vicinity of the Aqueduct, such as the pallid bat (*Antrozous pallidus*), may occasionally utilize the Aqueduct to forage for insects or other small prey inhabiting the water in the Aqueduct.

SAN LUIS RESERVOIR

According to the California Natural Diversity Database (CNDDB), sensitive species known to occur in the San Luis Reservoir area include, although may not be limited to the following, blunt-nosed leopard lizard (*Gambelia silus*), California tiger salamander (*Ambystoma californiense*), burrowing owl (*Athene cunicularia*), California horned lark (*Eremophila alphestris actia*), Swainson's hawk (*Buteo swainsoni*), tricolored blackbird (*Agelaius tricolor*), and San Joaquin kit fox (*Vulpes macrotis mutica*) (CNDDB 2002).

CASTAIC LAKE

Sensitive plant species known to occur in the Castaic Lake area include, although may not be limited to: Nevin's barberry *(Berberis nevinii)*, and San Gabriel bedstraw *(Galium grande)* (California Department of Parks and Recreation 1985; CNDDB 2002). Both Nevin's barberry and San Gabriel bedstraw occur in chaparral or cismontane woodland habitat areas, and may occur in appropriate upland habitat areas around Castaic Lake. One additional sensitive plant species, the San Fernando Valley spineflower, has historically been in the area (CNDDB 2002). Sensitive wildlife species known to occur in the Castaic Lake area include, although may not be limited to the following: California condor *(Gymnogyps californianus)*, bald eagle, osprey, golden eagle *(Aquila chrysaetos)*, least bell's vireo *(Vireo bellii pusillus)*, arroyo toad *(Bufo californicus)*, California red-legged frog *(Rana aurora draytonii)*, San Diego horned lizard, coastal western whiptail *(Cnemidophorus tigris multiscutatus)*, San Diego black-tailed jackrabbit *(Lepus californicus bennettii)*, San Diego desert woodrat *(Neotoma lepida intermedia)*, Southern California rufous-crowned sparrow *(Aimophila ruficeps ruficeps)*, and Bell's sage sparrow *(Amphispiza belli belli)* (CCWA 1995, PCR 2000, CNDDB 2002).

3.4.1.2 *Wheeler Ridge-Maricopa Water Storage District*

Vegetation and Wildlife

Most of the lands in the district are cultivated agricultural areas. The predominant habitat on lands not cultivated is annual grassland characterized by introduced annual grasses and a combination of native and non-native forbs (Lower Sonoran grassland [Moe and Twisselmann 1995], California prairie [Williams 1998], or non-native grassland [Holland 1986]). Formerly cultivated lands typically support an annual grassland community dominated by introduced grasses such as red brome (*Bromus madritensis rubens*), common foxtail (*Hordeum glaucum*), and wild oats (*Avena fatua*). Within the district, there are also fairly extensive areas of chenopod scrub vegetation (Holland 1986) dominated by shrubby members of the family Chenopodiaceae, typically saltbushes (*Atriplex* spp.). Riparian, wetland, and open water habitats are limited to short stretches along intermittent or ephemeral stream channels, agricultural ponds and drainage ditches, and along the California Aqueduct.

Higher elevation foothill areas within the district were historically characterized by Blue Oak Woodland habitat. Blue Oak Woodland is characteristically an open woodland dominated by blue oak (*Quercus douglasii*) with a grassy or shrubby understory. It is found, for example, on the slopes of the middle elevations of the mountains at the southern end of the San Joaquin Valley. Blue oak is often accompanied by gray pine (*Pinus sabiniana*).

The alkali sink community in Kern County was formerly relatively extensive, surrounding lakes in undrained valley bottom habitats where salts accumulated from evaporating water. This community is also associated with sag ponds along major fault zones (1967, reprinted in Moe and Twisselmann 1995). Alkali-tolerant species are often perennial, markedly halophytic, and highly specialized members of the family Chenopodiaceae, such as glasswort pickleweed (*Salicornia subterminalis*), iodine bush (*Allenrolfea occidentalis*), and sea-blite (*Suaeda moquinii*). Much of the land supporting this community has been converted to productive farmland.

The native wildlife composition of the district and the San Joaquin Valley has been affected by the extensive conversion of native habitats to cropland and the fragmentation of the remaining habitat. Upland wildlife species have been replaced over large areas by a small subset of native and introduced wildlife species that are more ubiquitous and frequent row crops, vineyards, or orchard agricultural operations. Typical mammalian species of the area include the California ground squirrel (*Spermophilus beecheyi*), Botta's pocket gopher (*Thomomys bottae*), deer mouse, big brown bat (*Eptesicus fuscus*), coyote, opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), introduced red fox (*Vulpes vulpes*), and striped skunk (*Mephitis mephitis*). Typical birds include the American crow (*Corvus brachyrhynchos*), house sparrow (*Passer domesticus*), house finch (*Carpodacus mexicanus*), killdeer (*Charadrius vociferus*), lark sparrow (*Chondestes grammacus*), mourning dove (*Zenaida macroura*), common raven (*Corvus corax*), red-winged blackbird (*Agelaius phoeniceus*), and the American robin (*Turdus migratorius*). Birds of prey occur in a large variety and number in the area due to the abundant rodent populations that thrive in fallow fields and grazing lands. Common birds of prey in the area include the golden eagle, red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), prairie falcon (*Falco mexicanus*), and turkey vulture (*Cathartes aura*), great horned owl (*Bubo virginianus*), and barn owl (*Tyto alba*). Native waterfowl and herons, such as the American avocet (*Recurvirostra americana*), snowy plover (*Charadrius alexandrinus*), mallard duck (*Anas platyrhynchos*), northern pintail duck (*Anas acuta*), gadwall duck (*Anas strepera*), common teal duck (*Anas crecca*), redhead duck (*Aythya americana*), northern shoveler duck (*Anas clypeata*), eared grebes (*Podiceps nigricollis*), great blue heron (*Ardea herodias*), and the snowy egret (*Egretta thula*) are concentrated in natural water bodies with aquatic and wetland habitat as well as many man made features where these habitat types have developed.

Species that were once widespread and characteristic of native Central Valley habitats such as the San Joaquin kit fox (*Vulpes macrotis mutica*), San Joaquin pocket mouse (*Perognathus inornatus*), and burrowing owl (*Athene cunicularia*) are now rare in the area due to the extensive conversion of native valley habitat to other uses. These species are discussed below under the subheading of sensitive species.

Plants and animals of the southern San Joaquin Valley were described in recent field investigations conducted for the San Emidio New Town Specific Plan (Kern County 1992a, b), Pacific Pipeline Project (Aspen Environmental Group 1996), and Metropolitan Bakersfield Habitat Conservation Plan (City of Bakersfield 1994). Additional relevant data are assembled in the San Joaquin Valley Endangered Species Recovery Program (Williams 1998; USFWS 1997) and Kern County Draft Valley Floor Habitat Conservation Plan (Kern County 2001). General discussions of the vegetation of the region are provided in Twisselmann (1967, reprinted in Moe and Twisselmann 1995).

Sensitive Species and Habitats

Sensitive plants include state and federally listed, proposed, and candidate species, and species listed in the California Native Plant Society's (CNPS) Inventory of Rare and Endangered Plants (CNPS 2001). This evaluation includes plants that were identified in previous site inventories (Mitchell 1991, Aspen Environmental Group 1996). Sensitive plants known or likely to occur within the district and greater San Joaquin Valley floor are provided in Appendix B.

Sensitive wildlife species include state and federally listed, proposed and candidate species, and state and federal species of concern. The sensitive wildlife species potentially occurring or known to occur within the district and greater San Joaquin Valley floor are provided in Appendix B. Since 1998, the federal status of the Buena Vista Lake shrew (*Sorex ornatus relictus*) has changed from federal species of concern to federally listed as endangered (CNDDB 2002).

There are no significant stands of designated sensitive plant communities within the district. Undeveloped grassland and saltbush scrub habitats south of Highway 166 support noteworthy stands of the endangered Bakersfield cactus (*Opuntia basilaris* var. *treleasei*) and so would be considered sensitive with regard to future land use decisions.

An HCP has been adopted for the Metropolitan Bakersfield Area. Kern County is in the process of developing the Kern County Valley Floor Habitat Conservation Plan (KCVFHCP) for additional portions of the county. A draft of the KCVFHCP was released in April 2001 for public review, and the United States Fish and Wildlife Service (USFWS) released a Notice of Intent to prepare an EIS for the KCVFHCP in October 2002 (USFWS 2002). In addition, the Tejon Ranch Valley Floor HCP (TRVFHCP) is being developed for Tejon Ranch lands within the San Joaquin Valley, some of which are within the district.

3.4.1.3 *Castaic Lake Water Agency*

Vegetation and Wildlife

For the most part, the CLWA service area coincides with the Santa Clarita planning area (City of Santa Clarita 1991) and encompasses the Santa Clara River Valley, the east extension of the Santa Susana Mountains, the westernmost reaches of the San Gabriel Mountains, and the southern slopes of the Sierra Pelona. The principal natural features of the Santa Clarita Valley include the Santa Clara River (which is a dry riverbed most of the year, although portions contain riparian habitat patches), Castaic Valley, San Francisquito Canyon, Bouquet Canyon, Placerita Canyon, and Hasley Canyon. The Santa Clara River flows west intermittently from the San Gabriel Mountains to the Santa Susana Mountains and on through Ventura County to the ocean. This complex topography provides a natural setting that supports a diverse assemblage of biotic communities (City of Santa Clarita 1991).

Much of the existing development is concentrated along the Santa Clara River and Interstate 5. Although substantial portions of the Santa Clarita planning area have been developed, a large portion of the lands within the CLWA service area remains undeveloped. These undeveloped lands still support ecologically important vegetation and wildlife habitats. Major vegetation/habitat types include oak woodlands (distinct stands of valley oak, coast live oak, and interior live oak can be distinguished), chaparral, Southern California walnut woodlands, coastal and/or Riversidean (Venturan) sage scrub, non-native grassland, riparian scrub (characterized by mulefat and/or shrubby willows), and riparian woodlands (characterized by large willows and cottonwoods [*Populus fremontii*], including densely forested areas). Although large amounts of riparian habitat are not present in the CLWA service area, this habitat is important where it does occur. Inventories of plants and wildlife associated with these habitats are described in Aspen Environmental Group (1996) and County of Los Angeles (1996). The current vegetation and habitat setting is generally the same as in 1998; however, continued

growth and development in the area have resulted in some conversion of habitat to urban land uses.

In addition to the above habitats, there is open water habitat provided by Castaic Lake, Castaic Lagoon, and limited areas along the Santa Clara River. Except during and immediately after rainfall and runoff events, open water in the Santa Clara River west of Interstate 5 is principally a result of permitted discharges from the regional water reclamation facilities. Castaic Lake supports recreational fishing for bass, trout, catfish and bluegill, along with swimming, boating, and other recreation. The Santa Clara River is a regionally significant habitat area for native fishes and other wildlife.

Sensitive Species and Habitats

Within the CLWA service area, no regional HCPs or NCCPS have been adopted. However, some unincorporated portions of the service area are subject to Los Angeles County Significant Ecological Area (SEA) zoning overlays, which indicate the presence of sensitive resources and require county environmental review. These areas are discussed at greater length below.

Sensitive plants and animals potentially occurring or known to occur within the CLWA service area are listed in Appendix D. These compilations are based largely on the EIRs for the Pacific Pipeline Project (Aspen Environmental Group 1996) and the Newhall Ranch Specific Plan (County of Los Angeles 1996), and the Los Angeles County SEA Update Study (PCR 2000), all of which provide information on the regional and local occurrence of sensitive species in the area. These documents are available from the County of Los Angeles, Department of Regional Planning, 320 West Temple Street, Los Angeles, California 90012. Sensitive species information was also gleaned from the CNDDB (CNDDB 2002).

Los Angeles County has designated five locations in and around the Santa Clarita Valley as SEAs. The SEAs include the Santa Clara River, the Santa Susana Mountains, San Francisquito Canyon, Lyon Canyon, and Valley Oaks Savannah and are described below (City of Santa Clarita 1991). The SEAs are originally described in England and Nelson (1976).

1. **Santa Clara River.** This is the largest SEA in the Santa Clarita Valley, extending through the City of Santa Clarita and along the entire Santa Clara River watershed. It supports a variety of natural habitats including freshwater marsh, coastal sage scrub, oak woodland, and riparian woodlands. A great portion of the river channel, through the Santa Clarita planning area, is ephemeral and remains dry for most of the year. In scattered areas, however, the water table under the streambed is high, and lush riparian vegetation provides refuge for birds and wildlife. This assemblage of vegetation described as a broad wash association in the SEA descriptions is unlike that found in steeper mountain canyons. It is the only major river drainage from the San Gabriel Mountains that remains unchannelized for most of its length. This area was designated as an SEA primarily because of the threat of loss of suitable habitat for the unarmored threespine stickleback (*Gasterosteus aculeatus williamsoni*), a federally and state-listed endangered species. This species formerly occurred in the Los Angeles, San Gabriel, and Santa Ana rivers but is now restricted to San Francisquito Canyon, three areas in the Santa Clara River, and San Antonio Creek on Vandenberg Air Force Base. The

stickleback requires clean, free-flowing perennial streams and ponds surrounded by natural vegetation. The adjacent floodplain of the Santa Clara River is included in this SEA in order to preserve this habitat. The natural vegetation along the intermittent portion of the stream slows heavy runoff during rainy seasons and thus decreases destruction and siltation of stickleback habitats downstream.

2. **Santa Susana Mountains SEA.** The westernmost portion of the Santa Clarita planning area encompasses a portion of this SEA that covers 12,000 acres. These mountains are one of several relatively small ridges (dominated by Oat Mountain at elevation 3,840 feet) that form the eastern end of the transverse ranges and blend eastward into the larger San Gabriel and San Bernardino Mountains. The Santa Monica Mountains are also part of this system. Vegetation within this SEA consists of coastal sage scrub on the south-facing sunlit slopes and dense chaparral on the north facing slopes. Riparian and oak woodland vegetation is found along stream drainages and within canyons, along with bigcone spruce (*Pseudotsuga macrocarpa*), bigleaf maple (*Acer macrophyllum*), and California walnut (*Juglans californica*). The oak woodland habitat is extremely diverse containing six species of oaks. The interior portions of the Santa Susana Mountains are largely undisturbed by the urbanization that has occurred both to the south (San Fernando Valley) and to the north (Santa Clarita). These wilderness areas are important for maintaining gene flow and wildlife movement between the Santa Monica and the San Gabriel mountains, which are now largely isolated from one another by urban development.

3. **San Francisquito Canyon SEA.** San Francisquito Canyon SEA contains an intermittent stream that drains the hillsides north of the planning area in the Angeles National Forest. Riparian vegetation is located in the canyon bottom along the stream channel, while grasslands and chaparral are found on the walls. This SEA was designated because it supports populations of the unarmored threespine stickleback. The San Francisquito Canyon SEA is currently maintained to prevent downstream siltation of the Santa Clara River and provide constant water flows to preserve designated critical habitat for the unarmored threespine stickleback. The San Francisquito floodplain is included in the SEA in order to preserve downstream stickleback habitats.

4. **Lyon Canyon SEA.** The Lyon Canyon SEA is located in the southwest portion of the Santa Clarita planning area, west of Interstate-5, and covers approximately 150 acres. This SEA is a relatively narrow canyon that contains both an oak woodland community and a substantial chamisal chaparral community. The oak woodland, found in the southern portion of the SEA contains both the coast live oak (*Quercus agrifolia*) and the valley oak. The northern region of the SEA contains the chaparral community consisting of species such as sugarbush (*Rhus ovata*), ceanothus (*Ceanothus* sp.), black sage (*Salvia mellifera*), mulefat, and chamise (*Adenostoma fasiculatum*), the latter of which is the dominant shrub.

5. **Valley Oaks Savannah SEA.** The Valley Oaks Savannah SEA covers approximately 400 acres and is located west and east of Interstate-5, south of the Valencia Boulevard interchange. This area contains one of the last remaining stands of valley oak in the Santa Clarita Valley, and it represents the southernmost limit of large, contiguous Valley

Oak Savannah in California. Although the stand is quite extensive, little regeneration is occurring, possibly due to grazing or other disturbances. The vegetative land cover consists mainly of weed-dominated grasslands. Scattered coast live oaks occur throughout the area as well. Recent development, however, has significantly altered this SEA.

The County of Los Angeles is currently reviewing the SEA program as part of the General Plan Update. Recommendations from the county's consulting biologist include revised boundaries that would group smaller SEAs into larger connected SEAs (PCR 2000). Although the proposed boundaries cover a considerably larger area, they generally contain the same resources that persist in the exiting SEAs. A revised general plan and SEA program are not expected to be adopted until mid to late 2004.

Other sensitive biological resources located within the CLWA service area include riparian habitats, oak woodlands, walnut woodlands, and potential nesting and foraging habitat for sensitive and endangered species.

Riparian habitats, especially along the Santa Clara River, provide nesting and foraging habitat for many sensitive bird species including the federally and state listed endangered least Bell's vireo and the federally listed endangered southwestern willow flycatcher (*Empidonax traillii extimus*). Scrub habitat in the foothills supports some of the most northerly occurrences of the federally listed threatened California gnatcatcher (*Polioptila californica californica*). Riparian habitats along the Santa Clara River, Soledad Canyon, and/or San Francisquito Canyon support population of the federally and state listed endangered unarmored threespine stickleback, federally listed endangered Santa Ana sucker (*Catostomus santaanae*), federally listed endangered arroyo toad, and the federally listed threatened California red-legged frog. Vernal pool habitat in the vicinity of Cruzan Mesa have historically supported the federally listed threatened vernal pool fairy shrimp (*Branchinecta lynchii*), federally listed endangered Riverside fairy shrimp (*Streptocephalus woottoni*), federally listed threatened spreading navarretia (*Navarretia fossalis*), and the federally and state listed endangered California Orcutt grass (*Orcuttia californica*) and thread-leaved brodiaea (*Brodiaea filifolia*). Two additional listed plant species, federally and state listed endangered Nevin's barberry and slender-horned spineflower (*Dodecahema leptoceras*), have been documented in the region (City of Santa Clarita 1991; PCR 2000). Since 1998, the San Fernando Valley spineflower was added to the state endangered list (CNDDB 2002). Additionally, the Arroyo toad was moved from the federal list of threatened species to the list of endangered species. With the above exceptions, the current environmental setting is generally the same as it was in 1998; however, continued growth and development in the area may have resulted in some impacts to the abundance of sensitive species with the conversion of land to urban uses.

Other important habitats and biological resource areas within the Santa Clarita planning area are listed below (from City of Santa Clarita 1991):

- Land within the Angeles and Los Padres National Forests, including Elsmere Canyon, and wildlife corridors between the Santa Susana Mountains and the San Gabriel Mountains.

- Canyon areas, including Whitney Canyon, Elsmere Canyon, Wiley Canyon, East Canyon, Towsley Canyon, Rice Canyon, San Francisquito Canyon, and other canyons that provide important habitat (water, food and shelter) and biological resources, and add to the viewshed of the Santa Clarita Valley.
- Open water habitat provided by Castaic Lake, Castaic Lagoon, and isolated locations along the Santa Clara River.
- Habitat for federally listed endangered, threatened, or rare plant and wildlife species found in chaparral and coastal sage scrub vegetation.
- State listed endangered plant and wildlife species found in chaparral and coastal sage scrub habitat.
- Oak trees that are protected by ordinances within the City of Santa Clarita and elsewhere in Los Angeles County.

3.4.2 Potential Impacts of the Project

3.4.2.1 Significance Criteria

The criteria used to determine the significance of impacts to biological resources are based on Appendix G of the State CEQA Guidelines. The Project would result in a significant impact if it would:

- have a substantial adverse impact, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFG or USFWS;
- have a substantial adverse impact on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the CDFG or USFWS;
- adversely impact federally protected wetlands (including marsh, vernal pool, coastal, etc.) either individually or in combination with the known or probable impacts of other activities through direct removal, filling, hydrological interruption, or other means;
- interfere substantially with the movement of any resident or migratory fish or wildlife species or with the established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites;
- conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance; or
- conflict with the provisions of an adopted HCP, NCCP, or other approved, local, regional, or state habitat conservation plan.

For the purpose of this analysis, "sensitive" habitats or species are those that are demonstrably rare, threatened, or endangered; are protected by statute or regulation; or have recognized commercial, recreational, or scientific importance.

3.4.2.2 *Environmental Impacts*

3.4.2.2.1 *State Water Project and Associated Facilities*

DIRECT IMPACTS

Implementation of the Project would not require new construction or the modification of existing SWP facilities. The annual amount of SWP diversions from the Delta would be unchanged, and runoff would continue to be captured when available and stored in SWP and local facilities. Runoff would be used to meet SWP demand based on current SWP operating criteria and management practices. As described in section 3.0, the timing of SWP diversions at the Delta could change slightly, although this change would be minor and within the current operating criteria. The slight change in the timing of diversions would not result in an impact to biological resources.

The Project would result in a slight increase in the amount of water transported in the California Aqueduct from southern Kern County to Castaic Lake. This change would not adversely impact fish or other wildlife that use the Aqueduct. As described in section 3.0, minor seasonal changes in the average volume of water stored in San Luis Reservoir would result from Project implementation. The average volume of stored water would decrease slightly from December through June and would slightly increase the rest of the year. The amount of water stored in the reservoir already fluctuates, and the changes resulting from the Project would fall within the range of fluctuations present under both current and historic operations. Impacts to biological resources at San Luis Reservoir would be less than significant. The volume of water stored at Castaic Lake would not change as a result of the Project, and biological resources would not be impacted.

Since the only changes to the operation of SWP facilities are minor and since no construction would occur, the Project would not adversely impact candidate, sensitive, or special status species, riparian habitat or other sensitive natural communities, federally protected wetlands; interfere with the movement of any fish or wildlife species or impede the use of native wildlife nursery sites; conflict with any local policies or ordinances protecting biological resources, or conflict with the provisions of an adopted HCP, NCCP, or other approved, local, regional, or state HCP. In summary, there would be no direct impact to biological resources for the California Aqueduct, associated facilities, or adjacent lands.

INDIRECT IMPACTS

No indirect impacts to biological resources would occur.

3.4.2.2.2 *Wheeler Ridge-Maricopa Water Storage District*

DIRECT IMPACTS

The Project would not result in changes in the amount of land actively used for agriculture or other uses. Since the Project would not require new construction, no direct loss of habitat or impacts to sensitive species would occur from construction activities. Overall, the Project would not adversely impact candidate, sensitive, or special status species, riparian habitat or

other sensitive natural communities, federally protected wetlands; interfere with the movement of any fish or wildlife species or impede the use of native wildlife nursery sites; conflict with any local policies or ordinances protecting biological resources, or conflict with the provisions of an adopted HCP, NCCP, or other approved, local, regional, or state HCP.

INDIRECT IMPACTS

No indirect impacts to biological resources would occur.

3.4.2.2.3 Castaic Lake Water Agency

DIRECT IMPACTS

Since implementation of the Project would not require the construction of new CLWA facilities or modification of existing CLWA facilities, no direct impact to biological resources would occur.

INDIRECT IMPACTS

Potential environmental impacts from growth that could occur as an indirect impact of the Project are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.4.3 Mitigation Measures

3.4.3.1 State Water Project and Associated Facilities

No direct or indirect significant impacts to biological resources were identified, therefore no mitigation measures are required.

3.4.3.2 Wheeler Ridge-Maricopa Water Storage District

No direct or indirect significant impacts to biological resources were identified, therefore no mitigation measures are required.

3.4.3.3 Castaic Lake Water Agency

No direct significant impacts to biological resources were identified, therefore no mitigation measures are required. Indirect impacts are addressed in Chapter 4, Growth Inducement and Growth-Related Impacts.

3.4.4 Significant Unavoidable Impacts

No direct or indirect significant unavoidable impacts would result from the Project, with the exception of potential indirect impacts within the CLWA service area. These are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.5 CULTURAL RESOURCES

3.5.1 Environmental Setting

Cultural resources include prehistoric and historic archaeological sites, districts, and objects; standing historic structures, buildings, districts, and objects; and locations of important historic events, or sites of traditional/cultural importance.

These "historical resources" are defined in State CEQA Guidelines section 15064.5 as the following:

1. A resource listed in, or determined to be eligible by the State Historical Resources Commission for listing in the California Register of Historical Resources (Pub. Res. Code section 5024.1, Title 14 CCR, section 4850 et seq.).
2. A resource included in a local register of historical resources, as defined in section 5020.1(k) of the Public Resources Code or identified as significant in a historical resource survey meeting the requirements of section 5024.1(g) of the Public Resources Code, shall be presumed to be historically or culturally significant. Public agencies must treat any such resource as significant unless the preponderance of evidence demonstrates that it is not historically or culturally significant.
3. Any object, building, structure, site, area, place, record, or manuscript that a lead agency determines to be historically significant or significant in the architectural, engineering, scientific, economic, agricultural, educational, social, political, military, or cultural annals of California may be considered to be a historical resource, provided the lead agency's determination is supported by substantial evidence in light of the whole record. Generally, a resource shall be considered by the lead agency to be "historically significant" if the resource meets the criteria for listing on the California Register of Historical Resources (Pub. Res. Code section 5024.1, Title 14 CCR, section 4852), including the following:
    a. is associated with events that have made a significant contribution to the broad patterns of California's history and cultural heritage;
    b. is associated with the lives of persons important in our past;
    c. embodies the distinctive characteristics of a type, period, region, or method of construction, or represents the work of an important creative individual, or possesses high artistic values; or
    d. has yielded, or may be likely to yield, information important in prehistory or history.

Paleontologic resources are the recognizable remains of once-living, non-human organisms. Identified as fossils, these resources represent a record of the history of life on the planet dating as far back as approximately four billion years ago. Paleontologic resources can include shells, bones, leaves, trails, and other fossilized floral or faunal materials.

3.5.1.1 State Water Project and Associated Facilities

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP.

California Aqueduct

The California Aqueduct is a 444-mile-long concrete-lined canal running between the Delta and Lake Perris. The oldest sections were built in the early 1960s, and the most recent sections were built in the early 1990s. The California Aqueduct, along with the regional feeder aqueducts, passes through Alameda, Contra Costa, San Joaquin, Stanislaus, Merced, Fresno, Kings, Kern, Santa Barbara, San Luis Obispo, Los Angeles, and San Bernardino counties. Its corridor includes the areas traditionally inhabited by the Miwok, Northern Valley Yokuts, Southern Valley Yokuts, Chumash, Tataviam, Gabrielino, Serrano, Cahuilla, and other neighboring tribes.

San Luis Reservoir

San Luis Reservoir is a storage reservoir for the CVP and SWP that was filled for the first time in 1969. San Luis Reservoir is located on the flanks of the San Joaquin Valley, on land that was traditionally inhabited by the Northern Valley Yokuts at the time of first European contact. The San Joaquin River, associated channels and sloughs, formed the core of the Northern Yokuts' homeland (Wallace 1978a). The Northern Yokuts' subsistence practices centered around the San Joaquin River, fishing salmon and harvesting tule roots that grew in riverine marshes. Acorns from valley oaks also played an important role in their diet, and were made into a thick soup or gruel. The valley floor of the San Joaquin River region contains numerous Native American archaeological sites, such as stone tool manufacturing stations (i.e., lithic scatters) and acorn processing sites (e.g., bedrock mortars) (USBR 1997).

The Northern Yokut population rapidly declined as the result of disease, missionization, and, later, by the arrival of American miners and settlers during the gold rush years (Wallace 1978a). Spanish soldiers, Mexican ranchers, and early gold miners traveled through nearby Pacheco Pass, named after Don Juan Pacheco who settled there in 1840, and the pass became part of an early stage route between San Francisco and Missouri. By the late 1800s, the economy of the west side of San Joaquin Valley was firmly rooted in agricultural pursuits (USBR 1997). The San Joaquin River region contains numerous historic sites related to early mining, settlement, and agricultural (USBR 1997). There may be historic, prehistoric, or paleontologic sites either along the reservoir margins or located on submerged knolls.

Castaic Lake

The West Branch of the California Aqueduct terminates at Castaic Lake, in the northern portion of the CLWA service area. Local ethnographic groups and historic land uses are the same as those described for the CLWA service area in section 3.5.1.3 below.

The creation of the Castaic Dam and lake facility in 1972 inundated cultural resources located along on the margins of the lake (CCWA 1995), including seven prehistoric sites listed in Table 3.5-1. No historic resources are recorded in the area; however, no systematic survey of the lake margins was conducted prior to the construction of the dam (CCWA 1995). Therefore, there

Table 3.5-1. Castaic Lake Cultural Resources

Site	Description	Condition
CA-LAN-323	Prehistoric village site with bedrock mortars	Cultivated prior to inundation
CA-LAN-324	Prehistoric village with cemetery	Bulldozed before inundation
CA-LAN-325	Prehistoric rock shelter	Heavily looted
CA-LAN-326	Prehistoric stone tool scatter	Crossed by highway prior to inundation
CA-LAN-327	Prehistoric temporary camp	Cultivated prior to inundation
CA-LAN-1221	Prehistoric sandstone rock shelter	Lake flooding, boating access, and illicit artifact collection
CA-LAN-1222	Prehistoric sandstone rock shelter	Lake flooding, boating access, and illicit artifact collection

Note: No historic resources have been recorded.
Source: CCWA 1995.

may be unrecorded historic, prehistoric, or paleontologic sites either along the lake margins or located on submerged knolls.

3.5.1.2 *Wheeler Ridge-Maricopa Water Storage District*

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP. Several ethnographic groups were scattered throughout what is now Kern County, including the Southern Valley Yokuts, Kitanemuk, Castac Chumash (Heizer 1978). The Southern Valley Yokuts inhabited the southern end of the San Joaquin Valley, from the lower Kings River to the Tehachapi Mountains (Wallace 1978b). The Kitanemuck were located principally in the Tehachapi Mountains at the southern end of the San Joaquin Valley (Blackburn and Bean 1978), while the traditional territory of the Castac Chumash is located in the southwestern portion of Kern County (Grant 1978a). Cultivated areas are considered to have a low to moderate cultural resource sensitivity because historic plowing and grading associated with cultivated agriculture generally destroys or damages the integrity of any cultural sites within the cultivated area.

Although Spanish explorers entered Kern County area as early as the 1770s, major European influence began in the mid-1800s with the influx of settlers associated with Spanish land grants and gold miners drawn to the 1857 gold discovery in the Greenhorn Mountain area of eastern Kern County. As gold-fever declined, agricultural pursuits and oil exploration began to grow in Kern County, and historic resources in the county are often associated with these early industries.

3.5.1.3 *Castaic Lake Water Agency*

For purposes of this analysis, no substantial changes in baseline conditions have occurred between 1998 and the present. The CLWA service area is located in Ventura and Los Angeles counties, where at least four distinct ethno-linguistic groups were living at the time of first European contact. The area around Castaic Lake itself was the home of the Tataviam, a group of about 1,000 people who lived in villages along Piru Creek, Castaic Creek, and the upper

portions of the Santa Clara River drainage (King and Blackburn 1978). The lower Santa Clara River drainage was home to the Ventureño Chumash, a much larger (about 4,000 people) and more maritime oriented group (Grant 1978b). The upper portions of Piru Creek, along with much of the inland portions of Ventura County, were inhabited by the Emigdiano and Castac Chumash (Grant 1978a). Native American archaeological sites from various time periods exists within the CLWA service area, especially along the Piru and Castaic drainage systems, at the Vasquez Rocks and Escondido Canyon, and along major ridgelines (CLWA 1999).

Spanish contact with Native American groups along the coast began as early as the mid 1500s, but it was not until the late 1700s that the Spanish, and then Mexicans, established any kind of continuous presence. The discovery of gold in Placerita Canyon near Newhall during the 1840s attracted many miners to the area, and agricultural and livestock operations rose up in the Santa Clara River valley to support their need for provisions. Oil was discovered in the area in the 1870s, and settlement accelerated throughout the late 1800s with the development of regional and interregional transportation systems. Historic resources documented in the CLWA service area are usually associated with major routes of travel, watercourses, and early homesteading practices in and around Newhall (Scientific Resource Surveys 1988).

The CLWA service area contains at least three types of geologic units that have yielded fossilized material. Fossilized fish, shark teeth, and invertebrate remains have been recovered from the Castaic Formation, remains of Clarendonian land mammals have been recorded in the Saugus Formation, and marine invertebrates are often common in Quaternary terrace deposits (Scientific Resource Surveys 1988).

3.5.2 Potential Impacts of the Project

3.5.2.1 Significance Criteria

Section 15064.5 of the CEQA Guidelines indicates a project may have a significant environmental effect if it causes "substantial adverse change" in the significance of an "historical resource" or a "unique archaeological resource" as defined or referenced in CEQA Guidelines section 15064.5[b, c]. Such changes include "physical demolition, destruction, relocation, or alteration of the resource or its immediate surroundings such that the significance of an historical resource would be materially impaired" (CEQA Guidelines section 15064.5 [b]).

An impact on cultural resources is considered significant, therefore, if it adversely affects a resource that is listed in or eligible for listing in the California Register of Historical Resources or is otherwise considered a unique or important archaeological resource under CEQA. In general, a project may have an adverse effect on a cultural resource if it would:

- cause a substantial adverse change in the significance of a historical resource as defined in State CEQA Guidelines section 15064.5;
- cause a substantial adverse change in the significance of an archaeological resource pursuant to State CEQA Guidelines section 15064.5;
- directly or indirectly destroy a unique paleontological resource or site or unique geologic feature; or
- disturb any human remains, including those interred outside of formal cemeteries.

3.5.2.2 *Environmental Impacts*

Direct impacts to cultural resources are primarily associated with ground disturbance from construction-related activities. Changing water levels of a reservoir or lake could also impact a cultural resource by permanently submerging a resource or by repeatedly inundating and then exposing a resource (USBR 1997). Submerging a site would eliminate access to the site for future scientific study and could affect site integrity. Repeated inundations/exposures could lead to site erosion and could cause perishable artifacts to disintegrate more rapidly. Sites could also be more susceptible to looting if site erosion led to the exposure of more artifacts or fossils on the ground surface. Such actions could compromise the integrity of a cultural resource.

3.5.2.2.1 *State Water Project and Associated Facilities*

DIRECT IMPACTS

Implementation of the Project would not require new construction or the modification of existing SWP facilities; nor would it change the operating criteria of these facilities. The proposed transfer would result in a slight increase in the amount of water transported in the California Aqueduct from Kern County to Castaic Lake, but this would not affect cultural resources. As described in section 3.0, minor seasonal changes in the volume of water stored in San Luis Reservoir would result from Project implementation. The average volume of water stored would decrease slightly from December through June, potentially exposing more submerged cultural resources during this period, but the change would be minor and the resulting elevations would fall within the range of fluctuations present under both current and historic operations. The impact would be less than significant. The amount of water stored in Castaic Lake would not change as a result of the Project; thus, no impacts to cultural resources would occur.

Since no construction or substantive operational changes would occur, the Project would not cause a substantial adverse change in the significance of historical or archaeological resources, directly or indirectly destroy a unique paleontological resource or site or unique geologic feature, or disturb any human remains.

INDIRECT IMPACTS

No indirect impacts to cultural resources would occur.

3.5.2.2.2 *Wheeler Ridge-Maricopa Water Storage District*

DIRECT IMPACTS

Implementation of the Project would not require new construction or the modification of existing WRMWSD facilities, nor would it change the current operation of these facilities. Since no construction or substantive operational changes would occur, the Project would not cause a substantial adverse change in the significance of historical or archaeological resources, directly or indirectly destroy a unique paleontological resource or site or unique geologic feature, or disturb any human remains.

INDIRECT IMPACTS

No indirect impacts to cultural resources would occur.

3.5.2.2.3 *Castaic Lake Water Agency*

DIRECT IMPACTS

Implementation of the Project would not require the construction of new CLWA facilities or modification of existing facilities. Since no construction or operational changes would occur, the Project would not cause a substantial adverse change in the significance of historical or archaeological resources, directly or indirectly destroy a unique paleontological resource or site or unique geologic feature, or disturb any human remains.

INDIRECT IMPACTS

Potential environmental impacts from growth that could occur as an indirect impact of the Project are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.5.3 Mitigation Measures

3.5.3.1 *State Water Project and Associated Facilities*

No direct or indirect significant impacts to cultural resources would occur; therefore, no mitigation measures are required.

3.5.3.2 *Wheeler Ridge-Maricopa Water Storage District*

No direct or indirect significant impacts to cultural resources would occur; therefore, no mitigation measures are required.

3.5.3.3 *Castaic Lake Water Agency*

No direct significant impacts to cultural resources would occur; therefore, no mitigation measures are required. Mitigation measures for significant indirect impacts are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.5.4 Significant Unavoidable Impacts

No direct or indirect significant unavoidable impacts would result from the Project.

3.6 GEOLOGY, SOILS AND MINERAL RESOURCES

3.6.1 Environmental Setting

3.6.1.1 State Water Project and Associated Facilities

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP. The portion of the SWP and associated facilities that would potentially be affected by implementation of the Project extends from the South Delta region near the confluence of the San Joaquin and Sacramento rivers to the terminus of the West Branch at Castaic Lake. In order from north to south, the SWP facilities traverse the relatively flat terrain of the western San Joaquin Valley, the Tehachapi Mountain Range, and the Santa Clarita Valley. The environmental setting of the southern San Joaquin and Santa Clarita valleys are described in detail in sections 3.6.1.2 and 3.6.1.3, respectively. This section describes the topography, soils, and geology of the north and central San Joaquin Valley and the Tehachapi Mountain Range.

Topography and Stratigraphy. The California Aqueduct conveys water along the western side of the San Joaquin Valley from the Delta down to Kern County. The alignment follows the land contours in the San Joaquin Valley where possible to minimize energy costs from pumping the water. The SWP facilities through the northern and central portion of the San Joaquin Valley traverse the contact between the Coast Range and Central Valley geologic provinces.

The landform types along the San Joaquin Valley alignment are basin rim/basin floor and terrace (CALFED 1999). Basin lands consist of poorly drained soils, and saline and alkali soils in the valley trough and on the basin rims (CALFED 1999). Soils at a moderate depth to bedrock (20-40 inches) occur in the northern part of the San Joaquin Valley where the annual rainfall is intermediate to moderately high (CALFED 1999). Soils less than 20 inches deep occur in the medium- to low-rainfall zone at lower elevations in the southern San Joaquin Valley (CALFED 1999). Soil salinity problems occur primarily in the western and southwestern portions of the San Joaquin Valley, in areas derived from the marine sediments of the Coast Ranges containing salts and trace elements such as arsenic, boron, molybdenum, and selenium (CALFED 1999).

From the southern San Joaquin Valley, water is pumped through a series of tunnels, pipelines, and canals through the Tehachapi Mountain. The highest peaks in the Techachapi Mountains are over 7,000 feet above mean sea level. The Techachapi Mountains consist of a basement complex of crystalline rocks (Hagan 2001).

Minerals. Numerous oil wells, groundwater wells and gravel mining operations are scattered throughout the regions traversed by or containing SWP facilities. Any mineral resources directly associated with SWP facilities would be under the jurisdiction of DWR or its designee.

Seismicity. Numerous earthquake fault systems lie within or traverse the San Joaquin River Region. The Coast Ranges and the western boundary of the San Joaquin Valley joins the Great Valley thrust fault system, which has a maximum credible earthquake (MCE) of 6.7 (CALFED 1999). To the west of the valley is the Diablo Range, which is mainly subject to seismicity from northwest-trending faults associated with the San Andreas Fault system (CALFED 1999). The

mapped active[1] faults of this system that are most likely to affect the upper watersheds west of the San Joaquin Valley are the Ortigalita Fault, and the Greenville-Marsh Creek Fault, which have MCEs of 7.0 and 7.25 respectively (Mualchin 1996).

3.6.1.2 *Wheeler Ridge-Maricopa Water Storage District*

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP.

Topography and Stratigraphy. The district is located in southern Kern County, and extends southward onto Wheeler Ridge. Elevations range from 295 to 1,800 feet above mean sea level. The district is located within the Great Valley and Sierra Nevada batholith geologic provinces. This portion of the batholith is composed predominantly of Mesozoic-age granitic rock and overlying Miocene sediments. The San Andreas and Garlock fault systems are located south of the district, and the district and straddles the White Wolf fault. Sand and clay loams characterize the soils present in the district. Complexes composed of several soil combinations are also present. Many of these soils contain saline-sodic properties. Areas of major riverwashes also exist in the district.

Due to the relatively gentle slopes found in the district, erosion is generally related to agricultural practices, although most landowners within the district implement voluntary erosion control measures. Generally, the district does not contain extensive areas of expansive soils. Due to the gentle slopes found in the district and the deep groundwater levels, only a small portion of the district is subject to liquefaction, lateral spreading and landslides. Historically, groundwater overdraft has occurred in areas of the district (BE 1995); therefore, portions of the district may be subject to subsidence. Throughout the district, however, groundwater levels have either stabilized or have risen since the importation of SWP water (BE 1995), reducing the risk of subsidence.

Minerals. Portions of the district are, or have historically been, used for oil and gas exploration and production. In addition, active sand and gravel mining areas exist within the district.

Seismicity. Numerous earthquake faults have been identified in the vicinity of the district. The Pleito, Springs, and White Wolf faults traverse the district. The Pleito fault is capable of producing an MCE of 7.3 (Mark 1977), but no substantial historic earthquakes have been attributed to the Pleito fault. The Springs fault is estimated as being capable of producing an MCE of 6.75 (Greensfelder 1974). The White Wolf fault is estimated as being capable of producing an MCE of 7.75 (Greensfelder 1974). The White Wolf fault was the origin of the 1952 Arvin-Tehachapi earthquake, which had a magnitude of 7.7 on the Richter Scale. Other nearby active faults capable of producing earthquakes in WRMWSD include the Garlock and San Andreas faults, located approximately 8.5 miles south/southeast and 12 miles south/southwest, respectively. The Garlock fault is capable of producing an MCE of 7.75 and the San Andreas is capable of producing an MCE of 8.25 (Greensfelder 1974).

1 An active fault is defined as a fault that has shown displacement in the last 11,000 years (Holocene) and a potentially active fault is defined as showing evidence of displacement during the last 1.6 million years (Quaternary) (CDMG 1992).

3.6.1.3 *Castaic Lake Water Agency*

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP.

Topography and Stratigraphy. The CLWA service area encompasses the relatively flat-lying Santa Clarita Valley and portions of the surrounding hills and mountains. The geology of the CLWA service area consists of a relatively thick sequence of Plio-Pleistocene Saugus Formation, locally overlain by more recent alluvial deposits. The Saugus Formation consists primarily of semi-consolidated conglomerate and sandstone materials, which reach a maximum thickness of approximately 7,000 feet (Slade 1988). Alluvial deposits consist of a maximum of 200 feet of unconsolidated gravel, sand, silt, and clay, which occur as relatively narrow strips underlying and adjacent to major stream channels (Slade 1988).

Soils within and adjacent to the CLWA service area typically consist of sandy silts and silty sands. The soil erosion potential is very high in many of the steep, mountainous regions of the CLWA service area. Although generally not prevalent, clay-rich soils within CLWA may be subject to expansion. Liquefaction is most likely to occur in areas of the CLWA service area that are saturated at very shallow depths, such as adjacent to the Santa Clara River (City of Santa Clarita 1991, CLWA 1988). Lateral spreading would most likely occur within CLWA along the banks of the Santa Clara River or its tributaries. Historically, groundwater overdraft has not occurred within the Alluvial and Saugus Formation aquifers of the Santa Clarita Valley, and regional ground subsidence has not occurred (CLWA 2001). Due to the rugged, high relief of the foothill and mountainous areas surrounding the Santa Clarita Valley, landslides and unstable slopes are present in many portions of the CLWA service area (City of Santa Clarita 1991).

Minerals. Portions of the CLWA service area historically have been used for oil and gas exploration and production. Oil fields in the area include the Newhall-Potrero, Placerita, Castaic Junction, Castaic Hills, Bouquet Canyon, Wayside Canyon, Tapia, and Honor Rancho fields (California Department of Conservation, Division of Oil, Gas and Geothermal Resources [DOGGR] 1998, 1999).

Much of the CLWA service area is classified as potential sand and gravel mineral resource areas. Most of the floodplain of the Santa Clara River drainage system is classified by the California Department of Mines and Geology (CDMG) as Zone MRZ-2, which is an area where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists. This zone along the Santa Clara River also includes the major tributaries Castaic and Newhall creeks. The remainder of the tributaries, which contain substantial alluvial deposits, are classified as Zone MRZ-3, which are those areas containing mineral deposits, the significance of which cannot be evaluated from available data. The larger of these remaining tributary alluvial deposits that may be future sources of aggregate include San Francisquito, Bouquet, Mint, Upper Soledad, Oak Spring, Sand, Pico, and Hasley Canyons (CDMG 1987).

Tertiary sedimentary rocks in the CLWA service area are also considered alternative sources of aggregate. The Saugus Formation is classified as Zone MRZ-3. Although in many areas the

Saugus Formation contains an abundance of clayey silt, clayey sandstone, and sandy mudstone, many areas consist of relatively clean sandstone and conglomerate, which are suitable sources of aggregate (CDMG 1987).

Seismicity. Two faults, including the active San Gabriel fault, and the potentially active Holser fault, traverse the CLWA service area. The active San Andreas fault is located approximately 18 miles northeast of the central portion of the Santa Clarita Valley. The San Fernando and Sierra Madre faults are also located in the vicinity of the CLWA service area. The San Gabriel fault is capable of producing an MCE of 7.5 (Mark 1977). The Holser fault is estimated as being capable of producing an MCE of 7.25 (Slemmons 1977). The San Andreas fault is estimated as being capable of producing an MCE of 8.25 (Greensfelder 1974). The San Fernando and Sierra Madre faults are capable of producing an MCE of 6.7 (Slemmons 1977) and 7.5 (Greensfelder 1974) respectfully. Areas of potential liquefaction have been identified adjacent to the Santa Clara River. Soils in the area typically consist of sandy silts and silty sands.

3.6.2 Potential Impacts of the Project

3.6.2.1 Significance Criteria

The criteria listed below are based on Appendix G of the State CEQA Guidelines. The Project would have a significant impact on geology, soils, and mineral resources if it would:

- expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:
  - rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault;
  - strong seismic ground shaking;
  - seismic-related ground failure, including liquefaction;
  - landslides; or
- result in substantial soil erosion or the loss of topsoil; or
- involve construction located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse; or
- be located on expansive soil, as defined in the Uniform Building Code, creating substantial risks to life or property; or
- result in the substantial loss of availability of a known mineral resource that would be of value to the region and the residents of the state; or
- result in the substantial loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

Alquist-Priolo Earthquake Fault Zoning Act

The Alquist-Priolo Earthquake Fault Zoning Act of 1972 requires the State Geologist to delineate zones along active faults in California so that structural development can be regulated to reduce the risk to humans and structures associated with seismic activity. The act prohibits the construction of structures intended for human occupancy within these zones (occupancy rate of more than 2,000 person-hours per year), as well as requires local agencies to regulate certain developments.

3.6.2.2 *Environmental Impacts*

3.6.2.2.1 *State Water Project and Associated Facilities*

DIRECT IMPACTS

Implementation of the Project would not require new construction or the modification of existing SWP facilities; nor would it change the operating criteria of these facilities. The Project would result in a slight increase in the amount of water transported in the California Aqueduct from Kern County to Castaic Lake, but this volume would be within the range that has been transported by the aqueduct both in recent years and historically. Slightly increasing the amount of water transported in the aqueduct would not affect geology, soils, or minerals. As described in section 3.0, minor seasonal changes in the volume of water stored in San Luis Reservoir would result from Project implementation. The average volume of water stored would decrease slightly from December through June, exposing more soil to wind and water erosion during this period, but the change would be minor and the resulting elevations would fall within the range of fluctuations present under both current and historic operations. This impact would be less than significant. Changes in the timing of water storage at this facility would not affect other geologic resources or minerals. The amount of water stored in Castaic Lake would not change as a result of the Project; thus, no erosional impacts would occur. Since no construction or substantive operational changes would occur, implementation of the Project would not expose people or structures to seismic hazards or other hazards involving construction on an unstable or potentially unstable unit or expansive soils. The Project would not result in soil erosion or loss of topsoil, nor would it result in the loss of mineral resources.

INDIRECT IMPACTS

No indirect impacts to geology, soils, or mineral resources would occur.

3.6.2.2.2 *Wheeler Ridge-Maricopa Water Storage District*

DIRECT IMPACTS

Implementation of the Project would not require new construction or the modification of existing WRMWSD water distribution facilities, nor would it change the current operation of these facilities. Since no construction or operational changes would occur, implementation of the Project would not expose people or structures to seismic hazards or other hazards involving construction on an unstable or potentially unstable unit or expansive soils, result in substantial erosion or the loss of topsoil, nor would it result in the loss of mineral resources.

INDIRECT IMPACTS

No indirect impacts to geology, soils, or mineral resources would occur.

3.6.2.2.3 Castaic Lake Water Agency

DIRECT IMPACTS

Implementation of the Project would not require the construction of new CLWA facilities or modification of existing CLWA facilities. Transferring an additional 41,000 AF of water through existing facilities for use within the service area would not affect geology, soils, or minerals. Since no construction or operational changes would occur, implementation of the Project would not expose people or structures to seismic hazards or other hazards involving construction on an unstable or potentially unstable unit or expansive soils. The Project would not result in water erosion of soils or the loss of topsoil, nor would it result in the loss of mineral resources.

INDIRECT IMPACTS

Potential impacts from population growth that could occur as an indirect impact of the Project are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.6.3 Mitigation Measures

3.6.3.1 State Water Project and Associated Facilities

No direct or indirect significant impacts to geologic resources would occur; therefore, no mitigation measures are required.

3.6.3.2 Wheeler Ridge-Maricopa Water Storage District

No direct or indirect significant impacts to geologic resources would occur; therefore, no mitigation measures are required.

3.6.3.3 Castaic Lake Water Agency

No direct significant impacts to geologic resources would occur; therefore, no mitigation measures are required. Mitigation measures for indirect impacts are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.6.4 Significant Unavoidable Impacts

No direct or indirect significant unavoidable impacts would result from the Project.

3.7 HAZARDS AND HAZARDOUS MATERIALS

A material is considered hazardous if it appears on a list of hazardous materials prepared by a federal, state, or local agency, or if it has characteristics defined as hazardous by such an agency. Chemical and physical properties cause a substance to be considered hazardous, including the properties of toxicity, ignitability, corrosivity and reactivity. These properties are defined in California Code of Regulations, Title 22, Sections 66261.20-66261.24. Common materials that are considered hazardous include fuels, motor oil, grease, various lubricants, solvents, soldering equipment and glues. A "hazardous waste" is any hazardous material that is discarded, abandoned, or recycled. The criteria that render a material hazardous also make a waste hazardous (California Health and Safety Code, Section 25117).

3.7.1 Environmental Setting

3.7.1.1 State Water Project and Associated Facilities

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP. Much of the area traversed by the California Aqueduct is used for agricultural purposes. Pesticides and fertilizers used for agricultural operations may accumulate in the soil and may over time contaminate surface water and groundwater supplies. Urban areas contain commercial and industrial facilities that may produce and/or use a wide variety of hazardous materials, including fuels and solvents. Fuels, chemicals, and other hazardous materials and hazardous wastes are also transported via roadways and railways in the vicinity of SWP facilities. A variety of fuels, solvents, and other hazardous materials are used as part of DWR's regular operations and maintenance of SWP facilities.

3.7.1.2 Wheeler Ridge-Maricopa Water Storage District

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP. A substantial portion of the district is used for agricultural purposes. Pesticides and fertilizers used for agricultural operations may accumulate in the soil and may over time contaminate surface water and groundwater supplies. Industrial facilities and other entities in the district may use a wide variety of hazardous materials, including fuels and solvents. Fuels, chemicals, and other hazardous materials and hazardous wastes are also transported via roadways and railways.

3.7.1.3 Castaic Lake Water Agency

The CLWA service area is largely urbanized and has a variety of industries and commercial enterprises that likely use or produce hazardous materials and/or hazardous wastes. Fuels, chemicals, and other hazardous materials and hazardous wastes are also transported via roadways and railways. Numerous hazardous materials/waste sites are present in the CLWA service area. Since 1998, continued growth and development in the area have increased the amount of hazardous materials and/or hazardous wastes that are produced and transported around the region. The CLWA service area contains mountainous areas that are classified as high fire hazard areas.

3.7.2 Potential Impacts of the Project

3.7.2.1 Significance Criteria

The criteria listed below are based on Appendix G of the State CEQA Guidelines. The Project would result in significant impacts if it would:

- create a significant hazard to the public or the environment through the routine transport, storage, use, or disposal of hazardous materials;
- create a significant hazard to the public or the environmental through reasonably foreseeable upset and accident involving the release of hazardous materials into the environment;
- emit hazardous emissions or handle hazardous or acutely hazardous materials, substances or waste within one-quarter mile of an existing or proposed school;
- be located on a site which is included in a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5, and as a result could create a significant hazard to the public or the environment;
- be located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, and result in a safety hazard for people residing or working in the project area;
- be located with the vicinity of a private airstrip, and result in a safety hazard for people residing or working in the project area;
- impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan; or
- expose people or structures to a significant risk of loss, injury, or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands.

3.7.2.2 Environmental Impacts

3.7.2.2.1 State Water Project and Associated Facilities

DIRECT IMPACTS

Implementation of the Project would not require new construction or the modification of existing SWP facilities; nor would it change the operating criteria of these facilities or substantially change their operation. The Project would result in a slight increase in the amount of water transported in the California Aqueduct from Kern County to Castaic Lake, but this volume would be within the range that has been transported by the aqueduct both in recent years and historically and would not increase safety risks. Slightly increasing the amount of water transported in a portion of the SWP system would require more pumping, which would incrementally increase the use of hazardous materials associated with pumping. This impact would be less than significant since these materials already are used for operations and

maintenance in accordance with established practices and the incremental increase in their use would not result in a significant hazard to the public or the environment.

As described in section 3.0, minor seasonal changes in the volume of water temporarily stored in San Luis Reservoir would result from Project implementation. The average volume of water stored would decrease slightly from December through June, but the change would be minor and the resulting elevations would fall within the range of fluctuations present under both current and historic operations. This change in the timing of water storage would not constitute a hazard. The amount of water stored in Castaic Lake would not change as a result of the Project; thus, no impacts to hazards or hazardous materials would occur.

No elements of the Project would emit hazardous emissions within one-quarter mile of an existing or proposed school, and no actions would occur that could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan or expose people or structures to a significant risk of loss, injury, or death involving wildland fires.

INDIRECT IMPACTS

No indirect impacts would occur.

3.7.2.2.2 *Wheeler Ridge-Maricopa Water Storage District*

DIRECT IMPACTS

The Project would not involve construction or operational changes that could require the use of hazardous materials or otherwise increase hazards in the district. The Project would not require the routine transport, storage, use, or disposal of additional hazardous materials in this district and thus could not increase the frequency or severity of the release of hazardous materials into the environment or emit hazardous emissions. No other actions would occur that could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan or expose people or structures to a significant risk of loss, injury, or death involving wildland fires.

INDIRECT IMPACTS

No indirect impacts would occur.

3.7.2.2.3 *Castaic Lake Water Agency*

DIRECT IMPACTS

No construction would occur that potentially could emit hazardous emissions. No other actions would occur that could impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan or expose people or structures to a significant risk of loss, injury, or death involving wildland fires.

The use of up to 41,000 AF of water within the CLWA service area would result in an increased use of hazardous materials to treat water. The primary hazardous chemicals used in the treatment of water at the CLWA facilities are ferric chloride, sodium hydroxide, chlorine, and

aluminum sulfate. Any additional use of hazardous materials to treat the water would be conducted in accordance with existing policies, procedures, and regulations to prevent upset or release into the environment. Thus, impacts from the incremental increase in use of hazardous materials to treat water would be less than significant.

INDIRECT IMPACTS

Potential impacts from population growth that could occur as an indirect impact of the Project are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.7.3 Mitigation Measures

3.7.3.1 State Water Project and Associated Facilities

No direct or indirect significant impacts to hazards or hazardous materials would occur; therefore, no mitigation measures are required.

3.7.3.2 Wheeler Ridge-Maricopa Water Storage District

No direct or indirect significant impacts to hazards or hazardous materials would occur; therefore, no mitigation measures are required.

3.7.3.3 Castaic Lake Water Agency

No direct significant impacts to hazards or hazardous materials would occur; therefore, no mitigation measures are required. Mitigation measures for indirect impacts are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.7.4 Significant Unavoidable Adverse Impacts

No direct or indirect significant unavoidable impacts would result from the Project.

3.8 LAND USE AND PLANNING

3.8.1 Environmental Setting

3.8.1.1 State Water Project and Associated Facilities

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP. SWP facilities such as the California Aqueduct and pumping and generation facilities are under the jurisdiction of DWR or its designee. The San Luis Reservoir State Recreation Area is under the jurisdiction of the State Department of Parks and Recreation. The Castaic Lake State Recreation Area is under the jurisdiction of the Los Angeles County Department of Parks and Recreation. Each of these agencies regulates development on lands within their jurisdiction.

3.8.1.2 Wheeler Ridge-Maricopa Water Storage District

WRMWSD is located within Kern County, which has land use and planning authority in the unincorporated portions of the County, including this district. The Kern County General Plan regulates the type and intensity of land uses and specifies other development-related requirements. It consists of seven state-mandated and three optional elements and also includes rural community plans and specific plans for smaller geographic areas within the county. Kern County has adopted an HCP for the Metropolitan Bakersfield Area and is in the process of developing the KCVFHCP for additional portions of the county in order to provide a long-term program designed to conserve federally protected species, state-protected species, and/or other species of concern. In addition, the TRVFHCP is being developed for the Tejon Ranch lands within the San Joaquin Valley, some of which are within the WRMWSD. There are no adopted NCCPs within Kern County.

At the time the 1998 NOP was prepared, WRMWSD contained approximately 146,620 acres. Land uses included the following: farmed area (94,500 acres, or 64 percent); fallow lands (17,650 acres, or 12 percent); miscellaneous and other lands, defined as developed but nonfarmed areas within cultivated lands, such as farm roads, farmsteads, reservoirs, airstrips, cotton gins, tank farms, utility yards, etc. (8,040 acres, or 5 percent); and native vegetation/non-developed lands (26,430 acres, or 18 percent) (WRMWSD 2001).

In 2000, the most recent year for which information is available, the district contained approximately 146,950 acres. Land uses included the following: farmed area (90,630 acres, or 62 percent); fallow lands (21,660 acres, or 15 percent); miscellaneous lands, defined as developed but nonfarmed areas within cultivated lands, such as farm roads, farmsteads, and reservoirs (6,865 acres, or 5 percent); other lands, consisting of airstrips, cotton gins, tank farms, utility yards, etc. (1,360 acres, or 1 percent) and native vegetation/non-developed lands (26,435 acres, or 18 percent) (WRMWSD 2001). Additional detail regarding changes in agricultural land uses between 1998 and 2000 is included in section 3.2.

3.8.1.3 Castaic Lake Water Agency

The CLWA service area is located primarily in the Santa Clarita Valley in northwestern Los Angeles County and also in eastern Ventura County. Plans and policies of local and regional agencies with planning authority in the CLWA service area include those adopted by the Southern California Association of Governments (SCAG), County of Los Angeles, County of Ventura (for the Piru Planning Area portion of the county), and the City of Santa Clarita. The relevant plans include SCAG's Regional Comprehensive Plan and Guide, the Santa Clarita Valley Area Plan of the County of Los Angeles General Plan, the County of Ventura General Plan, and the City of Santa Clarita General Plan. Consistency with adopted plans and policies is discussed in Chapter 5.0, Plans and Policies. Additionally, the City of Santa Clarita and Los Angeles County have initiated a joint planning effort to address future growth in the Santa Clarita Valley. Phase I of the Santa Clarita Valley Joint General Plan was completed in 2001, including securing Regional Planning Commission and City Council approval of the Guiding Principles and Vision.

CLWA makes decisions related to the wholesale and retail (within defined boundaries) provision of water and does not have the authority to approve land development within its service area. Rather, such approvals are the responsibility of the local planning agencies identified above. CLWA's role is limited to complying with laws that went into effect on January 2002 and require retail water purveyors to provide information regarding the availability of water supplies to land use planning agencies. Senate Bills 610 and 221 amended state law in an attempt to improve the link between information on water supply availability and certain land use decisions made by cities and counties. Both statutes require detailed information to be provided to city and county decision-makers prior to the approval of specified large development projects.

Land uses in the service area range from the urbanized environment of the City of Santa Clarita and other developed communities to the undeveloped environment of the eastern Santa Susana and western San Gabriel Mountains. As shown in Table 3.8-1, in 1998 when the first NOP was prepared for the Project, approximately 30,000 acres of land within the CLWA service area were improved, and approximately 88,000 acres were unimproved (CLWA 1998b). Of the 30,000 acres of improved land, almost half were classified in one of the six urban and non-urban residential categories. Another substantial portion of the service area is designated as Hillside Management. Lands with this designation are located in non-urban areas that typically exceed a 25 percent slope. Depending upon the degree of slope, maximum residential densities are specified, up to one unit per 2 acres. As shown on Table 3.2-5, the amount of Urban and Built-Up Land in the CLWA service area increased by 1,731 acres between 1998 and 2000[1], while the amount of agricultural and "other" land decreased by the same amount ("other land" refers to such land uses as low-density rural development, brush, timber, vacant and nonagricultural land larger than 40 acres in size and surrounded on all sides by urban development, and a variety of other rural land uses).

1 2000 is used instead of 2003 because 2000 was the most recent census. This census yielded the most available data.

3.8.2 Potential Impacts of the Project

3.8.2.1 *Significance Criteria*

The criteria used to determine the significance of impacts to land use and planning are based on Appendix G of the State CEQA Guidelines. The Project would result in a significant impact if it would:

- physically divide an established community;
- conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project adopted for the purpose of avoiding or mitigating an environmental effect; or
- conflict with any applicable HCP or NCCP.

Table 3.8-1. CLWA Service Area 1998 Land Use

Plan Code Designation/ Land Use Category		IMPROVED PARCELS		UNIMPROVED PARCELS		*Total*
		Acres	*Percent*	*Acres*	*Percent*	*Acres*
C	Commercial	1,564	1.3	1,558	1.3	3,122
HM	Hillside Management	6,057	5.1	33,614	28.4	39,671
M	Industrial	2,349	2.0	3,246	2.7	5,595
MU	Municipal	407	0.3	72	0.1	479
N1	Non-Urban Residential (0.5 DU/Ac)	2,812	2.4	4,810	4.1	7,622
N2	Non-Urban Residential (1.0 DU/Ac)	706	0.6	2,314	2.0	3,020
NF	National Forest	647	0.5	8,442	7.1	9,089
O	Open Space & Agriculture	880	0.7	12,069	10.2	12,949
P	Public Service Facilities	89	0.1	2,763	2.3	2,852
PF	Public Service Facilities	0	0.0	32	0.0	32
RR	Resort Recreation	518	0.4	74	0.1	592
TC	Transportation Corridor	0	0.0	49	0.0	49
U1	Urban Residential (1.1-3.3 DU/Ac)	8,682	7.3	8,389	7.1	17,071
U2	Urban Residential (3.4-6.6 DU/Ac)	1,064	0.9	1,692	1.4	2,756
U3	Urban Residential (6.7-15.0 DU/Ac)	68	0.1	405	0.3	473
U4	Urban Residential (15.1-40.0 DU/Ac)	252	0.2	186	0.2	438
VC	Floodway/Floodplain	2,365	2.0	6,121	5.2	8,486
W	Undefined	1,596	1.4	2,305	2.0	3,901
	TOTAL	30,056	25.3	88,141	74.5	118,197

Source: CLWA 1998b.
Note: DU/Ac = dwelling units per acre
Percentages total slightly less than 100 due to rounding.

3.8.2.2 *Environmental Impacts*

3.8.2.2.1 *State Water Project and Associated Facilities*

DIRECT IMPACTS

Implementation of the Project would not require new construction or the modification of existing SWP facilities; nor would it change the operating criteria of these facilities or substantially change their operation. Since no construction would occur, the Project would not physically divide an established community. As discussed in the other sections of Chapter 3 and in Chapter 5, the Project would not result in significant environmental effects associated with SWP facilities and thus would not conflict with an applicable land use plan, policy, or regulation of any agency with jurisdiction over the Project adopted for the purpose of avoiding or mitigating an environmental effect, nor would it conflict with any applicable HCP or NCCP.

INDIRECT IMPACTS

No indirect impacts to land use and planning would occur.

3.8.2.2.2 *Wheeler Ridge-Maricopa Water Storage District*

DIRECT IMPACTS

Implementation of the Project would not require new construction or the modification of existing facilities. Since no construction would occur, the Project would not physically divide an established community. As discussed in the other sections of Chapter 3 and in Chapter 5, the Project would not result in significant environmental effects in the district and thus would not conflict with an applicable land use plan, policy, or regulation of any agency with jurisdiction over the Project adopted for the purpose of avoiding or mitigating an environmental effect, nor would it conflict with any applicable HCP or NCCP.

INDIRECT IMPACTS

No indirect impacts to land use and planning would occur.

3.8.2.2.3 *Castaic Lake Water Agency*

DIRECT IMPACTS

Implementation of the Project would not require new construction or the modification of existing facilities. Since no construction would occur, the Project would not physically divide an established community. As discussed in the other sections of Chapter 3 and in Chapter 5, the Project would not result in significant environmental effects in the CLWA service area and thus would not conflict with an applicable land use plan, policy, or regulation of any agency with jurisdiction over the Project adopted for the purpose of avoiding or mitigating an environmental effect, nor would it conflict with any applicable HCP or NCCP.

INDIRECT IMPACTS

Potential impacts from population growth that could occur as an indirect impact of the Project are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.8.3 Mitigation Measures

3.8.3.1 State Water Project and Associated Facilities

No direct or indirect significant impacts to land use and planning would occur; therefore no mitigation measures are required.

3.8.3.2 Wheeler Ridge-Maricopa Water Storage District

No direct or indirect significant impacts to land use and planning would occur; therefore no mitigation measures are required.

3.8.3.3 Castaic Lake Water Agency

No direct significant impacts to land use and planning would occur; therefore no mitigation measures are required. Mitigation measures for indirect impacts are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.8.4 Significant Unavoidable Impacts

No direct or indirect significant unavoidable impacts would result from the Project.

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3.9 NOISE

Sources of stationary or transient noise can be characterized as unwanted sound that could disrupt normal activities or diminish the quality of the environment. Stationary sources are generally localized, while transient or mobile sources can occur irregularly. The noise generated combines with the ambient sounds to produce the local acoustical environment. The response to noise can be quite varied depending on the noise source, the sensitivity of the receptor and the time of day in which it occurs.

Several noise measurement scales are used to describe noise in a particular location. A decibel (dB) is a unit of measurement that indicates the relative amplitude of a sound. The zero on the decibel scale is based on the lowest sound level that the healthy, unimpaired human ear can detect. Sound levels in decibels are calculated on a logarithmic basis. An increase of 10 dB represents a ten-fold increase in acoustic energy, while 20 dB is 100 times more intense, 30 dB is 1,000 times more intense, etc. Each 10 dB increase in sound level is perceived as approximately a doubling of loudness over a fairly wide range of intensities. There are several methods of characterizing sound. The most common in California is the A-weighted sound level, or dBA. This scale gives greater weight to the frequencies of sound to which the human ear is most sensitive.

Because sound levels can vary markedly over a short period of time, a method for describing either the average character of the sound or the statistical behavior of the variations must be utilized. Most commonly, environmental sounds are described in terms of an average level that has the same acoustical energy as the summation of all the time-varying events. This energy-equivalent sound/noise descriptor is called L_{eq}. The most common averaging period is hourly, but L_{eq} can describe any series of noise events of arbitrary duration.

Since the sensitivity to noise increases during the evening and at night—because excessive noise interferes with the ability to sleep—24-hour descriptors have been developed that incorporate artificial noise penalties added to quiet-time noise events. The Community Noise Equivalent Level, CNEL, is a measure of the cumulative noise exposure in a community, with a 5 dB penalty added to evening (7:00 P.M. to 10:00 P.M.) and a 10 dB addition to nocturnal (10:00 P.M. to 7:00 A.M.) noise levels. The Day/Night Average Sound Level, L_{dn}, is essentially the same as CNEL, with the exception that the evening time period is dropped and all occurrences during this 3-hour period are grouped into the daytime period.

Noise-sensitive receptors include residential areas, facilities such as schools and hospitals, and certain types of recreational uses where a quiet setting is considered to be an integral part of the recreational experience.

Representative outdoor and indoor noise levels in units of dBA are shown in Table 3.9-1.

1

Table 3.9-1. Typical Sound Levels Measured in the Environment and Industry

At a Given Distance From Noise Source	*dBA*	*Noise Environments*	*Subjective Impression*
	140		
Civil Defense Siren (100')	130		
Jet Takeoff (200')	120		Pain Threshold
	110	Rock Music Concert	
Diesel Pile Driver (100')	100		Very Loud
	90	Boiler Room	
Freight Cars (50')		Printing Press Plant	
Pneumatic Drill (50')	80		
Freeway (100')		In Kitchen with Garbage Disposal Running	
Vacuum Cleaner (10')	70		Moderately Loud
		Data Processing Center	
	60		
		Department Store	
Light Traffic (100')	50		
Large Transformer (200')			
	40	Private Business Office	Quiet
Soft Whisper (5')	30	Quiet Bedroom	
	20	Recording Studio	
	10		Threshold of Hearing
	0		

Source: U.S. Department of Housing and Urban Development. 1985

2 **3.9.1 Environmental Setting**

3 ***3.9.1.1 State Water Project and Associated Facilities***

4 No substantial changes in baseline conditions have occurred between the 1998 NOP and the
5 2003 NOP. Noise within the rural portions of the San Joaquin Valley, where many of the SWP
6 facilities affected by the Project are located, primarily results from agricultural activities (e.g.,
7 the operation of farming equipment and pumps) and vehicular traffic. In urban areas, noise

primarily results from vehicular traffic and activities commonly associated with residential, commercial, industrial, and recreational uses. Along the California Aqueduct, noise levels vary considerably, depending largely on its proximity to heavily traveled roadways such as Interstate 5. Pumps are the primary source of noise caused directly by operation of the SWP facilities. At San Luis Reservoir and Castaic Lake, noise results mainly from recreational activities. Noise standards are typically developed by local jurisdictions. The State of California has not adopted any quantitative noise regulations; however, the State Department of Health Services, Environmental Health Division has established noise compatibility guidelines for different land use types (California Department of Health Services [CA DHS] 1976). For example, an L_{dn} or CNEL of 50 to 75 dB is considered normally acceptable at areas used for water recreation; 70 to 80 dB is normally unacceptable and above 80 dB is clearly unacceptable.

3.9.1.2 Wheeler Ridge-Maricopa Water Storage District

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP. Noise within the WRMWSD is primarily related to agricultural activities and vehicular traffic, although noise also is generated by activities commonly associated with residential, commercial, industrial, and recreational uses.

The Noise Element of the Kern County General Plan (1989) contains standards for noise control in unincorporated portions of the county. Kern County also has adopted a noise control ordinance as a provision of its Health and Safety Code, Subsection 8.36 Noise Control; however, this ordinance has very limited provisions and primarily addresses noise from amplification. The Kern County Noise Element divides land uses into four categories according to noise sensitivity: insensitive land uses; moderately sensitive land uses; sensitive land uses; and highly sensitive land uses. Different numerical noise quality standards apply to each of the four sensitivity categories, and corrections are applied if a "noise operation" or activity would produce noise that is not smooth and continuous.

3.9.1.3 Castaic Lake Water Agency

The CLWA service area includes developed urban areas, primarily within the City of Santa Clarita and adjacent unincorporated portions of Los Angeles County, as well as lower density residential or rural/agricultural areas, including portions of eastern Ventura County. The Southern Pacific Railroad, Interstate 5, State Route 14 and Highway 126 traverse the Santa Clarita Valley and are major sources of noise. Noise also is generated by activities commonly associated with residential, commercial, industrial, and recreational uses. Ambient noise levels likely have increased in some portions of the service area since development has increased between 1998 and the present.

The Noise Element of the County of Los Angeles General Plan establishes noise-related goals and policies. In addition, the county has adopted a Noise Control Ordinance (County Code Title 12.08 Noise Control (Ord. 11778 Section 2 (Art. 1 Section 101), 1978: Ord. 11773 Section 2 (Art. 1 Section 101), 1978.) and Title 12.12 Building Construction Noise) that identifies exterior noise standards for various land use categories as identified in Table 3.9-2.

County of Los Angeles Noise Ordinance also restricts noise generated by construction activities at noise sensitive land uses. Additionally, all mobile and stationary internal-combustion

powered equipment and machinery is required to be equipped with suitable exhaust and air-intake silencers in proper working order. These regulations are summarized below in Table 3.9-3.

The Noise Element of the City of Santa Clarita's General Plan contains noise-related goals and policies, and the City's Noise Ordinance establishes noise thresholds for specific land uses. The allowable noise levels in residential areas are 65 dBA during the daytime and 55 dBA during the nighttime. In commercial and manufacturing areas, up to 80 dBA is allowed during the daytime and 70 dBA is allowed during the nighttime. Construction work is limited to the hours between 7 A.M. and 7 P.M. Monday through Friday and between 8 A.M. and 6 P.M. on Saturday. Construction is prohibited on Sundays and six holidays.

Table 3.9-2. County of Los Angeles Exterior Noise Standards for Stationary and Point Noise Sources

Noise Zone	*Land Use*	*Time Interval*	*Exterior Noise Level dBA L_{eq}[1]*
I	Noise Sensitive Area[2]	Anytime	45
II	Residential	10:00 P.M. to 7:00 A.M. 7:00 A.M. to 10:00 P.M.	45 50
III	Commercial	10:00 P.M. to 7:00 A.M. 7:00 A.M. to 10:00 P.M.	55 60
IV	Industrial	Anytime	70

Source: County of Los Angeles Ordinance No. 11743, Section 12.08.390.

1. ***Standard No. 1*** shall be the exterior noise level which may not be exceeded for a cumulative period of more than 30 minutes in any hour. Standard No.1 shall be the applicable noise level; or, if the ambient L_{50} exceeds the foregoing level, then the ambient L_{50} becomes the exterior noise level Standard No. 1.

   Standard No. 2 shall be the exterior noise level which may not be exceeded for a cumulative period of more than 15 minutes in any hour. Standard No.2 shall be the applicable noise level from Standard No. 1 plus 5.0 dB(A);or, if the ambient L_{25} exceeds the foregoing level, then the ambient L_{25} becomes the exterior noise level Standard No.2

   Standard No. 3 shall be the exterior noise level which may not be exceeded for a cumulative period of more than 5 minutes in any hour. Standard No.3 shall be the applicable noise level from Standard No. 1 plus 10.0 dB(A);or, if the ambient $L_{8.3}$ exceeds the foregoing level, then the ambient $L_{8.3}$ becomes the exterior noise level Standard No. 3.

   Standard No. 4 shall be the exterior noise level which may not be exceeded for a cumulative period of more than 1 minute in any hour. Standard No.3 shall be the applicable noise level from Standard No. 1 plus 15.0 dB(A);or, if the ambient $L_{1.7}$ exceeds the foregoing level, then the ambient $L_{1.7}$ becomes the exterior noise level Standard No. 4.

   Standard No. 5 shall be the exterior noise level which may not be exceeded for any period of time. Standard No. 4 shall be the applicable noise level from Standard 1 plus 20 dB(A); or, if the ambient L_0 exceeds the forgoing level, then the ambient L_0 becomes the exterior noise level for Standard No. 4.

2. Not defined in the County Noise Ordinance; to be designated by the County Health Officer.

Both the Ventura County General Plan and the Area Plan for the Piru Area contain goals and policies relating to noise. The General Plan, which also applies to the Piru Area, states that noise generators proposed to be located near any noise sensitive receptor shall incorporate noise control measures so that the outdoor noise levels at the receptor do not exceed:

- An hourly Leq of 55 dBA or ambient noise level plus 3 dBA, whichever is greater, during any hour from 6:00 A.M. to 7:00 P.M.
- An hourly Leq of 50 dBA or ambient noise level plus 3 dBA, whichever is greater, during any hour from 7:00 P.M. to 10:00 P.M.
- An hourly Leq of 45 dBA or ambient noise level plus 3 dBA, whichever is greater, during any hour from 10 P.M. to 6 A.M.

Table 3.9-3. Mobile Construction Equipment Noise Limits

	Mobile Construction Equipment Maximum Noise Levels (Leq)		*Stationary Construction Equipment Maximum Noise Levels (Leq)*	
LAND USE	DAYTIME	NIGHTTIME	DAYTIME	NIGHTTIME
Residential	75 dBA	60 dBA	60 dBA	50 dBA
Multi-family residential	80 dBA	65 dBA	65 dBA	55 dBA
Residential / commercial	85 dBA	70 dBA	70 dBA	60 dBA

Note: Daytime: 7 A.M. to 8 P.M., excluding Sundays and holidays; nighttime: 8 P.M. to 7 A.M. daily and all day on Sundays and holidays.

3.9.2 Potential Impacts of the Project

3.9.2.1 Significance Criteria

The significance criteria are based on Appendix G of the State CEQA Guidelines. The Project would result in a significant impact if it would:

- expose persons to or generate noise levels in excess of standards established in the local General Plan or Noise Ordinance, or applicable standards of other agencies;
- expose persons to or generate excessive ground-borne vibration or ground-borne noise levels;
- cause a substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project;
- cause a substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project;
- for a project located within an airport land use plan or, where such a plant has not been adopted, within two miles of a public airport or public use airport, expose people residing or working in the project area to excessive noise levels; or
- for a project within the vicinity of a private airstrip, expose people residing or working in the project area to excessive noise levels.

3.9.2.2 Environmental Impacts

3.9.2.2.1 State Water Project and Associated Facilities

DIRECT IMPACTS

The Project would not involve construction or significant operational changes that could generate noise or vibration or increase current noise levels associated with the SWP and related activities. While increased pumping could result from the Project, no new pumps would be required. The existing pumps are housed in concrete structures and generally are located in rural areas; thus, increased pumping would not expose persons to or generate noise levels in excess of established standards, generate or expose persons to excessive ground-borne vibration or ground-borne noise levels, cause a substantial permanent, temporary, or periodic increase in ambient noise levels in the Project vicinity, or expose people residing or working in the Project area to excessive noise levels.

INDIRECT IMPACTS

No indirect noise impacts would occur.

3.9.2.2.2 Wheeler Ridge-Maricopa Water Storage District

DIRECT IMPACTS

The Project would not involve construction or operational changes that could generate noise or vibration or increase current noise levels in the district. The Project would not expose persons to or generate noise levels in excess of established standards, generate or expose persons to excessive ground-borne vibration or ground-borne noise levels, cause a substantial permanent, temporary, or periodic increase in ambient noise levels in the Project vicinity, or expose people residing or working in the Project area to excessive noise levels.

INDIRECT IMPACTS

No indirect noise impacts would occur.

3.9.2.2.3 Castaic Lake Water Agency

DIRECT IMPACTS

The Project would not involve construction or operational changes that could generate noise or vibration or increase current noise levels. Thus, the Project would not expose persons to or generate noise levels in excess of established standards, generate or expose persons to excessive ground-borne vibration or ground-borne noise levels, cause a substantial permanent, temporary, or periodic increase in ambient noise levels in the Project vicinity, or expose people residing or working in the Project area to excessive noise levels.

INDIRECT IMPACTS

Potential impacts from population growth that could occur as an indirect impact of the Project are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.9.3 Mitigation Measures

3.9.3.1 State Water Project and Associated Facilities

No direct or indirect significant noise impacts would occur; therefore, no mitigation measures are required.

3.9.3.2 Wheeler Ridge-Maricopa Water Storage District

No direct or indirect significant noise impacts would occur; therefore, no mitigation measures are required.

3.9.3.3 Castaic Lake Water Agency

No direct significant noise impacts would occur; therefore, no mitigation measures are required. Mitigation measures for indirect impacts are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.9.4 Significant Unavoidable Impacts

No direct or indirect significant unavoidable impacts would result from the Project.

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3.10 POPULATION AND HOUSING

3.10.1 Environmental Setting

3.10.1.1 State Water Project and Associated Facilities

Population and housing are not directly associated with the SWP, although the SWP is a water storage and delivery system that serves a large portion of California's population.

3.10.1.2 Wheeler Ridge-Maricopa Water Storage District

Based on U.S. Census Bureau data[1], between 1990 and 2000, the population within the district increased from 2,480 to 2,854, or by approximately 15 percent. The number of households also increased during this period from 728 households in 1990 to 857 households in 2000, or by approximately 18 percent.

3.10.1.3 Castaic Lake Water Agency

Based on U.S. Census Bureau data, the population in the CLWA service area in 2000 was approximately 190,000[2]. (This is the most recent data available. The next census will not be taken until 2010.) About 80 percent of the CLWA service area population resides in the City of Santa Clarita, whose population increased by about 36 percent between 1990 and 2000, from 110,642 to 151,088. Within the City of Santa Clarita, the 2000 Census reported 50,787 occupied housing units, a 12,313-unit increase since 1990. Based on 2000 Census data, about three persons occupy each housing unit. Assuming the same persons per occupied housing unit, there would be about 63,300 occupied housing units in the CLWA service area.

3.10.2 Potential Impacts of the Project

3.10.2.1 Significance Criteria

The criteria used to determine the significance of impacts related to population and housing are based on Appendix G of the State CEQA Guidelines. The Project would result in significant impacts it if would:

- induce substantial population growth in an area either directly (e.g., by proposing new homes and businesses) or indirectly (e.g., through extension of roads or other infrastructure);
- displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere; or

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1. Using GIS, the census blocks and tracts that were fully or partially within the WRMWSD were determined. If a block was partially within the district, the percentage of the area within the district was multiplied by the block census counts. U.S. Census data is the most current information available for population and housing.
2. Using GIS, the census blocks and tracts that were fully or partially within the CLWA service area were determined. If a block was partially within the service area, the percent of the area within the service area was multiplied by the block census counts.

- displace substantial numbers of people, necessitating the construction of replacement housing elsewhere.

3.10.2.2 Environmental Impacts

3.10.2.2.1 State Water Project and Associated Facilities

DIRECT IMPACTS

Implementation of the Project would not require new construction or the modification of existing SWP facilities. The use of existing SWP facilities to transport water associated with the Project would not require the creation of new homes or businesses or otherwise directly induce population growth.

INDIRECT IMPACTS

The Project would not result in changes in employment or new business opportunities associated with the SWP, nor would it extend infrastructure. No indirect impacts to population and housing would occur.

3.10.2.2.2 Wheeler Ridge-Maricopa Water Storage District

DIRECT IMPACTS

Implementation of the Project would not require new construction or the modification of existing WRMWSD water distribution facilities. The Project would not require the creation of new homes or businesses or otherwise directly induce population growth.

INDIRECT IMPACTS

The Project would not result in changes in employment or new business opportunities in WRMWSD, nor would it extend infrastructure. No indirect impacts to population and housing would occur.

3.10.2.2.3 Castaic Lake Water Agency

DIRECT IMPACTS

Implementation of the Project would not require new construction or the modification of existing CLWA facilities. The Project would not require the creation of new homes or businesses or otherwise directly induce population growth.

INDIRECT IMPACTS

The Project would remove an obstacle to population growth by providing additional SWP water within the CLWA service area. Because it would remove such an obstacle, the Project may indirectly foster economic or population growth or the construction of additional housing within the CLWA service area. Assumptions regarding the population that could be served by the Project are described in section 3.0. Given an average year water supply, it is expected that

the Project would be able to serve a population of approximately 106,700 persons and could serve about 35,600 housing units (see Chapter 4, Growth-Inducing Effects and Growth-Related Impacts). Specific potential impacts from population and housing growth that could occur as an indirect impact of the Project are addressed for each resource in Chapter 4. With the exception of aesthetics, air quality, biological resources, transportation and circulation, and utilities and service systems, all indirect, growth-related impacts would be mitigable to less than significant.

3.10.3 Mitigation Measures

3.10.3.1 State Water Project and Associated Facilities

No direct or indirect significant impacts to population and housing would occur; therefore, no mitigation measures are required.

3.10.3.2 Wheeler Ridge-Maricopa Water Storage District

No direct or indirect significant impacts to population and housing would occur; therefore, no mitigation measures are required.

3.10.3.3 Castaic Lake Water Agency

No direct significant impacts to population and housing would occur; therefore, no mitigation measures are required for direct impacts. Mitigation measures for indirect impacts associated with Project-induced population and housing growth are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts (section 4.2.10, Population and Housing).

3.10.4 Significant Unavoidable Impacts

No significant unavoidable direct impacts would result from the Project. Significant and unavoidable indirect impacts to aesthetics, air quality, biological resources, transportation and circulation, and utilities and service systems may result from Project-induced population and housing growth.

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3.11 PUBLIC SERVICES

Public services addressed in this section include police protection, fire protection, schools, and libraries. Parks and other recreational facilities are discussed in section 3.12, Recreation Resources.

3.11.1 Environmental Setting

3.11.1.1 State Water Project and Associated Facilities

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP. The SWP facilities traverse California between the Delta and southern California. Public services are provided by either by the State of California or local jurisdictions, depending on the location of individual facilities. The California Highway Patrol (CHP) has the primary authority for the major roadways accessing or adjacent to SWP facilities with support from individual county sheriff departments and local police departments. Fire protection is provided by the California Department of Forestry and by county, city, and special district fire departments. Since the SWP is a water storage and delivery system, it does not generate a demand for schools or library services.

3.11.1.2 Wheeler Ridge-Maricopa Water Storage District

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP. Population increased modestly during this period (the entire increase between 1998 and 2000 was less than 400 persons); thus, the demand for public services likely increased as well.

Police Protection

The CHP provides services along the major highways of Kern County. Unit response stations for the CHP are located in Bakersfield, Taft, and Lebec. The Kern County Sheriff's Department provides police protection for the unincorporated areas of the county, including the district. The Kern County Sheriff's Department also is under contract to provide police protection to several cities within the county. Currently, the Sheriff's Department has one main station and 14 sub-stations throughout the county. These are staffed by approximately 1,050 employees, of which approximately 450 are sworn peace offices (Kern County Sheriff's Department 2002).

Fire Protection

Fire protection in the unincorporated portions of Kern County, including the district, is provided by the Kern County Fire Department, which operates 45 full time stations and one seasonal station throughout the county (Kern County Fire Department 2001).

Education

Kern County has 35 elementary school districts, four high school districts, and two community college districts (Kern County Superintendent of Schools 2002). No schools are present within the district.

Library Services

Kern County operates one main library and 24 branch libraries throughout the county. No libraries are present within the district.

3.11.1.3 *Castaic Lake Water Agency*

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP, except as noted below under Education and Library Services. Population increased during this period; thus, the demand for public services likely increased as well.

Police Protection

The Los Angeles County Sheriff's Department provides law enforcement services via contract to the unincorporated areas of Los Angeles County and the City of Santa Clarita. Over 140 deputy sheriffs currently staff the Santa Clarita Sheriff's Station. With a planning standard of one deputy per 1,000 residents, the current ratio is well within the planning range (Santa Clarita Valley Sheriff's Station 2002). The station includes a jail with beds for eight females and 31 males and also is equipped with a Helicopter, K-9 unit, Search and Rescue team, Mobile Command Post, and Detective Unit. The Sheriff's Department provides traffic services within the limits of the City of Santa Clarita, while the CHP provides service to the unincorporated portions of the CLWA service area.

The Ventura County Sheriff's Department is the law enforcement provider for Ventura County, including five of the county's ten incorporated cities (Thousand Oaks, Camarillo, Moorpark, Fillmore, and Ojai), plus the unincorporated areas of the county.

Fire Protection

The Consolidated Fire Protection District (Los Angeles County Fire Department, Battalion 6) provides fire protection services in the Santa Clarita Valley, both in the unincorporated portions of Los Angeles County and the City of Santa Clarita. Battalion 6 has a total of ten stations; eight are in the Santa Clarita Valley and two are in Gorman and Chatsworth (personal communication, L. Bagwell 2004). The eight stations located in the Santa Clarita Valley maintain nine engines, one truck, three paramedic squad cars, one water tender, and one helicopter with a paramedic team. Additional resources and staff are utilized for emergency back-up situations or as needed according to fire hazard levels throughout the year. The County Fire Department has planned for 11 more fire stations in the City of Santa Clarita by 2007 or 2008 (personal communication, L. Bagwell 2004), but the timing of these stations depends on the pace of development since developer fees fund new station construction (personal communication, D. Aguirre 2004. Angeles National Forest personnel provide wildland fire protection services to the Santa Clarita Valley and vicinity.

Fire protection services within the portion of the CLWA service area that is in Ventura County are provided by Ventura County Fire Department Station No. 28, which is located in Piru. Back-up fire protection is provided by both the Ventura County Fire Department, Los Angeles County Fire Department and in cases of wildland fire, Los Padres National Forest personnel.

Education

The Santa Clarita Valley has five school districts serving grades K-12. Based on conversations with school officials (as noted in Table 3.11-1), all school districts are at capacity or are experiencing overcrowding. Table 3.11-1 provides a list of school districts and enrollments within the area. No schools are located in the portion of the CLWA service area that is in Ventura County.

Table 3.11-1. School Districts in the CLWA Service Area

School District	1998[1]			2002[2]		
	Number of Schools	Grades Served	Enrollment	Number of Schools	Grades Served	Enrollment
Castaic Union School District	2 elementary 1 junior high	K-8	2,120	2 elementary 1 middle school	K-8	3,398[3]
Newhall School District	7 elementary	K-6	5,946	7 elementary	K-6	6,547
Saugus Union School District	11 elementary	K-6	8,300	14 elementary	K-6	10,046
Sulphur Springs School District	7 elementary	K-6	4,810	8 elementary	K-6	5,466
William S. Hart Union High School District	4 junior high 4 high school 1 continuation school 4 alternative sites	7-12	13,500	4 junior high 6 high school 1 continuation school 4 alternative sites	7-12	18,622

Notes:
1. Personal communications with Pam Wellcome, Castaic Union School; Dr. Herbert D. Bartelt Jr., Newhall School District; Sandy Kuhlman, Saugus School District; Carol Greenwood, Sulphur Springs School District; and Connie Ford, William S. Hart High School District, May 1998.
2. Personal communications with Kitty Belendez, Castaic Union School; Sue Malone, Newhall School District; Judy Fish, Saugus School District; Leslie Turner, Sulphur Springs School District; Rory Livingston, William S. Hart High School District, 2002.
3. A new elementary school within the district is expected to open September 2003 (Personal communication, Kitty Belendez).

Library Services

Three libraries operated by the County of Los Angeles Libraries Department serve the residents of the Santa Clarita Valley: the Canyon Country Library, the Newhall Library, and the Valencia Library (see Table 3.11-2). In 1998, the three libraries did not meet the planning standard of 1.7 square feet of library space per capita. The County Library currently uses a planning standard of two material items per capita and 0.389 gross square feet of space per capita. A recently completed service area analysis for the three Santa Clarita libraries (County of Los Angeles Public Library 2002), using 2000 population data, indicated that:

- The Valencia Library has an adequate materials collection and a facility space deficit of 13,737 square feet.

- The Newhall Library has an adequate materials collection and a facility space deficit of 7,776 square feet.
- The Canyon Country Library has a materials deficit of 62,229 and a facility space deficit of 15,419 square feet.

Table 3.11-2. Santa Clarita Valley Libraries

Library	1998[1]		2002[2]	
	Number of Books	*Size of Library (square feet)*	*Number of Books*	*Size of Library (square feet)*
Canyon Country Library	61,537	5,050	70,389	12,000
Newhall Library	54,401	4,842	63,126	4,842
Valencia Library	185,243	22,966	198,331	22,966

Notes: 1. Personal communications, S. Hampton and F. Hungerford, 1998.
2. Valencia Library, 2002; Newhall Library, 2002; Canyon Country Library, 2002.

Overall, there is currently a total deficit of 36,932 square feet in the combined service areas of these libraries.

With projected population growth for the Santa Clarita Valley by the year 2010 (Los Angeles County 1980), Santa Clarita libraries would need approximately 65,000 more square feet of space. Alternative funding sources for all libraries in the project area include Mello-Roos Community Facilities Districts, developer impact fees and agreements, and property taxes.

3.11.2 Potential Impacts of the Project

3.11.2.1 Significance Criteria

The significance criteria listed below are based on Appendix G of the State CEQA Guidelines. The Project would have a significant impact on public services if it would:

- result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities; or
- result in the need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services: fire protection, police protection, schools, parks, and other public facilities.

3.11.3 Environmental Impacts

State Water Project and Associated Facilities

Direct Impacts

Since the Project would not require new construction or the modification of existing SWP facilities, it would not involve the provision of new or physically altered governmental facilities or result in the need for new or physically altered governmental facilities.

Indirect Impacts

No indirect impacts to public services would occur.

Wheeler Ridge-Maricopa Water Storage District

Direct Impacts

Transferring 41,000 AF of Table A Amount to CLWA would not require new construction or the modification of existing WRMWSD water distribution facilities, nor would it change the current operation of these facilities. Thus, the Project would not involve the provision of new or physically altered governmental facilities or result in the need for new or physically altered governmental facilities.

Indirect Impacts

No indirect impacts to public services would occur.

Castaic Lake Water Agency

Direct Impacts

The Project would not involve new construction, nor would it directly result in population growth. The use of existing facilities to transport an additional 41,000 AF of water would not require the provision of new or physically altered governmental facilities or result in the need for new or physically altered governmental facilities.

Indirect Impacts

Potential impacts to public services from population growth that could occur as an indirect impact of the Project are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.11.4 Mitigation Measures

State Water Project and Associated Facilities

No direct or indirect significant impacts to public services would occur; therefore, no mitigation measures are required.

Wheeler Ridge-Maricopa Water Storage District

No direct or indirect significant impacts to public services would occur; therefore, no mitigation measures are required.

Castaic Lake Water Agency

No direct significant impacts to public services would occur; therefore, no mitigation measures are required. Mitigation measures for indirect impacts are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.11.5 Significant Unavoidable Impacts

No direct or indirect significant unavoidable impacts would result from the Project.

3.12 RECREATION

Recreational resources consist of natural and manmade features or areas that are used, or could potentially be used, by the public for recreational purposes.

3.12.1 Environmental Setting

3.12.1.1 State Water Project and Associated Facilities

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP.

California Aqueduct

The California Aqueduct provides year-round recreational fishing opportunities, primarily for striped bass and catfish. The aqueduct contains eleven designated fishing areas within the San Joaquin Valley (DWR 2001c). Other recreational uses, such as boating and swimming, are not permitted.

San Luis Reservoir

The San Luis Reservoir complex includes the reservoir itself, the O'Neill Forebay and the Los Banos Detention Reservoir. The San Luis Reservoir is typically full in the spring and recedes throughout the summer and fall as water is used to meet the needs of both SWP and CVP contractors. San Luis Reservoir is surrounded by the San Luis Reservoir State Recreation Area, which is a popular recreation area used for boating, sailboarding, camping, picnicking, and fishing (DWR 2001b). The O'Neill Forebay receives the heaviest recreational use since it has a gentle shoreline and developed day use areas containing such amenities as lawns, beaches, and pit barbeques (DWR 2001b).

Castaic Lake

The Castaic Lake State Recreation Area, located at the northern end of the Santa Clarita Valley, is home to one of the largest SWP reservoirs in southern California. Castaic Lake's recreational facilities were built by DWR and the State Department of Parks and Recreation, but the 8,000-acre park is operated and maintained by the Los Angeles County Department of Parks and Recreation. The facility consists of two separate lakes—the main reservoir and the lagoon/afterbay. The main reservoir forms a V-shaped body of water with approximately 29 miles of shoreline. The east arm of the lake is open to boating, fishing and sailing, and a portion is open to water skiing and wakeboarding. The west arm is reserved for water-skiing and wakeboarding, with a special use area for all personal watercraft. Fishing in the west arm is allowed only in the coves. Ramps are provided on the east and west sides of the dam, and picnic facilities are located in both areas. The recreation area offers self-contained overnight camping on the lagoon/afterbay. Campgrounds containing 60 campsites are located on the east side and can accommodate travel trailers, campers, and RVs. Tent camping also is available on a limited basis. The campgrounds also include a picnic area and provide access to areas designated for boating, swimming (seasonal), and fishing.

3.12.1.2 *Wheeler Ridge-Maricopa Water Storage District*

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP. No recreational facilities are located within WRMWSD. Parks and/or recreational services within Kern County are under the jurisdiction of the county, eight recreation and park districts, other special districts, cities, school districts, the state and federal governments, and private organizations (Kern County 1994). Kern County provides both regional park facilities and local park facilities to serve unincorporated areas of the county not served by the recreation and park districts or special districts. Three state parks (Fort Tejon State Historical Park, Tule Elk State Reserve, and Red Rock Canyon State Park), two national forests (Los Padres National Forest and Sequoia National Forest), along with approximately 10,000 acres of USFWS land and over 500,000 acres of Bureau of Land Management land are located, in total or in part, within Kern County (Kern County 1994).

3.12.1.3 *Castaic Lake Water Agency*

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP, although demand for recreational resources has increased as the population increased. Recreational resources in the CLWA service area consist of state, county/regional and local parks, and designated regional and local recreational trails. The Los Angeles County Department of Parks and Recreation provides local parks and recreation facilities for northwestern Los Angeles County residents and provides regional parks for all residents of the county. The Ventura County Parks Department provides this function for eastern Ventura County portions of the CLWA service area. The City of Santa Clarita provides local parks within the city boundaries. Los Angeles County has determined that there is a county-wide shortage of local parkland, including portions of the Santa Clarita Valley.

Regional recreation areas under the control of the federal government include the Angeles National Forest, the Los Padres National Forest, and the Santa Monica Mountains National Recreation Area. The Castaic Lake Recreation Area, described above, is also located within the CLWA service area.

3.12.2 Potential Impacts of the Project

3.12.2.1 *Significance Criteria*

The criteria used to determine the significance of impacts to recreation resources are based on Appendix G of the State CEQA Guidelines. The Project would have a significant environmental impact if it would:

- increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated; or
- include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment.

3.12.2.2 *Environmental Impacts*

State Water Project and Associated Facilities

DIRECT IMPACTS

The Project would result in a slight increase in the amount of water transported in the California Aqueduct to Castaic Lake, which would not adversely impact fishing opportunities in the aqueduct. As described in section 3.0, minor seasonal changes in the average volume of water stored in San Luis Reservoir would result from Project implementation. The average volume of stored water would decrease slightly from December through June and would slightly increase the rest of the year. The amount of water stored in the reservoir already fluctuates, and the changes resulting from the Project would fall within the range of fluctuations present under both current and historic operations. Impacts to recreational resources at San Luis Reservoir would be less than significant. The volume of water stored at Castaic Lake would not change as a result of the Project, and recreational resources would not be affected. The use of existing SWP facilities to transport water to the CLWA service area would not increase the use of recreational facilities, nor does the Project include recreational facilities or require the construction or expansion of recreational facilities.

INDIRECT IMPACTS

No indirect impacts to recreational resources would occur.

Wheeler Ridge-Maricopa Water Storage District

DIRECT IMPACTS

The Project would not result in short-term or long-term population growth in the district (refer to section 3.10) and therefore would not increase the use of recreational facilities. The Project does not include or require the construction or expansion of recreational facilities.

INDIRECT IMPACTS

No indirect impacts to recreational resources would occur.

Castaic Lake Water Agency

DIRECT IMPACTS

The Project would not directly result in short-term or long-term population growth in the district (refer to section 3.10) and therefore would not directly increase the use of recreational facilities. The Project does not include or require the construction or expansion of recreational facilities.

INDIRECT IMPACTS

Potential impacts from population growth that could occur as an indirect impact of the Project are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.12.3 Mitigation Measures

3.12.3.1 State Water Project and Associated Facilities

No direct or indirect significant impacts to recreational resources would occur; therefore no mitigation measures are required.

3.12.3.2 Wheeler Ridge-Maricopa Water Storage District

No direct or indirect significant impacts to recreational resources would occur; therefore no mitigation measures are required.

3.12.3.3 Castaic Lake Water Agency

No direct significant impacts to recreational resources would occur; therefore no mitigation measures are required. Mitigation measures for indirect impacts are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.12.4 Significant Unavoidable Impacts

No direct or indirect significant unavoidable impacts would result from the Project.

3.13 TRANSPORTATION AND CIRCULATION

3.13.1 Environmental Setting

3.13.1.1 State Water Project and Associated Facilities

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP. The SWP and associated facilities are served by, lie adjacent to, or are traversed by, several major transportation routes, including Interstates 5 and 580, State Route 152, and Highways 33, 41, 46, 55, 119, 138, 166, and 198. Numerous general aviation airports exist within the regions traversed by the SWP and associated facilities, but none is immediately adjacent to the SWP facilities. Passenger bus and rail service are generally available in the urbanized areas traversed by the California Aqueduct.

3.13.1.2 Wheeler Ridge-Maricopa Water Storage District

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP. The minor population increase in a rural area during this period would cause minor changes to transportation and traffic.

Planning, design, construction, and operation of regional transportation systems in the Kern County area are primarily the responsibility of the California Department of Transportation (CalTrans), District 6. The WRMWSD is served by several major transportation routes, including Interstate 5 and State Highways 99 and 166. Interstate 5 and State Highway 99 trend generally north to south through the district and serve as the major north/south routes through the San Joaquin Valley. State Highway 166 trends east to west through the district. Local roadways are under the jurisdiction of Kern County. The district does not contain any commercial or general aviation airport facilities, and the nearest commercial airport is Meadows Field, located northwest of Bakersfield. The area is not served by scheduled passenger rail or bus services.

3.13.1.3 Castaic Lake Water Agency

The primary agency responsible for the planning, design, construction, and operation of regional transportation systems in the Santa Clarita Valley is CalTrans District 7. Local roadways are under the jurisdiction of local cities and/or Los Angeles County. Two regional freeways serve the Santa Clarita Valley area. Interstate 5 traverses the area in a north-south direction on the west side of the City of Santa Clarita and continues south through the Los Angeles area. State Route 14 serves the eastern part of the area and beyond, connecting to the communities of Palmdale and Lancaster. State Route 126 traverses Ventura County in an east-west direction and continues to Los Angeles County intersecting with Interstate 5 near Santa Clarita.

The highway and roadway system in the Santa Clarita Valley is being modified in response to local and regional development projects, and Caltrans has developed long-range plans for state highways in this area based on projected travel demand over a 20-year period. Interstate 5, which has eight lanes from State Route 126 to State Route 14, is projected to need two additional

high occupancy vehicle (HOV) and two additional truck lanes to meet future traffic volumes (Caltrans 1991c). In general, traffic volumes increased between 1998 and the present since the population increased during this period.

The closest commercial airport to the CLWA service area is the Burbank Glendale Pasadena Airport, approximately 15 miles from Valencia. Passenger bus service is available to most of the service area, provided by Greyhound, Amtrak, and Santa Clarita Transit. Santa Clarita Transit provides transportation services connecting the communities of Castaic, Val Verde, Valencia, Saugus, Friendly Valley, Canyon Country, and Newhall and express service to downtown Los Angeles (Santa Clarita Transit 2002). In addition, three Metrolink rail stations are located within the CLWA service area.

3.13.2 Potential Impacts of the Project

3.13.2.1 Significance Criteria

The criteria used to determine the significance of an impact related to transportation are based on the initial study checklist in Appendix G of the State CEQA Guidelines. The Project would result in a significant impact if it would:

- cause an increase in traffic that is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections;
- exceed either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways;
- result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks;
- substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment);
- result in inadequate emergency access;
- result in inadequate parking capacity; or
- conflict with adopted policies supporting alternative transportation (e.g., bus turnouts, bicycle racks).

3.13.2.2 Environmental Impacts

State Water Project and Associated Facilities

DIRECT IMPACTS

The Project would not involve construction or operational changes that could generate traffic or otherwise affect traffic conditions. Similarly, the Project would not produce a change in population or employment that would produce addition demands on the transportation system. Thus, the Project would not cause an increase in traffic, result in an exceedance of an established level of service standard, change air traffic patterns, substantially increase hazards,

result in inadequate emergency access, result in inadequate parking capacity, conflict with adopted policies supporting alternative transportation.

INDIRECT IMPACTS

No indirect impacts to transportation and circulation would occur.

Wheeler Ridge-Maricopa Water Storage District

DIRECT IMPACTS

The Project would not involve construction or operational changes that could generate traffic or otherwise adversely affect traffic conditions. Similarly, the Project would not produce a change in population or employment that would produce addition demands on the transportation system. Thus, the Project would not cause an increase in traffic, result in an exceedance of an established level of service standard, change air traffic patterns, substantially increase hazards, result in inadequate emergency access, result in inadequate parking capacity, conflict with adopted policies supporting alternative transportation.

INDIRECT IMPACTS

No indirect impacts to transportation and circulation would occur.

Castaic Lake Water Agency

DIRECT IMPACTS

The Project would not involve construction or operational changes that could generate traffic or otherwise affect traffic conditions. Similarly, the Project would not directly produce a change in population or employment that would produce addition demands on the transportation system. Thus, the Project would not cause an increase in traffic, result in an exceedance of an established level of service standard, change air traffic patterns, substantially increase hazards, result in inadequate emergency access, result in inadequate parking capacity, conflict with adopted policies supporting alternative transportation.

INDIRECT IMPACTS

Potential impacts from population growth that could occur as an indirect impact of the Project are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.13.3 Mitigation Measures

3.13.3.1 State Water Project and Associated Facilities

No direct or indirect significant impacts to transportation and circulation would occur; therefore, no mitigation measures are required.

3.13.3.2 Wheeler Ridge-Maricopa Water Storage District

No direct or indirect significant impacts to transportation and circulation would occur; therefore, no mitigation measures are required.

3.13.3.3 Castaic Lake Water Agency

No direct significant impacts to transportation and circulation would occur; therefore, no mitigation measures are required. Mitigation measures for indirect impacts are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.13.4 Significant Unavoidable Impacts

No direct or indirect significant unavoidable impacts would result from the Project, with the exception of potential indirect impacts within the CLWA service area. These are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.14 UTILITIES/SERVICE SYSTEMS

This section addresses potential impacts to utilities and service systems, including solid waste disposal and domestic and wastewater service. In addition, since the Project would require electrical power for pumping additional water through SWP facilities from the WRMWSD turnout to the CLWA turnout and for potable water treatment prior to use in the CLWA service areas, the sections describing the SWP and associated facilities and CLWA service area also include a discussion of energy consumption.

3.14.1 Environmental Setting

3.14.1.1 State Water Project and Associated Facilities

The SWP is a water storage and delivery system consisting of reservoirs, aqueducts, power plants, and pumping plants. Solid waste disposal services associated with SWP facilities are provided by municipalities as well as local disposal companies. Domestic water service is provided by municipalities and special districts. Wastewater service is provided by local municipalities as well as local treatment companies.

Electrical Power

The SWP is the single largest user of electrical power in California. The electricity needed to operate the SWP comes from a combination of SWP hydroelectric facilities, the Reid Gardner Coal-fired Generation Plant (approximately 68 percent of Unit 4 is owned by DWR), and through long-term and short-term contracts with other energy producers (DWR 2002).

In 1998, operating the 25 SWP pumping and generating plants required 3.445 billion kilowatt hours (kWh) (DWR 2001a) to deliver approximately 1.8 million AF of water overall and approximately 666,000 AF of water to southern California. During 1998, SWP facilities produced approximately 4.533 billion kWh of energy (not including the 1.382 million kWh of energy produced under DWR's share of the Reid Gardner coal-fired generation plant) (DWR 2001a). In 1998, DWR sold approximately 6.9 billion kWh to 36 utilities and 19 power marketers (DWR 2001a). DWR also purchased or exchanged 4.43 billion kWh of energy in 1998 (DWR 2001a).

In 2000, operating the 25 SWP pumping and generating plants required 9.19 billion kWh to deliver approximately 3.6 million AF overall and approximately 1.8 million AF to southern California (DWR 2002)[1]. In 2000, DWP sold approximately 2.92 billion kWh to 24 utilities and 16 power markets (DWR 2002). DWR also purchased 2.94 billion kWh of energy in 2000 (DWR 2002).

Water delivered to the WRMWSD turnouts passes though the Banks, Dos Amigos, and Buena Vista pumping plants on the California Aqueduct as it travels from the SWP south Delta facilities to the first of WRMWSD's turnouts. When water is stored in San Luis Reservoir, it also

1 These values are total water delivered and include deliveries associated with Table A, Article 21, flexible storage, and non-project water. See Table 9-1 in DWR 2002.

passes through the Gianelli Pumping-Generating Plant located adjacent to the reservoir. The SWP Teerink and Chrisman pumping plants, both located within the WRMWSD, lift water in the Aqueduct as it continues south. Water in the Aqueduct is then lifted over the Tehachapi Mountain Range by the Edmonston pumping plant, and lifted again at the Oso pumping plant. Water then flows through the Warne powerplant just north of Pyramid Lake. Water is delivered from Pyramid Lake to Castaic Lake by gravity. Some power is recovered at the Warne and Castaic powerplants (Castaic powerplant is owned and operated by the Los Angeles Department of Water and Power) when water flows down the Aqueduct from the south side of the Tehachapi Mountain Range to Castaic Lake.

Electrical energy demand varies in response to economic trends and population. As a result of these factors, peak electrical energy demand is expected to increase by approximately 10 MW per year for the foreseeable future (CEC 2002b). However, when one considers the West as a whole, more generation capacity is being built than is necessary to meet the anticipated demands of growth. Based on the evaluations of recent demand trends, population trends, fuel costs, power generation capability and construction, meteorological conditions, actions outside California, and other factors, CEC concluded that, for the foreseeable future, capacity additions will exceed the peak demand growth both within California and the Northwest, Southwest, and Rocky Mountain regions. While various factors may trigger calls for load curtailments, supply reserve margins should be adequate to meet the reasonably foreseeable demands.

3.14.1.2 *Wheeler Ridge-Maricopa Water Storage District*

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP. Population increased modestly during this period (the entire increase between 1998 and 2000 was less than 400 persons); thus, the demand for utilities and service systems likely increased as well.

Solid Waste

Kern County Waste Management Department operates seven landfills including Bena, Boron, Mojave-Rosamond, Ridgecrest, Shafter-Wasco, Taft, and Tehachapi; and six transfer stations including Buttonwillow, Glennville, Kern Valley, Lebec, Lost Hills, and McFarland-Delano. In addition, four bin sites serve Kern County and include Caliente, Keene, Lorraine-Twin Oaks, and Randsburg.

Wastewater

Wastewater treatment within Kern County is provided by public entities and individual wastewater treatment facilities such as septic tanks and leach fields. All residential and commercial buildings in WRMWSD use individual wastewater treatment facilities.

Storm Water

The Kern County Engineering & Survey Services Department (KCESSD) provides storm water services to WRMWSD. These services includes the design, maintenance, and monitoring of pollutant discharges from Kern County's storm water management infrastructure. The Engineering & Survey Services Department is also responsible for reviewing and inspecting

street, sewer, water, drainage, and grading plans for Kern County project and development permits, collecting floodplain mapping and hydrologic data, and implementing the National Flood Insurance Program (KCESSD 2002).

3.14.1.3 *Castaic Lake Water Agency*

No substantial changes in baseline conditions have occurred between the 1998 NOP and the 2003 NOP, except as noted. In general, population increased during this period; thus, the demand for utilities and service systems likely increased as well.

Solid Waste Disposal

Waste generated in the CLWA service area is generally hauled by private contractors to public landfills in Los Angeles County. The Chiquita Canyon Landfill and the Sunshine Canyon Sanitary Landfill handle the majority of waste from the Santa Clarita Valley, although numerous other landfills in Los Angeles County also provide service. Landfill capacity available to the CLWA service area is therefore not limited to those areas in the immediate vicinity. In 1998, Chiquita Canyon Landfill had a remaining capacity of approximately 1 million tons and had an expansion permit pending for an additional 23.0 million tons. The landfill had a daily limit of 5,000 tons per day or 30,000 tons per week. Since 1998, the 23.0 million ton expansion permit for the Chiquita Canyon Landfill was approved, and it has a remaining capacity of 20.1 million tons (LACSD 2002). The landfill's allowable daily tonnage is currently 6,000 tons per day; however, the weekly allowable amount is still 30,000 tons per week (California Integrated Waste Management Board [CIWMB] 2001a).

In 1998, the capacity of the Sunshine Landfill was 17 million tons, which was expected to last for another nine years (personal communication, S. Rohas 1998). The maximum daily tonnage rate in 1998 was 6,000 tons per day or 36,000 tons per week (personal communication, J. Aidukas 1998). This facility is developing plans for expansion to a 90 million ton capacity that would be expected to last 26 years after date of approval. Expansion would include an increase in the maximum tonnage rate from 6,000 to 11,000 tons per day. As of May 2001, the daily tonnage rate increased to 6,600 tons per day, and the landfill has a remaining capacity of 16 million cubic yards (CIWMB 2001b). The Sunshine Landfill currently has an estimated closure date of January 2004 (CIWMB 2001b).

Water Treatment

Surface water and groundwater are treated prior to the distribution for potable use. Treatment of groundwater within the CLWA service area is generally limited to disinfection and is completed at individual wellhead facilities. Surface water (such as from imported sources) is filtered and disinfected, in compliance with applicable regulations, at either the Earl Schmidt Filtration Plant (ESFP) or Rio Vista Water Treatment Plant (RVWTP). Construction is underway at the ESFP to upgrade the treatment process to meet anticipated water quality requirements and to expand the ESFP capacity from 33.6 million gallons per day (mgd) to 56 mgd (refer to section 4.2.14 regarding Growth-Related Impacts and Chapter 6.0, Cumulative Impacts, for additional details). The ESFP was originally constructed with a capacity of 12.5 mgd in 1980 and expanded to 25 mgd in 1987. In the 1990s, the California Department of Health Services re-rated the treatment plant to a capacity of 28 mgd and then in 2001 to a capacity of 33.6 mgd.

The ESFP is located in Castaic, near Castaic Lake. The ESFP obtains its raw water supply from SWP water stored in Castaic Lake. The RVWTP was constructed in the early 1990s with a rated capacity of 30 mgd. The RVWTP is located in Santa Clarita, near Bouquet Canyon Road.

Water treatment capacity is based on peak demand. Current and anticipated operations of the existing and proposed water production and treatment facilities have a great deal of flexibility to meet peak (summer) demands and non-peak ("baseload" or winter) demands by coordinated use of imported and local groundwater resources and associated treatment facilities. Based on the operations and peaking factors used by CLWA, the combined capacity of the existing facilities is sufficient to treat approximately 35,600 AFY for potable use. If these facilities were operated at peak capacity for a full year they would have the capacity to treat approximately 71,200 AF. The routine operation of the treatment plants at full rated capacity would not follow sound engineering or operational practices. When the ESFP expansion project is completed (expected in 2005), normal treatment capacity would be increased to approximately 48,200 AFY. If expanded peak operations were maintained for a full year, the treatment capacity would be approximately 96,300 AFY.

Wastewater

Santa Clarita Valley and Unincorporated Los Angeles County. Two wastewater treatment facilities managed by the County Sanitation Districts of Los Angeles County service the Santa Clarita Valley and vicinity: the Saugus Water Reclamation Plant and the Valencia Water Reclamation Plant. These facilities are operated by the County Sanitation Districts of Los Angeles County. These facilities work jointly to treat the wastewater of the Santa Clarita Valley. Any excess flows from the Saugus facility are treated by the Valencia facility. The Saugus facility has a maximum capacity of 6.5 mgd. The treatment processes used are primary, secondary, and tertiary treatment. Both the Saugus and Valencia facilities discharge treated effluent into the Santa Clara River. The Valencia Water Reclamation Plant is also a primary, secondary, and tertiary treatment facility with a capacity of 12.6 mgd. These two districts jointly operate a regional system known as the Santa Clarita Valley Joint Sewerage System (SCVJSS) for which the 2015 Joint Sewerage System Facilities System Plan has been completed (LACSD 1998). The SCVJSS has a current combined capacity (from the Saugus and Valencia treatment plants in 2003) of 19.1 mgd and plans to expand capacity to 28.1 mgd by 2004. The System Plan identifies further expansion to the practical site capacity of 34.1 mgd by 2010, which has been extended to 2020 (personal communication, S. Highter, 2003). To date, the efforts to expand capacity to 28.1 mgd are on schedule, and completion is expected in Spring 2004. All expansions are occurring at the Valencia plant. The ultimate expansion is intended to serve a population of 321,000. Nitrification and denitrification process upgrades have been completed at both facilities (final construction is ongoing but the processes have been underway since June of 2003) and the related required effluent standards have been met since June of 2003 (personal communication, R. Kettle 2004).

Unincorporated Ventura County. A package plant located on the north side of Highway 126 at its intersection with Hopper Creek provides wastewater treatment service to the residents of the nearby unincorporated areas of Ventura County (personal communication, R. Pakala 1998). This package plant, managed by Ventura County Public Works, Water and Sanitation Department, uses an activated sludge process to service 220,000 gallons of wastewater per day

(Ventura County Public Works Agency 2001). All treated effluent is discharged into several percolation ponds located on the south side of Highway 126.

Storm Water

Santa Clarita Valley and Unincorporated Los Angeles County. The Los Angeles County Department of Public Works provides storm water services for the Santa Clarita Valley and unincorporated Los Angeles County. The Department of Public Works is responsible for the design, construction, operation, maintenance, and repair of roads, bridges, airports, sewers, water supply, flood control and water conservation facilities; and for the design and construction of capital projects. Additional responsibilities include regulatory and ministerial programs for the County of Los Angeles, Los Angeles County Flood Control District, other special districts, and contract cities that request services. A 24-hour Emergency Operations Center is maintained to respond to problems reported by the public and other agencies as well as major emergencies, such as floods, windstorms, snowstorms, earthquakes, etc., and to monitor various Department facilities (Los Angeles County Department of Public Works 2002).

Unincorporated Ventura County. The Flood Control Department of the Ventura County Public Works Agency has the operational responsibilities for the Ventura County Flood Control District, which provides storm water services to the unincorporated regions of Ventura County.

Electrical Power

Southern California Edison (Edison) provides electricity to the CLWA service area. Edison generates electricity from a variety of energy resources, including solar, geothermal, hydroelectric, natural gas, and nuclear. Edison also purchases electricity from independent producers and is part of the Pacific Intertie and the western power supply grid.

The Edison transmission system includes transmission lines of approximately 50 miles in length or greater with a capacity of 220,000 volts, as well as sub-transmission systems with a 66,000 volt capacity, which transmit power from the larger capacity lines to 7 existing substations serving the Santa Clarita Valley. The Elizabeth Lake Substation, located in Castaic, serves the ESFP. Edison has a proprietary 10-year plan for the Santa Clarita Valley and has earmarked additional substations and power lines to be built, as needed, depending upon growth in the area (personal communication, M. Hughes 2002). Power consumption in the CLWA service area likely increased between 1998 and the present since the population increased during this period.

3.14.2 Potential Impacts of the Project

3.14.2.1 Significance Criteria

The significance criteria listed below are based on Appendix G of the State CEQA Guidelines. The Project would have a significant impact on utilities and service systems if it would:

- exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board;

- require or result in the construction of new water, wastewater treatment, or electrical power generation facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
- require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
- exceed water supplies available to serve the project from existing entitlements and resources and require new or expanded entitlements;
- exceed existing wastewater treatment capacity;
- exceed existing landfill capacity; and/or
- not comply with federal, state, and local statutes and regulations related to solid waste.

3.14.2.2 Environmental Impacts

3.14.2.2.1 State Water Project and Associated Facilities

DIRECT IMPACTS

Implementation of the Project would not require new construction or the modification of existing SWP conveyance facilities. SWP conveyance facilities were constructed to meet the anticipated demands of the SWP Contractors; however, these delivery demands vary from year to year and many Contractors don't request delivery of their total Table A Amounts in every year, thereby resulting in the availability of additional conveyance capacity. The use of existing SWP facilities to transport water from the WRMWSD service area to the CLWA service area would not affect wastewater treatment, require or result in the construction of new or expanded water or wastewater treatment facilities or storm water drainage facilities, require a water supply to serve the Project, or require the disposal of additional solid waste.

The Project would require additional electricity to pump the transferred water to the CLWA turnouts. About 3,450 kWh per AF are required to pump water through the Teerink, Chrisman, Edmonston, and Oso pumping plants for delivery to the CLWA turnout (DWR 2001a). Although the average amount of water transferred would vary from year to year (refer to section 3.15), assuming the full Table A Amount of 41,000 AF were delivered to CLWA, about 0.14 billion kWh would be required to pump the additional water through these pumping plants for delivery to the CLWA turnout. This is approximately 3 percent of the total energy used by the 25 SWP pumping and generating plants in 1998, and approximately 1.5 percent of the power used in 2000. The difference in these values is a result of the differing amounts of water delivered by the SWP in these two years (approximately 1.76 million AF in 1998 and approximately 3.57 million AF in 2000; DWR 2002).

SWP pumping facilities are rated to meet the anticipated demands of the SWP Contractors, and this rated capacity would not be exceeded by implementation of the Project. The amount of additional power required would be within the limits of the planned power supply, and no expansion or construction of new facilities to generate power would be required. The impact to electrical power would be less than significant.

INDIRECT IMPACTS

No indirect impacts to utilities and service systems would occur.

3.14.2.2.2 Wheeler Ridge-Maricopa Water Storage District

DIRECT IMPACTS

The Project would not involve new construction or other changes that would result in increased demand for utilities and service systems. Therefore, the Project would not affect wastewater treatment, require or result in the construction of new or expanded water or wastewater treatment facilities or storm water drainage facilities, require a water supply to serve the Project, require the disposal of additional solid waste, or generate additional demand for electrical power.

INDIRECT IMPACTS

No indirect impacts to utilities and service systems would occur.

3.14.2.2.3 Castaic Lake Water Agency

DIRECT IMPACTS

The Project would not involve new construction or other changes that directly would result in increased demand for utilities and service systems. Therefore, the Project would not directly affect wastewater treatment, require or result in the construction of new or expanded water or wastewater treatment facilities or storm water drainage facilities, require a water supply to serve the Project, require the disposal of additional solid waste, or generate additional demand for electrical power.

The Project would generate additional demand for water treatment and electrical power to treat and distribute the transferred water within the CLWA service area. The pumping plants and treatment facilities have the existing or planned capacity to accommodate the additional amount of water provided by the Project; thus, the amount of additional power and water treatment required would be within the limits of the planned supplies, and no expansion or construction of new facilities to generate power or water treatment beyond that which is already being planned would be required. The impact to electrical power and water treatment would be less than significant.

INDIRECT IMPACTS

Potential impacts to utilities and service systems from population growth that could occur as an indirect impact of the Project are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.14.3 Mitigation Measures

3.14.3.1 State Water Project and Associated Facilities

No direct or indirect significant impacts to utilities and service systems would occur; therefore, no mitigation measures are required.

3.14.3.2 Wheeler Ridge-Maricopa Water Storage District

No direct or indirect significant impacts to utilities and service systems would occur; therefore, no mitigation measures are required.

3.14.3.3 Castaic Lake Water Agency

No direct significant impacts to utilities and service systems would occur; therefore, no mitigation measures are required. Mitigation measures for indirect impacts are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.14.4 Significant Unavoidable Impacts

No direct or indirect significant unavoidable impacts would result from the Project, with the exception of potential indirect impacts to solid waste disposal within the CLWA service area. These are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.15 WATER RESOURCES

As discussed in section 3-0, this EIR's description of the Project's environmental setting includes information from the general timeframe when the January 2003 NOP was issued (referred to as current or present conditions), as well as information describing the environmental setting as it existed when the NOP for the 1999 Supplemental Water Project Final EIR was published (April 1998). Table 3.0-1 describes the key substantive changes in the environmental setting, if any, that occurred between 1998 and the present for each environmental resource analyzed in this EIR. The differences relevant to water resources are summarized below for the three geographic areas under consideration.

State Water Project

Total Table A deliveries fluctuated, ranging from a low of 1,546,740 AF in 2001 to a high of 3,714,230 AF in 2003. SWP Table A Amounts were transferred among SWP Contractors, including MWD to Coachella Valley Water Authority – 35,000 AF; Belridge Water Storage District to Zone 7 – 2,219 AF; and Tulare Lake Basin Water Storage District to Zone 7 – 400 AF. The PCL litigation challenging the Monterey Amendment was settled and essentially leaves these amendments in place (see sections 12.2 and 1.4.2 for a more complete description).

Wheeler Ridge-Maricopa Water Storage District

Water supplies are generally the same, although WRMWSD has increased participation in other, more cost effective, water management options. In 1998, such water management activities could have supplied WRMWSD with an additional 59,500 AFY, and 106,000 AFY in 2002. WRMWSD's contract with KCWA from SWP water was 197,088 AF in 2002. WRMWSD's contract with KCWA was 238,088 AF of "firm supply" in 1998.

Castaic Lake Water Agency

Water supply sources are generally the same, although CLWA's SWP Table A Amount was was increased by 41,000 AF due to the Project. In 1998, CLWA's average year SWP supply was estimated to be 46,500 AF based on available DWR model analysis. CLWA's average year SWP supply now is estimated to be 68,300 AF based on new DWR model results and Project implementation. In 1998, the total water demand in 2010 was projected to be approximately 106,300 AF. Future demand now is expected to be approximately 82,400 AF in 2010 and 102,500 AF by 2020.

3.15.1 Environmental Setting

3.15.1.1 State Water Project

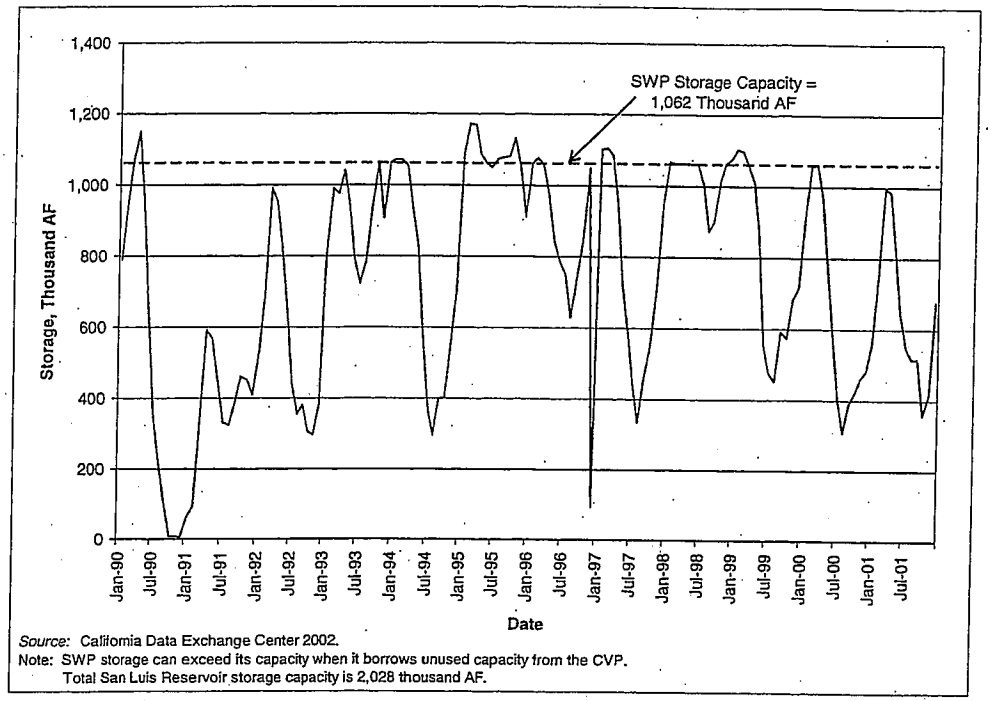
SWP Facilities

The SWP is a water supply, storage, and distribution system that includes 28 storage facilities, reservoirs, and lakes; 20 pumping plants; six pumping-generating plants and hydroelectric power plants; and about 660 miles of aqueducts and pipelines (DWR 2001a). Principal SWP facilities are shown on Figure 1.3-1.

The primary water source for the SWP is within the drainage of the Feather River, a tributary of the Sacramento River, where runoff is stored behind Oroville Dam. Water released from Oroville Dam flows down natural channels to the Delta. In the southern Delta, water is pumped into the 444-mile-long California Aqueduct at the Clifton Court Forebay by the Banks Pumping Plant (or by agreement with the U.S. Bureau of Reclamation [USBR], at the Central Valley Project's [CVP] Tracy Pumping Plant). SWP water exports for users south of the Banks and Tracy pumping plants are currently limited by a series of water quality and operational constraints, governed primarily by the SWRCB's Water Right Decision 1641, as amended. Decision 1641 was adopted by the SWRCB in 1999; prior to that time, SWP water exports from the Delta were limited by the SWRCB's Water Right Decision 1485 (adopted in 1978), Order Water Right (WR) 95-6 (adopted in 1995), and Order WR 98-09 (adopted in 1998).

From the southern Delta facilities, water in the California Aqueduct travels along the west side of the San Joaquin Valley and is delivered directly to SWP Contractors or is stored in San Luis Reservoir, the SWP's main storage facility south of the Delta. San Luis Reservoir, located near Los Banos, is an off-stream storage reservoir with a total storage capacity of more than 2 million AF (of which approximately 1,062,000 AF are allocated to the SWP; the remainder is allocated to the CVP [DWR 2001a]).

In general, the SWP is operated to fill storage reservoirs during the high runoff months of the winter and early spring. Regulatory requirements for the Delta and associated operational constraints also affect the timing and ability to fill reservoirs south of the Delta. Under current operating conditions, including Decision 1641, SWP diversions from the Delta are substantially reduced as of April 15 of each year. As a result, the SWP is operated to store as much water as possible in San Luis Reservoir prior to April 15. The stored water is then released to meet Contractor demands during the high-demand summer and fall months to supplement the more limited pumping from the Delta during those months. Figure 3.15-1 shows the volume of SWP water stored in San Luis Reservoir for the period between 1990 and 2001. Figure 3.15-2 shows the average end-of-month SWP storage in San Luis Reservoir from 1990 to 2001. As is shown on these figures, San Luis Reservoir SWP storage levels vary considerably, both during the year and from year to year. From 1990 to 2001, SWP storage in the reservoir has ranged from approximately zero to more than 1.1 million AF.



Source: California Data Exchange Center 2002.
Note: SWP storage can exceed its capacity when it borrows unused capacity from the CVP. Total San Luis Reservoir storage capacity is 2,028 thousand AF.

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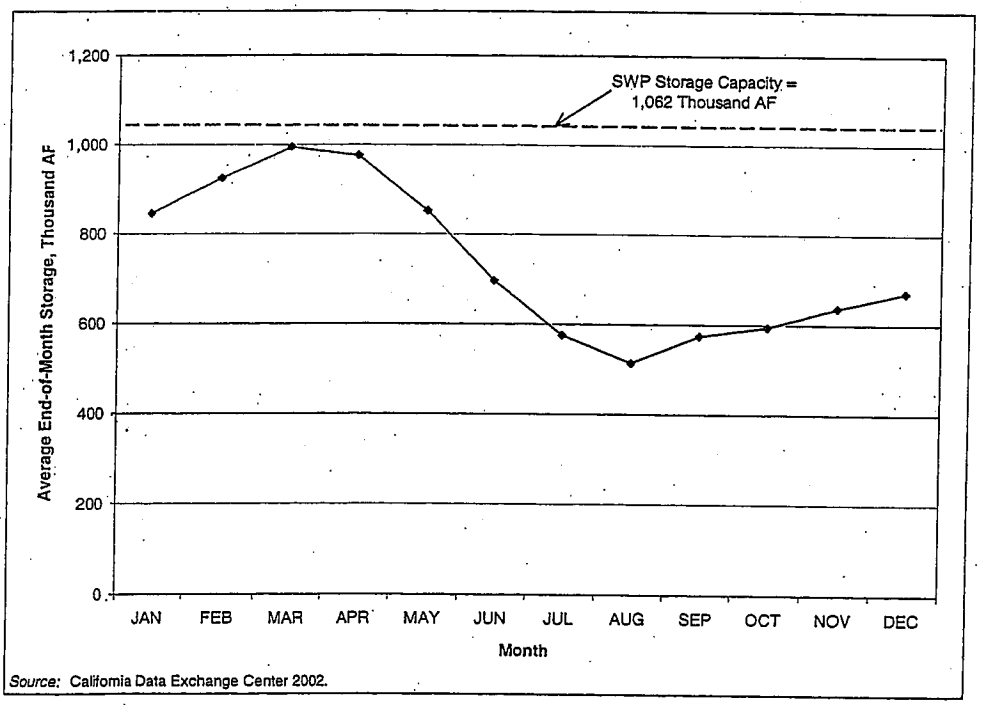
2

Figure 3.15-1. SWP Storage in San Luis Reservoir, 1990 to 2001



Source: California Data Exchange Center 2002.

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Figure 3.15-2. SWP Storage in San Luis Reservoir, 1990 to 2001 Average End-of-Month Storage

Water is conveyed southward from San Luis Reservoir via the California Aqueduct to the primarily agricultural users in the San Joaquin Valley and the primarily urban regions of the Central Coast and southern California. Water is diverted from the Aqueduct and delivered directly to SWP Contractors, including KCWA, in the central and southern San Joaquin Valley at various locations along the Aqueduct. The Aqueduct traverses the west side of the San Joaquin Valley, and water is pumped through a series of four pumping plants (Dos Amigos, Buena Vista, Teerink, and Chrisman) before reaching the Edmonston Pumping Plant. The capacity in these reaches of the Aqueduct ranges from 10,000 cubic feet per second (cfs) at the northern end to approximately 4,400 cfs at the Edmonston Pumping Plant. The Edmonston Pumping Plant pumps water over the Tehachapi Mountain Range, and the California Aqueduct then divides into the East Branch and the West Branch. Water intended for use by CLWA is conveyed through the West Branch through Quail and Pyramid lakes and then to Castaic Lake, the terminus for the West Branch.

Quail and Pyramid lakes are located between the KCWA turnouts for deliveries to WRMWSD and the CLWA turnout on the West Branch of the California Aqueduct. Because of Quail Lake's limited storage capacity (approximately 7,800 AF) the lake is primarily used for the re-regulation of Aqueduct flows. Pyramid Lake, which has a storage capacity of approximately 171,200 AF, is used to provide an emergency water supply to the SWP Contractors that receive deliveries from the West Branch in the case of a major supply system outage, and is used in the operation of the Castaic Power Plant, located between Pyramid and Castaic lakes.

Castaic Lake has a storage capacity of approximately 323,700 AF. As shown on Figure 3.15-3, from 1990 to 2001, storage has ranged from a minimum of approximately 150,000 AF to a maximum of approximately 320,000 AF. The average end-of-month storage from 1990 to 2001 in Castaic Lake is shown on Figure 3.15-4. The reservoir is operated to provide regulatory storage to meet peak deliveries during the summer months for the three SWP Contractors that receive water from Castaic Lake (CLWA, The Metropolitan Water District of Southern California [MWD], and the Ventura County Flood Control District [VCFCD]), and to provide an emergency water supply in the case of a major supply system outage. As part of the Monterey Amendment, these three SWP Contractors have access to 160,000 AF of the storage from Castaic Lake as "flexible storage," which they may withdraw in addition to their allocated SWP supplies and which they must replace within five years of any withdrawal. Local runoff captured in Castaic Lake is managed in compliance with an agreement between DWR and the holders of prior water rights. From 1990 to 2000, SWP deliveries to CLWA from Castaic Lake averaged approximately 19,200 AF, or approximately 6 percent of the total annual SWP deliveries from the lake (see Table 3.15-1). From 1990 to 2000, the majority of the SWP water delivered from the lake (approximately 93 percent) was delivered to MWD due to its relatively larger Table A Amount and storage rights in Castaic Lake.

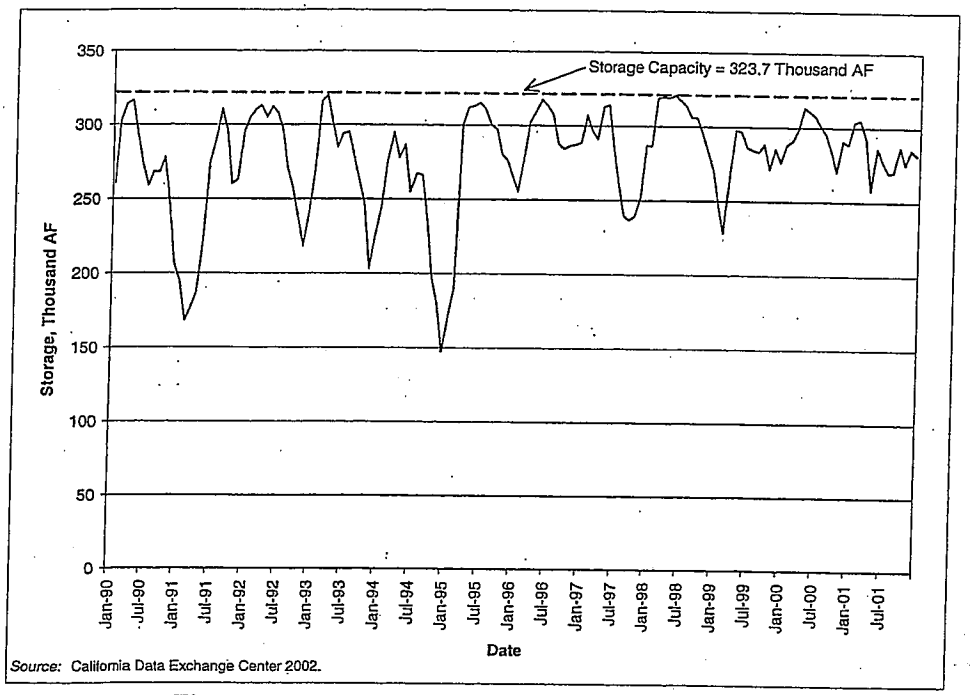


Figure 3.15-3. Castaic Lake Storage, 1990 to 2001

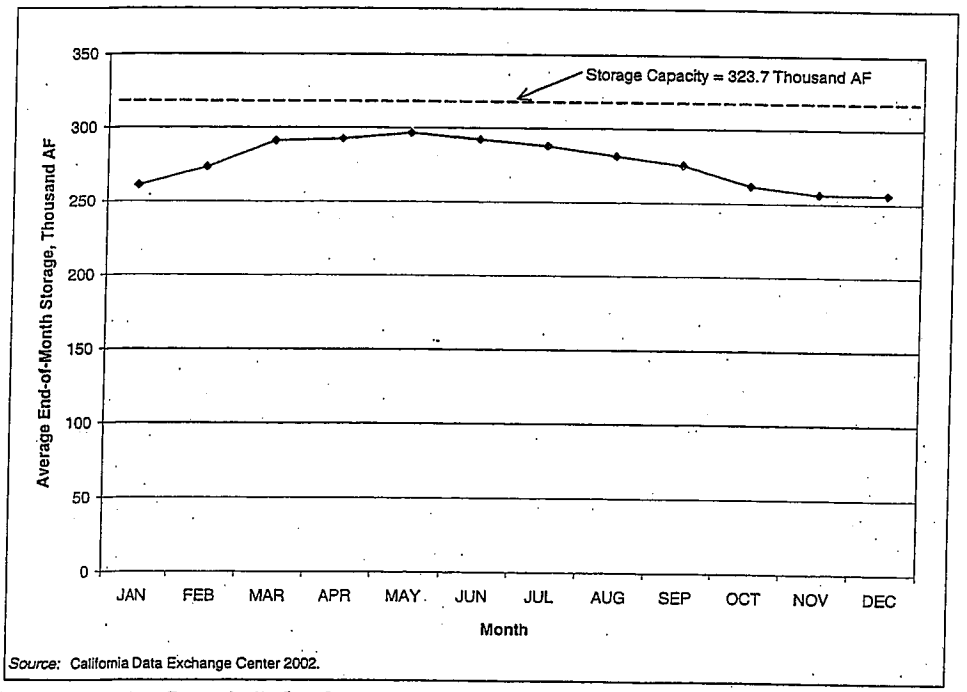


Figure 3.15-4. Castaic Lake Storage, 1990 to 2001 Average End-of-Month Storage

Table 3.15-1. Annual SWP Water Deliveries from Castaic Lake by Contractor, 1990 to 2000

	CLWA	MWD	VCFCD	Other[1]	Total	CLWA as a % of Total
1990	22,139	764,380	0	0	786,519	2.81
1991	3,846	257,835	0	1,240	262,921	1.46
1992	14,812	420,849	0	0	435,661	3.40
1993	13,787	437,470	0	0	451,257	3.06
1994	14,919	475,900	0	0	490,819	3.04
1995	17,747	139,882	0	0	157,629	11.26
1996	18,448	267,618	0	0	286,066	6.45
1997	22,842	271,379	1,850	27,130	323,201	7.07
1998	19,782	187,277	1,850	0	208,909	9.47
1999	28,813	327,001	1,850	0	357,664	8.06
2000	33,674	632,993	1,848	0	668,515	5.04
Average	19,164	380,235	673	2,579	402,651	5.56

Source: DWR 2002.

1. Includes deliveries from Castaic Lake via exchange. These deliveries were made by the Santa Barbara County Flood Control and Water Conservation District in 1991 via exchange with VCFCD, and by the Coachella Valley Water District and Desert Water Agency in 1997 via exchange with MWD.

Water Supply and Demands[1]

As described in section 1.4.2, in the early 1960s, DWR began entering into individual Water Supply Contracts with various urban and agricultural public water supply agencies, known as Contractors. The total planned annual delivery capability of the SWP and the sum of all Contractors' maximum Table A Amounts specified in the Water Supply Contracts were approximately 4.2 million AF. The initial SWP facilities were designed to meet Contractors' water demands in the early years of the project, with the construction of additional facilities planned as demands increased. Water deliveries to Contractors began as initial SWP facilities were completed in the late 1960s and early 1970s; essentially no additional SWP storage facilities have been constructed since that time.

As shown on Table 3.15-2, from 1990 to 2003, actual SWP annual deliveries of Table A supplies to Contractors have ranged from approximately 550,000 AF in 1991 to approximately 3.7 million AF in 2003. Many Contractors did not request delivery of their full Table A Amount during this period. Climatic conditions and other factors can significantly alter the availability of SWP water in any year. The annual allocations of water made by DWR are based on that year's hydrologic conditions, the amount of water in storage in the SWP system, and Contractors' requests for SWP supplies. Contractors' water needs vary from year to year, and many

1 Bulletin 132-01, *Management of the California State Water Project*, is the most recent published data by DWR for SWP operations, including SWP deliveries to Contractors. Because Bulletin 132-01 covers SWP activities through calendar year 2000, the baseline information presented in this EIR for SWP operations includes information through calendar year 2000.

Contractors did not request delivery of their full Table A Amount in a number of years during this 14-year period.

Table 3.15-2. SWP Annual Table A Deliveries, 1990 to 2003

	Agricultural Contract Holders		*M&I Contract Holders*		*Total Table A Deliveries (AF)*
	Table A Deliveries (AF)	*Allocation Percentage (%)*	*Table A Deliveries (AF)*	*Allocation Percentage (%)*	
1990	706,080	50	1,876,070	100	2,582,150
1991	12,440	0	536,670	30	549,110
1992	509,810	45	961,650	45	1,471,460
1993	1,250,370	100	1,064,870	100	2,315,240
1994	614,360	53	1,134,990	53	1,749,350
1995	1,165,520	100	801,570	100	1,967,090
1996	1,369,190	100	1,145,640	100	2,514,830
1997	1,067,320	100	1,258,460	100	2,325,780
1998	860,720	100	864,800	100	1,725,520
1999	1,333,590	100	1,405,300	100	2,738,890
2000	1,177,200	90	2,022,700	90	3,199,900
2001	383,840	39	1,162,900	39	1,546,740
2002	827,128	70	2,059,886	70	2,887,014
2003	1,064,267	90	2,649,966	90	3,714,230

Source: For 1990 to 2000, DWR 2002. For 2001, DWR 2004a. For 2002, DWR 2003c. For 2003, DWR 2004b.

Under conditions specified in the Water Supply Contracts, DWR can make water available to SWP Contractors above and beyond a Contractor's Table A supply. Table 3.15-3 provides an overview of the various types of SWP water supplies discussed throughout this EIR.

In 1998, DWR estimated that annual deliveries to SWP Contractors would average approximately 3.1 million AF (based on estimates of then-existing levels of Contractor demands and land and water use upstream of the Banks Pumping Plant[2], with existing facilities operated under the constraints of Order WR 95-6; DWR 1998). This estimate is generally consistent with DWR's recent SWP Delivery Reliability Report (DWR 2003b). In this report, DWR estimated that the SWP currently can be expected to deliver an average annual supply of approximately 2.96 million AF, based on a 2001 level of Contractor demand and upstream land and water use, with existing facilities operated under existing constraints (DWR 2003b).

2 Land and water use upstream of the Banks Pumping Plant affects the amount of water flowing into the Delta. In general, increases in the amount of water flowing into the Delta can increase SWP supplies, while decreases in the amount of water flowing into the Delta (due to increased water use upstream or a variety of other factors) can decrease SWP supplies.

1 **Table 3.15-3. SWP Surplus and Other Water Types**

Surplus Water	SWP water that can be made available to Contractors when water and capacity are available in excess of SWP storage needs and Table A supplies. See below for terminology for, and descriptions of, specific types of surplus water. Surplus water terminology changed with implementation of the Monterey Amendment.	
	Without Monterey Amendment (Including With Implementation of Article 18(b))	**With Monterey Amendment**
	Scheduled surplus water - Water that DWR determined to be available, in addition to Table A supplies, which was scheduled for delivery throughout the year (in the same manner as Table A supplies). This water was generally available only during the early years of the SWP (when Contractor demands were low).	Category deleted as part of the Monterey Amendment. Given increased Contractor demands, this water was physically no longer available.
	Unscheduled surplus water - Water that DWR made available when water and capacity were available in excess of SWP storage needs and Table A supplies. This water is only available for limited time periods, generally only in the winter or early spring when Contractors demands are low, and only under specific conditions that do not occur on an annual basis.	**Article 21 water** - Same as unscheduled surplus water. Article 21 water was defined under the Monterey Amendment as "interruptible water" but is more commonly referred to as "Article 21 water."
Carryover Water	SWP Table A water that is allocated to, and paid for by, a Contractor in one year, but is stored in SWP supply reservoirs (when storage is available) for use by that Contractor in a following year.	
DWR Dry Year Purchase	Water from DWR's Dry Year Water Purchase Program, through which water is purchased by DWR in shortage years from willing sellers in areas that have available supplies, and is then sold by DWR to Contractors willing to purchase those supplies.	
Flexible Storage (Added as part of the Monterey Amendment)	Storage available to Contractors that share in repayment of the costs of terminal reservoirs (Castaic and Perris lakes). These Contractors may withdraw water from their share of flexible storage, in addition to any other SWP supplies available to the Contractor. The Contractor must replace any water it withdraws from flexible storage within five years. Flexible storage was added to the Water Supply Contracts as part of the Monterey Amendment. CLWA may withdraw up to 4,684 AF of water from Castaic Lake as flexible storage.	
Turnback Pool Water (Added as part of the Monterey Amendment)	Water sold or purchased through the SWP Turnback Pool. The Turnback Pool is a program in which Contractors with allocated Table A supplies that are in excess of their needs in a given year may turn back that excess supply for purchase by other Contractors that need additional supplies that year. The Turnback Pool can make water available in all types of hydrologic years, although there is generally less excess water turned back in dry years. The Turnback Pool was created as part of the Monterey Amendment.	

2 *Water Quality*

3 Water quality in the California Aqueduct is primarily a reflection of the quality of water
4 diverted from the Delta. Wet hydrologic years have lower concentrations of total dissolved

solids (TDS[3]) and other constituents relative to drier hydrologic years due to higher Delta outflows pushing the Delta's seawater/fresh water interface further downstream. Water quality sampling data are available at various locations in the California Aqueduct from the California Data Exchange Center (CDEC) operated by DWR. Table 3.15-4 summarizes the water quality data at the Banks Pumping Plant, Check 29 on the California Aqueduct (the nearest upstream location to WRMWSD), and at Castaic Lake from 1990 to 2001.

Table 3.15-4. SWP Water Quality Summary based on Monthly Data for the Banks Pumping Plant, Check 29, and Castaic Lake, 1990 to 2001

Constituent[1]	*MCL*[1]	*Harvey Banks Delta Pumping Plant*		*Check 29*[2]		*Castaic Lake*[3]	
		AVERAGE	RANGE	AVERAGE	RANGE	AVERAGE	RANGE
Chloride[4] (mg/L)	250	82.27	12 to 162	85.05	3 to 170	77.64	41 to 119
Nitrate + Nitrite, (mg/L)	10	3.33	0.13 to 13	2.909	0.1 to 8.9	1.18	0.044 to 3.1
TDS[4] (mg/L)	500	276.12	85 to 466	330.55	66 to 687	386.59	239 to 429
Arsenic[5] (mg/L)	0.010	0.002	0.001 to 0.01	0.002	0.001 to 0.017	0.002	0.002 to 0.008
Selenium (mg/L)	0.05	0.001	0.001 to 0.002	0.005	0.001 to 0.1	0.001	0.001 to 0.001

Source: Personal communication, C. Erickson 2003.

1. An MCL (Maximum Contaminant Level) is the maximum permissible level of a contaminant in drinking water that is delivered to any user of a public water system.
2. Check 29 is located near Highway 119, north of the Buena Vista Pumping Plant and south of the Coastal Aqueduct.
3. Castaic Lake data were taken from MWD's inlet pipe and the outlet tower.
4. The chloride and TDS standards are secondary standards, which are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards but does not require compliance. States may choose to adopt them as enforceable standards, however.
5. On January 22, 2001, EPA adopted a new standard for arsenic in drinking water at 0.010 milligrams per liter (mg/L), replacing the previous standard of 0.050 mg/L. The rule became effective on February 22, 2002. Systems must comply with the new 0.010 mg/L standard is January 23, 2006 (EPA 2002).

The beneficial uses[4] designated by the Central Valley Regional Water Quality Control Board (CVRWQCB) for the California Aqueduct include municipal, agricultural, industrial, recreational (except for canoeing and rafting), and wildlife habitat uses (CVRWQCB 1998). The San Luis Reservoir has the same beneficial uses designated for the Aqueduct except that the reservoir does not have an industrial processing use. San Luis Reservoir is also designated as a

3 TDS is a measure of the total amount of minerals, organic matter, and nutrients that are dissolved in water. The dissolved solids concentration commonly is called the water's salinity and is classified as follows: fresh, 0-1,000 mg/L; slightly saline, 1,000-3,000 mg/L; moderately saline, 3,000-10,000 mg/L; very saline, 10,000-35,000 mg/L; and briny, more than 35,000 mg/L.

4 The Porter-Cologne Water Quality Control Act gave the SWRCB authority over water quality within California and established nine regional water quality control boards. The regional boards prepare water quality plans (called basin plans) for their region that identify the beneficial uses of water to be protected, establish water quality objectives (limits or levels of water constituents based on both state and federal laws), and define a program to implement water quality objectives.

warm freshwater fishery. The beneficial uses designated by the Los Angeles Regional Water Quality Control Board (LARWQCB) for Castaic and Pyramid lakes include municipal, agricultural, industrial, groundwater recharge, freshwater replenishment of surface waters to maintain quality or flow, power, recreational activities, warm and cold water fisheries, wildlife habitat and fish spawning, and rare species habitat (LARWQCB 1994).

3.15.1.2 *Wheeler Ridge-Maricopa Water Storage District*

Facilities and District Areas

WRMWSD receives SWP water through 16 separate turnouts along the California Aqueduct via KCWA's Water Supply Contract with DWR. The WRMWSD distribution system consists of a series of pipelines, pumping plants, canals, and related facilities to deliver surface water from the California Aqueduct to approximately 72,000 acres of contract lands within the district. Contract lands are those lands within the district where landowners have executed long-term contracts with WRMWSD for the delivery of surface water, including SWP water, by the WRMWSD distribution system. These contract lands rely mainly on surface water to meet water demands, although many of the landowners use groundwater to supplement supplies when adequate surface water supplies are not available. Non-contract lands, those lands that do not hold long-term contracts for surface water, rely mainly on groundwater supplies to meet water demands. Surface water, including SWP water when available, can be delivered to certain non-contract lands within the district (generally those lands that historically have held contracts) via the existing WRMWSD distribution system.

Owners of contract lands pay an annual fixed cost based on the amount of land specified in the contract and annual variable costs based on the amount of water received by a particular contract land holder. Contract holders are required to pay the annual fixed cost regardless of the amount of water delivered to their land. Because contract holders can use local groundwater to irrigate their lands, the decision by individual landowners to enter into a contract (or likewise reduce a contract amount or cancel a contract), or to order surface water from WRMWSD instead of using local groundwater is predominantly an economic decision.

WRMWSD delivers untreated surface water predominantly for agricultural uses. Water delivered by WRMWSD is not intended for municipal or potable use without additional treatment.

Water Supply

WRMWSD obtains its water supplies from the SWP, other surface water sources, and groundwater sources, and delivers water to agricultural and industrial users within the district. WRMWSD also participates in a variety of other water management activities, including groundwater banking programs outside of the district and other in-lieu and direct groundwater recharge programs within the district.

LOCAL SURFACE WATER

WRMWSD is located along Wheeler Ridge and east of the Tejon Hills in southern Kern County. Sandy, Bitterwater, Santiago, Pleitito, Pleito, Salt, Tecuya, Grapevine, Pastoria, Tunis, El Paso,

Liveoak, and Caparell creeks flow from the south into the district; and Tejon Creek flows from the east into the district. Most of these creeks are intermittent and do not provide substantial water for irrigation or conveyance for irrigation water. Floods occur along the creeks and in areas where sheetflow may occur during high intensity rainfall (KCWA 1998).

The water quality of most of the streams entering the district is generally suitable for irrigation. Because these streams are ephemeral, however, they cannot be used as a reliable source of irrigation water supply for large-scale irrigation (KCWA 1998).

GROUNDWATER

Deep groundwater wells in the district initially were drilled in the mid-1940s. Over the next 20 years, groundwater was the primary water supply in the southern Kern County area. As a result, the groundwater levels declined by 150 to 200 feet (Bookman-Edmonston Engineering, Inc. [BE] 1995). In the late 1960s, the annual groundwater overdraft was estimated to be about 112,000 AF (BE 1995). Use of SWP water has allowed groundwater levels to rise to levels equal to, or above, those observed prior to the availability of SWP water (BE 1995).

The San Joaquin Valley is underlain by a large aquifer system generally referred to as the San Joaquin Valley Groundwater Basin. DWR has divided the San Joaquin Valley Groundwater Basin into smaller groundwater basins based on hydrologic differences (such as water quality and rate of movement of water through the basin). The Kern County Groundwater Basin is the part of the San Joaquin Valley Groundwater Basin that underlies the district. The basin is bounded on the north by the Kern County line and the Tule Groundwater Basin, on the east and southeast by the granitic bedrock of the Sierra Nevada and Tehachapi Mountain ranges, and on the west and southwest by the marine sediments of the San Emigdio and Coast Mountain ranges (DWR 2003a). The surface area of the basin is approximately 1.945 million acres, or 3,040 square miles (DWR 2003a). Total water in storage within the basin is estimated to be 40 million AF, and the dewatered (available) aquifer storage is estimated to be 10 million AF (DWR 2003a). Recharge to the basin results from the seepage of surface water from local streams along the eastern extent of the basin and the Kern River, as well as seepage of surface water from agriculture-related land uses, which is the largest contributor to recharge (DWR 2003a).

The White Wolf Groundwater Basin, a sub-basin to the Kern County Groundwater Basin, underlies the eastern portion of the district. The White Wolf sub-basin is separated from the remainder of the Kern County Groundwater Basin to the north by the White Wolf Fault, and to the southwest by the Springs Fault. The White Wolf Fault historically has been considered a barrier to movement of groundwater from the White Wolf sub-basin to the rest of the Kern County basin (BE 1967; BE 1975). Recent studies have indicated that the White Wolf Fault may act as only a partial barrier to groundwater flow, and only when the aquifer is stressed by pumping (Hagan 2001). The surface area of the White Wolf basin is approximately 52,000 acres (BE 1975). The volume of groundwater in storage has been estimated to be 2.5 million AF (BE 1975). Recharge to the White Wolf basin results from seepage of surface water from local streams and seepage of surface water from agriculture-related land uses.

IMPORTED WATER

KCWA holds the Water Supply Contract through which WRMWSD receives SWP water. KCWA's SWP Table A Amount in 2003 was 1,000,949 AF, and was 1,087,730 AF in 1998. This reduction in Table A Amount was due to several Table A Amount transfers KCWA completed with SWP Contractors since early 1999 consistent with the terms of the Monterey Amendment, including the 41,000 AF transferred to CLWA that is the subject of this EIR. WRMWSD's contract with KCWA included 263,200 AF of SWP Table A Amount in 1971[5]. This quantity was reduced to 251,370 AF in 1988, to 238,088 AF in 1996, and to 197,088 AF in 2000, after the Project was implemented.

Table 3.15-5 summarizes SWP Table A deliveries from 1990 through 2001. From 1990 to 1999 (before the Project was implemented), the SWP deliveries by WRMWSD averaged about 137,360 AF, with a minimum of zero AF in 1991 to a maximum of about 198,100 AF in 1997.

OTHER WATER MANAGEMENT ACTIONS

WRMWSD participates in a variety of other water management actions, including groundwater banking both within and outside of the district. Through its groundwater banking program, WRMWSD stores water when available and draws on that water in dry years to reduce shortages. WRMWSD's other water management actions consist of the following: ongoing in-lieu groundwater recharge within the district through delivery of surface water, when available, to non-contract lands; groundwater wells available to WRMWSD starting in 1992 and additional wells developed or acquired by WRMWSD since 1992; participation in the Kern Water Bank beginning in 1995; participation in the Pioneer Groundwater Banking Project initiated in 1997; and participation in the Berrenda Mesa Project beginning in 1999. These water management actions provide water supplies above and beyond the additional supplies that may be obtained from purchases and exchanges. In 1998, these water management actions could have supplied WRMWSD with an additional 59,500 AF, and by 2001 the amount had increased to over 88,000 AF. In 2002, the amount available from these other water management actions was over 106,000 AF.

Table 3.15-5 summarizes deliveries of water from these other water management actions from 1990 to 2001.

TOTAL SUPPLY

Table 3.15-5 summarizes the annual amount of SWP supply and other water supplies (such as the User Input Program[6], other transfers and exchanges, and other water management actions) available to WRMWSD, and the amount of water delivered within the district from 1990 to 2001. As identified in this table, except for 1990 and 1991, both drought years, WRMWSD's

5 As discussed in Chapter 1, the term Table A Amount in connection to WRMWSD is used for brevity. The parallel term used in the KCWA—WRMWSD member unit contract is "Contract Entitlement," sometimes referred to as "Table 1 Entitlement."

6 The User Input Program allows water users within the district to deliver water into the WRMWSD distribution system. The water user is then credited with an equal amount of water, less any losses, to be delivered to the user by WRMWSD within the same calendar year.

1

Table 3.15-5. Summary of Annual SWP and Other Water Supply to WRMWSD and Delivered within the District, 1990 to 2001
(all values in AF except percentages)

Year	Water Supply					Water Delivered				Table A Water Delivered as a Percent of Table A Supply	Total Delivered as a Percent of Total Supply
	SWP Table A Amount (AF)	SWP Allocation Percent[1]	SWP Table A Water Supply[2] (a)	Other Water Supply[3] (b)	Total Supply (a + b)	SWP Table A Water Delivered (c)	Carryover Water Delivered (d)	Other Water Delivered[3] (e)	Total Delivered (c + d + e)		
1990	251,370	50%	126,535	60,888	187,423	126,544	40,884	20,004	187,432	100%	100%
1991	251,370	0%	0	66,656	66,656	0	0	66,656	66,656	N/A[4]	100%
1992	251,370	45%	113,117	18,431	131,548	107,504	1,382	17,048	125,934	95%	96%
1993	251,370	100%	251,370	22,774	274,144	133,600	10,370	2,555	146,525	53%	53%
1994	251,370	53%	133,226	50,544	183,770	132,316	0	28,248	160,564	99%	87%
1995	251,370	100%	251,370	49,614	300,984	161,024	0	1,114	162,138	64%	54%
1996	238,088	100%	238,088	60,244	298,332	191,279	11,319	425	203,023	80%	68%
1997	238,088	100%	238,088	59,740	297,828	198,065	0	240	198,305	83%	67%
1998	238,088	100%	238,088	63,111	301,199	145,605	949	2,738	149,292	61%	50%
1999	238,088	100%	238,088	66,162	304,250	177,702	0	4,868	182,570	75%	60%
2000	197,088	90%	177,379	77,013	254,392	165,090	2,579	16,260	183,929	93%	72%
2001	197,088	39%	76,864	114,025	190,889	73,247	3,441	61,640	138,508	96%	73%

1. SWP allocation (i.e., the percent of Table A Amount that each Contractor could have received based on that year's supply availability and Contractor requests), as determined by DWR for the year. Based on agricultural Table A allocations for years prior to implementation of the Monterey Amendment in 1996.
2. SWP Table A water available equals SWP Table A Amount multiplied by the SWP allocation percentage.
3. Other water includes the following: SWP surplus water (unscheduled surplus water/Article 21 water); SWP Carryover water (refer to Table 3.15-3); WRMWSD wells; Blanca Rosa Improvement District wells; User Input Program water; Kern Water Bank; Pioneer Groundwater Banking Project; Berrenda Mesa Project; and other miscellaneous water supplies such as water purchased from the Drought Water Bank, and other water transfers and purchases. Of these sources, Article 21 water, Carryover water, other miscellaneous water supplies, and to some extent User Input Program water is not available for use in future years.
4. SWP water (Table A or surplus) was not available to Agricultural Contractors in 1991; therefore, no SWP water was delivered in this year.

water supply (both SWP Table A supply and total supply) has been greater than the amount of water delivered within the district.

Water Demand

A variety of factors, including the cost and availability of different water sources, the anticipated crop market value, anticipated or existing crop subsidies, and other factors (such as labor cost, regulation of the use of certain chemicals, etc.) are considered by farmers in the determination to plant or fallow fields, and to plant certain crops. Therefore, water demands within the district can vary substantially from year to year depending on irrigated acreage and the types of crops grown. Refer to section 3.2, Agricultural Resources for further discussion of crop types and irrigated acres within the district. In addition, demands within the district can vary depending on local hydrologic and climatic conditions (e.g., amount and timing of rainfall and local temperatures).

WRMWSD has estimated that under favorable economic conditions, demands within the contract lands are approximately 180,000 to 190,000 AF (personal communication, W. Taube 2002). In only four years from 1990 to 1999 (prior to the Project), did WRMWSD deliver greater than 180,000 AF of SWP water, indicating that favorable economic conditions occurred approximately 40 percent of the time. Demands within the district vary from year to year depending on agricultural economic conditions and hydrologic conditions (amount and timing of local rainfall), but demands within the district are not anticipated to materially increase in the future because the suitable agricultural lands within the district are already in agricultural production, and because WRMWSD does not provide potable water.

Water Quality

WRMWSD is within the jurisdiction of the CVRWQCB, Region 5c. Within the district, there are no impaired water bodies or established Total Maximum Daily Load (TMDL) programs[7] (CVRWQCB 1995, SWRCB 1998). Local surface water is of generally good quality. Water quality of imported supplies is primarily dependent on the SWP water quality, which is discussed above.

Groundwater quality varies across the district, and there are portions of the district in which groundwater is not used due to poor quality. These areas are generally located in the most westerly portions of the district. Within the district, the Kern County Groundwater Basin has TDS concentrations that generally increase from east to west, with concentrations ranging from 300 to 2,600 milligrams per liter (mg/L) (BE 1995). TDS concentrations within the White Wolf

7 The federal Clean Water Act requires states to designate appropriate water uses to be protected and directs states to set water quality criteria based on these uses (United States Environmental Protection Agency [EPA] 2000a). Under section 303(d) of the Clean Water Act, states, territories, and authorized Indian tribes are required to submit lists to the EPA detailing water bodies for which existing pollution controls are insufficient to attain or maintain water quality standards. After submitting the list of "impaired waters" to the EPA, states must develop a TMDL plan to limit excess pollution. A TMDL is a number that represents the assimilative capacity of water for a particular pollutant, or the amount of a particular pollutant that the waterbody can receive without impacting its beneficial uses. TMDL plan implementation can be accomplished through revised permit requirements (for point source contaminants) and through implementation of Best Management Practices (EPA 1999).

Groundwater Basin range from 300 to 700 mg/L in the eastern two-thirds of the basin and 1,000 to 3,500 mg/L in the western one-third of the basin (BE 1995).

3.15.1.3 *Castaic Lake Water Agency*

CLWA is the wholesale water supplier for the Santa Clarita Valley. In addition, CLWA's Santa Clarita Water Division is one of four retail water purveyors within the Santa Clarita Valley. The other three retailers are Los Angeles County Waterworks District #36, Newhall County Water District and Valencia Water Company.

Facilities

CLWA receives SWP water through the terminus of the West Branch of the California Aqueduct at Castaic Lake. Surface water supplies (whether derived from local or imported water supplies) require treatment (filtration and disinfection) prior to distribution. SWP water from Castaic Lake is treated at the ESFP and RVWTP (both owned and operated by CLWA), and is distributed to the four water retailers through a system of pipelines.

The RVWTP is planned for future expansion from its current 30 mgd treatment capacity, to 60 mgd and eventually to 90 mgd as demands for treated water increase. This expansion was programmatically evaluated in CLWA's Capital Program Final EIR (CLWA 1988). In April 2003, CLWA approved an upgrade of treatment technology and a capacity expansion at the ESFP from 33.6 mgd to 56 mgd. The combined capacity of the two treatment plants currently is approximately 63.6 mgd. When the ESFP is expanded, the total treatment capacity will increase to about 86 mgd. Without the Project, CLWA's Water Supply Contract provides for a delivery maximum of 99 cfs for its 54,200 AF of Table A Amount. This delivery rate is approximately 65 mgd, or similar to the current treatment capacity, and would yield a maximum monthly delivery of approximately 6,000 AF. With the Project, CLWA's contractual delivery limit increases to 150 cfs (or approximately 98 mgd, yielding a maximum of approximately 9,000 AF per month) for the 95,200 AF of Table A Amount.

Water Supply

The current water supply for the Santa Clarita Valley is derived from both local and imported sources. The principal components of this supply are groundwater from the Alluvial Aquifer, groundwater from the Saugus Formation, and imported water from the SWP. A variety of future water sources (including local recycled[8] water, desalted ocean water, increased Saugus Formation production, conjunctive use of local or non-local groundwater basins, and other imported water sources) could be developed to supply future development planned for the CLWA service area.

CLWA completed an analysis of its water supply as part of the UWMP (CLWA 2000). Prior to that analysis, CLWA had determined that it could reliably depend on the SWP to deliver about half of its Table A Amount (about a 25,000 AF supply vs. 54,200 AF of Table A) in any year (CLWA 1996). The UWMP is scheduled to be updated in 2005.

8 Initial deliveries of recycled water commenced in 2003.

Table 3.15-6 summarizes water supplies available to meet demands in the CLWA service area in 1998, prior to the Project. SWP supplies identified in the table are based on results from DWR's SWP operations model, DWRSIM (discussed in section 3.15.2.2), with SWP water supplies allocated among Contractors under the Water Supply Contract provisions then in effect (i.e., based on the Monterey Amendment provisions). The table displays water supplies available under various hydrologic conditions.

Table 3.15-6. 1998 Water Supplies for the CLWA Service Area
(all values in AF)

Hydrologic Condition[1]	SWP Supplies		Existing Local Supplies		*Total*
	Table A[2]	*SWP Flexible Storage*[3]	*Alluvial Aquifer*	*Saugus Formation*	
Average Year	46,500	0	35,000	11,000	**92,500**
Single Dry Year	12,100	4,680	32,500	15,000	**64,280**
Multiple Dry Year Period	24,000	1,170	32,500	15,000	**72,670**

1. The average year supply is the average amount of water available based on DWRSIM model results over its entire period of hydrologic record. The single dry year supply is the supply available in the single year with the lowest total SWP deliveries based on DWRSIM model results (1977). Multiple dry year period supply is the average amount of water available over the four consecutive drought years of 1988 through 1991 based on DWRSIM model results. (See section 3.15.2.2).
2. Values based on CLWA's Table A Amount in 1998 (prior to the Project) of 54,200 AF, and percentages for Table A deliveries based on DWR's DWRSIM SWP operations model (discussed in section 3.15.2.2).
3. CLWA may withdraw up to about 4,680 AF of water from Castaic Lake as "flexible storage." It is assumed that CLWA would use this supply only in drier years, with the entire amount used in the one single dry year. For the multiple dry year, it is assumed that the entire amount would be used during the four-year period, or an annual average of 1,170 AF.

Table 3.15-7 summarizes existing (2002) water supplies available to meet demands in the CLWA service area, including the Project. SWP supplies are based on the data presented in DWR's SWP Delivery Reliability Report, with SWP water supplies allocated among Contractors under the Water Supply Contract provisions currently in effect (i.e., based on the Monterey Amendment provisions). The table displays water supplies available under various hydrologic conditions. In 2002, CLWA was able to store some of its allocated SWP Table A supply on a short-term basis (10 years or less) pursuant to a groundwater banking agreement with the Semitropic Water Storage District. CLWA may withdraw up to 21,600 AF within 10 years. Similar to 2002, in February 2004, CLWA was again able to store up to 35,000 AF of its allocated 2003 SWP Table A supply on a short-term basis (10 years or less) pursuant to a groundwater banking agreement with the Semitropic Water Storage District. CLWA may withdraw up to 31,500 AF within 10 years. In addition to the supplies identified in Tables 3.15-6 and 3.15-7, CLWA may obtain additional surface supplies on a limited basis when surplus water is available within the SWP system, along with various other SWP and non-SWP purchases and exchanges.

Local Surface Water

The primary drainage course in the CLWA service area is the Santa Clara River. Principal tributaries to the Santa Clara River include creeks flowing from Mint, Bouquet, San Francisquito, Castaic Creek, Oak Spring, Sand, and Potrero canyons. Water flow in the stream

Table 3.15-7. Existing Water Supplies for the CLWA Service Area

(all values in AF)

Hydrologic Condition[1]	SWP Supplies			Existing Local Supplies		Total
	Table A[2]	SWP Flexible Storage[3]	Semitropic Storage[4]	Alluvial Aquifer	Saugus Formation	
Average Year	68,300	0	0	35,000	11,000	114,300
Single Dry Year	18,600	4,680	7,200	32,500	15,000	77,980
Multiple Dry Year Period	34,300	1,170	5,400	32,500	15,000	88,370

1. The average year supply is the average amount of water available based on DWRSIM model results over its entire period of hydrologic record. The single dry year supply is the supply available in the single year with the lowest total SWP deliveries based on DWRSIM model results (1977). Multiple dry year period supply is the average amount of water available over the four consecutive drought years of 1988 through 1991 based on DWRSIM model results. (See section 3.15.2.2).
2. Values based on current Table A Amount of 95,200 AF (which includes the Project), and percentages for Table A deliveries from DWR's SWP Delivery Reliability Report (DWR 2003b).
3. CLWA may withdraw up to about 4,680 AF of water from Castaic Lake as "flexible storage." It is assumed that CLWA would use this supply only in drier years, with the entire amount used in the one single dry year. For the multiple dry year, it is assumed that the entire amount would be used during the four-year period, or an annual average of 1,170 AF.
4. In 2002, CLWA was able to store some if its allocated SWP Table A supply on a short-term basis (10 years or less) under a groundwater banking agreement with the Semitropic Water Storage District. Under this agreement, CLWA stored 24,000 AF of SWP water, and after consideration for losses, may withdraw up to 21,600 AF within 10 years. It is assumed that CLWA could expect to withdraw up to 1/3 of this amount in the single dry year, and the entire amount would be used during the four-year dry period. It is assumed that CLWA would only use this supply in drier years.

canyons and the upper Santa Clara River is ephemeral, and diminishes rapidly after most rainfall events. Surface water resources include the Santa Clara River and Castaic Lake.

Primary flood hazard areas occur in and along natural drainage channels, such as the Santa Clara River and its tributaries, and in areas where sheetflow may occur during high intensity rainfall (CLWA 1988, CLWA 1998a). CLWA does not utilize local surface water as a water supply, although landholders within the service area may use runoff from these natural drainages as a water supply.

Groundwater

The existing local water supply in the CLWA service area is groundwater extracted from the Alluvial Aquifer and from the underlying Saugus Formation. Historically, groundwater has been the primary source of water in the Santa Clarita Valley. Since 1980, local groundwater supplies have been supplemented with imported water from the SWP.

Although the Alluvial Aquifer is the smaller of the two-aquifer systems as measured by storage capacity, most water wells within the CLWA service area are drilled into this aquifer. In his original assessment of the Alluvial Aquifer, Slade (1986) estimated the practical perennial yield of the Alluvial Aquifer to be 31,600 AFY to 32,600 AFY. The total annual groundwater production from the Alluvial Aquifer over the last 10 years (urban and agricultural production) has averaged approximately 35,000 AFY, about 10 percent higher than the "practical perennial yield" without any evidence of undesirable conditions that might be an indication of aquifer

overdraft (Slade 2002). Slade (2002) suggested that the primary reason that the Alluvial Aquifer has been able to supply groundwater in volumes that are in excess of its previously estimated perennial yield is due to the increase in imports of SWP water by CLWA. For example, most of the historical period on which Slade's original work was based predated the importation of SWP water. Based on discharge records published by the LARWQCB (2002), approximately half of this additional water is returned to the Alluvial Aquifer in the form of discharge from the two wastewater reclamation plants located along the Santa Clara River. Additionally, percolation of SWP water from various municipal and industrial uses (such as landscape irrigation) also contributed to recharge of the Alluvial Aquifer.

In this recent updated report on the groundwater basin, Slade (2002) identified the operational yield of the Alluvial Aquifer to be about 30,000 to 40,000 AF in normal weather years, and 30,000 to 35,000 AF in dry years. In updating his original (1986) analysis of the yield of the Alluvium, Slade recognized that the analytical methodology employed in his original work was no longer applicable, primarily due to a combination of stable groundwater levels and storage, and the progressive changes in the hydrology of the basin as a result of the increasing importation of supplemental water (from the SWP). In his updated analysis, Slade proposed that the concept of operational yield of the basin was more applicable to current conditions in the basin since it allows fluctuations in year-to-year yield in response to fluctuating hydrologic conditions, yet protects the renewability of the groundwater by retaining longer-term pumping within the basin's perennial yield on an average basis. The normal and dry-year ranges of basin yield were based by Slade on that operational yield concept.

Recharge amounts are highly variable depending on annual precipitation, with documented annual water level recoveries of 70 feet or more during wet years that follow dry periods. Multi-year dry periods have in the past resulted in water level decreases of as much as 100 feet from the beginning to the end of the multi-year drought period, particularly in Soledad Canyon. However, groundwater levels have remained very stable over time (and near the ground surface) throughout the western part of the basin, generally west of Bouquet Canyon. This relative stability occurs because the regional discharge zone for the valley's groundwater resources is the alluvium west of Interstate 5. In this area, the Saugus Formation discharges to the alluvium, which in turn discharges to the Santa Clara River. The discharge zone is present in this area because of the east-west movement of groundwater and the bedrock materials that form the western margin of the basin aquifer systems at Blue Cut (just to the west of the Los Angeles County / Ventura County line). The shallow and stable nature of the groundwater levels in this area are further supported by a continual supply of recharge water from the treatment plant discharges described above.

From 1980 to 2002, groundwater extraction from the Alluvial Aquifer for urban uses ranged from approximately 8,700 to 27,200 AFY, while total extraction for all uses ranged between 20,300 and 43,400 AFY. Average extractions from the Alluvial Aquifer during this same period were approximately 17,500 AFY for urban uses and 30,400 AFY for all uses (SCVWP 2002). The latter remains well within all historical estimates of the yield of the Alluvial Aquifer. The use of one well in the Alluvial Aquifer has been suspended due to the detection of perchlorate. (Groundwater quality in the Alluvial Aquifer is discussed in more detail under the subheading Groundwater Quality.)

The Saugus Formation contains much greater quantities of groundwater than the Alluvial Aquifer. In his original assessment of the Saugus Formation, Slade (1988) estimated that approximately 1.41 million AF of potentially useable groundwater was present from depths of 500 to 2,500 feet in the Saugus Formation. More recent information on the thickness of the alluvium and the degree of potential drawdown interference between adjacent Saugus Formation and Alluvial Aquifer wells has supported a re-calculation of groundwater in storage in the Saugus Formation to approximately 1.65 million AF (Slade 2002).

The principal source of recharge to the Saugus Formation is precipitation on exposed outcrops and direct infiltration from the overlying alluvium. In his initial assessment of the Saugus Formation, Slade (1988) estimated the combined potential recharge to the Saugus Formation from these two sources to be from 20,000 to 22,000 AFY in wet periods, and from 11,00 to 13,000 AFY in dry periods. The Saugus Formation has supplied about 7,500 to 15,000 AF in normal weather years, and 11,000 to 15,000 AF in dry years (CLWA 2000). No long-term continuous or permanent decline in either water levels or the amount of groundwater in storage has occurred under this historical range of pumping (Slade, 2002). Based on the amount of water in storage and the historic aquifer performance, Slade (2002) identified that production from the Saugus Formation for dry period water supply could be increased from 15,000 to 20,000 AFY, and ultimately to 35,000 AFY if dry conditions continue. The increase to 35,000 AFY would be temporary and would need to return to, or be reduced below, the historical range of 7,500 to 15,000 AFY once rainfall patterns returned to normal in order to recharge, or replenish, storage and avoid long-term adverse effects to the aquifer.

From 1980 to 2002, groundwater extractions from the Saugus Formation for urban uses ranged between approximately 2,700 and 14,400 AFY, while total extraction for all uses ranged between about 3,700 and 14,900 AFY. Average extraction from the Saugus Formation during this same period has been approximately 6,200 AFY for urban uses and 6,800 AFY for all uses (SCVWP 2002); these values remain well within all historical estimates of the yield or recharge potential of the Saugus Formation. The use of four wells in the Saugus Formation has been suspended due to the detection of perchlorate. (Groundwater quality in the Saugus Formation is discussed in more detail under the subheading Groundwater Quality.)

There are numerous wells in the Saugus Formation, other than the wells that were voluntarily shut down due to perchlorate contamination. Additionally, other Saugus wells are planned for construction, including those included in CLWA's Capital Improvements Program. If operated continuously during the year, the wells not subject to perchlorate contamination have the capability to produce approximately 21,000 AFY (personal communication, L. Takaichi 2004). However, a more realistic production capability is 15,000 AFY due to periodic shutdown for maintenance, monitoring, or storage limitations (personal communication, L. Takaichi 2004). The current groundwater production capability from the Saugus Formation is estimated to be 5,000 AFY during normal years but could reach 15,000 AFY during dry periods or other periods of need (personal communication, L. Takaichi 2004). These capabilities will increase as additional production wells in the Saugus Formation are completed and a response action to perchlorate contamination is implemented.

With regard to the impacts of perchlorate on the water supply capacity of several wells as noted above, field studies and groundwater modeling activities are in progress to evaluate how best

to hydraulically contain the portion of the aquifer system where production wells have been shut down, while simultaneously preventing perchlorate movement to currently unimpacted areas. The field studies have included the installation and sampling of monitoring wells at multiple depths and locations on and around the Whittaker-Bermite site, the most likely source of perchlorate; water level monitoring in these wells; aquifer testing of two unimpacted water supply wells; and groundwater velocity testing in alluvial monitoring wells located between the site and the Santa Clara River. These studies have helped the Purveyors and the Whittaker Corporation further refine the current understanding of groundwater flow patterns in specific areas on and near the site (such as along the Holser Fault). This information has been incorporated into a regional groundwater flow model that has been developed by the Purveyors and whose calibration and construction was recently reviewed and approved by the DTSC. The model is being used to identify a pumping scheme that would meet the objectives of restoring the lost water supply from the impacted wells (with wellhead treatment) while simultaneously containing perchlorate and hydraulically limiting its movement downgradient to unimpacted wells and other portions of the aquifer system where new water supply wells might be constructed. The modeling analysis accounts not only for the pumping of impacted wells, but also (a) the UWMP's pumping plan for unimpacted wells throughout the Santa Clarita Valley and (b) the significant year-to-year variation in local hydrology (especially groundwater recharge) that occurs in the Valley (CH2MHill 2004). The modeling simulations will be used to guide selection of a final pumping plan for the impacted Alluvial Aquifer well and the impacted Saugus Formation wells. The selection of a final pumping plan will be made jointly by the Purveyors and the Whittaker Corporation, with regulatory oversight and permitting performed by CA DHS with technical support from DTSC. (Groundwater quality and perchlorate are discussed in more detail under the subheading Groundwater Quality.)

Imported Water

CLWA provides imported water supplies via the SWP to the CLWA service area. CLWA facilities and supplies of SWP water are described above.

SWP deliveries to CLWA from 1990 through 2002 are provided in Table 3.15-8. SWP supplies supplement local water sources and are used to meet the municipal and industrial demand of the region. From 1990 to 1999 (prior to implementation of the Project), CLWA's use of its SWP supply averaged approximately 18,000 AF. This low level of SWP delivery (relative to CLWA's Table A Amount) is a reflection of generally low demand in the CLWA service area for this water during this period and is not due to limited SWP supplies. With the exception of 1991, during 1990 to 1999 CLWA received adequate SWP supplies to meet its demands. As is shown on Table 3.15-8, SWP deliveries to CLWA generally have increased over the past decade because demands within the service area have risen during this time.

Total Supply

Table 3.15-8 shows total water deliveries in the CLWA service area from 1990 through 2002. These include deliveries by the four municipal water purveyors, along with groundwater pumped by agriculture and miscellaneous uses. Agriculture and miscellaneous uses include irrigated agriculture, landscape irrigation, golf course irrigation, and other miscellaneous uses within the service area.

Table 3.15-8. Summary of Annual SWP and Local Groundwater Use within the CLWA Service Area, 1990 to 2002

Year	SWP Table A Amount (AF)	SWP Allocation[1] (Percent)	SWP Deliveries (AF)	Local Groundwater Deliveries[2] (AF)	Agriculture and Miscellaneous Uses[3] (AF)	Total (AF)
1990	41,500	100	21,600	21,500	11,280	54,380
1991	54,200	30	7,970	31,800	10,280	50,050
1992	54,200	45	14,900	27,300	12,150	54,350
1993	54,200	100	13,840	30,000	11,220	55,060
1994	54,200	53	14,700	31,600	13,870	60,170
1995	54,200	100	17,000	28,700	14,350	60,050
1996	54,200	100	18,870	32,100	15,350	66,320
1997	54,200	100	23,220	32,000	16,390	71,610
1998	54,200	100	20,270	28,600	13,610	62,480
1999	54,200	100	27,300	30,000	17,140	74,440
2000	95,200	100	32,580	28,400	15,320	76,300
2001	95,200	39	35,370	25,320	16,090	76,780
2002	95,200	70	41,770	26,460	16,810	85,040

Source: SCVWP 2003.

1. SWP allocation (i.e. the percent of Table A Amount that each Contractor could have received based on that year's supply availability and Contractor requests), as determined by DWR for the year. The values shown are M&I Table A allocation percentages. In 1991, the Devil's Den Water District permanently transferred 12,700 AF of agricultural Table A Amount to CLWA. For years prior to implementation of the Monterey Amendment in 1996, agricultural Table A allocations were as follows: 0 percent in 1991; 45 percent in 1992; 100 percent in 1993; 53 percent in 1994; and 100 percent in 1995.
2. Groundwater deliveries by municipal water purveyors within the CLWA service area.
3. Includes groundwater pumped by, and SWP water delivered to, agricultural and miscellaneous uses within the CLWA service area. SWP deliveries to agricultural and miscellaneous uses within the CLWA service area occurred from 1992 to 2000, with a maximum of approximately 1,070 AF delivered in 1997.

Water Demand

In 1998, the total water demand within the CLWA service area in 2010 was projected to be approximately 106,300 AF. Table 3.15-9 provides CLWA's projected total future water demands in years of average local precipitation based on the UWMP, the most recent future water demand projections by CLWA. CLWA's demands vary from year-to-year depending on local hydrologic and meteorologic conditions, with demands generally increasing in years of below average local precipitation and decreasing in years of above average local precipitation. Based on various planning factors, CLWA's average year demand is expected to increase to approximately 75,100 AF in 2005 and 102,500 AF by 2020, or approximately 1,370 AFY (CLWA 2000). This is consistent with the annual average increase in CLWA's SWP deliveries from 1990 to 2001 of approximately 1,150 AFY (SCVWP 2002).

Table 3.15-9. CLWA's Projected Total Water Demand in Average Hydrologic Years
(AFY; reductions in parenthesis)

	2005	*2010*	*2015*	*2020*
M&I	66,600	77,700	90,900	106,000
Other Demand[1]	15,100	12,400	9,800	7,100
Subtotal	*81,700*	*90,100*	*100,700*	*113,100*
Projected Conservation	(6,600)	(7,700)	(9,100)	(10,600)
Total	**75,100**	**82,400**	**91,600**	**102,500**

Source: CLWA 2000.
1. Includes irrigated agriculture and miscellaneous uses.

Because growth has exceeded that projected when the UWMP was prepared in 2000, actual demand exceeds projected demand. The UWMP is scheduled to be updated in 2005. This EIR uses the best available data. New UWMP data is not available at this time.

In 2001, CLWA signed the Memorandum of Understanding Regarding Urban Water Conservation in California (MOU) on behalf of the CLWA service area, as recommended in the UWMP. By signing the MOU, CLWA became a member of the California Urban Water Conservation Council (CUWCC) and pledged to implement all cost-effective Best Management Practices (BMPs) for water conservation. CLWA has implemented 11 of the 14 BMPs recommended by CUWCC. CLWA has estimated that conservation measures within the service area can reduce total water demands by 6,600 AF in 2005 and up to 10,600 AF in 2020, or about 10 percent of demand.

Water Quality

With regard to water quality, the main regulatory driver for CLWA is the Safe Drinking Water Act[9], because CLWA, as a wholesale water purveyor, must deliver water that meets the applicable drinking water standards.

EXISTING WATER QUALITY

Existing water quality conditions for urban water uses in the CLWA service area are documented in the Santa Clarita Valley 2002 Water Quality Report (CLWA 2002). That report provides the cumulative results of thousands of water quality tests performed in the Santa Clarita Valley area on CLWA's and the local purveyors' water supplies. Table 3.15-10 provides basic water quality data for CLWA's drinking water supplies, which includes test results from both SWP water and groundwater.

9 The Safe Drinking Water Act is intended to protect public health by regulating the nation's public drinking water supply, and requires a variety of actions to protect drinking water and its sources. The Act authorizes the EPA to set national health-based standards for drinking water to protect against both naturally occurring and man-made contaminants that may be found in drinking water.

Table 3.15-10. CLWA Drinking Water Quality Summary

Constituent[1]	*MCL*[2]	*Typical Value*	*Range*
Turbidity, nephelometric turbidity Unit (NTU)	5	0.08	0.05-0.40
Chloride[3], mg/L	250	86	65-112
Nitrate (as NO3), mg/L	45	2-2.8	2.0-2.8
Fluoride, mg/L	2	0.15	0.12-0.18
Trihalomethanes (THMs)	100	86	65-112
Haloacetic Acids (HAA5)	60	34	16-81
Coliform, percent positive samples	5	0	0-2
Sulfates, mg/L	250	52	38-64
TDS, mg/L	500	314	--
pH	None	7.86	7.5-8.2

Source: CLWA 2002b.

1. Unless stated otherwise, all tests were run in 2001.
2. A MCL (Maximum Contaminant Level) is the maximum permissible level of a contaminant in drinking water that is delivered to any user of a public water system.
3. The chloride standard is a Secondary Standard. Secondary Standards are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. States may choose to adopt them as enforceable standards, however.

Local Surface Water Quality

In accordance with the Porter-Cologne Act and the Clean Water Act, the LARWQCB developed the Water Quality Control Plan for the Coastal Watersheds of Los Angeles and Ventura Counties (Basin Plan), as amended (LARWQCB 1994). The Basin Plan addresses five constituents of concern that are relevant for inland surface water and groundwater (TDS, sulfate, chloride, boron, and nitrogen) and considers local hydrology, land use, population, sensitive environmental resources, and established water quality objectives for each of the watersheds, including the Santa Clara River. New and proposed water quality objectives for the Santa Clara River watershed have either been established or are currently undergoing discussion for future approval and/or consideration. Within the Santa Clara River watershed, chlorides have been prioritized for further study, with higher priority given to nutrients. Other constituents are currently (2003) not prioritized.

On February 4, 2003, the SWRCB adopted the 2002 Clean Water Act Section 303(d) List of Water Quality Limited Segments for Surface Waters in California (referred to herein as "Section 303(d) List") (SWRCB 2003b). This list identifies water quality-limited water bodies and pollutants of concern for which a TMDL must be developed. Reach 3[10] of the Santa Clara River (Freeman Diversion to A Street) was listed as impaired for ammonia, chloride, and TDS. Reach 7 (Blue Cut near the Los Angeles/Ventura County line to West Pier Hwy 99 Bridge) was listed as

10 The Santa Clara River is divided into nine reaches for management purposes. Reach 1 begins at the Santa Clara River Estuary at the Pacific Ocean. Reach numbers increase upstream.

impaired for chloride, high coliform count, nitrite and nitrate, and delisted for ammonia. Reach 8 (West Pier Hwy 99 to Bouquet Canyon Road) was listed as impaired for chloride and for high coliform count. Lastly, Reach 9 (Bouquet Canyon Road to above Lang Gaging Station) was listed as impaired for high coliform count.

Chlorides – In recent years, high concentrations of chloride have been measured in waters of the Santa Clara River watershed. These concentrations are primarily due to various types of loading during beneficial water uses, including agricultural uses (irrigation and leaching); commercial uses; domestic uses; and water treatment (e.g., water softeners) (LACSD 2002a). In addition to loading from urban runoff, imported water in certain year types, and the discharge of treated wastewater, naturally occurring chloride concentrations contribute to excessive chloride concentrations in Santa Clarita Valley groundwater (LARWQCB 1999b). The identification of excessive chloride concentrations resulted in the addition of several reaches of the Santa Clara River in the Section 303(d) List, as identified above. Table 3.15-11 provides a timeline summary of the regulatory actions taken to regulate chloride loading within the Santa Clara River.

Table 3.15-11. Regulatory Timeline for Chloride

Time	*Action*
January 1997	LARWQCB adopts a Chloride Policy, which consists of Resolution No. 97-02: Amendment to the California Regional Water Quality Control Plan for the Los Angeles Region, to Incorporate a Policy for Addressing Levels of Chloride in Discharges of Wastewaters.
Fiscal Year 1997/1998	Santa Clara River Reaches 3, 7 and 8 are added to the Section 303(d) List for chloride impairment, and TMDL monitoring commences.
October 2002	LARWQCB amended the 1994 Basin Plan to incorporate a TMDL for chloride for the upper Santa Clara River, establishing the 100 mg/L surface water quality objective for Reaches 7 and 8 (SWRCB 2002).
February 2003	SWRCB remanded the chloride TMDL back to the LARWQCB to consider sequentially phasing TMDL implementation tasks, extending the interim limits, and reevaluation of the chloride objective itself (SWRCB 2003a).
March 2003	LACSD adopts an ordinance that prohibits the installation and use of new self-regenerating water softeners in the Santa Clarita Valley to help lessen the chloride loading in the region (LACSD 2002a).
May 2003	EPA is developing chloride TMDLs for Reaches 3, 7 and 8 of the Santa Clara River, in the event that the LARWQCB does not adopt it's chloride TMDL by June 2003 (EPA 2003).
July 2003	The LARWQCB adopted the chloride TMDL in light of the Remand Resolution, and revised the Basin Plan to incorporate the chloride TMDL.

In October 2002, the LARWQCB amended the 1994 Basin Plan to incorporate a TMDL for chloride for the upper Santa Clara River, establishing a 100 mg/L surface water quality objective for Reaches 7 and 8 to protect the agricultural beneficial use of the river (SWRCB 2002). The TMDL is intended to reduce the sources in the upper Santa Clara River by reducing the sources of chloride discharged from households and industries and, if necessary, by constructing a chloride removal system to treat water reclamation plant effluent before discharge to the Santa Clara River. On February 19, 2003, the SWRCB remanded the chloride TMDL back to the LARWQCB to consider sequentially phasing TMDL implementation tasks,

extending the interim limits, and reevaluation of the chloride objective itself (SWRCB 2003a). The LARWQCB adopted the 100 mg/L chloride TMDL, and incorporated it into the Basin Plan on July 10, 2003 (LARWQCB 2003a). Because the State was not able to complete adoption of a chloride TMDL for Reach 3 (80 mg/L) of the Santa Clara River by the June 22, 2003 deadline, EPA is establishing the TMDL for Reach 3 to fulfill its legal obligations (EPA 2003). The EPA is also establishing chloride TMDLs for Reaches 5 and 6[11] (100 mg/L) at this time, at the request of the LARWQCB.

The Los Angeles County Sanitation Districts (LACSD) have compiled the Santa Clarita Valley Joint Sewerage System Chloride Source Report, a detailed and comprehensive study of the sources of chloride loading in the Santa Clarita Valley (LACSD 2002a). That study identified that residential water use, primarily from self-regenerating water softeners, greatly contributes to the chloride loading. Based on the results of that study, the LACSD adopted an ordinance that prohibits the installation and use of new self-regenerating water softeners in the Santa Clarita Valley. This ordinance took effect in March 2003.

Nitrogen –The LARWQCB adopted a nutrient TMDL in late 2003 for the upper Santa Clara River that addresses the Section 303(d) List for nitrate plus nitrite impairment (LARWQCB 2003b). The TMDL limits nitrate (NO_3), nitrite (NO_2), ammonia (NH_3), and total nitrogen (N). Principal sources of nitrogen to a watershed typically include discharges from water reclamation plants and runoff from agricultural activities. Elevated nitrogen concentrations (ammonia, nitrate, and nitrite) can cause impairments in warm water fish and wildlife habitat, along with contributing to eutrophic effects such as algae growth and low dissolved oxygen.

Other Impairments – Reaches 7, 8, and 9 of the Santa Clara River are listed as impaired on the Section 303(d) List for fecal coliform. Sources of coliform can include discharges from water reclamation plants, urban stormwater runoff, and septic tanks. A coliform TMDL for the upper Santa Clara River is scheduled for completion in 2006.

Typical data ranges for the Santa Clara River and Basin Plan objectives are provided in Table 3.15-12. Water quality in the Santa Clara River is considered generally impaired due to high concentrations of chlorides (LARWQCB 1999b). Much of the water present in the Santa Clara River west of Bouquet Canyon Road is a result of discharges from current wastewater treatment and reclamation plants. Beneficial uses for Pyramid and Castaic lakes as designated by the LARWQCB were presented in the discussion of the SWP facilities.

Imported Water Quality

Raw water from Castaic Lake delivered to the ESFP and RVWTP is generally of high quality. CLWA produces water that meets drinking water standards set by the EPA and the California Department of Health Services (CA DHS) (SCVWP 2003). A summary of the water quality data for 1990 to 2001 for Castaic Lake can be found in Table 3.15-4, in the discussion of SWP water quality.

11 The 303 (d) list identifies the impaired Reaches as 3, 7, and 8. Reaches 7 and 8, however, correspond to those identified as Reaches 5 and 6 in the Basin Plan and in the chloride TMDL. EPA is using the designations of Reaches 5 and 6 in the TMDL to correspond to the Basin Plan (EPA 2003).

Table 3.15-12. Water Quality Summary for the Santa Clara River

Constituent	*Applicable Objective/Criteria*	*Typical Data Ranges Resulting in Impairment*	*303(d) Listed Waters/ Santa Clara River Reaches*
Ammonia[1]	0.53-2.7 mg/L	ND-4.9 mg/L (mean of 1.4 ± 1.3)	Reaches 3, 7, and 8
Chloride	80-100 mg/L	10-138 mg/L (mean of 105 ± 21)	Reaches 3, 7, 8, and 9
Nitrate + Nitrite	≤ 10 mg/L	0.3-15.4 mg/L (mean of 5.7 ± 2.4)	Reach 8
Organic enrichment/low Dissolved Oxygen	5.0-7.0 mg/L[2]	0.8-11.0 mg/L (mean of 7.7 ± 2.5)	Reaches 8 and 9
Coliform	100-400 MPN/100ml[3]	20-24000 MPN/100ml	Estuary and Reach 8
Sulfate	150 mg/L	ND	Reach 9

Source: LARWQCB 2001.

Abbreviations: mg/L = milligrams per liter; MPN = most probable number; ND = none detected; ml = milliliter.

1. Basin Plan numeric objective varies depending on pH and temperature. The general range is 0.53-2.7 mg/L of total ammonia (at average pH and temp.) in waters designated as warm to protect against chronic toxicity and 2.3-28.0 mg/L to protect against acute toxicity.
2. Annual Basin Plan numeric objective mean greater than 7.0 mg/L and no single sample less than 5.0 mg/L.
3. Inland objective: fecal coliform not to exceed log mean of 200 most probable number (MPN)/100 milliliters (ml) in 30-day period and not more than 10 percent of samples exceed 400 MPS/100ml. Beach objective: total coliform not to exceed 1,000 MPN/100 ml in more than 20% of samples in 30 days and not more than 10,000 MPN/100 ml at any time.

GROUNDWATER QUALITY

Groundwater monitoring in Alluvial Aquifer wells has shown chloride concentrations to be below the Basin Plan groundwater chloride objective of 150 mg/L, and nitrate concentrations to be below the 10 mg/L Basin Plan groundwater objective (LADRP 2003). The 1994 Basin Plan includes water quality objectives for bacteria, chemical constituents and radioactivity, mineral quality, nitrogen (nitrate, nitrite), taste and odor, TDS, sulfate, chloride and boron objectives for groundwater. All Basin Plan groundwater objectives are designed to protect groundwater for municipal drinking water purposes.

The groundwater quality of the Alluvial Aquifer is generally acceptable quality for domestic use without treatment, although Alluvial Aquifer water produced for domestic use is disinfected by the domestic water purveyors prior to delivery. The groundwater is generally of calcium bicarbonate, calcium sulfate or calcium-bicarbonate sulfate character, depending on location within the aquifer. TDS concentrations in the Alluvial Aquifer generally increase in concentration from approximately 550 to 610 mg/L in the eastern portion of the aquifer to approximately 660 to 710

mg/L in the western portion of the aquifer (Slade 2002). Other inorganic constituents follow similar trends.

The groundwater quality of the Saugus Formation is generally acceptable for domestic use without treatment, although Saugus Formation water produced for domestic use is disinfected by the domestic water purveyors prior to delivery. The groundwater is generally of calcium bicarbonate or calcium-magnesium sulfate character. Water quality generally deteriorates near the perimeter or base of the aquifer (e.g., near the geologic contact between the Saugus Formation and the underlying Pico Formation). Calculations of TDS concentrations in the Saugus Formation indicate levels greater than 800 ppm for both shallow (500 to 1,000 feet) and deep (2,000 to 2,500 feet) aquifers within the Saugus Formation (Slade 1988).

Groundwater produced by the water purveyors in the CLWA service area consistently meets drinking water standards set by the EPA and the CA DHS. In 2002, the local purveyors conducted additional water quality monitoring for constituents that lack drinking water standards in compliance with the federal and state Unregulated Contaminant Monitoring Rule (UCMR) regulations (SCVWP 2003).

Perchlorate – As of April 2003, according to the CA DHS, over 173 surface water and groundwater sampling points within the Los Angeles Region have detected perchlorate, ranging from 4 micrograms per liter (µg/L) to 159 µg/L (LARWQCB 2003). Within the CLWA service area, perchlorate has been a concern with respect to the groundwater quality since it was detected in four production wells in the eastern part of the Saugus Formation in 1997. Perchlorate is a chemical associated with many industrial applications, but primarily as a component of rocket fuel. Although there are neither Federal nor State limits/standards for perchlorate in drinking water, it was placed on the EPA's Drinking Water Contaminant Candidate List in 1998. In a further step to establish standards, the EPA required drinking water monitoring for perchlorate under the UCMR in 1999.

On December 6, 2002, the California Office of Environmental Health Hazard Assessment (OEHHA) proposed a public health goal, in the range of 2 to 6 parts per billion (ppb), for the amount of perchlorate present in drinking water (LADRP 2003a). Both the federal and state governments require monitoring for perchlorate and have recommendations for potable water uses of water sources exceeding 18 µg/L. The CA DHS has lowered the action level for perchlorate in drinking water from 18 ppb to 4 ppb (CA DHS 2002). In addition to the OEHHA's proposed public health goal, the CA DHS is required to adopt a primary drinking water standard for perchlorate by January 1, 2004 (LADRP 2003a). A Maximum Contaminant Level (MCL)[12] for perchlorate is not expected until 2004 (SCVWP 2003).

In 1997, perchlorate was detected in two production wells in the Saugus Formation, both of which are near the Whittaker-Bermite property, a former weapons manufacturing and testing site. These two wells had perchlorate levels above the 18 µg/L recommendation level and the use of these wells has been suspended. Two other production wells in the Saugus Formation

12 A MCL is the maximum permissible level of a contaminant in drinking water which is delivered to any user of a public water system. MCLs ensure that drinking water does not pose either a short-term or long-term health risk. MCLs are specified by the EPA, as authorized by the Safe Drinking Water Act.

have shown detectable levels of perchlorate below 18 µg/L and the use of these wells has been suspended. Due to the number and distribution of wells in the Santa Clarita Valley, the need to suspend use of these wells (the combined capacity of the four wells is 8,000 gallons/minute) has not had a substantial effect on overall water supply. In 2002, perchlorate was detected in one Alluvial Aquifer production well located near the Whittaker-Bermite property. That well tested positive for perchlorate at a level of 5.9 µg/L (SCVWP 2003). All five perchlorate-impacted wells have been removed from active water supply service (SCVWP 2003). The local purveyors are continuing to test for perchlorate in all of their active wells, and are developing a plan for a water treatment process to return the impacted wells to service.

The development and implementation of a cleanup plan for the Whittaker-Bermite site and the impacted groundwater is being coordinated among CLWA, the local purveyors, the City of Santa Clarita, DTSC, and the U.S. Army Corps of Engineers. In February 2003, the DTSC and the impacted local purveyors entered into an agreement in which DTSC will provide review and oversight of the response activities being undertaken by the impacted local purveyors related to the detection of perchlorate in the five impacted wells (SCVWP 2003). Under the scope of work of that agreement, the local purveyors will prepare: (a) well characterization reports; (b) a health-based risk assessment; (c) a regional groundwater flow model; and (d) a treatment technology evaluation report (SCVWP 2003). Several treatment technologies for the removal of perchlorate from water are currently available. As discussed above under the sub-heading of Water Supply, these various studies are underway.

In 2002, the EPA implemented the new Disinfectants and Disinfection Byproducts Rule, which in part, establishes a new MCL of 80 µg/L for total trihalomethanes (TTHM). TTHMs are a byproduct that is created when free chlorine is used as a means for disinfection. CLWA and the local purveyors are investigating alternative methods of disinfection to be able to maintain compliance with the new rule and future regulations relating to disinfection byproducts (SCVWP 2003).

Similarly, the EPA has revised the MCL for arsenic from 50 µg/L to 10 µg/L. Compliance with the federal standard is not required until 2006. However, in March of 2003, the OEHHA proposed a draft Public Health Goal for arsenic at 4 parts per trillion (ppt) (SCVWP 2003). CA DHS is required to establish a new MCL for arsenic by June 30, 2004. Historically, naturally occurring arsenic concentrations less than 5 µg/L have been detected in a few local groundwater supplies and less than 3 µg/L in SWP water supplies. Most groundwater wells in the Santa Clarita Valley have non-detectable concentrations of arsenic.

3.15.2 Impacts of the Project

3.15.2.1 Significance Criteria

The criteria listed below are based on Appendix G of the State CEQA Guidelines. The Project would have a significant impact on water resources if it would:

- violate (or cause the violation of) any water quality standards or waste discharge requirement;

- substantially deplete groundwater supplies or interfere substantially with naturally occurring groundwater recharge;
- substantially alter the existing drainage pattern of the site or area, including the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site;
- substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;
- create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
- otherwise substantially degrade water quality;
- place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;
- place within a 100-year flood hazard area structures which would impede or redirect flood flows;
- expose people or structures to significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam; or,
- cause inundation by seiche, tsunami, or mudflow.

3.15.2.2 *Environmental Impacts*

Analysis Methodology

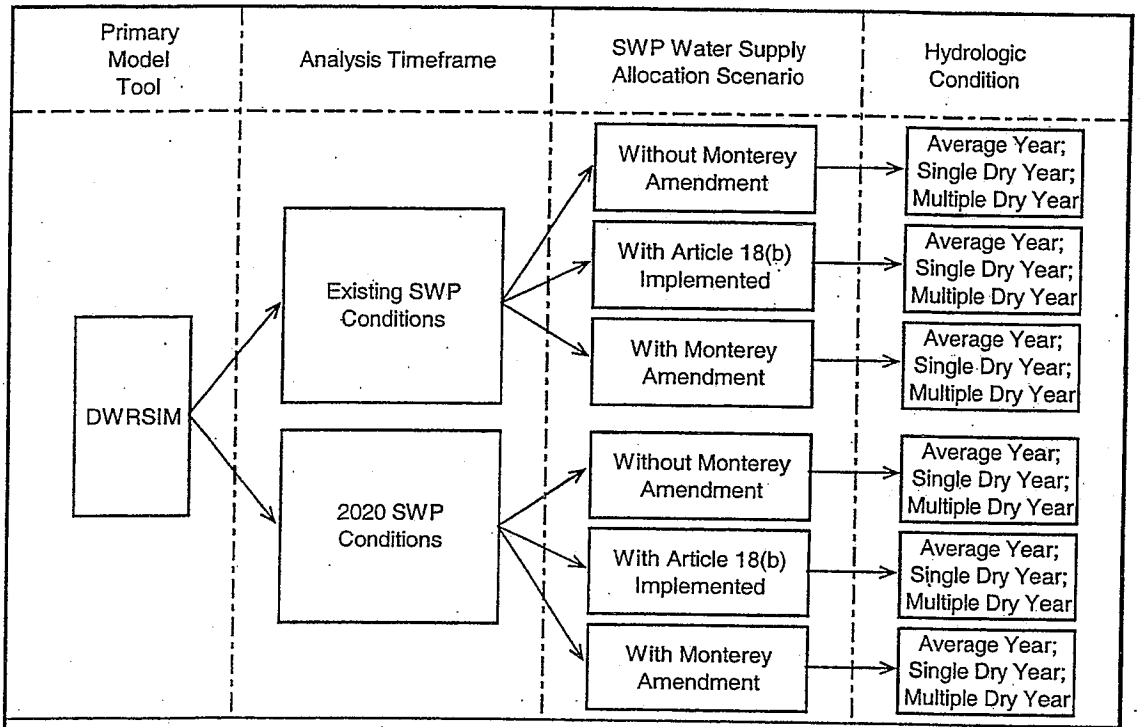
The analysis of direct impacts focuses on the Project's potential to affect water quality, groundwater supplies, and surface water supplies associated with the SWP, WRMWSD, and CLWA. Alterations in elevation, depth, and surface area of water bodies, while not necessarily an impact to hydrology, can affect other resources such as aesthetics, biological resources, cultural resources, and geology and soils. These potential effects are considered within the impact discussions for the specific resources affected.

Figure 3.15-5 provides an overview of the SWP water supply analysis. The components shown in this figure, including the Primary Model Tool, Analysis Timeframe, SWP Water Supply Allocation Scenarios, and Hydrologic Conditions are described directly below. Following these discussions is a description of the general methodology followed in the analyses. Appendix D provides additional detail on the water supply analysis methodology and results.

PRIMARY MODEL TOOL AND ANALYSIS TIMEFRAME

The amount of SWP water supply that would be available for use by CLWA given the transfer of the Project's 41,000 AF of Table A Amount was assessed using results from DWR's planning

1



Definitions:

DWRSIM - DWR's SWP operations model. DWRSIM calculates the amount of water the SWP could deliver to Contractors in each month over a 73-year period of hydrologic record, based on a given set of facilities and operating constraints and for a given level of Contractor demand. (DWRSIM studies used were conducted by DWR in 1998 for CALFED Bay-Delta Program EIS/EIR [CALFED 2000].)

Existing SWP Conditions - A timeframe for anlaysis in the DWRSIM study. The existing condition study assumes the use of then-existing (1998) SWP facilities and operating constraints, along with then-current estimates of Contractor demands and upstream land and water use. (DWRSIM study 1995D06E-CALFED-771)

2020 SWP Conditions - A timeframe for analysis in the DWRSIM study. The 2020 condition study assumes the use of then-existing (1998) SWP facilities and operating constrains, along with estimated future (2020) Contractor demands upstream land and water use. (DWRSIM study 2020D09C-CALFED-786)

Without Monterey Amendment (Initial agricultural reduction in allocations) - Allocation of available SWP supplies based on the original terms of the Water Supply Contracts.

With Article 18(b) Implemented (Proportionate reduction in Table A Amounts) - Proportionate reduction in Contractor's Table A Amounts and allocation of available SWP supplies based on the original terms of the Water Supply Contracts, assuming DWR implemented Article 18(b) (i.e., the permanent shortage provision).

With Monterey Amendment (Proportionate reduction in allocations) - Allocation of available SWP supplies based on the terms of the Monterey Amendment to the Water Supply Contracts.

Average Year - The average quantity of supply available, based on the 73 years of DWRSIM model results.

Single Dry Year - Supply available in the single year with the lowest total SWP deliveries, based on the DWRSIM model results (1977). The single dry year supply is considered to be the worst-case scenario, with a probability of occurrence of once in 73 years, or about 1.4 percent of the time.

Multiple Dry Year - Average supply available over the four consecutive drought years of 1988 through 1991, based on the DWRSIM model results.

2

3 **Figure 3.15-5. Water Supply Analysis Overview**

4

model, DWRSIM. The two model studies used in this analysis simulate SWP and CVP operations and were conducted by DWR in 1998 for the CALFED Bay-Delta Program EIS/EIR (CALFED 2000). One of the model's inputs is a time series of monthly runoff based on historic hydrologic data from 1922 through 1994 (73 years), with that hydrologic data adjusted to reflect a current or future level of upstream land and water use. DWRSIM estimates the amount of water the SWP could deliver to Contractors in each month over the 73 years of operation, for a given set of facilities and operating constraints and for a given level of Contractor demand. The results are interpreted as the capability of the SWP to meet the assumed SWP demand, over a range of hydrologic conditions, for that assumed set of physical facilities and operating constraints.

The two DWRSIM studies both assume the use of SWP facilities and operating constraints that were present in 1998. One study uses 1998 estimates of existing Contractor demands and upstream land and water use, and the other uses 2020 projections for both Contractor demands and upstream land and water use.

These model runs provide the best estimates of SWP supply reliability that were available in 1998, and are consistent with the 1998 environmental setting used in this EIR. Since these studies were conducted, the modeling tool DWR uses to simulate operations has evolved (first to CALSIM I, and more recently to CALSIM II). However, while the modeling tool itself has changed, the criteria used in the models to simulate SWP operations have not significantly changed. While DWR has completed a more recent assessment of SWP reliability in its SWP Delivery Reliability Report using CALSIM II, the results of these new studies are comparable to the results of the DWRSIM studies (see Appendix D for a comparison of these model study results).

Although this EIR uses results from the two DWRSIM studies for determining SWP water supplies for both the pre-project 1998 environmental baseline and the project environmental impact analyses, it uses results from the CALSIM II studies from DWR's SWP Delivery Reliability Report (2003b) for determining estimates of SWP water supplies for the current environmental setting.

The estimates of SWP supplies associated with the 41,000 AF of Table A Amount based on DWR's SWP Delivery Reliability Report are slightly lower than the amounts under the DWRSIM studies for the comparable allocation scenario, particularly under "existing" conditions. The difference between SWP supply estimates in this EIR compared to estimates based on DWR's SWP Delivery Reliability Report is due to several reasons, including: (1) the use of two different models (DWRSIM in this EIR and CALSIM II in DWR's report), which show slightly different supply results in some years; (2) the results in this EIR account for the variable demand used by DWR in its model studies (consistent with the way DWR actually allocated water), while the results as presented in DWR's report do not (i.e., in DWR's report deliveries are presented as a percentage of Table A, regardless of the lower demands used in some years of the study); and, (3) the "existing" case in this EIR is based on 1998 SWP demand conditions, while the "existing" case in DWR's report is based on higher 2001 SWP demand conditions. The 2001 total SWP demand is higher than the 1998 demand due to increased M&I Contractor demands. A lower total demand can result in some years in more water being

allocated to the same Table A Amount, so the lower 1998 demand results in a slightly higher quantity of water associated with the 41,000 AF of Table A Amount.

SWP Water Supply Allocation Scenarios

The Project could be authorized under Article 41 of CLWA's original Water Supply Contract with DWR or under terms added to CLWA's contract as part of the Monterey Amendment (Article 53). Both contract terms allow for the transfer of Table A Amount between SWP Contractors. As described in section 1.3.2 under the Monterey Amendment, Agricultural Contractors committed, on a willing buyer-willing seller basis, to make available 130,000 AF of Table A Amount for permanent transfer to M&I Contractors (Article 53). The transfer of Table A Amount that is the subject of this EIR was implemented under this permanent transfer provision of the Monterey Amendment, although the transfer could be implemented under Article 41 of CLWA's original Water Supply Contract.

As was discussed in Chapter 1, DWR is in the process of preparing a new EIR for the Monterey Amendment. Since the Monterey Amendment changes the way SWP supplies are allocated among Contractors, this EIR provides three separate analyses of the Project's impacts to water supply available to WRMWSD and CLWA. The three analyses represent three possible scenarios for allocating available SWP supplies among Contractors, and provide an evaluation of the amount of SWP supply that would be associated with the 41,000 AF of Table A Amount under each of the allocation scenarios. The three analyses are governed by specific terms in the Water Supply Contracts, and are referred to in this EIR as: "SWP Allocation without the Monterey Amendment" (Without Monterey Amendment); "SWP Allocation without the Monterey Amendment and with Implementation of Article 18(b) Permanent Shortage Provision" (With Article 18(b) Implemented); and, "SWP Allocation with the Monterey Amendment" (With Monterey Amendment). The SWP allocation scenarios that form the basis of the three analyses are described below and summarized in Table 3.15-13. DWR is currently allocating SWP supplies in accordance with the Water Supply Contract as amended by the Monterey Amendment ("With Monterey Amendment").

It is important to note that the total amount of SWP supply is independent of the allocation scenario. The total amount of SWP supply available in a given year is a result of that year's hydrology, the amount of storage in SWP reservoirs at the beginning of the year, and the operational constraints that govern operations in the Delta (in 1998, Order WR 95-6 and currently, SWRCB Decision 1641).

SWP Allocation without the Monterey Amendment (i.e., Initial agricultural reduction in allocations), (Without Monterey Amendment) – Under the original terms of the Water Supply Contracts, water supply shortages, as well as any surplus water that might be available, were allocated differently among Contractors depending on whether Contractors' Table A Amounts were classified as agricultural or M&I. Under the original SWP contract terms, in a year with a water supply shortage (i.e., a year when total available SWP supplies were less than Contractor requests), available water supplies were allocated such that Agricultural Contractors received certain initial reductions in deliveries, and any remaining shortages were then allocated proportionately among all Contractors.

Conversely, when surplus water was available, Agricultural Contractors were given priority to this water. This priority to surplus water was given to both scheduled surplus water and unscheduled surplus water (refer to Table 3.15-3 for a definition of scheduled surplus water and unscheduled surplus water). Scheduled surplus water was generally available only during the early years of the SWP, when total Contractor demands were low. Due primarily to increasing Contractor demands for Table A supplies, scheduled surplus water has not been available since the mid-1980s.

Since WRMWSD's Table A Amount is classified as agricultural, the Table A Amount transferred to CLWA would be considered agricultural. Therefore, in this allocation scenario, under shortage conditions the 41,000 AF of Table A Amount would be subject to the initial agricultural reductions. Similarly, under surplus water conditions the 41,000 AF of Table A Amount would have the agricultural priority to surplus water.

SWP Allocation without the Monterey Amendment and with Implementation of Article 18(b) Permanent Shortage Provision (i.e., Proportionate Reduction in Table A Amounts), (With Article 18(b) Implemented) – Under the original terms of the Water Supply Contracts, DWR could invoke Article 18(b) of the Water Supply Contracts if DWR determined that the SWP was in a "permanent shortage" situation. With implementation of Article 18(b), DWR would determine a new "minimum project yield" for the SWP, and reduce Contractors' Table A Amounts proportionately[13] until they equaled the reduced minimum project yield.

There is a great deal of controversy and uncertainty regarding this allocation scenario and how it might have been implemented by DWR. More specifically, there are several different legal and contractual interpretations, particularly between Agricultural and M&I Contractors, primarily regarding whether DWR could have validly invoked Article 18(b), and assuming that it could have done so, how it could have allocated water under Article 18(b). In general, the water allocation rules that would apply under this allocation scenario are similar to the allocation rules described for the Without Monterey Amendment scenario described above, with Agricultural Contractors receiving initial reductions in shortage years and priority to surplus water when it was available. However, with all Contractor Table A Amounts reduced, shortages (i.e., supplies insufficient to meet Contractor requests for Table A water) would occur much less frequently (because the SWP could deliver the smaller Table A Amounts more regularly), and the initial agricultural reduction would be applied to a smaller Table A Amount (i.e., the reductions would be smaller). And with Table A Amounts reduced, SWP supplies in excess of the reduced minimum project yield would be available for scheduled delivery in most years. Unscheduled surplus water would be available under the same conditions, in the same amounts, and allocated in the same way as in the Without Monterey Amendment scenario.

13 Without the Monterey Amendment, Article 18(b) of the Water Supply Contracts stated "In the event that the State is unable to construct sufficient additional conservation facilities to prevent a reduction in the minimum project yield, or if for any other reason there is a reduction in the minimum project yield, which, notwithstanding preventive or remedial measures taken or to be taken by the State, threatens a permanent shortage in the supply of project water to be made available to the contactors: (1) The annual entitlements and the maximum annual entitlements of all Contractors, except to the extent such entitlements may reflect established rights under the area of origin statutes, shall, by amendment of Table A of this contract, be reduced proportionately by the State to the extent necessary so that the sum of the revised maximum annual entitlements of all Contractors will then equal such reduced minimum project yield...."

Table 3.15-13. Summary of SWP Water Supply Contract Without Monterey Amendment, With Article 18(b) Implemented and With Monterey Amendment Allocation Scenarios

	Without Monterey Amendment	*With Article 18(b) Implemented*	*With Monterey Amendment*
SWP Supplies Allocated Based on:	Original terms of Water Supply Contracts.	Original terms of Water Supply Contracts, assuming DWR implemented Article 18(b), (i.e., if it determined SWP was in "permanent shortage" situation). All Contractors' Table A Amounts proportionately reduced until they total new "minimum project yield," as determined by DWR.	Terms of Monterey Amendment to Water Supply Contracts.
Table A Water Shortage Allocation	Agricultural Contractors receive initial supply reduction (up to 50% of Table A Amount in one year, and up to 100% in any consecutive seven years). Any remaining shortage allocated proportionately among all Contractors.	Same as Without Monterey Amendment[1].	Shortages allocated in proportion to Contractors' Table A Amounts; no agricultural and M&I allocation differential.
Surplus Water Allocation	First priority given to Agricultural Contractors. Two categories of surplus water: • Scheduled surplus. • Unscheduled surplus.	Same as Without Monterey Amendment[2].	Surplus allocated in proportion to Contractors' Table A Amounts. Scheduled surplus water eliminated. Unscheduled surplus water renamed; referred to as Article 21 water.
Results for Contractors	Agricultural Contractors have: • Less reliable Table A supply than M&I Contractors (due to initial agricultural reductions), but, • More access to surplus water.	Supplies shift from M&I Contractors to Agricultural Contractors, due to: • Smaller and less frequent initial agricultural reductions, and, • More of available supply classified as surplus water (with agricultural priority).	Reliability of both Table A supply and surplus supply is same for Agricultural Contractors and M&I Contractors.

1. Same allocation rules apply, but because Table A Amounts are reduced, initial agricultural reductions are smaller and less frequent.
2. Same allocation rules apply, but because Table A Amounts are reduced, surplus supplies are available more frequently.

There are two primary uncertainties under this allocation scenario. This first unknown is what value of minimum project yield DWR would have used in reducing Table A Amounts. A specific value for minimum project yield had not been calculated in the several years leading up to the Monterey Amendment, but was commonly thought at the time to be in the range of 2.0 to 2.5 million AF (Cal. App. 3d PCL vs. DWR September 15, 2000). The second uncertainty is how any water supply in excess of minimum project yield would have been allocated. This is an area of controversy, with some Contractors contending it should be allocated as surplus water with Agricultural Contractors receiving a priority, and others contending it should be allocated in proportion to Table A Amounts.

Given these uncertainties, two Article 18(b) allocation scenarios that bound the various assumptions and interpretations described above were analyzed for this EIR. The first scenario assumes minimum project yield is reduced to 2.0 million AF, and scheduled surplus water is allocated with priority given to Agricultural Contractors. The second scenario assumes minimum project yield is reduced to 2.5 million AF, and deliveries above this amount are allocated in proportion to Table A Amounts. The first of these scenarios would result in more water being allocated to Agricultural Contractors than the second, and therefore would result in more water being associated with the Project's 41,000 AF of Agricultural Table A Amount. Because this first scenario would result in the worst case for purposes of analysis of potential growth impacts, only the results of the first scenario are presented in this EIR (for the water supply results of both scenarios, refer to Appendix D).

SWP Allocation with the Monterey Amendment (i.e., Proportionate reduction in allocations), (With Monterey Amendment) – Under the terms of the Water Supply Contracts as amended by the Monterey Amendment, all SWP water supplies are shared among all Contractors in proportion to their Table A Amounts. Therefore, the 41,000 AF of Table A Amount transferred to CLWA from WRMWSD would be subject to the same shortages as all other Table A Amounts (i.e., it would not be subject to an initial agricultural reduction and would not have the priority to certain surplus deliveries), and would have access to the same proportionate share of any available surplus water as all other Table A Amounts. As part of the Monterey Amendment, the category of scheduled surplus water was eliminated because it was no longer available, the category of unscheduled surplus water was retained but is now referred to as Article 21 water, and Article 18(b) was deleted.

Hydrologic Conditions

Because SWP water supplies vary from year to year depending on a variety of factors, this EIR presents water supply results for three different hydrologic conditions. A Contractor's "average year" supply is the average quantity of water available to the Contractor, based on the 73 years of DWRSIM model results. A Contractor's "single dry year" supply is the amount of water available to the Contractor in the single year with the lowest total SWP deliveries, based on the DWRSIM model results, which was 1977. The single dry year supply is considered to be a worst-case scenario, with a probability of occurrence of once in 73 years, or about 1.4 percent of the time. A Contractor's "multiple dry year period" supply is the average amount of water available over the four consecutive years drought years of 1988 to 1991, based on the DWRSIM model results.

GENERAL METHODOLOGY

The potential impacts of the Project to WRMWSD and CLWA SWP water supplies and to SWP facilities were evaluated using the general methodology described below. Appendix D provides additional detail on the water supply analysis methodology.

First, the amount of SWP water supply available to WRMWSD and CLWA, including the amount associated with the 41,000 AF of Table A Amount, was analyzed. Data from the DWRSIM model studies discussed above (including the M&I and Agricultural Contractor demands used as input to the studies, and the total annual SWP deliveries to all Contractors from the model study results) were used as a starting point for the analysis. For this analysis, these total annual deliveries were allocated among Contractors in accordance with the three SWP water allocation scenarios described above (Without Monterey Amendment, With Article 18(b) Implemented, and With Monterey Amendment), for each year over the model's period of record. The results of these analyses were used to determine the SWP deliveries that could be expected by WRMWSD and CLWA under each water allocation scenario, for each hydrologic condition considered.

Next, impacts to SWP facilities were analyzed. This analysis also used data from these same DWRSIM model studies as a starting point for the analysis, using model study results related to San Luis Reservoir operations (i.e., reservoir storage, diversions to and releases from storage, and Aqueduct flows upstream and downstream of the reservoir). The change in reservoir storage and Aqueduct flow due to the Project was then estimated based on the difference between WRMWSD and CLWA in the timing of monthly deliveries (i.e., the difference in timing between agricultural use and M&I use), given the allocated supplies determined in the supply analysis.

In the supply analyses conducted for this EIR, the classifications of Table A Amounts as agricultural or as M&I were maintained. The 41,000 AF of Table A Amount transferred from WRMWSD (through KCWA) is agricultural. Although CLWA serves M&I users, the agricultural classification of the 41,000 AF Table A Amount would remain because the classification is determined by the original Water Supply Contract terms according to anticipated use (i.e., KCWA's original Water Supply Contract) and has not changed. Agricultural Table A Amount can be used for M&I uses and, conversely, M&I Table A Amount can be used for agricultural uses. Of CLWA's 54,200 AF of SWP Table A Amount without the Project, 41,500 AF is classified as M&I, and 12,700 AF as agricultural.

In addition to Table A supplies, CLWA and WRMWSD can also receive deliveries of surplus water (see Table 3.15-3 for descriptions of types of surplus water). Unscheduled surplus water/Article 21 water is not included in the water supply analysis for any of the three water allocation scenarios. This is because it is not available on a routine or predictable basis, and is generally only available for short periods of time during low demand months when most Contractors have a limited ability to use it. It is noted, however, that unscheduled surplus water/Article 21 water could provide additional water supplies that could be used by WRMWSD and CLWA. Scheduled surplus water is only included in the With Article 18(b) Implemented allocation scenario, because with the reduced Table A Amounts under that scenario scheduled surplus water would have been available on a scheduled or more

dependable basis similar to Table A supplies (i.e., Contractors could schedule in advance, in a manner similar to their annual Table A requests, deliveries of scheduled surplus water). Scheduled surplus water is assumed to not be available under the Without Monterey Amendment and With Monterey Amendment allocation scenarios because (1) for the Without Monterey Amendment allocation scenario, scheduled surplus water was generally available only during the early years of the SWP, when total Contractor demands were low, and has not been available since the mid-1980s due primarily to increasing Contractor demands for Table A supplies, and (2) for the With Monterey Amendment allocation scenario, the category of scheduled surplus water was eliminated as part of the Monterey Amendment because it was no longer available (refer to Table 3.15-3).

For the purposes of estimating the impacts of the Project, the impact analyses assume that CLWA will take delivery of the entire amount of water made available from the 41,000 AF Table A Amount transferred. This assumption conservatively provides the largest effect on SWP operations, even though CLWA may not currently have the local demand for this entire amount of water in average and wetter hydrologic years.

State Water Project and Associated Facilities

DIRECT IMPACTS

The Project would not result in a change in the total amount of SWP supply available for delivery to SWP Contractors. The total amount of SWP supply available in a given year is a result of that year's hydrology, the amount of storage in SWP reservoirs at the beginning of the year, and the operational constraints that govern operations in the Delta (in 1998, SWRCB Order WR 95-6 and currently, SWRCB Decision 1641). The total available SWP supply is then allocated among the SWP Contractors and is independent of the location of use south of the Delta. Impacts described below and summarized in Table 3.15-14 for the SWP and associated facilities are primarily due to two changes as a result of the Project, which are:

- *Change in end use of water associated with the 41,000 AF Table A Amount* – The project would result in a change from agricultural end use to M&I end use of water associated with the 41,000 AF Table A Amount. Typically, agricultural water users use proportionately more of their annual water supply during the heavy irrigation months of the late spring and summer than do urban water users, and proportionately less of their supply than urban users during the remainder of the year. In the case of WRMWSD and CLWA, this difference in delivery during the year would result in a net reduction in deliveries of water associated with the 41,000 AF Table A Amount in May through September, and a net increase in deliveries during the remaining months of the year (October through April). In addition, deliveries to WRMWSD historically have peaked in July, while CLWA's deliveries historically have peaked in August.

- *Changes in the amount of water transported to the CLWA turnouts* – The Project would result in the delivery of water to the CLWA turnout that could have otherwise been delivered to the WRMWSD turnouts. Because the CLWA turnout is located further

down the Aqueduct than the WRMWSD turnout (see Figure 1.3-1), water associated with the Table A transfer would need to be transported this additional distance.

Table 3.15-14. Summary of Impacts to the SWP and Associated Facilities

The Delta	The Project would not change the total amount of SWP supply available for delivery to Contractors, so there would be no change in the total amount of water diverted from the Delta. The difference in timing of water used for urban purposes rather than agricultural purposes would result in a slight change in timing of deliveries of the 41,000 AF of Table A Amount. This change in timing could also result in a slight change in the timing of the filling of San Luis Reservoir, which could result in minor changes in the timing of Delta diversions. However, these changes would fall well within the range of historical and future anticipated SWP diversions from the Delta. Any change in Delta diversions that did occur would result in an imperceptible or minor change in Delta water quality (slight salinity decreases withy lower diversions, and slight salinity increase with higher diversions). All changes would be within applicable water quality standards and agreements. Impacts would be less than significant.
California Aqueduct from the Delta to San Luis Reservoir	If the changes in Delta diversions described above occurred, there would be a corresponding change in the timing of water transported in the California Aqueduct from the Delta facilities to San Luis Reservoir. This would not result in an environmental impact to water resources.
San Luis Reservoir	The difference in timing of water used for urban purposes rather than agricultural purposes would result in a slight increase in storage at San Luis Reservoir from July through November, and a slight decrease in storage during the remainder of the year. The change in storage at San Luis Reservoir resulting from the Project would represent a small portion of the total average storage in the SWP share of San Luis Reservoir, reflecting storage changes of less than 0.5 percent of average monthly storage in most months and not more than two percent in any month. This would not result in an environmental impact to water resources.
California Aqueduct downstream of San Luis Reservoir	The Project would result in a minor change in the timing of water transported in the Aqueduct between San Luis Reservoir and the WRMWSD turnouts, with a slight increase in the amount of water transported from October to April, and a slight decrease during the remainder of the year (May to September). This would not result in an environmental impact to water resources. The Project would result an annual increase of up to 41,000 AF transported in the California Aqueduct from the WRMWSD turnouts to the CLWA turnout. This increase would slightly increase the flow (velocity) in the California Aqueduct and may result in a minor change in the water level within the non-pipeline portions of the Aqueduct. This would not result in an environmental impact to water resources.
Castaic Lake	The Project would increase SWP water delivered to CLWA resulting in additional water being conveyed to, and delivered from, Castaic Lake, but would have little effect on the overall storage volume in the lake at any given time. This would not result in an environmental impact to water resources.
Other SWP Reservoirs (Quail and Pyramid lakes)	The Project would not result in changes to the overall volume of water stored in either Quail or Pyramid lakes, but would increase the amount of water that is conveyed to and released from the lakes. This would not result in an environmental impact to water resources.

Unless otherwise noted, the impacts of the Project to the SWP and associated facilities would be similar regardless of the SWP water allocation scenario (Without Monterey Amendment, With Article 18(b) Implemented, and With Monterey Amendment), and under both SWP demand conditions (existing and 2020).

The Delta – As discussed above, the Project would not change the total amount of SWP supply available for delivery to the Contractors. Therefore, there would be no change in the total amount of water diverted from the Delta. The difference in the timing of water used for urban purposes by CLWA rather than for agricultural purposes by WRMWSD would result in a slight change in the timing of deliveries of the 41,000 Table A Amount south of the Delta. This slight change in the timing of deliveries would require a slight change in operations (i.e., either in diversions from the Delta or in San Luis Reservoir operations). Generally, the SWP operates to divert as much water from the Delta as is available under prevailing hydrologic conditions, within the water quality standards and operational constraints that govern Delta operations (i.e., currently, SWRCB Decision 1641 and in 1998, Order WR 95-6). This is true regardless of the timing of deliveries south of the Delta because when Delta diversions exceed downstream deliveries, that excess is stored in San Luis Reservoir for delivery later in the year.

Because Delta diversions are limited by either water availability or operational/regulatory constraints, the change in the timing of deliveries of the 41,000 AF of Table A due to the Project would primarily result in changes in San Luis Reservoir storage (as is discussed in more detail below). These changes in storage could in some years result in the reservoir reaching full capacity at a slightly different time than if the Project were not implemented, which in turn could result in a slight change in Delta diversions (because diversions would generally be reduced when storage becomes full). Given the small magnitude of the change in the timing of deliveries, any change in the timing of Delta diversions that did occur would be minor, and would likely be on the order of hours or days (i.e., with the Project, certain changes in Delta diversions that would have occurred without the Project would still occur, but might shift by a few hours or days).

Delta diversions and their effect on Delta water quality vary from year to year. Any minor change in Delta diversions that did occur as a result of the Project would be small relative to total SWP diversions and would fall well within the range of historical and future anticipated SWP diversions from the Delta. Any minor change in the timing of Delta diversions due to the Project would result in an imperceptible or minor change in Delta water quality (slight salinity decrease with lower diversions, and slight salinity increase with higher diversions). Because (1) the Project would not change the operating criteria for diversions from the Delta, (2) the Project would very infrequently result in minor changes to Delta diversions within the applicable environmental and regulatory constraints, and (3) under those conditions that diversions could change, the changes would be minor, the Project would result in less than significant impacts to water resources, including water quality, within the Delta.

California Aqueduct from the Delta to San Luis Reservoir – As described above, the change in the timing of deliveries for WRMWSD and CLWA could result in some years in minor changes to Delta diversions. However, these changes would fall well within the range of historical and future anticipated SWP diversions from the Delta. If these timing changes in Delta diversions occurred, there would be a corresponding change in the timing of water transported in the

California Aqueduct from the Delta facilities to San Luis Reservoir. These changes in water transported in the Aqueduct would be minor. Water associated with the 41,000 AF of Table A Amount has historically been transported through this reach, and the amount of water transported would not exceed the capacity of the Aqueduct. Changing the timing of water transported in the Aqueduct would not result in an environmental impact to water resources.

San Luis Reservoir – As discussed in section 3.15.1.1, the general operation at San Luis Reservoir is to try to fill the reservoir during the high runoff months of the winter and early spring, and then release the stored water to supplement the more limited diversions from the Delta during the higher-demand summer and fall months to meet Contractor demands. The Project, in combination with the net change in the timing of deliveries during the year between WRMWSD and CLWA, would result in a slight increase in storage at San Luis Reservoir from July through November, and a slight decrease in storage during the remainder of the year. The magnitude of the storage increase would be greatest in August and September, averaging approximately 4,500 AF at existing SWP demand conditions and approximately 4,200 AF at 2020 SWP demand conditions. The magnitude of the reduction in storage would be greatest in March and April, averaging approximately 3,000 AF at existing SWP demand conditions and approximately 2,700 AF at 2020 SWP demand conditions. As shown on Figure 3.15-6, the change in storage at San Luis Reservoir resulting from the Project would represent a small portion of the total average storage in the SWP share of San Luis Reservoir (SWP capacity is over 1 million AF), reflecting storage changes of less than 0.5 percent of average storage in most months and not more than 2 percent in any month. The information provided above and in Figure 3.15-6 is based on implementation of the Project under the terms of the With Monterey Amendment scenario. These storage changes would be similar under the Without Monterey Amendment and With Article 18(b) Implemented scenarios because the amount and timing of deliveries under each of the allocation scenarios is quite similar.

These changes in storage are well within the substantial differences in San Luis Reservoir storage that occur in normal SWP operations over the course of the year and from year to year, and would not result in an environmental impact to water resources at San Luis Reservoir.

California Aqueduct downstream of San Luis Reservoir – The Project would result in a minor change in the timing of water transported in the Aqueduct between San Luis Reservoir and the WRMWSD turnouts. Within this reach of the Aqueduct, a slight increase in the amount of water transported would occur from October to April, and a slight decrease would occur during the remainder of the year (May to September). These changes in the amount of water transported from the Delta to the WRMWSD turnouts would result from the change in end use of the water (urban rather than agricultural use) and the associated shift in the timing of delivery. These changes in water transported in the Aqueduct would be minor. Water associated with the 41,000 AF of Table A Amount has historically been transported through this reach, and the amount of water transported would not exceed the capacity of the Aqueduct. Changing the timing of water transported in the Aqueduct would not result in an environmental impact to water resources.

The Project would result in an annual increase of up to 41,000 AF transported in the California Aqueduct from the WRMWSD turnouts to the CLWA turnout. This increase would slightly increase the flow (velocity) in the California Aqueduct and may result in a minor change in the water level within the non-pipeline portions of the Aqueduct. Because these changes in the

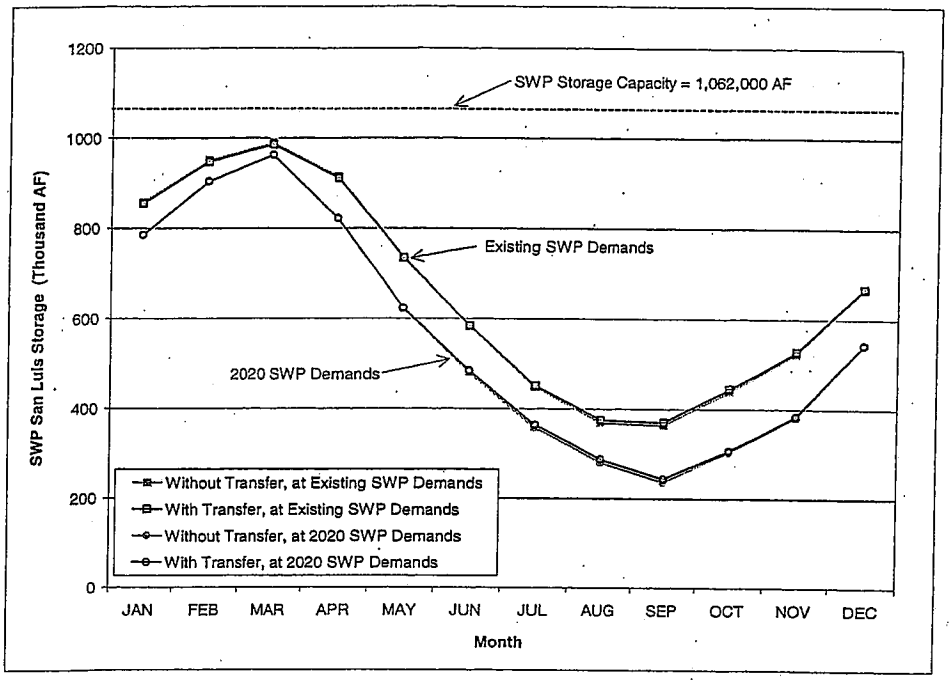


Figure 3.15-6. Average Monthly SWP San Luis Reservoir Storage With and Without the Project, under With Monterey Amendment SWP Allocations

amount of water transported in the Aqueduct would be minor, and because the Project would not result in changes to the operating criteria of the Aqueduct (i.e. the additional amount of water would not be allowed to exceed the capacity of the Aqueduct), these changes in timing of flows in the Aqueduct would not result in an environmental impact to water resources.

The Project would require the transport of water associated with the 41,000 AF Table A Amount through the Teerink, Chrisman, Edmonston, and Oso pumping plants (transport to WRMWSD also requires pumping a portion of the water through the Teerink and Chrisman pumping plants) and the Warne and Castaic power plants located within and between WRMWSD and Castaic Lake (refer to Figure 1.1-1). This would not result in an environmental impact to water resources.

The Project would not change the source of water in the California Aqueduct or otherwise affect water quality in the Aqueduct.

Castaic Lake – The amount of water stored at Castaic Lake would not be expected to change as a result of the Project. As discussed in section 3.15.1.2, Castaic Lake is the terminal reservoir on the West Branch of the California Aqueduct and is operated to help meet peak deliveries during the summer months for those SWP Contractors that receive deliveries from Castaic Lake and to provide an emergency water supply in case of a major supply system outage. Castaic Lake is also used for year-round recreational purposes. Under normal operations, the amount of storage that is withdrawn from Castaic Lake to make deliveries to Contractors over the summer (the amount withdrawn that exceeds the amount delivered to the lake) is typically about 30,000 AF (or about 10 percent of the lake's volume). The amount of this storage withdrawal is small

relative to total deliveries from the West Branch, which averaged about 403,000 AF from 1990 through 2000. In other words, most deliveries from the West Branch are conveyed through the California Aqueduct and Castaic Lake in about the same month the water is delivered to Contractors from the lake. In the future, DWR is expected to maintain this same general operation at Castaic Lake regardless of whether deliveries from the West Branch increase, and regardless of whether increased deliveries are due to increasing Contractor demands or due to Table A Amount transfers such as the Project.

Over the past decade, CLWA's Table A water deliveries from Castaic Lake have averaged only about 6 percent of the total SWP water delivered from the lake. Over this same period, the majority of the SWP water delivered from the lake (approximately 93 percent) was delivered to MWD due to its relatively larger Table A Amount and storage rights in Castaic Lake. The increase in water delivery to CLWA from the Project would result in additional water being conveyed to, and delivered from, Castaic Lake, but would have little effect on the overall storage volume in the lake at any given time. Because CLWA's deliveries from Castaic Lake with the Project would be minor compared to the total amount of water delivered from the lake, most of the SWP water is conveyed to the lake in the same month it is delivered to CLWA, and the Project would not change DWR's operating criteria for the lake, the Project would not result in an environmental impact to water resources at Castaic Lake. Because the Project would not change the source of water delivered to Castaic Lake and would result in minor, if any changes in the lake's volume, water quality would not be affected.

Although not an impact of the Project, it is noted that flexible storage is a component of the Monterey Amendment. CLWA would only have the ability to access water stored in Castaic Lake under the "flexible storage" provision of the Monterey Amendment in the With Monterey Amendment scenario. The amount of flexible storage available to CLWA would not change as a result of the Project.

Other SWP Reservoirs – Quail Lake and Pyramid Lake are located between the WRMWSD turnouts and the CLWA turnout on the West Branch of the California Aqueduct. DWR operates Quail Lake to re-regulate Aqueduct flows. Pyramid Lake is used in the operation of the Castaic Power Plant located between Pyramid and Castaic lakes, as well as to provide an emergency water supply for the West Branch Contractors. The Project would be implemented in accordance with DWR's existing operation of these lakes. As with Castaic Lake, most of the SWP water delivered to both Quail and Pyramid lakes is conveyed to, and released from, the lakes within the same month. Therefore, the Project would not result in changes to the overall volume of water stored in either Quail or Pyramid lakes, but would increase the amount of water that is conveyed to and released from the lakes. Because water is conveyed to and released from these lakes in approximately the same month, and because the project would not result in changes to DWR's operations of these facilities, the Project would not result in an environmental impact to water resources.

INDIRECT IMPACTS

Because the Project would be implemented in accordance with DWR's operation of the SWP and associated facilities, no indirect impacts to water resources would occur.

Wheeler Ridge-Maricopa Water Storage District

DIRECT IMPACTS

The Project reduces WRMWSD's Water Supply Contract Table A Amount by 41,000 AF (from 238,088 AF to 197,088 AF, a reduction of 17.2 percent). Because SWP water supplies are allocated among Contractors on the basis of Table A Amounts, this reduction in WRMWSD's Table A Amount would result in a reduction in the total amount of SWP water that WRMWSD could obtain (including both Table A and any available surplus supplies) from the SWP. Under all SWP allocation scenarios and hydrologic conditions, the Project would result in a maximum reduction in the SWP Table A water available to WRMWSD of approximately 17.2 percent.

As discussed in section 3.15.2.2, the supplies presented below are Table A supplies only (or in the case of the allocation scenario With Article 18(b) Implemented, Table A supplies and scheduled surplus water), and do not include unscheduled surplus water/Article 21 water.

Water Supply

All SWP Allocation Scenarios under Existing SWP Demand Conditions – Table 3.15-15 presents the results of the analysis of WRMWSD's SWP Table A supply under the existing (1998) SWP demand conditions used in the DWRSIM study, and under the various hydrologic conditions (average year, single dry year, and multiple dry year period) and water allocation scenarios considered (With Monterey Amendment, Without Monterey Amendment, and With Article 18(b) Implemented). Under current SWP allocation rules (With Monterey Amendment), implementation of the Project would result in a reduction in the Table A supply available to WRMWSD of 34,400 AF, 9,200 AF, and 18,100 AF under the average year, single dry year, and multiple dry year period conditions, respectively. Considering all allocation scenarios, the largest reduction in supplies available to WRMWSD with implementation of the Project would be 35,300 AF under average year conditions With Article 18(b) Implemented; 9,200 AF under a single dry year With Monterey Amendment; and 18,100 AF under a multiple dry year period With Monterey Amendment.

With the Project, WRMWSD would have sufficient SWP supplies at least 57 percent of the time to deliver Table A water in an amount that would independently meet its minimum demands under favorable economic conditions (180,000 AF). In addition, the average amount of Table A water WRMWSD could expect to receive with the Project under all allocation scenarios (157,000 to 169,500 AF) is greater than the average amount of historic SWP water deliveries to WRMWSD from 1990 to 1999 (137,360 AF) by approximately 14 and 23 percent, respectively. With the Project, sufficient SWP Table A water would be available within the district in years of average or greater than average SWP supplies. In years of less than average SWP supplies, and depending on that year's specific demand, WRMWSD may not have sufficient SWP Table A water to meet demands. In these years, WRMWSD would need to rely on other water management actions, such as previously banked water, and/or individual farmers within the district would use additional local groundwater.

As previously discussed, the decision to use local groundwater (i.e., groundwater pumped from wells owned and operated by farmers) or previously banked water supplies on lands within the district is predominately an economic decision made by farmers. In years when SWP deliveries

Table 3.15-15. WRMWSD's SWP Table A Supply at Existing SWP Demand Conditions, under all SWP Allocation Scenarios[1]

(all values in AF, rounded to the nearest 100 AF)

		Table A Amount	*Average Year*	*Single Dry Year*	*Multiple Dry Year Period[2]*
With Monterey Amendment	Without the Project	238,100	199,900	53,300	105,300
	With the Project	197,100	165,500	44,100	87,100
	Difference[3]	***41,000***	***34,400***	***9,200***	***18,100***
Without Monterey Amendment	Without the Project	238,100	189,700	0	79,700
	With the Project	197,100	157,000	0	65,900
	Difference[3]	***41,000***	***32,700***	***0***	***13,700***
With Article 18(b) Implemented[4]	Without the Project	113,800	204,800	11,500	100,600
	With the Project	94,200	169,500	9,500	83,200
	Difference[3]	***19,600***	***35,300***	***2,000***	***17,300***

Note: Numbers may not add due to rounding.
1. Based on water deliveries from DWRSIM study 1995D06E-CALFED-771. This study used 1998 DWR estimates of then-existing SWP Contractor demands.
2. Multiple dry year period supplies shown are average annual supplies over a four-year period.
3. Supplies shown are the amount of water attributable to the 41,000 AF of Table A Amount.
4. Under the SWP allocation scenario With Article 18(b) Implemented, the Table A Amounts shown are estimates of WRMWSD's reduced Table A Amount, based on its proportionate share of a reduced SWP minimum project yield of 2.0 million AF. The supplies shown include both Table A supplies and scheduled surplus supplies estimated to be available, with surplus supplies allocated based on priority for agricultural use.

are less than crop demands, individual farmers may choose to use local groundwater to meet demands. Because WRMWSD has substantially diversified its water sources through other water management actions, resulting in sufficient water available to the district to meet demands in most years at a lower fixed cost (when total costs are considered) than SWP water, increased reliance on groundwater would likely be a result of independent actions by the individual farmers (refer to Appendix C). However, it is reasonable to assume that some farmers may use local groundwater when SWP deliveries are not sufficient to meet demands, and, therefore, the Project may result in additional groundwater pumping in these years. Due to the complexity of factors that may be considered by individual farmers when deciding to use local groundwater in lieu of using imported water, the exact amount of additional reliance on groundwater that may occur in dry years cannot be determined. Because the Project could result in a reduction of up to 9,200 AF of Table A water in a single dry year and up to 18,100 AF of Table A water in a multiple dry year period, this is assumed to be the amount of additional groundwater use that could result from implementation of the Project in these year types. These amounts are small relative to the total amount of water in storage in the Kern County Groundwater Basin (total storage is 40 million AF; DWR 2003a) and the White Wolf sub-basin (total storage is about 2.5 million AF; BE 1975). Because groundwater levels in the portions of these basins underlying WRMWSD generally have been increasing over time (BE 1995), indicating that the basins could sustain an increase in use under these limited conditions

without resulting in a net deficit in aquifer volume or a lowering of the local groundwater table, impacts to groundwater would be less than significant.

As was discussed previously, the supplies presented above do not include unscheduled surplus water/Article 21 water. Generally, when this type of water is available, there is enough to meet all Contractor requests for it. It is only when total Contractor requests for this water exceed the amount available that DWR would need to allocate that limited supply among Contractors. If this situation occurred, the Project could result in a reduction in the amount of unscheduled surplus water/Article 21 water that WRMWSD could obtain (because it is allocated based on Contractor Table A Amounts). Because this reduction is minor, and would only occur infrequently, the reduction in the amount of unscheduled surplus water/Article 21 water that WRMWSD could obtain would not materially affect WRMWSD's surplus water supply and the impact would be less than significant.

All SWP Allocation Scenarios under 2020 SWP Demand Conditions – Table 3.15-16 presents the results of the analysis of WRMWSD's SWP Table A supply under the 2020 SWP demand conditions used in the DWRSIM study, and under the various hydrologic conditions considered (average year, single dry year, and multiple dry year period) and water allocation scenarios (With Monterey Amendment, Without Monterey Amendment, and With Article 18(b) Implemented). Under current SWP allocation rules (With Monterey Amendment), implementation of the Project would result in a reduction in the Table A supply available to WRMWSD of 32,000 AF, 9,200 AF, and 17,600 AF under the average year, single dry year, and multiple dry year period conditions, respectively. Considering all allocation scenarios, the largest reduction in supplies available to WRMWSD with implementation of the Project would be: 34,900 AF under average year conditions With Article 18(b) Implemented; 9,200 AF under a single dry year With Monterey Amendment; and 17,600 AF under a multiple dry year period With Monterey Amendment.

The amount of SWP supply available for a given Table A Amount is somewhat less under 2020 SWP demand conditions than under the existing SWP demand conditions discussed previously. This SWP supply reduction is primarily due to two factors: an increase in future water use upstream of the Delta, which reduces the amount of water flowing into the Delta and therefore the amount available for SWP supplies; and, an increase in SWP Contractor demands, which in certain years when supplies are limited, can result in less SWP supply being allocated to a given Table A Amount. This supply reduction is independent of the Project, and can be seen by comparing the supplies between Table 3.15-15 (existing SWP demands) and Table 3.15-16 (2020 SWP demands). Assuming that future WRMWSD water demand remains at current levels, it is likely that WRMWSD would need to rely more on other water management actions and/or individual farmers within the district would use additional local groundwater (i.e., groundwater pumped from wells owned and operated by farmers) to meet demands within the district (refer to Appendix C). This would occur with or without the Project, although the Project would exacerbate this condition.

Under current SWP allocation rules (With Monterey Amendment) and with implementation of the Project, WRMWSD could expect to receive at least 180,000 AF (their minimum demands under favorable economic conditions) approximately 31 percent of the time, and at least 190,000 AF approximately 20 percent of the time. In addition, WRMWSD could expect to receive an

Table 3.15-16. WRMWSD's SWP Table A Supply at 2020 SWP Demand Conditions, Under all SWP Allocation Scenarios[1]
(all values in AF, rounded to the nearest 100 AF)

		Table A Amount	*Average Year*	*Single Dry Year*	*Multiple Dry Year Period[2]*
With Monterey Amendment	Without the Project	238,100	185,700	53,500	102,200
	With the Project	197,100	153,800	44,300	84,600
	Difference[3]	***41,000***	***32,000***	***9,200***	***17,600***
Without Monterey Amendment	Without the Project	238,100	165,300	42,200	98,100
	With the Project	197,100	136,900	35,000	81,200
	Difference[3]	***41,000***	***28,500***	***7,300***	***16,900***
With Article 18(b) Implemented[4]	Without the Project	113,800	202,900	12,300	99,300
	With the Project	94,200	168,000	10,200	82,200
	Difference[3]	***19,600***	***34,900***	***2,100***	***17,100***

Note: Numbers may not add due to rounding.
1. Based on water deliveries from DWRSIM study 2020D09C-CALFED-786.
2. Multiple dry year period supplies shown are average annual supplies over the four-year period.
3. Supplies shown are the amount of water attributable to the 41,000 AF of Table A Amount.
4. Under the SWP allocation scenario With Article 18(b) Implemented, the Table A Amounts shown are estimates of WRMWSD's reduced Table A Amount, based on its proportionate share of a reduced SWP minimum project yield of 2.0 million AF. The supplies shown include both Table A supplies and scheduled surplus supplies estimated to be available, with surplus supplies allocated based on priority for agricultural use.

average SWP Table A supply approximately 11 percent greater than historic SWP deliveries to WRMWSD from 1990 to 1999 (137,360 AF). Considering all allocation scenarios, with implementation of the Project WRMWSD could expect to receive average SWP Table A supplies ranging from approximately 136,900 AF to 168,000 AF, which is approximately 0.3 percent less to 22 percent more than the amount of historic SWP deliveries to WRMWSD from 1990 to 1999.

As previously discussed, the decision to use local groundwater (i.e., groundwater pumped from wells owned and operated by farmers) or other previously banked water supplies on lands within WRMWSD is predominately an economic decision made by farmers. Due to the complexity of factors that may be considered by individual farmers when deciding to use local groundwater in-lieu of using imported water, the exact amount of additional reliance on groundwater that may occur in dry years cannot be determined (refer to Appendix C). Because the Project could result in a reduction in average year SWP supplies below historic average deliveries to WRMWSD from 1990 to 1999 (only in the Without Monterey Amendment scenario) of up to 9,200 AF of Table A water in a single dry year, and up to 17,600 AF of Table A water in a multiple dry year period, this is assumed to be the amount of additional use of local groundwater that could be contributed by the Project in these year types. These amounts are small relative to the total amount of water in storage in the Kern County Groundwater Basin (total storage is 40 million AF; DWR 2003a) and the White Wolf sub-basin (total storage is about 2.5 million AF; BE 1975). Because groundwater levels in the portions of these basins underlying

WRMWSD have been generally increasing over time (BE 1995), indicating that the basins could sustain an increase in use under these limited conditions without resulting in a net deficit in aquifer volume or a lowering of the local groundwater table, impacts to groundwater would be less than significant.

For reasons similar to those identified above, the Project would result in a minor reduction in the amount of unscheduled surplus water/Article 21 water that WRMWSD could obtain, although this reduction would not materially affect WRMWSD's surplus water supply.

Comparison of WRMWSD Supplies Presented to Supplies based on DWR's Recent SWP Delivery Reliability Report – As discussed in section 3.15.2.2, DWR recently completed an analysis of the delivery reliability of the SWP in its SWP Delivery Reliability Report. This DWR report presents the results of CALSIM II model studies run using current allocation rules (i.e., With Monterey Amendment). Starting with these same DWR results and applying the same methodology suggested by DWR in its report, the Project would result in a decrease in WRMWSD's SWP supplies: under "existing" (2001 in DWR's SWP Delivery Reliability Report) conditions of 29,400 AF, 8,000 AF, and 14,800 AF under the average year, single dry year, and multiple dry year period conditions, respectively; and under 2020 conditions of 30,600 AF, 8,200 AF, and 15,000 AF under the average year, single dry year, and multiple dry year period conditions, respectively.

Water Quality

All SWP Allocation Scenarios under Existing SWP Demand Conditions – Overall, within the WRMWSD the Project may result in a minor increase in the use of previously banked water and local groundwater in the drier hydrologic years. Water banked outside of the WRMWSD would be delivered to the district as a SWP water exchange, and would be the same quality as SWP supplies. Water banked within the WRMWSD would be the same quality as the groundwater quality, which has slightly higher TDS than SWP water. The Project may result in a minor increase in the use of water banked with the district and groundwater in the drier hydrologic years, and these sources generally have higher TDS concentrations. Because this water is of sufficient quality for agricultural operations, impacts to surface water quality would be less than significant. Because the increased use of water banked within the district and local groundwater would be minor and would occur infrequently (in drier hydrologic years), the minor use of these supplies and the additional increase in TDS from irrigation related uses would result in less than significant impacts to groundwater quality.

All SWP Allocation Scenarios under 2020 SWP Demand Conditions - The decrease in SWP delivery reliability due to an increase in future levels of demand by M&I Contractors would result, with the transfer, in the use of more groundwater and banked water to meet agricultural needs within the WRMWSD. For the reasons noted above, impacts to surface and groundwater quality would be less than significant.

INDIRECT IMPACTS

No indirect impacts to water resources would occur.

Castaic Lake Water Agency

DIRECT IMPACTS

Potential direct impacts from implementation of the Project to water supply, including groundwater resources and water quality are addressed below. Because the Project would be implemented using existing CLWA facilities and new facilities would not be required, construction and land disturbance related impacts would not occur.

The Project increases CLWA's Water Supply Contract Table A Amount by 41,000 AF (from 54,200 AF to 95,200 AF, an increase of 75.6 percent). Because SWP water supplies are allocated among Contractors on the basis of Table A Amounts, this increase in Table A would result in an increase in the total amount of SWP water that CLWA could obtain (including both Table A and any available surplus water supplies). Under all SWP allocation and hydrologic scenarios, the Project would result in a maximum increase in the SWP Table A water available to CLWA of approximately 75.6 percent.

As discussed in section 3.15.2.2, the supplies presented below are Table A supplies only (or in the case of the allocation scenario With Article 18(b) Implemented, Table A supplies and scheduled surplus water), and do not include unscheduled surplus water or Article 21 water.

Water Supply

All SWP Allocation Scenarios under Existing SWP Demand Conditions – Table 3.15-17 presents the results of the analysis of CLWA's SWP Table A supply under the existing (1998) SWP demand conditions used in the DWRSIM study, and under the various hydrologic conditions (average year, single dry year, and multiple dry year period) and water allocation scenarios (With Monterey Amendment, Without Monterey Amendment, and With Article 18(b) Implemented) considered. Under current SWP allocation rules (With Monterey Amendment), implementation of the Project would result in an increase in the Table A supply available to CLWA of 34,400 AF, 9,200 AF, and 18,100 AF under the average year, single dry year, and multiple dry year period conditions, respectively. Considering all allocation scenarios, the largest increase in supplies available to CLWA with implementation of the Project would be 35,300 AF under average year conditions With Article 18(b) Implemented; 9,200 AF under a single dry year With Monterey Amendment; and 18,100 AF under a multiple dry year period With Monterey Amendment. The Project would increase CLWA's SWP Table A Amount and increase the amount of SWP water that could be delivered to CLWA. This increased water supply would serve the needs of both existing water users and a portion of future water demand from anticipated growth within the CLWA service area.

Because CLWA could obtain up to an additional 41,000 AF of Table A water (depending on hydrologic conditions) to meet water demands of existing users and a portion of future water demand from anticipated growth within the service area, the Project would have a beneficial impact to water supplies in the CLWA service area. Because the Project would increase the amount of SWP water delivered to the CLWA service area, replacing water that could have otherwise been pumped from groundwater, the Project would have a beneficial impact to groundwater resources via indirect recharge (or percolation) through irrigation with SWP water.

Table 3.15-17. CLWA's Total SWP Table A Supply at Existing SWP Demand Conditions, under all SWP Allocation Scenarios[1]

(all values in AF, rounded to the nearest 100 AF)

		Table A Amount	*Average Year*	*Single Dry Year*	*Multiple Dry Year Period*
With Monterey Amendment	Without the Project	54,200	46,500	12,100	24,000
	With the Project	95,200	80,900	21,300	42,100
	Difference[3]	***41,000***	***34,400***	***9,200***	***18,100***
Without Monterey Amendment	Without the Project	54,200	47,400	13,100	25,200
	With the Project	95,200	80,100	13,100	38,900
	Difference[3]	***41,000***	***32,700***	***0***	***13,700***
With Article 18(b) Implemented[4]	Without the Project	25,900	46,400	12,900	24,400
	With the Project	45,500	81,700	14,900	41,700
	Difference[3]	***19,600***	***35,300***	***2,000***	***17,300***

Note: Numbers may not add due to rounding.

1. Based on water deliveries from DWRSIM study 1995D06E-CALFED-771. This study used 1998 DWR estimates of then-existing SWP Contractor demands.
2. Multiple dry year period supplies shown are average annual supplies over the four-year period.
3. Supplies shown are the amount of water attributable to the 41,000 AF of Table A Amount.
4. Under the SWP allocation scenario With Article 18(b) Implemented, the Table A Amounts shown are estimates of CLWA's reduced Table A Amount, based on its proportionate share of a reduced SWP minimum project yield of 2.0 million AF. The supplies shown include both Table A supplies and scheduled surplus supplies estimated to be available, with surplus supplies allocated based on priority for agricultural use.

As was discussed previously, the supplies presented above do not include unscheduled surplus water/Article 21 water. Generally, when this type of water is available, there is enough to meet all Contractor requests for it. It is only when total Contractor requests for this water exceed the amount available that DWR would need to allocate that limited supply among Contractors. If this situation occurred, the Project could result in an increase in the amount of unscheduled surplus water/Article 21 water that CLWA could obtain (because it is allocated based on Contractor Table A Amounts). Since this increase would only occur infrequently, the increase in the amount of unscheduled surplus water/Article 21 water that CLWA could obtain would not materially affect CLWA's surplus water supply.

All SWP Allocation Scenarios under 2020 SWP Demand Conditions – Table 3.15-18 presents the results of the analysis of CLWA's SWP Table A supply under the 2020 SWP demand conditions used in the DWRSIM study, and under the various hydrologic conditions (average year, single dry year, and multiple dry year period) and water allocation scenarios (With Monterey Amendment, Without Monterey Amendment, and With Article 18(b) Implemented) considered. Under current SWP allocation rules (With Monterey Amendment), implementation of the Project would result in an increase the Table A supply available to CLWA of 32,000 AF, 9,200 AF, and 17,600 AF under the average year, single dry year, and multiple dry year period conditions, respectively. Considering all allocation scenarios, the largest increase in supplies available to CLWA with implementation of the Project would be: 34,900 AF under the average year With Article 18(b) Implemented; 9,200 AF under a single dry year With Monterey Amendment; and 17,600 AF under a multiple dry year period With Monterey Amendment.

The Project would increase CLWA's SWP Table A Amount and increase the amount of SWP water that could be delivered to CLWA. This increased water supply would serve the needs of both existing water users and a portion of future water demand from anticipated growth within

the CLWA service area. Because CLWA could obtain up to an additional 41,000 AF of Table A water (depending on hydrologic conditions) to meet water demands of existing users and a portion of future water demand from anticipated growth within the service area, the Project would have a beneficial impact to water supplies in the CLWA service area. Because the Project would increase the amount of SWP water delivered to the CLWA service area, replacing water that could have otherwise been pumped from groundwater, the Project would have a beneficial impact to groundwater resources via indirect recharge (or percolation) through irrigation with SWP water.

For reasons similar to those identified above, the Project would result in an increase in the amount of unscheduled surplus water/Article 21 water that CLWA could obtain, although this increase would not materially affect CLWA's surplus water supply.

Table 3.15-18. CLWA's Total SWP Table A Supply at 2020 SWP Demand Conditions, under all SWP Allocation Scenarios[1]
(all values in AF, rounded to the nearest 100 AF)

		Table A Amount	*Average Year*	*Single Dry Year*	*Multiple Dry Year Period[2]*
With Monterey Amendment	Without the Project	54,200	42,900	12,200	23,300
	With the Project	95,200	74,900	21,400	40,900
	Difference[3]	***41,000***	***32,000***	***9,200***	***17,600***
Without Monterey Amendment	Without the Project	54,200	43,500	12,400	23,300
	With the Project	95,200	72,000	19,600	40,200
	Difference[3]	***41,000***	***28,500***	***7,300***	***16,900***
With Article 18(b) Implemented[4]	Without the Project	25,900	43,000	12,800	23,300
	With the Project	45,500	78,000	15,000	40,400
	Difference[3]	***19,600***	***34,900***	***2,100***	***17,100***

Note: Numbers may not add due to rounding.
1. Based on water deliveries from DWRSIM study 2020D09C-CALFED-786.
2. Multiple dry year period supplies shown are average annual supplies over the four-year period.
3. Supplies shown are the amount of water attributable to the 41,000 AF of Table A Amount.
4. Under the SWP allocation scenario With Article 18(b) Implemented, the Table A Amounts shown are estimates of CLWA's reduced Table A Amount, based on its proportionate share of a reduced SWP minimum project yield of 2.0 million AF. The supplies shown include both Table A supplies and scheduled surplus supplies estimated to be available, with surplus supplies allocated based on priority for agricultural use.

Comparison of CLWA Supplies Presented to Supplies based on DWR's Recent SWP Delivery Reliability Report – The existing SWP water supplies included in Table 3.15-7 are based on results from DWR's recent SWP Delivery Reliability Report, which presents the results of CALSIM II model studies run using current allocation rules (i.e., With Monterey Amendment). Starting with these same DWR results and applying the same methodology suggested by DWR in its report, the Project would result in an increase in CLWA's SWP supplies: under "existing" (2001 in DWR's SWP Delivery Reliability Report) conditions of 29,400 AF, 8,000 AF, and 14,800 AF under the average year, single dry year, and multiple dry year period conditions,

respectively; and under 2020 conditions of 30,600 AF, 8,200 AF, and 15,000 AF under the average year, single dry year, and multiple dry year period conditions, respectively.

Water Quality

The Project would result in the delivery of additional SWP water to the CLWA service area when demands are sufficient to make such deliveries feasible. Although SWP water quality varies from year to year depending on hydrologic conditions, regardless of the SWP allocation scenario (With Monterey Amendment, Without Monterey Amendment, and With Article 18(b) Implemented) and the SWP demand conditions (existing or 2020), the Project would not result in a direct impact to water quality within the CLWA service area. CLWA and the local purveyors would continue to meet all applicable drinking water standards and water quality criteria.

The Project would not result in direct surface water quality impacts. CLWA has no discharge permits regulating water quality and is only regulated with regard to the drinking water quality of distributed potable water. It is the actual use of the imported water and discharge after use (i.e., as wastewater) that has the potential to affect water quality of surface waters. This potential impact was considered in the Basin Plan and is considered in the discussion of indirect growth-related impacts in Chapter 4. The Project would not affect the frequency and magnitude of flood flow releases or spills from Castaic Lake. These events are related to rights of downstream users and not related to CLWA or the Project.

INDIRECT IMPACTS

Potential impacts from population growth that could occur as an indirect impact of the Project are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.15.3 Mitigation Measures

3.15.3.1 State Water Project and Associated Facilities

No significant direct or indirect impacts to water resources were identified; therefore no mitigation measures are required.

3.15.3.2 Wheeler Ridge-Maricopa Water Storage District

No significant direct or indirect impacts to water resources were identified; therefore no mitigation measures are required.

3.15.3.3 Castaic Lake Water Agency

No significant direct impacts to water resources were identified; therefore no mitigation measures are required. Mitigation measures for indirect impacts are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.15.4 Significant Unavoidable Impacts

No direct or indirect significant unavoidable adverse impacts have been identified within the SWP and associated facilities or within WRMWSD. No direct significant unavoidable adverse impacts have been identified within the CLWA service area. Indirect impacts within the CLWA service area, including significant unavoidable adverse impacts are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

4.0 GROWTH-INDUCING EFFECTS AND GROWTH-RELATED IMPACTS

4.1 GROWTH-INDUCING EFFECTS

CEQA Requirements

CEQA Guidelines Section 15126.2(d) states that an EIR must discuss the ways in which a Project could:

- foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment;
- remove obstacles to population growth;
- require the construction of new community facilities that could cause significant environmental effects;
- encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively.

The Guidelines further state that it must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment. The analysis below discusses whether the Project is growth inducing using the CEQA definition. Consistency with growth projections included in local and regional planning documents is addressed in Chapter 5.

General Factors Affecting Population Growth

Growth does not necessarily result from only one project or factor in a community. Rather, several factors affect the location, size, direction, timing, type and rate of population growth, depending on the region where the community is located. These factors include local government planning, public services, natural resources, economic climate, and political and environmental concerns. City and county planning agencies adopt and administer general and specific plans, zoning maps and ordinances, and other planning documents that contain policies and maps to identify the intensity and type of development that would be allowed in specific locations. As part of the local government development approval process, wholesale and retail water purveyors provide information on their ability to serve additional water users; however, local jurisdictions other than wholesale or retail water purveyors ultimately control development approval decisions.

Although local governments play a role in growth management, the location and timing of growth also depends on economic factors such as the availability and cost of developable land, recessions in local and national economies, interest rates, and demand for housing. Political factors include state and local laws that mandate businesses to comply with certain rules, regulations, and permitting requirements that address environmental and community concerns. Other political decisions also impact growth, such as alleviation of property taxes as an incentive to lure businesses to certain communities. Quality of life issues such as crime, climate, air quality, traffic and commuting distances, as well as the availability, cost and quality

of community services such as schools, transportation facilities, recreation facilities, and police and fire protection, may also be important factors influencing the timing and location of growth.

Growth Inducement Associated with the State Water Project and Associated Facilities

The Project does not include construction or modification of existing SWP facilities, nor would it change the current operating criteria or materially change the operation of the SWP and its associated facilities. As described in Chapter 3, implementation of the Project would result in no impacts or minor impacts to environmental resources associated with the SWP, none of which would trigger any of the four CEQA criteria listed above. The Project would not be growth inducing in the areas that comprise the SWP and its associated facilities.

Growth Inducement in WRMWSD

The Project does not include construction of new facilities or the modification of existing facilities within WRMWSD; nor would it change their existing operation. As described in Chapter 3, implementation of the Project would result in no impacts or minor impacts to environmental resources within the WRMWSD, none of which would trigger any of the four CEQA criteria listed above. The Project would not be growth inducing in the areas that comprise the SWP and its associated facilities.

Growth Inducement in the CLWA Service Area

The Project is an action by CLWA to maintain the water supply needed to meet water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area. As described in section 3.0, however, in order to provide a "worst-case" analysis, it is assumed that all of the Project water would be used to serve new population. Thus, it is assumed that the Project could serve 106,700 new persons and 35,600 new housing units given an average year water supply. The Project would remove an obstacle to population growth by providing additional SWP water within the CLWA service area. Because it would remove such an obstacle, the Project may indirectly foster economic or population growth or the construction of additional housing within the CLWA service area. CEQA Guidelines Section 15126.2 (d) states that it must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment. Potential environmental impacts from growth that could result from the Project are addressed in section 4.2 below.

4.2 GROWTH-RELATED IMPACTS

Introduction

CEQA Guidelines Section 15064(d) requires that an EIR evaluate the indirect impacts of a project. Indirect impacts are those that are caused by a project and are reasonably foreseeable, but that may occur later in time or at some distance from the project site(s). Growth-related impacts are the indirect impacts of population growth or development, such as the conversion of open land to developed land, added traffic, and increased demand for public services.

CLWA has the responsibility to provide wholesale water to retail purveyors within the CLWA service area, but does not approve the locations of new development. City and county

planning agencies are responsible for creating land use plans that direct where development should occur and for enforcing those plans. The Project would provide water that could be used by new development in the CLWA service area, but it would not affect the specific locations of planned development.

This EIR generally discusses growth-related impacts in a qualitative manner based on the likely changes that could occur as a result of future land use changes and/or specific development projects within the CLWA service area. It references impacts identified in the Final EIR for the City of Santa Clarita General Plan (City of Santa Clarita 1991) since this document provides the most current and comprehensive overview of environmental impacts resulting from projected growth in the Santa Clarita Valley.

4.2.1 Aesthetic/Visual Resources

Significant growth-related impacts to aesthetic/visual resources may include changes to the visual characteristics and resources of the area through the development of open space and further urbanization of hillside and natural areas. Development could result in substantial adverse effects on scenic vistas, substantially damage scenic resources, or substantially degrade the existing visual character or quality of individual sites and their surroundings. Further, potential development within the CLWA service area could also result in an increase in the amount of night lighting and unwanted glare in presently undeveloped areas. Haphazard development could obstruct scenic views of, and from, the project area and contribute to a "confused urban image."

Mitigation Measures

Impacts to aesthetic/visual resources would be reduced by local governments implementing existing policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans (see Table 4.2-1 for a listing of applicable policies). Impacts may not be fully mitigable to less than significant, however, depending on the magnitude of future development and its specific location. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review, as required under CEQA. Implementing these plans and policies would also reduce adverse but less than significant project impacts.

4.2.2 Agricultural Resources

The amount of land designated for agriculture within the Santa Clarita Valley planning area is small (roughly 1 square mile [City of Santa Clarita 1991]). Most of the land designated for agricultural purposes is present in the Ventura County portion of the CLWA service area. This land is located on the Santa Clara River floodplain, primarily along the Highway 126 corridor. A substantial portion of the agricultural land in the Los Angeles County portion of the service area has been recently re-designated by the County of Los Angeles to other land uses defined in the Newhall Ranch Specific Plan. The State of California Farmland Mapping and Monitoring Program has designated approximately 3 percent of the mapped area within the CLWA service area as either Prime Farmland, Unique Farmland, or Farmland of Statewide Importance. Impacts to agricultural resources could be significant because there is a potential for these lands to be

Table 4.2-1. Summary of Mitigation Measures from Plans and Policies

Environmental Resources	APPLICABLE PLANS AND POLICIES					
	County of Los Angeles –General Plan	*County of Los Angeles - Santa Clarita Area Plan*	*City of Santa Clarita – General Plan*	*County of Ventura – General Plan*	*County of Ventura – Piru Area Plan*	*Other Plans*
Aesthetic/Visual Resources	Scenic Highways Element Circulation policies 9 through 14. Conservation and Open Space Element policies 18, 19, and 24	Circulation Element contains policies 4.1 - 4.3 Community Design Element policies (1.1, 2.1, 3.1, 3.2 through 3.7)	Community Design Element policies 1.1 through 1.3, 2.1 through 2.6, 3.1 through 3.6, 4.1 through 4.4, 5.1 through 5.3, 6.1 through 6.8, 7.1 through 7.4, 8.1 through 8.5, 9.1 through 9.10, 10.1 through 10.5, and 11.1 through 11.9	Scenic Resources policies 1 through 5	Scenic Resources policies (1 through 5)	None
Agricultural Resources	Land Use policy 7, 20 and 21. Conservation and Open Space Element policy 7	None	None	Farmland Resources policies 1 through 6	Agricultural Soils policies 1 and 2	None
Air Quality	Conservation and Open Space Element policy 1	Environmental Resources Management Element policy 1.8	Air Quality Element 1.1, 1.2, 7.1, 8.1 through 8.3, 9.1, 14.1, 15.1, and 15.2. Mobile emissions are controlled by policies 1.1, 1.2, 12.1 through 12.3, 2.1 through 2.5, 3.1, 4.1, 5.1, 6.1, 10.1, 10.2, 11.1, and 11.2	Air quality policies 1 through 6	Air quality policies 1 through 5	SCAQMD *1997 Air Quality Management Plan* and the *1999 Revised Ozone Plan* SCAQMD proposed comprehensive plan update, *Proposed 2003 Air Quality Management Plan*
Biological Resources	Conservation and Open Space Element policy 8 and 13	Land Use Element policy 5.3 and 5.4. Environmental Resources Management Element policies 1.1through 1.4, 1.9, and 2.1 through 2.3	Land Use Element policy 1.10. Open Space and Conservation Element policies 1.1, 1.5, 1.6, 1.7, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 5.5, and 7.7	Biological Resources policies 1 through 5	Biological Resources policies 1, 2 and 3	Section 404 of the Clean Water Act, Section 10 of the Endangered Species Act, and Section 1600 of the Fish and Game Code

Table 4.2-1. Summary of Mitigation Measures from Plans and Policies

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Environmental Resources	Applicable Plans and Policies					
	County of Los Angeles –General Plan	*County of Los Angeles - Santa Clarita Area Plan*	*City of Santa Clarita – General Plan*	*County of Ventura – General Plan*	*County of Ventura – Piru Area Plan*	*Other Plans*
Cultural Resources	Conservation and Open Space Element policies 20 through 23	Environmental Resources Management Element policy 1.6 and 1.7	Open Space and Conservation Element policies 10.1 through 10.6	Paleontological and Cultural Resources policies 1 through 6	Cultural Resources policies 1 through 3	None
Geology, Soils, and Minerals	Land Use Element policies 7, 25, 26, and 28. Safety Element policies 1 through 7, 8, and 10. Conservation and Open Space Element policy 17	Land Use Element policies 4.1, 4.2. Safety Element policy 3.3, and 4.2. Environmental Resources Management Element policy 3.3	Open Space and Conservation Element policies 2.2, and 5.1. Safety Element policies 1.3 through 1.6, 1.8, 1.12, 1.13	Hazards policies 1 through 3. Fault Rupture policies 1 through 6. Ground Shaking policy 1. Seiche policies 1 and 2. Liquefaction policy 2, Subsidence policies 1 through 3, Expansive Soils policies 1 through 3, and Landslides/Mudslides policies 1 through 3. Water Resources policy 3. Mineral Resources policy 6 and 8	This plan contains goals for protecting sand, gravel, oil, and gas resources, and avoiding land uses that would preclude or hamper access to or extraction of such resources	State of California Uniform Building Code.
Hazards and Hazardous Materials	Conservation and Open Space Element policy 29. Safety Element's Wildland and Urban Fire Hazards policies 15 through 19. Hazardous Materials policies 20 through 24. Emergency Response, Preparedness and Recovery policies 25 through 35. Research and Safety Information Systems policies 36 through 38	Land Use Element policy 4.1. Environmental Resources Management Element policy 4.3. Safety Element policy 2.1	Safety Element policies 2.1, 3.1 through 3.10, and 4.1 through 4.5	Hazardous Materials and Waste policies 1 through 5. Fire Hazards policies 1 through 4	Fire Hazards policies 1 through 3.	None
Land Use and Planning	Land Use Element policies	Land Use Element policies	Land Use Element policies	Land Use Element policies 1 through 11	General land use policies 1 through 8	None
Noise	Noise Element policies 1 though 16	Noise Element policies 1.2 and 1.3	Noise Element policies 1.2 and 1.4, 2.1 through 2.8, 3.1 through 4.3	Noise policies 1 through 3	Noise policies 1 through 3	None

Table 4.2-1. Summary of Mitigation Measures from Plans and Policies

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Environmental Resources	APPLICABLE PLANS AND POLICIES					
	County of Los Angeles –General Plan	*County of Los Angeles - Santa Clarita Area Plan*	*City of Santa Clarita – General Plan*	*County of Ventura – General Plan*	*County of Ventura – Piru Area Plan*	*Other Plans*
Population and Housing	Population projections	Population projections and Land Use Element policies	Population projections and Land Use Element policies	Population projections	Land use policy and associated building intensity/population density standards	None
Public Services	None	Land Use Element policy 7.1	Land Use Element policies 1.2 through 1.5. Public Services, Facilities, and Utilities Element 1.2 through 1.5, 1.14, 1.16 through 1.18, 2.1, and 2.2	Public Facilities and Services policies 1 through 3. Law Enforcement and Emergency Services policies 1 through 5. Fire Protection policies 1 through 2. Fire Hazards policies 1 through 4	Education policies 1 through 3. Law Enforcement policies 1 through 3. Fire Protection policy 1	Leroy F. Green School Facilities Act of 1998 (SB 50) provides a statewide financing program for school facilities
Recreation	Conservation and Open Space Element policies 30 through 33	Environmental Resources Management Element policies 5.1 through 5.7. Trails policies 6.1 through 6.6. Bikeways policies 7.1 through 7.6	Parks and Recreation Element policy 4.1	Parks and Recreation policies 1 through 3 and 6	Recreation policies 2 and 3	Los Angeles County Ordinance 21.24.340 *et seq.*, the Parkland Dedication Ordinance, requires that the subdivider of a residential subdivision "shall provide local park space to serve the subdivision, pay a fee in lieu of provision of such park land . . provide local park space containing less than the required obligation but developed with amenities equal in value to the park fee, or do a combination of the above.
Transportation and Circulation	Transportation Element Circulation policies 1 through 41. Plan of Bikeways policy 2	Circulation Element policies 1.1 through 1.7, and 2.1 through 2.3	Land Use Element policies 1.1, 1.8,and 1.9	Transportation/Circulation policies 1 through 6	Transportation and Circulation policies 1 through 6	Southern California Association of Governments – 2001 Regional Transportation Plan

Table 4.2-1. Summary of Mitigation Measures from Plans and Policies

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Environmental Resources	APPLICABLE PLANS AND POLICIES					
	County of Los Angeles –General Plan	*County of Los Angeles - Santa Clarita Area Plan*	*City of Santa Clarita – General Plan*	*County of Ventura – General Plan*	*County of Ventura – Piru Area Plan*	*Other Plans*
Utilities/Service Systems	Public Facilities policies 1 through 10, 12 through 15, 17 through 20, and 25	Public Services and Facilities Element policies 2.1 and 2.2. Land Use Element policy 7.1	Public Services, Facilities, and Utilities Element policies 1.2 through 1.5, 1.14, 1.16 through 1.18, 2.3, 2.6, 2.7, 5.1, and 5.6	Waste Treatment and Disposal Facilities policies 1 through 6. Flood Control and Drainage Facilities policies 1 and 2	Sanitation Services policies 1 and 3	None
Water Resources	Conservation and Open Space Element policies 4 through 6, and 26. Safety Element policies 11 through 14	Public Services and Facilities Element policies 1.1, 1.2, 3.3, and 4.1	Open Space and Conservation Element policies 5.1 through 5.3, 5.6, and 7.1 through 7.15, and 7.3. Public Services, Facilities, and Utilities Element policies 1.2, 1.3 through 1.7, and 1.8. Public Safety Element policy 1.10	Water Resources policies 1 through 5. Flood Hazards policies 1 through 4. Water Supply Facilities policies 1 and 2	Water policies 1 and 2. Flood Hazards policies 1 through 3	The LARWQCB Basin Plan and Santa Clara River Basin Plan

converted to non-agricultural use or for changes in agricultural zoning to be approved by local jurisdictions in order to allow a higher density or intensity of development.

Mitigation Measures

Impacts to agricultural resources would be mitigated to less than significant by local governments implementing existing policies listed in Table 4.2-1 of the County of Los Angeles General Plan, the County of Ventura General Plan, and the Piru Area Plan since these contain measures to preserve and protect agricultural land. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review, as required under CEQA. Implementing these plans and policies would also reduce adverse but less than significant project impacts.

4.2.3 Air Quality

Population, employment, and manufacturing growth would result in increased air pollutant emissions for which the SCAB does not currently meet federal or state standards. Toxic emissions may result from some industrial development. Additionally, mobile emissions from vehicle operations would increase, including localized CO concentrations and PM_{10} emissions. Fugitive dust emissions also would result from construction.

A determination of the Project's consistency with the 2003 AQMP, which includes assumptions and objectives that demonstrate future attainment of the ambient air quality standards within the project region, is largely dependent on the planning factors selected to estimate growth served by the Project. The SCAQMD used SCAG demographic and economic factors found in the 2001 Regional Transportation Plan (RTP) to forecast future emissions in the 2003 AQMP. SCAG currently projects that the 2025 population for the Santa Clarita Valley will be 352,382, with 126,563 households (personal communication, P. Gutierrez 2003). The Project can serve approximately 106,700 persons. Adding this to the 2000 population of 190,000 produces an estimated population of 296,700, which is lower than the SCAG 2025 projection. Therefore, the Project would be consistent with the 2003 AQMP.

Other impacts would be significant because development could violate air quality standards or contribute substantially to an existing or projected air quality violation. It also could result in a cumulatively considerable net increase in certain criteria pollutants for which the region is in non-attainment, and it could expose sensitive receptors to substantial pollutant concentrations. Certain types of industrial development could create objectionable odors affecting a substantial number of people if constructed without appropriate mitigations.

Mitigation Measures

Impacts to air quality would be reduced by local governments implementing existing policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans. Additionally, compliance with SCAQMD plans also would reduce air quality impacts (see Table 4.2-1). All impacts may not be reduced to less than significant levels, particularly since the Project area does not currently meet federal or state standards. Specific mechanisms for implementing these plans and policies would be determined in the course of project-specific

environmental review, as required under CEQA. Implementing these plans and policies would also reduce adverse but less than significant project impacts.

4.2.4 Biological Resources

The Project would provide water for land development, thereby indirectly affecting biological resources. Impacts to threatened and endangered species and other sensitive biological resources within the CLWA service area, including wetlands, generally would be adverse due to the conversion and degradation of habitat. Although increased water use may increase certain types of habitat areas (e.g., through increased runoff) resulting in a positive impact to wetlands, related land development would entail the loss, degradation, or fragmentation of habitats, which may result in local native plant and wildlife populations, including sensitive species, being reduced in size and made increasingly vulnerable to local extinction. Non-native species introduced through ornamental landscaping or habitat disturbances could compete with native species or invade previously disturbed habitats, including those of special status species. Additionally, development could disrupt established wildlife corridors and impede the use of native wildlife nursery sites. These impacts would be significant.

Increased wastewater treatment plant discharges, additional runoff from impervious surfaces (i.e., surfaces that are incapable of being penetrated by moisture) and new runoff from the irrigation of urban landscaping could increase the amount of wetlands and aquatic habitat below such discharges. However, water quality below these discharges could be degraded from pollutants (both point and non-point sources) carried in these waters. This could have a substantial adverse effect on riparian habitat and sensitive fish and amphibian populations, which would be a significant impact.

Development also could result in conflicts with local policies and ordinances protecting biological resources, which would be a significant impact. As noted in section 3.4, Biological Resources, however, there are no adopted HCPs or NCCPs within the CLWA service area. Federal and State Endangered Species Act compliance, as necessary, has been accomplished on a development-specific basis.

Mitigation Measures

Impacts to biological resources would be reduced by local governments implementing the existing policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans, although all impacts may not be reduced to less than significant depending on the magnitude and specific location of development (see Table 4.2-1). Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review, as required under CEQA. Implementing these plans and policies would also reduce adverse but less than significant project impacts. Regulatory agencies such as the U.S. Army Corps of Engineers (which has regulatory authority over wetlands), U.S. Fish and Wildlife Service, and California Department of Fish and Game also may impose permit conditions that reduce significant impacts.

4.2.5 Cultural Resources

As discussed in the EIR for the City of Santa Clarita General Plan, excavation and grading activities associated with future development could result in significant impacts to

archaeological, historical, and paleontological resources. Development also could result in significant impacts associated with the disturbance of human remains. Significant impacts on cultural resources may include the following:

- grading of prehistoric archaeological or paleontological sites, thereby demolishing the site and eliminating its ability to yield important information;
- construction of new buildings that could impair the setting of a historic structure or district, thereby altering the structure's or district's ability to embody distinctive characteristics of a type or period; or
- excavation of utility trenches for new developments that uncover human remains or a paleontologic deposit, thereby destroying those remains.

Mitigation Measures

Impacts to cultural resources would be mitigated to less than significant by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans since the policies contain measures for either avoiding impacts to such resources or providing adequate documentation of the resources (see Table 4.2-1). Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review, as required under CEQA. Implementing these plans and policies also would also reduce adverse but less than significant project impacts.

4.2.6 Geology, Soils, and Minerals

The County of Los Angeles, City of Santa Clarita, and Ventura County general plans all indicate that the CLWA service area contains a number of seismic hazards. Several active faults located in the general Project area, such as the San Gabriel, San Andreas, San Fernando, and Sierra Madre faults, could cause structural damage as a result of ground shaking, subsidence, and liquefaction. The San Gabriel fault is also capable of causing structural damage as a result of ground rupture. Depending on the location, new construction within the CLWA service area could expose people or structures to adverse effects, including risk of loss, injury, or death involving rupture of a known earthquake fault; strong seismic ground shaking; seismic-related ground failure, including liquefaction; and landslides. Liquefaction is most likely to occur in areas of the CLWA service area that are saturated at very shallow depths, such as adjacent to the Santa Clara River. Due to the rugged, high relief of the foothill and mountainous areas surrounding the Santa Clarita Valley, landslides and unstable slopes are present in many areas of the CLWA service area. The impacts on development are dependent upon the type of construction, proximity to faults, degree of slope, bedrock orientation within slopes, and soil type of individual project sites. Impacts throughout the CLWA service area could be significant.

There also is a potential for the CLWA service area to contain geologic units or soils that are unstable. Future development projects could be subject on- or off-site landslides, lateral spreading, subsidence, liquefaction, or collapse. This would be a significant impact.

As noted in the EIR for the City of Santa Clarita General Plan, new construction could result in localized soil erosion on or adjacent to future development sites, which could result in the loss

of topsoil and siltation of downstream drainages, creeks, and the Santa Clara River. This would be a significant impact.

The County of Los Angeles General Plan, City of Santa Clarita General Plan, and Ventura County General Plan all indicate that the CLWA service area contains expansive soils. Future development could be located on such soils, creating substantial risks to life or property. This would be a significant impact.

The County of Los Angeles General Plan, City of Santa Clarita General Plan, and Ventura County General Plan all indicate that the CLWA service area contains mineral resources such as gold, oil, and aggregate. The EIR for the City of Santa Clarita General Plan notes that if development encroached on mineral resource areas, the extraction of these resources could be incompatible if development is allowed in such areas. To the extent that future development resulted in the loss of availability of a known mineral resource that was of value to the residents of the region and state or the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan, impacts would be significant.

Mitigation Measures

Impacts to geology, soils, and minerals would be mitigated to less than significant by local governments implementing the existing policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans since these policies contain adequate measure to avoid or reduce such impacts (see Table 4-2). Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review, as required under CEQA. Implementing these plans and policies also would also reduce adverse but less than significant project impacts.

4.2.7 Hazards and Hazardous Materials

Operations of past and existing businesses and industries in the CLWA service area may have resulted in soil contamination from the use of hazardous materials, spills, or disposal of these materials. Therefore, depending on the specific location, new development on previously contaminated sites may require the removal or remediation of soils before property development can commence. New commercial and residential development also may result in increased transport, use, and disposal of hazardous materials, along with increased risks of hazardous substance releases. Certain types of development could impair implementation of or physically interfere with emergency response plans or emergency evacuation plans, and could result in increased exposure to wildland fires where urbanization is adjacent to such areas. These impacts would be significant. No airport-related risks would occur because the CLWA service area is not located within an airport land use plan area; nor is it in the vicinity of a public airport, public use airport, or private airstrip.

Mitigation Measures

Impacts to hazards and hazardous materials would be mitigated to less than significant by local governments implementing the following policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans since these contain adequate measures to avoid or reduce such impacts (see Table 4.2-1). Specific mechanisms for

implementing these policies would be determined in the course of project-specific environmental review, as required under CEQA. Implementing these plans and policies would also reduce adverse but less than significant project impacts.

4.2.8 Land Use and Planning

The residential, commercial, and industrial development that could occur in the future in the CLWA service area could convert undeveloped or agricultural portions of the service area to some form of urbanized development. While adopted policies and plans of local jurisdictions would reduce most potential conflicts between incompatible uses, these policies and plans may not eliminate building in some sensitive areas such as hillside management areas, open space areas, and sensitive wildlife habitat areas. In addition, as more land within the CLWA service area is developed, there may be more pressure to build in areas that have greater constraints, such as hillside areas, and to convert open space to developed uses. Depending on the location and type of development, there is the potential for new development to physically divide an established community. Without adequate mitigation, there also is a potential for some conflicts with adopted land use plans, policies, or regulations that were adopted for the purpose of avoiding or mitigating an environmental effect. These land use impacts would be considered to be significant. No HCPs or NCCPs have been adopted within the CLWA service area. Federal and State Endangered Species Act compliance has been accomplished on a development-specific basis. The County of Los Angeles has identified and protected areas of particular environmental concern through the designation of five specific SEAs in the Santa Clarita Valley. City and county planning agencies are responsible for creating land use plans that direct where development should occur and for enforcing those plans. While CLWA has the responsibility to provide wholesale water to water retailers within the CLWA service area, it does not approve the locations of new development. The Project would provide water that could be used by new development in the CLWA service area, but it would not affect the specific locations of planned development.

Mitigation Measures

Impacts to land use and planning would be mitigated to less than significant by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans since they contain adequate measures to reduce or avoid such impacts (see Table 4.2-1). Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review, as required under CEQA. Implementing these plans and policies would also reduce adverse but less than significant project impacts.

4.2.9 Noise

Development would result in an increase in ambient noise levels due to the potential increase in associated traffic. Long-term increases in noise levels also could be associated with commercial and industrial development. Residential areas and other sensitive receptors near transportation corridors and other noise generators may experience increased noise. Development also would result in short-term increases in local noise levels from construction and grading activities. Impacts would be significant if noise generated were in excess of local standards or if a substantial temporary or permanent increase in noise occurred. Impacts also

would be significant if development resulted in exposure of persons to excessive groundborne noise or vibration.

Mitigation Measures

Impacts to noise would be mitigated to less than significant by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans since they contain adequate measures to reduce or avoid such impacts (see Table 4.2-1). Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review, as required under CEQA. Implementing these plans and policies would also reduce adverse but less than significant project impacts.

4.2.10 Population and Housing

As described in section 3.0, given an average year water supply, it is assumed that the Project could serve 106,700 persons and 35,600 housing units. Impacts would be significant because the Project could indirectly induce substantial population growth in the CLWA service area. The Project would not displace substantial numbers of existing houses or substantial numbers of people.

Mitigation Measures

Impacts to population and housing would be mitigated to less than significant by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans since they contain adequate measures to reduce or avoid such impacts. Applicable plans and policies are listed in Table 4.2-1. Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review, as required under CEQA. Implementing these plans and policies would also reduce adverse but less than significant project impacts.

4.2.11 Public Services

Growth in the CLWA service area could result in impacts to the following public services:

Police - Increased demand for services from the Los Angeles County Sheriff's Department (which also contracts with the City of Santa Clarita to provide services), the Ventura County Sheriff's Department, and the California Highway Patrol would occur. This would include additional staffing, facilities, and equipment, and could affect response times to handle calls for service. Any special problems posed by new developments (e.g., roadway access or terrain) would be considered at the time the development is reviewed. Impacts could be significant since the new development could require new or physically altered governmental facilities, the construction of which could cause significant environmental impacts.

Fire - Increased demand for services from the Los Angeles County and Ventura County Fire departments and from private providers of emergency response/paramedic services for additional staffing, facilities, and equipment would occur and could affect response times to handle calls for service. Any special problems posed by new developments (e.g., roadway access or terrain) would be considered at the time the development is reviewed. Additional

considerations such as the location of a proposed new development in moderate or high fire hazard zones, the adequacy of water supplies/fire flows, and types of vegetative cover would be taken into account. In addition, State and County fire codes, standards and guidelines exist to which all developments must adhere. Impacts could be significant, since the new development could require new or physically altered governmental facilities, the construction of which could cause significant environmental impacts.

Schools - Growth would generate increased enrollments and the need for additional staffing, facilities, and resources in some or all of the school districts in the CLWA service area. All school districts in the service area have reported that they are either at capacity or are experiencing overcrowding, and temporary facilities are being used in every district. However, newly built schools since 2002 have eased the overcrowding to some degree. Additional enrollments would be considered at the time new development is reviewed, and would include input from affected school districts. Impacts are considered to be significant based on current capacity limitations since additional schools would likely have to be built, which could cause significant environmental impacts.

Libraries - Growth would generate increased demand for library services and associated need for staffing, facilities, and resources (books, magazines, periodicals, etc.) in some or all of the libraries in the CLWA service area. Library services provided by the County of Los Angeles Library Department in the Santa Clarita Valley are currently below planning standards, based on a planning standard of two material items per capita and 0.389 gross square feet of space per capita. Additional demands, including cumulative demands for square feet of library space and related resources would be considered at the time new development is reviewed. Impacts on libraries are considered to be significant based on current shortages, since additional libraries would likely have to be built, which could cause significant environmental impacts.

Mitigation Measures

Impacts to public services would be mitigated to less than significant by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans since they contain adequate measures to reduce or avoid such impacts (see Table 4.2-1). Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review, as required under CEQA. Implementing these plans and policies would also reduce adverse but less than significant project impacts.

4.2.12 Recreation

Significant growth-related impacts to recreational resources may include increased demand for recreational resources, such as public parks and trails and other recreation areas. This demand could exacerbate existing shortfalls in local parkland and may outpace the ability of public agencies to provide these resources.

Mitigation Measures

Impacts to recreation would be mitigated to less than significant by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans since they contain adequate measures to reduce or avoid such

impacts (see Table 4.2-1). Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review, as required under CEQA. Implementing these plans and policies would also reduce adverse but less than significant project impacts.

4.2.13 Transportation and Circulation

Growth in the CLWA service area would result in the following:

- Daily trips in the service area would potentially increase over current levels.
- There would be a related need for new private or public roadways, parking facilities, and for subsequent road maintenance.
- Increased demand for transit systems could occur, and there may be an alteration of present patterns of circulation.
- Roadways with existing capacity constraints could require upgrading or may experience further deterioration in levels of service.

The EIR for the City of Santa Clarita General Plan noted significant, potentially unmitigable impacts at certain isolated road segments from growth allowed under the General Plan. The segments most likely to be significantly affected are Bouquet Canyon Road near Haskell Canyon Road, McBean Parkway north of State Route 126, Soledad Canyon Road between Sierra Highway and Whites Canyon Road, Rye Canyon Road east of Interstate 5, and San Fernando Road between Newhall Avenue and State Route 14. In general, growth-related impacts would be significant because they could cause an increase in traffic that is substantial in relation to the existing load and capacity of the street system and could cause an exceedance of an established level of service standard. Specific developments could substantially increase hazards due to a design feature, or result in inadequate emergency access or parking capacity. Development also could conflict with adopted plans and policies or programs supporting alternative transportation. Air traffic is projected to increase throughout the southern California region regardless of whether the Project is implemented, and new or expanded airports are being evaluated. Planning efforts for these projects would be required to demonstrate that the new locations/expansions do not result in substantial safety risks.

Mitigation Measures

Impacts to transportation and circulation would be reduced, but not necessarily mitigated to less than significant, by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans due to the delay between the time improvements are needed and the time they can be provided (see Table 4.2-1). Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review, as required under CEQA. Implementing these plans and policies would also reduce adverse but less than significant project impacts. Impacts also would be reduced by compliance with the SCAG 2001 RTP.

4.2.14 Utilities/Service Systems

Solid Waste. Growth would generate increased demand for solid waste disposal services due to construction-related and operational impacts of new land development. Los Angeles County and Ventura County operate several landfills that serve the CLWA service area. The location and volume of waste generation, including cumulative demands, provision of recycling programs, and existing landfill capacity and expansion plans, would be considered at the time new development is reviewed. Impacts are considered significant, however, because an adequate supply of landfill space has not been ensured for the future and would remain so unless additional landfill space or other disposal alternatives are approved.

Water Treatment. Growth would increase the need for potable water and consequently create an increased demand for water treatment facilities operated by the four local purveyors and CLWA. The current combined capacity of the existing facilities (ESFP at 33.6 mgd and RVWTP at 30 mgd in 2003) is sufficient to treat approximately 40,000 AFY for potable use on an average annual basis and 71,000 AFY while operating at peak capacity. With the ESFP expansion project (construction started in September 2003 and is expected to be completed in 2005), average annual treatment capacity will be increased to approximately 54,000 AFY, and the peak capacity will be 96,000 AFY. During an average year, given implementation of the Project, the total amount of water that could be treated at the two plants (i.e., CLWA's total SWP Table A Amount) would be 81,000 AFY. During average years, the water supply requiring treatment would be greater than the existing peak capacity of the two facilities, but less than the peak capacity that would be present after the ESFP expansion is completed. The Table A Amount would be available to CLWA as needed, and not all would be required in the immediate future. SWP deliveries have never exceeded 41,800 AF, and demand for water treatment would increase incrementally, as development is approved. Given the current expansion of the ESFP, impacts would be less than significant because adequate capacity is being provided to treat the water available as a result of the Project.

Wastewater. Growth would result in an increase in wastewater generation and demand for wastewater treatment primarily at facilities operated by County Sanitation District No. 26 and District No. 32 in Los Angeles County, which service the Santa Clarita Valley. These two districts jointly operate a regional system known as the SCVJSS for which the 2015 Joint Sewerage System Facilities System Plan has been approved (LACSD 1998). The SCVJSS has a current combined capacity (from the Saugus and Valencia treatment plants) of 19.1 mgd and plans to expand capacity to 28.1 mgd by 2004. The System Plan identified the need for further expansion to the practical site capacity of 34.1 mgd by 2010, which has been extended to 2020. To date, the efforts to expand capacity up to 28.1 mgd are on schedule, and completion is expected in Spring 2004. All expansions are occurring at the Valencia plant; however, nitrification and denitrification upgrades are currently underway at both facilities, and should be completed by the end of 2003. The deadline for the final expansion capacity (i.e., for increasing the capacity by 6 mgd from 28.1 to 34.1 mgd) has been extended to 2020 (personal communication, S. Highter 2003). The ultimate expansion is intended to serve a population of 321,000.

Assuming that the 41,000 AF of Table A Amount produces an average year supply of 34,400 AF that is delivered to users, and that roughly 50 percent of the delivered water requires treatment

in a wastewater treatment plant, this would represent approximately 15.5 mgd (3,400 AF x 0.5 = 17,200 AF x 0.33 = 5,676 mg per year divided by 365 = 15.5 mgd).

Based on per capita demand, if the ultimate wastewater treatment plant expansion to 34.1 mgd is intended to serve 321,000 persons, the expansion to 28.1 mgd that is scheduled for completion in 2004 would have the capacity to serve approximately 265,000 persons. The Project can serve approximately 106,700 persons. Adding this to the estimated population in the Santa Clarita Valley of 177,000 persons in 1998 (the original baseline year for the Project) would result in 283,700 persons. Adding this to the 2000 population of 190,000 produces an estimated population of 296,700. Given the approved plans to expand wastewater treatment facilities in the Santa Clarita Valley, impacts would be less than significant because adequate capacity is being provided to treat the water available as a result of the Project.

Storm Water Drainage. New construction would likely require the construction of new storm water drainage facilities or the expansion of existing facilities, which could cause significant environmental impacts.

Mitigation Measures

Impacts to utilities and service systems generally would be mitigated to less than significant by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans since they contain adequate measures to reduce or avoid impacts. Impacts to solid waste disposal, however, may not be avoidable unless additional landfill capacity is approved and constructed (see Table 4.2-1). Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review, as required under CEQA. Implementing these plans and policies also would reduce adverse but less than significant project impacts.

4.2.15 Water Resources

As local purveyors become increasingly dependent on SWP supplies, which are variable and may be reduced during dry years, local groundwater resources may be required to support a larger portion of the total demand from future development during periods of reduced SWP supplies. Should it occur, this short-term reliance on groundwater resources would be considered a significant impact since it could result in the substantial depletion of groundwater supplies on a short-term basis in dry hydrologic years.

Increased municipal and industrial use of water would increase the amount of water treated at the existing and planned raw and wastewater treatment plants. This could result in additional discharges from the wastewater treatment plants and increased flows in the portion of the Santa Clara River west of Interstate Highway 5. In the future, some of the water presently being discharged into the Santa Clara River could be diverted prior to discharge for landscape irrigation and other permitted uses of reclaimed water within the CLWA service area. Impacts would be significant if future development violated any water quality standard or waste discharge requirements.

The Project would not indirectly affect drinking water quality in the CLWA service area, but it could adversely affect the water quality of surface waters discharged by the local wastewater treatment plants. While the future inflow water to the water reclamation plants would have

approximately the same concentration of chloride and other constituents as present today, the use of the 41,000 AF of Table A Amount would increase the load of chloride and other constituents treated and discharged by these treatment plants. As discussed in section 3.15, however, the LACSD recently has adopted an ordinance that prohibits the installation and use of new self-regenerating water softeners in the Santa Clarita Valley, which would reduce the amount of chloride load in the watershed. The potential indirect impact would be less than significant because new development would be required to comply with this ordinance.

Future development within the CLWA service area could increase the amount of impervious surface (roads, buildings, other paved areas). This could reduce percolation of rainwater to groundwater in the urbanized portions of the CLWA service areas, alter surface flows, and increase the amount and rate of stormwater runoff through storm sewers or other engineered drainages. However, most surface runoff enters the Santa Clara River and recharges the Alluvial Aquifer. As noted in the EIR for the City of Santa Clarita General Plan, development could affect water quality from non-point source discharges. The Project would result in significant indirect impacts from increased urban runoff. The increase in impervious surface also could affect the peak flow rates of floodwaters and could increase flooding on- or off-site of future development. Increased flooding and peak flow rates could result in substantial erosion or siltation on- or off-site. Impacts could be significant.

If new development were allowed in floodplains, it could expose additional persons and property to flood hazards and would impede or redirect flood flows. Development, in particular the placement of impervious surfaces (i.e., surfaces that can not be penetrated by moisture), in areas critical to the recharge of the Alluvial Aquifer and Saugus Formation could reduce the rate of aquifer recharge. This effect would not alter the storage capabilities of these aquifers; however, it could, under certain circumstances, reduce aquifer recharge. These would be considered significant impacts.

Seiches (creation of large waves on a lake or reservoir) could occur as a result of earthquake-induced ground shaking or landslides in Castaic Lake, Pyramid Lake, or Bouquet Reservoir, potentially resulting in flooding of downstream communities. Mudflows also could occur, particularly in mountainous areas, as a result of new development.

Mitigation Measures

Impacts to water resources would be mitigated to less than significant by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans since they contain adequate measures for reducing or avoiding impacts (see Table 4.2-1). Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review, as required under CEQA. Implementing these plans and policies would also reduce adverse but less than significant project impacts. Additionally, compliance with the LARWQCB Water Quality Control Plan [Basin Plan] for the Coastal Watersheds of Los Angeles and Ventura Counties, as amended, also would reduce significant and less than significant impacts.

5.0 CONSISTENCY WITH ADOPTED PLANS AND POLICIES

CEQA Guidelines Section 15125(d) requires that a proposed project be compared to existing general and regional plans. The following sections address the consistency of the Project with adopted plans and policies of the local agencies that have planning authority over the area directly affected by the Project, including Los Angeles County, the City of Santa Clarita, and Ventura County for the CLWA service area, and Kern County for the WRMWSD. Project consistency with the SCAG Regional Comprehensive Plan and Guide (RCPG) and RTP also is addressed.

The Project would not result in new construction or the modification of existing SWP facilities, nor would it change SWP operating criteria or otherwise result in material changes to SWP operations. As discussed in detail in Chapter 3, the Project would not adversely affect environmental resources as a result using of SWP facilities between the Banks Pumping Plant and CLWA's Castaic Lake turnout; thus, use of SWP facilities would be consistent with general and regional plans applicable to the Project area, and they are not addressed further.

The discussion also focuses on growth management policies of planning agencies where indirect development could occur (i.e., within the CLWA service area). A discussion of Project consistency with growth projections in the relevant regional, general, or area plans, including those of SCAG, Los Angeles County, the City of Santa Clarita, and Ventura County is included. CLWA's UWMP (CLWA 2000) is addressed in section 5.6 below. Consistency with relevant air quality management plans is included in section 3.3, Air Quality.

5.1 SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENT'S (SCAG) REGIONAL COMPREHENSIVE PLAN AND GUIDE (RCPG) AND REGIONAL TRANSPORTATION PLAN (RTP)

Scoping comments received from SCAG requested a review of the policies listed below. SCAG is a regional planning agency whose functions include regional transportation planning, air quality planning, demographic projections, and the review of projects of regional significance to determine consistency with regional plans, including SCAG's RCPG and RTP. The numbered policies and other text shown in italics below are taken directly from SCAG's comments on the NOP for this EIR.

5.1.1 Regional Comprehensive Plan and Guide

Growth Management Chapter (GMC)

3.03 *The timing, financing, and location of public facilities, utility systems, and transportation systems shall be used by SCAG to implement the region's growth policies.*

The Project would be consistent with this policy because it would not conflict with the timing, financing, and location of public facilities, utility systems, and transportation systems.

GMC Policies Related to the RCPG Goal to Improve the Regional Standard of Living

The Growth Management goals to develop urban forms that enable individuals to spend less income on housing cost, that minimize public and private development costs, and that enable firms to be more competitive, strengthen the regional strategic goal to stimulate the regional economy. The evaluation of the proposed project in relation to the following policies would be intended to guide efforts toward achievement of such goals and does not infer regional interference with local land use powers.

3.09 Support local jurisdictions' efforts to minimize the cost of infrastructure and public service delivery, and efforts to seek new sources of funding for development and the provision of services.

The Project does not include new construction of water system infrastructure but would provide an additional means of providing wholesale water service. It would be consistent with this policy.

3.10 Support local jurisdictions' actions to minimize red tape and expedite the permitting process to maintain economic vitality and competitiveness.

The Project would not change local jurisdictions' permitting processes and would be consistent with this policy.

GMC Policies Related to the RCPG Goal to Improve the Regional Quality of Life

The Growth Management goals to attain mobility and clean air goals and to develop urban forms that enhance quality of life, that accommodate a diversity of life styles, that preserve open space and natural resources, and that are aesthetically pleasing and preserve the character of communities, enhance the regional strategic goal of maintaining the regional quality of life. The evaluation of the proposed project in relation to the following policies would be intended to provide direction for plan implementation, and does not allude to regional mandates.

3.18 Encourage planned development in locations least likely to cause environmental impact.

While CLWA has the responsibility to provide wholesale water-to-water retailers within the CLWA service area, CLWA does not have the authority to approve new development in its service area. Rather, the authority and responsibility for approving and mitigating the impacts of specific development projects is primarily the responsibility of local governments and regulatory agencies.

3.19 Support the protection of vital resources such as wetlands, groundwater recharge areas, woodlands, production lands, and land containing unique and endangered plants and animals.

As discussed in Chapter 3, the Project would not directly affect wetlands, woodlands, production lands, or land containing unique and endangered plants and animals. It would not affect groundwater recharge areas but could have the potential to indirectly affect groundwater levels during period of lower than normal deliveries when, and if, potential future development water demands exceed local water supply. The Project could also indirectly reduce demand for groundwater when imported water supplies are high and they are delivered in a higher proportion and groundwater withdrawals are reduced. The Project could result in indirect, growth-related effects to the above-referenced vital resources, as discussed in section 4.2.

CLWA does not have the authority to approve new development in its service area, however. Rather, the authority and responsibility for approving and mitigating the impacts of specific development projects is primarily the responsibility of local governments and regulatory agencies. The Project would be consistent with this policy.

3.21 *Encourage the implementation of measures aimed at the preservation and protection of recorded and unrecorded cultural resources and archaeological sites.*

The Project would not have a direct impact on cultural resources. While it could result in indirect, growth-related effects on cultural resources, as discussed in section 4.2, CLWA does not have the authority to approve the location of new development in its service area or to impose mitigation measures. Rather, the authority and responsibility for approving and mitigating the impacts of specific development projects is primarily the responsibility of local governments and regulatory agencies. The Project would be consistent with this policy.

3.22 *Discourage development, or encourage the use of special design requirements, in areas with steep slopes, high fire, flood, and seismic hazards.*

The Project would not directly result in any development, including development in areas with steep slopes, high fire, flood, or seismic hazards. While it could result in indirect, growth-related development in such areas, as discussed in section 4.2, CLWA does not have the authority to approve the location of new development in its service area or to impose mitigation measures. Rather, the authority and responsibility for approving and mitigating the impacts of specific development projects is primarily the responsibility of local governments and regulatory agencies. The Project would be consistent with this policy.

3.23 *Encourage mitigation measures that reduce noise in certain locations, measures that would reduce exposure to seismic hazards, minimize earthquake damage, and to develop emergency response and recovery plans.*

The Project would not directly result in any development, including development that would generate noise, or result in exposure to seismic hazards, earthquake damage, or affect emergency response plans. While it could result in indirect, growth-related development that could have such effects, as discussed in section 4.2, CLWA does not have the authority to approve the location of new development in its service area or to impose mitigation measures. Rather, the authority and responsibility for approving and mitigating the impacts of specific development projects is primarily the responsibility of local governments and regulatory agencies. The Project would be consistent with this policy.

GMC Policies Related to the RCPG Goal to Provide Social, Political, and Cultural Equity

The Growth Management Goal to develop urban forms that avoid economic and social polarization promotes the regional strategic goal of minimizing social and geographic disparities and of reaching equity among all segments of society. The evaluation of the proposed project in relation to the policy stated below is intended guide direction for the accomplishment of this goal, and does not infer regional mandates and interference with local land use powers.

3.27 *Support local jurisdictions and other service providers in their efforts to develop sustainable communities and provide, equally to all members of society, accessible and effective services such as: public education, housing, health care, social services, recreational facilities, law enforcement, and fire protection.*

In its function as a water wholesaler, CLWA provides water to purveyors within its service area who, in turn, serve local customers. CLWA provides water without regard to the circumstances of the end-user customers. The Project would be consistent with this policy.

Air Quality Chapter Core Actions

5.07 *Determine specific programs and associated actions needed (e.g., indirect source rules, enhanced use of telecommunications, provision of community based shuttle services, provision of demand management based programs, or vehicle-miles-traveled/emission fees) so that options to command and control regulations can be assessed.*

The Project would not have an impact on local agencies' determination of air quality programs and actions and would be consistent with this policy.

5.11 *Through the environmental document review process, ensure that plans at all levels of government (regional, air basin, county, subregional and local) consider air quality, land use, transportation and economic relationships to ensure consistency and minimize conflicts.*

The Project would not have an impact on SCAG's environmental document review process for government plans and would be consistent with this policy.

Open Space Chapter and Ancillary Goals

Public Health and Safety

9.04 *Maintain open space for adequate protection of lives and properties against natural and man-made hazards.*

The Project would not directly result in any development that would affect open space. While it could result in indirect, growth-related development that could result in the loss of open space, as discussed in section 4.2, CLWA does not have the authority to approve the location of new development in its service area or to impose mitigation measures. Rather, the authority and responsibility for approving and mitigating the impacts of specific development projects is primarily the responsibility of local governments and regulatory agencies. The Project would be consistent with this policy.

9.05 *Minimize potentially hazardous developments in hillsides, canyons, areas susceptible to flooding, earthquakes, wildfire and other known hazards, and areas with limited access for emergency equipment.*

The Project would not directly result in any development, including development in hazardous areas. While it could result in indirect, growth-related development in such areas, as discussed

in section 4.2, CLWA does not have the authority to approve the location of new development in its service area or to impose mitigation measures. Rather, the authority and responsibility for approving and mitigating the impacts of specific development projects is primarily the responsibility of local governments and regulatory agencies. The Project would be consistent with this policy.

9.06 Minimize public expenditure for infrastructure and facilities to support urban type uses in areas where public health and safety could not be guaranteed.

The Project would not directly result in public expenditures for infrastructure and facilities to support urban uses and would be consistent with this policy.

Resource Protection

9.08 Develop well-managed viable ecosystems or known habitats of rare, threatened, and endangered species, including wetlands.

The Project would not have a direct effect on ecosystems or known habitats of sensitive species and would not preclude the management of ecosystems or habitats. While it could result in indirect, growth-related development in biologically sensitive areas, as discussed in section 4.2, CLWA does not have the authority to approve the location of new development in its service area or to impose mitigation measures. Rather, the authority and responsibility for approving and mitigating the impacts of specific development projects is primarily the responsibility of local governments and regulatory agencies. The Project would be consistent with this policy.

Water Quality Chapter Recommendations and Policy Options

The Water Quality Chapter core recommendations and policy options related to the two water quality goals: to restore and maintain the chemical, physical and biological integrity of the nation's water; and, to achieve and maintain water quality objectives that are necessary to protect all beneficial uses of all waters.

11.02 Encourage "watershed management" programs and strategies, recognizing the primary role of local governments in such efforts.

CLWA considers watershed management in its water management and capital improvement planning efforts, along with locally adopted plans. In addition, CLWA has supported local planning efforts intended to provide watershed management. For example, CLWA has participated in meetings to discuss the formulation of the Santa Clara River Enhancement Plan and has provided written comments on the plan. The Project would be consistent with this policy.

11.05 Support regional efforts to identify and cooperatively plan for wetlands to facilitate both sustaining the amount and quality of wetlands in the region and expediting the process for obtaining wetlands permits.

The Project would not directly affect wetlands and would not affect regional efforts to identify and cooperatively plan for wetlands. While it could result in indirect, growth-related development that could affect wetlands, as discussed in section 4.2, CLWA does not have the

authority to approve the location of new development in its service area or to impose mitigation measures. Rather, the authority and responsibility for approving and mitigating the impacts of specific development projects is primarily the responsibility of local governments and regulatory agencies. The Project would be consistent with this policy.

11.06 Clean up the contamination in the region's major groundwater aquifers since its water supply is critical to the long-term economic and environmental health of the region. The financing of such clean-ups should leverage state and federal resources and minimize significant impacts on the local economy.

The treatment of transferred water would result in additional utilization of hazardous chemicals, but the Project would not result in the contamination of the region's aquifers and could result in a smaller percentage of the Santa Clarita Valley's total water supply coming from groundwater sources. Therefore, the Project would be consistent with this policy since it would not result in the contamination of aquifers.

11.07 Encourage water reclamation throughout the region where it is cost-effective, feasible, and appropriate to reduce reliance on imported water and wastewater discharges. Current administrative impediments to increased use of wastewater should be addressed.

Water and reclamation efforts are part of CLWA's water management planning efforts, and the Project would be consistent with this policy.

5.1.2 Regional Transportation Plan

The RTP links the goal of sustaining mobility with the goals of fostering economic development, enhancing the environment, reducing energy consumption, promoting transportation-friendly development patterns, and encouraging fair and equitable access to residents affected by socioeconomic, geographic, and commercial limitations.

Core Regional Transportation Plan Policies

4.02 Transportation investments shall mitigate environmental impacts to an acceptable level.

The Project would not require transportation investments. While it could result in indirect, growth-related development that could require transportation improvements, as discussed in section 4.2, CLWA does not have the authority to approve the location of new development in its service area or to impose mitigation measures. Rather, the authority and responsibility for approving and mitigating the impacts of specific development projects is primarily the responsibility of local governments and regulatory agencies. The Project would be consistent with this policy.

4.04 Transportation Control Measures shall be a priority.

The Project would not directly affect transportation and would not require transportation control measures. While it could result in indirect, growth-related development that could require transportation control measures, as discussed in section 4.2, CLWA does not have the authority to approve the location of new development in its service area or to impose mitigation measures. Rather, the authority and responsibility for approving and mitigating the impacts of

specific development projects is primarily the responsibility of local governments and regulatory agencies. The Project would be consistent with this policy.

4.16 Maintaining and operating the existing transportation system will be a priority over expanding capacity.

The Project would not have a direct impact on the existing transportation system. While it could result in indirect, growth-related development that could affect this system, as discussed in section 4.2, city and county planning agencies are responsible for creating transportation plans that determine whether expansion should occur. CLWA does not have the authority to approve or implement transportation plans. The Project would be consistent with this policy.

5.1.3 Consistency with Growth Projections

The following section addresses the Project's consistency with SCAG's adopted growth forecasts. SCAG adopted demographic forecasts for the Santa Clarita Valley Area (i.e., Regional Statistical Area 8) in 1998 as part of its RTP (SCAG 1998) and updated the forecast in 2001 (SCAG 2001). This analysis is based on the latter forecast since it supersedes the 1998 projections. SCAG currently projects that the 2025 population for the Santa Clarita Valley will be 352,382, with 126,563 households (personal communication, P. Gutierrez 2003). The Project can serve approximately 106,700 persons (see section 4.1 for assumptions). Adding this to the 2000 population of 190,000 produces an estimated population of 296,700, which is lower than the SCAG 2025 projection. The Project also could serve about 35,600 housing units. Adding this to the 63,300 housing units present in the CLWA service area (based on 2000 Census data) would result in 98,900 housing units, which also is less than the 2020 projection. Thus, the Project would serve a portion of the growth projected by SCAG and would be consistent with SCAG's growth projections.

5.2 COUNTY OF LOS ANGELES GENERAL PLAN

5.2.1 Consistency with Policies

General Goals and Policies

18. Conserve the available supply of water and protect water quality.

Conservation is already part of CLWA's water resource management program, and the Project would not affect these water conservation efforts. As noted in section 3.15, Water Resources, the Project would not have a direct effect on water quality and would provide a portion of the water supply necessary to support anticipated future development. It could result in indirect impacts to groundwater supply and water quality that would be mitigable to less than significant by complying with local plans and policies, including the Basin Plan.

43. Maintain a balance between increased intensity of development and the capacity of needed facilities such as transportation, water and sewage systems.

As discussed in section 4.2.13, Transportation and Circulation and section 4.2.14, Utilities/Service Systems, the Project would not directly require or result in the construction or expansion of facilities such as those mentioned in this policy. The 41,000 AF of Table A Amount that would be made available by the Project would be used as needed to support a portion of the anticipated future development in the CLWA service area, which would be consistent with this policy. The portion of the anticipated future development served by the Project's water supply would require construction of additional transportation, water storage and delivery, and sewage collection systems that would either be provided by developers or various service providers, as appropriate. CLWA does not have the authority to approve new development or to increase the capacity of transportation, sewage, and other facilities not related to its role as a wholesale water provider. Rather, this is primarily the responsibility of local governments and regulatory agencies.

Conservation, Open Space, and Recreation

1. *Protect ground water recharge and watershed areas, conserve storm and reclaimed water, and promote water conservation programs.*

The Project could potentially reduce the portion of future water demand in the Santa Clarita Valley that is met by groundwater by providing additional imported surface water supplies. The Project would not include new construction and therefore would not have a direct impact on groundwater recharge and watershed areas. It would serve a portion of anticipated future development that could reduce recharge areas; however, CLWA does not have the authority to approve new development in its service area. Rather, the authority and responsibility for approving and mitigating the impacts of specific development projects is primarily the responsibility of local governments and regulatory agencies. Although the conservation of storm and reclaimed water and other conservation measures are not a part of the Project, it would not in any way inhibit these actions. The Project would be consistent with this policy.

5. *Encourage the maintenance, management, and improvement of the quality of imported domestic water, ground water supplies, natural runoff and ocean water.*

The Project would provide an additional supply of high quality, imported raw water received from the SWP. The delivery of imported water would not directly affect groundwater quality of the Alluvial or Saugus formations; nor would it affect natural runoff or ocean water. The Project would be consistent with this policy.

Safety Element

20. *Review proposed development projects involving the use or storage of hazardous materials, and disapprove proposals, which cannot properly mitigate unacceptable threats to public health and safety to the satisfaction of responsible agencies.*

Transferring an additional 41,000 AF of water for use within the CLWA service area would result in an increased use of hazardous materials to treat water. Any additional

use of hazardous materials to treat the water would be conducted in accordance with existing policies, procedures, and regulations to prevent upset or release into the environment. Thus, the Project would be consistent with this policy.

21. *Promote the safe transportation of hazardous materials.*

Chemicals used by CLWA for water treatment are shipped in containers and on vehicles approved by the U.S. Department of Transportation (DOT) and are restricted to approved roads. DOT requires periodic testing and inspection of containers that transport hazardous materials. CLWA uses measures to promote the safe transportation and delivery of hazardous materials, consistent with this policy.

22. *Encourage businesses and organizations which store and use hazardous materials to improve management and transportation of such materials.*

As noted above, all chemicals would be shipped in containers and on vehicles approved by the DOT and would be restricted to approved roads. State and local mandates require the development and implementation of hazardous materials-related plans. The Project would be consistent with this policy.

24. *Encourage improved, timely communications between businesses and emergency response agencies regarding hazardous materials/waste incidents.*

State and local mandates require the preparation of hazardous materials related plans. Measures to facilitate timely communications between CLWA and emergency response agencies are included in these existing plans. The Project would be consistent with this policy.

Public Facilities Chapter

3. *Encourage private firms and public agencies providing water and waste management services to cooperate with all levels of government in establishing, enacting and enforcing consistent standards and criteria.*

CLWA is subject to applicable standards and criteria regulating provision of water service. The Project would be consistent with this policy.

5.2.2 Consistency with Growth Projections

Growth projections for the Project area are included in the Santa Clarita Valley Area Plan, discussed under section 5.3.

5.3 SANTA CLARITA VALLEY AREA PLAN OF THE COUNTY OF LOS ANGELES GENERAL PLAN

The Santa Clarita Valley Area Plan (comprehensively updated December 6, 1990), in conjunction with other chapters and elements of the Los Angeles County General Plan, is used for making critical public decisions regarding the Santa Clarita Valley.

5.3.1 Consistency with Policies

The Area Plan states that for the Santa Clarita Valley, it shall be the policy of the Los Angeles County Board of Supervisors to:

Land Use Element

1.1 *Accommodate the year 2010 population and land use demand as projected for the Santa Clarita Valley, designating sufficient area for appropriate use and a reasonable excess to provide adequate flexibility.*

1.2 *Closely monitor growth in the Santa Clarita Valley, so that growth does not exceed the capacity of the existing or planned infrastructure nor result in significant negative environmental impacts.*

1.3 *Provide for development in the study area, which is consistent with the plan, and encourage other governmental and private agencies to do the same.*

7.1 *Encourage development of convenient services to meet the needs of Santa Clarita Valley residents including . . . public utilities. Such services should be expanded at a rate commensurate with population growth. Phasing of development and implementation should be timed to prevent gaps in service as the area grows.*

The Project could serve approximately 106,700 persons. When added to the 2000 population of the CLWA service area (190,000), the resulting population would exceed Los Angeles County's 2010 population projection of 270,000 persons by 26,700. Thus, the Project would accommodate the 2010 demand. The County of Los Angeles would be responsible for ensuring that future development, including development that could be served by the Project, would be consistent with these policies, which direct that development be consistent with the general plan and that adequate public and commercial services and infrastructure be provided to serve population growth, while minimizing environmental impacts. The Project would be consistent with these policies.

Public Services and Facilities Element

1.2 *Use imported water supply to relieve over drafted groundwater basins and maintain their safe yield for domestic uses outside of urban areas.*

The Project would be consistent with this policy since it would import SWP water. The Santa Clarita Valley groundwater basin is not classified as overdrafted (DWR 2003a).

Energy Conservation Element

1.1 *Conserve energy in all its forms to a degree commensurate with an optimum level of living and economic activities.*

The Project would utilize additional energy for increased treatment of raw imported water. CLWA utilizes energy conservation measures at its treatment facilities, however, and the Project would be consistent with this policy.

5.3.2 Consistency with Growth Projections

The Santa Clarita Valley Area Plan includes population and housing projections for the Santa Clarita Valley adopted by the County of Los Angeles. The projections are based on 1987 population estimates and extend to the year 2010. The area plan projects that the Santa Clarita Valley will contain 270,000 persons and 93,400 housing units in 2010. Los Angeles County is in the process of updating the General Plan and expects completion within approximately three years, at which time new demographic projections may be adopted.

As described in section 3.0, the Project can serve approximately 106,700 persons. Adding this to the 2000 population of 190,000 for the Santa Clarita Valley area produces an estimated population of 296,700. This exceeds the 2010 forecast of 270,000 persons. The Project is not intended, however, to serve population only through 2010, and CLWA's UWMP, which was prepared after the transfer of 41,000 of Table A Amount occurred, assumes that the full amount will not be needed by 2010. The UWMP assumes a rate of 2,240 connections per year. If all of these connections were residential (recognizing that the methodology utilized in the UWMP reflects that these connections may include other types of connections in addition to households), and assuming that three people are served by each connection, this would result in an annual increase of 6,720 people. This rate of growth would result in an increased population of 67,200 between 2000 and 2010, for a total population of 257,200. Thus, CLWA's projections in its UWMP indicate that the growth forecast for 2010 would not be exceeded as a result of the Project.

5.4 VENTURA COUNTY GENERAL PLAN

The Ventura County portion of the agency area contains 8,468 acres or approximately 13 square miles of property. This area is located the Piru Planning Area, which contains 42,945 acres or about 67 square miles. The Ventura County General Plan amended through October 28, 1997 (Ventura County 1997) contains a Countywide 1980-2010 Population Forecast of 310 persons in the "Piru Non-Growth Area," a smaller portion of the Piru Planning Area, which contains the agency area as well as other lands.

5.4.1 Area Plan for the Piru Area

The Piru Area Plan (amended through July 1997) contains goals, policies, and programs divided into four major categories: resources, hazards, land use, and public facilities and services. Growth management is addressed through a related land use policy and associated building intensity/population density standards.

Land Use Policy 3.1.2.7: All discretionary development projects shall be reviewed and conditioned to ensure that they are in conformance with the Building Intensity/ Population Density Summary Table (see Table 5-1).

As shown in Table 5-1, if full build-out were to occur under current land use designations, Ventura County projects a total population of 3,620 persons in the Piru Planning Area. The agency portion of the planning area is designated either Open Space (80-acre minimum lot size and 0.04 persons per acre) or Agricultural (40-acre minimum lost size and 0.08 persons per

acre). In addition, the area contains prime agricultural lands. These land use designations are intended to allow rural development densities and encourage preservation of agricultural uses.

CLWA does not presently provide water to this planning area. If the County of Ventura were to approve future General Plan land use or zoning designations which allow urban development within this portion of the agency area, CLWA would at that time determine its ability to provide service to specific development proposals.

Table 5-1. Building Intensity/Population Density Standards — Piru Area Plan

Designation	*Acres*	*Population*
Open Space	37,483	1,488
Agricultural	5,214	413
R-4	13	165
R-6	69	1,316
R-15	5	238
Total	**42,784**	**3,620**
Designation	*Acres*	*Employees*
Commercial	10	130
Hotel	1	5
Industrial	36	627
Community Facility	114	496
Total	**161**	**1,258**

Source: Ventura County 1997.

5.4.2 Ventura County Save Open-Space and Agricultural Resources (SOAR) Initiative

This initiative was passed in 1998 in order to "ensure that Agricultural, Open Space and Rural lands are not prematurely or unnecessarily converted to other more intensive development uses." It requires a vote of the people for changes to the County's general plan policies and land use designations regarding open space, agricultural, and rural lands in unincorporated areas with certain exceptions. The Project would not result in land use changes to Ventura County and would be consistent with this policy.

5.5 CITY OF SANTA CLARITA GENERAL PLAN

The section below analyzes the consistency of the Project with relevant growth management policies and population forecasts in the City of Santa Clarita General Plan and its associated EIR.

The Final EIR for the City of Santa Clarita General Plan (1991) identifies low, moderate, and high buildout population estimates for the City of Santa Clarita Planning Area, which comprises 256 square miles within the Santa Clarita Valley. The City of Santa Clarita occupied approximately 42 square miles when the Planning Area was initially identified in 1991 and developed the larger Planning Area in recognition of its probable ultimate responsibility for services and governmental jurisdiction within the valley. The City of Santa Clarita has land development approval authority within the city boundaries and Los Angeles County has development approval authority in unincorporated Los Angeles County. The Final EIR

identifies several public services, such as schools, libraries and roads that "cannot at present adequately serve the existing population." The City of Santa Clarita reported a population of 143,800 persons in 1998 and 151,088 in 2000.

The population buildout estimates in the city's Final EIR are 228,274 persons (low), 256,944 (medium), and 521,977 (high). As described in section 4.1, the Project could serve approximately 106,700 persons. Adding the potential population served by the Project to the city's 2000 population (151,088) would result in a potential population of approximately 257,788 persons. This exceeds the low buildout estimate, is roughly comparable to the medium buildout estimate (exceeding it by 844 persons), and is less than the high buildout estimate.

Growth Management

Goal 1: *To preserve the character of communities and the integrity of the Santa Clarita Valley by permitting orderly growth through synchronization of development with the availability of public facilities such as roads, sewers, water service and schools needed to support it.*

The Project could make water available to local purveyors who provide water services for development within the CLWA service area and would be consistent with this goal.

LU-1.1: *Develop and implement a Public Facilities Ordinance that requires that adequate infrastructure exist or be programmed for construction within a defined period of time as a condition of development approval.*

The City of Santa Clarita's authority to develop and implement a Public Facilities Ordinance would not be affected by the Project, which seeks to make adequate water supply available for future development.

LU-1.2: *Develop and implement a program of Development Impact Fees to provide adequate public facilities and services in a timely manner.*

The City of Santa Clarita's authority to develop and implement a Development Impact Fee program would not be affected by the Project, which seeks to make adequate water supply available in a timely manner.

LU-1.8: *Encourage the concept of traffic mitigation agreements that provide a variety of transportation options included but not limited to automobiles, transit, commuter trains, light rail and bicycle pathways.*

The Project would not have a direct impact on traffic demand (see section 3.13, Transportation and Circulation). The City of Santa Clarita's authority to encourage traffic mitigation agreements that provide a variety of transportation options would not be affected by the Project.

LU-1.9: *Continue to pursue a policy of cooperation with Los Angeles County and seek adequate documentation, notification, and mitigation of infrastructure impacts beyond or bordering the City's boundaries.*

The Project would not affect cooperation between the City of Santa Clarita and Los Angeles County. This EIR provides information regarding potential indirect impacts of the Project to both Los Angeles County and the City of Santa Clarita, consistent with the spirit of this policy.

H-1.1: Implement the land use plan which provides opportunities for the development of a wide range of new housing types within the city.

The City of Santa Clarita has the authority to implement its General Plan by approving or denying residential and mixed-use development plans within its jurisdiction, which could include development served by the Project. CLWA does not have the authority to approve land development.

5.6 CLWA URBAN WATER MANAGEMENT PLAN 2000

A UWMP is a planning tool whose periodic preparation (every five years, in years ending with a 5 and 0) is mandated by the Legislature pursuant to the California Urban Water Management Planning Act. It generally guides the actions of water management agencies, serving as a management tool and providing a framework for action, but not functioning as detailed project development or action. As encouraged by the Act, the 2000 UWMP was prepared for the regional CLWA service area, which includes the service areas of the four retail water purveyors. The plan presents information about the water demand, water supply, water conservation, water recycling, and reliability planning in the CLWA's service area. The 2000 UWMP was prepared after the 41,000 AF of SWP Table A Amount was transferred; thus, it is included as part of the current water supply.

The UWMP was challenged in the Superior Court of Kern County, and a judgment was entered July 2003 upholding the UWMP in all respects. The petitioners in that case have appealed the judgment. The appellate court briefing is scheduled to be completed in March 2004, and oral argument is estimated to take place in the fall of 2004. The UWMP is and remains a valid document as of the time of the preparation of this EIR. Although information in the UWMP was considered in the analysis for the Project, an independent analysis and determination of environmental impacts was carried out for the Project.

5.7 CLWA GROUNDWATER MANAGEMENT PLAN, SANTA CLARA RIVER VALLEY GROUNDWATER BASIN, EAST SUBBASIN, LOS ANGELES COUNTY, 2003

In January 2002, CLWA initiated the preparation of a groundwater management plan pursuant to the requirements of Section 103-15.1 of the CLWA Act and section 10,750 et seq of the California Water Code. CLWA adopted the plan on December 10, 2003. The plan describes the Santa Clara River Valley Groundwater Basin and East Subbasin, historic and projected water use, and requirements of the affected area. In addition, the document provides a framework for present and future actions to develop groundwater while avoiding groundwater overdraft and preserving groundwater quality (including addressing perchlorate concentrations), and it also discusses interrelated surface water resources. Additionally, the document calls for integrating management of the groundwater basin with surface and groundwater resources of the United Water Conservation District, which is downstream along the Santa Clara River in Ventura

County. The Project is consistent with the groundwater management plan and would support the avoidance of overdrafting the groundwater basin by making supplemental water available, thus facilitating conjunctive use of local and imported water to the best advantage of the affected area.

5.8 KERN COUNTY GENERAL PLAN

The Land Use, Open Space, and Resource Element of the Kern County General Plan contains several policies that relate to preservation of agriculture and development of local surface water resources.

Resource Policy 1: Areas with designated agricultural use, which include Class I and II soils with surface water delivery systems, will be protected against residential and commercial subdivision activities.

No residential or commercial subdivisions are proposed as part of the Project, which would be consistent with this policy.

Resource Policy 2: Areas identified by the Soil Conservation Service as having high rangesite value will be reserved for extensive agricultural uses, or as resource reserve if located within a County water district.

SWP water is used only minimally on rangeland in the district (it is used for stock water rather than irrigation), and the Project would not have an impact on rangeland conversion. It would be consistent with this policy.

Resource Policy 12: The County will support programs and policies that provide tax and economic incentives to ensure the long-term retention of agriculture, timber, and other resource land.

Kern County participates in the Williamson Act program and provides tax incentives to landowners voluntarily enrolled in the program who preserve land in agricultural use. As described in section 3.2.2.2.2, the Project would not affect the County's participation in the Williamson Act program, nor would it conflict with Williamson Act contracts. The Project would be consistent with this policy.

Resource Policy 15: Encourage effective management of groundwater resources for the long-term benefit of the county by any or all of the following: ...development of alternative local and imported surface water supplies.

As discussed in section 3.15, Water Resources, the Project would have a less than significant impact on groundwater resources in WRMWSD. The Project would not inhibit WRMWSD's implementation of water management actions that are intended to conjunctively manage the district's surface and groundwater resources for the long-term benefit of district lands. The Project would be consistent with this policy.

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6.0 CUMULATIVE IMPACTS

6.1 CEQA REQUIREMENTS

Cumulative impacts refer to two or more individual impacts that, when considered together, are considerable or that compound or increase other environmental impacts. A cumulative impact is the change in the environment that results from the incremental impact of a project when added to other closely related past, present, or reasonably foreseeable future projects. Cumulative impacts can result from individually minor but collectively significant impacts taking place over time. An EIR must discuss the cumulative impacts of a project when the project's incremental impact is cumulatively considerable (CEQA Guidelines section 15130[a]). "Cumulatively considerable" means that the project's incremental effects are considerable when viewed in connection with the impacts of other related projects (CEQA Guidelines section 15065 [c]). In this analysis, if the Project's incremental impact would be cumulatively considerable in combination with the impacts of other projects, the impact is identified as a "significant cumulative impact."

6.2 CUMULATIVE IMPACT ANALYSIS METHODOLOGY

Projects included in the cumulative impact analysis were identified using a list approach (CEQA Guideline section 15130[b][1]) and are those that could result in impacts to the same resources as the Project, in the same geographic areas. Projects considered in this analysis fall into two major categories:

- Water supply, management, and distribution projects, and
- Land use development within and adjacent to the three geographic areas being analyzed, the SWP area, the WRMWSD area, and the CLWA area.

The analysis of the water supply, management, and distribution projects principally addresses the amount and timing of diversions from the Delta, manner in which water is conveyed and stored in the SWP and associated facilities, and its eventual use. Since the specific magnitude, location, and timing of impacts from these projects is anticipated to vary from year to year or is not yet known, the cumulative impact analysis is qualitative. Individual water and land use development projects are evaluated for cumulative impacts in combination with the direct effects of the Project. Additionally, where the Project would have indirect growth-related effects (i.e., in the CLWA service area), the potential for cumulative indirect impacts resulting from projected growth associated with both water and land development projects is evaluated, as well.

6.3 ANALYSIS OF CUMULATIVE IMPACTS

This section describes the projects included in the cumulative impact analysis, the status of their environmental documentation, anticipated environmental impacts of those projects (identifying only those resources that also would be affected by the Project), and the potential cumulative impacts of those projects in combination with the Project. Projects are grouped according to the geographic area affected. Projects with environmental effects that extend over more than one geographic area are discussed in each of the applicable regions and only as to

the resources that are potentially affected. The analysis addresses impacts from large-scale water management programs (e.g., the CALFED Bay Delta Program [CALFED] discussed in section 6.3.1.1 below) that may affect environmental resources and projects that tier from those programs (e.g., the Environmental Water Account Project [EWA] discussed in section 6.3.1.2 below) that are sufficiently mature to have definable impacts.

6.3.1 Other Projects Affecting the SWP and Associated Facilities

The following are water supply, management, and distribution projects that could affect the SWP and associated facilities. As discussed in the preceding sections of this EIR, the Project would result in no significant impacts and no indirect impacts to environmental resources within and adjacent to SWP facilities. It would, however, have less than significant impacts that, which when considered and combined with other projects might have a significant effect on the environment. The less than significant impacts identified are: to aesthetics (minor seasonal changes in the volume of water stored in San Luis Reservoir); air quality (increased air emissions from the generation of additional electrical power to move water from WRMWSD to CLWA and increased fugitive dust emissions from exposed soil at San Luis Reservoir); cultural resources (minor seasonal changes in the volume of water stored in San Luis Reservoir could expose submerged cultural resources); geology and soils (minor seasonal changes in the volume of water stored in San Luis Reservoir could expose more soil to wind and water erosion); utilities and service systems (energy) resources (additional electricity would be required to convey water to CLWA); and water resources (minor changes in the timing of diversion of water from the Delta, amount of water transported in SWP facilities, and minor temporal changes in storage volume of SWP reservoirs). Thus, other projects that could affect these resources might contribute to a cumulative impact when considered in combination with the Project.

6.3.1.1 CALFED Bay Delta Program (CALFED)

Project Description

The CALFED Bay Delta Program is an association of agencies and stakeholders whose goal is to develop and implement a long-term plan to address chronic water supply and environmental problems in the Sacramento-San Joaquin River Delta and San Francisco Bay. This association has developed a Program Action Plan that provides a framework for the implementation of projects within the CALFED Program. The major program components are ecosystem restoration; water supply reliability (including water use efficiency, water transfers, watershed management, water storage, and water conveyance); water quality; and levee system integrity.

Environmental Analysis Status and Anticipated Impacts

An EIS/EIR was prepared for this project in 1999 and a Record of Decision (ROD) was published on August 28, 2000. In April 2003, a Sacramento Superior Court upheld the EIR and its certification under CEQA. (*Bay-Delta Programmatic Environmental Impact Report Coordinated Proceedings* [SCSC Case No. JC04152] May 5, 2003.) Two Notices of Appeal have been filed from the Judgment in this Coordinated case (Case No. C044267 on June 6, 2003 and Case No. C044577 on July 7, 2003).

Cumulative Impacts with the Project

The CALFED EIS/EIR identified potential impacts to the following environmental resources in and adjacent to the Delta, some of which also would be affected by the Project: aesthetics, air quality; cultural resources; geology and soils; utilities and public services; and water resources.

AESTHETIC RESOURCES

CALFED would affect aesthetic resources in the following ways: (1) long-term visual effects of new facilities or modified existing facilities; (2) effects in visually sensitive areas from restoration actions; (3) degraded watershed views from such actions as erosion control and fire management practices; (4) creation of borrow pits or spoils material disposal sites associated with storage, conveyance, levee projects, and other CALFED actions; and (5) long-term visual effects from construction activities extending more than 5 years. Project impacts would not compound or increase these impacts because Project-related impacts would be minor, seasonal in nature, and would generally not occur in the same areas as aesthetic impacts of CALFED. Therefore implementation of the Project in combination with CALFED would not have a cumulative impact to aesthetic resources.

AIR QUALITY

CALFED would affect air quality in the following ways: (1) direct, short-term air pollutant emissions during construction activities; (2) fugitive wind-blown dust emissions; (3) emissions associated with prescribed burning programs described in the CALFED Final EIS/EIR; (4) emissions from increases in equipment use and cultivation, agricultural chemical use, and crop shifting and burning; (5) emissions if land use changes lead to higher recreational uses; and (6) emissions from use of fossil fuels or other energy resources associated with pressurized irrigation systems; and (7) indirect air quality impacts from increased power generation (associated with pressurized irrigation systems) to meet CALFED energy consumption and changes in operation. The indirect impacts of increased power generation of the Project and CALFED would result in a less than significant cumulative impact to air quality because the Project and CALFED would utilize existing power plants that are already permitted, and no new power generation facilities would be required for either the Project or CALFED. Additionally, because the changes in storage of water in San Luis Reservoir that would result from the Project would fall within the range of fluctuations present under both current and historic operations, and would not produce fugitive dust emissions from exposed shorelines that differ from historic levels, cumulative impacts would be less than significant.

CULTURAL RESOURCES

CALFED would affect cultural resources in the following ways: (1) site-specific effects during construction, excavation, filling and flooding; and (2) alteration of historic setting of cultural resources. Project impacts would not compound or increase these impacts because the Project would not result in construction-related cultural resource impacts. Additionally, the Project would result in only minor impacts to cultural resources in San Luis Reservoir from lake elevation fluctuations that are within the range of fluctuations present under both current and historic operations and would not result in an alteration of the historic setting of cultural resources in the reservoir. Therefore the Project would not have a cumulative impact to cultural resources.

GEOLOGY, SOILS, AND MINERALS

CALFED would affect these resources in the following ways: (1) conversion of agricultural land soils for levee system construction and potential for erosion on outboard slope of levees; (2) increases in local subsidence from potential increased reliance on groundwater use; (3) increases in wind and soil erosion and in soil salinity due to fallowed agricultural lands; (4) increased construction-related short-term soil erosion, and increased sediment deposition and soil compaction; (5) potential changes in downstream geomorphology from enlarging existing storage facilities and other CALFED actions; and (6) ground disturbance, inundation, seepage, and shoreline wind- and wave-generated erosion from new storage facilities and other CALFED actions. The Project would result in minor changes to timing of water stored in San Luis Reservoir, but this would not compound or increase the impacts of CALFED because the Project impacts would be minor and lake elevation fluctuations would be within the range of fluctuations present under both current and historic operations. Therefore implementation of the Project in combination with CALFED would not have a cumulative impact to geologic, soil, and mineral resources.

UTILITIES AND PUBLIC SERVICES

CALFED would affect these resources in the following ways: (1) modify major infrastructural components (i.e., pipelines and powerlines) may need to be relocated or modified; and (2) increased risk of pipeline rupture during construction. Project impacts would not compound or increase these impacts because the Project would be implemented using existing SWP facilities and no modification or construction of facilities would occur. Therefore the Project would not have a cumulative impact on utilities and public services.

WATER RESOURCES

CALFED would temporarily affect surface water supplies and management characteristics by increasing turbidity during construction of CALFED facilities, levee construction and maintenance, and during habitat restoration activities. These impacts would not compound or increase with Project impacts because the Project would not require construction activities that would increase turbidity or otherwise affect water supplies and management. The Project would result in changes in the timing of diversions from the Delta, but because these changes would be minor and would not change the total amount diverted, cumulative impacts would be less than significant.

6.3.1.2 Environmental Water Account Project (EWA)

Project Description

The EWA is a cooperative water management program designed to provide protection to at-risk native fish species of the Delta estuary while improving water supply reliability for water users. Such a program was identified in the 2000 CALFED Programmatic ROD. The EWA program makes environmentally beneficial changes in the operations of the SWP and the CVP at no uncompensated water loss to the CVP and SWP water users. The protective actions for at-risk native fish species proposed as part of the EWA would range from reducing Delta export pumping to augmenting instream flows and Delta outflows. Beneficial changes in SWP and CVP operations could include changing the timing of some flow releases from storage and the

timing of water exports from the Delta pumping plants to coincide with periods of greater or lesser vulnerability of various fish species to environmental conditions in the Delta.

The purpose and need for the EWA project is to (1) provide a highly flexible, immediately implementable water management strategy that protects the at-risk native Delta-dependent fish species affected by SWP/CVP operations and facilities; (2) contributes to the recovery of these fish species; (3) allows timely water management responses to changing environmental conditions and changing fish protection needs; (4) improves water supply reliability for water users downstream from the Delta; and, (5) does not result in uncompensated water cost to the SWP's water users.

Environmental Analysis Status and Anticipated Impacts

The USBR and DWR published a Draft EIS/EIR in July 2003 that identifies a range of alternatives that could affect the following environmental resources that also could be affected by the Project: aesthetics, air quality, cultural resources, geology and soils, and utilities and service systems. The Final EIS/EIR was released in January 2004.

Cumulative Impacts with the Project

AESTHETIC RESOURCES

EWA would affect aesthetic resources by decreasing water levels in CVP and SWP reservoirs and non-CVP and SWP reservoirs. Consequently, scenic quality could be impacted at some SWP reservoirs south of the Delta that could also be impacted from the Project. However, the natural hydrology and pattern of Delta exports in combination with CVP and SWP Contractors' water demands already result in substantial reservoir level fluctuations and the combined change in fluctuation would not perceptibly change the scenic qualities. Additionally, the changes that would result from the Project and from EWA would be minor. Therefore, the Project would have a less than significant cumulative impact to aesthetic resources.

AIR QUALITY

EWA would affect air quality in the following ways: (1) direct, short-term air pollutant emissions from diesel-powered groundwater pumps, and (2) fugitive emissions of wind-blown dust for the idling of crops. The Project would result in increased air emissions from the generation of additional electrical power to move water from WRMWSD to CLWA and increased fugitive dust emissions from exposed soil at San Luis Reservoir. However, existing power plants that are already permitted would be used and no new power plants would be constructed. Additionally, the changes in storage in San Luis Reservoir that would result from the Project would be minor and fall within the range of fluctuations present under both current and historic operations. Therefore, the Project would have a less than significant cumulative impact to air quality.

CULTURAL RESOURCES

EWA acquisition of water from non-CVP or SWP reservoirs would lower water levels, thereby exposing potential cultural resources that would normally be inundated. Project impacts would compound or increase these impacts. However, the natural hydrology and pattern of

Delta exports in combination with CVP and SWP Contractors water demands already results in substantial reservoir level fluctuations and the combined change in fluctuation would less than significant. Therefore the Project would have a less than significant cumulative impact to cultural resources.

GEOLOGY, SOILS, AND MINERALS

EWA would affect local soils by the idling of crops. Project impacts would not compound or increase these impacts. Therefore the Project would not have a cumulative impact to geologic, soil and mineral resources.

UTILITIES AND SERVICE SYSTEMS

The storage and release of water from reservoirs for the EWA would alter the timing of hydroelectric power production. While the alteration of timing would be expected to somewhat overlap with the Project-related increased demands for electricity, Project impacts would compound or increase these impacts. However, the Project would have a less than significant cumulative impact to utilities and service systems because anticipated power supplies available or planned should be sufficient to meet demands in California and no expansion or construction of new electrical power generation facilities would be required.

WATER RESOURCES

EWA would temporarily affect surface water supplies and management characteristics by acquiring water (1) stored in non-CVP or SWP reservoirs after operators of those reservoirs have addressed refill criteria considering carryover storage and the potential for future hydrologic conditions, or (2) participating in a consumption reduction action with willing sellers able to idle agricultural water use. These actions would change the timing and amount of flows into the Delta and exports from Delta diversion facilities. These impacts would tend to ameliorate and not compound or increase with Project impacts.

EWA would affect water quality in the Delta by changing the timing of flows in the Delta. EWA would reduce Delta exports from December through June, thereby reducing the effects of seawater inflows. EWA fish actions would shift Delta exports from spring to later in the year in the same manner as the Project. This would produce a less than significant beneficial effect.

6.3.1.3 State Water Resources Control Board Decision 1641 – Bay/Delta Water Quality Control Plan (Decision 1641)

Project Description

Decision 1641 is an action by the SWRCB to establish water quality objectives for water uses in the Delta. The Bay/Delta Water Quality Control Plan was developed as a means to attain these water quality objectives and includes the following components: implementation of flow objectives for specific water quality criteria in the Bay-Delta Estuary; a petition to change the point of diversion for the Central Valley Project (CVP) and SWP in the southern Delta; and a petition for change in place of use and purpose of use of the Central Valley Project.

Environmental Analysis Status and Anticipated Impacts

The EIR for Decision 1641 was certified in 1999, and the SWRCB adopted Decision 1641 in December 1999. The Bay/Delta Water Quality Control Plan increases the quantity of water dedicated to protection of aquatic resources in the Delta. Consequently, water deliveries available for municipal and agricultural uses from the Delta and the SWP decline. Over the long term, annual average delivery reductions would be approximately 350,000 AF. Infrequently, in critically dry periods, the annual delivery reductions would be approximately 800,000 AF. This water would remain in the waterways of the Delta and would thus improve water quality. These reductions were considered in the analysis of the Project's impacts. Potential impacts were identified for the following resources that also would be affected by the Project: aesthetics; air quality; cultural resources; utilities and service systems (energy resources); and surface water supply.

Cumulative Impacts with the Project

AESTHETIC RESOURCES

Decision 1641 would affect aesthetic resources in the following ways: (1) changes in flow could have the effect of lowering water levels in reservoirs upstream of the Delta earlier in the season, for longer periods, or below the levels than would otherwise occur; and (2) lower water levels in some SWP and CVP reservoirs. Consequently, scenic quality could be impacted at some reservoirs upstream of the Delta and SWP and CVP reservoirs located south of the Delta. Project impacts would compound or increase these impacts to SWP and CVP reservoirs from the Delta to Castaic Lake, including San Luis Reservoir, which is a shared SWP and CVP facility. However, the natural hydrology and pattern of Delta exports in combination with CVP and SWP contractors' water demands already result in substantial reservoir level fluctuations and the combined change in fluctuation would not perceptibly change the scenic qualities. Additionally, the changes that would result from the Project and from Decision 1641 are minor. Therefore the Project would have a less than significant cumulative impact to aesthetic resources.

AIR QUALITY

The increased groundwater pumping to replace surface water supplies would lead to increased pumping lifts and increases in energy consumption, thereby increasing air pollution. However, no expansion or construction of new electrical power generation facilities would be anticipated and all existing and proposed electrical generation facilities would operate within existing permitted levels. The indirect impacts of increased power generation of the Project and Decision 1641 would result in a less than significant cumulative impact to air quality.

CULTURAL RESOURCES

Decision 1641 would affect cultural resources in the following ways: (1) changes in flow could have the effect of lowering water levels in reservoirs upstream of the Delta earlier in the season, for longer periods, or below the levels than would otherwise occur; and (2) lower water levels in some SWP and CVP reservoirs south of the Delta. Consequently, cultural resource subject to inundation could be impacted at some reservoirs upstream of the Delta and SWP and CVP reservoirs located south of the Delta. Project impacts would compound or increase these

impacts to SWP reservoirs from the Delta to Castaic Lake, including San Luis Reservoir, a shared SWP and CVP facility. However, the natural hydrology and pattern of Delta exports in combination with CVP and SWP Contractors water demands already results in substantial reservoir level fluctuations and the combined change in fluctuation would less than significant. Additionally, the changes that would result from the Project and from Decision 1641 are minor. Therefore, the Project would have a less than significant cumulative impact to cultural resources.

UTILITIES AND SERVICE SYSTEMS

Implementation of Decision 1641 results in higher net hydropower generation by the SWP and the CVP because exports would be somewhat reduced. The increased groundwater pumping to replace surface water supplies (described in the previous section) would lead to increased pumping lifts and increases in energy consumption. However, no expansion or construction of new electrical power generation facilities is anticipated. Project impacts would compound or increase these impacts by increasing the demand for electrical power generation. However, the Project would have a less than cumulative impact on utilities and service systems because anticipated power supplies available or planned should be sufficient to meet demands in California, and no expansion or construction of new electrical power generation facilities would be required.

WATER RESOURCES

The project would result in changes in the timing of diversions from the Delta, and Decision 1641 also would result in changes in the timing of diversions from the Delta or an overall reduction in the amount of water diverted. Surface water supply operations of the Project would be consistent with the implementation of Decision 1641 and would therefore not compound or increase the impacts of Decision 1641.

6.3.1.4 Central Valley Improvement Act Project (CVPIA)

Project Description

In addition to reauthorizing the CVP and mandating the renegotiation of water supply contracts, the CVPIA identified the protection, restoration, and enhancement of fish, wildlife, and associated habitats in the Central Valley. It established a requirement for the acquisition of water for protecting, restoring, and enhancing fish and wildlife populations.

Environmental Analysis Status and Anticipated Impacts

The U.S. Bureau of Reclamation (USBR) evaluated the CVPIA in a Programmatic EIS (USBR 2001) and a series of related project-specific evaluations (e.g., water delivery contract renewal NEPA evaluations). The Programmatic EIS identified potential impacts to the following environmental resources in and adjacent to the Delta, some of which also would be affected by the Project: cultural resources, utilities and service systems, and water resources. However, CVPIA potential effects to cultural resources were identified but could not be quantified until project-specific evaluations were conducted.

Cumulative Impacts with the Project

Project-related impacts to utilities and service systems would contribute to the impacts of CVPIA to these resources. CVPIA affects utilities (energy resources) as a result of changes in operations that shift patterns of power generation, resulting in a reduction in hydroelectric power generation. Project impacts would compound or increase these impacts by increasing the demand for electrical power generation. However, the Project would have a less than significant cumulative impact to utilities and service systems because anticipated power supplies available or planned should be sufficient to meet demands in California and all existing and proposed electrical generation facilities would operate within existing permitted levels.

CVPIA effects to surface water supplies and management include (1) reductions in deliveries from the Trinity River basin to the Sacramento River basin; (2) increased releases from Shasta Lake; (3) increased flows on Clear Creek (near Redding, California) in non-critical years; (4) changes in release from Folsom Lake to stabilize flows in the American River; and, (5) increased instream flows in non-critical years on the Stanislaus River. These impacts would not compound or increase with Project impacts because the Project would not affect these areas.

6.3.1.5 Monterey Amendment

Project Description

The Monterey Amendment describes a project that would amend the Water Supply Contracts between DWR and the SWP Contractors to improve the management of SWP supplies and operations. Additional discussions of the Monterey Amendment are provided in section 1.2.2, section 3.15, section 6.3.2.5, section 6.3.3.4, and Appendix D. The 41,000 AF transfer associated with the Project represents a portion of 130,000 AF of Agricultural Table A Amounts made available for permanent sale to M & I Contractors as part of the Monterey Amendment. The Project could also be completed under terms of the CLWA Water Supply Contract prior to the implementation of the Monterey Amendment.

Environmental Analysis Status and Anticipated Impacts

An EIR is being prepared to evaluate the potential environmental impacts of both the Monterey Amendment and the additional program components specified in the Settlement Agreement (see section 1.2.2 for a more detailed discussion of the Settlement Agreement). The NOP for the Monterey Agreement EIR does not specify the environmental resources to be addressed in the EIR or anticipated impacts of the project. Based on comment letters responding to the NOP, however, impacts to the following environmental resources in and adjacent to the Delta and SWP facilities that also would be affected by the Project include aesthetics, air quality, cultural resources, geology and soils, utilities and service systems, and water resources.

Cumulative Impacts with the Project

Impacts of the Monterey Amendment would vary depending on the various components and the location of their implementation. Impacts to the Delta and SWP facilities of the Agricultural to M&I water transfer components of the Monterey Amendment vary depending on the

location of the receiving agency (KCWA and its member units have committed to sell the 130,000 AF of Agricultural Table A Amounts) to M & I Contractors.

- Receiving agencies using the North Bay Aqueduct (e.g., Napa County Flood Control and Water Conservation District and Solano County Water Agency) would not utilize facilities south of that point of diversion and would decrease average demands on the Delta facilities and those south of the Delta. These impacts would not compound or increase with the Project impacts.
- Receiving agencies using the South Bay Aqueduct (e.g., Alameda County Flood Control and Water Conservation District, Zone 7) would continue to use pumping facilities in the Delta but would reduce average demands on facilities below where the South Bay Aqueduct braches off the California Aqueduct (approximately the City of Tracy or the end of Reach 2 of the California Aqueduct). These impacts would compound or increase with the Project impacts associated with the Delta pumping facilities but would not compound or increase with the Project impacts below Reach 2.
- Receiving agencies south of Kern County would utilize many of the same facilities as the Project (e.g., San Luis Reservoir, the same reaches of the California Aqueduct, and the same pumping facilities), and impacts to those facilities are likely to be similar to those created by the Project. Projects that that would affect these facilities include transfers from districts within Kern County to districts in southern California (e.g., to Mojave Water Agency and Palmdale Water District). These impacts would compound or increase with the Project impacts.

Aesthetic Resources

Table A Amount transfers would affect aesthetic resources by changing water levels in SWP reservoirs in a manner similar to the Project. Consequently, scenic quality would be impacted at some reservoirs. Project impacts would compound or increase these impacts. However, the natural hydrology and pattern of Delta exports in combination with SWP demands already results in substantial reservoir level fluctuations and the combined change in fluctuation would not perceptibly change the scenic qualities. Therefore, the Project would have a less than significant cumulative impact to aesthetic resources.

Air Quality

Implementation of the Monterey Amendment would increase the amount of pumping in the SWP facilities and thereby adversely affect air quality by increasing the amount of air emissions necessary to generate electricity. Project impacts would compound or increase these impacts by increasing the demand for electrical power generation. However, the Project would have a less than cumulative impact air quality because anticipated power supplies available or planned should be sufficient to meet demands in California and all existing and proposed electrical generation facilities would operate within existing permitted levels.

Cultural Resources

Table A Amount transfers would affect cultural resources by changing water levels in SWP reservoirs in a manner similar to the Project. Consequently, potential cultural resources normally inundated would be exposed and could be impacted at some reservoirs. Project

impacts would compound or increase these impacts. However, the natural hydrology and pattern of Delta exports in combination with SWP demands already results in substantial reservoir level fluctuations and the combined change in fluctuation would not perceptibly change reservoir water levels. Therefore the Project would have a less than significant cumulative impact to cultural resources.

GEOLOGY, SOILS, AND MINERALS

Table A Amount transfers would affect geology, soils, and mineral resources by changing water levels in SWP reservoirs in a manner similar to the Project. Consequently, soils and mineral resources that would normally be inundated would be exposed and could be eroded at some reservoirs. Project impacts would compound or increase these impacts. However, the natural hydrology and pattern of Delta exports in combination with SWP demands already results in substantial reservoir level fluctuations and the combined change in fluctuation would not perceptibly change reservoir water levels. Therefore the Project would have a less than significant cumulative impact to geology, soils and mineral resources.

UTILITIES AND SERVICE SYSTEMS

Implementation of the Monterey Amendment would increase the amount of pumping in the SWP facilities and thereby increase demand for electricity. Project impacts would compound or increase these impacts by increasing the demand for electrical power generation. The Project would have a less than cumulative impact on utilities and service systems since anticipated power supplies available or planned should be sufficient to meet demands in California and no expansion or construction of new electrical power generation facilities would be required.

WATER RESOURCES

Table A Amount transfers would affect surface water management and supply characteristics by slightly changing (1) the timing of water pumped from the Delta and, and (2) the timing of water withdrawals from SWP reservoirs. Consequently, springtime flows in the Delta would be greater and reservoir water levels would remain higher for a longer period of time at some reservoirs. Project impacts would compound or increase these impacts. However, the Project and the Monterey Amendment would not change the operating criteria for diversions from the Delta, and the changes in timing of Delta diversions would occur infrequently and would result in only minor changes to Delta diversions within the applicable environmental and regulatory constraints. Additionally, changes in timing of water withdrawals in SWP reservoirs would be within the substantial differences in San Luis Reservoir storage that occur in normal SWP operations over the course of the year and from year to year. Therefore the Project would have a less than significant cumulative impact on water resources.

6.3.1.6 Sacramento Valley Water Management Agreement (SVWMA)

Project Description

The SWRCB has engaged in several years of proceedings regarding the responsibilities for meeting flow-related water quality standards for the Delta (established in Decision 1641). In order to resolve and expedite this process, the parties of concern (including DWR, USBR, water right holders in the Sacramento Valley, and SWP and DWR Contractors) entered into the

SVWMA in April 2001. The SVWMA establishes a process to develop and implement a variety of local water management projects that will increase supplies in order to meet both in-basin demands and the water quality requirements for the Delta. The SVWMA will be implemented by a series of work plans facilitating groundwater management and planning, water conservation and efficiency, fish passage improvements, water transfers and exchanges, flood protection, conjunctive use and other environmental improvements (SVWMA 2002).

Environmental Analysis Status and Anticipated Impacts

Planning for an environmental evaluation under both CEQA and NEPA is underway. Since the SVWMA is a specific agreement to help satisfy the requirements of Decision 1641 the impacts of the SVWMA are anticipated to be similar to and less that those described for the Decision 1641 project. Potential impacts are anticipated for the following resources that also would be affected by the Project: aesthetics, air quality, cultural resources, utilities and service systems (energy), and, surface water supply. These impacts would primarily be a result of construction and other water management actions in the Sacramento Valley. However, the SVWMA would shift some of the burden for meeting water quality requirements in the Delta from SWP and CVP Contractors to water users in the Sacramento Valley thereby allowing for additional water exports to SWP and CVP Contractors south of the Delta.

Cumulative Impacts with the Project

The SVWMA would offset some of the impacts of Decision 1641 in the Delta and south of Delta because it would make more water available for environmental uses within the Delta, thereby allowing SWP and CVP water currently used for environmental purposes in the Delta to be exported to water users south of the Delta. Construction-related impacts of the SVWMA would occur outside of the area potentially affected by the Project and therefore would not be cumulative. The SVWMA's effects in the Delta would be beneficial. Therefore, no cumulative impacts would occur.

6.3.1.7 *San Luis Reservoir Low Point Improvement Project*

Project Description

The San Luis Reservoir Low Point Improvement Project would address the water quality issues associated with low water levels in the San Luis Reservoir (i.e., when the water level gets too low, excessive algae is produced, which creates water quality, reliability, and operational impacts on the CVP and to some SWP contractors). The problems presently include additional operating costs, risks to public health and safety from interruption in water supply, and economic losses to agriculture and industry. There are also significant opportunity costs to the CVP and SWP as a result of their inability to fully utilize all of the available storage in the reservoir that would increase in the future if the low point occurred more frequently and for a longer duration. In recognition of the need to resolve the low point problem, the San Luis Reservoir Low Point Improvement Project was included in the August 2000 CALFED Bay-Delta Program's ROD as a complementary conveyance action. The ROD referred to a bypass canal to the San Felipe Unit at the San Luis Reservoir as one complementary action. The bypass canal would allow the San Felipe Division contractors to receive water directly from the Delta pumping facilities and increase the effective storage capacity in San Luis Reservoir up to 200,000 AF.

Environmental Analysis Status and Anticipated Impacts

The Santa Clara Valley Water District and the USBR issued an NOP in August 2002. The NOP identified a range of alternatives that could affect the following environmental resources that also would be affected by the Project: air quality, cultural resources, geology, soils and minerals, and utilities and service systems.

Cumulative Impacts with the Project

The Project would result in less than significant impacts to aesthetics, cultural resources, geology and soils, and water resources associated with temporal changes in San Luis Reservoir's water elevation as a result of changes in the timing of deliveries to the reservoir. The Low Point project would reduce water levels and result in a larger, more effective storage capacity and better water quality in San Luis Reservoir. Because the Project would delay the removal of water from San Luis Reservoir (thereby ameliorating or delaying a portion of the impacts of the Low Point project) there would be less than significant cumulative impacts on these resources.

AESTHETIC RESOURCES

Scenic qualities at San Luis Reservoir could be impacted due to decreasing water levels associated with the Low Point project. Project impacts would compound or increase these impacts at certain times and reduce or ameliorate these impacts at other times. The natural hydrology and normal pattern of Delta exports in combination with SWP demands already results in substantial fluctuations in water levels (and associated aesthetic impacts) in San Luis Reservoir. The combined change in fluctuation would not perceptibly change the scenic qualities. Therefore the Project would have a less than significant cumulative impact to aesthetic resources.

AIR QUALITY

Implementation of the bypass canal alternative of the Low Point project would affect air quality by increasing the amount of air emissions necessary to generate electricity because additional electricity would be needed to pump water in the bypass canal. No expansion or construction of new electrical power generation facilities would be anticipated. Project impacts would compound or increase these impacts by increasing the demand for electrical power generation. However, the Project would have a less than cumulative impact on air quality because anticipated power supplies available or planned to meet demands in California and all existing and proposed electrical generation facilities would operate within existing permitted levels.

CULTURAL RESOURCES

The Low Point project would lower water levels in San Luis Reservoir, thereby exposing potential cultural resources that would normally be inundated. Project impacts would compound or increase these impacts under certain conditions for limited periods of time. However, the natural hydrology and pattern of Delta exports in combination with SWP demands already result in substantial reservoir level fluctuations. The combined change in fluctuation would be within current operational limits and would result in a less than significant impact to cultural resources.

GEOLOGY, SOILS, AND MINERALS

The Low Point project would affect geology, soils, and mineral resources in and adjacent to San Luis Reservoir by allowing water levels to be reduced below the current 300,000 AF pool under normal operational. Consequently, soils and mineral resources that would normally be inundated would be exposed and could be eroded. The Project would result in changes to the timing of storage of water in San Luis Reservoir and the Project's impacts would compound or increase impacts of the Low Point project. However, the natural hydrology and pattern of Delta exports in combination with SWP demands already result in substantial reservoir level fluctuations and the Project's contribution to the change in fluctuation would not perceptibly change reservoir water levels. Therefore, the Project would have a less than significant cumulative impact on geology, soils, and mineral resources.

UTILITIES AND SERVICE SYSTEMS

The storage and release of water from San Luis Reservoir for the Low Point project and alternatives would alter the timing of pumping demands and hydroelectric power production from releases from San Luis Reservoir. Project impacts would compound or increase these impacts. However, the Project would have a less than cumulative impact on utilities and service systems because anticipated power supplies available or planned should be sufficient to meet demands in California and no expansion or construction of new electrical power generation facilities would be required.

WATER RESOURCES

The Low Point project would affect surface water supplies and management characteristics by reducing the amount of water stored in San Luis Reservoir to meet export and environmental demands. These actions would change the timing and amount of flows into the Delta and exports from Delta diversion facilities. The Project would result in minor changes to the timing releases of water stored in San Luis Reservoir and minor changes in the timing of diversions from the Delta. Because these changes would be minor and would not alter the historical fluctuation amounts they would not substantially contribute to the impacts of the Low Point project. The Project would have a less than significant cumulative impact to water resources.

6.3.1.8 South Delta Improvement Project (SDIP)

Project Description

DWR and USBR are proposing the SDIP, which would increase the maximum allowable diversion capacity at the SWP's Clifton Court Forebay, provide an adequate water supply for South Delta Water Agency (SDWA) and improve conditions for San Joaquin River salmon in the southern portion of the Delta.

The SDIP would include the following components: increasing the maximum allowable diversion capacity at Clifton Court Forebay to 8,500 cubic feet per second (the same as that

identified in the "Delta Improvements Package")[1]; dredging portions of Old River and West Canal to improve conveyance capability during periods of high SWP and CVP Delta exports; constructing permanent operable barriers to improve water supply reliability and water quality in the south Delta; dredging local channels to reduce the frequency of barrier operations and to accommodate improvements to existing agricultural diversions both upstream and downstream of the proposed barriers; and constructing a permanent operable fish control structure at the head of Old River to reduce fish losses at the CVP and SWP export facilities.

The SDIP would result in increased water supply reliability for SWP, CVP, and the EWA (see section 6.3.1.2 above); increased water surface levels for SDWA agricultural water diverters; improved water quality for SDWA agricultural water diverters; improvement of conveyance capacity in portions of the south Delta; and improved conditions for San Joaquin River salmon.

Project's Environmental Analysis Status and Anticipated Impacts

DWR and USBR issued an NOP and NOI and held scoping meetings in October 2002. The Draft EIR/EIS is currently being prepared. The NOP identified issues for resolution including:

- physical and regulatory constraints limiting Clifton Court Forebay maximum allowable diversion rates;
- water supply availability for beneficial use within the SDWA service area; water supply availability from other programs and projects; effects of SWP and CVP export operations on San Joaquin River salmon;

The NOP also identified potential impacts to biology and water quality.

Cumulative Impacts with the Project

Although the SDIP EIR/EIS has not been completed, it is reasonable to assume that the SDIP would result in construction-related impacts, increased Delta diversions, and beneficial effects to SWP and CVP water supplies. The only construction-related impacts that could result in cumulative impacts with the Project would be air quality impacts. However, the Project would result in only minor air quality impacts and because the SDIP project's air quality impacts are expected to be temporary, cumulative impacts would be less than significant. Increased Delta diversions as a result of the SDIP would be conducted in a manner consistent with Decision 1641 and the Project's changes in the timing of diversions from the Delta would also be consistent with Decision 1641. Therefore, cumulative impacts of the Project and SDIP would be less than significant.

[1] The Delta Improvements Package is a proposed set of State Water Project/Central Valley Project (SWP/CVP) operating rules that may be evaluated and considered as part of a larger set of actions to improve the water supply reliability, water quality, and ecosystem health of the Bay-Delta system and includes increasing the SWP's pumping capacity to 8,500 cubic feet per second during periods when plentiful, high quality water is available.

6.3.1.9 North Delta Improvement Project (NDIP)

Project Description

The channel system in several of the streams in the North Delta lacks capacity to convey flows from the upstream watershed through the Delta to the San Joaquin River and to the San Francisco Bay. In concert with the CALFED ROD, the NDIP is designed to implement flood control improvements in a manner that also contributes to ecosystem restoration, water quality, and water supply reliability concerns in the North Delta. The NDIP will improve water conveyance, improve water supply reliability, facilitate reductions in salinity, recommend ecosystem restoration actions, and improve levee stability and integrity while minimizing impacts to agricultural and recreation resources.

Environmental Analysis Status and Anticipated Impacts

The DWR and U.S. Army Corps of Engineers published an NOI/NOP for the EIS/EIR on this project in January 2003. The NOI/NOP identified a range of alternatives that could affect the following environmental resources that also would be affected by the Project: air quality, cultural resources, geology, soils and mineral resources, and water resources.

Cumulative Impacts with the Project

The impacts resulting from the NDIP would be primarily construction-related impacts. The only construction-related impacts that could result in cumulative impacts with the Project would be air quality impacts. However, the NDIP project's air quality impacts are expected to be temporary and the Project's indirect impacts to air quality would not compound or increase these impacts. The Project would have no cumulative impact to air quality. All other Project impacts would be in a different geographic location than those associated with the NDIP or would not involve ground disturbance and, therefore, no other cumulative impacts would result.

6.3.1.10 16,000 AF Proposed Transfer of SWP Table A Amount From Kern County Water Agency, including Possible Annexations to CLWA

CLWA is studying a proposal to acquire additional SWP Table A Amount and to annex lands to the CLWA service area. This project is evaluated in this section because it would have the potential to adversely affect environmental resources associated with the use of SWP facilities. This project also is discussed in section 6.3.3.1 because it has the potential to affect environmental resources in the CLWA service area, as well.

Project Description

CLWA would acquire up to 16,000 AF of SWP Table A Amount from KCWA through an agreement with the Berrenda Mesa Water District (BMWD), thus increasing CLWA's SWP Table A Amount from 95,200 AF to up to 111,200 AF. The project would use existing SWP facilities to store and convey the water to CLWA. The 16,000-AF project would be completed either under the provisions of the Monterey Amendment or under the terms of CLWA's SWP water supply contract without the Monterey Amendment.

Environmental Analysis Status and Anticipated Impacts

CLWA issued a Draft EIR addressing the impacts of a smaller Table A Amount (9,500 AF) and proposed annexations in February 2000 (CLWA 2000). No Final EIR was issued. Subsequently, the Table A Amount transfer was increased to 16,000 AF and an NOP and Initial Study on the project were issued in July 2003. That NOP and Initial Study and the anticipated EIR (in-preparation) supersede the Draft EIR issued in February 2000.

According to the 2003 Initial Study, the 16,000 AF Transfer project would result in less than significant impacts to aesthetics, air quality, cultural resources, geology and soils, utilities/service systems (energy) resources, and water resources within and adjacent to SWP facilities. These impacts to resources within and adjacent to the SWP and associated facilities would be similar in nature to those described for the Project. The quantitative impact would be approximately 40 percent of the Project because the amount of water proposed for transfer is approximately 40 percent of the Project (16,000/41,000 = 0.39). These impacts would be included in those described as a permanent sale of an Agricultural SWP Table A from KCWA to the M & I Contractors under the Monterey Amendment south of KCWA, in section 6.3.1.5 above.

Cumulative Impacts with the Project

The Project's impacts would incrementally add to those of the 16,000 AF Transfer project. Cumulative impacts to the timing of diversions from the Delta would be less than significant because the two projects would result in only minor changes to the timing of Delta diversions and because these changes would be consistent with the water quality standards and operational constraints that govern Delta operations. Likewise, the cumulative impacts of these projects on aesthetics, cultural resources, and geology and soils associated with the SWP facilities would be less than significant because the overall changes to the timing of water stored in San Luis Reservoir would be minor (storage changes of less than 1 percent of average storage in most months and not more than 3 percent in any month for the Project and less than half of those amounts for the 16,000 AF Transfer project). Impacts to utilities/service systems (energy) resources would be cumulatively less than significant because the additional electrical energy would be acquired from the generation and supply reserve margins. These margins should be adequate to meet the reasonably foreseeable demands (CEC 2002b) and no expansion or construction of new electrical power generation facilities would be required.

6.3.2 Projects Affecting the WRMWSD

The Project impacts in the WRMWSD are associated with water resources. The Project would reduce WRMWSD's SWP Table A supply by approximately 17.2 percent, but this would not result in a material effect to WRMWSD's SWP water supply because this water would not otherwise be used. Under some conditions, this decrease in SWP water supply could result in increased reliance on other water sources and groundwater, but the impact would be less than significant. The Project would result in higher total dissolved solids (TDS) water used and recharged to local groundwater, but this would have a less than significant impact to water quality because increased use of other water and groundwater would be minor. The following projects are both land development and water supply, management, and distribution projects.

6.3.2.1 *Pastoria Power Plant*

Project Description

The Pastoria Power Plant is a 750-megawatt natural gas-fired, combined cycle electric generating station presently under construction and located approximately 6.5 miles east of the Interstate 5/Pump Plant Road intersection. The plant is located on an approximately 31-acre site, approximately 1 mile north of the California Aqueduct and 1.3 miles north of the Edmonston Pumping Plant. The plant will connect with the Pastoria substation, located approximately 4,000 feet south of the proposed plant. Natural gas will be delivered to the project through an existing interstate natural gas pipeline that runs approximately 7 miles north of the plant site. The Pastoria Power Plant's annual average water demand of 2,443 gallons per minute (gpm) or approximately 3,750 AFY at 95 percent operation will be met by a contract with WRMWSD and a back-up water supply through a contract with the Kern Water Bank Authority (CEC 2000). Construction on the Pastoria Power Plant began in June 2001 and commercial operation is targeted for mid-2005 (Calpine 2002).

Environmental Analysis Status and Anticipated Impacts

WRMWSD issued a Notice of Exemption (NOE) for the water supply contract on June 29, 2000 (SCH # 2000068257). The Pastoria Power Plant project was certified and granted a license by the California Energy Commission (CEC) on December 20, 2000 (CEC 2002a). The environmental analysis described in the Application for Certification (CEC 2000) indicated that the project would result in the permanent loss of 36.1 acres of non-native grassland habitat due to the construction of the power plant and associated transmission line and access road, and the temporary loss of 124.5 acres of native and non-native grassland, which includes the construction laydown area and lands associated with the transmission line, access road, water supply pipelines, and a fuel gas supply pipeline. Environmental resources affected by the Pastoria Power Plant that would also be affected by the Project include water resources (surface water quality and drainage, and water supply).

Cumulative Impacts with the Project

WATER RESOURCES

The Pastoria Power Plant project would meet its water demand in most years through a contract with WRMWSD, which is "backed up" though a contract with the Kern Water Bank Authority. The water supply needed for the Pastoria Power Plant is small (3,750 AFY) in comparison to the overall supply of the WRMWSD. Additionally, WRMWSD has sufficient supplies to accommodate the demands of its customers without relying on the 41,000 AF of Table A Amount associated with the Project (personal communication, W. Taube 1997 and 2002). Significant but mitigable impacts to surface water quality and drainage related to earthmoving activities were identified in the power plant environmental analysis. The Project would not adversely affect surface water quality or drainage because the Project would not involve construction related activities. Therefore, the Project would have a less than significant cumulative impact to water resources.

6.3.2.2 *Laval Farms Water Management and Exchange and WRMWSD Pump-Back*

Project Description

This project contains two components: (a) Laval Farms, the farming subsidiary of Tejon Ranchcorp (TRC) Water Management and Exchange, including water right applications to the SWRCB, and (b) WRMWSD's 850 Canal/Reservoir No. 1 Pump-back. The Water Management and Exchange component of the project would formalize the use of local water supplies to the extent feasible to meet TRC's water demand, for agricultural irrigation, livestock, and related operations on Tejon Ranch. The 850 Canal/Reservoir No. 1 Pump-back component of the project would reduce overall WRMWSD electrical power costs by reducing energy demands for pumping during on-peak hours and generating electrical energy during on-peak hours from SWP water stored in TRC's Reservoir No. 1.

The project is located in the southern portion of the San Joaquin Valley in Kern County. Approximately 8,200 acres of the project area are in the WRMWSD and are served by the C and D Laterals of WRMWSD's 850 Canal. Approximately 15,000 acres are part of Tejon Ranch's agricultural and range lands in the southeastern end of the San Joaquin Valley (a portion of these lands are located in the WRMWSD).

Environmental Analysis Status and Anticipated Impacts

A Notice of Preparation was issued for this project on November 15, 2001 and a Draft EIR for this project was released in late 2003 (SCH # 2001061013). It identified less than significant impacts to hydrology, water quality, and water supply, including a reduction in the duration and downstream extent of stream flows, minor changes in net groundwater recharge and groundwater levels in the White Wolf Sub-basin, and water quality and drainage impacts due to construction activities (WRMWSD 2003).

Cumulative Impacts with the Project

WATER RESOURCES

Under some conditions, the decrease in SWP water supply associated with the Project would result in increased reliance on other water sources and groundwater by users in WRMWSD. However, this would be a less than significant cumulative impact because these amounts are small relative to the total amount of water in storage in the Kern County Groundwater Basin and the White Wolf sub-basin, which underlie the WRMWSD. Also, groundwater levels in the portions of these basins underlying the service area generally have been increasing over time (BE 1995), indicating that the basins could sustain an increase in use under these limited conditions without resulting in a net deficit in aquifer volume or a lowering of the local groundwater table. The Laval Farms project would reduce the amount of net groundwater recharge and groundwater levels in the White Wolf Sub-basin, but net recharge and groundwater levels would continue to be positive (increasing). The Project would have a less than significant cumulative impact to water supply in WRMWSD and would not result in impacts to surface water drainage or flooding in the WRMWSD because it would not involve construction related activities. Thus, cumulative impacts would be less than significant. Minor impacts associated with increased TDS levels from the Project would compound with those of the Laval Farms project but both projects would result in minor impacts that would not

cumulative result in significant impacts to groundwater quality. Thus, the Project, in combination with the Laval Farms project, would have less than significant cumulative impacts to water quality.

6.3.2.3 *Tejon Industrial Complex East Specific Plan*

Project Description

Tejon Industrial Complex East (TICE) is a proposed 1,100-acre master-planned industrial complex on the east side of Interstate 5 at the Wheeler Ridge/Laval Road interchange, just north of the California Aqueduct. The project site currently consists of approximately 375 acres of previously irrigated vineyards in the central and northern portion of the site. The southern portion of the site abuts the California Aqueduct and is currently fallow land. The TICE would focus primarily on the needs of trucking, warehousing, and distribution industries. Under the TICE Specific Plan, approximately 990 acres of the site may be developed with industrial/warehouse uses (including associated roadways, landscaping, and parking areas), along with 110 acres of commercial uses, a 100-room hotel, and child-care facility. The site would utilize groundwater supplies in the White Wolf Sub-basin and SWP water (Kern County 2002). The area was annexed into the Tejon-Castac Water District (TCWD) and SWP water would be provided by TCWD.

Environmental Analysis Status and Anticipated Impacts

An NOP and Initial Study were issued by Kern County for the TICE Specific Plan in October 2001, and an EIR was completed in 2002 and certified in January 2003. The EIR (Kern County 2002a) identified less than significant impacts to hydrology and water quality due to increased runoff from impervious surfaces and/or groundwater contamination from abandoned oil wells, and a less than significant impact to groundwater from the White Wolf Sub-basin because the TICE would use groundwater as a possible water supply.

Cumulative Impacts with the Project

WATER RESOURCES

SWP water for TICE would come from the Table A Amount held by a separate member unit of KCWA, the TCWD. The TICE would also rely on groundwater, but because groundwater levels in the portions of the basins underlying WRMWSD have been generally increasing over time (BE 1995), the basins could sustain an increase in use under limited conditions without resulting in a net deficit in aquifer volume or a lowering of the local groundwater table. Similarly, implementation of the TICE Specific Plan would impact surface water quality and drainage from impervious surfaces and other surface water contaminants. These impacts to water quality would not be compounded or increased by the potential water quality impact associated with the Project because the Project would only result in a less than significant increase in TDS in groundwater. Further, the Project would not affect drainage in the WRMWSD. Therefore, the Project would have less than significant cumulative impacts to water resources.

6.3.2.4 *Tejon Industrial Complex West Specific Plan*

Project Description

The Tejon Industrial Complex West (TICW) Specific Plan is a 350-acre master-planned industrial complex located between Interstate 5 on the east and Tecuya Creek on the west near the Wheeler Ridge/Laval Road interchange, and north of the California Aqueduct. The project includes the following: about 3,930,850 square feet of industrial/warehouse uses, two gas stations, up to four fast food restaurants with drive-throughs, one 5,000 square-foot high turnover restaurant with drive-through, one 6,000 square-foot sit-down restaurant, one motel, and two mini-marts. The project is currently approximately 50 percent completed. The TICW area was annexed into the TCWD and SWP water would be provided by TCWD; groundwater from the White Wolf Sub-basin would also be used as a water supply.

Environmental Analysis Status and Anticipated Impacts

The Final Environmental Impact Report (FEIR) for the project was completed in February 2000. Based on the Initial Study and NOP prepared for the project, either no significant impact or less-than-significant impacts were found for water resources and therefore, were not analyzed in detail in the FEIR. Based on the NOP, the TICW would result in a less than significant impact to groundwater from the White Wolf Sub-basin because the TICW would use groundwater as a possible water supply.

Cumulative Impacts with the Project

The Project and TICW in combination would have less than significant cumulative impacts to water resources. Although the Project would transfer water from WRMWSD, this water would not otherwise be used by WRMWSD and, therefore, no additional demands on groundwater would occur.

6.3.2.5 *Kern County Valley Floor Habitat Conservation Plan*

Project Description

The Kern County Valley Floor Habitat Conservation Plan (VFHCP) is a program designed to conserve federally protected species, state protected species, and/or other species of concern within the VFHCP plan area. The objective of the VFHCP is to provide long-term protection of identified species while allowing for development and other land use changes within Kern County. The VFHCP plan area, generally described as the San Joaquin Valley floor, is bounded by San Luis Obispo County to the west, Kings and Tulare counties to the north, and the 2,000-foot elevation contour to the east and south, covering approximately 3,110 square miles.

Project's Environmental Analysis Status and Anticipated Impacts

An NOP for an EIR was issued by Kern County on November 11, 1997. However, this NOP is now obsolete due to changes in the project description and a new notice is to be issued in the future (personal communication, S. Strait 2003). A Notice of Intent (NOI) was issued by the U.S. Fish and Wildlife Service in October of 2002. The NOI states that the VFHCP will address the incidental take of 28 covered species, including the blunt-nosed leopard lizard [*Gambelia*

silas], Tipton kangaroo rat [*Dipodomys nitratoides nitratoides*], giant kangaroo rat [*Dipodomys ingens*], and San Joaquin kit fox [*Vulpes macrotis mutica*]. These wildlife species are listed as endangered under the federal Endangered Species Act. The VFHCP would have a compensation framework that encourages conservation of habitat areas and creates a system of conservation credits based on habitat quality. Credits are created by willing landowners and purchased by project proponents. Several compensation options are described in the VFHCP, including an option that would address incidental take of covered species that may occur as a result of certain activities associated with major land uses such as oil and gas, water systems, urban development, and public infrastructure. Potential impacts of the VFHCP may include impacts to water resources (treatment, storage, and conveyance systems) through the construction and maintenance of habitat.

Cumulative Impacts with the Project

The VFHCP may include construction and supply-related impacts to water resources through the treatment, storage, and conveyance systems for the construction and maintenance of habitat. Because the Project would not require construction activities, it would not have impacts to water resources from construction. Therefore, no cumulative impacts would occur. The Project would result in increased reliance on other water sources and groundwater. However, the total amount of water needed to implement the VFHCP is likely to be minor and the number of specific VFHCP projects that would be constructed within the WRMWSD is likely to be small. Therefore, cumulative impacts to water supply and groundwater of the VFHCP and the Project would be less than significant.

6.3.2.6 Monterey Amendment

Project Description

The Monterey Amendment describes a project that amends the Water Supply Contracts between DWR and the SWP Contractors to improve the management of SWP supplies and operations. More detailed discussions of the Monterey Amendment are provided in section 1.2.2, section 3.15, section 6.3.1.5, section 6.3.3.4, and Appendix D. The components of the Monterey Amendment evaluated in this section include the following:

- the permanent transfers of 130,000 AF of Agricultural to M & I (89,000 AF of SWP Table A Amounts from within Kern County), including the 41,000 AF of the Project;
- the permanent retirement of 45,000 AF of Table A Amount by Agricultural Contractors; and
- the transfer of the Kern Fan Element property to local control.

Environmental Analysis Status and Anticipated Impacts

As a result of the PCL Litigation Settlement Agreement, a new EIR is being prepared to evaluate the potential environmental impacts of both the Monterey Amendment and the additional program components specified in the Settlement Agreement. The NOP for the Monterey Agreement EIR does not specify the environmental resources to be addressed in the EIR or anticipated impacts of the project. Comment letters responding to the NOP, however,

expressed concern that impacts to water resources (water supply and groundwater) could occur in Kern County.

Cumulative Impacts with the Project

Impacts related to the Monterey Amendment components (the permanent transfers of water, the permanent retirement of water, and the transfer of the Kern Fan Element to local control discussed above) vary depending on the type of and location of its implementation. Impacts of the transfer of the Kern Fan Element property from DWR to local control and of the permanent retirement of the 45,000 AF of Table A Amount by Agricultural Contractors occurred prior to 1998 and are therefore considered in the existing environment. Preparation of the new EIR for the Monterey Amendment is still in its early stages, so there are no known changes proposed in the use of the Kern Fan Element property that would impact WRMWSD. Impacts of the 130,000AF Agricultural to M & I water transfer components of the Monterey Amendment vary depending on the location of the selling and receiving agency. All of the impacts of selling Table A Amounts from WRMWSD are included in the Project and, therefore, this component of the 130,000AF Agricultural to M & I water transfer is not considered a separate action and requires no cumulative impacts analysis.

6.3.2.7 Proposed Projects in or Adjacent to the WRMWSD not Producing Cumulative Impacts

The following projects were considered for inclusion in the cumulative analysis but not carried forward for the reasons noted:

- The San Emidio Specific Plan, a mixed-use new town planned for about 9,450 acres of land, is not included in this analysis because the project proponent has not gone forward with the proposed plan and potions of the lands have been sold or otherwise transferred ownership. Therefore, the project will likely not be developed.
- The Pastoria Energy Facility Expansion Project is not discussed here because the Application for Certification to the California Energy Commission was withdrawn and the project is not moving forward at this time.

6.3.3 Projects Affecting the CLWA Service Area

The only direct, adverse impact to the CLWA service would be a less than significant impact to hazards and hazardous materials resulting from an incremental increase in the use of chemicals for water treatment. Indirect impacts within the CLWA service area could occur because the Project would serve a portion of anticipated future growth and thus would indirectly cause impacts from new development. If all of the net water supply for the Project (41,000 AF) were used for anticipated future growth, it would be able to support between 9,500 and 35,600 new residential units (see Chapter 4, Growth-Inducing and Growth Related Impacts). Indirect impacts were identified for all resources analyzed in the present EIR (refer to Chapter 4). The projects described below consist of land development and water (supply, management, and distribution) projects.

6.3.3.1 Other CLWA Projects

16,000 AF Proposed Transfer of State Water Project Table A Amount From Kern County Water Agency, including Possible Annexations to CLWA

PROJECT DESCRIPTION

This project is described above in section 6.3.1.10. Briefly, this project involves the transfer of up to 16,000 AF of SWP Table A Amount to CLWA from Berrenda Mesa Water District, a member unit of KCWA. This water would be used by CLWA to support anticipated future demands from proposed annexations to the CLWA service area and/or planned increases in water demand from future development. The cumulative impacts of this project are addressed in two places in this chapter because the project has the potential to affect environmental resources associated with SWP facilities as well as those within the CLWA service area.

ENVIRONMENTAL ANALYSIS STATUS AND ANTICIPATED IMPACTS

The CEQA status of this project is described in section 6.1.3.10. According to the 2003 Initial Study, the 16,000 AF Transfer project would result in indirect growth-related impacts similar to those of the Project (refer to Chapter 4). The quantitative impact would be approximately 40 percent of the Project since the amount of water proposed for transfer is approximately 40 percent of the Project (16,000/41,000 = 0.39).

CUMULATIVE IMPACTS WITH THE PROJECT

Project-related direct impacts related to hazards and hazardous materials would contribute to the impacts of 16,000 AF transfer project to these resources. The 16,000 AF transfer project would increase the direct use of hazardous chemicals and other material by CLWA during the raw water treatment process. Project impacts would compound or increase these impacts. However, these substances would be handled in compliance with applicable laws and regulations. Therefore, the Project would have a less than significant cumulative impact to hazards and hazardous materials.

Project-related indirect impacts to all environmental resources would contribute to the indirect impacts of 16,000 AF transfer project to these resources. The 16,000 AF transfer project would remove an obstacle to growth in the CLWA service area by providing a reliable water supply that would be available for future development of approximately 3,700 to 13,900 dwelling units within the CLWA service area or in the proposed annexation areas. This future development would impact the full range of environmental resources, as described in Chapter 4. Project impacts (providing a reliable water supply that would be available for future development of approximately 35,600 dwelling units within the CLWA service area) would compound or increase these impacts. Therefore, the Project would have a significant cumulative indirect impact to all environmental resources.

Expansion of Rio Vista Water Treatment Plant (RVWTP)

PROJECT DESCRIPTION

This project would expand the pumping capacity at the existing pump station and the water treatment capacity at the existing RVWTP site. The existing facility is located on Bouquet Canyon Road on approximately 600 acres near the CLWA Administration Building. The plant was designed to facilitate future expansion to help meet anticipated increasing demand for potable water in the Santa Clarita Valley. It is currently able to supply retail purveyors with an estimated 30 mgd of potable water. The associated pump station is located near the Bouquet Canyon Road crossing of the Santa Clara River.

The RVWTP's treatment capacity would be expanded to 60 mgd by expanding the existing clarifier/filter structure. The construction of the structure would be within a previously disturbed area at the treatment plant site. Additionally, minor modifications to the existing support systems would be completed, e.g., replacing existing equipment with higher capacity equipment. Replacement of equipment would be completely within existing structures and/or previously disturbed areas.

Detailed project-specific engineering design and environmental review have not yet commenced. However, anticipated increases in demand are likely to require consideration of this project within the next few years.

ENVIRONMENTAL ANALYSIS STATUS AND ANTICIPATED IMPACTS

The impacts of this project were programmatically evaluated by CLWA in 1988 (CLWA 1988), and in 1989, CLWA evaluated the environmental impacts of the original construction of the RVWTP in a Mitigated Negative Declaration (CLWA 1989). Because no project-level EIR has been done on the expansion, a preliminary analysis was conducted for purposes of the present EIR. In general, direct, construction-related impacts would be expected although limited because ground-disturbing activity would take place in previously disturbed areas. The total disturbed area is likely to be less than 5 acres. It is anticipated that construction could result in temporary but significant impacts to air quality (combustive and fugitive dust emissions), cultural resources (potential disturbance during construction), geology and soils (construction on expansive soils), noise, and transportation (increased traffic). The project would result in significant long-term impacts to hazards and hazardous materials (increased use of water treatment chemicals) and utilities and service systems (increase in electricity used for increased treatment and increased need for storm drainage facilities.

The expansion of the RVWTP would increase treatment capacity by approximately 30 mgd (total capacity would be 60 mgd) and thus would result in indirect, growth-related impacts. Assuming operations consistent with average annual capacity, the incremental increase in capacity would serve approximately 17,000 housing units, whereas the maximum (peak) increase in capacity could serve approximately 34,000 housing units. The RVWTP project would result in indirect growth-related impacts to all resource categories similar to the affects of the Project (refer to Chapter 4).

CUMULATIVE IMPACTS WITH THE PROJECT

Project-related direct impacts to hazards and hazardous materials would contribute to the impacts of RVWTP expansion project to these resources. The RVWTP project would increase the direct use of hazardous chemicals and other material by CLWA during the raw water treatment process. These substances would be handled in compliance with applicable laws and regulations. Project impacts would compound or increase these impacts. Therefore, the Project would have a significant cumulative impact to hazards and hazardous materials.

Project-related indirect impacts to all environmental resources would contribute to the direct and indirect impacts of the RVWTP expansion project. During construction the RVWTP expansion project would impact air quality, cultural resources, geology and soils, noise, and transportation. The RVWTP expansion project would result in significant long-term impacts to utilities and service systems. The RVWTP expansion project would also remove an obstacle to growth in the CLWA service area by providing potable water treatment for future development of approximately 17,000 dwelling units within the CLWA service area. This future development would impact the full range of environmental resources, as described in Chapter 4. Project impacts (providing a reliable water supply that would be available for future development of approximately 35,600 dwelling units within the CLWA service area) would compound or increase these impacts. Therefore, the Project would have a significant cumulative indirect impact to all environmental resources.

Expansion of Earl Schmidt Filtration Plant

PROJECT DESCRIPTION

CLWA is upgrading and expanding the treatment system of the existing Earl Schmidt Filtration Plant (ESFP) capacity from 33.6 mgd to 56 mgd. The existing ESFP is located at 32700 North Lake Hughes Road in the community of Castaic. Construction started in September 2003 and is anticipated to last approximately 18-24 months. The ESFP project will provide upgrades to meet water quality regulations, provide a greater degree of redundancy in treatment capacity in the event of an emergency, meet existing summer peaking needs, and serve future growth. The plant's expansion also includes process improvements to achieve compliance with current and proposed water quality regulations as well as replacement of an existing raw water pumping station.

PROJECT'S ENVIRONMENTAL ANALYSIS STATUS AND ANTICIPATED IMPACTS

In April 2003, CLWA certified the Final EIR on the ESFP Expansion project and filed the Notice of Determination (CLWA 2003a). Construction of the ESFP project would result in temporary but significant impacts to air quality, cultural resources (potential disturbance during construction), geology and soils (construction on expansive soils), noise, and transportation (increased traffic). Operation of the ESFP Expansion project would result in impacts to aesthetics, agricultural resources, biological resources, geology and soils, hazards and hazardous materials, land use and planning, noise, and recreation resources.

The ESFP expansion project would increase treatment capacity by approximately 22.4 mgd and thus would result in indirect, growth-related impacts. Assuming operations consistent with average annual capacity, the incremental increase in capacity would serve approximately

13,000 housing units, whereas the maximum (peak) increase in capacity could serve approximately 30,000 housing units. The ESFP expansion project would result in indirect growth-related impacts to all resource categories similar to the affects of the Project (refer to Chapter 4).

CUMULATIVE IMPACTS WITH THE PROJECT

Project-related direct impacts to hazards and hazardous materials would contribute to the impacts of ESFP expansion project to these resources. The ESFP project would increase the direct use of hazardous chemicals and other material by CLWA during the raw water treatment process. These substances would be handled in compliance with applicable laws and regulations. Project impacts would compound or increase these impacts. Therefore, the Project would have a significant cumulative impact to hazards and hazardous materials.

Project-related indirect impacts to all environmental resources would contribute to the direct and indirect impacts of ESFP expansion project. During construction the ESFP expansion project would impact aesthetics, agricultural resources, air quality, biological resources, cultural resources, geology and soils, land use and planning, populations and housing, public services, noise, transportation utilities and water resources. The ESFP expansion project would also remove an obstacle to growth in the CLWA service area by providing potable water treatment for future development of approximately 13,000 dwelling units within the CLWA service area. This future development would impact the full range of environmental resources, as described in Chapter 4. Project impacts (providing a reliable water supply that would be available for future development of approximately 35,600 dwelling units within the CLWA service area) would compound or increase these impacts. Therefore, the Project would have a significant cumulative indirect impact to all environmental resources.

Honby Extension Storage Project

CLWA is in the process of engineering the Honby Extension/Storage Reservoir Project (Honby Extension). The Honby Extension project is a 33-inch, approximately 30,000 foot long waterline, originating near the intersection of Honby Avenue and Santa Clara Street where a new pump station also will be constructed. The Pipeline will travel from the new pump station easterly and southerly, terminating in a new storage reservoir west of Rolling Hills Avenue and Warmuth Road. The new pump station would provide the lift to transport water to the proposed 21-million gallon storage reservoir. The Honby Extension is expected to be under construction starting in 2003, with construction lasting approximately 18 months.

PROJECT'S ENVIRONMENTAL ANALYSIS STATUS AND ANTICIPATED IMPACTS

CLWA completed a Mitigated Negative Declaration and approved the project in 1999. Hilltop construction of the storage reservoir will incorporate design elements to address site-specific geology including landslides, mudflows, and safety issues. Significant but mitigable impacts were identified for geology and soils (erosion, sedimentation, expansive soils, and collapsible soils), water quality (discharge of pollutants into adjacent water bodies), air quality (construction related air emissions), transportation and traffic (related to emergency access and bicycle/pedestrian traffic along the Santa Clara River), biological resources (e.g., least Bell's Vireo, southwestern willow flycatcher, alluvial scrub habitat, nesting of migratory birds), noise

(construction related), and aesthetics (related to construction of the pump station and reservoir).

CUMULATIVE IMPACTS WITH THE PROJECT

Project-related direct impacts to hazards and hazardous materials would contribute to the construction impacts of the Honby Extension project because both projects would require the use of hazardous materials. These potentially cumulative impacts would be limited to the duration of the construction period and implementation of the identified mitigation measures for each project would reduce this impact to a less than significant level.

Project-related indirect impacts to all environmental resources in the CLWA service area would also contribute to the impacts of Honby Extension project. Construction of the Honby Extension project would impact soils, degrade air quality from construction emissions, temporarily restrict emergency access, create additional noise, and degrade terrestrial habitat. Project impacts (providing a reliable water supply that would be available for future development in the CLWA service area) would compound or increase these impacts. Therefore, the Project would have a significant cumulative indirect impact to aesthetics, air quality, biological resources, geology and soils, noise, and transportation.

Pitchess Pipeline

The Pitchess Pipeline is a 24-inch, approximately 4,300-foot-long pipeline that would originate east of Interstate 5 near the intersection of the Old Road and Sedona Way in unincorporated Los Angeles County. A portion of the pipeline is located within the Pitchess Honor Farm and portions also cross Castaic Creek and other locations. The Pitchess Pipeline will provide imported water to supplement existing groundwater supplies currently used by local purveyors for demand generated in the northwestern portion of the CLWA service area.

PROJECT'S ENVIRONMENTAL ANALYSIS STATUS AND ANTICIPATED IMPACTS

CLWA approved a Mitigated Negative Declaration for the project in 1999, at that time referred to as the Lateral Extension (CLWA 1998c). Construction of the Pitchess Pipeline project would result in temporary but significant impacts to air quality, biological resources, cultural resources, geology and soils, hazards and hazardous materials, noise, transportation, and water quality. Operation of the Pitchess Pipeline project would result in indirect impacts to environmental resources from growth-related development.

Surveys for the arroyo toad were conducted at the Castaic Creek crossing and surveys for active nests of migratory birds were conducted in the construction area. Based on the results of the surveys, no additional measures are needed to reduce biological impacts. Other mitigation measures have been identified for impacts to archaeological/paleontological resources (i.e., construction monitoring under certain conditions), geology and soils impacts (i.e., Best Management Practices for erosion/sedimentation control), and mitigation measures for traffic, geotechnical/fault rupture, seismic and other hazards, collapsible soils, erosion, water quality, construction emissions, emergency access, air quality, and other impacts.

CUMULATIVE IMPACTS WITH THE PROJECT

Project-related direct impacts to hazards and hazardous materials would contribute to the construction impacts of the Pitchess Pipeline project. These potentially cumulative impacts would be limited to the duration of construction and implementation of the identified mitigation measures for each project would reduce this impact to a less than significant level.

Project-related indirect impacts to all environmental resources in the CLWA service area would also contribute to the impacts of Pitchess Pipeline project. Construction of the Pitchess Pipeline project would impact localized cultural resources, adjacent soils, and degrade terrestrial habitat by trenching and other direct disturbance. Construction would degrade air quality from construction emissions, temporarily restrict emergency access, create addition noise and. Project impacts (providing a reliable water supply that would be available for future development in the CLWA service area) would compound or increase these impacts. Therefore, the Project would have a significant cumulative indirect impacts to air quality, biological resources, cultural resources, geology and soils, noise, and transportation.

2002 and 2003 Groundwater Banking Projects

The Groundwater Banking Projects involve delivering a portion of CLWA's SWP Table A allocation that is not needed to meet anticipated demands in 2002 to the Semitropic Water Storage District (SWSD). SWSD would temporarily store up to 24,000 AF of CLWA's unused 2002 SWP deliveries and up to 35,000 AF of CLWA's unused 2003 SWP deliveries for later withdrawal and delivery to the CLWA service area in a future year or years, within 10 years from the date of banking the water in each project, i.e., 2012 and 2013, respectively. The 24,000 AF and 35,000 AF amounts would be stored in the SWSD Groundwater Banking Project, using SWSD's existing groundwater banking facilities. SWSD may use all or a portion of this SWP water in lieu of pumping groundwater for irrigation. Upon request, SWSD would return all or a portion of CLWA's previously stored water in one or more years, by either (1) pumping the water from its groundwater basin through pumpback facilities into the California Aqueduct, at which time the water would become part of the SWP water supply pool and would be conveyed to CLWA; or (2) by requesting that an equivalent amount of SWSD's SWP water be delivered to CLWA via the California Aqueduct. Storage of the water would not require the construction of new facilities or the improvement of any existing facilities within the CLWA or SWSD service areas.

PROJECT'S ENVIRONMENTAL ANALYSIS STATUS AND ANTICIPATED IMPACTS

CLWA circulated the Castaic Lake Water Agency 2002 Groundwater Banking Project Negative Declaration (and accompanying Initial Study) in August 2002 (CLWA 2002a). CLWA subsequently filed a Notice of Determination for this project in December of 2002. A lawsuit challenging this project was filed in Superior Court of Ventura County in February, 2003 (*California Water Network, Friends of the Santa Clara River v. Castaic Lake Water Agency* [Ventura County Superior Court Case No. CIV 215327]). Trial is scheduled for April, 2004. An additional lawsuit was filed on this project in Sacramento Superior Court in April 2003 (*Friends of the Santa Clara River v. State of California Department of Water Resources and Castaic Lake Water Agency* (Sacramento Superior Court Case No. 03-CS 00258) to challenge DWR approval of the point of delivery agreement to deliver the SWP water to the Semitropic Water Storage District. The case has been stayed until the completion of the Network case.

CLWA also circulated the Castaic Lake Water Agency 2003 Groundwater Banking Project Negative Declaration (and accompanying Initial Study) in December 2003 (CLWA 2003a). In each case, it was determined that the implementation of this project would result in a shift in the timing of use of electrical energy required to convey temporarily stored water to CLWA. Specifically, there would be a reduction in overall energy use for pumping along the SWP when water is stored in SWSD, and an increase in overall energy use when the water is returned to CLWA. The net effect would be an increase in the use of electrical energy needed to inject and recover the stored water. This incremental increase in energy use would indirectly result in increased air emissions from power plant operations, which would have less than significant adverse impacts within the San Joaquin Valley air basin, given that power plants are required to effectively mitigate air emissions under the conditions of air permits. Implementation of the groundwater banking projects were determined to not have the potential to significantly affect an environmental resource and no mitigation measures were proposed. The Groundwater Banking Projects would not result in growth inducement because each project period is temporary (i.e., 10 years), and would not provide a long-term water supply to support growth.

Cumulative Impacts with the Project

Project-related direct impacts to hazards and hazardous materials in the CLWA service area would contribute to the impacts of 2002 or 2003 Groundwater Banking projects. The water banking projects do not have impacts to environmental resources in the CLWA service area. Since there were no impacts identified to environmental resources in the CLWA service area there would be no cumulative impacts when this cumulative project is considered together with the Project. Water stored by these actions is considered to improve the reliability of the supply for the existing users in the CLWA service area but does not contribute to the reliability of water supplies for future development because it does not exceed 10 years from the date the water is banked.

Sky Blue Tank Site Additions

In April 2003, CLWA approved a Mitigated Negative Declaration (MND) for the Sky Blue Tank Site Additions (the Sky Blue project), a project that will be built by now CLWA Santa Clarita Water Division, a retail purveyor. The project will include construction of two above-ground water storage tanks and an associated storm drainage system on a site owned by the purveyor. The initial construction timeframe would last for approximately 3-4 months in the summer or fall of 2003, followed by another similar construction time period 2 years later. This site already contains a 1-million-gallon water tank and a 2-million-gallon water tank. Access to the site would be provided by the existing access road off of Whites Canyon Road just north of Enderly Street. The project would provide peak hour water usage for an approved residential development and would complete the water supply for this development. A previous EIR for this development (Engineering Service Corporation 1987) addressed all issues relating to water supply for the development. The Sky Blue project MND addresses only impacts resulting from the construction of the tanks.

Project's Environmental Analysis Status and Anticipated Impacts

The Sky Blue Project MND identifies significant impacts that would be reduced to less than significant after implementation of mitigation measures for the following resources: biological resources, geology and soils, hazards (construction in a high fire hazard area), hydrology and

water quality, and land use and planning. It identifies adverse, less than significant impacts for the following resources: aesthetics, air quality, noise, transportation and traffic, and utilities/service systems.

CUMULATIVE IMPACTS WITH THE PROJECT

Project-related direct impacts to hazards and hazardous materials in the CLWA service area would contribute to the impacts of Sky Blue project. Operational impacts not covered in the Sky Blue project were addressed in the 1987 EIR and were considered as part of the existing environmental conditions evaluated for the Project. Impacts to hazards and hazardous materials used during construction of the Sky Blue Tasks project would combine with the increased use of hazardous materials by the Project although the types of hazardous materials for water treatment would not combine with the types of materials to be used for the Sky Blue project. The Sky Blue project would insignificantly impact aesthetic, air quality biological resources, cultural resources, geology ands soils, fire danger hazards, noise, transportation, and utilities. Project indirect impacts (providing a reliable water supply that would be available for future development in the CLWA service area) would compound or increase these impacts. Therefore, the Project would have a significant cumulative indirect impact to aesthetics, air quality, biological resources, cultural resources, geology and soils, hazards, noise, transportation, and utilities.

Perchlorate Treatment and Aquifer Restoration

In 1997, the Santa Clarita Water Company (CLWA's Santa Clarita Water Division) detected perchlorate in two production wells tapping the Saugus Formation, both of which are near the Whittaker-Bermite property, located east of San Fernando Road and south of Soledad Canyon Road. These wells, Saugus-1 and Saugus-2, had perchlorate levels as high as 45 µg/L and have been retired. Two other Saugus production wells in the valley have shown detectable levels of perchlorate below 18 µg/L and the use of these wells has been suspended. These wells are located in the Newhall County Water District and in Valencia Water Company's service area. The combined capacity of all four Saugus wells is 8,000 gallons/minute. In addition, perchlorate has recently (2002) been detected in one Alluvial production well located near the former Whittaker-Bermite facility, which has been the primary focus of potential perchlorate contamination that has impacted the wells in the region. That well tested positive for perchlorate at a level of 5.9 µg/L (SCVWP 2003). The five perchlorate-impacted wells have been removed from active water supply service (SCVWP 2003). The affected Los Angeles County Purveyors are continuing to test for perchlorate in all of their active Alluvial and Saugus wells, and are developing a plan for a water treatment process to return the impacted wells to service as soon as possible.

The development and implementation of a cleanup plan for the Whittaker-Bermite site and the impacted groundwater is being coordinated among CLWA, the Purveyors, the State Department of Toxic Substances Control (DTSC), and the U.S. Army Corps of Engineers. In February 2003, the DTSC and the impacted Purveyors entered into an agreement entitled *Environmental Oversight Agreement* [Agreement] (SCVWP 2003). Under the Agreement, DTSC will provide review and oversight of the response activities being undertaken by the impacted Purveyors related to the detection of perchlorate in the five impacted wells (SCVWP 2003). Under the Scope of Work of that Agreement, the purveyors will prepare (1) Well

Characterization Reports; (2) a Health-Based Risk Assessment; (3) a Regional Groundwater Flow Model; and (4) a Treatment Technology Evaluation Report (SCVWP 2003). Several treatment technologies for the removal of perchlorate from water are currently available and the affected water agencies intend to develop their understanding of the contamination to assist in the selection of appropriate treatment to remediate the perchlorate problem. A standard for Maximum Containment Level (MCL) for perchlorate is not expected to be adopted until 2004 or 2005 (SCVWP 2003).

PROJECT'S ENVIRONMENTAL ANALYSIS STATUS AND CUMULATIVE IMPACTS WITH THE PROJECT

CEQA compliance has not been initiated for the perchlorate restoration project. Although remediation using some form of treatment technology is reasonably foreseeable based on the Agreement referred to above, and investigations are underway, the type of treatment technology, project timing, location, and description of facilities and processes utilized for cleanup, and the potential environmental effects, are currently speculative. The project has therefore not been carried forward for cumulative analysis. Cumulative impacts would be addressed, as determined to be necessary, in the future when project-specific CEQA compliance for that project is undertaken.

Honby Parallel

Planned and anticipated development in the eastern portion of the CLWA service area requires the installation of additional treated water conveyance capacity to serve current and future customers. CLWA is in the process of initiating engineering design of the Honby Parallel Pipeline Project (Honby Parallel). The Honby Parallel would connect to the outlet work of the RVWTP and traverse undeveloped land and follow the existing pipeline alignment eastward along and across the Santa Clara River to the intersection of Santa Clara Street and Furnival Avenue in Santa Clarita.

PROJECT'S ENVIRONMENTAL ANALYSIS STATUS AND ANTICIPATED IMPACTS

When pipeline design and siting is sufficiently complete CLWA will complete a CEQA analysis. Best Management Practices and other actions will be identified and incorporated into the project to reduce the impacts aesthetics, air quality, biological resources, cultural resources, hazards, geology and soils, noise, transportation, utilities, and water quality impacts. However, the Honby Parallel project would impact these resources.

CUMULATIVE IMPACTS WITH THE PROJECT

Project-related direct impacts to hazards and hazardous materials would contribute to the construction impacts of Honby Parallel project. These potentially cumulative impacts would be limited to the duration of the construction period and implementation of the identified mitigation measures for each project would reduce this impact to a less than significant level.

Project-related indirect impacts to all environmental resources in the CLWA service area would also contribute to the impacts of Honby Parallel project. Construction of the Honby Parallel project would impact soils, degrade air quality from construction emissions, temporarily restrict emergency access, create addition noise, and degrade terrestrial habitat. Project impacts (providing a reliable water supply that would be available for future development in the

CLWA service area) would compound or increase these impacts. Therefore the Project would have a significant cumulative indirect impact to aesthetics, air quality, biological resources, geology and soils, noise, and transportation.

6.3.3.2 *Projects Listed in the County of Los Angeles Development Monitoring System (DMS)*

Project Description

The DMS system is a list of proposed and approved projects maintained by the County of Los Angeles to provide a current estimate of certain development and environmental parameters. The DMS includes information on pending, approved, and recorded projects filed within the unincorporated area of the Santa Clarita Valley, as well as the City of Santa Clarita. Data were obtained for the Santa Clarita Valley for 1998 and an update is included for 2002. The intended use of the DMS system is to determine individual project and cumulative demands for public services and infrastructure. Because the Project is a water supply augmentation rather than a development project, a standard analysis using the DMS data would not apply. However, the DMS can be used to determine how much new development is anticipated in addition to development potentially accommodated by the Project. An estimate of additional development that could potentially be served by the Project was identified in Chapter 4.0.

Pending, approved, and recorded land development projects listed in the 1998 DMS and an update for 2002 are shown in Tables 6.3-1 and 6.3-2, respectively. The exact timing of the completion of these projects is uncertain because the completion schedule is dependent upon many variables including market demand, construction phasing, capital resources of the individual developers and ability of the various governmental agencies to process and issue the required permits. In addition, it should be noted that projects listed in the DMS sometimes remain on the list beyond completion or after construction has been delayed or may no longer be likely, and therefore the DMS list is only an estimate of known future development.

Table 6.3-1. 1998 DMS for the Santa Clarita Valley Planning Area (Housing Units)

Zone District Description	*Pending*	*Approved*	*Recorded*	*Totals*
Bouquet Canyon	834	676	56	1,566
Castaic Canyon	714	3,128	0	3,842
City of Santa Clarita	1,516	1,793	167	3,476
Newhall	514	1,758	91	2,363
North Claremount	-	-	-	-
Sand Canyon	920	1,030	474	2,424
Soledad	595	203	0	798
Miscellaneous.	-	-	1,504	1,504
Total Units	**5,093**	**8,588**	**2,292**	**15,973**

Source: Los Angeles County 1998.

Table 6.3-2. 2002 DMS for the Santa Clarita Valley Planning Area (Housing Units)

Zone District Description	Pending	Approved	Recorded	Totals
Bouquet Canyon	427	0	956	1,383
Castaic Canyon	4,090	3,049	1,910	9,049
City of Santa Clarita	1,592	2,853	1,973	6,418
Newhall	1,092	2,646	2,864	6,602
North Claremount	0	0	12	12
Sand Canyon	1,543	5,038	2,073	8,654
Soledad	868	0	127	995
Total Units	**9,612**	**13,586**	**9,915**	**33,113**

Source: Los Angeles County 2002.

Project's Environmental Analysis Status and Anticipated Impacts

Projects listed in the DMS would impact a broad spectrum of environmental resources. As a result of the land use approval process, including the project-specific CEQA analyses, many of these impacts have been reduced to less than significant or no impact through the application of mitigation measures. However, project-specific findings have found that other community needs and other factors have over-ridden the concerns for environmental resources and impacts to these resources.

Cumulative Impacts with the Project

If all of the water supply for the Project were used for anticipated future growth, it would be able to support 35,600 new residential units in an average water year; thus, there is overlap between the amount of growth supported by the Project and the amount of growth projected by the DMS. The impacts from development included in the DMS would not exceed those described as growth-related impacts of the Project in Chapter 4. The types of cumulative impacts that would occur are as described in Chapter 4.

6.3.3.3 Reasonably Foreseeable Land Development Projects Not Listed in the DMS

Reasonably foreseeable land development projects not identified in the DMS because tentative tract maps have not been submitted were also considered.

Newhall Ranch Specific Plan and Water Reclamation Plant

PROJECT DESCRIPTION

The project would include residential, commercial and mixed-use development. The project would include a total of 21,308 dwelling units, 5,549,00 square feet of commercial/mixed use development, and a 6.8 mgd water reclamation plant. The specific plan includes establishment

of San Fernando spineflower conservation/preserve areas. The project site is located wholly within the CLWA service area just east of Ventura County on the north slopes of the Santa Susana Mountains west of Valencia and one-eighth of a mile from the Magic Mountain Theme Park.

The project's potable water supplies would be supplied, in part, by using the applicant's historical Alluvial Aquifer groundwater, which is presently committed to agricultural uses. The project applicant also has secured a potable water supply through a contract with Nickel Family, LLC (the source of this water is the Kern River and is secured through pre-1914 water rights). This contract has secured the applicant's rights to 1,607 acre-feet of water per year from this source.

In addition, the applicant has entered into an agreement to reserve and purchase water storage capacity of up to 55,000 acre-feet in Semitropic Water Storage District's existing groundwater banking project. Any water stored in this account in Semitropic's existing banking project could be extracted in dry years in amounts of up to 4,950 acre-feet per year. This supply would be used as a source for the Specific Plan in dry years only.

The applicant's non-potable water for the project would be supplied, in part, by reclamation of wastewater from the Water Reclamation Plant, which is to be constructed as part of the Newhall Ranch Specific Plan. In addition, CLWA would serve the project with reclaimed water from existing upstream Water Reclamation Plants, consistent with CLWA's draft Reclaimed Water System Master Plan, which is being implemented in stages. These two sources would supply all of the project's non-potable water needs.

PROJECT'S ENVIRONMENTAL ANALYSIS STATUS AND ANTICIPATED IMPACTS

The Board of Supervisors of Los Angeles County certified the Newhall Ranch Specific Plan Final EIR, as revised by an additional environmental analysis, and re-approved the Specific Plan and related project approvals, on May 27, 2003. The additional environmental analysis was required to address certain specified issues arising from litigation challenging the Specific Plan and environmental documentation ("Newhall Ranch litigation"), discussed below.

The County's initial certification of the Specific Plan EIR was challenged in a consolidated CEQA action in Kern County Superior Court (United Water Conservation District v. County of Los Angeles, et al., Case No. 239324-RDR). After a hearing in 2000, the trial court found that the Final EIR required additional environmental analysis on certain issues, including water supplies to serve the Specific Plan. As a result, the trial court set aside approval of the project and the EIR certification, but only with respect to the specified issues. The trial court did not set aside approval of the project or EIR certification with respect to any other issues.

On May 27, 2003, the County's Board of Supervisors certified the additional environmental analysis and re-approved the project. Project opponents again challenged the adequacy of the environmental documentation, but the trial court ruled in favor of both the County and the applicant by finding that the additional analysis met the requirements of both CEQA and the court's prior decision in the Newhall Ranch litigation.

On December 19, 2003, project opponents filed an appeal of the trial court's decision in the Newhall Ranch litigation. On April 1, 2004, the parties settled their differences, resulting in the

dismissal of the appeal and the final resolution of the Newhall Ranch litigation. It also cleared the way for the Newhall Ranch environmental documentation to be used as the programmatic EIR to guide development of the Specific Plan.

The Newhall Ranch Final EIR, as revised (Impact Sciences 2003), identified impacts and mitigation to the following environmental resource areas: aesthetics, agricultural resources, air quality, biological resources, cultural resources, geology and soils, hazards and hazardous materials, noise, pollution, housing and employment, public services, public utilities, traffic and transportation, and water resources.

CUMULATIVE IMPACTS WITH THE PROJECT

Project-related direct impacts to hazards and hazardous materials as well as indirect impacts to all environmental resources in the Santa Clarita valley would contribute to the impacts of the Newhall Ranch project. The Newhall Ranch project environmental analysis (Impact Sciences 2003) has identified unavoidable significant impacts to the following resource areas: agricultural resources (loss of Prime Farmland); visual (conversion of land from rural to suburban); air quality (vehicular, construction, and operational emissions); and solid waste disposal (landfill capacity for solid and hazardous waste).

Significant but mitigable impacts have been identified to geology and soils (impacts associated with grading activities); environmental safety (oil and natural gas related impacts); biological resources (impacts to the San Fernando Valley spineflower); traffic/access (increase in the amount of average daily traffic trips); noise (vehicular noise); water resources and wastewater disposal (water supply and water quality of wastewater entering the Santa Clara River); natural gas and electricity demand; education (impacts on school facilities); public services and fire hazards (impacts relating to fire and police services); libraries (demands for library materials and services); and parks, recreation, and trails (impacts to County parks and trails).

Less than significant impacts were identified for the following resource areas: cultural/ paleontological resources (potential impacts to undiscovered buried resources from grading activities); environmental safety (placement of development within a dam inundation area, hazards associated with electrical transmission lines and natural gas lines, transportation of hazardous waste along SR-126, and the proximity of the project to the Chiquita Canyon Landfill); biological resources (impacts to the use of Salt Canyon as a wildlife corridor, and impacts to species within a Significant Ecological Area (SEA); and population, housing, and employment.

Project indirect impacts (providing additional water supply that would be available for future development with potential impacts to various environmental resources in the CLWA service area) would compound or increase these impacts. Since the water demands for the Newhall Ranch Project would be supplied by local groundwater, recycled water, and imported supplies from the Kern River, the water supply component of utilities would not be cumulatively compounding or increased by the Project. However, future use of water supplied by the Project would result in development not identified in the Newhall Ranch project-specific environmental analyses. Therefore the Project would have a significant cumulative indirect impact to much of the full range of environmental resources listed above.

Stevenson Ranch Phase V Specific Plan

PROJECT DESCRIPTION

This project consists of the development of approximately 3,500 single family and multi-family dwelling units, three schools, a sports complex, library facilities, commercial, and other uses. The location is 0.5 miles west of I-5 and 1.25 miles south of Highway 126, southwest of Six Flags Magic Mountain in Stevenson Ranch. The land is outside the CLWA service area and an annexation to the CLWA service area is in process (see the discussion above regarding the CLWA 16,000 Acre-Foot Proposed Transfer of State Water Project Table A Amount From Kern County Water Agency, Including Possible Annexations to CLWA).

PROJECT'S ENVIRONMENTAL ANALYSIS STATUS AND ANTICIPATED IMPACTS

The NOP and Initial Study for the Stevenson Ranch Phase V Specific Plan were issued in April 1999 (County of Los Angeles Department of Regional Planning [LADRP] 1999). A Draft EIR has not yet been issued and changes to the specific plan may occur. The Initial Study identified impacts on the following environmental resources: aesthetics, air quality, biological resources, cultural resources, geology and soils, noise, traffic and transportation public services, public utilities, population and housing, recreation, and water quality/water resources.

CUMULATIVE IMPACTS WITH THE PROJECT

The Initial Study identified significant impacts for the following resources: geology and soils (landslides, slope instability, grading); hazards of flood (creeks, erosion) and fire (Fire Zone 4, transmission line); noise (oil extraction facilities, schools proposed); water quality (run-off into storm drain); air quality (exceeds state criteria); biological resources (oak trees, creeks and riparian habitat,); cultural resources (along water courses and outcropping); aesthetics (trail, grading, altered viewshed); transportation (exceeds congestion management program thresholds); utilities including sewage disposal (requires annexation to Sanitation District); education (school and library impacts); fire/sheriff (water, sewage, solid waste); population/housing/employment, and recreation (growth inducing; recreation facilities may be needed).

Project indirect impacts (providing additional water supply that would be available for future development in the CLWA service area) would compound or increase these impacts. Since the Stevenson Ranch Phase V Project would be supplied by new water sources not currently available within CLWA, current and future uses of water supplied by the Project would result in development not identified in the Stevenson Ranch Phase V environmental analyses. Therefore, the Project would have significant cumulative indirect impacts to the full range of environmental resources listed above.

6.3.3.4 *Monterey Amendment*

Project Description

A discussion of the Monterey Amendment is provided in section 1.2.2, section 3.15, section 6.3.1.5, section 6.3.2.5, and Appendix D. This amendment contains many provisions including ones that allow the Project. The cumulative components of the Monterey Amendment

evaluated in section 6.3 are those not addressed as a portion of the Project and that may apply to Project-related impacts in the CLWA service area. As indicated in Table 6.3-3, these include the permanent transfers of the balance of the remaining portion of the 130,000 AF of Agricultural to M & I transfer (89,000 AF) of SWP Table A Amounts from within Kern County, in addition to the 41,000 AF included in the Project.

Project's Environmental Analysis Status and Anticipated Impacts

An EIR is being prepared to evaluate the potential environmental impacts of both the Monterey Amendment and the additional program components specified in the Settlement Agreement (see section 1.2.2 for a more detailed discussion of the Settlement Agreement). The NOP for the Monterey Agreement EIR does not specify the environmental resources to be addressed in the EIR, anticipated impacts of the project, or potential mitigation measures. Comment letters responding to the NOP, however, expressed concern that impacts could occur to the following environmental resources in the CLWA service area that also would be affected by the Project: aesthetics, agricultural resources, air quality, biological resources, cultural resources, geology and soils; hazards and hazardous materials, noise, land use, population and housing, public facilities, recreation, transportation, utilities and water resources.

Cumulative Impacts with the Project

Project-related direct impacts to hazards and hazardous materials as well as indirect impacts to all environmental resources in the Santa Clarita Valley would contribute to the impacts of the Monterey Amendment project, as implemented in other locations outside of the CLWA service area. The permanent transfer of Table A Amounts to other nearby urban water agencies would have the similar indirect impacts in those locations as the indirect impacts anticipated for the CLWA service area. Additional development supported by the permanent transfer of Table A Amounts to the Palmdale-Lancaster region of Los Angeles County would increase traffic on Highway 14, thereby increasing air pollutants and noise, and risks from the transportation of hazardous materials. The implementation of the Monterey Amendment would have impacts outside the service area to aesthetics, agricultural resources, biological resources, cultural resources, geology and soils; land use, population and housing, public facilities, recreation, transportation, utilities and water resources. These types of impacts are localized and would not contribute to a cumulative impact in combination with the Project (e.g., impacts to public facilities in one geographic area would not create a cumulative impact in combination with impacts to public facilities in another geographic area). Therefore, the Project would have only significant cumulative impacts to air quality, hazards and hazardous materials, noise, and transportation resources.

6.4 CUMULATIVE IMPACTS BY RESOURCE

This section summarizes cumulative impacts by resource in each of the three geographic areas under consideration and identifies mitigation measures where appropriate (Public Resources Code sec. 21102; CEQA Guidelines secs. 15002, 15021). The implementation of these mitigation measures may be the responsibility of agencies other than CLWA, who would adopt them as part of their own environmental review and approval processes.

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Table 6.3-3. Permanent Table A Transfers Completed Under the Monterey Amendment Provisions (Article 53)

From (Seller)	*To (Buyer)*	*Amount (AF)*	*Year Effective*	*CEQA Status*
COMPLETED TRANSFERS				
Berrenda Mesa Water District	Mojave Water Agency	25,000	1998	NOD – 11/1996
Belridge Water Storage District	Palmdale Water Agency	4,000	2000	NOD – 7/1998; NOD – 4/1999
Berrenda Mesa Water District	Alameda County Flood Control and Water Conservation District Zone 7	7,000	2000	NOD – 3/1996
Lost Hills Water District	Alameda County Flood Control and Water Conservation District Zone 7	15,000	2000	NOD – 7/1998
Wheeler Ridge-Maricopa Water Storage District	Castaic Lake Water Agency	41,000	2000	Subject of this EIR NOD – 3/1999
Belridge Water Storage District	Alameda County Flood Control and Water Conservation District Zone 7	10,000	2001	NOD – 7/1998; NOD – 4/1999
Belridge Water Storage District and Berrenda Mesa Water District	Solano County Water Agency	5,756	2001	NOD – 7/1998; NOD – 4/1999
Belridge Water Storage District and Berrenda Mesa Water District	Napa County Flood Control and Water Conservation District	4,025	2001	NOD – 12/2000
Subtotal		**70,781**		
ANTICIPATED TRANSFERS				
Berrenda Mesa Water District	Alameda County Flood Control and Water Conservation District Zone 7.	2,219	Future Year	NOP issued
Berrenda Mesa Water District	Castaic Lake Water Agency	16,000	Future Year	NOP – July 2003; Draft EIR in preparation
Subtotal		**18,219**		
Total		**130,000**		

Cumulative Impacts Associated with the SWP and Associated Facilities by Resource

Aesthetic Resources—The Project and other projects discussed in this section would result in adverse less than significant cumulative aesthetic impacts due to differences in the timing and location of the aesthetic impacts associated with the Project and other projects. Cumulative impacts to aesthetic resources associated with the SWP facilities would be less than significant because these projects would insignificantly change water levels in San Luis Reservoir, Quail Lake, Pyramid Lake, Castaic Lake, and other SWP facilities.

Air Quality—Significant cumulative impacts to air quality associated with the SWP and Associated Facilities geographic area would result from implementation of the Project and other projects because the Project impact, although less than significant, would increase the significant air quality impacts from the CALFED project and the San Luis Reservoir Low Point Project. The significant cumulative impacts would be reduced to less than significant through the implementation of the measures listed below. Significant impacts associated with the CALFED Bay Delta Program project would be mitigated with the implementation of the following mitigation strategies identified in the EIS/EIR: (1) setting traffic limits on construction vehicles; (2) maintaining properly tuned equipment; (3) limiting the hours of operation or amount of equipment; (4) limiting the amount of agricultural chemicals; (5) coordinating prescribed burning programs with relevant air quality management agencies; (6) regular, periodic watering of construction sites; (7) using soil stabilizers and dust suppressants on unpaved service roadways; (8) daily contained sweeping of paved surfaces; (9) limiting vehicle idling time; (10) using alternatively fueled equipment; (11) requiring selection of borrow sites that are closest to fill locations; (12) implementing construction practices that reduce generation of particulate matter; (13) hydroseeding and mulching exposed areas; (14) using cultivating practices that minimize soil disturbance; (15) following air basin management plans to avoid or minimize vehicle-related emissions; (16) restricting the kinds of recreational vehicles or the times of operation for certain off-road vehicles on fallowed agricultural land to limit the amount of fugitive dust. Although an EIR has not yet been published for the San Luis Reservoir Low Point Improvement Project, based on a preliminary analysis of the impacts, similar measures to those listed above for the CALFED project could be implemented to reduce significant impacts.

Cultural Resources—Less than significant cumulative impacts to cultural resources would result from the implementation of the Project and other cumulative projects because of differences in the timing and location of the cultural impacts associated with the Project and other cumulative projects. Cumulative impacts to cultural resources associated with the SWP facilities would be less than significant since these projects would insignificantly change water levels in San Luis Reservoir, Quail Lake, Pyramid Lake, Castaic Lake, and other SWP facilities.

Geology, Soils and Minerals—Less than significant impacts to geology, soils and minerals would result from the implementation of the Project and other cumulative projects mainly due to the differences in the timing, location and nature of the impacts associated with the Project and other projects. Cumulative impacts to geology, soils and mineral resources associated with the SWP facilities would be less than significant since these projects would insignificantly change water levels in San Luis Reservoir, Quail Lake, Pyramid Lake, Castaic Lake, and other SWP facilities.

Utilities/Service Systems—Less than significant cumulative impacts to utilities and service systems would result from the implementation of the Project and other cumulative projects. Increased energy consumption would result in cumulative impacts to utilities/service systems from the implementation of the Project and other projects, but impacts would be less than significant due to anticipated power supplies available or planned to meet demands in California and no expansion or construction of new electrical power generation facilities would be required (see section 3.14).

Water Resources—Less than significant cumulative impacts to water resources would result from the implementation of the Project and other cumulative projects due to the differences in the timing, location, and nature of the impacts associated with the Project and other projects. The Project impacts to water levels and water quality in the Delta would not cumulatively considerable.

6.4.1 Cumulative Impacts in the WRMWSD Service Area by Resource

This section considers the combined environmental impacts in WRMWSD of the Project and other projects discussed above on a resource-by-resource basis. Since the project would only affect water resources in the WRMWD, the Project would not contribute to cumulative impacts in other environmental resource categories.

Water Resources—Less than significant cumulative impacts to water resources would result from the implementation of the Project and other projects in the WRMWSD. As previously discussed in section 3.15, WRMWSD has sufficient supplies to accommodate the demands of its customers without relying on the 41,000 AF of Table A Amount associated with the Project. Under some conditions, the decrease in SWP water supply associated with the Project could result in increased reliance on other water sources and groundwater. However, this would not result in a significant cumulative effect for two reasons: these amounts are small relative to the total amount of water in storage in the Kern County Groundwater Basin and the White Wolf sub-basin; groundwater levels in the portions of these basins underlying the WRMWSD have been generally increasing over time. With regard to water quality, the potential minor increase in the use of water having higher TDS concentrations would result in a less than significant cumulative impact to water quality.

6.4.2 Cumulative Impacts in the CLWA Service Area by Resource

Aesthetics/Visual Resources—Cumulative aesthetics/visual resources impacts may include changes to the visual characteristics and resources of the area through the development of open space and further urbanization of hillside and natural areas. Development would result in substantial adverse effects on scenic vistas, substantially damage scenic resources, or substantially degrade the existing visual character or quality of individual sites and their surroundings. Further, potential development within the CLWA service area would also cumulatively result in an increase in the amount of night lighting and unwanted glare in presently undeveloped areas. Haphazard development would obstruct scenic views of, and from, the project area. These impacts are considered to be significant and unavoidable. Mitigation measures to reduce significant cumulative aesthetic/visual resources impacts are identified in section 4.2 but some significant impacts would be unavoidable.

Agricultural Resources—The amount of land designated for agriculture within the Los Angeles County/Santa Clarita Valley planning area is small (roughly 1 square mile [City of Santa Clarita 1991]), although more land is designated for agricultural purposes in the portion of the CLWA service area in Ventura County. This land is located on the Santa Clara River floodplain, primarily along the Highway 126 corridor. Lands in the County of Ventura would be subject to the limitations of the Save Open-Space and Agricultural Resources (SOAR) regulations. The State of California Farmland Mapping and Monitoring Program has designated approximately 3 percent of the mapped area within the CLWA service area as either prime farmland, unique farmland or farmland of statewide importance. Cumulative impacts to agricultural resources would be significant because there is a potential for these lands to be converted to non-agricultural use or for changes in agricultural zoning to be approved by local jurisdictions in order to allow a higher density or intensity of development, despite local legislation (e.g., see section 3.2.1.3 for a discussion of the SOAR initiative that provides for protection of agricultural resources and controls conversion of agricultural lands in portions of Ventura County). Mitigation measures to reduce these significant cumulative agricultural impacts to less than significant are identified in section 4.2.

Air Quality—Cumulative effects from population, employment, and manufacturing growth would result in increased air pollutant emissions for which the South Coast Air Basin does not currently meet federal or state standards. Toxic emissions could result from some industrial development. Additionally, mobile emissions from vehicle operations would increase, including localized CO concentrations and PM_{10} emissions. Fugitive dust emissions would also result from construction. Cumulative impacts would be significant if development violated air quality standards or contributed substantially to an existing or projected air quality violation. The Project together with other related projects could also result in a cumulatively considerable net increase in certain criteria pollutants for which the region is in non-attainment, and could expose sensitive receptors to substantial pollutant concentrations. Certain types of industrial development would create objectionable odors affecting a substantial number of people if constructed without appropriate mitigation measures. Mitigation measures to reduce significant cumulative air quality impacts are identified in section 4.2, but some significant air quality impacts would be unavoidable.

Biological Resources—The Project would provide water for existing users and a portion of anticipated growth. The associated land development, together with land development from other cumulative projects, would have cumulative impacts on biological resources. Cumulative impacts to threatened and endangered species and other sensitive biological resources within the CLWA service area, including wetlands, generally would be adverse due to the conversion and degradation of habitat. Although increased water use may increase certain types of habitat areas (e.g., through increased untreated runoff), related land development would entail the loss, degradation, or fragmentation of habitats, which may result in local native plant and wildlife populations, including sensitive species, being reduced in size and made increasingly vulnerable to local extinction. Non-native species introduced through ornamental landscaping or habitat disturbances would compete with native species or invade previously disturbed habitats, including those of special status species. Additionally, cumulative development would disrupt established wildlife corridors and impede the use of native wildlife nursery sites. These cumulative impacts would be significant.

Increased wastewater treatment plant discharges, additional runoff from impervious surfaces and new runoff from the irrigation of urban landscaping would increase the amount of wetlands and aquatic habitat below such discharges. However, water quality below these discharges would be degraded from pollutants (both point and non-point sources) carried in these waters. Implementation of Best Management Practices to reduce non-point source pollution and applicable permit requirements for point sources would reduce but not fully mitigate pollution from future development and cumulative projects. This would have a substantial adverse effect on riparian habitat and sensitive fish and amphibian populations, which would be a significant cumulative impact.

Development also could result in conflicts with local policies and ordinances protecting biological resources, which would be a significant cumulative impact. As noted in section 3.4, Biological Resources, however, there are no adopted HCPs or Natural Community Conservation Plans (NCCPs) within the CLWA service area.

Mitigation measures to reduce significant cumulative biological impacts are identified in section 4.2.4, but some significant cumulative impacts may be unavoidable depending on the magnitude and specific location of future development.

Cultural Resources—As discussed in the EIR for the City of Santa Clarita General Plan (City of Santa Clarita 1991), excavation and grading activities associated with future development could result in significant cumulative impacts to archaeological, historical, and paleontological resources. Development also could result in significant cumulative impacts associated with the disturbance of human remains. Significant cumulative impacts on cultural resources may include the following:

- grading of prehistoric archaeological or paleontological sites, thereby demolishing the site and eliminating its ability to yield important information;
- construction of new buildings that could impair the setting of a historic structure or district, thereby altering the structure's or district's ability to embody distinctive characteristics of a type or period; or
- excavation of utility trenches for new developments that uncover human remains or a paleontologic deposit, thereby destroying those remains.

Mitigation measures to reduce significant cumulative cultural resources impacts to less than significant are identified in section 4.2.

Geology, Soils and Minerals—The County of Los Angeles, City of Santa Clarita, and Ventura County general plans all indicate that the CLWA service area contains a number of seismic hazards. Several active faults located in the general project area, such as the San Gabriel, San Andreas, San Fernando, and Sierra Madre faults, could cause structural damage as a result of ground shaking, subsidence, and liquefaction. The San Gabriel fault is also capable of causing structural damage as a result of ground rupture. Depending on the location, new construction within the CLWA service area could expose people or structures to adverse effects, including risk of loss, injury, or death involving rupture of a known earthquake fault; strong seismic ground shaking; seismic-related ground failure, including liquefaction; and landslides. Liquefaction is most likely to occur in areas of the CLWA service area that are saturated at very shallow depths, such as adjacent to the Santa Clara River. Due to the rugged, high relief of the

foothill and mountainous areas surrounding the Santa Clarita Valley, landslides and unstable slopes are present in many areas of the CLWA service area. The cumulative impacts of development are dependent upon the type of construction, proximity to faults, degree of slope, bedrock orientation within slopes, and soil type of individual project sites. Cumulative impacts throughout the CLWA service area would be significant.

There also is a potential for the CLWA service area to contain geologic units or soils that are unstable or that could become unstable as a result of future development projects (i.e., either development served by the Project or other development) and result in on- or off-site landslides, lateral spreading, liquefaction, or collapse. This would be a significant cumulative impact.

As noted in the EIR for the City of Santa Clarita General Plan, new construction could result in localized soil erosion on or adjacent to future development sites, which could result in the loss of topsoil and siltation of downstream drainages, creeks, and the Santa Clara River. This would be a significant cumulative impact.

The County of Los Angeles General Plan, City of Santa Clarita General Plan, and Ventura County General Plan all indicate that the CLWA service area contains expansive soils. If future development were located on such soils, substantial risks to life or property could result. This would be a significant cumulative impact.

Sewers would serve future development in the urbanized portions of the CLWA service area, although the use of septic tanks or alternative wastewater disposal systems may be required in outlying areas. Cumulative impacts would be significant if construction were to occur on soils that were incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems.

The County of Los Angeles General Plan, City of Santa Clarita General Plan, and Ventura County General Plan all indicate that the CLWA service area contains mineral resources such as gold, oil, and aggregate. The EIR for the City of Santa Clarita General Plan notes that if development encroached on mineral resource areas, the extraction of these resources could be incompatible if development is permitted. To the extent that future development resulted in the loss of availability of a known mineral resource that was of value to the residents of the region and state or the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan, cumulative impacts would be significant.

Mitigation measures to reduce significant geological cumulative impacts to less than significant are identified in section 4.2.

Hazards and Hazardous Materials—Operations of past and existing businesses in the CLWA service area may have resulted in soil contamination from spills or disposal of hazardous materials. Therefore, depending on the specific location, new development on previously contaminated sites may require the removal or remediation of soils before property development can commence. New development also may result in increased transport, use, and disposal of hazardous materials, along with increased risks of hazardous substance releases. Certain types of development could impair implementation of or physically interfere

with emergency response plans or emergency evacuation plans, and could result in increased exposure to wildland fires where urbanization is adjacent to such areas. These cumulative impacts would be significant. No airport-related risks would occur because the CLWA service area is not located within an airport land use plan area; nor is it in the vicinity of a public airport, public use airport, or private airstrip. Mitigation measures to reduce significant cumulative hazards and hazardous materials impacts to less than significant are identified in section 4.2.

Land Use and Planning—The potentially accommodated residential, commercial, and industrial development that could occur in the CLWA service area could convert undeveloped or agricultural portions of the service area to some form of urbanized development. While adopted policies and plans of local jurisdictions would reduce most potential conflicts between incompatible uses, these policies and plans may not eliminate building in some sensitive areas such as hillside management areas, open space areas, and sensitive wildlife habitat areas. In addition, as more land within the CLWA service area is developed, there may be more pressure to build in areas that have greater constraints, such as hillside areas, and to convert open space to developed uses. Depending on the location and type of development, there is the potential for new development to physically divide an established community. Without adequate mitigation, there also is a potential for some conflicts with adopted land use plans, policies, or regulations that were adopted for the purpose of avoiding or mitigating an environmental effect. These cumulative land use impacts would be considered to be significant. No HCPs or NCCPs have been adopted within the CLWA service area. Mitigation measures to reduce significant land use and planning cumulative impacts to less than significant are identified in section 4.2.

Noise—Development would result in an increase in ambient noise levels due to the potential increase in associated traffic. Long-term increases in noise levels also could be associated with commercial and industrial development. Residential areas and other sensitive receptors near transportation corridors and other noise generators may experience increased noise. Development also would result in short-term increases in local noise levels from construction and grading activities. Cumulative impacts would be significant if noise levels exceed local standards or if a substantial temporary or permanent increase in noise occurred. Cumulative impacts would also be significant if development resulted in exposure of persons to excessive groundborne noise or vibration. Mitigation measures to reduce significant cumulative noise impacts to less than significant are identified in section 4.2.

Population and Housing—As discussed in section 4.1, the Project would be able to serve a population of between approximately 28,500 and 106,600 persons, based on assumptions regarding the availability of SWP water supply.

Depending on the planning assumptions outlined above, the Project could serve between 9,510 and 35,600 additional housing units. Impacts would be cumulatively significant because the Project, together with other projects, could cumulatively induce substantial population growth in the CLWA service area. The Project would not cumulatively displace substantial numbers of existing houses or substantial numbers of people. Mitigation measures to reduce significant cumulative population and housing impacts to less than significant are identified in section 4.2.

Public Services—Growth in the CLWA service area could result in cumulative impacts to the following public services:

Police—Increased demand for services from the Los Angeles County Sheriff's Department (which also contracts with the City of Santa Clarita to provide services), the Ventura County Sheriff's Department, and the California Highway Patrol would occur. This would include additional staffing, facilities, and equipment, and could affect response times to handle calls for service. Any special problems posed by new development (e.g., roadway access or terrain) would be considered at the time the development is reviewed. Impacts could be cumulatively significant because the new development could require new or physically altered governmental facilities, the construction of which could cause significant cumulative environmental impacts.

Fire—Increased demand for services from the Los Angeles County and Ventura County fire departments and from private providers of emergency response/paramedic services, including additional staffing, facilities, and equipment would occur and could affect response times to handle calls for service. Any special problems posed by new developments (e.g., roadway access or terrain) would be considered at the time the development is reviewed. Additional considerations such as the location of a proposed new development in moderate or high fire hazard zones, the adequacy of water supplies/fire flows, and types of vegetative cover would be taken into account. In addition, state and county fire codes, standards, and guidelines exist to which all developments must adhere. Impacts could be cumulatively significant, because the new development could require new or physically altered governmental facilities, the construction of which could cause significant cumulative environmental impacts.

Schools—Growth would generate increased enrollments and the need for additional staffing, facilities, and resources in some or all of the school districts in the CLWA service area. All school districts in the service area report that they are either at capacity or are experiencing overcrowding, and temporary facilities are being used in every district. Additional enrollments would be considered at the time new development is reviewed and would include input from affected school districts. Impacts would be cumulatively significant based on current capacity limitations because additional schools would likely have to be built, which could cause significant cumulative environmental impacts.

Libraries—Growth would generate increased demand for library services and associated need for staffing, facilities, and resources (books, magazines, periodicals, etc.) in some or all of the libraries in the CLWA service area. Library services provided by the County of Los Angeles Library Department are currently below planning standards, based on the per capita planning standard for the Santa Clarita Valley. Additional demands, including cumulative demands for square feet of library space and related resources would be considered at the time new development is reviewed. Impacts on libraries would be cumulatively significant based on current shortages, because additional libraries would likely have to be built, which could cause significant cumulative environmental impacts.

Mitigation measures to reduce significant cumulative public services impacts to less than significant are identified in section 4.2.

Recreation—Significant cumulative recreational impacts would result from increased demand for recreational resources, such as public parks and trails and other recreation areas. This

demand would exacerbate existing shortfalls in local parkland and may outpace the ability of public agencies to provide these resources. Mitigation measures to reduce significant recreational cumulative impacts to less than significant are identified in section 4.2.

Transportation and Circulation—Growth in the CLWA service area would result in the following cumulative impacts:

- Daily trips in the CLWA service area would potentially increase over current levels.
- There would be a related need for new private or public roadways, parking facilities, and for subsequent road maintenance.
- Increased demand for transit systems could occur, and there may be an alteration of present patterns of circulation.
- Roadways with existing capacity constraints could require upgrading or may experience further deterioration in levels of service.

The EIR for the City of Santa Clarita General Plan identified significant, potentially unmitigable impacts at certain isolated road segments from growth allowed under the General Plan. The segments most likely to be significantly affected are Bouquet Canyon Road near Haskell Canyon Road, McBean Parkway north of State Route 126, Soledad Canyon Road between Sierra Highway and Whites Canyon Road, Rye Canyon Road east of Interstate 5, and San Fernando Road between Newhall Avenue and State Route 14. In general, growth-related cumulative impacts would be significant because they could cause an increase in traffic that is substantial in relation to the existing load and capacity of the street system and could cause an exceedance of an established level of service standard. Specific developments could substantially increase hazards due to a design feature, or result in inadequate emergency access or parking capacity. Development also could conflict with adopted plans and policies or programs supporting alternative transportation. Cumulatively, air traffic is projected to increase throughout the southern California region, and new or expanded airports are being evaluated. Planning efforts for these projects would be required to demonstrate that the new locations/expansions do not result in substantial safety risks. Mitigation measures to reduce a portion of the cumulative significant transportation and circulation impacts are identified in section 4.2, but significant cumulative impacts to transportation and circulation would be unavoidable.

Utilities/Service Systems—The following impacts were identified for utilities/service systems:

Solid Waste—Cumulative growth would generate increased demand for solid waste disposal services due to construction-related and operational impacts of new land development. Los Angeles County and Ventura County operate several landfills that serve the CLWA service area. The location and volume of waste generation, including cumulative demands, provision of recycling programs, and existing landfill capacity and expansion plans, would be considered at the time new development is reviewed. Impacts are considered cumulatively significant because an adequate supply of landfill space has not been ensured for the future and would remain so unless additional landfill space or other disposal alternatives are approved. No feasible mitigation measure has been identified.

Raw Water Treatment—The indirect impacts of the Project, together with cumulative growth from other projects, would increase the demand for potable water and consequently increase

the demand for water treatment facilities. Impacts would be significant due to significant environmental impacts of expanding the two existing treatment facilities: the present expansion of the Earl Schmidt Filtration Plant and, based on a preliminary environmental analysis prior to project-specific CEQA analysis, the future expansion of the Rio Vista Water Treatment Plant (a discussion of the potential impacts of these two projects is provided in section 6.2.3.6).

Wastewater—Cumulative growth would increase wastewater generation and demand for wastewater treatment primarily at facilities operated by the County Sanitation Districts (District No. 26 and District No. 32) of Los Angeles County in Los Angeles County, which service the Santa Clarita Valley. These two districts jointly operate a regional system known as the Santa Clarita Valley Joint Sewerage System (SCVJSS) for which the 2015 Joint Sewerage System Facilities System Plan has been completed (LACSD 1998). The SCVJSS has a current combined capacity of 19.1 mgd and plans to expand capacity to 28.1 mgd by 2004, with further expansion to the practical site capacity of 34.1 mgd by 2020. The ultimate expansion is intended to serve a population of 321,000. Cumulative impacts to wastewater treatment capacity would be less than significant based on an adopted facility plan being in place to accommodate growth through 2020.

Storm Water Drainage—New construction and development would likely require the construction of new storm water drainage facilities or the expansion of existing facilities, which could cause significant cumulative environmental impacts.

Mitigation measures to reduce significant utilities/service systems cumulative impacts to less than significant are identified in section 4.2.14. Cumulative impacts to solid waste disposal, however, may not be avoidable unless additional landfill capacity is approved and constructed.

Water Resources—As local purveyors become increasingly dependent on SWP supplies, which are variable and may be reduced during dry years, local groundwater resources may be required to support a larger portion of the total demand from future development during periods of reduced SWP supplies. Should it occur, this short-term demand for groundwater resources would be considered a significant cumulative impact because it could result in the substantial depletion of groundwater supplies on a short-term basis in dry hydrologic years. It is noted, however, that on an average basis, over time, the annual amount of local groundwater pumping to meet urban and agricultural demand in the Santa Clarita Valley will not appreciably change, but its fraction of total water supply will decrease.

Increased municipal and industrial use of water would increase the amount of water treated at the existing and planned raw and wastewater treatment plants. This would result in additional discharges from the wastewater treatment plants and increased flows in the portion of the Santa Clara River west of Interstate Highway 5. However, in the future, some of the water presently being discharged into the Santa Clara River could be diverted prior to discharge for landscape irrigation and other permitted uses of reclaimed water within the CLWA service area. Impacts would be cumulatively significant.

Future development could result in an increase in the total amount of salts (including chlorides) in water delivered to the CLWA service area due to the increased volume of water (depending on the quality of raw water). Water quality of SWP deliveries infrequently approaches or exceeds water quality standards. Future development would cause an increase in effluent

volume from wastewater treatment plants in the CLWA service area. Given the recent implementation of the "Ordinance Prohibiting Installation of Certain Water Softening Appliances" (refer to section 3.15), however, it is reasonable to expect that new development would have better effluent quality than existing development and would result in similar effluent quantity per residence. This would ultimately result in no detectable change in the chloride concentrations discharged from the water treatment plants. The potential change in chloride concentrations is a less than significant cumulative impact.

Future development within the CLWA service area could increase the amount of impervious surface (roads, buildings, other paved areas). This could reduce percolation of rainwater to groundwater, alter surface flows, and increase the amount and rate of stormwater runoff through storm sewers or other engineered drainages. Growth-related development could affect water quality from non-point source discharges. The increase in impervious surface could also affect the peak flow rates of floodwaters and could increase flooding on or off-site of future development. Increased flooding and peak flow rates could result in substantial erosion or siltation on or off site. Cumulative water quality impacts could be significant.

New development in floodplains could expose additional persons and property to flood hazards and could impede or redirect flood flows. Development, in particular the placement of impervious surfaces, in areas critical to the recharge of the Alluvial and Saugus aquifers could reduce the rate of aquifer recharge. This effect would not alter the storage capabilities of these aquifers; however, it could, under certain circumstances, reduce aquifer recharge. These would be considered significant cumulative impacts.

Seiches (creation of large waves on a lake or reservoir) could occur as a result of earthquake-induced ground shaking or landslides in Castaic Lake, Pyramid Lake, or Bouquet Reservoir, potentially resulting in flooding of downstream communities. Since the Project would not substantially change lake levels or other reservoir characteristics that could affect seiche frequency or height, no cumulative impact to seiches would occur. Mudflows could also occur as a result of new development, particularly in mountainous areas. This would be considered significant cumulative indirect impacts.

Mitigation measures to reduce significant cumulative water resources impacts to less than significant are identified in section 4.2.

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7.0 ALTERNATIVES TO THE PROJECT

7.1 ALTERNATIVES EVALUATION PROCESS

This section analyzes alternatives to the Project. CEQA Guidelines (Section 15126) require that an EIR describe a reasonable range of feasible alternatives to the project or project location that could feasibly attain most of the basic project objectives and would avoid or substantially lessen one or more of the significant environmental impacts of the Project. Project alternatives must be feasible based on specific economic, social, legal, and technical considerations. The EIR must explain the rationale for selecting the alternatives to be discussed, identify those that were not carried forward because they were infeasible, and briefly explain why they were not carried forward. The range of alternatives required in an EIR is governed by a "rule of reason," which requires the EIR to set forth only those alternatives necessary to permit a reasoned choice. Additionally, the No Project Alternative must be analyzed. If there is an "environmentally superior" alternative to the Project, it must be identified. If the environmentally superior alternative is the No Project Alternative, the EIR must identify an additional "environmentally superior" choice among the other project alternatives. Section 7.2 discusses the alternatives that were considered but eliminated from detailed consideration. Section 7.3 evaluates the impacts of those alternatives carried forward for detailed consideration, and section 7.4 identifies the environmentally superior alternative.

For purposes of this analysis, the long-term average amount of water available from the Project's 41,000 AFY Table A Amount is established as 34,400 AFY, based on modeling assumptions regarding the reliability of SWP Table A deliveries. As discussed in detail in section 3.15 and Appendix D, the annual allocations of SWP water made by DWR are based on that year's hydrologic conditions, the amount of water in storage in the SWP system, and Contractors' requests for SWP supplies. Thus, the transfer of 41,000 AFY of Table A Amount would not result in the availability of this amount of water under most hydrologic conditions. The use of the average water supply is considered a reasonable scenario for purposes of the alternatives analysis because it represents the most typical condition that would occur during a given year.

7.2 ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

7.2.1 Alternative Imported Water Sources

A variety of alternative imported water sources were considered. These include sources other than the SWP, such as water from the central valley of California (CVP), transfers from other water rights holders in the Sacramento Valley, and water from other water supply systems (Los Angeles Department of Water and Power [LA DWP]). In addition, alternative imported water sources from SWP Contractors other than KCWA were considered.

The use of water from the CVP and other water rights holders in the Sacramento Valley was not carried forward for a number of reasons. This water would be transported to CLWA via SWP facilities, and as non-SWP water, its transmission by these facilities would have a low priority. Therefore, the water supply would be less reliable than that of the Project, which would not meet Project objectives. Additionally, the permanent conveyance of this water through the Delta could result in economic and social impacts associated with transferring water from

agricultural use to urban use. Water transfers from CVP Contractors also would not be feasible because their water already has been allocated for other uses, including environmental restoration projects, and is not available for long-term, reliable sale or exchange.

Similarly, LA DWP does not have excess water available for transfer; thus, use of water from this source is infeasible at this time. Exchanges or acquisition of SWP Table A Amount with other SWP Contractors are considered feasible, but the environmental consequences of such transfers would be similar to those of the Project and would not reduce or avoid any Project impacts. The use of any of these alternative water sources would not change the environmental impacts that would occur in the CLWA service area from treatment and use of the water, which are the primary impacts of the Project.

7.2.2 Increased Conservation/Recycling

This alternative involves implementing an aggressive water conservation/recycling program that would conserve or reuse an average of 34,400 AFY in the CLWA service area that is over and above what is currently projected in the UWMP (CLWA 2000). Replacement of the new water supply would require an additional 35 percent savings. Recycled water can only be used for limited purposes (irrigation or other non-potable uses) depending on the degree of treatment; thus, recycled water would be able to replace only a portion of the 34,400 AFY, and conservation would be required to provide potable water.

This alternative was rejected for several reasons.

- The amount of conservation that would be required under this alternative is not anticipated to be achievable and sustainable. Therefore, it is judged to be technically infeasible. A number of water conservation measures already are in place in the CLWA service area, and CLWA has adopted a water conservation goal of further reducing water demand by 7,700 AF in 2010 and 10,600 in 2020, or about 10 percent of demand (CLWA 2000). As discussed in section 3.15, CLWA is a member of the CUWCC and has pledged to implement all cost-effective BMPs for water conservation in order to achieve these goals. It is unlikely that the amount of additional conservation that would be required under this alternative could be implemented in a timely manner, if at all, particularly since such levels of conservation have not been demonstrated in the Project area and other areas of the State to be sustainable over long periods of time.

- The Saugus and Valencia water reclamation plants reclamation plants have the existing or planned capacity to meet the projected 2020 demand for recycled water (CLWA 2000). Since the use of recycled water is limited to landscaping and other non-potable uses, it may not be feasible to increase recycling beyond that which is currently planned for. Additionally, the cost of recycled water is currently greater than that of additional SWP water. Recycled water currently costs approximately $818 per AF (personal communication, L. Takaichi 2003), as opposed to Project water, which would cost approximately $250 per AF.

- This alternative would not reduce or avoid significant indirect impacts of the Project occurring in the CLWA service area.

7.2.3 Transporting Desalinated Seawater from Ventura County to CLWA

Two options for obtaining an average of 34,400 AFY of water from a new seawater desalination facility in Ventura County were considered. An alternative that included CLWA's contributing to the development of a desalination facility in exchange for delivery of SWP water was carried forward for analysis in this EIR (see section 7.3.3).

The alternative that was eliminated would have resulted in the direct transfer of water from the desalination facility to the CLWA service area and would have required the construction of a pipeline approximately 50 miles in length to transport the water. This alternative was eliminated because it would create greater environmental impacts than the other desalination alternative due to pipeline construction. These include impacts or potential impacts to resources such as air quality, biology, and cultural resources. Additionally, it would result in the same impacts to the CLWA service area as the Project and thus would not reduce or avoid Project impacts.

7.2.4 Upgrading the CLWA Water Treatment Plants

This alternative would involve implementation of the Project along with upgrades to the CLWA water treatment plants to reduce chlorides. These upgrades would require construction of a brine disposal line from CLWA's treatment plants to the coast, resulting in environmental impacts from ground disturbance and impacts to marine resources from off-shore disposal of the brine. This alternative would create greater environmental impacts than the Project due to construction of the brine disposal line (e.g., to air quality, biological resources, and cultural resources). Additionally, LACSD recently has adopted an ordinance that prohibits the installation and use of new self-regenerating water softeners in the Santa Clarita Valley, which would reduce the amount of chloride load in the watershed, and it is considering the feasibility and cost of various measures that would reduce discharge of chlorides at its Santa Clarita Valley water reclamation plants (LACSD 2002b). These measures would be more effective than upgrades at CLWA water treatment plants because LACSD facilities treat both imported SWP water and local groundwater, whereas CLWA facilities only treat SWP water. Therefore, any action by CLWA would result in chloride reductions in only approximately 50 percent of the volume of water that could be treated by LACSD. This alternative also would result in the same impacts to the CLWA service area as the Project.

This alternative was rejected because it would result in greater environmental impacts than the Project, would be less effective in treating water than other methods that have been implemented or are in the planning stages, and would not reduce or avoid significant impacts of the Project in the CLWA service area.

7.3 ALTERNATIVES CARRIED FORWARD FOR DETAILED ANALYSIS

Five alternatives were carried forward for detailed analysis.

7.3.1 Alternative 1, No Project Alternative

Under the No Project Alternative, CLWA would not acquire the additional Table A Amount or acquire the associated contractual rights for delivery of water associated with the transfer. The demand for high quality surface water is expected to increase throughout all of southern

California as a result of continued growth, and local planning agency documents project continuing growth in the CLWA service area. The contract right to the Table A Amount that is the subject of the Project could be acquired and transferred to other portions of urbanized California. The amount, timing, and location of such a transfer are highly speculative, however, and this scenario is not considered further. Two hypothetical scenarios have been carried forward for detailed analysis that are intended to define a reasonable range of possible actions that could occur under this alternative. Future land development is not under the control of CLWA and depending upon the actions of agencies with land use planning and permitting authority the possible actions could vary.

The discussion provided below under the Moratorium Scenario and the Build-Out Scenario includes projects in the County of Los Angeles Development Monitoring System (DMS) which includes: pending projects (not yet approved); approved projects (subdivisions that have been granted an approved tentative tract map that is not yet recorded or expired); and recorded projects (subdivisions that have recorded a final tract map but are not yet built).

Scenario 1 –Moratorium on New Development, Existing Users Subject to Delivery Cutbacks (Moratorium Scenario)

Under the Moratorium Scenario, a moratorium on new development would be implemented. This assumes that the local retail water purveyors[1] within the CLWA service area decide that there is insufficient water to issue "will serve" letters to supply development and that local land use agencies respond by imposing a moratorium on new development in the CLWA service area.

The 1998 DMS included 15,973 housing units (8,588 approved, 2,292 recorded, and 5,093 pending). The 2002 DMS included 33,113 housing units (13,586 approved, 9,915 recorded, and 9,612 pending). These housing units would not be built under this scenario. Assuming three persons per household, this amount of development would result in a population of approximately 49,510 persons, using the 1998 DMS, and 99,339 persons, using the 2002 DMS.

As noted in section 1.1, the Project (Transfer of Table A Amount) serves existing demand (users) (it also is intended to serve a portion of future demand). Under the No Project Alternative, some additional groundwater production wells might be required to serve existing demand that would have been met by the Table A Amount transfer. Treatment at the wellhead likely would be needed, depending upon local groundwater characteristics. New underground distribution pipelines also may be required. Electric pumps would be used as needed.

Environmental impacts of this scenario to individual resources are described below. It also could result in considerable economic and social impacts to residential, commercial, industrial, and public/governmental users in the CLWA service area if water deliveries were cut back or rationing occurred. Reduced deliveries could affect the ability of public and private property owners to water lawns, parks, golf courses, landscaping, and open space areas and could result in these areas dying off with resulting economic loss. Businesses that use high volumes of water may be forced to cutback production or close. A moratorium on new development

1 The CLWA Act refers to "retail water distributors," although the term "retail water purveyors" also is commonly used. For purposes of this report, the terms are synonymous.

would result in a delay or failure to meet County of Los Angeles and City of Santa Clarita General Plan population, housing, and job projections for which local governments have planned and/or constructed infrastructure and expended funds. A moratorium on new development would have potential economic consequences related to increased costs of housing in an already expensive southern California housing market, and developers with approved or recorded and unbuilt projects may experience economic loss if projects are delayed or cannot be completed. In addition, businesses considering relocating or expanding in the CLWA service area may be reluctant to invest capital because of uncertainties related to water supplies, lack of affordable housing for employees and stagnant local markets for goods and services. Alternative locations for siting or expanding businesses outside the service area would become more attractive. This could in some cases result in increased commuting, resulting in greater traffic, air emissions and energy use.

Scenario 2 – Build-Out of Recorded and Approved Projects in DMS (Build-Out Scenario)

Under the Build-Out Scenario, approved and recorded projects listed in the DMS for the Santa Clarita Valley would be developed, notwithstanding the potential shortfall in reliable water supply. Based on the DMS from both 1998 and 2002, the number of housing units in approved and recorded DMS projects considered under this scenario (10,880 and 23,500 units, respectively) is less than the number of housing units that could be supported by the Project given an average year water supply of 34,400 AF (35,600 units). The population associated with the development identified in the 1998 DMS would be 32,640 persons; the population associated with the 2002 DMS development would be 70,500 persons. In comparison, the population that could be served by the Project would be 106,700 persons.

Under this scenario, existing demand currently met by the Table A Amount transfer and the increased water demand from new development would rely on existing water supplies (principally local groundwater resources) that are currently not used for urban purposes. Treatment at the wellhead likely would be needed, depending upon local groundwater characteristics. New underground distribution pipelines also may be required. Electric pumps would be used as needed.

Impacts

Aesthetic/Visual Resources — Under the Moratorium Scenario, impacts on aesthetic/visual resources from development would not occur in the CLWA service area, although they could occur in another area if projected growth were re-located elsewhere.

Under the Build-Out Scenario, significant, unavoidable impacts on aesthetic/visual resources from development could occur, but the indirect impacts of the Project would be reduced because development would be limited to recorded and approved DMS projects.

Under both scenarios, new groundwater production wells and treatment facilities could be constructed, which could result in significant aesthetic impacts if they were located in proximity to visually sensitive resources. Construction of distribution pipelines would cause temporary impacts, but the pipelines would be underground and it is assumed that the corridor would be restored to its prior condition once the pipeline was laid. This impact would be less than significant. This impact would not occur if the Project were implemented.

Agricultural Resources — Under the Moratorium Scenario, impacts on agricultural resources from development would not occur in the CLWA service area, although they could occur in another area if projected growth were re-located elsewhere.

Under the Build-Out Scenario, significant impacts on agricultural resources from development could occur, but the indirect impacts of the Project would be reduced because development would be limited to recorded and approved DMS projects. Under this scenario, however, agricultural water users in the CLWA service area may have to compete for water with urban users, which could adversely affect irrigated agriculture, particularly during periods of drought. This impact would be significant if it resulted in the conversion of a substantial amount of agricultural land to non-agricultural use. If new groundwater production wells, treatment facilities, and distribution pipelines were located on Important Farmland, impacts would be less than significant, because their construction would not involve the loss of a substantial amount of farmland. These impacts would not occur if the Project were implemented.

Air Quality — Under the Moratorium Scenario, short-term and long-term impacts on air quality from development would not occur in the CLWA service area, although they could occur in another area if projected growth were re-located elsewhere.

Under the Build-Out Scenario, significant, unavoidable impacts on air quality from development could occur, but the indirect impacts of the Project would be reduced because development would be limited to recorded and approved DMS projects. Construction of new groundwater production wells, treatment facilities, and distribution pipelines would generate combustive and fugitive dust emissions. Depending on the mix of equipment used, construction activities could exceed the AQMD's daily significance thresholds, which would be a significant impact. This impact would not occur if the Project were implemented.

Biological Resources — Under the Moratorium Scenario, impacts on biological resources from development would not occur in the CLWA service area, although they could occur in another area if projected growth were re-located elsewhere.

Under the Build-Out Scenario, significant, unavoidable impacts on biological resources from development could occur, but the indirect impacts of the Project would be reduced because development would be limited to recorded and approved DMS projects. Additionally, increased use of groundwater resources under the Build-Out Scenario would likely decrease the amount and longevity of habitats that are dependent on groundwater seeps (i.e., springs and other areas where groundwater surfaces). This would potentially result in significant impacts to biological resources that are dependent on wetlands, springs, and aquatic habitats, including the protected species that use these habitats. This impact would be greater than would occur under the Project and could be significant. Depending on the location of individual sites, construction of the groundwater production wells, treatment facilities, and distribution pipelines could impact sensitive biological resources, including special status species. Locating distribution facilities along rights-of-way would reduce the potential for impacts to biological resources, but in the absence of specific sites, it is assumed that impacts from the construction and operation of all new facilities could be significant. This impact would not occur if the Project were implemented.

Cultural Resources — Under the Moratorium Scenario, short-term and long-term impacts on cultural resources from development would not occur in the CLWA service area, although they could occur in another area if projected growth were re-located elsewhere.

Under the Build-Out Scenario, significant impacts on cultural resources from development could occur, but the indirect impacts of the Project would be reduced because development would be limited to recorded and approved DMS projects. Depending on the location of individual sites, construction of the groundwater production wells, treatment facilities, and distribution pipelines could have a significant impact on cultural resources. This impact would not occur if the Project were implemented.

Geology, Soils, and Mineral Resources — Under the Moratorium Scenario, impacts on geology, soils, and minerals from development would not occur in the CLWA service area, although they could occur in another area if projected growth were re-located elsewhere.

Under the Build-Out Scenario, significant impacts on geology, soils, and minerals from development could occur, but the indirect impacts of the Project would be reduced because development would be limited to recorded and approved DMS projects. The construction of new groundwater production wells, treatment facilities, and distribution pipelines could cause short-term soil erosion, which could be a significant impact that could be mitigated by implementing BMPs. This impact would not occur if the Project were implemented.

Increased groundwater pumping could potentially result in land subsidence under both scenarios. There has been no recorded historical inelastic (irreversible) subsidence, or indirect evidence of its occurrence (i.e., subsidence-related impacts on surface structures, drainage facilities, etc.), attributable to groundwater pumping in the Santa Clarita Valley. The most recent comprehensive review of historical groundwater conditions in the basin (Slade 2002) describes how temporary fluctuations in groundwater storage have occurred in response to natural variations in recharge and changes in groundwater discharge such as pumping, but how such fluctuations (only notable in the eastern portion of the basin) have only been temporary and have fully recovered in response to wet period rainfall and associated recharge. Slade (2002), however, identifies subsidence as a potential undesirable result of exceeding the perennial yield of the groundwater basin. In order for subsidence to occur, there would need to be a "continued and progressive decline in groundwater levels leading to a permanent loss of groundwater in storage." Such conditions could occur under this alternative, which would result in a significant and unavoidable impact.

Hazards and Hazardous Materials – Under the Moratorium Scenario, impacts on hazards and hazardous materials from development would not occur in the CLWA service area, although they could occur in another area if projected growth were re-located elsewhere.

Under the Build-Out Scenario, significant impacts on hazards and hazardous materials from development could occur, but the indirect impacts of the Project would be reduced because development would be limited to recorded and approved DMS projects. Hazardous materials would be used during the construction of groundwater production wells and associated facilities as well as during groundwater treatment. Any use of hazardous materials for these activities would be conducted in accordance with existing policies, procedures, and regulations to prevent upset or release into the environment. Thus, impacts from the incremental increase

in use of hazardous materials during construction and to treat water would be less than significant. The Project would require the use of hazardous materials to treat the transferred water, but would not require new construction. Thus, impacts would be incrementally greater under this scenario than under the Project.

Land Use and Planning — Under the Moratorium Scenario, impacts on land use and planning from development would not occur in the CLWA service area; thus, the significant growth-related impacts of the Project would not occur in the CLWA service area, although they could occur in another area if projected growth were re-located elsewhere.

Under the Build-Out Scenario, significant impacts on land use and planning from development could occur, but the indirect impacts of the Project would be reduced because development would be limited to recorded and approved DMS projects. The siting of groundwater production wells and associated facilities would take local land use planning requirements into consideration, although there is a potential for conflicts with adopted policies intended to protect the environment to occur. Impacts could be significant. This impact would not occur if the Project were implemented.

Noise — Under the Moratorium Scenario, impacts on noise from development would not occur in the CLWA service area, although they could occur in another area if projected growth were re-located elsewhere.

Under the Build-Out Scenario, significant impacts on noise from development could occur, but the indirect impacts of the Project would be reduced because development would be limited to recorded and approved DMS projects. Noise would result from the construction of new groundwater production wells and associated facilities and the operation of pumps. Impacts could be significant if sensitive receptors were located nearby. This impact would not occur if the Project were implemented.

Population and Housing — Under the Moratorium Scenario, a moratorium would be imposed on new development; thus, the future population of the Santa Clarita Valley and associated housing units would be less than could occur under the Project.

Under the Build-Out Scenario, population and housing growth in the Santa Clarita Valley would be less than could occur under the Project since it would be limited to approved and recorded DMS units.

Public Services — Under the Moratorium Scenario, impacts on public services from development would not occur in the CLWA service area, although they could occur in another area if projected growth were re-located elsewhere.

Under the Build-Out Scenario, significant impacts on public services from development could occur, but the indirect impacts of the Project would be reduced because development would be limited to recorded and approved DMS projects. The construction and operation of groundwater production wells would not affect public services. This impact would be comparable to that of the Project.

Recreation — Under the Moratorium Scenario, impacts on recreation from development would not occur in the CLWA service area, although they could occur in another area if projected growth were re-located elsewhere.

Under the Build-Out Scenario, significant impacts on recreation from development could occur (e.g., from increased use of facilities), but the indirect impacts of the Project would be reduced because development would be limited to recorded and approved DMS projects. The construction and operation of groundwater production wells would not result in physical changes to recreational facilities or lead to the construction of new facilities. This impact would be comparable to that of the Project.

Transportation and Circulation — Under the Moratorium Scenario, impacts on noise from development would not occur in the CLWA service area, although they could occur in another area if projected growth were re-located elsewhere.

Under the Build-Out Scenario, significant impacts on noise from development could occur, but the indirect impacts of the Project would be reduced because development would be limited to recorded and approved DMS projects. The construction of groundwater production wells and treatment facilities would generate minor amounts of traffic, which would not cause significant impacts. Construction of pipelines could result in temporary lane closures or other short-term traffic disruptions, but this would be less significant because standard procedures would have to be followed to allow safe access through the construction area. Long-term maintenance would generate minimal amounts of traffic. These impacts would not occur if the Project were implemented.

Utilities/Service Systems — Under the Moratorium Scenario, impacts on utilities/service systems from development would not occur in the CLWA service area, although they could occur in another area if projected growth were re-located elsewhere.

Under the Build-Out Scenario, significant impacts on utilities/service systems from development could occur, but the indirect impacts of the Project would be reduced because development would be limited to recorded and approved DMS projects. Increased operation of groundwater pumps and treatment facilities would require the consumption of additional electricity, but this would not require the construction or expansion of electrical power facilities. This impact would be less than significant and less than the impact associated with the Project.

Water Resources — Under the Moratorium Scenario, a moratorium would be imposed on new development in order to meet water demands of existing development. Thus, certain significant indirect impacts on water resources, such as water quality impacts and impacts from increased runoff would not occur in the CLWA service area, although they could occur in another area if projected growth were re-located elsewhere. Other impacts in the CLWA service area would be greater. For example, water supplies and delivery dependability within the CLWA service area would decrease compared to the Project. Since a portion of existing demand is served by the 41,000 AF transfer, this scenario would result in a greater dependence upon local groundwater and recycled water to meet the needs of the current population. Groundwater resources would likely be stressed, especially during periods of extended drought, and deliveries may be limited or reduced depending on demand. Mandatory

conservation measures would be required during periods of drought. Groundwater basin adjudication legal proceedings also could occur. Individual landowners may assert their rights to groundwater resources beneath their land and drill new groundwater production wells; however, they would not be able to receive development rights based on that water supply. Impacts to groundwater would be greater under the Moratorium Scenario than under the Project and would be significant and unavoidable if the substantial depletion of groundwater supplies occurred. Additionally, if groundwater production wells were improperly sited, there would be the potential for perchlorate contamination plumes to spread, which could cause a significant water quality impact. These impacts would not occur under the Project.

Under the Build-Out Scenario, allowed development would depend more heavily upon groundwater resources within the CLWA service area than under the Project and the Moratorium Scenario. Groundwater resources likely would be stressed, and local water purveyors may require mandatory conservation measures more frequently than under the Moratorium Scenario, especially during periods of extended drought when SWP deliveries would be reduced. Impacts to local water resources would be significant and unavoidable if the substantial depletion of groundwater supplies occurred. Additionally, if groundwater production wells were improperly sited, there would be the potential for perchlorate contamination plumes to spread, which could cause a significant water quality impact. These impacts would not occur under the Project.

7.3.2 Alternative 2, Increased Extractions from the Saugus Formation (Increased Groundwater Extractions)

Under this alternative, in lieu of the Project, an average of 34,400 AFY would be extracted from the Saugus Formation and delivered to users in the CLWA service area in lieu of the water anticipated from the transfer of SWP Table A Amount. This amount would be above what is currently extracted or planned for extraction. The extraction would be accomplished by increased use of existing wells and by the installation of 15 additional wells, pumps, and wellhead treatment facilities. Existing or new distribution facilities such as pipelines and pumping stations would be used to transport this water to existing and planned treated water distribution facilities. Pumps and treatment facilities would use electrical power. Wherever possible, distribution facilities would be placed in public rights-of-way, including streets, utility, and railroad corridors. Disturbed areas would be restored to their former appearance once construction was completed. It is estimated that approximately 40 acres would be disturbed by the new facilities, which would be constructed and operated either by CLWA, individual purveyors, or other parties. A detailed geohydrologic investigation would be necessary prior to drilling on a site-by-site basis.

Until contaminant remediation is completed, existing, localized perchlorate contamination in a small part of the Saugus Formation would limit potential well locations. Field studies and groundwater modeling activities are in progress to evaluate how best to hydraulically contain the portion of the aquifer system where production wells have been shut down, while simultaneously preventing perchlorate movement to currently unimpacted areas. The field studies have included the installation and sampling of monitoring wells at multiple depths and locations on and around the Whittaker-Bermite site, the most likely source of perchlorate; water level monitoring in these wells; aquifer testing of two unimpacted water supply wells; and groundwater velocity testing in alluvial monitoring wells located between the site and the

Santa Clara River. These studies have helped the water purveyors and the Whittaker Corporation further refine the current understanding of groundwater flow patterns in specific areas on and near the site (such as along the Holser Fault). This information has been incorporated into a regional groundwater flow model that has been developed by the purveyors and whose calibration and construction was recently reviewed and approved by the California Department of Toxic Substances Control (DTSC). The model is being used to identify a pumping scheme that would meet the objectives of restoring the lost water supply from the impacted wells (with wellhead treatment) while simultaneously containing perchlorate and hydraulically limiting its movement downgradient to unimpacted wells and other portions of the aquifer system where new water supply wells might be constructed. The modeling analysis accounts not only for the pumping of impacted wells, but also (a) the 2000 Urban Water Management Plan's (UWMP) pumping plan for unimpacted wells throughout the Santa Clarita Valley and (b) the significant year-to-year variation in local hydrology (especially groundwater recharge) that occurs in the Valley (CH2MHill 2004). The modeling simulations will be used to guide selection of a final pumping plan for the impacted Alluvial Aquifer well and the impacted Saugus Formation wells. The selection of a final pumping plan will be made jointly by the purveyors and the Whittaker Corporation, with regulatory oversight and permitting performed by the California Department of Health Services (CA DHS) with technical support from the DTSC.

There are numerous wells in the Saugus Formation, other than the wells that were voluntarily shut down due to perchlorate contamination. Additionally, other Saugus wells are planned for construction, including those included in CLWA's Capital Improvements Program. If operated continuously during the year, the wells not subject to perchlorate contamination have the capability to produce approximately 21,000 AFY (personal communication, L. Takaichi 2004). However, a more realistic production capability is 15,000 AFY due to periodic shutdown for maintenance, monitoring, or storage limitations (personal communication, L. Takaichi 2004). The current groundwater production capability from the Saugus Formation is estimated to be 5,000 AFY during normal years but could reach 15,000 AFY during dry periods or other periods of need (personal communication, L. Takaichi 2004). These capabilities will increase as additional production wells in the Saugus Formation are completed and a response action to perchlorate contamination is implemented.

Impacts

Growth inducement and growth-related impacts within the CLWA service area would be as described for the Project. This alternative, therefore, would not reduce or avoid the significant indirect impacts of the Project in the CLWA service area. Direct impacts of this alternative are described below and compared to those of the Project.

Aesthetic/Visual Resources – Depending on the location of specific sites, production wells and treatment facilities could be visible from sensitive viewpoints and could substantially degrade the character of the area or affect a scenic vista. This impact would be significant but would be mitigable to less than significant by siting these facilities to avoid sensitive viewpoints where feasible, and where it is necessary to place them in visually sensitive areas, to screen them from view. The distribution pipelines would be located below ground, generally in already disturbed rights-of-way; and pipeline corridors would be restored once construction was completed; therefore, no long-term impacts to aesthetic/visual resources would result from

pipeline construction. Because no new facilities would be constructed as part of the Project, impacts of Alternative 2 to aesthetic/visual resources would be greater than under the Project.

Agricultural Resources — If new facilities were constructed on Important Farmland, it would result in the conversion of a small amount of this land to non-agricultural use. As noted above, however, distribution facilities would be placed in public rights-of-way to the extent possible, which would reduce the potential for this impact to occur. This impact would be less than significant because a substantial amount of Important Farmland would not be affected by this alternative. Increased groundwater extraction under this alternative would reduce groundwater levels in the CLWA service area, which could result in increased pumping costs and affect agricultural economics. In addition, it is possible that groundwater currently used for agricultural purposes could be used for urban purposes instead of to meet the increased demand, which could adversely affect irrigated agriculture. Impacts from increased groundwater cost and decreased availability would be significant since they could result in the substantial loss of agricultural productivity. No feasible mitigation measures have been identified for this impact. The Project would not directly affect agricultural resources; therefore, impacts would be greater under this alternative.

Air Quality — Since the pumps and treatment facilities would be powered by electricity, no long-term increases in air emissions would occur. Approximately 24 million kWh per year would be required to operate the wells, which would be considerably less than the power required to operate SWP pumps under the Project (approximately 140 million kWh per year). Thus, air emissions from facilities that generate electricity would be less than would occur under the Project. Short-term combustive and fugitive dust emissions would result from construction of required wells and distribution facilities. Depending on the mix of equipment used, construction activities could exceed the AQMD's daily significance thresholds, which would be a significant impact. Short-term impacts of this alternative would be mitigable to less than significant by implementing standard operating practices to ensure that fugitive dust (PM_{10}) emissions are minimized (e.g., applying water to areas where vehicles and equipment operate on bare soil and cover inactive soil stockpiles or treat them with soil binders, such as crusting agents or water them to keep moist) and implementing measures to reduce peak daily NO_x emission impacts (e.g., using alternative diesel fuels, such as diesel emulsions or biodiesels, extending the duration of the construction period to reduce daily equipment usage, and maximizing the use of diesel-powered construction equipment manufactured after year 1995). No construction impacts would be associated with the Project; therefore, air quality impacts would be greater under this alternative.

Biological Resources — Depending on the location of individual sites, construction of the groundwater production wells and distribution facilities could either temporarily or permanently impact sensitive biological resources, including special status species present in the Santa Clarita Valley. Locating distribution facilities along rights-of-way would reduce the potential for impacts to biological resources, but in the absence of specific sites, it is assumed that impacts from the construction and operation of new facilities could be significant. Impacts would be mitigable to less than significant by surveying sites prior to construction to determine whether sensitive biological resources are present and taking appropriate measures to avoid or reduce impacts if they are present. Depending on the resources present, measures could include relocating the facilities to sites that do not contain sensitive resources or avoiding construction during the breeding season of sensitive species. Additionally, increased use of

groundwater resources would likely decrease the amount and longevity of habitats that are dependent on groundwater seeps (i.e., springs and other areas where groundwater surfaces). This would potentially result in significant impacts to biological resources that are dependent on wetlands, springs, and aquatic habitats, including the protected species that use these habitats. The Project would not directly impact biological resources in the CLWA service area; thus, impacts would be greater under this alternative.

Cultural Resources — Depending on the location of individual sites, construction of the groundwater production wells and distribution facilities could have a significant impact on cultural resources. This impact would be mitigable to less than significant by conducting a survey to identify whether cultural resources are present prior to construction and taking appropriate measures to avoid or reduce impacts. These may include relocating construction sites to avoid the cultural resources or performing testing, evaluation, and data recovery if relocating the sites is not feasible. Impacts would be e greater than the Project because no additional facilities would be constructed for the Project. The Project would not directly impact cultural resources in the CLWA service area; thus, impacts would be greater under this alternative.

Geology, Soils, and Mineral Resources — As described above under the No Project Alternative, Build-Out Scenario, increased groundwater pumping could lead to subsidence, which would be a significant and unavoidable impact. The limited construction required would not result in the substantial loss of availability of a known mineral resource. Construction activities could, however, result in erosion. This impact could be significant but would be mitigable to less than significant through the implementation of BMPs. The Project would not directly impact geology and soils in the CLWA service area; thus, impacts would be greater under this alternative.

Hazards and Hazardous Materials — Groundwater from the Saugus Formation would require disinfection prior to use. The present disinfectant used for groundwater treatment is gaseous chlorine, which is provided in 150 lb. cylinders and injected at the wellheads, although CLWA may switch to chloramines (e.g., by adding an ammonia solution, treating with chloramines) in several years. Because these treatment facilities would be sited at several locations, potential public exposure in the event of an accidental release could be higher than at the centralized treatment facilities utilized for the Project. These treatment facilities are located in relatively remote areas and have scrubbing facilities to mitigate potential accidental releases. Any use of hazardous materials would need to comply with applicable laws and regulations, and impacts would be less than significant. Because of the higher potential for public exposure to hazardous materials under this alternative, hazards and hazardous materials impacts would be greater than that of the Project.

Land Use and Planning — Where possible, the distribution pipelines would be placed in public rights-of-way; these underground pipelines would not affect nearby land uses. Depending on the location of production wells, their construction and operation could result in environmental impacts that would conflict with land use plans and policies adopted for the purpose of avoiding environmental impacts. Impacts could be significant but would be mitigable to less than significant by implementing measures such as those described elsewhere in this section that would bring the project into compliance with those policies. The Project would not result

in land use impacts since no construction would occur or conflict with adopted plans and policies.

Noise — Noise would result from the construction of new facilities and the operation of pumps. Impacts could be significant if sensitive receptors were located nearby. Impacts could be mitigated to less than significant through the implementation of measures such as limiting construction to daylight hours on weekdays, using muffled construction equipment, and enclosing pumps. The Project would not directly impact noise in the CLWA service area; thus, impacts would be greater under this alternative.

Population and Housing — Construction of the groundwater production wells and distribution facilities would not displace existing housing or populations. This impact is comparable to that of the Project.

Public Services — Increased extractions from the Saugus Formation would not result in increased demands on public services, including police protection, fire protection, education, and library services. This impact is comparable to that of the Project.

Recreation — The construction and operation of groundwater production wells would not result in physical changes to recreational facilities or lead to the construction of new facilities. Neither this alternative nor the Project would result in adverse impacts to recreational resources.

Transportation and Circulation — The construction of groundwater production wells and treatment facilities would generate minor amounts of traffic, which would not cause significant impacts. Construction of pipelines could result in temporary lane closures or other short-term traffic disruptions, but this would be less significant because standard procedures would have to be followed to allow safe access through the construction area. Long-term maintenance would generate minimal amounts of traffic. The Project would not directly impact transportation and circulation in the CLWA service area; thus, impacts would be greater under this alternative.

Utilities/Service Systems — This alternative would affect utilities and service systems by requiring an increased amount of electrical power to operate groundwater pumps and treatment facilities. The increase of approximately 29 million kWh per year would be less than the Project's estimated 140 million kWh demand, and no expansion or new construction of power-generating facilities would be required. This impact would be less than significant and less than the Project impact.

Water Resources — Depending on individual site locations, construction of the groundwater production wells and distribution facilities could impact the water quality of drainage courses located adjacent to the facilities due to increased erosion. This impact could be significant but would be mitigable to less than significant by the implementation of BMPs. The Project would not directly cause erosion in the CLWA service area; thus, impacts would be greater under this alternative.

Extractions from the Saugus Formation vary according to hydrologic conditions. As shown on Table 3.15-8, extractions in recent years have ranged from 21,500 AF in 1990 to 32,100 in 1996.

The formation should be capable of producing as much as 40,000 AFY during a dry period of five to six years (Montgomery Watson 1998). However, there are no historical records or studies that can guarantee that the Saugus Formation can reliably produce an additional 34,400 AFY over an extended period of time. Increasing the groundwater production to such an extent without implementation of other measures (e.g., the reduction of non-urban use of groundwater resources and local aquifer storage and recovery programs) could exceed the normal year yield of the Saugus Formation. This would be a significant and unmitigable impact. This impact would be greater than those of the Project, which would have a beneficial impact to groundwater.

Perchlorate contamination has been discovered in parts of the Saugus Formation (see section 3.15.1.3 under the subheading Groundwater Quality for a more detailed discussion of perchlorate, some of which is summarized in this section). Field studies and groundwater modeling activities are in progress to evaluate how best to hydraulically contain the portion of the aquifer system where production wells have been shut down due to perchlorate contamination, while simultaneously preventing perchlorate movement to currently unimpacted areas. The field studies have included the installation and sampling of monitoring wells at multiple depths and locations on and around the Whittaker-Bermite site, the most likely source of perchlorate; water level monitoring in these wells; aquifer testing of two unimpacted water supply wells; and groundwater velocity testing in alluvial monitoring wells located between the site and the Santa Clara River. These studies have helped the water purveyors and the Whittaker Corporation further refine the current understanding of groundwater flow patterns in specific areas on and near the site (such as along the Holser Fault).

This information has been incorporated into the purveyor's regional groundwater flow model, which is being used to identify a pumping scheme for impacted wells that would meet the objectives of restoring the lost water supply from the impacted wells (with wellhead treatment) while simultaneously containing perchlorate and hydraulically limiting its movement downgradient to unimpacted wells and other portions of the aquifer system where new water supply wells might be constructed. The modeling analysis accounts not only for the pumping of impacted wells, but also (a) the 2000 UWMP's pumping plan for unimpacted wells throughout the Santa Clarita Valley and (b) the significant year-to-year variation in local hydrology (especially groundwater recharge) that occurs in the Valley (CH2MHill 2004). The modeling simulations will be used to guide selection of a final pumping plan for the impacted Alluvial Aquifer well and the impacted Saugus Formation wells. The selection of a final pumping plan will be made jointly by the purveyors and the Whittaker Corporation, with regulatory oversight and permitting performed by the CA DHS with technical support from the DTSC.

Development of additional wells or increased pumping from existing wells could be limited in some locations to avoid expansion of the contamination plumes. Because perchlorate historically has not been considered a common drinking water contaminant, no federal or state drinking water standards exist. In 2002, the OEHHA proposed a public health goal, in the range of 2 to 6 ppb, for the amount of perchlorate present in drinking water (LADRP 2003a). Both the federal and state governments require monitoring for perchlorate and have recommendations for potable water uses of water sources exceeding 18 μg/L or 18 ppb. The CA DHS has lowered the action level for drinking water in perchlorate from 18 ppb to 4 ppb

(CA DHS 2002). In addition to the OEHHA's proposed public health goal, the CA DHS is required to adopt a primary drinking water standard for perchlorate by January 1, 2004 (LADRP 2003a). An MCL for perchlorate is not expected until 2004 (SCVWP 2003). Several treatment technologies for the removal of perchlorate from water are currently available, and impacts to water quality would be less than significant because water would be treated prior to distribution. This would, however, increase the cost for treating water from these wells to achieve applicable water quality standards. This impact would be comparable to that of the Project, since SWP water also would require treatment.

The less than significant impacts to the resources associated with the SWP from changes in the timing of water use would not occur since no water would be transferred, nor would the less than significant impacts to groundwater and water quality in the WRMWSD.

7.3.3 Alternative 3, Exchange Desalinated Water for SWP Water (Desalination/Exchange)

This alternative comprises two primary components in lieu of the Project: (1) CLWA would contribute a portion of the funds needed by another agency to develop a seawater desalination facility along the southern California coast; and (2) an average of 34,400 AFY of desalinated water produced by this facility would be exchanged with CLWA for SWP water. A likely partner in such an arrangement would be The Metropolitan Water District of Southern California (Metropolitan). If both parties agreed, CLWA would enter into a contract with Metropolitan indicating that a portion of Metropolitan's annual SWP Table A Amount would be delivered to Castaic Lake for use by CLWA in exchange for CLWA's contribution to a desalination facility to be constructed by Metropolitan. CLWA would treat and distribute SWP this water in existing CLWA facilities, and Metropolitan would use water from the desalination facility in lieu of the SWP water exchanged with CLWA.

Assuming a 50 percent recovery rate, a plant capacity of approximately 61 mgd would be required to produce an average of 34,400 AFY. Depending on the extent of ancillary facilities included at the site, a site of at least 2 acres could be required. In addition to the desalting plant, the coastal facility would likely include new electrical power conveyance and control equipment, ocean water intake and brine disposal structures, and a treated water pumping plant. Total site area could be up to 5 acres. Depending on site location, additional pipelines and related pumping facilities may be required to convey the desalinated water a short distance to the existing Metropolitan distribution facilities.

Impacts

Growth inducement and growth-related impacts within the CLWA service area would be as described for the Project. This alternative, therefore, would not reduce or avoid the significant indirect impacts of the Project in the CLWA service area. Direct impacts of this alternative are described below and compared to those of the Project.

Aesthetic/Visual Resources — Construction of a desalination facility on 2 to 5 acres of land and associated pipelines could impact aesthetic/visual resources. These impacts could be significant but mitigable to less than significant if they were located in visually sensitive areas, which are common along the coast. Mitigation measures could include relocating, redesigning, or screening the desalination facility and restoring the pipeline corridor to minimize visual

impacts. These impacts would be greater than those of the Project, which would not directly affect visual/aesthetic resources.

Agricultural Resources — Some agricultural areas are located along the southern California coast. If the desalination facility and pipeline were located on Important Farmland, the impact would be less than significant because a substantial amount of farmland would not be converted to non-agricultural use. This impact would be greater than that of the Project, which would not directly affect agricultural resources.

Air Quality — Section 30253(3) of the Coastal Act requires that new development be consistent with requirements imposed by an air pollution district or the State Air Resources Control Board. In general, the air emissions from reverse osmosis desalination plant consist only of discharges of a degasifier. The production of electricity for use in desalination plants, however, would increase air emissions (Woodward-Clyde 1994), although they likely would not be significant because any existing fossil fuel-fired power plant that provides electricity for the Project would have to comply with all ambient air quality standards and applicable air permit conditions, such as emission offsets. Short-term combustive and fugitive dust emissions would result from construction of the desalination plant and any conveyance pipelines. Depending on the mix of equipment used, construction activities could exceed the relevant air pollution control district's daily significance thresholds, which would be a significant impact. Short-term impacts of this alternative would be mitigable to less than significant by implementing standard operating practices to ensure that fugitive dust (PM_{10}) emissions are minimized (e.g., applying water to areas where vehicles and equipment operate on bare soil and cover inactive soil stockpiles or treat them with soil binders, such as crusting agents or water them to keep moist) and implementing measures to reduce peak daily NO_x emission impacts (e.g., using alternative diesel fuels, such as diesel emulsions or biodiesels, extending the duration of the construction period to reduce daily equipment usage, and maximizing the use of diesel-powered construction equipment manufactured after year 1995). Air quality impacts would be greater than under the Project.

Biological Resources — Marine resources in the vicinity of a desalination plant could be affected by the constituents present in the concentrate discharges, by the concentrate discharge method used, and by the process of feed water intake. Coastal Act Sections 30230 and 30231 provide for the maintenance, enhancement, and restoration of marine resources and biological productivity (California Coastal Commission 2003).

All desalination plants use chlorine or other biocides, which are hazardous to marine resources, to clean pipes and other equipment and sometimes to pretreat the feed water. The SWRCB does not permit chlorine or other biocides to be discharged directly to the ocean. Consequently, these chemicals would have to be neutralized before discharge (California Coastal Commission 2003). Concern over the potential adverse effects to marine resources of desalination plant discharges is tempered by the following factors: total volume of concentrate being released; the constituents of the concentrate discharge; and, the amount of dilution prior to release. The high salt concentration of the concentrate and resulting localized fluctuations in salinity levels may kill organisms near the outfall that cannot tolerate either high salinity levels or fluctuations in the levels. In addition, discharges from desalination plants would be denser than seawater and could sink to the ocean floor, potentially causing adverse impacts to benthic communities. These effects may be considerably reduced if desalination plant concentrate discharges are

combined with sewage treatment plant discharges (which are less dense than seawater) or are diluted by mixing with power plant cooling water discharges. At this time, however, there is considerable uncertainty about how well desalination plant discharges, either alone or combined with other discharges, would be diluted in seawater. Metals in the concentrate discharge may become concentrated in the upper few micrometers of the ocean (the microlayer), which could be toxic to fish eggs, marine organisms, and larvae that are located there. Impacts to biological resources could be significant but likely could be mitigated to less than significant by measures such as treating water prior to discharge. These impacts would be greater than those of the Project, which would not directly affect biological resources.

Construction activities also could result in disturbance to sensitive habitat and wildlife species. Impacts would be significant but could be mitigable to less than significant by measures such as modifying construction timing, avoiding construction sites when sensitive species are present, and restoring disturbed habitat. These impacts would be greater than those of the Project, which would not directly affect biological resources.

Cultural Resources — Depending on the location of individual sites, construction of the seawater desalination facility and conveyance pipelines could have a significant impact on cultural resources. This impact would be mitigable to less than significant by conducting a survey to identify whether cultural resources are present prior to construction and taking appropriate measures to avoid or reduce impacts. These may include relocating construction sites to avoid the cultural resources or performing testing, evaluation, and data recovery if relocating the sites is not feasible. The Project would not directly impact cultural resources; thus, impacts would be greater under this alternative.

Geology, Soils, and Mineral Resources —The limited construction required would not result in the substantial loss of availability of a known mineral resource. The seawater desalination facility and water conveyance pipelines could be subject to geologic hazards, including seismic hazards, expansive soils, and unstable ground units depending on site locations. Construction also could result in erosion and siltation. These impacts would be mitigable to less than significant through appropriate siting and the implementation of appropriate engineering practices and BMPs. The Project would not directly impact geology and soils; thus, impacts would be greater under this alternative.

Hazards and Hazardous Materials — The desalination plant would require the use of hazardous materials, such as chlorine, caustic soda (sodium hydroxide), acid, dechlorination chemicals, and carbon dioxide. An accidental release of these chemicals could have adverse effects on plant personnel, the general public, and plant and, possibly, aquatic life depending on the location of the facility (Woodward-Clyde 1991). Impacts could be significant but would be mitigable to less than significant through compliance with federal, state, and local laws and regulations. These regulations stipulate minimum standards for design of facilities, storage requirements, spill prevention procedures, emergency response and contingency plans, risk, management, and employee training procedures. The proposed desalination facility would have to adhere to pertinent regulations including the Uniform Building Code, the Uniform Fire Code, and related regulations related to risk management (Woodward-Clyde 1991). The Project would not directly impact hazards and hazardous materials; thus, impacts would be greater under this alternative.

Land Use and Planning — Depending on site location, the desalination facility could result in conflicts with existing land uses or with future development plans. The facility and associated pipeline also could result in environmental impacts that would conflict with relevant adopted plans and policies. Impacts could be significant but likely could be mitigated to less than significant through the implementation of measures such as those described elsewhere in this section. These impacts would be greater than those of the Project, which would not directly affect land use or planning.

Noise — Noise would result from the construction of new facilities and the operation of pumps and an emergency generator. Impacts could be significant if sensitive receptors were located nearby. Impacts could be mitigated to less than significant through the implementation of measures such as limiting construction to daylight hours on weekdays, using muffled construction equipment, and enclosing pumps and the generator. The Project would not directly impact noise; thus, impacts would be greater under this alternative.

Population and Housing — Constructing and operating a desalination plant and pipeline would not displace population or housing, nor would it directly induce population growth. Impacts would be comparable to the Project.

Public Services — Constructing and operating a desalination plant and pipeline would place minimal demands on fire and police protection and would not affect schools or library services. No new public services facilities would be required as a result of this alternative. Impacts would be negligible and would be comparable to those of the Project.

Recreation — Depending on the site selected, coastal recreation and access could be restricted, and impacts could be significant. They could be mitigated to less than significant through the implementation of measures such as selecting sites that are not used for recreational purposes and providing public access where appropriate. Impacts could be greater than those of the Project since it would not affect recreational opportunities.

Transportation and Circulation — Constructing and operating the desalination facility and pipeline would result in increased traffic associated with the transportation of materials, equipment, and employees to and from the site(s). Existing traffic levels on surrounding freeways and roads leading to the facility would determine the level of impact on transportation, but impacts likely would be less than significant or mitigable to less than significant through scheduling of deliveries, use of flagpersons where needed, and other standard traffic control measures. Construction of pipelines could result in temporary lane closures or other short-term traffic disruptions, but this would be less significant because standard procedures would have to be followed to allow safe access through the construction area. The Project would not directly impact transportation and circulation; thus, impacts would be greater under this alternative.

Utilities/Service Systems — Constructing and operating the desalination facility and pipeline would generate some materials (e.g., construction materials, filters, and office materials) that would require disposal in a landfill. The significance of the impact would depend upon the amount of materials generated and the availability of disposal space. Electrical power would be needed to operate the desalination plant and water pumps. Impacts likely would be less than significant. This alternative would have greater impacts to solid waste disposal than the

Project; the impacts to electrical power generation likely would be comparable to those of the Project.

Water Resources — Construction could result in erosion and short-term water quality impacts to nearby water bodies. This impact could be significant but would be mitigable to less than significant through the implementation of BMPs. Effluent discharge could affect the water quality of coastal areas, but this impact would be mitigable to less than significant through compliance with permitting conditions imposed by the RWQCB. These impacts would be greater than the Project and would be significant, although incorporation of standard mitigation measures would reduce the severity of impacts. The Project would not directly cause erosion; thus, this impact would be greater under this alternative. The less than significant impacts to the resources associated with the SWP from changes in the timing of water use would not occur since no water would be transferred, nor would the less than significant impacts to groundwater and water quality in the WRMWSD.

7.3.4 Alternative 4, Transfer of a Smaller Table A Amount (Smaller Table A Amount)

Under this alternative, CLWA would acquire a smaller amount of SWP Table A Amount than under the Project. A transfer of approximately 20,000 AF of SWP Table A Amount was analyzed since it is the approximate mid-point between the amount that would be transferred under the Project and the No Project Alternative. Existing facilities would be used, as described for the Project.

Since the demand for high quality surface water is expected to increase in southern California as a result of anticipated growth, the remaining SWP Table A Amount (21,000 AF) could be acquired and transferred to other (unidentified) portions of urbanized southern California. The Table A Amount not acquired by CLWA would likely be acquired by other agencies with growing urban water demands. However, the timing, amount, and location of the transfer(s) as well as the associated impacts are speculative and are not evaluated under this alternative.

Impacts

Growth inducement and growth-related impacts within the CLWA service area generally would be as described for the Project but would be reduced proportionately. This alternative, therefore, would reduce the significant indirect impacts of the Project in the CLWA service area. Direct impacts of this alternative are described below and compared to those of the Project.

Aesthetic/Visual Resources – As described for the Project, no direct impacts to aesthetic/visual resources would occur.

Agricultural Resources — As described for the Project, no direct impacts to agricultural resources would occur.

Air Quality — This alternative would result in lower air emissions from power plants that provide electricity for pumping than the Project since approximately half of the water would be transported.

Biological Resources — As described for the Project, no direct impacts to biological resources would occur.

Cultural Resources —The same types of impacts on cultural resources from minor seasonal changes in the volume of water stored in San Luis Reservoir would occur as described for the Project, but would be lessened since less water would be transferred.

Geology, Soils, and Mineral Resources — The same types of impacts on erosion from minor seasonal changes in the volume of water stored in San Luis Reservoir would occur as described for the Project, but would be lessened since less water would be transferred.

Hazards and Hazardous Materials — The same types of impacts associated with hazardous materials from water treatment would occur as described for the Project, but lesser quantities would be required.

Land Use and Planning — As described for the Project, no direct impacts to land use and planning would occur.

Noise — As described for the Project, no direct impacts to noise would occur.

Population and Housing — As described for the Project, no direct impacts to population and housing would occur.

Public Services — As described for the Project, no direct impacts to public services would occur.

Recreation — As described for the Project, no direct impacts to recreation would occur.

Transportation and Circulation — As described for the Project, no direct impacts to transportation and circulation would occur.

Utilities/Service Systems — Less electrical power would be required for this alternative than for the Project, since less water would be transported and treated. Impacts would remain less than significant.

Water Resources — Like the Project, this alternative would have a beneficial impact to the CLWA service area's water supply, although less water would be provided. Thus, less benefit would result from this alternative. The less than significant impacts to the resources associated with the SWP from changes in the timing of water use would be lessened since less water would be transferred. Similarly, the less than significant impacts to groundwater and water quality in the WRMWSD would be lessened, as well.

Assuming groundwater resources are managed so that long-term groundwater extractions do not exceed long-term groundwater recharge, the water resource impacts from this alternative would be similar to those of the Project. However, if local groundwater resources were utilized on a long-term basis in excess of the long-term groundwater recharge to supply water during periods of drought or if overall water demand exceeded supply, significant impacts to water resources would occur.

As was the case in the No Project Alternative, local groundwater resources and other water management actions (including local and out-of-region conjunctive groundwater management, groundwater banking and mandatory conservation measures) may play a larger role in the satisfaction of future water demands. Should water demands exceed supplies, groundwater resources would likely be stressed, especially during periods of extended drought, and deliveries may be limited or reduced depending on demands. Under the Lower Table A alternative, individual landowners may be more likely to assert their rights to confined groundwater resources beneath their land, drill groundwater production wells and seek development rights based on that water supply, however these impacts are not specifically quantified, evaluated or assumed. Since the Smaller Table A alternative does not identify a level of regional water demand, specific impacts on water resources and other water dependent indirect impacts (e.g. biological impacts to wetland habitats) cannot be specifically determined. In the absence of appropriate regional management of groundwater resources, the indirect impacts on local water resources from the Smaller Table A alternative could be similar to or greater than those from the Project, and would be significant.

7.3.5 Alternative 5, Transfer of a Larger Table A Amount (Larger Table A Amount)

Under this alternative, CLWA would acquire a larger SWP Table A Amount than under the Project. Such an alternative would require the use of a larger proportion of the SWP facilities and capacities than described for the Project, and would attempt to reduce or avoid the effects of reductions in SWP supplies (during periods of drought) on local groundwater resources. In order to provide an analysis of impacts of a transfer greater than the Project (transfer of 41,000 AF of Table A Amount), a transfer of approximately 60,000 AF of SWP Table A Amount was established for this alternative. This Table A Amount is potentially available from other KCWA member units who have expressed interest in reducing their Table A Amount and have completed CEQA analysis of the sale of this contract right (e.g., Belridge Water Storage District, Berrenda Mesa Water District, and Lost Hills Water District [BWSD 1998; BMWD 1996]). Existing facilities would be used, as described for the Project.

Impacts

Indirect Impacts

If development within the CLWA service area were held to the level that could be served by the Project, indirect impacts to most environmental resources would be the same as those described for the Project. This might occur if, for example, the additional Table A Amount (i.e., the incremental 20,000 AF above the Project Table A Amount) were used in lieu of groundwater pumping. Under this assumption, the larger Table A Amount (approximately 50 percent greater than the Project amount, or approximately 20 percent greater than the total CLWA Table A Amount with the Project) also would be used to avoid some of the adverse impacts during periods of reduced deliveries from the SWP to local groundwater and water-dependent biological resources that are described in Chapter 4. The additional Table A Amount would provide approximately 20 percent more water (under each of the hydrologic conditions described) than would be delivered by the total CLWA Table A Amount with the Project, thereby reducing the potential impact by about 20 percent (i.e., when the total Table A Amount is considered, or 50 percent if only the Project increment is considered).

If local governments approved development within the CLWA service area beyond a level that could be supported by the 41,000 AF of Table A Amount for the Project, indirect, growth-related impacts described in section 4.0 could increase proportionately.

Direct Impacts

Aesthetic/Visual Resources – As described for the Project, no direct impacts to aesthetic/visual resources would occur.

Agricultural Resources — As described for the Project, no direct impacts to agricultural resources associated with the SWP, WRMWSD, or the CLWA service area would occur. Prior environmental analyses by KCWA member units (e.g., BWSD 1998) have concluded that the sale of approximately this total amount of SWP Table A Amount would result in less than significant impacts to agricultural resources within areas served by the selling water district(s).

Air Quality — This alternative would result in greater air emissions from power plants that provide electricity for pumping than the Project since approximately 50 percent more water would be transported (approximately 210 million kWh per year would be required). As described for the Project, any existing fossil fuel-fired power plant that provides electricity for the Project would have to comply with all ambient air quality standards and applicable air permit conditions, such as emission offsets. Therefore, air quality impacts due to the generation of electrical power for this alternative would be less than significant.

Biological Resources — As described for the Project, no direct impacts to biological resources would occur.

Cultural Resources —The same types of impacts on cultural resources from minor seasonal changes in the volume of water stored in San Luis Reservoir would occur as described for the Project, but would be somewhat greater since more water would be transferred.

Geology, Soils, and Mineral Resources — The same types of impacts on erosion from minor seasonal changes in the volume of water stored in San Luis Reservoir would occur as described for the Project, but would be somewhat greater since more water would be transferred.

Hazards and Hazardous Materials — The same types of impacts associated with hazardous materials from water treatment would occur as described for the Project, but greater quantities would be required.

Land Use and Planning — As described for the Project, no direct impacts to land use and planning would occur.

Noise — As described for the Project, no direct impacts to noise would occur.

Population and Housing — As described for the Project, no direct impacts to population and housing would occur.

Public Services — As described for the Project, no direct impacts to public services would occur.

Recreation — As described for the Project, no direct impacts to recreation would occur.

Transportation and Circulation — As described for the Project, no direct impacts to transportation and circulation would occur.

Utilities/Service Systems — More electrical power would be required for this alternative than for the Project, since more water would be transported and treated (approximately 210 million kWh per year would be required). This is approximately 4-5 percent of the total electrical power used by the 25 SWP pumping and generating plants in 1998, which was a year in which 100 percent of Contractors' allocations were available and therefore power demand was high. It is approximately 2-3 percent of the electrical power used in 2000 (a 90 percent allocation year for the SWP). According to the California Energy Commission (CEC 2002b), for the foreseeable future, the addition of capacity will exceed increase in peak demand both within California and in the Northwest, Southwest, and Rocky Mountain regions. While various factors may trigger calls for load curtailments, supply reserve margins should be adequate to meet the reasonably foreseeable demands. Direct impacts would be greater than the Project, but would remain less than significant.

Water Resources — Like the Project, this alternative would have a beneficial impact to the CLWA service area's water supply, including a greater benefit to groundwater resources.

Assuming groundwater resources are managed so that long-term groundwater extractions do not exceed long-term groundwater recharge, the groundwater resource impacts from the Larger Table A alternative would be similar to those of the Project. In addition, the increased SWP Table A Amount transfer would result in additional water being delivered to the CLWA service area in years of lower SWP water deliveries. Provided the same amount of anticipated development occurred within the CLWA service area as under the Project, this increased delivery in drier years would reduce potential impacts to groundwater resources. However, if a more likely scenario occurs in which continued demand for additional housing in the Santa Clarita Valley results in incrementally greater development being approved by local government and if the additional 19,000 AF of Table A Amount supported this additional development, no benefit to the local groundwater resources would be realized and no enhanced water delivery capability would be developed. As with the Project, if local groundwater resources were utilized on a long-term basis in excess of the long-term groundwater recharge to supply water during periods of drought or if water demand exceeded supply, significant impacts to water resources would occur.

7.4 ENVIRONMENTALLY SUPERIOR ALTERNATIVE

Table 7.4-1 compares the direct and indirect environmental impacts of each of the alternatives carried forward for detailed analysis with those of the Project. Scenarios 1 and 2 of Alternative 1, the No Project Alternative, would reduce or avoid the significant indirect (growth-related) impacts of the Project in the CLWA service area, but these impacts could occur in another area if projected growth were re-located elsewhere. Each alternative would result in greater direct impacts since new groundwater wells, treatment facilities, and associated pipelines would be required. Additionally, each of these scenarios could result in significant unavoidable impacts to groundwater supply and groundwater quality. This alternative would not augment CLWA's water supply and therefore would not meet the Project objectives. Since the direct impacts of

the No Project Alternative would be substantially greater than the Project and since it would not meet Project objectives, this alternative is not considered environmentally superior.

Table 7.4-1. Comparison of Direct and Indirect Environmental Impacts of Alternatives with Project Impacts

	ALTERNATIVE											
	No Project				*Increased Groundwater Extractions*		*Desalination/ Exchange*		*Smaller Table A Amount*		*Larger Table A Amount*	
Resource Area	*Moratorium Scenario**		*Build-Out Scenario*									
	Dir.	Ind.	Dir.	Ind.	Dir.	Ind.	Dir.	Ind.	Dir.	Ind.	Dir.	Ind.
Aesthetic/Visual Resources	+	--	+	-	+	=	+	=	=	-	=	+
Agricultural Resources	+	--	+	-	+	=	+	=	=	-	=	+
Air Quality	+	--	+	-	+	=	+	=	=	-	+	+
Biological Resources	+	--	+	-	+	=	+	=	=	-	=	+
Cultural Resources	+	--	+	-	+	=	+	=	-	-	+	+
Geology, Soils, and Mineral Resources	+	--	+	-	+	=	+	=	-	-	+	+
Hazards and Hazardous Materials	+	--	+	-	+	=	+	=	-	-	+	+
Land Use and Planning	+	--	+	-	+	=	+	=	=	-	=	+
Noise	+	--	+	-	+	=	+	=	=	-	=	+
Population and Housing	=	-	=	—	=	=	=	=	=	-	=	+
Public Services	=	--	=	-	=	=	=	=	=	-	=	+
Recreation	=	--	=	-	=	=	+	=	=	-	=	+
Transportation and Circulation	+	--	+	-	+	=	+	=	=	-	=	+
Utilities and Service Systems	-	--	-	-	-	=	+	=	-	-	+	+
Water Resources	+	--/+	+	-/+	+	=	+	=	-	-	+	+

* Under the Moratorium Scenario, indirect, growth-related impacts would not occur in the CLWA service area, but could occur elsewhere if projected growth were relocated.
= Alternative's impacts comparable to Project
- Alternative would reduce Project impacts
-- Alternative would avoid Project impacts
+ Alternative's impacts greater than the Project
-/+ Alternative would reduce or avoid some impacts, increase other impacts

Alternative 2, the Increased Groundwater Extractions Alternative, would result in the same indirect impacts as the Project and thus would not reduce or avoid the Project's significant

growth-related impacts. It would result in greater direct impacts to many environmental resources because new groundwater wells, treatment facilities, and pipelines would have to be constructed. It also would result in a significant, unavoidable impact to groundwater supply, whereas the Project would result in a beneficial impact to groundwater supply through recharge. This alternative would not augment CLWA's water supply for its customers and therefore would not meet the Project objectives. Because the direct impacts of the Increased Groundwater Extractions Alternative would be substantially greater than the Project and since it would not meet Project objectives, this alternative is not considered environmentally superior.

Alternative 3, the Desalination/Exchange Alternative, would result in the same indirect impacts as the Project and thus would not reduce or avoid the Project's significant growth-related impacts. It would result in greater direct impacts to many environmental resources from the construction and operation of a new desalination plant and pipeline. This alternative would augment CLWA's water supply since desalinated water would be exchanged with another water agency's SWP Table A Amount, which would be conveyed to existing CLWA facilities, and therefore would meet the Project objectives. Because the direct impacts of the Desalination/Exchange Alternative would be substantially greater than the Project, however, this alternative is not considered environmentally superior.

Alternative 4, the Smaller Table A Amount Alternative, would reduce the potentially significant indirect impacts of the Project and would result in similar or lessened direct impacts, as well. This alternative would not meet one of the two Project objectives, however, which is to "Augment CLWA's SWP Table A Amount to meet water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area." Thus, while this alternative would result in lessened direct and indirect impacts, it does not meet an important basic Project objective[2] and is not considered the environmentally superior alternative.

Alternative 5, the Larger Table A Amount Alternative, could increase the significant indirect impacts of the Project and would result in similar or greater direct impacts, as well. It would meet the Project objectives but would result in greater environmental impacts than the Project and is not considered environmentally superior.

The Project is identified as the environmentally superior alternative that meets Project objectives.

2 Under CEQA Guidelines 15126.6, an EIR must describe a range of reasonable alternatives that would feasibly attain most of the basic objectives of the proposed project but would avoid or substantially lessen significant impacts of the project.

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Anders, Doug	Representative, Toland Landfill. 1998
Bagwell, Loretta	Representative, Los Angeles County Fire Department. 2004
Bartlet Jr., Herbert D.	Administrator, Newhall School District. 1998
Belendez, Kitty	Administrator, Castaic Union School. 2002
Erickson, Chris	Database Manager, DWR, Department of Water Quality. 2003
Fish, Judy	Administrator, Saugus School District. 2002
Ford, Connie	Administrator, William S. Hart High School District. 1998
Greenwood, Carol	Administrator. Sulphur Springs School District. 1998
Gutierrez, Pablo	Associate Regional Planner, Southern California Association of Governments. 2003
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10.0 LIST OF ACRONYMS AND GLOSSARY OF TERMS

ACRONYMS

AF	acre-feet
AF/acre	acre-feet per acre
AFY	acre-feet per year
AQMP	Air Quality Management Plan
APCD	Air Pollution Control District
ARB	California Air Resources Board
BE	Bookman-Edmonston Engineering
BMP	Best Management Practice
BMWD	Berrenda Mesa Water District
BWSD	Belridge Water Storage District
CAA	Clean Air Act
CAAA	California Clean Air Act
CAAQS	California Ambient Air Quality Standards
CA DHS	California Department of Health Services
Cal OSHA	California Occupational Safety and Health Administration
CalTrans	California Department of Transportation
CCR	California Code of Regulations
CCWA	Central Coast Water Authority
CDEC	California Data Exchange Center
CDFG	California Department of Fish and Game
CDMG	California Division of Mines and Geology
CEQA	California Environmental Quality Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cfs	cubic feet per second
CHP	California Highway Patrol
CIP	Capital Improvements Plan
CIWMB	California Integrated Waste Management Board
CLWA	Castaic Lake Water Agency
CMP	Conservation Management Practice
CNEL	Community Noise Equivalent Level

CNDDB	California Natural Diversity Data Base
CNPS	California Native Plant Society
CO	carbon monoxide
CPA	Citizens Planning Association of Santa Barbara County
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
CVRWQCB	Central Valley Regional Water Quality Control Board
cy	cubic yard
D-1641	Water Right Decision 1641
dB	decibel
° F	degree Fahrenheit
DEIR	Draft Environmental Impact Report
DMS	Development Monitoring System
DOGGR	California Department of Conservation, Division of Oil, Gas and Geothermal Resources
DOT	U.S. Department of Transportation
DTSC	California Department of Toxic Substances Control
DU/Ac	dwelling units per acre
DWR	California Department of Water Resources
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EPA	United States Environmental Protection Agency
ESA	Federal Endangered Species Act
ESFP	Earl Schmidt Filtration Plant
FEIR	Final EIR
FMMP	Farmland Mapping and Monitoring Program
GMC	Growth Management Chapter
HAA5	Haloacetic Acids
HCP	Habitat Conservation Plan
HOV	high occupancy vehicle
ICU	intersection capacity utilization
IWRP	Integrated Water Resources Plan
JPOD	Joint Points of Diversion

KCESSD	Kern County Engineering and Survey Services Department
KCFD	Kern County Fire Department
KCVFHCP	Kern County Valley Floor Habitat Conservation Plan
KCWA	Kern County Water Agency
kWh	kilowatt hour
LACSD	Los Angeles County Sanitation Districts
LADRP	Los Angeles Department of Regional Planning
LADWP	Los Angeles Department of Water and Power
LARWQCB	Los Angeles Regional Water Quality Control Board
L_{dn}	Day/Night Average Sound Level
L_{eq}	Energy-equivalent sound/noise descriptor
LOS	Level of Service
M&I	municipal and industrial
MAF	million acre-feet
MCE	Maximum Credible Earthquake
MCL	Maximum Containment Level
MCLG	Maximum Contaminant Level Goal
mgd	million gallons per day
$\mu g/m^3$	micrograms per cubic meter
$\mu g/L$	micrograms per liter
mg/l	milligrams per liter
ml	millileters
MND	Mitigated Negative Declaration
MOU	Memorandum of Understanding
MPN	most probable number
MW	megawatt
MWD	Metropolitan Water District of Southern California
NAAQS	National Ambient Air Quality Standards
NCCP	Natural Community Conservation Plan
NCWD	Newhall County Water District
NEA	Northwest Economic Associates
NEPA	National Environmental Policy Act
NH_3	ammonia

1	NO_2	nitrogen dioxide
2	NO_3	nitrate
3	NOE	Notice of Exemption
4	NOP	Notice of Preparation
5	NPDES	National Pollution Discharge Elimination System
6	NTU	nephelometric turbidity unit
7	OEHHA	California Office of Environmental Health Hazard Assessment
8	O_3	ozone
9	PCL	Planning and Conservation League
10	PG&E	Pacific Gas & Electric Company
11	PHG	Public Health Goal
12	$PM_{2.5}$	particulate matter less than 2.5 microns in diameter
13	PM_{10}	particulate matter less than 10 microns in diameter
14	ppb	parts per billion
15	ppm	parts per million
16	ppt	parts per trillion
17	PRC	Public Resource Code
18	RCPG	Regional Comprehensive Plan and Guide
19	RCRA	Resource Conservation and Recovery Act
20	RO	reverse osmosis
21	ROC	reactive organic compound
22	ROD	Record of Decision
23	ROG	reactive organic gas
24	ROI	region of influence
25	RTP	Regional Transportation Plan
26	RVWTP	Rio Vista Water Treatment Plant
27	RWQCB	Regional Water Quality Control Board
28	SCAB	South Coast Air Basin
29	SCAG	Southern California Association of Governments
30	SCAQMD	South Coast Air Quality Management District
31	SCVJSS	Santa Clarita Valley Joint Sewerage System
32	SCWC	Santa Clarita Water Company
33	SDIP	South Delta Improvements Program

LETTER 4

SDWA	Safe Drinking Water Act
SEA	Significant Ecological Area
SIP	State Implementation Plan
SJVAB	San Joaquin Valley Air Basin
SJVAPCD	San Joaquin Valley Unified Air Pollution Control District
SoCal Gas	Southern California Gas Company
SOAR	Save Open-Space and Agricultural Resources
SO_2	sulfur dioxide
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
THM	Trihalomethane
TMDL	Total Maximum Daily Load
TRVFHCP	Tejon Ranch Valley Floor Habitat Conservation Plan
TSCA	Toxic Substances Control Act
TTHM	Total Trihalomethanes
UCMR	Unregulated Contaminant Monitoring Rule
USACE	United States Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Survey
UWMP	Urban Water Management Plan
VCFCD	Ventura County Flood Control District
VWC	Valencia Water Company
WR	Water Right
WRMWSD	Wheeler Ridge-Maricopa Water Storage District

GLOSSARY OF TERMS

acre-foot	Volume of water (43,560 cubic feet, or 325,900 gallons) that would cover one acre to a depth of one foot.
affected environment	Existing biological, physical, social, and economic conditions of an area subject to change, both directly and indirectly, as a result of a proposed human action.
Agricultural Contractor	A public water agency that has contracted with DWR for the delivery of SWP water for "Agricultural Use", as defined in the contractor's Water Supply Contract. Agricultural Contractors can use SWP water for purposes other than agricultural uses. (DWR 1962.)
aquifer	Any underground formation that stores, transmits and yields water to wells and springs.
Article 21 water	Water that DWR makes available when water and capacity are available in excess of SWP storage needs and Table A supplies. This water is only available for limited time periods, generally only in the winter or early spring when Contractors demands are low, and only under specific conditions that do not occur on an annual basis. This type of water is identified in Article 21 of the Water Supply Contracts. It is the same as, but replaced, unscheduled surplus water as part of the Monterey Amendment. Additionally, Article 21 water was defined under the Monterey Amendment as "interruptible water," but it is more commonly referred to as "Article 21 water."
average year	For purposes of analyzing water supplies in the EIR, three hydrologic conditions were identified and evaluated: average year, single dry year and multiple dry year. The average year represents the average quantity of water available to the Contractor, based on the 73 years of DWRSIM model results.
candidate species	Plant or animal species not yet officially listed as threatened or endangered, but which is undergoing status review by the Service.
carryover water	SWP Table A water that is allocated to, and paid for by, a Contractor in one year, but is stored in San Luis Reservoir (when storage is available) for use by that Contractor in a following year.

Contractor or Contractors	Urban and agricultural public water agencies that hold Water Supply Contracts with DWR for the delivery of SWP water (DWR 1962).
critical habitat	Specific areas with physical or biological features essential to the conservation of a listed species and that may require special management considerations or protection. These areas have been legally designated via *Federal Register* notices.
cumulatively considerable	When the incremental effects of an individual project are considerable when viewed in connection with the effect of past projects, the effects of other projects, and the effects of probably future projects.
cultural resource	Building, site, district, structure, or object significant in history, architecture, archeology, culture, or science.
direct groundwater recharge	Direct groundwater recharge is the process of recharging groundwater supplies by the percolation of surface water supplies into the groundwater basin, most commonly done through the use of groundwater recharge ponds.
DWR dry year purchase	Water from DWR's Dry Year Water Purchase Program, through which water is purchased by DWR in shortage years from willing sellers in areas that have available supplies, and is then sold by DWR to Contractors willing to purchase those supplies.
effluent	Solid, liquid or gaseous wastes that enter the environment as a by-product of human-oriented processes; or water that has undergone treatment to remove pollutants.
endangered species	A species or subspecies whose survival is in danger of extinction throughout all or a significant portion of its range.
erosion	Wearing away of earth rock by running water, glaciers, winds and waves.
expansive soils	Expansive soils shrink and swell in volume as a result of the wetting and drying of fine-grained, clay-rich sediments. Development on expansive soils can result in damage to overlying structures over a long period of time, due to continued movement of soil.
fallow land	Usually cultivated land that is allowed to lie idle during the growing season.
flexible storage	Storage available to Contractors that share in repayment of the costs of terminal reservoirs (Castaic and Perris lakes). These

	Contractors may withdraw water from their share of flexible storage, in addition to any other SWP supplies available to the Contractor. The Contractor must replace any water it withdraws from flexible storage within five years. Flexible storage was added to the Water Supply Contracts as part of the Monterey Amendment. CLWA may withdraw up to 4,684 AF of water from Castaic Lake as flexible storage. (DWR 1995)
groundwater	Water stored beneath the surface in open pore spaces and fractures in rock.
groundwater recharge	Refers to the addition to the water within the earth that occurs naturally from infiltration of rainfall and from water flowing over the earth materials that allow water to infiltrate below the land surface.
hydrology	Science dealing with natural runoff and its effect on streamflow.
impaired waters	Water bodies for which existing pollution controls are insufficient to attain or maintain water quality standards pursuant to section 303(d) of the Clean Water Act.
inert pollutant	A pollutant that does not react in the atmosphere.
in-lieu groundwater recharge	In-lieu groundwater recharge is the process of recharging groundwater supplies by using surface water instead of groundwater that would otherwise be extracted and used.
insolation	Solar radiation received at the surface of the earth.
Interruptible water	Same as Article 21 water, described above. Water that DWR makes available when water and capacity are available in excess of SWP storage needs and Table A supplies. This water is only available for limited time periods, generally only in the winter or early spring when Contractors demands are low, and only under specific conditions that do not occur on an annual basis. This type of water is identified in Article 21 of the Water Supply Contracts, but it was more commonly referred to as "interruptible water" prior to the Monterey Amendment.
landslides	Landslides are ground failures that are dependent on the geology and slope of an area as well as the amount of rainfall and the potential for seismic activity. Areas most susceptible to landslides have high relief and an unstable accumulation of material. Areas least likely to have landslides are characterized by low relief, such as valleys.

lateral spreading	Lateral spreading is the separating or rupturing of the ground surface, generally associated with liquefaction, as a result of strong seismically induced ground shaking. Lateral spreading commonly occurs along drainage banks, cliff areas, or steep shoreline areas, where generally loose sediments collapse due to a lack of lateral support.
Lead Agency	The agency initiating and overseeing the preparation of an environmental impact statement.
liquefaction	Liquefaction occurs when saturated soils lose cohesive strength as a result of strong seismically induced ground shaking of saturated, generally fine-grained sediments (i.e., typically silty fine sands). Strong ground motion of such sediments causes pore water pressure in the soil to increase, thereby turning the soil from a solid to a liquid state.
maximum contaminant level (MCL)	The maximum possible level of a contaminant allowed in water delivered to any user of a public water system.
megawatt (MW)	One million watts of electrical power (capacity).
megawatt hour (MWh)	One million watt-hours of electrical energy.
minimum project yield	The dependable annual supply of the SWP to be made available to SWP Contractors, as determined by DWR. The minimum project yield was originally estimated to be 4,000,000 AFY, was increased to 4,230,000 AFY in 1964, and decreased to 4,185,000 AFY as part of the Monterey Amendment. Under a recent amendment, estimated amounts are no longer included in the Water Supply Contract. (The minimum project yield would be reduced under a scenario in which DWR implemented Article 18(b); such a scenario is evaluated as part of this EIR.)
M&I Contractor	A public water agency that has contracted with DWR for the delivery of SWP water for "Municipal and Manufacturing Use", as defined in the contractor's Water Supply Contract. M&I Contractors can use SWP water for purposes other than municipal and manufacturing uses. (DWR 1962.)
multiple dry year	For purposes of analyzing water supplies in the EIR, three hydrologic conditions were identified and evaluated: average year, single dry year and multiple dry year. The multiple dry year represents the amount of water available to the Contractor over the four consecutive years drought years of 1988 to 1991, based on the DWRSIM model results.
percolation	The vertical movement of water within the soil.

reliability	Water supply reliability or reliability refers to the amount of water that a Contractor can anticipate to be delivered at a specific place and time (DWR 2003b). Water supply reliability indicates a particular amount of water that can be delivered with a certain numerical frequency (e.g., the amount that can be delivered 1 in 10 years, or 10 percent of the time, etc.; DWR 2003b).
runoff	Rainfall or snow melt which is not absorbed by soil, evaporated, or transpired by plants, but finds its way into streams as surface flow.
scheduled surplus water	Water that DWR determined to be available, in addition to Table A supplies, which was scheduled for delivery throughout the year (in the same manner as Table A supplies). This water was generally available only during the early years of the SWP (when Contractor demands were low).
single dry year	For purposes of analyzing water supplies in the EIR, three hydrologic conditions were identified and evaluated: average year, single dry year and multiple dry year. The single dry year represents the amount of water available to the Contractor in the single year with the lowest total SWP deliveries, based on the DWRSIM model results, which was 1977. The single dry year is considered to be a worst-case scenario, with a probability of occurrence of once in 73 years, or about 1.4 percent of the time.
subsidence	Subsidence is the sinking and settling of surface sediment commonly as a result of an overdrawn water table or oil and gas over-development.
surplus water	SWP water that can be made available to Contractors when water and capacity are available in excess of SWP storage needs and Table A supplies. Note that surplus water terminology changed with implementation of the Monterey Amendment. Prior to the Monterey Amendment, surplus water was referred to as scheduled or unscheduled. With implementation of the Monterey Amendment, the category of scheduled surplus water was deleted and what was unscheduled surplus water is now referred to as Article 21 water. (DWR 1962; DWR 1995.)
SWP allocation or allocation	The percent of Table A amount, as determined by DWR, that each SWP Contractor can receive in any one year based on that year's supply availability and Contractor requests.
Table A amount	A term used in the Water Supply Contracts. The "Table A Amount" is the annual maximum amount of water to which a

	SWP Contractor has a contract right, and is specified in Table A of each Contractor's Water Supply Contract. The Table A Amount was previously referred to as "entitlement."
Table A water	SWP water allocated to a Contractor pursuant to its annual request for SWP water.
tributary	River or stream flowing into a larger river or stream.
Turnback Pool water	Water sold or purchased through the SWP Turnback Pool. The Turnback Pool is a program in which Contractors with allocated Table A supplies that are in excess of their needs in a given year may turn back that excess supply for purchase by other Contractors that need additional supplies that year. The Turnback Pool can make water available in all types of hydrologic years, although there is generally less excess water turned back in dry years.
unscheduled surplus water	Water that DWR made available when water and capacity were available in excess of SWP storage needs and Table A supplies. This water was only available for limited time periods, generally only in the winter or early spring when Contractors demands are low, and only under specific conditions that do not occur on an annual basis. This is the same as Article 21 water, which replaced this category of surplus as part of the Monterey Amendment.
User Input Program	A program implemented by the WRMWSD that allows water users within the district to deliver water into the WRMWSD distribution systems. The water user is then credited with an equal amount of water, less any losses, to be delivered to the user by WRMWSD within the same calendar year.
watershed	The drainage area upstream of a specified point on a stream.
Water Supply Contracts	Contracts between DWR and individual urban and agricultural public water agencies for the delivery of SWP water. (DWR 1962.)

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11.0 LIST OF PREPARERS

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Appendix A

Notice of Preparation and Comments Received

NOTICE OF PREPARATION

SUBJECT: Notice of Preparation of a Draft Environmental Impact Report

PROJECT TITLE: Castaic Lake Water Agency Supplemental Water Project Transfer of 41,000 Acre-feet of State Water Project Table A Amount from Kern County Water Agency

LEAD AGENCY: Castaic Lake Water Agency

The proposed project is the transfer of 41,000 acre-feet (AF) of State Water Project (SWP) Table A amount from Kern County Water Agency (KCWA), and its member district the Wheeler Ridge-Maricopa Water Storage District (WRMWSD), to the Castaic Lake Water Agency (CLWA). The proposed project also establishes the right to use the 41,000 AF as part of CLWA's SWP Table A amount of 95,200 AF pursuant to a Trial Court judgment on remand described below. Also, the 41,000 AF has been delivered to CLWA from KCWA through agreements including KCWA and its member district, the WRMWSD, as well as the California Department of Water Resources (DWR). The proposed project also includes possession of SWP contractual rights that provide a means of water storage and delivery of water associated with the Table A amount to CLWA. The proposed project results in a total CLWA SWP Table A amount of 95,200 AF. The SWP water is being transported from points of origin in the SWP system to the CLWA intake south of Castaic Lake via existing SWP facilities. The proposed project does not include the construction of any additional SWP facilities.

CLWA's prior environmental review of the project, the *Supplemental Water Project Environmental Impact Report* ("CLWA's 1999 EIR", State Clearinghouse No. 98041127), analyzing CLWA's Agreement ("Agreement") to transfer the 41,000 AF of SWP Table A amount, was ordered decertified by the Court of Appeal in January of 2002. *Friends of the Santa Clara River v. Castaic Lake Water Agency* (2002) 95 Cal. App. 3d 1373 ("*Friends*"). The decision in *Friends* occurred because an EIR on which the CLWA's 1999 EIR has been tiered was itself ordered decertified as a result of an appellate court decision issued while *Friends* was on appeal. "All other contentions" concerning CLWA's 1999 EIR were found to be "without merit". The Court of Appeal specifically ordered the Trial Court to "issue a writ of mandate vacating the certification of the EIR", and to "retain jurisdiction until [CLWA] certifies an EIR complying with CEQA [the California Environmental Quality Act]," and "consider such orders it deems appropriate under Section 21168.9 [of the Public Resources Code]." The CLWA Board of Directors decertified CLWA's 1999 EIR on November 27, 2002.

On remand, the Trial Court refused to invalidate the Agreement, maintained its jurisdiction over the matter, and authorized the CLWA to utilize "any of the 41,000 AFY [acre-feet per year]," albeit, with certain limitations:

"Respondent [the CLWA] will not be prohibited from using the water to which it is entitled, but petitioner may renew its application for such prohibition based upon evidence of the actual use of such additional water for purposes it considers improper."

The above Order was issued without prejudice to a renewed request by the Petitioner to invalidate the Agreement. Pursuant to the Trial Court's Order, the EIR will contain a complete no project alternative analysis pursuant to the requirements of the CEQA Guidelines Section 15126.6(e).

The Agreement has been approved by KCWA, WRMWSD and CLWA, as well as DWR. WRMWSD is the KCWA member district providing this Table A amount.

The 1998 factual baseline utilized in the CLWA 1999 EIR must be combined with new material information that reflects environmental conditions that may have changed since 1998, which will allow informed and reasoned decision-making by the lead agency, other public agencies, and the general public. New material information is noted in the various sections of Attachment 1 to the Notice of Preparation (NOP), and where appropriate will be expanded and included in the EIR.

Attachment 1 describes the proposed project, the project location, and provides additional information on the types of impacts that may occur as a result of the implementation of the proposed project. CLWA will be the Lead Agency under CEQA, and will prepare an Environmental Impact Report (EIR) for the proposed project. CLWA is requesting comments from interested parties regarding the scope and content of the EIR.

A scoping meeting will be held on Monday, February 10, 2003 at 7:00 p.m. at the CLWA offices located at 27234 Bouquet Canyon Road in Santa Clarita. The meeting will provide an opportunity for agencies and the public to comment on the scope and content of the EIR. Due to the time limits mandated by State law, comments must be received at the earliest possible date, ***but not later than 30 days*** after receipt of this notice. Please send your comments to:

Castaic Lake Water Agency
Attention: Dan Masnada, General Manager
27234 Bouquet Canyon Road
Santa Clarita, CA 91350-2173
Phone: 661-297-1600

January 22, 2003
Date

Dan Masnada
General Manager, Castaic Lake Water Agency

ATTACHMENT 1

PROJECT DESCRIPTION

The proposed project is the transfer of 41,000 acre-feet (AF) of State Water Project (SWP) Table A amount[1] from Kern County Water Agency (KCWA), and its member district the Wheeler Ridge-Maricopa Water Storage District (WRMWSD), to the Castaic Lake Water Agency (CLWA). The proposed project also establishes the right to use the 41,000 AF as part of CLWA's SWP Table A amount of 95,200 AF pursuant to a Trial Court judgment on remand described below. Also, the 41,000 AF has been delivered to CLWA from KCWA through agreements including KCWA and its member district, the WRMWSD, as well as the California Department of Water Resources (DWR). The proposed project also includes possession of SWP contractual rights that provide a means of water storage and delivery of water associated with the Table A amount to CLWA. The proposed project results in a total CLWA SWP Table A amount of 95,200 AF. The SWP water is being transported from points of origin in the SWP system to the CLWA intake south of Castaic Lake via existing SWP facilities. The proposed project does not include the construction of any additional SWP facilities.

CLWA's prior environmental review of the project, the *Supplemental Water Project Environmental Impact Report* ("CLWA's 1999 EIR", State Clearinghouse No. 98041127), analyzing CLWA's Agreement ("Agreement") to transfer the 41,000 AF of SWP Table A amount, was ordered decertified by the Court of Appeal in January of 2002. *Friends of the Santa Clara River v. Castaic Lake Water Agency* (2002) 95 Cal. App. 3d 1373 ("*Friends*"). The decision in *Friends* occurred because an EIR on which the CLWA's 1999 EIR has been tiered was itself ordered decertified as a result of an appellate court decision issued while *Friends* was on appeal. "All other contentions" concerning CLWA's 1999 EIR were found to be "without merit". The Court of Appeal specifically ordered the Trial Court to "issue a writ of mandate vacating the certification of the EIR", and to "retain jurisdiction until [CLWA] certifies an EIR complying with CEQA [the California Environmental Quality Act]," and "consider such orders it deems appropriate under Section 21168.9 [of the Public Resources Code]." The CLWA Board of Directors decertified CLWA's 1999 EIR on November 27, 2002.

On remand, the Trial Court refused to invalidate the Agreement, maintained its jurisdiction over the matter, and authorized the CLWA to utilize "any of the 41,000 AFY [acre-feet per year]," albeit, with certain limitations:

> "Respondent [the CLWA] will not be prohibited from using the water to which it is entitled, but petitioner may renew its application for such prohibition based upon evidence of the actual use of such additional water for purposes it considers improper."

The above Order was issued without prejudice to a renewed request by the Petitioner to invalidate the Agreement. Pursuant to the Trial Court's Order, the EIR will contain a complete

1. "Table A" is a term used in the SWP Water Supply Contracts. The "Table A amount" is the amount of water to which a SWP Contractor is contractually entitled, and is specified in Table A to each Contractor's Water Supply Contract. (The Table A amount was previously referred to as "entitlement".) However, the amount of water actually available for delivery in any year may be an amount less than the Contractor's Table A amount due to hydrology and a number of other factors.

no project alternative analysis pursuant to the requirements of the CEQA Guidelines Section 15126.6(e).

The Agreement has been approved by KCWA, WRMWSD and CLWA, as well as DWR. WRMWSD is the KCWA member district providing this Table A amount.

CLWA will be, and is the proper lead agency for preparation of the EIR. CLWA has the principle responsibility for carrying out and implementing the proposed project since 1) a substantial portion of the proposed project occurs within the CLWA's jurisdiction and substantially affects the CLWA, 2) CLWA has been the major proponent of the project with the KCWA and WRMWSD and has assumed the primary task of effectuating the agreement, 3) CLWA has the expertise for implementing the proposed project, and 4) the proposed project, although involving SWP facilities, only concerns three agencies (CLWA, KCWA and WRMWSD) within a limited geographic area and does not implicate the entire statewide water rights or supply framework.

PROJECT LOCATION

The proposed project would utilize existing SWP facilities and could affect environmental resources in the CLWA, KCWA, and WRMWSD service areas (refer to Figure 1) as well as environmental resources associated with selected SWP facilities. The CLWA service area comprises approximately 195 square miles of land in northwestern Los Angeles County and eastern Ventura County. The KCWA service area includes all of the lands within Kern County, approximately 8,064 square miles. The WRMWSD service area comprises approximately 228 square miles of land in southern Kern County. The potentially affected SWP facilities include those SWP facilities that convey water to either CLWA or WRMWSD and include SWP facilities from the south Sacramento-San Joaquin Delta (Delta) facilities to Castaic Lake, including the California Aqueduct and associated pumping, storage and affected turnout facilities, along with San Luis Reservoir (refer to Figure 2). These potentially affected SWP facilities are collectively referred to as "SWP and associated facilities" within this Attachment.

BACKGROUND AND ENVIRONMENTAL SETTING

Castaic Lake Water Agency - CLWA is a special district water agency created by the California Legislature in 1962 to acquire and distribute SWP water. CLWA currently holds contractual rights to delivery of water from the California SWP and contains incorporated and unincorporated areas in, or adjacent to, the Santa Clarita Valley area of Los Angeles County and also extends into eastern Ventura County. Elevations in the service area range from approximately 800 feet to in excess of 3,000 feet above sea level. Land use in the service area ranges from the urbanized environment of the Santa Clarita Valley (including the City of Santa Clarita and several developed, unincorporated communities in northern Los Angeles County) to the undeveloped environment of the eastern Santa Susana and western San Gabriel Mountains. Interstate Highway 5 and California State Routes 14 and 126 provide regional access to the Santa Clarita Valley. The population of the CLWA service area was estimated at approximately 190,000 persons in 2000 based on U.S. Census Bureau data. Substantial portions of the CLWA service area also contain ecologically important vegetation and wildlife habitats including sensitive plant and animal species. Major vegetation/habitat types include oak woodlands, chaparral, coastal and/or

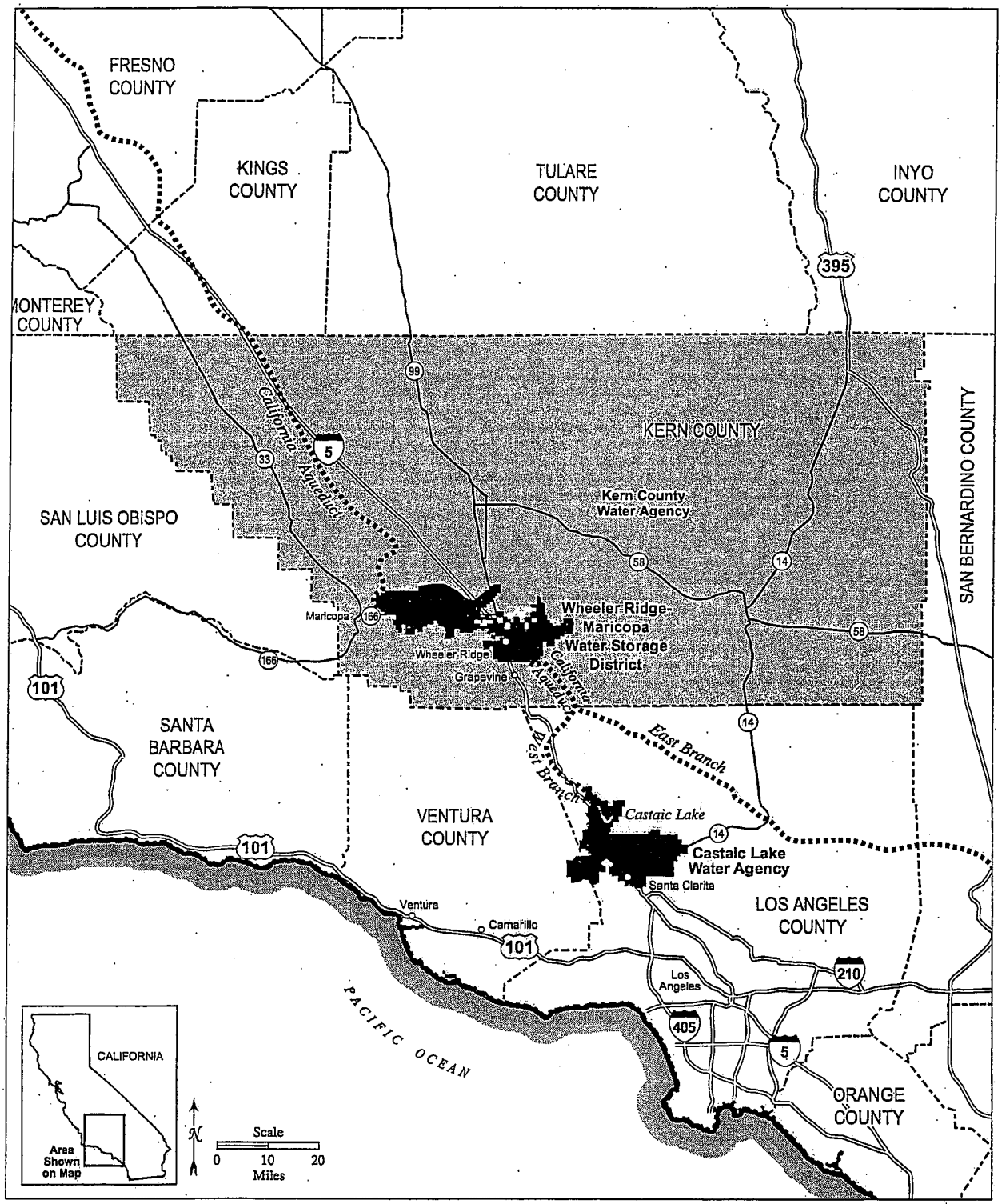
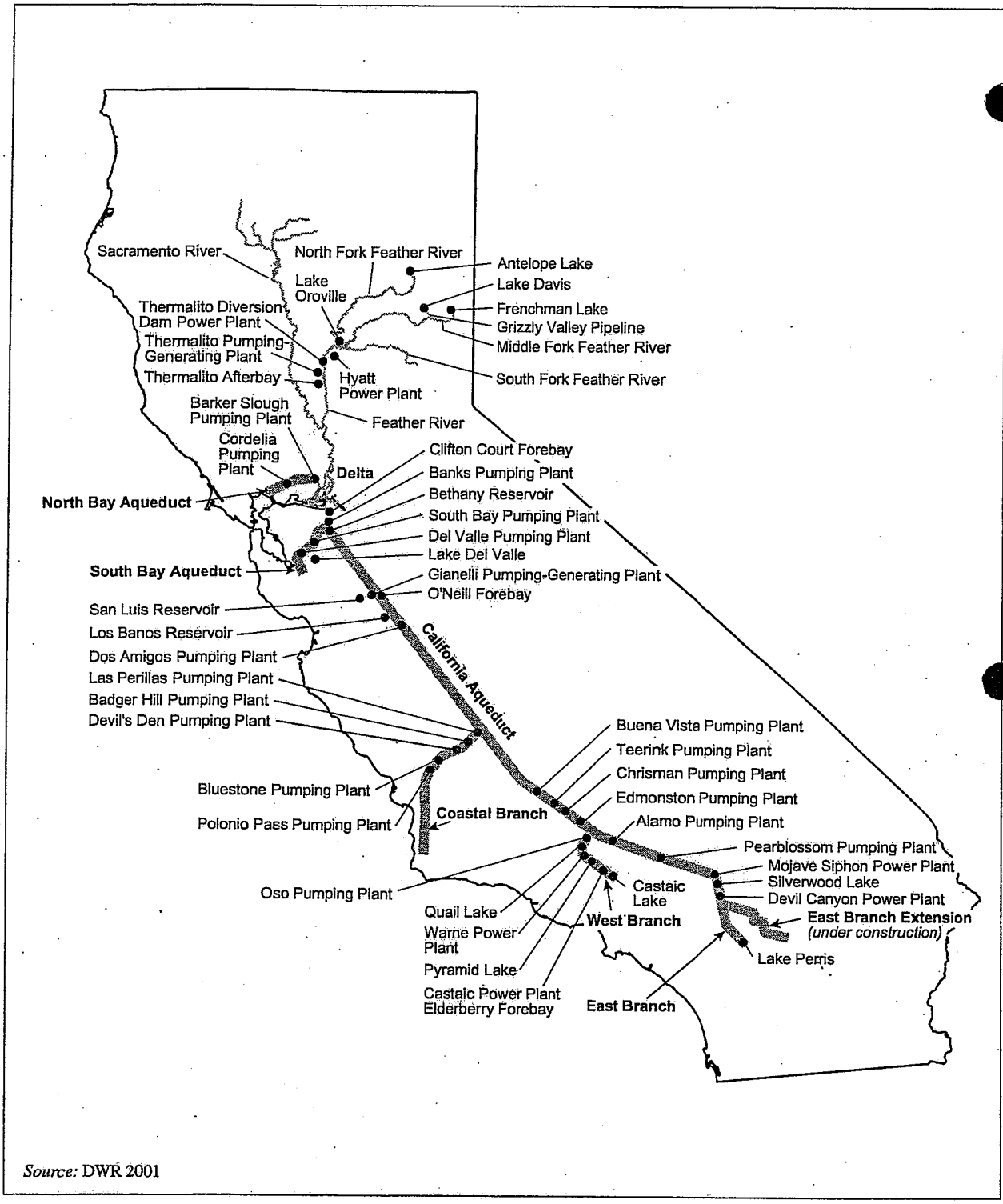


Figure 1. Regional Setting Including Kern County Water Agency, Wheeler Ridge-Maricopa Water Storage District, and Castaic Lake Water Agency Service Areas



Source: DWR 2001

Figure 2. Primary SWP Facilities

Riversidean (Venturan) sage scrub, non-native grassland, riparian scrub, and riparian woodlands. In addition, Castaic Lake, Castaic Lagoon, and limited areas along the Santa Clara River provide open water habitat. The Santa Clara River is a regionally significant habitat for native fish and other wildlife. The CLWA service area contains several Significant Ecological Areas designated for various sorts of protection by Los Angeles County.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - KCWA was created by the California Legislature in 1961 to secure and supply water to its local member districts in Kern County. In 1998, KCWA, together with its 14 member water districts, including WRMWSD, held approximately 1,088,000 AF of SWP contractual rights. KCWA serves municipal, industrial and agricultural water users in Kern County.

The KCWA service area contains primarily agricultural lands with some oil, urban and industrial development. Urban and industrial development is concentrated within the metropolitan Bakersfield area and rural communities are scattered throughout the service area. In 2000, the population of Kern County was 661,645 persons with approximately 231,560 housing units. The KCWA service area includes areas within the southern San Joaquin Valley, Tehachapi Mountain Range, Sierra Nevada Mountain Range, and the Antelope Valley. The EIR will primarily focus on the KCWA service area within the San Joaquin Valley; although, where appropriate, other areas will be discussed. Lands which are no longer subjected to irrigation support a grassland community of introduced plants such as red brome (*Bromus madritensis rubens*), common foxtail (*Hordeum glaucum*), wild oats (*Avena fatua*), and thistles or remnant grains from previous farming. Riparian, wetland and open water habitats are limited to short stretches along intermittent or ephemeral stream channels, agricultural ponds and drainage ditches, and along the California Aqueduct. The KCWA service area supports a variety of sensitive plant and animal species including, although not limited to, the Bakersfield smallscale (*Atriplex tularensis*), Bakersfield cactus (*Opuntia basilaris* var. *treleasei*), Giant kangaroo rat (*Dipodomys ingens*), Tipton kangaroo rat (*Dipodomys nitratoides nitratoides*), Blunt-nosed leopard lizard (*Gambelia sila*), and the San Joaquin kit fox (*Vulpes macrotis mutica*). Sensitive species within the KCWA service area will be further discussed in the EIR.

WRMWSD was formed in 1959, by an election of landowners as provided by Division 14 of the California Water Code. The service area mostly occupies the valley floor and smooth sloping foothill lands at the southern apex of the San Joaquin Valley between the Coast Mountain Range to the west and the Tehachapi Mountain Range to the south and east. The WRMWSD service area consists predominantly of agricultural lands, although small areas of industrial development and the unincorporated community of Lakeview are within the service area, along with the town site of Wheeler Ridge. Based on U.S. Census Bureau data, in 2000, the population of the WRMWSD service area was estimated to be 2,854 persons, or less than one percent of the population of Kern County. Agricultural production in WRMWSD service area includes nut orchards, grains, cotton, mixed produce and vineyards. Portions of the service area include fallowed lands, and some agricultural lands are also unplanted on a rotational basis as a part of normal agricultural practices. Other portions of the service area include fairly extensive areas of scrub vegetation and other plant and wildlife species as described above with respect to the KCWA service area. In addition, the WRMWSD service area supports a variety of sensitive plant and animal species including the species identified above with respect to the KCWA

service area. Sensitive species within the WRMWSD service area will be further discussed in the EIR.

WRMWSD obtains its water supplies from the SWP, through contract with KCWA, other surface water sources and groundwater sources, and delivers water to agricultural and industrial users within its service area. WRMWSD's contract right to SWP water through KCWA was approximately 238,000 AF in 1998. The WRMWSD also participates in groundwater recharge programs and groundwater banking outside of the service area.

State Water Project and Associated Facilities - The SWP is a large water supply, storage and distribution system authorized by an act of the California State Legislature in 1959. Today, the SWP includes 28 storage facilities, reservoirs and lakes; 20 pumping plants; six pumping-generating plants and hydroelectric power plants; and about 660 miles of aqueducts and pipelines. The primary purpose of the SWP is to distribute water to 29 urban and agricultural water contractors in Northern California, the San Francisco Bay Area, the San Joaquin Valley, the Central Coast, and Southern California. The SWP provides supplemental water to approximately 22 million persons and 750,000 acres of farmland. In addition to its primary purpose, the SWP is also operated to assist in the control of Feather River floodwaters, and to provide recreation, generate energy, and enhance fish and wildlife habitats.

The primary water source for the SWP is within the drainage of the Feather River, a tributary of the Sacramento River. Runoff released from Oroville Dam in Butte County flows down natural channels to the Delta. In the southern Delta, water is pumped from the Clifton Court Forebay by the Harvey O. Banks Delta Pumping Plant (Banks Pumping Plant) into the 444-mile-long California Aqueduct. The California Aqueduct travels along the west side of the San Joaquin Valley. The California Aqueduct conveys water to the primarily agricultural users in the San Joaquin Valley and the primarily urban regions of the San Francisco Bay Area, the Central Coast, and Southern California. Water from the California Aqueduct is delivered directly to contractors within the San Joaquin Valley, including WRMWSD and the other member districts of the KCWA, is stored in San Luis Reservoir, or continues down the aqueduct for delivery and/or storage in the Southern California area. (San Luis Reservoir, located approximately 60 miles south of the Banks Pumping Plant, is an off-stream storage reservoir for both SWP and Central Valley Project[2] water.) The California Aqueduct traverses the west side of the San Joaquin Valley through a series of four pumping plants before reaching the Edmonston Pumping Plant. The Edmonston Pumping Plant lifts the California Aqueduct water 1,926 feet to the Antelope Valley, where the California Aqueduct divides into the East and West Branches. Water intended for use in Southern California is conveyed through the West Branch to Castaic Lake and through the East Branch to Lake Perris.

OTHER PROJECTS

In addition to the proposed project, CLWA is also planning or considering several other separate projects that would be analyzed further in the EIR if they would create cumulative environmental impacts:

2. The Central Valley Project is a federal water supply project that supplies water to users in Northern California and the San Joaquin Valley.

- An EIR addressing the proposed transfer of up to 16,000 AF of SWP Table A amount from the KCWA and its member district, the Berrenda Mesa Water District (BMWD) to CLWA. The 16,000 AF project would increase CLWA's total SWP Table A amount from its current level of 95,200 AF to up to 111,200 AF and would also involve annexing lands into CLWA's service area. The EIR for the 16,000 AF project will also address establishment of a program to create a possible mechanism for new development to comply with laws requiring specified showings of long-term water availability.

- An EIR for the Earl Schmidt Filtration Plant (ESFP) Expansion project. The ESFP project would increase the plant's raw water treatment capacity from 33.6 million gallons per day to 56 million gallons per day, replace an existing raw water pumping station, and construct treatment process upgrades to meet existing and anticipated water treatment regulatory requirements. The ESFP project is expected to cover a portion of the increased demands through 2010, based on the adopted Los Angeles County growth forecast. CLWA prepared a NOP in June 2002 for the ESFP project.

- CLWA currently is in the process of engineering the Honby Extension/Storage Reservoir Project ("Honby Extension"), approved by CLWA in 1999. An existing Mitigated Negative Declaration (prepared in December 1998 and adopted by CLWA in early 1999 with Board Resolution No. 2034) titled, *Initial Study and Mitigated Negative Declaration for the Extension of Imported Water Transmission Systems in the Castaic Lake Water Agency Service Area*) addressed the Honby Extension and capital facilities. The Honby Extension project is a 33-inch, approximately 30,000 foot long waterline, originating near the intersection of Honby Avenue and Santa Clara Street where a new pump station also will be constructed. The pipeline will travel from the new pump station easterly and southerly, terminating in a new storage reservoir west of Rolling Hills Avenue and Warmuth Road.

- The CLWA Board has approved an Initial Study, Negative Declaration, and Notice of Determination for CLWA's 2002 Groundwater Banking Project. CLWA will temporarily store, for up to 10 years, up to 24,000 AF of its 2002 SWP water that exceeds the 2002 demand, for later withdrawal and delivery to the CLWA service area. The 24,000 AF would be placed in storage during 2002 in the Semitropic Water Storage District (SWSD) Groundwater Banking Project. SWSD would store the delivered water using its existing groundwater banking facilities or through in lieu storage, and would withdraw and return the water to CLWA within a ten-year period, in one or more future years in which CLWA's demand exceed supply.

- CLWA is considering a proposal to deliver 6,786 AF of water to United Water Conservation District via Pyramid Lake and Piru Creek. CLWA will undertake the appropriate environmental review prior to implementation of the project.

- The CLWA Board of Directors may, in the future, consider adoption of a recycled water master plan, which would provide for approximately 17,000 AF of recycled water to be used in lieu of treated potable water.

The CLWA Board of Directors may, in the future, consider adopting other water management actions including the construction of additional facilities, which, if appropriate, would be

considered in the cumulative impacts section of the EIR. Projects other than those for which CLWA is the proponent, including projects within the KCWA and WRMWSD service areas, or projects where KCWA and WRMWSD are the project proponent, and other projects in the CLWA service area, would also be identified in the EIR and considered in the cumulative impacts section of the EIR, as required by CEQA. In addition, actions occurring in the Delta area, including but not limited to the CALFED program, may affect the SWP and would be addressed in the cumulative impacts section of the EIR.

As noted above, the CLWA is considering and/or implementing several other projects, including the transfer of 16,000 AF of SWP Table A amount from BMWD to the CLWA and the expansion of the ESFP. While these other projects contribute to CLWA's overall water management, these projects are proceeding separately since the completion of each project does not depend on any other project being completed, and each project would cause unique environmental impacts. The separate projects do not constitute parts of phases of a larger project since each project involves its own timeframe and serves differing purposes. Thus, unlike situations where the larger project's purpose would be compromised without the completion of related projects, none of the projects' purposes here would be compromised by the failure of other projects. For instance, the establishment of the right to use the 41,000 AF as part of CLWA's SWP Table A amount of 95,200 AF does not depend on whether the ESFP expansion will be completed or completed within the currently anticipated timeframe.

Nevertheless, the proposed project EIR will examine the cumulative impacts of the proposed project in combination with other projects, including the 16,000 AF of SWP Table A transfer and the ESFP expansion project. The cumulative impact analysis will examine how each project's potential individual environmental impacts may be greater than the sum of its parts, and will provide possible mitigation measures to address these significant cumulative impacts, if any. Thus, the environmental impacts of the proposed project along with the other projects proposed by CLWA will not be determined in isolation.

ENVIRONMENTAL IMPACTS

Implementation of the proposed project would have the potential to have direct and indirect impacts on the physical environment within and adjacent to SWP facilities, and the service areas of KCWA, WRMWSD, and CLWA. The following discussions summarize the components of the proposed project that could affect environmental resources and potential impacts of the proposed project to environmental resources.

Castaic Lake Water Agency – Implementation of the proposed project would not directly require the construction of new CLWA facilities or modification of existing CLWA facilities, nor would it directly change the existing operation of CLWA facilities. Implementation of the proposed project would not directly require land disturbance nor would it directly change the existing land uses within the CLWA service area. Potential impacts of the proposed project within the CLWA service area would generally be associated with indirect effects of an increased water supply for users within the service area.

Substantial growth is expected in the Santa Clarita Valley. Future land use changes and/or new developments within the CLWA service area that could be implemented as a result of the

proposed project may result in potentially significant indirect impacts to environmental resources. Indirect impacts of the proposed project within the CLWA service area would result from land use changes, new developments, and associated population growth. These indirect, growth-related impacts of the proposed project are discussed below and will be addressed in the EIR.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - Implementation of the proposed project would not require the construction of new facilities or modification of existing KCWA and WRMWSD facilities, nor would implementation of the proposed project change the existing operation of these facilities.

WRMWSD obtains its water supplies from the SWP, other surface water sources and groundwater sources, and delivers water to agricultural and industrial users within its service area. The WRMWSD also participates in groundwater recharge programs. Some of the landowners within the WRMWSD service area have executed long-term contracts with WRMWSD for the delivery of surface water, including SWP water, by the WRMWSD distribution system. These lands are collectively referred to as "contract lands" and principally rely on imported surface water. Lands in the service area that do not hold long-term contracts for surface water or "non-contract lands" principally rely on groundwater supplies to meet water demands. In addition, certain non-contract lands within the service area (generally those that have historically held contracts) can be delivered surface water, including SWP water, when available, utilizing the existing WRMWSD distribution system.

Since 1990, WRMWSD has not delivered its full pre-project SWP Table A amount (238,000 AF), nor has there been demand within the contract lands for this amount of water. In addition, from 1990 to 2000, the demand within the contract lands has not exceeded 197,000 AF (the amount of WRMWSD's SWP Table A amount with implementation of the proposed project). From 1990 to 2000, the demand within the contract lands has averaged approximately 156,100 AF, with a maximum of approximately 178,400 in 1998 and a minimum of approximately 112,600 AF in 1991. As previously noted, the WRMWSD participates in other water management actions, including groundwater recharge programs within the service area and groundwater banking programs outside of the service area. These water management actions are intended to supply the WRMWSD (or landowners within the WRMWSD) with additional water supplies when SWP supplies are insufficient to meet demands. WRMWSD estimates that it can deliver approximately 100,000 AF in four out of seven consecutive drought years through these other water management actions.

In summary, a combination of factors, which include varied water supply sources, historic water demand that is less than the amount of WRMWSD's Table A amount even following implementation of the proposed project, and landowners' flexibility to manage agricultural lands differently from year to year, indicate that implementation of the proposed project would result in less than significant direct and indirect impacts within the WRMWSD service area. As a result of long-term agricultural decisions and other water management practices used by farmers within the WRMWSD service area and by WRMWSD, implementation of the proposed project would not be expected to materially affect irrigated agriculture in the WRMWSD service area served by SWP water, nor would the proposed project change existing land uses within the WRMWSD service area.

Water in WRMWSD service area would continue to be made available from a combination of historic and current water management actions including, historic modification of surface water supply contracts, improved irrigation efficiency, historic changes in water supply management, and continuation of agricultural management approaches. A variety of factors, including the cost and availability of different water sources, the anticipated crop market value, anticipated or existing crop subsidies, and other factors (such as labor cost, regulation of the use of certain chemicals, etc.) are considered in the determination to plant certain crops.

State Water Project and Associated Facilities - Implementation of the proposed project would not require the construction or modification of existing SWP facilities, nor would implementation of the proposed project substantially change the current operation of the SWP and associated facilities. Implementation of the proposed project would not change the operating criteria[3] of the SWP and associated facilities.

The proposed project would result in a slight change in the timing of deliveries associated with the 41,000 AF of SWP Table A amount, although the proposed project would not affect the total amount of supply available. The total amount of SWP supply available is a function of SWP diversions from the Delta (governed almost exclusively by hydrology, water quality standards in the Delta and other operational criteria), and the operation of San Luis Reservoir (operated to store water in months when Delta diversions exceed demands, and to provide supplemental supplies when Delta diversions are less than demands). As the proposed project would not result in changes to the SWP operating criteria, the amount and timing of Delta diversions would not change with implementation of the proposed project.

The proposed project would change the amount of water transported within the SWP facilities to the CLWA. In addition, implementation of the proposed project would slightly change the timing of storage of water associated with the project in San Luis Reservoir and Castaic Lake. Overall, implementation of the proposed project would transfer the 41,000 AF of Table A amount and water associated with this amount from WRMWSD to CLWA and would not substantially change the operations of the SWP.

Therefore, implementation of the proposed project is not expected to have significant direct or indirect impacts to environmental resources within the SWP and associated facilities. Increased use of energy for pumping water would occur south of the San Luis Reservoir but would be partially offset by additional power generation within this portion of the SWP system.

Environmental Resource Impacts

Direct and indirect impacts that may result from implementation of the proposed project are addressed below by environmental resource area and geographic area. Direct impacts are those impacts caused by the project and that occur at the same time and place. Indirect impacts are those changes in the environment not immediately related to the project, but caused by the project, and may be later in time or farther removed in distance, but are still reasonably

3. The operating criteria of the SWP are the rules, regulations and other policies under which DWR operates SWP facilities. Operating criteria include, although are not limited to, environmental regulations and operating criteria for diversions from the Sacramento-San Joaquin Delta, operations of Oroville and San Luis Reservoirs, and criteria for terminal reservoirs such as Castaic Lake.

foreseeable. Indirect impacts may include growth-inducing effects and other effects related to induced changes in the pattern of land use, population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems. State CEQA Guidelines Section 15358.

Pursuant to CEQA, an EIR must include a description of the physical environmental conditions in the vicinity of the project, as they exist at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced, from both a local and regional perspective. This information constitutes the "baseline" and it is sometimes necessary to provide more recent baseline information in order to meaningfully review a project's environmental impacts. Since the factual baseline for this project was prepared in 1998, the 1998 baseline must be combined with new material information that reflects environmental conditions that may have changed since 1998, which will allow informed and reasoned decision-making by the lead agency, other public agencies, and the general public. New material information is noted in the various sections of this Attachment, and where appropriate will be expanded and included in the EIR.

Aesthetic Impacts

Direct Impacts

Castaic Lake Water Agency - The Angeles National Forest, the Los Padres National Forest, and their ridgelines provide a visual backdrop for much of the Santa Clarita Valley. The Santa Clara River, traversing the City of Santa Clarita and the Santa Clarita Valley, is another important visual element. The topography of the Santa Clarita Valley is varied with numerous canyons and waterways. Within this natural setting, several unincorporated communities developed, which are not part of the City of Santa Clarita. Implementation of the proposed project would not require land disturbance nor would it have a direct impact on the existing land uses within the CLWA service area or cause other changes that would directly affect aesthetic resources including scenic vistas, scenic resources and visual character. In addition, implementation of the proposed project would not create or increase light or glare. As identified within the discussion of the SWP and associated facilities below, changes in the timing of SWP deliveries to Castaic Lake would not be expected to change the visual character of the lake or surrounding area. Therefore, no direct impacts to aesthetic resources within the CLWA service area would result from implementation of the proposed project.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - Kern County designates most of the county as having a visual rating of Class II, meaning that the area is excellent visual space. The foothills provide a dramatic backdrop for the area and can be clearly viewed throughout the county due to the flat plains and vast open space. The undeveloped lands and agricultural operations contribute to the rural character typical of the San Joaquin Valley. Implementation of the proposed project would not materially affect irrigated acreage in the WRMWSD service area served by SWP water on an average annual basis, nor would it change existing land uses within the KCWA or WRMWSD service areas. No scenic vistas or scenic resources would therefore be adversely affected. The visual character of the area would remain rural and agricultural. In addition, implementation of the proposed project would not create or increase light or glare. Therefore, implementation of the proposed project is not

anticipated to result in direct impacts to aesthetic resources within the KCWA and WRMWSD service areas.

State Water Project and Associated Facilities - From the southern Delta facilities to the Tehachapi Mountain Range, the undeveloped lands and agricultural operations contribute to the rural character that is typical of the San Joaquin Valley. Throughout the valley, the foothill areas and associated Coast Mountain Range to the west and Sierra Nevada Mountain Range to the east provide a dramatic backdrop. These foothill and mountain range areas can be viewed throughout the valley due to the relatively flat plains and vast open space. Within the Tehachapi Mountain Range to the SWP terminal reservoir at Castaic Lake, the visual resources of the area are similar to those described for the CLWA service area above. Minor changes in SWP storage and transport amounts would not be expected to have any significant adverse impacts to scenic vistas, scenic resources, and visual character. In addition, implementation of the proposed project would not create or increase light or glare. Therefore, no direct impacts are anticipated to occur to aesthetic resources within the SWP and associated facilities from implementation of the proposed project.

Indirect Impacts

Castaic Lake Water Agency - There is the potential for indirect impacts to aesthetic resources due to potential land use changes as a result of development in the CLWA service area that may be accommodated by an increased water supply. The potential development in the CLWA service area that may be supported by the proposed project could involve substantial alteration of topography, removal of an unknown number of trees, and construction of residences and other structures that may adversely affect scenic vistas and scenic resources. As a result, views from roadways and other developed and undeveloped areas could be altered. The visual alteration would be primarily a change of visual character from a natural landscape to a manmade or urban landscape. The project could cause and/or result in an increase in the amount of glare and night lighting in a presently undeveloped area. These indirect impacts are considered potentially significant.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - Implementation of the proposed project would not result in land use changes within the KCWA or WRMWSD service areas or other changes that could affect aesthetic resources including scenic vistas, scenic resources, visual character, or light and glare. Therefore, indirect impacts to aesthetic resources within the KCWA and WRMWSD service areas are not anticipated to result from implementation of the proposed project.

State Water Project and Associated Facilities - As implementation of the proposed project would not result in construction or modification of existing SWP facilities, nor would it change the operating criteria of the SWP and associated facilities, no indirect impacts to aesthetic resources including scenic vistas, scenic resources, visual character, or light and glare are anticipated to result from implementation of the proposed project.

Agricultural Impacts

Direct Impacts

Castaic Lake Water Agency - Agricultural and grazing areas within the CLWA service area are predominately located in the western portion of the service area along the State Route 126 corridor and adjacent hills in both Los Angeles and Ventura counties. Approximately 3,250 acres of active irrigated agriculture exist within the CLWA service area. Los Angeles County does not participate in the Williamson Act program. Implementation of the proposed project would not require land disturbance nor would it directly change the existing land uses within the CLWA service area. The proposed project would not directly convert agricultural areas to other non-agricultural uses, nor would it directly conflict with zoning for agricultural use or conflict with a Williamson Act contract. Therefore, no direct impacts to agricultural resources within the CLWA service area would result from implementation of the proposed project.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - In 1998, Kern County had approximately 1,705,730 acres enrolled in Williamson Act contracts, or approximately 32 percent of the county area, and approximately 10 percent of the statewide Williamson Act lands (Department of Conservation 1998). In 1998, the WRMWSD service area contained approximately 146,620 acres of land (WRMWSD 2001). Land uses included the following: farmed area (94,269 acres or 64.3 percent); fallow lands (17,979 acres or 12.3 percent); miscellaneous and other lands, defined as developed but non-farmed areas within cultivated lands, such as farm roads, farmsteads, reservoirs, airstrips, cotton gins, tank farms, utility yards, etc. (8,201 acres or 5.6 percent); and native vegetation/non-developed lands (26,171 acres or 17.8 percent) (WRMWSD 2001). As a result of long-term agricultural decisions and other water management practices used by farmers within the WRMWSD service area and by WRMWSD, implementation of the proposed project would not be expected to materially affect irrigated agriculture in the WRMWSD service area served by SWP water, nor would it change existing land uses within the WRMWSD service area. In addition, the proposed project would not directly convert agricultural areas to other non-agricultural uses, nor would it directly conflict with zoning for agricultural use or conflict with a Williamson Act contract. Implementation of the proposed project would result in the reduction of WRMWSD's SWP Table A amount and therefore, a reduction in the amount of SWP Table A water that could be delivered to the WRMWSD service area. As water in WRMWSD service area would continue to be made available from a combination of historic and current water and agricultural management actions, implementation of the proposed project is anticipated to result in a less than significant impact to agricultural resources within the KCWA and WRMWSD service areas. Because all potential agricultural impacts cannot be strictly categorized as either direct or indirect when they relate to potential changes in water supply, agricultural issues in KCWA and WRMWSD are also discussed under the indirect impact section.

State Water Project and Associated Facilities - SWP water is used to irrigate approximately 750,000 acres of farmland with the state. In 1998, the SWP delivered approximately 1,745,000 AF of Table A water, of which, approximately 871,000 AF was delivered to agricultural users (DWR 2001). An additional 10,300 AF of unscheduled (Article 21) water was delivered to agricultural users in 1998 (DWR 2001). Agricultural resources are not specifically associated with the SWP system or its associated facilities. Implementation of the proposed project would not require

the construction or modification of existing SWP facilities, nor would it change the operating criteria of the SWP and associated facilities. In addition, implementation of the proposed project would not change the overall SWP supply, but would shift water that could have previously been requested by, and delivered to, WRMWSD to CLWA. The proposed project would not directly convert agricultural areas to other non-agricultural uses, nor would it directly conflict with zoning for agricultural use or conflict with a Williamson Act contract. Therefore, implementation of the proposed project is not anticipated to result in direct impacts to agricultural resources served by the SWP.

Indirect Impacts

Castaic Lake Water Agency - There is the potential for indirect impacts to agricultural resources due to potential land use changes as a result of future development in the CLWA service area potentially accommodated as a result of additional water supplies. Future development within the CLWA service area could utilize the additional proposed water supply and may require changes to zoning designations to allow residential, commercial and other uses in areas currently or previously used for agricultural purposes. The potential therefore exists for changes to agricultural lands, agricultural designations or zoning due to development within the CLWA service area and for conversion of Important Farmland designated by the State, which could result in significant impacts.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District – Due to a combination of factors which are discussed in the Environmental Impact section above, and which will be discussed further in the EIR, the project is anticipated to result in a less than significant indirect impact to agricultural resources within the WRMWSD service area. Due to the agricultural nature of the WRMWSD, water users within the service area have substantial flexibility to manage land uses, and therefore, water use, from year to year. A variety of factors, including the cost and availability of different water sources, the anticipated crop market value, anticipated or existing crop subsidies, and other factors (such as labor cost, regulation of the use of certain chemicals, etc.) are considered in the determination to plant certain crops. In addition, as the proposed project would not directly or indirectly result in land use changes within the KCWA or WRMWSD service areas, the proposed project would not convert agricultural areas to other non-agricultural uses, nor would it conflict with zoning for agricultural use or conflict with a Williamson Act contract.

State Water Project and Associated Facilities - As implementation of the proposed project would not result in construction or modification of existing SWP facilities, nor would it change the operating criteria of the SWP and associated facilities, the proposed project would not convert agricultural areas to other non-agricultural uses, nor would it conflict with zoning for agricultural use or conflict with a Williamson Act contract. Therefore, no indirect impacts to agricultural resources are anticipated to result from implementation of the proposed project.

Air Quality Impacts

Direct Impacts

Castaic Lake Water Agency - The CLWA service area is located in the Santa Clarita Valley, which is in the northwestern portion of the South Coast Air Basin (SCAB). The area of the SCAB that

encompasses the CLWA service area is presently in "extreme" nonattainment for ozone, and "serious" nonattainment for carbon monoxide and particulate matter less than 10 microns in diameter. The South Coast Air Quality Management District is responsible for regulating emission sources within the SCAB, and has developed the *1997 Air Quality Management Plan* and the *1999 Revised Ozone Plan* to bring the region into attainment of the state and national ambient air quality standards. Implementation of the proposed project would not require construction of facilities, or directly result in land disturbance, nor would it directly change the existing land uses within the CLWA service area or cause other changes that could materially affect air quality. In addition, implementation of the proposed project would not obstruct the implementation of any air quality plan in the SCAB, violate or contribute to the violation of an air quality standard, result in a cumulatively considerable increase of any pollutant for which the SCAB is in nonattainment for, create odors, or result in the exposure of sensitive receptors to substantial pollution concentrations. Therefore, no direct impacts to air quality within the CLWA service area would result from implementation of the proposed project.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - The San Joaquin Valley floor areas of the KCWA and the WRMWSD are located in the southernmost region of the San Joaquin Valley Air Basin (SJVAB). The Kern County portion of the SJVAB is presently in non-attainment for ozone and particulate matter less than 10 microns in diameter. The San Joaquin Valley Unified Air Pollution Control District is responsible for regulating stationary sources of emissions within the SJVAB, and has developed rules and air quality attainment plans designed to reduce emissions to a level that will bring the region into attainment. With implementation of the proposed project, WRMWSD would continue to make water available from a combination of historic and current water and agricultural management actions within the service area. Implementation of the proposed project is not anticipated to obstruct the implementation of any air quality plan in the SJVAB, violate or contribute to the violation of an air quality standard, result in a cumulatively considerable increase of any pollutant for which the SJVAB is in nonattainment for, create odors, or result in the exposure of sensitive receptors to substantial pollution concentrations. In addition, implementation of the proposed project would not materially affect irrigated agriculture in the WRMWSD service area served by SWP water, nor would it change existing land uses within the WRMWSD service area. Therefore, implementation of the proposed project is anticipated to result in a less than significant impact to air quality within the KCWA and WRMWSD service areas.

State Water Project and Associated Facilities - The California Aqueduct and associated facilities of concern are predominately located within the SCAB and SJVAB. These air basins are discussed above. Implementation of the proposed project would not require the construction or modification of existing SWP facilities, nor would implementation of the proposed project substantially change the current operation of the SWP and associated facilities. In addition, implementation of the proposed project would not change the operating criteria of the SWP and associated facilities. Pumping of water south of the WRMWSD turnouts to CLWA would require additional energy use and could result in increased air emissions caused by increases in energy production or use. Although, power plants providing energy supplies are required to have air quality permits and to mitigate air quality impacts. Implementation of the proposed project would not obstruct the implementation of any air quality plan in the SCAB or the SJVAB, violate or contribute to the violation of an air quality standard, result in a cumulatively considerable increase of any pollutant for which the SCAB or the SJVAB is in nonattainment for,

create odors, or result in the exposure of sensitive receptors to substantial pollution concentrations. Therefore, no direct impacts to air quality are anticipated to result from implementation of the proposed project.

Indirect Impacts

Castaic Lake Water Agency - There is the potential for indirect impacts on air quality due to potential land use changes as a result of development in the CLWA service area. The potential development in the CLWA service area that may be supported by this project could result in a substantial amount of grading and other construction activities that would create temporary impacts on air quality including construction vehicle emissions and the creation of fugitive dust. Following construction, increased local traffic would substantially increase regional motor vehicle emissions and other emissions related to development of manufacturing, industrial, commercial facilities and infrastructure of various types could occur. These indirect impacts have the potential to obstruct the implementation of any air quality plan in the SCAB, violate or contribute to the violation of an air quality standard, result in a cumulatively considerable increase of any pollutant for which the SCAB is in nonattainment for, create odors, or result in the exposure of sensitive receptors to substantial pollution concentrations, and therefore, are considered potentially significant.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - As the implementation of the proposed project would not result in land use changes within the KCWA or WRMWSD service areas, no aspect of the proposed project is anticipated to obstruct the implementation of any air quality plan in the SJVAB, violate or contribute to the violation of an air quality standard, result in a cumulatively considerable increase of any pollutant for which the SJVAB is in nonattainment for, create odors, or result in the exposure of sensitive receptors to substantial pollution concentrations. Therefore, indirect impacts to air quality are anticipated to be less than significant as a result of implementation of the proposed project.

State Water Project and Associated Facilities - As implementation of the proposed project would not result in construction or modification of existing SWP facilities, nor would it change the operating criteria of the SWP and associated facilities, no aspect of the proposed project is anticipated to obstruct the implementation of any air quality plan in the SCAB or the SJVAB, violate or contribute to the violation of an air quality standard, result in a cumulatively considerable increase of any pollutant for which the SCAB or the SJVAB is in nonattainment for, create odors, or result in the exposure of sensitive receptors to substantial pollution concentrations. Therefore, no indirect air quality impacts are anticipated to result from implementation of the proposed project.

Biological Impacts

Direct Impacts

Castaic Lake Water Agency - For the most part, the CLWA service area encompasses the Santa Clara River Valley, the east extension of the Santa Susana Mountains, the westernmost reaches of the San Gabriel Mountains, and the southern slopes of the Sierra Pelona. The principal natural features of the Santa Clarita Valley are the Santa Clara River, Castaic Valley, San Francisquito Canyon, Bouquet Canyon, Placerita Canyon, and Hasley Canyon. Although

substantial portions of the Santa Clarita Valley have been developed, a large portion of the lands within the CLWA service area still supports ecologically important vegetation and wildlife habitats including sensitive plant and animal species. Major vegetation/habitat types include oak woodlands (distinct stands of valley oak [*Quercus lobata*], coast live oak [*Quercus agrifolia*], and interior live oak [*Quercus wislizeni*] can be distinguished), chaparral, coastal and/or Riversidean (Venturan) sage scrub, non-native grassland, riparian scrub (characterized by mulefat and/or shrubby willows), and riparian woodlands (characterized by large willows [*Salix* sp.] and cottonwoods [*Populus fremontii*], including densely forested areas). In addition to the above habitats, there is open water habitat provided by Castaic Lake, Castaic Lagoon, and limited areas along the Santa Clara River. The Santa Clara River is a regionally significant habitat for native fishes and other wildlife.

The CLWA service area contains several Significant Ecological Areas designated for various sorts of protection by Los Angeles County. No habitat conservation plans, natural community conservation plans or similar plans have been adopted in the CLWA service area.

Implementation of the proposed project would not require land disturbance nor would it directly change the existing land uses within the CLWA service area or cause other changes that would create direct impacts to biological resources within the CLWA service area. In addition, implementation of the proposed project would not directly result in habitat modifications including the modification of sensitive habitat types such as riparian or wetland habitats, interfere with the movement or migration of wildlife species, impede the use of wildlife nursery sites, or conflict with local policies and ordinances protecting biological resources. Therefore, no direct impacts to biological resources within the CLWA service area would result from implementation of the proposed project. Castaic Lake is addressed under the discussion of SWP and associated facilities below.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - Most of the lands in the KCWA and WRMWSD service areas are cultivated agricultural areas. Lands which are no longer subjected to irrigation support a grassland community of introduced plants such as red brome, common foxtail and wild oats. More recently, non-irrigated lands have more non-native species such as thistles or remnant grains from previous farming. The predominant habitat on lands not cultivated is grassland characterized by introduced annual grasses and forbs (Lower Sonoran grassland [Moe and Twisselmann 1995], California prairie [Williams 1998], or non-native grassland [Holland 1986]). Within the WRMWSD service area, there are also fairly extensive areas of scrub vegetation typically dominated by saltbush (*Atriplex* spp.). Riparian, wetland and open water habitats are limited to short stretches along intermittent or ephemeral stream channels, agricultural ponds and drainage ditches, and along the California Aqueduct. The KCWA and WRMWSD service areas support a variety of sensitive plant and animal species.

Implementation of the proposed project would not directly result in habitat modifications including the modification of sensitive habitat types such as riparian or wetland habitats, interfere with the movement or migration of wildlife species, impede the use of wildlife nursery sites, or conflict with local policies and ordinances protecting biological resources. With implementation of the proposed project, WRMWSD would continue to make water available from a combination of historic and current water and agricultural management actions within

the service area. Implementation of the proposed project would not materially affect irrigated agriculture in the WRMWSD service area, nor would it change existing land uses within the WRMWSD service area. Therefore, implementation of the proposed project is anticipated to result in a less than significant impact to biological resources within the KCWA and WRMWSD service areas.

The project would not conflict with any natural community conservation plans in the KCWA or WRMWSD service areas, since none have been adopted. A habitat conservation plan is being developed for the San Joaquin Valley floor within Kern County and in the vicinity of Tejon Ranch in the WRMWSD service area. In addition, a habitat conservation plan has been developed for the Bakersfield area. It is not anticipated that the project would conflict with these plans, the status of which would be described in the EIR.

State Water Project and Associated Facilities - The California Aqueduct begins in the southern Delta near the City of Tracy. Within the Delta region, agricultural lands occupy approximately 72 percent of the total land area with grassland and rural, open-water, wetland, and riparian habitats occupying the majority of the remaining area (CALFED 1999). The Delta region provides habitat for numerous sensitive plant communities and special status plant and animal species.

South of the SWP facilities in the Delta, the California Aqueduct traverses predominately the west side of the San Joaquin Valley to the Tehachapi Mountain Range in the southern end of the valley. The dominant land use within the San Joaquin Valley consists of agricultural and agricultural related uses. The aqueduct within the San Joaquin Valley is a concrete lined canal with a few short segments of enclosed pipe, and biological resources within the aqueduct are limited to common fish species, mostly introduced, and a variety of invertebrate species which may occupy the water column. Other upland species and birds may utilize the aqueduct in some locations for drinking water or to forage for fish and invertebrates. At the southern end of the San Joaquin Valley, the open canal structure of the aqueduct changes principally to a buried pipeline, which traverses the Tehachapi Mountains in a southerly direction and eventually empty water into Castaic Lake. No biological resources are associated with the piped portion of the aqueduct because it is a closed system.

San Luis Reservoir was constructed as an off-stream storage reservoir. Water is pumped from the O'Neil Forebay into the main reservoir during the winter and spring. The reservoir supports a large variety of fish and wildlife species, including sensitive species, both within the water column and in the surrounding riparian habitat. The dominant shoreline vegetation of the reservoir is grassland, making up approximately 70 percent of the shoreline. The remaining 30 percent of the shoreline vegetation consists of montane hardwood (USBR 1997).

Castaic Lake is a terminal water storage facility for the SWP located at the confluence of Castaic Creek and Elizabeth Lake Canyon Creek. The lake supports a large variety of fish and wildlife species, including sensitive species, both within the water column and in the surrounding riparian habitat. Adjacent to the lake, vegetation consists of dry upland scrub and chaparral communities on the steep slopes above the water. The steep banks along almost the entire perimeter of the lake and fluctuating water levels prevent the establishment of shoreline vegetation; therefore, there is minimal shoreline and aquatic vegetation associated with the lake.

Scattered willows (*Salix* sp.) and mulefat (*Bacharis salicifolia*) exist in areas with more gradually sloped banks.

Implementation of the proposed project would not result in construction or modification of existing SWP facilities. In addition, implementation of the proposed project would not substantially change the current operation of the SWP and associated facilities, nor would it change the operating criteria of the SWP and associated facilities. Due to the variety of water management criteria, and as implementation of the proposed project would deliver water to CLWA that could otherwise have been delivered to WRMWSD, or used in other water management activity within the KCWA or other areas served by the SWP, the total amount of water diverted from the Delta would not change with implementation of the proposed project. Water exportation from the Delta is accomplished while maintaining the Delta water quality standards and other related operating criteria, and implementation of the proposed project would not change these established operating criteria. As is currently the case, runoff would be captured when available and stored in SWP and local facilities, and used to meet SWP demand based on current SWP operating criteria and management practices. Implementation of the proposed project would not change these current operating criteria and management practices. In addition, changes to the timing and amount of water stored in both San Luis Reservoir and Castaic Lake are expected to be minimal and within the historic and current lake level fluctuations. Implementation of the proposed project would not directly result in habitat modifications including the modification of sensitive habitat types such as riparian or wetland habitats, interfere with the movement or migration of wildlife species, impede the use of wildlife nursery sites, conflict with local, regional and state-wide policies and ordinances protecting biological resources, or conflict with an adopted habitat conservation plan or natural community conservation plan. Therefore, implementation of the proposed project is anticipated to result in a less than significant impact to biological resources associated with the SWP and associated facilities.

Indirect Impacts

Castaic Lake Water Agency - Potential urban development within the CLWA service area that may be accommodated by this additional water supply could adversely impact plant and animal communities due to the potential for extensive grading and construction activities, hillside development, and the amount of overall urbanization that could occur. Potential land use changes may result in a substantial adverse affect to sensitive species, result in habitat modifications including the modification of sensitive habitat types such as riparian or wetland habitats, interfere with the movement or migration of wildlife species, impede the use of wildlife nursery sites, and conflict with local policies and ordinances protecting biological resources. The project would not conflict with any habitat conservation plan or natural community conservation plan in the CLWA service area, as none have been adopted. Potential indirect impacts to biological resources that may result from future land use changes are considered potentially significant.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District – As implementation of the proposed project would not change land use within the KCWA or WRMWSD service areas, the proposed project would not result in habitat modifications including the modification of sensitive habitat types such as riparian or wetland habitats, interfere with the movement or

migration of wildlife species, impede the use of wildlife nursery sites, conflict with local policies and ordinances protecting biological resources including adopted and anticipated habitat conservation plans, or otherwise result in changes that may affect biological resources. Therefore, implementation of the proposed project is anticipated to result in a less than significant indirect impact to biological resources within the KCWA and WRMWSD service areas.

State Water Project and Associated Facilities – As implementation of the proposed project would not change the operating criteria of the SWP and associated facilities, implementation of the proposed project would not result in habitat modifications including the modification of sensitive habitat types such as riparian or wetland habitats, interfere with the movement or migration of wildlife species, impede the use of wildlife nursery sites, conflict with local, regional and state-wide policies and ordinances protecting biological resources, or conflict with adopted habitat conservation plans or natural community conservation plans, or otherwise result in changes that may affect biological resources. Any changes in delivery schedules and amounts would be not expected to have indirect impacts on biological resources as changes are expect to be within the current and historic operation of the SWP and associated facilities. Therefore, implementation of the proposed project is anticipated to result in a less than significant indirect impact to biological resources in connection with the SWP and associated facilities.

Cultural Impacts

Direct Impacts

Castaic Lake Water Agency - The CLWA service area is located in Ventura and Los Angeles counties, where at least four distinct ethno-linguistic groups were living at the time of first European contact, including the Tataviam, the Ventureño Chumash, the Emigdiano Chumash, and the Castac Chumash. Native American archaeological sites from various time periods exist within the CLWA service area, especially along the Piru and Castaic drainage systems, at the Vasquez Rocks and Escondido Canyon, and along major ridgelines (Science Applications International Corporation 1998). Historic resources documented in the CLWA service area are usually associated with major routes of travel, water courses, and early homesteading practices in and around Newhall (Scientific Resource Surveys 1988). Implementation of the proposed project would not require land disturbance nor would it directly change the existing land uses within the CLWA service area or cause other direct changes that could affect cultural resources. Nor would implementation of the proposed project cause a change in the significance of a historic or cultural resource, directly destroy a unique paleontological resource or unique geologic feature, or disturb human remains. No direct impacts to cultural resources within the CLWA service area would result from implementation of the proposed project.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - The KCWA and WRMWSD service areas are located in Kern County. Several ethnographic groups were scattered throughout what is now Kern County, including the Southern Valley Yokuts, Kitanemuk, Castac Chumash (Heizer 1978). Kern County contains numerous Native American sites; however, no Native American archaeological or cultural resources are known to exist in the cultivated areas of the WRMWSD service area. The cultivated areas are considered to have

a low to moderate cultural resource sensitivity. No historic resources are recorded in the cultivated areas of the WRMWSD service area.

Implementation of the proposed project would not require the construction of new facilities or modification of existing KCWA and WRMWSD facilities, nor would implementation of the proposed project change the existing operation of these facilities. The proposed project would not cause a change in the significance of a historic or cultural resource, directly destroy a unique paleontological resource or unique geologic feature, or disturb human remains. Implementation of the proposed project would not materially affect irrigated agriculture in the WRMWSD service area. Therefore, implementation of the proposed project is anticipated to result in a less than significant impact to cultural resources within the KCWA and WRMWSD service areas.

State Water Project and Associated Facilities - The California Aqueduct is a 444-mile-long concrete-lined canal running between the Delta and Lake Perris, the oldest sections of which were built in the early 1960s. The aqueduct and its branches pass through Contra Costa, Alameda, San Joaquin, Stanislaus, Merced, Fresno, Kings, Kern, Santa Barbara, San Luis Obispo, Los Angeles, and San Bernardino counties, and includes the areas traditionally inhabited by the Miwok, Northern Valley Yokuts, Southern Valley Yokuts, Chumash, Tataviam, Gabrielino, Serrano, Cahuilla and other neighboring tribes. No prehistoric, historic, or paleontological resources are located within the aqueduct.

San Luis Reservoir is located in the San Joaquin Valley, in land that was traditionally inhabited by the Northern Valley Yokuts at the time of first European contact. There may be historic, prehistoric, or paleontologic sites either along the reservoir margins or located on submerged knolls. Any sites located below the full pool level of the reservoir are subject to periodic inundation for short or long periods of time depending on location, due to normal reservoir operations. The creation of the Castaic Dam and lake facility in 1972 inundated cultural resources. No historic resources are recorded in the area; however, no systematic survey of the lake margins was conducted prior to the construction of the dam. Therefore, there may be unrecorded historic, prehistoric, or paleontologic sites either along the lake margins or located on submerged knolls.

Implementation of the proposed project would not result in construction or modification of existing SWP facilities. In addition, implementation of the proposed project would not substantially change the current operation of the SWP and associated facilities, nor would it change the operating criteria of the SWP and associated facilities. Changes in SWP water storage, transport amounts and delivery schedules could result in minor changes in water flows in the California Aqueduct and other conveyance facilities and may change water reservoir levels. These changes would be within current and historic operational ranges, and would not be expected to have any significant adverse direct impacts on cultural resources within the SWP and associated facilities. As implementation of the proposed project would not directly require construction, change land use, or change SWP operating criteria, implementation of the proposed project is not anticipated to result in a change in the significance of a historic or cultural resource, directly destroy a unique paleontological resource or unique geologic feature, or disturb human remains. Therefore, implementation of the proposed project is anticipated to

result in a less than significant impact to cultural resources within the SWP and associated facilities.

Indirect Impacts

Castaic Lake Water Agency - There is the potential for indirect impacts to cultural resources due to potential land use changes as a result of development in the CLWA service area. The potential development in the CLWA service area that may be supported by this project could result in disturbance to archaeological and historic resources as a result of grading and construction activities and other land use changes as well as erosion along natural and manmade slopes. These disturbances may result in the change in the significance of a historic or cultural resource, may destroy a unique paleontological resource or unique geologic feature, and may result in the disturbance of human remains. Potential impacts to cultural resources that may result from land use changes are considered potentially significant.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - Most agricultural lands have been previously disturbed by cultivation activities or construction of agricultural structures and irrigation systems. Implementation of the proposed project would not result in land use changes within the KCWA or WRMWSD service areas, and therefore, is not anticipated to indirectly cause a change in the significance of a historic or cultural resource, destroy a unique paleontological resource or unique geologic feature, disturb human remains, or otherwise indirectly affect cultural resources. Implementation of the proposed project is anticipated to result in a less than significant indirect impact to cultural resources within the KCWA and WRMWSD service areas.

State Water Project and Associated Facilities - As implementation of the proposed project would not result in construction or modification of existing SWP facilities, nor would it change the operating criteria of the SWP and associated facilities, the proposed project is not anticipated to indirectly cause a change in the significance of a historic or cultural resource, destroy a unique paleontological resource or unique geologic feature, disturb human remains, or otherwise indirectly affect cultural resources. Implementation of the proposed project is anticipated to result in a less than significant indirect impact to cultural resources within the SWP and associated facilities.

Geology and Soil Impacts

Direct Impacts

Castaic Lake Water Agency - The CLWA service area encompasses the relatively flat-lying Santa Clarita Valley and portions of the surrounding hills and mountains. The geology of the CLWA service area consists of a relatively thick sequence of Plio-Pleistocene Saugus Formation, locally overlain by recent alluvial deposits. Areas within the CLWA service area may be subject to landslides, liquefaction, lateral spreading, subsidence, soil erosion, soil expansion, and other geologic hazards. Two faults, the active San Gabriel fault and the potentially active Holser fault, traverse the CLWA service area. The active San Andreas fault is located approximately 18 miles northeast of the central portion of the Santa Clarita Valley, and the San Fernando and Sierra Madre faults are also located in the vicinity of the CLWA service area. Implementation of the proposed project would not require land disturbance nor would it directly change the

existing land uses within the CLWA service area, and therefore, would not directly expose people or structures to geologic hazards including rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, liquefaction and landslides. Nor would implementation of the proposed project directly result in substantial soil erosion, or be located on an unstable or expansive geologic unit or soil. In addition, the proposed project does not include the construct of structures or changes in land use that would result in impacts from septic tanks or alternative wastewater disposal systems. Therefore, no direct impacts to geologic resources within the CLWA service area would result from implementation of the proposed project.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - The topography within the KCWA areas within the San Joaquin Valley and the WRMWSD service area is generally flat with rolling foothills and several ephemeral creeks. Sand and clay loams characterize the soils present in the WRMWSD service area. As the topography of the WRMWSD service area is generally flat to gently sloping, landslide potential is low. In addition, soils within the WRMWSD service area are generally not subject to expansion, subsidence, liquefaction and lateral spreading. Numerous earthquake faults have been identified in the vicinity of the WRMWSD service area. Implementation of the proposed project would not require the construction of new facilities or modification of existing KCWA and WRMWSD facilities, nor would implementation of the proposed project change the existing operation of these facilities. Implementation of the proposed project would not materially affect irrigated acreage in the WRMWSD service area served by SWP water on an average annual basis, nor would it change existing land uses within the WRMWSD service area. Therefore, implementation of the proposed project is not anticipated to directly expose people or structures to geologic hazards including rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, liquefaction and landslides. Nor would implementation of the proposed project directly result in substantial soil erosion, or be located on an unstable or expansive geologic unit or soil. In addition, the proposed project does not include the construction of structures or changes in land use that would result in impacts from septic tanks or alternative wastewater disposal systems. Therefore, implementation of the proposed project is anticipated to result in a less than significant impact to geologic resources within the KCWA and WRMWSD service areas.

State Water Project and Associated Facilities - Geologic features for the areas traversed by the SWP, or containing SWP facilities within the San Joaquin Valley, are generally similar to those described for the KCWA and WRMWSD service areas above. Geologic features for the areas traversed by the SWP, or containing SWP facilities within and south of the Tehachapi Mountain Range, are generally similar to those described for the CLWA service area above. Implementation of the proposed project would not result in construction or modification of existing SWP facilities. In addition, implementation of the proposed project would not substantially change the current operation of the SWP and associated facilities, nor would it change the operating criteria of the SWP and associated facilities. Changes in SWP water storage, transport amounts, and delivery schedules could result in minor changes in water flows in the California Aqueduct and other conveyance facilities and could result in changes to water levels within San Luis Reservoir and Castaic Lake. These changes are expected to be within current and historic operational ranges, and would not be expected to have significant impacts to geology and soils within the SWP and associated facilities. Implementation of the proposed project is not

anticipated to directly expose people or structures to geologic hazards including rupture of a known earthquake fault, strong seismic ground shaking, seismic-related ground failure, liquefaction and landslides. Nor would implementation of the proposed project directly result in substantial soil erosion, or be located on an unstable or expansive geologic unit or soil. In addition, the proposed project does not include the construction of structures or changes in land use that would result in impacts from septic tanks or alternative wastewater disposal systems. Therefore, no direct impacts to geologic resources within the SWP and associated facilities would result from implementation of the proposed project.

Indirect Impacts

Castaic Lake Water Agency - There is the potential for indirect impacts to geologic resources due to potential land use changes as a result of development in the CLWA service area. Potential future development within the CLWA service area that could be served by this additional water supply could include areas with rugged topography. Slopes could range from relatively flat in some of the drainage channels to very steep on some of the canyon sides. Due to the existence of rugged topography and steep slopes, landslides have occurred in the area, and other areas of unstable slopes likely exist. Some of the lower elevation drainages have a potential for high groundwater and mudflows. Development would generally be served by the extension of existing sewer systems or would require soils and geologic studies to determine capability to adequately support alternative wastewater disposal systems. Potential development within the CLWA service area could require extensive grading and earthwork that would substantially alter the landforms and topography. Grading would require removal of vegetation and further destabilization of slopes during the construction period. This could lead to accelerated erosion and sedimentation in local drainages. Additionally, portions of the CLWA service area are within a seismically active region, and potential land use changes could expose people or structures to loss, injury or death involving seismic activity and seismic related ground failures. These indirect impacts are considered potentially significant.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - As the implementation of the proposed project would not result in land use changes within the KCWA or WRMWSD service areas, implementation of the proposed project would not indirectly expose people or structures to geologic hazards from seismic activities and seismic related ground failures, result in substantial soil erosion, be located on an unstable or expansive geologic unit or soil, or include the construction of structures or changes in land use that would result in impacts from septic tanks or alternative wastewater disposal systems. Due to the variability and flexibility of agricultural management practices and varied water sources, implementation of the proposed project is anticipated to result in a less than significant indirect impact to geologic resources.

State Water Project and Associated Facilities - As implementation of the proposed project would not result in construction or modification of existing SWP facilities, nor would it change the operating criteria of the SWP and associated facilities, implementation of the proposed project would not indirectly expose people or structures to geologic hazards from seismic activities and seismic related ground failures, result in substantial soil erosion, be located on an unstable or expansive geologic unit or soil, or include the construction of structures or changes in land use that would result in impacts from septic tanks or alternative wastewater disposal systems.

Therefore, no indirect impacts to geologic resources are anticipated to result from implementation of the proposed project.

Hazards and Hazardous Materials Impacts

Direct Impacts

Castaic Lake Water Agency - As much of the CLWA service area is urbanized, it contains a range of industries and commercial enterprises that use, have used, or produced hazardous materials and/or hazardous wastes. Numerous fuels, chemicals, and other hazardous materials and hazardous wastes are also transported via roadways and railways. In addition, numerous hazardous materials/waste sites are present in the CLWA service area. A wide variety of potential safety hazards are present throughout the CLWA service area including open water bodies, and active industrial and commercial areas. Implementation of the proposed project would not require land disturbance nor would it directly change the existing land uses within the CLWA service area. No aspect of the proposed project would directly create a hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials, create a hazard to the public or the environment through the reasonably foreseeable upset or accident involving the release of hazardous materials, emit hazardous emissions or handle hazardous materials with one-quarter mile of an existing or proposed school, be located on an existing hazardous materials site, or impair or physically interfere with an adopted emergency plan. As no airport land use plans, public use airports, or private airports are located within the CLWA service area, implementation of the proposed project would not create safety or other hazards as a result of proximity to an airport. In addition, as no construction or land use changes would directly result from implementation of the proposed project, the proposed project would not expose people or structures to a significant risk involving wildfires. Due to the incremental increase in the use of hazardous materials for additional water treatment requirements, the proposed project is anticipated to result in a less than significant impact to hazards and hazardous materials within the CLWA service area.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - Substantial portions of the KCWA and WRMWSD service areas are used for agricultural purposes. Agricultural operations use pesticides and fertilizers, some of which are considered hazardous materials. Industrial facilities and other entities in the KCWA and WRMWSD service areas use a wide variety of hazardous materials including fuels and solvents. A wide variety of potential safety hazards are present throughout the KCWA and WRMWSD service areas including open water bodies, agricultural equipment storage areas, and active industrial and commercial areas.

Implementation of the proposed project would not require the construction of new facilities or modification of existing KCWA and WRMWSD facilities, nor would implementation of the proposed project change the existing operation of these facilities. Implementation of the proposed project would not materially affect irrigated agriculture in the WRMWSD service area served by SWP water, nor would it change existing land uses within the WRMWSD service area. No increase in transport or use of hazardous materials or hazardous substances releases would occur. The project would not result in construction within a hazardous materials site, airport land use plan area or the vicinity of a private airstrip and would not disrupt an emergency plan or cause increased risk of wildland fires. Therefore, implementation of the proposed project

is not anticipated to result in a direct impact to hazards or hazardous materials within the KCWA and WRMWSD service areas.

State Water Project and Associated Facilities - Hazardous material use, hazardous waste production and potential hazards for the San Joaquin Valley area is similar to that described above for the KCWA and WRMWSD service areas. Hazardous material use, hazardous waste production and potential hazards for the SWP areas within the Tehachapi Mountain Range to Castaic Lake is similar to that described for the CLWA service area above. SWP facilities utilize a variety of fuels, solvents and other hazardous materials at the various facilities. Numerous fuels, chemicals, and other hazardous materials and hazardous wastes are also transported via roadways and railways that run adjacent to or traverse the California Aqueduct or other SWP facilities.

Implementation of the proposed project would not result in construction or modification of existing SWP facilities. In addition, implementation of the proposed project would not substantially change the current operation of the SWP and associated facilities, nor would it change the operating criteria of the SWP and associated facilities. Changes in the amount of water transported by the SWP between the WRMWSD turnouts and the CLWA turnouts could increase hazardous materials use related to increased pumping requirements. Changes in delivery schedules could result in changes in water flows in the California Aqueduct and other conveyance facilities and could result in changes in water levels within San Luis Reservoir and Castaic Lake. As such, these changes would be within current and historic fluctuations and would not be expected to increase hazards to the public or the environment through the routine transport, use, or disposal of hazardous materials, increase hazards to the public or the environment through the reasonably foreseeable upset or accident involving the release of hazardous materials, increase hazards from hazardous emissions or the handling hazardous materials with one-quarter mile of an existing or proposed school, increase hazards from being located on an existing hazardous materials site, increase safety hazards from being in the proximity of an airport land use plan, public use airports or private airports, or increase hazards as a result of wildfires. In addition, implementation of the proposed project is not anticipated to impair or physically interfere with an adopted emergency plan. Therefore, implementation of the proposed project is not anticipated to result in a direct impact to hazards and hazardous materials within the SWP and associated facilities.

Indirect Impacts

Castaic Lake Water Agency - There is the potential for indirect impacts as a result of increases in hazards and hazardous materials due to potential land use changes from development in the CLWA service area. Historic as well as present hydrocarbon exploration and extraction activities have resulted in soil contamination from spills or disposal of hazardous materials in the ground within the CLWA service area. Depending on the specific location, development within the CLWA service area potentially served by this additional water supply may require the removal or remediation of any such contamination before property development could commence. Increases in water treatment would result in greater use of hazardous or toxic materials used. In addition, potential indirect project effects associated with growth may create increased risks such as hazardous substance releases, changes in emergency response needs, and similar public health and safety hazards. In addition, potential land use changes may create a hazard to the public or the

environment through the routine transport, use, or disposal of hazardous materials, create a hazard to the public or the environment through the reasonably foreseeable upset or accident involving the release of hazardous materials, emit hazardous emissions or handle hazardous materials within one-quarter mile of an existing or proposed school, be located on an existing hazardous materials site, impair or physically interfere with an adopted emergency plan, or increase hazards as a result of wildfires. These impacts are considered potentially significant. No lands within the CLWA service area are located within an airport land use plan, nor are they located in the vicinity of a public airport, public use airport or private airstrip.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - As the implementation of the proposed project would not result in land use changes within the KCWA or WRMWSD service areas, implementation of the proposed project would not indirectly create a hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials, create a hazard to the public or the environment through the reasonably foreseeable upset or accident involving the release of hazardous materials, emit hazardous emissions or handle hazardous materials within one-quarter mile of an existing or proposed school, be located on an existing hazardous materials site, impair or physically interfere with an adopted emergency plan, increase safety hazards from being in the proximity of an airport land use plan, public use airports or private airports, or increase hazards as a result of wildland fires. Therefore, no indirect impacts to hazards and hazardous materials would result from implementation of the proposed project.

State Water Project and Associated Facilities - As implementation of the proposed project would not result in construction or modification of existing SWP facilities, nor would it change the operating criteria of the SWP and associated facilities, implementation of the proposed project would not indirectly create a hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials, create a hazard to the public or the environment through the reasonably foreseeable upset or accident involving the release of hazardous materials, emit hazardous emissions or handle hazardous materials within one-quarter mile of an existing or proposed school, be located on an existing hazardous materials site, impair or physically interfere with an adopted emergency plan, increase safety hazards from being in the proximity of an airport land use plan, public use airports or private airports, or increase hazards as a result of wildland fires. Therefore, no indirect impacts are anticipated to hazards and hazardous materials would result from implementation of the proposed project.

Hydrology and Water Quality Impacts

The implementation of the proposed project will be evaluated taking into consideration contract terms with and without the Monterey Amendments[4]. For example, under certain water shortage conditions without the Monterey Amendments in place, the amount of water delivered to holders of agricultural Table A amount in a particular year can be reduced first, prior to holders of Municipal and Industrial (M&I) Table A amount being affected. Whereas, under the Monterey Amendments, holders of both agricultural and M&I Table A amounts would, under defined shortage conditions, be subject to proportional reductions.

In *Planning and Conservation League, et al. v. Department of Water Resources* (2000) 83 Cal. App. 4th 892, the Court issued a writ of mandate ordering that the certification of the EIR for the Monterey Agreement be vacated since the Court found that the EIR failed to comply with CEQA. Although the Court ordered the decertification of the EIR, the Court did not invalidate nor stay the implementation of the Monterey Agreement. In the meantime, the trial court is continuing to retain jurisdiction over the CEQA litigation, which is currently in settlement by the parties.

Direct Impacts

Castaic Lake Water Agency - The primary surface water drainage course in the CLWA service area is the Santa Clara River. Surface water resources include the Santa Clara River, Bouquet

4. The Monterey Amendment envisioned a long-term restructuring of the SWP Water Supply Contracts to reflect the compromises and give and take of the mediated settlement. The Monterey Amendment does not result in an increase in total SWP supplies but instead settles the dispute regarding how any available supplies are allocated, and also provides flexibility and cooperation among the SWP Contractors in more efficient use of existing facilities to better manage the available supplies. The Monterey Amendment has the following major provisions:
   - All SWP water supplies are allocated among SWP Contractors in proportion to their Table A amount.
   - Agricultural SWP Contractors have reduced their cumulative Table A amount by 45,000 AF.
   - Agricultural SWP Contractors (including KCWA) committed to make available 130,000 AF of Table A amount for permanent transfer to urban SWP Contractors on a willing buyer-willing seller basis.
   - The Kern Fan Element property would be transferred to agricultural SWP Contractors so that they may use it for water banking and other purposes.
   - SWP Contractors who are unable to use all of their allocated supply in a certain year may place any excess in a "turn-back pool" that will be available for sale at fixed rates, thereby making that water available to other SWP Contractors and allowing the selling Contractor to recover some of their fixed costs.
   - SWP Contractors are provided rate reductions or credits, starting in 1997 and continuing through 2035, based on formulas set forth in the Monterey Amendment.
   - In addition, the Monterey Amendment deleted a provision in the SWP Water Supply Contracts generally referred to as Article 18(b) that would reduce SWP Contractor's Table A amounts by an amount determined by DWR in the event that a "permanent shortage" were to exist.

   The Monterey Amendment has three primary objectives: (1) to increase the reliability of all SWP Contractors' water supplies; (2) to stabilize the rate structure to improve the financial viability of the SWP; and (3) to increase water management flexibility for all SWP Contractors. A permanent transfer of agricultural Table A amount to an area with urban development potential, such as that analyzed in this document, is one of the ways these objectives are intended to be met.

Reservoir, and Castaic Lake. Primary flood hazard areas occur in and along natural drainage channels, such as the Santa Clara River and its tributaries, and in areas where sheetflow may occur during high intensity rainfall (CLWA 1988; Slade 1986). CLWA receives SWP water through the terminus of the West Branch of the California Aqueduct at Castaic Lake.

The existing local water supply in the CLWA service area is groundwater extracted from the Alluvial aquifer and from the underlying Saugus Formation aquifer. Although the Alluvial aquifer is the smaller of the two-aquifer systems, as measured by storage capacity, most water wells within the CLWA service area are drilled into this aquifer. The Alluvial aquifer has supplied about 30,000 to 40,000 acre-feet per year (AFY) in normal weather years, and 30,000 to 35,000 AFY in dry years (CLWA 2000, Slade 2002). The Saugus Formation contains much greater quantities of groundwater than the Alluvial aquifer. Approximately 1.65 million AF of potentially usable groundwater is present from depths of 500 to 2,500 feet in the Saugus Formation. The principal source of recharge to the Saugus Formation is from precipitation on exposed outcrops and direct infiltration from the overlying alluvium (Slade 2002). Preliminary estimates of the combined potential recharge to the Saugus Formation from these two sources range from 20,000 to 22,000 AFY in wet periods, and from 11,000 to 13,000 AFY in dry periods. The Saugus Formation has supplied about 7,500 to 15,000 AFY in normal weather years, and 11,000 to 15,000 AFY in dry years (CLWA 2000). No long-term continuous or permanent decline in either water levels or the amount of groundwater in storage has occurred under the historical range of pumping (Slade 2002). Based on the volume of water in storage and the history of aquifer performance, extractions from the Saugus Formation could be increased from 15,000 to 25,000 AFY, and ultimately to 35,000 AFY on an infrequent basis (Slade 2002).

Implementation of the proposed project would not require land disturbance nor would it directly change the existing land uses within the CLWA service area. No aspect of the proposed project would (1) directly violate a water quality standard, wastewater discharge requirement or otherwise deplete water quality, (2) deplete groundwater supplies or interfere with groundwater recharge, (3) alter the existing drainage pattern of an area that would result in erosion, siltation or flooding, (4) create or contribute runoff which would exceed stormwater system capacity or generate polluted runoff, (5) place housing or structures within the 100-year floodplain, (6) create inundation by tsunami or mudflow, or (7) increase risk of inundation by seiche. Therefore, no direct impacts to hydrology and water quality within the CLWA service area would result from implementation of the proposed project.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - KCWA is the entity that holds the SWP contract within Kern County. In 1998, KCWA, together with its 14 member water districts, including WRMWSD, held approximately 1,088,000 AF of SWP contract rights. KCWA serves municipal, industrial and agricultural water users in Kern County. WRMWSD obtains water from the SWP, local sources and groundwater sources. WRMWSD receives SWP water through turnouts along the California Aqueduct, and delivers this water through the existing WRMWSD conveyance system to lands within its service area. Lands within the service area that do not hold contracts for SWP water rely on groundwater to meet demands (although, excess SWP water can be delivered to these certain areas through existing conveyance facilities).

Sandy Creek, Bitterwater Creek, Santiago Creek, Pleitito Creek, Pleito Creek, Salt Creek, Tecuya Creek, Grapevine Creek, Pastoria Creek, Tunis Creek, El Paso Creek, Liveoak Creek, and Caparell Creek flow from the south into the WRMWSD; and Tejon Creek flows from the east into the WRMWSD. Most of these creeks are intermittent and do not provide significant water for irrigation or conveyance for irrigation water.

The WRMWSD service area overlies the Kern County groundwater basin. The Kern County groundwater basin is part of the main San Joaquin Valley groundwater basin. The Kern County groundwater basin is, itself, composed of smaller basins, referred to as sub-basins. The sub-basins underlying WRMWSD are the Wheeler Front and the White Wolf sub-basins. Generally both basins contain water of sufficient quality for agricultural use. Deep groundwater wells in the WRMWSD service area were initially drilled in the mid-1940s. Until the early 1970s, groundwater was the primary water supply in the southern Kern County area and, as a result, the groundwater levels declined by 150 to 200 feet from levels observed in the 1940s. Use of the SWP water has generally allowed the groundwater levels to rise to levels equal to or above levels observed in the late 1960s and early 1970s.

No aspect of the proposed project would (1) directly violate a water quality standard, wastewater discharge requirement or otherwise deplete water quality, (2) deplete groundwater supplies or interfere with groundwater recharge, (3) alter the existing drainage pattern of an area that would result in erosion, siltation or flooding, (4) create or contribute runoff which would exceed stormwater system capacity or generate polluted runoff, (5) place housing or structures within the 100-year floodplain, or (6) create inundation by seiche, tsunami or mudflow. With implementation of the proposed project, WRMWSD would continue to make water available from a combination of historic and current water and agricultural management actions within the service area. Implementation of the proposed project would not materially affect irrigated acreage in the WRMWSD service area served by SWP water on an average annual basis, nor would it change existing land uses within the WRMWSD service area. Therefore, implementation of the proposed project is anticipated to result in a less than significant impact to hydrology and water quality within the KCWA and WRMWSD service areas.

State Water Project and Associated Facilities - The SWP is the largest state-built, multi-purpose water project in the country, and includes 28 storage facilities, reservoirs and lakes; 20 pumping plants; six pumping-generating plants and hydroelectric power plants; and about 660 miles of aqueducts and pipelines. In general, the SWP is operated to fill storage reservoirs during the high runoff months of the winter and early spring. Under current operating criteria SWP diversions from the Delta are significantly reduced as of April 15 of each year. San Luis Reservoir, located approximately 60 miles south of the Banks Pumping Plant, is an off-stream storage reservoir with a total capacity of over two million AF (slightly more than half of the capacity is allocated to the SWP, and the remainder is allocated to the Central Valley Project). The SWP is operated to store as much water as possible in San Luis Reservoir prior to April 15. The stored water is then used during the high-demand summer and fall months to supplement the more limited pumping from the Delta in meeting contractor demands. Therefore, San Luis Reservoir water levels vary considerably during the year to provide storage of water in the winter months for later use in the summer months. Castaic Lake is operated to provide regulatory storage to meet peak deliveries during the summer months for those contractors that

receive water from the lake, and to provide an emergency supply in the case of a major supply system outage. Castaic Lake has a storage volume of approximately 323,700 AF.

Implementation of the proposed project would not result in construction or modification of existing SWP facilities. In addition, implementation of the proposed project would not substantially change the current operation of the SWP and associated facilities, nor would it change the operating criteria of the SWP and associated facilities. No aspect of the proposed project would (1) directly violate a water quality standard, wastewater discharge requirement or otherwise deplete water quality, (2) deplete groundwater supplies or interfere with groundwater recharge, (3) alter the existing drainage pattern of an area that would result in erosion, siltation or flooding, (4) create or contribute runoff which would exceed stormwater system capacity or generate polluted runoff, (5) place housing or structures within the 100-year floodplain, or (6) create inundation by seiche, tsunami or mudflow.

The proposed project involves the contractual transfer of SWP Table A amount as described in both CLWA and KCWA's water supply contracts. However, the proposed project would not change the annual aggregate amount of SWP water (Table A or other water class types) available for use by any SWP contractor. The proposed project includes changes in the amount of SWP Table A amounts available to KCWA (in particular WRMWSD), and CLWA as well as associated changes in the location and timing of SWP deliveries and changes in the utilization of conveyance and storage facilities.

Due to the variety of water management criteria, and as implementation of the proposed project would deliver water to CLWA that could otherwise have been delivered to WRMWSD, the total amount of water diverted from the Delta would not change with implementation of the proposed project. Water exported from the Delta must comply with established water quality standards and other operating criteria, and implementation of the proposed project would not change these established operating criteria.

Minor changes in SWP storage and transport amounts could occur within SWP facilities as a result of the proposed project. There is a potential for differences in monthly storage and release schedules, and pumping as a result of the change from agricultural to M&I use and the delivery of water further south within the SWP system. SWP water pumped from the Delta is stored in SWP and local facilities for later delivery. Releases from San Luis Reservoir could change based upon changes in timing of deliveries from agricultural to M&I use. Overall, implementation of the proposed project is anticipated to result in a less than significant impact to the SWP and associated facilities.

Indirect Impacts

Castaic Lake Water Agency - There is the potential for indirect impacts to hydrology and water quality due to potential land use changes as a result of development in the CLWA service area. Indirect effects within CLWA include potential changes in the use of local groundwater supplies. Increased availability of SWP supplies resulting from the proposed project could indirectly affect the use of local groundwater in the Santa Clarita Valley. Although the amount of the SWP Table A amount would increase, the SWP supply available to CLWA in any one year following the Table A amount transfer may vary due to hydrologic and weather

conditions, and the amount of delivery may vary due to local water demands and CLWA's ability to take the total amount of its annual delivery (i.e., due to limited local storage). This could result in increased use of groundwater in certain years and could also change (both potentially increasing and decreasing) the amount of groundwater recharge in some years.

The EIR would evaluate the potential effects of growth that could be served by the proposed project, with regard to its effects on hydrology and water quality for existing lands within the CLWA service area. The potential development of lands within the CLWA service area would increase the amount of impervious surface (roads, buildings, other paved areas). This could reduce percolation of rainwater to groundwater, alter surface flows and drainage, and increase the amount and rate of stormwater runoff through storm sewers or other engineered drainages. Increases in erosion and siltation could also result from land use changes. Projected increases in runoff could, in some cases, exceed existing capacities requiring additional engineered drainages or other alterations in on and off-site locations of development and increasing polluted runoff.

There is also the potential for growth to affect the 100-year floodplain, including, redirecting flood flows as a result of elevating lands above the floodplain, construction within the floodplain, or other similar measures that could slow or redirect flood flows. Depending upon the location of future growth served by the project and design factors, people or structures could be exposed to a significant risk of loss, injury or death involving flooding and inundation by seiche or mudflow.

The Santa Clarita Valley has water supplies from sources in addition to SWP water, including groundwater. In 1997, perchlorate, a toxic substance, was found in the groundwater of the Saugus Formation near the site of an old munitions factory in the Santa Clarita Valley. Four Saugus production wells and one Alluvial production well have been shut down due to perchlorate contamination. Water agencies are evaluating several methods of safely removing perchlorate from the groundwater. The proposed project and the effects associated with growth are not expected to have a significant adverse effect on perchlorate concentrations in the groundwater, however, the EIR will address potential effects of the proposed project on perchlorate concentrations in the groundwater.

Runoff from development in the CLWA service area would eventually drain into the Santa Clara River. Wastewater produced on these lands would be treated in existing and future water reclamation facilities. Discharges from these facilities would also be discharged into the Santa Clara River in compliance with existing discharge permits. The identification of excessive chloride concentrations has resulted in inclusion of Reaches 7 and 8 of the Santa Clara River in the Clean Water Act Section 303(d) List of impaired water bodies. This list identifies water quality-limited water bodies and pollutants of concern for which a total maximum daily load (TMDL) must be developed[5]. The Regional Water Quality Control Board is currently in the process of development of a TMDL plan for the Santa Clara River.

The proposed project would not be expected to substantially increase chloride concentrations in surface water runoff in the Santa Clarita Valley. However, the proposed project would result in an increase in wastewater effluent volume (and therefore increased total chloride load) into the

5. A TMDL is a number that represents the assimilative capacity of water for a particular pollutant, or the amount of a particular pollutant that water can receive without impacting its beneficial uses.

Santa Clara River. It is anticipated that development planned in the CLWA service area would be similar to existing uses in the Santa Clarita Valley (i.e., primarily residential) and therefore would be expected to produce wastewater with similar water quality characteristics, although the overall volume of wastewater would increase. The potential for the proposed project to have a significant impact on surface waters of the Santa Clarita Valley with respect to chloride concentrations would be evaluated in the EIR.

Overall, implementation of the proposed project has the potential to have significant indirect impacts to hydrology and water quality within the CLWA service area.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - Implementation of the proposed project is unlikely to result in indirect impacts to hydrology and water quality within the KCWA and WRMWSD service areas. WRMWSD participates in groundwater recharge programs that are intended to augment surface water supplies when supply is insufficient to meet demand. Due to the flexibility of water management practices associated with agricultural lands, implementation of the proposed project is anticipated to result in a less than significant impact to hydrology and water quality within the KCWA and WRMWSD service areas. In addition, as implementation of the proposed project would not result in land use changes, the proposed project is not anticipated to result in indirect impacts that would (1) violate a water quality standard, wastewater discharge requirement or otherwise deplete water quality, (2) deplete groundwater supplies or interfere with groundwater recharge, (3) alter the existing drainage pattern of an area that would result in erosion, siltation or flooding, (4) create or contribute runoff which would exceed stormwater system capacity or generate polluted runoff, (5) place housing or structures within the 100-year floodplain, or (6) create inundation by seiche, tsunami or mudflow.

State Water Project and Associated Facilities - As implementation of the proposed project would not result in construction or modification of existing SWP facilities, nor would it change the operating criteria of the SWP and associated facilities, the proposed project would not result in indirect impacts that would (1) violate a water quality standard, wastewater discharge requirement or otherwise deplete water quality, (2) deplete groundwater supplies or interfere with groundwater recharge, (3) alter the existing drainage pattern of an area that would result in erosion, siltation or flooding, (4) create or contribute runoff which would exceed stormwater system capacity or generate polluted runoff, (5) place housing or structures within the 100-year floodplain, or (6) create inundation by seiche, tsunami or mudflow. Due to the slight changes in the SWP storage and transport amounts that could occur as a result of the proposed project, indirect impacts are considered to be less than significant.

Land Use and Planning Impacts

Direct Impacts

Castaic Lake Water Agency - The CLWA service area includes portions of unincorporated Los Angeles County, the City of Santa Clarita (including previously unincorporated communities of Newhall, Saugus, Valencia and Canyon Country), the communities of Stevenson Ranch, Castaic, Val Verde and unincorporated portions of eastern Ventura County. Land uses in the CLWA service area include urban uses such as higher density residential, commercial, industrial and

public/institutional uses, rural or lower density residential development, agricultural and open space uses, and national forest lands. Portions of the valley have development constraints due to steep terrain and potential flooding. Adopted plans and policies of local governments and planning bodies with jurisdiction in the CLWA service area include those adopted by the Southern California Association of Governments, Los Angeles County, Ventura County, and the City of Santa Clarita.

In addition, CLWA and certain local water purveyors developed and adopted a revised Urban Water Management Plan in 2000. This plan is a management tool, providing a framework for action but not functioning as detailed project development or action. The plan presents information about the water demand, water supply, water conservation, water recycling, and reliability planning in the CLWA service area.

Implementation of the proposed project would not require land disturbance nor would it directly change the existing land uses within the CLWA service area. In addition, implementation of the proposed project would not directly divide an established community, or conflict with adopted land use plans, policies, or regulations that were adopted for the purpose of avoiding or mitigating environmental effects. The project would not conflict with any habitat conservation plan or natural community conservation plan in the CLWA service area, as none have been adopted. Therefore, no direct impacts to land uses and planning within the CLWA service area would result from implementation of the proposed project.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - Land use within Kern County is primarily agricultural with some oil and mineral development. Urban development is concentrated in the metropolitan Bakersfield area; rural communities are scattered throughout the county. Land use in unincorporated portions of Kern County is under the jurisdiction of the county, with the exception of non-jurisdictional lands such as those owned by federal or state governments. In 1998, the WRMWSD service area contained approximately 146,620 acres (WRMWSD 2001). Land uses included the following: farmed area (94,269 acres or 64.3 percent); fallow lands (17,979 acres or 12.3 percent); miscellaneous and other lands, defined as developed but nonfarmed areas within cultivated lands, such as farm roads, farmsteads, reservoirs, airstrips, cotton gins, tank farms, utility yards, etc. (8,201 acres or 5.6 percent); and native vegetation/non-developed lands (26,171 acres or 17.8 percent) (WRMWSD 2001).

Implementation of the proposed project would not require or promote the adoption or modification of existing land uses or land use plans within the KCWA and WRMWSD service areas. In addition, implementation of the proposed project would not directly divide an established community, or conflict with adopted land use plans, policies, or regulations that were adopted for the purpose of avoiding or mitigating environmental effects. With implementation of the proposed project, WRMWSD would continue to make water available from a combination of historic and current water and agricultural management actions within the service area. Implementation of the proposed project would not materially affect irrigated agriculture in the WRMWSD service area served by SWP water, nor would it change existing land uses within the WRMWSD service area. Therefore, no direct impacts to land use and planning within the KCWA or WRMWSD service areas are anticipated to result from implementation of the proposed project.

The project would not conflict with any natural community conservation plans in KCWA or WRMWSD service areas, since none have been adopted. A habitat conservation plan is being developed for the San Joaquin Valley floor within Kern County and in the vicinity of Tejon Ranch in the WRMWSD service area. In addition, a habitat conservation plan has been developed for the Bakersfield area. It is not anticipated that the project would conflict with these plans, the status of which would be described in the EIR.

State Water Project and Associated Facilities - Land use and planning directly associated with SWP facilities is under the jurisdiction of DWR or its designee for such things as facilities, easements, etcetera. Implementation of the proposed project would not result in construction or modification of existing SWP facilities. In addition, implementation of the proposed project would not substantially change the current operation of the SWP and associated facilities, nor would it change the operating criteria of the SWP and associated facilities. Implementation of the proposed project would not directly divide an established community, or conflict with adopted land use plans, policies, or regulations that were adopted for the purpose of avoiding or mitigating environmental effects. As no construction or land use changes would result with implementation of the proposed project, the project is not anticipated to conflict with any adopted habitat conservation plan or natural community conservation plan. Therefore, no direct impacts to land use and planning within the SWP and associated facilities are anticipated to result from implementation of the proposed project.

Indirect Impacts

Castaic Lake Water Agency - There is the potential for indirect impacts to land use and planning due to potential land use changes as a result of development in the CLWA service area. Potential development within the CLWA service area served by this additional water supply could, in some cases, require changes to zoning designations to accommodate residential, commercial, and other uses or to increase the density or intensity of allowed uses. Depending on the location and type of development, there is the potential for new development to physically divide an established community. Without adequate mitigation, there also is a potential for some conflicts with adopted land use plans, policies, or regulations that were adopted for the purpose of avoiding or mitigating environmental effects. Land use changes would not conflict with an adopted habitat conservation plan or natural community conservation plan as no habitat conservation plan or natural community conservation plan exist in the CLWA service area.

As a result of the proposed increased SWP water supply associated with this project, land development projects would potentially be accommodated within the CLWA service area. The approval of these development projects requires land use approvals by local governments. Potential land use changes are considered potentially significant.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - As the implementation of the proposed project would not result in land use changes within the KCWA or WRMWSD service areas, the proposed project is not anticipated to divide an established community, conflict with adopted land use plans, policies, or regulations that were adopted for the purpose of avoiding or mitigating environmental effects, or conflict with an adopted or anticipated habitat conservation plan or natural community conservation plan. Therefore, no

indirect impacts to land use and planning are anticipated to result from implementation of the proposed project.

State Water Project and Associated Facilities - As implementation of the proposed project would not result in construction or modification of existing SWP facilities, nor would it change the operating criteria of the SWP and associated facilities, the proposed project is not anticipated to divide an established community, conflict with adopted land use plans, policies, or regulations that were adopted for the purpose of avoiding or mitigating environmental effects, or conflict with an adopted habitat conservation plan or natural community conservation plan. Therefore, no indirect impacts to land use and planning are anticipated to result from implementation of the proposed project.

Mineral Resource Impacts

Direct Impacts

Castaic Lake Water Agency - Much of the CLWA service area is classified as potential sand and gravel mineral resource areas. Most of the floodplain of the Santa Clara River drainage system is classified by the California Department of Mines and Geology as Zone MRZ-2, which is an area where adequate information indicates that significant mineral deposits are present or where it is judged that a high likelihood for their presence exists. Tertiary sedimentary rocks in the CLWA service area are also considered alternative sources of aggregate. Implementation of the proposed project would not require land disturbance nor would it directly change the existing land uses within the CLWA service area. The proposed project would not directly result in the loss of availability of a known mineral resource or the loss of availability of a locally important mineral resource, and therefore no direct impacts to mineral resources within the CLWA service area would result from implementation of the proposed project.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - Numerous oil wells, groundwater wells and gravel mining operations are scattered throughout the KCWA and WRMWSD service areas. Implementation of the proposed project would not materially affect irrigated agriculture in the WRMWSD service area served by SWP water, nor would it change existing land uses within the WRMWSD service area. The proposed project would not directly result in the loss of availability of a known mineral resource or the loss of availability of a locally important mineral resource. Therefore, no direct impacts to mineral resources within the KCWA or WRMWSD service areas are anticipated to result from implementation of the proposed project.

State Water Project and Associated Facilities - Numerous oil wells, groundwater wells and gravel mining operations are scattered throughout the regions traversed or containing SWP facilities. Any mineral resources directly associated with SWP facilities would be under the jurisdiction of DWR or its designee. Implementation of the proposed project would not result in construction or modification of existing SWP facilities. In addition, implementation of the proposed project would not substantially change the current operation of the SWP and associated facilities, nor would it change the operating criteria of the SWP and associated facilities. The proposed project would not directly result in the loss of availability of a known mineral resource or the loss of availability of a locally important mineral resource. Therefore, no direct impacts to

mineral resources within the SWP and associated facilities are anticipated to result from implementation of the proposed project.

Indirect Impacts

Castaic Lake Water Agency - There is the potential for indirect impacts to mineral resources due to potential land use changes as a result of development in the CLWA service area. Hydrocarbon resources occur in portions of the Santa Clarita Valley. Most wells were developed in the 1940s and 1950s. Many of these wells have been abandoned. Since the proposed project may also remove an impediment to growth, there may be indirect impacts related to increased gravel mining and production caused by a growth-related demand for aggregate to build roads and other infrastructure. To the extent that future development will result in the loss of availability of a known mineral resource that is of value to the residents of the region and state or the loss of availability of a locally important mineral resource recovery site, impacts would be significant.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - As the implementation of the proposed project would not result in land use changes within the KCWA or WRMWSD service areas, the proposed project would not result in the loss of availability of a known mineral resource or the loss of availability of a locally-important mineral resource. Therefore, no indirect impacts to mineral resources would result from implementation of the proposed project.

State Water Project and Associated Facilities - As implementation of the proposed project would not result in construction or modification of existing SWP facilities, nor would it change the operating criteria of the SWP and associated facilities, the proposed project would not directly result in the loss of availability of a known mineral resource or the loss of availability of a locally-important mineral resource. Therefore, no indirect impacts to mineral resources would result from implementation of the proposed project.

Noise Impacts

Direct Impacts

Castaic Lake Water Agency - The CLWA service area includes developed urban areas, primarily within the City of Santa Clarita and developed portions of unincorporated Los Angeles County, as well as lower density residential or rural/agricultural areas, including portions of eastern Ventura County. Common sources of noise are highways, railroads, buses, and aircraft. The Union Pacific Railroad, Interstate 5, State Route 14 and Highway 126 traverse the Santa Clarita Valley and contribute to ambient noise levels. Implementation of the proposed project would not require land disturbance nor would it directly change the existing land uses within the CLWA service area. No aspect of the proposed project would expose persons to or generate noise levels in excess of established standards, expose persons to or generate excessive ground-borne vibration or ground-borne noise levels, or cause a substantial permanent temporary or periodic increase in ambient noise levels. No lands within the CLWA service area are located within an airport land use plan, nor are they located in the vicinity of a public airport, public use airport or private airstrip. Therefore, no direct noise impacts within the CLWA service area would result from implementation of the proposed project.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - Noise within Kern County is primarily related to agricultural and vehicular uses in rural areas, and within areas of urban development routine noise related primarily to vehicular traffic and other noises commonly associated with residential, commercial, industrial, public facilities, recreation and other developed uses. Land use within the WRMWSD service area is predominantly agricultural use (farming and grazing), undeveloped lands or open space. The main noise sources are from agricultural uses and vehicular traffic (particularly along Interstate 5, U.S. 99 and State Highway 166).

Implementation of the proposed project would not require the construction of new facilities or modification of existing KCWA and WRMWSD facilities, nor would implementation of the proposed project change the existing operation of these facilities. Therefore, no aspect of the proposed project is anticipated to expose persons to or generate noise levels in excess of established standards, expose persons to or generate excessive ground-borne vibration or ground-borne noise levels, or cause a substantial permanent temporary or periodic increase in ambient noise levels. Implementation of the proposed project would not materially affect irrigated agriculture in the WRMWSD service area served by SWP water, nor would it change existing land uses within the WRMWSD service area. The project would not expose people residing or working in the KCWA or WRMWSD service areas to excessive noise levels associated with lands subject to an airport land use plan, or in the vicinity of a public airport, public use airport or private airstrip. Therefore, implementation of the proposed project is not anticipated to result in direct impacts to noise within the KCWA and WRMWSD service areas.

State Water Project and Associated Facilities - Noise associated the SWP and related facilities can vary from minimal amounts along the aqueduct to higher levels of noise due to vehicular traffic and other noises commonly associated with pumping facilities, recreational facilities, highways, and other noise generating uses along and associated with the operation of the aqueduct and related facilities. Implementation of the proposed project would not result in construction or modification of existing SWP facilities. In addition, implementation of the proposed project would not substantially change the current operation of the SWP and associated facilities, nor would it change the operating criteria of the SWP and associated facilities. Therefore, no aspect of the proposed project is anticipated to expose persons to or generate noise levels in excess of established standards, expose persons to or generate excessive ground-borne vibration or ground-borne noise levels, cause a substantial permanent temporary or periodic increase in ambient noise levels, or expose people to excessive noise levels in the vicinity of a public airport, public use airport or private airstrip. No direct noise impacts within the SWP and associated facilities are anticipated to result from implementation of the proposed project.

Indirect Impacts

Castaic Lake Water Agency - There is the potential for indirect noise impacts due to potential land use changes as a result of development in the CLWA service area. Potential development within the CLWA service area that could be served by this additional water supply could substantially alter the land uses from vacant land, low density and agricultural uses to urban uses (residential, commercial and other uses) with associated activities, traffic, and noise sources which could change ambient noise levels on a temporary or permanent basis. In addition, potential land use changes could expose persons to or generate noise levels in excess of established standards,

expose persons to or generate excessive ground-borne vibration or ground-borne noise levels, or cause a substantial permanent temporary or periodic increase in ambient noise levels. These impacts are considered potentially significant. The CLWA service area is not located within an airport land use plan, nor is it in the vicinity of a public airport, public use airport or private airstrip.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - As the implementation of the proposed project would not result in land use changes within the KCWA or WRMWSD service areas, the proposed project is not anticipated to expose persons to or generate noise levels in excess of established standards, expose persons to or generate excessive ground-borne vibration or ground-borne noise levels, cause a substantial permanent temporary or periodic increase in ambient noise levels, or expose people to excessive noise levels in the vicinity of a public airport, public use airport or private airstrip. Therefore, no indirect noise impacts would result from implementation of the proposed project.

State Water Project and Associated Facilities - As implementation of the proposed project would not result in construction or modification of existing SWP facilities, nor would it change the operating criteria of the SWP and associated facilities, the proposed project is not anticipated to expose persons to or generate noise levels in excess of established standards, expose persons to or generate excessive ground-borne vibration or ground-borne noise levels, cause a substantial permanent temporary or periodic increase in ambient noise levels, or expose people to excessive noise levels in the vicinity of a public airport, public use airport or private airstrip. Therefore, no indirect noise impacts would result from implementation of the proposed project.

Population and Housing Impacts

Direct Impacts

Castaic Lake Water Agency - In 1998, it was estimated that there was approximately 177,000 persons, 57,000 housing units, and 59,000 jobs in the Santa Clarita Valley (SCAG 1998). These estimates reflect increases of approximately 9-10 percent since 1994 when there were approximately 162,000 persons, 52,000 households, and 53,000 jobs in the Santa Clarita Valley (SCAG 1998). The population of the CLWA service area was estimated at approximately 190,000 persons in 2000 based upon the U.S. Census. Los Angeles County projects a population of 270,000 persons, 93,400 housing units, and 111,000 jobs by the year 2010. Compared to the 1998 estimates, the 2010 projections anticipate an increase of 53 percent for population, 64 percent for housing, and 88 percent for jobs. Implementation of the proposed project would not require land disturbance nor would it directly change the existing land uses within the CLWA service area. The proposed project would not result in increased employment or make other changes in activities that would directly affect population and housing. In addition, the proposed project would not directly displace a substantial number of people or existing houses. Therefore, no direct impacts to population and housing within the CLWA service area are anticipated to result from implementation of the proposed project.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - The population of Kern County in 1990 was 543,477 persons, and 661,645 persons in 2000 (U.S. Census Bureau 2000). From 1990 to 2000, the population grew approximately 21 percent. Based on Census

data, in 2000, Kern County contained approximately 231,560 housing units, as compared to approximately 198,640 housing units in 1990. The WRMWSD service area consists predominantly of agricultural lands, although small areas of industrial development and the unincorporated community of Lakeview are within the service area, along with the town site of Wheeler Ridge. Based on U.S. Census Bureau data, the population of the WRMWSD service area in 1990 was estimated to be 3,029 persons, or less than one percent of the population of Kern County. In 2000, the population of the WRMWSD service area was estimated to be 2,854 persons, or less than one percent of the population of Kern County. The WRMWSD service area does not contain large areas of residential development.

Implementation of the proposed project would not require the construction of new facilities or modification of existing KCWA and WRMWSD facilities, nor would implementation of the proposed project change the existing operation of these facilities. Implementation of the proposed project would not materially affect irrigated agriculture in the WRMWSD service area served by SWP water, nor would it change existing land uses within the WRMWSD service area. In addition, the proposed project would not directly induce substantial population growth, nor would it displace a substantial number of people or existing houses. Therefore, no direct impacts to population and housing within the KCWA or WRMWSD service areas would result from implementation of the proposed project.

State Water Project and Associated Facilities - As the SWP and associated facilities are a statewide water distribution system, there are no population and housing resources directly associated with the SWP facilities. Implementation of the proposed project would not result in construction or modification of existing SWP facilities. In addition, implementation of the proposed project would not substantially change the current operation of the SWP and associated facilities, nor would it change the operating criteria of the SWP and associated facilities. The proposed project would not directly induce substantial population growth, nor would it displace a substantial number of people or existing houses. Therefore, no direct impacts to population and housing within the SWP and associated facilities would result from implementation of the proposed project.

Indirect Impacts

Castaic Lake Water Agency - There is the potential for indirect impacts to population and housing due to potential land use changes as a result of accommodation of development in the CLWA service area. The project is considered to be growth inducing because it would remove an obstacle to growth by providing additional SWP water to CLWA that could be used to serve existing as well as future water users. Further, it is possible that future land use development approvals for lands that could be served as a result of the project would include amendments to the existing general plans, zoning, and adopted growth forecasts, which could be considered growth inducing. These impacts are considered potentially significant. Potential development within the CLWA service area served by the proposed additional water supply could create a large number of new housing units, employment increases and associated population. While it is possible that new development in certain areas could in some cases result in the displacement of older dwellings or relocation of individuals, no substantial redevelopment or relocation is anticipated. Growth inducement and growth related indirect impacts are potentially significant and will be addressed further in the EIR.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - As the implementation of the proposed project would not result in land use changes within the KCWA or WRMWSD service areas, the proposed project would not induce substantial population growth, nor would it displace a substantial number of people or existing houses. Therefore, no indirect impacts to population and housing would result from implementation of the proposed project.

State Water Project and Associated Facilities - As implementation of the proposed project would not result in construction or modification of existing SWP facilities, nor would it change the operating criteria of the SWP and associated facilities, the proposed project would not induce substantial population growth, nor would it displace a substantial number of people or existing houses. Therefore, no indirect impacts to population and housing would result from implementation of the proposed project.

Public Services Impacts

Direct Impacts

Castaic Lake Water Agency - Public services within the CLWA service area are provided by a variety of state, regional and local agencies including, although not limited to the following: California Department of Forestry, California Highway Patrol, County of Los Angeles, County of Ventura, and the City of Santa Clarita. Implementation of the proposed project would not require land disturbance nor would it directly change the existing land uses within the CLWA service area. In addition, the proposed project would not create direct changes in demand for public services that would require the construction or modification of governmental facilities to maintain acceptable response service ratios, response times or other performance objectives. Therefore, no direct impacts to public services within the CLWA service area would result from implementation of the proposed project.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - Public services within the KCWA and WRMWSD service areas are provided by a variety of state, regional and local agencies including, although not limited to: California Department of Forestry, California Highway Patrol, Kern County, and the City of Bakersfield. Implementation of the proposed project would not require the construction of new facilities or modification of existing KCWA and WRMWSD facilities, nor would implementation of the proposed project change the existing operation of these facilities. Implementation of the proposed project would not materially affect irrigated agriculture in the WRMWSD service area served by SWP water, nor would it change existing land uses within the WRMWSD service area. In addition, the proposed project would not create direct changes in the demand for public services that would require the construction or modification of governmental facilities to maintain acceptable response service ratios, response times or other performance objectives. Therefore, no direct impacts to public services within the KCWA or WRMWSD service areas would result from implementation of the proposed project.

State Water Project and Associated Facilities - Public services associated with the SWP facilities are provided by a variety of state, regional and local agencies including, although not limited to the following, California Department of Forestry and California Highway Patrol. Implementation

of the proposed project would not result in construction or modification of existing SWP facilities. In addition, implementation of the proposed project would not substantially change the current operation of the SWP and associated facilities, nor would it change the operating criteria of the SWP and associated facilities. The proposed project would not create direct changes in the demand for public services that would require the construction or modification of governmental facilities to maintain acceptable response service ratios, response times or other performance objectives. Therefore, no direct impacts to public services within the SWP and associated facilities would result from implementation of the proposed project.

Indirect Impacts

Castaic Lake Water Agency - There is the potential for indirect impacts to public services due to potential land use changes as a result of development in the CLWA service area. Potential development within the CLWA service area that could be served by this additional water supply could increase the population within the CLWA service area. As a result, additional demands could be generated for public facilities (e.g., fire stations, police stations, schools, parks, or other facilities) and services that could result in expansion of facilities or construction of new facilities that could have potentially significant impacts on the environment. These impacts are considered potentially significant. Potential development within the CLWA service area accommodated by this additional water supply could increase human activity in high fire hazard areas. Development plans would be required to incorporate or address adequate fire protection infrastructure, fire stations and water systems, as well as other fire protection techniques such as adequate clear zones.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - As the implementation of the proposed project would not result in land use changes within the KCWA or WRMWSD service areas or create increased demands for public services, no indirect impacts to public services would result from implementation of the proposed project.

State Water Project and Associated Facilities - As implementation of the proposed project would not result in construction or modification of existing SWP facilities, nor would it change the operating criteria of the SWP and associated facilities, the proposed project would not indirectly create changes in the demand for public services. Therefore, no indirect impacts to public services would result from implementation of the proposed project.

Recreation Impacts

Direct Impacts

Castaic Lake Water Agency - Recreational resources in the CLWA service area consist of state, county/regional and local parks, and designated regional and local recreational trails. The Los Angeles County Department of Parks and Recreation provides local parks and recreation facilities for northwestern Los Angeles County residents and provides regional parks for all residents of the county. The Ventura County Parks Department provides this function for eastern Ventura County portions of the CLWA service area. The City of Santa Clarita provides local parks within the city boundaries. Regional recreation areas under the control of the federal government include the Angeles National Forest, the Los Padres National Forest, and the Santa Monica Mountains National Recreation Area. Implementation of the proposed project

would not require land disturbance nor would it directly change the existing land uses within the CLWA service area or directly create increased demands for recreation. In addition, the proposed project would not directly increase the use of exiting recreational facilities, nor does the project require or include the construction or modification of recreational facilities. Therefore, no direct impacts to recreation resources within the CLWA service area are anticipated to result from implementation of the proposed project.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - Parks and/or recreation services within Kern County are under the jurisdiction of the county, eight recreation and park districts, other special districts, cities, school districts, the state and federal governments, and private organization. Three state parks, Fort Tejon State Historical Park, Tule Elk State Reserve, and Red Rock Canyon State Park, and two national forests, Los Padres National Forest and Sequoia National Forest, along with other federal lands, are located, in total or in part, within Kern County. Implementation of the proposed project would not require the construction of new facilities or modification of existing KCWA and WRMWSD facilities, nor would implementation of the proposed project change the existing operation of these facilities. Implementation of the proposed project would not materially affect irrigated agriculture in the WRMWSD service area served by SWP water, nor would it change existing land uses within the WRMWSD service area. Therefore, implementation of the proposed project would not create changes in demand for recreation, nor does the project require or include the construction or modification of recreational facilities. No direct impacts to recreation resources within the KCWA or WRMWSD service areas are expected to result from implementation of the proposed project.

State Water Project and Associated Facilities - The SWP facilities provide year-round recreational opportunities including fishing, boating, swimming, camping, hiking, and wildlife viewing within both the California Aqueduct (limited to fishing at designated locations only) and associated reservoirs. Implementation of the proposed project would not result in construction or modification of existing SWP facilities. In addition, implementation of the proposed project would not substantially change the current operation of the SWP and associated facilities, nor would it change the operating criteria of the SWP and associated facilities. With implementation of the proposed project, and depending on the volume and schedule of water deliveries to CLWA, reservoir levels in San Luis Reservoir and Castaic Lake could change, which could in turn affect recreation use. Although, changes in lake levels at both San Luis Reservoir and Castaic Lake as a result of implementation of the proposed project are expected to be minor, and are not expected to have a substantial adverse effect on the environment or recreation facilities. Other changes in SWP facilities, such as changes in aqueduct flow associated with implementation of the proposed project are not expected to affect recreation in a manner that would alter the environment. As implementation of the proposed project is not anticipated to result in substantial changes that would adversely affect recreation, and, as implementation of the proposed project would not change the SWP operating criteria, the proposed project is anticipated to result in a less than significant impact to recreation resources within the SWP and associated facilities. In addition, the proposed project would not directly increase the use of exiting recreational facilities, nor does the project require or include the construction or modification of recreational facilities.

Indirect Impacts

Castaic Lake Water Agency - There is the potential for indirect impacts to recreation resources due to potential land use changes as a result of development in the CLWA service area. Opportunities for recreation on developed sites and natural recreation such as hiking, jogging, bicycling, water-based recreation and horseback riding are available within the CLWA service area. Potential development within the CLWA service area accommodated by this additional water supply could have impacts on these and other existing recreation opportunities within the CLWA service area. Increased demand on recreational facilities could exacerbate existing shortfalls in local and regional park space. Residential development is subject to applicable requirements to provide public park sites or in-lieu fees based on population-based ratios (e.g., Quimby Act requirements). These impacts are considered potentially significant given the potential for increased demand and impacts to the environment from facility expansion, such as construction of developed recreation areas.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - As the implementation of the proposed project would not result in land use changes within the KCWA or WRMWSD service areas, the proposed project would not increase the use of existing recreational facilities, nor does the project require or include the construction or modification of recreational facilities. Therefore, no indirect impacts to recreation resources would result from implementation of the proposed project.

State Water Project and Associated Facilities - Implementation of the proposed project would not result in construction or modification of existing SWP facilities, nor would it change the operating criteria of the SWP and associated facilities. As a result of land use changes within the CLWA service area, the proposed project may increase the recreational use of Castaic Lake. This increase is not anticipated to require the construction or modification of recreational facilities, and therefore, would result in less than significant indirect impact to recreational resources within the SWP and associated facilities.

Traffic/Transportation Impacts

Direct Impacts

Castaic Lake Water Agency - The circulation system in the Santa Clarita Valley is limited by the topography of the area including steep slopes, canyons, and the Santa Clara River. Local roadways are under the jurisdiction of the City of Santa Clarita and/or Los Angeles and Ventura counties. The primary agency responsible for the planning, design, construction, and operation of regional transportation systems in the Santa Clarita Valley is the California Department of Transportation (CalTrans) District 7. Greyhound, Amtrak, and Santa Clarita Transit provide passenger bus service within the CLWA service area. The closest commercial airport to the CLWA service area is the Burbank Glendale Pasadena Airport, approximately 15 miles from the City of Santa Clarita. Implementation of the proposed project would not require land disturbance nor would it directly change the existing land uses or traffic generating activities within the CLWA service area. Therefore, no direct impacts to transportation and traffic within the CLWA service area are anticipated to result from implementation of the proposed project.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - Planning, design, construction, and operation of regional transportation systems in the Kern County area are primarily the responsibility of CalTrans, District 6. General aviation airports are scattered throughout Kern County, but the major commercial airport is Meadows Field, located northwest of Bakersfield. Passenger bus and train service are available to and from Bakersfield, provided by Greyhound and Amtrak. The WRMWSD is served by several major transportation routes service area, although the service area does not contain any commercial or general aviation airport facilities, nor is it served by scheduled passenger rail or bus services. Implementation of the proposed project would not require the construction of new facilities or modification of existing KCWA and WRMWSD facilities, nor would implementation of the proposed project change the existing operation of these facilities. Implementation of the proposed project would not materially affect irrigated agriculture in the WRMWSD service area served by SWP water, nor would it change existing land uses within the WRMWSD service area. Therefore, implementation of the proposed project would not materially affect traffic generating activities within the KCWA and WRMWSD service area, and is anticipated to result in a less than significant impact to transportation and traffic within the KCWA and WRMWSD service areas.

State Water Project and Associated Facilities - The SWP and associated facilities are served by, lie adjacent to, or are traversed by, several major transportation routes. Numerous general aviation airports exist within the regions traversed by the SWP and associated facilities. Passenger bus and rail service are generally available in the urbanized areas traversed by the SWP and associated facilities. Implementation of the proposed project would not result in construction or modification of existing SWP facilities. In addition, implementation of the proposed project would not substantially change the current operation of the SWP and associated facilities, nor would it change the operating criteria of the SWP and associated facilities. Therefore, implementation of the proposed project would not affect traffic generating activities within the SWP and associated facilities, and would have no direct impacts to transportation and traffic within, or related to, the SWP and associated facilities.

Indirect Impacts

Castaic Lake Water Agency - There is the potential for indirect impacts to transportation and traffic due to potential land use changes as a result of development in the CLWA service area. Potential development within the CLWA service area that could be served by this additional water supply could result in a substantial increase in vehicle trips within and adjacent to the CLWA service area. Increased vehicle trips would affect local and regional roads resulting in an increase in traffic congestion, and may exceed of level of service standards and volume to capacity ratios on roads. In addition, increased vehicle trips may result in increased hazards due to a design failure or incompatible uses. Land use and associated traffic changes may also result in inadequate emergency access, inadequate parking capacity and conflict with adopted policies, plans, or programs supporting alternative transportation. These impacts are considered potentially significant. Changes in demand for air travel and changes in air traffic patterns are anticipated to be less than significant.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - As the implementation of the proposed project would not result in land use changes or other traffic

generating activities within the KCWA or WRMWSD service areas, no indirect impacts to transportation and traffic are expected to result from implementation of the proposed project.

State Water Project and Associated Facilities - As implementation of the proposed project would not result in construction or modification of existing SWP facilities, nor would it change the operating criteria of the SWP and associated facilities, the proposed project would not indirectly result in changes to traffic generating activities. Therefore, no indirect impacts to transportation and traffic are expected to result from implementation of the proposed project.

Utilities & Service System Impacts

Direct Impacts

Castaic Lake Water Agency - Utilities and service systems associated with the CLWA service area are provided by a variety of state, regional and local agencies, along with a variety of private agencies. Implementation of the proposed project would not require land disturbance nor would it directly change the existing land uses within the CLWA service area. No aspect of the proposed project would directly exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board, require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, require or result in the construction of new storm water drainage facilities or expansion of existing facilities, exceed water supplies available to serve the project, exceed existing wastewater treatment capacity, exceed existing landfill capacity; and/or not comply with federal, state, and local statutes and regulations related to solid waste. No direct impacts to utilities and service systems within the CLWA service area are anticipated to result from implementation of the proposed project.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - Utilities and service systems associated with the KCWA and WRMWSD service areas are provided by a variety of state, regional and local agencies, along with a variety of private agencies. Implementation of the proposed project would not require the construction of new facilities or modification of existing KCWA and WRMWSD facilities, nor would implementation of the proposed project change the existing operation of these facilities. Implementation of the proposed project would not materially affect irrigated acreage in the WRMWSD service area served by SWP water on an average annual basis, nor would it change existing land uses within the WRMWSD service area. No aspect of the proposed project would directly exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board, require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, require or result in the construction of new storm water drainage facilities or expansion of existing facilities, exceed water supplies available to serve the project, exceed existing wastewater treatment capacity, exceed existing landfill capacity; and/or not comply with federal, state, and local statutes and regulations related to solid waste. Therefore, no direct impacts to utilities and service systems within the KCWA or WRMWSD service areas are expected to result from implementation of the proposed project.

State Water Project and Associated Facilities - Utilities and service systems associated with the SWP facilities are provided by a variety of state (including DWR), regional and local agencies, along with a variety of private agencies. Energy needed to operate the SWP comes from a combination

of SWP hydroelectric facilities, the Reid Gardner coal-fired generation plant, and power purchased from other utilities. As part of the operation of the SWP, DWR both buys and sells energy under long and short-term contracts. Implementation of the proposed project would not result in construction or modification of existing SWP facilities. In addition, implementation of the proposed project would not substantially change the current operation of the SWP and associated facilities, nor would it change the operating criteria of the SWP and associated facilities. Current and future availability of a reliable supply of electricity at a stable cost to consumers is uncertain given the current energy environment. Energy utilized to deliver water associated with the proposed project to CLWA rather than KCWA would vary depending on the amount of SWP water delivered to CLWA in any one year. Some power would be recovered at the Warne and Castaic power plants, as water flows down the California Aqueduct from the south side of the Tehachapi Mountain Range to Castaic Lake. The proposed project may result in less than significant environmental impacts with respect to energy requirements to transport water that could have been delivered to WRMWSD to CLWA. These potential impacts will be further evaluated in the EIR.

No aspect of the proposed project would exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board, require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, require or result in the construction of new storm water drainage facilities or expansion of existing facilities, exceed water supplies available to serve the project, exceed existing wastewater treatment capacity, exceed existing landfill capacity; and/or not comply with federal, state, and local statutes and regulations related to solid waste.

Indirect Impacts

Castaic Lake Water Agency - There is the potential for indirect impacts to utilities and service systems due to potential land use changes as a result of development in the CLWA service area. Potential development within the CLWA service area that could be served by this additional water supply could increase the population within the CLWA service area. As a result, additional demands could be generated for utilities and service systems including water and wastewater treatment, storm water drainage facilities, solid waste disposal/landfills, energy and other utilities. These impacts are considered potentially significant.

Kern County Water Agency and Wheeler Ridge-Maricopa Water Storage District - As the implementation of the proposed project would not result in land use changes within the KCWA or WRMWSD service areas, no indirect impacts to utilities and service systems would result from implementation of the proposed project.

State Water Project and Associated Facilities - As implementation of the proposed project would not result in construction or modification of existing SWP facilities, nor would it change the operating criteria of the SWP and associated facilities, no indirect impacts to utilities and service systems would result from implementation of the proposed project.

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ACRONYMS

AF	acre-feet
AFY	acre-feet per year
BMWD	Berrenda Mesa Water District
CEQA	California Environmental Quality Act
CLWA	Castaic Lake Water Agency
EIR	Environmental Impact Report
ESFP	Earl Schmidt Filtration Plant
DWR	California Department of Water Resources
KCWA	Kern County Water Agency
M&I	Municipal and Industrial
NOP	Notice of Preparation
SCAB	South Coast Air Basin
SJVAB	San Joaquin Valley Air Basin
SWP	State Water Project
SWSD	Semitropic Water Storage District
TMDL	total maximum daily load
USBR	United States Department of the Interior, Bureau of Reclamation
WRMWSD	Wheeler Ridge-Maricopa Water Storage District

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PUBLIC COMMENTS ON THE NOP

LETTER 4

LETTER 4

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY

GRAY DAVIS, Governor

DEPARTMENT OF TRANSPORTATION
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Flex your power!
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IGR/CEQA No. 030162AL
Castaic Lake Water Agency Supplemental Water Project Transfer of 41,000 Acre-feet of State Water Project Table A Amount from Kern County Water Agency
Vic. LA-5 / Various Locations

January 28, 2003

Mr. Dan Masnada
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350-2173

Dear Mr. Masnada:

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the above referenced project. The proposed project is the transfer of 41,000 acre-feet of State Water Project Table A amount from Kern County Water Agency, and its member district the Wheeler Ridge-Maricopa Water Storage District, to the Castaic Lake Water Agency, CLWA.

Please discuss the transportation method for transferring the water to Castaic Lake Water Agency. Additionally, please discuss the potential indirect traffic impact and mitigation as a result of potential development within and adjacent to the CLWA service area that could be served by this additional water supply.

If you have any questions, please feel free to contact me at (213) 897-4429 or Alan Lin the project coordinator at (213) 897-8391 and refer to IGR/CEQA No. 030162AL.

Sincerely,

STEPHEN J. BUSWELL
IGR/CEQA Branch Chief

Steve Buswell/AL

LETTER 4

LETTER 4

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www.scag.ca.gov

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Riverside County: Bob Buster, Riverside County • Ron Loveridge, Riverside • Jeff Miller, Corona • Greg Pettis, Cathedral City • Ron Roberts, Temecula • Charles White, Moreno Valley
San Bernardino County: Paul Biane, San Bernardino County • Bill Alexander, Rancho Cucamonga • Lawrence Dale, Barstow • Lee Ann Garcia, Grand Terrace • Susan Longville, San Bernardino • Gary Ovitt, Ontario • Deborah Robertson, Rialto
Ventura County: Judy Mikels, Ventura County • Glen Becerra, Simi Valley • Carl Morehouse, San Buenaventura • Toni Young, Port Hueneme
Riverside County Transportation Commission: Robin Lowe, Hemet
Ventura County Transportation Commission: Bill Davis, Simi Valley

RECEIVED
FEB 21 2003
By

February 19, 2003

Mr. Dan Masnada
General Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350 - 2173

RE: **Comments on the Notice of Preparation for a Draft Environmental Impact Report for the Castaic Lake Water Agency Supplemental Water Project Transfer of 41,000 Acre Feet of State Water Project Table A Amount from Kern County Water Agency – SCAG No. I 20030030**

Dear Mr. Masnada:

Thank you for submitting the **Notice of Preparation for a Draft Environmental Impact Report for the Castaic Lake Water Agency Supplemental Water Project Transfer of 41,000 Acre Feet of State Water Project Table A Amount from Kern County Water Agency** to SCAG for review and comment. As areawide clearinghouse for regionally significant projects, SCAG reviews the consistency of local plans, projects, and programs with regional plans. This activity is based on SCAG's responsibilities as a regional planning organization pursuant to state and federal laws and regulations. Guidance provided by these reviews is intended to assist local agencies and project sponsors to take actions that contribute to the attainment of regional goals and policies.

We have reviewed the **Notice of Preparation** and have determined that the proposed Project is regionally significant per SCAG mandates for regionally significant projects that directly relate to policies and strategies contained in the Regional Comprehensive Plan and Guide (RCPG) and Regional Transportation Plan (RTP). CEQA requires that EIRs discuss any inconsistencies between the proposed project and applicable general plans and **regional plans (Section 15125 [d])**. If there are inconsistencies, an explanation and rationalization for such inconsistencies should be provided.

Policies of SCAG's Regional Comprehensive Plan and Guide and Regional Transportation Plan, which may be applicable to your project, are outlined in the attachment. **We expect the Draft EIR to specifically cite the appropriate SCAG policies and address the manner in which the Project is consistent with applicable core policies or supportive of applicable ancillary policies. Please use our policy numbers to refer to them in your Draft EIR. Also, we would encourage you to use a side-by-side comparison of SCAG policies with a discussion of the consistency or support of the policy with the Proposed Project.**

Please provide a minimum of 45 days for SCAG to review the Draft EIR when this document is available. If you have any questions regarding the attached comments, please contact me at (213) 236-1867. Thank you.

Sincerely,

JEFFREY M. SMITH, AICP
Senior Regional Planner
Intergovernmental Review

COMMENTS ON THE PROPOSAL TO DEVELOP A DRAFT ENVIRONMENTAL IMPACT REPORT FOR THE CASTAIC LAKE WATER AGENCY SUPPLEMENTAL WATER PROJECT TRANSFER SCAG NO. I 20030030

PROJECT DESCRIPTION

The proposed Project considers the transfer of 41,000 acre-feet (AF) of State Water Project (SWP) Table A amount from Kern County Water Agency (KCWA), and its member district the Wheeler Ridge-Maricopa Water Storage District, to the Castaic Lake Water Agency (WRMWSD). The proposed Project also establishes the right to use the 41,000 acre-feet as part of Castaic Lake Water Agency's State Water Project Table A amount of 95,200 acre-feet pursuant to a Trial Court judgement on remand. Also, the 41,000 AF has been delivered to CLWA from KCWA through agreements including KCWA and its member district, the WRMWSD, as well as the California Department of Water Resources (DWR).

The proposed Project also includes possession of SWP contractual rights that provide a means of water storage and delivery of water associated with the Table A amount to CLWA. The proposed project results in a total CLWA SWP Table A amount of 95,200 AF. The SWP water is being transported from points of origin in the SWP system to the CLWA intake south of Castaic Lake via existing SWP facilities. The proposed project does not include the construction of any additional SWP facilities.

CONSISTENCY WITH REGIONAL COMPREHENSIVE PLAN AND GUIDE POLICIES

The **Growth Management Chapter (GMC)** of the Regional Comprehensive Plan and Guide (RCPG) contains the following policies that are particularly applicable and should be addressed in the Draft EIR for the Castaic Lake Water Agency Supplemental Water Project Tansfer.

3.03 The timing, financing, and location of public facilities, utility systems, and transportation systems shall be used by SCAG to implement the region's growth policies.

GMC POLICIES RELATED TO THE RCPG GOAL TO IMPROVE THE REGIONAL

STANDARD OF LIVING

The Growth Management goals to develop urban forms that enable individuals to spend less income on housing cost, that minimize public and private development costs, and that enable firms to be more competitive, strengthen the regional strategic goal to stimulate the regional economy. The evaluation of the proposed project in relation to the following policies would be intended to guide efforts toward achievement of such goals and does not infer regional interference with local land use powers.

3.09 Support local jurisdictions' efforts to minimize the cost of infrastructure and public service delivery, and efforts to seek new sources of funding for development and the provision of services.

3.10 Support local jurisdictions' actions to minimize red tape and expedite the permitting process to maintain economic vitality and competitiveness.

GMC POLICIES RELATED TO THE RCPG GOAL TO IMPROVE THE REGIONAL QUALITY OF LIFE

The Growth Management goals to attain mobility and clean air goals and to develop urban forms that enhance quality of life, that accommodate a diversity of life styles, that preserve open space and natural resources, and that are aesthetically pleasing and preserve the character of communities, enhance the regional strategic goal of maintaining the regional quality of life. The evaluation of the proposed project in relation to the following policies would be intended to provide direction for plan implementation, and does not allude to regional mandates.

3.18 Encourage planned development in locations least likely to cause environmental impact.

3.20 Support the protection of vital resources such as wetlands, groundwater recharge areas, woodlands, production lands, and land containing unique and endangered plants and animals.

3.21 Encourage the implementation of measures aimed at the preservation and protection of recorded and unrecorded cultural resources and archaeological sites.

3.22 Discourage development, or encourage the use of special design requirements, in areas with steep slopes, high fire, flood, and seismic hazards.

3.23 Encourage mitigation measures that reduce noise in certain locations, measures aimed at preservation of biological and ecological resources, measures that would

reduce exposure to seismic hazards, minimize earthquake damage, and to develop emergency response and recovery plans.

GMC POLICIES RELATED TO THE RCPG GOAL TO PROVIDE SOCIAL, POLITICAL, AND CULTURAL EQUITY

The Growth Management Goal to develop urban forms that avoid economic and social polarization promotes the regional strategic goal of minimizing social and geographic disparities and of reaching equity among all segments of society. The evaluation of the proposed project in relation to the policy stated below is intended guide direction for the accomplishment of this goal, and does not infer regional mandates and interference with local land use powers.

3.27 *Support local jurisdictions and other service providers in their efforts to develop sustainable communities and provide, equally to all members of society, accessible and effective services such as: public education, housing, health care, social services, recreational facilities, law enforcement, and fire protection.*

REGIONAL TRANSPORTATION PLAN

The **Regional Transportation Plan (RTP)** also has goals, objectives, policies and actions pertinent to this proposed project. This RTP links the goal of sustaining mobility with the goals of fostering economic development, enhancing the environment, reducing energy consumption, promoting transportation-friendly development patterns, and encouraging fair and equitable access to residents affected by socio-economic, geographic and commercial limitations. Among the relevant goals, objectives, policies and actions of the RTP are the following:

Core Regional Transportation Plan Policies

4.02 *Transportation investments shall mitigate environmental impacts to an acceptable level.*

4.04 *Transportation Control Measures shall be a priority.*

4.16 *Maintaining and operating the existing transportation system will be a priority over expanding capacity.*

AIR QUALITY CHAPTER CORE ACTIONS

The **Air Quality Chapter** core actions related to the proposed project includes:

5.07 Determine specific programs and associated actions needed (e.g., indirect source rules, enhanced use of telecommunications, provision of community based shuttle services, provision of demand management based programs, or vehicle-miles-traveled/emission fees) so that options to command and control regulations can be assessed.

5.11 Through the environmental document review process, ensure that plans at all levels of government (regional, air basin, county, subregional and local) consider air quality, land use, transportation and economic relationships to ensure consistency and minimize conflicts.

OPEN SPACE CHAPTER ANCILLARY GOALS

Public Health and Safety

9.04 Maintain open space for adequate protection of lives and properties against natural and man-made hazards.

9.05 Minimize potentially hazardous developments in hillsides, canyons, areas susceptible to flooding, earthquakes, wildfire and other known hazards, and areas with limited access for emergency equipment.

9.06 Minimize public expenditure for infrastructure and facilities to support urban type uses in areas where public health and safety could not be guaranteed.

Resource Protection

9.08 Develop well-managed viable ecosystems or known habitats of rare, threatened and endangered species, including wetlands.

WATER QUALITY CHAPTER RECOMMENDATIONS AND POLICY OPTIONS

The **Water Quality Chapter** core recommendations and policy options relate to the two water quality goals: to restore and maintain the chemical, physical and biological integrity of the nation's water; and, to achieve and maintain water quality objectives that are necessary to protect all beneficial uses of all waters.

11.02 Encourage "watershed management" programs and strategies, recognizing the primary role of local governments in such efforts.

11.05 Support regional efforts to identify and cooperatively plan for wetlands to facilitate both sustaining the amount and quality of wetlands in the region and expediting the process for obtaining wetlands permits.

11.06 Clean up the contamination in the region's major groundwater aquifers since its water supply is critical to the long-term economic and environmental health of the region. The financing of such clean-ups should leverage state and federal resources and minimize significant impacts on the local economy.

11.07 Encourage water reclamation throughout the region where it is cost-effective, feasible, and appropriate to reduce reliance on imported water and wastewater discharges. Current administrative impediments to increased use of wastewater should be addressed.

CONCLUSIONS

All feasible measures needed to mitigate any potentially negative regional impacts associated with the proposed project should be implemented and monitored, as required by CEQA.

SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS

Roles and Authorities

THE SOUTHERN CALIFORNIA ASSOCIATION OF GOVERNMENTS (SCAG) is a ***Joint Powers Agency*** established under California Government Code Section 6502 et seq. Under federal and state law, SCAG is designated as a Council of Governments (COG), a Regional Transportation Planning Agency (RTPA), and a Metropolitan Planning Organization (MPO). SCAG's mandated roles and responsibilities include the following:

SCAG is designated by the federal government as the Region's ***Metropolitan Planning Organization*** and mandated to maintain a continuing, cooperative, and comprehensive transportation planning process resulting in a Regional Transportation Plan and a Regional Transportation Improvement Program pursuant to 23 U.S.C. '134, 49 U.S.C. '5301 et seq., 23 C.F.R. '450, and 49 C.F.R. '613. SCAG is also the designated ***Regional Transportation Planning Agency,*** and as such is responsible for both preparation of the Regional Transportation Plan (RTP) and Regional Transportation Improvement Program (RTIP) under California Government Code Section 65080 and 65082 respectively.

SCAG is responsible for developing the demographic projections and the integrated land use, housing, employment, and transportation programs, measures, and strategies portions of the ***South Coast Air Quality Management Plan,*** pursuant to California Health and Safety Code Section 40460(b)-(c). SCAG is also designated under 42 U.S.C. '7504(a) as a ***Co-Lead Agency*** for air quality planning for the Central Coast and Southeast Desert Air Basin District.

SCAG is responsible under the Federal Clean Air Act for determining ***Conformity*** of Projects, Plans and Programs to the State Implementation Plan, pursuant to 42 U.S.C. '7506.

Pursuant to California Government Code Section 65089.2, SCAG is responsible for ***reviewing all Congestion Management Plans (CMPs) for consistency with regional transportation plans*** required by Section 65080 of the Government Code. SCAG must also evaluate the consistency and compatibility of such programs within the region.

SCAG is the authorized regional agency for ***Inter-Governmental Review*** of Programs proposed for federal financial assistance and direct development activities, pursuant to Presidential Executive Order 12,372 (replacing A-95 Review).

SCAG reviews, pursuant to Public Resources Code Sections 21083 and 21087, Environmental Impacts Reports of projects of regional significance for consistency with regional plans [California Environmental Quality Act Guidelines Sections 15206 and 15125(b)].

Pursuant to 33 U.S.C. '1288(a)(2) (Section 208 of the Federal Water Pollution Control Act), SCAG is the authorized ***Areawide Waste Treatment Management Planning Agency.***

SCAG is responsible for preparation of the ***Regional Housing Needs Assessment,*** pursuant to California Government Code Section 65584(a).

SCAG is responsible (with the Association of Bay Area Governments, the Sacramento Area Council of Governments, and the Association of Monterey Bay Area Governments) for preparing the ***Southern California Hazardous Waste Management Plan*** pursuant to California Health and Safety Code Section 25135.3.

Revised July 2001

LETTER 4

LETTER 4

COUNTY OF LOS ANGELES
DEPARTMENT OF PARKS AND RECREATION

RECEIVED
MAR 06 2003
By

March 4, 2003

Mr. Dan Masnada, General Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, California 91350-2173

Dear Mr. Masnada:

NOTICE OF PREPARATION FORCASTAIC LAKE WATER AGENCY SUPPLEMENTAL WATER PROJECT TRANSFER OF 41,000 ACRE-FEET OF STATE WATER PROJECT TABLE A AMOUNT FROM KERN COUNTY WATER AGENCY

The Above stated Notice of Preparation for the Castaic Lake Water Agency Supplemental Water Project has been reviewed for its potential impact on the Parks and Recreation facilities. Transferring the water through the California Aqueduct will not impact the facilities under the jurisdiction of this Department as described in the Notice of Preparation. However, we would appreciate review of the Draft and Final Environmental Impact Reports for internal information with this Department.

Thank you for including this Department in the review of the Notice of Preparation. If we may be of further assistance, you may contact Ms. Lillie Lowery, Departmental Facilities Planner I, at (213) 738-3235.

Sincerely,

Lillie Lowery

Lillie Lowery, Departmental Facilities Planner I For
Joan Rupert, Section Head
Environmental and Grants Section

C: Lillie Lowery, DPR

LETTER 4

LETTER 4

COUNTY OF LOS ANGELES

DEPARTMENT OF PUBLIC WORKS

900 SOUTH FREMONT AVENUE
ALHAMBRA, CALIFORNIA 91803-1331
Telephone: (626) 458-5100
www.ladpw.org

JAMES A. NOYES, Director

ADDRESS ALL CORRESPONDENCE TO:
P.O. BOX 1460
ALHAMBRA, CALIFORNIA 91802-1460

IN REPLY PLEASE
REFER TO FILE: W-0

February 3, 2003

Mr. Dan Masnada, General Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350-2173

LOS ANGELES COUNTY WATERWORKS DISTRICT NO. 36, VAL VERDE
NOTICE OF PREPARATION OF A DRAFT ENVIRONMENTAL IMPACT REPORT
COMMENTS

Thank you for the opportunity to review your Notice of Preparation of a Draft Environmental Impact Report for the transfer of 41,000 acre-feet of State Water Project Table A Amount from Kern County Water Agency to you. We have no comments to offer.

Very truly yours,

JAMES A. NOYES
Director of Public Works

for BRIAN D. HOOPER
Assistant Deputy Director
Waterworks and Sewer Maintenance Division

GMP:lb
WW3262

LETTER 4

LETTER 4

COUNTY OF LOS ANGELES

FIRE DEPARTMENT

1320 NORTH EASTERN AVENUE
LOS ANGELES, CALIFORNIA 90063-3294

(323) 890-4330

RECEIVED
MAR 0 3 2003
By

P. MICHAEL FREEMAN
FIRE CHIEF
FORESTER & FIRE WARDEN

February 28, 2003

Dan Masnada, General Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

Dear Mr. Masnada:

NOTICE PREPARATION FOR THE DRAFT ENVIRONMENTAL IMPACT REPORT CASTAIC LAKE WATER AGENCY SUPPLEMENTAL WATER PROJECT, TRANSFER OF 41,000-ACRE FEET OF STATE WATER PROJECT TABLE A AMOUNT FROM KERN COUNTY WATER AGENCY, "CITY OF CASTAIC" -- (EIR #1586/2003)

The Notice of Preparation for the Draft Environmental Impact Report for the Castaic Lake Water Agency Supplemental Water Project has been reviewed by the Planning Section, Land Development Unit, and Forestry Division of the County of Los Angeles Fire Department. The following are their comments:

LAND DEVELOPMENT UNIT:

The County of Los Angeles Fire Department, Land Development Unit appreciates the opportunity to comment on this project. However, this project does not propose structures or any other improvements that appear to have a significant impact that requires a comment from the Land Development Unit.

Should any questions arise regarding subdivision, water systems, or access please contact Inspector J. Scott Greenelsh at (323) 890-4235.

FORESTRY DIVISION:
The statutory responsibilities of the County of Los Angeles Fire Department, Forestry Division include erosion control, watershed management, rare and endangered species, vegetation, fuel modification for Very High Fire Hazard Severity Zones or Fire Zone 4, archeological and cultural resources and the County Oak Tree Ordinance. Potential impacts in these areas should be addressed in the Environmental Impact Report.

If you have any additional questions, please contact this office at (323) 890-4330.

Very truly yours,

David R. Leininger

DAVID R. LEININGER, CHIEF, FORESTRY DIVISION
PREVENTION BUREAU

DRL:lc

LETTER 4

County of Los Angeles Public Library
7400 East Imperial Hwy., P.O. Box 7011, Downey, CA 90241-7011
(562) 940-8461, TELEFAX (562) 803-3032

MARGARET DONNELLAN TODD
COUNTY LIBRARIAN

February 25, 2003

Castaic Lake Water Agency
Attn: Dan Masnada, General Manager
27234 Bouquet Canyon Road
Santa Clarita, CA 91350-2173

CASTAIC LAKE WATER AGENCY SUPPLEMENTAL WATER PROJECT TRANSFER FROM KERN COUNTY WATER AGENCY REQUEST FOR COMMENTS

Dear Mr. Masnada:

This is in response to your request for comments on the above-referenced project. We have reviewed the material and are providing the following comments concerning library service.

The project area is in the Santa Clarita Valley Bookmobile service area, located at 22704 West Ninth St., Santa Clarita, CA 91321. The expansion project does not propose development of new residential units, therefore, there will be no impact on library service. Impact on library service is based on an increase in population, which triggers the need for additional facility space, books, and other materials. Any increase in population would create an impact on library service.

Thank you for the opportunity to respond to the Notice of Preparation. If you have any questions or need additional information please call me at (562) 940-8455.

Sincerely,

Michele Mathieu

Michele Mathieu
Administrative Assistant

:mm

c: Margaret Donnellan Todd
David Flint

LETTER 4

LETTER 4

County of Los Angeles
Sheriff's Department Headquarters
4700 Ramona Boulevard
Monterey Park, California 91754-2169
(805) 255-1121

LEROY D. BACA, SHERIFF

RECEIVED
JAN 2003

January 27, 2003

Castaic Lake Water Agency
Attn: Dan Masnada, General Manager
27234 Bouquet Canyon Road
Santa Clarita, California 91350

Dear Mr. Masnada:

NOTICE OF PREPARATION
CASTAIC LAKE WATER AGENCY
TRANSFER OF 41,000 ACRE-FEET OF STATE WATER

I am in receipt of your letter dated January 22, 2003, regarding the Castaic Lake Water Agency and its acquisition of 41,000 acre feet of water from the Kern County Water Agency.

I have reviewed the document and do not anticipate any impacts on our agency as a result of the implementation of this project.

If you have any further questions please feel free to call me at (661) 255-1121 ext. 5101 or Deputy Patrick Rissler at ext. 5159.

Sincerely,

LEROY D. BACA, SHERIFF

Donald A. Rodriquez, Captain
Santa Clarita Valley Station

DAR:par

A Tradition of Service

LETTER 4

county of ventura

RECEIVED
APR 1 4 2003
By

PUBLIC WORKS AGENCY
RONALD C. COONS
Agency Director

Transportation Department
Wm. Butch Britt, Director
Water Resources & Development Department
John C. Crowley, Director
Central Services Department
Lane B. Holt, Director
Environmental & Energy Resources Department
Kay Martin, Director
Watershed Protection District
Jeff Pratt, Director
Engineering Services Department
Alec T. Pringle, Director

April 8, 2003

Castiac Lake Water Agency
Mr. Dan Masnada, General Manager

27234 Bouquet Canyon Rd.
Santa Clarita, Ca 91350

SUBJECT: Supplemental Water Project Transfer, 41,000 Acre Feet of Water from Kern County Water Agency to Castaic Water Agency, State Water Project

Dear Mr. Masnada :

The Ventura County Watershed Protection District (District) has reviewed the submittal for the transfer of water from Kern County Water Agency to the Castiac Water Agency. The project has no existing or proposed direct connections to District jurisdictional facilities and does not indicate any encroachments to District Rights of Way. The District has no comments with respect to flood control and NPDES issues. If you have questions regarding this review, please call the undersigned at 654-2906.

Very truly yours,

Kevin Keivanfar, P.E.
Permit Engineer, Permit Section
Flood Control Department

KK/tt

LOG NO. 20030122-006

LETTER 4

LETTER 4

Friends of the Santa Clara River

660 Randy Drive, Newbury Park, California 91320-3036 • (805) 498-8328

RECEIVED
FEB 21 2003
By

February 20, 2003

Castaic Lake Water Agency
Attention: Dan Masnada, General Manager
27234 Bouquet Canyon Road
Santa Clarita, CA 91350-2173

Re: Notice of Preparation, EIR for 41,000 Acre-feet Transfer from Kern County Water Agency, Dated January 22, 2003

Dear Mr. Masnada,

Friends of the Santa Clara River (FSCR) offers the following comments on the referenced Notice of Preparation (NOP).

The Castaic Lake Water Agency (CLWA) is not the proper Lead Agency to prepare an Environmental Impact Report (EIR) for this project under the California Environmental Quality Act.

The 1995 Monterey Agreement between the California Department of Water Resources (DWR) and water contractors of the State Water Project was put in place to control transfers of the type described in the subject document. There is at present no Monterey Agreement EIR because of the PCL decision of September 2000, which held that the Monterey Agreement EIR prepared by CCWA was inadequate. The court held that the DWR was the proper Lead Agency for this Agreement because only the DWR has the statewide perspective needed to evaluate the environmental impacts to the entire water distribution system.

The EIR for the 41,000 acre-feet transfer must tier from a certified Monterey Agreement EIR, which does not currently exist. This was indeed suggested by the Second Appellate District Court decision of January 2002 in the case brought against CLWA by FSCR. Page 19 of this decision states that "Respondent may be able to cure the PCL problem by awaiting action by the state DWR complying with the PCL decision, then issuing a subsequent EIR, supplement to EIR, or Addendum to EIR (Guidelines 15162, 15163, 15164) tiering on a new Monterey Agreement EIR.".

Board of Directors

Ron Bottorff
Chair
Barbara Wampole
Vice-Chair
Lynne Plambeck
Treasurer
Jo Rogers
Secretary

Affiliated Organizations

California Native Plant Society
L.A./Santa Monica Mountains Chapter

Santa Clarita Organization for Planning the Environment (SCOPE)

Sierra Club
Angeles Chapter
Los Padres Chapter

Surfrider Foundation

Audubon Society
Ventura Chapter

Ventura County Environmental Coalition

LETTER 4

Since CLWA cannot legally be the Lead Agency for the subject transfer, the only legitimate way for CLWA to proceed with EIR preparation is to await DWR's preparation and certification of a Monterey Agreement EIR.

Thank you for the opportunity to comment.

Sincerely,

Ron Bottorff

Ron Bottorff, Chair

cc: California Department of Water Resources

LETTER 4

RECEIVED
2/24/03
LP

SCOPE

Santa Clarita Organization for Planning and the Environment

TO PROMOTE, PROTECT AND PRESERVE THE ENVIRONMENT, ECOLOGY AND QUALITY OF LIFE IN THE SANTA CLARITA VALLEY

POST OFFICE BOX 1182, SANTA CLARITA, CA 91386

2-23-03

Attn: Dan Masnada, General Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Rd.
Santa Clarita, Ca. 91350-2173

Re: Notice of Preparation - 41,000 AF Water Transfer EIR

Dear Mr.Masnada:

We are concerned that your Notice of Preparation ignores the ruling by the 2nd District Appellate Court set which set aside the original EIR in this matter. That EIR was set aside because the Monterey Agreement EIR on which it was tiered had been set aside. The new Monterey Agreement EIR has not yet been completed, therefore CLWA must wait to complete their new document until this program EIR is completed.

Further, we protest your Agency's continued reliance on this 41,000AF transfer in your Urban Water Management Plan and to support, new, additional and unapproved development. Such actions make a mockery of the EIR process. No valid evaluation of impacts can be discussed, if you are proceeding with the project no matter what is disclosed. This is illegal and is not supported by Judge Yaffee's decision.

An EIR that purports to address all impacts statewide, thus eliminating the need for a program EIR on the Monterey Agreement, must be prepared by the Dept. of Water Resources as the lead agency. The 3rd District Appellate Court, in its decision on the Monterey Agreement EIR, found that Central Coast Water Agency, was the wrong lead agency. We urge you not to attempt to move forward using the same judicial error for which a previous action, very well known to you, was set aside as it will be a waste of the public's time and money.

We therefore ask that you do not proceed with this EIR as the lead agency, since this action is clearly illegal. If you wish to proceed, then the Dept. of Water Resources must be the lead agency for the EIR.

Sincerely,

Pat Saletore

Pat Saletore
Faxed to 661 297-1611

LETTER 4

LETTER 4

SIERRA CLUB
FOUNDED 1892
Angeles Chapter

3435 Wilshire Boulevard
Suite 320
Los Angeles, CA 90010-1904

(213) 387-4287 phone
(213) 387-5383 fax
www.angeles.sierraclub.org

RECEIVED
FEB 25 2003
By

2-22-03

Castaic Lake Water Agency
Attn: Dan Masnada, General Manager
27234 Bouquet Canyon Rd.
Santa Clarita, Ca. 91350-2173

Re: Notice of Preparation
41,000 AF Water Transfer EIR

Dear Sir:

As you are well aware, the 2nd District Appellate Court set aside the original EIR in this matter because the Monterey Agreement EIR on which it was tiered had been set aside. The new Monterey Agreement EIR has not yet been completed, therefore CLWA must wait to complete their new document until this program EIR is completed.

Further, if the water transfer EIR purports to address all impacts statewide, thus eliminating the need for a program EIR on the Monterey Agreement, then the Dept. of Water Resources must be the lead agency. The 3rd District Appellate Court, in its decision on the Monterey Agreement EIR, found that Central Coast Water Agency (then headed by yourself, Mr. Masnada), was the wrong lead agency. The Sierra Club finds it incredible that you would attempt to move forward using the same judicial error for which a previous action, very well known to you, was set aside. You are wasting the public's time and money.

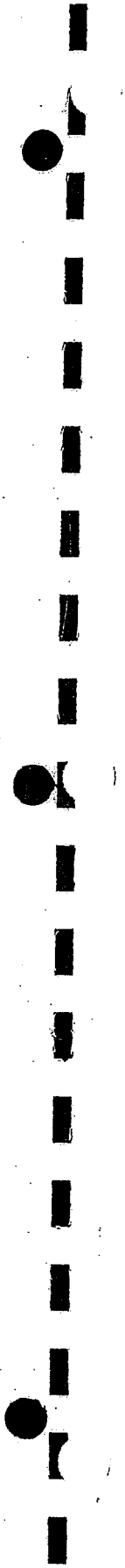
We therefore ask that you do not proceed with this EIR as the lead agency, since this action is clearly illegal. If you wish to proceed, then the Dept. of Water Resources must be the lead agency for the EIR.

Sincerely,

Dr. Gordon LaBedz
Conservation Chair

Faxed to 661 297-1611
Hard copy to follow by regular mail

LETTER 4



In re: Castaic Lake Water Agency)
Supplemental Water Project)
Transfer of 41,000 Acre-feet)
Water Project Table A Amount from)
Kern County Water Agency EIR.)
)
)
)

Public Comment Hearing Castaic Lake Water Agency Supplemental Water Project Transfer of 41,000 Acre-feet Water Project Table A Amount from Kern County Water Agency EIR, at Castaic Water Agency, 27234 Bouquet Canyon Road, Santa Clarita, California, scheduled for 7:00 p.m., Monday, February 10, 2003, before Lisa DiGiovanni, Certified Shorthand Reporter No. 11969.

A P P E A R A N C E S

LISBETH A. SPRINGER, A.I.C.P.
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION
525 Anacapa Street
Santa Barbara, California 93101
(805) 564-6154
springerl@saic.com

ALSO PRESENT:
ALICIA GASDICK
DAN MASNADA

BARKLEY
Court Reporters

SANTA CLARITA, CALIFORNIA

MONDAY, FEBRUARY 10, 2003; 7:32 P.M.

MS. SPRINGER: My name is Lisbeth Springer. We are here to open the scoping meeting for the Castaic Lake Water Agency Supplemental Water Project Transfer of 41,000 Acre-feet Water Project Table A Amount from Kern County Water Agency EIR. The date is February 10th, 2003. No members of the public are present to provide comments. It's 7:32, and since no one has appeared from the public to provide comments, we will go ahead and close the scoping meeting.

(Meeting adjourned at 7:32 p.m.)

BARKLEY
Court Reporters

LETTER 4

Appendix B

Biological Resources

LETTER 4

Table 1. Sensitive Plant Species Potentially Occurring in the WRMWSD or the San Joaquin Valley Floor Area

(page 1 of 3)

Scientific Name/ Common Name	*Regulatory Status Federal/State/CNPS*	*Habitat and Regional Occurrence*[1]
Federally or State-Listed Rare, Threatened or Endangered Species		
Atriplex tularensis Bakersfield smallscale	FSC/E/1B	Chenopod scrub; possibly extinct, the only recent reported occurrence at Kern Lake Preserve (within the WRMWSD) may be *A. serenana* and not *A. tularensis* (CNPS 2001); KCVFHCP.
Caulanthus californicus California jewel-flower	E/E/1B	Sandy soils in chenopod scrub, pinyon and juniper woodland, valley and foothill grassland; historically reported from within the WRMWSD about 8 miles north of Taft, but believed to be extirpated from this location (CNDDB 2002); KCVFHCP.
Eremalche kernensis Kern mallow	E/-/1B	Chenopod scrub, valley and foothill grassland; KCVFHCP.
Eriastrum hooveri Hoover's eriastrum	T/-/4	Chenopod scrub, pinyon and juniper woodland, valley and foothill grassland; possible in grassland-scrub habitats; KCVFHCP.
Fritillaria striata Striped adobe-lily	FSC/T/1B	Usually clay soils in cismontane woodland, valley and foothill grassland; known only from Kern and Tulare counties, reported from the Tejon Ranch area within the WRMWSD; KCVFHCP.
Monolopia (= Lembertia) congdonii San Joaquin woollythreads	E/-/1B	Chenopod scrub, valley and foothill grassland; KCVFHCP.
Opuntia basilaris var. *treleasei* Bakersfield beavertail cactus	E/E/1B	Chenopod scrub, cismontane woodland, valley and foothill grassland; several reported occurrences in the WRMWSD (CNDDB 2002); KCVFHCP.
Pseudobahia peirsonii San Joaquin adobe sunburst	T/E/1B	Found in adobe clay soils in cismontane woodland, valley and foothill grassland in Kern, Tulare and Fresno counties; KCVFHCP.
Federal Species of Special Concern and Species Listed by CNPS		
Antirrhinum ovatum Oval-leaved snapdragon	-/-/4	Clay or gypsum, often alkaline soils in chaparral, cismontane woodland, pinyon and juniper woodland, valley and foothill grassland.
Atriplex cordulata Heartscale	FSC/-/1B	Found in saline or alkaline, sandy soils in chenopod scrub, meadows and seeps, valley or foothill grassland; reported from within the WRMWSD in the vicinity of the Buena Vista Lake Bed (CNDDB 2002); KCVFHCP.
Atriplex depressa Brittlescale	FSC/-/1B	Alkaline, clayey soils in chenopod scrub, meadows and seeps, valley and foothill grassland, vernal pools.
Atriplex vallicola Lost Hills crownscale	FSC/-/1B	Chenopod scrub, valley and foothill grasslands, vernal pools, alkaline soils; KCVFHCP.
Calochortus striatus Alkali mariposa lily	FSC/-/1B	Chaparral, chenopod scrub, Mojavean desert scrub, alkaline meadows and ephemeral washes; reported from the Buena Vista Aquatic Recreation Area (CNDDB 2002) within the WRMWSD.

Table 1. Sensitive Plant Species Potentially Occurring in the WRMWSD or the San Joaquin Valley Floor Area
(page 2 of 3)

Scientific Name/ Common Name	*Regulatory Status Federal/State/CNPS*	*Habitat and Regional Occurrence*[1]
Calycadenia villosa Dwarf calycadenia	FSC/-/1B	Chaparral, cismontane woodland, meadows and seeps, valley and foothill grassland; believed extirpated from Kern County (CNPS 2001).
Canbya candida Pygmy poppy	-/-/4	Joshua tree "woodland," Mojavean desert scrub, pinyon and juniper woodland.
Cirsium crassicaule Slough thistle	FSC/-/1B	Chenopod scrub, marshes and swamps (sloughs), riparian scrub in Kings, Kern and San Joaquin counties; KCVFHCP.
Clarkia tembloriensis ssp. *calientensis* Vasek's clarkia	FSC/-/1B	Valley and foothill grassland; endemic to Kern County, known from three occurrences near Caliente Creek; KCVFHCP.
Cordylanthus mollis ssp. *hispidus* Hispid bird's-beak	FSC/-/1B	Alkaline areas in meadows and seeps, playas, valley and foothill grasslands; believed extirpated from much of the lower San Joaquin Valley, reported from the Tulare Basin within the WRMWSD (CNDDB 2002).
Delphinium recurvatum Recurved larkspur	FSC/-/1B	Cismontane woodland, chenopod scrub, valley and foothill grassland; reported from the WRMWSD (CNDDB 2002); KCVFHCP.
Erodium macrophyllum Round-leaved filaree	-/-/2	Cismontane woodland, valley and foothill grassland; reported from Wind Wolves Preserve within the WRMWSD (CNDDB 2002).
Eschscholzia lemmonii ssp. *kernensis* Tejon poppy	FSC/-/1B	Valley and foothill grassland; endemic to Kern County, reported from several occurrences within the WRMWSD (CNDDB 2002).
Heterotheca shevockii Shevock's golden-aster	-/-/1B	Sandy soils in chaparral, cismontane woodland; endemic to Kern County, known only from the lower Kern River canyon in the Greenhorn Mountains.
Layia leucopappa Comanche Point layia	FSC/-/1B	Chenopod scrub, valley and foothill grassland; endemic to Kern County, several occurrences reported near Comanche Point in the Tejon Hills (CNDDB 2002) within the WRMWSD; KCVFHCP.
Layia munzii Munz's tidy-tips	FSC/-/1B	Alkaline or clayey areas in chenopod scrub, valley and foothill grassland in Fresno, Kern and San Luis Obispo counties.
Lepidium jaredii ssp. *jaredii* Jared's pepper-grass	FSC/-/1B	Alkaline, adobe areas in valley and foothill grassland in Kern and San Luis Obispo counties; known only from the Devil's Den area in Kern County.
Linanthus serrulatus Madera linanthus	FSC/-/1B	Cismontane woodland, lower montane coniferous forest.
Madia radiata Showy madia	FSC/-/1B	Cismontane woodland, valley and foothill woodland.

Table 1. Sensitive Plant Species Potentially Occurring in the WRMWSD or the San Joaquin Valley Floor Area

(page 3 of 3)

Scientific Name/ Common Name	*Regulatory Status Federal/State/CNPS*	*Habitat and Regional Occurrence*[1]
Mimulus pictus Calico monkeyflower	FSC/-/1B	Broadleaved upland forest, cismontane woodland in Kern and Tulare counties; reported in the vicinity of Tejon Ranch within the WRMWSD (CNDDB 2002).
Navarretia peninsularis Baja navarretia	-/-/1B	Mesic areas in openings in chaparral, lower coniferous forest.
Navarretia setiloba Piute Mountains navarretia	FSC/-/1B	Cismontane woodland, pinyon-juniper woodland, valley and foothill grasslands in Kern and Tulare counties; known from fewer than ten occurrences, reported near Grapevine Peak within the WRMWSD (CNDDB 2002).
Phacelia nashiana Charlotte's phacelia	FSC/-/1B	Joshua tree "woodland," Mojavean desert scrub, pinyon and juniper woodland in Inyo, Kern and Tulare counties.
Stylocline citroleum Oil neststraw	FSC/-/1B	Chenopod scrub, coastal scrub (?), valley and foothill grassland, clay soils in oil-producing areas, Kern and San Diego counties (believed extirpated from San Diego County); known from approximately ten occurrences in the East Elks Hills, historically reported from the Buena Vista Hills within the WRMWSD (CNDDB 2002).
Stylocline masonii Mason's neststraw	FSC/-/1B	Chenopod scrub, pinyon and juniper woodland.

Notes: 1. WRMWSD denotes species reported from the Wheeler Ridge-Maricopa Water Storage District (CNDDB 2002); KCVFHCP denotes species identified in the Kern County Valley Floor Habitat Conservation Plan (Kern County 2001); other special status plants are reported from Kern County (CNDDB 1999) but not within WRMWSD.

Status:

Federal:
- E = Listed as Endangered.
- T = Listed as Threatened.
- FSC = Federal Species of Concern.

State:
- E = Listed as Endangered.
- T = Listed as Threatened.

CNPS:
- 1B = List 1B - Plants rare and endangered in California and elsewhere
- 2 = List 2 - Plants rare and endangered in California but more common elsewhere
- 4 = List 4 - A watch list, plants of limited distribution

Table 2. Sensitive Wildlife Species Potentially Occurring in the WRMWSD or the San Joaquin Valley Floor Area

(page 1 of 4)

Scientific Name/ Common Name	*Regulatory Status Federal/State*	*Habitat and Regional Occurrence*
Federally or State-Listed Rare, Threatened or Endangered Species		
Ammospermophilus nelsoni San Joaquin antelope squirrel	FSC/T	Open, sparsely vegetated grassland, desert scrub with gullies and washes. Numerous records within the region; KCVFHCP.
Charadrius alexandrinus nivosus (nesting) Western snowy plover	T/CSC	Sandy beaches, salt pond levees, and shores of large alkali lakes. Needs sandy, gravelly, or friable soils for nesting. Historical record from Buena Vista Lake bed.
Charina bottae umbratica. Southern rubber boa	FSC/T	Fossorial to semi-fossorial occurring in higher elevation forests and meadows as well as lower elevation riparian woodlands. May occur on Central Valley floor.
Coccyzus americanus occidentalis (nesting) Western yellow-billed cuckoo	-/E	Riverine woodlands, thickets, and farms. Historic records from Buena Vista Lake bed.
Desmocerus californicus dimorphus Valley elderberry longhorn beetle	T/-	Elderberry trees associated with riparian habitat along rivers throughout the Central Valley. No known populations in southern San Joaquin Valley region.
Dipodomys ingens Giant kangaroo rat	E/E	Annual grasslands on the western side of the San Joaquin Valley; marginal habitat in alkali scrub. Several records from region; KCVFHCP.
Dipodomys nitratoides nitratoides Tipton kangaroo rat	E/E	Saltbrush scrub and sink scrub communities in the Tulare Lake Basin of the southern San Joaquin Valley. Several occurrences in the region; KCVFHCP.
Empidonax traillii (nesting) Willow flycatcher	-/E	Riparian woodlands that contain water and low growing willow thickets. Known to occur in higher elevations and may occur in foothills and valley bottom.
Empidonax traillii extimus (nesting) Southwestern willow flycatcher	E/E	Riparian woodlands that contain water and low growing willow thickets. Known to occur in higher elevations and may occur in foothills and valley bottom.
Euproserpinus euterpe Kern primrose sphinx moth	T/-	Adult females lay their eggs on evening primrose plants, *Camissonia* sp. in southern Kern County. No known populations.
Gambelia silus (=*G. sila*) Blunt-nosed leopard lizard	E/E	Prefers sparsely vegetated plains, alkali flats, low foothills, desert scrub, and large washes. Several records documented in the region; KCVFHCP
Vulpes macrotis mutica San Joaquin kit fox	E/T	Grasslands and blue oak savannas of San Joaquin Valley; loose soils for burrowing. Numerous records within the region; KCVFHCP.

Table 2. Sensitive Wildlife Species Potentially Occurring in the WRMWSD or the San Joaquin Valley Floor Area

(page 2 of 4)

Scientific Name/ Common Name	*Regulatory Status Federal/State*	*Habitat and Regional Occurrence*
Federal Species of Concern and State Species of Special Concern		
Accipiter cooperii (nesting) Cooper's hawk	-/CSC	Open woodlands especially riparian woodland. Occurs throughout southern San Joaquin Valley.
Agelaius tricolor (nesting colony) Tricolored blackbird	FCS/CSC	Inhabits freshwater marshes and riparian scrub. Several occurrence documented in the region.
Antrozous pallidus Pallid bat	-/CSC	Nests in dry, rocky habitats/caves, crevices in rocks, arid habitats including deserts, chaparral, and scrublands. Occurs throughout San Joaquin Valley.
Aquila chrysaetos (nesting and wintering) Golden eagle	-/CSC	Mountains, deserts, and open country. Suitable nest habitat is primarily cliffs and rocky ledges, sometimes trees, and occasionally ground and man-made structures. Occasionally observed in the region.
Asio otus Long-eared owl	-/CSC	Riparian and live oak woodlands. Dense stands of trees. Known to occur in the region.
Athene cunicularia (burrow sites) Burrowing owl	FSC/CSC	Open grasslands, deserts, scrublands; low growing vegetation; small mammal burrows. Several records within the region.
Clemmys marmorata pallida Southwestern pond turtle	FCS/CSC	Inhabits ponds, marshes, rivers, streams, and irrigation ditches. Several observations within the region have been documented.
Corynorhinus townsendii pallescens Pale big-eared bat	FSC/CSC	Needs caves, tunnels, or other structures for roosting, vegetation and mesic edges for feeding; maternity roosts are in warm places. Known to occur in the region.
Dendroica petechia brewsteri (nesting) Yellow warbler	-/CSC	Riparian woodlands, montane chaparral, and mixed conifer habitats. Known to occur throughout southern San Joaquin Valley.
Dipodomys nitratoides brevinasus Short-nosed kangaroo rat	FSC/CSC	Western side of San Joaquin Valley in grassland and desert shrub associations; highly alkaline soils. Several records within southern San Joaquin Valley; KCVFHCP.
Eremophila alpestris actia California horned lark	-/CSC	Open habitats, grasslands along the coast, deserts near sea level to alpine dwarf shrub habitat, uncommonly in coniferous and chaparral habitats. May occur in region.
Eumops perotis californicus California mastiff bat	FSC/CSC	Primarily arid lowlands, especially deserts; open, semiarid to arid habitats including conifer and deciduous woodlands, coastal scrub, annual and perennial grasslands, palm oases, chaparral, desert scrub, and urban. Known to occur throughout region.
Falco mexicanus (nesting) Prairie falcon	-/CSC	Grasslands, savannahs, rangeland, agricultural fields, and desert scrub; often uses sheltered cliff ledges for cover. Known to occur in the region.

Table 2. Sensitive Wildlife Species Potentially Occurring in the WRMWSD or the San Joaquin Valley Floor Area
(page 3 of 4)

Scientific Name/ Common Name	*Regulatory Status Federal/State*	*Habitat and Regional Occurrence*
Icteria virens (nesting) Yellow-breasted chat	-/CSC	Riparian woodlands with a thick understory. Known to occur in the region.
Lytta hoppingi Hopping's blister beetle	FSC/-	Vernal pools and grasslands in San Joaquin Valley. Known to occur in region
Lytta molesta Molestan blister beetle	FSC/-	Most likely grasslands; adults are plant feeders. Several records from San Joaquin Valley including within Kern County.
Masticophis flagellum ruddocki San Joaquin whipsnake	FCS/CSC	Dry, hot, open vegetation with little or no tree cover such as valley grasslands. Known to occur in the region.
Myotis ciliolabrum Small-footed myotis	FSC/-	Cliff-face crevices, erosion cavities, and beneath rocks on the ground; also hibernating in caves or mines. Known to occur throughout the region.
Myotis yumanensis Yuma myotis	FSC/-	Caves, tunnels, or buildings; prefers open forests and woodlands with water but uses a variety of habitats; arid areas. Known to occur throughout Central Valley.
Onychomys torridus tularensis Tulare grasshopper mouse	FSC/CSC	Arid shrubland communities, arid grassland and shrubland associations, blue oak woodlands, alkali sink and mesquite associations on Valley Floor. No recent records in southern San Joaquin Valley; KCVFHCP.
Perognathus inornatus inornatus San Joaquin pocket mouse	FSC/-	Grasslands and blue oak savannas. Several records from southern San Joaquin Valley; KCVFHCP.
Phrynosoma coronatum frontale California horned lizard	FCS/CSC	Exposed gravelly, sandy soils with minimal shrubs, riparian woodland clearings, dry chamise chaparral, and annual grasslands with scattered seepweed or saltbush. Known to occur in southern San Joaquin Valley.
Scaphiopus hammondii Western spadefoot toad	FSC/CSC	Temporary pools in semiarid to arid short grass plains and sandy, gravelly areas such as alkali flats, washes, and river floodplains. Occurs in Central Valley foothills and valley floor.
Sorex ornatus relictus Buena Vista Lake shrew	E/CSC	Marshlands and riparian areas in the Tulare Basin. Several occurrences reported from the region; KCVFHCP.
Taxidea taxus American badger	-/CSC	Drier open stages of most shrub, forest, and herbaceous habitats with friable soils. Recently observed in the Maricopa Flat area; KCVFHCP.

Table 2. Sensitive Wildlife Species Potentially Occurring in the WRMWSD or the San Joaquin Valley Floor Area

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Scientific Name/ Common Name	*Regulatory Status Federal/State*	*Habitat and Regional Occurrence*
Toxostoma lecontei Le Conte's thrasher	-/CSC	Open desert wash, desert scrub, alkali desert scrub, and desert succulent scrub, nests in dense, spiny shrub or cactus in desert wash habitat. Several records within the region.

Notes: 1. KCVFHCP denotes species identified in the Kern County Valley Floor Habitat Conservation Plan (Kern County 2001).

Status:

Federal:

- E = Listed as Endangered.
- T = Listed as Threatened.
- FSC = Federal Species of Concern.

State:

- E = Listed as Endangered.
- T = Listed as Threatened.
- CSC = California Species of Special Concern.

Table 3. Sensitive Plants Potentially Occurring in the CLWA Service Area

(page 1 of 2)

Scientific Name / Common Name	*Regulatory Status Federal/State/CNPS*	*Habitat and Regional Occurrence*
State or Federally Listed Species		
Astragalus brauntonii Braunton's milk-vetch	E/-/1B	Recently burned chaparral vegetation, limestone soils; known from Simi Hills, Santa Monica Mountains.
Berberis nevinii Nevin's barberry	E/E/1B	Coastal scrub and chaparral along sandy washes; scattered occurrences in Transverse Ranges.
Brodiaea filifolia Thread-leaved brodiaea	T/E/1B	Vernal pools, recently rediscovered in Los Angeles County (1996).
Dodecahema leptoceras Slender-horned spineflower	E/E/1B	Restricted to alluvial fan sage scrub; known from Santa Clara River tributaries.
Navarretia fossalis Spreading navarretia	T/-/1B	Chenopod scrub, shallow fresh water marshes, and vernal pools; reported from Cruzan Mesa.
Orcuttia californica California Orcutt grass	E/E/1B	Vernal pools; historic and recent records from Cruzan Mesa.
Federal Candidate and CNPS Lists 1 and 2 Species that Could Be Eligible for Listing		
Calochortus clavatus var. *gracilis* Slender mariposa lily	-/-/1B	Foothill canyons in chaparral; occurs in San Gabriel Mountains.
Calochortus plummerae Plummer's mariposa lily	-/-/1B	Chaparral, other habitats, usually on granitic soils; Transverse and Peninsular Ranges.
Chorizanthe parryi var. *fernandina* San Fernando Valley spineflower	FL/SL[1]/1B	Sandy/gravelly washes in coastal scrub; historically in vicinity of Castaic, Newhall; recently discovered in the Simi Hills.
Deinandra (= Hemizonia) minthornii Santa Susana tarplant	-/R/1B	Rocky areas in chaparral, coastal scrub; common in Santa Susana Pass.
Dudleya multicaulis Many-stemmed dudleya	-/-/1B	Grassland and scrub habitats, associated with rock outcrops on clay soils; known from east of Simi Valley .
Galium grande San Gabriel bedstraw	-/-/1B	Lower montane coniferous forest, south slope of San Gabriel Mountains.
Opuntia basilaris var. *brachyclada* Short-joint beavertail	-/-/1B	Dry slopes in chaparral (at higher elevations than on project site); known from Santa Susana Pass.
Plants of Limited Distribution		
Acanthomintha obovata ssp. *cordata* Heart-leaved thorn-mint	-/-/4	Woodland, chaparral, and grassland habitats; known from areas to west in Ventura County.
Androsace elongata ssp. *acuta* California androsace	-/-/4	Scrub and woodland habitats; widely distributed but rare; not found recently in Los Angeles County.
Baccharis plummerae ssp. *plummerae* Plummer's baccharis	-/-/4	Rocky slopes, scrub and woodland habitats; primarily coastal, known from areas to west.
Calandrinia breweri Brewer's calandrinia	-/-/4	Disturbed or burned sites in coastal scrub and chaparral; widespread though uncommon.

Table 3. Sensitive Plants Potentially Occurring in the CLWA Service Area

(page 2 of 2)

Calystegia peirsonii Peirson's morning glory	-/-/4	Hillsides, rocky slopes in chaparral, coastal scrub; known from Newhall Ranch, Marple, Mint, and San Francisquito Canyons.
Convolvulus simulans Small-flowered morning glory	-/-/4	Wet clay and serpentine ridges; scattered at low to mid-elevations in coastal Southern California..
Galium cliftonsmithii Santa Barbara bedstraw	-/-/4	Partially shaded canyon habitats; mostly coastal, known from West Transverse Ranges.
Harpagonella palmeri Palmer's grapplinghook	-/-/4	On clay soils in grassland and scrub habitats; historically found near Saugus but unconfirmed in Los Angeles County in recent years.
Juncus acutus ssp. *leopoldii* Southwestern spiny rush	-/-/4	Marshes, wet meadows, often in saline habitats; widespread in coastal southern California and deserts.
Lilium humboldtii ssp. *ocellatum* Ocellated lily	-/-/4	Canyons; in oak woodland; widely distributed though uncommon in southern California.
Microseris douglasii ssp. *platycarpha* Small-flowered microseris	-/-/4	Inland clay soils, often near vernal pools or serpentine; widely distributed though uncommon in coastal central and southern California.
Mucronea californica California spineflower	-/-/4	Coastal scrub, chaparral on sandy soils; widespread though uncommon in coastal central and southern California.
Perideridia pringlei Adobe yampah	-/-/4	Grassland, scrub, woodland habitats, on serpentine; coastal central California to West Transverse Ranges.

Notes: 1. This species was listed as endangered under the California Endangered Species Act in August of 2001.

Source: CDFG (2002b), CNPS (2001), Aspen Environmental Group (1996), Hickman (1993), PCR (2000), and County of Los Angeles (1996)

Status:

Federal:
- E = Listed as Endangered.
- T = Listed as Threatened.
- FL = Federal Candidate for Listing.

State:
- E = Listed as Endangered.
- R = Listed as Rare.
- SL = State Candidate for Listing.

CNPS:
- 1B = List 1B - Plants rare and endangered in California and elsewhere
- 4 = List 4 - A watch list, plants of limited distribution

Table 4. Sensitive Wildlife Species Potentially Occurring in the CLWA Service Area
(page 1 of 4)

Scientific Name / Common Name	*Regulatory Status Federal/State*	*Habitat and Regional Occurrence*
State or Federally Listed or Proposed Species		
Bufo californicus Arroyo toad	E/CSC	Sandy stream terraces with closed canopies and grassy groundcover next to perennial stream. Primarily in Ventura and northern Los Angeles counties; Santa Clara River.
Buteo swainsoni Swainson's hawk	—/T	Forages over grasslands, savannas, and open areas. Nests in scattered trees near open areas. Nesting rare in Southern California. Possible as brief migrant, not likely to breed.
Catostomus santaanae Santa Ana sucker	T/CSC	Found in flowing streams with coarse substrate and little modification or pollution. Present in Santa Clara River but may have hybridized with the introduced Owens sucker.
Coccyzus americanus occidentalis Western yellow-billed cuckoo	—/E	Riverine woodlands, thickets, and farms. Known to occur in the region.
Empidonax traillii extimus Southwestern willow flycatcher	E/E	Dense willow thickets near slow-moving streams. Nests along Santa Clara River and other large streams.
Falco peregrinus anatum American peregrine falcon	DM/E	Forages over open areas, especially over water. Nests on cliffs with small caves.
Gasterosteus aculeatus williamsoni Unarmored threespine stickleback	E/E	Found in streams and pools with flowing water and emergent vegetation. Inhabits Santa Clara River.
Gymnogyps californianus California condor	E/E	Open savannahs and grassland. Nests on cliffs with small caves. Possibly forages over open areas.
Polioptila californica californica Coastal California gnatcatcher	T/CSC	Inhabits coastal sage scrub. Scattered observations throughout the area.
Rana aurora draytonii California red-legged frog	T/CSC	Inhabits unpolluted freshwater streams and marshes with emergent aquatic vegetation such as tules, bulrushes, or cattails. Known from Piru Creek, San Francisquito Creek; possible elsewhere.
Vireo bellii pusillus Least Bell's vireo	E/E	Extensive, dense willow riparian thicket. Nests along Santa Clara River and other large streams.
Federal Candidate and Federal and State Species of Special Concern		
Accipiter cooperii Cooper's hawk	—/CSC	Heavily wooded, semi-open areas, breeds in riparian and oak woodlands. Known to occur throughout the region.
Accipiter striatus Sharp-shinned hawk	—/CSC	Uncommon migrant and winter visitor in heavily wooded semi-open areas. Mostly likely during winter, unlikely breeder.
Agelaius tricolor Tricolored blackbird	FSC/CSC	Freshwater marshes and riparian scrub. Few occurrences in region.

Table 4. Sensitive Wildlife Species Potentially Occurring in the CLWA Service Area

(page 2 of 4)

Scientific Name / Common Name	*Regulatory Status Federal/State*	*Habitat and Regional Occurrence*
Aimophila ruficeps canescens Southern California rufous-crowned sparrow	FSC/CSC	Generally, steep, rocky areas within coastal sage scrub and chaparral, often with scattered bunches of grass; prefers relatively recently burned areas. Observed on Newhall Ranch; locally common.
Amphispiza belli Bell's sparrow	FSC/CSC	Dense, dry chamise chaparral and coastal slopes of coastal sage scrub. Locally common.
Anniella pulchra pulchra Silvery legless lizard	FSC/CSC	Several habitats but especially in coastal dune, valley-foothill, chaparral, and coastal scrub habitats; loose sandy soil. Known to occur throughout the region.
Antrozous pallidus Pallid bat	–/CSC	Forages in open areas; roosts in rock crevices and caves.
Aquila chrysaetos Golden eagle	–/CSC	Mountains, deserts, and open country. Suitable nest habitat is primarily cliffs and rocky ledges, sometimes trees, and occasionally ground and man-made structures. Occasionally observed in the region.
Asio otus Long-eared owl	–/CSC	Riparian and live oak woodlands. Known to occur in region.
Athene cunicularia hypugea Burrowing owl	FSC/CSC	Dry grasslands, desert habitats, open pinyon-juniper, ponderosa pine woodlands below 5,300 feet elevation; berms, ditches, and grasslands adjacent to rivers, agricultural, and scrub areas. Occasional visitor.
Buteo regalis Ferruginous hawk	–/CSC	Rivers, lakes, and coasts; open tracts of sparse shrubs and grasslands, and agricultural areas during winter. Rare migrant through region.
Circus cyaneus Northern harrier	–/CSC	Forages in marshes and grassy meadows; uncommon; occasionally forages over open desert and brushlands.
Cnemidophorus tigris multiscutatus Coastal western whiptail	FSC/–	Arid and semi-arid desert to open woodlands, where vegetation is sparse; loose soils in chaparral and scrub habitats. Known to occur throughout the region.
Dendroica petechia brewsteri Yellow warbler	–/CSC	Inhabits willow-riparian habitats. Numerous records from region.
Elanus leucurus White-tailed kite	–/FP	Forages in meadows and open areas. Nests in riparian woodland. Nesting in woodlands along Santa Clara River, Live Oak Springs and Placerita Canyon; near Pico Canyon; common locally.
Eremophila alpestris actia California horned lark	FSC/CSC	Open grasslands, fields, and agricultural areas. Known to occur throughout the region.
Euderma maculatum Spotted bat	FSC/CSC	Deserts, scrublands, chaparral, and coniferous woodlands. At least one record from the region.
Eumops perotis californicus Greater western mastiff-bat	FSC/CSC	Forages over chaparral and grasslands; roosts in rock crevices and old buildings.

Table 4. Sensitive Wildlife Species Potentially Occurring in the CLWA Service Area
(page 3 of 4)

Scientific Name / Common Name	*Regulatory Status Federal/State*	*Habitat and Regional Occurrence*
Falco mexicanus Prairie falcon	—/CSC	Forages in dry open habitat. Nests on cliffs with potholes. Known to breed in area.
Felis concolor Mountain lion	—/CSC	Rare residents of rugged terrain with dense cover, forages over large area. Tracks observed in Newhall Ranch area and presumed to occasionally forage on site.
Gila orcutti Arroyo chub	FSC/CSC	Adapted to the warm fluctuating streams of the Los Angeles Plain. Prefers the slowest moving sections of stream where bottom is sand or mud. Inhabits Santa Clara River and Castaic Creek.
Icteria virens Yellow-breasted chat	—/CSC	Prefer dense willow-riparian habitats. At least one record from San Francisquito Creek.
Ixobrychus exilis hesperis Western least bittern	—/CSC	Emergent wetlands of cattails and tules. Records from the Santa Clara River.
Lanius ludovicianus Loggerhead shrike	FSC/CSC	Open grassland, savannas, and chaparral. Fairly common.
Lepus californicus bennettii San Diego black-tailed jackrabbit	FSC/CSC	Open brushlands and scrub habitats between sea level and 4,000 feet elevation. Known to occur in region.
Macrotus californicus California leaf-nosed bat	FSC/CSC	Desert riparian, desert wash, desert scrub, desert succulent shrub, alkali desert scrub, and palm oasis. Roosts in tunnels, caves and possible buildings and bridges. Becoming rare locally.
Myotis thysanodes Fringed myotis	FSC/—	Dry, rocky habitats/caves, crevices in rocks, arid habitats, chaparral. Known to occur in region.
Myotis yumanensis Yuma myotis	FSC/CSC	Open forests and woodlands with water are optimal but uses a variety of habitats. Known to occur in region.
Neotoma lepida intermedia San Diego desert woodrat	FSC/CSC	Dense riparian and chaparral. Observed on Newhall Ranch and likely elsewhere.
Phrynosoma coronatum Coast horned lizard	FSC/CSC	Scrubland, grassland, coniferous forest, broad-leaf woodlands; sandy loose soils in chaparral scrub and washes. Known to occur throughout the region.
Onychomys torridus Ramona Southern grasshopper mouse	FSC/CSC	Grasslands, desert areas, especially scrub with friable soils. Recorded in Soledad Canyon.
Plecotus townsendii pallescens Pale Townsend's big-eared bat	FSC/CSC	Forages in forests, woodlands, grasslands, and open areas; roosts in caves and man-made structures.
Piranga rubra Summer tanager	—/CSC	Cottonwood-willow woodland and riparian scrub. Record from Santa Clara River near Lang.

Table 4. Sensitive Wildlife Species Potentially Occurring in the CLWA Service Area
(page 4 of 4)

Scientific Name / Common Name	*Regulatory Status Federal/State*	*Habitat and Regional Occurrence*
Salvadora hexalepis virgultea Coast patch-nosed snake	FSC/CSC	Found in coastal chaparral, desert scrub, washes, sandy flats, and rocky areas. Barren creosote bush desert flats. Sagebrush semi-deserts; sea level to 7,000 feet. Known to occur throughout the region.
Scaphiopus hammondii Western spadefoot toad	FSC/CSC	Lowland washes, floodplains, temporary ponds and vernal pools. Observed in Potrero Canyon Pond (Aspen 1996) and likely elsewhere.
Strix occidentalis occidentalis California spotted owl	—/CSC	Oak and oak-conifer habitats. Reported within the region.
Taxidea taxus American badger	—/CSC	Open areas with sandy soils.
Thamnophis hammondii Two-striped garter snake	FSC/CSC	Riparian and freshwater marshes with perennial water. Several records within the region.

Source: Aspen Environmental Group (1996), County of Los Angeles (1996), CDFG (2002a), PCR (2000)

Status:

Federal:
- E = Listed as Endangered.
- T = Listed as Threatened.
- FSC = Federal Special of Concern
- DM = Delisted Taxon, Recovered, Being Monitored First 5 Years

State:
- E = Listed as Endangered.
- T = Listed as Threatened.
- FP = Fully Protected Species.
- CSC = California Species of Special Concern.

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Appendix C

Agricultural Resources

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Effects on Agricultural Production from Transferring 41,000 Acre-Feet of State Water Project Entitlement from Wheeler Ridge-Maricopa Water Storage District

DRAFT REPORT

Prepared for

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May 23, 2003

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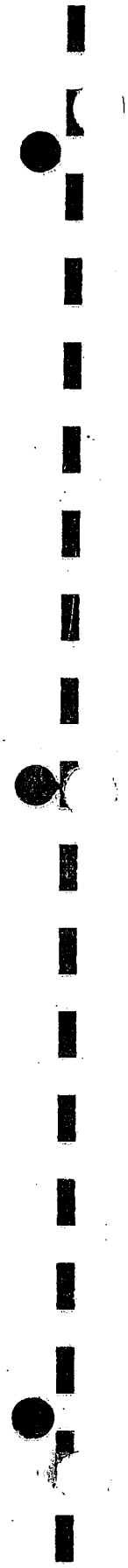

Executive Summary

- Between 1990 and 1999, permanent crops increased from 30 percent to 38 percent of cropped land in WRMWSD. Between 1999 and 2001, they rose to 48 percent. Vineyards are the single most important permanent crop. Permanent cropped acreage has increased in both surface water and ground water service areas of the district.

- Because of the large capital costs for establishing a vineyard, grove, or orchard, the increase in permanent crop acreage suggests that farmers in the service area are confident that they will be able to consistently obtain the water necessary for their operations. The actions of WRMWSD have increased the reliability of water and helped offset the rising costs of SWP surface water. Growers are able to produce more labor-intensive, higher value crops.

- WRMWSD has diversified its water supply and management portfolio dramatically since the 1980s. The district's SWP entitlement remains an integral component of total supplies, but supplemental sources now provide a substantial drought buffer for the district.

- WRMWSD has invested in ground water recharge storage and recovery systems outside of the WRMWSD service area as well as distribution and pumping infrastructure in order to increase the reliability of water in dry years. Banking surface water when available or conjunctively using ground water in wet and normal years allows WRMWSD to have a more reliable water supply when normal demand exceeds supplies available from the SWP. This banking and reliability more than offsets any of the impacts of the 41,000 AF transfer of SWP surface water.

- The transfer of 41,000 AF of SWP water will have little or no impact on cropping patterns and production in WRMWSD. The district has taken adequate steps to insure that more reliable water supplies from various sources will be available at lower cost to offset the transfer. The transfer and resulting payment for the transferred water reduce the fixed cost burden of the unneeded SWP entitlement and thus reduce the financial

burden to WRMWSD. The district is better able to continue to improve its water infrastructure and supply. Without this infrastructure and reliable supply, more lands will likely be removed from production temporarily or permanently.

- Farmed land in the WRMWSD has varied from a low of 60,370 acres in 1991, a severe drought year, to a high of 94,499 acres in 1998. Crop acreage fluctuated by an average of 11.6 percent each year between 1990 and 2001. The principal factors causing the variations likely have included water availability, crop rotations, and crop prices.

- During the last 12 years, the Wheeler Ridge-Maricopa Water Storage District (WRMWSD) has experienced a significant shift in agricultural cropping patterns, likely due in great part to the reliability and cost of water.

- Annual crop acreage has declined, while acreage in permanent crops has increased. Annual crop acreage fell by 13,376 acres in the WRMWSD surface water service areas from between 1990 and 1999 and by a further 9,068 acres between 1999 and 2001. In the surface water service areas, cotton acreage declined by 15,534 acres between 1990 and 1999 and by a further 1,528 acres between 1999 and 2001. Over the same two periods in the groundwater service areas, annual crop acreage increased by 8,668 and decreased by 5,128, respectively.

- Many economic factors influence cropping decisions and resultant cropping patterns. Changes in crop prices, particularly for cotton, and the total of variable costs (including water prices), as well as strong demands for grapes and citrus, appear to have influenced the decisions of farmers in the WRMWSD regarding crop choices.

- As overall production costs increase, including those for water, cotton growers find it harder and harder to stay in production. Rotation crops such as grain and hays do not even cover variable costs in some years. Growers are better off to fallow lands than to continue production of these crops.

- Fallowing has been a regular part of cropping patterns in WRMWSD. Between 1991 and 1998, the amount of fallowed land decreased by 34,000 acres. Since 1998, fallowed acreage has increased by 11,600 acres.

- During the early 1990s drought period, it became apparent that Department of Water Resources (DWR) announced water shortages could become a reality and that water costs would soar when water was not delivered. Following this period of drought impacts, WRMWSD experienced a significant shift of acreage to higher value crops such as fruits and vegetables and a reduction of acreage in lower value crops such as cotton,

hay, and other field crops. The last two to three years appears to be a period of leveling out of new perennial crop plantings and increased fallowing.

- Fallowing has increased since 1998 even though State Water Project (SWP) deliveries, with the exception of 2001, have been relatively high. The increase is probably due to market conditions, particularly for cotton, as well as other economic and agronomic reasons.

- Total applied agricultural water within WRMWSD averaged about 251,000 acre-feet (AF) annually between 1990 and 1999 and about 259,000 AF annually between 1999 and 2001. Over those two periods, total WRMWSD deliveries from all sources averaged 158,000 AF and 168,000 AF annually, respectively. The remainder was supplied by on-farm ground water pumping, user input, or other water supplies available to farmers in the WRMWSD area.

- Before the 41,000 AF transfer, WRMWSD held a water supply contract for about 238,000 AF of SWP water. After the transfer, the remaining 197,000 AF of contract amount, with supplemental supplies, should leave the district comfortably able to meet demands in normal and wet years. Neither cost nor availability should be adversely affected in those years, and the transfer should not, of itself, cause an increase in fallowing.

The WRMWSD supplemental water supplies were developed primarily to help meet demands during dry years. Those sources will more than make up for any dry year shortfall incurred as a result of the 41,000 AF of water transferred.

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Introduction

Agriculture is the main industry in the Wheeler Ridge-Maricopa Water Storage District (WRMWSD) service area. Agricultural lands in this area are among the most productive in Kern County and the entire state. Water is a key input to agriculture here, and has been instrumental in the production of a variety of crops destined for both domestic and international markets. The cost and availability of various water sources have significant effects on farm profitability and survivability.

Over time, farmers in the service area have changed cropping mixes, adopted different rotations, and used different water sources for their operations. These changes are an outgrowth of the many factors incorporated into the decision-making framework used by farmers, some unique to each farm, others common to all.

This report considers the farm-level impacts of the 41,000 acre-feet (AF) transfer of State Water Project (SWP) entitlement from WRMWSD to Castaic Lake Water Agency (CLWA). The focus of the analysis is on whether the transfer will cause changes in agricultural practices, including additional land fallowing within WRMWSD. The report is presented in three sections. The first is an assessment of pertinent existing conditions within WRMWSD. The discussion includes a review of crop acreages and use of various water sources over time. The second section describes the decision-making framework which farmers seeking specific economic objectives follow in determining which crops to plant and which inputs, including water, to use on these crops. This development follows widely-accepted principles of farm management and agricultural economics. The third section evaluates the effects of the transfer on land fallowing within WRMWSD.

Existing Conditions

Cropping Patterns[2]

Crops grown within the WRMWSD service area had a farm-level production value of nearly $283 million in 2001 (see Table 1).[3] Grapes provided the greatest dollar value, at 31 percent of the total, followed by mixed produce and melons at 26 percent, citrus at 25 percent, and cotton at seven percent. Total value in 2001 was 6 percent greater than the comparable value in 1999, and the value in 1999 was 23 percent higher than that in 1990. The allocation of value among crops has also changed a great deal since 1990, when grapes accounted for just 18 percent of the total, mixed produce and melons 36 percent, citrus 11 percent, and cotton 20 percent. Because of the 1987-92 drought that so severely impacted Kern County and the entire San Joaquin Valley, the value of crop production in WRMWSD fell between 1990 and 1992 and then rose to exceed the 1990 value only by 1995.

Since 1990, net farmed land[4] in WRMWSD has varied from a low of 60,370 acres in 1991 to a maximum of 94,499 acres in 1998 (see Table 2). For the 12 years shown, the normal annual variation in net farmed land was 11.6 percent,[5] or about 9,700 acres. As shown in Figure 1, the general trend in net cropped acreage was positive until about 1999.[6] Similarly,

2 Cropping information for WRMWSD is taken from annual crop reports provided by the district for the years 1990 through 2001.

3 Based on crop acreages reported by WRMWSD and average price and yield data reported for Kern County by the Kern County Department of Agriculture.

4 Measured as total cropped less double-cropped land.

5 Measured as the coefficient of variation, calculated as the standard deviation divided by the mean. See Snedecor and Cochran.

6 A two-period moving average is used to reduce variation typical between years.

the general trend in annual cropped acreage was positive until about 1996, then notably negative. In 1990, annual crops accounted for 70 percent of cropped acres.[7] By 1999, the annual crop share had fallen to 62 percent and by 2001 to 52 percent. Cotton, historically the predominant annual crop in WRMWSD, represented 61 percent of annual cropped land in 1990, but only 36 percent in 1999 and 37 percent in 2001. From its peak in 1996, annual cropped land fell 9,011 acres by 1999 and an additional 14,196 acres by 2001. Cotton accounted for nearly 80 percent of that reduction. Conversely, the acreage shares of mixed produce and melons rose from 31 percent in 1990 to 38 percent in 1999 and fell to 35 percent in 2001. The share of irrigated grains increased from zero in 1990 to 18 percent in 1999 and fell to 14 percent in 2001.

The negative trend for annual crops has been offset almost completely by the increases in permanent crop acreage. In 1990, permanent crops accounted for 30 percent of cropped land, with vineyards comprising 40 percent of the total, deciduous nuts 26 percent, citrus 23 percent, and deciduous fruits eight percent. In 1999, permanent crops accounted for 38 percent of cropped land, with vineyards 43 percent of the total, deciduous nuts 23 percent, citrus 27 percent, and deciduous fruits five percent. By 2001, permanent crops represented 48 percent, with vineyards at 44 percent of the total, deciduous nuts 21 percent, citrus 30 percent, and deciduous fruits five percent.

Table 2 shows fallowed land[8] ranging from a maximum of 51,620 acres in 1991 to a minimum of 17,649 acres in 1998. The spike in fallowed land in 1991 was attributable largely to the ongoing drought in California and sharply-reduced water supplies, together with higher costs of water from virtually all sources. Because of its different water sources, which are even more diversified today, WRMWSD was able to provide some water to farmers in 1991. Subsequently, fallowed acreage declined sharply until 1998 and has risen since then (see Figure 2). About 1,700 acres more land were fallowed in 2001 than in 1990.

Farmers fallow land for many reasons, both agronomic and economic. Agronomic reasons include the use of fallowing as part of crop rotations. Economic reasons include such factors as the market conditions and prices for the crops typically grown on the land and the cost and availability of production inputs, including water.

Without information from individual landowners, it is very difficult to distinguish between land that is fallowed temporarily and land that is removed from production either permanently or for a long term. The California Department of Conservation, which monitors land use with aerial photos taken every two years, reports previously productive, but

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7 Calculated relative to total cropped land because some annual cropland is double cropped.

8 As shown in WRMWSD crop reports. Fallowing generally refers to temporarily removing land from production to conserve moisture or to control pests.

currently idle, land as fallowed for at three monitoring cycles (that is, six years).[9] Ultimately, land may be fallowed for eight years before it is no longer considered to be in active agricultural use. Thus, it is not at all apparent that the increase in fallowed land with the WRMWSD service area since 1998 is attributable to a reduction in SWP entitlements within the district. Rather, the increase appears to be related more closely to crop markets and prices.

9 Molly Penberth, California Department of Conservation, April 30, 2003, personal communication.

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Table 1
Farm Level Value of Production, by Crop and Total, WRMWSD

Crop/Acres	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Cotton	$43,019,069	$16,689,629	$27,663,667	$33,714,831	$37,911,348	$34,831,452	$40,411,911	$38,485,118	$19,421,271	$26,461,166	$25,490,070	$18,582,103
Sugar Beets	$751,012	$672,471	$840,597	$862,677	$373,257	$466,458	$152,213	$0	$205,582	$0	$0	$0
Grain	$886,863	$953,001	$1,384,366	$2,017,655	$1,253,304	$3,138,780	$5,285,858	$3,058,269	$3,995,594	$4,101,029	$2,741,375	$2,808,474
Green Feeds	$1,396,620	$687,643	$705,721	$989,778	$1,415,864	$1,345,331	$1,415,121	$2,275,038	$1,968,264	$2,059,065	$1,980,664	$2,539,051
Mixed Produce	$77,196,114	$73,993,874	$37,366,098	$48,444,836	$41,735,435	$57,430,236	$49,788,591	$59,466,855	$54,425,094	$80,285,572	$72,435,938	$66,370,246
Melons	$0	$0	$15,178,882	$11,810,000	$17,527,192	$13,455,741	$13,424,661	$14,715,280	$13,970,325	$10,559,005	$8,968,780	$8,727,570
Vineyard	$38,927,352	$31,865,396	$37,027,240	$45,790,453	$45,763,512	$55,045,475	$64,192,513	$80,301,649	$73,479,669	$84,173,400	$84,581,368	$86,940,385
Deciduous Nuts	$18,754,834	$14,452,109	$12,384,408	$19,367,333	$16,053,249	$15,309,727	$18,210,636	$16,487,093	$16,267,367	$11,491,679	$13,021,446	$13,035,331
Deciduous Fruit	$11,206,519	$11,677,651	$7,492,311	$8,957,975	$7,888,785	$12,950,470	$11,608,728	$9,852,647	$10,991,313	$8,961,073	$14,345,391	$11,845,011
Citrus	$23,176,485	$10,233,881	$14,588,823	$31,144,607	$38,931,957	$39,672,318	$34,076,041	$55,669,042	$58,690,301	$37,264,234	$73,962,958	$71,330,901
Pomegranates	$375,112	$355,687	$917,011	$1,007,081	$1,324,308	$1,350,818	$1,408,974	$758,959	$647,472	$1,227,749	$454,063	$704,100
Eucalyptus	$15,437	$14,637	$36,576	$40,168	$22,638	$23,091	$76,269	$41,083	$36,396	$61,876	$22,884	$35,485
Jojoba	$997,211	$120,026	$519,901	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Value	$216,702,627	$161,716,007	$156,105,602	$204,147,394	$210,200,848	$235,019,897	$240,051,517	$281,111,032	$254,098,647	$266,645,848	$298,004,936	$282,918,657

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Table 2
WRMWSD Annual and Permanent Crop and Other Acreage

Crop	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Annual												
Cotton	38,071	16,192	24,621	31,063	33,369	36,795	34,702	32,369	24,953	20,781	22,110	16,204
Sugar Beets	723	746	825	689	370	409	151	0	181	0	0	0
Grain	2,692	3,450	9,859	8,162	3,739	9,530	11,804	8,203	15,586	0	0	0
Grain, Irrigated	0	0	0	0	0	0	0	0	0	10,605	7,378	6,208
Grain, Dry Farmed	0	0	0	0	0	0	0	0	0	1,655	2,117	3,099
Green Feeds	1,836	1,146	1,206	1,442	1,514	2,002	1,737	2,923	2,938	3,340	2,933	2,924
Mixed Produce	19,504	17,469	12,971	12,414	13,618	13,333	14,770	16,408	14,553	17,783	16,889	13,246
Melons	0	0	4,064	3,361	3,832	4,073	3,965	3,924	3,845	3,954	2,350	2,241
Total Annual	62,826	39,003	53,546	57,131	56,442	66,142	67,129	63,827	62,056	58,118	53,777	43,922
Surface Water Service Areas	43,092	20,947	34,731	36,939	35,870	43,153	45,183	42,945	40,634	29,716	26,591	20,648
Ground Water Service Areas	19,734	18,056	18,815	20,192	20,572	22,989	21,946	20,882	21,422	28,402	27,186	23,274
Permanent												
Vineyard	10,719	9,883	9,633	9,708	9,778	10,774	12,547	14,222	15,315	15,745	17,387	17,701
Almonds	0	0	5,103	5,225	5,301	5,155	5,540	5,524	6,099	6,282	6,410	5,994
Pistachios & Walnuts	0	0	1,797	1,797	2,098	2,100	2,100	2,100	2,099	2,099	2,099	2,376
Deciduous Nuts	6,865	6,899	6,900	7,022	7,399	7,255	7,640	7,624	8,198	8,381	8,509	8,370
Deciduous Fruit	2,074	2,102	2,013	2,008	2,060	2,066	2,154	2,205	2,104	1,989	2,058	1,928
Citrus	6,212	6,233	6,675	6,932	7,241	7,471	7,870	8,482	9,011	9,737	11,123	12,029
Pomegranates	243	243	351	351	351	351	351	351	338	377	377	377
Eucalyptus	10	10	14	14	6	6	19	19	19	19	19	19
Jojoba	646	82	199	0	0	0	0	0	0	0	0	0
Total Permanent	26,769	25,452	25,785	26,035	26,835	27,923	30,581	32,903	34,985	36,248	39,473	40,424
Surface Water Service Areas	24,824	24,025	24,339	24,598	25,242	26,005	28,081	29,923	31,364	32,350	35,021	35,533
Ground Water Service Areas	1,945	1,427	1,446	1,437	1,593	1,918	2,500	2,980	3,621	3,898	4,452	4,891
Total Cropped	89,595	64,455	79,331	83,166	83,277	94,065	97,710	96,730	97,041	94,366	93,250	84,346
-Double Crop	5,314	4,085	3,525	4,510	4,233	4,663	5,092	5,441	2,542	3,155	2,622	1,541
Net Farmed	84,281	60,370	75,806	78,656	79,044	89,402	92,618	91,289	94,499	91,211	90,628	82,805
+Fallow Lands	27,588	51,620	36,031	33,189	32,980	22,523	19,584	20,949	17,649	20,855	21,659	29,291
Total Cultivated	111,869	111,990	111,837	111,845	112,024	111,925	112,202	112,238	112,148	112,066	112,287	112,096
Miscellaneous	6,840	6,847	6,839	6,843	6,849	6,841	6,859	6,860	6,856	6,850	6,864	6,852
Deferred Lands	1,659	1,659	1,659	1,659	1,659	1,659	1,659	0	0	0	0	0
Other Lands	668	738	880	968	919	1,073	1,098	1,129	1,183	1,270	1,361	1,257
Native Vegetation	25,626	25,428	25,405	25,305	25,169	25,122	24,802	26,393	26,434	26,434	26,434	26,739
Total District	146,662	146,662	146,620	146,620	146,620	146,620	146,620	146,620	146,621	146,620	146,946	146,944

Figure 1
Annual, Permanent, and Net Crop Acreage, WRMWSD

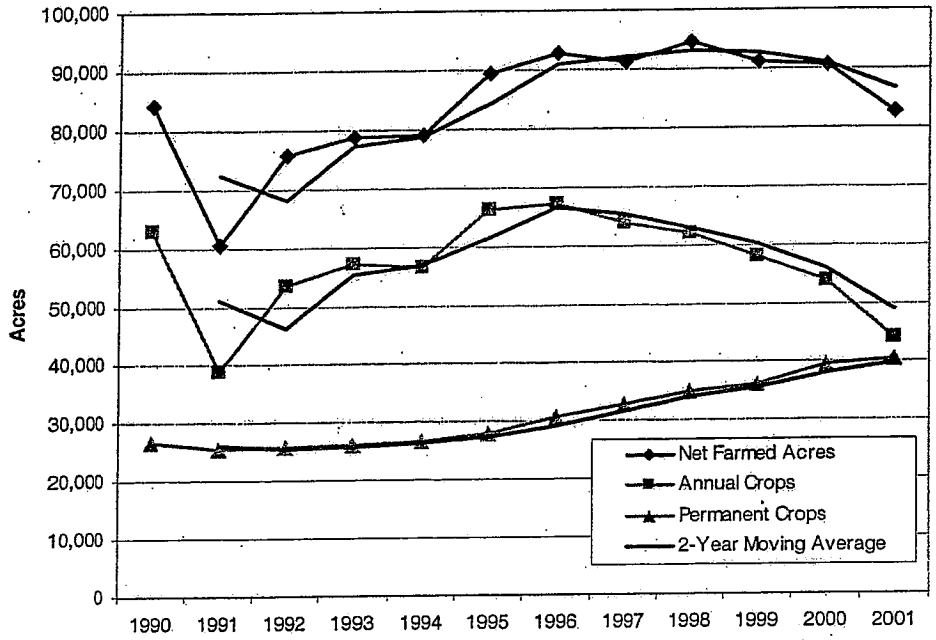
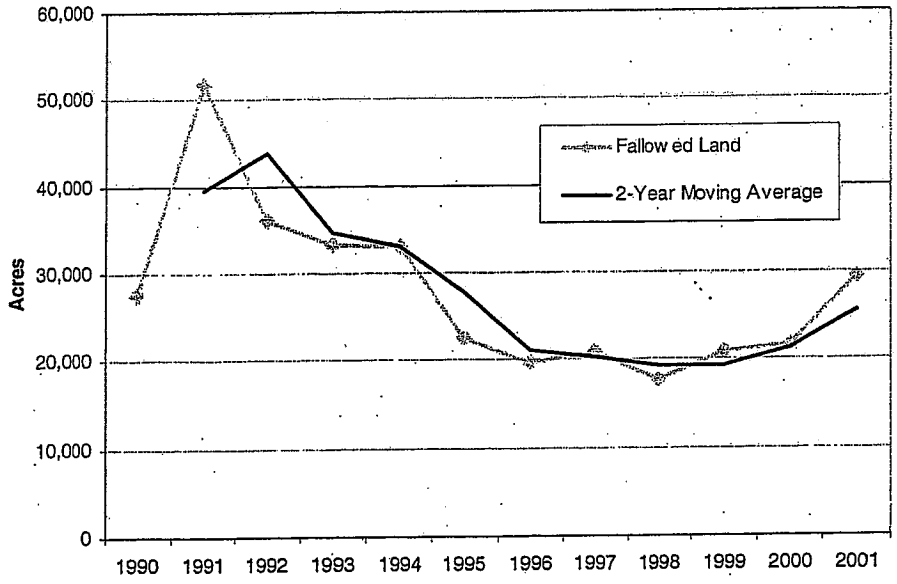


Figure 2
Fallowed Land, WRMWSD



Cropping Pattern Changes by Service Area

WRMWSD includes lands served by surface water or ground water or, in some cases, both. Cropped acreage in the surface water service areas (without exclusion of double cropping) fell by 5,850 acres between 1990 and 1999 and a further 5,885 acres between 1999 and 2001. Cropped land in the ground water areas increased 10,621 acres between 1990 and 1999 and fell 4,135 acres between 1999 and 2001.[10] The amount of annual crops in surface water areas fell by 13,376 acres between 1990 and 1999 and a further 9,068 acres between 1999 and 2001. For the two periods in the ground water areas, annual crop land increased by 8,668 acres and fell by 5,128 acres. The acreage of permanent crops rose in both surface water and groundwater service areas (see Figures 3 and 4).

The decline in annual crops and increase in permanent crops in surface water areas relates well to lower prices for some annual crops and higher water prices over the period. As discussed elsewhere in this section, cotton prices have fallen in both nominal and real terms since 1990, and it is no longer feasible to grow cotton in many parts of Kern County. Many cotton producers have been impacted by a "cost-price squeeze" quite common in agriculture.

The shift to permanent crops in the surface water service areas suggests that farmers in those areas are confident that they will be able to obtain water regularly either from within or outside WRMWSD, with or without the 41,000 AF of water under consideration. The capital investment for establishing an orchard, grove, or vineyard can easily exceed $8,000 per acre, excluding land, and farmers will not make those investments unless they are confident that they will be able to obtain adequate water for commercial production or, at minimum, keeping the trees or vines alive. While SWP water certainly remains an important part of the total WRMWSD supply, the SWP component of supply has been supplemented by the development and availability of several sources of supplemental water discussed elsewhere in this section.

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10 Wheeler Ridge-Maricopa Water Storage District, various years, "Crop and Land Use Summary," Bakersfield. The changes also reflect, in part, the reclassification of lands within WRMWSD.

Figure 3
Annual Crop Land in Surface and Ground Water Service Areas, WRMWSD

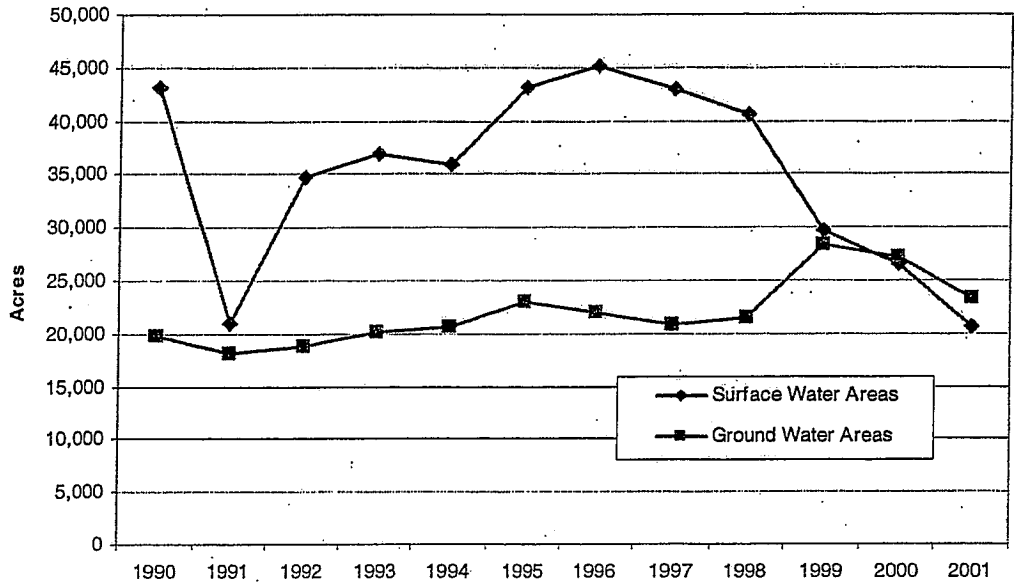
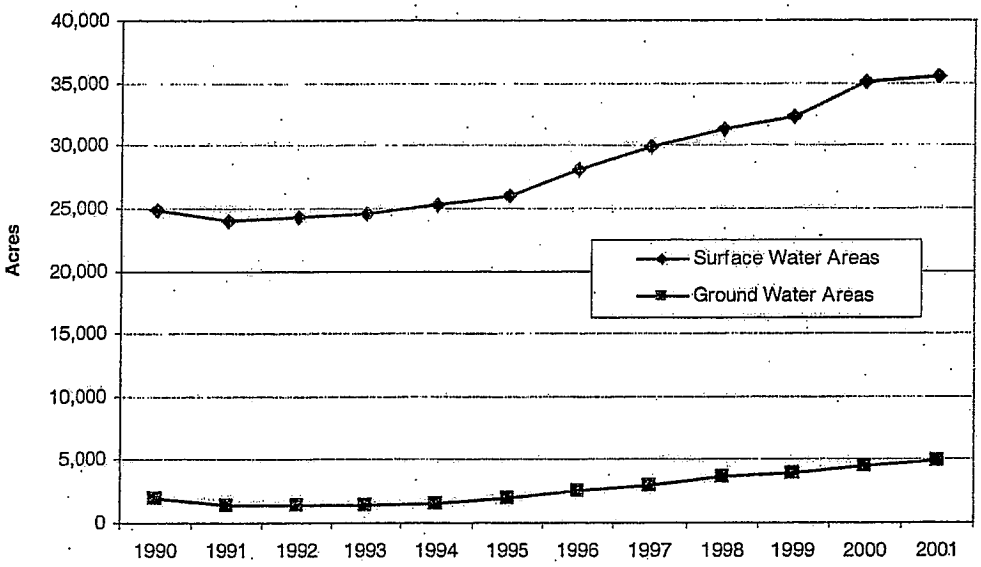


Figure 4
Permanent Crop Land in Surface and Ground Water Areas, WRMWSD



Factors Accounting for Cropping Pattern Changes

Changes in cropping patterns, whether from one type of annual crop to another or from annual crops to permanent crops, may be due to several factors. Some of the more important within WRMWSD may include:[11]

- Market conditions and crop prices;
- Input requirements and costs;
- Soil and micro-climate characteristics;
- Crop rotation requirements, including fallowing;
- Water availability and cost;
- Government programs; and
- Contracts with crop processors.

Absent detailed information from each farmer in an area, it is not possible to attribute changes in cropping patterns to any of these or other individual factors. However, changes in prices and production costs for key crops, particularly cotton, grapes, and citrus, and in water costs and availability appear to have played important roles.

Cotton prices have declined in both nominal and real terms since 1990. Acala cotton grown in Kern County[12] sold at an average farm price of $0.77 per pound in 1990. Yield averaged 1,200 pounds per acre, and gross revenue thus averaged $924 per acre.[13] In 2001, the last year for which data are currently available, the average farm price for Acala cotton grown in Kern County was $0.68 per pound. Yield averaged 1,342 pounds per acre, and gross revenue averaged $905 per acre.

While average per-acre gross revenue fell 2.1 percent between 1990 and 2001, costs of production have increased sharply and profitability has declined or disappeared for many growers. In 1995, average total costs to produce cotton in the San Joaquin Valley were estimated at $815 per acre, assuming a yield of 1,250 pounds of lint and application of 2.5

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11 These are discussed in more detail in the section on farm-level decision making.

12 Acala cotton has accounted for 76 to 93 percent of all Kern County cotton since 1990.

13 Kern County Department of Agriculture.

AF of water at $50 per AF.[14] The total cost figure excludes a payment for management or risk. Average gross revenue for cotton that year in Kern County was reported to be $815 per acre.[15] Thus, the average gross revenue for cotton in 1995 would just cover all costs, but not cover a payment to compensate for management and risk. Moreover, WRMWSD delivered water costs that year were between $58 and $193 per AF, depending on the zone of the district to which the water was delivered.[16] Thus, all other factors unchanged, cotton production in WRMWSD that year would have generated losses of between $20 and $483 per acre, disregarding any compensation for risk or management.[17]

Current published costs are $1,002 per acre for Acala cotton, assuming a lint yield of 1,250 pounds per acre and 2.5 AF of water at $60 per AF, but also excluding payments for risk and management.[18] Under these conditions and based on current cotton prices (assumed at $0.70 per pound, including loan deficiency payments), gross revenue would exceed total costs by $61 per acre, but without a return for management or risk. However, WRMWSD delivered water costs ranged from $89 to $230 per AF in 2001 and are expected to range from $101 to $260 per AF for all of 2002.[19] Clearly, cotton production is infeasible in parts of WRMWSD, and the result has been a continued shift from cotton to other, higher-profit crops

While not an exhaustive list, several factors may limit farmers from changing their crop mix. First, the market demands for fruits, nuts, and vegetable crops may signal that additional plantings of those crops would have adverse effects on supply and price. Second, processing capacity and the unavailability of processor contracts may limit the amount of vegetable crops such as tomatoes a farmer chooses to grow. Third, field and grain crops, while sometimes unprofitable in isolation, remain important parts of diversified crop rotations. Fourth, the crop history and risk characteristics of farmers may reduce the attraction of changing established cropping patterns.

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14 University of California Cooperative Extension, 1995.

15 Kern County Department of Agriculture.

16 Robert Kunde, WRMWSD, April 1, 2003, personal communication.

17 It is acknowledged that every farm is unique, characterized by soil type, debt levels, water sources and other factors. Moreover, acreage data show that cotton is clearly still profitable on some farms in WRMWSD. However, the sharp declines in cotton acreage since 1990 indicate that the crop is less profitable or unprofitable in many parts of the district.

18 University of California Cooperative Extension, 2003.

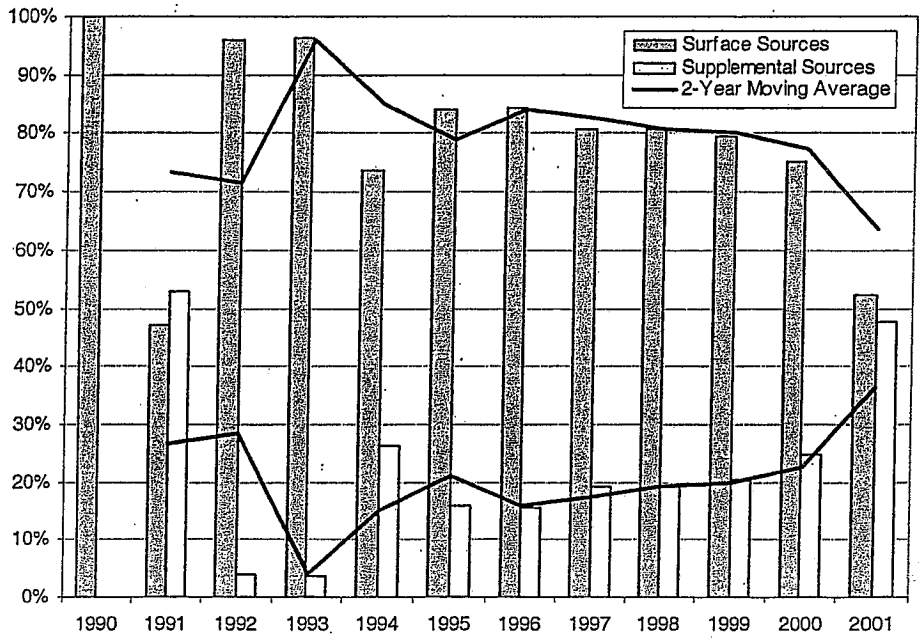
19 Robert Kunde, WRMWSD, April 1, 2003, personal communication.

Water Sources

WRMWSD has a contract for SWP water through Kern County Water Agency and regularly provides that water to farmers as supplies permit. However, WRMWSD has also developed district wells and has access to other water sources such that its "water portfolio" is much more diversified today than it was in the late 1980s or early 1990s. Much of this diversification was in response to the nearly complete abrogation of the State of California's responsibility to provide a reliable water supply from the State Water Project, aggravated by the effects of the 1987-92 drought.

Several individual sources collectively comprise the "supplemental water." These include district wells, Blanco Rosa Improvement District wells, Kern Water Bank, Pioneer Project, Berrenda Mesa project, and miscellaneous supplies. Figure 5 shows that these alternative sources have become an increasingly-important component of total WRMWSD potential water availability. The two-period moving average trend line is clearly upward sloping, while that for traditional surface sources is declining. It should be noted that the data on which the figure is based include potential surface and supplemental water supplies rather than actual deliveries. Potential surface supplies are calculated as the sum of Article 21 water, carryover, user input, and the product (SWP Entitlement * Percentage of SWP Allocation) for each year.

Figure 5
Surface and Supplemental Water Sources, WRMWSD



Water Use

WRMWSD maintains records for all water deliveries it makes each year. It does not obtain information on ground water pumping by individual farmers. Thus, total water use within the district for any given year is not a single number that can be taken from a report. Bookman-Edmonston Engineering developed average applied water requirements for crops grown in WRMWSD.[20] Estimates of total applied water within WRMWSD were developed by using these estimates and multiplying those rates by acreages taken from the annual WRMWSD crop reports. The application rates used are shown in Table 3. The estimated applications, total WRMWSD deliveries, and estimated water applied, but from other sources, are shown in Table 4.

For the period from 1990 through 1999, total annual deliveries by WRMWSD averaged 158,056 AF. From 1999 through 2001, they averaged 168,335 AF. Based on the application rates shown in Table 3 and the crop acreages shown in Table 2, WRMWSD deliveries accounted for about 63 percent of total water applied to crops in the service area from 1990 through 1999 and 65 percent from 1999 through 2001. It should be noted that the estimated applied water figures in Table 4 represent potential applications and assume that farmers were able to obtain all required water in each year. For years in which all water supplies were limited (e.g., 1991), the applied water figures overstate actual applications.

Table 3
Average Applied Water Requirements for Various Crops Grown in WRMWSD

Crop	Average Applied Water Requirement (Acre-feet per acre)
Cotton	3.00
Sugar beets	4.20
Grains	1.35
Green feeds	5.00
Mixed produce	2.20
Melons	2.20
Vineyards	2.80
Deciduous nuts	3.90
Deciduous fruits	3.90
Citrus	3.60
Pomegranates	3.60
Eucalyptus/jojoba	2.50

20 Bookman-Edmonston Engineering.

LETTER 4

Table 4
Estimated Applied Water, by Crop and Source, WRMWSD Service Area (Acre-Feet)

Crop	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Cotton	114,213	48,576	73,863	93,189	100,107	110,385	104,106	97,107	74,862	62,343	66,327	48,612
Sugar beets	3,037	3,133	3,465	2,894	1,554	1,718	634	0	760	0	0	0
Grain	3,634	4,658	13,310	11,019	5,048	12,866	15,935	11,074	21,041	16,551	12,820	12,566
Green feeds	9,180	5,730	6,030	7,210	7,570	10,010	8,685	14,615	14,685	16,700	14,665	14,620
Mixed produce	42,909	38,432	28,536	27,311	29,960	29,333	32,494	36,098	32,017	39,123	37,158	29,141
Melons	0	0	8,941	7,394	8,430	8,961	8,723	8,633	8,459	8,699	5,168	4,930
Vineyard	30,013	27,672	26,972	27,182	27,378	30,167	35,132	39,822	42,882	44,086	48,684	49,563
Deciduous Nuts	26,774	26,906	26,910	27,386	28,856	28,295	29,796	29,734	31,972	32,686	33,185	32,639
Deciduous Fruit	8,089	8,198	7,851	7,831	8,034	8,057	8,401	8,600	8,206	7,757	8,026	7,519
Citrus	22,363	22,439	24,030	24,955	26,068	26,896	28,332	30,535	32,436	35,053	40,043	43,308
Pomegranates	875	875	1,264	1,264	1,264	1,264	1,264	1,264	1,217	1,357	1,357	1,357
Eucalyptus/jojoba	1,640	230	533	35	15	15	48	48	48	48	48	48
Total estimated applied water [1/]	262,726	186,848	221,704	237,670	244,283	267,965	273,549	277,527	268,584	264,402	267,480	244,303
Total WRMWSD Deliveries	187,335	65,274	125,979	146,524	160,564	162,138	202,581	198,305	149,292	182,570	183,929	138,506
WRMWSD Deliveries/Total estimated applied water	71%	35%	57%	62%	66%	61%	74%	71%	56%	69%	69%	57%
Estimated Water Applied From Other Sources	75,391	121,574	95,725	91,146	83,720	105,827	70,968	79,222	119,292	81,832	83,551	105,797

1/ Assumes supplies available regardless of source.

Decision-Making by Farmers

The data shown in the previous section reflect the combined effects of innumerable decisions made by farmers in the WRMWSD service area each year. Farm-level decision making in WRMWSD and every other agricultural area is a continuous process that adheres to and at times departs from traditional economic theory and models.

Farmers operate, more than most other industries, in an environment closely aligned with the "purely competitive" model of economics.[21] Agriculture includes thousands of producing units all making decisions independent of each other, virtually all are price takers, all have access to good information about markets and prices, and all, or nearly all, are trying to earn as much profit as they can from their operations.

There are extensive domestic and international influences on agriculture. Domestically, the price of natural gas affects fertilizer prices, the price of crude oil affects costs of gasoline and diesel fuel, interest rates affect the cost of operating loans, and economic growth affects consumer demands for all types of products. Agriculture is also subject to many influences from the global economy, evident in the tariffs in the U.S. and other countries on agricultural imports, the increasing production of such crops as cotton and deciduous nuts in Asia, and fluctuating exchange rates.

The decision-making framework which farmers must employ for their operations therefore includes considerations well beyond the farm gate. The results are indicated by decisions such as:

- Crops to plant and when;
- Inputs used and in what combinations;

21 See Henderson and Quandt.

- When and how to acquire or sell resources;
- When and where to sell harvested crops; and
- When to adopt new technology.

Profit Maximization

One of the key assumptions in agricultural economics and farm management is that farmers attempt to use resources in a way that will maximize the profit of their operations.[22] An expanded form of that assumption is that farmers, with limited capital, attempt to allocate resources to their land in order to maximize profit across all crops they grow. There are many combinations of inputs which farmers can use in their operations, reflecting opportunities and costs. For example, weeds can be controlled chemically or with manual labor. Seeding and harvesting can be accomplished mechanically or by hand. Land preparation and fertilizing can be undertaken by the farmer or performed by custom operators.

In attempting to maximize profits, farmers weigh the tradeoffs and combine inputs in such a way that, at the margin, the value of product produced with each unit of input is the same for all inputs. All other factors unchanged, so long as the "value of marginal product" is greater for one input than for others, it is rational for the farmer to use at least one more unit of that input because the revenue from the product produced with that unit will exceed the cost of the input.[23] It is reasonable to assume that this framework is applicable not only to such inputs as fertilizer and chemicals, but also to water.

Crop Rotations and Profit Maximization Over Time

The decision-making framework is somewhat more complicated for the more realistic situation of farming continuously over time rather than in many separate single-year periods. This is particularly true for trees and vines, which take several years to mature and then remain productive for many years. However, for farmers growing several annual crops, a realistic goal would be to maximize profits over a crop rotation. Rotations generally include a sequence which alternates a variety of crops. Rotations may involve several crops and

22 See, for example, Heady and Kay and Edwards.

23 It is recognized that not all farmers are in business to maximize profits and do not have, at all times, the information possibly relevant to efficient decision making. However, given the unavailability of information on alternative goals, it is usually assumed that farmers are in business to maximize their profits. See Heady.

cover a period of several years. Accordingly, crop rotations may have a direct effect on the cropping pattern data reported for a given area.

The purposes of rotations include rebuilding soil nutrient levels, reducing pest concentrations and disease problems, and enhancing soil organic matter. It has been demonstrated that continuously planting the same crop on land causes the population of soil borne pathogens to increase.[24] Planting crops that are not hosts causes the populations of those pathogens to decline. Plants which belong to the same family or class of plants (e.g., broadleaf) often share similar pest problems. Thus, effective rotations must incorporate crops which are not closely related.

Some of the factors which affect the rotations used by farmers include the following:[25]

- Cropping history;
- Grower experience;
- Input requirements for crops;
- Compatibility of crops with existing equipment complement and with labor;
- Existing array of pests; and
- Value of crop and market conditions.

Cotton has traditionally been the core crop for rotations in many parts of Kern County. Historically, rotations included cotton and small grains, both grown for commercial sale.[26] More recently, however, small grains have not been grown as extensively for commercial sale because of low crop prices. They are still grown for silage. Other crops more typically included in cotton rotations are tomatoes, onions, melons, carrots, and alfalfa. Typical rotations might include:

- Two years of cotton and one year of tomatoes or melons;
- Two years of cotton, one year of tomatoes or melons or onions, and three years of alfalfa; and

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24 See Nunez.

25 University of California Cooperative Extension, 1995.

26 Brian Marsh, University of California Cooperative Extension, Bakersfield, March 26, 2003, personal communication.

- One or two years of cotton, three years of alfalfa, one year of tomatoes or melons or onions or carrots, and one year of small grain.

By incorporating small grain and comparable crops into rotations, farmers sometimes appear to be growing economically-inefficient crops. However, the use of low-return crops such as small grains in rotations often reflects agronomic rather than purely economic considerations. The value from these crops would be reflected in better soil conditions and higher yields for other rotation crops in subsequent years. Thus, because of rotations, profit maximization must be viewed from a multi-year rather than a single-year perspective.

Fallowing may be an integral part of crop rotations. Fallowing, with a cover crop, may offer efficient opportunities to rebuild soil organic matter and conserve soil moisture. In addition, farmers may fallow some of their land in order to divert irrigation water usually used there to other, more productive parts of their farms. Farmers may also fallow land in order to be eligible for provisions of various government farm programs or as a component of reduced-tillage strategies.

Effects of Water Costs and Availability

As noted previously, changes in measured cropping patterns for an area may be due to a variety of factors, including market conditions, crop prices, government programs, contracts with crop processors, and soil and climate characteristics. For WRMWSD farmers and other farmers throughout the San Joaquin Valley, the availability and cost of water are also critical factors in farmers' decisions on which crops to grow and thus in reported cropping patterns. As water reliability is reduced or water costs increase, economic theory suggests that farmers will adjust their crop and input choices to reflect the greater relative scarcity or cost of the resource.

For SWP water, both factors are likely important. Reliability of SWP water was addressed in a recently-completed report, which projected likely delivery capability of the system through 2021.[27] The key findings were that:

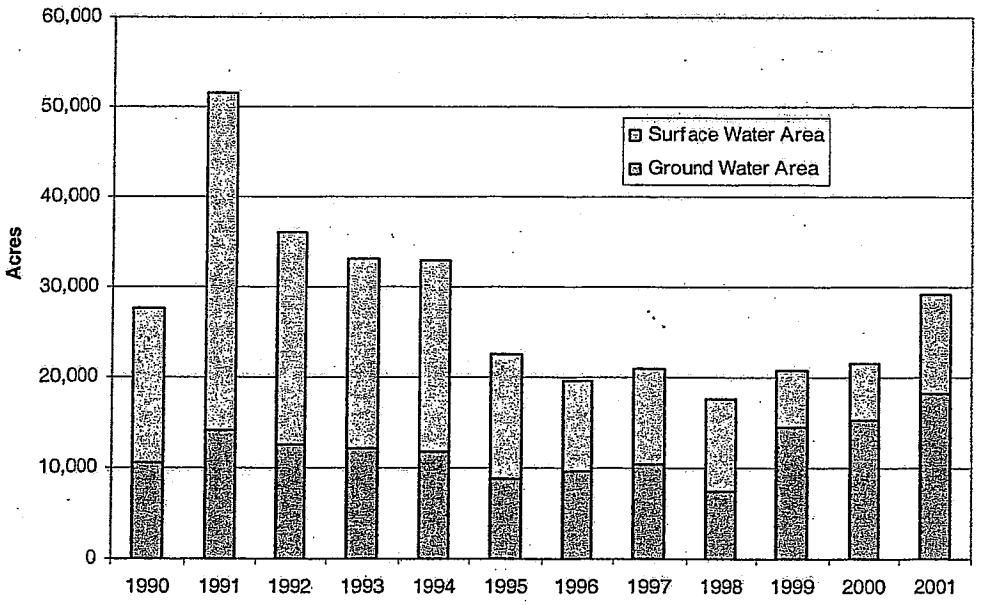
- In 75 percent of the years, the annual water delivery of the SWP is estimated to be at least 66 percent of full Table A deliveries
- In 50 percent of the years, annual water delivery is estimated to be at least 83 percent; and
- In 10 percent of the years, annual water delivery is estimated to be at least 98 percent.

[27] California Department of Water Resources, 2002.

Moreover, costs of SWP water and other key inputs have risen, in some cases to the point that uncertainties over water deliveries, crop prices, and other key variables have caused some farmers to change their rotations and crop selection. The shift from annual to permanent crops in WRMWSD likely reflects this behavior. As discussed previously, cotton production is no longer feasible for many farmers. The shift from cotton and other annual crops to permanent crops in the surface water service areas of WRMWSD is evidence of these and other issues. Similar shifts in ground water service areas likely reflect the increased costs of production, including increased costs for energy used in pumping.

District data show that the amount of fallowed land has increased since 1998. Prior to that year, most of the fallowed land in WRMWSD was in the surface water service areas. Since then, an increasing amount of fallowed land has been in ground water service areas (see Figure 6). It is likely that some land has been fallowed for longer periods or idled because of the high costs of production, including water. Between 1992 and 1996, SWP deliveries to WRMWSD rose, and total fallowed land in the district fell. In 1997, about equal amounts of land were fallowed in surface water and ground water service areas. However, while SWP deliveries fell from 1996 to 1998, the amount of fallowed land in surface water areas decreased rather than increased. As deliveries rose by about 36,000 AF between 1998 and 2000, fallowed land in surface water areas declined about 3,700 acres, while that in ground water areas increased about 9,800 acres.

Figure 6
Fallowed Land in Ground Water and Surface Water Service Areas, WRMWSD



Results

This section evaluates the expected effects on agricultural practices, including land fallowing, of the 41,000 AF transfer of SWP water from WRMWSD. It draws from the discussion of farm-level decision making and from a review of data presented throughout the report. The approach utilized to estimate the impacts relies on a review of long-term water demands in WRMWSD and of other data previously presented. Discussion includes the expected effects of the transfer during normal and wet years and in dry years on district supplies and costs and on farmer responses.

Table 4 shows that total WRMWSD deliveries of water from all sources since 1990 have varied from a minimum of about 65,000 AF in 1991 to a maximum of nearly 203,000 AF in 1996. Table 4 also shows that estimated total applied water requirements have ranged from about 187,000 AF in 1991 to nearly 278,000 AF in 1997. Estimated total water applied using all water sources fell by 13,125 AF between 1997 and 1999 and by an additional 20,099 AF between 1999 and 2001. From 1990 through 1999, WRMWSD deliveries accounted for an average of 63 percent of total applied water. From 1999 through 2001, they accounted for 65 percent.

Prior to the 41,000 AF transfer, WRMWSD had a water supply contract to Kern County Water Agency for Table A amount of about 238,000 AF of SWP water. In normal or wet years, the 41,000 AF appears to be in excess of district needs. It is therefore reasonable to assume that in those years, the transfer would have no effects or minimal adverse effects on overall water supply. Moreover, it is likely that the transfer would not cause overall water costs to increase in normal or dry years. Therefore, neither quantity nor cost of district water should be affected adversely, and the impacts on land fallowing should be minimal.

In years when the demand for SWP water exceeds supply, the impacts of the transfer on fallowing are more difficult to estimate. Assuming an SWP allocation of 50 percent, the 41,000 AF contract amount would provide 20,500 AF of water, sufficient to irrigate 6,000 to 7,000 acres of land. Cropped acreage within WRMWSD varies by an average of 11.6 percent per year, or about 9,700 acres. That variation is a result not only of water supplies

and costs, but also market conditions and crop prices, changes in government programs, input costs, and other factors. In a series of consecutive 'dry years,' the unavailability of a proportional share of the SWP contract amount may contribute to a mismatch between water supply and demand. However, the effect depends on the annual reliable supply and costs of the water from district wells and the other supplemental sources. If the supplies from the supplemental sources offset the reduced SWP entitlement, there should be a limited effect on water availability. Overall, the water supplies from the supplemental sources more than offset the reduced SWP Entitlement and, when the carrying cost of holding excess SWP Entitlement is considered, at a lower cost.

If overall water costs increase, there may be some farm-level impacts. WRMWSD has used several of its supplemental sources concurrently only in 2001. The variable and fixed costs (excluding capital costs) for that year did not differ substantially from SWP costs over the previous five years. If the costs in 2001 are representative, the incremental impacts of the transfer on delivered water costs to farmers should not be significant. The amount of land fallowed in this dry year scenario, including the transfer, should not be materially different from the normal variation in cropped acreage between years.

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Appendix D

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INTRODUCTION

The purpose of this appendix is to provide supporting information for the water analyses conducted for the Environmental Impact Report (EIR) for the Castaic Lake Water Agency's (CLWA's) supplemental State Water Project (SWP) Table A Amount transfer of 41,000 acre-feet (AF). Specifically, the appendix contains supporting information about the analysis of the SWP water supply and San Luis Reservoir and Castaic Lake storage performed for the Project.

The Project is the transfer of an existing 41,000 AF of SWP Table A Amount from the Kern County Water Agency (KCWA), and its member unit, the Wheeler Ridge-Maricopa Water Storage District (WRMWSD), to CLWA. The Project also includes the use of SWP facilities from Northern California to Los Angeles County for the delivery of SWP water to the CLWA service area, and use of this water within the CLWA service area. The Project water is transported from points of origin in the SWP system to the CLWA intake south of Castaic Lake via existing SWP facilities.

The Project currently is being implemented by an amendment to the SWP Water Supply Contracts of CLWA and KCWA. The Project is to authorize CLWA to use the water from the 41,000 AF of SWP Table A Amount for water demands of existing users and some anticipated future water demands.

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1.0 STATE WATER PROJECT DESCRIPTION

1.1 STATE WATER PROJECT FACILITIES

The SWP is a large water supply, storage, and distribution system authorized by an act of the California State Legislature in 1959. In 1960, California voters approved a $1.75 billion bond issue to begin building SWP facilities. Today, the SWP includes 28 storage facilities, reservoirs and lakes; 20 pumping plants; six pumping-generating plants and hydroelectric power plants; and about 660 miles of aqueducts and pipelines (DWR 2002). Figure 1-1 provides an overview of SWP facilities.

The primary purpose of the SWP is to distribute water to 29 urban and agricultural public water agencies (or "Contractors") in Northern California, the San Francisco Bay Area, the San Joaquin Valley, the Central Coast, and Southern California. The 29 SWP Contractor service areas are shown in Figure 1-2. Of total current SWP deliveries, approximately 50 percent goes to meet the needs of the state's growing urban population, and approximately 50 percent is used to irrigate farmland (DWR 2002). The SWP provides supplemental water to approximately 22 million persons and 600,000 acres of farmland (DWR 2002). In addition to its primary purpose, the SWP is also operated to assist in the control of Feather River floodwaters, provide recreation, generate energy, and enhance fish and wildlife habitats.

The primary water source for the SWP is within the drainage of the Feather River, a tributary of the Sacramento River. This runoff is primarily stored behind Oroville Dam in Butte County. Lake Oroville can hold a maximum of 3.5 million AF, including storage for both water supply and flood control. Water released from Oroville Dam flows down natural channels to the Sacramento-San Joaquin River Delta (Delta) where some of the water is pumped through the North Bay Aqueduct to serve Napa and Solano counties.

In the southern Delta, water is pumped into the 444-mile-long Governor Edmund G. Brown California Aqueduct (California Aqueduct) at the Clifton Court Forebay by the Harvey O. Banks Delta Pumping Plant (Banks Pumping Plant). The Clifton Court Forebay provides storage and regulation capability for the Banks Pumping Plant. Water from the Delta enters the Clifton Court Forebay from the West Canal, a channel of Old River, through an intake structure at the southeastern corner of the forebay. From Clifton Court Forebay, water passes through the John E. Skinner Delta Fish Protective Facility where fish are screened out before the water is pumped into the aqueduct.

SWP water exports for users south of the Delta pumping facilities are currently limited by a series of water quality and operational constraints, governed primarily by the California State Water Resources Control Board's (SWRCB) Water Right Decision 1641, as amended. Decision 1641 is summarized in Figure 1-3. Decision 1641 was adopted by the SWRCB in 1999; prior to that time, SWP water exports from the Delta were limited by the SWRCB's Water Right Decision 1485 (adopted in 1978), Order Water Right (WR) 95-6 (adopted in 1995), and Order WR 98-09 (adopted in 1998).

The Central Valley Project (CVP), a federal water supply project that supplies water to users in Northern California and the San Joaquin Valley, also diverts water from the southern Delta at

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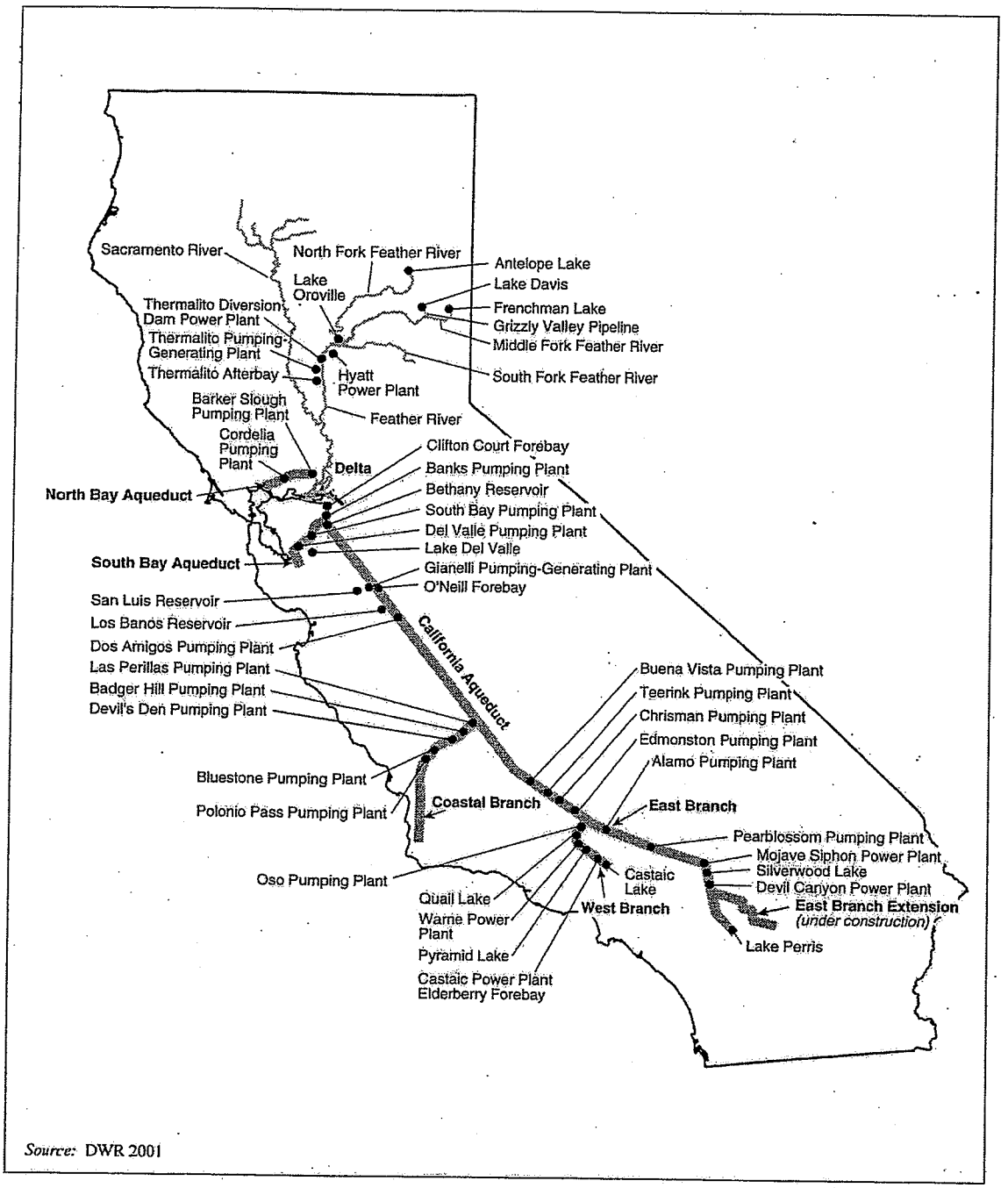

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Source: DWR 2001

Figure 1-1. Primary SWP Facilities

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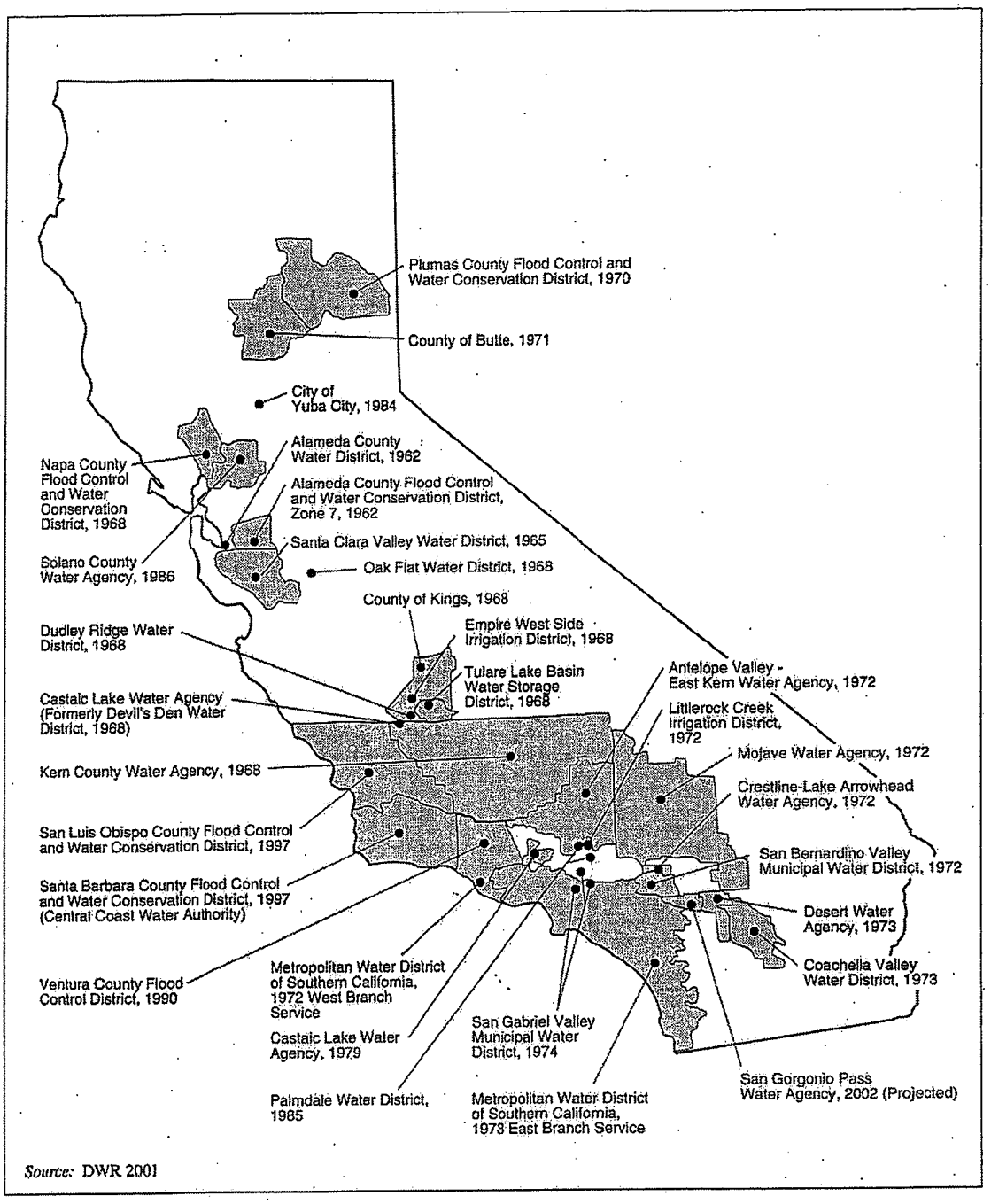

Figure 1-2. SWP Contractor Service Areas

Figure 1-3. Water Quality Criteria Applicable to SWP Delta Pumping
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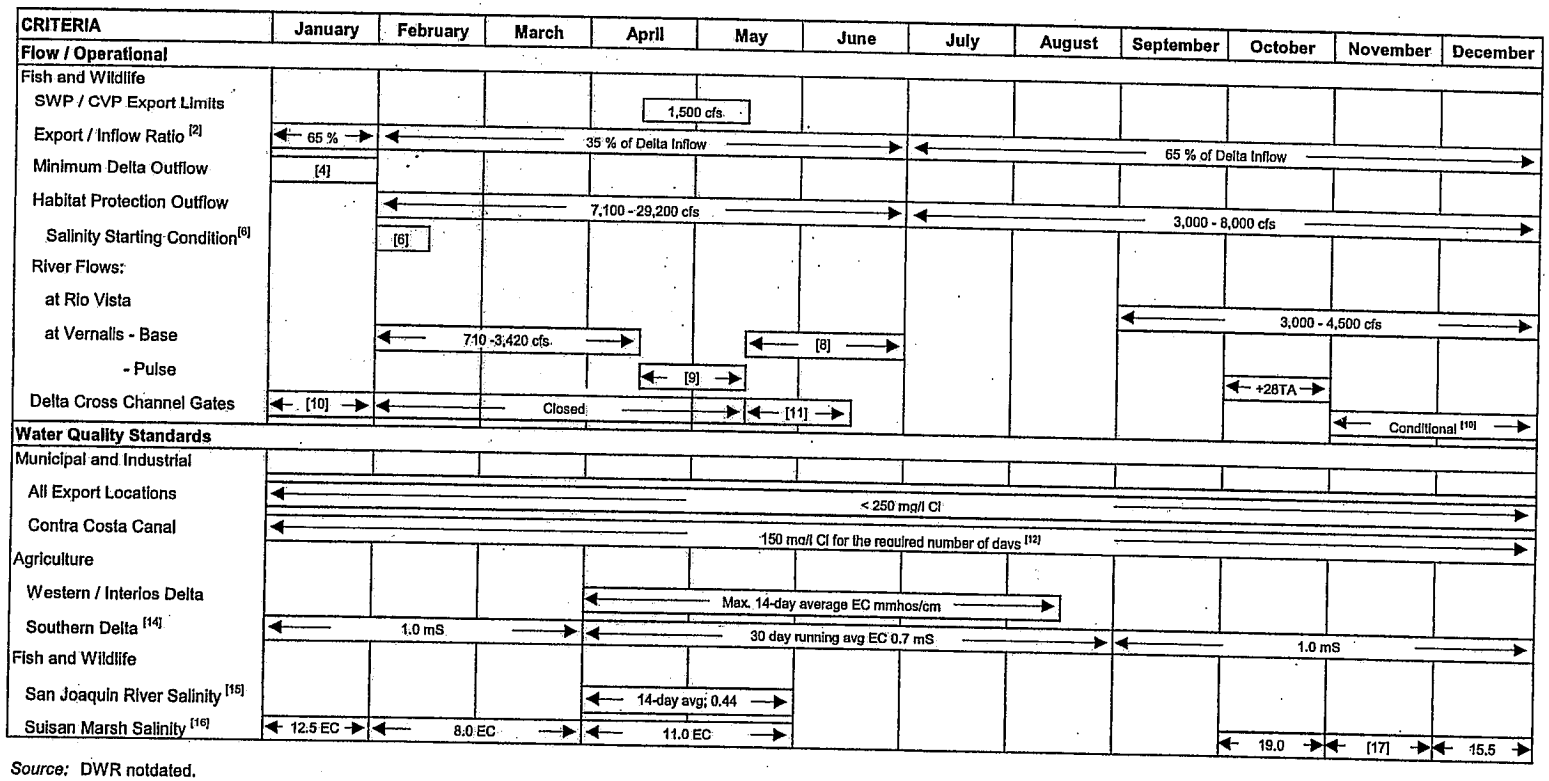

Source: DWR notdated.

Figure 1-3. Water Quality Criteria Applicable to SWP Delta Pumping
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Footnotes:

[1] Maximum 3-day running average of combined export rate (cfs) which includes Tracy Pumping Plant and Clifton Court Forebay inflow less Byron-Bethany.

Year Type	All
Apr. 15	The greater of 1,500 or 100%
May 15*	of 3-day average Vernalis flow

*This time period may need to be adjusted to coincide with fish migration. Maximum export rate may be varied by CalFed Op's group.

[2] The maximum percentage of average Delta inflow (use 3-day average for balanced conditions with storage withdrawal, otherwise use 14-day average) diverted at Clifton Court Forebay (excluding Byron-Bethany pumping) and Tracy Pumping Plant using a 3-day average. (These percentages may be adjusted.)

[3] The maximum percent Delta inflow diverted for Feb may vary depending on the January 8RI.

Jan 8RI	Feb exp. Limit
≤ 1.0 MAF	45%
between 1.0 & 1.5 MAF	35% - 45%
> 1.5 MAF	35%

[4] Minimum monthly average Delta outflow (cfs). If monthly standard ≤ 5,000 cfs, then the 7-day average must be within 1,000 cfs of standard; If monthly standard > 5,000 cfs, then the 7-day average must be > 80% of standard.

Year Type	All	W	AN	BN	D	C
Jan	4,500*					
Jul		8,000	8,000	6,500	5,000	4,000
Aug		4,000	4,000	4,000	3,500	3,000
Sep	3,000					
Oct		4,000	4,000	4,000	4,000	3,000
Nov-Dec		4,500	4,500	4,500	4,500	3,500

*Increase to 6,000 if the Dec 8RI is greater than 800,000 AF.

[5] Minimum 3-day running average of daily Delta outflow of 7,100 cfs OR: either the daily average or 14-day running average EC at Collinsville is less than 2.64 mmhos/cm (This standard for March may be relaxed if the Feb 8RI is less than 500 KAF. The standard does not apply in May and June if the May estimate of the SRI is < 8.1 MAF at the 90% exceedance level in which case a minimum 14-day running average flow of 4,000 cfs is required.) For additional Delta outflow objectives, see TABLE A.

[6] February starting salinity: If Jan 8RI > 900 KAF, then the daily or 14-day running average EC at Collinsville must be < 2.64 mmhos/cm for at least one day between Feb 1-14. If Jan 8RI is between 650 KAF and 900 KAF, then the CalFed Op's group will determine if this requirement must be met.

[7] Rio Vista minimum monthly average flow rate in cfs (the 7-day running average shall not be less than 1,000 below the monthly objective.

Year Type	All	W	AN	BN	D	C
Sep	3,000					
Oct		4,000	4,000	4,000	4,000	3,000
Nov-Dec		4,500	4,500	4,500	4,500	3,500

[8] BASE Vernalis minimum monthly average flow rate in cfs (the 7-day running average shall not be less than 20% below the objective). Take the higher objective if X2 is required to be west of Chipps Island.

Year Type	All	W	AN	BN	D	C
Feb-Apr 14 and May 16 - Jun		2,130 or 3,420	2,130 or 3,420	1,420 or 2,280	1,420 or 2,280	710 or 1,140

[9] PULSE Vernalis minimum monthly average flow rate in cfs. Take the higher objective if X2 is required to be west of Chipps Island.

Year Type	All	W	AN	BN	D	C
Apr 15 - May 15		7,330 or 8,620	5,730 or 7,020	4,620 or 5,480	4,020 or 4,880	3,110 or 3,540
Oct	1,000					

* Up to an additional 28 KAF pulse/attraction flow to bring flows up to a monthly average of 2,000 cfs except for a critical year following a critical year. Time period based on real-time monitoring and determined by CalFed Op's group.

[10] For the Nov-Jan period, Delta Cross Channel gates may be closed for up to a total of 45 days.

[11] For the May 21-June 15 period, close Delta Cross Channel gates for a total of 14 days per CALFED Op's group. During the period the Delta cross channel gates may close 4 consecutive days each week, excluding weekends.

[12] Minimum # of days that the mean daily chlorides ≤ 150 mg/l must be provided in intervals of not less than 2 weeks duration. Standard applies at Contra Costa Canal Intake or Antioch Water Works Intake.

Year Type	W	AN	BN	D	C
# Days	240	190	175	165	155

[13] The maximum 14-day running average of mean daily EC (mmhos/cm) depends on water year type.

	WESTERN DELTA				INTERIOR DELTA			
	Sac River @ Emmaton		SJR @ Jersey Point		Mokelumne R @ Terminous		SJR @ San Andreas	
Year Type	0.45 EC from April 1 to date shown	EC value from date shown to Aug 15*	0.45 EC from April 1 to date shown	EC value from date shown to Aug 15*	0.45 EC from April 1 to date shown	EC value from date shown to Aug 15*	0.45 EC from April 1 to date shown	EC value from date shown to Aug 15*
W	15-Aug		15-Aug		15-Aug		15-Aug	
AN	1-Jul	0.63	15-Aug		15-Aug		15-Aug	
BN	20-Jun	1.14	20-Jun	0.74	15-Aug		15-Aug	
D	15-Jun	1.67	15-Jun	1.35	15-Aug		25-Jun	0.58
C		2.78		2.2		0.54		0.87

* When no date is shown, EC limit continues from April 1.

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Figure 1-3. Water Quality Criteria Applicable to SWP Delta Pumping
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[14] As per D-1641, for San Joaquin River at Vernalis: however, the April through August maximum 30-day running average EC for San Joaquin River at Brandt Bridge, Old River near Middle River, and Old River at Tracy Road Bridge shall be 1.0 EC until April 1, 2005 when the value will be 0.7 EC.

[15] Compliance will be determined between Jersey Point & Prisoners Point. Does not apply in critical years or in May when the May 90% forecast of SRI < 8.1 MAF.

[16] & [17] During deficiency period, the maximum monthly average mhtEC at Western Suisun Marsh stations as per SMPA is:

Month	mhtEC
Oct	19.0
Nov	16.5
Dec-Mar	15.6
Apr	14.0
May	12.5

In November, maximum monthly average mhtEC = 16.5 for Western Marsh stations and maximum monthly average mgtEC = 15.5 for Eastern Marsh stations in all periods types.

TABLE A **Number of Days When Max. Daily Average Electrical Conductivity of 2.64 mmhos/cm Must Be Maintained**

(This can also be met with a maximum 14-day running average EC of 2.64 mmhos/cm, or 3-day running average Delta outflows of 11,400 cfs and 29,200 cfs, respectively.) Port Chicago Standard is triggered only when the 14-day average EC for the last day of the previous month is 2.64 mmhos/cm or less. PMI is previous month's SRI. If salinity/flow objectives are met for a greater number of days than required for any month, the excess days shall be applied towards the following month's requirement. The number od day's for values of the PMI between those specified below shall be determined by linear interpolation.

PMI (TAF)	Chipps Island (Chipps Island Station D10)				
	FEB	MAR	APR	MAY	JUN
≤ 500	0	0	0	0	0
750	0	0	0	0	0
1000	28*	12	2	0	0
1250	28	31	6	0	0
1500	28	31	13	0	0
1750	28	31	20	0	0
2000	28	31	25	1	0
2250	28	31	27	3	0
2500	28	31	29	11	1
2750	28	31	29	20	2
3000	28	31	29	27	4
3250	28	31	29	29	8
3500	28	31	29	30	13
3750	28	31	29	31	18
4000	28	31	29	31	23
4250	28	31	29	31	25
4500	28	31	29	31	27
4750	28	31	29	31	28
5000	28	31	29	31	29
5250	28	31	29	31	29
≥5500	28	31	29	31	30

PMI (TAF)	Port Chicago (continuous recorder at Port Chicago)				
	FEB	MAR	APR	MAY	JUN
0	0	0	0	0	0
250	1	0	0	0	0
500	4	1	0	0	0
750	8	2	0	0	0
1000	12	4	0	0	0
1250	15	6	1	0	0
1500	18	9	1	0	0
1750	20	12	2	0	0
2000	21	15	4	0	0
2250	22	17	5	1	0
2500	23	19	8	1	0
2750	24	21	10	2	0
3000	25	23	12	4	0
3250	25	24	14	6	0
3500	25	25	16	9	0
3750	26	26	18	12	0
4000	26	27	20	15	0
4250	26	27	21	18	1
4500	26	28	23	21	2
4750	27	28	24	23	3
5000	27	28	25	25	4
5250	27	29	25	26	6
5500	27	29	26	28	9
5750	27	29	27	28	13
6000	27	29	27	29	16
6250	27	30	27	29	19
6500	27	30	28	30	22
6750	27	30	28	30	24
7000	27	30	28	30	26
7250	27	30	28	30	27
7500	27	30	29	30	28
7750	27	30	29	31	28
8000	27	30	29	31	29
8250	28	30	29	31	29
8500	28	30	29	31	29
8750	28	30	29	31	30
9000	28	30	29	31	30
9250	28	30	29	31	30
9500	28	31	29	31	30
9750	28	31	29	31	30
10000	28	31	30	31	30
>10000	28	31	30	31	30

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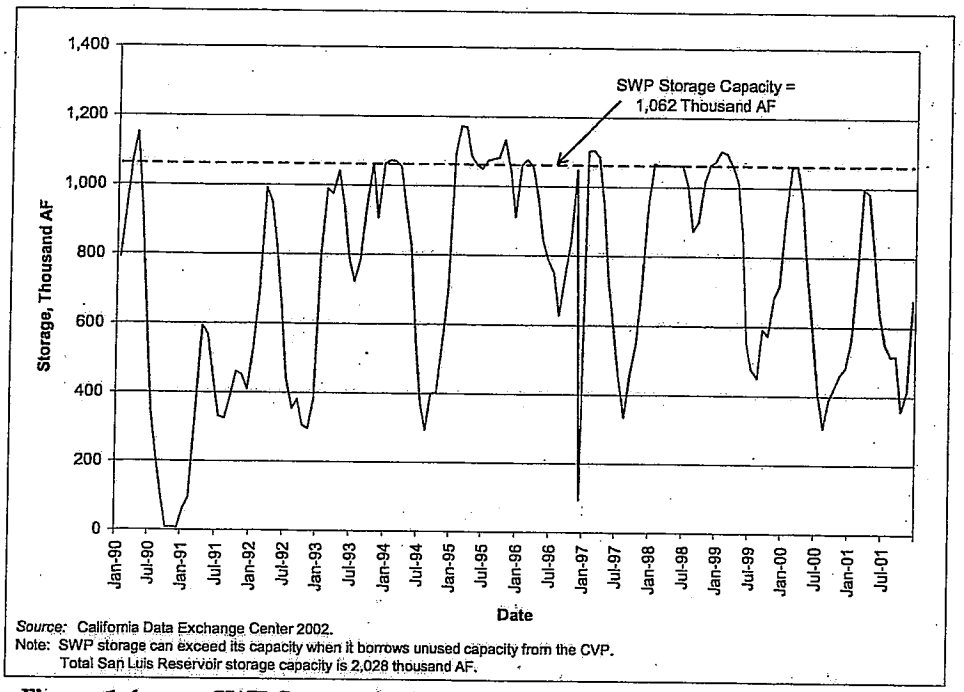
the CVP's Tracy Pumping Plant. The SWP and CVP include facilities south of the Delta that were specifically designed for joint use by both projects, including San Luis Reservoir and a section of the California Aqueduct south of San Luis Reservoir. In addition, the SWRCB in the 1999 Water Rights Decision 1641, authorized the SWP and CVP to use their separate pumping plants as joint points of diversion, allowing each project to use excess pumping capacity at the other project's pumping plant.

From the southern Delta facilities, water in the California Aqueduct travels along the west side of the San Joaquin Valley and is either delivered directly to Contractors or is stored in San Luis Reservoir, the SWP's main storage facility south of the Delta. San Luis Reservoir, located approximately 60 miles south of the Banks Pumping Plant, is an off-stream storage reservoir with a total capacity of more than 2 million AF (of which, approximately 1,062,000 AF is allocated to the SWP and the remainder is allocated to the CVP [DWR 2002]). The SWP's California Aqueduct and the CVP's Delta Mendota Canal join at the O'Neill Forebay. Water is lifted by a pump-generating plant from O'Neill Forebay into the San Luis Reservoir. Water is released from San Luis Reservoir back through the pump-turbines to the forebay and energy is reclaimed.

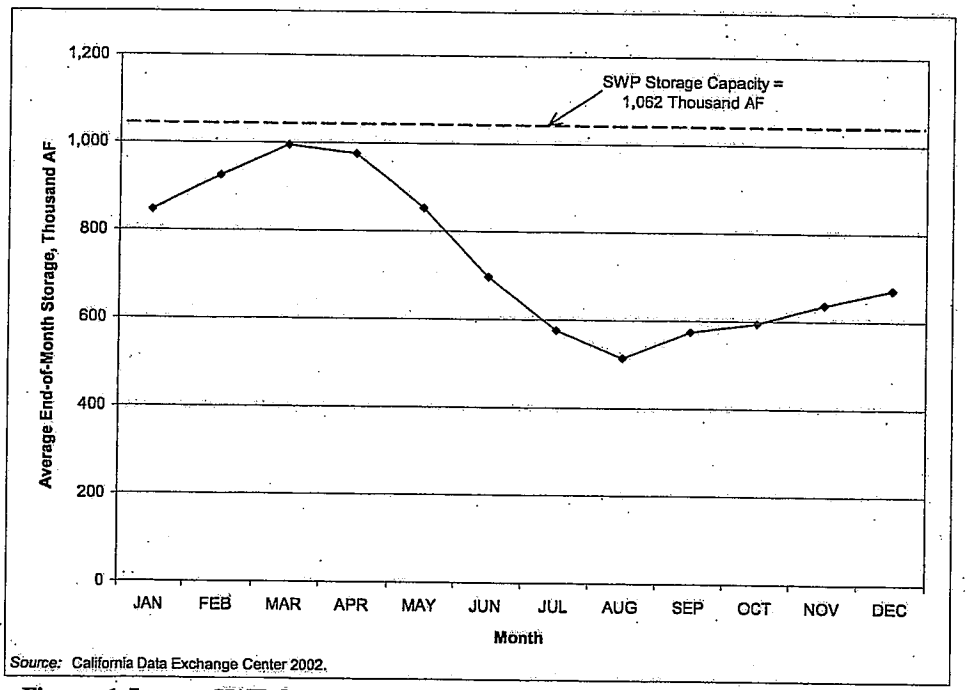
In general, the SWP is operated to fill storage reservoirs during the high runoff months of the winter and early spring. In addition to hydrology, regulatory requirements for the Delta and associated operational constraints also affect the timing and ability to fill reservoirs south of the Delta. Under current operating conditions, including Decision 1641, SWP diversions from the Delta are significantly reduced as of April 15 of each year (see Figure 1-3). As a result, the SWP is operated to store as much water as possible in San Luis Reservoir prior to April 15. The stored water is then released to meet Contractor demands during the high-demand summer and fall months to supplement the more limited pumping from the Delta during those months. Figure 1-4 shows the volume of SWP water stored in San Luis Reservoir for the period of 1990 to 2001. Figure 1-5 shows the average end-of-month SWP storage in San Luis Reservoir from 1990 to 2001. As is shown in these figures, San Luis Reservoir SWP storage levels vary considerably, both during the year and from year to year. From 1990 to 2001, SWP storage in the reservoir has ranged from approximately zero to more than 1.1 million AF (see Figure 1-4).

Water is conveyed southward from San Luis Reservoir via the California Aqueduct to the primarily agricultural users in the San Joaquin Valley and the primarily urban regions of the Central Coast and Southern California. Water is diverted from the aqueduct and delivered directly to SWP Contractors, including KCWA, in the central and southern San Joaquin Valley at various locations along the aqueduct. Near Kettleman City, SWP water is diverted from the California Aqueduct into the Coastal Branch, which carries water to San Luis Obispo and Santa Barbara counties. Most of the flow in the California Aqueduct continues southward, traversing the west side of the San Joaquin Valley through a series of four pumping plants (Dos Amigos, Buena Vista, Teerink and Chrisman) before reaching the Edmonston Pumping Plant. The capacity of these reaches of the California Aqueduct ranges from 10,000 cfs at the northern end to approximately 4,400 cfs at the Edmonston Pumping Plant. The Edmonston Pumping Plant pumps water over the Tehachapi Mountain Range, the California Aqueduct then divides into the East Branch and the West Branch. Water intended for use by CLWA is conveyed through the West Branch through Quail and Pyramid lakes and then to Castaic Lake, the terminus for the West Branch.



Source: California Data Exchange Center 2002.
Note: SWP storage can exceed its capacity when it borrows unused capacity from the CVP.
Total San Luis Reservoir storage capacity is 2,028 thousand AF.

Figure 1-4. SWP Storage in San Luis Reservoir, 1990 to 2001



Source: California Data Exchange Center 2002.

Figure 1-5. SWP Storage in San Luis Reservoir, 1990 to 2001 Average End-of-Month Storage

Quail and Pyramid lakes are located between the KWCA turnouts for deliveries to WRMWSD and the CLWA turnout on the West Branch of the California Aqueduct. Because of Quail Lake's limited storage capacity (approximately 7,800 AF) the lake is primarily used for re-regulation of aqueduct flows. Pyramid Lake, which has a storage capacity of approximately 171,200 AF, is used to provide an emergency water supply, in the case of a major supply system outage, to the SWP Contractors that receive deliveries from the West Branch; and is used in the pump/generation operation of the Castaic Power Plant, located between Pyramid and Castaic lakes.

Castaic Lake has a storage volume of approximately 323,700 AF. As shown on Figure 1-6, from 1990 to 2001, storage has ranged from a minimum of approximately 150,000 AF to a maximum of approximately 320,000 AF. The average end-of-month storage from 1990 to 2001 in Castaic Lake is shown on Figure 1-7. The reservoir is operated to provide regulatory storage to meet peak deliveries during the summer months for the three Contractors that receive water from Castaic Lake (CLWA, the Metropolitan Water District of Southern California [MWD], and the Ventura County Flood Control District [VCFCD]), and to provide an emergency water supply in the case of a major supply system outage. As part of the Monterey Amendment, these three SWP Contractors have access to 160,000 AF of the storage from Castaic Lake as "flexible storage," which they may withdraw in addition to their allocated SWP supplies and which they must replace within five years of any withdrawal. Local runoff captured in Castaic Lake is managed in compliance with an agreement between DWR and the holders of prior water rights.

SWP deliveries from Castaic Lake to each SWP Contractor that received water from the lake from 1990 to 2000 are provided in Table 1-1. From 1990 to 2000, CLWA's deliveries from Castaic Lake averaged approximately 19,200 AF, or approximately 6 percent of total annual SWP deliveries from the lake.

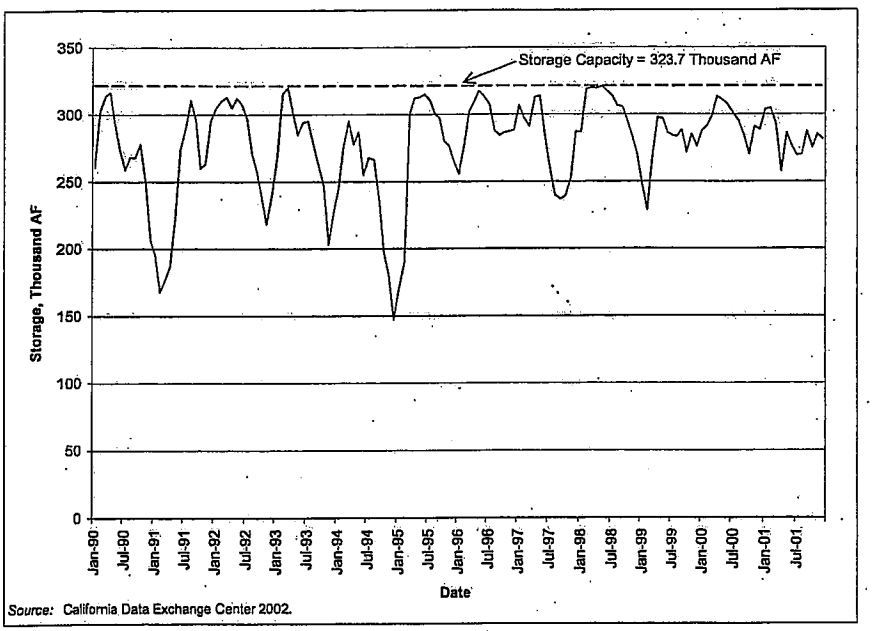
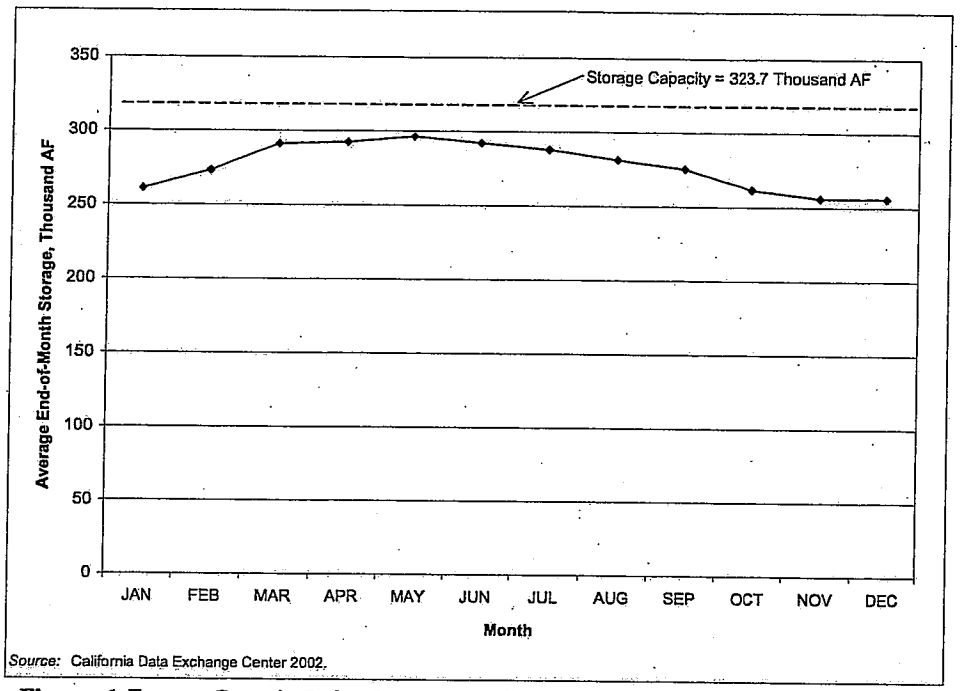


Figure 1-6. Castaic Lake Storage, 1990 to 2001



Source: California Data Exchange Center 2002.

Figure 1-7. Castaic Lake Storage, 1990 to 2001 Average End-of-Month Storage

Table 1-1. Annual SWP Deliveries from Castaic Lake by Contractor, 1990 to 2000

	CLWA	*MWD*	*VCFCD*	*Other*[1]	*Total*	*CLWA as a % of Total*
1990	22,139	764,380	0	0	786,519	2.81
1991	3,846	257,835	0	1,240	262,921	1.46
1992	14,812	420,849	0	0	435,661	3.40
1993	13,787	437,470	0	0	451,257	3.06
1994	14,919	475,900	0	0	490,819	3.04
1995	17,747	139,882	0	0	157,629	11.26
1996	18,448	267,618	0	0	286,066	6.45
1997	22,842	271,379	1,850	27,130	323,201	7.07
1998	19,782	187,277	1,850	0	208,909	9.47
1999	28,813	327,001	1,850	0	357,664	8.06
2000	33,674	632,993	1,848	0	668,515	5.04
Average	19,164	380,235	673	2,579	402,651	5.56

Source: DWR 2002.

1. Includes deliveries from Castaic Lake via exchange. These deliveries were made by the Santa Barbara County Flood Control and Water Conservation District in 1991 via exchange with VCFCD, and by the Coachella Valley Water District and Desert Water Agency in 1997 via exchange with MWD.

1.2 STATE WATER PROJECT SUPPLY CAPABILITY

As originally planned, the annual delivery capability of the SWP was to eventually reach approximately 4.2 million AF. DWR entered into individual Water Supply Contracts with public water agencies (referred to as "Contractors") for water delivery, and the sum of the maximum delivery amounts of all Contractors totaled this same 4.2 million AF. The initial SWP facilities were designed to meet Contractors' water demands in the early years of the project, with the construction of additional facilities planned as Contractor demands increased. Water deliveries to Contractors began as initial SWP facilities were completed in the late 1960s and early 1970s. CLWA received its initial delivery of SWP water in 1980. Initial deliveries of SWP water from the California Aqueduct to KCWA in the area of its member unit WRMWSD occurred in 1971 and 1972.

The original plans for the SWP were to construct additional water storage facilities as Contractor demands increased. However, essentially no additional SWP storage facilities have been constructed since the initial SWP facilities were completed. In the meantime, increasing environmental concerns related to several fish species have resulted in increasingly stringent regulatory constraints in the Delta, reducing the reliability of SWP supplies from existing facilities. This situation makes the amount of SWP supply available for delivery in any given year even more dependent on the hydrology of that particular year and the amount of water in SWP storage at the beginning of that year.

At the same time, Contractor demands have been increasing. While some Contractors are not yet requesting the maximum amounts allowable under their Water Supply Contracts, even at current demands, the SWP cannot meet all water delivery requests in some years. The availability of SWP water in any given year is dependent on that year's hydrologic conditions and the amount of water in storage in the SWP system. The amount of water actually delivered in that year is also dependent on the Contractors' requests for SWP supplies, which can vary from year to year based on Contractors' local conditions and their other supplies. The actual annual deliveries of SWP Table A supplies to Contractors are provided in Table 1-2 for 1990 to 2003. Over this period, total SWP deliveries have ranged from approximately 550,000 AF in the critical drought year of 1991 to approximately 3.7 million AF in 2003. Many Contractors did not request delivery of their full Table A Amount during this period.

In 1998, DWR estimated that annual deliveries to SWP Contractors would average approximately 3.1 million AF (based on estimates of then-existing levels of Contractor demands and land and water use upstream of the Banks Pumping Plant[1], with existing facilities operated under the constraints of Order WR 95-6 [DWR 1998]). This estimate is generally consistent with DWR's recent SWP Delivery Reliability Report (DWR 2003). In the SWP Delivery Reliability Report, DWR estimated that the SWP currently can be expected to deliver an average annual supply of approximately 2.96 million AF, based on a 2001 level of Contractor demand and upstream land and water use, with existing facilities operated under existing constraints (DWR 2003). As part of the SWP Delivery Reliability Report, DWR also estimated that in the future the

1 Land and water use upstream of the Banks Pumping Plant affects the amount of water flowing into the Delta. In general, increases in the amount of water flowing into the Delta can increase SWP supplies, while decreases in the amount of water flowing into the Delta (due to increased water use upstream or a variety of other factors) can decrease SWP supplies.

SWP can be expected to deliver an average annual supply of approximately 3.1 million AF based on 2021 level of Contractor demand and upstream consumptive use, with existing facilities operated under existing constraints (DWR 2003b). Contractor demands are expected to increase in the 2021 level evaluation as urban Contractor demands increase up to their Table A Amounts. The increase in average deliveries for 2021 is the result of the SWP being able to meet the increased Contractor demands in wetter years. However, limited SWP supplies in drier years, allocated over an increased demand for that limited supply, will result in a decrease in the reliability of dry-year supplies.

Table 1-2. SWP Annual Table A Deliveries, 1990 to 2003

	Agricultural Contract Holders		*M&I Contract Holders*		*Total Table A Deliveries (AF)*
	Table A Deliveries (AF)	*Allocation Percentage (%)*	*Table A Deliveries (AF)*	*Allocation Percentage (%)*	
1990	706,080	50	1,876,070	100	2,582,150
1991	12,440	0	536,670	30	549,110
1992	509,810	45	961,650	45	1,471,460
1993	1,250,370	100	1,064,870	100	2,315,240
1994	614,360	53	1,134,990	53	1,749,350
1995	1,165,520	100	801,570	100	1,967,090
1996	1,369,190	100	1,145,640	100	2,514,830
1997	1,067,320	100	1,258,460	100	2,325,780
1998	860,720	100	864,800	100	1,725,520
1999	1,333,590	100	1,405,300	100	2,738,890
2000	1,177,200	90	2,022,700	90	3,199,900
2001	383,840	39	1,162,900	39	1,546,740
2002	827,128	70	2,059,886	70	2,887,014
2003	1,064,267	90	2,649,966	90	3,714,230

Source: For 1990 to 2000, DWR 2002. For 2001, DWR 2004a. For 2002, DWR 2003c. For 2003, DWR 2004b.

1.3 STATE WATER PROJECT WATER SUPPLY CONTRACTS

As discussed above, in 1960 DWR began executing individual Water Supply Contracts with public agencies throughout the State of California for financing and constructing SWP facilities designed to deliver water to each public agency. The Water Supply Contracts specified Contractor obligations for repayment of SWP capital, operation, and maintenance costs, including bondholder obligations and repayment of funds loaned from the California Water Fund.

Each Water Supply Contract sets forth, in Table A, a schedule identifying an upper bound on the Contractor's annual request for delivery of SWP water, referred to as "Table A Amount" (formerly referred to as "entitlement"). The Table A Amount is specified as either agricultural or municipal and industrial (M&I). Table A in each Water Supply Contract contains an annual buildup in Table A Amounts of SWP water, from the first year of the Water Supply Contract through a specific year, based on growth projections made before the Water Supply Contract

was executed. For most Contractors, the maximum annual Table A Amount was reached in 1990. The total of all Contractors' maximum Table A Amounts is currently about 4.17 million AF.

Each Contractor annually submits a request to DWR for water delivery in the following year, in any amount up to the Contractor's Table A Amount. The Water Supply Contracts provide that in a year when DWR is unable to deliver total Contractor requests, deliveries to all Contractors will be reduced, in accordance with specified water allocation rules, so that total deliveries equal total available supply for that year. Some Contractors have never requested delivery of their full Table A Amount as a result of factors such as less-than-planned water demand, availability of other water supplies, and water conservation efforts that have held demand below initial contract projections. Other Contractors order their full Table A Amount nearly every year.

Under the original Water Supply Contracts, the Agricultural Contractors agreed in years of shortage (i.e., when SWP supplies were insufficient to meet Contractors' requests) to accept a certain amount of reduction in deliveries (the "initial agricultural reduction"), with any remaining shortage shared proportionately among the Agricultural and M&I Contractors. In exchange, the Agricultural Contractors received, among other favorable terms, a priority for "surplus" SWP supplies (i.e., SWP supplies that could be delivered in excess of Table A requests, generally available in wetter hydrologic years and/or in the early years of the SWP when demands were still low). Under the original plan for the SWP, which involved the construction of additional water storage facilities as Contractor demands increased, shortages in SWP supplies were anticipated to occur relatively infrequently and in small enough magnitudes that only Agricultural Contractors were expected to incur shortages. In the early 1990s, however, a multi-year drought coupled with increased SWP operational constraints and environmental water requirements due to the listing of several fish species as endangered or threatened, resulted in several years when SWP supplies fell below Contractors' requests for deliveries. The initial agricultural reduction provision in the Water Supply Contracts resulted in Agricultural Contractors receiving only half their requested supply in 1990 and no water in 1991, while the M&I Contractors received all of their requested supply in 1990 and less than half their requests in 1991. Because Contractors pay their proportionate share of fixed project costs regardless of how much water is delivered, plus variable costs based on the amount of water delivered, Agricultural Contractors underwent severe delivery reductions but received little financial relief from their fixed project cost obligations. This situation led to increasing disagreements between DWR, the Agricultural Contractors, and the M&I Contractors about how available supplies should be allocated.

Monterey Amendment

The SWP Contractors and DWR agreed to negotiate a settlement of their differences and develop a new approach to managing SWP resources through a major overhaul of the Water Supply Contracts. After a series of exhaustive negotiating sessions, an agreement was reached in December 1994 in Monterey, California on a set of principles, known as the "Monterey Agreement." The Monterey Agreement principles were implemented through an amendment to the Water Supply Contracts between DWR and the SWP Contractors, which became known as the "Monterey Amendment." The Monterey Amendment was approved in 1995 and went

into effect in August 1996. A summary of the provisions of the Monterey Amendment is provided below.

Allocation of SWP Water Supplies

- New method for allocation of all water supplies in proportion to each Contractor's contract amount (Table A Amounts).
- Elimination of the initial supply reduction to Agricultural Contractors in years of shortage (modification of Article 18(a) of the Water Supply Contracts).
- Replacement of certain categories of water with a single category of Article 21 water allocated on the basis of Table A Amounts and delivered at the same power rate as Table A Amounts.
- Elimination of the permanent shortage provision (Article 18(b) of the Water Supply Contracts).

Transfer of Table A Amounts and Land

- Transfer to DWR for permanent retirement 45,000 AF of agricultural Table A Amounts.
- Make 130,000 AF of agricultural Table A Amounts available for permanent sale to M&I Contractors[2].
- Transfer of the Kern Fan Element property to local control.

Water Management Provisions

- Enable voluntary water marketing, groundwater banking, and more effective use of existing SWP facilities.
- Explicitly provide for groundwater or surface storage of SWP water outside Contractor's service area for later use within its service area.
- Expand Contractor rights to store water in San Luis Reservoir when storage space is available.
- Specify Contractor rights to flexible storage in terminal reservoir facilities.
- Clarify terms for transport of non-SWP water in SWP facilities for Contractors.
- Create a Turnback Pool for the annual sale to interested Contractors of SWP supplies allocated to other Contractors but unneeded by them.

Financial Restructuring

- Use SWP funds to establish an SWP operating reserve.

2 The 41,000 AF transfer associated with the Project represents a portion of the 130,000 AF transfer that the Agricultural Contractors agreed to make available for permanent transfer in the Monterey Amendment.

- Establish a program of water rate management which, when SWP cash flow permits, provides for a credit in charges to M&I Contractors, as well as Agricultural Contractor trust funds for rte management.

A Program EIR analyzing the environmental impacts of the Monterey Amendment was prepared and certified by the Central Coast Water Authority (CCWA) in 1995. In late 1995, a lawsuit was filed by the Planning and Conservation League (PCL), Plumas County Water Conservation and Flood Control District (Plumas County), and Citizens Planning Association of Santa Barbara County (collectively referred to as the "plaintiffs") challenging the EIR. The plaintiffs argued that the environmental impact analysis prepared was inadequate because CCWA was not the proper lead agency and the EIR analysis did not reflect the inability of the SWP to deliver full Contract amounts to Contractors, even though they held contractual "entitlements" to those supplies. In 2000, the California State Court of Appeal (Third District) found that a new EIR must be prepared. That litigation is referred to as the PCL Litigation in this EIR.[3]

Discussions to mediate a settlement began in 2001 and were finalized in May 2003[4]. All parties to the litigation have signed the Settlement Agreement. The Settlement Agreement calls for DWR to prepare a new EIR pursuant to the California Environmental Quality Act (a Notice of Preparation [NOP] was issued by DWR on January 24, 2003),[5] while the Monterey Amendment's provisions remain in operation. Pursuant to the Settlement Agreement, the parties are now administering the preparation of a new EIR, which is anticipated to be completed in approximately two years. The new EIR will evaluate the potential environmental impacts of changes to SWP operations incorporated in the Monterey Amendment and the Settlement Agreement. The Settlement Agreement also calls for DWR to produce a biennial SWP Delivery Reliability Report. The *State Water Project Delivery Reliability Report - 2002* was issued in May 2003 (DWR 2003). A summary of the Settlement Agreement is provided below. The Settlement Agreement did not change the substance of the Monterey Amendment, but addressed the process by which the new Monterey Amendment EIR will be prepared.

Settlement Agreement

- Continue operation under Monterey Amendment provisions.
- Establish a watershed forum for Plumas County to pursue watershed restoration and provide for amending Plumas County's Water Supply Contract regarding shortages.
- Impose additional restrictions on use of the Kern Water Bank lands.
- Amend and clarify SWP Water Supply Contracts to substitute in certain instances "Table A Amount" for "entitlement."
- Implement new procedures for disclosure of SWP delivery capabilities.

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3 *Planning and Conservation League, et al. v. Department of Water Resources* (2000) 83 Cal. App. 4th 892.

4 In May 2003, the settlement agreement among the plaintiffs, DWR, and the SWP Contractors (referred to herein as the "Settlement Agreement") was executed and approved by the State Attorney General's office. On May 20, 2003 the Settlement Agreement was approved by the Sacramento Superior Court.

5 The NOP is entitled *Notice of Preparation of Environmental Impact Report for the Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Other Contract Amendments and Associated Actions as part of a Proposed Settlement Agreement in Planning and Conservation League v. Department of Water Resources.*

- Issue guidelines on permanent Table A Amount transfers.
- Establish procedures for public participation in certain Water Supply Contract amendment negotiations.
- Provide certain funding to the plaintiffs for multiple purposes, including watershed restoration.

Monterey Amendment Effect on Water Deliveries

The Monterey Amendment did not change of the total amount of SWP supply available for delivery in any year. It did, however, change how that available supply is allocated among the Contractors. Under the allocation methodology used prior to the Monterey Amendment, in a year when total available SWP supplies were less than Contractor requests, Agricultural Contractors received an initial supply reduction of up to 50 percent in any one year and up to a cumulative total of 100 percent in any seven consecutive years. Any shortages remaining in the year after the initial agricultural reduction were shared among all Contractors proportionately. The result of this allocation provision was that, due to the initial agricultural reductions, agricultural Table A Amounts were less reliable than M&I Table A Amounts.

Under the provisions of the Monterey Amendment, all SWP supplies are allocated among Contractors in proportion to their Table A Amounts. The result of this change in allocation is that the reliability of all SWP Table A Amounts is now the same. This means that in a shortage year, with the elimination of the initial agricultural reduction, a portion of the supply that would previously have been allocated to M&I Contractors would now be allocated to Agricultural Contractors; and when additional SWP supplies are available, with the elimination of the agricultural priority to surplus water, a portion of the supply that might previously have been delivered to Agricultural Contractors would now be available to M&I Contractors.

Transfers of Table A Amounts

SWP Table A Amounts could be transferred under the original terms of the Water Supply Contracts (under Article 41). The Monterey Amendment provided an additional opportunity for transfers of Table A Amounts (under Article 53). Under the Monterey Amendment, the Agricultural Contractors agreed to make available up to 130,000 AF of Table A Amount for permanent sale and transfer to M&I Contractors. Transfers of more than half of this 130,000 AF of Table A Amount have already been completed by various M&I Contractors. The transfer evaluated in this EIR (the Project) could be completed under either of these Water Supply Contract provisions, although Article 53 was the vehicle utilized to execute the transfer.

2.0 DWR MODEL STUDIES

2.1 MODEL STUDIES SELECTED FOR USE

The amount of SWP water supply that would be available for use by CLWA given the transfer of the Project's 41,000 AF of Table A Amount was evaluated using results from DWR model studies of SWP and CVP operations. The model studies that were used in analyses for this EIR were studies previously conducted by DWR (i.e., no new model studies were run for this EIR). Results from these DWR model studies were used as a starting point for the water resources analyses conducted for this EIR.

The model studies used in this analysis were two studies conducted by DWR for the CALFED Bay-Delta Program EIS/EIR (CALFED 2000). These model studies were conducted in 1998 using DWR's planning model DWRSIM. These model studies provide the best estimates of SWP supply reliability that were available in 1998, and are consistent with the pre-project 1998 environmental baseline used in this EIR. Therefore, these model studies were used as the basis for the water resources environmental impact analyses conducted for this EIR.

DWRSIM is a monthly planning model that simulates operations of the SWP and CVP. One of the model's inputs is a time series of monthly runoff based on historic hydrologic data from 1922 through 1994 (73 years), with that hydrologic data adjusted to reflect a current or future level of upstream land and water use. DWRSIM estimates the amount of water the SWP could deliver to Contractors in each month over the 73 years of operation, for a given set of facilities and operating constraints and for a given level of Contractor demand. The results are interpreted as the capability of the SWP to meet the assumed SWP demand, over a range of hydrologic conditions, for that assumed set of physical facilities and operating constraints.

The two DWRSIM studies used in this EIR both assume the use of SWP facilities and operating constraints that were present in 1998. One study uses 1998 estimates of then-existing Contractor demands and upstream land and water use, and the other uses projections for 2020 of both Contractor demands and upstream land and water use (DWRSIM model studies 1995D06E-CALFED-771 and 2020D09C-CALFED-786, respectively)[6].

2.2 COMPARISON OF DWRSIM TO CALSIM II

Since these studies were conducted, the modeling tool DWR uses to simulate operations has evolved (first to CALSIM I, and more recently to CALSIM II). However, while the modeling tool itself has changed, the criteria used in the models to simulate SWP operations have not significantly changed. While DWR has completed a more recent assessment of SWP reliability in its SWP Delivery Reliability Report (DWR 2003) using CALSIM II, the results of these new studies are generally comparable to the results of the DWRSIM studies used in this EIR. The results of these new studies were used as the basis for determining CLWA SWP supplies for the current environmental setting, as is described below in section 6.0.

6 In the CALFED Bay-Delta Program EIS/EIR, these two studies represent the Existing Condition, and the No Action Alternative with a 2020 level of Contractor demand, respectively.

Figures 2-1 and 2-2 show a comparison of DWRSIM and CALSIM II model study results of total SWP Table A deliveries. Figure 2-1 shows this comparison at "existing" demand conditions, while Figure 2-2 shows this same comparison at 2020 demand conditions. In these figures, deliveries over the hydrologic period are shown in the form of probability of exceedance curves (see the sidebar for an explanation of how to interpret this kind of graph).

> ***Interpreting Probability of Exceedance Graphs***
>
> The graphs of supplies available over DWRSIM's entire hydrologic record are presented as probability of exceedance curves. These curves show the probability of supplies being greater than or equal to specific quantities. For example, Figure 2-1 would be interpreted, based on the DWRSIM run, as showing that about 80 percent of the time, total SWP supplies would be expected to be 2,500 or more thousand AF; and about 20 percent of the time, supplies would be expected to be less than 2,500 thousand AF.

The "existing" demand in the DWRSIM study used in this EIR is based on 1998 DWR estimates of then-existing SWP demands, while the "existing" demand in the CALSIM II study in DWR's SWP Delivery Reliability Report is based on 2001 estimates of then-existing SWP demands. The 2001 total SWP demand is higher than the 1998 total SWP demand due to increased M&I Contractor demands. Since the models only deliver supplies up to Contractor demands, the deliveries shown in the wetter years, when adequate supply is usually available, are limited by demands. Therefore, the DWRSIM study shows lower deliveries than the CALSIM II study in the wetter years (see Figure 2-1), not because supplies are not available, but because the lower demands in the DWRSIM study limit deliveries. The lower demand can also result in more water being delivered in some dry years, if more water was left in storage at the end of the year preceding the dry year. This explains a portion of the higher DWRSIM deliveries shown on Figure 2-1 in drier years. Any differences in SWP deliveries due to factors other than demands can be seen on Figure 2-2, since the demands used in the 2020 level DWRSIM study and 2021 level CALSIM II study are the same. Other differences in SWP deliveries between the two model studies could result from factors such as changes in assumptions for regulatory standards and operating criteria, and differences in certain algorithms used in the models.

2.3 MODEL ASSUMPTIONS

In order to simulate operation of the SWP and CVP with DWRSIM, certain information and assumptions are required as model input. The most significant categories of input affecting the model results used in the analyses for this EIR include:

- Water system facilities and their physical characteristics.
- Regulatory, operational, and institutional requirements and constraints.
- Hydrology (as adjusted for upstream land and water use).
- Level of SWP demand.

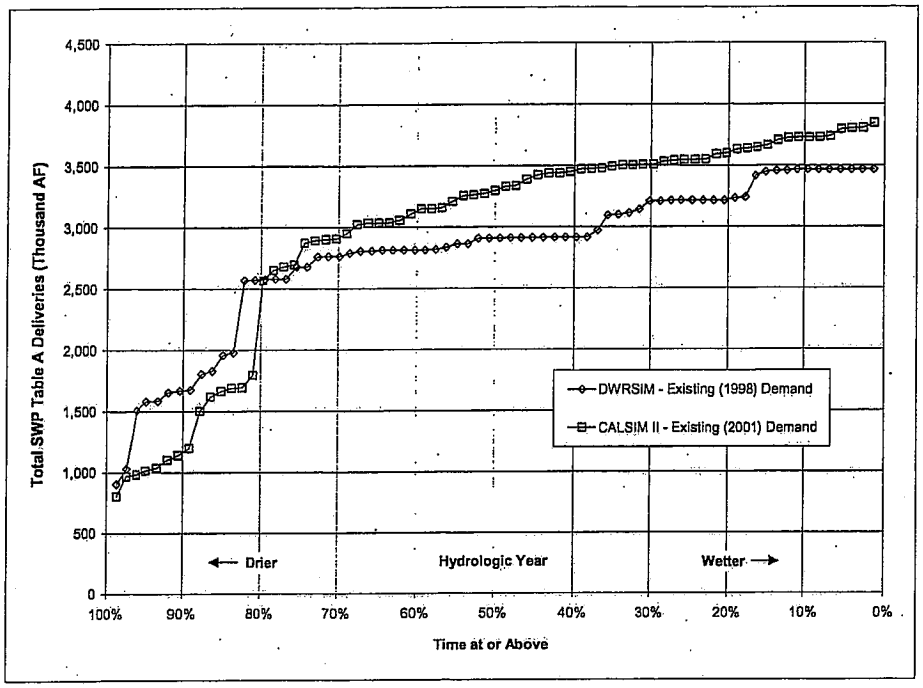

Figure 2-1. Total SWP Table A Deliveries at Existing SWP Demand Conditions

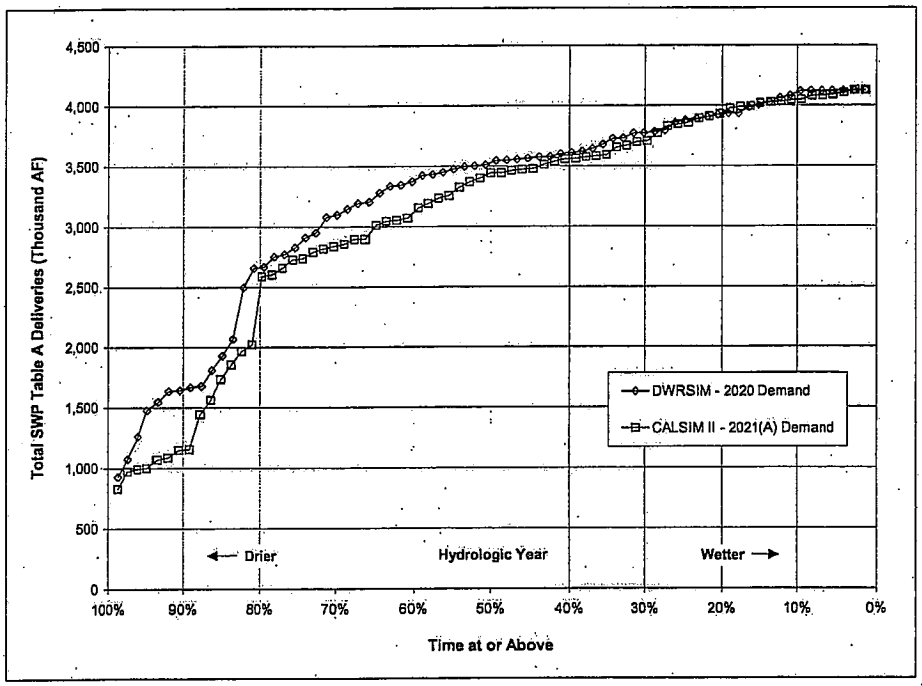

Figure 2-2. Total SWP Table A Deliveries at 2020 SWP Demand Conditions

In the two DWRSIM model studies used in this EIR analysis, the assumptions for the first two of these categories of input are the same. The hydrology and level of SWP demand, however, differ between the two studies. A summary of key model assumptions used in these two model runs, including both study-specific assumptions and common assumptions, is provided in Table 2-1.

The SWP demands used as input to these two DWRSIM model studies are particularly important for the water supply analyses conducted for this EIR. These demands, along with Contractor Table A Amounts, are used in allocating total available SWP supplies among Contractors, and ultimately in determining how much of that available SWP supply is associated with the 41,000 AF of the Project, as is described in more detail in section 3.1 below.

Both of these DWRSIM studies use a demand that varies from year to year during the 73-year study period, based on local wetness indices. The purpose of this variable demand is to account for the real situation where a Contractor's demand changes from one year to the next due to how wet or dry it is in its service area, with higher demand in drier years and lower demand in wetter years. For the demands used in these studies, Agricultural Contractor demands are reduced in wetter years using a Kern River flow index, and MWD demands are reduced in wetter years using a southern California precipitation index. The demands of the other M&I Contractors are not adjusted for wetness and are fixed at maximum Table A Amounts in all years of the study. The specific SWP demands used as input to these studies are provided in section 2.4.

Table 2-1. Key DWRSIM Study Assumptions

	Existing Conditions (1995D06E-CALFED-771)	*2020 Conditions (2020D09C-CALFED-786)*
Study-Specific Assumptions		
Hydrology	1995 Level hydrology (based on DWR Bulletin 160-98 land use projections)	2020 Level hydrology (based on DWR Bulletin 160-98 land use projections)
SWP Demand (includes south of Delta and North Bay Aqueduct)	2.6 – 3.5 million AF/year (varies based on local wetness indices)	3.3 – 4.1 million AF/year (varies based on local wetness indices)
Common Assumptions		
SWP Facilities	Existing	
Delta Regulatory Standards	1995 Delta Water Quality Control Plan standards, with select Anadromous Fish Restoration Plan (AFRP) CVPIA(b)(2) Delta Actions (from Actions in Nov 20, 1997 AFRP Document)	
Operations Criteria	Banks Pumping Plant export limit at 6,680 cfs with certain exemptions	
	SWP operation coordinated with CVP per 1986 Coordinated Operations Agreement	

Source: DWR 1999, CALFED 2000.

2.4 SELECTED MODEL INPUT AND OUTPUT

Certain input to the two DWRSIM studies and certain results (or output) from the model studies were used as a starting point for the analyses conducted for this EIR. The model input used in the EIR analyses was annual SWP Contractor demands, with demands for each year of the model study, aggregated for the following three broad Contractor groups: Agricultural Contractors, MWD, and Other M&I Contractors (i.e., all M&I Contractors except MWD). The model output used in the EIR analyses includes total annual SWP deliveries, output related to San Luis Reservoir operations (i.e., reservoir storage, diversions to and releases from storage, and aqueduct flows upstream and downstream of the reservoir), and Castaic Lake storage.

The DWRSIM model operates on a water year (October through September) basis, starting with hydrology from October 1921 and running for 73 water years, through September 1994. However, the water supply analyses for this EIR had to be conducted on a calendar year basis, since SWP supplies are allocated, both in real practice and within the model, based on calendar years. Therefore, any monthly DWRSIM data used was arranged based on calendar years and any annual totals used were calendar-year totals. Since the first and last calendar years of the model run (1921 and 1994) contain only three and nine months of data, respectively, the annual totals for these years are not meaningful. As a result, any analyses that started with annual totals, such as the water supply analysis, excluded data for the partial years of 1921 and 1994.

Specific data used from the DWRSIM model studies are shown on Figures 2-3 to 2-6, and Tables 2-2 to 2-7. Figure 2-3 shows a probability of exceedance graph of total SWP Table A deliveries over the entire hydrologic period, for existing and 2020 demand conditions. Tables 2-2 and 2-3 provide the DWRSIM input of annual demands for the three Contractor groups and the DWRSIM output of total annual SWP deliveries, for each year over the hydrologic period, for the existing conditions study and 2020 conditions study, respectively.

To more clearly show the impact of the demands used as input in these model studies on the model's output, the total SWP Table A deliveries shown on Figure 2-3 are shown again on Figure 2-4, presented both as a percent of total Contractor demand and as a percent of total Table A Amounts. The differences in potential interpretation are particularly apparent for the existing conditions study, which used a lower total SWP demand as input. As was discussed previously, since DWRSIM deliveries are limited to demand, in the existing conditions study the lower deliveries in the wetter years occur not because supplies are not available, but because the lower demand limits deliveries. At the existing demand level, model results indicate that the SWP could meet full Contractor demands about two thirds of the time. Note that for this same study, because the maximum total demand is less than total Table A Amounts, these same deliveries presented as a percent of Table A Amount never exceed about 86 percent (i.e., it appears Contractors would never receive a 100 percent SWP supply allocation, giving the appearance that Contractor demands are never fully met). This interpretation is clearly a mischaracterization of the model results, and highlights the importance of considering the demands used in these studies in interpreting study results. For the 2020 conditions study, since total Contractor demands in many years are equal to total Table A Amounts, the output supplies shown in the graph as a percent of demand begin to converge with those same supplies shown as a percent of Table A Amount.

Figure 2-5 shows a graph of average monthly storage at San Luis Reservoir, with the monthly data for the hydrologic period provided in Tables 2-4 and 2-5, for existing and 2020 demand conditions, respectively.

Figure 2-6 shows a graph of average monthly storage at Castaic Lake, with the monthly data for the hydrologic period provided in Tables 2-6 and 2-7, for existing and 2020 demand conditions, respectively. It should be noted that DWRSIM only models operation of Castaic Lake in meeting Contractor deliveries, and does not model Contractor use of flexible storage. Since Contractors can use flexible storage for any number of reasons, including for their own operations unrelated to the SWP, use of flexible storage cannot effectively be modeled. Therefore, the DWRSIM output shown reflects only normal Castaic Lake operations to meet Contractor deliveries.

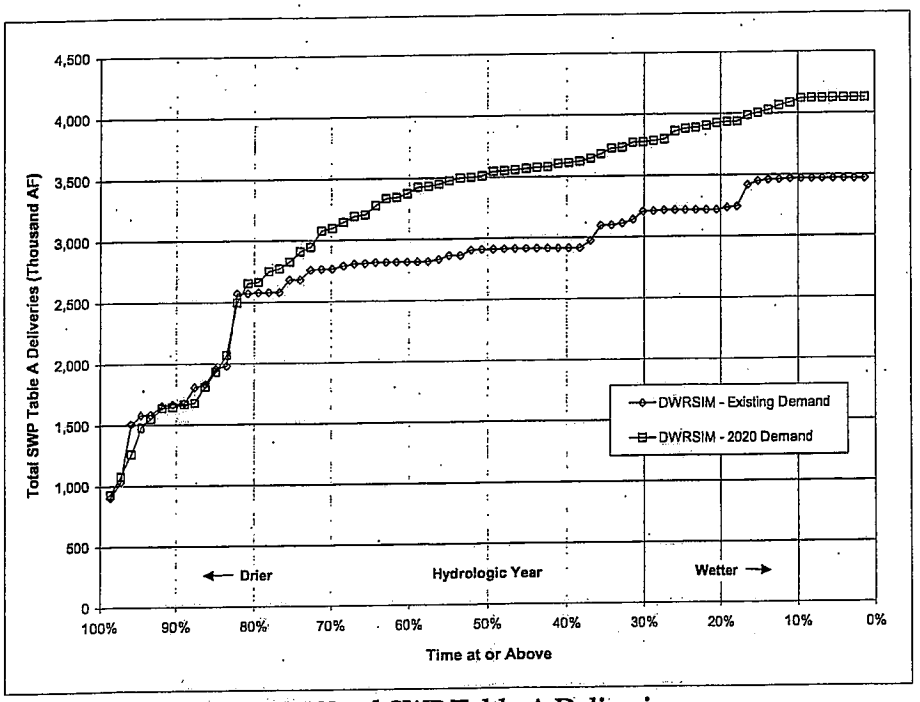

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Figure 2-3. DWRSIM Total SWP Table A Deliveries

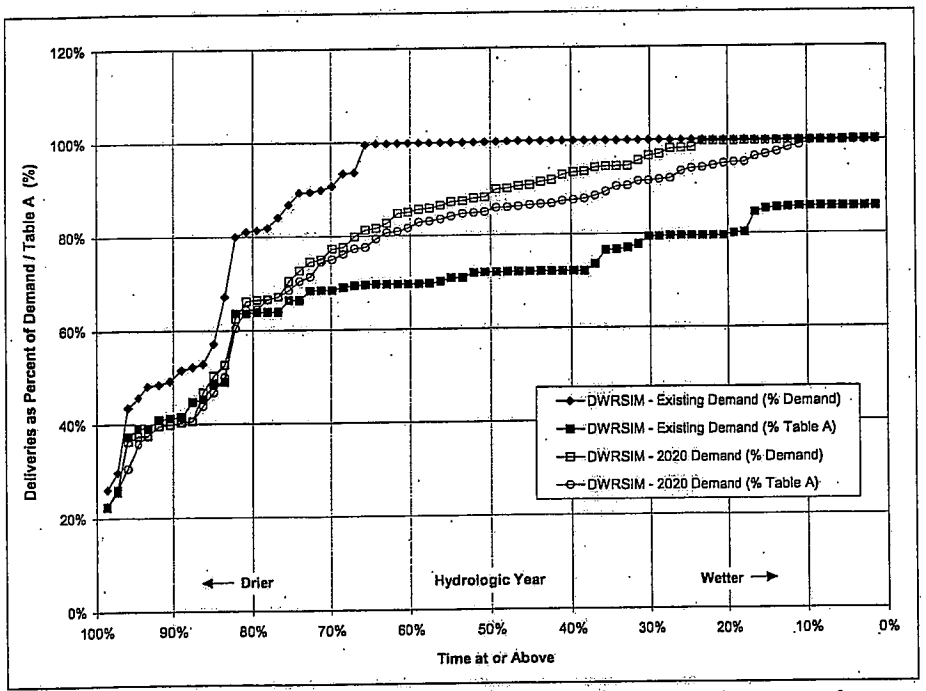

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Figure 2-4. DWRSIM Total SWP Table A Deliveries, as Percent of Demand and Percent of Table A Amount

Table 2-2. DWRSIM SWP Demand Input and Delivery Output at Existing SWP Demand Conditions

(DWRSIM study 1995D06E-CALFED-771; Calendar year data, in thousands of AF)

Hydrologic Year	DWRSIM INPUT: DEMANDS				DWRSIM OUTPUT
	Ag Contractrs	MWD	Other M&I Contractrs	Total SWP Demand	Total SWP Delivery
Table A Amount	1175.4	2011.5	856.8	4043.7	N/A
1922	1175.4	883.0	856.8	2915.2	2913.2
1923	1175.4	1183.0	856.8	3215.2	3215.4
1924	1175.4	1433.0	856.8	3465.2	1979.4
1925	1175.4	1433.0	856.8	3465.2	1806.3
1926	1175.4	1183.0	856.8	3215.2	2789.3
1927	1175.4	883.0	856.8	2915.2	2910.2
1928	1175.4	1183.0	856.8	3215.2	3215.4
1929	1175.4	1433.0	856.8	3465.2	1829.2
1930	1175.4	1433.0	856.8	3465.2	2808.4
1931	1175.4	1433.0	856.8	3465.2	1583.6
1932	1175.4	883.0	856.8	2915.2	1958.0
1933	1175.4	1183.0	856.8	3215.2	1654.9
1934	1175.4	1433.0	856.8	3465.2	1676.9
1935	1175.4	883.0	856.8	2915.2	2907.2
1936	1175.4	883.0	856.8	2915.2	2908.0
1937	1125.0	783.0	856.8	2764.8	2760.6
1938	1125.0	783.0	856.8	2764.8	2764.7
1939	1175.4	783.0	856.8	2815.2	2815.1
1940	1175.4	1183.0	856.8	3215.2	3208.7
1941	940.0	783.0	856.8	2579.8	2579.8
1942	1175.4	783.0	856.8	2815.2	2815.1
1943	1125.0	883.0	856.8	2864.8	2864.8
1944	1175.4	783.0	856.8	2815.2	2815.1
1945	1175.4	883.0	856.8	2915.2	2912.0
1946	1175.4	1183.0	856.8	3215.2	3215.4
1947	1175.4	1433.0	856.8	3465.2	3458.8
1948	1175.4	1433.0	856.8	3465.2	3141.6
1949	1175.4	1433.0	856.8	3465.2	2817.8
1950	1175.4	1433.0	856.8	3465.2	3098.6
1951	1175.4	1433.0	856.8	3465.2	3465.4
1952	940.0	883.0	856.8	2679.8	2679.7
1953	1175.4	883.0	856.8	2915.2	2915.2
1954	1175.4	1433.0	856.8	3465.2	3465.4
1955	1175.4	1183.0	856.8	3215.2	2570.5
1956	1175.4	1433.0	856.8	3465.2	3464.5
1957	1175.4	1433.0	856.8	3465.2	3465.4
1958	1125.0	883.0	856.8	2864.8	2864.8
1959	1175.4	883.0	856.8	2915.2	2915.2
1960	1175.4	1433.0	856.8	3465.2	3113.4
1961	1175.4	1433.0	856.8	3465.2	2834.7
1962	1175.4	1433.0	856.8	3465.2	3456.7
1963	1175.4	1183.0	856.8	3215.2	3215.4
1964	1175.4	1433.0	856.8	3465.2	3465.4
1965	1175.4	1433.0	856.8	3465.2	3234.8
1966	1175.4	1183.0	856.8	3215.2	3215.4
1967	1125.0	783.0	856.8	2764.8	2764.7
1968	1175.4	883.0	856.8	2915.2	2915.2
1969	940.0	883.0	856.8	2679.8	2679.7
1970	1175.4	883.0	856.8	2915.2	2915.2
1971	1175.4	1433.0	856.8	3465.2	3465.4
1972	1175.4	1433.0	856.8	3465.2	3447.4
1973	1175.4	1183.0	856.8	3215.2	3209.4
1974	1175.4	1183.0	856.8	3215.2	3215.4
1975	1175.4	1433.0	856.8	3465.2	3465.4
1976	1175.4	1433.0	856.8	3465.2	3242.6
1977	1175.4	1433.0	856.8	3465.2	904.4
1978	940.0	783.0	856.8	2579.8	2571.1
1979	1175.4	783.0	856.8	2815.2	2815.1
1980	940.0	783.0	856.8	2579.8	2579.8
1981	1175.4	883.0	856.8	2915.2	2915.2
1982	1125.0	1433.0	856.8	3414.8	3415.1
1983	940.0	783.0	856.8	2579.8	2579.8
1984	1175.4	783.0	856.8	2815.2	2815.1
1985	1175.4	1433.0	856.8	3465.2	3465.4
1986	940.0	1183.0	856.8	2979.8	2972.8
1987	1175.4	1433.0	856.8	3465.2	3095.0
1988	1175.4	1433.0	856.8	3465.2	1507.9
1989	1175.4	1433.0	856.8	3465.2	2912.7
1990	1175.4	1433.0	856.8	3465.2	1667.3
1991	1175.4	1433.0	856.8	3465.2	1031.8
1992	1175.4	1183.0	856.8	3215.2	1581.8
1993	1175.4	783.0	856.8	2815.2	2805.6
AVG	1148.3	1155.9	856.8	3161.0	2787.8
MIN	940.0	783.0	856.8	2579.8	904.4
MAX	1175.4	1433.0	856.8	3465.2	3465.4

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Table 2-3. DWRSIM SWP Demand Input and Delivery Output at 2020 SWP Demand Conditions

(DWRSIM study 2020D09C-CALFED-786; Calendar year data, in thousands of AF)

Hydrologic Year	DWRSIM INPUT: DEMANDS				DWRSIM OUTPUT
	Ag Contractrs	MWD	Other M&I Contractrs	Total SWP Demand	Total SWP Delivery
Table A Amount	1175.5	2011.5	946.1	4133.1	N/A
1922	1175.5	2011.5	946.0	4133.0	4123.4
1923	1175.5	2011.5	946.0	4133.0	4119.4
1924	1175.5	1358.0	946.0	3479.5	1262.6
1925	1175.5	2011.5	946.0	4133.0	1930.4
1926	1175.5	2011.5	946.0	4133.0	2749.1
1927	1175.5	2011.5	946.0	4133.0	4122.6
1928	1175.5	2011.5	946.0	4133.0	3372.7
1929	1175.5	1322.0	946.0	3443.5	1810.2
1930	1175.5	2011.5	946.0	4133.0	2769.9
1931	1175.5	2011.5	946.0	4133.0	1645.0
1932	1175.5	1994.0	946.0	4115.5	2068.0
1933	1175.5	2011.5	946.0	4133.0	1668.5
1934	1175.5	2011.5	946.0	4133.0	1678.3
1935	1175.5	1785.0	946.0	3906.5	3578.4
1936	1175.5	2011.5	946.0	4133.0	3601.9
1937	1175.5	2011.5	946.0	4133.0	3192.7
1938	1175.5	2011.5	946.0	4133.0	4123.2
1939	1175.5	1826.0	946.0	3947.5	3549.4
1940	1175.5	2011.5	946.0	4133.0	3904.3
1941	940.0	1595.0	946.0	3481.0	3474.0
1942	1175.5	1759.0	946.0	3880.5	3880.3
1943	1175.5	1998.0	946.0	4119.5	3621.0
1944	1175.5	1589.0	946.0	3710.5	3645.3
1945	1175.5	1826.0	946.0	3947.5	3727.1
1946	1175.5	1847.0	946.0	3968.5	3679.3
1947	1175.5	1821.0	946.0	3942.5	3146.7
1948	1175.5	2011.5	946.0	4133.0	3077.6
1949	1175.5	1874.0	946.0	3995.5	2655.4
1950	1175.5	2011.5	946.0	4133.0	3098.0
1951	1175.5	1972.0	946.0	4093.5	3858.4
1952	940.0	1624.0	946.0	3510.0	3509.7
1953	1175.5	1941.0	946.0	4062.5	3794.5
1954	1175.5	2011.5	946.0	4133.0	3772.4
1955	1175.5	1873.0	946.0	3994.5	2494.8
1956	1175.5	2011.5	946.0	4133.0	4121.3
1957	1175.5	1907.0	946.0	4028.5	3448.7
1958	1175.5	1820.0	946.0	3941.5	3935.0
1959	1175.5	2011.5	946.0	4133.0	3609.7
1960	1175.5	1908.0	946.0	4029.5	2665.5
1961	1175.5	1772.0	946.0	3893.5	2826.7
1962	1175.5	1811.0	946.0	3932.5	3555.5
1963	1175.5	2011.5	946.0	4133.0	4064.8
1964	1175.5	1908.0	946.0	4029.5	3423.6
1965	1175.5	1844.0	946.0	3965.5	3278.7
1966	1175.5	1924.0	946.0	4045.5	3924.4
1967	1175.5	1911.0	946.0	4032.5	4025.4
1968	1175.5	2006.0	946.0	4127.5	3565.7
1969	940.0	1697.0	946.0	3583.0	3574.9
1970	1175.5	1882.0	946.0	4003.5	3783.6
1971	1175.5	2011.5	946.0	4133.0	4124.3
1972	1175.5	2011.5	946.0	4133.0	3204.3
1973	1175.5	1997.0	946.0	4118.5	3731.2
1974	1175.5	1968.0	946.0	4089.5	4083.3
1975	1175.5	1991.0	946.0	4112.5	3933.9
1976	1175.5	1594.0	946.0	3715.5	3334.8
1977	1175.5	2011.5	946.0	4133.0	929.2
1978	940.0	2011.5	946.0	3897.5	3887.8
1979	1175.5	2011.5	946.0	4133.0	3545.4
1980	940.0	1865.0	946.0	3751.0	3496.9
1981	1175.5	2011.5	946.0	4133.0	3502.5
1982	1175.5	1887.0	946.0	4008.5	4002.4
1983	940.0	1457.0	946.0	3343.0	3342.7
1984	1175.5	1939.0	946.0	4060.5	3984.4
1985	1175.5	1783.0	946.0	3904.5	3772.6
1986	940.0	2011.5	946.0	3897.5	3431.7
1987	1175.5	1507.0	946.0	3628.5	2947.5
1988	1175.5	1821.0	946.0	3942.5	1479.1
1989	1175.5	2011.5	946.0	4133.0	2908.5
1990	1175.5	2011.5	946.0	4133.0	1636.3
1991	1175.5	2011.5	946.0	4133.0	1075.9
1992	1175.5	2011.5	946.0	4133.0	1548.6
1993	1175.5	2011.5	946.0	4133.0	4121.3
AVG	1152.6	1896.8	946.0	3995.4	3229.6
MIN	940.0	1322.0	946.0	3343.0	929.2
MAX	1175.5	2011.5	946.0	4133.0	4124.3

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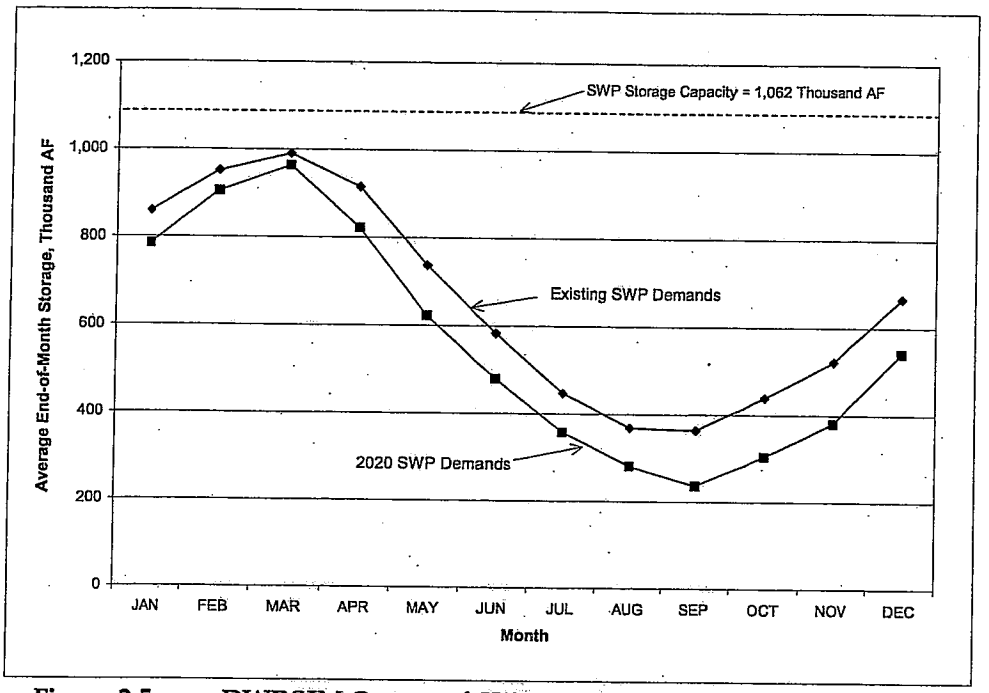


Figure 2-5. DWRSIM Output of SWP San Luis Reservoir Storage, Average End-of-Month Storage

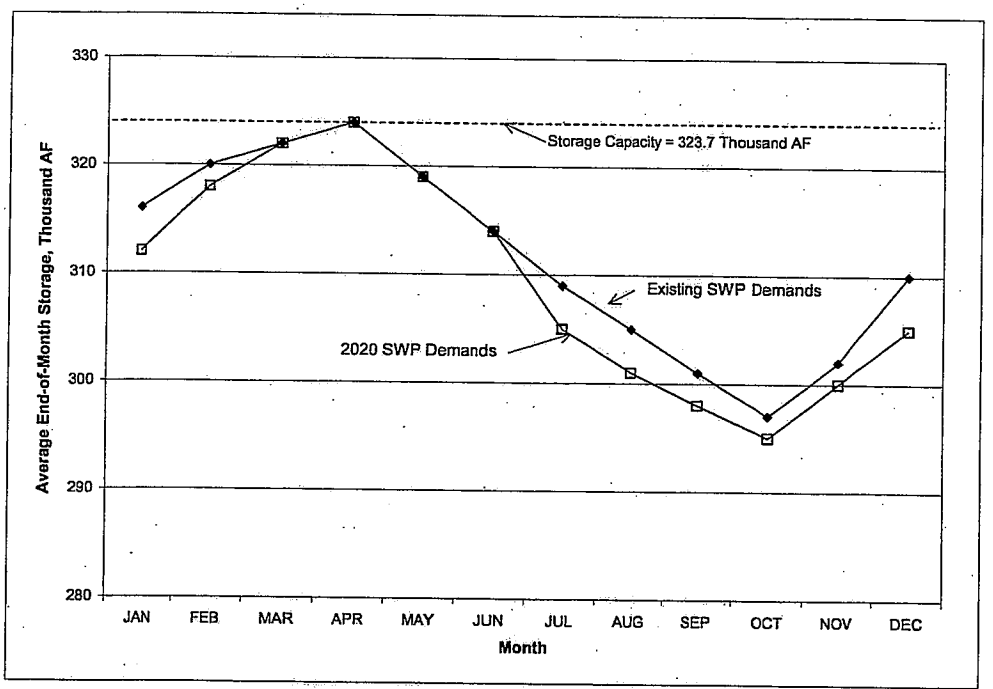


Figure 2-6. DWRSIM Output of Castaic Lake Storage, Average End-of-Month Storage

Table 2-4. DWRSIM Output of SWP San Luis Reservoir Storage at Existing SWP Demand Conditions

(DWRSIM study 1995D06E-CALFED-771)

(End-of-Month Storage, in thousands of AF)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1921	—	—	—	—	—	—	—	—	—	225	247	491
1922	818	1067	1067	1017	847	850	594	517	549	783	996	1067
1923	1067	1067	1067	1004	805	599	571	326	332	344	344	500
1924	806	948	948	851	755	602	410	162	42	42	77	270
1925	376	715	715	716	613	380	155	42	93	117	117	300
1926	660	954	963	890	668	449	226	253	66	127	328	573
1927	900	1067	1067	1016	839	669	597	402	441	675	886	1067
1928	1067	1067	1067	1009	794	557	424	326	187	187	307	504
1929	829	1009	1009	929	766	537	298	69	42	42	42	337
1930	691	796	1060	927	705	489	269	305	162	162	140	371
1931	625	625	625	568	415	215	42	42	42	42	42	371
1932	773	952	952	898	787	617	414	183	88	88	88	88
1933	399	494	667	667	555	341	119	42	42	42	42	293
1934	651	730	730	684	520	308	88	42	42	42	157	230
1935	632	722	1012	970	815	671	625	316	231	301	295	295
1936	675	1003	1067	1031	857	684	611	305	335	335	315	480
1937	838	1067	1067	1051	900	832	581	287	298	445	663	961
1938	1067	1067	1067	1067	975	1027	1016	1052	1067	1067	1067	1067
1939	1067	1067	1067	954	754	552	350	286	85	85	52	52
1940	477	818	1066	997	793	563	517	341	307	324	424	672
1941	1046	1067	1067	1042	936	1021	829	896	1048	1067	1067	1067
1942	1067	1067	1067	1048	921	935	769	797	928	1067	1067	1067
1943	1067	1067	1067	1021	874	716	585	442	498	691	802	1022
1944	1067	1067	1067	966	788	621	574	286	132	132	354	618
1945	918	1067	1067	972	762	615	590	296	231	382	594	888
1946	1067	1067	1067	954	751	565	537	326	284	288	422	665
1947	943	1067	1067	898	612	313	42	42	42	42	42	42
1948	402	402	526	518	283	86	42	42	42	94	141	333
1949	616	706	997	865	646	493	511	307	249	249	249	249
1950	619	920	1049	925	678	489	458	340	379	468	647	910
1951	1067	1067	1067	944	728	476	374	335	370	474	644	873
1952	1067	1067	1067	1067	986	1060	1067	1067	1067	1067	1067	1067
1953	1067	1067	1067	979	819	740	591	609	731	965	1067	1067
1954	1067	1067	1067	980	743	481	386	347	297	390	560	774
1955	1067	1067	1067	955	772	651	523	267	225	225	302	602
1956	952	1067	1067	962	741	675	620	580	646	832	910	1067
1957	1067	1067	1067	954	720	497	442	351	370	557	726	942
1958	1067	1067	1067	1021	856	898	911	936	1061	1067	1067	1067
1959	1067	1067	1067	925	708	478	240	261	261	261	249	451
1960	754	1050	1067	912	658	402	148	134	50	132	272	485
1961	819	1067	1067	936	717	503	280	307	184	184	184	414
1962	595	980	1067	901	626	354	212	141	69	240	391	585
1963	872	1067	1067	1021	857	675	641	614	703	888	1067	1067
1964	1067	1067	1067	872	598	308	42	42	42	42	175	406
1965	768	1038	1067	1022	848	632	610	604	664	798	980	1067
1966	1067	1067	1067	928	704	445	196	186	109	109	299	588
1967	925	1067	1067	1052	960	1012	1035	1067	1067	1067	1067	1067
1968	1067	1067	1067	961	760	527	289	296	231	319	506	763
1969	1067	1067	1067	1067	967	1056	1067	1067	1067	1067	1067	1067
1970	1067	1067	1067	984	808	592	428	296	277	381	594	856
1971	1067	1067	1067	964	760	589	533	494	561	747	878	1067
1972	1067	1067	1067	897	635	362	109	75	42	130	297	504
1973	822	1067	1067	1000	807	699	643	449	539	746	933	1067
1974	1067	1067	1067	997	799	699	671	657	749	957	1067	1067
1975	1067	1067	1067	1004	817	762	678	638	704	890	1059	1067
1976	1067	1067	1067	902	647	411	220	217	61	144	124	124
1977	196	196	196	188	118	42	42	42	58	42	61	329
1978	738	1067	1067	1067	1023	952	633	603	750	995	1067	1067
1979	1067	1067	1067	1016	850	746	579	286	309	495	716	981
1980	1067	1067	1067	1067	945	845	606	674	827	1067	1067	1067
1981	1067	1067	1067	978	776	548	317	296	198	252	465	720
1982	1067	1067	1067	991	779	734	687	655	726	913	1067	1067
1983	1067	1067	1067	1067	1055	1067	1067	1067	1067	1067	1067	1067
1984	1067	1067	1067	975	780	628	575	441	548	731	952	1067
1985	1067	1067	1067	905	637	350	53	42	42	46	90	299
1986	653	987	1067	1017	813	650	615	316	421	605	605	825
1987	1067	1067	1067	925	682	459	241	253	72	72	42	196
1988	548	548	548	494	354	204	42	42	42	42	127	239
1989	495	495	831	733	490	236	42	42	42	42	42	141
1990	456	484	526	478	373	209	42	42	42	42	42	42
1991	64	42	396	416	362	231	94	42	42	42	42	50
1992	245	583	894	847	695	517	323	118	42	42	42	345
1993	782	1065	1067	1032	884	893	588	611	693	932	1052	1067
1994	1067	1067	1067	917	698	491	278	286	237	—	—	—
AVG:	859	951	990	915	737	583	447	369	364	439	522	666
MIN:	64	42	196	188	118	42	42	42	42	42	42	42
MAX:	1067	1067	1067	1067	1055	1067	1067	1067	1067	1067	1067	1067

Table 2-5. DWRSIM Output of SWP San Luis Reservoir Storage at 2020SWP Demand Conditions

(DWRSIM study 2020D09C-CALFED-786)
(End-of-Month Storage, in thousands of AF)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1921	—	—	—	—	—	—	—	—	—	270	257	430
1922	723	983	1067	877	611	546	465	398	271	366	479	658
1923	923	908	823	658	405	176	97	42	42	94	42	156
1924	475	687	687	625	510	372	211	56	42	61	156	432
1925	628	955	955	936	847	631	414	216	232	239	239	249
1926	597	866	862	764	566	413	221	270	101	137	345	582
1927	868	1067	1067	875	604	358	277	211	114	209	317	480
1928	747	931	1067	965	761	578	462	318	158	158	290	464
1929	777	988	988	887	728	532	305	83	42	42	42	344
1930	686	779	1005	842	645	486	290	278	141	141	148	379
1931	641	641	641	560	412	233	42	42	42	42	42	374
1932	761	952	952	868	760	615	412	180	106	106	106	106
1933	437	512	658	658	551	366	151	42	42	42	42	320
1934	665	727	727	662	510	327	119	42	42	42	180	274
1935	664	739	1012	931	713	529	455	384	153	153	82	82
1936	460	793	959	812	585	423	357	304	220	220	140	225
1937	601	948	1067	969	782	762	647	329	211	265	439	669
1938	973	1067	1067	944	751	723	645	584	555	662	794	962
1939	1067	1067	1067	869	630	422	170	148	50	50	42	42
1940	444	792	957	778	523	275	197	133	42	86	149	307
1941	625	857	1047	912	746	791	642	496	514	691	863	1067
1942	1067	1067	1067	938	739	704	626	547	533	691	848	1047
1943	1067	1067	1067	937	751	590	553	335	339	474	554	735
1944	1001	1067	1067	873	638	438	342	292	69	130	300	501
1945	791	1067	1067	863	587	408	337	281	83	175	325	536
1946	798	798	834	648	427	264	216	176	70	159	288	487
1947	772	988	1066	870	633	434	187	188	50	50	50	50
1948	402	402	519	491	279	148	104	69	58	158	233	416
1949	709	796	1067	915	730	645	540	271	225	225	225	225
1950	582	867	990	826	600	471	460	319	351	452	639	889
1951	1067	1067	1067	879	655	435	321	265	246	340	496	692
1952	992	1067	1067	1007	874	919	892	874	960	1067	1067	1067
1953	1067	1067	1067	885	674	573	513	461	489	589	750	931
1954	1067	1067	1067	929	705	479	377	324	249	301	459	640
1955	941	974	954	812	655	591	475	240	212	212	295	599
1956	902	1067	1067	871	615	547	468	403	360	469	509	638
1957	868	1049	1067	922	719	570	551	323	318	503	684	890
1958	1067	1067	1067	901	655	637	556	488	500	648	750	914
1959	1067	1067	1067	829	574	344	63	42	42	84	42	42
1960	379	690	793	623	429	280	98	151	57	57	251	481
1961	798	1042	1067	901	701	539	333	284	163	163	163	390
1962	569	940	1067	844	578	364	240	183	79	229	375	545
1963	781	993	1067	945	715	499	419	352	314	411	534	693
1964	924	867	797	570	323	103	42	42	42	42	174	391
1965	714	944	1067	986	833	700	614	547	639	773	963	1067
1966	1067	1067	1067	841	580	318	42	42	42	42	154	352
1967	661	860	1067	910	720	694	614	549	548	661	763	931
1968	1067	1067	1067	875	628	403	132	112	50	177	352	556
1969	902	1067	1067	972	811	862	869	838	915	1067	1067	1067
1970	1067	1067	1067	888	659	424	192	141	50	156	317	508
1971	718	750	890	685	447	266	187	124	125	232	332	495
1972	734	840	1013	821	608	436	246	266	181	314	510	730
1973	1011	1067	1067	925	708	616	552	361	384	544	701	900
1974	1067	1067	1067	894	644	551	471	406	409	539	661	831
1975	1058	1067	1067	927	719	679	604	544	554	701	846	1019
1976	1067	1067	1067	861	623	437	274	277	133	177	164	164
1977	239	239	239	220	162	86	42	42	68	42	67	388
1978	798	1067	1067	919	758	585	528	396	364	364	364	460
1979	784	1036	1067	924	712	599	557	340	256	381	549	748
1980	1067	1067	1067	984	801	669	652	565	650	814	795	993
1981	1067	1067	1067	904	675	457	193	176	50	144	321	524
1982	801	1004	1067	909	669	625	545	479	494	642	788	1011
1983	1067	1067	1067	1022	962	1067	1067	1067	1067	1067	1067	1067
1984	1067	1067	1067	867	610	410	336	275	225	329	477	654
1985	884	980	1015	773	492	225	42	42	42	42	61	213
1986	556	872	1056	909	680	525	483	343	406	542	494	684
1987	966	1067	1067	902	691	539	356	287	139	139	64	290
1988	632	632	632	564	438	316	136	42	42	42	154	272
1989	520	520	839	694	468	269	42	44	42	47	42	159
1990	485	508	525	461	370	240	60	42	42	42	42	42
1991	53	42	384	387	328	208	69	42	42	42	42	64
1992	273	603	896	832	702	558	375	183	108	108	108	423
1993	796	1025	1067	896	661	591	511	402	282	320	337	485
1994	709	882	813	584	328	118	42	42	42	—	—	—
AVG:	785	905	963	822	622	480	358	281	237	304	381	541
MIN:	53	42	239	220	162	86	42	42	42	42	42	42
MAX:	1067	1067	1067	1022	962	1067	1067	1067	1067	1067	1067	1067

Table 2-6. DWRSIM Output of Castaic Lake Storage at Existing SWP Demand Conditions

(DWRSIM study 1995D06E-CALFED-771)
(End-of-Month Storage, in thousands of AF)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1921	—	—	—	—	—	—	—	—	—	294	299	304
1922	309	324	324	324	319	314	309	304	299	294	299	324
1923	324	314	319	324	319	314	309	304	299	294	299	304
1924	309	314	319	324	319	314	309	304	299	294	299	304
1925	309	314	319	324	319	314	309	304	299	294	299	304
1926	309	314	319	324	319	314	309	304	299	294	299	304
1927	309	324	324	324	319	314	309	304	299	294	299	324
1928	324	324	324	324	319	314	309	304	299	294	299	304
1929	309	314	319	324	319	314	309	304	299	294	299	304
1930	309	314	319	324	319	314	309	304	299	294	299	304
1931	309	314	319	324	319	314	309	304	299	294	299	304
1932	309	314	319	324	319	314	309	304	299	294	299	304
1933	309	314	319	324	319	314	309	304	299	294	299	304
1934	309	314	319	324	319	314	309	304	299	294	299	304
1935	309	314	319	324	319	314	309	304	299	294	299	304
1936	309	314	324	324	319	314	309	304	299	294	299	304
1937	309	324	324	324	319	314	309	304	299	294	299	304
1938	324	324	324	324	319	314	309	304	324	324	324	324
1939	324	324	324	324	319	314	309	304	299	294	299	304
1940	309	314	319	324	319	314	309	304	299	294	299	304
1941	309	324	324	324	319	314	309	304	299	324	324	324
1942	324	324	324	324	319	314	309	304	299	324	324	324
1943	324	324	324	324	319	314	309	304	299	294	299	304
1944	324	324	324	324	319	314	309	304	299	294	299	304
1945	309	324	324	324	319	314	309	304	299	294	299	304
1946	324	324	324	324	319	314	309	304	299	294	299	304
1947	309	324	324	324	319	314	309	299	294	294	299	304
1948	309	314	319	324	319	314	301	294	294	294	299	304
1949	309	314	319	324	319	314	309	304	299	294	299	304
1950	309	314	319	324	319	314	309	304	299	294	299	304
1951	324	324	324	324	319	314	309	304	299	294	299	304
1952	324	324	324	324	319	314	323	324	324	324	324	324
1953	324	324	324	324	319	314	309	304	299	294	324	324
1954	324	324	324	324	319	314	309	304	299	294	299	304
1955	309	324	324	324	319	314	309	304	299	294	299	304
1956	309	324	324	324	319	314	309	304	299	294	299	304
1957	324	324	324	324	319	314	309	304	299	294	299	304
1958	324	324	324	324	319	314	309	304	299	324	324	324
1959	324	324	324	324	319	314	309	304	299	294	299	304
1960	309	314	324	324	319	314	309	304	299	294	299	304
1961	309	314	324	324	319	314	309	304	299	294	299	304
1962	309	314	324	324	319	313	302	299	299	294	299	304
1963	309	324	324	324	319	314	309	304	299	294	299	324
1964	324	324	319	324	319	314	309	304	294	294	299	304
1965	309	314	324	324	319	314	309	304	299	294	299	324
1966	324	324	324	324	319	314	309	304	299	294	299	304
1967	309	324	324	324	319	314	309	304	324	324	324	324
1968	324	324	324	324	319	314	309	304	299	294	299	304
1969	324	324	324	324	319	314	324	324	324	324	324	324
1970	324	324	324	324	319	314	309	304	299	294	299	304
1971	324	324	324	324	319	314	309	304	299	294	299	304
1972	324	324	324	324	319	314	309	304	299	294	299	304
1973	309	324	324	324	319	314	309	304	299	294	299	324
1974	324	324	324	324	319	314	309	304	299	294	303	324
1975	324	324	324	324	319	314	309	304	299	294	299	324
1976	324	324	324	324	319	314	309	304	299	294	299	304
1977	309	314	319	324	319	314	309	304	299	294	299	304
1978	309	314	324	324	319	314	309	304	299	294	314	324
1979	324	324	324	324	319	314	309	304	299	294	299	304
1980	324	324	324	324	319	314	309	304	299	294	299	324
1981	324	324	324	324	319	314	309	304	299	294	299	304
1982	309	324	324	324	319	314	309	304	299	294	299	324
1983	324	324	324	324	319	324	324	324	324	324	324	324
1984	324	324	324	324	319	314	309	304	299	294	299	324
1985	324	324	324	324	319	314	309	304	299	294	299	304
1986	309	314	324	324	319	314	309	304	299	294	299	304
1987	324	324	324	324	319	314	309	304	299	294	299	301
1988	309	314	319	324	319	314	309	304	299	294	299	304
1989	309	314	319	324	319	314	309	304	299	294	294	294
1990	309	314	319	324	319	314	309	304	299	294	299	304
1991	309	314	319	324	319	314	309	304	299	294	299	304
1992	309	314	319	324	319	314	309	304	299	294	299	304
1993	309	314	324	324	319	314	309	304	299	294	299	324
1994	324	324	319	324	319	314	309	304	299	—	—	—
AVG:	316	320	322	324	319	314	309	305	301	297	302	310
MIN:	309	314	319	324	319	313	301	294	294	294	294	294
MAX:	324	324	324	324	319	324	324	324	324	324	324	324

Table 2-7. DWRSIM Output of Castaic Lake Storage at 2020 SWP Demand Conditions

(DWRSIM study 2020D09C-CALFED-786)
(End-of-Month Storage, in thousands of AF)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1921	—	—	—	—	—	—	—	—	—	294	299	304
1922	309	314	324	324	319	314	294	294	294	294	299	304
1923	309	314	319	324	319	314	294	294	294	294	299	303
1924	309	314	319	324	319	314	309	304	299	294	299	304
1925	309	314	319	324	319	314	309	304	299	294	299	304
1926	309	314	319	324	319	314	309	304	299	294	299	304
1927	309	324	324	324	319	314	294	294	294	294	299	304
1928	309	314	324	324	319	314	309	304	299	294	299	304
1929	309	314	319	324	319	314	309	304	299	294	299	304
1930	309	314	319	324	319	314	309	304	299	294	299	304
1931	309	314	319	324	319	314	309	304	299	294	299	304
1932	309	314	319	324	319	314	309	304	299	294	299	304
1933	309	314	319	324	319	314	309	304	299	294	299	304
1934	309	314	319	324	319	314	309	304	299	294	299	304
1935	309	314	319	324	319	314	294	294	294	294	299	304
1936	309	314	319	324	319	314	303	294	299	294	299	304
1937	309	314	324	324	319	314	309	304	299	294	299	304
1938	309	324	324	324	319	314	294	294	294	294	299	304
1939	324	324	324	324	319	314	309	304	299	294	299	299
1940	309	314	319	324	319	314	294	294	294	294	299	304
1941	309	314	319	324	319	314	309	304	299	294	299	304
1942	324	324	324	324	319	314	309	299	299	294	299	304
1943	324	324	324	324	319	314	309	304	299	294	299	304
1944	309	324	324	324	319	314	309	304	299	294	299	304
1945	309	319	324	324	319	314	302	294	299	294	299	304
1946	309	314	319	324	319	314	309	304	299	294	299	304
1947	309	314	319	324	319	314	309	304	299	294	299	304
1948	309	314	319	324	319	314	309	304	299	294	299	304
1949	309	314	319	324	319	314	309	304	299	294	299	304
1950	309	314	319	324	319	314	309	304	299	294	299	304
1951	324	324	324	324	319	314	309	300	299	294	299	304
1952	309	324	324	324	319	314	309	304	299	310	324	324
1953	324	324	324	324	319	314	309	304	299	294	299	304
1954	324	324	324	324	319	314	309	302	299	294	299	304
1955	309	314	319	324	319	314	309	304	299	294	299	304
1956	309	324	324	324	319	314	294	294	294	294	299	304
1957	309	314	324	324	319	314	309	304	299	294	299	304
1958	324	324	324	324	319	314	297	294	299	294	299	304
1959	324	324	319	324	319	314	309	304	299	294	299	304
1960	309	314	319	324	319	314	309	304	299	294	299	304
1961	309	314	324	324	319	314	309	304	299	294	299	304
1962	309	314	324	324	319	314	298	294	299	294	299	304
1963	309	314	324	324	319	314	294	294	294	294	299	304
1964	309	314	319	324	319	314	309	304	294	294	299	304
1965	309	314	324	324	319	314	309	304	299	294	299	324
1966	324	324	324	324	319	314	303	294	294	294	299	304
1967	309	314	322	324	319	314	294	294	294	294	299	304
1968	324	324	324	324	319	314	309	304	299	294	299	304
1969	309	324	324	324	319	314	309	304	299	294	299	304
1970	324	324	324	324	319	314	309	304	299	294	324	324
1971	309	314	319	324	319	314	294	294	294	294	299	304
1972	309	314	319	324	319	314	309	304	299	294	299	304
1973	309	324	324	324	319	314	309	302	299	294	299	304
1974	324	324	324	324	319	314	294	294	294	294	299	304
1975	309	324	324	324	319	314	295	294	299	294	299	304
1976	324	324	324	324	319	314	309	304	299	294	299	304
1977	309	314	319	324	319	314	309	304	299	294	299	304
1978	309	318	324	324	319	314	294	294	294	294	299	304
1979	309	314	324	324	319	314	309	304	299	294	299	304
1980	309	324	324	324	319	314	309	304	299	294	299	304
1981	324	324	324	324	319	314	309	304	299	294	299	304
1982	309	314	324	324	319	314	297	294	299	294	299	304
1983	324	324	324	324	319	324	324	313	324	324	324	324
1984	324	324	324	324	319	314	300	294	299	294	299	304
1985	309	314	319	324	319	314	309	294	294	294	299	304
1986	309	314	319	324	319	314	309	304	299	294	299	304
1987	309	324	324	324	319	314	309	304	299	294	299	304
1988	309	314	319	324	319	314	309	304	299	294	299	304
1989	309	314	319	324	319	314	309	304	299	294	299	299
1990	309	314	319	324	319	314	309	304	299	294	299	304
1991	309	314	319	324	319	314	309	304	299	294	299	304
1992	309	314	319	324	319	314	309	304	299	294	299	304
1993	309	314	323	324	319	314	294	294	294	294	299	304
1994	309	314	319	324	319	314	309	303	294	—	—	—
AVG:	312	318	322	324	319	314	305	301	298	295	300	305
MIN:	309	314	319	324	319	314	294	294	294	294	299	299
MAX:	324	324	324	324	319	324	324	313	324	324	324	324

3.0 STATE WATER PROJECT SUPPLY ANALYSIS

3.1 ANALYSIS ASSUMPTIONS AND METHODOLOGY

3.1.1 Overview of Analysis

The water supply analysis included in this EIR shows the potential impacts resulting from implementation of the Project to both WRMWSD SWP supplies and CLWA SWP supplies. Figure 3-1 provides an overview of the water supply analysis. The first two components shown in this figure, Primary Model Tool and Analysis Timeframe, are described in section 2.1. The remaining two components in the figure, SWP Water Supply Allocation Scenarios and Hydrologic Conditions, are described directly below. Following these discussions is a description of both the assumptions and the general methodology followed in these analyses that are common to all three allocation scenarios.

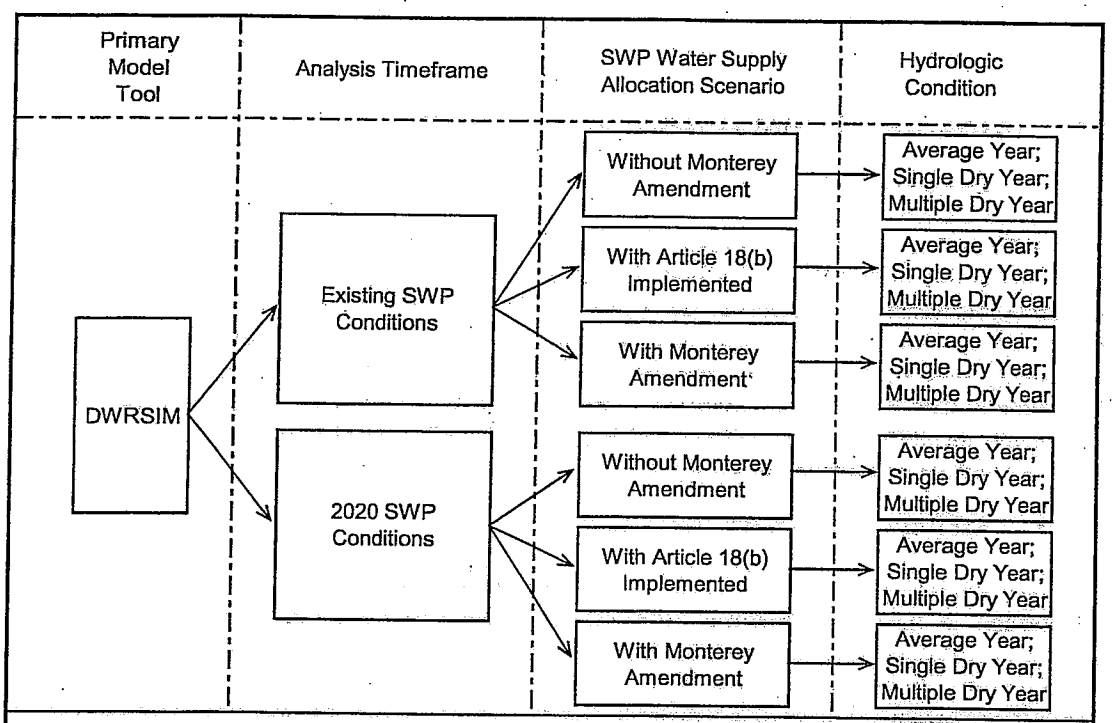
3.1.1.1 SWP Water Supply Allocation Scenarios

As was discussed in section 1.3, DWR is in the process of preparing a new EIR for the Monterey Amendment. Since the Monterey Amendment changes the way SWP supplies are allocated among Contractors, this EIR provides three separate analyses of the Project's potential impacts to SWP water supplies available to WRMWSD and CLWA. The three analyses represent three possible scenarios for allocating available SWP supplies among Contractors, and provide an evaluation of the amount of SWP supply that would be associated with the 41,000 AF of Table A Amount under each of the allocation scenarios. The three analyses are governed by specific terms in the Water Supply Contracts, and are referred to in this EIR as: "SWP Allocation without the Monterey Amendment" (Without Monterey Amendment); "SWP Allocation without the Monterey Amendment and with Implementation of Article 18(b) Permanent Shortage Provision" (With Article 18(b) Implemented); and, "SWP Allocation with the Monterey Amendment" (With Monterey Amendment). DWR is currently allocating SWP supplies in accordance with the Water Supply Contract as amended by the Monterey Amendment (i.e., the With Monterey Amendment scenario). The SWP supply allocation scenarios that form the basis of the three analyses are summarized in Table 3-1. These allocation scenarios are further described, along with analysis methodology and assumptions that are specific to each scenario, in sections 3.1.3.1 through 3.1.3.3 below.

It is important to note that the total amount of SWP supply available in any given year is independent of the allocation scenario. The total amount of SWP supply available in a given year is determined by that year's hydrology, the amount of storage in SWP reservoirs at the beginning of the year, and the regulatory and operational constraints that govern Delta and SWP facility operations. The different allocation scenarios determine only how that available SWP supply is allocated among the Contractors.

3.1.1.2 Hydrologic Conditions

Because SWP water supplies vary from year to year depending on a variety of factors, the supply analyses for this EIR were conducted for each year in the period of hydrologic record included in the DWRSIM model studies. The results of the water supply analysis are presented



Definitions:

DWRSIM - DWR's SWP operations model. DWRSIM calculates the amount of water the SWP could deliver to Contractors in each month over a 73-year period of hydrologic record, based on a given set of facilities and operating constraints and for a given level of Contractor demand. (DWRSIM studies used were conducted by DWR in 1998 for CALFED Bay-Delta Program EIS/EIR [CALFED 2000].)

Existing SWP Conditions - A timeframe for anlaysis in the DWRSIM study. The existing condition study assumes the use of then-existing (1998) SWP facilities and operating constraints, along with then-current estimates of Contractor demands and upstream land and water use. (DWRSIM study 1995D06E-CALFED-771)

2020 SWP Conditions - A timeframe for analysis in the DWRSIM study. The 2020 condition study assumes the use of then-existing (1998) SWP facilities and operating constrains, along with estimated future (2020) Contractor demands upstream land and water use. (DWRSIM study 2020D09C-CALFED-786)

Without Monterey Amendment (Initial agricultural reduction in allocations) - Allocation of available SWP supplies based on the original terms of the Water Supply Contracts.

With Article 18(b) Implemented (Proportionate reduction in Table A Amounts) - Proportionate reduction in Contractor's Table A Amounts and allocation of available SWP supplies based on the original terms of the Water Supply Contracts, assuming DWR implemented Article 18(b) (i.e., the permanent shortage provision).

With Monterey Amendment (Proportionate reduction in allocations) - Allocation of available SWP supplies based on the terms of the Monterey Amendment to the Water Supply Contracts.

Average Year - The average quantity of supply available, based on the 73 years of DWRSIM model results.

Single Dry Year - Supply available in the single year with the lowest total SWP deliveries, based on the DWRSIM model results (1977). The single dry year supply is considered to be the worst-case scenario, with a probability of occurrence of once in 73 years, or about 1.4 percent of the time.

Multiple Dry Year - Average supply available over the four consecutive drought years of 1988 through 1991, based on the DWRSIM model results.

1
2

Figure 3-1. Water Supply Analysis Overview

LETTER 4

Table 3.1. Summary of SWP Water Supply Contract Without Monterey Amendment, With Article 18(b) Implemented and With Monterey Amendment Allocation Scenarios

	Without Monterey Amendment	*With Article 18(b) Implemented*	*With Monterey Amendment*
SWP Supplies Allocated Based on:	Original terms of Water Supply Contracts.	Original terms of Water Supply Contracts, assuming DWR implemented Article 18(b), (i.e., if it determined SWP was in "permanent shortage" situation). All Contractors' Table A Amounts proportionately reduced until they total new "minimum project yield," as determined by DWR.	Terms of Monterey Amendment to Water Supply Contracts.
Table A Water Shortage Allocation	Agricultural Contractors receive initial supply reduction (up to 50% of Table A Amount in one year, and up to 100% in any consecutive seven years). Any remaining shortage allocated proportionately among all Contractors.	Same as Without Monterey Amendment[1].	Shortages allocated in proportion to Contractors' Table A Amounts; no agricultural and M&I allocation differential.
Surplus Water Allocation	First priority given to Agricultural Contractors. Two categories of surplus water: • Scheduled surplus. • Unscheduled surplus.	Same as Without Monterey Amendment[2].	Surplus allocated in proportion to Contractors' Table A Amounts. Scheduled surplus water eliminated. Unscheduled surplus water renamed; referred to as Article 21 water.
Results for Contractors	Agricultural Contractors have: • Less reliable Table A supply than M&I Contractors (due to initial agricultural reductions), but, • More access to surplus water.	Supplies shift from M&I Contractors to Agricultural Contractors, due to: • Smaller and less frequent initial agricultural reductions, and, • More of available supply classified as surplus water (with agricultural priority).	Reliability of both Table A supply and surplus supply is same for Agricultural Contractors and M&I Contractors.

1. Same allocation rules apply, but because Table A Amounts are reduced, initial agricultural reductions are smaller and less frequent.
2. Same allocation rules apply, but because Table A Amounts are reduced, surplus supplies are available more frequently.

in section 3.2 below, both in graphical form over the entire period of record and in tabular form for three selected hydrologic conditions, as follows:

1. Graph of supplies available over DWRSIM's entire 73-year period of hydrologic record, presented as probability of exceedance curves (i.e., the probability of supplies being greater than or equal to specific quantities).
2. Table of supply results for selected hydrologic conditions, defined as:
   - Average Year - The average supply available, based on the 73 years of DWRSIM model results.
   - Single Dry Year - The supply available in the single year with the lowest total SWP deliveries, based on the DWRSIM model results, which occurred in the critical drought year of 1977. The single dry year supply is considered to be the worst-case scenario, with a probability of occurrence of once in 73 years, or about 1.4 percent of the time.
   - Multiple Dry Year Period – The average supply available over the four consecutive drought years of 1988 to 1991, based on the DWRSIM model results.

3.1.2 Common Assumptions and Methodology

Assumptions

The general assumptions made in determining the amount of SWP water supply available to WRMWSD and CLWA that are common to all three water allocation scenarios are described below.

Classification of Table A Amounts - In the SWP supply analyses conducted for this EIR, the classifications of Table A Amounts either as agricultural or as M&I were maintained throughout all allocation scenarios. These classifications were determined as part of the original Water Supply Contracts based on the anticipated use of the water at the time the original contracts went into effect, and these classifications have not changed as Table A Amounts have been transferred. Therefore, any agricultural Table A Amounts that have been transferred to M&I Contractors were treated in the allocation scenarios as agricultural Table A amounts. For purposes of allocating supplies among the three broad Contractor groups, all transferred agricultural Table A Amounts were initially included with the remaining agricultural Table A Amounts of the Agricultural Contractors to determine the total supply allocated to total agricultural Table A Amounts, based on the allocation rules appropriate for that Table A Amount classification. Agricultural Table A Amounts transferred to M&I Contractors, which are all still treated as agricultural in this supply analysis, consist of the following:

- A 1991 transfer to CLWA of 12,700 AF (the remaining 41,500 AF of CLWA's 54,200 AF total Table A Amount without the Project is classified as M&I),
- All transfers as part of the 130,000 AF of Table A Amount made available to M&I Contractors by Agricultural Contractors under Article 53 of the Monterey Amendment that have already completed by other M&I Contractors, and
- The Project's 41,000 AF (also part of the 130,000 AF).

Surplus Water - In addition to Table A supplies, CLWA and WRMWSD can also receive deliveries of surplus water (see Table 3-2 for descriptions of types of surplus water).

- Scheduled surplus water is not assumed to be available under the Without Monterey Amendment and With Monterey Amendment allocation scenarios. Scheduled surplus water was generally available only during the early years of the SWP, when total Contractor demands were low. Due primarily to increasing Contractor demands for Table A supplies, scheduled surplus water has not been available since the mid-1980s. Further, this type of surplus water was eliminated as part of the Monterey Amendment. In the water supply analyses here, scheduled surplus water is only included in the allocation scenario With Article 18(b) Implemented, since under that scenario scheduled deliveries of water in excess of a reduced minimum project yield (i.e., scheduled surplus water) would once again be available on a scheduled basis similar to Table A supplies.
- Unscheduled surplus water/Article 21 water is not included in the water supply analysis for any of the three water allocation scenarios. This is because it is not available on a routine or predictable basis, and is generally only available for short periods of time during low demand months, when most Contractors have a limited ability to use it.

Table 3-2. SWP Surplus Water Types

Surplus water: SWP water that can be made available to Contractors when water and capacity are available in excess of SWP storage needs and Table A supplies. See below for terminology for and descriptions of specific types of surplus water. Note that surplus water terminology changed with implementation of the Monterey Amendment.	
Without Monterey Amendment	With Monterey Amendment
Scheduled surplus water: Water that DWR determined to be available, in addition to Table A supplies, which was scheduled for delivery throughout the year (in the same manner as Table A supplies). This water was generally available only during the early years of the SWP (when Contractor demands were low).	Category deleted as part of the Monterey Amendment. Given increased Contractor demands, this water was physically no longer available.
Unscheduled surplus water: Water that DWR made available when water and capacity were available in excess of SWP storage needs and Table A supplies. This water is only available for limited time periods, generally only in the winter or early spring when Contractors demands are low, and only under specific conditions that do not occur on an annual basis.	**Article 21 water:** Same as unscheduled surplus water. (Was defined under the Monterey Amendment as "interruptible water," but is more commonly referred to as "Article 21 water."

Deliveries to CLWA - For the purposes of estimating the maximum potential impact, the impact analyses assume that CLWA will take delivery of the entire amount of water made available from the 41,000 AF Table A Amount transferred. This assumption conservatively provides the largest effect on SWP operations, even though CLWA may not currently have the local demand for this entire amount of water in average and wetter hydrologic years.

Methodology

The general methodology to determine the amount of SWP water supply available to WRMWSD and CLWA that is common to all three water allocation scenarios is as follows:

1. Data from the two DWRSIM model studies described in section 2.1 were used as a starting point for the analysis. The specific model data used as this starting point consisted of: (a) input of annual Contractor demands, including demands totaled for the three broad Contractor groups of Agricultural Contractors, MWD, and Other M&I Contractors, for each hydrologic year; and (b) output of total annual SWP Table A deliveries to Contractors, for each hydrologic year.

2. The DWRSIM output of total annual SWP deliveries was allocated, for each year over the model's hydrologic period, among the three broad Contractor groups in accordance with the specific allocation rules for each of the three SWP water allocation scenarios described above (Without Monterey Amendment, With Article 18(b) Implemented, and With Monterey Amendment). In this allocation process, the supply for each year was allocated among each broad Contractor group, up to that group's demand; and any remaining SWP supply was then allocated among the remaining Contractor group(s) with unmet demand that year.

3. The annual SWP supplies available to WRMWSD and CLWA were then calculated by multiplying the supplies for each year from step 2 for the Agricultural Contractors and Other M&I Contractors by the proportionate shares of WRMWSD's and CLWA's specific Table A Amounts to the total Table A Amounts within those broad Contractor groups.

3.1.3 Scenario-Specific Assumptions and Methodology

3.1.3.1 Without Monterey Amendment

Allocation Description

Under the original terms of the Water Supply Contracts, water supply shortages, as well as any surplus water that might be available, were allocated differently among Contractors depending on whether Contractors' Table A Amounts were classified as agricultural or M&I. Under the original SWP contract terms, in a year with a water supply shortage (i.e., a year when total available SWP supplies were less than Contractor requests), available water supplies were allocated such that Agricultural Contractors received initial reductions in their deliveries of up to 50 percent in any one year, and up to a cumulative total of 100 percent in any seven consecutive years. Any shortages remaining in a year after the initial agricultural reduction were then allocated proportionately among all Contractors. When surplus water was available, priority to this water was given to agricultural use and groundwater replenishment. This priority to surplus water was given to both scheduled surplus water and unscheduled surplus water.

Since WRMWSD's Table A Amount is classified as agricultural, the Table A Amount transferred to CLWA would be considered agricultural. Therefore, in this allocation scenario, under

shortage conditions the 41,000 AF of Table A Amount would be subject to the initial agricultural reductions. Similarly, under surplus water conditions the 41,000 AF of Table A Amount would have the agricultural priority to surplus water.

Assumptions

- Since the Project's 41,000 AF of Table A Amount is classified as agricultural, this Table A Amount would be subject to the initial agricultural reductions under shortage conditions.
- Scheduled surplus water was assumed to be unavailable.

Methodology

The DWRSIM output of total annual SWP deliveries of Table A water was allocated, for each year over the model's hydrologic period, among the three broad Contractor groups. In years when there was no shortage (i.e., when available SWP supplies met Contractor demands), all three Contractor groups were allocated supplies equal to their demands. In shortage years (i.e., when supplies were less than demands), the total available SWP supply that year was allocated among the three Contractor groups according to the following methodology:

1. Agricultural Contractors received initial reductions of up to 50 percent of their demand in any one year, and up to a cumulative total of 100 percent in any seven consecutive years.
2. Any remaining shortage in a year was allocated proportionately among all Contractor groups.
3. The resulting supplies for each Contractor group were compared to that group's demands. If supplies for any Contractor group exceeded its demand, its supply was reduced to its demand.
4. Any remaining available supplies were allocated among Contractor group(s) with unmet demands.
5. Steps 3 and 4 were repeated until all available supplies for that year were allocated.

3.1.3.2 *With Article 18(b) Implemented*

Allocation Description

Under the original terms of the Water Supply Contracts, DWR could invoke Article 18(b) of the Water Supply Contracts if it determined that the SWP was in a "permanent shortage" situation. With implementation of Article 18(b), DWR would determine a new "minimum project yield"

for the SWP, and reduce Contractors' Table A Amounts proportionately until they totaled this reduced minimum project yield[7,8].

There is a great deal of controversy and uncertainty regarding this allocation scenario and how it might have been implemented by DWR. More specifically, there are several different legal and contractual interpretations, particularly between Agricultural and M&I Contractors, primarily regarding whether DWR could have validly invoked Article 18(b), and assuming that it could have done so, how it would have allocated water under Article 18(b). In general, the water allocation rules that would apply under this allocation scenario are similar to the allocation rules described for the Without Monterey Amendment scenario described above, with Agricultural Contractors receiving initial reductions in shortage years and priority to surplus when it was available. However, with all Contractor Table A Amounts reduced, shortages (i.e., supplies insufficient to meet Contractor requests for Table A water) would occur much less frequently (because the SWP could deliver the smaller Table A Amounts more regularly), and the initial agricultural reduction would be applied to a smaller Table A Amount (i.e., the reductions would be smaller). And with Table A Amounts reduced, SWP supplies in excess of the reduced minimum project yield would be available for scheduled delivery in most years. Unscheduled surplus water would be available under the same conditions, in the same amounts, and allocated in the same way as in the Without Monterey Amendment scenario.

There are two primary uncertainties under this allocation scenario. The first unknown is what value of minimum project yield DWR would have used in reducing Table A Amounts. A specific value for minimum project yield had not been calculated in the several years leading up to the Monterey Amendment, but was commonly thought at the time to be in the range of 2.0 to 2.5 million AF. The second uncertainty is how any water supply above minimum project yield would have been allocated. This is an area of controversy, with some Contractors contending it should be allocated as surplus water with Agricultural Contractors receiving a priority, and others contending it should be allocated in proportion to Table A Amounts.

Given these uncertainties, two separate Article 18(b) allocation scenarios that bound the various assumptions and interpretations described above were analyzed for this EIR. Scenario 1 assumes minimum project yield is reduced to 2.0 million AF, and scheduled surplus water is allocated with priority given to Agricultural Contractors. The second scenario assumes

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7 Without the Monterey Amendment, Article 18(b) of the Water Supply Contracts stated "In the event that the State is unable to construct sufficient additional conservation facilities to prevent a reduction in the minimum project yield, or if for any other reason there is a reduction in the minimum project yield, which, notwithstanding preventive or remedial measures taken or to be taken by the State, threatens a permanent shortage in the supply of project water to be made available to the contactors: (1) The annual entitlements and the maximum annual entitlements of all contractors, except to the extent such entitlements may reflect established rights under the area of origin statutes, shall, by amendment of Table A of this contract, be reduced proportionately by the State to the extent necessary so that the sum of the revised maximum annual entitlements of all contractors will then equal such reduced minimum project yield...".

8 Without the Monterey Amendment, Minimum Project Yield was defined in the Water Supply Contracts as "the dependable annual supply of project water to be made available, estimated to be 4,230,000 AF per year, said amount to be determined by the State on the basis of coordinated operation studies of initial project conservation facilities and additional conservation facilities, which studies shall be based upon: (1) the estimated relative proportion of deliveries for agricultural use to deliveries for municipal use for the year 1990, and the characteristic distributions of demands for these two uses throughout the year; (2) an allowable reduction in the agricultural use portion of the minimum project yield, due to drought, of not to exceed fifty percent (50%) in any one year, nor a total of one hundred percent (100%) of one year's supply in any series of seven consecutive years; and (3) agreements now in effect or as hereafter amended or supplemented between the State and the United States and others regarding the diversion or utilization of waters of the Delta or streams tributary thereto."

minimum project yield is reduced to 2.5 million AF, and deliveries above this amount are allocated in proportion to Table A Amounts. Both scenarios are discussed further and their results are presented below.

Note that in this EIR (outside of this appendix), to keep the number of allocation scenarios presented to a more manageable number, only one of these two Article 18(b) scenarios is presented. Scenario 1 would result in more water being allocated to Agricultural Contractors than Scenario 2, and, therefore, would result in more water associated with the Project's 41,000 AF of Agricultural Table A Amount. Since Scenario 1 would result in the worst case for purposes of analysis of potential growth impacts, only the results of Scenario 1 are presented in the EIR outside this appendix.

Assumptions

As was noted above, there are several different legal and contractual interpretations regarding how DWR would have allocated water under implementation of Article 18(b). The following assumptions regarding the Water Supply Contract provisions, made solely for the purpose of this EIR, are considered a reasonable interpretation.

SWP Supply Availability - DWR would maintain its existing reservoir operations and delivery criteria in determining how much water is available for delivery in a given year. DWR would deliver the same total amount of water in any given year that it would have delivered without Article 18(b) implementation. The only change is the label on the water delivered, with a portion labeled as Table A water and a portion labeled as scheduled surplus water.

Reductions in Table A Amounts - Total SWP Table A Amounts would be reduced to a new minimum project yield, and each Contractor's Table A Amount would be reduced proportionately from its current Table A Amount. In the analysis for this EIR, the minimum project yield is reduced from 4.2 million AF to an assumed value of 2.0 million AF for Scenario 1 and 2.5 million AF for Scenario 2.

Note that the specific value of a reduced minimum project yield is quite speculative. Had Article 18(b) been invoked, minimum project yield could have been determined based on a calculation, in accordance with the minimum project yield definition, or perhaps more likely, would have been reached through a negotiation or litigation process. Even if a calculated value would have been used, differing values could have been determined based on which specific methodology was used and how strictly the criteria in the definition was followed. Commonly referenced estimates of minimum project yield in the early 1990s were 2.0 to 2.5 million AF. However, these estimates were from the early 1990s, prior to D-1641 and its added restrictions on SWP operations, and so might be considered high. On the other hand, the calculation described in the minimum project yield definition can be interpreted to include yield from future SWP facilities or supply improvement programs. Given the wide range in potential values of minimum project yield and the speculative nature of how such a value might have been settled upon, two values were selected for use in this analysis. The values of 2.0 and 2.5 million AF are considered a reasonable range that would likely bound the potential value of minimum project yield that might have been settled upon.

Contractor Water Demands - A Contractor's total demand for water would not change. Its demand for Table A water would be up to its reduced Table A Amount, and its demand for scheduled surplus water would be any demand in excess of its reduced Table A Amount.

Scheduled Surplus Water Demands - A Contractor's demand for scheduled surplus water would be any demand in excess of its reduced Table A Amount, limited to the amount that would allow total scheduled deliveries up to its pre-reduction Table A Amount. Since surplus water priorities are based on both agricultural use and groundwater replenishment, M&I Contractor demands were split into demands for groundwater replenishment and demands for all other uses. M&I Contractor demands for groundwater replenishment were assumed in this analysis to be ten percent of their total demands.

Table A Water Deliveries - In any year when total SWP deliveries are less than the reduced minimum project yield, shortages would be allocated under the Without Monterey Amendment provisions, with initial cuts to Agricultural Contractors of up to 50 percent of their reduced Table A Amount in any one year and up to a cumulative 100 percent of their reduced Table A Amount in any consecutive seven years. Any remaining shortage would be shared among all Contractors in proportion to their reduced Table A Amounts.

Total Scheduled Surplus Water Deliveries - The total amount of scheduled surplus water available for delivery would be that portion of the total available SWP supply that is in excess of the reduced minimum project yield.

Surplus Water Allocation Criteria - Under Scenario 1, any scheduled surplus water available would be allocated among Contractors in accordance with the Without Monterey Amendment surplus provisions. These provisions specify that if surplus supplies are less than surplus water demands for agricultural and groundwater replenishment uses, surplus water is allocated first among Contractors upstream and downstream of Dos Amigos Pumping Plant, in proportion to their demands for those uses. The portion of the supply allocated for Contractors downstream of Dos Amigos is further apportioned, in proportion to and up to the demands for those uses, as follows: 69 percent to the San Joaquin service area, 29 percent to the Southern California service area, and 2 percent to the Central Coast service area. If surplus supplies are greater than demands for agricultural and groundwater replenishment uses but less than total surplus demands, the surplus supply in excess of agricultural and groundwater replenishment demands is allocated in proportion to the surplus demand for other uses.

Under Scenario 2, any scheduled surplus water available would be allocated among Contractors in proportion to Table A Amounts. The amount allocated to a Contractor would be limited to the amount that would allow total scheduled deliveries to that Contractor (including Table A water and scheduled surplus water) to equal its pre-reduction Table A Amount

Methodology

The DWRSIM output of total annual SWP deliveries of Table A water was allocated, for each year over the model's hydrologic period, among the three broad Contractor groups according to the following methodology:

1. The Table A Amounts of the three Contractor groups were proportionately reduced until they totaled the reduced minimum project yield.

2. In years when there was no shortage (i.e., when available SWP supplies met Contractor demands), all three Contractor groups were allocated supplies equal to their demands.

3. In shortage years (i.e., when supplies were less than demands), the total available SWP supply that year was allocated among the three Contractor groups as follows:

   a. First, Table A water was allocated. If the available SWP supply exceeded the total reduced minimum project yield, each Contractor group was allocated Table A water equal to its reduced Table A Amount. If the available SWP supply was less than the total reduced minimum project yield, the supply available was allocated among the three Contractor groups as follows:

      i. Agricultural Contractors received initial reductions of up to 50 percent of their reduced Table A Amount in any one year, and up to a cumulative total of 100 percent in any seven consecutive years.

      ii. Any remaining shortage in a year was allocated proportionately among all Contractor groups.

   b. Next, scheduled surplus water was allocated. Contractor demands for scheduled surplus water were determined to be that portion of their total demand for SWP water unmet by Table A water deliveries. The manner is which the scheduled surplus water was allocated differed between Scenarios 1 and 2, as follows:

      Scenario 1: For each Contractor group, this demand for scheduled surplus water was separated into: demand for agricultural and groundwater replenishment use, and demand for all other uses. These demands were further split into four geographic SWP areas (upstream of Dos Amigos Pumping Plant, San Joaquin service area, Southern California service area, and Central Coast service area).

      i. If scheduled surplus water supplies were less than scheduled surplus water demands for agricultural and groundwater replenishment uses, scheduled surplus water was allocated first among Contractors upstream and downstream of Dos Amigos Pumping Plant, in proportion to their demands for those uses. The portion of the supply allocated for Contractors downstream of Dos Amigos was further apportioned, up to the demands for those uses, as follows: 69 percent to the San Joaquin service area, 29 percent to the Southern California service area, and 2 percent to the Central Coast service area.

      ii. If scheduled surplus water supplies were greater than demands for agricultural and groundwater replenishment uses but less than total scheduled surplus demands: (1) scheduled surplus supply for agricultural and groundwater replenishment uses was allocated up to the demands for those uses; and (2) the scheduled surplus supply in excess of agricultural and groundwater

replenishment demands was allocated in proportion to the scheduled surplus demand for other uses, up to the demands for those uses.

iii. These various uses and locations of use were then aggregated to get total scheduled surplus supplies for each of the three Contractor groups.

Scenario 2:

i. The scheduled surplus water supply was allocated among all Contractor groups in proportion to each group's total Table A Amount.

ii. The resulting scheduled surplus water supply for each Contractor group was compared to that group's demand for scheduled surplus water. If scheduled surplus water supplies for any Contractor group exceeded its scheduled surplus water demand, its scheduled surplus water supply was reduced to its scheduled surplus water demand.

iii. Any remaining available scheduled surplus water supplies were allocated among Contractor group(s) with unmet scheduled surplus water demands.

c. The allocated Table A supplies and allocated scheduled surplus water supplies were then added to get total SWP supplies for each Contractor group.

3.1.3.3 *With Monterey Amendment*

Allocation Description

Under the terms of the Water Supply Contracts as amended by the Monterey Amendment, all SWP water supplies are shared among all Contractors in proportion to their Table A Amounts. Therefore, the 41,000 AF of Table A Amount transferred to CLWA from WRMWSD would be subject to the same shortages as all other Table A Amounts (i.e., it would not be subject to an initial agricultural reduction), and would have access to the same proportionate share of any available surplus water as all other Table A Amounts. As part of the Monterey Amendment, the category of scheduled surplus water was eliminated since it was no longer available, the category of unscheduled surplus water was retained but is now referred to as Article 21 water, and Article 18(b) was deleted.

Assumptions

- The surplus water category of scheduled surplus water was deleted as part of the Monterey Amendment and so was not considered.

Methodology

The DWRSIM output of total annual SWP deliveries of Table A water was allocated, for each year over the model's hydrologic period, among the three broad Contractor groups. In years when there was no shortage (i.e., when available SWP supplies met Contractor demands), all three Contractor groups were allocated supplies equal to their demands. In shortage years (i.e.,

when supplies were less than demands), the total available SWP supply that year was allocated among the three Contractor groups according to the following methodology:

1. The total supply was allocated among all Contractor groups in proportion to each group's total Table A Amount.

2. The resulting supplies for each Contractor group were compared to that group's demands. If supplies for any Contractor group exceeded its demand, its supply was reduced to its demand.

3. Any remaining available supplies were allocated among Contractor group(s) with unmet demands.

4. Steps 2 and 3 were repeated until all available supplies for that year were allocated.

3.2 ANALYSIS RESULTS

As was discussed above in section 3.1.1, the supply analyses for this EIR were conducted for each year in DWRSIM's period of hydrologic record because SWP water supplies vary from year to year. The results of the water supply analyses are presented below both in graphical form over the entire period of record (see Figures 3-2 through 3-13 in the subsequent sections), and in tabular form showing SWP supplies under selected hydrologic conditions (see Tables 3-3 through 3-8 in the subsequent sections). The selected hydrologic conditions are: average year, single dry year, and multiple dry year (for further definitions, see section 3.1.1.2, Hydrologic Conditions).

The graph of supplies available over DWRSIM's entire hydrologic record are presented as probability of exceedance curves. These curves show the probability of supplies being greater than or equal to specific quantities. For an explanation of how to interpret these graphs, refer to the sidebar in section 2.2.

3.2.1 Without Monterey Amendment

Wheeler Ridge-Maricopa Water Storage District

Table 3-3 provides the results of the analysis of WRMWSD's SWP Table A supply for the Without Monterey Amendment allocation scenario, under selected hydrologic conditions, and based on both the existing and 2020 conditions DWRSIM model runs.

Figure 3-2 presents the results of the analysis of WRMWSD's SWP Table A supply under the Without Monterey Amendment allocation scenario, based on the existing conditions DWRSIM model run. Figure 3-3 presents the results of this same analysis, based on the 2020 conditions DWRSIM run.

Table 3-3. WRMWSD SWP Table A Supply at Existing and 2020 SWP Demand Conditions, Without Monterey Amendment
(all values in AF)

		Table A Amount	*Average Year*	*Single Dry Year*	*Multiple Dry Year*[3]
Existing SWP Demand Conditions[1]	Without the Project	238,088	189,700	0	79,700
	With the Project	197,088	157,000	0	65,900
	Difference[4]	***41,000***	***32,700***	***0***	***13,700***
2020 SWP Demand Conditions[2]	Without the Project	238,088	165,300	42,200	98,100
	With the Project	197,088	136,900	35,000	81,200
	Difference[4]	***41,000***	***28,500***	***7,300***	***16,900***

Note: Supplies are rounded to the nearest 100 AF. Numbers may not add due to rounding.
1. Based on water deliveries from DWRSIM study 1995D06E-CALFED-771.
2. Based on water deliveries from DWRSIM study 2020D09C-CALFED-786.
3. Multiple dry year period supplies shown are average annual supplies over the four-year period.
4. Supplies shown are the amount of water attributable to the 41,000 AF of Table A Amount.

Castaic Lake Water Agency

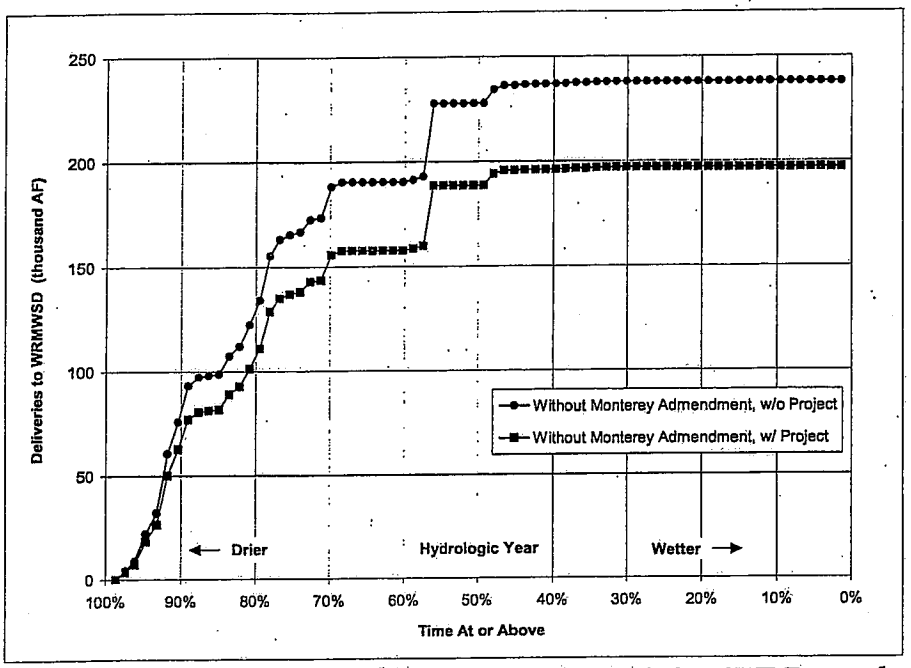
Table 3-4 provides the results of the analysis of CLWA's SWP Table A supply for the Without Monterey Amendment allocation scenario, under selected hydrologic conditions, and based on both the existing and 2020 conditions DWRSIM model runs.

Figure 3-4 presents the results of the analysis of CLWA's SWP Table A supply under the Without Monterey Amendment allocation scenario, based on the existing conditions DWRSIM model run. Figure 3-5 presents the results of this same analysis, based on the 2020 conditions DWRSIM run.

Table 3-4. CLWA SWP Table A Supply at Existing and 2020 SWP Demand Conditions, Without Monterey Amendment
(all values in AF)

		Table A Amount	*Average Year*	*Single Dry Year*	*Multiple Dry Year*[3]
Existing SWP Demand Conditions[1]	Without the Project	54,200	47,400	13,100	25,200
	With the Project	95,200	80,100	13,100	38,900
	Difference[4]	***41,000***	***32,700***	***0***	***13,700***
2020 SWP Demand Conditions[2]	Without the Project	54,200	43,500	12,400	23,300
	With the Project	95,200	72,000	19,600	40,200
	Difference[4]	***41,000***	***28,500***	***7,300***	***16,900***

Note: Supplies are rounded to the nearest 100 AF. Numbers may not add due to rounding.
1. Based on water deliveries from DWRSIM study 1995D06E-CALFED-771.
2. Based on water deliveries from DWRSIM study 2020D09C-CALFED-786.
3. Multiple dry year period supplies shown are average annual supplies over the four-year period.
4. Supplies shown are the amount of water attributable to the 41,000 AF of Table A Amount.



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2
3

Figure 3-2. WRMWSD SWP Table A Supply at Existing SWP Demand Conditions, Without Monterey Amendment

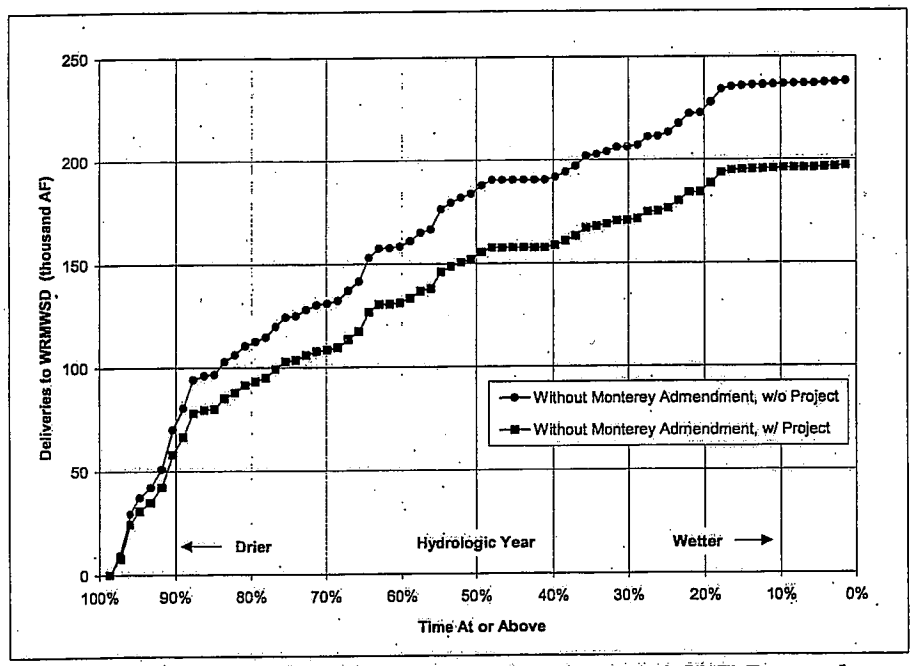

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Figure 3-3. WRMWSD SWP Table A Supply at 2020 SWP Demand Conditions, Without Monterey Amendment

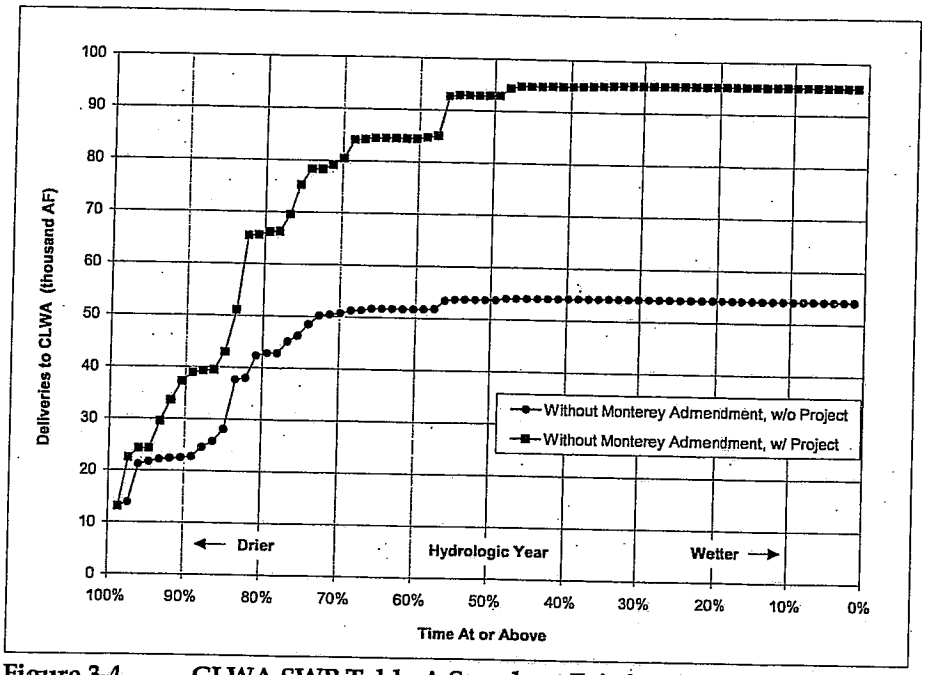

Figure 3-4. **CLWA SWP Table A Supply at Existing SWP Demand Conditions, Without Monterey Amendment**

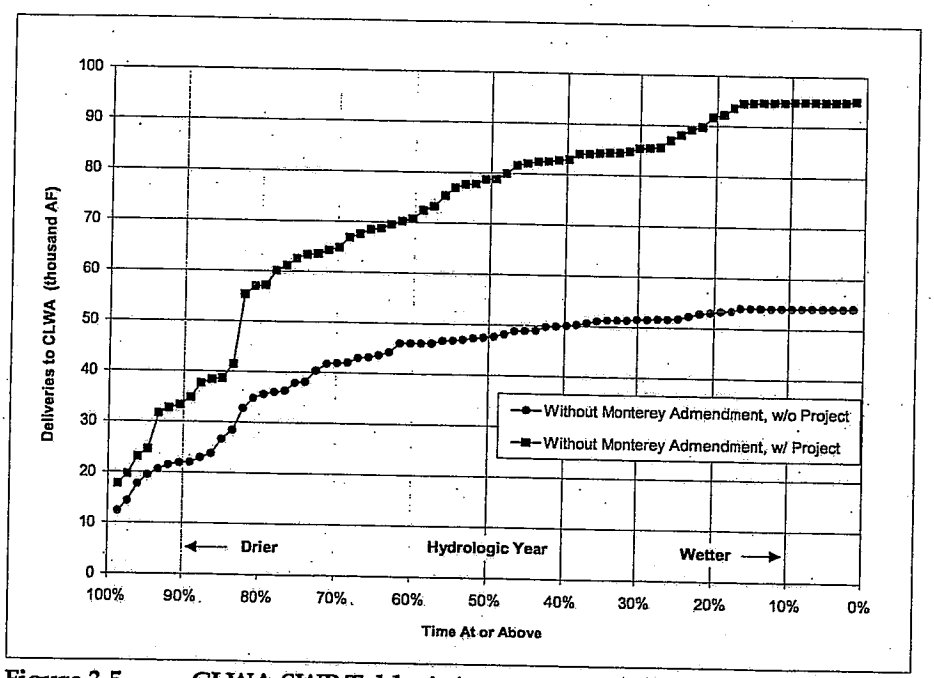

Figure 3-5. **CLWA SWP Table A Amount at 2020 SWP Demand Conditions, Without Monterey Amendment**

3.2.2 With Article 18(b) Implemented

Wheeler Ridge-Maricopa Water Storage District

Table 3-5 provides the results of the analysis of WRMWSD's SWP Table A supply for the With Article 18(b) Implemented allocation scenarios 1 and 2, under selected hydrologic conditions, and based on both the existing and 2020 conditions DWRSIM model runs.

Figure 3-6 presents the results of the analysis of WRMWSD's SWP Table A supply under the With Article 18(b) Implemented allocation scenarios 1 and 2, based on the existing conditions DWRSIM model run. Figure 3-7 presents the results of this same analysis, based on the 2020 conditions DWRSIM run.

Note that under the With Article 18(b) Implemented allocation scenarios, the supplies shown in the figures and table are the total of both Table A supplies and scheduled surplus water supplies.

Table 3-5. WRMWSD SWP Table A and Scheduled Surplus Supply at Existing and 2020 SWP Demand Conditions, With Article 18(b) Implemented
(all values in AF)

		Table A Amount[5]	*Average Year*	*Single Dry Year*	*Multiple Dry Year*[6]
		Scenario 1[1]			
Existing SWP Demand Conditions[3]	Without the Project	113,800	204,800	11,500	100,600
	With the Project	94,200	169,500	9,500	83,200
	Difference[7]	***19,600***	***35,300***	***2,000***	***17,300***
2020 SWP Demand Conditions[4]	Without the Project	113,800	202,900	12,300	99,300
	With the Project	94,200	168,000	10,200	82,200
	Difference[7]	***19,600***	***34,900***	***2,100***	***17,100***
		Scenario 2[2]			
Existing SWP Demand Conditions[3]	Without the Project	142,200	195,200	1,000	79,200
	With the Project	117,700	161,600	900	65,500
	Difference[7]	***24,500***	***33,600***	***200***	***13,600***
2020 SWP Demand Conditions[4]	Without the Project	142,200	180,700	2,000	76,500
	With the Project	117,700	149,600	1,700	63,300
	Difference[7]	***24,500***	***31,100***	***300***	***13,200***

Note: Supplies are rounded to the nearest 100 AF. Numbers may not add due to rounding.

1. Scenario 1 assumptions: SWP reduced minimum project yield is 2.0 million AF, and scheduled deliveries above reduced minim project yield are allocated based on priority for agricultural use and groundwater replenishment.
2. Scenario 2 assumptions: SWP reduced minimum project yield is 2.5 million AF, and scheduled deliveries above reduced minimum project yield are allocated in proportion to Table A Amounts.
3. Based on water deliveries from DWRSIM study 1995D06E-CALFED-771.
4. Based on water deliveries from DWRSIM study 2020D09C-CALFED-786.
5. The Table A Amounts shown are estimates of WRMWSD's reduced Table A Amount, based on its proportionate share of the reduced minimum project yield.
6. Multiple dry year period supplies shown are average annual supplies over the four-year period.
7. Supplies shown are the amount of water attributable to the 41,000 AF of Table A Amount.

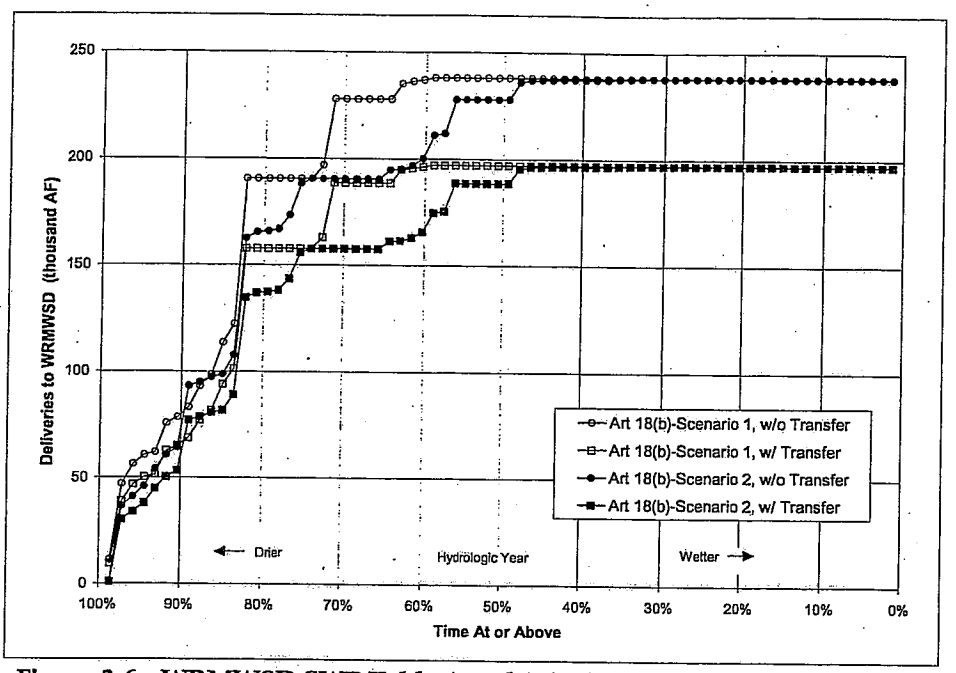

Figure 3-6. WRMWSD SWP Table A and Scheduled Surplus Supply at Existing SWP Demand Conditions, With Article 18(b) Implemented

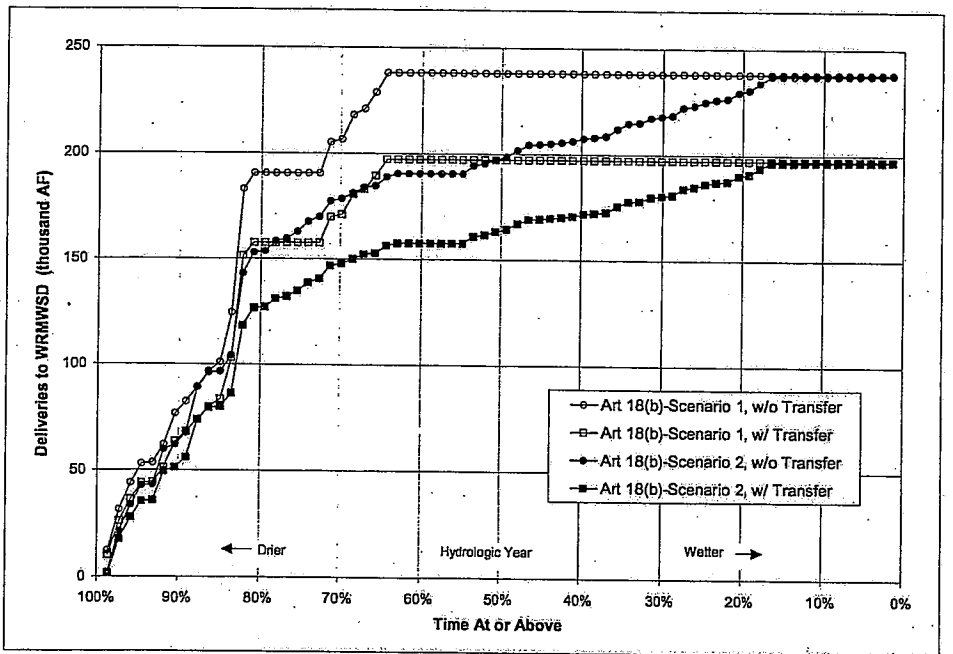

Figure 3-7. WRMWSD SWP Table A and Scheduled Surplus Supply at 2020 SWP Demand Conditions, With Article 18(b) Implemented

Castaic Lake Water Agency

Table 3-6 provides the results of the analysis of CLWA's SWP Table A supply for the With Article 18(b) Implemented allocation scenarios 1 and 2, under selected hydrologic conditions, and based on both the existing and 2020 conditions DWRSIM model runs.

Figure 3-8 presents the results of the analysis of CLWA's SWP Table A supply under the With Article 18(b) Implemented allocation scenarios 1 and 2, based on the existing conditions DWRSIM model run. Figure 3-9 presents the results of this same analysis, based on the 2020 conditions DWRSIM run.

Note that under the With Article 18(b) Implemented allocation scenarios, the supplies shown in the figures and table are the total of both Table A supplies and scheduled surplus water supplies.

Table 3-6. CLWA SWP Table A and Scheduled Surplus Supply at Existing and 2020 SWP Demand Conditions, With Article 18(b) Implemented

(all values in AF)

		Table A Amount[5]	*Average Year*	*Single Dry Year*	*Multiple Dry Year*[6]
		Scenario 1[1]			
Existing SWP Demand Conditions[3]	Without the Project	25,900	46,400	12,900	24,400
	With the Project	45,500	81,700	14,900	41,700
	Difference[7]	***19,600***	***35,300***	***2,000***	***17,300***
2020 SWP Demand Conditions[4]	Without the Project	25,900	43,000	12,800	23,300
	With the Project	45,500	78,000	15,000	40,400
	Difference[7]	***19,600***	***34,900***	***2,100***	***17,100***
		Scenario 2[2]			
Existing SWP Demand Conditions[3]	Without the Project	32,400	46,600	13,100	24,400
	With the Project	56,900	80,200	13,200	38,100
	Difference[7]	***24,500***	***33,600***	***200***	***13,600***
2020 SWP Demand Conditions[4]	Without the Project	32,400	43,000	13,000	23,700
	With the Project	56,900	74,100	13,300	36,900
	Difference[7]	***24,500***	***31,100***	***300***	***13,200***

Note: Supplies are rounded to the nearest 100 AF. Numbers may not add due to rounding.

1. Scenario 1 assumptions: SWP reduced minimum project yield is 2.0 million AF, and scheduled deliveries above reduced minim project yield are allocated based on priority for agricultural use and groundwater replenishment.
2. Scenario 2 assumptions: SWP reduced minimum project yield is 2.5 million AF, and scheduled deliveries above reduced minimum project yield are allocated in proportion to Table A Amounts.
3. Based on water deliveries from DWRSIM study 1995D06E-CALFED-771.
4. Based on water deliveries from DWRSIM study 2020D09C-CALFED-786.
5. The Table A Amounts shown are estimates of CLWA's reduced Table A Amount, based on its proportionate share of the reduced minimum project yield.
6. Multiple dry year period supplies shown are average annual supplies over the four-year period.
7. Supplies shown are the amount of water attributable to the 41,000 AF of Table A Amount.

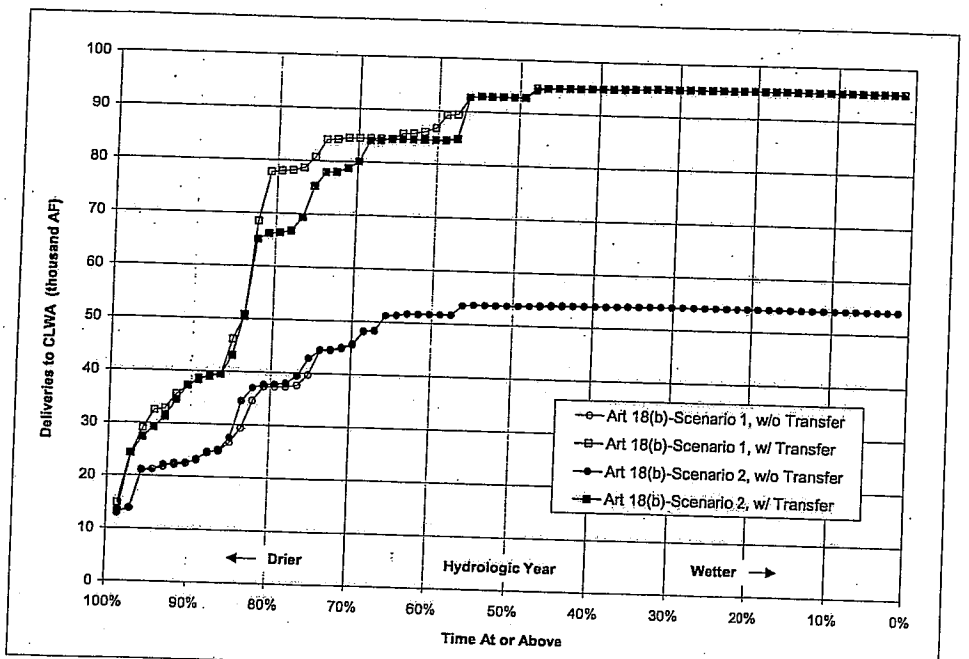

Figure 3-8. CLWA SWP Table A and Scheduled Surplus Supply at Existing SWP Demand Conditions, With Article 18(b) Implemented

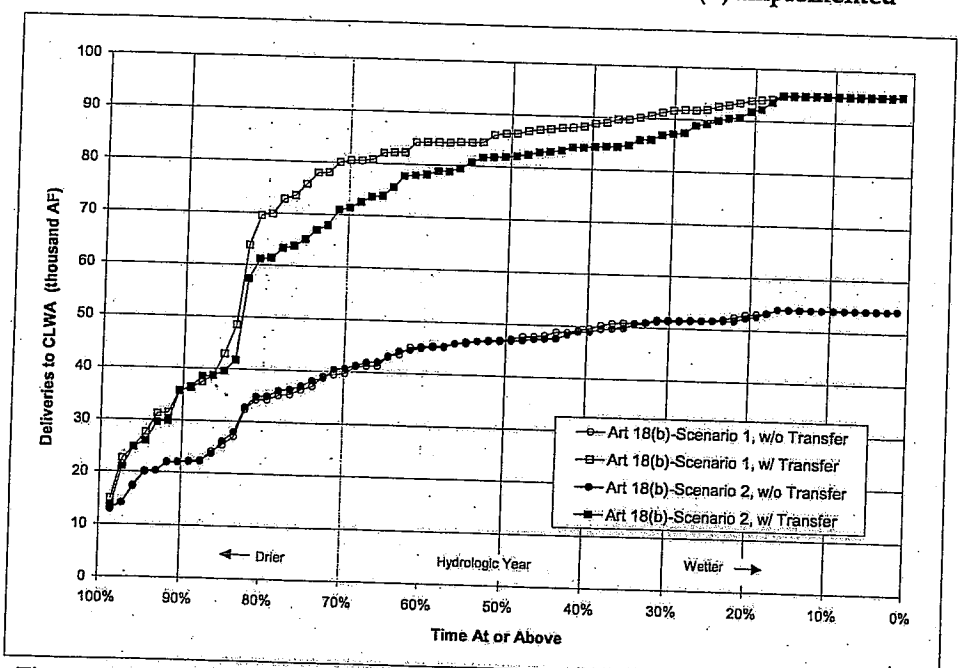

Figure 3-9. CLWA SWP Table A and Scheduled Surplus Supply at 2020 SWP Demand Conditions, With Article 18(b) Implemented

3.2.3 With Monterey Amendment

Wheeler Ridge-Maricopa Water Storage District

Table 3-7 provides the results of the analysis of WRMWSD's SWP Table A supply for the With Monterey Amendment allocation scenario, under selected hydrologic conditions, and based on both the existing and 2020 conditions DWRSIM model runs.

Figure 3-10 presents the results of the analysis of WRMWSD's SWP Table A supply under the With Monterey Amendment allocation scenario, based on the existing conditions DWRSIM model run. Figure 3-11 presents the results of this same analysis, based on the 2020 conditions DWRSIM run.

Table 3-7. WRMWSD SWP Table A Supply at Existing and 2020 SWP Demand Conditions, With Monterey Amendment
(all values in AF)

		Table A Amount	*Average Year*	*Single Dry Year*	*Multiple Dry Year*[3]
Existing SWP Demand Conditions[1]	Without the Project	238,088	199,900	53,300	105,300
	With the Project	197,088	165,500	44,100	87,100
	Difference[4]	***41,000***	***34,400***	***9,200***	***18,100***
2020 SWP Demand Conditions[2]	Without the Project	238,088	185,700	53,500	102,200
	With the Project	197,088	153,800	44,300	84,600
	Difference[4]	***41,000***	***32,000***	***9,200***	***17,600***

Note: Supplies are rounded to the nearest 100 AF. Numbers may not add due to rounding.
1. Based on water deliveries from DWRSIM study 1995D06E-CALFED-771.
2. Based on water deliveries from DWRSIM study 2020D09C-CALFED-786.
3. Multiple dry year period supplies shown are average annual supplies over the four-year period.
4. Supplies shown are the amount of water attributable to the 41,000 AF of Table A Amount.

Castaic Lake Water Agency

Table 3-8 provides the results of the analysis of CLWA's SWP Table A supply for the With Monterey Amendment allocation scenario, under selected hydrologic conditions, and based on both the existing and 2020 conditions DWRSIM model runs.

Figure 3-12 presents the results of the analysis of CLWA's SWP Table A supply under the With Monterey Amendment allocation scenario, based on the existing conditions DWRSIM model run. Figure 3-13 presents the results of this same analysis, based on the 2020 conditions DWRSIM run.

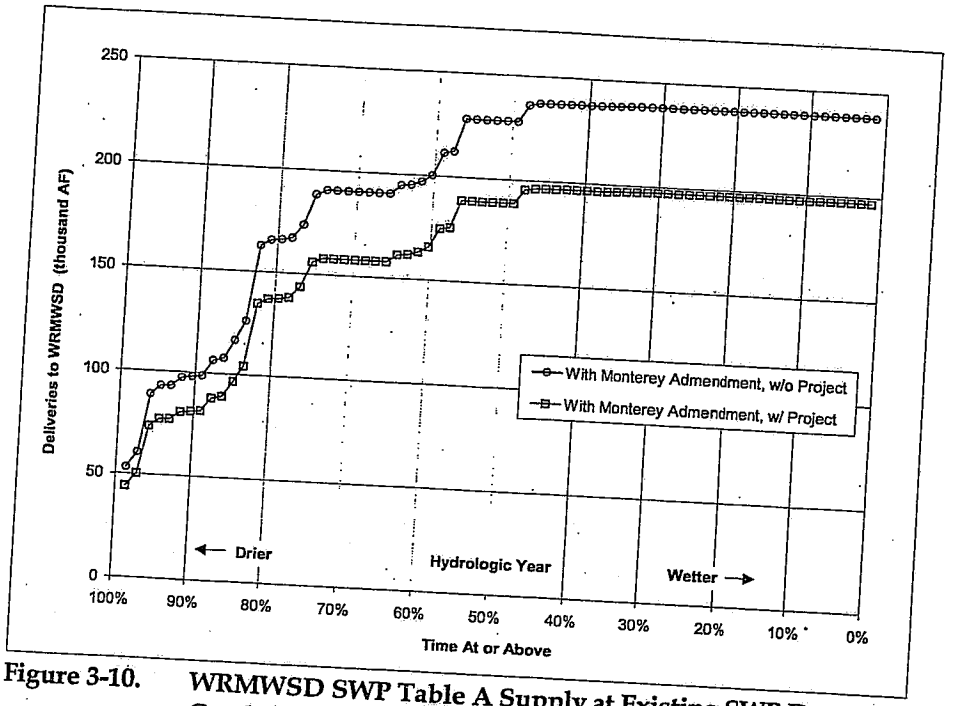

Figure 3-10. **WRMWSD SWP Table A Supply at Existing SWP Demand Conditions, With Monterey Amendment**

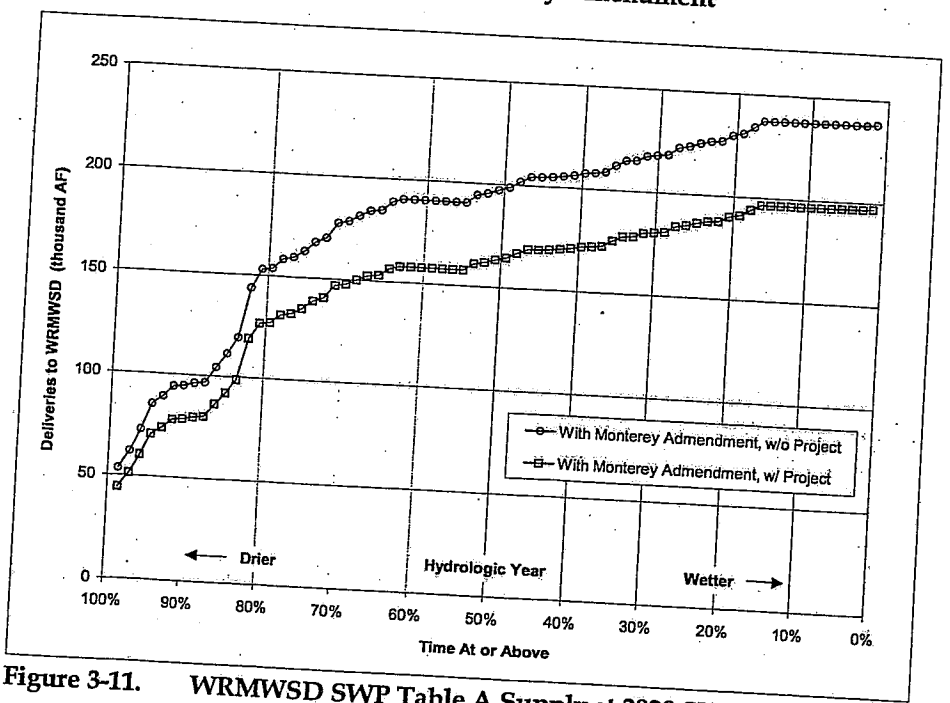

Figure 3-11. **WRMWSD SWP Table A Supply at 2020 SWP Demand Conditions, With Monterey Amendment**

Table 3-8. CLWA SWP Table A Supply at Existing and 2020 SWP Demand Conditions, With Monterey Amendment
(all values in AF)

		Table A Amount	*Average Year*	*Single Dry Year*	*Multiple Dry Year*[3]
Existing SWP Demand Conditions[1]	Without the Project	54,200	46,500	12,100	24,000
	With the Project	95,200	80,900	21,300	42,100
	Difference[4]	***41,000***	***34,400***	***9,200***	***18,100***
2020 SWP Demand Conditions[2]	Without the Project	54,200	42,900	12,200	23,300
	With the Project	95,200	74,900	21,400	40,900
	Difference[4]	***41,000***	***32,000***	***9,200***	***17,600***

Note: Supplies are rounded to the nearest 100 AF. Numbers may not add due to rounding.
1. Based on water deliveries from DWRSIM study 1995D06E-CALFED-771.
2. Based on water deliveries from DWRSIM study 2020D09C-CALFED-786.
3. Multiple dry year period supplies shown are average annual supplies over the four-year period.
4. Supplies shown are the amount of water attributable to the 41,000 AF of Table A Amount.

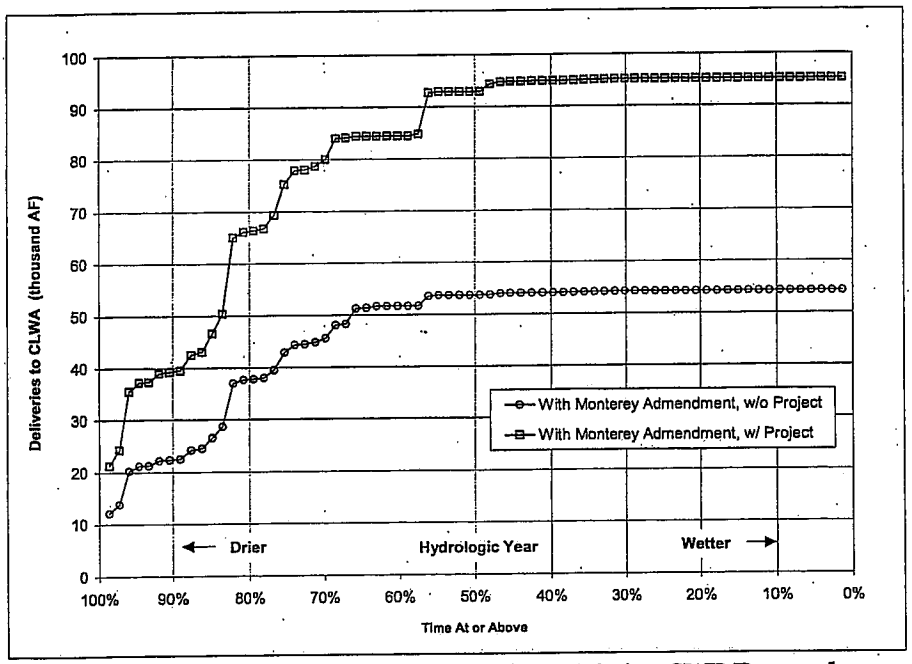

Figure 3-12. CLWA SWP Table A Supply at Existing SWP Demand Conditions, With Monterey Amendment

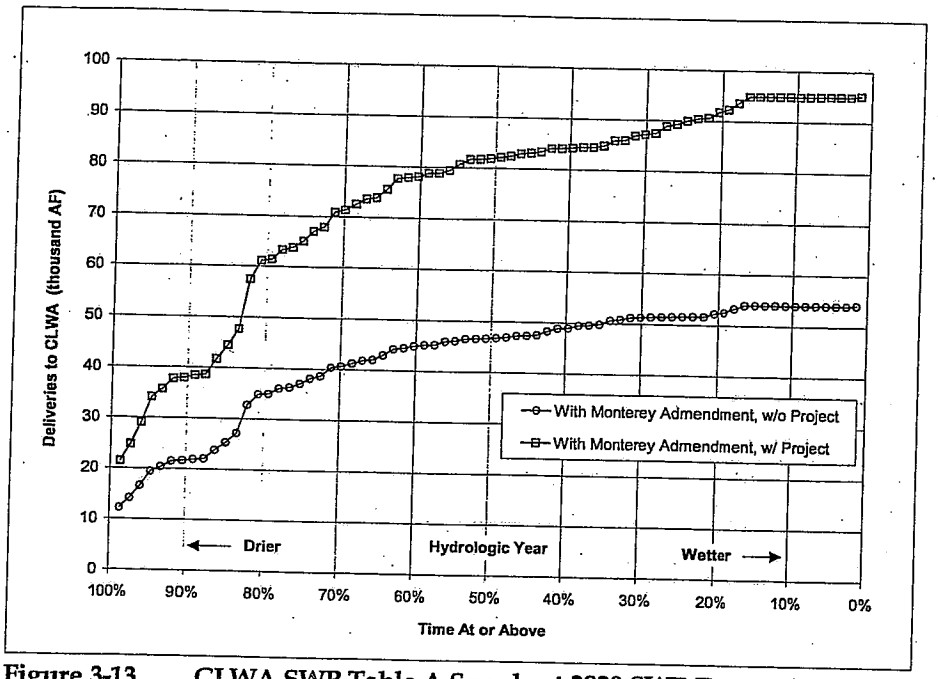

Figure 3-13. **CLWA SWP Table A Supply at 2020 SWP Demand Conditions, With Monterey Amendment**

4.0 SAN LUIS RESERVOIR STORAGE ANALYSIS

4.1 ANALYSIS METHODOLOGY AND ASSUMPTIONS

The San Luis Reservoir storage analysis shows the potential impacts resulting from implementation of the Project to SWP storage in San Luis Reservoir.

4.1.1 Background

As was noted previously, the total amount of SWP supply available in a given year is determined by that year's hydrology, the amount of storage in SWP reservoirs at the beginning of the year, and the regulatory and operational constraints that govern Delta and SWP facility operations. Since the location of use of SWP water south of the Delta is not a factor in determining the amount of SWP supply available, the Project would not result in a change in the total amount of SWP supply available for delivery to SWP Contractors. Therefore, there would be no change in the total amount of water diverted from the Delta.

The Project would, however, result in a change in the end use of the water associated with the 41,000 AF of Table A Amount from agricultural use to M&I use. Typically, agricultural water users use proportionately more of their annual water supply during the heavy irrigation months of the late spring and summer than do urban water users, and proportionately less of their supply than urban users during the remainder of the year. In the case of WRMWSD and CLWA, this difference in delivery during the year would result in a net reduction in deliveries of water associated with the 41,000 AF Table A Amount in May through September, and a net increase in deliveries during the remaining months of the year (October through April).

This net change in the timing of deliveries would require a slight change in SWP operations south of the Delta. Generally, the SWP operates to divert as much water from the Delta as is available under prevailing hydrologic conditions, within the water quality standards and operational constraints that govern Delta operations. This is true regardless of the timing of deliveries south of the Delta since when Delta diversions exceed downstream deliveries, that excess is stored in San Luis Reservoir for delivery later in the year. The general operation at San Luis Reservoir is to try to fill the reservoir during the high runoff months of the winter and early spring, and then release the stored water in meeting Contractor demands during the higher-demand summer and fall months to supplement the more limited diversions from the Delta during that period. Since Delta diversions are generally limited by either water availability or operational/ regulatory constraints, the change in the timing of deliveries of the 41,000 AF of Table A due to the Project would primarily result in changes in San Luis Reservoir storage.

4.1.2 Overview of Analysis

The analysis of the potential impact of the Project on storage in San Luis Reservoir consisted of a two-part analysis:

1. *Monthly Delivery Distribution* - The first part of the analysis was an assessment of the difference in monthly SWP deliveries to WRMWSD and CLWA. This analysis was

conducted using the annual supplies to WRMWSD and CLWA calculated in the water supply analysis described in section 3.0, and using the monthly distributions of deliveries to WRMWSD and CLWA for each year from the two DWRSIM model studies described in section 2.1.

2. *San Luis Reservoir Storage* - The second part of the analysis was an estimate of the potential impacts of the Project on storage at San Luis Reservoir. This analysis was conducted using the difference in monthly deliveries to WRMWSD and CLWA calculated in the first part of the analysis, and using San Luis Reservoir storage and aqueduct flow data from the two DWRSIM model studies.

This analysis was conducted only for water supplies allocated under the With Monterey Amendment allocation scenario. Since the amount of the water supply associated with the Project's 41,000 AF of Table A Amount is not significantly different among the three allocation scenarios, and the relative timing of deliveries would not change among the allocation scenarios, it was concluded that the storage changes under the Without Monterey Amendment and With Article 18(b) Implemented scenarios would be similar in magnitude and timing to those analyzed in the With Monterey Amendment scenario. Given this, as well as the small (less than two percent) changes in San Luis Reservoir storage determined in the analysis conducted, analysis of the other two allocation scenarios was deemed unnecessary.

Specific methodology and assumptions regarding this two-part analysis are described in sections 4.1.2.1 and 4.1.2.2 below.

4.1.2.1 Monthly Delivery Distribution

Methodology

1. Model output of monthly deliveries to WRMWSD and CLWA were taken from the two DWRSIM studies described in section 2.1, for each of the 73 hydrologic years. From this data, the monthly percent distribution of annual deliveries for both WRMWSD and CLWA was calculated for each of the 73 hydrologic years. For CLWA, the distribution calculated was for its M&I Table A delivered from Castaic Lake.

2. Monthly deliveries to WRMWSD and CLWA were then calculated for each hydrologic year by multiplying the monthly distribution percentages from step 1 by the annual deliveries calculated for WRMWSD and CLWA in the SWP water supply analysis described in section 3.0 above, for water supplies allocated under the With Monterey Amendment allocation scenario.

3. From the 73 years of monthly deliveries in step 2, the average and the expected range of deliveries to WRMWSD and CLWA were determined by month.

Assumptions

1. The distribution of deliveries to WRMWSD and CLWA in any year would not change with the Project (i.e., the reduction/increase in annual deliveries in any year would proportionately reduce/increase monthly deliveries in that year).

4.1.2.2 *San Luis Reservoir Storage*

Methodology

1. Model output of monthly San Luis Reservoir-related data for the 73 years of hydrologic data were taken from the two DWRSIM runs, including: SWP San Luis Reservoir storage, aqueduct flows just upstream and downstream of San Luis Reservoir, and diversions to and releases from San Luis Reservoir.

2. San Luis Reservoir was re-operated each month of the 73 hydrologic years, based on the output in step 1 and the change in deliveries to WRMWSD and CLWA resulting from the Project.

3. From the 73 years of monthly storage from step 2, the average storage and the expected range of the change in storage were determined by month.

Assumptions

1. Exports from the Delta (and therefore, the flow in the aqueduct upstream of San Luis Reservoir) will not change with the transfer.

2. Demands downstream of San Luis Reservoir (to meet Contractor deliveries and operational requirements such as aqueduct losses and terminal reservoir refilling) change with the transfer only by the difference in deliveries to WRMWSD and CLWA.

3. Water is diverted from the aqueduct into San Luis Reservoir when exports from the Delta exceed the demand downstream of San Luis, and water is released from San Luis when Delta exports are less than demand downstream of San Luis.

4. Losses at San Luis Reservoir will not change with the slight change in storage resulting from the transfer.

4.2 ANALYSIS RESULTS

As was described previously in section 4.1, the San Luis Reservoir storage analysis was conducted only for water supplies allocated under the With Monterey Amendment allocation scenario. While the results presented below are specifically for that allocation scenario, they are considered indicative of results that would occur under the Without Monterey Amendment and With Article 18(b) Implemented scenarios.

4.2.1 Monthly Delivery Distribution

The results of the monthly delivery distribution analysis are shown on Figures 4-1 and Figure 4-2, and in Tables 4-1 through 4-3. The average monthly changes in SWP Table A deliveries that would result from the Project, due to the difference in the timing of deliveries during the year between WRMWSD and CLWA, are shown on Figure 4-1 for existing SWP demand conditions, and on Figure 4-2 for 2020 demand conditions. These results are summarized in Table 4-1. More detailed results showing the net changes in monthly SWP Table A deliveries for the entire

hydrologic period are provided in Table 4-2 for existing SWP demand conditions, and in Table 4-3 for 2020 SWP demand conditions.

Table 4-1. Average Change in SWP Table A Deliveries Resulting From the Project at Existing and 2020 SWP Demand Conditions, With Monterey Amendment
(all values in thousand AF, unless otherwise noted)

	Jan	*Feb*	*Mar*	*Apr*	*May*	*Jun*	*Jul*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Total*
Existing SWP Demand Conditions													
WRMWSD	-0.4	-1.0	-1.5	-2.7	-4.0	-6.3	-5.9	-6.3	-3.7	-0.8	-0.7	-1.0	-34.4
CLWA	1.7	1.9	2.3	2.8	3.5	3.9	3.9	3.9	3.5	2.8	2.1	2.1	34.4
Net Change	*1.2*	*0.8*	*0.8*	*0.1*	*-0.5*	*-2.4*	*-2.1*	*-2.5*	*-0.1*	*2.0*	*1.4*	*1.1*	*0.0*
Net Change (cfs)	*20*	*15*	*14*	*2*	*-8*	*-41*	*-34*	*-40*	*-2*	*33*	*23*	*18*	*0*
2020 SWP Demand Conditions													
WRMWSD	-0.4	-0.9	-1.3	-2.5	-3.8	-5.9	-5.5	-5.9	-3.4	-0.7	-0.7	-0.9	-32.0
CLWA	1.4	1.7	2.1	2.6	3.3	3.6	3.6	3.6	3.3	2.6	2.0	2.0	32.0
Net Change	*1.1*	*0.8*	*0.8*	*0.1*	*-0.5*	*-2.3*	*-1.9*	*-2.3*	*-0.1*	*1.9*	*1.3*	*1.1*	*0.0*
Net Change (cfs)	*18*	*14*	*12*	*2*	*-7*	*-38*	*-31*	*-37*	*-2*	*31*	*22*	*18*	*0*

Note: Supplies are rounded to the nearest 0.1 thousand AF. Number may note add due to rounding.

4.2.2 San Luis Reservoir Storage

The results of the storage analysis are presented on Figures 4-3 and 4-4. The existing San Luis Reservoir operation, in combination with the net change in the timing of deliveries during the year between WRMWSD and CLWA, would result in an increase in storage at San Luis Reservoir from July through November, and a decrease in storage during the remainder of the year. As shown on Figure 4-3, the magnitude of the storage increase would be greatest in August and September, averaging approximately 4,500 AF at existing SWP demand conditions and approximately 4,200 AF at 2020 SWP demand conditions. The magnitude of the reduction in storage would be greatest in March and April, averaging approximately 3,000 AF at existing SWP demand conditions and approximately 2,700 AF at 2020 SWP demand conditions. As shown on Figure 4-4, the change in storage at San Luis Reservoir resulting from the Project would represent a small portion of the total average storage in the SWP share of San Luis Reservoir (SWP capacity is over one million AF), reflecting storage changes of less than 0.5 percent of average storage in most months and not more than two percent in any month.

More detailed results showing the net changes in monthly San Luis Reservoir storage for the entire hydrologic period are provided in Table 4-4 for existing SWP demand conditions, and in Table 4-5 for 2020 SWP demand conditions.

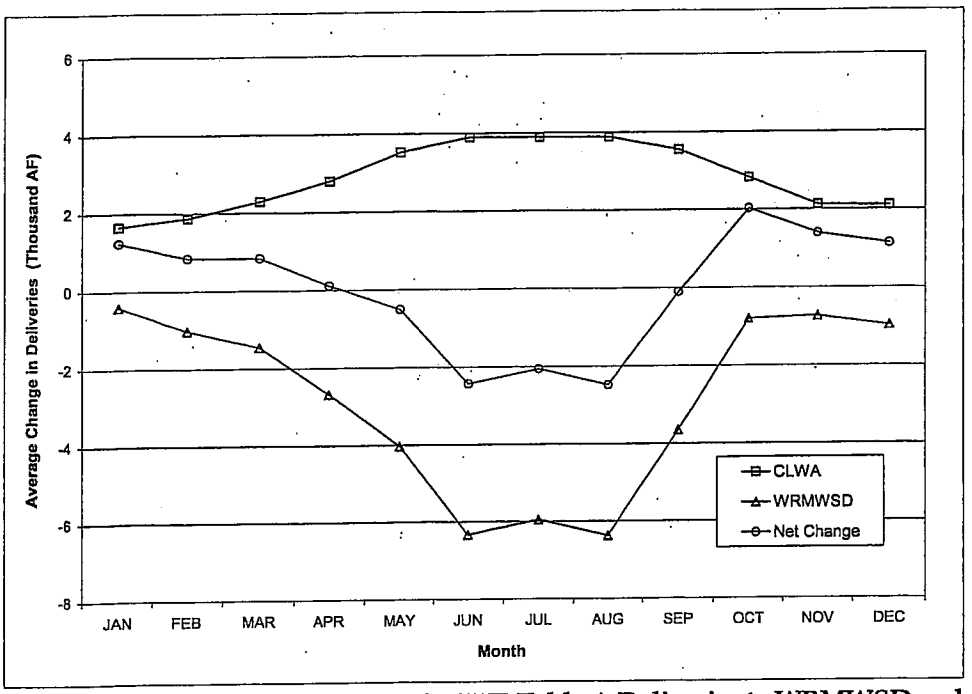

Figure 4-1. **Average Change in SWP Table A Deliveries to WRMWSD and CLWA at Existing SWP Demand Conditions**

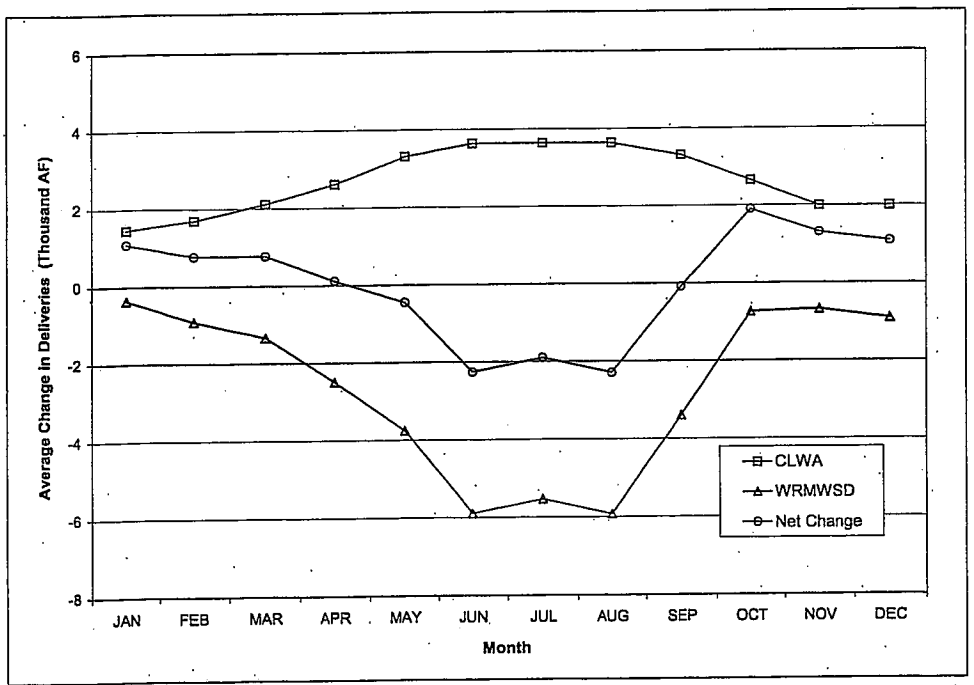

Figure 4-2. **Average Change in SWP Table A Deliveries to WRMWSD and CLWA at 2020 SWP Demand Conditions**

Table 4-2. Net Change in SWP Table A Deliveries Resulting From the Project at Existing SWP Demand Conditions, With Monterey Amendment

(all values in thousand AF)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1922	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1923	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1924	0.7	0.5	0.5	0.1	-0.3	-1.4	-1.2	-1.4	-0.1	1.2	0.8	0.7	0.0
1925	0.5	0.3	0.5	0.1	-0.3	-1.3	-1.0	-1.3	-0.1	1.1	0.7	0.7	0.0
1926	0.5	0.5	0.8	0.2	-0.4	-2.3	-1.9	-2.3	0.0	2.1	1.4	1.2	0.0
1927	1.2	1.1	1.1	0.1	-0.6	-2.9	-2.4	-2.9	-0.1	2.4	1.6	1.4	0.0
1928	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1929	0.6	0.5	0.5	0.1	-0.3	-1.3	-1.1	-1.3	-0.1	1.1	0.7	0.6	0.0
1930	0.6	0.6	0.7	0.2	-0.4	-2.0	-1.7	-2.0	0.0	1.8	1.2	1.0	0.0
1931	0.6	0.4	0.4	0.0	-0.2	-1.1	-0.9	-1.1	0.0	0.9	0.7	0.5	0.0
1932	0.6	0.6	0.6	0.1	-0.3	-1.5	-1.3	-1.6	0.0	1.3	0.9	0.7	0.0
1933	0.5	0.4	0.3	0.1	-0.2	-1.2	-1.0	-1.2	0.0	1.0	0.7	0.6	0.0
1934	0.5	0.4	0.5	0.1	-0.2	-1.2	-1.0	-1.2	0.0	1.0	0.7	0.6	0.0
1935	0.5	0.5	0.6	0.3	-0.4	-2.8	-2.3	-2.8	0.1	2.7	1.9	1.6	0.0
1936	0.6	0.9	1.2	0.2	-0.5	-2.8	-2.3	-2.8	0.0	2.5	1.7	1.4	0.0
1937	0.9	0.8	1.1	0.2	-0.5	-2.7	-2.3	-2.8	-0.1	2.4	1.6	1.4	0.0
1938	1.7	1.1	1.0	0.1	-0.6	-2.8	-2.4	-2.9	-0.2	2.2	1.5	1.2	0.0
1939	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1940	0.5	0.6	1.2	0.2	-0.4	-2.7	-2.3	-2.8	0.0	2.6	1.7	1.5	0.0
1941	1.5	0.9	0.8	0.1	-0.5	-2.3	-2.0	-2.4	-0.1	1.9	1.3	1.0	0.0
1942	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1943	1.7	1.1	1.0	0.1	-0.6	-2.8	-2.4	-2.9	-0.2	2.2	1.5	1.2	0.0
1944	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1945	1.7	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.4	1.6	1.3	0.0
1946	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1947	1.2	0.7	0.8	0.2	-0.5	-2.8	-2.4	-2.9	0.0	2.5	1.7	1.5	0.0
1948	0.5	0.4	0.3	0.1	-0.3	-2.4	-1.9	-2.4	0.1	2.5	1.7	1.4	0.0
1949	0.8	0.5	0.6	0.1	-0.4	-2.0	-1.7	-2.0	-0.1	1.8	1.2	1.0	0.0
1950	0.5	0.5	0.7	0.3	-0.3	-2.3	-1.9	-2.3	0.0	2.2	1.5	1.2	0.0
1951	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1952	1.5	0.9	0.8	0.1	-0.5	-2.3	-2.0	-2.4	-0.1	1.9	1.3	1.0	0.0
1953	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1954	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1955	1.1	0.8	0.7	0.0	-0.5	-2.0	-1.7	-2.0	-0.1	1.6	1.1	0.9	0.0
1956	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1957	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1958	1.7	1.1	1.0	0.1	-0.6	-2.8	-2.4	-2.9	-0.2	2.2	1.5	1.2	0.0
1959	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1960	0.5	0.5	0.7	0.2	-0.3	-2.3	-1.9	-2.3	0.1	2.2	1.5	1.2	0.0
1961	0.8	0.6	0.6	0.1	-0.3	-2.0	-1.7	-2.0	-0.1	1.8	1.2	1.0	0.0
1962	0.5	0.4	0.9	0.3	-0.4	-2.8	-2.3	-2.8	0.1	2.7	1.9	1.5	0.0
1963	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1964	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1965	1.4	1.1	0.9	0.1	-0.6	-2.6	-2.2	-2.6	-0.2	2.1	1.4	1.2	0.0
1966	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1967	1.7	1.1	1.0	0.1	-0.6	-2.8	-2.4	-2.9	-0.2	2.2	1.5	1.2	0.0
1968	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1969	1.5	0.9	0.8	0.1	-0.5	-2.3	-2.0	-2.4	-0.1	1.9	1.3	1.0	0.0
1970	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1971	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1972	1.8	1.1	1.0	0.1	-0.6	-2.9	-2.4	-2.9	-0.2	2.3	1.6	1.3	0.0
1973	1.1	1.2	1.1	0.2	-0.6	-2.9	-2.4	-2.9	-0.1	2.4	1.7	1.3	0.0
1974	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1975	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1976	1.8	1.0	0.9	0.0	-0.6	-2.7	-2.2	-2.7	-0.2	2.1	1.4	1.2	0.0
1977	0.4	0.2	0.2	0.0	-0.1	-0.6	-0.6	-0.7	-0.1	0.5	0.4	0.3	0.0
1978	0.3	0.5	1.0	0.2	-0.3	-2.2	-1.8	-2.2	0.0	2.0	1.4	1.2	0.0
1979	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1980	1.5	0.9	0.8	0.1	-0.5	-2.3	-2.0	-2.4	-0.1	1.9	1.3	1.0	0.0
1981	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1982	1.7	1.1	1.0	0.1	-0.6	-2.8	-2.4	-2.9	-0.2	2.2	1.5	1.2	0.0
1983	1.5	0.9	0.8	0.1	-0.5	-2.3	-2.0	-2.4	-0.1	1.9	1.3	1.0	0.0
1984	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1985	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1986	0.5	0.4	1.0	0.2	-0.4	-2.2	-1.9	-2.3	0.0	2.1	1.4	1.2	0.0
1987	1.3	0.8	0.8	0.1	-0.5	-2.4	-2.0	-2.4	-0.1	2.0	1.4	1.1	0.0
1988	0.5	0.5	0.4	0.0	-0.3	-1.1	-0.9	-1.1	-0.1	0.9	0.6	0.5	0.0
1989	0.5	0.4	0.3	0.2	-0.3	-2.0	-1.7	-2.1	0.1	2.0	1.4	1.2	0.0
1990	0.5	0.4	0.4	0.1	-0.2	-1.2	-1.0	-1.2	-0.1	1.0	0.7	0.6	0.0
1991	0.4	0.2	0.3	0.0	-0.2	-0.7	-0.6	-0.8	0.0	0.6	0.4	0.3	0.0
1992	0.4	0.3	0.3	0.1	-0.2	-1.1	-0.9	-1.1	0.0	1.0	0.7	0.6	0.0
1993	0.6	1.2	1.1	0.2	-0.5	-2.8	-2.4	-2.9	0.0	2.4	1.7	1.4	0.0
AVG	1.2	0.8	0.8	0.1	-0.5	-2.4	-2.1	-2.5	-0.1	2.0	1.4	1.1	0.0
MIN	0.3	0.2	0.2	0.0	-0.7	-2.9	-2.5	-3.0	-0.2	0.5	0.4	0.3	0.0
MAX	1.8	1.2	1.2	0.3	-0.1	-0.6	-0.6	-0.7	0.1	2.7	1.9	1.6	0.0

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Table 4-3. Net Change in SWP Table A Deliveries Resulting From the Project at 2020 SWP Demand Conditions, With Monterey Amendment

(all values in thousand AF)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
1922	1.2	0.8	1.1	0.2	-0.6	-2.9	-2.4	-2.9	-0.1	2.5	1.7	1.4	0.0
1923	1.7	1.1	1.0	0.1	-0.6	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1924	0.5	0.3	0.3	0.0	-0.2	-0.9	-0.8	-0.9	0.0	0.7	0.5	0.4	0.0
1925	0.5	0.3	0.5	0.1	-0.2	-1.3	-1.1	-1.4	0.0	1.2	0.8	0.7	0.0
1926	0.6	0.5	0.7	0.1	-0.3	-1.9	-1.6	-1.9	-0.1	1.7	1.2	1.0	0.0
1927	1.1	0.9	1.1	0.2	-0.5	-2.9	-2.4	-2.9	-0.1	2.5	1.7	1.4	0.0
1928	1.3	0.9	0.9	0.1	-0.5	-2.4	-2.0	-2.4	-0.2	1.9	1.3	1.1	0.0
1929	0.7	0.5	0.5	0.1	-0.3	-1.3	-1.1	-1.3	-0.1	1.0	0.7	0.6	0.0
1930	0.6	0.7	0.7	0.1	-0.4	-1.9	-1.6	-1.9	0.0	1.7	1.1	0.9	0.0
1931	0.6	0.5	0.4	0.1	-0.3	-1.2	-1.0	-1.2	-0.1	1.0	0.7	0.5	0.0
1932	0.5	0.5	0.5	0.0	-0.3	-1.4	-1.2	-1.4	0.0	1.2	0.8	0.7	0.0
1933	0.5	0.4	0.4	0.0	-0.2	-1.2	-1.0	-1.2	-0.1	1.0	0.7	0.6	0.0
1934	0.6	0.4	0.5	0.1	-0.2	-1.2	-1.0	-1.2	-0.1	1.0	0.6	0.6	0.0
1935	0.5	0.5	0.5	0.2	-0.3	-2.4	-2.0	-2.5	0.1	2.4	1.7	1.4	0.0
1936	0.5	0.5	1.0	0.2	-0.4	-2.5	-2.0	-2.5	0.0	2.2	1.6	1.3	0.0
1937	0.5	0.4	0.7	0.2	-0.4	-2.2	-1.8	-2.2	0.0	2.0	1.4	1.2	0.0
1938	1.5	1.1	1.1	0.1	-0.6	-2.9	-2.5	-2.9	-0.2	2.3	1.6	1.4	0.0
1939	1.6	0.9	0.9	0.1	-0.6	-2.5	-2.1	-2.6	-0.2	2.0	1.4	1.1	0.0
1940	0.4	0.4	1.0	0.3	-0.4	-2.6	-2.2	-2.7	0.1	2.5	1.7	1.5	0.0
1941	0.9	0.9	0.9	0.1	-0.5	-2.3	-1.9	-2.3	-0.1	1.9	1.3	1.1	0.0
1942	1.8	1.1	1.0	0.1	-0.7	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1943	1.6	1.1	0.9	0.0	-0.6	-2.6	-2.2	-2.7	-0.2	2.0	1.4	1.1	0.0
1944	1.3	1.0	1.0	0.1	-0.6	-2.8	-2.4	-2.8	-0.1	2.4	1.6	1.3	0.0
1945	1.1	0.7	1.0	0.2	-0.5	-2.6	-2.2	-2.6	-0.1	2.3	1.5	1.3	0.0
1946	1.7	1.0	0.9	0.1	-0.6	-2.6	-2.2	-2.7	-0.2	2.1	1.4	1.2	0.0
1947	0.9	0.6	0.6	0.2	-0.4	-2.2	-1.8	-2.2	0.0	1.9	1.3	1.1	0.0
1948	0.5	0.4	0.3	0.1	-0.3	-2.1	-1.7	-2.1	0.1	2.1	1.5	1.2	0.0
1949	0.7	0.5	0.5	0.1	-0.3	-1.9	-1.5	-1.8	0.0	1.6	1.2	1.0	0.0
1950	0.5	0.5	0.7	0.2	-0.3	-2.1	-1.8	-2.1	0.0	2.0	1.4	1.1	0.0
1951	1.6	1.1	1.0	0.1	-0.6	-2.7	-2.3	-2.8	-0.2	2.2	1.5	1.2	0.0
1952	1.5	0.9	0.8	0.1	-0.5	-2.3	-2.0	-2.4	-0.1	1.9	1.3	1.0	0.0
1953	1.8	1.1	0.9	0.1	-0.6	-2.7	-2.3	-2.8	-0.2	2.1	1.4	1.2	0.0
1954	1.5	1.0	0.9	0.1	-0.6	-2.7	-2.3	-2.7	-0.2	2.2	1.5	1.2	0.0
1955	1.0	0.7	0.6	0.1	-0.4	-1.8	-1.5	-1.8	-0.1	1.4	1.0	0.8	0.0
1956	1.6	1.1	1.1	0.1	-0.6	-2.9	-2.4	-2.9	-0.2	2.3	1.6	1.3	0.0
1957	1.5	1.0	0.8	0.1	-0.6	-2.5	-2.1	-2.5	-0.2	1.9	1.3	1.1	0.0
1958	1.3	1.0	0.9	0.1	-0.6	-2.9	-2.5	-2.9	-0.1	2.5	1.7	1.4	0.0
1959	1.6	1.0	0.9	0.1	-0.6	-2.6	-2.2	-2.6	-0.2	2.0	1.4	1.1	0.0
1960	0.4	0.3	0.5	0.2	-0.2	-1.8	-1.5	-1.8	0.0	1.7	1.2	1.0	0.0
1961	0.7	0.6	0.6	0.1	-0.3	-2.0	-1.7	-2.0	0.0	1.7	1.2	1.0	0.0
1962	0.5	0.3	0.9	0.2	-0.4	-2.4	-2.0	-2.4	0.1	2.3	1.6	1.3	0.0
1963	1.5	1.0	0.9	0.1	-0.6	-2.9	-2.4	-2.9	-0.1	2.4	1.7	1.3	0.0
1964	1.5	1.0	0.8	0.1	-0.6	-2.4	-2.1	-2.5	-0.2	1.9	1.3	1.1	0.0
1965	1.4	0.9	0.8	0.1	-0.5	-2.3	-2.0	-2.4	-0.2	1.9	1.3	1.0	0.0
1966	1.8	1.1	1.0	0.1	-0.6	-2.8	-2.4	-2.8	-0.2	2.2	1.5	1.2	0.0
1967	1.1	1.2	0.9	0.1	-0.6	-2.8	-2.4	-2.9	-0.1	2.4	1.7	1.4	0.0
1968	1.6	1.1	0.8	0.1	-0.6	-2.5	-2.2	-2.6	-0.2	2.0	1.4	1.1	0.0
1969	0.9	0.9	0.9	0.1	-0.5	-2.3	-1.9	-2.3	-0.1	1.9	1.3	1.1	0.0
1970	1.7	1.1	0.9	0.1	-0.6	-2.7	-2.3	-2.7	-0.2	2.1	1.4	1.2	0.0
1971	1.8	1.1	0.9	0.1	-0.6	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1972	1.5	0.9	0.8	0.1	-0.5	-2.3	-2.0	-2.3	-0.1	1.8	1.2	1.0	0.0
1973	1.2	1.0	0.9	0.1	-0.5	-2.6	-2.2	-2.7	-0.1	2.2	1.5	1.2	0.0
1974	1.8	1.1	0.9	0.1	-0.6	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1975	1.6	1.0	0.9	0.1	-0.6	-2.8	-2.3	-2.8	-0.2	2.3	1.5	1.3	0.0
1976	1.7	0.9	0.8	0.1	-0.6	-2.4	-2.1	-2.5	-0.2	1.9	1.3	1.0	0.0
1977	0.4	0.2	0.3	0.0	-0.2	-0.7	-0.5	-0.7	0.0	0.5	0.3	0.3	0.0
1978	0.3	0.4	0.4	0.3	-0.3	-2.1	-1.8	-2.2	0.1	2.1	1.5	1.2	0.0
1979	1.2	0.9	0.9	0.1	-0.5	-2.5	-2.1	-2.5	-0.1	2.1	1.4	1.1	0.0
1980	1.1	0.8	0.8	0.1	-0.5	-2.3	-2.0	-2.3	-0.1	1.9	1.3	1.1	0.0
1981	1.5	1.0	0.9	0.1	-0.6	-2.5	-2.1	-2.5	-0.2	2.0	1.4	1.1	0.0
1982	1.8	1.1	1.0	0.1	-0.6	-2.9	-2.5	-3.0	-0.2	2.3	1.6	1.3	0.0
1983	1.5	0.9	0.8	0.1	-0.5	-2.3	-2.0	-2.4	-0.1	1.9	1.3	1.0	0.0
1984	1.8	1.1	1.0	0.1	-0.6	-2.8	-2.4	-2.9	-0.2	2.3	1.5	1.3	0.0
1985	1.5	0.9	0.9	0.1	-0.6	-2.7	-2.3	-2.7	-0.1	2.3	1.5	1.3	0.0
1986	0.5	0.5	0.9	0.2	-0.4	-2.3	-1.9	-2.3	0.0	2.0	1.4	1.2	0.0
1987	1.1	0.7	0.7	0.1	-0.4	-2.1	-1.8	-2.1	-0.1	1.7	1.2	1.0	0.0
1988	0.6	0.5	0.4	0.0	-0.2	-1.1	-0.9	-1.1	-0.1	0.8	0.6	0.4	0.0
1989	0.5	0.3	0.3	0.2	-0.3	-2.0	-1.6	-2.0	0.1	2.0	1.3	1.1	0.0
1990	0.5	0.4	0.4	0.0	-0.2	-1.1	-1.0	-1.1	-0.1	1.0	0.7	0.5	0.0
1991	0.4	0.2	0.3	0.0	-0.2	-0.8	-0.6	-0.8	0.0	0.6	0.4	0.4	0.0
1992	0.4	0.2	0.3	0.1	-0.2	-1.1	-0.9	-1.1	0.0	1.0	0.7	0.5	0.0
1993	0.6	1.0	1.1	0.2	-0.5	-2.8	-2.4	-2.9	0.0	2.5	1.7	1.4	0.0
AVG	1.1	0.8	0.8	0.1	-0.5	-2.3	-1.9	-2.3	-0.1	1.9	1.3	1.1	0.0
MIN	0.3	0.2	0.3	0.0	-0.7	-2.9	-2.5	-3.0	-0.2	0.5	0.3	0.3	0.0
MAX	1.8	1.2	1.1	0.3	-0.2	-0.7	-0.5	-0.7	0.1	2.5	1.7	1.5	0.0

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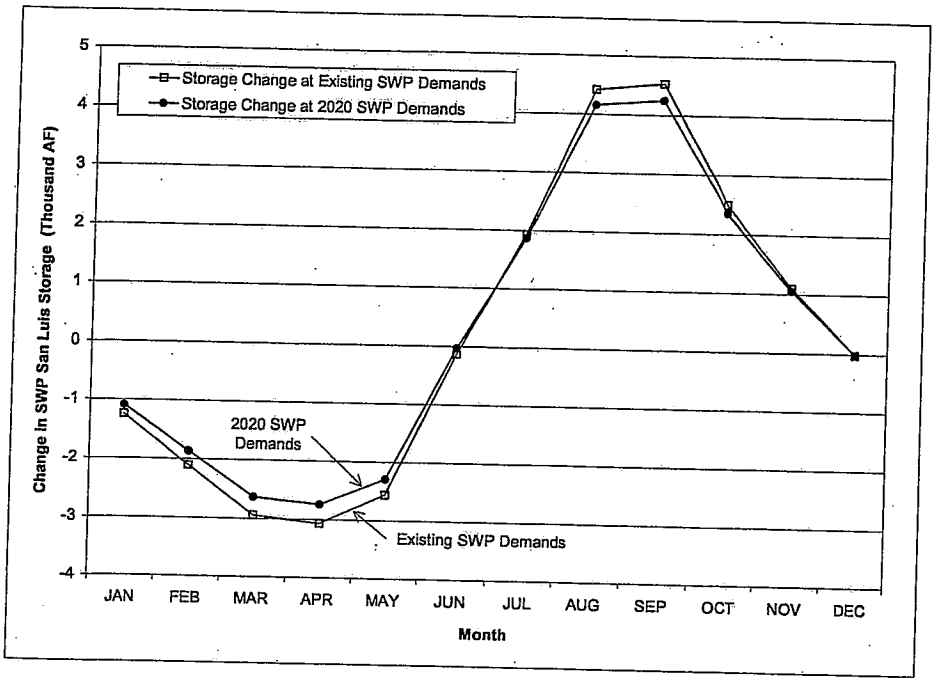

Figure 4-3. **Average Monthly Change in SWP San Luis Storage with the Project, With Monterey Amendment**

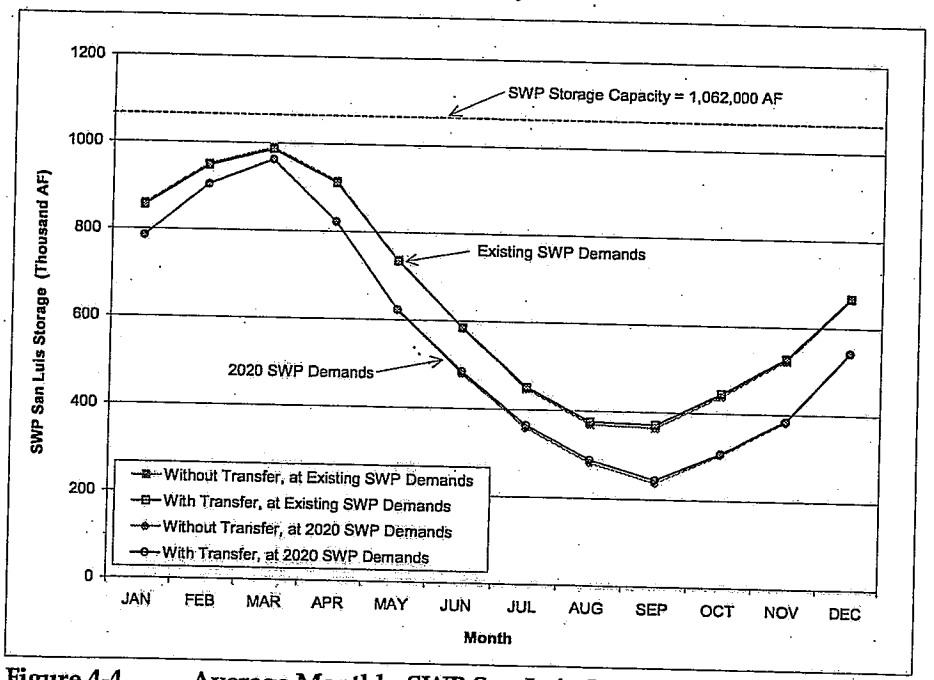

Figure 4-4. **Average Monthly SWP San Luis Storage With and Without the Project, With Monterey Amendment**

Table 4-4. Net Change in San Luis Reservoir Storage Resulting From the Project at Existing SWP Demand Conditions, With Monterey Amendment

(all values in thousand AF)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1922	-1.8	-2.9	-3.9	-4.0	-3.4	-0.5	2.1	5.1	5.2	2.9	1.3	-0.1
1923	-1.8	-2.9	-4.0	-4.1	-3.4	-0.5	2.0	5.0	5.2	2.8	1.2	-0.1
1924	-0.8	-1.3	-1.8	-1.9	-1.5	-0.2	1.0	2.5	2.6	1.4	0.6	-0.1
1925	-0.5	-0.8	-1.4	-1.4	-1.2	0.1	1.1	2.4	2.4	1.3	0.6	-0.1
1926	-0.6	-1.0	-1.8	-2.0	-1.6	0.6	2.5	4.7	4.7	2.7	1.2	0.0
1927	-1.3	-2.4	-3.5	-3.6	-3.0	-0.1	2.3	5.3	5.3	2.9	1.3	-0.1
1928	-1.8	-3.0	-4.0	-4.1	-3.4	-0.5	2.1	5.1	5.4	3.0	1.3	0.1
1929	-0.6	-1.1	-1.7	-1.7	-1.5	-0.1	1.0	2.3	2.4	1.3	0.6	0.0
1930	-0.6	-1.2	-1.9	-2.0	-1.6	0.4	2.1	4.0	4.0	2.3	1.0	-0.1
1931	-0.6	-1.0	-1.4	-1.4	-1.2	-0.1	0.9	2.0	2.0	1.1	0.5	-0.1
1932	-0.6	-1.1	-1.7	-1.9	-1.5	0.0	1.2	2.8	2.8	1.6	0.6	-0.1
1933	-0.5	-0.9	-1.2	-1.3	-1.1	0.1	1.1	2.3	2.3	1.3	0.6	0.0
1934	-0.4	-0.8	-1.3	-1.4	-1.2	0.0	1.1	2.3	2.3	1.3	0.7	0.1
1935	-0.5	-1.0	-1.6	-1.9	-1.5	1.3	3.5	6.4	6.3	3.5	1.6	0.1
1936	-0.6	-1.4	-2.7	-2.8	-2.4	0.3	2.7	5.6	5.6	3.0	1.3	-0.1
1937	-0.9	-1.7	-2.7	-2.9	-2.4	0.3	2.6	5.3	5.4	3.0	1.4	0.0
1938	-1.7	-2.9	-3.8	-4.0	-3.3	-0.5	1.9	4.8	5.0	2.7	1.2	0.0
1939	-1.9	-3.1	-4.1	-4.2	-3.5	-0.5	2.0	5.0	5.2	2.8	1.2	-0.1
1940	-0.5	-1.0	-2.2	-2.4	-2.1	0.7	3.0	5.9	5.9	3.2	1.5	0.0
1941	-1.5	-2.4	-3.2	-3.3	-2.8	-0.4	1.6	4.0	4.1	2.3	0.9	-0.1
1942	-1.9	-3.1	-4.1	-4.2	-3.5	-0.6	1.9	4.9	5.1	2.8	1.2	0.0
1943	-1.7	-2.8	-3.8	-3.9	-3.2	-0.4	2.0	4.8	5.0	2.7	1.1	-0.1
1944	-1.8	-3.0	-4.0	-4.1	-3.4	-0.5	2.1	5.1	5.2	3.0	1.3	0.1
1945	-1.7	-2.9	-3.9	-4.1	-3.4	-0.6	1.9	4.9	5.1	2.7	1.1	-0.1
1946	-1.9	-3.0	-4.0	-4.1	-3.5	-0.5	2.0	5.0	5.2	2.8	1.3	0.0
1947	-1.2	-1.9	-2.7	-2.9	-2.3	0.4	2.8	5.7	5.7	3.2	1.5	-0.1
1948	-0.5	-0.9	-1.2	-1.3	-1.0	1.4	3.3	5.7	5.6	3.1	1.4	-0.1
1949	-0.8	-1.4	-2.0	-2.1	-1.8	0.2	1.8	3.8	3.8	2.1	0.8	-0.2
1950	-0.5	-1.0	-1.7	-1.9	-1.5	0.8	2.7	5.0	5.0	2.7	1.2	0.0
1951	-1.8	-3.0	-4.0	-4.2	-3.5	-0.6	1.9	5.0	5.1	2.8	1.2	-0.1
1952	-1.4	-2.3	-3.1	-3.2	-2.6	-0.3	1.7	4.1	4.3	2.4	1.1	0.1
1953	-1.8	-2.9	-4.0	-4.1	-3.4	-0.6	1.9	4.9	5.1	2.8	1.1	-0.2
1954	-1.8	-3.0	-4.0	-4.1	-3.4	-0.5	2.0	5.1	5.2	2.8	1.2	-0.1
1955	-1.1	-1.9	-2.6	-2.6	-2.2	-0.2	1.5	3.5	3.6	2.0	0.9	-0.1
1956	-1.8	-2.9	-4.0	-4.1	-3.5	-0.6	1.9	5.0	5.1	2.8	1.2	-0.1
1957	-1.8	-3.0	-4.0	-4.1	-3.4	-0.5	2.0	5.0	5.1	2.8	1.2	-0.1
1958	-1.8	-2.9	-3.8	-3.9	-3.3	-0.5	1.9	4.7	5.0	2.7	1.2	0.0
1959	-1.8	-2.9	-4.0	-4.1	-3.5	-0.6	2.0	5.0	5.2	2.8	1.2	0.0
1960	-0.6	-1.0	-1.7	-2.0	-1.6	0.7	2.6	4.9	4.9	2.8	1.2	0.0
1961	-0.7	-1.3	-1.9	-2.1	-1.7	0.3	2.1	4.1	4.1	2.4	1.1	0.1
1962	-0.5	-0.9	-1.7	-2.1	-1.7	1.1	3.4	6.3	6.2	3.5	1.7	0.1
1963	-1.8	-2.9	-4.0	-4.0	-3.4	-0.4	2.2	5.1	5.4	2.9	1.3	0.1
1964	-1.8	-2.9	-4.0	-4.1	-3.4	-0.5	2.0	5.1	5.2	3.0	1.3	0.1
1965	-1.4	-2.5	-3.4	-3.5	-2.9	-0.3	1.9	4.5	4.7	2.6	1.2	0.1
1966	-1.8	-3.0	-4.0	-4.1	-3.4	-0.5	2.0	5.1	5.3	3.0	1.3	0.0
1967	-1.7	-2.8	-3.8	-3.9	-3.2	-0.4	2.0	4.8	5.0	2.8	1.2	0.1
1968	-1.8	-2.9	-4.0	-4.1	-3.4	-0.5	2.0	5.1	5.2	2.9	1.2	0.0
1969	-1.5	-2.4	-3.2	-3.2	-2.7	-0.4	1.6	4.0	4.2	2.3	1.0	0.0
1970	-1.8	-2.9	-4.0	-4.1	-3.4	-0.5	2.0	5.0	5.2	2.8	1.2	0.0
1971	-1.8	-2.9	-4.0	-4.1	-3.4	-0.5	2.0	5.1	5.2	2.8	1.2	-0.1
1972	-1.8	-3.0	-4.0	-4.1	-3.4	-0.5	1.9	4.9	5.0	2.7	1.2	-0.1
1973	-1.1	-2.2	-3.3	-3.5	-2.9	-0.1	2.4	5.3	5.4	3.0	1.3	0.0
1974	-1.8	-3.0	-4.0	-4.1	-3.4	-0.4	2.1	5.1	5.3	3.0	1.3	0.1
1975	-1.8	-3.0	-4.0	-4.1	-3.4	-0.6	1.9	5.0	5.1	2.8	1.2	-0.1
1976	-1.9	-2.8	-3.8	-3.8	-3.2	-0.5	1.7	4.4	4.6	2.6	1.1	0.0
1977	-0.5	-0.7	-0.9	-1.0	-0.9	-0.3	0.3	1.0	1.0	0.5	0.1	-0.1
1978	-0.3	-0.8	-1.8	-2.0	-1.7	0.5	2.4	4.5	4.5	2.5	1.1	0.0
1979	-1.9	-3.1	-4.1	-4.2	-3.5	-0.5	2.0	5.1	5.3	3.0	1.4	0.1
1980	-1.5	-2.4	-3.3	-3.4	-2.9	-0.5	1.5	3.9	4.0	2.1	0.8	-0.2
1981	-1.8	-2.9	-4.0	-4.1	-3.4	-0.5	2.0	5.1	5.2	2.8	1.2	0.0
1982	-1.7	-2.9	-3.8	-3.9	-3.3	-0.5	1.9	4.7	4.9	2.7	1.1	-0.1
1983	-1.5	-2.4	-3.2	-3.2	-2.7	-0.4	1.6	4.0	4.1	2.3	1.0	-0.1
1984	-1.9	-3.0	-4.0	-4.2	-3.5	-0.5	2.0	5.0	5.2	2.9	1.3	0.0
1985	-1.8	-3.0	-4.0	-4.1	-3.4	-0.5	2.1	5.1	5.3	3.0	1.3	0.1
1986	-0.6	-0.9	-1.9	-2.1	-1.7	0.5	2.4	4.6	4.6	2.5	1.1	-0.1
1987	-1.3	-2.1	-2.9	-3.0	-2.5	-0.1	1.9	4.4	4.4	2.4	1.1	0.0
1988	-0.5	-1.1	-1.5	-1.6	-1.3	-0.3	0.7	1.7	1.8	1.0	0.4	0.0
1989	-0.5	-0.8	-1.2	-1.5	-1.2	0.8	2.5	4.5	4.4	2.4	1.0	-0.1
1990	-0.5	-0.9	-1.4	-1.5	-1.3	0.0	1.0	2.2	2.4	1.3	0.6	0.1
1991	-0.4	-0.7	-0.9	-0.9	-0.8	0.0	0.6	1.4	1.5	0.9	0.4	0.1
1992	-0.4	-0.7	-1.0	-1.1	-0.9	0.2	1.1	2.2	2.2	1.3	0.6	0.1
1993	-0.6	-1.8	-2.9	-3.1	-2.6	0.2	2.6	5.4	5.5	3.1	1.4	-0.1
AVG	-1.2	-2.1	-2.9	-3.1	-2.6	-0.1	1.9	4.4	4.5	2.5	1.1	0.0
MIN	-1.9	-3.1	-4.1	-4.2	-3.5	-0.6	0.3	1.0	1.0	0.5	0.1	-0.2
MAX	-0.3	-0.7	-0.9	-0.9	-0.8	1.4	3.5	6.4	6.3	3.5	1.7	0.1

Table 4-5. Net Change in San Luis Reservoir Storage Resulting From the Project at 2020 SWP Demand Conditions, With Monterey Amendment

(all values in thousand AF)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1922	-1.2	-2.0	-3.1	-3.3	-2.7	0.2	2.7	5.6	5.6	3.2	1.6	0.2
1923	-1.7	-2.9	-4.0	-4.1	-3.5	-0.5	1.9	4.9	5.1	2.8	1.2	-0.2
1924	-0.5	-0.8	-1.1	-1.1	-0.9	0.0	0.7	1.6	1.7	0.9	0.5	0.1
1925	-0.5	-0.8	-1.3	-1.4	-1.2	0.2	1.3	2.6	2.6	1.5	0.7	-0.1
1926	-0.6	-1.2	-1.9	-2.1	-1.8	0.2	1.7	3.6	3.7	2.0	0.8	-0.2
1927	-1.1	-2.0	-3.1	-3.2	-2.7	0.2	2.6	5.5	5.7	3.2	1.5	0.1
1928	-1.3	-2.3	-3.2	-3.3	-2.7	-0.3	1.7	4.1	4.2	2.4	1.1	-0.1
1929	-0.7	-1.2	-1.6	-1.7	-1.4	-0.1	0.9	2.2	2.3	1.3	0.5	-0.1
1930	-0.6	-1.3	-1.9	-2.1	-1.8	0.1	1.7	3.6	3.6	1.9	0.9	-0.1
1931	-0.5	-1.0	-1.4	-1.5	-1.2	-0.1	0.9	2.1	2.1	1.2	0.5	0.1
1932	-0.5	-1.0	-1.5	-1.6	-1.2	0.2	1.3	2.8	2.8	1.5	0.7	0.0
1933	-0.6	-1.0	-1.4	-1.4	-1.2	0.0	1.0	2.2	2.3	1.3	0.6	0.1
1934	-0.6	-1.0	-1.4	-1.5	-1.3	-0.1	0.9	2.1	2.2	1.2	0.5	-0.1
1935	-0.4	-1.0	-1.5	-1.7	-1.4	1.1	3.1	5.6	5.6	3.1	1.4	0.0
1936	-0.5	-0.9	-2.0	-2.2	-1.8	0.6	2.7	5.1	5.1	2.9	1.4	0.1
1937	-0.5	-1.0	-1.7	-1.9	-1.6	0.6	2.4	4.6	4.6	2.6	1.2	0.0
1938	-1.5	-2.6	-3.7	-3.7	-3.1	-0.2	2.3	5.2	5.4	3.1	1.5	0.1
1939	-1.6	-2.6	-3.5	-3.7	-3.0	-0.5	1.6	4.2	4.3	2.3	1.0	-0.2
1940	-0.4	-0.8	-1.9	-2.1	-1.7	0.9	3.1	5.8	5.7	3.2	1.5	0.1
1941	-0.9	-1.8	-2.6	-2.8	-2.3	0.0	1.9	4.3	4.4	2.4	1.1	-0.1
1942	-1.8	-2.9	-4.0	-4.1	-3.4	-0.5	2.0	5.0	5.2	2.8	1.3	-0.1
1943	-1.6	-2.8	-3.7	-3.7	-3.2	-0.7	1.6	4.3	4.5	2.4	1.1	-0.1
1944	-1.3	-2.3	-3.3	-3.3	-2.8	0.1	2.3	5.2	5.3	3.0	1.3	0.0
1945	-1.1	-1.7	-2.7	-2.9	-2.4	0.1	2.2	4.9	4.9	2.7	1.1	-0.1
1946	-1.7	-2.7	-3.5	-3.6	-3.0	-0.3	1.9	4.6	4.8	2.7	1.4	0.2
1947	-1.0	-1.6	-2.2	-2.4	-1.9	0.2	2.0	4.1	4.2	2.3	1.0	-0.1
1948	-0.5	-0.8	-1.2	-1.3	-1.1	1.0	2.7	4.9	4.8	2.6	1.1	-0.1
1949	-0.7	-1.2	-1.8	-1.9	-1.6	0.3	1.8	3.6	3.6	1.9	0.7	-0.2
1950	-0.5	-1.0	-1.6	-1.8	-1.5	0.6	2.4	4.5	4.5	2.5	1.1	0.0
1951	-1.7	-2.9	-3.8	-3.8	-3.2	-0.5	1.8	4.6	4.8	2.6	1.2	0.0
1952	-1.5	-2.4	-3.2	-3.3	-2.8	-0.4	1.6	4.0	4.1	2.3	1.0	-0.1
1953	-1.8	-3.0	-3.8	-3.9	-3.4	-0.6	1.7	4.5	4.7	2.6	1.1	-0.1
1954	-1.5	-2.6	-3.5	-3.6	-3.0	-0.4	1.9	4.6	4.8	2.6	1.1	-0.1
1955	-1.0	-1.7	-2.4	-2.5	-2.2	-0.3	1.3	3.1	3.1	1.8	0.9	0.0
1956	-1.6	-2.7	-3.8	-3.9	-3.2	-0.3	2.1	5.1	5.3	2.9	1.3	0.0
1957	-1.5	-2.5	-3.3	-3.4	-2.8	-0.4	1.7	4.2	4.3	2.3	0.9	-0.1
1958	-1.3	-2.3	-3.3	-3.4	-2.8	0.1	2.5	5.5	5.5	3.1	1.4	0.0
1959	-1.6	-2.6	-3.5	-3.5	-3.0	-0.5	1.7	4.3	4.5	2.5	1.1	-0.1
1960	-0.4	-0.7	-1.3	-1.4	-1.2	0.6	2.1	3.9	3.9	2.2	1.0	0.1
1961	-0.8	-1.4	-2.0	-2.2	-1.8	0.1	1.7	3.7	3.8	2.0	0.8	-0.1
1962	-0.6	-0.9	-1.7	-2.0	-1.6	0.8	2.8	5.2	5.1	2.8	1.3	0.0
1963	-1.5	-2.5	-3.4	-3.6	-3.0	-0.1	2.3	5.2	5.3	2.9	1.2	-0.1
1964	-1.5	-2.5	-3.3	-3.4	-2.8	-0.3	1.7	4.1	4.3	2.4	1.1	0.1
1965	-1.4	-2.3	-3.1	-3.2	-2.7	-0.4	1.5	4.0	4.1	2.2	0.9	-0.1
1966	-1.8	-3.0	-3.9	-3.9	-3.3	-0.4	1.9	4.8	5.0	2.9	1.3	0.1
1967	-1.1	-2.3	-3.3	-3.4	-2.9	0.0	2.4	5.4	5.4	3.1	1.4	0.1
1968	-1.6	-2.8	-3.6	-3.7	-3.1	-0.6	1.6	4.3	4.5	2.5	1.2	0.1
1969	-0.9	-1.8	-2.7	-2.8	-2.3	-0.1	2.0	4.3	4.4	2.4	1.0	-0.1
1970	-1.7	-2.9	-3.7	-3.8	-3.2	-0.5	1.9	4.6	4.7	2.6	1.3	0.1
1971	-1.8	-2.9	-3.7	-3.8	-3.2	-0.2	2.2	5.2	5.4	3.0	1.4	0.0
1972	-1.5	-2.3	-3.1	-3.1	-2.6	-0.4	1.6	3.9	4.0	2.2	1.0	0.0
1973	-1.1	-2.2	-3.1	-3.3	-2.8	-0.2	2.1	4.7	4.8	2.6	1.2	-0.1
1974	-1.8	-2.9	-3.9	-3.9	-3.3	-0.3	2.2	5.2	5.3	2.9	1.4	0.1
1975	-1.6	-2.6	-3.5	-3.6	-3.0	-0.2	2.1	4.9	5.1	2.8	1.3	0.0
1976	-1.7	-2.7	-3.5	-3.6	-3.0	-0.6	1.5	4.0	4.2	2.3	1.0	-0.1
1977	-0.3	-0.6	-0.8	-0.9	-0.7	0.0	0.5	1.2	1.2	0.7	0.3	0.1
1978	-0.3	-0.6	-1.1	-1.4	-1.1	1.0	2.7	4.8	4.7	2.6	1.1	-0.1
1979	-1.2	-2.0	-3.0	-3.1	-2.7	-0.2	1.9	4.5	4.6	2.5	1.0	-0.1
1980	-1.1	-2.0	-2.8	-2.9	-2.5	-0.2	1.8	4.0	4.2	2.3	1.0	-0.1
1981	-1.5	-2.5	-3.5	-3.5	-3.0	-0.5	1.7	4.2	4.4	2.4	1.0	-0.1
1982	-1.8	-2.9	-3.9	-4.0	-3.3	-0.4	2.0	5.0	5.2	3.0	1.3	0.0
1983	-1.4	-2.3	-3.1	-3.2	-2.7	-0.4	1.6	4.0	4.2	2.3	1.0	0.1
1984	-1.9	-3.0	-4.0	-4.0	-3.4	-0.6	1.8	4.7	4.9	2.7	1.1	-0.1
1985	-1.5	-2.4	-3.2	-3.3	-2.8	0.0	2.2	5.0	5.2	2.9	1.4	0.1
1986	-0.5	-1.1	-2.0	-2.2	-1.9	0.4	2.2	4.5	4.5	2.4	1.0	-0.1
1987	-1.1	-1.8	-2.4	-2.6	-2.1	0.0	1.7	3.8	3.9	2.2	1.0	0.0
1988	-0.6	-1.1	-1.5	-1.5	-1.3	-0.2	0.7	1.8	1.9	1.1	0.5	0.1
1989	-0.6	-1.0	-1.3	-1.5	-1.2	0.7	2.4	4.4	4.3	2.3	1.0	-0.1
1990	-0.6	-1.0	-1.3	-1.4	-1.1	0.0	1.0	2.1	2.2	1.2	0.6	0.0
1991	-0.4	-0.6	-0.9	-0.9	-0.8	0.0	0.6	1.4	1.4	0.8	0.4	0.0
1992	-0.4	-0.6	-1.0	-1.0	-0.8	0.3	1.1	2.2	2.2	1.3	0.5	0.0
1993	-0.6	-1.6	-2.7	-2.9	-2.4	0.4	2.8	5.7	5.8	3.3	1.5	0.1
AVG	-1.1	-1.9	-2.6	-2.7	-2.3	0.0	1.9	4.2	4.2	2.4	1.1	0.0
MIN	-1.9	-3.0	-4.0	-4.1	-3.5	-0.7	0.5	1.2	1.2	0.7	0.3	-0.2
MAX	-0.3	-0.6	-0.8	-0.9	-0.7	1.1	3.1	5.8	5.8	3.3	1.6	0.2

5.0 CASTAIC LAKE STORAGE ANALYSIS

5.1 ANALYSIS METHODOLOGY AND ASSUMPTIONS

The Castaic Lake storage analysis is a qualitative analysis describing the potential impacts resulting from implementation of the Project to storage in Castaic Lake.

5.1.1 Background

As was discussed previously in section 1.1, Castaic Lake is the terminal reservoir on the West Branch of the California Aqueduct and is operated to provide regulatory storage to help meet peak deliveries during the summer months to the three SWP Contractors that receive deliveries from Castaic Lake (CLWA, MWD, and the Ventura County Flood Control District), and to provide an emergency water supply to those Contractors in case of a major supply system outage. Castaic Lake is also used for year-round recreational purposes.

Total deliveries to Contractors from Castaic Lake averaged 403,000 AF from 1990 through 2000, ranging from 158,000 AF in 1995 (a very wet year) to 787,000 AF in 1990 (see Table 1-1). During this same period, deliveries to CLWA averaged 19,200 AF, while deliveries to MWD, due to its relatively larger Table A Amount and demand, averaged 380,000 AF. As a percent of total deliveries, deliveries to CLWA averaged about 6 percent of the total during this period, while deliveries to MWD averaged about 93 percent.

As part of the Monterey Amendment, the three West Branch Contractors have access to a total of 160,000 AF of the storage from Castaic Lake as "flexible storage." These Contractors may withdraw up to their proportionate share of the total flexible storage, in addition to their allocated SWP supplies, and must replace any water withdrawn within five years of withdrawal. CLWA's proportionate share of this flexible storage is 4,684 AF. CLWA's proportionate share of flexible storage and their access to this storage do not change due to the Project.

With implementation of the Monterey Amendment in 1996, annual operations at Castaic Reservoir were somewhat modified as a result of flexible storage. In order to keep enough water available in storage to provide both for flexible storage and for emergency purposes, since 1996 DWR has typically limited the amount of its storage withdrawals over the summer to meet peak deliveries to about 30,000 AF. These more limited annual storage withdrawals since 1996 can be seen on Figure 1-6. Any withdrawals from flexible storage, which have occurred in several years since implementation of the Monterey Amendment, are in addition to these typical DWR annual operations and have resulted in larger total withdrawals during those years in which they occurred.

5.1.2 Overview of Analysis

The qualitative analysis of the potential impact of the Project on storage in Castaic Lake was based on storage data from model studies conducted based on the With Monterey Amendment scenario, which includes Castaic Lake operations consistent with the Monterey Amendment.

The conclusions drawn from this analysis, however, are independent of how water is allocated and so would be the same for all allocation scenarios.

Methodology

1. Monthly target storage values for Castaic Lake that were used as input to the two DWRSIM studies described in section 2.1, and well as model output of monthly storage at Castaic Lake for the 73 hydrologic years of each study, were reviewed to determine the amount of storage that would be withdrawn in normal operations to meet peak summer Contractor deliveries from Castaic Lake.

2. This annual storage withdrawal was then compared to typical total Contractor deliveries from Castaic Lake.

Assumptions

1. The monthly target storage values used to govern Castaic Lake operations, and therefore the annual withdrawal from the Lake to meet peak summer deliveries, would not change in the future, regardless of whether deliveries from Castaic Lake increase.

5.2 ANALYSIS CONCLUSIONS

The monthly target storage values used to govern Castaic Lake operations in the model studies range from a maximum of 324,000 AF in April to a minimum of 294,000 AF in October. This means that operational targets are to have the lake full by the end of April, and to draw the storage down by 30,000 AF by the end of October. This storage withdrawal of 30,000 AF is used to meet Contractor deliveries from Castaic Lake during the peak demand period over the summer. This modeled operation of Castaic Lake is consistent with actual operations of the lake since implementation of the Monterey Amendment.

The 30,000 AF of storage withdrawal from Castaic Lake is small relative to total deliveries from the lake. These total deliveries averaged about 403,000 AF per year from 1990 through 2000, and deliveries from Castaic Lake are anticipated to increase in the future as demands within MWD and CLWA service areas increase. Typically, roughly two thirds of total annual deliveries from the lake are made during the storage withdrawal period from May through October. Applying this two-thirds value to the average deliveries from 1990 to 2000 means an average of roughly 270,000 AF delivered from May through October, which significantly exceeds the 30,000 AF of storage withdrawal during those same months. This means that under existing operations, most deliveries from Castaic Lake are conveyed through the California Aqueduct and through Castaic Lake in about the same month water is delivered. In other words, Castaic Lake is used more for conveyance than for storage.

Since the 30,000 AF of storage withdrawal at Castaic Lake is limited both by contractual and operational considerations, this amount of withdrawal is not anticipated to increase as delivery demands increase. Therefore, any additional deliveries from the lake must be delivered through the aqueduct in about the same month as the delivery, and storage in the lake would not change. This is true regardless of whether deliveries from Castaic Lake increase due to increasing Contractor demands, or due to Table A Amount transfers such as the Project.

Therefore, the increase in water delivery to CLWA from the Project would result in additional water being conveyed to, and delivered from, Castaic Lake, but would have little effect on the overall storage volume in the lake at any given time.

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2

6.0 CLWA SUPPLIES FOR ENVIRONMENTAL SETTING

6.1 ASSUMPTIONS

The current water supply for the Santa Clarita Valley is derived from both local and imported sources. The principal components of this supply are groundwater from the Alluvial Aquifer, groundwater from the Saugus Formation and imported water from the SWP. A variety of future water sources (including local recycled water,[9] desalted ocean water, increased Saugus Formation production, conjunctive use of local or non-local groundwater basins, and other imported water sources) could be developed to supply future development planned for the CLWA service area. CLWA completed an analysis of its water supply as part of its Urban Water Management Plan (UWMP) (CLWA 2000). The UWMP is scheduled to be updated in 2005.

The water supplies included in this EIR for the pre-project 1998 environmental baseline and current environmental setting were limited to existing supply sources and programs, with the amount of water available from these sources estimated based only on existing supply facilities. The existing supply sources are:

Local Supplies:	Groundwater from the Alluvial Aquifer
	Groundwater from the Saugus Formation
Imported Supplies:	SWP Table A
	SWP Flexible Storage
	SWP Table A Amount in Semitropic Storage

6.1.1 Common Assumptions

Assumptions that are common to both the 1998 environmental baseline and current environmental setting are described below.

Local Groundwater - The amount of available groundwater supplies from the Alluvial Aquifer and Saugus Formation are taken, for the most part, directly from the UWMP. In the UWMP, annual supplies from the Alluvial Aquifer were projected to be 30,000 to 40,000 AF in average years, and 30,000 to 35,000 AF in dry years; and annual supplies from the Saugus Formation were projected to be 7,500 to 15,000 AF in average years, and 11,000 to 15,000 AF in dry years. While an updated report on these two aquifers (Slade 2002) concluded that short-term, dry-year supply from the Saugus Formation could increase to up to 35,000 AF per year, annual pumping from existing wells and appurtenant facilities is limited to approximately 15,000 AF. Therefore, given the additional supply capability of the Saugus Formation, it is assumed that annual dry-year pumping would be limited only by existing facilities, to 15,000 AF.

The projected groundwater supplies used in this EIR are generally the midpoints of the ranges set forth in the UWMP, with the exception as noted above for dry-period pumping from the

9 Initial deliveries of recycled water commenced in 2003.

Saugus Formation. For the multiple dry-year period, it was assumed that while groundwater supplies might change from year to year during that period, the average annual supply over the dry period would be the same as for a single, very dry year. Therefore, the dry-year supply identified above was used in both the single dry year and the multiple dry-year period.

The detection of perchlorate in four production wells in the Saugus Formation in 1997 and one production well in the Alluvial Aquifer in 2002 has resulted in suspending the use of these five wells. Due to the number and distribution of the remaining production wells, however, this suspended use has not had a substantial effect on overall water supply.

SWP Flexible Storage - Under the SWP Water Supply Contracts, the Contractors that share in the repayment of Castaic Lake may access a portion of the storage in that reservoir. This accessible storage is referred to as "flexible storage." These Contractors may withdraw water from flexible storage, in addition to their allocated Table A supplies, on an as-needed basis. A Contractor must replace any water it withdraws from this storage within five years. As one of the three Contractors sharing in the repayment of Castaic Lake, CLWA has access to this flexible storage. Its share of the total flexible storage is about 4,680 AF.

For this EIR, it is assumed that this supply would only be used in dry years. For the single dry-year condition, it is assumed the entire amount would be used. For the multiple dry-year condition, it is assumed that the entire amount would be used sometime during the four-year period, so the average annual supply during that period would be one fourth of the total, or 1,170 AF.

6.1.2 Scenario-Specific Assumptions

6.1.2.1 1998 Environmental Baseline

Assumptions that are specific to the 1998 environmental baseline are described below.

SWP Table A Supplies – The SWP Table A supplies estimated for this environmental baseline are based on results from the DWRSIM model study at existing (1998) demand conditions (as was described previously in section 2.1), with SWP water supplies allocated among Contractors under the Water Supply Contract provisions then in effect (i.e., based on Monterey Amendment provisions). The availability of SWP supplies to CLWA are estimated by multiplying CLWA's pre-project Table A Amount of 54,200 AF, by the Table A delivery percentages determined in the With Monterey Amendment water supply analysis for Other M&I Contractors (see section 3.1 for an explanation of this water supply analysis). For the three hydrologic conditions evaluated, the delivery percentages used here are based on: the average over DWRSIM's entire hydrologic period for the average year, 1977 for the single dry year, and the 1988 to 1991 average for the multiple dry year. The specific delivery percentages multiplied by CLWA's Table A Amount for each of these three hydrologic conditions were 86.3 percent, 22.4 percent, and 44.2 percent, respectively.

6.1.2.2 Current Environmental Setting

Assumptions that are specific to the current environmental setting are described below.

SWP Table A Supplies - The SWP Table A supplies estimated for the current environmental setting are based on results in DWR's SWP Delivery Reliability Report (DWR, 2003) from the CALSIM II model study at existing (2001) demand conditions (as was described previously in section 2.1). In the CALSIM II studies, SWP water supplies are allocated among Contractors based on Monterey Amendment provisions. Since the Project's 41,000 AF of Table A Amount has actually already been transferred, the availability of SWP supplies to CLWA are estimated by multiplying CLWA's Table A Amount with the Project, or 95,200 AF, by the Table A delivery percentages from the CALSIM II study. For the three hydrologic conditions evaluated, the delivery percentages used here are based on the average over the model's entire hydrologic period for the average year, 1977 for the single dry year, and the 1988 to 1991 average for the multiple dry year. The specific delivery percentages multiplied by CLWA's Table A Amount for each of these three hydrologic conditions were 71.7 percent, 19.5 percent, and 36.0 percent, respectively.

Semitropic Storage - In 2002, CLWA stored some of its allocated SWP Table A supply through a groundwater banking agreement with the Semitropic Water Storage District in Kern County. Under this agreement, CLWA stored 24,000 AF of its excess SWP supply and, after consideration for losses within the groundwater basin, may withdraw up to 21,600 AF when needed over the next ten years. In addition to this short-term storage for CLWA, Semitropic has a long-term groundwater banking program with several other partners, including SWP Contractors. The facilities that Semitropic may use in the return of CLWA's banked water supply are the same facilities that Semitropic may use to return banked water to its long-term banking program partners. As a result, there may be competition for use of those facilities in a particularly dry year, which could limit CLWA's ability to access that water in that year.

It is assumed that this supply would only be used in dry years. For the single dry-year condition, it is assumed that competition among Semitropic's banking partners for use of return facilities would limit CLWA's supply to one third of the storage available, or 7,200 AF. For the multiple dry-year condition, it is assumed that the entire amount would be accessible and used sometime during the four-year period, so the average annual supply during that period would be one fourth of the total available, or 5,400 AF.

It should be noted that in February 2004, CLWA was again able to store up to 35,000 AF of its allocated 2003 SWP Table A supply on a short-term basis (10 years or less) pursuant to a groundwater banking agreement with the Semitropic Water Storage District. CLWA may withdraw up to 31,500 AF within 10 years. This recently stored water is not included in the existing water supplies (for this analysis, those available in 2002) shown below.

6.2 BASELINE SUPPLIES

6.2.1 1998 Environmental Baseline

Table 6-1 summarizes waters supplies available to meet demands in the CLWA service area in 1998, prior to the Project. The table displays water supplies available under various hydrologic conditions.

Table 6-1. 1998 Water Supplies for the CLWA Service Area
(all values in AF)

Hydrologic Condition[1]	*SWP Supplies*		*Existing Local Supplies*		*Total*
	Table A[2]	*SWP Flexible Storage*[3]	*Alluvial Aquifer*	*Saugus Formation*	
Average Year	46,500	0	35,000	11,000	**92,500**
Single Dry Year	12,100	4,680	32,500	15,000	**64,280**
Multiple Dry Year Period	24,000	1,170	32,500	15,000	**72,670**

1. As defined in section 3.1.1.2, the average year supply is the average amount of water available, based on DWRSIM model results over its entire period of hydrologic record. The single dry year supply is the supply available in the single year with the lowest total SWP deliveries, based on DWRSIM model results (1977). Multiple dry year period supply is the average amount of water available over the four consecutive drought years of 1988 through 1991, based on DWRSIM model results.
2. Values based on CLWA's Table A Amount in 1998 (prior to the Project) of 54,200 AF, and percentages for Table A deliveries based on DWR's DWRSIM SWP operations model (discussed in section 3.1).
3. CLWA may withdraw up to about 4,680 AF of water from Castaic Lake as "flexible storage". It is assumed that CLWA would use this supply only in drier years, with the entire amount used in the one single dry year. For the multiple dry year, it is assumed that the entire amount would be used during the four-year period, or an annual average of 1,170 AF.

6.2.2 Current Environmental Setting

Table 6-2 summarizes existing (2002) water supplies available to meet demands in the CLWA service area, and includes the Project. The table displays water supplies available under various hydrologic conditions.

Table 6-2. Existing Water Supplies for the CLWA Service Area
(all values in AF)

Hydrologic Condition[1]	*SWP Supplies*			*Existing Local Supplies*		*Total*
	Table A[2]	*SWP Flexible Storage*[3]	*Semitropic Storage*[4]	*Alluvial Aquifer*	*Saugus Formation*	
Average Year	68,300	0	0	35,000	11,000	**114,300**
Single Dry Year	18,600	4,680	7,200	32,500	15,000	**77,980**
Multiple Dry Year Period	34,300	1,170	5,400	32,500	15,000	**88,370**

1. As defined in section 3.1.1.2, the average year supply is the average amount of water available, based on DWRSIM model results over its entire period of hydrologic record. The single dry year supply is the supply available in the single year with the lowest total SWP deliveries, based on DWRSIM model results (1977). Multiple dry year supply is the average amount of water available over the four consecutive drought years of 1988 through 1991, based on DWRSIM model results.
2. Values based on current Table A Amount of 95,200 AF (which includes the Project), and percentages for Table A deliveries from DWR's SWP Delivery Reliability Report (DWR 2003b).
3. CLWA may withdraw up to about 4,680 AF of water from Castaic Lake as "flexible storage". It is assumed that CLWA would use this supply only in drier years, with the entire amount used in the one single dry year. For the multiple dry year, it is assumed that the entire amount would be used during the four-year period, or an annual average of 1,170 AF.
4. In 2002, CLWA was able to store some if its allocated SWP Table A supply on a short-term basis (10 years or less) under a groundwater banking agreement with the Semitropic Water Storage District. Under this agreement, CLWA stored 24,000 AF of SWP water, and after consideration for losses, may withdraw up to 21,600 AF within 10 years. It is assumed that CLWA could expect to withdraw up to 1/3 of this amount in the single dry year, and the entire amount would be used during the four-year dry period. It is assumed that CLWA would only use this supply in drier years.

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8.0 ACRONYMS

AF	acre-feet
AFRP	Anadromous Fish Restoration Plan
cfs	cubic feet per second
CLWA	Castaic Lake Water Agency
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CVWD	Coachella Valley Water District
Delta	Sacramento-San Joaquin River Delta
DWA	Desert Water Agency
DWR	California Department of Water Resources
EIR	Environmental Impact Report
KCWA	Kern County Water Agency
M&I	municipal and industrial
MWD	Metropolitan Water District of Southern California
NOP	Notice of Preparation
PCL	Planning and Conservation League
SBCFC & WCD	Santa Barbara County Flood Control and Water Conservation District
SWRCB	California State Water Resources Control Board
USBR	U.S. Bureau of Reclamation
UWMP	Urban Water Management Plan
VCFCD	Ventura County Flood Control District
WRMWSD	Wheeler Ridge-Maricopa Water Storage District

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CLWA RETURN TO WRIT

EXHIBIT NO. 4

LETTER 4

LETTER 4

FINAL
Environmental Impact Report
California State Clearinghouse No. 1998041127

Castaic Lake Water Agency

Supplemental Water Project Transfer of
41,000 Acre-Feet of State Water Project
Table A Amount

Volume II

CASTAIC LAKE WATER AGENCY

Volume I is the Draft Environmental Impact Report

December 2004

LETTER 4

LETTER 4

FINAL

Environmental Impact Report

California State Clearinghouse No. 1998041127

Castaic Lake Water Agency

Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount

Volume II

CASTAIC LAKE WATER AGENCY

Prepared for:
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, California 91350

Prepared by:
Science Applications International Corporation
An Employee-Owned Company
525 Anacapa Street, Santa Barbara, California 93101

December 2004

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Section 1 – Introduction

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1.0 INTRODUCTION

The Environmental Impact Report (EIR) for the Castaic Lake Water Agency Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount contains two volumes. The first volume of the EIR, incorporated herein by reference, comprises the Draft EIR (DEIR), published in June 2004. The second volume of the EIR (this volume) contains public comments received on the DEIR, responses to the public comments and changes to the text of the DEIR.

BOTH VOLUMES OF THE EIR MUST BE READ TOGETHER. THE SECOND VOLUME DOES NOT REPEAT THE INFORMATION INCLUDED IN THE FIRST VOLUME.

A 60-day public review period (June 17 to August 16, 2004) was held to receive comments on the DEIR. A public hearing was held at CLWA on July 28, 2004 to receive comments on the DEIR.

A second public hearing was noticed prior to consideration of the adoption of the EIR to consider the comments to the DEIR and the responses to those comments. The purpose of this additional public hearing is to provide the CLWA Board the opportunity to consider the public comments and responses thereto as part of its decisional process concerning the proposed project (Project). This additional hearing neither re-opens nor extends the public review period, which closed on August 16, 2004. While the public is invited to attend the hearing, the EIR is now in final form for Board review and possible certification.

This second volume contains the following information:

Section 1—Introduction

Section 2—Public Comments contains the list of agencies, organizations, and individuals that submitted comment letters on the DEIR, copies of those letters, and the transcript of the July 28, 2004 public hearing. Each substantive comment is numbered.

Section 3—Responses to Comments contains a matrix including each of the public comments received and individual responses to those comments. The comments in the matrix were excerpted directly from the comment letters or public hearing transcript. This section also includes a Master Response that addresses similar issues raised in a number of comments regarding the appropriate lead agency for the EIR and the relationship of the Project to the Monterey Amendment EIR.

Section 4—Changes to the Text of the EIR presents text changes since publication of the DEIR.

Copies of the second volume of the EIR and a notice of availability identifying the date of the public hearing at which the CLWA Board of Directors is scheduled to consider certification of the EIR were mailed to those who provided comments on the DEIR.

Copies of both volumes of the FEIR are available for review at CLWA or can be purchased by contacting Mary Lou Cotton, CLWA Water Resources Manager, 27234 Bouquet Canyon Road,

Santa Clarita, California 93150-2173 or by calling (661) 297-1600. Both volumes of the FEIR also are available for public review at the following local public libraries:

Los Angeles County Public Library, Newhall
22704 W. 9th Street
Newhall, CA 91321

Los Angeles County Public Library, Canyon Country Jo Anne Darcy Library
18601 Soledad Canyon Road
Canyon Country, CA 91351

Los Angeles County Public Library, Valencia
23743 West Valencia Boulevard
Valencia, CA 91355

OTHER CEQA ACTIONS RELATED TO THIS EIR

A public hearing will be scheduled by the CLWA Board of Directors to consider certification of the EIR and approval of the Project. The public hearing date and time will be set forth in a separate notice provided to the public, public agencies, and other interested parties. As required by Public Resources Code (PRC), Division 13, section 21092.5, CLWA will provide a proposed written response to public agencies that commented on the DEIR at least 10 days prior to certifying the EIR. Those proposed responses are contained in Section 3 of this second volume of the EIR.

If the CLWA Board of Directors acts to certify the EIR and approves the Project, a Notice of Determination will be filed with Los Angeles County, Ventura County, and the State Clearinghouse.

Section 2 – Public Comments

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2.0 PUBLIC COMMENTS

LIST OF COMMENTING AGENCIES, ORGANIZATIONS, AND INDIVIDUALS, AND COMMENT LETTERS

The following agencies, organizations, and individuals submitted comment letters on the DEIR during the 60-day review period. Verbal comments also were provided during the public hearing held on July 28, 2004. The comment letters are contained on the following pages, along with the transcript of the public hearing.

State Agencies

State of California, Department of Transportation (Caltrans)
Letter dated August 4, 2004 from Cheryl Powell, IGR/CEQA Branch Chief

California Department of Water Resources (DWR)
Letter dated July 30, 2004 from Barbara McDonnell, Chief

Department of California Highway Patrol (CHP)
Letter dated July 6, 2004 from E. Conley, Captain

State Water Contractors (SWC)
Letter dated August 16, 2004 from Terry L. Erlewine, General Manager

Local or Regional Agencies

United Water Conservation District (UWCD)
Letter dated July 26, 2004 from Dana L. Wisehart, General Manager

City of Santa Clarita (City SC)
Letter dated July 20, 2004 from Vincent Bertoni, Interim Director of Planning and Building Services

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Planning and Conservation League (PCL) and Citizens Planning Association (CPA)
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SCOPE
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Sierra Club, Angeles Chapter
Letter dated August 10, 2004 from Johanna Zetterberg

TriCounty Watchdogs (TCW)
Letter dated August 13, 2004 from Jan de Leeuw

Individuals

Arve R. Sjovold
Letter dated August 15, 2004

Mr. and Mrs. Arnold D. Swan, et al.
Letter dated August 13, 2004

Jim Churchill
Letter dated August 14, 2004

Law Offices of Stephan C. Volker
Letter dated August 16, 2004 from Stephan C. Volker, Attorney

Letters from the following were received after the close of the public comment period, but these comments were considered, and responses have been provided in the FEIR.

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1 Endangered Habitats League (EHL)
2 Letter dated August 19, 2004 from Dan Silver, Executive Director

3 County of Los Angeles, Public Library
4 Letter dated August 23, 2004 from Malou Rubio, Head, Staff Services

5 The Southern California Association of Governments (SCAG)
6 Letter dated September 3, 2004 from Jeffrey M. Smith, Senior Regional Planner,
7 Intergovernmental Review

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LETTER 4

STATE OF CALIFORNIA—BUSINESS, TRANSPORTATION AND HOUSING AGENCY ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF TRANSPORTATION
DISTRICT 7, REGIONAL PLANNING
IGR/CEQA BRANCH
120 SO. SPRING ST.
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PHONE: (213) 897-3747
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Flex your power!
Be energy efficient!

IGR/CEQA No. 040627AL, EIR
Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount
Vic. LA-5 / Various Locations
SCH # 1998041127

August 4, 2004

Ms. Mary Lou Cotton
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350-2173

Dear Ms. Cotton:

Thank you for including the California Department of Transportation (Caltrans) in the environmental review process for the above referenced project.

The Project would not involve construction or operational changes that could generate traffic or otherwise affect traffic conditions. Based on the information received, we have no comments at this time. Thank you for the opportunity to have reviewed this project. 1

Any transportation of water which requires the use of oversized-transport vehicles on State highways will require a Caltrans transportation permit. We recommend that large size truck trips be limited to off-peak commute periods. Thank you for the opportunity to have reviewed this project.

If you have any questions, please feel free to contact me at (213) 897-3747 or Alan Lin the project coordinator at (213) 897-8391 and refer to IGR/CEQA No. 040627AL.

Sincerely,

Cheryl Powell

CHERYL POWELL
IGR/CEQA Branch Chief

cc: Scott Morgan, State Clearinghouse

LETTER 4

STATE OF CALIFORNIA -- THE RESOURCES AGENCY
ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

July 30, 2004

Post-it® Fax Note 7671	Date 7/30/04	# of pages ▶ 2
To CLWA - Mary Lou Cot	From H. Walter	
Co./Dept.	Co.	
Phone # 916 227-1311	Phone #	
Fax #	Fax #	

Ms. Mary Lou Cotton
Water Resources Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, California 91350

Dear Ms. Cotton:

The Department of Water Resources' (DWR) staff have reviewed the Draft Environmental Impact Report (DEIR) for the *Castaic Lake Water Agency Supplemental Water Project Transfer of 41,000 Acre-Feet of Table A Amount* (SCH No. 1998041127), and found that the document adequately and thoroughly discusses the proposed project and its impacts. The DEIR discusses the effects of the project on the environment and State Water Project (SWP) and uses baseline conditions consistent with those being considered for inclusion in the DEIR. DWR is currently preparing for the *Monterey Amendment to the State Water Project Contracts (including Kern Water Bank Transfer and Other Contract Amendments and Associated Actions as Part of a Proposed Settlement Agreement in Planning and Conservation League v. Department of Water Resources* (SCH No. 2003011118), referred to hereafter as "Monterey Plus." 2

The DEIR provides a good discussion of the relationship between the 41,000 acre-feet Table A transfer and the current Monterey Plus process. DWR will analyze the effects of all Table A transfers that were part of the Monterey Amendment to the SWP contracts in the Monterey Plus EIR. The proposed CLWA 41,000 acre-feet Table A transfer will be included in this analysis. 3

One of the tools being used by DWR to assess potential impacts associated with these Table A transfers is the CALSIM II model. DWR acknowledges that CLWA used an earlier model, DWRSIM, to analyze the effect of the 41,000 acre-feet transfer; however, DWR will use the next generation model, CALSIM II, to assess potential impacts associated with all Table A transfers in its DEIR for Monterey Plus. The use of CALSIM II may cause slight changes in results, which may lead DWR to different conclusions than the conclusions made by Castaic Lake Water Agency in the current DEIR. 4

As final comments, DWR notes that this DEIR adequately discusses the reliability of the SWP, pre- and post-Monterey Amendment conditions, future conditions, and SWP operations. 5

LETTER 4

Coordination between DWR and CLWA is essential to produce accurate environmental documentation that leads to informed decision-making and full public disclosure as the California Environmental Quality Act mandates. DWR appreciates inclusion and consultation in the early stages of preparation of this DEIR. Please ensure that DWR's Division of Environmental Services and SWP Analysis Office receive copies of the Final EIR. 6

Sincerely,

Barbara McDonnell

Barbara McDonnell, Chief
Division of Environmental Services

LETTER 4

State of California—Business, Transportation and Housing Agency ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF CALIFORNIA HIGHWAY PATROL
28648 The Old Road
Valencia, CA 91355
(661)294-5540
(800) 735-2929 (TT/TDD)
(800) 735-2922 (Voice)

SCH#1998041127

July 6, 2004

File No.: 540.10868.9367

State Clearinghouse
1400 Tenth Street
Sacramento, CA 95812-3044

This is in response to the Notice of Preparation of a Draft Environmental Impact Report, dated June 18, 2004 regarding the Castaic Lake Water District Supplemental Water Project Transfer.

The proposed project will be located in the unincorporated area of Los Angeles County and within the jurisdiction of the California Highway Patrol. Therefore, traffic enforcement and accident investigation will be the responsibility of our agency.

In reviewing this project, our concern was what effect these projects will have on traffic. It is our opinion there should not have a significant impact. 7

Sergeant B. A. Dibene will be our Department's contact person for the project. If you have any questions or concerns, he may be reached at the above address or telephone number.

Thank you for allowing us the opportunity to comment on this project.

Sincerely,

For E. CONLEY, Captain
Commander
Newhall Area

RECEIVED
JUL 23 2004
STATE CLEARING HOUSE

Clear 8-16-04 e

11

LETTER 4

State Water Contractors

455 Capitol Mall, Suite 220 • Sacramento, CA 95814-4409
Terry L. Erlewine - General Manager (916) 447-7357 • FAX 447-2734

Directors

Russell E. Fuller, President
Antelope Valley-East Kern Water Agency
Vince Wong, Vice President
Alameda County FC&WCD, Zone 7
Roy A. Stokes, Secretary-Treasurer
Central Coast Water Authority
Stephen N. Arakawa
Metropolitan Water District of Southern California
Thomas N. Clark
Kern County Water Agency
Thomas R. Hurlbut
Tulare Lake Basin Water Storage District
Thomas E. Levy
Coachella Valley Water District
Dan Masnada
Castaic Lake Water Agency
David B. Okita
Solano County Water Agency

August 16, 2004

Mary Lou Cotton
Water Resources Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

Dear Ms. Cotton:

This letter provides comments on the Draft EIR entitled "Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount," on behalf of the State Water Contractors ("SWC"). As you know, the SWC represents nearly all contractors that receive water from the State Water Project ("SWP"). Thus, the SWC is vitally interested in the proper application of CEQA to water transfers under Articles 41 and 53 of the SWP water service contracts and, in general, with respect to operations of the SWP. 8

The SWC commends Castaic Lake Water Agency ("Castaic") for going far beyond what is required by CEQA and the appellate court decision that invalidated Castaic's earlier EIR for the 41,000 acre foot water transfer. Both the trial court and the appellate court found that all of the environmental analyses contained in that first EIR complied with CEQA, except for reliance (through "tiering") on the original Monterey Amendment EIR which had later been found inadequate by the Third District Court of Appeal. Nevertheless, Castaic has taken a comprehensive, fresh look at the transfer's potential impacts in a single document, when arguably a short supplement eliminating the references to the Monterey Amendment would have sufficed. By so doing, you have provided decision makers with a complete picture of the transfer and its impacts so they can make new informed decisions related to the project.

During scoping, several parties made suggestions that this Supplemental EIR should not move forward until the new EIR for the Monterey Amendment had been completed. The SWC suggests that Castaic should respond more directly to these contentions. Those contentions overlook or intentionally mischaracterize a central element of the Monterey EIR litigation Settlement Agreement. The Settlement Agreement explicitly states that the SWP will operate under the Monterey Amendment while the new EIR is prepared. This includes operation 9

under Article 53, pursuant to which the Kern County Water Agency consented to up to 130,000 acre feet of agriculture to urban transfers. Suggestions that consideration of such transfers must await completion of the new Monterey Plus EIR would render this element of the Settlement Agreement a nullity, contrary to the clear understanding of the signatories to that document. 9

Further, nothing in the Settlement Agreement affects the rights of contractors and DWR to agree to and proceed with implementing long-term transfers of Table A Amounts. In this respect, the draft Supplemental EIR contains a confusing statement to the effect that certain terms in the Settlement Agreement constitute a "specific exclusion" of the 41,000 acre foot transfer from "any prohibitions against transfers of Table A amounts by the Settlement Agreement." The Settlement Agreement does not contain any such prohibitory language. Thus, specific exclusions are not necessary. The final Supplemental EIR for the 41,000 acre foot transfer should point out that several other Table A transfers have been consummated since the Settlement Agreement was executed and that the Settlement Agreement contains no language that could be interpreted as prohibiting such transactions or the 41,000 acre foot transfer. 10

The SWC suggests that the final Supplemental EIR reference the July 14, 2004, trial court opinion in *California Water Network v. Castaic Lake Water Agency*, which discusses the proper lead agency for projects similar to the 41,000 acre foot transfer. In that case, the Court held that Castaic was the proper lead agency for a water banking project, stating "Castaic is the agency most deeply involved in the planning, and execution of this project." The trial court rejected the argument that DWR was the only proper lead agency when actions concerning the SWP are involved. As in the *California Network Case*, Castaic is the agency promoting, planning, and primarily carrying out the 41,000 acre foot transfer. It is also the agency with the greatest knowledge about growth inducement and similar local issues. State government, including DWR, has no role in local land use planning and the local water supply issues that arise from planning decisions. The plenary role of local agencies in the land use arena should be pointed out in the final Supplemental EIR. 11

The SWC has reviewed the water supply analysis set forth in the draft Supplemental EIR and believes it will provide valuable information for decision makers in determining how the 41,000 acre foot transfer will affect Castaic's ability to meet the future water needs engendered by Los Angeles County's and local cities' land use decisions. The SWC suggests that the final Supplemental EIR reemphasize that urban water suppliers do not make the land use and growth decisions; but, instead, try to provide needed water supplies in the most economical and environmentally sound manner. From this standpoint, the draft Supplemental EIR provides the best information reasonably available from recognized scientific sources. More than that can not be asked of lead agencies dealing with highly complex natural and man made water systems. 12

Thank you for the opportunity to comment on the draft Supplemental EIR. If you have any questions, please contact me at (916) 447-7357.

Sincerely,

Terry L. Erlewine
General Manager

cc: Mr. Lester A. Snow, DWR
SWC Members

LETTER 4

City of
Santa Clarita

23920 Valencia Blvd.
Suite 300
Santa Clarita
California 91355-2196
Website: www.santa-clarita.com

Phone
(661) 259-2489
Fax
(661) 259-8125

July 20, 2004

Ms. Mary Lou Cotton
Water Resources Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

Subject: Draft Environmental Impact Report for the Transfer of Supplemental Water

Dear Ms. Cotton:

Thank you for allowing the City of Santa Clarita to comment on the Draft Environmental Impact Report for the Supplemental Water Project Transfer. At this time, the City of Santa Clarita has no comments on the draft document regarding this project. 13

Thank you again for this opportunity to comment on the project. Please contact Fred Follstad, AICP, Senior Planner or myself at (661) 255-4330 if you have any questions.

Sincerely,

Vincent P. Bertoni, AICP
Interim Director of Planning and Building Services

VPB:FLF:lep
pbs\current\agency monitoring\CLWA EIR Comments 0704

cc: Mayor Kellar and Members of the City Council
Chair Trautman and Members of the Planning Commission
Chair Hauser and Members of the Parks, Recreation and Community Services Commission
Kenneth R. Pulskamp, City Manager
Michael Murphy, Intergovernmental Relations Officer
Fred Follstad, AICP, Senior Planner

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LETTER 4

COUNTY OF LOS ANGELES
DEPARTMENT OF PARKS AND RECREATION
"Creating Community Through People, Parks and Programs"
Tim Gallagher, Director

August 16, 2004

Ms. Mary Lou Cotton
Water Resources Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

Dear Ms. Cotton:

ENVIRONMENTAL IMPACT REPORT FOR THE
CASTAIC LAKE WATER AGENCY SUPPLEMENTAL WATER PROJECT
TRANSFER OF 41,000 ACRE-FEET OF TABLE A AMOUNT PROJECT

The Environmental Impact Report (EIR) for the Castaic Lake Water Agency Supplemental Water Project Transfer of 41,000 Acre-Feet of Table A Amount has been reviewed for potential impacts on the facilities of this Department. The Castaic Lake Recreation Area, a recreational lake that is managed and operated by the Department, would be directly affected by the project. Common activities at the lake include sailing, power boating, water and jet skiing, fishing, non-power boating, and canoeing. That Department offers the following comments regarding the EIR:

- Page 3.0-10 of the Draft EIR states that the "DWR's operation of these lakes (Quail, Pyramid, and Castaic) generally would not change with the Project, although the project would result in additional water transported through these lakes in about the same months the water is delivered to CLWA." Page 3.15-41 also confirms that "the amount of water stored at Castaic Lake would not be expected to change as a result of the Project." The optimum operating level of Castaic Lake is 1515 above sea level. Scheduling of the release of the SWP water should be done so to maintain this level. Assuming that this operating criterion and the physical conditions of the lake do not change as a result of the project, adverse impacts to Department facilities are not anticipated. The Department requests that any future changes in the operating criteria of the lake be coordinated directly with Mr. Dana Robertson, Parks Superintendent. Contact information is provided below: 14

  Mr. Dana Robertson, Parks Superintendent
  Castaic Lake Recreation Area
  32132 Castaic lake Drive
  Castaic, CA 91384
  Phone (661) 257-4050 / Fax (661) 257-3759

- Section 3.12.3 of the Draft EIR states that the implementation of the project will have no direct or indirect impacts to recreation within the CLWA. However, the potential development (Page 4-2) for 106, 700 new residents and 35,600 new units to house them may impact future recreation opportunities for those within the CLWA, and in turn, to future Castaic Lake operations. 15

Thank you for including this department in the review of this notice. If we may be of further assistance, please me at (213) 351-5133.

Sincerely,

Bryan Moscardini, Park Project Coordinator

cc: Kathleen Ritner, DPR
Dana Robertson, DPR
Boyd Horan, DPR

LETTER 4

COUNTY OF LOS ANGELES

FIRE DEPARTMENT

1320 NORTH EASTERN AVENUE
LOS ANGELES, CALIFORNIA 90063-3294
(323) 890-4330

P. MICHAEL FREEMAN
FIRE CHIEF
FORESTER & FIRE WARDEN

August 9, 2004

Ms. Mary Lou Cotton
Water Resource Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

Dear Ms. Cotton:

DRAFT ENVIRONMENTAL IMPACT REPORT FOR THE CASTAIC LAKE WATER AGENCY SUPPLEMENTAL WATER PROJECT TRANSFER OF 41,000 ACRE-FEET OF STATE WATER PROJECT TABLE A AMOUNT FROM KERN COUNTY WATER AGENCY – "CASTAIC" (EIR #2028/2004)

The Draft Environmental Impact Report for the above project has been reviewed by the Planning Division, Land Development Unit, and Forestry Division of the County of Los Angeles Fire Department. The following are their comments: The project site that is reflective of our statutory responsibilities encompasses approximately 180 square miles of land in northwestern Los Angeles County in unincorporated Castaic.

LAND DEVELOPMENT UNIT: 16
The County of Los Angeles Fire Department, Land Development Unit appreciates the opportunity to comment on this project. However, this project does not propose structures or any other improvements that appear to have a significant impact that requires a comment from the Land Development Unit.

Specific fire and life safety requirements for the construction phase will be addressed at the Building and Fire Safety plan check. There may be additional fire and life safety requirements during this time. Should any questions arise regarding subdivision, water systems or access, please contact Inspector Marvin Dorsey at (323) 890-4243.

FORESTRY DIVISION: 17
The statutory responsibilities of the County of Los Angeles Fire Department, Forestry Division include erosion control, watershed management, rare and endangered species, vegetation, fuel modification for Very High Fire Hazard Severity Zones or Fire Zone 4, archeological and cultural resources, and the County Oak Tree Ordinance. The areas germane to the statutory responsibilities of the Los Angeles County Fire Department, Forestry Division have been addressed.

If you have any additional questions, please contact this office at (323) 890-4330.

Very truly yours,

DAVID R. LEININGER, CHIEF, FORESTRY DIVISION
PREVENTION BUREAU

DRL:sc

SERVING THE UNINCORPORATED AREAS OF LOS ANGELES COUNTY AND THE CITIES OF:

AGOURA HILLS	BRADBURY	CUDAHY	HAWTHORNE	LA MIRADA	MALIBU	POMONA	SIGNAL HILL
ARTESIA	CALABASAS	DIAMOND BAR	HIDDEN HILLS	LA PUENTE	MAYWOOD	RANCHO PALOS VERDES	SOUTH EL MONTE
AZUSA	CARSON	DUARTE	HUNTINGTON PARK	LAKEWOOD	NORWALK	ROLLING HILLS	SOUTH GATE
BALDWIN PARK	CERRITOS	EL MONTE	INDUSTRY	LANCASTER	PALMDALE	ROLLING HILLS ESTATES	TEMPLE CITY
BELL	CLAREMONT	GARDENA	INGLEWOOD	LAWNDALE	PALOS VERDES ESTATES	ROSEMEAD	WALNUT
BELL GARDENS	COMMERCE	GLENDORA	IRWINDALE	LOMITA	PARAMOUNT	SAN DIMAS	WEST HOLLYWOOD
BELLFLOWER	COVINA	HAWAIIAN GARDENS	LA CANADA FLINTRIDGE	LYNWOOD	PICO RIVERA	SANTA CLARITA	WESTLAKE VILLAGE
							WHITTIER

LETTER 4

RESOURCE MANAGEMENT AGENCY

County of Ventura

Planning Division
Christopher Stephens
Director

August 16, 2004

Post-it® Fax Note 7671	Date 8/16/04	# of pages ▶ 2
To M.L. Cotton	From C. Morehouse	
Co./Dept.	Co.	
Phone #	Phone #	
Fax #	Fax #	

Mary Lou Cotton
Water Resources Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

FAX #: (661) 297-1610

Subject: Castaic Lake Water Agency Supplemental Water Project Transfer of 41,000 acre-feet of Table A Amount; Draft EIR

Thank you for the opportunity to review and comment on the subject document. Attached are the comments that we have received resulting from intra-county review of the subject document. 18a

Your proposed responses to these comments should be sent directly to the commentator, with a copy to Carl Morehouse, Ventura County Planning Division, L#1740, 800 S. Victoria Avenue, Ventura, CA 93009.

If you have any questions regarding any of the comments, please contact the appropriate respondent. Overall questions may be directed to Carl Morehouse at (805) 654-2476.

Sincerely,

B Smith, FOR

Christopher Stephens
County Planning Director

G:\WPC\WINWORD\1H4-7.04.doc

Attachment

County RMA Reference Number 04-053

COUNTY OF VENTURA
PUBLIC WORKS AGENCY
Watershed Protection District
Water Resources Division

MEMORANDUM

July 21, 2004

To: Carl Morehouse
RMA Planning Division

From: Lowell Preston
Water Resources Division

Subject: **RMA 04-0053, Draft EIR - Supplemental Water Project Transfer of 41,000 acre-ft of Table A**

Project Description

The project authorizes the Castaic Lake Water Agency (CLWA) to use 41,000 af of water from the State Water Plan (SWP) Table A amount for water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area. Water will be transferred from the Kern County Water Agency. The project does not include the construction of any additional SWP facilities or new facilities in the CLWA. CLWA is the lead agency and has for the most part determined to have less than significant impacts.

Comment

None.

18b

LETTER 4

Stanislaus County
Striving to be the Best

CHIEF EXECUTIVE OFFICE
1010 10th Street, Suite 6800, Modesto, CA 95354
P.O. Box 3404, Modesto, CA 95353-3404
Patricia Hill Thomas
Interim Chief Executive Officer
Phone: 209.525.6333 Fax 209.544.6886

STANISLAUS COUNTY ENVIRONMENTAL REVIEW COMMITTEE

August 9, 2004

Mary Lou Cotton
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 93150

SUBJECT: **ENVIRONMENTAL REFERRALS-AMENDED NOTICE OF COMPLETION-CASTAIC LAKE WATER AGENCY-SUPPLEMENTAL WATER PROJECT TRANSFER OF 41,000 ACRE-FEET OF TABLE A AMOUNT, STATE CLEARINGHOUSE #1998041127**

Ms. Cotton:

The Stanislaus County Environmental Review Committee (ERC) has reviewed the subject project and has no comments at this time. 19

The ERC appreciates the opportunity to comment on this project.

Sincerely,

W. Richard Jantz, Deputy Executive Officer
Raul Mendez, Senior Management Consultant
Environmental Review Committee

cc: ERC Members

LETTER 4

BIA
Greater L.A. / Ventura Chapter

Building Industry Association of Southern California
24005 Ventura Boulevard
Calabasas, California 91302
818.591.2001
fax 818.591.0072
http://www.biasc.org

July 28, 2004

Mr. Dan Masnada. General Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

RE: Castaic Lake Water Agency Supplemental Water Project Transfer of 41,000 AF of Table A

Dear Mr. Masnada:

On behalf of the approximately 400 companies and their representative employees who make up the Greater LA/Ventura Chapter of the Building Industry Association of Southern California, thank you for the opportunity to comment on CLWA's Draft EIR on the Supplemental Water Project Transfer of 41,000 Acre-Feet of Table A.

CLWA's transfer of 41,000 acre-feet of water from Kern County in 1999 represented wise water planning for the Santa Clarita Valley. The BIA is pleased to see that the CLWA has produced this new EIR so that the litigation pending on the 1999 transaction can finally be resolved. 20

We are in the midst of a housing shortage in our State, especially in the Los Angeles and Ventura County regions. With housing supply in high demand it is critical for agencies such as CLWA to plan for future infrastructure needs. The continuance of such planning and water management programs is designed to enable the agency to meet its mission of providing water for anticipated growth in the Santa Clarita Valley. We support the Agency board and staff in continuing that mission.

CLWA has taken the proper steps to insure that its current users as well as future users will be assured safe and reliable water. The Building Industry Association would like to commend the CLWA for taking these preemptive actions.

Thank you once again for the opportunity to provide comments. Please feel free to contact us if you have any questions or comments.

Sincerely,

Ray Pearl
Executive Officer

Terra Donlon
Director of Government Affairs

27

LETTER 4

by fax
30 pgs

california water impact network

Caroline K. Kroger president
Dorothy Green secretary
Joan H. Wells treasurer
Melinda Cleveland director
Yvon Chouinard director
Hap Dunning director
Michael Jackson director
Huey Johnson director
Imaging Space director

August 11, 2004

Mary Lou Cotton, Water Resources Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

RE: Comments on Castaic Lake Water Agency Supplemental Water Project Environmental Impact Report on the Proposed Transfer of 41,000 Acre-Feet of Table A Amount, State Clearinghouse Number 1998041127

Dear Ms. Cotton;

The California Water Impact Network (C-WIN) would like to submit comments on the Castaic Lake Water Agency's EIR for the proposed permanent transfer of 41,000 Acre-feet of Table A allocation from the Kern County Water Agency to the Castaic Lake Water Agency. C-WIN is opposed to the proposed transfer on the following grounds:

1. **CLWA is the Wrong Lead Agency and Must Wait for DWR to Complete the new Monterey Plus EIR** 21

Under the principles articulated by the 3rd District Court of Appeal in the PCLvDWR case (#CO24576), CLWA is not the proper lead agency in this transaction which has tremendous statewide significance as it necessarily must address the Monterey Amendments. DWR is the only proper lead agency.

This transfer is not consistent with the PCLvDWR settlement, reached in May of 2003, under which DWR has already commenced its own statewide review of the Monterey Amendments. Until the new EIR, known as "Monterey Plus" is finalized and the project is approved, the only transfers recognized as final are those listed in attachment B of the settlement. This is not one of those transfers and therefore would be illegal until completion and certification of the new "Monterey Plus" EIR. The CLWA proposed EIR is potentially on a collision course with DWR's "Monterey Plus" EIR and could produce a result that is at odds with the court mandated EIR on the Monterey Amendments currently being produced by DWR. 22

C-WIN incorporates the January 10, 2002 letter from attorney Robert H. Clark to then General Manager of CLWA Robert C. Sagehorn where he points out this problem and warns,

> "Alternatively, CLWA may choose to create an EIR that does not rely in any way on Monterey Amendment provisions, and then complete the 41,000 AF water entitlement transfer outside of Monterey. There are adverse financial implications to this course of action, and any water transfer outside of Monterey—assuming it might be acceptable to Kern County Water Agency and Wheeler Ridge—*could be made subject to agricultural water deficiency provisions in the same manner that the Devil's Den water entitlement transfer was originally made subject to those agricultural water deficiency provisions." (emphasis added)* (See Attachment A.)

C-Win also incorporates a letter from attorney Alyse M. Lazar to DWR Director Lester Snow dated May 18, 2004 and the response from Mr. Snow's office dated June 17, 2004. In the response letter, Mr. Snow says,

> "DWR's treatment of the transfer of Table A amounts from Kern County Water Agency to Castaic

P.O. Box 5462, Santa Barbara, CA 93150, email: carolinekroger@cox.net, Phone: 805.969.0624, Fax 805.565.3194

Lake Water Agency will be governed by the Settlement Agreement. As provided in Paragraph III.C.4 of the Settlement Agreement, the EIR will include an "analysis of the potential environmental impacts relating to (a) the Attachment E transfers, and (b) the Kern-Castaic Transfer, in each case as actions that relate to the potential environmental impacts approving the Monterey Amendments." Section 1(0) of the Settlement Agreement defines the "Kern-Castaic Transfer" as "the transfer of 41,000 AF of water from Kern County Water Agency to the Castaic Lake Water Agency, approved by DWR on March 31, 1999." DWR has not completed any draft or final analysis regarding these transfers." (See Attachment B.) 22

2. **This Proposed Transfer is Currently the Subject of Litigation** 23
The CLWA EIR states that CLWA has 95,200 AF of Table A SWP water. This is not accurate as the 41,000 AF from the sale by KCWA to CLWA under the old Monterey Amendments is the subject of ongoing litigation. Allowing development of new homes based on this challenged and uncertain source of water is not prudent or reasonable.

C-WIN is currently a plaintiff in several cases against CLWA opposing proposed transfers that depend on the 41,000 AF transfer mentioned above. Any transfer that is dependent on a water source that is not free and clear is not reliable. C-WIN hereby incorporates our ongoing case against CLWA, the Department of Water Resources (DWR) and Semitropic Water Storage District, Civ No. 215327. Castaic is proposing to transfer 24,000 AF of its 2002 allocation of it's State Water Project (SWP) water, heavily relying on and siting the 41,000 AF transfer as complete to help justify the 24,000 AF transfer, and store it in the Semitropic Water Bank. This case is currently going to appeal.

As the EIR states, under current law, urban water suppliers must maintain updated water management plans (Urban Water Management Plan). CLWA's UWMP is currently being challenged in court for claiming to have more water than is actually available. Public comments submitted on the recently finalized DWR "SWP Delivery Reliability Report" underscore the continuing problem that contractor estimates of reliability have frequently promised more water than is actually obtainable for building purposes. This EIR is representative of the "paper water" critically described in the 3rd District Appeal Court decision mentioned above. 24 25

3. **Water Reliability as Stated in the Proposed EIR is Not Accurate**
This EIR, along with many other proposed developments in California, is dependent on the analysis by DWR and its State Water Project Delivery Reliability Report, Final 2002, to give planners and the public accurate information on SWP water reliability. These numbers are critical because planners and the public count on them when considering water availability to meet future demand. This Reliability Report has been seriously criticized for overstating actual available supply, questionable modeling and simulations, and lack of proper peer review. C-WIN hereby incorporates this Final Report, including all of the published comment letters in Appendix E. Please make a special note of those letters submitted by Senator Michael Machado, Robert Wilkinson, Arve Sjovold, Joan Wells, Dr. Peter Gleick and myself.

C-WIN also incorporates "A Strategic Review of CALSIM II and its Use for Water Planning, Management, and Operations in Central California" submitted by the California Bay Delta Authority Science Program Association of Bay Governments, December 4, 2003. This document raises significant questions about the accuracy of DWR's Delivery Reliability Report.

In addition, C-WIN incorporates two letters, the first from Systems Analyst Arve R. Sjovold dated November 11, 2003, titled, "Analysis of SWP Reliability of Delivery". (See Attachment C.) The second is from PCL President Sage Sweetwood dated February 2, 2004 to Delores Brown of DWR raising grave concerns about the validity of the DWR model known as CALSIM II. (See Attachment D.)

C-WIN incorporates a table prepared by DWR dated 9/16/02 titled "Historical versus Modeled Table A Deliveries and Demands." This is a draft document released by DWR. The modeled deliveries are significantly above the actual historical deliveries...graphically showing what the Third District Court of Appeal was referred to when they sited the "paper water" in the system. (See Attachment E.)

4. Significant Cumulative Impacts Not Recognized 26

CLWA is continuing to speculatively and irresponsibly approve proposed developments incrementally based on the hope that they will successfully acquire this 41,000 AF of SWP Table A allocation from the Kern County Water Agency. C-WIN hereby incorporates the following comment letters to show just how much is being proposed incrementally using this contended source as final. The cumulative impacts are not being considered. This is very significant when the true reliability numbers for the actual water supply are factored in as well.

- The C-WIN January 1, 2004 objection letter to the CLWA on the Negative Declaration for a proposed 35,000 AF transfer for a Groundwater Banking Project that depends on this same 41,000 AF transfer.
- The C-WIN February 3, 2004 objection letter to the LA County Regional Planning Department on the proposed West Creek Project #98-008 to build 2,545 residential units that depend on this same 41,000 AF transfer.
- The C-WIN February 26, 2004 objection letter to the County of Los Angeles Regional Planning Department regarding the proposed River Valley Project No.00-196 to build 1,444 residential units, 1.5 million square feet of non-residential mixed-use space, along with a 7 acre elementary school and public recreational facilities; this project also relies on this 41,000 acre foot transfer.
- The C-WIN May 4, 2004 letter to the Planning and building Services Department of the City of Santa Clarita regarding the proposed River Park Project No. 02-175 to build 1,183 residential units, heavily relying on this same 41,000 AF transfer.

This 41,000 AF water transfer should be rejected until the EIR for the new "Monterey Plus" has been finalized and adopted. When and if you do proceed, it is required that DWR be the lead agency. 27

CWN hereby incorporates all other comments by reference opposing this transfer submitted on this CLWA EIR proposing to permanently transfer 41,000 AF of Table A allocation from the Kern County Water Agency to the Castaic Lake Water Agency. 28

Sincerely,

Carolee Krieger

Carolee K. Krieger,
President

Attachments;

A. Letter from Robert H. Clark to CLWA Manager Robert C. Sagehorn, dated 1.10.02
B. Correspondence between Alyse Lazar (5.18.04) and DWR Director Lester Snow (6.17.04)
C. Analysis of SWP Reliability of Delivery by Arve Sjovold, 11.11.03
D. Letter from Sage Sweetwood to Delores Brown, 2.2.04
E. DWR Historical versus Modeled Table A Deliveries and Demands (Draft), 9.16.02

(A)

LAW OFFICES
ROBERT H. CLARK

[redacted]
SANTA CLARITA, CA [redacted]

TELEPHONE [redacted]
FACSIMILE [redacted]

January 10, 2002

To: Robert C. Sapshorn, General Manager
Castaic Lake Water Agency

From: Counsel

Subject: Today's Court of Appeal Decision in Friends of the Santa Clara River vs. Castaic Lake Water Agency

Further environmental work needs to be done to secure CLWA's March, 1999 acquisition of 41,000 acre feet of State Project water entitlement from Wheeler Ridge-Maricopa Water Storage District.

The Court of Appeal this afternoon found that all challenges to CLWA's environmental document on the above-specified water entitlement transfer were "without merit," except for the legal implications of the last year's PCL case wherein another Court of Appeal ordered decertification of the Monterey Amendment EIR. Specifically, the Court of Appeal in our current case wrote: "If the PCL/tiering problem had not arisen, we would have affirmed the [Superior Court] judgment in favor of CLWA)".

CLWA's 41,000 acre feet water entitlement transfer is now in the hands of the Los Angeles Superior Court, unless CLWA chooses to and receives California Supreme Court acceptance of an Agency appeal from the current Court of Appeal judgment.

It is in the Los Angeles Superior Court's discretion whether to enjoin, reverse, or condition all or portions of CLWA's 41,000 acre feet water entitlement acquisition pending completion of a new and adequate environmental document that does not tier on the Monterey Amendment EIR. In the opinion of the Court of Appeal, CLWA may be able to "cure the PCL problem by awaiting action by the State DWR complying with the PCL decision, then issuing a subsequent EIR, supplement to EIR, or addendum to EIR tiering upon a newly certified Monterey Amendment EIR." Of course, as we know, the course suggested in the preceding sentence may be impossible to complete for a period of years, due to the inherent delays involved with DWR's preparation of a new EIR on the Monterey Agreement.

Alternatively, CLWA may choose to create an EIR that does not rely in any way on Monterey Amendment provisions, and then complete the 41,000 acre feet water entitlement transfer outside of Monterey. There are adverse financial implications

to this course of action, and any water transfer outside of Monterey Accounting it might be acceptable to Kern County Water Agency and Wheeler Ridge could be made subject to agricultural water deficiency provisions in the same manner that the Devils Den's water entitlement transfer was originally made subject to these agricultural water deficiency provisions.

Bottom line, this decision is not a good development; however, it creates an opportunity to preserve the Wheeler Ridge water transfer pending completion of other environmental documents as described above, provided that the Los Angeles Superior Court determines that such a course of action is appropriate under CEQA.

The text of the decision was received at approximately 3 p.m. today, is some 20 pages in length, and will require further analysis. That said, CLWA has essentially been made a victim of the Monterey Amendment environmental deficiencies as first outlined in the year 2000 decision in the PCL case.

(B)

LAW OFFICE OF
ALYSE M. LAZAR
Attorney at law
3075 East Thousand Oaks Blvd., Suite 100
Westlake Village, California 91362

Admitted to practice:
STATE BAR OF CALIFORNIA
NEW YORK STATE BAR

Telephone: (805) 496-5390
Facsimile: (805) 496-7462

May 18, 2004

Lester Snow, Director
Department of Water Resources
Room 1115-1
P.O. Box 942836
Sacramento, California 94236

RE: New Monterey Agreement EIR

Dear Director Snow:

Pursuant to the Court decision in *Planning & Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892 (hereafter "*PCL*"), the Department of Water Resources is required to prepare a new Environmental Impact Report regarding all aspects of the Monterey Amendments. I understand that you will be overseeing this process.

The Settlement Agreement that was entered into between all of the parties to the *PCL* case on May 5, 2003 set forth various requirements for the EIR. According to Attachment E-1 of this Settlement Agreement, the parties specifically excluded the 41,000 afy entitlements purchased by Castaic Lake Water Agency ("CLWA") emanating from the Monterey Amendments from the list of final transfers. It is therefore my understanding that your office will be evaluating the environmental impacts of this 41,000 afy transfer as part of the Environmental Impact Report for your project (the Monterey Amendments Project.) In fact, page 11, paragraphs III C.4 of the Settlement Agreement mandates DWR to analyze the potential environmental effects relating to CLWA's project ("the Kern-Castaic Transfer").

As you may also be aware, the EIR prepared by CLWA for the 41,000 afy transfer was decertified by the Los Angeles Superior Court on November 1, 2002 in *Friends of the Santa Clara River v. Castaic Lake Water Agency*, Los Angeles County Superior Court Case No. BS 056954. In order for CLWA's new EIR to be legally sufficient and in conformance with the appellate court's decision, it must contain an analysis of the potential environmental effects of the Kern-Castaic Transfer on the entities that have and will continue to lose this 41,000 afy source of water due to the transfer as well as the impacts on the State Water Project ("SWP") system resulting from the movement of this water from its source in Kern County to Santa Clarita. Logically and in conformance with CEQA, both DWR's EIR and CLWA's EIR must contain an analysis of the impacts from this loss of water upon Kern County agricultural users as well as all others affected by the transfer.

I currently represent Friends of the Santa Clara River in the *Friends of the Santa Clara River v. Castaic Lake Water Agency*, litigation. In the Judgment Granting Peremptory Writ of Mandate in the Friends' case, the Court ordered that it " retains jurisdiction until respondent Castaic Lake Water Agency certifies an Environmental Impact Report that complies with the California Environmental

Quality Act and is consistent with the views expressed by the Court of Appeal Opinion filed January 10, 2002, Case No. B 145283."

For these reasons, I am requesting that you provide me with a copy of any analysis performed to date by DWR regarding the potential environmental impacts of the Kern-Castaic transfer, whether in draft or final form.

Additionally, please advise me of the procedural steps that DWR will take before making a determination whether or not to approve the Kern-Castaic transfer as a "final" transfer and the criteria that will be utilized for making this determination. If there is a proposed schedule for the completion of the Monterey Amendments EIR and/or for these procedural steps for determining whether or not to approve the Kern-Castaic transfer as a long-term transfer, please provide me with a copy of same.

I would appreciate receiving this information from you by May 28, 2004. If you have questions regarding the above or would like to discuss the matter, please call me at (805) 496-5390. Thank you for your anticipated assistance. I look forward to hearing from you.

Very truly yours,

Alyse M. Lazar

cc: Delores Brown

LETTER 4

FROM :

07/19/2004 08:54 8858888888

STATE OF CALIFORNIA – THE RESOURCES AGENCY

ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

JUN 17 2004

Alyse M. Lazar, Esq.
3075 East Thousand Oaks Boulevard, Suite 100
Westlake Village, California 91362

Dear Ms. Lazar:

In response to your letter of May 18, 2004, the Department of Water Resources (DWR) is preparing an Environmental Impact Report (EIR) on the Monterey Amendments and the Settlement Agreement resulting from the Court of Appeal decision in *Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892.

DWR's treatment of the transfer of Table A amounts from Kern County Water Agency to Castaic Lake Water Agency will be governed by the Settlement Agreement. As provided in Paragraph III.C.4 of the Settlement Agreement, the EIR will include an "analysis of the potential environmental impacts relating to (a) the Attachment E transfers, and (b) the Kern-Castaic Transfer, in each case as actions that relate to the potential environmental impacts of approving the Monterey Amendments." Section 1(O) of the Settlement Agreement defines the "Kern-Castaic Transfer" as "the transfer of 41,000 acre feet of water from Kern County Water Agency to the Castaic Lake Water Agency, approved by DWR on March 31, 1999." DWR has not completed any draft or final analysis regarding these transfers. Attached is an estimated schedule for completion of the EIR.

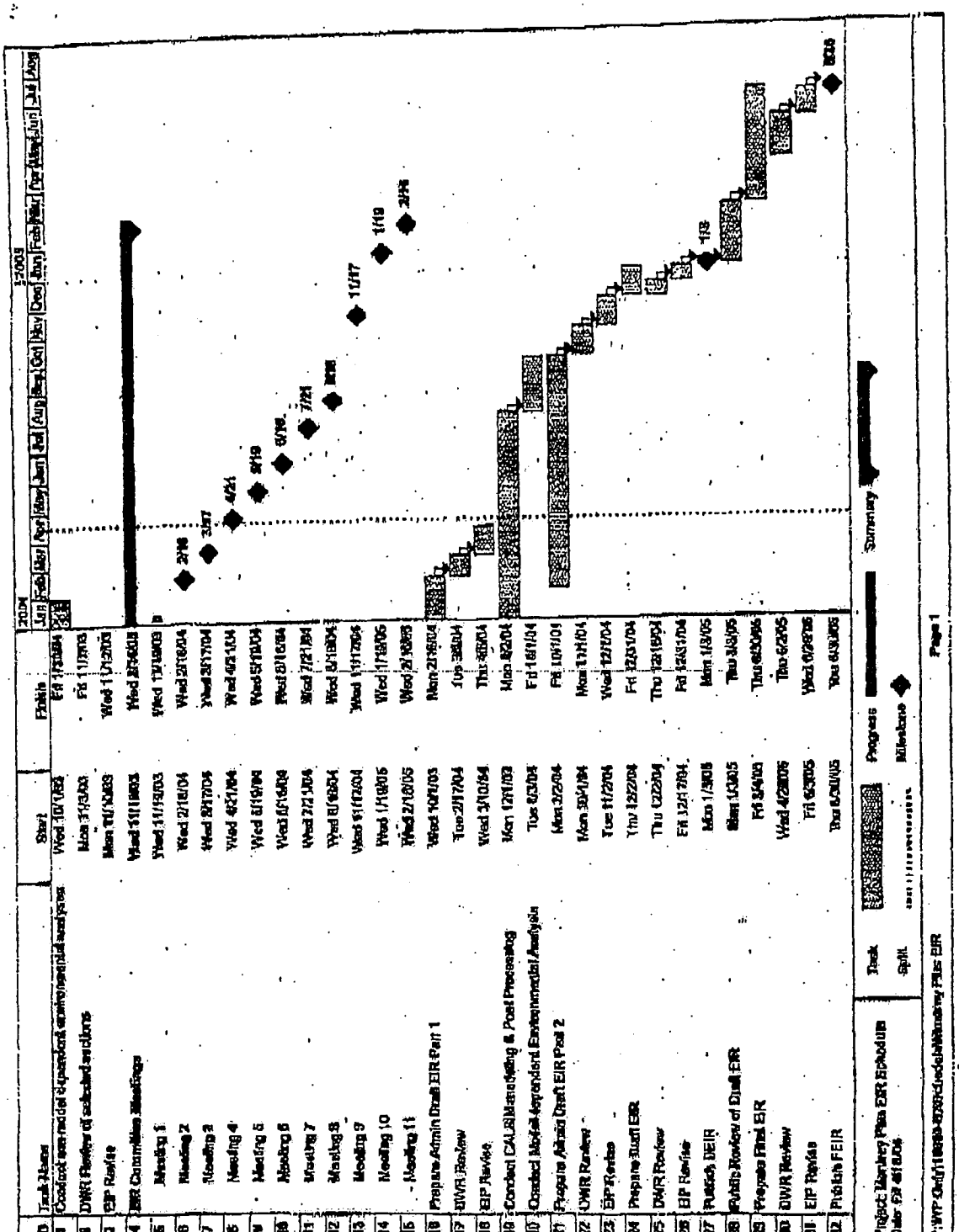
The Settlement Agreement (Section III.E) also provides "with respect to Section III.(C)(4)(b) regarding the Kern-Castaic Transfer, the Parties recognize that such water transfer is subject to pending litigation. The Parties agree that jurisdiction with respect to that litigation should remain in that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation."

If you would like further information regarding the EIR on the Monterey Amendments and the Settlement Agreement, please contact Delores Brown at (916) 227-2407.

Sincerely,

for Lester A. Snow
Director

Attachment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Project: Manley Plan EIR Schedule
Date: Fri 4/16/04
Task
Split
Progress
Milestone
Summary
Page 1
E:\WP Docs\Manley Plan EIR\Schedule\Manley Plan EIR

(C)

ANALYSIS OF SWP RELIABILITY OF DELIVERY

**(Based on the DWR Report:
"The State Water Project Delivery Reliability Report,
2002, Final)**

November 11, 2003

Introduction

The California Department of Water Resources (DWR) released its final draft of a report presenting its analyses of the reliability of delivery of State Water Project (SWP) delivery reliability. The analyses are based on a series of simulations performed with its CALSIM II model, which is a combination of two previously independent models, DWRSIM developed by DWR for the SWP, and PROSIM developed by the Bureau of Reclamation (BOR) for the Central Valley Project. It was deemed necessary to merge these two models because the joint operations in the Delta from which the water is exported have become very integrated.

The CALSIM II model is also being proposed as the primary analytic tool to evaluate the impacts of the SWP under the Monterey Amendments in an EIR now underway. The adequacy of this model is now under scrutiny as part of this EIR process and questions have been raised as to how accurate its calculations are and how well those calculations have verified by model calibrations.

This analysis of SWP reliability is based on the calculations done with CALSIM II as reported in DWR's report as stated above. This report does not assume that the calculations are necessarily accurate but there still is much to be learned from these results even if their accuracy is in question.

This analysis first explores the character of the statistical output of the CALSIM II published results. Then we explore the kinds of interpretations that can be deduced from these results once we understand their statistical character. Some conclusions are then drawn about SWP delivery reliability in general and under varying circumstances that can be expected among the several SWP contractors receiving this water and what they can truly rely on. However, we must stress that even these conclusions are preliminary and still subject to change once the CALSIM II model has been properly calibrated and peer reviewed.

CALSIM Calculations

The basis for the statistical analysis in this report is the CALSIM II output record presented in the referenced report as Table B-3, "Study 2001 SWP Delta water delivery," which provides calculations of the annual export of SWP water over the 73 year period from 1922 to 1994. The reference to 2001 in the Table title refers to the condition that all actual hydrologic records for this period have been adjusted to reflect 2001 conditions of development. That is, the withdrawals of water in the Sacramento Valley are based on the

level of agriculture evident or reasonably expected to prevail at that time and the system of dams and diversions are those expected to be in place at that time. The calculations also assume the level of State Water Resources Control Board (SWRCB) constraints that will exist at that time except for variable restrictions that may be imposed by the Endangered Species Act (ESA) to protect targeted species in the Delta.

The calculations also make assumptions about the level of demands from the SWP contractors to be supplied by water exported from the Delta by the project. The explicit demand functions for each contractor are not presented in the report but it is evident in Table B-3 that the demands are variable. The Table B-3 calculations present for each year, the level of demand sought by the contractors in the aggregate, the calculated deliveries against those demands (explained in the report to be the "Table A" demands called for in the contracts), the calculated percentage of the full "Table A" demands that the estimated delivery represents, and the calculated delivery of Article 21 water that would be expected to be delivered. (Article 21 water is essentially "surplus" water that is available only on certain conditions and cannot be assumed to be reliably available.) The Table B-3 is reproduced here as Table 1 for reference except the column for the percentage calculation was not included.

This statistical analysis deals only with the deliveries of Table A water that DWR is obligated to deliver when it is available to meet contractor requests. Reliability of delivery should be related solely to that water that DWR is obligated to deliver.

How is Reliability defined?

Reliability is not a precisely calculated attribute. It involves considerations of risk. For water supply, one normally establishes the level of risk for shortfalls in the supply at some level of probability. For "Safe Yield" calculations for reservoirs like Cachuma in Santa Barbara County, a reservoir dedicated primarily to urban supply, the risk level is established at a 5% chance of not delivering the stated "safe yield" in any given year if the worst drought of record is repeated. This is a relatively prudent choice if the record of runoff supplying the reservoir is sufficiently lengthy to provide confidence in the calculation. For Cachuma, the worst drought is probably the late 40s and early 50s and it establishes a six year period that the reservoir must carry-over water before it is refilled and spilling.

For SWP contractors, it is apparent that no one level can be chosen that will provide the same risks to all. Each contractor has different capabilities to withstand a drought depending on his particular mix of other water supplies. So it is important for each contractor to be able to deduce what level of deliveries he can utilize and rely on from the SWP, so that he may be able to efficiently operate all of his sources in conjunction. Since the SWP is not operated to carry-over water for more than a year, it is important to characterize the level of deliveries that can be expected over a variety of conditions. In this manner, each contractor can deduce the reliable level of SWP deliveries appropriate to his system of water supplies.

Since periods of drought are the ones that stress water supplies, the calculation of reliability must focus strongly on the project's capability to deliver water in those periods. Contractors that have significant storage means may be able to take delivery of more water in preceding wet periods to be held in reserve for use in droughts. Thus such

TABLE 1

CALSIM RESULTS, TOTAL SAMPLE=73

	OBSERVATION	MODEL_DEM	CALSIM_DE	ART_21	*KEYWORDS
	1922	3407	3389	175	
	1923	3717	3727	143	
	1924	3961	1014	0	
	1925	3940	1502	0	
	1926	3777	2951	0	
	1927	3543	3504	220	
	1928	3897	3337	155	
	1929	3952	1037	0	
	1930	3922	2697	92	
.0	1931	3971	1141	0	
.1	1932	3673	1620	199	
.2	1933	3938	1663	134	
.3	1934	3981	1689	0	
.4	1935	3697	3439	81	
.5	1936	3769	3638	0	
.6	1937	3451	3297	87	
.7	1938	3418	3438	470	
.8	1939	3673	3475	227	
.9	1940	3713	3544	102	
:0	1941	3013	3036	100	
:1	1942	3583	3599	513	
:2	1943	3632	3545	447	
:3	1944	3563	3449	0	
:4	1945	3612	3479	136	
:5	1946	3710	3724	3	
:6	1947	3954	2652	0	
:7	1948	3959	2681	2	
:8	1949	3864	2568	2	
:9	1950	3812	2909	0	
;0	1951	3779	3794	311	
;1	1952	3078	3108	103	
;2	1953	3790	3801	272	
;3	1954	3833	3803	98	
;4	1955	3761	1694	0	
;5	1956	3639	3649	261	
<6	1957	3759	3331	96	
<7	1958	3481	3492	441	
<8	1959	4055	3506	265	
<9	1960	4115	1795	0	
=0	1961	4115	2873	0	
=1	1962	3689	3158	21	
=2	1963	3634	3630	223	
=3	1964	3907	3262	5	
=4	1965	3586	3256	98	
=5	1966	3722	3731	147	
=6	1967	3439	3424	497	
=7	1968	3792	3548	402	
>8	1969	3157	3151	100	
>9	1970	3714	3727	406	
?0	1971	3837	3845	0	
?1	1972	4012	3057	2	
?2	1973	3611	3592	261	
?3	1974	3649	3664	287	
?4	1975	3720	3737	415	
?5	1976	4014	3150	110	

TABLE 1 (cont.)

CALSIM RESULTS, TOTAL SAMPLE=73 (Cont.)

	OBSERVATION	MODEL_DEM	CALSIM_DE	ART_21	*KEYWORDS
[illegible]	1977	3948	804	0	
67	1978	3126	3036	100	
68	1979	3527	3509	140	
69	1980	3197	3208	100	
70	1981	3834	3532	124	
71	1982	3451	3471	386	
72	1983	3007	3036	200	
73	1984	3692	3706	408	
74	1985	3753	3540	0	
75	1986	3345	3023	51	
76	1987	3904	2894	0	
77	1988	4026	967	0	
78	1989	4097	2902	0	
79	1990	3961	1101	0	
70	1991	3957	983	0	
71	1992	3880	1199	0	
72	1993	3559	3505	133	
73	1994	3739	3272	9	
74	*VARIABLES	DEM	DELKAF	ARTKAF	
75	*KEYWORDS				

a contractor can improve his capability to serve demand during droughts. However, that capability for that contractor does not necessarily improve the prospects of those contractors without much storage who must rely on SWP.

The first step then is to examine the CALSIM II calculated output record in Table 1 to establish the temporal variations in expected deliveries.

Statistical Character of the 73 year record

Table 1 presents the results of the CALSIM II model for the 73 year period, 1922 to 1994. This record was analyzed using standard statistical techniques available in a software package called "COSTAT," which includes a variety of standard calculational routines for multiple regression as well as simple univariate data sets. Only the univariate capability was necessary to apply here.

The results of a univariate analysis of the entire 73 year sample are presented in Table 2 and in Figure 1. Table 2 shows the sample mean, variance, standard deviation, and other attributes of the data set. Figure 1 shows the histogram of the frequency of different levels of delivery. Figure 1 is most interesting in that it shows the sample to comprise two distinct domains, one constituting most of the sample showing the deliveries for what can be called normal or wet years and the other constituting the collection of dry years. There is a region in between these two domains, between 2100 and 2540 taf (thousands of acre-feet) for which there are no calculated deliveries. According to Table 2 the average of this 73 sample is 2961.8 taf which is not within the main mode of the normal/wet year data. Thus the sample average is not representative of any particular attribute of this bi-modal distribution.

Statistical tests were performed to determine whether or not these two subsets of the data, normal/wet and dry, can be considered to come from the same population. The answer is most definitely not. To perform this test the 73 year period was separated into the two nominal populations for which means and variances were calculated and tested for significant differences using a standardized "t-test." The probability that such a bi-modal distribution could be drawn from one population by chance is infinitesimally small. Accordingly, no confident statements can be made about probabilities of delivery by assuming the sample to come from one population. As a consequence, the reported average and the use of the frequency charts in DWR's report are without statistical validity.

If we examine the record of calculated deliveries shown in Table 1, it is quite evident that there are extensive dry periods, the worst of which is shown as that from 1929 through 1934. In fact, this is referred to as the historic worst drought. The drought most recently experienced, 1987 through 1992, also 6 years in duration, was almost as severe from a hydrologic standpoint. Each of these two periods has embedded one decent year that if it were not part of the drought episode would not be so significant. The fact that it is embedded is important because following a dry year or dry sequence the embedded year is not good enough to refill the two big SWP reservoirs, Oroville and San Luis, for the following year. Hence it is part of the drought sequence. (It would have been helpful to understanding SWP operations if the calculated record showed the end of water year storage levels for these two reservoirs.)

TABLE 2
ANALYSIS, TOTAL SAMPLE

ta Set: SWP_REL.cst
ate & Time: 01-04-80 09:37 am

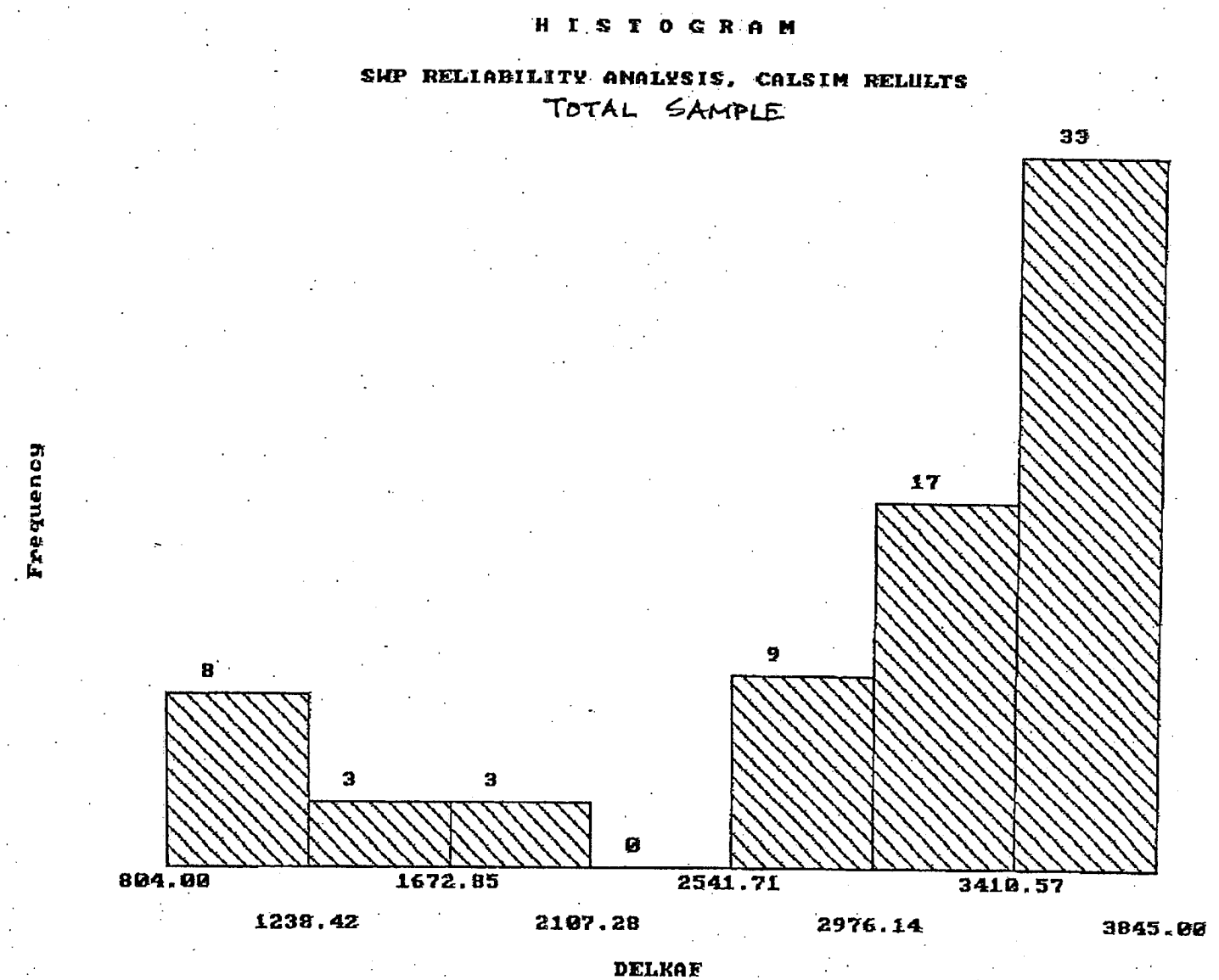
VARIATE DATA ANALYSIS : (DELKAF)

Data Description		Descriptive Measures	
# of observations	: 73	Mean	: 2961.781
# of missing values	: 0	Std Dev(Sample)	: 878.175
Maximum	: 3845.000	RMS(Population)	: 872.139
Minimum	: 804.000	Median	: 3297.000
Range	: 3041.000	1st Quartile	: 2785.000
		3rd Quartile	: 3544.500
		Skewness	: -1.269

Inferential Values

Measures		Confidence Interval (95%)	
Mean	: 2961.781	Lower	: 2760.327
Std Error	: 102.783	Upper	: 3163.235

FIGURE 1



LETTER 4

44

TABLE 2

SWP RELIABILITY ANALYSIS, DROUGHT YEARS

	OBSERVATION	MODEL_DEM	CALSIM_DE	ART_21	*KEYWORDS
	1929	3952	1037	0	
	1930	3922	2697	92	
	1931	3971	1141	0	
	1932	3673	1620	199	
	1933	3938	1663	134	
	1934	3981	1689	0	
	1988	4026	967	0	
	1989	4097	2902	0	
	1990	3961	1101	0	
	1991	3957	983	0	
1	1992	3880	1199	0	
2	*VARIABLES	DEM	DELKAF	ARTKAF	
	*KEYWORDS				

TABLE 4
ANALYSIS, DROUGHT YEARS

Data Set: SWP_REL4.cst
Date & Time: 01-04-80 09:18 am

UNIVARIATE DATA ANALYSIS : (DELKAF)

Data Description		Descriptive Measures	
# of observations	: 11	Mean	: 1545.364
# of missing values	: 0	Std Dev(Sample)	: 678.004
Maximum	: 2902.000	RMS(Population)	: 646.452
Minimum	: 967.000	Median	: 1199.000
Range	: 1935.000	1st Quartile	: 1037.000
		3rd Quartile	: 1689.000
		Skewness	: 1.069

Inferential Values

Measures		Confidence Interval (95%)	
Mean	: 1545.364	Lower	: 1089.903
Std Error	: 204.426	Upper	: 2000.825

is this saying that during droughts the SWP can reliably deliver:
lower 1.89 MAF
mean 1.54 MAF
upper 2.0 MAF

FIGURE 2

HISTOGRAM

SWP RELIABILITY ANALYSIS, CALSIM RESULTS

DROUGHT YEARS

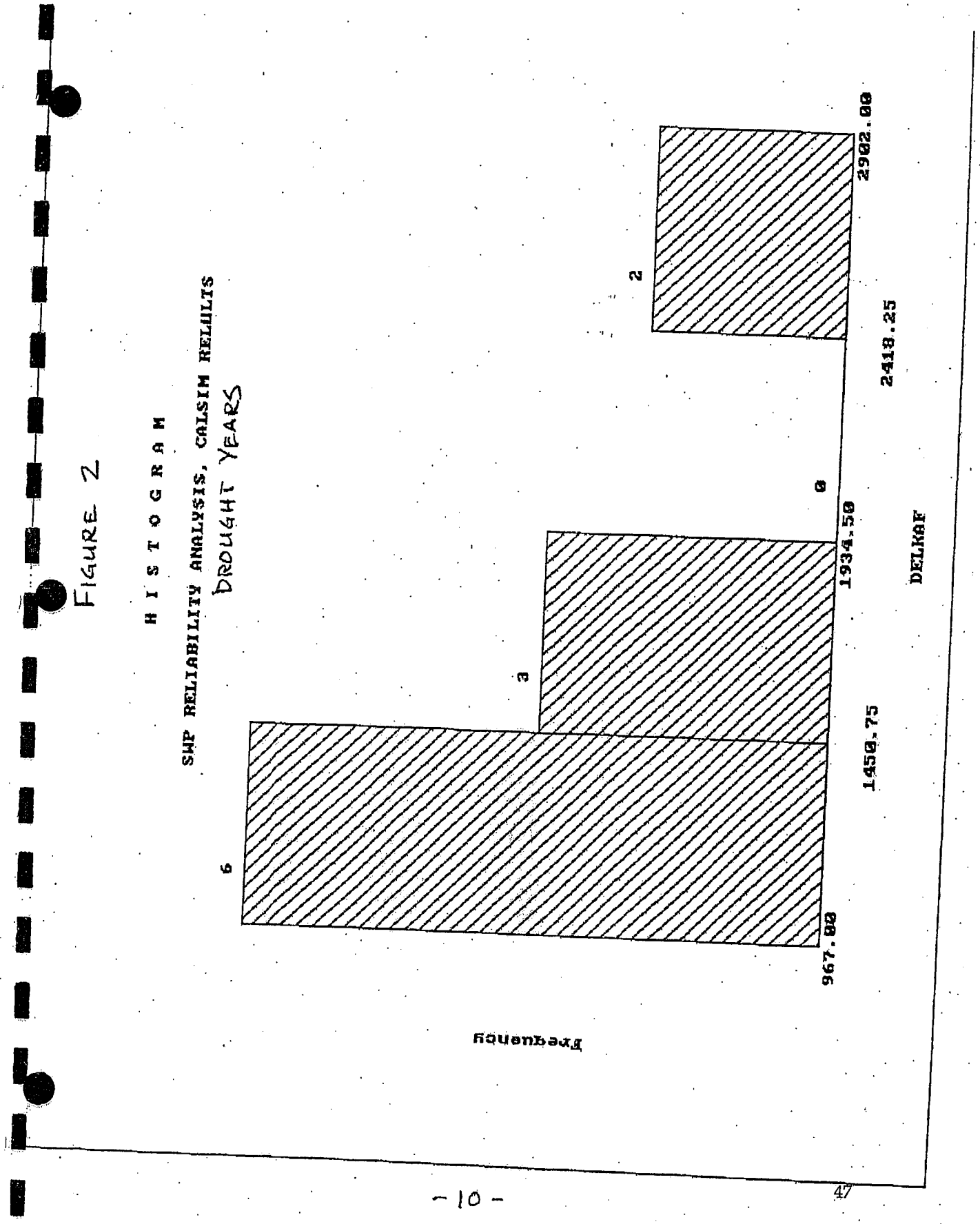


TABLE 5

SWP RELIABILITY ANALYSIS, NORMAL_WET YEARS

	OBSERVATION	MODEL_DEM	CALSIM_DE	ART_21	*KEYWORDS	W
1	1922	3407	3389	175		1
2	1923	3717	3727	143		1
3	1926	3777	2951	0		1
4	1927	3543	3504	220		1
5	1928	3897	3337	155		1
6	1930	3922	2697	92		1
7	1935	3697	3439	81		1
8	1936	3769	3638	0		1
9	1937	3451	3297	87		1
10	1938	3418	3438	470		1
11	1939	3673	3475	227		1
12	1940	3713	3544	102		1
13	1941	3013	3036	100		1
14	1942	3583	3599	513		1
15	1943	3632	3545	447		1
16	1944	3563	3449	0		1
17	1945	3612	3479	136		1
18	1946	3710	3724	3		1
19	1947	3954	2652	0		1
20	1948	3959	2681	2		1
21	1949	3864	2568	2		1
22	1950	3812	2909	0		1
23	1951	3779	3794	311		1
24	1952	3078	3108	103		1
25	1953	3790	3801	272		1
26	1954	3833	3803	98		1
27	1956	3639	3649	261		1
28	1957	3759	3331	96		1
29	1958	3481	3492	441		1
30	1959	4055	3506	265		1
31	1961	4115	2873	0		1
32	1962	3689	3158	21		1
33	1963	3634	3630	223		1
34	1964	3907	3262	5		1
35	1965	3586	3256	98		1
36	1966	3722	3731	147		1
37	1967	3439	3424	497		1
38	1968	3792	3548	402		1
39	1969	3157	3151	100		1
40	1970	3714	3727	406		1
41	1971	3837	3845	0		1
42	1972	4012	3057	2		1
43	1973	3611	3592	261		1
44	1974	3649	3664	287		1
45	1975	3720	3737	415		1
46	1976	4014	3150	110		1
47	1978	3126	3036	100		1
48	1979	3527	3509	140		1
49	1980	3197	3208	100		1
50	1981	3834	3532	124		1
51	1982	3451	3471	386		1
52	1983	3007	3036	200		1
53	1984	3692	3706	408		1
54	1985	3753	3540	0		1
55	1986	3345	3023	51		1

TABLE 5 (Cont.)

SWP RELIABILITY ANALYSIS, NORMAL_WET YEARS (Cont.)

	OBSERVATION	MODEL_DEM	CALSIM_DE	ART_21	*KEYWORDS	W
6	1987	3904	2894	0		1
7	1993	3559	3505	133		1
8	1994	3739	3272	9		1
9	*VARIABLES	DEM	DELKAF	ARTKAF	*KEYWORDS	*
0						
1	*KEYWORDS					

TABLE 6
ANAYSIS, NORMAL_WET YEARS

ata Set: SWP_REL2.cst
ate & Time: 01-04-80 09:21 am

UNIVARIATE DATA ANALYSIS : (DELKAF)

Data Description

# of observations	: 58
# of missing values	: 1
Maximum	: 3845.000
Minimum	: 2568.000
Range	: 1277.000

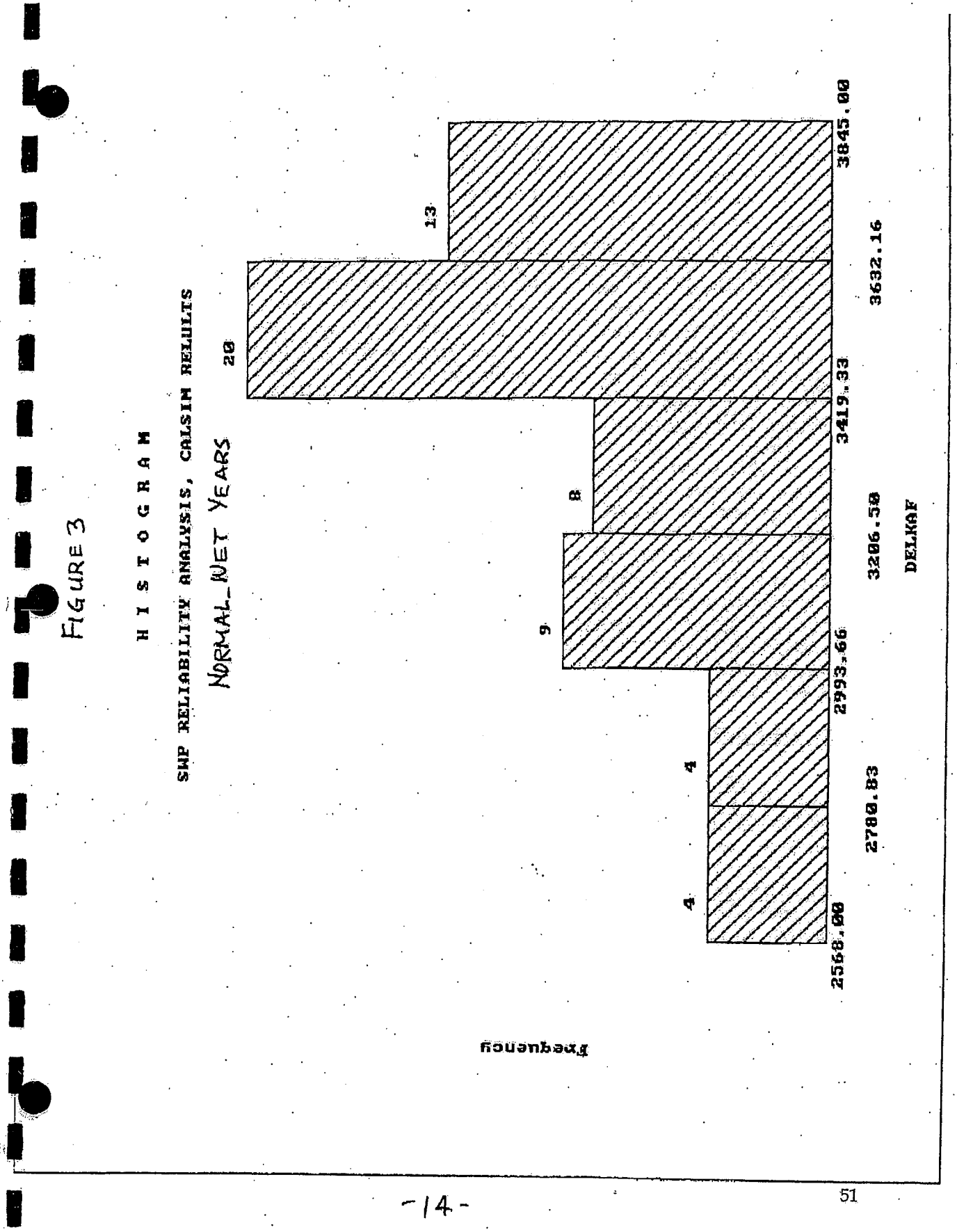
Descriptive Measures

Mean	: 3363.776
Std Dev(Sample)	: 324.661
RMS(Population)	: 321.850
Median	: 3460.000
1st Quartile	: 3139.500
3rd Quartile	: 3606.750
Skewness	: -0.659

Inferential Values

Measures		Confidence Interval (95%)	
Mean	: 3363.776	Lower	: 3278.516
Std Error	: 42.630	Upper	: 3449.036

FIGURE 3


H I S T O G R A M
SWP RELIABILITY ANALYSIS, CALSIM RELULTS
NORMAL_WET YEARS
Frequency
13
20
8
9
4
4
3845.00
3632.16
3419.33
3206.50
2993.66
2780.83
2568.00
DELKAF

Further analyses were undertaken treating the two domains as independent populations. Because the dry year set comprises both the dry sequences of drought and several individual dry years sprinkled throughout the record, we have focused the dry year analyses on the drought periods. The two periods are combined into one population for analysis. However, we did exclude the beginning year, 1987, for the second period as it was not embedded in the sequence and could easily be classified as a fair to good year. Thus, we ended with a sample of 11 years, 6 years between 1929 and 1934 and 5 years between 1988 and 1992. The data set is shown in Table 3 and the resulting statistics are shown in Table 4. Table 4 shows an average delivery of 1545 taf and a standard deviation of 678 taf. If the year 1987 were included the average would increase to approximately 1657 taf with not much change in the standard deviation. If the two embedded decent years, 1930 and 1989, are eliminated from the sample the average is decreased to 1267 taf with a standard deviation of 302 taf. These changes suggest that judged as separate occurrences these two years may not be statistically representative of the dry population. However, we will assume that the results shown in Table 4 are representative of the expectation for drought periods.

Lastly, we analyze the population for the normal/wet periods, a record of 58 years, not all in sequence. The years 1930 and 1987 were included in this sample and the individual dry years not part of either of the extended drought periods were excluded. Table 5 presents the data set used in the analysis and Table 6 shows the calculated statistics. Figure 2 shows the frequency histogram for this data set which clearly depicts a central maximum but still with some skewness. (Skewness is a term used to identify distributions that are not symmetric, that is distributions whose sample mean and median are significantly different.) Table 6 shows an average delivery of 3364 taf with a standard deviation of 325 taf. This then represents what is typical of periods of non-drought, an average that is about 81% of the full Table A value of delivery. The standard deviation represents 9.66% of the average delivery, showing a very consistent delivery for normal and wet periods.

How much delivery can we rely on?

As we stated before, what each contractor can rely on depends on the circumstances of his other sources of supply. However, we now have some valid statistical analyses upon which to base the level of delivery that can be relied on for specific circumstances.

First, we note that for any contractor without significant storage availability, the reliable level of delivery is dictated almost solely by drought conditions. If a particular contractor had no other supply to tap and wanted to pick a confident level of supply from the SWP, he would have to select from among the lowest individual years on record which could be as low as 804 taf or 19.5% of the full Table A value. However, we assume that most SWP contractors have other sources available with which to operate conjunctively with SWP deliveries and the appropriate level of delivery would be the average value during a drought episode, approximately 38% of the full Table A value. If the average level is to be relied on, the other sources must make up the variation within the drought period. In other words, SWP deliveries would have to be taken at the available level shown in the CALSIM II output. This might cause a rearrangement of

priorities of when all the other local sources are brought in to play in a given year. Ordinarily, local purveyors operate on a least cost basis meaning that sources are used in the order of increasing marginal cost. Since SWP marginal costs are likely in some instances to be greater than some local sources, the requirement to use SWP as available may require it to supersede the priority of some local sources in order that the notion of a reliable average delivery is indeed fact. This switch in priorities would entail some cost increases depending on the differences in marginal costs.

If a contractor has significant storage available, he may be able to store some wet year deliveries to be held in reserve for drought periods thereby increasing his reliance on SWP during droughts. The normal/wet period deliveries at 81% could be relied on with high confidence (95%) at the average minus 1.6 times the standard deviation. This 95% confidence level would then be 69% of the full Table A value. In other words, such a contractor could state with high confidence that in normal or wet periods he can rely on 69% of full Table A deliveries with the strong likelihood that in many years he could receive more if it can be utilized. Whether or not it can be utilized depends again on his willingness to reorder the priorities of use of all his sources with the expectation that such a reordering will increase overall costs of supply slightly.

Even if a highly confident 69% can be relied on for normal and wet periods, that leaves the question of what to do in drought periods. Clearly, there will be sufficient excess delivery that can be stored for drought use but the level depends critically on the magnitude of storage. If it was desired to bring the drought level of SWP use up to the normal/wet year reliable level, 69%, enough storage would have to provided to make up the 31% of Table a value represented by the difference between the drought period average and the 69% level. Thus, 31% per year for 6 years (the worst drought on record) of the contractor's Table A value would have to be kept in storage. This amounts to 1.86 times the contractor's Table A amount and there would have to be some allowance for storage losses, say 2.5 times would be reasonable. Thus, for such a contractor to rely on 69% deliveries from the SWP through wet and dry periods, he would have to have available in magnitude 2.5 times or so his Table A amount dedicated to SWP storage. For the entire SWP contract in the aggregate, this amounts to 2.5 times 4130 taf or approximately 10 million acre-feet. This would have to be storage south of the Delta since the CALSIM already takes maximum advantage of the pumping capability of the project.

Clearly, the right level of reliance on SWP deliveries depends on the circumstances for each contractor. Because it is highly unlikely that the storage requirement to reach 69% can be achieved for many contractors, especially the larger ones, a level lower than 69% will have to be calculated. Each contractor will have to do so independently.

Some Conclusions

We have shown that the values for SWP delivery reliability presented in DWR's report are not statistically valid. The level of 76%, which represents the average calculated by CALSIM over the 73 year record, cannot be assumed without question by any contractor and it is highly unlikely that such a level can be substantiated by any contractor. The DWR report does acknowledge that during the two 6 year drought

periods, a level of only 39% to 40% can be relied on. However, that is the average for a six year drought period and still requires each contractor to analyze how he will adjust his priorities of use among all his sources. Even levels in wet years may stretch an individual contractor's capabilities given that there are capacity constraints in the aqueducts that prevent taking full deliveries in low demand months without significant means for equalizing storage between low and high demand periods. In all of this it is important to recognize that seizing on an "average" value implies that deliveries will follow the project's capability to pump the amounts calculated in the CALSIM II model. This means that in wet years the water must be taken and either used or stored if the average is to have any meaning. The DWR report is not candid on this aspect.

(D)

February 2, 2004

Delores Brown
Chief, Mitigation and Restoration Branch
Department of Water Resources
3251 S Street, Sacramento, CA 95816

Dear Ms. Brown:

As you are aware, the CALSIM II External Review Panel issued its findings on December 4, 2003. This panel included some of the world's leading experts on water resource systems modeling. We applaud CALFED's willingness to solicit input from these experts, as well as the thoughtful conclusions that they reached during their brief but concentrated model review process.

We have carefully reviewed this document and find that it raises several issues relevant to the application of CALSIM II in the context of the Monterey Plus Environmental Impact Report, which must come to terms with both the applications and limitations of the model if it is to be used. While the Panel concluded that "CALSIM II represents a state-of-the-art modeling system" (page 4), the experts also pointed out several shortcomings regarding the current formulation of this system. In general, their findings indicate that while the use of a simulation model that employs optimization to solve the allocation problem is consistent with the current state of the practice, problems remain with the way this approach is being used to model the California water system. In fact, several of the Panel findings are coincident with concerns we have articulated in the EIR committees regarding the use of CALSIM II in the context of the Monterey Plus EIR.

The following excerpts, which are taken directly from the Strategic Review, highlight points of agreement between the Panel findings and our comments to DWR over the past several months.

1. Most successful applications of optimization that attempts to simulate the behavior of a system have calibrated the objective functions (i.e. set the weights that prioritize flows over time and space) so that the model results correspond to

what actually happens or would happen under a particular hydrologic and demand scenario. It does not appear that such a calibration of the objective function weights in CALSIM has yet been completed. (page 4)

2. The model provides limited and inadequate coverage of non CVP or SWP water and of the California water system south of the Delta. (page 8)

3. Regardless of how possible it is to match the model closely with observed behavior, statistics on the accuracy of the calibration run should be supplied to users to enable them to gauge the likely errors involved with using the model output. (page 9)

4. Examination of the report *'CALSIM II Simulation of Historical SWP/CVP Operations'*, indicates that the current formulation of CALSIM II:

    - Overestimates water deliveries to SWP and CVP contractors,
    - Determines carryover storage target values that differ from those the operators have determined in the past, and
    - Operates the San Luis Reservoir at lower levels and fills it later in the season than operators have in the past. (page 11)

5. Important aspects of CALSIM II rest upon the representations of other models of Delta hydrodynamics and water quality, water demands, and groundwater. The creditability of CALSIM II also rests on testing these models, which send important data/representations to CALSIM II, and documenting them adequately. (page 22)

6. In general, it appears that the developers of CALSIM II do not have a clear idea of how to define the scope of CALSIM II use and many of its applications are evolving in a reactionary manner. Model developers should identify clearly the desired uses for CALSIM II and then determine acceptable approaches for satisfying those desires. Developers should

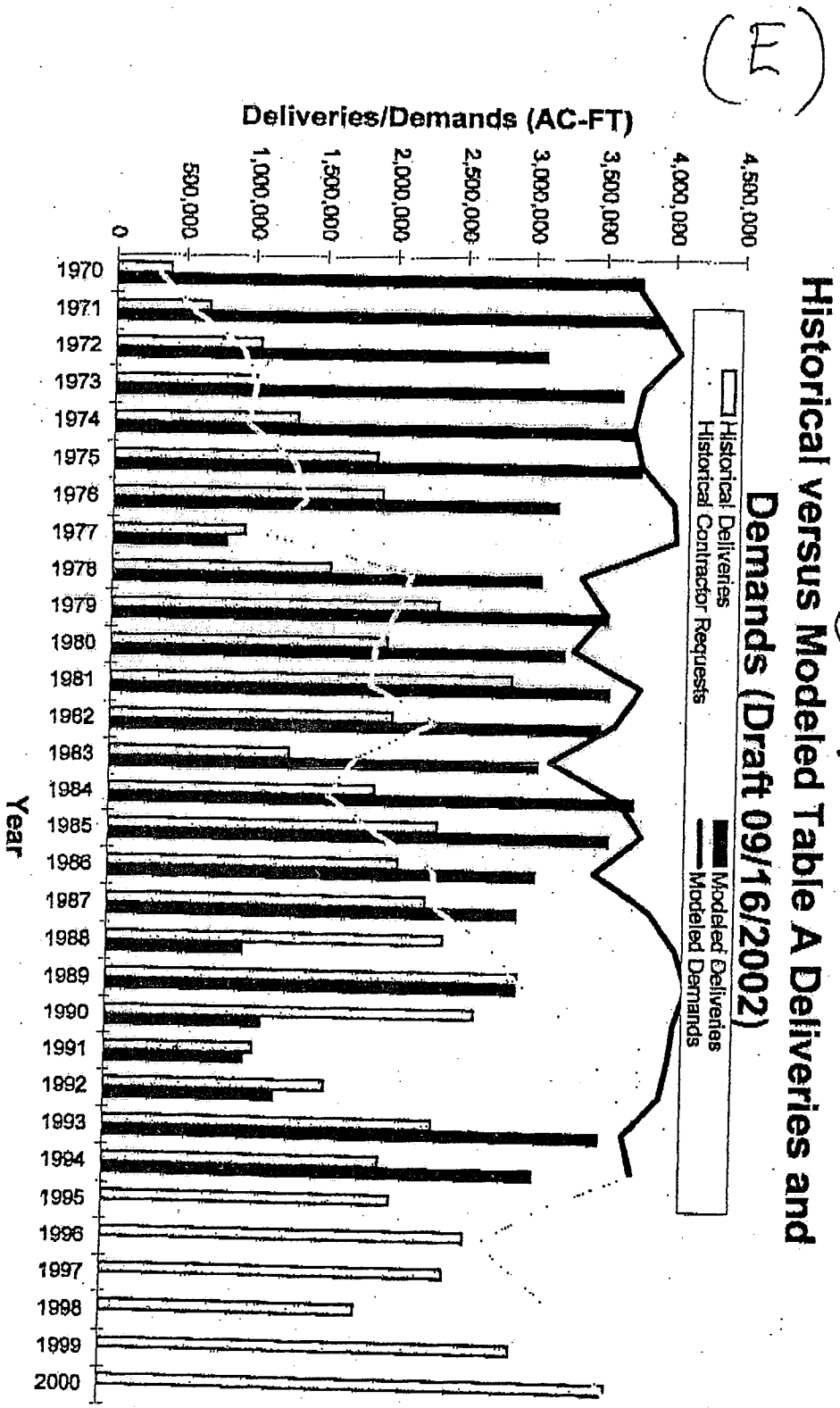
> seek to improve data accuracy and overcome unrealistic assumptions to improve the confidence in model results. (page 25)

These findings, coming from such an esteemed review panel, deserve thorough review and assessment from DWR.

We ask that DWR be prepared present a plan to address these concerns at the next meeting of the Monterey Plus EIR Modeling Sub-Committee that is currently scheduled for February 18, 2004. We find it implausible to conclude that the results of any completed or anticipated CALSIM II runs could be considered relevant to the EIR process in advance of such an analysis. Assuming that you agree, we stand ready to work with DWR to define actions that can be taken to address the Panel's concerns.

Sincerely,

Sage Sweetwood
Planning and Conservation League


Historical versus Modeled Table A Deliveries and Demands (Draft 09/16/2002)
Deliveries/Demands (AC-FT)
0
500,000
1,000,000
1,500,000
2,000,000
2,500,000
3,000,000
3,500,000
4,000,000
4,500,000
Year
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983
1984
1985
1986
1987
1988
1989
1990
1991
1992
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1994
1995
1996
1997
1998
1999
2000
Historical Deliveries
Historical Contractor Requests
Modeled Deliveries
Modeled Demands

LETTER 4

Friends of the Santa Clara River

660 Randy Drive, Newbury Park, California 91320-3036 • (805) 498-4323

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Santa Clarita Organization for Planning the Environment (SCOPE)

Sierra Club
Angeles Chapter
Los Padres Chapter

Surfrider Foundation

Audubon Society
Ventura Chapter

Ventura County Environmental Coalition

Wishtoyo Foundation

August 2, 2004

Mary Lou Cotton
Water Resources Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

Re: Draft EIR for Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount, State Clearinghouse Number 1998041127

Dear Ms. Cotton,

Friends of the Santa Clara River (FSCR) offers the following comments on the referenced Draft Environmental Impact Report (DEIR).

As we noted in our response to the Notice of Preparation, the Castaic Lake Water Agency (CLWA) is not the proper Lead Agency to prepare an Environmental Impact Report (EIR) for this project under the California Environmental Quality Act. 29

The 1995 Monterey Agreement between the California Department of Water Resources (DWR) and water contractors of the State Water Project was put in place to control transfers of the type described in the subject document. There is at present no Monterey Agreement EIR because of the PCL decision of September 2000, which held that the Monterey Agreement EIR prepared by CCWA was inadequate. The court held that the DWR was the proper Lead Agency for this Agreement because only the DWR has the statewide perspective needed to evaluate the environmental impacts to the entire water distribution system. 30

The EIR for the 41,000 acre-feet transfer must tier from a certified Monterey Agreement EIR, which does not currently exist. This was indeed suggested by the Second Appellate District Court decision of January 2002 in the case brought against CLWA by Friends of the Santa Clara River. Page 19 of this decision states that "Respondent may be able to cure the PCL problem by awaiting action by the state DWR complying with the PCL decision, then issuing a subsequent EIR, supplement to EIR, or Addendum to EIR (Guidelines 15162, 15163, 15164) tiering on a new Monterey Agreement EIR." 31

Since CLWA cannot legally be the Lead Agency for the subject transfer, the only legitimate way for CLWA to proceed with EIR preparation is to await DWR's preparation and certification of a Monterey Agreement EIR. The subject DEIR is thus invalid and not in compliance with court decisions involving this transfer of state water. 32

Thank you for the opportunity to comment.

Sincerely,

Ron Bottorff, Chair

LETTER 4

RECEIVED
AUG 12 2004
By

Friends of the Santa Clara River
660 Randy Drive Newbury Park, California 91320 (805) 498-4323

Board of Directors

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Santa Clarita Organization for Planning the Environment (SCOPE)

Sierra Club, Angeles Chapter

Sierra Club, Los Padres Chapter

Surfrider Foundation

Ventura Audubon Society

8-6-04

Castaic Lake Water Agency
27234 Bouquet Canyon Rd.
Saugus, Ca. 91350

Re: 41,000 AF Transfer EIR SCH #1998041127

Dear Directors:

Please include the following correspondence between our attorney and the Department of Water Resources and their response regarding the timeline for the completion of the Monterey Agreement Environmental Impact Report. Because this EIR must be tiered on the State wide impacts addressed in the Monterey Agreement EIR and could not proceed without this Agreement, your Agency must wait until the state wide document has been certified before certifying the EIR for this project. 33

We continue to protest that you may not approve this document because you are not the correct lead agency for a project with state-wide impacts. Since the Dept. of Water Resources was found to be the legitimate lead agency for such a transfer in the decision *PCL v. DWR*, 2000, we protest your disregard for legal precedent on this matter. We note that your current general manager, Dan Masnada, is the same person that proceeded illegally in the above case when he was general Manager of Central Coast Water Agency. He is well aware that your agency is not proceeding according to law. 34

Further, we wish to state that none of these documents, nor the current EIR before you address the effects of an earthquake or levee break (such as recently occurred in the Sacramento Delta, news article attached). These emergencies were also not addressed in the Urban Water Management Plan 2000. We ask that you address how your agency intends to manage such a water emergency under current water availability scenarios and how water supply would be affected under such an emergency with the additional buildout this transfer would permit. 35

We ask that you respond to the recommendations made recently by the two experts, Kathy Kelly and Jonas Minton who gave testimony regarding State Water project availability before the City of Santa Clarita Planning Commission on June 29th, 2004. They both suggested that the planners should analyze the effect of cutbacks that would be required under the worst case historical delivery rate, 13% of Title A amounts in 1991, on existing businesses and residents in the Santa Clarita Valley. Since ground water sources are in the Santa Clarita Valley are fully utilized, substantial cutbacks would be required. This significant impact should be addressed. 36

Thank-you for your time.

Sincerely,
RON BOTTORFF, Chair

Attachments :
1. Court order in *PCL v. DWR*
2. Correspondence from Alyse Lazar to DWR dated May 18th, 2004 re: Status of Monterey Agreement EIR
3. Correspondence from DWR to Alyse Lazar dated June 16th, 2004 re: Status of Monterey
4. LA Times Article June 4th, 2004

FILED
ENDORSED
03 JUN -6 PM 3:27
SACRAMENTO COURTS
DEPT. #53

IN THE SUPERIOR COURT OF THE STATE OF CALIFORNIA

FOR THE COUNTY OF SACRAMENTO

PLANNING AND CONSERVATION LEAGUE a California not for profit corporation, PLUMAS COUNTY FLOOD CONTROL AND WATER CONSERVATION DISTRICT, a California public agency; CITIZENS PLANNING ASSOCIATION OF SANTA BARBARA COUNTY, INC., a California not for profit corporation,

Plaintiffs and Petitioners,

v.

DEPARTMENT OF WATER RESOURCES, a California State Agency, et al.,

Defendants and Respondents.

Case No. 95CS03216

ORDER PURSUANT TO PUBLIC RESOURCES CODE SECTION 21168.9

On remand from the Third District Court of Appeal on May 20, 2003, in Department 53 of the Sacramento Superior Court, the Honorable Loren E. McMaster, presiding, this proceeding came on for a status report and joint motion. Petitioners and Plaintiffs, Planning and Conservation League, Plumas County Flood Control and Water Conservation District, and Citizens Planning Association of Santa Barbara County ("Petitioners"), appeared through Antonio Rossmann and Roger B. Moore. Respondent and Defendant, Central Coast Water Authority (CCWA), appeared through Susan F. Petrovich of the Law Firm of Hatch & Parent. Respondent and Defendant, Department of Water Resources (DWR), appeared through Deputy Attorney General Marian E. Moe.

Robert S. Draper of O'Melveny and Myers, LLP and Clifford W. Schulz appeared, respectively, on behalf of the Metropolitan Water District of Southern California and Dudley Ridge Water District, entities that submitted answers to the First Amended Complaint subsequent to the Court of Appeal's final determination in this action and prior to any further order of this Court on remand.

In light of the direction from the Third District Court of Appeal on remand in Planning and Conservation League v. Department of Water Resources (2000) 83 Cal.App.4th 892, this Court hereby makes the following findings:

1. The parties to this lawsuit and other public agencies have engaged in extensive settlement negotiations, mediated by retired Judge Daniel Weinstein of JAMS Dispute Resolution, with the intent to avoid further litigation and associated expenses, to provide for an effective way to cooperate in the preparation of a new environmental impact report (EIR), and to make other specified improvements in the administration and operation of the State Water Project.

2. The mediation has resulted in an executed Settlement Agreement for approval by this Court, attached to this Order as Exhibit A.

3. DWR as lead agency has commenced the preparation of the new EIR.

4. As part of the Settlement Agreement, DWR and the State Water Project (SWP) contractors who are signatories to the Settlement Agreement have agreed that, pending DWR's filing of a return in satisfaction of the Writ of Mandate and this Court's dismissal of the Writ of Mandate, they will not approve any new project or activity (as defined in section VII.A of the Settlement Agreement) in reliance on the 1995 Environmental Impact Report for the Implementation of the Monterey Agreement.

5. This Order is made pursuant to the provisions of Public Resources Code section 21168.9 and pursuant to this Court's equitable powers. This Court finds that the actions described in this Order, including actions taken in compliance with the Writ of Mandate, comprise the actions necessary to assure DWR's compliance with Division 13 of the Public Resources Code. This Court further finds that this Order includes only those

mandates necessary to achieve compliance with Division 13.

THEREFORE, IT IS HEREBY ORDERED as follows:

1. This Court's Final Judgment denying the petition for writ of mandate, entered August 15, 1996, is reversed in accordance with the directive of the Third District Court of Appeal's decision in Planning and Conservation League v. Department of Water Resources (2000) 83 Cal.App.4th 892.

2. This Court's order granting the summary adjudication on the fifth cause of action, entered June 10, 1996, is vacated.

3. The Settlement Agreement attached as Exhibit A is hereby approved.

4. A Peremptory Writ of Mandate directed to Respondents Central Coast Water Authority and DWR shall issue under seal of this Court in the form attached hereto as Exhibit B.

5. In accordance with the Settlement Agreement and this Order, pending DWR's filing of the return in compliance with the Peremptory Writ of Mandate and this Court's Order discharging the Writ of Mandate, DWR and CCWA shall not approve any new project or activity (as defined section VII.A of the Settlement Agreement) in reliance on the 1995 EIR for the Implementation of the Monterey Agreement.

6. In the interim, until DWR files its return in compliance with the Peremptory Writ of Mandate and this Court orders discharge of the Writ of Mandate, the administration and operation of the State Water Project and Kern Water Bank Lands shall be conducted pursuant to the Monterey Amendments to the State Water Contracts, as supplemented by the Attachment A Amendments to the State Water Contracts (as defined in the Settlement Agreement) and the other terms and conditions of the Settlement Agreement.

7. Plaintiffs and petitioners shall recover such costs and attorney's fees as provided in prior court orders and in an amount as determined in the arbitration procedures agreed to in the Settlement Agreement, or as otherwise agreed to by the parties.

8. Except as provided, the Peremptory Writ of Mandate shall not limit or constrain the lawful jurisdiction and discretion of DWR. This Court retains jurisdiction until DWR files a return that complies with the terms of the Writ of Mandate, and this Court issues an order discharging the Writ of Mandate.

IT IS SO ORDERED.

Dated: JUN - 6 2003, 2003

LOREN E. McMASTER
Judge of the Superior Court

LETTER 4

LAW OFFICE OF
ALYSE M. LAZAR
Attorney at law
3075 East Thousand Oaks Blvd., Suite 100
Westlake Village, California 91362

Admitted to practice
STATE BAR OF CALIFORNIA
NEW YORK STATE BAR

Telephone: (805) 496-5390
Facsimile: (805) 496-7462

May 18, 2004

Lester Snow, Director
Department of Water Resources
Room 1115-1
P.O. Box 942836
Sacramento, California 94236

RE: New Monterey Agreement EIR

Dear Director Snow:

Pursuant to the Court decision in *Planning & Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892 (hereafter "*PCL*"), the Department of Water Resources is required to prepare a new Environmental Impact Report regarding all aspects of the Monterey Amendments. I understand that you will be overseeing this process.

The Settlement Agreement that was entered into between all of the parties to the *PCL* case on May 5, 2003 set forth various requirements for the EIR. According to Attachment B-1of this Settlement Agreement, the parties specifically excluded the 41,000 afy entitlements purchased by Castaic Lake Water Agency ("CLWA") emanating from the Monterey Amendments from the list of final transfers. It is therefore my understanding that your office will be evaluating the environmental impacts of this 41,000 afy transfer as part of the Environmental Impact Report for your project (the Monterey Amendments Project.) In fact, page 11, paragraphs III C.4 of the Settlement Agreement mandates DWR to analyze the potential environmental effects relating to CLWA's project ("the Kern-Castaic Transfer").

As you may also be aware, the EIR prepared by CLWA for the 41,000 afy transfer was decertified by the Los Angeles Superior Court on November 1, 2002 in *Friends of the Santa Clara River v. Castaic Lake Water Agency*, Los Angeles County Superior Court Case No. BS 056954. In order for CLWA's new EIR to be legally sufficient and in conformance with the appellate court's decision, it must contain an analysis of the potential environmental effects of the Kern-Castaic Transfer on the entities that have and will continue to lose this 41,000 afy source of water due to the transfer as well as the impacts on the State Water Project ("SWP") system resulting from the movement of this water from its source in Kern County to Santa Clarita. Logically and in conformance with CEQA, both DWR's EIR and CLWA's EIR must contain an analysis of the impacts from this loss of water upon Kern County agricultural users as well as all others affected by the transfer.

I currently represent Friends of the Santa Clara River in the *Friends of the Santa Clara River v. Castaic Lake Water Agency*, litigation. In the Judgment Granting Peremptory Writ of Mandate in the Friends' case, the Court ordered that it " retains jurisdiction until respondent Castaic Lake Water Agency certifies an Environmental Impact Report that complies with the California Environmental

LETTER 4

May 18, 2004 letter to Dir. Snow, Dept of Water Resources

Quality Act and is consistent with the views expressed by the Court of Appeal Opinion filed January 10, 2002, Case No. B 145283."

For these reasons, I am requesting that you provide me with a copy of any analysis performed to date by DWR regarding the potential environmental impacts of the Kern-Castaic transfer, whether in draft or final form.

Additionally, please advise me of the procedural steps that DWR will take before making a determination whether or not to approve the Kern-Castaic transfer as a "final" transfer and the criteria that will be utilized for making this determination. If there is a proposed schedule for the completion of the Monterey Amendments EIR and/or for these procedural steps for determining whether or not to approve the Kern-Castaic transfer as a long-term transfer, please provide me with a copy of same.

I would appreciate receiving this information from you by May 28, 2004. If you have questions regarding the above or would like to discuss the matter, please call me at (805) 496-5390. Thank you for your anticipated assistance. I look forward to hearing from you.

Very truly yours,

Alyse M. Lazar

cc: Delores Brown

LETTER 4

STATE OF CALIFORNIA -- THE RESOURCES AGENCY ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

JUN 17 2004

Alyse M. Lazar, Esq.
3075 East Thousand Oaks Boulevard, Suite 100
Westlake Village, California 91362

Dear Ms. Lazar:

In response to your letter of May 18, 2004, the Department of Water Resources (DWR) is preparing an Environmental Impact Report (EIR) on the Monterey Amendments and the Settlement Agreement resulting from the Court of Appeal decision in *Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892.

DWR's treatment of the transfer of Table A amounts from Kern Country Water Agency to Castaic Lake Water Agency will be governed by the Settlement Agreement. As provided in Paragraph III.C.4 of the Settlement Agreement, the EIR will include an "analysis of the potential environmental impacts relating to (a) the Attachment E transfers, and (b) the Kern-Castaic Transfer, in each case as actions that relate to the potential environmental impacts of approving the Monterey Amendments." Section 1(O) of the Settlement Agreement defines the "Kern-Castaic Transfer" as "the transfer of 41,000 acre feet of water from Kern Country Water Agency to the Castaic Lake Water Agency, approved by DWR on March 31, 1999." DWR has not completed any draft or final analysis regarding these transfers. Attached is an estimated schedule for completion of the EIR.

The Settlement Agreement (Section III.E) also provides "with respect to Section III.(C)(4)(b) regarding the Kern-Castaic Transfer, the Parties recognize that such water transfer is subject to pending litigation. The Parties agree that jurisdiction with respect to that litigation should remain in that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation."

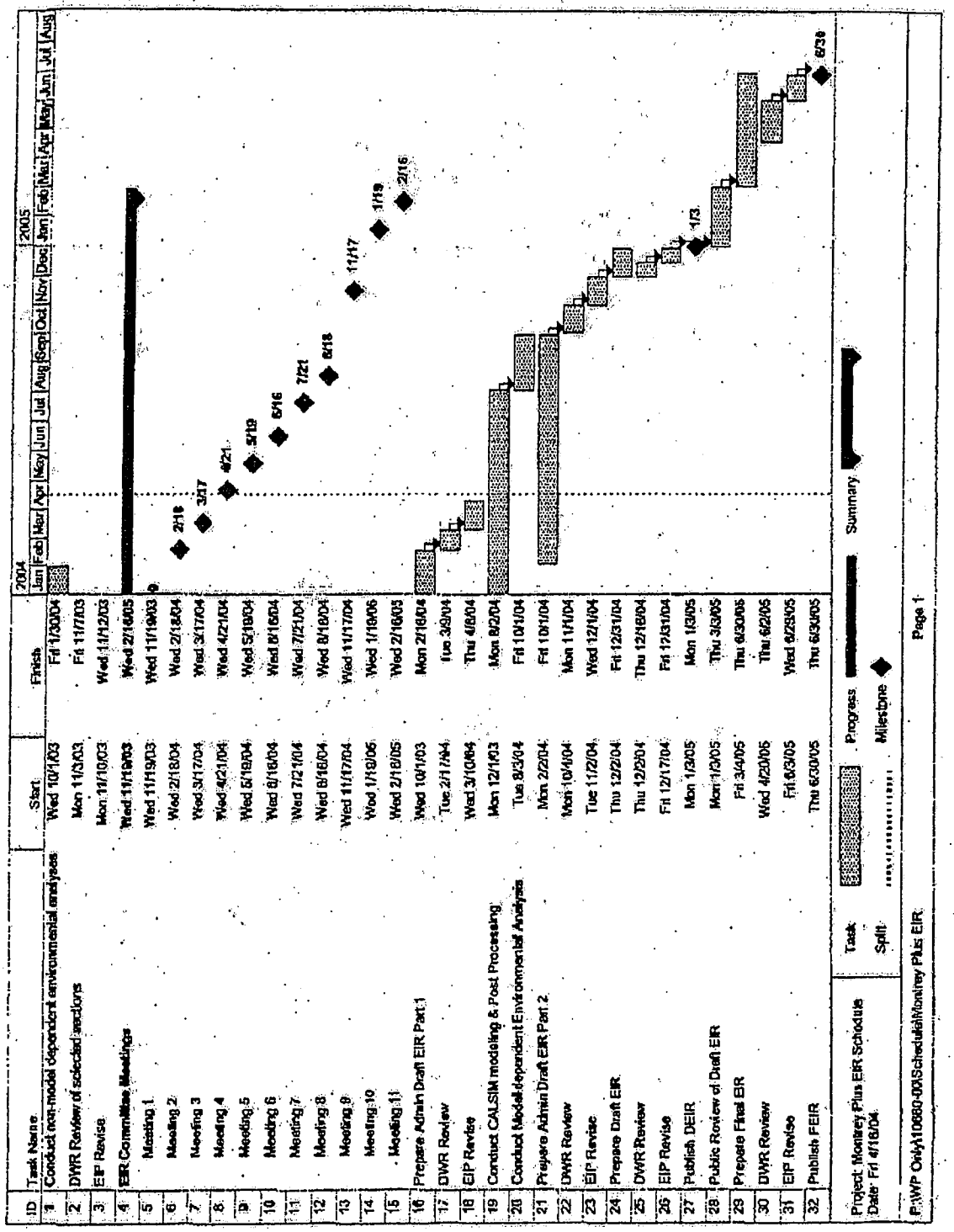
If you would like further information regarding the EIR on the Monterey Amendments and the Settlement Agreement, please contact Delores Brown at (916) 227-2407.

Sincerely,

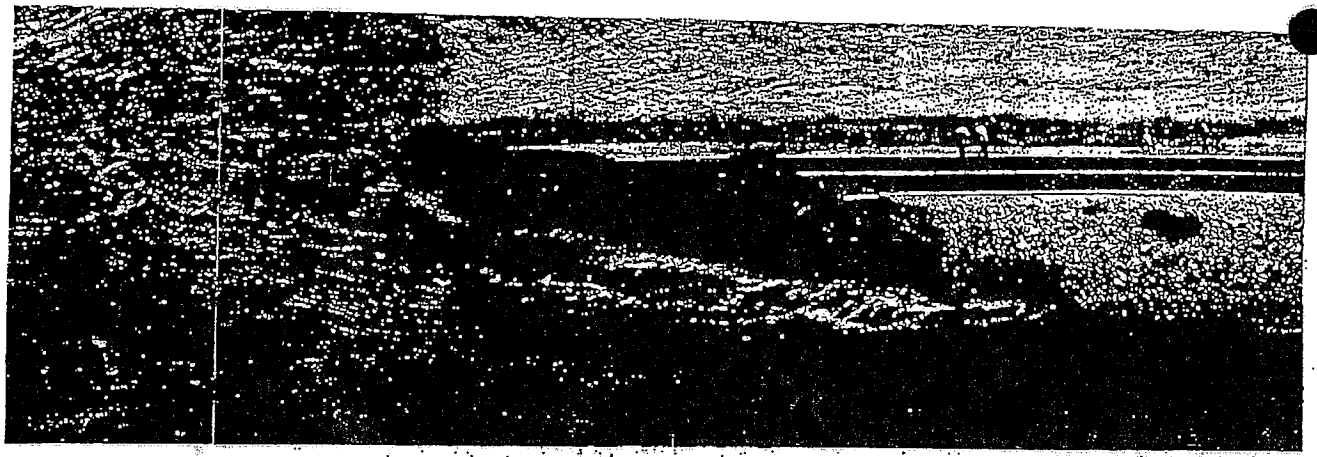
Harold E. Johns

for Lester A. Snow
Director

Attachment



ID	Task Name	Start	Finish
1	Conduct non-model dependent environmental analyses	Wed 10/1/03	Fri 1/30/04
2	DWR Review of selected analyses	Mon 11/3/03	Fri 11/7/03
3	EIP Revise	Mon 11/10/03	Wed 11/12/03
4	EIR Committee Meetings	Wed 11/19/03	Wed 2/16/05
5	Meeting 1	Wed 11/19/03	Wed 11/19/03
6	Meeting 2	Wed 2/18/04	Wed 2/18/04
7	Meeting 3	Wed 3/17/04	Wed 3/17/04
8	Meeting 4	Wed 4/21/04	Wed 4/21/04
9	Meeting 5	Wed 5/19/04	Wed 5/19/04
10	Meeting 6	Wed 6/16/04	Wed 6/16/04
11	Meeting 7	Wed 7/21/04	Wed 7/21/04
12	Meeting 8	Wed 8/18/04	Wed 8/18/04
13	Meeting 9	Wed 11/17/04	Wed 11/17/04
14	Meeting 10	Wed 1/19/05	Wed 1/19/05
15	Meeting 11	Wed 2/16/05	Wed 2/16/05
16	Prepare Admin Draft EIR Part 1	Wed 10/1/03	Mon 2/16/04
17	DWR Review	Tue 2/17/04	Tue 3/9/04
18	EIP Revise	Wed 3/10/04	Thu 4/8/04
19	Conduct CALSIM modeling & Post Processing	Mon 12/1/03	Mon 8/2/04
20	Conduct Model-dependent Environmental Analysis	Tue 8/3/04	Fri 10/1/04
21	Prepare Admin Draft EIR Part 2	Mon 2/2/04	Fri 10/1/04
22	DWR Review	Mon 10/4/04	Mon 11/1/04
23	EIP Revise	Tue 11/2/04	Wed 12/1/04
24	Prepare Draft EIR	Thu 12/2/04	Fri 12/31/04
25	DWR Review	Thu 12/30/04	Thu 12/16/04
26	EIP Revise	Fri 12/17/04	Fri 12/31/04
27	Publish DEIR	Mon 1/3/05	Mon 1/3/05
28	Public Review of Draft EIR	Mon 1/3/05	Thu 3/3/05
29	Prepare Final EIR	Fri 3/4/05	Thu 6/30/05
30	DWR Review	Wed 4/20/05	Thu 6/2/05
31	EIP Revise	Fri 6/3/05	Wed 6/29/05
32	Publish FEIR	Thu 6/30/05	Thu 6/30/05



CRAIG SANDERS *Stockton Record*

A TORRENT: *Water pours through an estimated 300-foot break in a levee along the Middle River into low-level farmland about 20 miles west of Stockton.*

Levee Break Forces 300 to Evacuate

San Joaquin Valley farmland is flooded, shutting a rail line. Drinking water supplies for millions could be affected.

By SARA LIN
Times Staff Writer

A levee break in fields west of Stockton on Thursday morning prompted the evacuation of about 300 people from a farming community, and forced federal and state water agencies to slow the pumping of delta water for irrigation and drinking water.

The break, estimated at 300 feet long, was discovered about 8:30 a.m. on the Middle River along Bacon Island Road north of California 4, about 20 miles west of Stockton, said Connie Cassinetto, a spokeswoman for the San Joaquin County Office of Emergency Services.

The amount of freshwater rushing across the low-lying farmlands of man-made Bacon Island is enough to supply 150,000 families for one year. Authorities expect the change in water levels to cause salt water from San Francisco Bay to seep into the San Joaquin-Sacramento River Delta, threatening freshwater fish and the quality of drinking water supplies for cities, including Los Angeles.

The federal Bureau of Reclamation cut its water exports from the delta by 80%, said spokesman Jeff McCracken. The California Department of Water Resources halted its exports from the area completely.

"We need to wait until island flows have stabilized to get decent readings on what salinity levels look like," McCracken said.

After that, he said, state and federal water agencies probably would consider releasing water from storage facilities to freshen the delta.

The break occurred on a stretch known as Upper Jones Tract, close to a main rail line and several pipelines that carry water to the San Francisco Bay Area. The pipes, located a mile north of the break, were not affected by floodwaters. Officials said those pipelines have been submerged before.

At 1:30 p.m., officials at the Burlington Northern and Santa Fe Railway shut down one of its two main lines after water reached the edge of the track.

While trains were being operated at restricted speeds on the second line, officials said they would shut it down if water crept closer. Forty trains pass daily through the area.

The railroad tracks, which were built on raised trestles where a levee broke in 1980, divide the island's 12,000 acres roughly in half and are keeping floodwaters from contaminating the lower portion of the island.

"Those levees in the delta are very old and very fragile," said Don Strickland, a spokesman for the Department of Water Resources.

Most levees were not built properly, he said, and were created more than a century ago by "farmers pushing dirt together."

"Over the years," he said, "more people put up dirt and rocks, and then people put a highway on it."

As a result, many of the man-made islands in that region sit more than 10 feet below sea level.

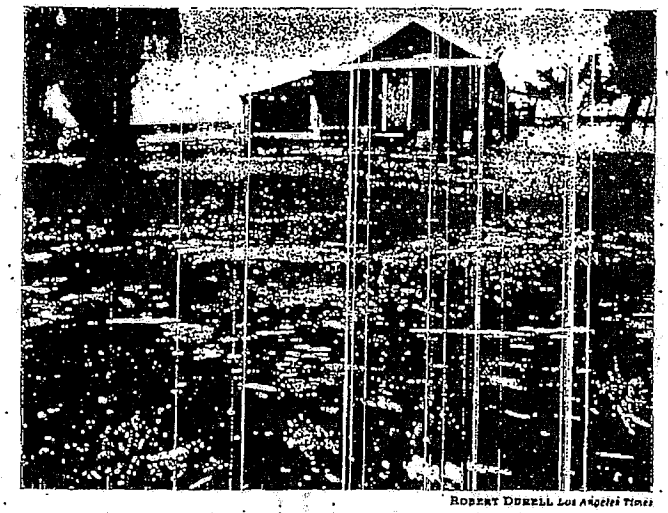
California Highway Patrol officials said a high-pressure fuel line in the flood zone was shut down, but there were no immediate plans to close California 4.

"This mostly affects farmers, their equipment, and some migrant farm laborers," Cassinetto said.

Typically, fewer than 100 migrant workers live in camps in the area, primarily used to farm row crops such as alfalfa, she said.

County officials expected water to spill through the break into the night before engineers could plug it and begin pumping water out.

"When these levees break, it's pretty slow. It's not like a flood," Cassinetto said. A levee can break at any time, she added. "They're just dirt."



ROBERT DURELL *Los Angeles Times*

ENGULFED: *Floodwaters surround a farmworker house about three miles from the levee. The occupants were among about 300 people who had to be evacuated.*

Tell of Laci Last Hours

Issues facing voters in November

The Nov. 2 general election ballot will lead with the race for U.S. president but will include 14 California measures, the last of which was qualified Thursday by the secretary of state.

Railroad — A $9.95-billion bond ... strike and imposes more severe

Jury Deliberations Begin in Killing of Transgender Teen

LETTER 4

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Save Mount Diablo
South Yuba River Citizens League

PCL

PLANNING AND CONSERVATION LEAGUE

Mary Lou Cotton
Water Resources Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350
(661) 297-1600

August 16, 2004

Dear Ms. Cotton:

This letter provides comments on the Draft EIR entitled *Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount*, on behalf of the Planning and Conservation League (PCL) and the Citizens Planning Association of Santa Barbara County (CPA). If finalized, that transfer would be the largest permanent agriculture-to-urban transfer under article 53 of the Monterey Amendments, with major implications for water resources and land use planning in Southern California. The environmental impacts of these amendments, including the instant transfer, remain to be addressed in DWR's pending "Monterey Plus" EIR review. The scoping comments submitted for that review (attached as Exhibit 1), including those of PCL, should be studied in connection with the present EIR review. 37

PCL and CPA were among the plaintiffs whose successful CEQA challenge set aside the Central Coast Water Authority's original 1995 Monterey Program EIR. That ruling led to decertification of the predecessor EIR for Castaic's transfer, which unlawfully relied upon that defective analysis. 38

The instant Draft EIR, prepared by the same firm (SAIC) as the decertified Monterey EIR, provides a case of history repeating itself. It is legally insufficient in process and substance, failing Castaic's duty under CEQA to properly inform decision-makers and the public of the project's environmental consequences. The Draft EIR cannot be reconciled with the Monterey Amendments court decision (*Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892) and the settlement agreement later reached in that case. (The full Settlement Agreement appears on DWR's website at http://www.montereyamendments.water.ca.gov/.)

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Website: www.pcl.org Email: pclmail@pcl.org

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PROCESS ISSUES:

Failure to Address Comments

PCL and CPA submitted a comment letter on August 22, 2004. This letter, attached as exhibit 1; addressed both the instant transfer and a related proposal to transfer 16,000 acre-feet of Table A amounts from another of the Kern County Water Agency's member districts. PCL urged Castaic that it should "refrain from moving forward with these separate project reviews, which are premature and likely to operate at cross-purposes with DWR's statewide review" of the project referenced in the Monterey Amendments case settlement. PCL and CPA advised Castaic that if it prematurely attempted to proceed with separate EIRs on these permanent transfers, it would "lack the institutional authority and statewide accountability" to serve as CEQA lead agency. The Draft EIR simply ignores PCL's comments, and sidesteps similar ones made by other organizations. 39

PCL filed similar comment letters on several local projects contesting Castaic's improper and premature reliance on the 41,000 acre-feet transfer as an integral part of its reliable water supply. These comments (addressing, respectively, the West Creek Project, the River Village Project, and the Riverpark project) are attached as exhibits 2-4. They raise important questions affecting the adequacy of this EIS, as well as the prospect of possible cumulative impacts not addressed in Castaic's draft. 40

Inconsistency with DWR's "Monterey Plus" Review 41

Castaic's so-called "stand-alone" Draft EIR is fraught with potential for inconsistency with DWR's upcoming environmental review and decision on the "Monterey Plus" project. That review will address the identical transfer from a statewide perspective, with an integrated analysis of that project in its entirety. Castaic lacks the expertise and authority to proceed based upon its isolated assessment of project impacts, alternatives, and mitigation, each of which may well be undermined by DWR's subsequent analysis and decision.

Two recent Second District Court of Appeals cases reinforce the point that Castaic Lake Water Agency (CLWA) should not pursue its own independent EIR on the 41,000 acre foot transfer in advance of the 42

completion of DWR's tier-one "Monterey Plus" EIR. 42

In *Friends of the Santa Clara River v. Castaic Lake Water Agency* (2002) 95 Cal.App.4th 1373, the Second District court of appeal ordered the decertification of the previous EIR Castaic prepared to support the instant transfer. The Friends group and other environmental organizations opposed the project decision on that Kern/Castaic transfer, citing environmental consequences in the Santa Clara River area and association with numerous sprawl development projects. In its CEQA assessment, the court recognized that the proposed 41,000 acre-feet transfer "is part of an overall larger scheme, analyzed on a programmatic basis in the Monterey Agreement EIR." (*Id.* at 1384.)

Another recent Second District appellate decision, *Santa Clarita Organization for Planning and the Environment (SCOPE) v. County of Los Angeles* (2003) 106 Cal.App.4th 715, critically addressed Castaic's characterization of the 41,000 acre-feet transfer. In that case, the County of Los Angeles violated CEQA in its review of the West Creek development project that erroneously assumed that 100 per cent of Castaic's purported 41,000 acre-feet would be available in wet years and 50 per cent in drought years. Drawing on *Planning and Conservation League's* assessment of the historic disparity between Table A amounts and deliverable water, the court concluded that the EIR failed to undertake a "serious and detailed analysis" of State Water Project supplies, and observed that "[t]he dream of water entitlements for the incomplete State Water Project is no substitute for the reality of actual water the SWP can deliver." (*Id.* at pp. 723, 717.) 43

Inconsistency with the "Lead Agency" Principle

The Courts have also emphasized that DWR must act as lead agency in performing Tier 1 environmental studies. If Castaic continues with its separate environmental reviews without awaiting DWR's assessment in the "Monterey Plus" EIR, it would violate CEQA's lead agency requirement based upon the well-established standards set forth in *Planning and Conservation League v. Department of Water Resources.* The court in that case could hardly have been clearer that *DWR* is the "state agency charged with the statewide responsibility to build, maintain, and operate" the State Water Project. (*Id.* at p. 906.; see also Wat. Code, §12930, *et seq.*) Finding that DWR was the only entity with the requisite statewide perspective and expertise to serve as lead agency, the court found it "incongruous to assert that any of the regional contractors" could "assume 44

DWR's principal responsibility for managing the SWP." (*Id.*)

44

The court-approved settlement agreement in *Planning and Conservation League* recognizes DWR's duty as "the State agency responsible for administration and operation of the SWP," as well as its continuing obligation to comply with applicable requirements of CEQA and the Water Code. (Settlement Agreement, Section X.B.) The transfer guidelines disclosed to contractors under the settlement agreement also recognize the continuing need to comply with all existing legal requirements, including CEQA, and to honor the lead agency principles identified in the Third District's decision in the Monterey Amendments case (see http://ceres.ca.gov/ceqa/cases/2000/PCLvDWR-2000.html).

These principles apply clearly to the proposed permanent transfers of the Table A amounts referenced in the state project contracts, which require DWR's approval and presuppose the application of Monterey. They also concededly require changes in the amount of supplies available to several water agencies, the location and timing of project deliveries, and changed utilization of the project's conveyance and storage facilities. The transfers, which may require the fallowing of farmland in agricultural areas outside the jurisdiction of CLWA and are associated with proposed annexations linked to some of the more controversial development projects in California, demand the statewide authority and experience that only DWR can provide.

Improper Hypothetical Assessment of Non-Monterey Transfer

45

Lastly, Castaic's hypothetical "non-Monterey" analysis of the transfers in the Draft EIR cannot substitute for DWR's new assessment of the Monterey changes. In *Friends*, Castaic unsuccessfully attempted to portray its transfer EIR as capable of standing alone, outside the Monterey Amendments program. Although transfers were available under Article 41 of the pre-Monterey State Water Project contracts subject to express DWR approval, DWR has neither reviewed nor conferred approval on the present transfer under Article 41. Moreover, it is highly speculative whether agriculture-to-urban transfers such as the 41,000 acre foot transfer would even have taken place without the Monterey Amendments, since those Table A amounts would have been subject to "agriculture first" cutbacks under pre-Monterey article 18(a). Read in context, such maneuvers would amount to little more than the "straw man" argument considered and rejected in the *Friends* appeal. (95 Cal.App. 4th at p. 1387.)

SUBSTANTIVE ISSUES

Mischaracterization of Settlement Agreement

The instant Draft EIR, includes glaring errors. A piecemeal and startlingly inaccurate description of the Monterey case Settlement Agreement (ES 2-4) fails even to inform the reader that DWR's statewide review of the "Monterey Plus" project could affect the future of this transfer or of the Monterey Amendments themselves. 46

The "Settlement Agreement underscores the non-finality of the 41,000 acre-feet transfer and the need for DWR's statewide review. For example: 47

- Section III.D refers to a list of transfers listed in attachment E to the agreement, which the settling parties, without specifically endorsing or opposing them, recognize as "final" and agree not to challenge. This transfer is *not* included in that list.

- Further evidence of the non-finality of the Castaic transfer is that section III.E singles out this transfer for a special acknowledgment recognizing that it is the subject of pending litigation in this Court.[1]

- Section III.C.4 recognizes DWR's commitment to provide in its forthcoming statewide programmatic EIR an "[a]nalysis of the potential environmental effects" relating to "the Kern-Castaic Transfer," identifying it as one of the actions "that relate to the potential environmental impacts of approving the Monterey Amendments."

DWR has recently confirmed that this transfer remains subject to the Settlement Agreement and its future "Monterey Plus" EIR. As DWR Director Lester Snow wrote on June 17, 2004 to *Friends* case lead counsel 48

[1] The Draft EIR erroneously attempts to recast this provision as a "specific exclusion" of this transfer from "any prohibitions against transfers of Table A amounts by the Settlement Agreement." That is simply wrong. Section III.E recognizes that this transfer is "subject to pending litigation in the Los Angeles Superior Court following remand from the Second District Court of Appeal." It reflects a recognition that "jurisdiction with respect to that litigation should remain in the [Los Angeles] court," and the settling parties' concurrence that "nothing in this settlement agreement is intended to predispose the remedies or other actions that may occur in that pending litigation."

Alyse Lazar, "DWR's treatment of the transfer of Table A amounts from Kern County Water Agency to Castaic Lake Water Agency will be governed by the Settlement Agreement. As provided in Paragraph IIIC4 of the Settlement Agreement, the EIR will include an "analysis of the potential environmental impacts relating to (a) the Attachment E transfers, and (b) the Kern-Castaic Transfer, in each case as actions that relate to the potential environmental impacts approving the Monterey Amendments." Section 1(0) of the Settlement Agreement defines the "Kern-Castaic Transfer" as "the transfer of 41,000 AF of water from Kern County Water Agency to the Castaic Lake Water Agency, approved by DWR on March 31, 1999." DWR has not completed any draft or final analysis regarding these transfers." Given both the required state leadership on an ongoing Tier 1 environmental study and the pending litigation, the future of the Castaic transfer and, indeed, the broader Monterey Amendments, cannot be assumed. 48

The Draft EIR's assertion that the Settlement Agreement "did not change the substance of the Monterey Amendments" is also misleading. Although those amendments are part of the "Monterey Plus" project, the agreement also eliminates misleading references to "entitlements" from the state contracts and adds a new provision to the contracts imposing water reporting requirements. The agreement also imposes a host of other substantive changes in State Water Project operation that should be described in the Final EIR. 49

Faulty Assessment of the No Project and Project Alternatives

Castaic's refusal to await DWR's "Monterey Plus" EIR would fatally compromise its ability to identify alternatives to the proposed transfer that might maximize its benefits and minimize its environmental impacts statewide prior to rendering the transfer a *fait accompli*. DWR's EIR will programmatically address Castaic's transfer in the context of statewide contract amendments. A major issue requiring assessment in that document will be the possible *alternative* dispositions of the 41,000 acre feet of Table A amounts to serve other uses. To list several possible examples, the alternative uses subject to statewide analysis might include ecological restoration, urban infill development in Los Angeles or San Diego, and relief from cutbacks of Colorado River deliveries in excess of the California's 4.4 million acre-feet in annual entitlement. (See *Arizona v. California* (1964) 376 U.S. 340 (Colorado River); fn. 7, *supra* p. 16).) In short, legally adequate assessment of these issues under CEQA will require 50

DWR's "statewide perspective" rather than the provincial experience of a local water agency, and demands recognition that this transfer is an overall part of the Monterey program. (*Friends I*, 95 Cal.App.4th at p. 1384.) 50

Faulty Assessment of Water Reliability

The Draft EIR's water supply assessment (especially in sections 3.15 and Appendix D) make highly problematic assumptions about state water reliability, as well as the availability of "surplus" water under Article 21 of the state project contracts. DWR's record of deliveries to contractors under the SWP figured centrally in the Third District's conclusion that the 1995 EIR must be set aside. (See *PCL v. DWR*, 83 Cal. App. 4th at 908 (noting the "huge gap between what is promised and what can be delivered" and that "actual, reliable water supply" is "in the vicinity of 2 to 2.5 MAF of water annually" rather than the 4.23 MAF of Table A "entitlements"); 83 Cal. App. 4th at 913 (average actual deliveries under the SWP from 1980-1993 "were around 2.0 MAF"). A frank assessment of DWR's record of deliveries is essential to a wide variety of issues addressed in the EIR, including the no project alternative as well as the assessment of hydrologic impacts, land use and planning impacts, growth-inducing impacts, and cumulative impacts. Anticipating the importance of this issue, the Monterey Settlement Agreement required periodic SWP reporting on the reliability of SWP deliveries. 51a 51b 51c

The Draft EIR uses dubious modeling assumptions to claim an average of annual deliveries exceeding the historical record by approximately a million acre-feet. (See DEIR, 3.15-7.) In part, Castaic's EIR relies upon dated studies employing an outmoded model (DWRSIM). To move beyond DWRSIM's obvious deficiencies, the Draft EIR also makes unwarranted extrapolations from DWR's 2003 reliability report. 51d 51e 51f

That report has faced significant controversy regarding its overall conclusions and the computer modeling that underpins its reliability projections. For instance, the reliability report constructs delivery probability charts for the SWP for two years, 2001 and 2021. As noted by several commenters, the median delivery identified in the report (3.297 MAF) is on the order of 50% greater than the actual record of historic deliveries to the SWP as reported by DWR. A detailed analysis by Dennis O'Connor for the California Research Bureau, referenced in the comment 51g

letter of Senator Machado,[2] indicates that the draft reliability report provides no credible explanation for this disparity. O'Connor's analysis concludes that among other problems, the results are inconsistent with previous estimates and models, recent deliveries were lower than the modeled 2001 conditions, and 2021 does not reflect any growth in upstream consumptive use. His assessment also observes that CALSIM II is not calibrated or otherwise verified, and that the draft reliability report does not use the CALSIM II model as designed. Because the draft reliability report appears to overstate the supply reliability of the SWP, O'Connor's analysis warns that DWR's assessments of reliability should not replace the "paper water" problem with a new, simulation-based "cyber water" problem. Other comment letters, notably those of Robert C. Wilkinson, Peter Gleick, and Arve Sjovold, reach similar conclusions. (Please see http://swpdelivery.water.ca.gov/ and comments submitted regarding the instant EIR by Arve Sjovold.) 51g

Controversy over the reliability report, on which this EIR relies, led to review of CALSIM II modeling by an External Review Panel including some of the world's leading experts on water resource systems. Their report, "Strategic Review of CALSIM II and its Use for Water Planning, Management, and Operations in Central California" was released on December 4, 2003. The Panel raised serious concerns regarding the application of the model to predicting reliable deliveries, especially as those deliveries related to particular contractors. Many of the Panel findings agree with concerns we have articulated throughout the Monterey EIR process. Notably, the Panel found that: 51h

- "Examination of the report "CALSIM II Simulation of Historical SWP/CVP Operations,' DWR (2003) indicates that the current formulation of CALSIM II: Overestimates water deliveries to SWP and CVP contractors..." (p. 11)
- "Most successful applications of optimization [CALSIM's type of computer model] ...have calibrated their objective functions...so that the model results correspond to what actually happens or would happen under a particular hydrologic and demand scenario...It does not appear that such a calibration of the objective function weights in CALSIM has yet been completed." (p. 4)

[2] See Appendix E page E-94 at http://swpdelivery.water.ca.gov/SWP%20Delivery%20Reliability.final.2002.pdf.

- "...currently many users are not sure of the accuracy of the results. A sensitivity and uncertainty prediction capability and analysis is needed" (p. 8)
- "In our opinion, CALSIM II has not yet been calibrated or validated for making absolute predictions values." (p. 9)
- Regardless of how possible it is to match the model closely with observed behavior, statistics on the accuracy of the calibration run should be supplied to users to enable them to gauge the likely errors involved with using the model output. (page 9)
- In CALSIM II, "Groundwater resources are assumed infinite, i.e., there is no upper limit to groundwater pumping." (p. 8)
- "Realistic upper bounds to pumping from any of the aquifers represented in the model need to be developed and implemented." (p. 27)
- "In general, the level of representation of groundwater in CALSIM II is not reasonable from the point of view of the reviewers." (p. 27)
- "In many cases, it appears that water use and other hydrologic data inputs to CALSIM II are based on data collection and analyses that took place during the 1960's when DWRSIM and PROSIM were being constructed. It is important to ensure that data used for CALSIM II are up-to-date and consistent with the best current information." (p. 20).
- In general, it appears that the developers of CALSIM II do not have a clear idea of how to define the scope of CALSIM II use and many of its applications are evolving in a reactionary manner. Model developers should identify clearly the desired uses for CALSIM II and then determine acceptable approaches for satisfying those desires. Developers should seek to improve data accuracy and overcome unrealistic assumptions to improve the confidence in model results. (page 25)

51h

Furthermore, as numerous CEQA cases have consistently held, local agencies such as CLWA have an independent responsibility to adequately assess reliability. Castaic therefore, and cannot rest its analysis solely on its old DWRSIM studies and the DWR Reliability Report.

52

Faulty Assessment of Growth-Inducing Impacts

Without adequate review, the transfer would place available water in one of the places in California most likely to promote urban sprawl and destroy environmental habitat The Draft EIR's growth inducement section (Chapter 4) fails to appreciate the significance of this transfer as a linchpin of sprawl development. Following the *PCL* decision and through the Monterey EIR, the state has a responsibility and, as noted above is the only entity with the requisite resources and purview, to determine the environmental impacts, particularly including induced growth impacts, of transfers such as the 41,000 acre-foot transfer. Local agency analysis of these impacts prior to the Tier I Monterey EIR impermissibly and imprudently ignore the state's role in considering alternatives to that transfer which would, for example, meet existing shortfalls in developed Southern California dependent on diminishing Colorado River supplies, while avoiding "dumb growth" in the undeveloped frontier at the Los Angeles-Kern County border. 53

Rather than squarely confronting the scope and mitigation of growth inducement, the Draft EIR improperly defers the issue to subsequent decisions of local agencies on individual projects. A "chicken and egg" problem emerges here. As reflected in PCL's comment letters on specific projects, local agencies are relying upon *Castaic* to inform them of the reliable water available to support specific proposed projects ranging in scope from small developments to Newhall Ranch. The Draft EIR is entirely speculative in its assumption that project-related growth can be mitigated to insignificance. This issue cannot be credibly reviewed in isolation from the statewide Monterey EIR. 54

Your consideration of these comments is greatly appreciated.

Sincerely,

Sage Sweetwood
President, PCL

Naomi Kovacs, MPA
Executive Director, CPA

LETTER 4

STATE OF CALIFORNIA -- THE RESOURCES AGENCY ARNOLD SCHWARZENEGGER, Governor
DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
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JUN 17 2004

Alyse M. Lazar, Esq.
3075 East Thousand Oaks Boulevard, Suite 100
Westlake Village, California 91362

Dear Ms. Lazar:

In response to your letter of May 18, 2004, the Department of Water Resources (DWR) is preparing an Environmental Impact Report (EIR) on the Monterey Amendments and the Settlement Agreement resulting from the Court of Appeal decision in *Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892.

DWR's treatment of the transfer of Table A amounts from Kern Country Water Agency to Castaic Lake Water Agency will be governed by the Settlement Agreement. As provided in Paragraph III.C.4 of the Settlement Agreement, the EIR will include an "analysis of the potential environmental impacts relating to (a) the Attachment E transfers, and (b) the Kern-Castaic Transfer, in each case as actions that relate to the potential environmental impacts of approving the Monterey Amendments." Section 1(O) of the Settlement Agreement defines the "Kern-Castaic Transfer" as "the transfer of 41,000 acre feet of water from Kern Country Water Agency to the Castaic Lake Water Agency, approved by DWR on March 31, 1999." DWR has not completed any draft or final analysis regarding these transfers. Attached is an estimated schedule for completion of the EIR.

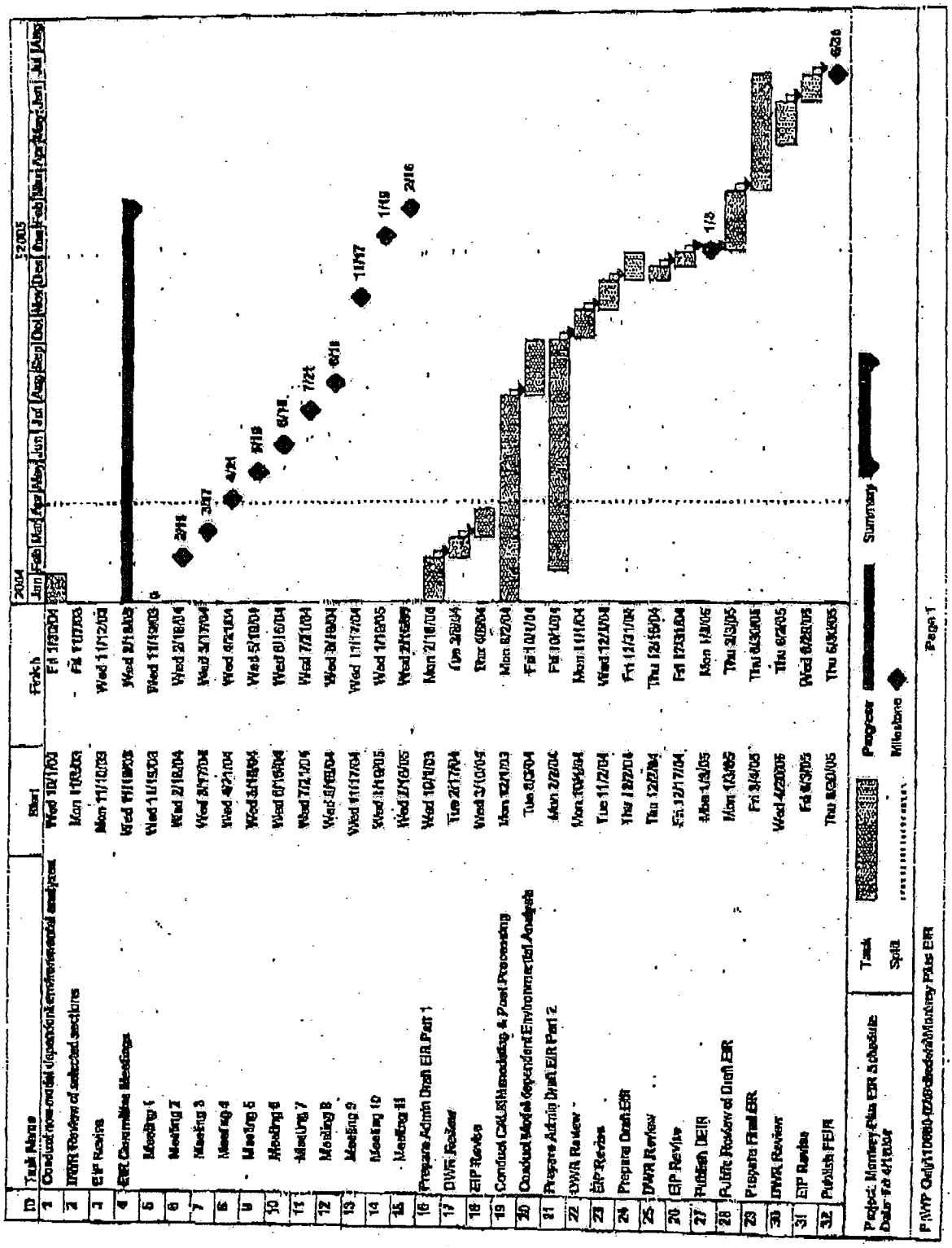
The Settlement Agreement (Section III.E) also provides "with respect to Section III.(C)(4)(b) regarding the Kern-Castaic Transfer, the Parties recognize that such water transfer is subject to pending litigation. The Parties agree that jurisdiction with respect to that litigation should remain in that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation."

If you would like further information regarding the EIR on the Monterey Amendments and the Settlement Agreement, please contact Delores Brown at (916) 227-2407.

Sincerely,

for Lester A. Snow
Director

Attachment


2004
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LETTER 4

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May 18, 2004

Lester Snow, Director
Department of Water Resources
Room 1115-1
P.O. Box 942836
Sacramento, California 94236

RE: New Monterey Agreement EIR

Dear Director Snow:

Pursuant to the Court decision in *Planning & Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892 (hereafter "*PCL*"), the Department of Water Resources is required to prepare a new Environmental Impact Report regarding all aspects of the Monterey Amendments. I understand that you will be overseeing this process.

The Settlement Agreement that was entered into between all of the parties to the *PCL* case on May 5, 2003 set forth various requirements for the EIR. According to Attachment E-1 of this Settlement Agreement, the parties specifically excluded the 41,000 afy entitlements purchased by Castaic Lake Water Agency ("CLWA") emanating from the Monterey Amendments from the list of final transfers. It is therefore my understanding that your office will be evaluating the environmental impacts of this 41,000 afy transfer as part of the Environmental Impact Report for your project (the Monterey Amendments Project.) In fact, page 11, paragraphs III C.4 of the Settlement Agreement mandates DWR to analyze the potential environmental effects relating to CLWA's project ("the Kern-Castaic Transfer").

As you may also be aware, the EIR prepared by CLWA for the 41,000 afy transfer was decertified by the Los Angeles Superior Court on November 1, 2002 in *Friends of the Santa Clara River v. Castaic Lake Water Agency*, Los Angeles County Superior Court Case No. BS 056954. In order for CLWA's new EIR to be legally sufficient and in conformance with the appellate court's decision, it must contain an analysis of the potential environmental effects of the Kern-Castaic Transfer on the entities that have and will continue to lose this 41,000 afy source of water due to the transfer as well as the impacts on the State Water Project ("SWP") system resulting from the movement of this water from its source in Kern County to Santa Clarita. Logically and in conformance with CEQA, both DWR's EIR and CLWA's EIR must contain an analysis of the impacts from this loss of water upon Kern County agricultural users as well as all others affected by the transfer.

I currently represent Friends of the Santa Clara River in the *Friends of the Santa Clara River v. Castaic Lake Water Agency* litigation. In the Judgment Granting Peremptory Writ of Mandate in the Friends' case, the Court ordered that it "retains jurisdiction until respondent Castaic Lake Water Agency certifies an Environmental Impact Report that complies with the California Environmental

Quality Act and is consistent with the views expressed by the Court of Appeal Opinion filed January 10, 2002, Case No. B 145283."

For these reasons, I am requesting that you provide me with a copy of any analysis performed to date by DWR regarding the potential environmental impacts of the Kern-Castaic transfer, whether in draft or final form.

Additionally, please advise me of the procedural steps that DWR will take before making a determination whether or not to approve the Kern-Castaic transfer as a "final" transfer and the criteria that will be utilized for making this determination. If there is a proposed schedule for the completion of the Monterey Amendments EIR and/or for these procedural steps for determining whether or not to approve the Kern-Castaic transfer as a long-term transfer, please provide me with a copy of same.

I would appreciate receiving this information from you by May 28, 2004. If you have questions regarding the above or would like to discuss the matter, please call me at (805) 496-5390. Thank you for your anticipated assistance. I look forward to hearing from you.

Very truly yours,

Alyse M. Lazar

cc: Delores Brown

LETTER 4

Public Citizen

Buyers Up • Congress Watch • Critical Mass • Global Trade Watch • Health Research Group • Litigation Group
Joan Claybrook, President

August 16, 2004

Castaic Lake Water Agency
Attn: Marylou Cotton
27234 Bouquet Canyon Rd.
Saugus, Ca. 91350
Fax 661 297-1611

Re: 41,000 Acre Foot Water Transfer SCH# 1998041127

Dear Ms. Cotton:

Public Citizen, a consumer rights organization that has been working to strengthen public oversight over water, urges Castaic Lake Water Agency to refrain from conducting the environmental review of permanent transfers of State Water Project Table Amounts. We believe that is unlawful for CLWA to be the lead agency under CEQA for this project because the Department of Water Resources is currently conducting its statewide review of the "Monterey Plus" Project. 55

Please refer to the Sierra Club's August 15 letter for further reasoning why the DWR must be the lead agency.

We request that this document be withdrawn and that the document not be re-submitted for circulation until the Monterey Agreement EIR is completed and certified. 56

Sincerely,

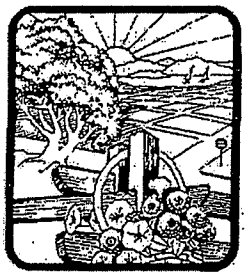
Juliette Beck

Juliette Beck
Director, Water for All California

1615 Broadway, Ninth Floor • Oakland, CA 94612 • (510) 663-0888 • www.citizen.org

LETTER 4

SCOPE
Santa Clarita Organization for Planning the Environment
TO PROMOTE, PROTECT AND PRESERVE THE ENVIRONMENT, ECOLOGY AND QUALITY OF LIFE IN THE SANTA CLARITA VALLEY
POST OFFICE BOX 1182, CANYON COUNTRY, CA 91386



8-10-04

Castaic Lake Water Agency
Attn: DEIR Comments
27234 Bouquet Canyon Rd.
Saugus, Ca. 91350
Fax 661 297-1611

08-16-2004 P01:17

Re: 41,000 Acre Foot Water Transfer SCH# 1998041127

Dear Sirs:

As we stated in our NOP comments, we believe that Dept. of Water Resources must be the lead agency for the following reasons 57

- The published appellate decision in *PCL v. DWR*, 2000 found that the Dept, of Water Resources should be the lead agency for this review.
- DWR is best suited to ensure that widespread notification of interested parties occur.
- DWR is best suited to recognize environmental impacts that might be incurred to a wide spread area of the state as a result of this water transfer and to properly asses such impacts.
- DWR, in its capacity as operations manager of the SWP, will be acquainted with other state projects that would affect or be affected by this transfer.

Changes to water quality including increased chlorides, nitrates or other constituents of SWP project water, and how those constituents will affect the new TMDL requirements approved by Regional Water Quality Control Board approved subsequently to the previous EIR, should be discussed and mitigated. Increased pollution from Trihalimethanes in public water supply due to higher percentage of reliance on SWP project water as main source should be disclosed. Trihalamethanes now exceed the new MCL standards after filtration by CLWA due to the filtration method currently used. 58

This document relies on transfers to the Semi-Tropic Water Banking project for supply reliability, but does not address potential water quality issues that could preclude ground water from being pumped back into the aqueduct. This is an issue that would be addressed if DWR were the lead agency. We incorporate by reference all contracts between, DWR, CLWA, and Semitropic, particularly the pumpback agreements and sections of the EIR indicating high arsenic and radon levels in the Semi-tropic ground water basin. There is no up to date water quality data from the ground water in the Semi-Tropic area included in this report. If the Semi-tropic Water Storage program is going to be relied upon to increase water supply reliability, then water quality data should be made available for review. 59

In conclusion, we request that this document be withdrawn, that the document not be re-submitted for circulation until the Monterey Agreement EIR is completed and certified, and that all parties whose ground water may be impacted are properly notified when re-circulation occurs. 60

Sincerely,
Pat Saletore
Pat Saletore

LETTER 4

SIERRA CLUB
FOUNDED 1892
Angeles Chapter

3435 Wilshire Boulevard
Suite 320
Los Angeles, CA 90010-1904

08-16-2004 P01:17 (213) 387-4287 phone
(213) 387-5383 fax
www.angeles.sierraclub.org

8-10-04

Castaic Lake Water Agency
Attn: Marylou Cotton
27234 Bouquet Canyon Rd.
Saugus, Ca. 91350
Fax 661 297-1611

Re: 41,000 Acre Foot Water Transfer SCH# 1998041127

Dear Ms. Cotton:

In the notice of preparation for this project, the Castaic Lake Water Agency announced its intention to move forward with its own separate environmental review of permanent transfers of State Water Project Table A Amounts. The Sierra Club and others commented at that time that such a procedure would violate state law, several court decisions and the Monterey Agreement Settlement to which CLWA is a signatory. 61

As you are aware, in the Monterey settlement agreement, which Castaic signed, the court-identified lead agency, the Department of Water Resources. DWR is already conducting a statewide environmental review of a new "Monterey Plus" project. We strongly urge Castaic to refrain from moving forward with this separate project review, which is premature and likely to operate at cross-purposes with DWR's statewide review.

Moreover, even if Castaic continues to proceed now with its own separate EIR on this transfer, it lacks the institutional authority and statewide accountability to serve as CEQA lead agency under the *Planning and Conservation League* decision. 62

The Sierra Club re-iterates the following legal issues put forward in the January 2004 comment letter by the Planning and Conservation League. These issues were either ignored or inadequately addressed in the Environmental Impact Report now under review: 63

The "Monterey Amendments" Problem

Under *Planning and Conservation League* and two sequel decisions addressing Castaic's transfer of Table A amounts, "tiering" or otherwise relying on that EIR would render the approval decision vulnerable to CEQA challenge. However, any attempts by Castaic to conduct a separate Monterey review in advance of DWR's, or to rely on its own hypothetical non-Monterey analysis, would shift rather than solve this fundamental CEQA problem.

In *Planning and Conservation League*, the Third District Court of Appeal found that Central Coast Water Agency's 1995 EIR "failed to meet the most important purpose of CEQA, to fully inform the decision makers and the public of the environmental impacts of the choices before them." (83 Cal.App.4th at 920.) CCWA improperly served as lead agency in place of DWR and prejudicially failed to analyze the enforcement of the pre-Monterey permanent shortage provision, article 18(b), prior to its elimination from the State Water Project contracts. The appellate court found it unnecessary to adjudicate the other CEQA deficiencies identified by the Monterey plaintiffs after analyzing the defects in the lead agency selection and no project assessment, 89

observing that "DWR, with its expertise on the statewide impacts of water transfers, may choose to address those issues in a completely different and more comprehensive manner." (*Id.*) The court also noted that the deficiencies in the 1995 EIR might be related to the "provincial experience" of CCWA. (*Id.*) 63

In *Friends of the Santa Clara River v. Castaic Lake Water Agency* (2002) 95 Cal.App.4th 1373, the Second District Court of Appeal ordered the decertification of an EIR prepared by Castaic, supporting its Monterey Amendments-based attempt to permanently acquire 41,000 acre-feet of State Water Project entitlements (now "Table A" amounts) from the Kern County Water Agency and its Wheeler Ridge member district. The appellate court found that Castaic's EIR violated CEQA by "tiering" from the invalidated Monterey EIR. This ruling involved precisely the same transfer that Castaic now attempts to address in its separate 41,000 NOP. That piecemeal approach, however, is in apparent defiance of the expectation of the court of the appeal in the *Friends* case that Castaic would await "action by the DWR complying with the *PCL* decision." (95 Cal.App.4th at p. 1388.)

Another recent Second District appellate decision, *Santa Clarita Organization for Planning and the Environment (SCOPE) v, County of Los Angeles* (2003) 106 Cal.App.4th 715, critically addressed Castaic's characterization of the 41,000 acre-feet transfer. In that case, the County of Los Angeles violated CEQA in its review of the West Creek development project that erroneously assumed that 100 per cent of Castaic's purported 41,000 acre-feet would be available in wet years and 50 per cent in drought years. Drawing on *Planning and Conservation League's* assessment of the historic disparity between Table A amounts and deliverable water, the court concluded that the EIR failed to undertake a "serious and detailed analysis" of State Water Project supplies, and observed that "[t]he dream of water entitlements for the incomplete State Water Project is no substitute for the reality of actual water the SWP can deliver." (*Id.* at pp. 723, 717.)

The EIR appears to confuse the legitimacy of Castaic's separate review with the distinct issue of the interim operation of the 41,000 acre-feet transfer pending further environmental review. (See Public Resources Code section 21168.9; 41,000 NOP p. 1.) The trial court did not enjoin interim operation, but left the issue open to further demonstrations that could lead to interim prohibition. Various cases addressing the interim use of this water for new projects prior to the completion of CEQA review are now working their way through the Court system.

The 41,000 acre-feet transfer is on not on the list of Table A amount transfers recognized as "final" in the Monterey Amendments settlement agreement (Attachment E). Such transfers cannot proceed without new environmental analysis satisfying CEQA. (Monterey Settlement Agreement, section VII.A.) That settlement agreement, while recognizing that the remedial issue remains before the Second District, also requires DWR's "Monterey Plus" EIR to analyze the 41,000 acre-feet transfer, as well as other transfers facilitated by Monterey Amendments provisions, such as other agriculture-to-urban transfers referenced in Article 53 of those amendments. (Section II.C.4.)

If Castaic rushes to finality by continuing its separate environmental reviews at this stage, without the benefit of DWR's statewide "Monterey Plus" EIR, its perspective would mirror the "provincial experience" criticized in the *Planning and Conservation League* decision. (83 Cal. App. 3d at 918.) Such an attempt would also create a substantial risk of final decisions based on local analysis that may well prove inconsistent with DWR's "Monterey Plus" EIR.

The "Lead Agency" Problem 64

If Castaic continues with this separate environmental review without awaiting DWR's assessment in the "Monterey Plus" EIR, it would violate CEQA's lead agency requirement based upon the well-established standards set forth in *Planning and Conservation League v. Department of Water Resources*. The court in that case could hardly have been clearer that DWR is the "state agency charged with the statewide responsibility to build, maintain, and operate" the State Water Project. (*Id.* at p. 906.; see also Wat. Code, §12930, *et seq.*) Finding that DWR was the only entity with the requisite statewide perspective and expertise to serve as lead agency, the court found it "incongruous to assert that any of the regional contractors" could "assume DWR's principal responsibility for managing the SWP." (*Id.*)

Similarly, the court-approved settlement agreement in *Planning and Conservation League* expressly recognizes DWR's duty as "the State agency responsible for administration and operation of the SWP," as well as its continuing obligation to comply with applicable requirements of CEQA and the Water Code. (Agreement, Section X.B.) The transfer guidelines disclosed to contractors under the settlement agreement also recognize the continuing need to comply with all existing legal requirements, including CEQA, and to honor the lead agency principles identified in the Third District's decision in the Monterey Amendments case. (Agreement, Attachment C.)

These principles apply clearly to the proposed permanent transfers of the Table A amounts referenced in the state project contracts, which require DWR's approval and presuppose the application of Monterey. They also concededly require changes in the amount of supplies available to several water agencies, the "location and timing" of project deliveries, and changed utilization of the project's "conveyance and storage facilities." The transfers, which may require the fallowing of farmland in agricultural areas and are associated with proposed annexations linked to some of the more controversial development projects in California, demand the statewide authority and experience that only DWR can provide.

Neither the summary references to other project EIRs nor a hypothetical "non-Monterey" analysis of the transfers can substitute for DWR's new assessment of the Monterey changes based on its statewide expertise and authority. For example, although transfers with DWR approval were available under Article 41 of the pre-Monterey State Water Project contracts, it is highly speculative whether agriculture-to-urban transfers such as this proposal would even have taken place without the Monterey Amendments, since those Table A amounts would have been subject to "agriculture first" cutbacks under pre-Monterey article 18(a). Read in context, such maneuvers would amount to little more than the "straw man" argument considered and rejected in the *Friends* appeal. (95 Cal.App. 4th at p. 1387.)

Lastly, we note that the same General Manager of Central Coast Water Agency, Dan Masnada, under whose guidance, CCWA proceeded in violation of CEQA as the wrong lead agency, is now the general manager of Castaic Lake Water Agency. In that capacity, he is once again directing his agency with full knowledge of the consequences, to proceed as lead agency in violation of the law.

Failure to notify all interested parties 65

Communities, local organizations and agencies that would have the most knowledge of impacts surrounding these statewide issues, the accuracy of the environmental disclosure and the viability of proposed mitigation, were not notified. Failure to notice and receive input from interested parties deprives the decision-makers of a full disclosure of all impacts and deprives the affected community or public agency of its right to provide information during the public process. The

91

DWR would be better equipped to ensure that all parties are properly noticed and involved in the project review. 65

Issues not addressed by the Environmental document 66

This EIR purports to analysis statewide issues, including but not limited to, impacts to agricultural lands, sensitive species, the accuracy of the DWR CalSim model, air quality, etc., but since the EIR was not circulated on a statewide basis, the public and agencies from other areas may not have been informed of the release of the document, and thus did not have the opportunity to review its accuracy.

Inpacts to DWR facilities - Castaic Lake Water Agency cannot presume to be the lead agency for State Water Project facilities. Nor does it discuss the ability of the State Water Project facilities to accommodate this huge transfer now that the Metropolitan Water District will be requiring delivery of a greater amount, if not all of its Tile A amount. Adequacy of facilities such as the Banks pumping station, effects of the ESA and CalFED Record of Decision, capacity in the San Luis Reservoir in light of recent sharing agreements are not discussed. 67 68

Impacts to Agricultural Resources - In a letter dated 5-19-98 from the Planning Department of Kern County to the original Notice of Preparation for this project, a request was made to ensure that the transfer of 130,000 acre feet from the Monterey agreement was not exceeded. This Agency requested that acknowledgment of previous actions be made in the DEIR and that cumulative impacts of SWP capacity rights be analyzed. We would like to re-state that request for this document and include that letter which you have in your possession by reference into these comments. They also requested an analysis of the impacts on the land within the WRMWSD in Kern County including agricultural Preserve Map 204, 220 and 220No. 4-12-19. Additionally, they requested a table showing "the ultimate potential amount of capacity that could be transferred how many acre feet would be converted to M&I allotment for urban users and as a condition of transfer, if any land in WRMWSD would be permanently fallowed, retired or detached from the District". This information is important because it allows the decision-makers to access the impacts that might be caused to agricultural land or the increase in pumping of groundwater that might be caused by this project. 69 70

The EIR includes a report entitled "Effects on Agricultural Production ...etc." found in Appendix C. We note that this report, included for circulation in the DEIR is labeled as *DRAFT* report. We wonder why the Final Report was not included for circulation and request that CLWA state how they can base their assumptions on a draft report. 71

A chart found on page 15 of this report is apparently presented in response to the Kern Agency request. It appears to show water needs already in excess of WRMWSD Title A amount even using 100% of the water entitlement, a situation that the Court has already found not to be tenable (see foot note 7, *PCL v DWR*, 2000). This chart is footnoted with the statement that it "Assumes supplies available regardless of source." There is no analysis as to whether this transfer will cause fallowing in future drought years, only the statement that it hasn't in the past. There is also no analysis as to whether overdraft is occurring or will occur in the next drought cycle, only a statement that the chart assumes supplies are available without any explanation of the impacts of over-pumping to make them available. There is no chart that shows how much water was used from what sources before the transfer in question and how much water will be needed and how it will be supplied *after the transfer.* 72

The original purpose of the state water project was to provide a supplementary water source so that ground water would not be pumped in excess of sustainable levels. Now it appears that this water transfer will bring about the very situation one sought to avoid. We believe it is imperative that CLWA notify all interested parties in surrounding areas of their intention to make this transfer, and of the possible increased need for ground water pumping if this transfer occurs. Because pumping of ground water sources to replace state water transferred to other areas will have significant impacts on the Public Trust and the viability of farming operations, we reiterate, the DWR should be the lead agency for this document. 73

The closing paragraphs of this report include a rather chilling understatement 74

> ***"In a series of consecutive 'dry years', the unavailability of a proportional share of the SWP contract amount may contribute to a mismatch between water supply and demand."***

Have farmers been notified of this "mismatch"? How much fallowing will this cause, what will be the economic impacts to farmers, laborers and communities? Isn't this exactly the question that everyone has requested that the EIR address? Where is the answer? Given the substantial move away from annual row crops into permanent orchards of fruits, nuts and vineyards that require multiple years of investment (see Table 2 on pg. 6), dry years with insufficient state water will substantially damage these crops. *One should also note the increase in groundwater pumping indicated by this table.*

Flooding and water quality changes - In a letter dated May 21st 1998 also from the previous EIR review, the Ventura County Flood Control Department notes that the NOP correctly identifies downstream flooding from increased effluent flows as a potential significant impact. There should be a discussion of the potential for this impact in the DEIR for the project before you. 75

Changes to water quality including increased chlorides, nitrates or other constituents of SWP project water, and how those constituents will affect the new TMDL requirements approved by Regional Water Quality Control Board approved subsequently to the previous EIR, should be discussed and mitigated. Increased pollution from Trihalimethanes in public water supply due to higher percentage of reliance on SWP project water as main source should be disclosed. (See attached news article). 76

This document purports to address statewide issues, but fails to discuss the impacts of the Bay-Delta water quality standards on this project. Again, this is but another example of why DWR must be the lead agency. 77

This document relies on transfers to the Semi-Topic Water Banking project for supply reliability, but does not address potential water quality issues that could preclude ground water from being pumped back into the aqueduct. This transfer project is currently being litigated. 78

Growth Impacts - In a letter dated May 12th, 1998 from the City of Santa Clarita, the City states that "the DEIR should define current and anticipated water availability for the CLWA service area as compared to the ultimate buildout of the City of Santa Clarita General Plan, and the Santa Clarita Valley Areawide Plan. This information was requested to clearly identify the need for the project, and should be included for the current project. The City's requests for disclosure in the areas of geology, growth inducement and impacts to Kern County ground water and development monitoring system analysis should also be addressed for the current project. 79

In response to this question, the CLWA relies, but pretends not to rely, on the Urban Water Management Plan that is being litigated. The issue under litigation is over-statement of 80 93

water supply, particularly the reliance on the availability of polluted water from wells that are now closed because they exceed the MCL for ammonium perchlorate. The Sierra Club requests that an analysis of the impact of growth in a multiyear drought scenario in the Santa Clarita Valley be conducted as part of this EIR. Santa Clarita is now relying on state water as its primary source of supply (since the ground water is either fully committed or polluted -see attachment). We believe it would be particularly important for decision makers to understand the impacts of the recurrence of the historical SWP worst case scenario when only 13% of the contractors' Title A amounts were available. (See notes attached from presentation to Santa Clarita City Council, June 29, 2004. Transcript to be provided before Final EIR is released.) 80

Sensitive Species - The current project is based on an EIR that does not address impacts to endangered species as a result of the entitlement transfer. Draw down of ground water will result in reduction or elimination of surface water and may occur in both the transferring and receiving agencies (during drought periods when state water is unavailable) as a result of this project. Since species issues were not addressed in the Warm Springs/Maricopa/Belridge EIR, they should be addressed for the proposed project, as its implementation would cause significant impacts. These include impacts to endangered species impacted in both areas including but not limited to the San Joaquin Kit Fox in the WRMWSD and the Unarmored Three-Spine Stickleback in the Castaic Lake Water Agency . The Kit fox could be impacted by drawdown of ground water that impacts surface flows or diversion of surface flows required by lack of state water project supplies. The Stickleback could be affected by increased effluent flows that cause a change in surface water quality (this problem has already been identified as an area of concern by the Regional Water Quality Board) or increased pumping of ground water required to make up for delivery cutbacks during a drought. Impacts and proposed mitigations should be discussed. We note that a section 4d consultation may be required if endangered species will be affected and request that the US Army Corps of Engineers be sent notification of this project since it appears that they have not been so notified. 81

The EIR includes a list of sensitive species in Appendix B, but does not discuss how these species will be affected when substantial over-draft occurs, either due to over-reliance on this SWP water in the Santa Clarita Valley without sufficient back up sources or over-draft in the farming areas due to transferring away to much of their supplemental SWP water supply. 82

Further, it has recently come to our attention that Berenda Mesa has published a draft EIR to withdraw/divert approximately 70,00AF from local streams and ground water sources. Since the transfer of SWP surface water will affect ground water pumping sources, this EIR and its impacts must be included and addressed during the water transfer review process. We therefore believe this document must be included in the review process and incorporate it by reference. 83

Air Quality - The effect of the project on increasing particulate matter from increased or overdraft use of ground water in a PM10 non-attainment zone for this air pollution problem should also be addressed. THE EIR only addressed project specific impacts such as pumping facilities and grading for new pipes. It did not address fugitive dust created by dried up landscapes. CLWA is well aware of the problems created by dust due to draw down of the Owens Lake and its impact on surrounding communities because one of its Directors helped negotiate the settlement on behalf of LADWP. This is an example of an impact that must be anticipated in both the transferring farmlands and the receiving Santa Clarita area. Santa Clarita is already in a non-attainment zone for PM10s as is the Central Valley. Clean Air Act compliance will be necessary. A cut-back in water supply caused by air quality concerns as already occurred for the LA Dept. of Water and Power in the Owens Valley, would be much more appropriately dealt with in the planning process than after new building is already approved based on that water. 84

State Water Reliability - One of the most apparent reasons that the review must await completion of the Monterey "Plus" environmental review is that a new hydrological model "CalSim II" is being proposed for use in evaluating the reliability of water deliveries of the sate project supply. This information is obviously critical to all the above stated issues. There has been substantial criticism of the model (peer review attached). Among other circumstances, the model does not address climate change or levee breaks such as the substantial recent failure in the Jones tract (news article attached). The DWR must complete its environmental review of this issue and resolve discrepancies before reliability factors on which the Castaic EIR is based, can be assumed to be accepted. Again, tiering is based on a DWR document that has not been circulated for review, has not been through the public comment process and has not been certified. 85

Summary 86

We believe that DWR must be the lead agency for the following reasons

- The published appellate decision in *PCL v. DWR*, 2000 stated:

  "We agree with the trial court that DWR, not CCWA, has the statutory duty of assessing environmental consequences of projects involving the SWP [State Water Project]." (Pg. 1 of Decision).

  We incorporate this decision by reference into the administrative record.
- DWR is best suited to ensure that widespread notification of interested parties occur.
- DWR is best suited to recognize environmental impacts that might be incurred to a wide spread area of the state as a result of this water transfer and to properly asses such impacts.
- DWR, in its capacity as operations manager of the SWP, will be acquainted with other state projects that would affect or be affected by this transfer.
- CLWA failed to address many issues of statewide concern in this document.

We therefore request that this document be withdrawn, that the document not be re-submitted for circulation until the Monterey Agreement EIR is completed and certified, and that all parties whose ground water may be impacted are properly notified when re-circulation occurs. 87

Sincerely,
Johanna Zetterberg
Conservation Coordinator

Attachments
1. News article on Trihalimethane pollution
2. Excerpt from "Groundwater Modeling Analysis Upper Santa Clara River Basin". Ch2Mhill showing loss of production from perchlorate contaminated wells.
3. Excerpts from reports indicating safe yield of the Santa Clara River and current pumping levels.
4. Notes from Presentation by DWR and the Planning and Conservation League to the City of Santa Clarita on June 29th, 2004.
5. Peer review of CalSim II water model for the state water project
6. News article on the June 2004 levee break in Upper Jones tract from the ACWA newsletter

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Royal Beating — The Angels win their fifth straight and sweep Kansas City. B1

Getting Even — Teen seeks to buy maker of gun that left his a quadriplegic. A9

reatment Taints Val Verde Wate

:yond-threshold levels of ılomethanes found in drinking :r, officials say.

By Matt Levin
IGNAL STAFF WRITER

potentially dangerous of compounds linked to cancer risks and miscarrates have exceeded ble levels in Val Verde's g water, county water officials said Monday.

More than 3,700 customers of Water Works District 36, the water utility that supplies Val Verde, have been drinking beyond-threshold levels of trihalomethanes (TTHMs), chemicals associated with various health problems including liver and kidney failure, bladder and colon cancer and failed pregnancy.

Water district and Environmental Protection Agency officials downplayed the danger and stressed that only a period of "prolonged exposure" of several years could cause serious health problems.

Val Verde water users have been exposed to the high contaminant levels for only three months and should not worry about their water, water district spokeswoman True Pawluk said.

"The water is safe," Pawluk said. "If it was dangerous, we would have taken it off-line immediately."

Water officials discovered the abnormally high levels of the contaminant in early July after conducting a routine test.

Samples revealed a TTHM concentration of 88 parts per billion, above the federal standard of 80 parts per billion.

This is the first time Water Works District 36 has exceeded the legal maximum TTHM concentration after the threshold was lowered in 2001, Pawluk said.

TTHMs are byproducts of the disinfection process used by many State Water Project wholesalers, including the Castaic Lake Water Agency. The chlorine used to kill bacteria and other harmful microorganisms bonds with organic matter present in the state water system, and the resulting toxic compound escapes the treatment plant undetected.

Water Works District 36 supplies only CLWA water to its customers.

CLWA officials said tl to replace chlorine as thi ry disinfection agent 2005. They will inste more costly chloram. does not produce TTHM combined with organic r

"This switch has bee plans for the better part years," CLWA General I Dan Masnada said. "Ess chloramine deals w TTHMs better, and tha

See WATER, >

ying to Beat the Summer Heat

Protecting

Water

Continued from page A1

we're phasing it in."

Other Santa Clarita utilities that purchase water from CLWA are less at risk for a high TTHM concentration because they combine CLWA's state water with local groundwater that is not susceptible to TTHM production.

Water Works District 36 is in negotiation with the Sheriff's Department to share some of the well water from the Pitchess Detention Center in Castaic until CLWA's chlorination process is phased out.

Although most of Val Verde's water would still come from CLWA, the new groundwater would help dilute the concentration of contaminants.

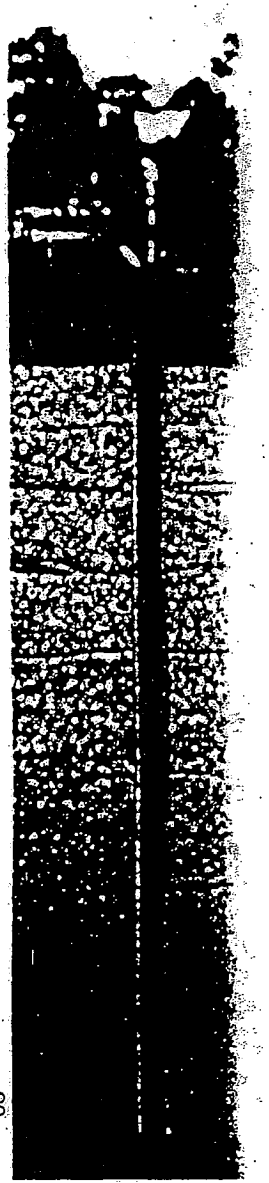
Pawluk said that although TTHM levels may not subside for the next few months, it is unnecessary for residents to take extreme measures such as boiling tap water or purchasing bottled water.

"This doesn't mean that customers will get sick," she said. "It's just an increased chance of getting sick. They (customers) don't need to use bottled water, but they can if they want."

Although most studies conducted on TTHMs concluded that only prolonged consumption leads to higher cancer risks, several studies have found a correlation between consumption during the first trimester of pregnancy and an increased likelihood of miscarriage.

A 1988 California study found a miscarriage rate of 15.7 percent for women who drank five or more glasses of cold water containing more than 75 parts per billion TTHMs, compared to a miscarriage rate of 9.5 percent for women with relatively low exposure.

> 'This doesn't mean that customers will get sick. It's just an increased chance of getting sick. They (customers) don't need to use bottled water, but they can if they want.'
>
> — True Pawluk, Spokeswoman Water Works District 36



Groundwater Modeling Analysis
Upper Santa Clara River Basin

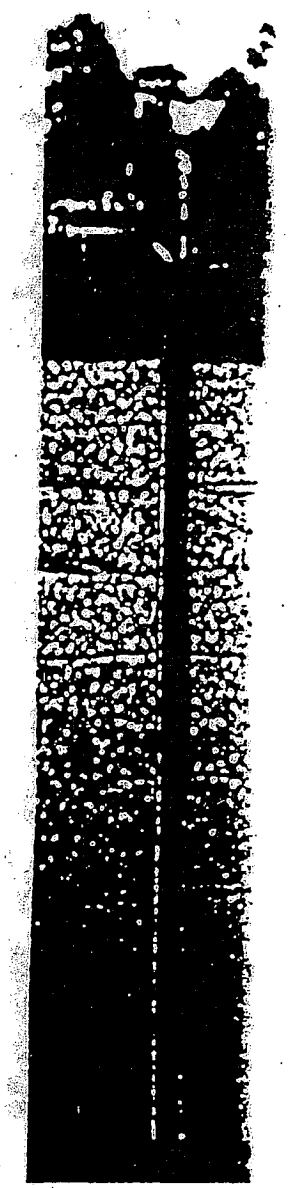
Restoring Impacted Water Supplies Near Whittaker-Bermite

presented by

John Porcello/CH2M HILL

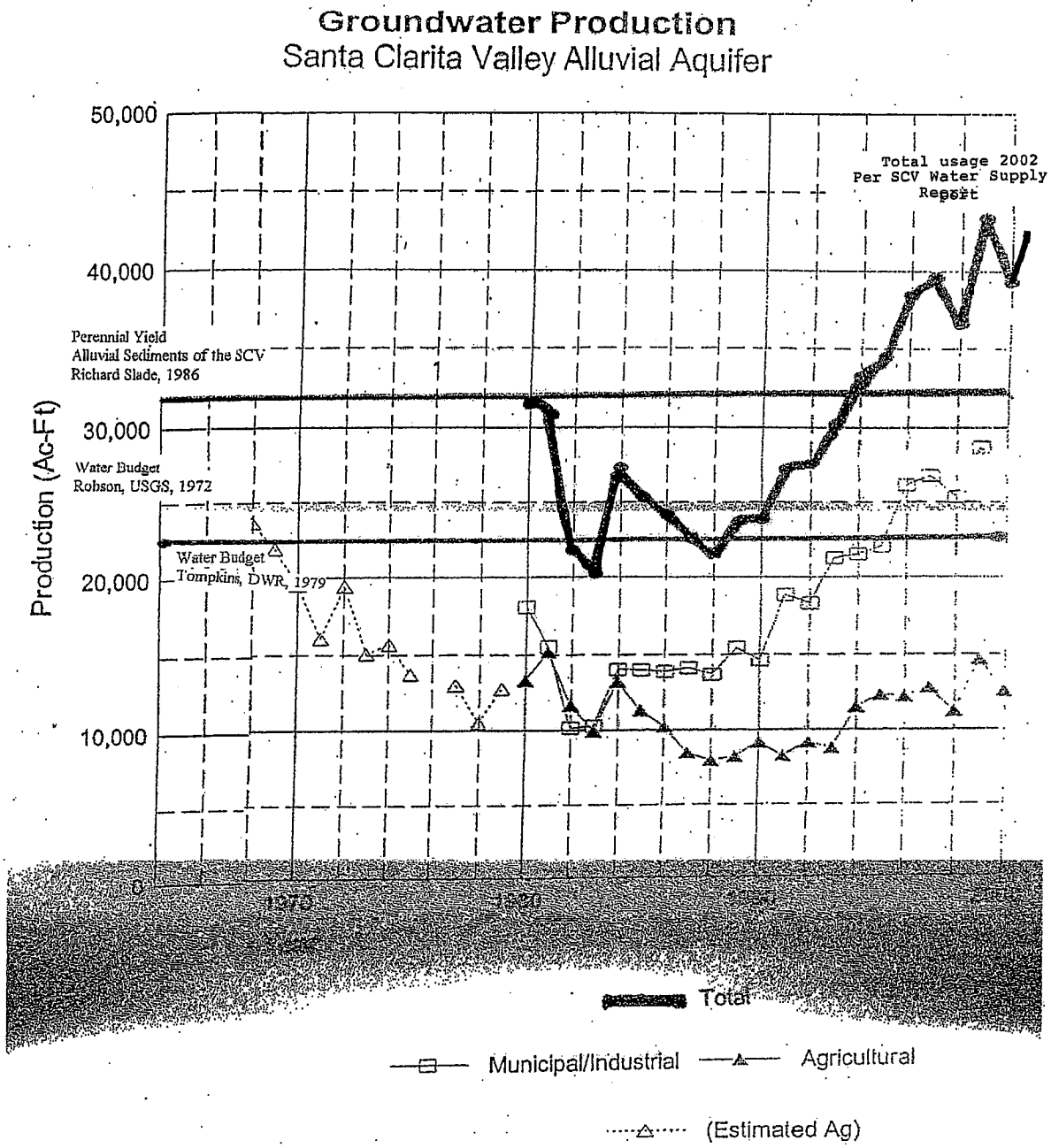
December 10, 2003

99



Objectives and Methods

- Evaluate pumping strategies for impacted wells that meet specific goals
  - Restoring lost water supplies
    - Saugus: 4,000 AF/yr
    - Alluvium: 700-1,000 AF/yr
  - Protecting downgradient wells
- Develop and apply groundwater flow model



FROM: Figure II-2

Santa Clarita Valley Water [illegible]
2000

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VOLUME I — REPORT TEXT

HYDROGEOLOGIC INVESTIGATION
PERENNIAL YIELD
and
ARTIFICIAL RECHARGE POTENTIAL
of the
ALLUVIAL SEDIMENTS
in the
SANTA CLARITA RIVER VALLEY
of
LOS ANGELES COUNTY, CALIFORNIA

FOR
UPPER SANTA CLARA WATER COMMITTEE
MEMBERS: LOS ANGELES COUNTY WATERWORKS
DISTRICT NO. 36 — VAL VERDE
NEWHALL COUNTY WATER DISTRICT
SANTA CLARITA WATER COMPANY
VALENCIA WATER COMPANY

AFFILIATE: CASTAIC LAKE WATER AGENCY

DECEMBER 1986

RICHARD C. SLADE
CONSULTING GROUNDWATER GEOLOGIST

a larger degree in the shallow wells of the alluvium compared to wells in the underlying Saugus Formation.

The Saugus Formation ranges in thickness between at least 1500 feet and at least 5000 feet from the northerly to the southerly sides of the San Gabriel fault, respectively. Little is known of the hydrogeology and water-yielding characteristics of the Saugus Formation.

2. Groundwater flows from east to west across the alluvium in the river valley; April 1945 represents the all-time water level high, while November 1965 represents the all-time water level low in much of the alluvium. In general, 1985 water levels are 10 to 30 feet lower than the 1945 levels. Water levels west of Castaic Junction have remained high throughout the period of record.

3. Groundwater in storage in the alluvium has ranged from a high in April 1945 of 201,000 ac-ft, to a low of 107,000 ac-ft in November 1965; at present (Fall 1985) groundwater in storage is approximately 176,400 ac-ft. Because the theoretical maximum storage capacity in the alluvium is 239,900 ac-ft, there is a theoretically available storage capacity of 63,500 ac-ft between the 1985 storage and the theoretically maximum possible storage.

4. Though historic groundwater extraction data are somewhat contradictory, groundwater production for 1985 was: 24,103 ac-ft from the alluvium, using 59 active wells; and 4892 ac-ft from the underlying Saugus Formation, using 8 active wells. The numbers, locations, and annual production from wells actively used by private homeowners, industries and/or commercial establishments are not known; it is probable that total annual production from these sources does not presently exceed a few hundred ac-ft/yr.

5. For our base period of study of 1957-58 through 1984-85, we calculate a practical perennial yield for the alluvium of 31,600 to 32,600 ac-ft per year.

6. Alluvial groundwater quality ranges from a natural calcium-bicarbonate character on the east near Lang to a degraded sodium-sulfate character west of Castaic Junction. Generally, TDS increases in the

their annual extractions are not metered. Because the cumulative total production by these private pumpers is not considered to be large, it has not been included in our perennial yield assessment.

Prior to 1954, alluvial groundwater production accounted for almost 100 percent of the total water production in the study area. However, in 1954, this percentage decreased to approximately 95 percent because in that year Newhall County Water District constructed the first of six wells which tap the Saugus Formation for domestic use. By 1985, production from the Saugus Formation approached 16 percent of total groundwater extractions (refer also to Table 2).

In recent years, there have been several shifts in the supply/demand usage of water in the region. Groundwater extractions from the Saugus Formation have gradually increased to about 15 percent of the total local production, while total extractions (alluvium plus Saugus Formation) have declined slightly. Water usage has shifted toward a greater proportion for urban uses, with a reduction for agricultural uses, as the region has become urbanized. In the future, it is projected that local alluvium production will remain relatively constant with more water going to urban uses as the agriculture is phased out, and there will be greater use of groundwater from the Saugus Formation.

Urbanization has had a rather startling impact on the availability of areas for recharge, however. All recharge to the aquifer system does not occur in the low-flow channels of the river and its tributaries, but infiltrates over much of the alluviated areas which are not within the flood channels of the Santa Clara River system. Paving of these areas has, and will continue to reduce the net effective area for natural recharge to the underlying groundwater system.

calculated values of average annual pumpage and average annual change in storage.

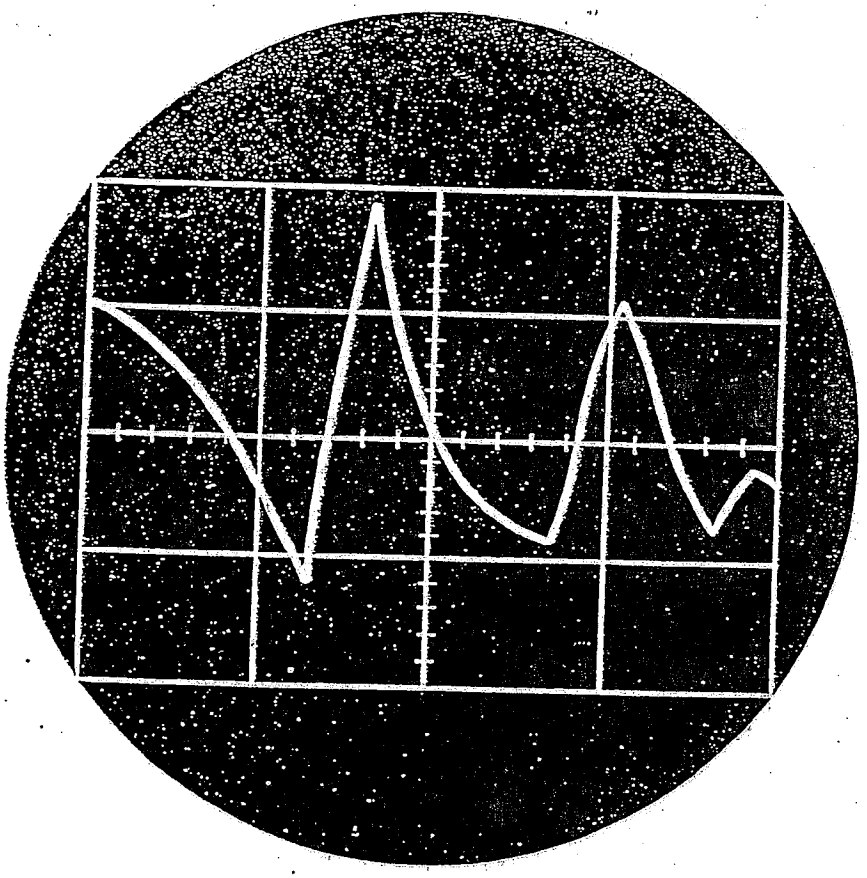
To determine the average annual groundwater production from the alluvial sediments in the Valley, files at the major water purveyors concerning present and historic production were obtained. These data vary widely in their apparent level of accuracy. For example, some of the data do not date back to 1957-58, other data are based on electrical consumption at the pump and not on actual metered gallonage, while other data are only estimates based on the number of persons using the water. Regardless, during the 28-year base period 1957-58 to 1984-85, we estimate the average annual groundwater production from the alluvial sediments in the Santa Clarita Valley to have been approximately in the range of 31,000 to 32,000 acre-feet per year.

In addition, at the beginning of the base period, the quantity of groundwater stored in the alluvial sediments was calculated to be approximately 159,688 acre-feet. By 1985, the quantity of groundwater in storage in the alluvium had been increased to 176,409 acre-feet (see Table 8). The increase in the quantity of water in storage in the alluvium is thus 16,721 acre-feet. This increase is the total quantity of groundwater added to storage during the 28-year Base Period as a result of excess precipitation. Hence, the average annual net change in groundwater in storage was determined by dividing the total quantity of water added to storage by the length of the Base Period, or +597 acre-feet per year.

The perennial yield is the quantity of groundwater what can be pumped annually without any change in groundwater levels or net change in groundwater in storage over the Base Period. This may be computed by determining the average annual pumping during the Base Period (31,000 to 32,000 acre-feet), and adding or subtracting from this value, that amount

WATER-RESOURCES INVESTIGATION USING ANALOG MODEL TECHNIQUES

IN THE SAUGUS-NEWHALL AREA LOS ANGELES COUNTY, CALIFORNIA



UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
WATER RESOURCES DIVISION

OPEN-FILE REPORT
Menlo Park, California
1972
PREPARED IN COOPERATION WITH THE NEWHALL COUNTY WATER DISTRICT

Because of the lack of data only four short-term deep-well hydrographs were available to use in the non-steady-state verification of the Saugus aquifer (pl. 7). The measurements indicate that in the area south of the San Gabriel fault and east of Castaic Junction, the potentiometric surface produced by the model is too flat (pl. 7). This was also indicated by the steady-state run. The model-based heads shown on plate 7 are correct south of Castaic Junction but are about 70 feet low at Newhall. This is shown by the discrepancy between the two hydrographs for well 4N/16W-35L1 (pl. 7). Because there are no water-level measurements for the area north of the San Gabriel fault and Castaic Junction, it is not known whether or not the potentiometric surface shown for that area is correct.

In view of the lack of definitive data for the Saugus aquifer, it is felt that this layer of the model is adequately verified for present needs. The hydrologic parameters used to model the Saugus aquifer are initial estimates. Consequently, before more detailed information about the Saugus aquifer can be obtained from the model, additional studies of the hydrologic characteristics of the aquifer should be made. With present data only general information can be deduced regarding the ground-water flow network in the Saugus aquifer.

A comparison of the assumed steady-state potentiometric surface (pl. 6) with the 1963 potentiometric surface (pl. 7) shows that in the model the Saugus aquifer has undergone a decline in head over most of the area of the aquifer. This decline is due to pumping from the Saugus aquifer and to water-level declines in the overlying alluvial aquifer. The model-generated hydrographs on plate 7 indicate that the declines in the Saugus aquifer have been similar to those that occurred at adjacent points in the alluvial aquifer. This suggests that future pumping from or artificial recharge to one of the aquifers will have an effect on the head in the other aquifer. Head changes in the Saugus aquifer, however, are generally less than the corresponding changes in the alluvial aquifer. This is due to the low vertical component of permeability between the two aquifers and lesser quantities of pumping from the Saugus aquifer than from the alluvial aquifer.

WATER BUDGET

Table 5 shows the water budgets for the steady-state and the non-steady-state model. All quantities of inflow and outflow used in the model are shown. Under steady-state conditions the quantity of inflow to the model must equal the quantity of outflow. As shown, the total inflow and total outflow are both equal to about 25,000 acre-feet per year. Surface-water recharge and underflow are the major sources of inflow, and ground-water discharge is the principal outflow.

In the water budget for the non-steady-state condition the figures shown are the total quantities of inflow or outflow which occurred in each area during the 23-year study period. When the ground-water storage depletion is added to the inflow data, the total inflow must equal the total outflow within the limits of accuracy of the model. As shown, these totals agree within 5.2 percent or about 44,000 acre-feet. Surface-water recharge and underflow are still the main sources of inflow, but ground-water pumpage is by far the greatest source of outflow from the basin.

MODEL READOUTS

The major water purveyors in the Saugus-Newhall area are presently considering the effects of various water-resources management practices in order to arrive at management techniques that will make the best use of the existing and future water resources of the areas. The analog model was used to supply information about the response of the aquifers to each of the following conditions:

1. What are the effects of loss of natural floodwater recharge to the aquifers?

2. What are the effects on the aquifers of artificial recharge of imported water?

3. What are the effects on the aquifers of increased pumpage to meet future water requirements?

Effects of Loss of Floodflow

Because water levels in the alluvial aquifer respond to variations in surface-water recharge, information about the effects of an extended drought during which no floodflow recharge occurs is of value.

To simulate an extended drought, the model was run for the 1945-67 period under the following conditions:

1. The surface-water recharge to the model did not exceed steady-state surface-water recharge.

2. Loss of floodflow recharge to the aquifers will cause large water-level declines which will decrease the quantity of ground-water discharge in the Santa Clara River below Castaic Junction. This ground-water discharge cannot be decreased by more than the original steady-state ground-water discharge. To simulate this limit in the model, the induced recharge in the area was not allowed to exceed the value of the steady-state ground-water discharge.

3. The aquifers were assumed to be in steady-state conditions at the beginning of the drought.

4. All other hydrologic parameters were maintained at the values which were normally used in the non-steady-state model during the 1945-67 study period.

Under these conditions the model produced the hydrographs shown in figure 9. Because the transmissibility in the model does not vary as a function of head, these hydrographs represent the theoretical response of the basin to the conditions set forth above." Under actual field conditions the decrease in transmissibility with decline in head would cause the alluvial aquifer to be dewatered sooner than indicated by the hydrographs in figure 9. The hydrographs do indicate, however, that without the effects of floodflow recharge most of the alluvial aquifer could not support the modeled rate of ground-water pumpage for more than 14 to 18 years after steady-state conditions. The aquifer would support this pumpage for an even shorter perio of time if the basin were not at steady-state condition at the beginning of the drought. The benefit the basin receives from floodflow recharge can be seen by comparing the hydrographs produced by the model for the alluvial aquifer under 1945-67 historic conditions with the hydrographs for the no-floodflow condition.

The loss of floodflow recharge in the alluvial aquifer causes head declines in the Saugus aquifer. As shown by the hydrographs in figure 10, after 23 years the no-floodflow condition produces declines in the Saugus aquifer about 100 feet below those of the normal condition. These declines do not produce complete dewatering of the aquifer because of its large saturated thickness.

Effects of Artificial Recharge

The Upper Santa Clara Valley Water Agency has contracted with the State of California for delivery of northern California water to meet future water requirements in the study area. The quantities of imported water tentatively will range from 1,600 acre-feet per year in 1971 to 41,500 acre-feet per year in 1990 but could be increased somewhat if required (table 6). One management procedure under consideration proposes that all water imported between 1971 and 1980 be artificially recharged to defer the cost of treatment facilities. The channel of the Santa Clara River between Solemint and Saugus was chosen as a possible site for artificial recharge on the basis of the hydrology of this area and the proposed alinement of a 36-inch diameter pipeline. The analog model was used as an aid in determining the effects of the recharge on the aquifers.

CONCLUSIONS

A second model run was made to show the effects on the basin of the conditions imposed in the previous run without artificial recharge in the Santa Clara River. The hydrographs produced under these conditions are shown on plate 9.

The model indicated that the alluvial aquifer would be dewatered in the upper and lower Soledad Canyon areas prior to 1980. This is primarily due to the heavy pumping in the lower Soledad Canyon area between 1970 and 1980 which is not compensated for by artificial recharge as it was in the previous run. After 1980 the hydrographs for this run and the previous run are almost parallel with the previous run water levels between 10 and 50 feet higher than those for this run.

In the Saugus aquifer the hydrographs for this run are between 10 and 30 feet lower than the corresponding hydrographs for the previous run. In general the removal of the artificial recharge from the alluvial aquifer does not produce a significant change in water levels in the Saugus aquifer. The same management problems are produced by this set of conditions as were produced in the previous run, the major differences being that the problems occur as much as 10 years sooner. These model-generated readouts are subject to the same limitations as are the readouts from the previous run (page 54).

CONCLUSIONS

On the basis of the study of the hydrology of the area and the readouts from the analog model the following conclusions have been reached:

1. The alluvial aquifer has been the source of most of the ground water pumped in the area. The quality of water in this aquifer is readily affected by small quantities of inflow of either better or poorer quality water because of the relatively small quantity of ground water in storage in the aquifer. The water in this aquifer can in turn affect the chemical quality of the water in the Saugus aquifer. Urbanization will place additional stress on both aquifers by increasing the quantity of poor-quality sewage effluent and good-quality imported water available for recharge into the alluvial aquifer. In addition, heavy pumping from the Saugus aquifer to meet future water demands could drastically reduce the ground-water discharge from the basin. This could result in the buildup of salts within the basin because of the lost flushing action of the ground-water discharge.

These conditions substantiate the belief that a proper water-quality management program must be established within the basin. This should include the initiation and operation of a systematic periodic water-quality sampling program. These data can then be used to evaluate the effects on the basin of the above water-quality considerations.

LETTER 4

2. The ability of the alluvial aquifer to accept artificial recharge is dependent on the storage space available within the aquifer. In the Saugus-Newhall area the space available for recharge in the alluvial aquifer varies widely depending on the quantity of surface-water recharge that occurs each year. To determine how much artificial recharge could take place each year, a water-level measuring program should be initiated in the lower Soledad Canyon area. Using these measurements and other data, estimates of the space available for the storage of water in the aquifer in the coming year could be made. This would facilitate obtaining the proper quantities of imported water for artificial recharge each year.

3. The model indicates that under historic pumping conditions the full entitlement of imported water to the year 1980 probably could not be artificially recharged in the 3.5-mile reach of the Santa Clara River below Solemint. This is due to the lack of storage in the alluvial aquifer. When an estimated maximum pumping rate to 1990 is distributed so the pumping near the artificial recharge reach is greatly increased, it seems possible to artificially recharge all the imported water to be delivered prior to 1980.

4. On the basis of readouts from the analog model it seems that the maximum quantities of pumping that might be demanded of the alluvial aquifer to 1990 cannot be supplied by that aquifer. To meet the maximum water requirements of the area, either more water must be imported than was used in the model run or pumping from the Saugus aquifer must be increased. However, the model indicates that increased pumping from the Saugus aquifer causes large head declines in that aquifer and induces declines in the alluvial aquifer. In the model declines were large enough to greatly diminish the ground-water discharge from the alluvial aquifer and to eliminate all natural outflow from the Saugus aquifer. If this condition were allowed to continue unchecked, water-quality problems could develop in the basin because of the imbalance of salts being carried in and out of the basin.

As a result, pumping in the Saugus aquifer cannot be increased indiscriminately without producing detrimental effects in both aquifers. A proper choice of pumping patterns in the Saugus and alluvial aquifers could minimize the adverse effects of increased pumpage. However, further interrogation of the model is required to determine whether or not the Saugus aquifer can support the proposed rate of pumping without dewatering the alluvial aquifer.

5. The Saugus aquifer is a potentially large source of ground water with an estimated maximum of 6 million acre-feet of recoverable water in storage. Further study of this aquifer is required to delineate the areas of poor water quality and to determine more accurately the transmissibility and storage coefficients of the aquifer. Future studies of the Saugus aquifer should give prime consideration to the area north of Castaic Junction and the San Gabriel fault because few hydrologic data are available for this area. With greater knowledge of this aquifer the ground-water basin model could be updated to give more precise information about the response of this aquifer to various ground-water management practices and to more accurately determine the potential for future utilization of the aquifer.

STUDY CODE NO. 1610-9-J-1

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES
Southern District
Water Projects Branch

PRELIMINARY EVALUATION OF STATE WATER PROJECT GROUND WATER STORAGE PROGRAM: SANTA CLARA RIVER VALLEY BASINS

-by-

Evelyn Tompkins
Graduate Student Assistant

This Technical Information Record (TIR) was prepared to document information developed during a reconnaissance-level investigation of the Santa Clara River Valley Ground Water Basins to determine if inclusion of these basins in the State Water Project Future Supply Program is feasible. Therefore, it should be considered as preliminary and subject to revision. This is primarily an internal office document with distribution limited to the cooperating agencies only.

February 1979

basins. Ground water is classed mainly as desirable for domestic and irrigation uses. TDS concentrations range from 260 mg/l to 500 mg/l.

Ground Water Use

The volume of ground water in storage is reduced by: pumped extractions, consumptive use of water by phreatophytes, and the outflow of rising water to Eastern Basin.

Currently, water demand is met entirely by pumped extractions; however, by 1980 imported water will be needed to meet the projected demands of an increasing population. Annual extractions were estimated to be 14.8 cubic hectometres (12,000 acre-feet) per year.

Storage Capacity

Ground water in storage between high and low water levels was estimated to be 19.7 cubic hectometres (16,000 acre-feet). Specific yield is approximately 20 percent.

The ground water level is often at or near the surface during storm flows. Therefore, the river channel alluvium has little capacity for further recharge immediately after heavy rains.

EASTERN BASIN

Description

Eastern Basin is downstream from Acton Basin and lies almost entirely within Los Angeles County. The basin is separated from Acton Basin by an impermeable bedrock constriction. Eastern Basin is composed of water-bearing deposits occurring along the Santa Clara River between the towns of Lang and Blue Cut and in the numerous canyons tributary to this area. The water-bearing deposits cover an approximate surface area of 11 655 hectares (29,000 acres).

The major aquifers in the basin are the Saugus Formation and the river channel alluvium. Only 1 067 metres (3,500 feet) of the Saugus Formation contribute to ground water development. This formation has been faulted, folded, and eroded. The river channel alluvium ranges from a few metres in thickness to about 61 metres (200 feet) thick near the town of Saugus.

Newhall-Saugus is the largest population center for the basin as well as for the whole Santa Clara River Valley.

Ground Water Occurrence

Ground water in the alluvium is unconfined, while ground water in the Saugus Formation is confined. Ground water moves westward. The San Gabriel and Holser Faults cross the water-bearing sediments and cause a water level differential of approximately 3 to 6 metres (10 to 20 feet).

No measurable subsurface inflow occurs from Acton Basin; inflow from Acton Basin occurs as rising water only. Outflow occurs either as subsurface outflow or as rising water. Rising water outflow was estimated to average 13 cubic hectometres (10,600 acre-feet) per year. The subsurface outflow was estimated to be 0.3 cubic hectometre (240 acre-feet) per year.

Percolation of precipitation, streamflow and the return flows of irrigation water recharge the basin. To a minor extent, inflow is derived from the semi-permeable formations which flank the main ground water basin. Other sources of recharge water for the basin are sewage and industrial waste effluents.

Quality

Widely ranging ground water conditions in this basin may cause localized variations from the favorable water quality of the basin. Ground water quality for domestic use ranges from suitable in most areas of the basin to unsuitable in the western portion. Ground water is generally suitable for irrigation of all but the most sensitive crops.

TDS ranges from 600 mg/l to 1 800 mg/l. The concentration of mineral constituents in the ground water increases westward along the basin. Concentrations of chlorides and nitrates are generally lower than 100 mg/l and 45 mg/l respectively.

Ground Water Use

Wells tapping the alluvium are very productive with yields up to 7 570.8 litres (2,000 gallons) per minute. Well extractions from both the alluvium and the Saugus Formation average 28.7 cubic hectometres (23,300 acre-feet) per year. Near Blue Cut, the Newhall Land and Farming Company pumps and exports from 4.9 to 8 cubic hectometres (4,000 to 6,500 acre-feet) per year to Piru Basin for agricultural purposes.

Storage Capacity

No data is available for the total storage capacity of the basin or the current volume in storage; however, data does indicate the basin had an available capacity of 24.7 cubic hectometres (20,000 acre-feet). The safe yield was estimated at 28.5 cubic hectometres (23,100 acre-feet) per year.

PIRU BASIN

Description

Piru Basin is the easternmost basin lying entirely within Ventura County between the towns of Blue Cut and Fillmore. The ground water basin covers a surface area of about 2 843 hectares (7,025 acres).

Piru Basin is comprised of two principal aquifers: alluvium beneath the flood-plains and permeable freshwater-bearing zones in the San Pedro Formation. Over most of the basin the thickness of the alluvial aquifer ranges from 26 to 70 metres (85 to 200 feet). The alluvium consists of fluvial sand and gravel of Recent and

Conjunctive Use of the Saugus Aquifer

Castaic Lake Water Agency

January 1990
K/J/C 884605.00

Kennedy/Jenks/Chilton

CLWA. Consequently, the water is currently utilized for agricultural lease operations within the Devil's Den Water District.

The SWP release pattern from its storage reservoirs is based on maintaining a supply of water to satisfy demand in a drought. Consequently, SWP entitlements are subject to cutbacks at times. To assess potential future reductions, Reiter created a model of the SWP supply available for release using a Monte-Carlo iteration, a random analysis, to project precipitation. Historical hydrologic data are incorporated into the analysis. Because the State plans to develop additional sources of water in the future, the Reiter model includes scenarios for each projected yield increase. The expected increases are 60,000 acre-feet/year in 1991, 300,000 acre-feet/year in 1995 and 300,000 acre-feet/year in 2000. Based on the method of determining reductions discussed in Chapter 3, the potential reductions to CLWA's deliveries (assuming full entitlement amounts were requested), and thus the projected water available for CLWA's use, are calculated for each scenario.

The sources of groundwater available to users within CLWA's boundaries in the future will continue to be the alluvial and Saugus aquifers. From the alluvial aquifer the safe yield is anticipated to be 32,500 acre-feet/year, a portion of which will be used for agricultural purposes and, therefore, is not available for M&I use. The Saugus aquifer production is anticipated to be 11,000 to 22,000 acre-feet/year of which the assumption is made that 10,000 acre-feet/year is allocated for use by the water purveyors and 2,000 acre-feet/year is utilized by other water users.

In addition to groundwater and imported water, reclaimed water will be available for CLWA's use. A reclaimed water system with a maximum capacity of 8,600 acre-feet/year is planned for construction in a phased program. It is anticipated that reclamation will begin in 1992 and will increase until reaching the maximum in 1999. The reclaimed water will be used for landscape irrigation, and, therefore, will most likely be utilized from May through September.

From Table 4-1 and Figure 4-1, it can be seen that, based on Reiter's analysis, the supply does not meet the demand every year. The remaining 1,000 to 10,000 acre-feet/year of unused Saugus water is available for development by CLWA for use in the years of shortfall. Development of additional supplies in the Saugus aquifer will be considered in the following chapters.

Final Report

Reclaimed Water System Master Plan

Castaic Lake Water Agency

September 1993
K/J 894012.00

Kennedy/Jenks Consultants

CHAPTER 3

EXISTING AND PROJECTED WATER SUPPLY AND DEMAND

In order to evaluate the need for reclaimed water, water supplies and demands were projected into the future. This chapter describes the existing and future water supplies, demands, and facilities within the Castaic Lake Water Agency (CLWA) service area.

EXISTING WATER SUPPLY, DEMAND AND FACILITIES

Water Supply

Water demands in the Santa Clarita Valley are currently met by two sources: the State Water Project (SWP) and local groundwater supplies. The estimated average total supply available for municipal and industrial (M&I) and agricultural uses is 98,000 to 109,000 acre-feet per year, depending on the yield available from the local groundwater aquifers. CLWA purchases State water and wholesales it to four domestic water purveyors, these being the Los Angeles County Waterworks District No. 36, the Newhall County Water District, the Santa Clarita Water Company and the Valencia Water Company. The approximate boundaries of the water purveyors are shown on Figure 3-1. CLWA has SWP entitlements of 41,500 acre-feet per year for M&I uses. In addition, SWP agricultural entitlements of 12,700 acre-feet per year have been transferred to CLWA from the Devil's Den Water District in Kern and Kings Counties. To date, the Devil's Den entitlements have not been used within the CLWA service area.

In addition to imported water, local groundwater supplies have been developed by domestic water purveyors and by agricultural water users. Two fresh-water bearing aquifers, the alluvial and Saugus aquifers, underlie CLWA's boundaries and form the Eastern Groundwater Basin of the Santa Clara River Valley Basin.

The alluvial aquifer lies above the Saugus aquifer and is comprised of the alluvial sediments along the river and its major tributaries. The maximum thickness of the alluvium is about 200 feet. A large number of wells penetrate this upper aquifer, and, historically, most water extracted from the groundwater basin has been from the alluvial aquifer. The perennial yield of the aquifer is considered to be 32,500 acre-feet, a portion of which is used for agricultural purposes and is increasingly available for M&I uses as agricultural land is developed for urban use.

Much less information is known about the Saugus aquifer. Historically, few wells penetrated the Saugus aquifer. However, as water demands in the valley have increased, more wells have been drilled into the aquifer. The anticipated annual

VALENCIA WATER COMPANY

WATER MANAGEMENT PROGRAM

DECEMBER, 1995

TABLE III-1

WATER SOURCES FOR SANTA CLARITA VALLEY

SOURCE Acre-Feet per Year	Minimum	Maximum
Santa Clara River Alluvium	31,600	32,600
Saugus Formation Normal Pumping	11,000	22,000
Saugus Short Term Overdraft	20,300	None
State Project Water		
CLWA Table A Entitlement[1]	43,360	54,200
TOTAL CURRENT RESOURCES	106,260	108,800
Reclaimed Water Potential	10,000	10,000
TOTAL WATER RESOURCES AVAILABLE	116,260	118,800
NON DOMESTIC & OTHER		
Agricultural uses	12,000	5,000[3]
Pitchess Honor Rancho	2,000[2]	3,000[3]
NET WATER RESOURCES FOR M & I	102,260	110,800

[1] Entitlements are subject to drought related cutbacks. Maximum cutback on Table A is estimated to be 20%. CLWA plans a conjunctive use program to mitigate the effects of State Project Water cutbacks which are shown in the column designated as minimum. This requires Saugus Short Term Overdraft.

[2] Estimated current use.

[3] Estimated future use.

Castaic Lake Water Agency

Draft

Integrated Water Resources Plan
Water Demand and Supply Evaluation

February 1998

MONTGOMERY WATSON

BOOKMAN-EDMONSTON
ENGINEERING, INC.

Pumping from the Saugus Aquifer has varied from about 3,900 acre-ft/yr up to 14,800 acre-ft/yr. In 1996, Saugus pumping was about 8,200 acre-ft/yr. Installed pumping capacity can produce 15,000 to 16,000 acre-ft/yr from the Saugus Aquifer.

In 1991, groundwater was pumped into the CLWA distribution system because of SWP supply deficiencies and the cost of water was less than purchasing State Drought Bank water. By moving groundwater from areas of adequate supply into areas with limited groundwater, the local water community illustrated a major element of a conjunctive use program.

Estimated Dry Period Groundwater Production Capability

Slade (1984) reported that the perennial yield of the Alluvial Aquifer is about 32,000 acre-ft/yr. This yield is the historical annual production adjusted for a minor change in storage. Because of he limited storage capacity in the Alluvium, this groundwater source may be limited in dry periods. Wells in the Alluvium near the eastern reaches of the Santa Clara River are known to have groundwater levels which decline during consecutive dry years by as much as 100 feet, reducing pumping capacity. A series of winter storms recharge the aquifer and result in water level recovery.

The data reviewed for the Pardee area (located near Bouquet Canyon Road and the Santa Clara River) shows that in 1990 and 1991, groundwater levels did not decline as much as those in the easterly areas. In 1991, the Valencia Water Company increased its pumping to offset limited SWP water supplies. Valencia Water Company reported delivery of about 5,000 acre-ft/yr into the CLWA distribution system. Total pumping from the Alluvium by Valencia Water Company in 1991 was about 9,900 acre-ft/yr, as reported to the State Water Resources Control Board.

Based on historical data, the Alluvial Aquifer east of Castaic Junction can support production of at least 20,400 acre-ft/yr as shown in Table 3-2.

Table 3-2
1991 Alluvial Groundwater Production
East of Castaic Junction

Water Purveyor	Annual Production (acre-ft/yr)
Newhall CWD	1,900
Santa Clarita WC	5,900
Valencia WC [1]	10,400
Wayside Honor Rancho	2,200
Total	20,400

1. Includes 500 acre-ft pumped in 1991 by Newhall Land & Farming Co. east of Castaic Junction.

PROPOSED FINAL

Supplemental Water Project Environmental Impact Report

SCH # 98041127

FEBRUARY 1999

3.2 SURFACE WATER, WATER USE, GROUNDWATER

Surface Water. The primary drainage course in the CLWA area is the Santa Clara River. Principal tributaries to the Santa Clara River include Mint Canyon, Bouquet Canyon, San Francisquito Canyon, Castaic Creek Canyon, Oak Spring Canyon, Sand Canyon, and Potrero Canyon. Water flow in the stream canyons is ephemeral, and diminishes rapidly after most rainfall events. Surface water resources include the Santa Clara River, Bouquet Reservoir, and Castaic Lake. Water (both imported and naturally occurring) is diverted from Pyramid Lake located a few miles to the north, through hydroelectric power generation facilities, into Castaic Lake. Water quality in the Santa Clara River is generally poor due to high concentrations of total dissolved solids, however, water in Pyramid Lake, Castaic Lake, and Bouquet Reservoir is suitable for municipal use. Primary flood hazard areas occur in and along natural drainage channels, such as the Santa Clara River and its tributaries, and in areas where sheetflow may occur during high intensity rainfall (CLWA 1988, 1998; Slade 1986).

Water Supplies. The existing local water supply in the CLWA service area is groundwater extracted from the alluvial aquifer and from the underlying Saugus Formation aquifer. Historically, groundwater has been the primary source of water in the Santa Clarita Valley. Since 1980, local groundwater supplies have been supplemented with imported water from the SWP. From 1984 to 1996, historic SWP entitlement has averaged 24,568 acre-feet per year (AFY) (including deliveries to Devil's Den in Kern County and Kings County), which is 45 percent of the existing 54,200 AFY entitlement.

Groundwater. Large quantities of water are pumped from relatively shallow wells in the highly permeable alluvial aquifer. Although this alluvial aquifer is the smaller of the two-aquifer systems, as measured by storage capacity, most water wells within CLWA are drilled into the alluvial aquifer. Slade (1986) estimated the perennial yield of the alluvial aquifer to be from 31,600 AFY to 32,600 AFY. The maximum historic quantity of water stored in the alluvium has been estimated to be approximately 201,000 acre-feet, following substantial rainfall in 1945 (CLWA 1998). Recharge amounts are highly variable, depending on annual precipitation with documented annual water level recoveries of 70 feet or more. Dry years have resulted in water level drops of approximately 100 feet, particularly in Soledad Canyon. However, groundwater levels have remained near the ground surface in the vicinity of Castaic Junction, due to the east-

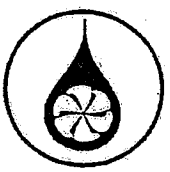
SANTA CLARITA VALLEY WATER REPORT
1999

Castaic Lake Water Agency

Los Angeles County Waterworks District #36

Newhall County Water District

Santa Clarita Water Company



Valencia Water Company

Prepared by: The Upper Santa Clara Valley Water Committee
February 2000

Executive Summary

Santa Clarita Valley Water Report 1998

This annual report provides factual information about the current water resources within the Santa Clarita Valley. The Upper Santa Clara Valley Water Committee, (Committee) whose members are responsible for ensuring that Valley residents have a safe, adequate and reliable water supply, prepared this report.

The Santa Clarita Valley is served by four retail water purveyors: Los Angeles County Waterworks District 36, Newhall County Water District, Santa Clarita Water Company and Valencia Water Company. The Castaic Lake Water Agency (CLWA) provides imported water from California's State Water Project to the four purveyors for distribution. These five entities meet regularly as the Upper Santa Clara Valley Water Committee to coordinate the beneficial use of water in the Valley.

This report provides information about the area's geology, the local groundwater basin, imported water supplies, water quality, precipitation, recycled water, existing and projected water demand and an overall outlook of water supply and demand.

In 1998, the Committee reports a total water supply of approximately 107,000 acre-feet per year and an existing water demand of 48,858 acre-feet. The Santa Clarita Valley currently has a surplus of supply of about 58,142 acre-feet over existing demand. The Committee projects this condition to continue for the foreseeable future given the overall availability of local and imported water supplies, the levels of precipitation both locally and regionally, the favorable operating condition of the groundwater basin and the existing facilities in place to deliver water throughout the valley.

Water Supplies include groundwater from the shallow Alluvial Aquifer and the underlying deeper Saugus Formation and imported water from the State Water Project. The following summarizes the water resources of the Valley in 1998:

Alluvial Aquifer

- The annual perennial yield for the Alluvial Aquifer is 32,500 acre-feet per year. This quantity of water represents an amount of water that can be pumped annually from the aquifer on a long-term basis and during dry year conditions without causing an undesirable result.

Section I

Introduction

Section I.A Background

For most residents of the Santa Clarita Valley (Valley), domestic water service is provided by four retail water purveyors. They are Los Angeles County Waterworks District 36, Newhall County Water District, Santa Clarita Water Company, and Valencia Water Company. The Castaic Lake Water Agency (CLWA) is a wholesaler that obtains water from California's State Water Project. CLWA draws water from Castaic Lake where it is filtered and disinfected at two treatment plants before distribution to the purveyors. These five entities meet regularly as the Upper Santa Clara Valley Water Committee (Committee) to coordinate the beneficial use of water in the Valley. Their respective service areas are shown in **Figure I-1**.

The Committee was officially formed in 1967 when its members requested the United States Geological Survey (USGS) to prepare a joint water resources study of the Santa Clara River Watershed. The purpose of the Committee was to consult with the USGS regarding the study, to assist with the accumulation of data, and to continue working toward coordinating water management programs for the area. The study was completed in 1972 by S. G. Robson of the USGS and provides the initial baseline information of the valley's groundwater resources.

Over the years, the Committee has continued to review and document the availability of water resources in the region. Past studies have assessed the condition of the local groundwater aquifers, their hydro-geologic character, aquifer storage capacity, perennial yield and recharge rate and the potential for conjunctive use of both groundwater and imported water resources.

Other efforts have included developing drought contingency plans, evaluating the impact of landfills on the groundwater basin, coordinating emergency response

Section II

Water Supplies

Historically, local groundwater extracted from the Alluvial and Saugus Aquifers has been the primary source of water in the Santa Clarita Valley. However, local groundwater supplies since 1980 have been supplemented with imported water from the State Water Project. This Section describes the geologic setting of the Santa Clarita Valley, the local and imported water supplies, water quality, precipitation records and recycled water programs.

Section II.A Eastern Groundwater Basin

Figure II-1 shows the approximate boundaries of the Eastern Groundwater Basin, which is the largest and most developed groundwater body of the Upper Santa Clara River HA. It is an alluvial-valley aquifer-stream system. The basin consists of Holocene Alluvium, Pleistocene terrace deposits, and the Plio-Pleistocene Saugus Formation.

Information on the hydrologic conditions of the groundwater basin comes from three previous studies. Robson (1972) evaluated the availability, quantity, and potential for development of the groundwater resources of the Saugus-Newhall area. Slade (1986) conducted an evaluation of the hydrologic conditions of the Alluvial Aquifer underlying the Santa Clarita Valley and its potential for artificial recharge. In 1988, Slade conducted a hydrologic evaluation of the Saugus Formation, its quantity, and potential for development.

Section II.A.1.a. Alluvial Aquifer - General

The Holocene Alluvium exists extensively on the valley floor and becomes restricted at the narrow channels of the river's tributaries in the upper reaches. The Alluvium is deepest along the center of the present river channel, with a

values where the alluvium is thickest in the center of the valley and generally west of Bouquet Canyon.

The amount of groundwater in storage in the Alluvium can vary considerably because of the effects of recharge and discharge from the aquifer. Based on an Alluvial area of 16,410 acres, variable thickness, and specific yield of 9 to 16 percent, it has been estimated that the theoretical maximum amount of groundwater that could be held and retrieved in usable storage is 240,000 acre-feet. Based on historical fluctuations in groundwater levels, calculated volumes of groundwater in storage in the Alluvium have ranged from a high of 201,000 acre-feet in April 1945 to a low of 107,000 acre-feet in November 1965.

Three of the four water companies pump local groundwater in addition to purchasing imported water from CLWA. The Los Angeles County Waterworks District 36 presently has no operating groundwater extraction facilities. Also, the County of Los Angeles and the Newhall Land and Farming Company pump from the Alluvial Aquifer to service their own lands.

In 1986, the Committee hired Richard C. Slade and Associates to study the Alluvial Aquifer and determine, among other things, the aquifer's hydrogeologic condition, perennial yield, storage capacity and potential for artificial recharge. Based on historical pumpage and hydrologic conditions over a 28 year base period (1957-58 through 1984-85), Slade estimated that the annual perennial yield for the Alluvial Aquifer is 31,600 acre-ft to 32,600 acre-ft per year (one acre-ft is +/- 325,900 gallons). Based on the results of that hydrogeologic report and the operating experience of its members, the Committee has adopted a perennial yield of 32,500 acre-ft per year. This quantity represents the amount of water that can be pumped annually from the aquifer on a long-term basis, including fluctuations above and below the perennial yield amount during wet and dry year conditions, without causing an undesirable result. Undesirable results could include long-term groundwater level decline (and associated decline in groundwater storage), degradation of water quality in the aquifer, or land

SANTA CLARITA VALLEY WATER REPORT 2002

PREPARED BY:

Castaic Lake Water Agency

Los Angeles County Waterworks District #36

Newhall County Water District

Valencia Water Company

April 2003

Table II-7
Total Water Supplies
(Acre-Feet)

Year	Sources of Supply									Total Per Year
	Water Retailors			Agriculture, Irrigation, & Miscellaneous Uses			Total Per Source			
	Alluvial Aquifer	Saugus Form.	SWP	Alluvial Aquifer	Saugus Form.	SWP	Alluvial Aquifer	Saugus Form.	SWP	All Sources
1980	16,625	4,569	1,125	14,831	20	0	31,456	4,589	1,125	37,170
1981	14,056	4,950	5,816	16,737	20	0	30,793	4,970	5,816	41,579
1982	8,684	3,569	9,659	13,184	521	0	21,868	4,090	9,659	35,617
1983	8,803	3,398	9,185	11,483	454	0	20,286	3,852	9,185	33,323
1984	12,581	3,809	10,996	14,737	640	0	27,318	4,449	10,996	42,763
1985	12,519	4,140	11,823	12,828	575	0	25,347	4,715	11,823	41,885
1986	12,418	4,975	13,759	11,787	510	0	24,205	5,485	13,759	43,449
1987	12,630	4,962	16,285	10,012	599	0	22,642	5,561	16,285	44,488
1988	12,197	6,404	19,033	9,451	524	0	21,648	6,928	19,033	47,609
1989	13,978	7,217	21,618	9,743	542	0	23,721	7,759	21,618	53,098
1990	13,151	8,302	21,613	10,725	559	0	23,876	8,861	21,613	54,350
1991	17,408	14,417	7,968	9,779	500	0	27,187	14,917	7,968	50,072
1992	16,897	10,458	13,911	10,694	466	987	27,591	10,924	14,898	53,413
1993	19,808	10,151	13,393	10,318	459	443	30,126	10,610	13,836	54,572
1994	20,068	11,531	14,389	13,065	494	311	33,133	12,025	14,700	59,858
1995	20,590	8,087	16,996	13,874	473	6	34,464	8,560	17,002	60,026
1996	24,681	7,373	18,093	13,757	813	780	38,438	8,186	18,873	65,497
1997	25,273	6,752	22,148	14,326	993	1,067	39,599	7,745	23,215	70,559
1998	23,898	4,706	20,254	12,750	849	12	36,648	5,555	20,266	62,469
1999	27,240	2,728	27,282	16,166	988	20	43,406	3,716	27,302	74,424
2000	25,216	3,193	32,579	14,433	887	3	39,649	4,080	32,582	76,311
2001	22,055	3,267	35,369	15,218	873	0	37,273	4,140	35,369	76,782
2002	22,097	4,360	41,768	16,006	800	0	38,103	5,160	41,768	85,031

NEWHALL COUNTY WATER DISTRICT

Summary of Annual Rainfall

October 1st Thru September 30th

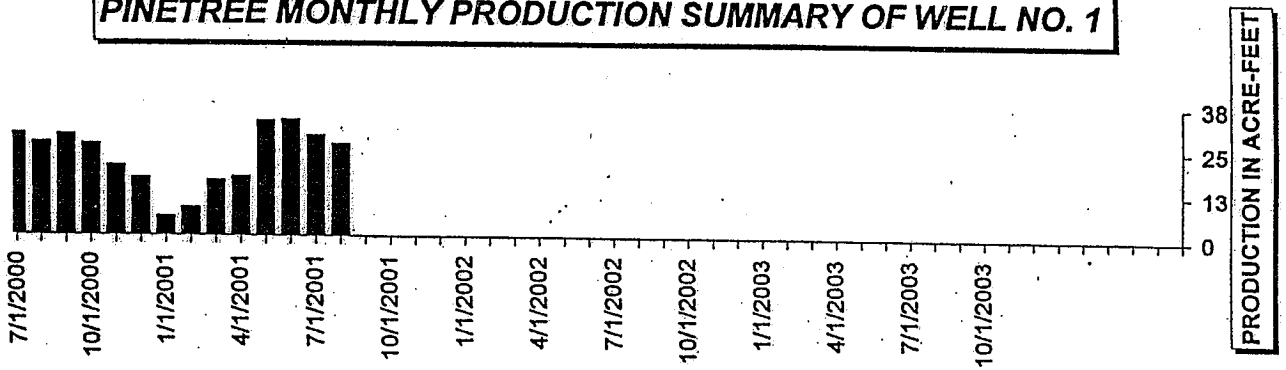
(Totals in inches)

	1986-87	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95
Oct	0.68	3.47	0.00	0.86	0.00	0.50	1.55	0.57	0.78
Nov	1.55	1.25	0.92	0.37	0.63	0.00	0.00	0.75	0.71
Dec	0.24	4.80	6.74	0.00	0.01	5.59	7.25	1.76	1.94
Jan	2.11	3.37	0.89	2.89	1.11	3.28	17.11	0.48	21.98
Feb	0.62	3.49	4.13	4.23	5.72	16.64	11.73	5.31	1.93
Mar	1.69	1.16	1.30	0.22	11.33	9.73	4.27	2.33	8.30
Apr	0.14	3.98	0.30	0.48	0.00	0.15	0.00	0.42	0.72
May	0.10	0.09	0.00	0.88	0.00	0.34	0.00	0.00	0.26
Jun	0.00	0.00	0.00	0.00	0.00	0.00	0.65	0.00	0.76
Jul	0.09	0.00	0.00	0.00	0.00	0.30	0.00	0.00	0.00
Aug	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sep	0.00	0.10	0.62	0.00	0.00	0.00	0.00	0.00	0.00
TOTAL	7.24	21.71	14.90	9.93	18.80	36.53	42.56	11.62	37.38

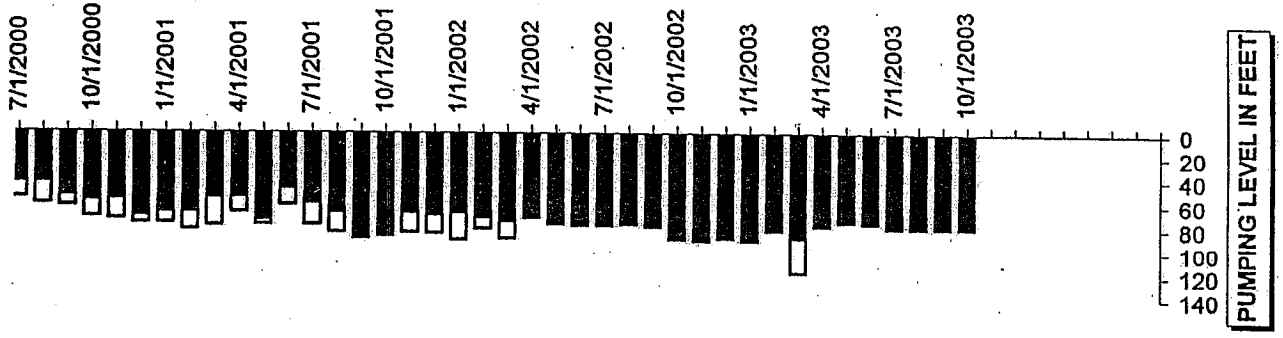
	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01	2001-02	2002-03	2003-04
Oct	0.00	1.30	0.00	0.33	0.00	1.13	0.22	0.00	1.10
Nov	0.00	1.06	3.73	1.39	0.00	0.00	3.18	3.01	0.63
Dec	2.33	8.70	6.72	1.39	0.05	0.00	1.30	5.85	2.57
Jan	2.97	6.64	3.49	2.08	1.21	5.84	1.55	0.00	
Feb	6.73	0.23	22.00	0.65	9.43	10.76	0.51	9.03	
Mar	2.08	0.00	5.15	3.00	3.15	3.38	0.38	2.38	
Apr	0.13	0.00	2.28	3.78	2.10	2.56	0.05	2.35	
May	0.68	0.00	5.50	0.00	0.00	0.00	0.12	1.70	
Jun	0.00	0.00	0.06	0.48	0.00	0.00	0.01	0.00	
Jul	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.02	
Aug	0.00	0.00	0.00	0.00	0.31	0.00	0.00	0.00	
Sep	0.00	0.53	0.21	0.01	0.00	0.00	0.02	0.00	
TOTAL	14.92	18.51	49.14	13.11	16.25	23.67	7.34	24.34	4.30

Newhall County Water District

PINETREE MONTHLY PRODUCTION SUMMARY OF WELL NO. 1



WELL NO. 1



For October 2003

Current Month's Production (AF);	**0.00**
AVG GPD	0

"July 1 Thru June 30"

TOTAL TO DATE (AF)	0.00
PREVIOUS YEAR (AF)	0.00
Comparative Ratio	**0.0%**

TIMED GPM	0
STATIC LEVEL	80
PUMPING LEVEL	0
TOP OF BOWLS	**160**

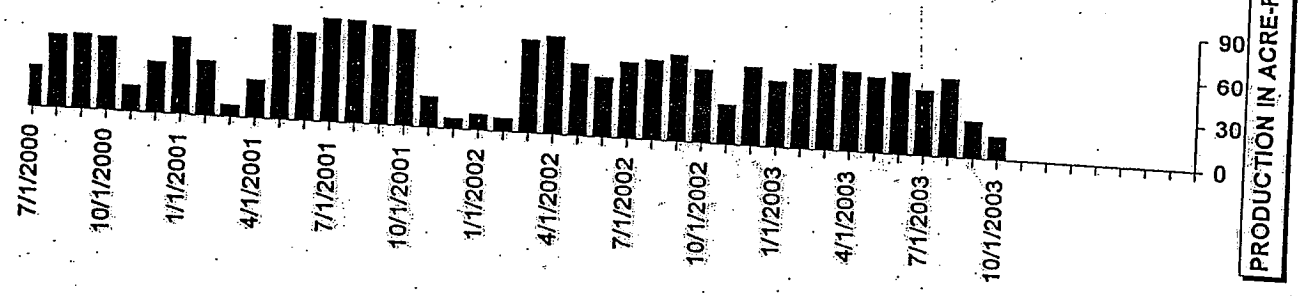
WEATHER:

AVG HIGH	90.8
AVG LOW	57.3
PRECIPITATION	0.10

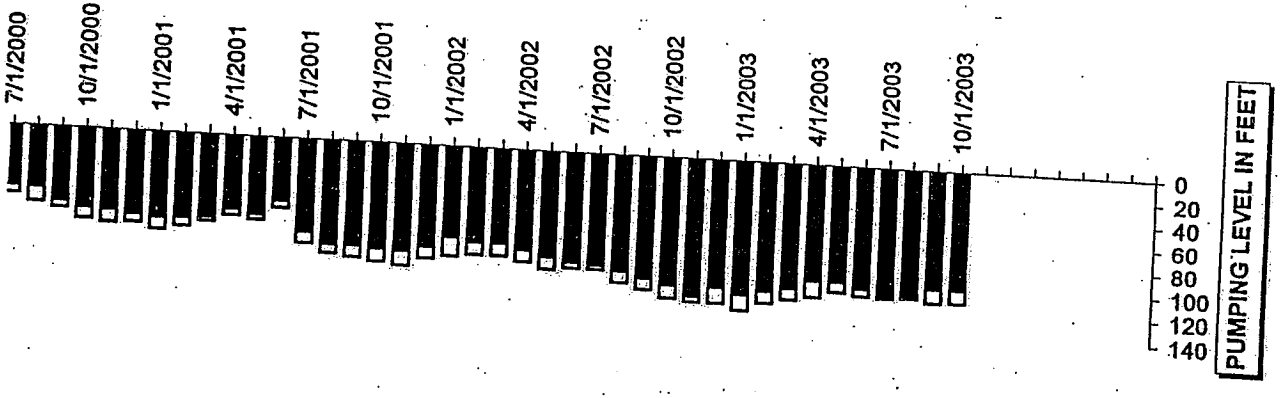
TOTAL PRECIPITATION SINCE OCT 1st	**0.10**

Newhall County Water District

PINETREE MONTHLY PRODUCTION SUMMARY OF WELL NO. 3



WELL NO. 3



For October 2003

Current Month's Production (AF):	14.84
AVG GPD	156,032

"July 1 Thru June 30"

TOTAL TO DATE (AF)	138.43
PREVIOUS YEAR (AF)	220.18
Comparative Ratio	-37.1%

TIMED GPM	525
STATIC LEVEL	102
PUMPING LEVEL	113
TOP OF BOWLS	135

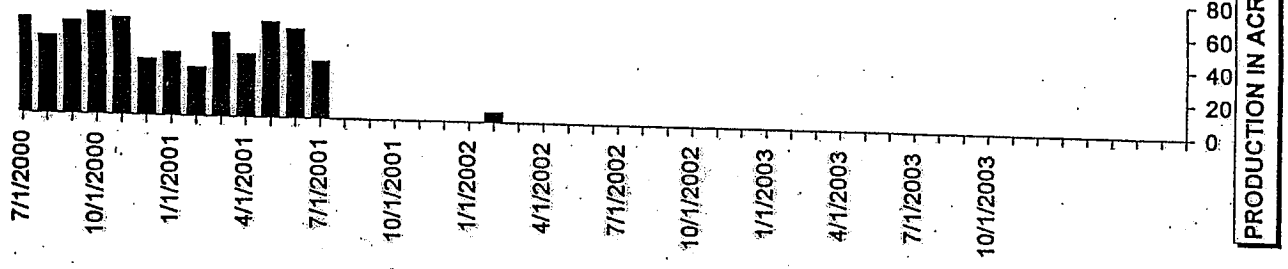
WEATHER:

AVG HIGH	90.8
AVG LOW	57.3
PRECIPITATION	0.10

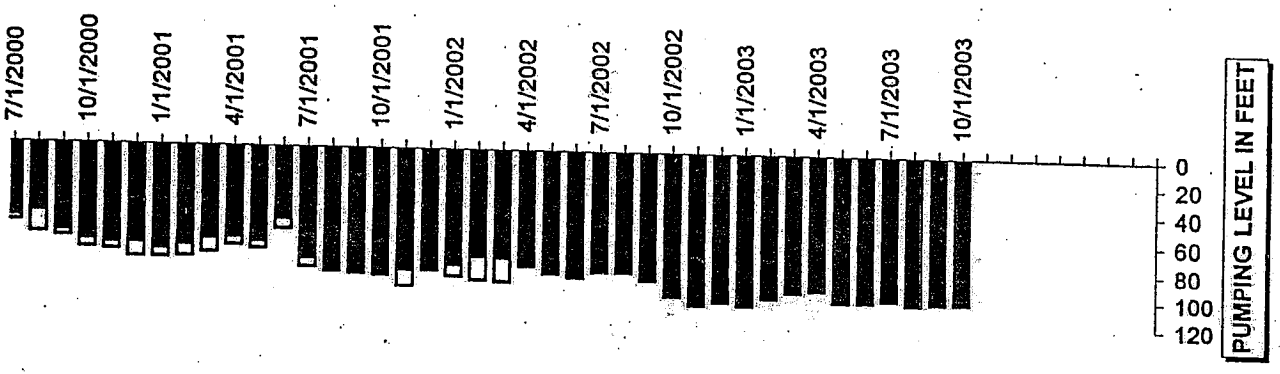
TOTAL PRECIPITATION SINCE OCT 1st 0.10

Newhall County Water District

PINETREE MONTHLY PRODUCTION SUMMARY OF WELL NO. 4



WELL NO. 4



For October 2003

Current Month's Production (AF):	**0.00**
AVG GPD	0

"July 1 Thru June 30"

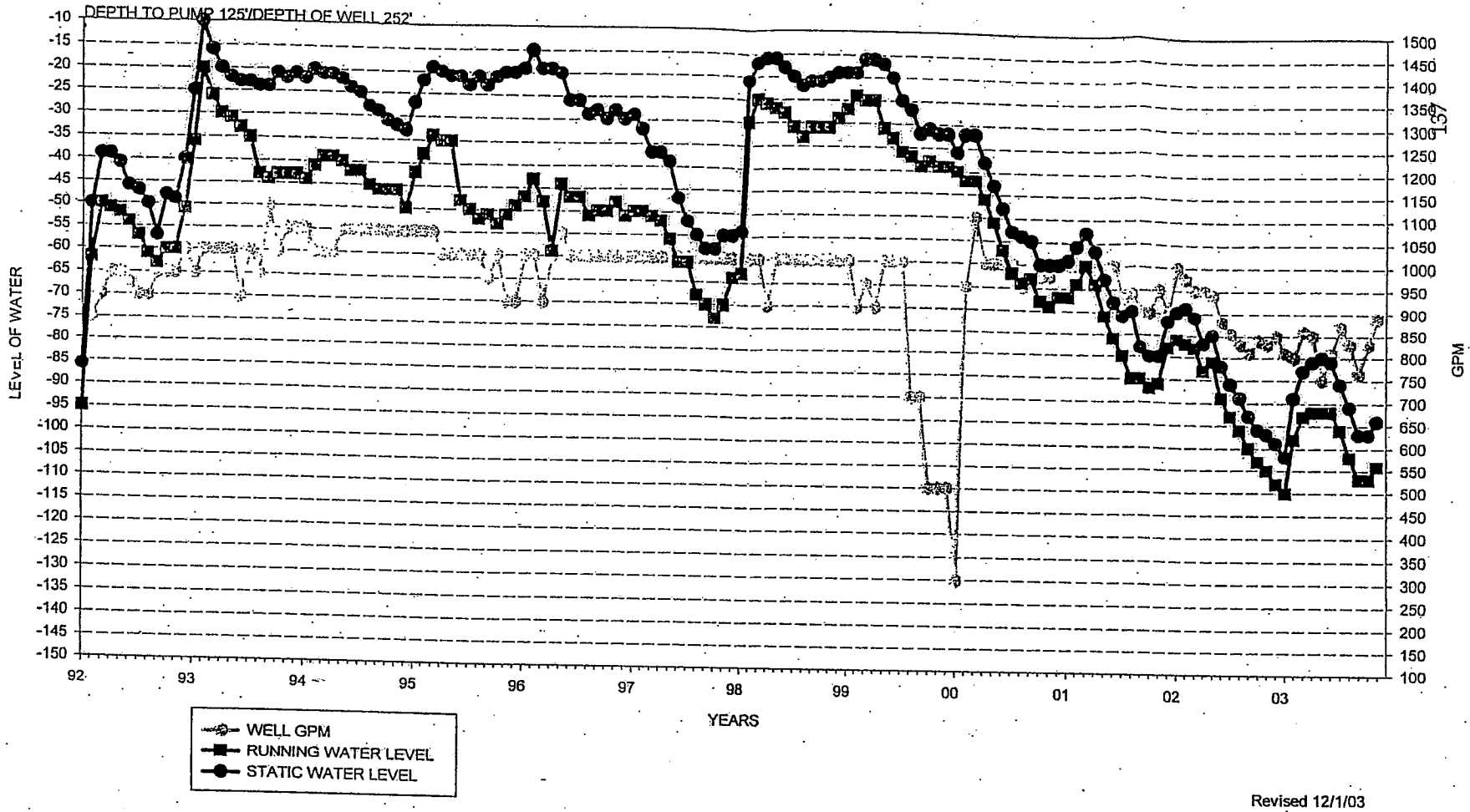
TOTAL TO DATE (AF)	0.00
PREVIOUS YEAR (AF)	0.00
Comparative Ratio	**0.0%**

TIMED GPM	0
STATIC LEVEL	104
PUMPING LEVEL	0
TOP OF BOWLS	165

WEATHER:

AVG HIGH	90.8
AVG LOW	57.3
PRECIPITATION	0.10

TOTAL PRECIPITATION SINCE OCT 1st	0.10



Revised 12/1/03

LETTER 4

ITEM NO. 2.A

STATE OF CALIFORNIA • RESOURCES AGENCY • DEPARTMENT OF WATER RESOURCES

NOTICE TO STATE WATER PROJECT CONTRACTORS

NUMBER: 04-04 DATE: MAR 0 1 2004

SUBJECT: 2004 State Water Project Allocation Increase

FROM: Tom Flory
DEPUTY DIRECTOR, DEPARTMENT OF WATER RESOURCES

The Department of Water Resources is increasing the allocation of 2004 State Water Project water for long-term contractors from 2.06 million acre-feet to 2.68 million acre-feet. Based on recent water supply conditions, SWP supplies are projected to meet 65 percent of most SWP contractors' 2004 Table A amounts, which total 4.13 MAF. Attached is the revised 2004 SWP allocation table.

The Department's new approval considered several factors, including existing storage in SWP conservation reservoirs, SWP operational constraints, and 2004 contractor demands. The Department will revise allocations as the year's hydrologic and water conditions develop.

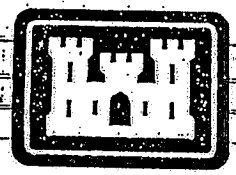
If you have any questions, please contact Dan Flory, Chief of the Department's State Water Project Analysis Office at (916) 653-4313, or you may call Craig Trombly of his staff at (916) 653-6250.

Attachment

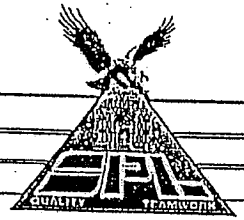
2004 STATE WATER PROJECT ALLOCATION
(ACRE-FEET)

SWP CONTRACTORS	TABLE A (1)	INITIAL REQUEST (2)	APPROVED ALLOCATION (3)	PERCENT APPROVED ALLOCATION (3)/(2) (4)
FEATHER RIVER				
County of Butte	3,500	3,500	2,275	65%
Plumas County FC&WCD	1,750	1,750	1,138	65%
City of Yuba City	9,600	9,600	6,240	65%
Subtotal	14,850	14,850	9,652	
NORTH BAY				
Napa County FC&WCD	21,350	21,350	14,203	65%
Solano County WA	47,206	47,206	30,684	65%
Subtotal	68,056	68,056	44,886	
SOUTH BAY				
Alameda County FC&WCD, Zone 7	80,619	80,619	52,402	65%
Alameda County WD	42,000	42,000	27,300	65%
Santa Clara Valley WD	100,000	100,000	65,000	65%
Subtotal	222,619	222,619	144,702	
SAN JOAQUIN VALLEY				
Oak Flat WD	5,700	5,700	3,705	65%
County of Kings	9,000	9,000	5,850	65%
Castaic Lake WA	12,700	12,700	8,255	65%
Dudley Ridge WD	57,343	57,343	37,273	65%
Empire West Side ID	3,000	3,000	1,950	65%
Kern County WA	998,730	998,730	649,174	65%
Tulare Lake Basin WSD	96,227	96,227	62,548	65%
Subtotal	1,182,700	1,182,700	768,755	
CENTRAL COASTAL				
San Luis Obispo County FC&WCD	25,000	25,000	16,250	65%
Santa Barbara County FC&WCD	45,486	45,486	29,566	65%
Subtotal	70,486	70,486	45,816	
SOUTHERN CALIFORNIA				
Antelope Valley-East Kern WA	141,400	141,400	91,910	65%
Castaic Lake WA	82,500	82,500	53,625	65%
Coachella Valley WD	33,000	33,000	21,450	65%
Crestline-Lake Arrowhead WA	5,800	5,800	3,770	65%
Desert WA	38,100	38,100	24,765	65%
Littlerock Creek ID	2,300	2,300	1,495	65%
Mojave WA	75,800	75,800	49,270	65%
Metropolitan WDSC	2,011,500	2,011,500	1,307,475	65%
Palmdale WD	21,300	21,300	13,845	65%
San Bernardino Valley MWD	102,600	102,600	66,690	65%
San Gabriel Valley MWD	28,800	28,800	18,720	65%
San Gorgonio Pass WA	8,000	8,000	3,900	65%
Ventura County FCD	20,000	20,000	13,000	65%
Subtotal	2,568,100	2,568,100	1,668,915	
TOTAL	4,128,811	4,128,811	2,683,727	

SWPAO
02-Mar-04



Los Angeles District



Citizens Advisory Group
Update on
City of Santa Clarita, CA

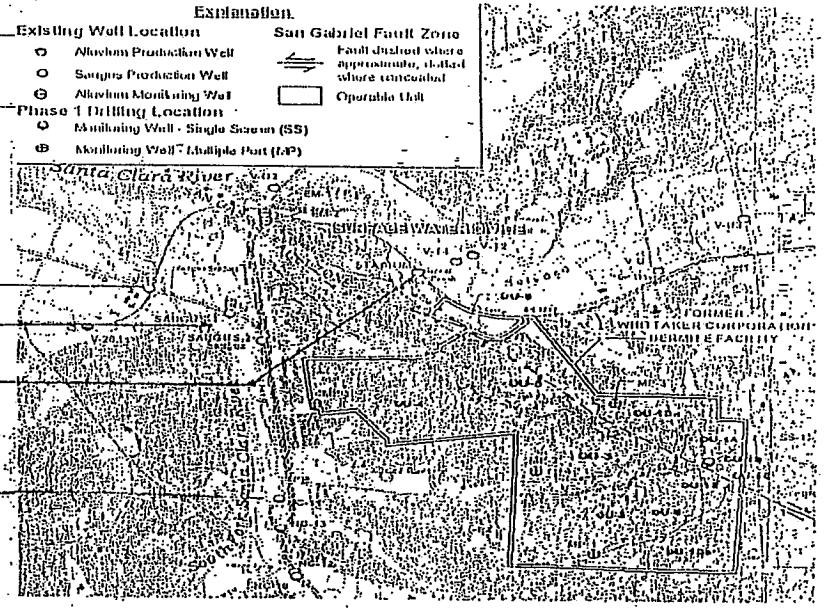
Eastern Santa Clara Subbasin
Groundwater Study

December 10, 2003
Larry Sievers
213 452 3989
Larry.A.Sievers@usace.army.mil

Los Angeles District

Impacted Production Wells

Well ID	Total Cased Depth (ft)	Formation Perforated	Maximum Concentration (µg/L)
Inactive since 1997/1998:			
V-157	2,014	Saugus	Perchlorate = 14 TCE = 3.8
Saugus-1	1,640	Saugus	Perchlorate = 42 TCE = 3.9
Saugus-2	1,612	Saugus	Perchlorate = 47 TCE = 1.3
NC-11	1,136	Saugus	Perchlorate = 23 TCE = ND
Recently on inactive status:			
Stadium	~150	Alluvium	Perchlorate = 5.9 TCE = ND



V-157

Saugus 1 & 2

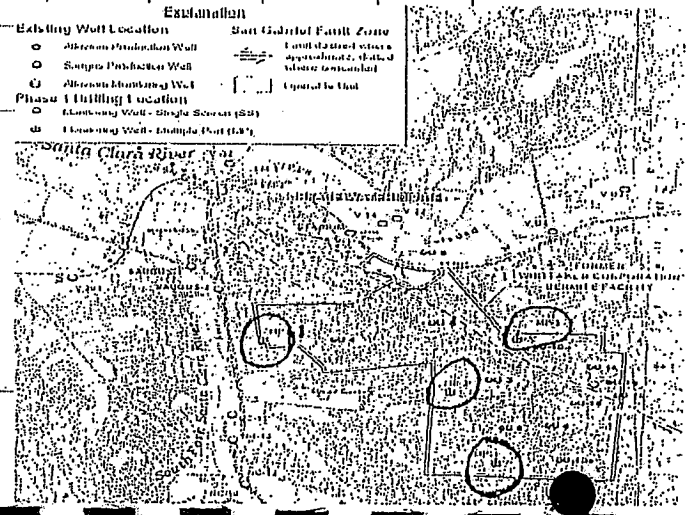
Stadium

NC-11

Perchlorate - MP Wells

Screen	MP-1			MP-2			MP-4			MP-3		
	Elev.	Rd. 1	Rd. 2	Elev.	Rd. 1	Rd. 2	Elev.	Rd. 1	Rd. 2	Elev.	Rd. 1	Rd. 2
1	935	20.9	23.7	1,101	58,200	64,500 J	1,022	3.5/ ND	ND/ ND	1,260	ND	ND
2	785	9.1/ 9.7	114/ 113	897	53,700/ 44,600	13,200 J	827	ND	ND	1,176	7.8	ND
3	645	14.9	29.9	827	21,400	72.2 J	485	ND	ND	997	18.7/ 23.6	ND
4	429	2 J	ND	657	99.6	ND/ 1.06 J	309	ND	ND	829	18.5	ND/ ND
5	344	2.5 J	ND	336	ND	4.5 J	209	ND	ND			
6	193	1.8 J	ND	201	267	33,400 J /23,800						
7	13	ND	ND									
8	-47	3.7 J	2 J									
9	-233	6.6	ND									
10	-363	ND	ND									

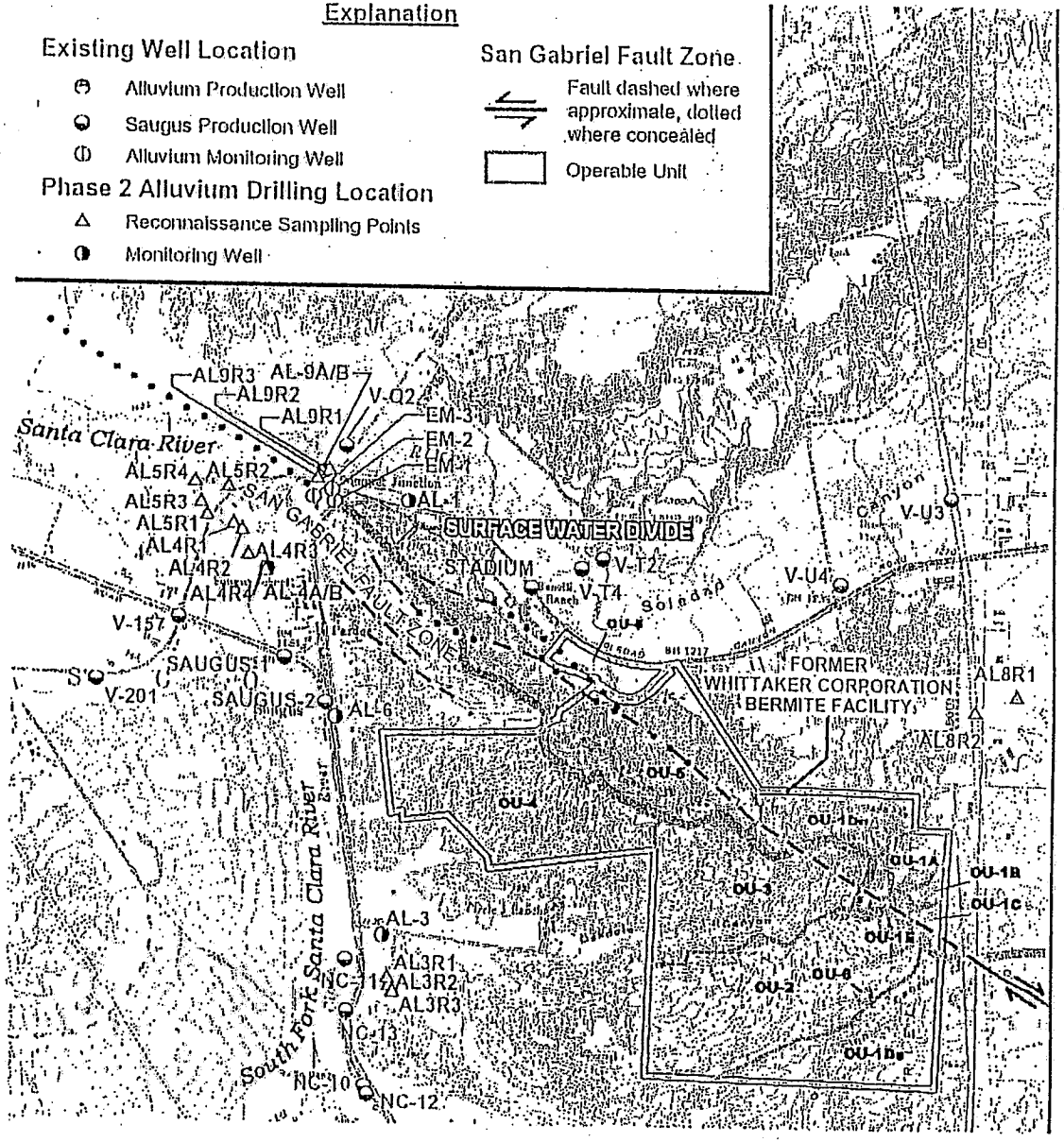
Concentration reported in µg/L
Elev. = MP port elevation in feet msl
J = Estimated value
ND = Not detected



Perchlorate - AL Recon

Sampling Point	AL-4		AL-5		AL-9	
	Depth	Conc.	Depth	Conc.	Depth	Conc.
R1	56	3.6	46	2.9 J	40	30.3
R1	66	2.7 J	56	2.0 J	47	38.9
R2	56	6.9	46	ND	41	17.6/18.0
R2	81	2.0 J	56	ND	51	31.2
R2	-	-	76	ND	-	-
R3	56	8.8	46	ND	-	-
R3	66	4.9/4.6	56	ND	-	-
R4	56	12.9	46	ND	-	-
R4	77	2.6 J	56	ND	-	-

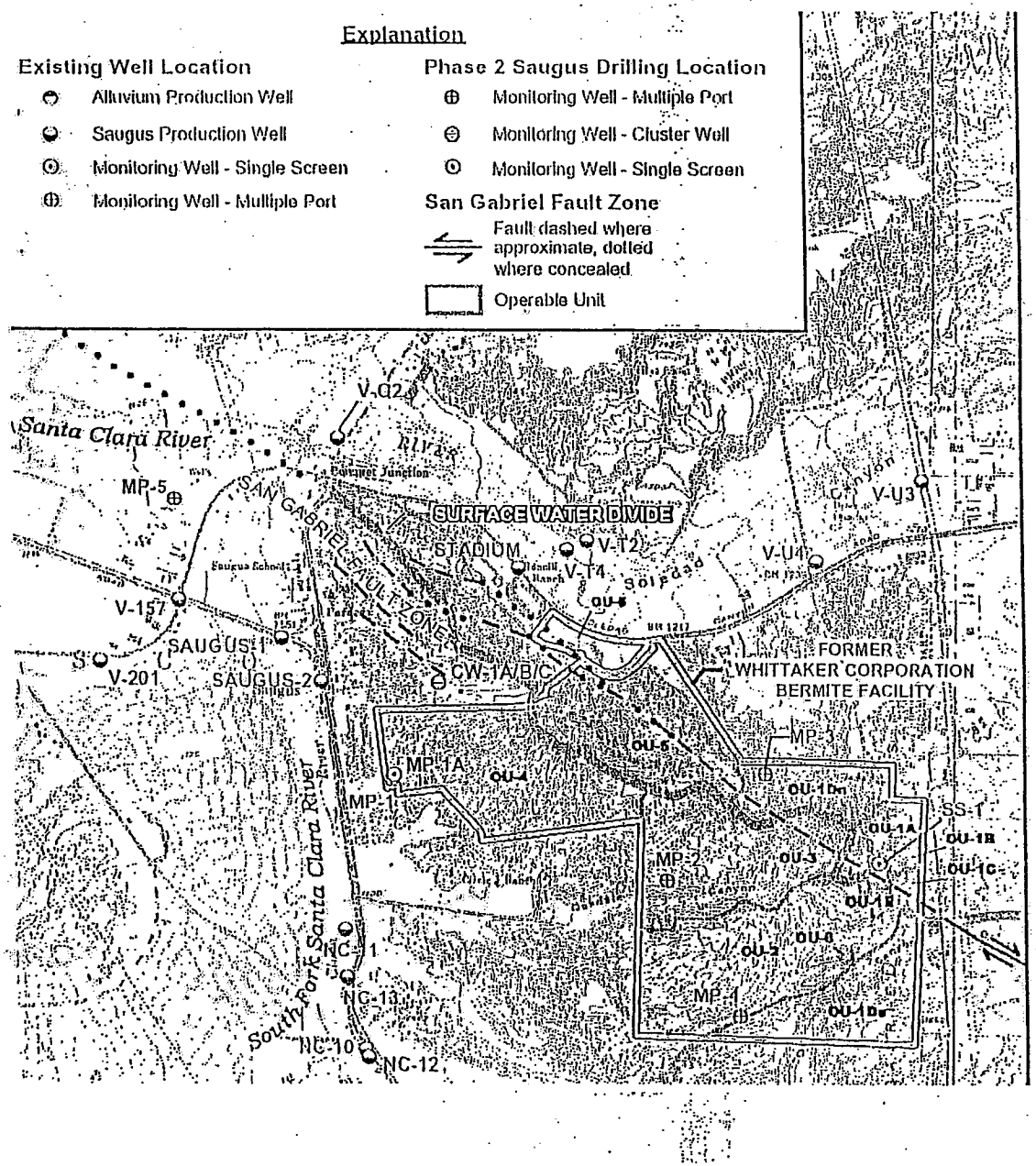
Conc. = reported in µg/L
Depth = in feet below ground surface
J = Estimated value
ND = Not detected



Alluvium

Phase 2 Monitoring Well Locations

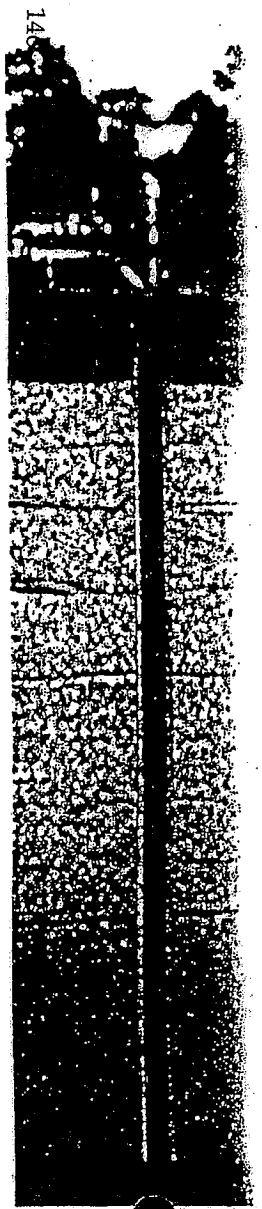
Will be sampled again in Jan 04



Saugus Formation

Phase 2 Monitoring Well Locations

Will be sampled again in Jan 04



Groundwater Modeling Analysis
Upper Santa Clara River Basin

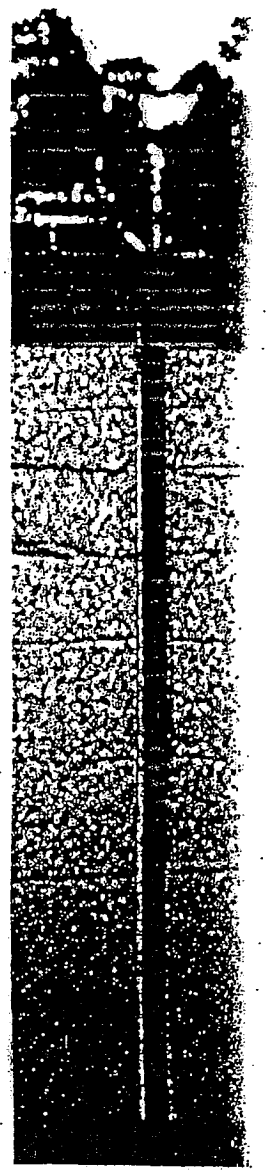
Restoring Impacted Water Supplies Near Whittaker-Bermite

presented by

John Porcello/CH2M HILL

December 10, 2003

LETTER 4



Objectives and Methods

- Evaluate pumping strategies for impacted wells that meet specific goals
  - Restoring lost water supplies
    - Saugus: 4,000 AF/yr
    - Alluvium: 700-1,000 AF/yr
  - Protecting downgradient wells
- Develop and apply groundwater flow model

State Water Project Delivery Reliability Report 2002

June 29, 2004

Department of Water Resources
Bay-Delta Office

Agenda Item: 1

SWP Delivery Reliability Report

Purpose

- To provide useful information to water suppliers and planners on the delivery reliability of the SWP presently and 20 years into the future.

Audience

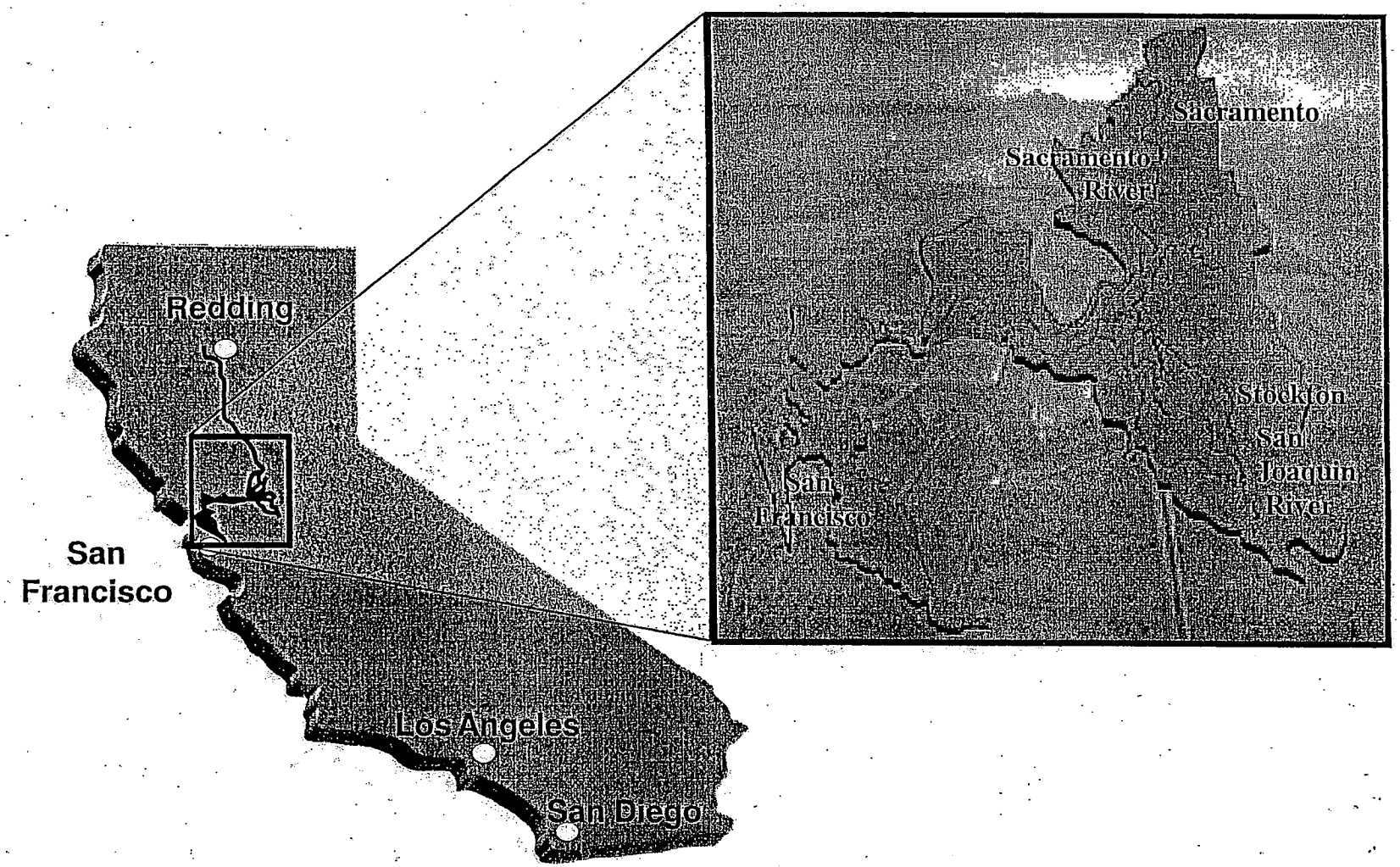
- State Water Contractors and related water providers; city, county, and regional planning agencies; interested citizens

SWP Delivery Reliability Report

- DWR supports local determination of the sufficiency of local water supply
- Explains how SWP delivery reliability is determined
- Presents results
- Provides examples of how to apply the information.
- Commits to an evaluation of CALSIM II

Some SWP Basics

Major Rivers
State Projects
Federal Projects
Local Projects
Redding
Sacramento
San Francisco
Fresno
Los Angeles
San Diego



Bay-Delta detail image from CALFED

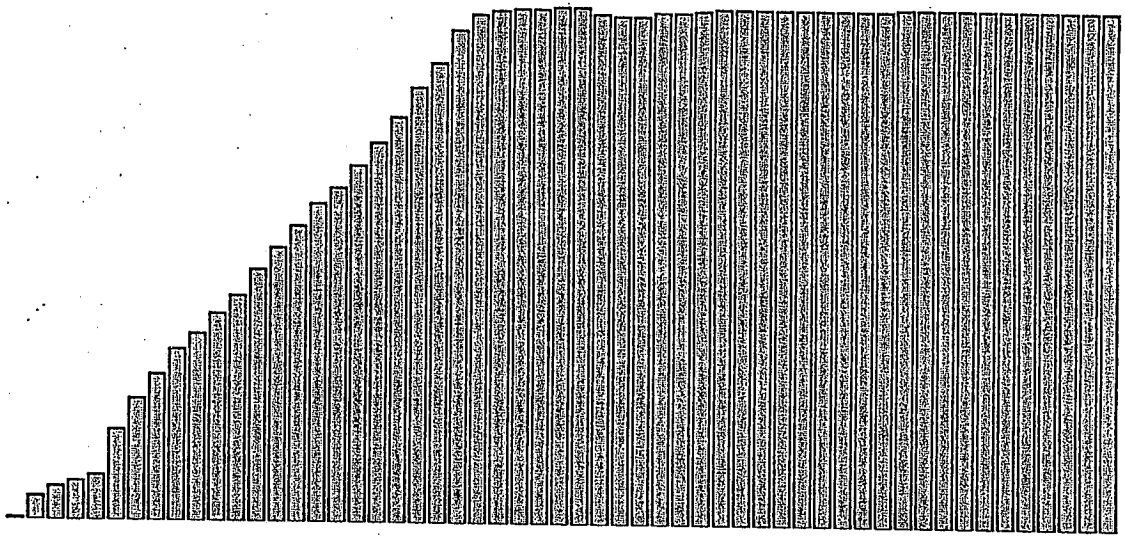
State Water Project
Redding
Sacramento
San Francisco
Fresno
Los Angeles
San Diego
California State Water Project

SWP Service Area Map

What is "Table A"?

- Maximum amount of water SWP is contracted to provide annually
- Tool used to apportion available water supply each year

Table A Amounts



Source: Bulletin 132-00 Table B-4 column 39

Conditions for Article 21 Deliveries

- Cannot interfere with SWP allocations or operations
- Excess water available in the Delta
- Conveyance capacity available
- Cannot be stored in the SWP system

Estimating SWP Delivery Reliability

CALSIM II

A computer model that simulates the operation of the SWP

CALSIM II

- Simulates operations of SWP and CVP facilities
- Represents the Sacramento and San Joaquin River system and Delta
- Accounts for system operational objectives, physical constraints, legal and institutional agreements and statutes
- Uses historical water conditions, which are modified to reflect a certain level of development

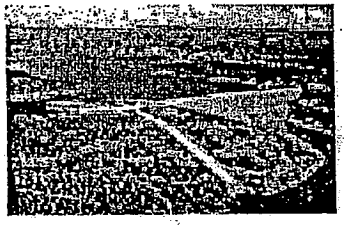
CALSIM II

- Accepted by DWR, the U.S. Bureau of Reclamation and CALFED
- Used in studying
  - CALFED Conveyance Program
  - CALFED Storage Program
  - Annual Operation of SWP and CVP
  - Proposed changes in Delta flow and quality requirements

What is Water Delivery Reliability?

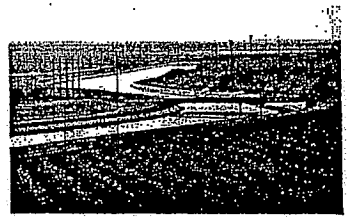
It is an estimate of the certainty that a given amount of water will be delivered to a specific place at a specific time.

Factors affecting SWP Delivery Reliability



Availability of water from the source

The means to convey the water



Amount and pattern of water demand

SWP Delivery Reliability Report Study Assumptions

- Existing facilities and regulatory requirements
- Three SWP Table A demand levels:
  - 2001 weather variable (3.0 – 4.1 maf/yr)
  - 2021 weather variable (3.3 – 4.1 maf/yr)
  - 2021 full Table A amount (4.1 maf/yr)
- Article 21 demand analyzed and assumed to increase from 2001 to 2021

Study Results

SWP Table A and Article 21 deliveries from the Delta (taf)

Study	Average	Maximum	Minimum
2001 Study			
Table A	2,960 (72%)	3,850 (93%)	800 (19%)
Article 21	130	510	0
2021A Study			
Table A	3,080 (75%)	4,130 (100%)	830 (20%)
Article 21	80	400	0
2021B Study			
Table A	3,130 (76%)	4,130 (100%)	830 (20%)
Article 21	70	400	0

Percent of Table A in parentheses.

Study Results

SWP Delta average and dry-year Table A deliveries [1]

	Average 73-year 1922-94	Single dry year 1977	2-year drought 1976-77	4-year drought 1931-34	6-year drought 1987-92	6-year drought 1929-34
2001	72%	19%	48%	37%	41%	40%
2006	73	19	47	38	41	40
2011	74	20	46	38	41	41
2016	74	20	45	39	40	41
2021	75	20	44	39	40	41

[1] Percent of Full Table A. Full Table A = 4.133 maf per year

Study Results

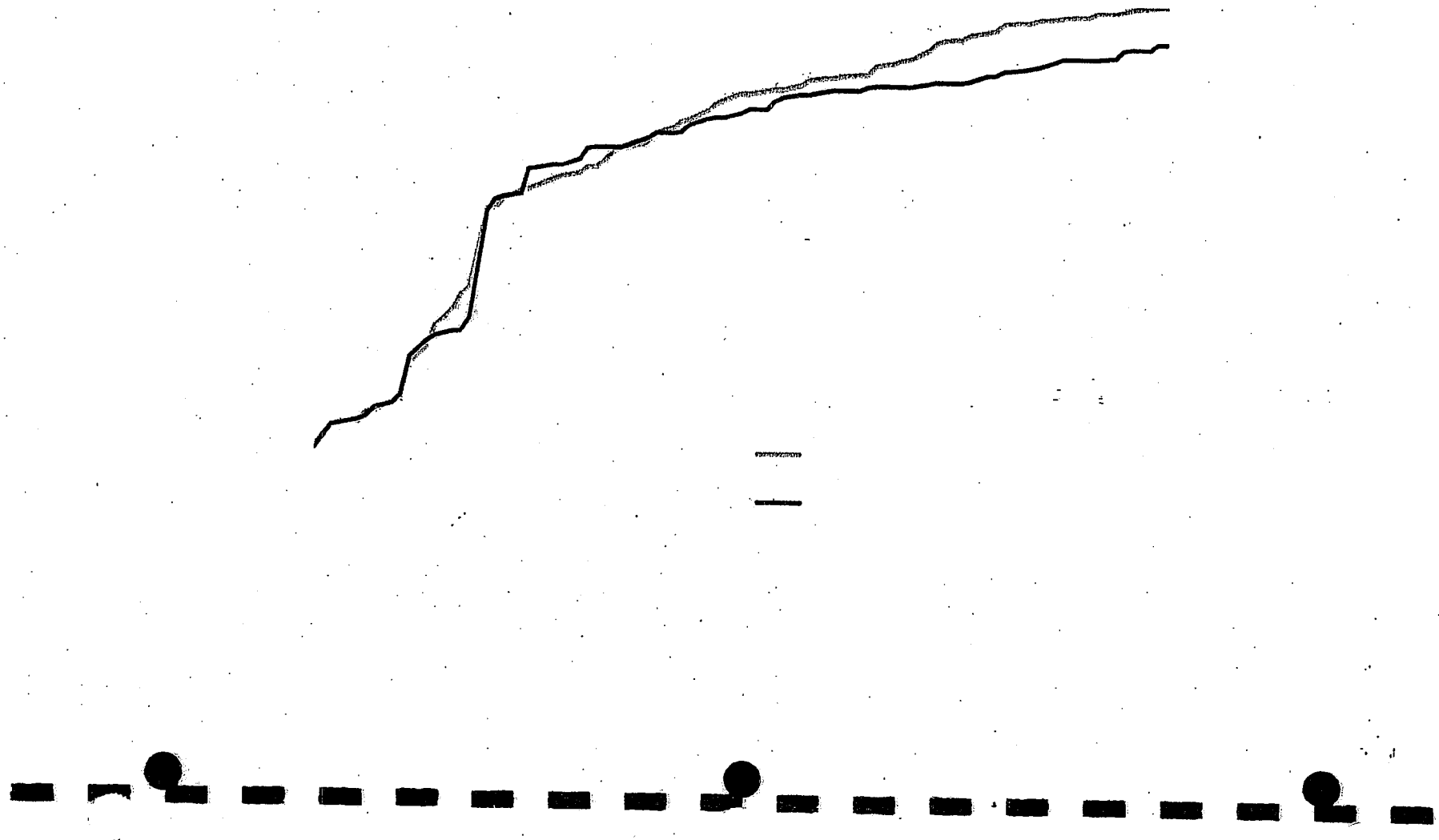
SWP Delta average and wet-year delivery

(Percent of Full Table A, 4.13 MAF)

Study	Average	Single wet 1983	2-year wet 1982-83	4-year wet 1980-83	6-year wet 1978-83	10-year wet 1978-87
2001	72%	73%	79%	80%	80%	80%
2021A	75	82	89	86	87	84
2021B	76	100	100	91	91	87

Study Results

Figure 1. SWP Delta Delivery Probability (Table A)

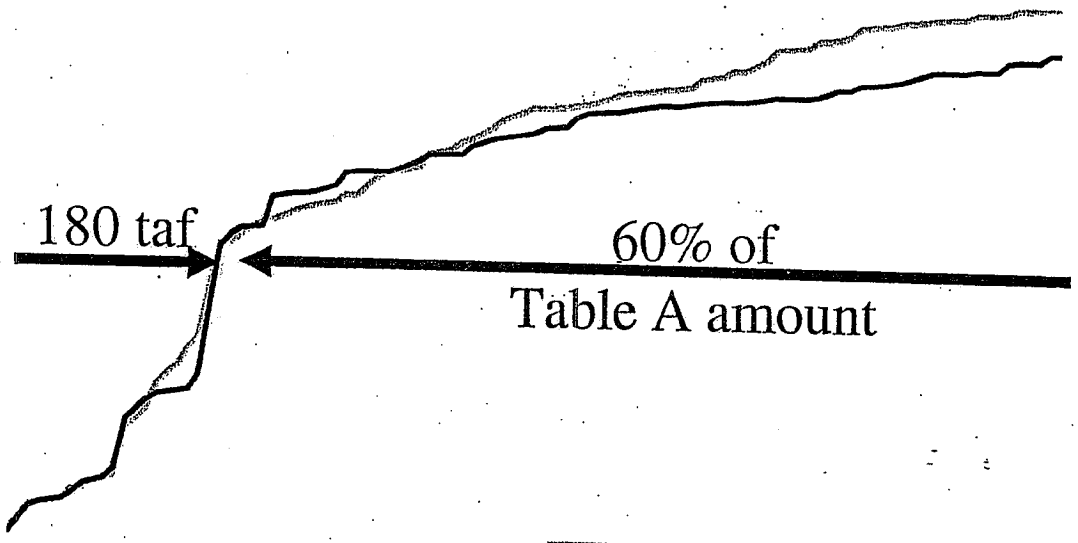


Greenacres ID Delivery Probability

Table A

Greenacres ID Delivery Probability Table A

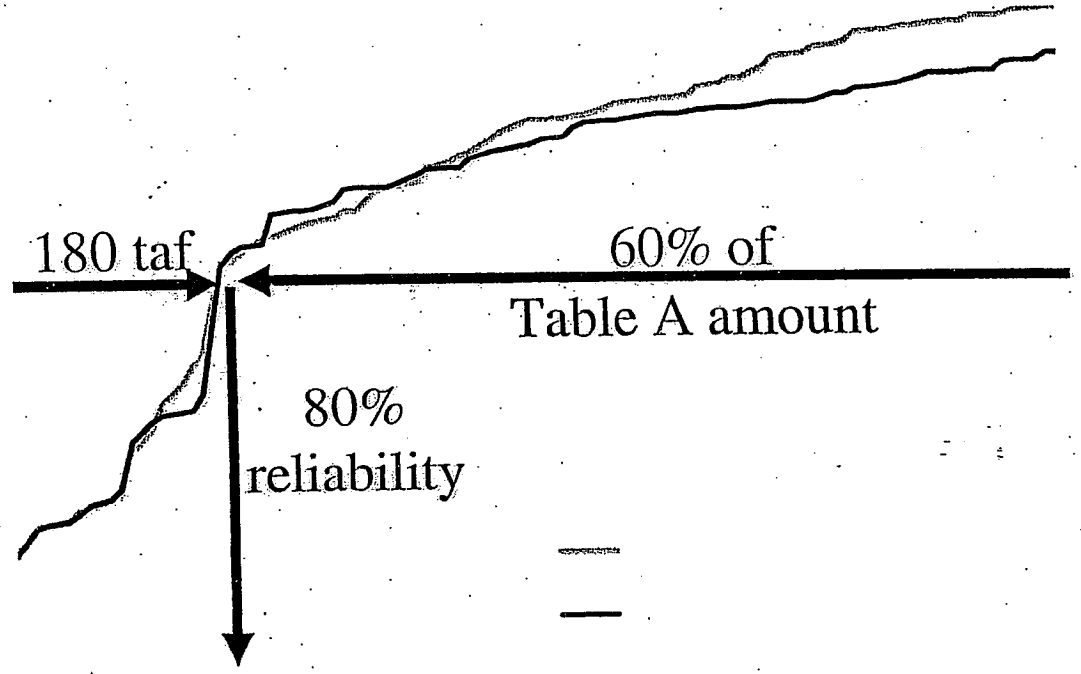
Step 1: Identify desired annual delivery



LETTER 4

Greenacres ID Delivery Probability

Step 1: Identify desired annual delivery
Step 2: Determine delivery probability



Status of Studies and Update

- Historical Simulations – Complete
- CALSIM II Peer Review – Complete
  - Draft work plan comments -- May, 2004
  - Final Work Plan -- August, 2004
- Sensitivity Studies – Underway
- Updated Delivery Reliability report -- Draft expected in October, 2004

Discussion and Questions

Study Results

Table 6a. Average and Wet Year Water supply under Article 21
(taf per year; year of delivery in parentheses)

Study	*Average*	*Single wet year 1983*	*2-year wet 1982-1983*	*4-year wet 1980-1983*	*6-year wet 1978-1983*	*10-year wet 1978-1983*
2001	130	200	390 (1982)	100 (1980)	100 (1978)	100 (1978)
			200 (1983)	120 (1981)	140 (1979)	140 (1979)
				390 (1982)	100 (1980)	100 (1980)
				200 (1983)	120 (1981)	120 (1981)
					390 (1982)	390 (1982)
					200 (1983)	200 (1983)
						410 (1984)
						0 (1985)
						50 (1986)
						0 (1987)

Numbers rounded to nearest 10,000 acre-feet

Study Results

Table 4. Water supply under Article 21 (taf per year; year of delivery in parentheses)

Study	*Average*	*Single dry year 1977*	*2-year drought 1976-1977*	*4-year drought 1931-1934*	*6-year drought 1987-1992*	*6-year drought 1929-1934*
2001	130	0	110 (1976)	0 (1931) 200 (1932) 130 (1933) 0 (1934)	0	0 (1929) 90 (1930) 0 (1931) 200 (1932) 130 (1933) 0 (1934)
2021 (A and B)	80	0	0	0 (1931) 40 (1932) 10 (1933) 0 (1934)	0	0 (1929) 30 (1930) 0 (1931) 40 (1932) 10 (1933) 0 (1934)

Numbers rounded to nearest 10,000 acre-feet

Contacts

- **Katherine Kelly**
  (916) 653-1099
- **Francis Chung**
  (916) 653-5924

Web Site: http://swpdelivery.water.ca.gov

LETTER 4

"The future ain't what it used to be"

-Yogi Berra

Agenda Item: 1

... And What You Can Do About It

-Jonas Minton

Jonas Minton

- 1978 California Department of Water Resources
- General Manager El Dorado County Water Agency

  -1994 first water supply assessment

  -17,000 acre feet of water rights for new development
- World Bank – Republic of China
- Executive Director American River Water Forum

  -Additional 200,000 acre feet of water for development

- Deputy Director California Dept. of Water Resources

  -Water Transfer Office; Water Conservation Office; Divisions of Planning, Dam Safety, Flood Management

  -Drought Task Force; Recycling Task Force; Desalination Task Force; Groundwater Bulletin

  -SB 610/221 Guidebook
- Retired in 2004
- Half Time for Planning and Conservation League

What Did The Future Used To Be?

- State Water Project "Entitlements" of 4,230,00 acre-feet
- Ample supplies of drinkable groundwater
- Reliable snow pack
- "Will Serve" letters

What's Changed?

- State Water Project says it can deliver about 2 million acre-feet (half the contract amount) 80% of the years

- In 1991 the State Water Project could just deliver 550,000 acre-feet- only 13% of contracted amounts

What Else?

- Monterey Amendment Lawsuits
- Groundwater contamination: Perchlorate, MTBE, Hexavalent Chromium, Arsenic, Nitrates, NDMA, etc.
- Senate Bills 610 and 221 "Show Me The Water" requirements
- CALSIM II peer review

"State Water Project Delivery Reliability Report," 2002;

In half the years SWP says it can deliver 80 % of Table A

1 year in 5 SWP says it can deliver 50% of Table A

1 year in 10 the SWP says it can deliver 20% of Table A

Limitations of the SWP Report

- Short time record
- Uses CALSIM II model
- Does not account for Climate Change impacts
- Ignores fragile levee system that delivers water to southern California

Tree Stump In Lake Tahoe

CALSIM II
Peer Review by CALFED

- Model is not calibrated or validated, and findings do not include error bars
- Model is a comparative tool, rather than a predictive tool
- Model assumes no limits to northern California groundwater pumping; allowing greater deliveries to southern California

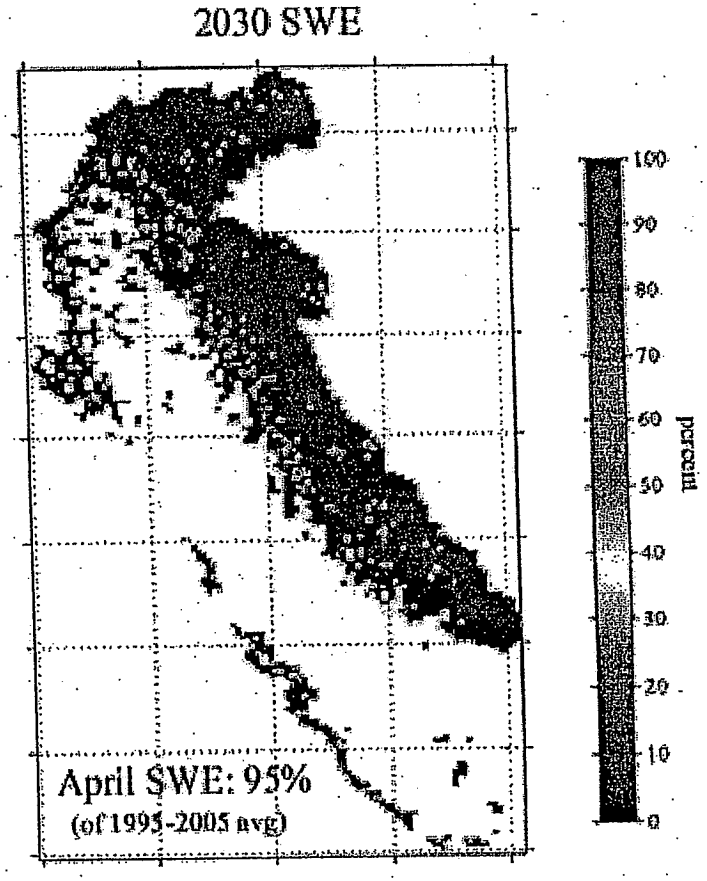
Global Climate Change
(No Matter What's Causing It)

- Warmer temperatures mean less snow
- Feather River watershed is primary source of SWP
- Feather River watershed is relatively low elevation-most affected by winter warming
- "…reduction of snow water equivalent by about one third to one half current levels…"

Snowpack Changes:

Evolution of Average Annual Snow Water Equivalent as a Percentage of Average 1995-2005 Values

(effect of temperature changes only: historical P, baseline T from WY 1965-1987)



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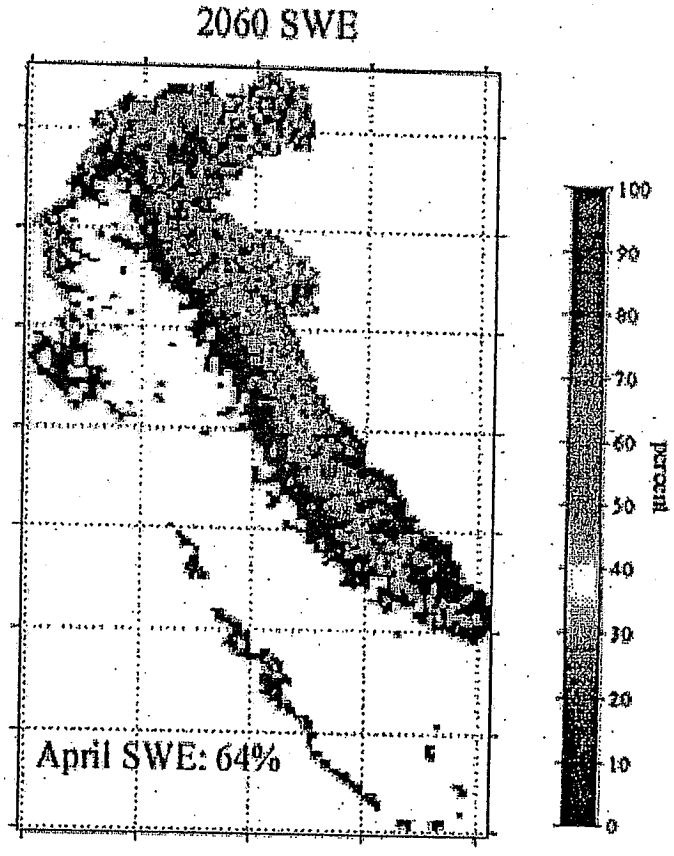

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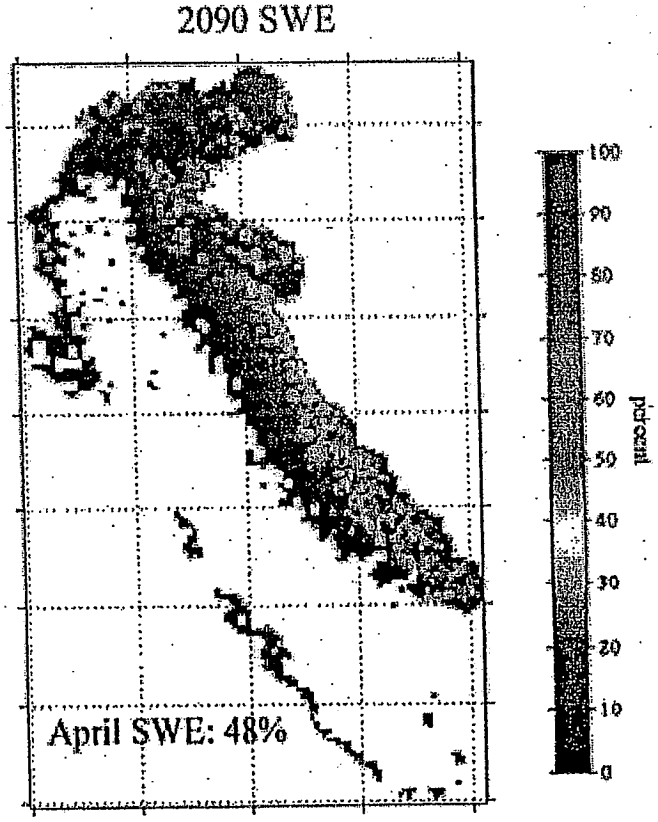


Fragile Delivery System

- SWP water delivered through fragile Bay-Delta
- Between 1981 and 1990 there were 22 levee breaches and 15 islands flooded in the Delta region
- Islands continue to sink, sea level is rising, levees are not maintained
- One chance in four of 6.0 earthquake in the Delta which could cause 8 to 26 simultaneous levee failures

Most recent break was on a "sunny day"!

Lower Jones Tract June, 2004

Who Is Supposed To Do What?

What DWR Does (And Does Not Do)

- Tries its best to deliver as much water as possible

- DWR does not certify Urban Water Management Plans. (Water Code Section 10657)

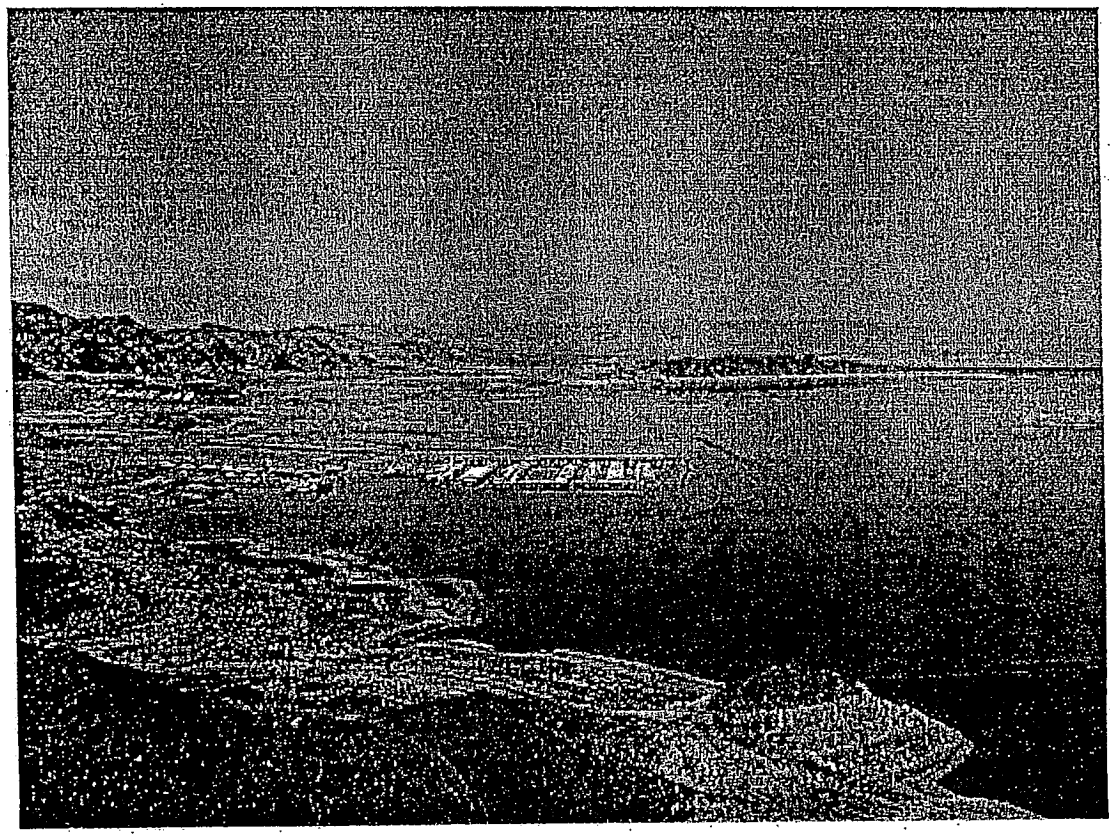
What Castaic Lake Water Agency Does

- Seeks to diversify water sources
- Uses DWR's "State Water Project Delivery Reliability Report" for water supply assessments
- All water managers are born optimists -We do not like saying there are limits

What Happens If The Water Is Not There?

- Look at the Colorado River – who would have thought?
- Cutbacks
- Landscapes
- Jobs and Businesses

... The **drought** that couldn't happen is here." said Ms Mulroy



Could It Happen Here?

February, 1991:

Governor Wilson within days of using Emergency Powers to order across the board 50% cutback in water use statewide – residential, business and agriculture

"March Miracle" bailed California out

What About Possible New Supplies

- 41,000 transfer from Kern County Water Agency not a done deal
- Local groundwater- 6ppb, 4ppb, or 1ppb?
- Perchlorate migrates
- Groundwater banking/conjunctive use

Conjunctive Use

- Can be good way to store water
- Conjunctive use does not create new water
- Need to be aware of potential and existing contaminants in some Central Valley aquifers

What Are You Required To Do ?

Under SB 610, "The city or county *(in this case Santa Clarita)* shall determine, based on the entire record, whether projected water supplies will be sufficient to satisfy the demands of the project, in addition to existing and future planned uses."

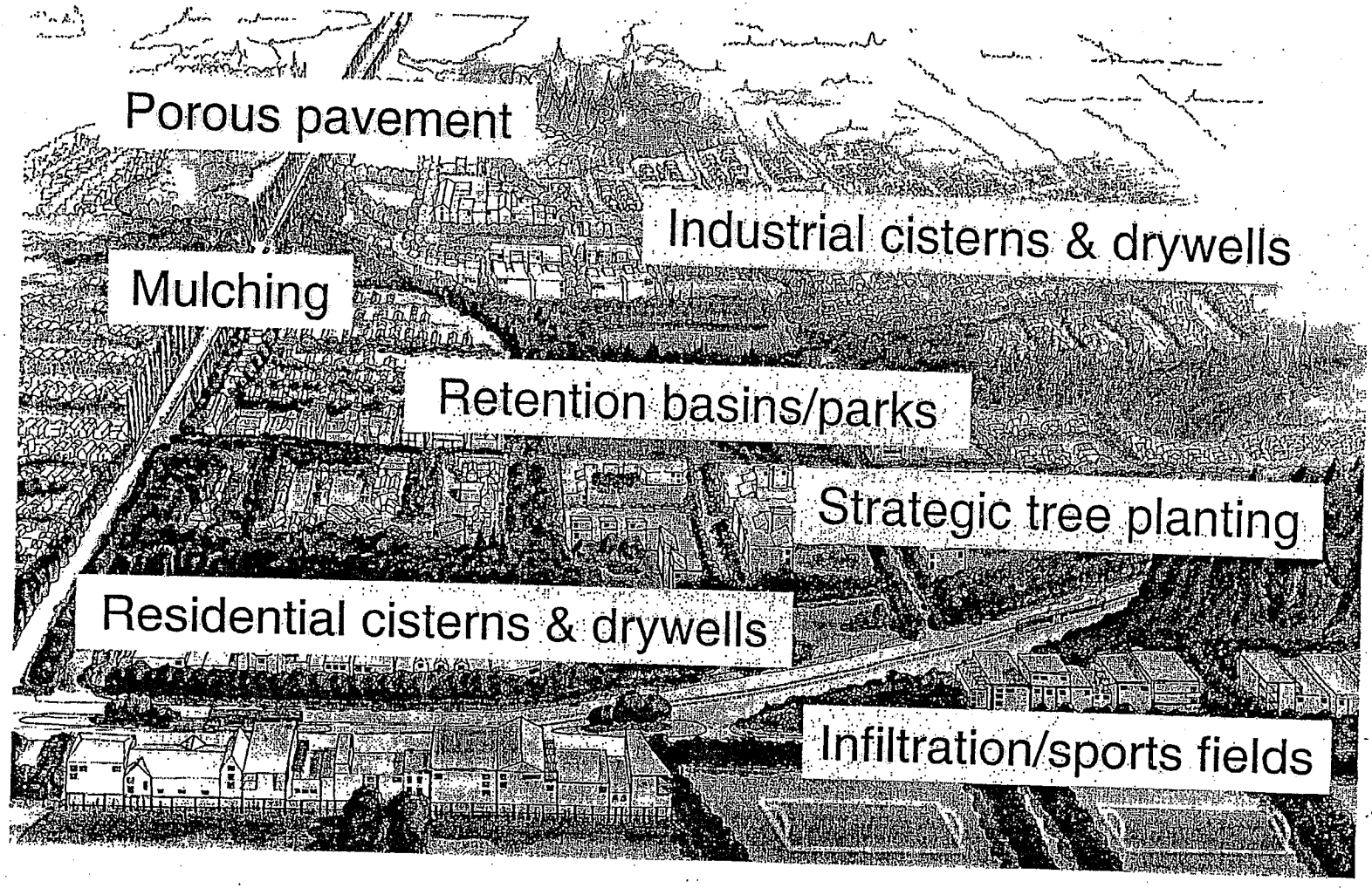
SB 221 Requirement

- Under SB 221 "The legislative body of a city or county or the advisory agency, to the extent that it is authorized by local ordinance to approve, conditionally approve, or disapprove the tentative map, shall include as a condition in any tentative map that includes a subdivision a requirement that a sufficient water supply shall be available."

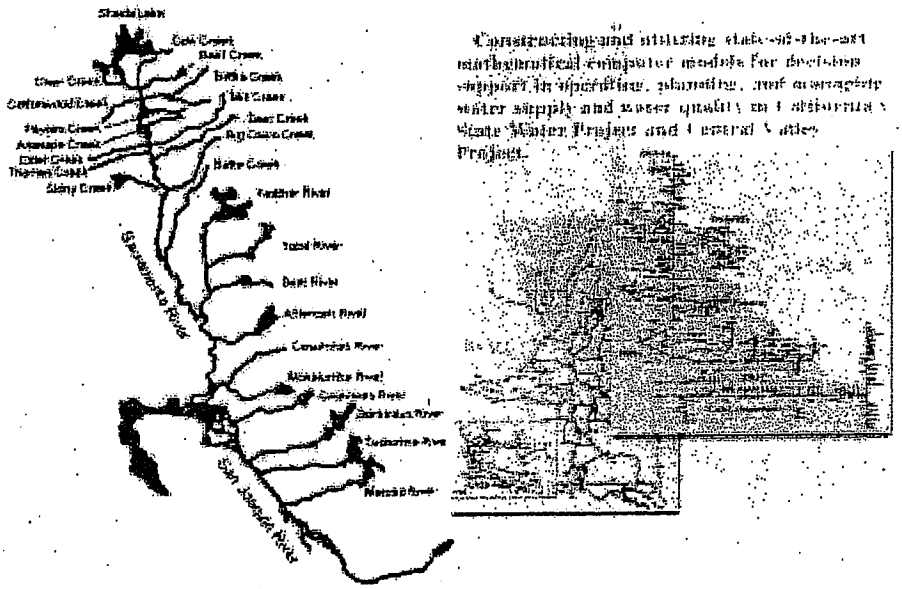
What Santa Clarita Should Do

- For land-use decisions do not assume 41,000 acre-feet are available until final court decision
- Include a margin of safety
- Identify & disclose impacts to existing customers if supplies don't materialize
- Require water efficiency in new growth

A vision for Sun Valley...



A Strategic Review of CALSIM II and its Use for Water Planning, Management, and Operations in Central California



Submitted to the

California Bay Delta Authority Science Program
Association of Bay Governments
Oakland, California

by

A. Close, W.M. Haneman, J.W. Labadie, D.P. Loucks (Chair), J.R. Lund, D.C. McKinney, and J.R. Stedinger

December 4, 2003

Executive Summary

1. Summary

The central all-encompassing question put to the panel is whether the CALFED program has adopted an appropriate approach to modeling the CVP-SWP-Central Valley system. Is the general CALSIM modeling approach appropriate for predicting the performance of the general facilities and for use in allocation planning, assessing water supply reliabilities and for carrying out operational studies? We believe the use of an optimization engine for simulating the hydrology and for making allocation decisions is an appropriate approach and is in fact the approach many serious efforts of this kind are using. It is a substantial improvement of the previous modeling approaches and provides a basis for consensus among federal and state interests. The modeling approach addresses many of the complexities of the CVP-SWP system and its water management decisions.

There exists a common tension between those who wish for greater detail and those who want less detail from the model. This argues for a more comprehensive, modular and flexible approach than is now available. In this report we suggest some ways this might be accomplished in the future. We also propose some management procedures that could be considered to improve model and model application quality control and documentation. The openness and availability of the model is admirable and very important given the numerous stakeholders who have interests in the management and allocation of water in the state. To increase the public's confidence in the many components and features of CALSIM II, we suggest that these components of CALSIM be subjected to careful technical peer review by appropriate experts and stakeholders.

2. Background

The California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (USBR) have developed a computer model called CALSIM II that simulates much of the water resources infrastructure in the Central Valley of California and the Delta region. This infrastructure is referred to as the CVP-SWP system. In particular CALSIM II provides quantitative hydrologic-based information to those responsible for planning, managing and operating the State Water Project (SWP) and the federal Central Valley Project (CVP). As the official model of those projects, CALSIM II is the default system model for any inter-regional or statewide analysis of water in the Central Valley of California.

CALSIM II has a central role in the analysis of many CVP-SWP and related issues, some of which require capabilities beyond those included in the model. California needs a large-scale relatively versatile inter-regional operations planning model and CALSIM II currently serves that purpose reasonably well. As the primary State and Federal-sponsored model available for water operations and planning, CALSIM II is critical to the study of many technical and policy issues related to water supply reliability, environmental management and performance, water demands, economics, hydrology and climate, and regulatory compliance.

CALSIM II is a particular application of the California Water Resources Simulation Model called CALSIM. It uses a mixed integer linear programming model solver to route water through a network over time. Currently it uses monthly time steps. Policies and priorities are implemented through the use of user-defined weights applied to the flows in the system (represented by arcs of the network). Simulation cycles at different temporal scales allow for successive implementation of constraints. The model can simulate the operation of relatively complex environmental water accounts and state and federal environmental regulations. In our judgment CALSIM II represents a very impressive modeling effort on the part of all those involved with its development and application.

The CALFED Science Program commissioned this external review panel (Appendix D) to 1) provide an independent analysis and evaluation of the strengths and weaknesses of CALSIM and CALSIM II, and 2) to offer suggestions on the appropriate uses of these modeling tools, on ways their use might complement or be complemented by other models, and on further development, quality assurance, and use in major water systems operations and planning in California.

The panel received background documents (Appendix B), including a survey by the University of California at Davis of stakeholder responses to questions about CALSIM II. We subsequently met for one and a half days in Sacramento for discussions and presentations (Appendix A) by CALFED, DWR and USBR staff. The discussions concluded with a summary presentation by the panel outlining our tentative conclusions.

The information we received and the shortness of our meetings with modeling staff precluded a thorough technical analysis of CALSIM II. We believe such a technical review should be carried out. Only then will users of CALSIM II have some assurance as to the appropriateness of its assumptions and to the quality (accuracy) of its results. By necessity our review is more strategic. It offers some suggestions for establishing a more complete technical peer review, for managing the CALSIM II applications and for ensuring greater quality control over the model and its input data, and for increasing the quality of the model, the precision of its results, and their documentation.

In this review we were asked to address the following questions:

1. Is CALSIM a reasonable modeling approach for current and proposed applications and problems?
2. Do other modeling approaches show similar or greater promise and flexibility for such problems? If so, how?
3. What are the major comparative strengths and weaknesses of the current CALSIM approach and alternative approaches?
4. What are major scientific, technical, and institutional limitations, uncertainties, and impediments for current and proposed applications of CALSIM?
5. What model, software, and data developments, special studies or tests would be beneficial to improve CALSIM for current and proposed uses?
6. How might CALSIM development and applications be managed and overseen to improve the quality assurance of model results for current and proposed applications?

7. What are your suggestions for long-term use, development, or replacement of the current suite of models and data available for the current and proposed uses of CALSIM?

The following sections of this summary present our responses to these questions. The main parts of this report and its appendices provide additional detail.

3. CALSIM Modeling Approach

CALSIM II is a simulation model developed as a joint venture between the California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (USBR) to (i) provide a significant modernization and upgrading of the DWRSIM and PROSIM models developed and used by these organizations, (ii) develop a comprehensive modeling system that simultaneously addresses the current and future needs of both the SWP and CVP systems; and (iii) develop a generalized modeling system that could be applied in any river basin system, in contrast with the previous models that were less generalized and more specifically designed for the existing SWP and CVP systems. In this respect, CALSIM II represents a state-of-the-art modeling system that is similar in general concept, while differing in specific details, to other data-driven river basin modeling systems such as ARSP, MODSIM, OASIS, REALM, RiverWare and WEAP.

CALSIM uses linear programming to solve sets of equations that simulate water movement through the CVP-SWP system in accordance with various objectives and constraints. This is a modeling approach which has been used successful in California (Johnson et al., 1991). In a complex system such as that being modeled, it is essential to have some mathematical representation of system flows that reflects all of the interconnections and constraints. Use of an optimization algorithm allows good decisions to be identified from among all possible and feasible decisions. To the extent this simulates what actually occurs, it is a good modeling approach. To the extent it optimizes when in reality no such optimization is implemented, it has the potential to produce inaccurate and overly optimistic outputs.

Most successful applications of optimization that attempt to simulate the behavior of a system have calibrated their objective functions (i.e., set the weights that prioritize flows over time and space) so that the model results correspond to what actually happens or would happen under a particular hydrologic and demand scenario. In these cases the model's decisions correspond to those the operators would make, as often prescribed by rules that have been worked out in a legal/political process. It does not appear that such a calibration of the objective function weights in CALSIM has yet been completed.

4. Other Modeling Approaches

There are two aspects of modeling, the model structure and algorithms used, and the model software. The use of linear optimization algorithms to solve simultaneous equations for simulating hydrology is a common way of avoiding a typically long list of procedural rules for simulating regional water systems. Such sets of procedures can be difficult to generate for

complex systems, and very different and new rule sets may be needed if structural or significant policy changes are to be investigated. In addition the performance of the system when simulated will be less than that which can be achieved in practice if a good set of rules is not provided. Optimization models are generally easier to reformulate when system changes are to be investigated. However unless the optimization is calibrated in such a way as to actually resemble what takes place in practice it can produce an optimistic description of system performance. This is particularly true if the optimization model is allowed to have perfect foresight of future events that in practice would not be available to system operators.

Large simulation models using optimization and procedural rules both need to have internal checks to ensure to the extent possible that errors in mass balances, for example, do not occur due to errors made when the model is being defined or created. Such internal checking is not apparent to us in our admittedly brief review of CALSIM II. Nor were calibration procedures well defined.

One obvious limitation of using linear optimization procedures is its inability to model accurately and efficiently some of the non-linear hydrologic and decision processes that occur in systems as complex as the CVP-SWP. One approach to addressing this issue of model accuracy, and possibly for decreasing the computational time as well, is to link linear optimization models to non-linear simulation models in a way that permits the simulation to represent the hydrology in any spatial and temporal detail desired. The optimization is used to determine what the decisions should be at every site where a water allocation, reservoir release, or other management decisions must be made. The time steps for simulation could be daily, or weekly or longer, depending on the needs of the user, but would likely be of shorter durations than the optimization time steps. After a predetermined number of simulation time steps, the optimization model would be run. The initial state of the optimization should be set at the beginning of each optimization time step. The optimization component should include multiple future time periods, with imperfect hydrologic and demand forecasts, but once solved only the current period's solutions are implemented – i.e., these decision variable values are sent to the simulation component. The decisions indicated for future periods are ignored. When appropriate, the initial state of the multi-period optimization model is updated and the model is again solved. And so on. Such a modeling approach may prove to be both more realistic, more accurate, and require less time, once developed. We believe such an approach might be worth considering for future development.

CALSIM II currently consists of a combination of software modules developed in several languages, including FORTRAN, Java and C. Several of the modules require proprietary software packages in order to run CALSIM II (Lahey FORTRAN and XA Solver). DWR and USBR staff have said that these components are being replaced by public domain software that can be obtained free of charge. We agree with this decision. Very good public domain software packages of optimization, visualization, file management, and data base support are currently available, and new ones will continually be produced. Periodic updates should be anticipated as part of the business of maintaining the modeling system.

Significant thought should be given to the sustainability of the CALSIM II software. How will future programmers be able to maintain this software? How will future software developments

be incorporated into the system? Will the solver currently being developed by LBNL be adequate in terms of accuracy and computation speed? Will other solvers need to be tested? Can the system accommodate these future developments without major modifications? What reasonable modifications could be made now in anticipate of future developments?

5. Comparative Strengths and Weaknesses

Many of the stakeholder perceived strengths and weaknesses of CALSIM and CALSIM II are very well identified in the survey report from the University of California at Davis (Ferreira, et al. 2003). Our background materials and briefings covered various strengths and weaknesses, but without first hand experience, all we can do here is to summarize those that we have heard expressed by others.

Here we provide a brief summary list.

5.1 Some Prominent Strengths

The strengths of CALSIM II are many. Most are expressed in comparison to previous DWRSIM and PROSIM models DWR and USBR were using. Some of these strengths include:

- Consensus model. CALSIM II is the official joint modeling environment of the State DWR and USBR. This includes a common schematic, hydrologic representation of the system, common set of facility capacities, and common representation of system operating policies. This helps all parties improve representations, rather than compete over representations.

- Common effort. The joint development of CALSIM II by USBR and DWR has provided more focused and effective use of resources and expertise than previous development of agency-specific models. CALSIM II development has also involved other agencies and consulting expertise more than pervious models of this system.

- Data-driven model. CALSIM II is a rather data-driven simulation model with an optimization engine. This modeling approach provides:
  a. greater flexibility than its predecessors and traditional water resources simulation approaches.
  b. a promising framework for improving transparency, data, and model documentation, compared to other approaches.

- Public domain. The model and data are substantially in the public domain, facilitating transparency and adaptability for California's decentralized water system.

- Steady improvements. Data improvements have been steadily pursued following the adoption of CALSIM II, although deficiencies remain.

- Improved Delta water quality representation. Although problems appear to remain, the model developers have made substantial gains in representing Delta water quality operating criteria and performance.

- Better groundwater representation. Efforts to better include groundwater and non-CVP-SWP project operations merit continuation and expansion.

- Benchmark Studies. The development of documented benchmark studies have resulted in significant model improvements and aided in the development of comparative model applications. Such exercises should be continued and improved.

- Long-term vision. The vision of a more transparent and publicly available model that can be employed by those outside the major agencies is excellent. This is a major change in direction, and achieving this vision will require adjustments over time. Often, these adjustments will be externally driven. Externally-driven improvements are a price of success and evidence of success for an open, public, modeling policy.

- Important CALSIM II features:
  a. CALSIM II is able to simulate the operation of the complete CVP-SWP system in all areas that contribute flow to the Delta in monthly time-steps.
  b. CALSIM II is being applied to examine a diverse range of options including flood control, water conservation and supply, power generation, recreation, water transfers, groundwater banking, recycling, desalination, conjunctive use, the purchase of options and streamflow and water quality protection.
  c. CALSIM II has successfully been applied by both DWR and USBR to examine both structural and non-structural changes to the CVP-SWP system as well as to ascertain the risks involved with different potential operating scenarios and to quantify the impacts of proposed actions.
  d. CALSIM II can dynamically model operation of environmental water accounts.
  e. Demands may vary according to various levels of development (e.g. 2001, 2020) and to hydrologic conditions.
  f. The regulatory environment under which the projects must operate can be simulated.
  g. CALSIM II can link to external modules as needed, e.g., to estimate the salinity at water quality stations within the Delta.

5.2 Some prominent weaknesses

As its strengths are many, so are its weaknesses. It seems worth saying, however, that no model can perfectly (meaning efficiently and effectively) serve all interests in a system as complex as the CVP-SWP. Tradeoffs need to be made. This can result in what some would call weaknesses. Such weaknesses are often accepted to gain strengths in another ways.

We heard that the CALSIM II model was too complex. We also heard that it did not handle particular components of the system with sufficient detail. And such is the dilemma of any

complex model, such as CALSIM II. The model is clearly too complex, and not complex enough. The root of this difficulty is that when such a model is constructed, it is not clear what level of detail is needed, so the model must be made sufficiently complex to ensure it is complex enough. And the complexity needed to address some issues will remain in the model when it is used to address other less complex issues, or the same issues at less complex locations. One approach to addressing this issue is to develop different linkable modules of CALSIM II having different complexities. In this way the level of detail can be varied to be consistent the application or study at hand, and level of sophistication and resources available to the user.

Other weaknesses model users would like addressed include:

- The model provides limited and inadequate coverage of non CVP or SWP water and of the California water system south of the Delta.
- The model assumes that facilities, land-use, water supply contracts and regulatory requirements are constant over this period, representing a fixed level of development rather than one that varies in response to hydrologic conditions or changes over time.
- Groundwater has only limited representation in CALSIM II.
- Groundwater resources are assumed infinite, i.e., there is no upper limit to groundwater pumping.
- The linear programming model considers only the current month, and hence CALSIM II operating rules are required to determine annual water allocations, to establish reservoir carryover storage targets, and to trigger transfers from north of Delta to south of Delta storage.
- Better quality control is needed both for the model and its current version and the input data. Procedures for model calibration and verification are also needed. Currently many users are not sure of the accuracy of the results. A sensitivity and uncertainty prediction capability and analysis is needed.
- Need improved ways of altering the model's geographic scope and resolution and its temporal resolution to better meet the needs of various analyses and studies.
- Need to improve the model's comparative as well as absolute (or predictive) capabilities.
- CALSIM II needs better capabilities for analyzing economic, water quality, and groundwater issues.
- Need improved documentation explaining how the model works, its assumptions, its limitations, and its applicability to various planning and management issues.
- DWR and USBR have not provided a centralized source of support for CALSIM II. More training for CALSIM II is needed. There is a need for more people who can run CALSIM II. There is a need for a well-publicized user group. A more extensive users' guide is needed.
- Improved capabilities are needed for real-time operations especially during droughts, gaming involving stakeholders during a simulation run, handling of evapotranspiration and agriculture demand changes over time, water transfers, Delta storage, carryover contract rights, refuge water demands and more up to date representation of Feather River, Stanislaus River, Upper American River, San Joaquin River and Yuba River operations.

- Need an improved graphical user interface to facilitate input of model data, setting of model constraints and weights, operating the model, and displaying and post analysis of model results.
- Need to be able to change the model time period durations for improved accuracy of model results.

6. Limitations, Uncertainties, and Impediments

6.1 Absolute Values or Comparative Results

Modelers sometimes make a distinction between the use of a model for *absolute* versus *comparative* analyses. In an absolute analysis one runs the model once to predict an outcome. In a comparative analysis, one runs the model twice, once as a baseline and the other with some specific change, in order to assess change in outcome due to the given change in model input configuration. The suggestion is that, while the model might not generate a highly reliable absolute prediction because of errors in model specification and/or estimation, nevertheless it might produce a reasonably reliable estimate of the relative change in outcome. The panel is somewhat skeptical of this notion because it relies on the assumption that the model errors which render an absolute forecast unreliable are sufficiently independent of, or orthogonal to, the change being modeled that they do not similarly affect the forecast of change in outcome; they mostly cancel out. This feature of the model is something that would need to be documented rather than merely assumed.

In our opinion CALSIM II has not yet been calibrated or validated for making absolute predictions values. Yet it is apparent that there has been a distinct need by model users for absolute predictions. In the absence of alternatives, users are adopting CALSIM II results as the best absolute prediction available and they are likely to continue to do so. We recommend that model developers recognize the requirement for CALSIM II to provide absolute predictions. To satisfy this new purpose, additional calibration of the model will be required to ensure that the output it produces is fit for this purpose. Regardless of how possible it is to match the model closely with observed behavior, statistics on the accuracy of the calibration run should be supplied to users to enable them to gauge the likely errors involved with using the model output.

6.2 Sensitivity and Uncertainty Analyses

Sensitivity analyses would be useful to identify which parameters and input data have major impacts on decisions and system performance criteria of concern. Uncertainty analyses would help users of the model understand better the risks of various decisions and the confidence they can have in various predictions.

6.3 Graphical User Interface

Having a graphical user interface would substantially aid those who use the model in managing both input and output data, and in controlling or managing model operations. This model will not likely become as available to and as well understood by the public, to the extent desired by the model developers, until an effective menu-driven GUI has been created that can help create and draw from a database of system parameters and characteristics, and simulation results.

6.4 Documentation and Training

When if ever is adequate documentation and training available? Rarely, but we believe there is a serious need to improve the documentation as well as the training available for all those interested in using CALSIM II.

7. Options for Improving CALSIM

7.1 CALSIM Model Software

We encourage the developers of CALSIM to convert their present software to that which is publicly available and to develop a useful graphic based user interface that can facilitate the input, editing, and display of all the data that are input to and output from CALSIM II. There are many options, some of which we have discussed with the model developers.

The CALSIM package should be made more modular and capable of linking to other more complex models of components of the CVP-SWP system. If the changes in code and modeling approach result in a quicker running model, it might be possible to link, when desired, modules that facilitate position analyses and other types of uncertainty analyses. A modular system would allow alternative representations of different components of the system. Thus different levels of spatial detail, or representations of the fundamental processes, would be allowed within the overall system representation and record of California hydrology. This will allow the use of more general and streamlined models for use of preliminary investigation and general planning, as well as a more detailed representation of the system for final analyses and more detailed studies. This would be very useful.

7.2 Sensitivity and uncertainty analyses

Both sensitivity analyses need to be performed, and procedures need to be developed to enable the estimation of measures of uncertainty associated with model output. Perhaps workshops focused on just these needs should be scheduled to better determine how best to meet these needs. There are numerous procedures available that could be applied. Appendix H contains some approaches for performing sensitivity and uncertainty analyses.

7.3 Model calibration

There is a need to develop the model so that it is able to provide absolute estimates of key model outputs rather than limiting the use of the model to comparative studies. One way to do this is to subject the model to a comprehensive calibration process where it is fine-tuned until it is able to reproduce the historical behavior of the system with sufficient accuracy to provide absolute results. The calibration of the model should aim to test all the key outputs of model including water quality in the San Joaquin River and in the Delta. It is necessary to test the monthly values of outputs for those outputs for which the monthly pattern is important.

7.4 Other extensions and improvements

- The opportunity of improving the collection of data on the use of water (preferably broken down by irrigation district and water source) should be investigated. The use of groundwater should be included in this investigation.
- It would be useful to expand the geographic extent of the model so that it includes all the components of the linked water supply system, including both the San Joaquin and Tulare Lake Basins of the Central Valley. The model should also account in some manner for imported supplies of water to users in southern California from the Colorado River.
- The linkage between surface water and groundwater would appear to be of critical importance and output that would enable the impact of surface water use on groundwater extractions would appear to be useful.
- Examination of the report *'CALSIM II Simulation of Historical SWP/CVP Operations'*, DWR (2003) indicates that the current formulation of CALSIM II:
  - Overestimates water deliveries to SWP and CVP contractors,
  - Determines carryover storage target values that differ from those the operators have determined in the past, and
  - Operates the San Luis Reservoir at lower levels and fills it later in the season than operators have in the past.

8. Managing CALSIM Development and Applications

The predicted impacts and other information derived from CALSIM II applied to the CVP and SWP can influence major investment decisions. It is thus self evident that those who use the model results need to have some confidence as to their precision. Is the science behind the information derived from CALSIM II been reviewed and judged correct? Is the model software free from errors? Are the assumptions made when performing the modeling the correct ones? Are the model results accurately and fully reported? In other words, just how much credence should decision makers place in the model output? Users of the model results should be assured that they are credible and unbiased. One way to help ensure this is to have the models, their associated software, and their applications under the control of some interagency organization that can oversee and provide quality control over model development, application and documentation. They can also plan and implement needed peer reviews.

One possible means of facilitating the peer review processes and for maintaining control on the particular versions of CALSIM II and accompanying models used for CVP-SWP planning and management decisions is to create an interagency modeling consortium (IMC) consisting of DWR, USBR, and other stakeholder organization (including university) personnel if they are interested and want to participate. This center would be responsible for maintaining a toolbox of 'acceptable' models for use by the agencies and contractors. The models placed in the toolbox should be peer reviewed with respect to their applicability and suitability for use in particular applications. Those that are not peer reviewed should be considered for peer review. New models proposed for use in California should be peer reviewed with respect to their suitability, and for their strengths and limitations, before being placed in the toolbox. The review should be of the theory underlying the model, the model's software, the documentation of the model as well as of its software, the model's functions and capabilities including those pertaining to model data input and output, the input data themselves, model calibration and verification, capabilities for sensitivity and uncertainty analyses, user control of all model operations including pre and post analyses (GUIs), spatial and temporal resolutions, and its limiting assumptions.

9. Future Use, Development, or Replacement of CALSIM

9.1 A coupled optimization simulation approach

Given a system as complex as the SWP/CVP system, it seems to us it might make sense to consider the development of a more detailed simulation 'engine' and couple it to an optimization or management 'engine'. The simulation component can more accurately model hydrologic processes. For example it can include the deterministic non-linear routing of flows and their quality constituents through the system on a smaller time step (e.g., daily) and hence much more realistically or accurately, than can linear optimization using longer time steps, even with all the known tricks for linearizing separable (single variable) non-linear functions and 'if-then-else' statements. The simulation engine itself may require a simultaneous equation solver, especially for the Delta. But the simulation engine needs to know what to do, i.e., what decisions to make. Periodic use of the optimization, say once a week or even less frequently if conditions are relatively constant, for determining the decisions to be simulated, e.g., the water allocation and reservoir release decisions, eliminates much of the maze of rules that otherwise would be required and which developers of CALSIM II are avoiding through the use of optimization. Each time the optimization or management 'engine' is run it is first updated with the current state of the system as determined from the more precise simulation 'engine'. The optimization component would include multiple time periods only to the extent that the current period's solution is not affected by the time horizon in the optimization. The other time period solutions are ignored. This coupled optimization-simulation approach has the potential to be both more accurate as well as quicker to execute. In our opinion it is worth considering for future development.

9.2 Models as hypotheses

CALSIM II is really about the future, not the past. Benchmarking studies can help establish the credibility of the model and provide estimates of its accuracy by comparing its performance to actual historical operations. A concern is how well the model reproduces historical operations, not whether it is valid or invalid on some absolute scale of perfection. But the real issue is how well CALSIM can predict what might happen in the future with sets of hydrological and meteorological conditions that have not yet been experienced, and may be significantly different from the past if climate variability and climate change are considered. In these cases the ability of the model to forecast what will happen depends both upon its ability to describe what would happen should a particular system operating policy, priorities and water demands be adopted. In this sense CALSIM II modeling studies should be thought of as the exploration of a hypothesis that particular policies and priorities have been adopted. Our ability to predict the future has generally been poor, but it is the obligation of agencies such as DWR and USBR to attempt to ensure that should water demands, water supplies, and water policies evolve as one would expect, society is prepared for the consequences. And that would seem to be what CALSIM II is about.

9.3 Future Model Development and Use

From the list of perceived weaknesses above, there are clearly many opportunities for further refinement of CALSIM II. Rather than attempt to meet all needs using only one model, namely CALSIM II, it seems preferable to improve its adaptability to various levels of detail through its ability to link to other models when additional detail in a particular region or for a particular feature is desired. For example, the monthly time step used by CALSIM II is sufficient for many studies. Yet some seasonal (multi-month) decision making is needed in CALSIM II to reflect decisions made by the SWP and CVP as to what Table A and other allocations to honor in full. On the other hand, it is clear that many water quality and ecosystem management decisions would profit from more detailed weekly or daily time steps. However, such shorted time-step models will need the guidance of a longer time-step model. As discussed earlier, models with shorter time scales can require increased spatial resolution, both of which lead to increased model complexity and a strong argument for model modularity.

Additional potential applications of CALSIM II include operational planning using gaming, or the involvement of potential decision makers during the simulation runs via a well developed graphical user interface, and to improve the capability of modeling water quality, energy production, conjunctive groundwater and surface water interactions and use, to mention a few.

There will always be a need to perform alternative 'what if' policy analyses where a relatively fast model that also provides some capability for uncertainty analyses is required. Perhaps CALSIM II will never be able to serve this need, and if so another more simplified modeling approach could be developed to fill that need. This simpler screening tool would be calibrated to produce results comparable to those of CALSIM II or observed data. Is this possible? We can not be certain but feel the idea should be seriously considered.

Acknowledgments

We want to acknowledge and thank all those who were involved in preparing the materials we received, in presenting additional information to us, and in arranging our activities and taking care of us during our brief review visit. Our special thanks to Kim Taylor for leading this effort, and to all those who did their best to educate us on the finer points of CALSIM II. All those involved in the development and implementation of CALSIM II are to be congratulated for extending the state-of-the-art in water systems modeling and for making it a critical part of the planning, development and management of California's water resource infrastructure.

Caveat

Just as all models are approximations of reality, so may all advice be an approximation of what it should be. We hope what we have written in this report is correct and useful, but encourage CALSIM model managers and California's water community to take our assessments and suggestions for what they are, arrived at based on our own experiences and some limited exposure to those who know much more about CALSIM and CALSIM II than we do.

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1. CALSIM Compared to Other Modeling Approaches

Management of complex systems such as coordination of the California State Water Project (SWP) and the Federal Central Valley Project (CVP) requires effective decision support tools for simulating and analyzing system components in a fully integrated manner. The classic definition of a decision support system (DSS) provided by Sprague and Carlson (1982) is *"an interactive computer-based support system that helps decision makers utilize data and models to solve unstructured problems."*

A DSS integrates the following interactive subsystems: (i) dialog generation and management subsystem (DGMS) for managing the interface between the user and the system; (ii) data base management subsystem (DBMS); and (iii) model base management subsystem (MBMS).

CALSIM II is a DSS developed as a joint venture between the California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (Bureau) to (i) provide a significant modernization and upgrading of the previous models DWRSIM and PROSIM employed by these organizations, (ii) develop a comprehensive modeling system that simultaneously addresses the current and future needs of both the SWP and CVP; and (iii) develop a generalized modeling system that could be applied in any river basin system, in contrast with the previous models that were less generalized and more specifically designed for the SWP and CVP. In this respect, CALSIM II represents a state-of-the-art modeling system that is similar in general concept, while differing in specific details, to other river basin modeling systems such as AQUATOOL (Valencia Polytechnic University, Spain), ARSP (Acres Reservoir Simulation Program) (Boss International, 2003), IRAS (Interactive River-Aquifer Simulation) (Loucks, et al. 1996), MIKE BASIN (Danish Hydrologic Institute, 2002), MODSIM (Labadie and Larson, 2000), OASIS (Randall, et al., 1997), RAISON (Young, et al. 2000), ResSim (U.S. Army Corps of Engineers, Hydrologic Engineering Center), Ribasim (River BAsin SIMulation Model) (Delft Hydraulics, Netherlands), REALM (REsource ALlocation Model) (James, 2003), RiverWare (Zagona, et al. 1998), WaterWare (Jamieson and Fedra, 1996), and WEAP (Water Evaluation and Planning System, 2003) (Hansen, 1994). All of these can be categorized as decision support systems since all three subsystems of a DSS are embodied within them.

A distinguishing feature of several of these modeling systems is the use of optimization on a period by period basis (not fully dynamic) to "simulate" the allocation of water under various prioritization schemes, such as water rights, without the presumption of perfect foreknowledge of future hydrology and other uncertain information. This is a valid approach since use of optimization overcomes the disadvantage of employing numerous, unwieldy prescriptive rules governing water allocation. Systems employing optimization in this manner include: ARSP, MODSIM, OASIS, REALM, RiverWare, and WEAP and are therefore more akin to CALSIM II. ARSP, MODSIM, REALM and Ribasim are further distinguished by use of specialized minimum cost network flow optimization algorithms, although of these only MODSIM includes iterative structures using an imbedded scripting language for including non-network "side constraints" in the optimization. The other modeling systems are essentially limited to a

pure network structure that does not allow inclusion of all the complex, non-network type constraints necessary to model the complex CVP-SWP system.

It may be useful to compare this use of optimization with some other uses that have appeared in the modeling literature. One use of optimization is purely for computational convenience; in this case optimization is employed as a numerical method for obtaining the solution of a series of simultaneous (often linear) equations. This approach, which was used in the first generation of computational economic models about forty years ago, exploited the fact that some existing computational algorithms for solving optimization problems were faster than those for solving large systems of simultaneous equations. A second use of optimization applies when the solution of the system of equations characterizing a water balance has multiple possible solutions; this is essentially the case described above, where optimization is being used primarily to identify a unique solution for a system of equations. Both of these uses of optimization are primarily descriptive rather than prescriptive (also referred to as positive vs. normative) in intent: the goal is to model how a system, characterized by a set of equations, operates. To the extent that the real–world managers of the system do optimize some objective function, the aim is to mimic their behavior by setting up and solving a similar optimization. But, the goal is to model what they actually do, not to advise them what they ought to do. The third use of optimization adopts an explicitly prescriptive goal and sets out to ascertain what managers ought to do if they wished to optimize some objective function (e.g. maximize economic efficiency). While this is certainly a legitimate analytical exercise, it should be kept conceptually distinct from the use of optimization in a purely descriptive context.

1.1 Advantages of Optimization-Driven Simulation

For large, complex, integrated systems, simulation models that optimize operation and allocation of water within each time-step by operational priorities have become the major simulation approach. Models of similar approach include ACRES (Acres Engineering), AQUATOOL (Spain), MODSIM (Colorado State U.), OASIS (Hydrologics, Inc.), WASP (Australia), and WEAP (Tellus Institute). Priority-based simulation models with optimization engines have become widespread in part because:

- The models are simpler to develop, comprehend, and modify.
- Their software is easier to upgrade, since the data set describing the system and its operating policies is substantially separate from the software code.
- Data are easier to update and modify, since changes require little or no software changes.
- Priority-based operations are a common basis for water rights and operating policies.
- Priority-based operations are relatively easy to explain.

The major exception to this technological trend in simulation modeling is to use more traditional procedural operating rules in simulation models with a graphical user interface for primarily flood control operations (HEC-RESSIM) or for exploratory study of large systems or detailed management of relatively small systems (Stella-type models).

Similar to several of these systems, CALSIM II allows specification of objectives and constraints in strategic planning and operations without the need for reprogramming of

complex models. The CALSIM II authors developed the English-like WRESL (Water Resources Engineering Simulation Language) as an intuitive means of defining the objective function and constraints for a mixed-integer linear programming model, similar to the OCL (Operational Control Language) used in OASIS and the Policy Editor employed in RiverWare. In MODSIM, the optimization model is formulated directly through the graphical user interface with no need for a modeling language, but with supplemental features of the optimization defined through the PERL scripting language. WRESL allows planners and operators to specify targets, objectives, guidelines, constraints, and their associated priorities, in ways familiar to them. WRESL provides simple text file output that is converted to FORTRAN 90 code by a parser-interpreter program, whereas PERL is fully embedded in the network optimization code. Both modeling systems are data centered, meaning that model operation is controlled solely by user specification of input data rather than hidden rules or hard-wired data structures.

CALSIM II, OASIS, RiverWare and MODSIM are similar in that all use a high level language with syntax and logical operators; are written to simple text files which are subsequently parsed and interpreted; use rule-based or IF-THEN-ELSE conditional structures; are designed to be easy for planners and operators to use without the need for reprogramming; allow adaptive and conditional rules which are dependent on current system state variable information; include constructs for assigning targets, guidelines and constraints, along with their associated priorities; and include a goal seeking capability. CALSIM employs a mixed integer linear programming solver for repeated period by period solution that is less efficient computationally than the network solver employed in MODSIM, ARSP, REALM and Ribasim.

Unfortunately, unlike these aforementioned modeling systems, CALSIM lacks a comprehensive graphical user interface for constructing and editing the river basin system topology. CALSIM II would be greatly enhanced if, similar to RiverWare, IRAS, and MODSIM, objects representing features of the basin such as reservoirs, canals, and river reaches, could be created on the palette of a graphical user interface by simply clicking and dragging various icons for the objects to the display. The objects are instances of various classes that share certain common characteristics, and each object contains its own physical process methods and associated data. We believe that complaints concerning the complexity of using CALSIM II would be greatly reduced with development of such an object-oriented graphical user interface.

2. Comparative Strengths and Weaknesses

2.1 Some Prominent Strengths

CALSIM II has important strengths as a general inter-regional operations planning model, particularly compared with available alternatives and its predecessors. The primary strengths include:

- Coordination of Federal and State Interests A unique aspect of CALSIM II is the high degree of cooperation between Federal (i.e., U.S. Bureau of Reclamation) and State (i.e.,

California Department of Water Resources) interests in its development. This kind of cooperation is rare, and in fact this may be the only such example of such coordination for a system of this scale and complexity. Although it is clear that DWR staff have taken the greatest degree of responsibility in the planning, development, coding, testing and application of CALSIM II, it is also clear that USBR staff have also played an important role. CALSIM II can provide a showcase for other states as to what can be accomplished with Federal and State cooperation for river basin management.

- Consensus model. CALSIM II is the official joint modeling environment of the State and USBR. This includes a common schematic, hydrologic representation of the system, common set of facility capacities, and common representation of system operating policies. This saves a lot of unproductive bickering and helps all parties improve representations, rather than compete over representations.

- Common effort. The joint development of CALSIM II by USBR and DWR has provided more focused and effective use of resources and expertise than previous development of agency-specific models. CALSIM II development has also involved other agencies and consulting expertise more than pervious models of this system.

- Data-driven model. CALSIM II is a rather data-driven simulation model with an optimization engine. This modeling approach provides:

    a. much greater flexibility than its predecessors and traditional water resources simulation approaches.
    b. a promising framework for improving transparency, data, and model documentation, compared to other approaches.

- Public domain. The model and data are substantially in the public domain, facilitating transparency and adaptability for California's decentralized water system. Ongoing software development efforts will improve CALSIM in this regard.

- Steady improvements. Data improvements have been steadily pursued following the adoption of CALSIM II, although deficiencies remain widespread.

- Improved Delta water quality representation. Although problems appear to remain, the model developers have made substantial gains in representing Delta water quality operating criteria and performance.

- Better groundwater representation. Efforts to better include groundwater and non-CVP-SWP project operations are good efforts in the right direction, and merit continuation and expansion.

- Benchmark Studies. The development of documented benchmark studies seems to have resulted in significant model improvements and aided in the development of comparative model applications. Such exercises should be continued and improved.

- Long-term vision. The vision of a more transparent and publicly available model that can be employed by those outside the major agencies is excellent. This is a major change in direction, and achieving this vision will require adjustments over time. Often, these adjustments will be externally driven. Externally-driven improvements are a price of success and evidence of success for modeling policy that is open and public.

Few, if any, modeling organizations in the country have consistently done as good a job on model development and application for such a large, complex, and controversial system as the modeling group which developed CALSIM II. They are to be commended for their work to take California water modeling beyond past "closed shop" practices in favor of the development and dissemination of modeling capabilities that are more relevant to California's current water management problems. Most areas and suggestions for improvement noted below are meant to aid the model developers in moving further and faster in the direction they are already heading.

2.2 Some Prominent Weaknesses

The strengths and weaknesses of CALSIM II are not only technical (software, data, and methods), but also are institutional regarding how this model has been developed and employed. The administrative setting and objectives of model development and application are important, and difficult to manage. Alas, the management/policy problems of a system change frequently, while data and modeling capability change more slowly, and effective administrative structures change very slowly, if at all.

- Inadequate data development and management are principal shortcomings of CALSIM II. There has not been a sufficiently systematic, transparent, and accessible approach to the development and use of hydrologic, water demand, capacity, and operational data for CALSIM II. This problem extends beyond inadequate documentation and has led to controversy, confusion, and inefficiency in application of CALSIM II.
    a. Inadequate data management steepens the unavoidably difficult learning curve inherent for a complex system. Data have mostly been considered a "back room" activity of a few experienced experts. Retirement, promotion, or departure of these experts has left many gaps in knowledge and created difficulties for re-developing data for newer policy and planning problems.
    b. The administration of data development is fragmented, disintegrated, and lacks a coherent technical or administrative framework. Data required by CALSIM II are developed by several administrative units, without systematic technical vision or quality control for modeling purposes. Within DWR, different groups develop hydrologic and water demand data under different Deputy Directors, without effective coordination. This division must be overcome for a coherent data and analytical framework to be developed and implemented.
    c. In many cases it appears that water use and other hydrologic data inputs to CALSIM II are based on data collection and analyses that took place during the 1960s when DWRSIM and PROSIM were being constructed. It is important to ensure that data used for CALSIM II are up-to-date and consistent with the best current information

- The expertise and insights of many in local agencies, system operators, and consulting firms have not been prominent in the development of CALSIM II. For such a system with many hundreds of local experts, this is somewhat unavoidable, especially early in model development. Periodic re-examinations of how each area in CALSIM II is represented, in consultation with local agency and consulting experts, might overcome these technical shortcomings, and create and maintain a broader technical, user, and credibility base for CALSIM II. Active involvement of local agencies in CALSIM II development and applications would be much easier with better data management, and would be rewarded with a broader base of CALSIM II expertise and enhanced model credibility.

- Compared to the current CALSIM II, any central operations planning model for California water management should be:
  a. Expanded in geographic scope to include major non-CVP-SWP areas, especially the Tulare Basin, the Colorado River, and southern California. Operations and demands in these regions seem increasingly important for CVP and SWP operations, and are important for the integrated operations of California's major local and regional water management agencies.
  b. Expanded in management scope to include local management options such as water conservation, reuse, water transfers, groundwater and conjunctive use management, etc. These additional water management options are important for local, regional, and statewide water policy, planning, and management efforts and can have significant effects on CVP and SWP water demands.
  c. Made regionally modular, so smaller regional models can be run independently and tested locally, with boundary conditions consistent with the larger model.
  d. Made modular in terms of hydrologic, water management, and water demand processes, allowing better development, comparison, and updating of hydrologic and water demand process models. Agricultural, urban, environmental, and other water demands should be represented more directly, and explicitly. Groundwater should be represented and operated more explicitly. Land use based local hydrology and water demand approaches might be implemented in such standardized modules.
  e. Subject to a systematic model and data testing regime and continuous quality improvement program. As the problems of California water change, different and greater demands will be placed on analytical capability, requiring an essentially continuous testing, re-testing, and improvement of data and models. This might parallel a continuous review of local representations and data involving local agency and consulting experts.
  f. Financed on a broader base, by more than the CVP and SWP projects. Increasing use of CALSIM II is being made by local, regional, State, and Federal agencies interested in developing bilateral or multi-lateral water transfers or projects, which incidentally involve the CVP and SWP. To develop inter-regional modeling capability needed to integrate these activities at local, regional, and inter-regional scales, more sustained funding and involvement from local and regional agencies is needed. In effect, local and regional agencies have been "free riders" on CALSIM

II's analytical capabilities, and it is not necessarily a good bargain for them. Everyone should benefit from broader technical and financial participation.

g. Capable of analyzing a wide range of scenarios. More capability is needed to examine various long-term scenarios with respect to hydrologic, water demand, and operational uncertainties in the future. There also needs to be a better capacity to accommodate other approaches to representing hydrologic uncertainty and variability besides simply simulating 70-plus years of record.

- Input data and its development. Important aspects of CALSIM II rest upon the representations of other models of Delta hydrodynamics and water quality, water demands, and groundwater. The credibility of CALSIM II also rests on testing these models that send important data/representations to CALSIM II, and documenting them adequately. These models include:
  a. CU Model and SIMETAW: The consumptive use model and the newer SIMETAW model, used to develop hydrologic inputs and estimate return flows, also require testing and more explicit documentation. The underlying data for these models also need more systematic, standardized, and transparent treatment.
  b. DSM2: Representation of the Sacramento-San Joaquin Delta will always be important and prone to controversy, given the prominent importance of Delta flows and water quality for the operation and planning of California's water system. The difficulties of representing the Delta in operations and planning models are compounded by the tidal nature of the Delta, which usually implies a need for shorter time-steps. Representation of Delta water quality constraints currently falls heavily on an ANN method within CALSIM II. This ANN is calibrated (trained) based on a hydrodynamics model, DSM2. Thus, controversies regarding Delta representation in CALSIM II are likely to lead to questions of the adequacy of DSM2. The transparency and testing procedures valuable for establishing the credibility and limitations of a Central Valley operations model would also seem to apply to DSM2, or any other Delta hydrodynamics-water quality model. Tests of methods used to represent small-time step phenomena with larger time-steps (e.g., "partial month standards") should be tested in a forum that would give the approach credibility and where its limits could be developed, discussed, and documented.
  c. CVPM/CALAG/LCPSIM/IWR-MAIN: Representations of water demands in CALSIM II rely heavily on other models, particularly CVPM and eventually CALAG for agricultural water demands and LCPSIM and eventually IWR-MAIN for urban water demands. Thus, these models also will attract attention, and will probably require the same types of testing, transparency, and documentation suggested for DSM2 and CALSIM II. Many water contractors of the CVP and SWP also have internal water sources (groundwater, water conservation, and water reuse) and side contracts with other agencies to supply water that can increase or decrease (at different times) their water demands from the CVP and SWP contracts and from the demands estimated from CALAG and IWR-MAIN types of models.
  d. IGSM /CVGSM: Water users in California rely on groundwater as a water source and as the major source of over-year drought storage. Groundwater is also being increasingly used and looked-towards as a source of storage as part of conjunctive use schemes, and water transfer and market schemes. Thus, representation of

groundwater in the system is important, and probably should be expanded considerably. The representation of groundwater quantities, storage, and recharge and pumping capability will also attract attention from interested and critical parties. Thus, the IGSM/CVGSM modeling efforts of DWR and USBR should include the same types of transparency, documentation, and testing suggested for CALSIM II.

e. Agricultural demands: Agricultural demands in the model are estimated by an external modeling system (CU model). Staff noted that the estimation methods being used are include out of date information on agricultural cropping patterns and irrigation technology, both of which result in inaccurate estimates of agricultural water demands. This estimation process needs to be revised and updated to include current information on an ongoing basis. The methodology needs to be improved to include economic factors in the estimation of cropping decisions and water demands. In many case, the preferred spatial scale for the economic modeling of agricultural water demand is going to be the individual irrigation district rather than very broad areas containing multiple quite heterogeneous districts.

- CALSIM II is currently awkward to apply for broader State and CVP-SWP policy questions. Practically, the time needed to complete analyses is too long and CALSIM II does not explicitly represent many of the management options which policy makers are interested in investigating, evaluating, and orchestrating.

- More CALSIM II modelers are needed. Many water managers and policy makers across California look to CALSIM II for many purposes, and there is near-universal consensus that the application of CALSIM II is currently limited by a dearth of knowledgeable modelers. Current training by DWR and USBR on CALSIM software is useful, but clearly insufficient. To be a functioning and credible CALSIM II modeler one must understand both CALSIM software and the operational complexities of the system (which probably no one can know in its entirety). Improved model and data documentation is also essential here.

- Stakeholders and policy makers are poorly guided in how to interpret CALSIM II results. Not only must CALSIM II become more responsive to current planning and policy concerns and management options, but current policy makers must receive some education in the benefits and limits of such modeling for their purposes. This is a very difficult problem that will often involve the role assigned to modeling and model results within larger politically-driven policy making processes.

- Non-interpretation of model results is not helpful. Several recent DWR reports based on CALSIM II results have been considerable improvements over past practices in terms of presenting model results, discussion of the model, and examination of model performance in a historical context. However, often the studies have not contained the kind of written discussion and interpretation of results that would demonstrate that the authors have thought about the results and drawn conclusions in a realistic and self-critical manner. This detracts from the perceived credibility of the work and makes the study less informative for readers (most of who surely do not have the modeling background of the authors).

- Some needs exist to improve CALSIM software. These are well-known to the model developers and include:
  a. Elimination of the need for the FORTRAN compiler,
  b. A public-domain mixed integer-linear programming (MIP) solver,
  c. A graphical user interface, including ties to databases and GIS display if possible,
  d. Post-processing tools for users to help new users and broader application and scrutiny of CALSIM II results,
  d. Version control software and system (also a problem for model administration),
  e. Better data and database management software and protocols (this has great data management and administration implications),
  f. An ability to more systematically set objective function weights,
  g. More automated input and output data checking is needed to improve productivity in model application and quality control of modeling output. This would also facilitate use of CALSIM II by a broader range of modelers,
  h. Ability to access and employ sensitivity analysis information coming from the MIP solver to identify possible multiple optima and identify binding constraints and slacks,
  i. A debug version of the code where water can be added or subtracted at any location and time (at a great penalty) to quickly identify locations and times of model infeasibilities. (Prof. J. Lund has had great success with this approach to correcting infeasibilities in the CALVIN model of California for a network flow algorithm.),
  j. Time-step issues should be explored and evaluated comparatively. There are major drawbacks to shortening time-steps system-wide (run-time, data development, interpretability of results, etc.), but short time-step components within the model or other approaches might adequately represent short-period aspects of the system for many purposes.

There will be some who argue that CALSIM II is and should remain a model of only the CVP and SWP system. While this would be simpler administratively and financially, it seems technically and politically untenable. California's water system is being asked to operate in an increasingly integrated manner across local and regional scales, with multiple local water demands, supplies, and aquifers being coordinated with the operations of major aqueduct and storage infrastructure. Any model of the CVP and SWP systems must be responsive to this operational integration, either implicitly through better parameterization of local supplies and demands, or explicitly by widening the geographic and functional scope of the model.

3. Limitations, Uncertainties, and Impediments

3.1 Removal of Unnecessary Ties to DWRSIM and PROSIM

Much of the spatial detail employed in CALSIM II is a carryover from the previous DWRSIM model. This is particularly evident in the coarse delineation of watersheds and sub-areas, which may no longer be relevant for future applications of CALSIM II. It is recommended that all unnecessary ties to the previous DWRSIM and PROSIM models be removed in further development of CALSIM II.

3.2 Relative vs. Absolute Predictions

As noted in the Executive Summary, we are skeptical of the usefulness of the distinction between comparative and absolute predictions. To declare that CALSIM II is intended for comparative predictions and should not be used for absolute predictions is not a helpful or desirable strategy. Rather than embracing this limited view of what CALSIM II can be expected to accomplish, we recommend that model developers recognize the requirement for CALSIM II to provide absolute values. To satisfy this purpose, additional calibration of the model will be required to ensure that it provides a reasonably reliable depiction of how the California water system operates. In addition, data on model accuracy and the outcome of the calibration runs should be made available so that users can gauge the likely errors involved in using the model for their own particular purposes. Some methods for doing this and performing sensitivity and uncertainty analyses are contained in Appendix H.

Model uses should realize that model calibration and validation exercises can illustrate only how well the model can reproduce historical decisions and system behavior. Our ability to predict future policy decisions and the emergency responses to water shortages is clearly limited, thus decreasing the absolute precision of any model's predicted values of various system performance measures. Thus it is useful to distinguish between the ability of the model to reproduce correctly the physical operations of the water systems in California (which should be good), its ability to reproduce and anticipate decisions by the agricultural sector that determine the quantities of water the consume, and its ability to mimic historical and current water operation decisions by the CVP, SWP and other water management agencies.

In general, it appears that the developers of CALSIM II do not have a clear idea of how to define the scope of CALSIM II use and many of the applications are evolving in a reactionary manner. Model developers should identify clearly the desired uses for CALSIM II and then determine acceptable approaches for satisfying those desires. Developers should seek to improve data accuracy and overcome unrealistic assumptions to improve confidence in model results.

3.3 Hydropower

CALSIM II is currently greatly lacking in hydropower computations, which is an important of the federal CVP system. This should include risk-based power capacity evaluation, and possible incorporate the ISM (indexed sequential hydrologic modeling) method that the Bureau has used for many years in hydropower capacity analysis. Also, hydropower should not simply be an after-the-fact calculation, but explicitly included in the system objectives.

3.4 Daily operations

A great challenge awaits the developers as they attempt to adapt CALSIM II to daily operations. These challenges are primarily related to the impacts of routing on distribution of flows and scheduling of reservoir releases. Under the current period-by-period optimization structure over daily time increments, without appropriate consideration of routing there is the

danger that the model will allow diversion of upstream flows to lower priority users, resulting in injury to higher priority downstream users in the following days where travel times exceed 1 day. The proper inclusion of routing in the daily operations requires some kind of look-ahead capability in CALSIM II, which is currently lacking. In addition, scheduling of reservoir releases on a daily basis creates difficult timing issues in order to minimize unnecessary downstream spills or shortages caused by routing and attenuation of upstream reservoir releases. Another complexity in moving into daily operations is that reservoir discharges now become head-dependent, whereas this can usually be ignored on a monthly time scale. This means that the maximum reservoir release in any day will be dependent on the head, and should be based on the average head over the day, which introduces the potential for time consuming iterative processes to deal with nonlinear relationships in discharge-head curves for any reservoir.

3.5 Groundwater model

Groundwater has only limited representation in CALSIM II. This resource is modeled as a series of inter-connected lumped-parameter basins. Groundwater pumping, recharge from irrigation, stream-aquifer interaction and inter-basin flow are calculated dynamically by the model.

The purpose of the multi-cell groundwater model is to better represent groundwater levels in the vicinity of the streams to better estimate stream gains and losses to aquifers.

In the Sacramento Valley floor, groundwater is explicitly modeled in CALSIM II using a multiple-cell approach based on DSA boundaries. For the Sacramento Valley, there are a total of 14 groundwater cells.

Currently no multi-cell model has been developed for the San Joaquin Valley. Instead stream-aquifer interaction is estimated from historical stream gage data. These flows are fixed and are not dynamically varied according to stream flows or groundwater elevation.

The approach to modeling groundwater in CALSIM II, a lumped-parameter "tank" model seems to be a reasonable approach. However, few details of this implementation were provided to the review panel, that it is not possible to assess its accuracy or reliability. Details of the calibration and verification activities performed to date should be carried out and reported for the groundwater tank model. The effect of using large size tanks should be assessed and the level of uncertainty in computed results reported. In addition, the effect of these uncertainties on CALSIM II calculations should also be assessed. The San Joaquin valley aquifers are not well represented in the tank model, but it is in the CVGSWM. The San Joaquin valley groundwater should also be modeled in CALSIM II.

Groundwater availability from aquifers is poorly represented in the model. This results from the fact that aquifers in the northern part of the state (Sacramento Valley) have not been investigated regarding storage and recharge characteristics. Thus, in the model, upper bounds on potential pumping from aquifers are undefined. This does not represent reality, since, if CALSIM II is used for statewide planning, it would allow pumping of vast quantities of water for export to southern parts of the state, something which agency staff claim is unrealistic.

Realistic upper bounds to pumping from any of the aquifers represented in the model need to be developed and implemented.

In addition, historical groundwater pumping is used to estimate local groundwater sources in the model. However, the information on the historical pumping is very limited, causing these pumping rates to be very uncertain. Better pumping information is needed and an analysis of the effect of this uncertainty on model results needs to be conducted.

In general, the level of representation of groundwater in CALSIM II is not reasonable from the point of view of the reviewers. This is due to several factors, perhaps the most important being the lack of information presented to the reviewers for their assessment. Another factor is the lack of data collected and analyzed by the State of California to properly account for groundwater resources in the Central Valley. These data are critical to an understanding of the availability of water in the state and the operation of the major water systems that supply water to agriculture and small municipalities in the Central Valley. Assumptions of unlimited groundwater resources in the Sacramento Valley are unfounded and unbelievable. Efforts should be taken to make reasonable estimates of these resources.

There are other approaches that provide reasonably accurate estimates of river-aquifer interactions and groundwater basin response, while not sacrificing computer time. The response function approach is a good example, whereby the CVGSM model is used to develop kernel functions describing this response. A similar approach is described in Fredericks, et al. (1998). These kernels may require readjustment as head conditions change in the basin, but they provide a more accurate prediction tool and are easily incorporated in the MIP model since they apply a linear superposition assumption and retain the linearity of the constraints in the model. A dynamically linked CALSIM-CVGSM configuration is not necessary for reasonably accurate solutions. If computer run time for CALSIM II is considered excessive now, it could only considerably worsen if this type of linkage is incorporated.

Soil moisture is not dealt with in a realistic manner and needs to be improved in applications where the model output might be sensitive to these assumptions.

3.6 Dynamic Variation of Priority Weights

A severe restriction in CALSIM II is the inability to dynamically vary the weights used to prioritize flow allocation in the system. It should not only be possible to dynamically vary these weights, but this variation should be conditional on the current system state, however that state (or states) is defined. In addition to dynamic variation of weights, more explanation is needed of the reservoir operating rules and how these rules are incorporated into CALSIM II. The description of operating rules used in the system is not very clear. For example, what kinds of hedging or shortage rules are used to mitigate the effects of drought?

3.7 Expanding Scope of CALSIM II

CALSIM II is a considerable advance on earlier models in that it fully incorporates both the State Water Project run by the Department of Water Resources and the Central Valley Project

operated by the Bureau of Reclamation. However to be able to examine the full range of Californian water issues, it would be desirable that all components of the linked system should be incorporated in the model including the Friant system, the larger Tulare Basin, and southern California and its links to the Colorado River. Also because of the very important linkage between surface water and groundwater use, improvements should be made in this area particularly with regard to how that linkage affects demand for surface water and how access to groundwater reduces the economic impact of surface water restrictions.

When expanding the geographical scope of the model to include non CVP-SWP areas, as well as Southern California, a hierarchical, decomposition approach would allow development of separate models for these areas that can then be linked together through iterative processes. Otherwise, the CALSIM II model can become extremely unwieldy. Again, integration can still be achieved through appropriate iterative interaction between the regional models. In the same vein, it is also unnecessary to explicitly integrate water quality and detailed water demand/consumptive use models into the model structure. Iterative schemes involving successive estimation of water quality and other parameters can produce comparable accuracy at reduced computer run times, while reducing the complexity of the model.

The replacement of DSM2 with a neural network is consistent with reinforcement or machine learning methods which are increasingly being used to replace complex, computationally time consuming models employed in decision support systems. The complex models are only used to provide the data sets used for training the neural network. Current research at Colorado State University and elsewhere is using neural networks for groundwater surface water interaction and return flow computation to replace computationally expensive groundwater models.

3.8 Key Model Outputs

In the past, the primary purpose behind the development of CALSIM II and its predecessors has been the examination of the reliability of water supplied to the State Water and the Central Valley Projects. However it is clear that there is now a demand for a model that will provide a wider range of outputs including:

- Water supply reliability for all water users
- Demand for water by existing users
- Outflows to Delta
- Use of groundwater and the rate of depletion of aquifers
- Water quality in the Delta and in the San Joaquin River
- Indicators of ecological health in particular with regard to key fish species
- The value of hydroelectric generation.

Although the modules in the CALSIM II package currently address many of these areas, the recognition that all these outputs are important may necessitate some further model development and a greater degree of testing and calibration of these parameters.

3.9 Modeling Allocation, Accounting and Operating Rules

CALSIM II uses a system of weights and constraints to define the water allocation process and the operating rules for storage reservoirs. Unfortunately these do not accurately reflect how operators of the state and federal water projects behave in managing their complex systems. Ideally, CALSIM should both reflect how the operators behave and be accepted by them as a useful tool when considering their management alternatives. The failure to achieve this limits the usefulness of CALSIM to investigate the specific operating or accounting rules that are of interest to those operators. For example, CALSIM II was not used to test changes to the accounting and allocation rules that have recently been proposed by the Department of Water Resources and the US Bureau of Reclamation because the rules that were changed do not exist in CALSIM II.

4. Options for Improving CALSIM

4.1 Optimization Model and Run Times

Many of the complaints regarding using of CALSIM II relate to long run times, which is not conducive to sensitivity or uncertainty analyses. Since CALSIM II employs a mixed integer linear programming (MIP) solver, the usual sensitivity information available in linear programming solvers, such as dual variables and right-hand-side ranging, are not available. The problem is that small changes in right-hand-side constants or objective coefficients (i.e., weights on water allocation priorities) can produce large abrupt changes in model solutions. In this case, dual variables do not provide useful information for MIP problems. Sensitivity analysis can only be conducted through trial and error processes involving incremental adjustment of important weights, coefficients, and uncertain data inputs with subsequent repetitive execution of the model. In light of this, it is crucial that the MIP solver employed in CALSIM II is upgraded. Significant advances have been made in MIP solvers, as described by Bixby, et al. (2000), which are not reflected in the current XA solver utilized in CALSIM II. There have been many recent improvements to the branch and bound method which should be incorporated, and the LP solver itself can be improved with better sparse matrix analysis. As planned by the CALSIM II developers, removal of the need for use of the FORTRAN 90 compiler will also improve run times when changes in optimization model structure are required.

4.2 Confidence in the model

The usefulness of a computer model in water resource management is only as good as the confidence that the stakeholders have in the accuracy and reliability of the model and the trust that they have in the modelers. There are several factors that affect that confidence and a number of ways that confidence can be improved.

- **Documentation**

Producing documentation of models requires considerable resources to do properly and ongoing resources to maintain especially when model development is continuing. Typically documentation of any water resource model is poorly done. However, where there are external model users, as is the case with CALSIM II, it is important. The survey conducted by Ferreira et al (2003) indicated that many users of the model thought that documentation of CALSIM II was poor.

- **Seminars**

In the Murray-Darling Basin, seminars with key users and interest groups in which the operation of the model is described and discussed have proved to be useful in increasing confidence in models. The practicality of this approach will depend on the number and location of the prospective participants and the resources available to support the process.

- **Data**

A model can only be as good as the data that is used to develop and calibrate it. The agreement over an acceptable set of hydrologic data that occurred during the development of CALSIM II is a considerable advance. However, there appears to be a need to improve the collection and use of data on water diversions and return flows. Because of the close links between the surface water use and groundwater use there also is a need to have better information on the use of groundwater.

The models used to calculate the Local Water Supplies in the Depletion Study Areas depend on estimates of surface water use, crop evapotranspiration rates and water use efficiencies developed using data from the 1970's. Confidence would be improved if more recent data were available to check these estimates.

- **Calibration**

A very good way to improve confidence in a model is to calibrate it against historical data to ensure that the model output is able to reproduce the observed data. Calibration is the process of using the model to reproduce the historical behavior of the system and then fine-tuning the model so that the match between modeled and observed values improves. The calibration of the model assists in detecting errors in the model and the input data. It also enables a comparison to be made between the way that the operators actually manage the system and the way that the model assumes that the system is managed.

A further consequence of the calibration process is that the statistics of the match between modeled and observed values can be used as a reasonable estimate of the absolute accuracy of the model output.

It is legitimate in a calibration/validation run to incorporate changes to infrastructure, institutional or operational rules as they occurred especially if these changes are specified as

input parameters to the model. This was done to a limited extent in the CALSIM II validation run with three regulatory periods modeled related to decisions made by the State Water Resources Control Board. It is also legitimate to incorporate growth in demand especially if that growth is described in a manner that is consistent with the way that demand is specified in the production run. Demand north of the Delta was specified in the validation run by inputting the historical crop areas.

A Calibration/Validation report should be very useful in demonstrating the accuracy of the model. However there are a number of elements in the CALSIM II validation run and the validation report which reduce that confidence including:

- State Water Project (SWP) demands south of the Delta were set at historical deliveries in years with no restriction and at the contractor's request level in restricted years. Neither of these pieces of information is available to a production run which calculates demand based on crop areas. Therefore the validation run does not provide reliable information on how well the model can represent these demands.
- The validation run omitted Article 21 deliveries. Although this omission will not affect the delivery of 'Table A' volumes south of the Delta, it will affect flow in the Delta and Delta water quality. Also, in the example model run presented in the paper by Draper A.J. et al (2003) which was supplied as part of the review, changes to Article 21 deliveries constituted the largest impact resulting from a change to the allowable pumping capacity at Banks between March and December. This suggests that the modeling of these demands is important.
- The DWR (2003) report produces estimates of SWP and Central Valley Project (CVP) deliveries south of the Delta but then adjusts them for changes in storage before presenting comparisons of those results with observed deliveries. This process merely checks that the model is preserving a water balance and does not present a legitimate validation of model deliveries.
- The report provides statistics on long term average deliveries and flows but no statistics on the fit for individual years. Additional analysis of the output would assist stakeholders to assess whether the estimate of water supply reliability and in particular the modeled volumes of water available in the most restricted years are accurate.
- In some instances, such as the examination of water quality in the Delta, the ability to accurately model monthly flows and deliveries will be important. The validation report contains no information that would enable the ability to model monthly flows to be assessed.
- A key model output is the water quality in the Delta. It would assist the validation of the model if a comparison of parameters such as the location of the X2 boundary was provided.

The users of CALSIM should recognize that models are a summary of what one believes to be true and important about a system. Validation is then an exercise to test how good that summary and understanding really is.

Appendix I contains brief descriptions of calibration modeling in the Murray-Darling Basin in Australia and in the State of Texas.

4.3 Assessment of the reliability of "delivered" water

An important recent application of CALSIM II which has drawn widespread attention is the "State Water Project Delivery Reliability Report. While this is an important step forward in the use of CALSIM for policy purposes, it highlights a number of issues, both conceptual and empirical, that need to be resolved in order to provide a more adequate assessment of the reliability of water supply in California.

First, it illustrates the need for sound calibration of CALSIM. The question being asked is not a comparative one – What are the consequences of changing some aspect of the system from X to Y? – but rather an absolute one – How does the system function at present? How often can users expect a shortage in deliveries of Z%?

Second, it highlights the fact any water system model such as CALSIM requires a blend of hydrology and behavioral analysis. To conduct a water balance, the model needs to know what deliveries are required by the customers of the given project, and what are the diversions by other user groups who extract water from the same surface or groundwater sources. These are fundamentally questions of economic and institutional behavior, not matters of hydrology. Therefore they cannot be dealt with by hydrologists alone. Like its predecessors, CALSIM tends to treat these as black boxes. The diversions by water users outside the CVP-SWP are taken as exogenously given, based on an assumed "level of development" and simplistic assumptions about the patterns of water use associated with that level of development. The deliveries required by the water users who are served by CVP-SWP are generally taken as given. For reasons explained below, both of these treatments are simplistic and unsatisfactory.

In CALSIM modeling exercises the level of development plays two different roles depending upon the context. In a simulation context, the level of development is used to represent hydrologic variability and uncertainty; in a calibration/validation context, it is used to reflect the actual historical demand for water withdrawals. These are very different purposes and it is important to keep them distinct. In most applications of CALSIM prior to the recent reliability study, the main focus was simulation and the representation of hydrologic variability. The chief purpose served by using 73 years of adjusted streamflow records was to represent the variability and uncertainty in the streamflow that one can expect to observe in any single year. Therefore, the calendar date of the record has no substantive significance, the (adjusted) streamflows for 1952 or 1982 are not being used to represented what happened historically in 1952 or 1982, but rather as an indication of the variation in streamflow that could be expected to occur next year, or any other year. In this context of simulating hydrologic variability, it makes good sense to apply the *same* level of development (i.e. the same pattern of water use) to every year in the sequence, rather than a series of different levels of development that vary with calendar time, because the streamflows represent alternative hydrologies that can occur in any given year.[1] The situation is different when one is conducting a calibration or validation

[1] This could be modified to allow for the fact that local weather conditions have a significant impact on irrigation (and urban) demands – e.g., farmers plant fewer acres of crops in a drought year. In that case, one could have different levels of water demand and extraction in different year *types;* but, these would all be keyed to the same overall level of economic development (e.g. the California economy in the 1990s). CALSIM II does not presently

exercise. In that case, one wants to represent the historical demands in 1952 or 1982 in order to compare what the model predicts with what actually happened. Therefore, in a calibration or validation exercise one wants the level of development to change each year in order to reflect the demand that occurred historically.

Both simulation and calibration/validation raise some other important technical issues. In the context of simulation, there are several different ways to generate a hydrologic sequence that is calibrated to a fixed level of development. One can use all 73 years for which data are available. One could use a subset of those years chosen either according to some deterministic rule or randomly. The subset could be oriented, for example, towards the extremes of the 73 sequence of annual records. However, the drawback of any approach based on sampling from the observed historical record is that it *understates* the full variability in streamflow that could be experienced in the future. The 73 years of record are drawings from a probability distribution the extremes of which extend beyond the minimum and maximum flows observed in the historical record. Relying on this record, therefore, understates the true minimum and maximum flows that might be encountered. In a reliability assessment exercise, one might want to take some steps to minimize the potential understatement of streamflow uncertainty. This could be accomplished by fitting a (parametric) probability model to the historical streamflow record and then sampling from the tails of the fitted distribution (Stedinger, 1981). The use of statistical models of streamflow variability could be considered in future applications of CALSIM to assess delivery reliability.

The assessment of delivery reliability requires that particular attention be given to the definition and measurement of the water users' demands. In this context, the user's demands play two roles: they affect the definition of "deliveries" and they influence the assessment of "reliability". With respect to deliveries, CALSIM II considers water to be delivered whenever it has the water irrespective of the ability of a contractor to use the water or to store it; The reality is that, if the contractor does not have a demand for the full quantity of water and is not able to store the excess, that amount will not be delivered. Therefore, the calculation of deliveries would be flawed. Furthermore, reliability cannot be assessed without reference to demand. Stating that a water supply system can deliver 100 acre feet in a wet year but only 70 acre feet in a dry year is useful only if one knows what the demands will be in wet and dry years. The implications are quite different if the user needs 105 acre feet per year than if he or she needs 65 acre feet per year. Thus, the users' demands should serve as the norm against which reliability is assessed. Instead, the recent reliability report uses the so-called 'Table A' water amounts as the norm for assessing deliveries to SWP contractors. This does not seem to be a satisfactory approach because there is no presumption that the Table A amounts, negotiated in 1960, measure the actual demands of SWP contractors in any particular year. The actual demands of the individual contractors will be influenced by how much storage they have, what access they have to other surface water or groundwater, and the demands of the farmers they serve to plant crops and apply water. Without accounting for these factors, it is difficult to generate a meaningful assessment of supply reliability.

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consider the impact of annual weather conditions on demands. In order to model water demands accurately in a year, the climate conditions would be linked to the flow conditions to provide an input set for a particular year.

The assessment of reliability should ideally go beyond a comparison with quantities demanded to incorporate the notion of a loss function. If a user has a demand for 100 acre feet and can only receive 90 acre feet in one scenario and 80 acre feet in another, while the shortfall is twice as large in the second scenario the actual *consequences* of the shortfall to the user, in terms of lost profit or higher cost, might be more than twice as large. To assess the economic value of reliability, or the economic cost of a lack of reliability, one needs to be able translate shortages into monetary losses. To accomplish this, the warning time provided and the delivery shortfalls from CALSIM would need to be processed through an economic model of the value of water to different SWP contractors.

Because water users face difference demands and have access to different sources of supply, when assessing reliability it is unhelpful to aggregate all contractors and simply present the results in terms of total annual project deliveries, as was done in the report. Precisely because of the potential non-linearity of the loss function, a given aggregate shortfall can have different consequences when distributed differently among the individual contractors. A similar observation applies to the temporal distribution of delivery shortfalls across the year. It is unhelpful to aggregate supply system deliveries into an annual total, as done in the report. For a user to be able to obtain 100% of his or her demands in the period from March to May but only 60% in the next three-month period from June to August has different consequences than being able to obtain 80% in each of the six months. Furthermore, for both agricultural users and many urban users, major decisions affecting water use have to be made in the spring. They are based on the expectation around March about the amount of water that will subsequently be available for delivery during the summer months. What matters to these users when assessing supply reliability is the amount of water they can expect around March to be delivered over the summer, rather than the ultimate total delivery.

For both reliability assessment and also model calibration/validation, it is important to avoid excessive aggregation when describing shortfalls between demand and supply, or deviations between model predictions and actual outcomes. In regression analysis, it is the convention to measure the goodness of fit of a regression equation not by the average deviation but rather by the sum of the squared deviations. In ordinary least squares regression, by definition the average deviation is always zero (that is to say, the average of the predicted values of the dependent variable always equals the average of the actual values) regardless of how well or badly the regression equation fits the data. The average deviation thus provides *no* information regarding the goodness of fit; by contrast, the sum of squared deviations or the sum of the absolute values of the deviations are sensitive measures of goodness of fit. Although the calibration of CALSIM is not an exercise in least squares regression, the same general principle applies. To judge whether the model is doing a good job, the goodness of fit should be measured by reference to the disaggregate results and not simply by the overall average deviation.

Additional comments on the 2003 CALSIM II Validation Report are contained in Appendix F.

5. Managing CALSIM Development and Applications

The costs of not continuously and substantially improving our analytical capabilities are political (in terms of continued controversy and diminished agency credibility), economic (as inferior system performance for agricultural and urban water users), environmental (in terms of inferior environmental system performance), and financial (lawyers and policy consultants are more expensive than engineers and scientists).

CALSIM II is a substantial improvement over its predecessor models, DWRSIM and PROSIM, with a great deal more flexibility, transparency, and potential than these earlier models. The modeling team for CALSIM has identified an exciting and relevant vision of how modeling should be done for this complex and difficult system in the coming years. However, implementation of this vision in a coherent technical manner that leads to both technical and stakeholder credibility will be a difficult process, requiring financial and institutional support if this kind of capability is to be developed and sustained.

To accomplish these objectives CALSIM II developers need to be in an institutional position where they can see the model more as "outsiders" view it. This would allow them to be more responsive in supporting the credibility of their work and the relevancy of their tools and results to the broad range of current water management problems. As such CALSIM II should no longer be solely responsible to CVP-SWP managers, but should be responsible to a broader range of technical managers from additional interests, reflecting its current and prospective uses.

It would be imprudent to manage a state's finances, a business, or a retirement plan without quantification – quantification in such matters is necessarily imperfect, but necessary nonetheless. While shortcomings have been identified in CALSIM II, it would be similarly irresponsible to manage California's water budget without carefully-interpreted quantification. Progressive and continuous improvement in our quantitative understanding of California's water system provides a common basis for improving its performance for all interests.

One possible means of maintaining control of the quality of particular versions of CALSIM II and accompanying models used for SWP-CVP planning and management decisions is to create an interagency modeling consortium (IMC) consisting of DWR, USBR, and persons from other stakeholder organizations if they are interested and want to participate. This consortium would be responsible for maintaining a toolbox of 'acceptable' models for 'official' use by the agencies and contractors.

IMC responsibilities and authority could include:

- Prioritize, coordinate, and provide consistency, technical guidance and oversight for all modeling applications,
- Approve model selection and insure that each requested application is carried out using the most appropriate model(s) and input data,
- Provide or otherwise insure documentation of the modeling process itself as well as the modeling results,

- Insure that the results are expressed and made available in a way such that others can understand and benefit from that modeling application, as applicable.
- Implement peer reviews of models and their applications as deemed appropriate.

To help meet their responsibilities the IMC will need to establish, publish and implement some procedures for insuring the quality of the entire model development and application process. They will need to identify among all the models that might be used, which are the most appropriate to address each of these separate groups of model applications. They must identify various models, i.e., establish a model toolbox, from which clients can choose the one that best meets their needs (or perhaps argue that another model should be added to the toolbox). The IMC will also need to maintain model documentation and provide for peer reviews of any model, its documentation, and/or its use in a project.

Further suggestions and discussion on the creation and operation of a possible IMC for model development and application, as well as for managing peer reviews of both the models and their applications, are contained in Appendix E.

6. Recommendations for Future Use, Development, and Application of CALSIM II

The most concise recommendation we might make would be to fix the shortcomings beginning with what are considered the most serious, and proceeding to those that are less serious, taking into account the time and other resources needed to address each weakness. However, we believe it is more useful to suggest ideas on how to systematically address both present shortcomings and those likely to emerge as stakeholders' quantitative understanding of California's water system and its problems continue to evolve.

6.1 Model development and support consortium

As discussed in the previous section and in Appendix E, it might be useful to explore creation of a broader interagency modeling consortium for developing operations planning models for California. The joint DWR-USBR development strategy used for CALSIM II has shown some notable successes, and should be expanded to include additional parties and sources of expertise. Such a consortium might include staffs from several agencies (DWR and USBR, as well as potential members from MWD, KCWA, CCWD, and other agencies), NGOs, some consultants, and universities. Such a model development forum would:

a. Bring a wider range of expertise to bear on model development problems.
b. Facilitate having more agencies involved in supporting model development with expertise and financial resources.
c. Better enable model developers to see the model as "outsiders" see it.
d. Potentially improve contracting for model development and testing.

e. Take model development and testing outside of the explicit agency framework; a broader consortium should be more conducive to self-critical and transparent technical practices.
f. Provide a common training ground for agency, NGO, and consulting staffs to become effective modelers, broadening the talent base for technical work in California.
g. Reduce impediments to model development and testing arising from current State budgetary and personnel hiring problems.

Many of the questions, concerns, and problems mentioned in the user community interviews could be addressed well in such a distributed model development, testing, and support framework. It would still be necessary for each stakeholder group and agency to maintain its own modeling staff, but these would be partially shared in an interagency modeling consortium.

The governance and finance of such a consortium would be difficult and would probably require a steering committee or governing board, but any resulting model(s) would have broader credibility and a broader and deeper technical base.

In the immediate term, a users' group should be formed and the formal listing of model development activities should be posted on the web, including short descriptions of each development activity and contact information.

6.2 Quality Control Program

The DWR and USBR modeling team (or a broader model development consortium) need an explicit quality control program. Such a program should include a variety of activities:

a. periodic external reviews on the broad modeling program
b. specialized external reviews of model products and applications
c. a standing (or sitting) external technical advisory body
d. software engineering and maintenance
e. a regime of model testing
f. model and data documentation
g. data development and management
h. user group activities
i. local agency and interest involvement
j. model, data, and documentation accessibility (including web site use).
k.

Such a quality control program would benefit from deep consultation with stakeholders and the broad community of water technical people, perhaps via the California Water and Environment Modeling Forum (www.cwemf.org).

6.3 A Training Program

DWR, USBR, and assorted agencies and consultants should establish a more formal common regimen to train new CALSIM II users in both CALSIM software and the complexities of actual system operation. All these groups currently rely on a relatively small pool of perhaps a

dozen knowledgeable CALSIM II users and all proclaim a need for many more capable users. A training regimen consisting of current CALSIM II training classes, supplemented by additional training in software application and system operation and apprenticeships or rotations through operations and model development shops would be useful to all concerned. The entire water community would benefit from having such expertise being widespread. Having widespread CALSIM II modeling expertise also makes explaining CALSIM II and its results easier. This might be an appropriate activity for a model development consortium.

6.4 Extend Improvements in Modeling Practice to Supporting Models

CALSIM II is at the center of a web of additional models used by DWR, USBR, and other agencies to prepare inputs for CALSIM II and post-process outputs from CALSIM II.

Delta controversies and difficulties of representation seem endemic to problems of modeling Central Valley operations. The technical basis for representations of Delta operations and water quality performance requires a similar level of transparency and testing to avoid this becoming a "weak link" in the Valley-wide operations planning model. Since so much is based on the DSM2 Delta model, documentation of fairly strenuous tests of the DSM2 model are highly desirable. This would provide a firm foundation for the use of ANN or other approaches for summarizing DSM2 behavior in an operations model. Similar documentation, testing, and development are desirable for the other models mentioned above which provide data for CALSIM II (CVGSM/IGSM, CVPM/CALAG, IWR-MAIN, LCPSIM, CU model, and SIMETAW).

6.5 Hydrologic Data and Data Development

An effort should be made to step back and perhaps re-define a more systematic and solid basis for developing hydrology for water management models of California's inter-tied water system. Currently, several efforts exist to develop surface or groundwater hydrologies for parts of the Central Valley (sponsored by DWR-USBR, USACE-Sacramento District, USEPA, USGS, CALFED, local agencies, etc.). An effort should be made to broaden the range of hydrologic expertise involved in hydrology data development for management modeling of California's inter-tied water system, and establish a consistent and high, but reasonable, standard of documentation and testing for developed data and any underlying hydrologic models. Establishing such a standard of documentation and testing would make existing hydrologic studies more accessible and useful for future studies and encourage the comparison and further development of existing representations of the system's hydrology.

6.7 Performance-Based Optimization

Performance-based optimization should be added to CALSIM's capabilities; it would not be difficult in terms of software or data, and would add much greater ability to explore and seek improvements in management within a complex system. The multi-period optimization approach being developed (CAM) is an operations-oriented first step in this direction, but could be expanded without great difficulty.

For large-scale water resource systems of great complexity and many options for system management, it is often difficult to find "optimal" operations with simulation modeling. There are simply many myriads of decision options and combinations of options, which theoretically each require a simulation model run – which would be prohibitive in terms of analysis cost and time. In such situations, performance-based optimization models, such as those seeking maximum economic performance, can offer useful insights as to where to look for improving system operations and management. Metropolitan Water District of Southern California (MWD) and San Diego County Water Authority (SDCWA) employ performance-based optimization modeling of parts of California's water system to gain strategic insights for planning and management. An economic-engineering optimization model has been developed for California and, despite significant limitations, shows several insights for California (CALVIN), suitable for identifying promising operational and management strategies worthy of more detailed analysis (Jenkins et al. 2001; Draper et al. 2003; Jenkins et al. 2004). The CALSIM II modeling approach could easily be adapted to provide greater functionality to this type of performance optimization. Having performance-based optimization capability together with a compatible simulation model for more detailed analysis and trade-off evaluation could greatly improve the capability of California's water community to explore and develop promising and creative options for improving operations, facilities, and overall system management.

6.8 Modular and Layered Versions of CALSIM II

Speedier versions of CALSIM II are needed for operations planning and integrated water planning studies. Such versions would be regional modules of CALSIM II (for regional studies) or explicitly aggregated system-wide models from the most detailed CALSIM II schematic for system-wide or statewide studies. Both approaches would simplify the model for particular purposes, yet be tied to a common detailed schematic and detailed hydrologic, operations, and water demand data sets.

Geographically modular or aggregated system-wide versions would allow additional local and regional water management options to be represented for particular operations and policy planning purposes and allow users to more quickly explore and develop operating policies. The final runs from such integrated or exploratory studies could then be evaluated using a more detailed and complete version of CALSIM II.

Modular regional models might represent regions with relatively few inter-ties, such as: Sacramento Valley, Delta and eastside streams, San Joaquin Valley, San Francisco Bay Area, Tulare Basin, and Southern California (DWR's South Coast and Colorado River hydrologic regions). (We have had good success with the CALVIN model of California with 5 modular regional models, which combine to form a system-wide model. These geographic sub-models greatly improved quality control in model development, work flow and data checking, and identification of problems in the model.)

6.9 Model Calibration and Testing

Many approaches exist for model calibration and testing (Modeling Forum 2000). Calibrating a planning model oriented to operations in an uncertain and distant future is always challenging. For a model that serves many uses (including policy-urgent uses unforeseen by developers), use-specific testing will often be impossible within a responsive time frame and budget. Such unavoidable situations call for more thorough, general, and well-documented model calibration and testing than would otherwise be needed.

For the model to have technical credibility, stakeholder credibility, and to serve the kind of training and reference function needed for the water management community, a systematic and coherent means of setting parameter values in the model and documenting these values is needed. Similarly, a systematic self-critical means of testing is needed for a model to establish and retain credibility, and have defined limitations, for a range of applications.

A potentially excellent resource for model testing is comparisons of seasonal operations planning CALSIM II model runs with recent years' seasonal operations, as done by actual operators. Similarly, system operators could scrutinize historical simulations, such as those in the recent November report, for systematic differences from operating practice. Such comparison with operator policies and philosophy could also be performed with SWP or CVP delivery reliability estimates. Such comparative analyses would both help define the likely (and unavoidable) differences between actual and modeled operations and water deliveries and identify potential opportunities to narrow such differences.

Credibility arises, in part, from demonstration that problems and limitations are systematically identified and addressed or considered in model development and in making and interpreting model runs. This can be accomplished by use of documentation, metadata, written guidance, and protocols and logs for identifying model problems and recording model improvements.

Given present and anticipated uses of CALSIM II, the model should be calibrated, tested, and documented for "absolute" or non-comparative uses. This is what many applications require today and will be increasingly desired and required in the future. Maintaining the traditional "comparative-only" use of CALSIM II is undesirable if the model is to be useful for the CVP and SWP systems, the operations of water contractors, or for statewide planning purposes.

6.10 Documentation of Model Improvements

Along with better documentation of model versions, logs of data and model improvements and "bug fixes" should be maintained. Explicit protocols and records for identifying and correcting modeling errors and problems would enhance the credibility of the modeling effort with technical people and policy makers. Such protocols also provide an internal aid to staff and staff development in modeling. I understand that this kind of record-keeping is done, but the precise form of, nature, and extent of this record-keeping is unclear. It would be useful and reassuring to stakeholders and policy makers to know that this kind of record-keeping of the software and data was being done.

6.11 Better Model Integration in Decision-Processes and Stakeholder Education

Greater aid should be given to interested parties and decision-makers who must work with the unavoidable limitations of any model. If possible, a document should be prepared for stakeholders and interested parties outlining the model, summarizing the model's primary limitations, and providing guidelines for interpreting model results. Those developing policy-making forums and processes should thoughtfully incorporate computer models in these processes in ways that do not assume model omniscience, or otherwise place too great or exclusive a reliance on model results.

Models and model results will never be perfect. If models are to be important for planning and policy-making, they be must be presented and used in ways that enlighten policy-makers more than they add confusion and controversy to already difficult situations, if possible.

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Appendix A: CALSIM II Science Review

Dates: Nov 13-14th
Location: Bay-Delta Room, CBDA Offices
650 Capitol Mall, 5th Floor
Sacramento, CA

Day 1: The Management Context, Model and Application Details

9:00 Welcome – Kim Taylor
- Overview of the CALFED Bay Delta Program -
- Introduction of the Panel

9:15 Water issues in California – Francis Chung
- General Hydrology
- SWP/CVP
- Operational challenges
- Sacramento-San Joaquin Delta – Ron Ott (5 min.)

9:35 Panel Q&A

9:45 Planning Models – Andy Draper
- CALSIM software
- CALSIM II application overview
- Interaction with other models

10:10 Panel Q&A

10:20 Break

10:30 Summary of CALSIM Applications
- DPLA/CalFed/US Bureau of Reclamation: Integrated Storage Investigations – Steve Roberts
- Bay Delta Office (DWR): SWP Delivery Reliability Report - Kathy Kelly
- USBR: Multi-layered modeling to simulate CVPIA (b)(2) water and Environmental Water Account Operations – Nancy Parker
- Operations Control Office (DWR): Oroville Relicensing, SWP Allocation decision procedure – Curtis Creel
- Department of Planning and Local Assistance (DWR): California Water Plan Update – Kamyar Guivetchi/Ken Kirby

12:15 Panel Q&A

12:30 Lunch

1:15 Summary of User and Stakeholder Interviews
- 1:15 Interview Summary and Findings – UC Davis
- 1:35 Panel Q&A
- 1:50 Public Comment

2:15 CalSim II Details
- Development philosophy – Francis Chung
- Operation priorities, constraints, common assumptions – Erik Reyes
- Hydrology development – Andy Draper
- Delta water quality constraints – Ryan Wilbur

3:15 CalSim Evaluation
- Historical Operations Study / Sensitivity Analysis – Sushil Arora

3:30 Panel Q&A

3:45 Break

4:00 Future Directions
- Data Structure / Version Control / Multi-Period Prescriptive Optimization – Ryan Wilbur
- Daily Time Step - Dan Easton
- CalSim II – CVGSM Integration – Tariq Kadir
- Water Quality / Upstream Models – Nancy Parker

5:00 Panel organizational meeting (additional information needs, questions of specific staff, discussion plan)

Day 2—Panel Deliberations and Preliminary Report

8:30 Panel Q&A with specific DWR and USBR staff on request

9:30 Panel *in camera* discussions

11:00 Panel presentation of draft main findings—Pete Loucks

12:00 Wrap up and next steps - Kim Taylor

Appendix B: Briefing Material for CALSIM II Peer Review

California Water
Averting a California Water Crisis (3 pages)
California Water Today, Bulletin 160-0, Chapter 2 (20 pages)
Water Supplies, California Water Plan Update, Bulletin 160-98, Chapter 3 (11pages)
Urban, Agricultural and Environmental Water Use, California Water Plan Update, Bulletin 160-98, Chapter 4 (17 pages)
California's Major Water Projects (map) (1 page)

CVP and SWP
State Water Project Operations (6 pages)
Central Valley Project Operations (16 pages)

CalSim and CalSim II Overview
CalSim: A Generalized Model for Reservoir System Analysis (19 pages)

CalSim Software Details
CalSim water resources simulation model: Users guide (18 pages)
CalSim water resources simulation model: Wresl language reference (11 pages)

CalSim II Details
Network Representation (1 page)
Sacramento-San Joaquin Delta Operations (9 pages)
Coordinated Operating Agreement (3 pages)
Reservoir Rule Curves (2 pages)
CalSim ANN Implementation (8 pages)
CVPIA (b)(2) Management and Operations (6 pages).ii
EWA Management and Operations (8 pages)
Multi-Cell Groundwater Model (2 pages)
SWP and CVP Delivery Allocation Logic (3 pages)

Hydrology Development
Surface Water Hydrology Development for CalSim II (8 pages)

Supporting Computer Models
Model Interaction (1 page)
CALAG (2 pages)
CU Model (2 pages)
DSM2 (2 pages)
IGSM2 – CVGSM (4 pages)
LCPSIM (5 pages)

CalSim II Evaluation
Planned Sensitivity Analysis (7 pages)
CalSim II Simulation of Historical SWP-CVP Operations - Extracts (61 pages)

CalSim II Applications
CalSim II Project Applications Summary (not completed)
SWP Delivery Reliability Report – Extracts (25 pages)
North of Delta Offstream Storage Investigations (3 pages)
In-Delta Storage Investigations (3 pages)
California Water Plan Update 2003 (3 pages)
CalSim II and SWP Operations Control Office (1 page).[iii]

Future Model Development

(a) CalSim Software
CalSimMulti-period Prescriptive Optimization (not completed)
CalSim Daily Time Step Model (not completed)
CalSim Water Quality Module (not completed)
Data Structure / Version Control (not completed)
CalSim Graphical User Interface (not completed)

(b) CalSim II Applications
CalSim II – CVGSM Integration (not completed)
CalSim II Geographical Expansion (not completed)
Global Climate Change (not completed)
Refined Spatial Resolution (not completed)
Expansion of Land Use Based Demands (not completed)
CalSim II – CALVIN Integration (not completed)
Revision of Urban Water Demands (not completed)

(c) Supporting Models
Replacement of Consumptive Use Model (not completed)

Appendix C: CALSIM II Review Process and Timeline

Establishing the Peer Review Panel

Dr. Pete Loucks (Cornell University and South Florida Water Management District) has accepted the CALFED Science Program's invitation to chair the panel. Other members are being currently being contacted by the Science Program staff

Organization of Briefing Material

Science Program and key agency staff, in consultation with the review panel chair, are identifying and organizing briefing material for panel members. Target date for completion is Sept 1, 2003. (This was extended to December 8, 2003)

Public Meeting of Review Panel

Target: 2-day session in November, 2003 in Sacramento area

Review workshop structure will include:

- Presentation overviews of California hydrology, water management, current issues, and the development of CALSIM II
- Presentations on the range of different current and potential applications of CALSIM for planning, operations, and supply reliability projects
- A summary of an independent interview project by Dr. Jay Lund of users and stakeholders explaining the major questions people are trying to answer with CALSIM II and other models
- Public comment to the panel
- Detail discussion of the model, including assumptions used in different applications, verification studies, and sensitivity analyses
- Opportunity for panel members to ask follow up questions of CALSIM developers and users
- An in camera session for panelists to discuss and begin compiling review comments
- A public presentation of the panel's draft findings

Panel Chair Provides Final Report to CALFED Lead Scientist

The panelists will be asked to finalize their review comments within 3 weeks of the public meeting and to transmit those directly to the Lead Scientist. The Science Program will transmit the completed review to CBDA and the CALFED community.

Appendix D: Panelists CALSIM II Review, Nov. 13-14, 2003

Name	Affiliation	Position	Address/Phone/E-mail
Andy Close	Murray Darling Basin Commission	Lead Modeler and System Manager	GPO Box 409 Canberra ACT 2601, AUSTRALIA (02)62790102 andy.close@mdbc.gov.au
Michael Haneman	UC Berkeley	"Senior Economist, Professor"	327 Giannini Hall, Berkeley, CA 94720-3310 (510)642-2670 hanemann@are.berkeley.edu
John Labadie	Colorado State University	Professor	B211 Engineering, Fort Collins, CO 80523 (970)491-6898 John.Labadie@colostate.edu
Pete Loucks	Cornell University	Professor	"Civil and Environmental Engineering, 311 Hollister Hall, Ithaca, NY 14853 " (607) 255-4896 DPL3@cornell.edu
Jay Lund	UC Davis	Professor	Civil and Environmental Engineering 3109 Engineering III, Davis, CA 95616" (530)752-5671 jrlund@ucdavis.edu
Daene McKinney	University of Texas at Austin	Professor	Civil and Environmental Engineering Campus Mail Code: C1786, Austin, TX 78712 (512)471-8772 daene_mckinney@mail.utexas.edu
Jery Stedinger	Cornell University	Professor	Civil and Environmental Engineering, Hollister Hall, Ithaca, NY 14853 (607) 255 2351 JRS5@Cornell.edu

Appendix E: Managing Model Development, Application, Documentation and Communication.

One possible means of maintaining control of the quality of particular versions of CALSIM II and accompanying models used for SWP-CVP planning and management decisions is to create an interagency modeling consortium (IMC) consisting of DWR, USBR, and persons from other stakeholder organizations, including NGOs and universities, if they are interested and want to participate. This consortium would be responsible for maintaining a toolbox of 'acceptable' models for 'official' use by the agencies and contractors.

IMC responsibilities and authority could include:

- Prioritize, coordinate, and provide consistency, technical guidance and oversight for all modeling applications,
- Approve model selection and insure that each requested application is carried out using the most appropriate model(s) and input data,
- Provide or otherwise insure documentation of the modeling process itself as well as the modeling results,
- Insure that the results are expressed and made available in a way such that others can understand and benefit from that modeling application, as applicable.
- Implement peer reviews of models and their applications as deemed appropriate.

To help meet their responsibilities the IMC will need to establish, publish and implement some procedures for insuring the quality of the entire model development and application process. They will need to identify among all the models that might be used, which are the most appropriate to address each of these separate groups of model applications. They must identify various models, i.e., establish a model toolbox, from which clients can choose the one that best meets their needs (or perhaps argue that another model should be added to the toolbox). The IMC will also need to maintain model documentation and provide for peer reviews of any model, its documentation, and/or its use in a project.

CMM Level 3 Performance Expectations

Firms that develop professional software are typically required to meet certain software standards. One such standard is defined in a book from Carnegie Mellon University. These so called Capability Maturity Model (CMM 1994) standards have various levels. For example, the South Florida Water Management District, that develops hydrologic models used as inputs to major investment decisions, strives to meet Level 3 standards. To meet such standards in software development and peer review, one needs to show that

- Modeling related problems are anticipated and prevented

- Model development and application groups work together as an integrated product team.
- Model use training is planned and provided as is needed.
- New modeling methodologies are identified and evaluated for possible implementation on a qualitative basis.
- Data are collected and used in all defined processes.
- Data are systematically shared across various projects.
- Both the models and their applications are evaluated and judged satisfactory by independent reviewers.

It seems to this panel that CALFED could without too much difficulty meet such standards if it chose to. Clearly planning for, conducting, and documenting these activities will require additional time and money. The expectation is that in the long run, such documentation and review will save time and money by redirecting misguided initiatives, identifying alternative approaches, or providing valuable technical support for a potentially controversial decision.

Model Toolbox

The IMC in collaboration with all agencies involved in water resources planning could be responsible for creating and maintaining a collection of models that agencies can use to meet their needs. As shown in Figure 1, this collection of models might be called the model toolbox. The criteria to be used as a basis for deciding whether a proposed model should or should not be included in the toolbox will depend in part on an assessment of the attributes of that model compared to alternative models and the suitability of the model to meet the needs of the project. Associated with the model toolbox is a library of completed model application documents and data bases for use by anyone who could benefit from them.

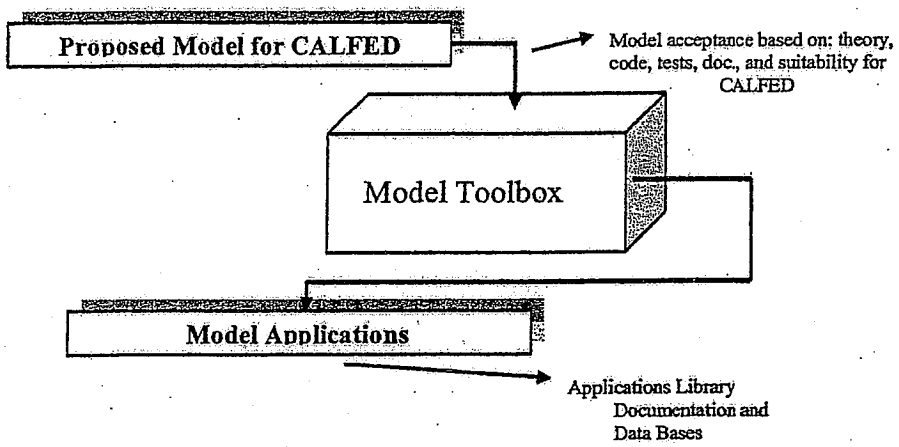


Figure 1. Model Toolbox consisting of approved models for use and Applications Library consisting of documentation and model data bases.

Everyone would agree that all modeling applications should be performed with the 'best' models available. But 'best' does not mean that all models used should be the most detailed, complex, realistic and thus usually the most expensive models available. The decision regarding the 'best' or most appropriate model should be based on the particular issues or questions being addressed, on the quantity and quality of the available input data, and on the time, personnel, and money available to perform the modeling application. The central question to be answered before initiating any modeling application is just what model output information (and precision) is needed to meet the needs of the decision making process. Expressed in other words, just how sensitive will the decision be to the type, amount and precision of the model output?

IMC in consultation with the other agencies could provide guidance on the adequacy of a particular version of CALSIM II or other associated model requested by each client with respect to the theory upon which it is based, its data requirements, its spatial and temporal resolutions, its documentation and status with respect to peer reviews, its capabilities, and its limitations. Similar considerations must be given to the proposed input data. To provide these services to each client requesting services from the IMC would require IMC to be staffed with personnel acquainted with the models in the toolbox, as well as be able to perform or review the simulations requested by various agencies.

There will likely be requests to use models not yet included in the model toolbox. IMC together with others from the DWR and/or USBR will need to judge the merits of such requests and if deemed beneficial, consider including such models in the toolbox. Undoubtedly the extent and quality of the documentation, testing, and peer review of various models in the toolbox will vary. However, a model's inclusion in the toolbox should signify that the model has been judged to be the best available for meeting the goals for which it was designed and is applicable to conditions in California.

Information Flows and Documentation

The IMC will probably be devoting a substantial amount of time giving guidance to clients and, when applicable, to the public. They will need to be working with the clients who are requesting model applications, and in situations where they are not doing this work, they will need to be reviewing and approving the work of the agencies or contractors who are performing the modeling services. IMC would provide technical assistance as well as oversight and coordination among all CALSIM II modeling activities.

Requests for modeling are easy to make, and time and money are required to carry them out. Requests sent to this proposed IMC should reflect some thought by those requesting such model runs as to just why the model application is desired, and just how the results are to be used. We would propose that requests include such items as:

- Reason for modeling,

- Type of modeling (e.g., event based or continuous),
- Particular model preference if any, and why, and possible alternatives,
- Model output information (data) needed and why and when it is needed,
    - What questions are the model results going to answer?
    - What issues are being studied?
    - What decisions are to be made, or at least to be informed, based on these model results?
    - When are the model results needed?
    - What formats are desired for presenting the model results?
- Location or site being modeled and the spatial and temporal scales desired,
- Particular input data assumptions, boundary conditions and other regional assumptions required,
- Source of input data, and format required or desired for the output data,
- Model calibration and verification needs and preferred procedures if any,
- Money and time available for modeling,
- Extent (duration) of the simulations to be performed,
- Desired performance measures, other than variables being simulated, if any,
- Alternative scenarios to be modeled (i.e., number of simulation runs needed),
- Other analyses or model applications that may or will need the output from this model application,
- Sensitivity and uncertainty analyses needed, and for which decision variables and why,
- Client contact person,
- Requirements for intermediate reviews of results or needs for periodic review of modeling application process logs and documents, and
- Other particular requirements or needs.

The use of a model nearly always takes place within a broader context. The model itself can also be part of a larger whole, such as a network of models in which some are using the outputs of other models. These conditions may impose constraints on the simulation modeling project. All these considerations need to be specified in the modeling application request.

Along with the proposal, there should also be a simple order-of-magnitude estimate of the expected values of all relevant decision variables based on simple mass-balance analytical solution methods that can be used without requiring a computer. These estimated values should be used to validate (check the reasonableness of) selected portions of the model runs. If there are any serious discrepancies, it may signify a major problem in the model output.

Is all this paperwork useful? It is to the extent it leads to a more effective and efficient use of personnel, money and time. Preparing a formal modeling application request requires some serious thought as to just why this is necessary and just what information is needed to further the project or analysis. It involves defining the objectives that are to be accomplished. Writing this down in some detail helps reduce the differences in perception that can exist between those who need information and those who are going to provide that information (IMC or a contractor). The problem as stated is often not the problem as understood, by either

the client or the model user. In addition, problem perceptions and modeling objectives can change over the duration of a project. One should ask and answer the question of whether or not modeling in general is the right way to obtain the needed information. What are the alternatives to modeling?

The objective of any modeling project should be clearly understood with respect to the domain and the problem area, the reason for using a particular model, the questions to be answered by the model, the model assumptions and limitations, and the scenarios to be modeled. Throughout the project these objective components should be checked to see if any have changed and if they are being met.

If IMC is to serve as a central point to coordinate CALSIM II-related modeling activities, and to provide modeling services, it needs to have the authority to do so. This authority extends to giving advice on issues related to model and input data selection, and for reviewing, approving and prioritizing requests for services. Should contractors be involved in particular model applications, IMC must be authorized to specify the technical terms to be met and oversee the work done by the contractor. Finally IMC will need the financial and human resources needed to do this in a timely manner.

Modeling Application Documentation

One common problem of model studies once they are underway occurs when one wishes to go back over a series of simulation results to see what was changed or why a particular simulation was made or what was learned. It is also commonly difficult if not impossible for third parties to continue from the point at which any previous modeling project was terminated, especially if some time has passed. These problems are caused by a lack of information on how the study was carried out. What was the pattern of thought that took place? Which actions and activities were carried out? Who carried out what work and why? What choices were made? How reliable are the end results? These questions should be answerable if a model journal is kept. Just like computer programming documentation, modeling project documentation is often neglected under the pressure of time and perhaps because writing it is not as interesting as running the models themselves.

The paper trail of what has happened, what assumptions have been made, how calibration and verification were carried out, what results were obtained, why changes, if any, were made, what sensitivity analysis procedures were used and their results, and so on, could be contained in a modeling application documentation (MAD). Once the model application is completed, a copy of the MAD should be given to the requesting agency, as applicable and a copy should remain in IMC. These reports, or at least a summary of them, should be available for downloading from the web. Should further model applications be requested and approved, the requester as well as the IMC can refer to this previously prepared documentation to better understand what was done previously that pertains to the current request.

Model Calibration

Once a model is tested satisfactorily, it can be calibrated. Calibration of models such as CALSIM II are difficult because there are no historical observations of future scenarios to compare with model results. Historical runs, such as have been made, can provide some basis for calibration. In general the smaller the deviation between the calculated model results and the field observations, the better the model. This is true to a certain extent, as the deviations in a perfect model are only due to measurement errors. In practice, however, a good fit is by no means a guarantee of a good model.

The deviations between the model results and the field observations can be due to a number of factors. These factors include possible software errors, inappropriate modeling assumptions such as the (conscious) simplification of complex structures, neglecting certain processes, errors in the mathematical description or in the numerical method applied, inappropriate parameter values, errors in input data and boundary conditions, and measurement errors in the field observations.

To determine whether or not a calibrated model is a 'good' predictor, it should be validated or verified. Calibrated models should be able to reproduce field observations not used in calibration. Validation can be carried out for calibrated models if an independent data set has been kept aside for this purpose. If all available data are used in the calibration process in order to arrive at the best possible results, validation will not be possible. A decision to leave out validation may be a justifiable one especially when data are limited.

Philosophically it is impossible to know if a simulation model of a complex system is 'correct'. There is no way to prove it. Experimenting with a model, such as by carrying out multiple validation tests, can increase confidence in that model. After a sufficient number of successful tests, one might be willing to state that the model is 'good enough', based on the modeling project requirements. The model can then be regarded as having been validated, at least for the ranges of input data and field observations used in the validation.

If model predictions are to be made for situations or conditions for which the model has been validated, there may be some confidence in the reliability of those predictions. Yet one cannot be certain. Much less confidence can be placed on model predictions for conditions outside the range for which the model was validated.

While a model should not be used for extrapolations as commonly applied in predictions and in scenario analyses, this is often exactly the reason for the modeling project. What is likely to happen given events we have not yet experienced? A model's answer to this question should also include the uncertainties attached to these predictions. Depending on the type of model selected and used, one might end up predicting an incorrect future with great accuracy, or predicting the correct future with great uncertainty'. We don't yet know how to predict the correct future with great accuracy – so we do 'what ifs'. One can then argue about what scenarios – the ifs – are the most reasonable or probable, or about the impacts from improbable scenarios that you want to avoid should such scenarios occur.

Use the model

Once the model has been judged 'good enough,' the model may be used to obtain the information desired. Close communication between the client and the modeler during the modeling application process is essential to avoid any unnecessary misunderstandings about what information is wanted and the assumptions on which that information is to be based.

Before the end of this model-use step one should determine whether all the necessary simulations have been performed and whether they have been performed well. Questions to ask include

- did the model fulfill its purpose?
- are the results valid?
- are the quality requirements met?
- was the discretization of space and time chosen well?
- was the choice of the model restrictions correct?
- was the correct model and/or model program chosen?
- was the numerical approach appropriate?
- was the implementation performed correctly?
- what are the sensitive parameters (and other factors)?
- was an uncertainty analysis performed?

If any of the answers to these questions is no, then the situation should be corrected. If it cannot, the reason(s) for why it cannot be corrected should be documented in the model application document (MAD).

Interpret model results

Interpreting the information resulting from models is a crucial step in the modeling application process, especially in situations in which the client may only be interested in those results and not the way they were obtained. The model results can be compared to those of other similar studies. Are the results consistent? IMC must make that judgment. Any unanticipated results should be discussed and explained. The results should be judged with respect to the modeling project objectives.

The results of any modeling project typically include large files of time-series data. Only the most dedicated of clients will want to read those files. Thus these data must be presented in a more concise form. Statistical summaries should explicitly include any restrictions and uncertainties in the results. They should identify any gaps in the domain knowledge, thus generating new research questions or identifying the need for more field observations and measurements.

Report model results

Once the modeling application is completed, the organization doing the modeling will be responsible for preparing a report. The contents of this report should conform to the agreement

made between modeling organization and the client prior to the initiation of the modeling application (see above). Although the results of a model are very rarely used as the sole basis for policy decisions, those requesting model applications may have a responsibility to translate their model results into policy recommendations. Policymakers, managers, and indeed the participating stakeholders typically want simple and clear unambiguous answers to complex questions. Much of the scientifically justified discussion, say regarding the uncertainties associated with some of the data, included in the main body of a report are not included in the executive summary of that report. This executive summary is often the only part read by those responsible for making decisions. Therefore, the conclusions of the model study must not only be scientifically correct, but also concisely formulated, without jargon, and fully understandable by managers and policymakers. When preparing or reviewing contractor model results reports, the IMC should consider this need.

These model application and model results reports should include sufficient detail to allow others to reproduce the model study (including its results) and/or to proceed from the point where this study ended. The report therefore requires a clear indication of the validity, usability and any restrictions of the model results.

Data Management

CALSIM II and its associated or linked models will require data. They will also produce data. Many of these data will have spatial and temporal dimensions. This information must be documented (meta data), preserved, and made accessible to IMC customers, coordination agencies and others. IMC should participate in data management strategic development, storage, documentation and dissemination. It should work with data base managers of various agencies to help them satisfy the IMC's data management requirements.

The availability of quality assured data is a critical dependency that must be met to facilitate timely completion of model development, implementation and application. To mitigate the impact of the availability of data on the timeline for the major model completion deadlines, the following issues should be addressed. :

- Updating land use / land cover data at regular and timely intervals.
- Developing and maintaining a common modeling database. This data base should include infrastructure design and operating policy data as well as water quality, ecological, land use, economic and of course hydrological data. Many of these data sets will have spatial as well as temporal dimensions. Each data set should have an associated metadata file.
- Pre-processed and post-processed datasets from previous model runs should be archived along with its metadata file in a central location for ease of access and availability.
- Measures to insure the consistency and quality of the input data.
- Measures to insure adequate communication among model developers, users and stakeholders. This includes measures to assist in developing documentation appropriate for each type of stakeholder.

Support of IMC activities

Common failures of IMC type organizations are typically due to:

- Insufficient staff to enable cross-training. This may lead to the dependency on one person or a very small group of employees for each sub module or the overall effort.
- Inadequate funding to institute good project management discipline.
- Inadequate funding to contract for technical writers and software engineers.
- Inadequate funding to contract for peer reviews.

Risk assessments

A risk assessment of CALSIM II and its associated models and data should be completed. The timely availability of quality assured data for example, is a risk. Project risk management includes the processes concerned with identifying, analyzing, and responding to uncertainties. Risk management attempts to minimize the results of adverse events. As a guide, the template, such as shown at the end of this Appendix, may be used to facilitate the assessment of risks.

Problem Management

Given the high visibility and criticality of the CALSIM II modeling effort an issue or problem management process should be developed within IMC. Issue/problem management includes the process for identifying, communicating, and resolving issues and problems.

The purpose of this procedure is to ensure that:

- Issues are identified, reported, managed, and resolved in a timely and effective manner. Responsibility is assigned to an owner for reporting, managing and resolving each issue
- All affected stakeholders are aware of the status of the issues
- Escalation of unresolved issues take place according to a defined procedure

In order to ensure that project issues and problems are appropriately managed various issue/problem management steps should be identified and followed to track the actions taken to resolve the issue or problem throughout the life of a modeling project.

B. Managing Peer Reviews

One means of quality control involves peer reviews of the models, their associated software, and their applications. One possible means of facilitating the peer review processes and for maintaining control on the particular versions of CALSIM II and accompanying models used for SWP-CVP planning and management decisions is another reason to create an interagency modeling consortium (IMC) consisting of DWR, USBR, and other stakeholder organization personnel if they are interested and want to participate. As suggested above, this consortium could be responsible for maintaining a toolbox of 'acceptable' peer-reviewed models for use by the agencies and contractors. The peer reviews should be of the theory underlying each

model, the model's software, the documentation of that software, the model's functions and capabilities including those pertaining to model data input and output, model calibration and verification, sensitivity analyses, uncertainty analyses, user control (GUIs), spatial and temporal resolutions, limiting assumptions, and on the model (as opposed to code) documentation.

Just having evidence of published articles about a particular model in peer reviewed journals is not a substitute for a peer review of the model software and its applicability or suitability for certain types of analyses for SWP-CVP. Peer reviews of all models, their software, and their use should be accomplished by experts both within and outside of the originating agencies. 'Inside' agency (or internal) reviews may uncover some needed changes and identify other issues or problems that external reviewers could be asked to specifically examine and address. Internal reviews can make the external review process more effective, less costly and less time consuming.

Peer reviews are considered a key process area for Level 3 and higher of the Capability Maturity Model guidelines for improving the software process (Carnegie Mellon University, 1994). The purpose of peer review evaluations is to find defects in the model formulation and software and in its use, i.e., model application. Peer reviewers can also identify possible ways of correcting those defects, if any. If there are no defects, or after all known defects have been corrected, both the developers and users of any model and its software can have a stronger basis for believing that their product and its output are reliable.

Peer reviews serve the same function as accountants. Once a firm's financial records have been peer reviewed by accountants (assuming they are qualified, objective and honest) the board of directors as well as the stockholders will have more assurance of the liabilities and net worth of their firm, and just how well it is being managed. In this case it is the assurance of the quality of the models, their software, and on their use in project evaluations, that actual and potential users of the model results depend upon.

The types of problems and issues for which a model, its software, and its documentation are designed to address are called the model's 'application niche'. Peer review of model development should include the evaluation of the intended application niche along with consideration of other aspects of model performance. Users of any model should be aware of the types of analyses for which the model is best suited and those for which the model is not well suited. This, along with the results of a peer review of any model application, should help the potential model user, or the user of the model results, better understand the limitations of the scientific basis of the model and just how much confidence can be placed on the model output.

Peer review triggers

Clearly judgment will have to be exercised as to just when and in what detail a peer review needs to be implemented. However the triggers on when a decision about a peer review needs to be made can be defined.

As shown in Figure 2, decisions regarding peer review are needed when models are proposed for the tool box and when model applications are completed. Should IMC decide a peer review is warranted when either of those events takes place, they will have to decide on the type of review and its level of detail. They will also need to identify the individuals to be asked to carry out that peer review.

Peer reviews are going to take time and cost money. They will also require IMC time to prepare the documentation needed for the peer reviewers and to read and act on reports prepared by the peer reviewers. This will apply if the peer review is internal or external.

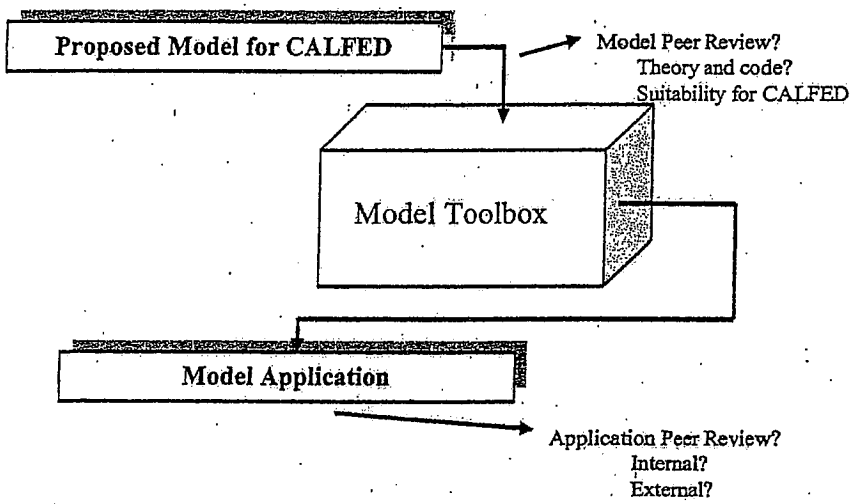


Figure 2. Schematic showing events where a peer review decision can be made.

The particular models and their associated software and documentation to be peer reviewed should be identified by the individuals or departments or agencies. This can include model process descriptions, software source code, documents, test results, and other supporting materials, as needed, for an adequate peer review of the entire model and its software. These products to be reviewed should be identified in writing and a written history of the review of different versions of each item should be maintained.

Events that take place in the progression of model development and use and subsequent modifications that warrant a peer review should be identified and specified in a written document. (This fits in to the model development and use documentation that should be maintained for Level 3 or higher CMM) When these events take place a peer review process should be considered, and if warranted, implemented. Depending on the event, the review can be solely internal, or it can involve an independent external review team as well.

Model application reviews should include an evaluation of the intended model application niche, and its applicability to current needs. Peer review may be appropriate for existing models when new information becomes available that could negate some or all of the conclusions of previous reviews or suggest a change in the currently specified application niche. Peer review of a model's applicability to a particular study should be planned well in advance of when model results are needed. The results of application reviews can influence the decisions made based on the model outputs. Once a peer review has been conducted for a particular model and its input data, peer reviews of subsequent applications of a model with similar inputs might be unnecessary. However, any time the model results may be controversial, or end up in litigation, another peer review may be justified.

Peer Review Process

The extent and process of performing and responding to peer reviews can vary in any organization. The ones discussed in this section attempt to follow the processes recommended by the Capability Maturity Model Level 3 guidelines.

Project peer review process should be specified in writing. A first step in this process should be to identify the particular modeling products and processes that will undergo peer review. This includes the models (i.e. the processes being modeled and the assumptions built into the models for describing these processes), their supporting software, the documentation of the model and its software, as well as all the written guidelines on how the models are to be used.

A second step is to perform an internal peer review prior to a model's use for project evaluation. It should be peer reviewed for accuracy, its suitability for use, and for identifying any possible errors in its logic, its coding, or in its documentation. Following an internal review, an external peer review can be performed.

Following the successful conclusion of internal and external peer reviews of a model and its documentation, the model can be applied to evaluate alternative projects. After the model has been applied to a particular project, the modeling process and its results should be peer reviewed to insure that the model has been applied properly, that the input data were appropriate, and that the conclusions drawn were valid.

Peer review teams should be selected, along with a peer review team leader. The particular personnel on the team will depend on the particular model and its software and documentation being reviewed. CALFED should have a list of qualified peer reviewers representing all applicable disciplines, both internal and external, that it can call upon to perform these reviews. The peer reviews are to be of the models and their use, not of the people who developed or used them. The reviews are to be used to evaluate the quality of modeling products and processes, not of the personnel involved.

Establishing and carrying out ongoing peer review processes costs money. Adequate funding must be made available to

1. identify and recruit a peer review team and team leader
2. prepare and distribute the peer review materials to the peer review team
3. support the time required for the team to review the materials prior to a team meeting
4. support the team meeting and to participate in it as appropriate (e.g., answering questions, conducting model experiments and sensitivity analyses, etc.)
5. reproduce and distribute the team report and to take actions as needed
6. monitor the modifications or changes being made to the model, its software, and its documentation, or redoing the model application, as needed.
7. prepare and distribute to model developers and potential users a report on the results of the peer review and the actions taken.

The particular peer review process may depend on just what is being peer reviewed and the resources and time available to perform the review. In general, however, the steps of a peer review could include the following:

1. DWR or CALFED should identify and establish a pool of possible reviewers representing various disciplines, with sufficient redundancy to allow for scheduling conflicts when ever some subset of those reviewers are needed. This includes both internal as well as external reviewers. What ever administrative work is need to establish this pool should be completed prior to when these reviewers will be needed.

2. At particular milestones in any new model development or in model application an internal peer review process could be initiated, to examine the modeling assumptions, the software that implements those assumptions in the case of model development or the data being used for model inputs in the case of model applications, and the documentation being prepared to describe the processes, to document the software code, and to document the tests that were run to test the code, or to document the results of the model application. If deemed appropriate, an external peer review could also be performed. If an external review is to take place, the particular reviewers need to be selected, notified, sent supporting documents, and be scheduled for one or more meetings, as needed. They should be issued contracts specifying the requirements (the checklist of items to be reviewed) and products expected.

3. Recommendations made by the peer review team need to be addressed and the actions taken along with the rationale for those actions should be documented.

4. The peer review team should review the actions taken and the results obtained from these actions. If not judged acceptable new recommendations should be made and submitted. A final report should be prepared by the peer review team when all recommendations have been successfully implemented or addressed, or if no further actions based on review team's recommendations will be taken by the model developers or users.

The time and effort required for various levels of review should also be assessed and provided to the review team so that they can carry out the level of review requested of them. Otherwise the reviews may be superficial and while appearing to be peer reviewed, a model and its

associated products may in fact be inadequately reviewed. Peer review teams have the responsibility to specify in writing the scope and limitations of their reviews.

As was the case for this peer review panel, the materials to be sent to the review team to allow them to prepare for their meeting should include the statement of review objectives and the level of detail desired, the applicable requirements and standards upon which to judge the adequacy of the products being reviewed, and of course the material that is to be reviewed. There should be a list of questions for the reviewers to address. Each review team member should be assigned and given responsibility for answering specific questions and for completing specific aspects of the overall review. All team members should be given specific review standards or requirements, including the expected completion dates. Checklists should be provided the review team that are applicable to the specific type of product being reviewed and the level of detail to be examined. These checklists will contain the criteria for judging the product, such as compliance with any standards and procedures, completeness, correctness, rules of construction, and maintainability.

Peer Review Issues and Questions

Each model development or application review will dictate its own special set of questions to be addressed. Some of these questions could relate to:

- Model Purpose and Objective
  - Use of model related to decisions being considered.
  - Model application niche, and why.
  - Model strengths and weaknesses –is it the best model?
- Model Processes and Limitations
  - Model processes, spatial and temporal scales, grid resolution.
  - Model variables and level of aggregation.
- Model Theoretical Basis
  - Model algorithms, numerical or analytical methods,
  - Model process formulation
  - Modeling approach in comparison with other models
  - Any shortcomings in relation to application niche
- Model Parameter Estimation
  - Methods used
  - Data available for parameter estimation
  - Parameter estimate reliabilities
  - Boundary conditions and appropriateness.
- Model Input Data Quantity/Quality
  - Data used in design of model
  - Data adequacy (quantity, quality, resolution) for model purpose and application
  - Data necessary for application of model
  - Key data gaps in model application
  - Additional data needs and why
- Model Key Assumptions
  - Basis for major assumptions

- Sensitivity of model outputs to key assumptions
- Sensitivity of potential decisions to key assumptions
- Ease in modifying key assumptions

- Model Performance Measures
  - Criteria for assessing model performance
  - Correspondence of model output with measured observed data
  - Any model bias throughout range of model predictions
  - Variability and uncertainty analyses and representations in model results
  - What determines model's variability and uncertainty.
  - Model performance relative to others in application niche
- Model Documentation and User's Guide
  - Clarity of documentation, comprehensiveness of user's guide
  - Model applicability and limitations
  - Input data requirements for calibration, verification, model runs
  - Post modeling analyses, display and interpretation of results
  - Model code documentation
  - Model application documentation examples for prospective users.
- Review Retrospective
  - How well model and its application meet objectives and needs of project
  - Possible changes in the model to improve model performance
  - Robustness of model solutions to small changes in uncertain parameters, etc.
  - Ease of including uncertainty analyses associated with uncertain input data.
  - Key research needs for model improvement.

Peer Review Completion Reports

Procedures need to be established to track and confirm actions based on suggested changes or modifications in the material being reviewed. Once these actions are taken and completed, and documented, the peer review process for that particular product is completed. Peer review completion reports should contain data on what was reviewed and the results of the review. These data should include a description of the products that were reviewed, the level of detail of the review, any review limitations or qualifications, the number and backgrounds of the reviewers, the time spent preparing for and during review team meetings, the defects found and recommendations made, and the actions taken to address these recommendations.

Overall Peer Review Evaluations

The IMC or initiating agency should document the planning for and scheduling of peer reviews. The products to be reviewed and the level of detail to be examined also need to be specified. The procedures to be followed for selecting peer review team members, and the team leader, should also be determined and documented. Procedures for training potential reviewers, if such training is needed, should be identified and implemented, as required.

Periodically the IMC or applicable agency should assess just how well the plan described in the preceding paragraph is being carried out, and just how beneficial these peer reviews are to the overall modeling effort. Measures should be identified and used to determine the status of the

peer review activities. These measures could include the number of completed peer reviews performed compared to the number expected to be performed, the overall effort expended on peer reviews compared to that expected, and the number and extent of peer review recommendations requiring actions.

At a minimum these periodic reviews should verify that

1. The planned peer reviews and/or audits are conducted.
2. The peer review leaders are adequately trained for their roles.
3. The reviewers are properly trained or experienced in their roles.
4. The processes for preparing for and conducting peer reviews, and for following up on reviewer's recommendations are adequate and are being followed.
5. The reporting of peer review results is complete, accurate, timely and is being made available to model users.

Risk Management Template

Risk Definition Name	Enter a short name that uniquely defines the risk
Risk #	Enter a unique number assigned to the risk. Range starts with 1 and continues.
Date Risk Identified	Enter the date the risk was identified
Risk Identification Source	Enter the source of the risk identification. In example, meeting name, group, or person.
Risk Owner	Enter the name of the person who will be responsible for ensuring the risk is approved, managed, periodically assessed, communicated, and tracked through closed or transfer.
Risk Detailed Description	Enter a detailed description of the risk so that a reader clearly understands the risk.
Probable Impact of Risk on Project (H, M, L)	Enter the impact on the project. o High = the risk will most likely occur and the impact could prevent the project from achieving its purpose. o Medium = there is a 50/50 change the risk would occur and the impact is serious but the project could still achieve its purpose if appropriately managed. o Low = there is a low probability that the risk would occur and minimal impact to the project's purpose.
Probable Impact of Risk on Project Costs	Enter the impact on the project in dollars. Determine what the potential cost to the project would be if the risk occurs.
Probable Impact of Risk on Project Schedule	Enter the schedule impact on the project. Determine how the schedule would be potentially impacted if the risk occurs.
Probable Impact of Risk on Project Results	Enter the impact on the project. Determine how the overall project purpose and results will be potentially impacted if the risk occurs.
Detailed Plan to Mitigate or Transfer Risk	Enter the detailed plan to mitigate the risk or a statement that the risk will be accepted. Mitigation could include ways to minimize, avoid, or transfer the risk to another party or group. Risk transfer would include evidence of agreement by the accepting party.
Detailed Project Action Items Required to Mitigate or Transfer Risk	Enter the detailed action items required to mitigate the risk. These items will be summarized and assigned within the project Action Log, along with an action item owner, and target completion date.
Detailed Project Plan Tasks Required to Mitigate Risk	Enter the detailed project plan task required to mitigate the risk. These items will be summarized and contained within the MS Project Schedule along with the effort, duration, schedule, and assigned resources.
Comments	Enter any permanent comments that cannot be included in the above items.
Referenced Documents	Enter any documents that a reader should consider in understanding, analyzing, mitigating, or accepting this risk.
Date Risk Closed	Enter the date this risk was closed. This would include when all action items or project tasks were completed, or the risk was transferred to another party or group.

Appendix F: Analysis of the November 2003 CALSIM II Validation Report

The following comments come from an analysis of the model results presented in the validation report *'CALSIM II Simulation of Historical SWP/CVP Operations'*, DWR (2003). The observations relate to the formulation of the model at November 2003. Changes might be made to that formulation which could resolve these issues.

Overestimation of Project Deliveries

The validation run suggests that the modeled demands included in CALSIM II overestimate the actual demands. CVP demands south of the Delta are assumed to be always equal to the contract entitlement whereas the observed deliveries in unrestricted years are consistently less than this amount. The modeled North of Delta deliveries are also consistently higher than observed. The modeled and observed CVP deliveries from the validation report are listed in Table 1.

Table 1. Comparison of modelled and observed CVP deliveries (1975-1998)

Project	Simulated Delivery (Taf/yr)	Historical Delivery (taf/yr)	Difference (taf/yr)	% Difference
CVP North of Delta	1960	1750	210	12
CVP South of Delta	2650	2490	160	6.4

Because the SWP south of delta demands were set to historical deliveries in many years, comparison with the historical deliveries in the validation report is of limited validity. However the fact that the historical SWP deliveries over the last ten years have averaged only 2385 taf/year while the modeled 'year 2001 development' SWP Delta deliveries reported in the 2002 State Water Project Delivery Reliability Report average 3090 taf/year, suggests that modeled SWP deliveries may also be too high.

Allocations to Project Contractors

Seasonal allocations to SWP and CVP contractors are made on the basis of water in storage, forecast inflows, projected carryover storage requirements and in-Basin and Delta regulatory requirements. The allocation processes used by the operators and those used by CALSIM II, are not identical. An examination of the way that CALSIM II has restricted project deliveries during the dry period of 1987-1992 (Figures 10, 16, 17 and 24 of the validation report) suggests that CALSIM II has allocated less water in the early years of the dry sequence than occurred in practice and consequently had more water available in 1991 and 1992 when the most severe restrictions were experienced. The carryover storage rules adopted can have a significant impact on the expected frequency and severity of water supply restrictions. The

model rules need to be examined to ensure that the accurately reflect the way the system will be managed in the future.

San Luis Reservoir Operation

The rules used by the system operators for transferring water from headwater storages to the San Luis Reservoir can have a significant impact on:

- the pattern of flow in the Delta,
- the operation of accounting rules between the SWP and the CVP and
- opportunities for SWP wheeling of CVP water and possibly the availability of Article 21 water to SWP contractors.

A comparison of the modeled and observed storage behavior of the SWP component of San Luis (Figure 15) reveals that the model consistently underestimates the volume in storage. A comparison of the CVP component of the storage (Figure 23) indicates that the actual storage is filled earlier in the season and that the actual storage is also slightly higher than the modeled.

Users of CALSIM II output need to be confident that the rules adopted by the model for determining these transfers reflect the way this component of the system will be operated in the future.

Appendix G: Some Principles for Strategic Water Analysis for the California Water Plan Bulletin 160-03 (from the stakeholder review Draft, Sept. 30, 2003)

Strategy:

1) A frequently amended strategic document will lay out DWR's strategic analysis framework and identify the technical objectives, roles, and responsibilities of major DWR data collection efforts and analytical tools and their interactions and their responsible managers.

Transparency:

2) All data and models should be in the public domain and available on the web.
3) All data and models should have significant documentation.
4) Known limitations should be documented.

Longer-term viability:

5) Modularity: Major analytical tools will be designed and implemented to fit modularly and explicitly within the larger strategic analysis framework.
6) Adaptive data management framework: Major data efforts will fall within a larger data management framework, including protocols for data documentation and updating, and documentation of limitations.
7) A frequently-updated document will outline short-term and long-term efforts, budgets, and responsibilities for continuous improvement of analytical tools and data, with policy for continued user, local agency, and stakeholder involvement.

Coverage:

8) Spatial coverage for the basic data and analytical framework will be statewide.
9) Local and regional water management and resources will be explicitly represented.

Accountability and Quality Control:

10) In developing analytical tools, systematic efforts should be made to involve local agencies and stakeholders.
11) Major analytical products will undergo external review by a) external unaffiliated experts and b) local agencies whose systems are included in the model. User groups will exist for all major analytical products.
12) DWR's strategic analysis framework will undergo periodic internal and external review.

Appendix H: Model Sensitivity and Uncertainty Analysis

(This is a draft of a book chapter by DPL/JRS that may be useful for CALSIM II developers)

1. Introduction
2. Issues, concerns, and terminology
3. Variability and uncertainty in model output
   - 3.1 Natural variability
   - 3.2 Knowledge uncertainty
   - 3.3 Decision uncertainty
4. Sensitivity and uncertainty analyses
   - 4.1 Sensitivity Analyses
   - 4.2 Uncertainty Analyses
5. Performance indicator uncertainties
   - 5.1 Performance measure target uncertainty
   - 5.2 Distinguishing differences between performance indicator distributions
6. Communicating model output uncertainty
7. Conclusions
8. References

The usefulness of any model is in part dependent on the accuracy and reliability of its output data. Yet, because all models are imperfect abstractions of reality, and because precise input data are rarely if ever available, all output values are subject to imprecision. The input data and modeling uncertainties are not independent of each other. They can interact in various ways. The end result is imprecision and uncertainty associated with model output. This chapter focuses on ways of identifying, quantifying, and communicating the uncertainties in model outputs.

1. Introduction

Models are the primary way we have to estimate the multiple affects of alternative water resource system design and operating policies. Models predict the values of various system performance indicators. Model outputs are based on model structure, hydrologic and other time-series inputs and a host of parameters whose values describe the system being simulated. Even if these assumptions and input data reflect, or are at least representative of, conditions believed to be true, we know they will be wrong. Our models are always simplifications of the

real systems we are studying. Furthermore, we simply cannot forecast the future with precision. So we know the model outputs of future conditions are uncertain estimates, at best.

Some prediction uncertainties can be reduced by additional research and data collection and analysis. Before undertaking expensive studies to gather and analyze additional data it is reasonable to ask what improvement in estimates of system performance or what reduction in the uncertainty associated with those estimates would result if all data and model uncertainties could be reduced. Such information helps determine how much one would be willing to 'pay' to reduce prediction uncertainty. If prediction uncertainty on average is costing a lot, it may pay to invest in additional data collection, more studies, or in better models all aimed at reducing that prediction uncertainty. If that uncertainty has no, or only a very modest, impact on the likely decision that is to be made, one should find other issues to worry about.

If it appears that reducing prediction uncertainty is worthwhile, then one should consider how best to do it. If doing this involves obtaining additional information, then it is clear that the value of this additional information, however measured, should exceed the cost of obtaining it. The value of such information will be the increase in system performance, or the reduction in its variance, that one can expect from obtaining such information. If additional information is to be obtained, it should be that information which reduces the uncertainties considered important, not the unimportant ones.

This chapter reviews some methods for identifying and communicating model prediction uncertainty. The discussion begins with a review of the causes of risk and uncertainty in model output. It then examines ways of measuring or quantifying uncertainty and model output sensitivity to model input imprecision, concentrating on methods that seem most relevant or practical for large-scale regional simulation modeling. It builds on some of the statistical methods reviewed in Chapter III and the modeling of risk and uncertainty in Chapter VI.

2. Issues, concerns, and terminology

Outcomes or events that cannot be predicted with certainty are often called risky or uncertain. Some individuals draw a special and interesting distinction between risk and uncertainty. In particular, the term risk is often reserved to describe situations for which probabilities are available to describe the likelihood of various events or outcomes. If probabilities of various events or outcomes cannot be quantified, or if the events themselves are unpredictable, some would say the problem is then one of uncertainty, and not of risk. In this chapter what is not certain is considered uncertain, and uncertainty is often described by a probability distribution. When the ranges of possible events are known and their probabilities are measurable, risk is called objective risk. If the probabilities are based solely on human judgment, the risk is called subjective risk.

Such distinctions between objective and subjective risk, and between risk and uncertainty, rarely serve any useful purpose to those developing and using models. Likewise the distinctions are often unimportant to those who should be aware of the risks or uncertainties associated with system performance indicator values.

Uncertainty in information is inherent in future-oriented planning efforts. Uncertainty stems from inadequate information and incorrect assumptions, as well as from the variability of natural processes. Water managers often need to identify both the uncertainty as well as the sensitivity of, or changes in, system performance indicator values due to the any changes in possible input data and parameter values from what were predicted. They need to reduce this level of uncertainty to the extent practicable. Finally, they need to communicate the residual uncertainties clearly so that decisions can be made with this knowledge and understanding.

Sensitivity analysis can be distinguished from uncertainty analysis. Sensitivity analysis procedures explore and quantify the impact of possible errors in input data on predicted model outputs and system performance indices. Simple sensitivity analysis procedures can be used to illustrate either graphically or numerically the consequences of alternative assumptions about the future. Uncertainty analyses employing probabilistic descriptions of model inputs can be used to derive probability distributions of model outputs and system performance indices. Figure 1 illustrates the impact of both input data sensitivity and input data uncertainty on model output uncertainty.

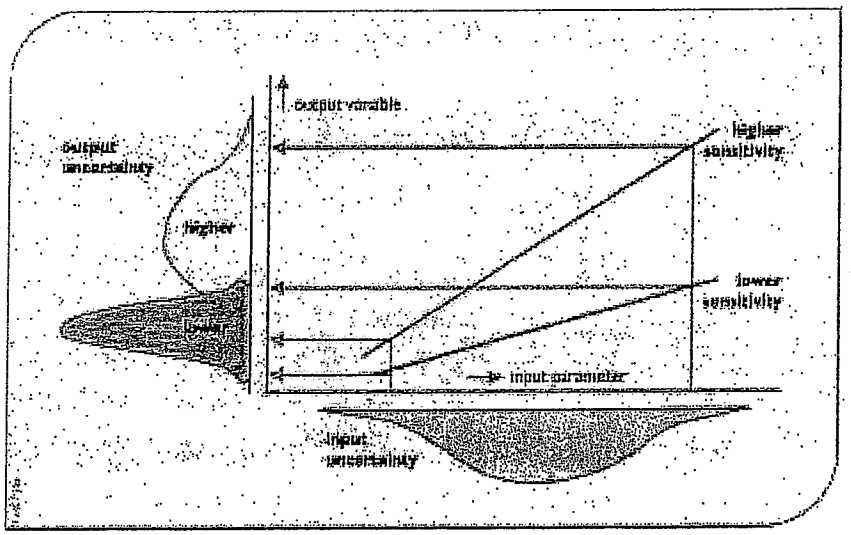


Figure 1. Schematic diagram showing relationship among model input parameter uncertainty and sensitivity to model output variable uncertainty (Lal, 1995).

It is worthwhile to explore the transformation of uncertainties in model inputs and parameters into uncertainty in model outputs when conditions differ from those reflected by the model inputs. Historical records of system characteristics are typically used as a basis for model inputs. Yet conditions in the future may change. There may be changes in the frequency and

amounts of precipitation, changes in land cover and topography, and changes in the design and operation of control structures, all resulting in changes of water stages and flows, and their qualities, and consequently changes in the impacted ecosystems.

If asked how the system would operate with inputs similar to those in the historical database, the model should be able to interpolate within the available knowledge base to provide a fairly precise estimate. Still that estimate will not be perfect. This is because our ability to reproduce current and recent operations is not perfect, though it should be fairly good. If asked to predict system performance for situations very different from those in the historical knowledge base, or when the historical data are not considered representative of what might happen in the future, say due to climate change, such predictions become much less precise. There are two reasons why. First, our description of the characteristics of those different situations or conditions may be imprecise. Second, our knowledge base may not be sufficient for calibrating model parameters in ways that would enable us to reliably predict how the system will operate under conditions unlike those that have been experienced historically. The more conditions of interest are unlike those in the historical knowledge base, the less confidence we have that the model is providing a reliable description of systems operation. Figure 2 illustrates this issue.

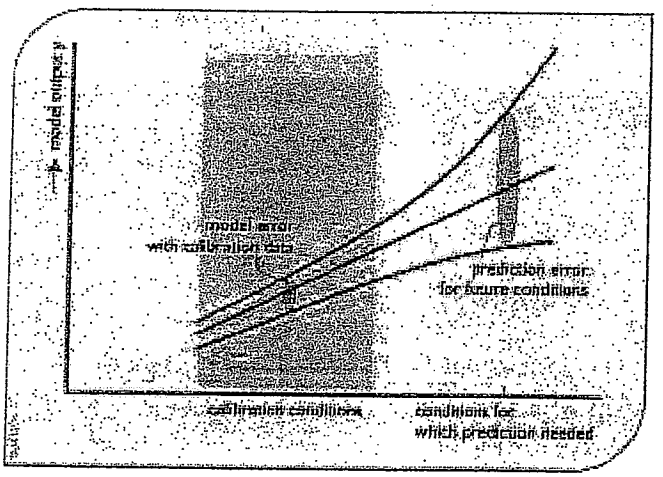


Figure 2. The precision of model predictions is affected by the difference between the conditions or scenarios of interest and the conditions or scenarios for which the model was calibrated.

Clearly a sensitivity analysis needs to consider how well a model can replicate current operations, and how similar the target conditions or scenarios are to those described in the

historical record. The greater the required extrapolation from what has been observed, the greater will be the importance of parameter and model uncertainties.

The relative and absolute importance of different parameters will depend on the system performance indicators of interest. Seepage rates may have a very large local effect, but a small global effect. Changes in system-wide evapotranspiration rates will likely impact system-wide flows. The precision of model projections and the relative importance of errors in different parameters will depend upon the:

(1) precision with which the model can reproduce observed conditions,
(2) difference between the conditions predicted and the historical experience included in the knowledge base, and the
(3) system performance characteristics of interest.

Errors and approximations in input data measurement, parameter values, model structure and model solution algorithms, are all sources of uncertainty. While there are reasonable ways of quantifying and reducing these errors and the resulting range of uncertainty of various system performance indicator values they are impossible to eliminate. Decisions will still have to be made in the face of a risky and uncertain future. Decisions can be modified as new data and knowledge are obtained in a process of adaptive management.

There is also uncertainty with respect to human behavior and reaction related to particular outcomes and their likelihoods, i.e., to their risks and uncertainties. As important as risks and uncertainties associated with human reactions are to particular outcomes, they are not usually part of the models themselves. Social uncertainty may often be the most significant component of the total uncertainty associated with just how a water resource system will perform. For this reason we should seek designs and operating policies that are flexible and adaptable.

When uncertainties associated with system operation under a new operating regime are large, one should anticipate the need to make changes and improvements as experience is gained and new information accumulates. When predictions are highly unreliable, responsible managers should favor actions that are robust (e.g., good under a wide range of situations), gain information through research and experimentation, monitor results to provide feedback for the next decision, update assessments and modify policies in the light of new information, and avoid irreversible actions and commitments.

3. Variability and uncertainty in model output

Differences between model output and observed values can result from either natural variability, say caused by unpredictable rainfall, evapotranspiration, water consumption, and the like, and/or by both known and unknown errors in the input data, the model parameters, or the model itself. The later is sometimes called knowledge uncertainty but it isn't always due to a lack of knowledge. Models are always simplifications of reality and hence 'imprecision' can result. Sometimes imprecision occurs because of a lack of knowledge, such as just how a

particular species will react to various environmental and other habitat conditions. Other times known errors are introduced simply for practical reasons.

Imperfect representation of processes in a model constitutes model structural uncertainty. Imperfect knowledge of the values of parameters associated with these processes constitutes model parameter uncertainty. Natural variability includes both temporal variability and spatial variability, to which model input values may be subject.

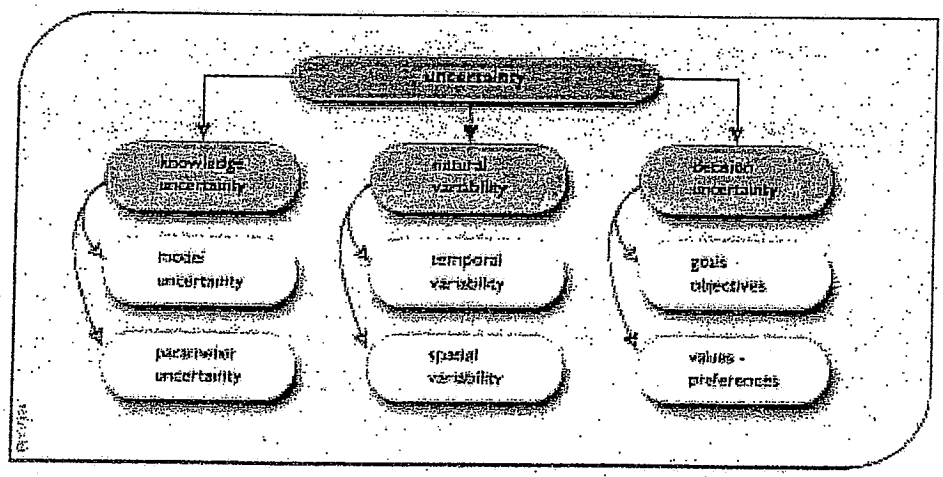


Figure 3. One way of classifying types of uncertainty.

Figure 3 illustrates these different types of uncertainty. For example, the rainfall measured at a weather station within a particular model grid cell may be used as an input value for that cell, but the rainfall may actually vary at different points within that cell and its mean value will vary across the landscape. Knowledge uncertainty can be reduced through further measurement and/or research. Natural variability is a property of the natural system, and is usually not reducible at the scale being used. Decision uncertainty is simply an acknowledgement that we cannot predict ahead of time just what decisions individuals and organizations will make, or even just what particular set of goals or objectives will be considered and the relative importance of each.

Rather than contrasting 'knowledge' uncertainty vs. natural variability vs. decision uncertainty, one can classify uncertainty in another way based on specific sources of uncertainty, such as those listed below, and address ways of identifying and dealing with each source of uncertainty.

Informational Uncertainties:

- imprecision in specifying the boundary and initial conditions that impact the output variable values
- imprecision in measuring observed output variable values

Model Uncertainties:

- uncertain model structure and parameter values
- variability of observed input and output values over a region smaller than the spatial scale of the model
- variability of observed model input and output values within a time smaller than the temporal scale of the model. (e.g., rainfall and depths and flows within a day)
- errors in linking models of different spatial and temporal scales

Numerical Errors:

- errors in the model solution algorithm

3.1 Natural variability

The main source of hydrologic model output value variability is the natural variability in hydrological and meteorological input series. Periods of normal precipitation and temperature can be interrupted by periods of extended drought and intense meteorological events such as hurricanes and tornadoes. There is no reason to think such events will not continue to occur and become even more frequent and extreme. Research has demonstrated that climate has been variable in the past and concerns about anthropogenic activities that may increase that variability increase each year. Sensitivity analysis can help assess the affect of errors in predictions if those predictions are based only on past records of historical time-series data describing precipitation, temperature and other exogenous forces across and on the border of the regions being studied.

Time series input data are often actual, or at least based on, historical data. The time-series values typically describe historical conditions including droughts and wet periods. What is distinctive about natural uncertainty, as opposed to errors and uncertainty due to modeling limitations, is that natural variability in meteorological forces cannot be reduced by improving the model's structure, increasing the resolution of the simulation, or by better calibration of model parameters.

Errors result if meteorological values are not measured or recorded accurately, or if mistakes are made in the generation of computer data files. Furthermore, there is no assurance the statistical properties of historical data will accurately represent the statistical properties of future data. Actual future precipitation and temperature scenarios will be different from those in the past, and this difference in many cases may have a larger affect than the uncertainty due to incorrect parameter values. However, the affects of uncertainties in the parameter values

used in stochastic generation models are often much more significant than the affects of using different stochastic generation models (Stedinger and Taylor, 1982).

While variability of model output is a direct result of variability of model input (e.g., hydrologic and meteorological data), the extent of the variability, and the lower and upper limits of that variability, may also be affected by errors in the inputs, the values of parameters, initial boundary conditions, model structure, processes and solution algorithms.

Figure 4 illustrates the distinction between the variability of a system performance indicator due to input data variability, and the extended range of variability due to the total uncertainty associated with any combination of the causes listed in the previous section. This extended range is what is of interest to water resource planners and managers.

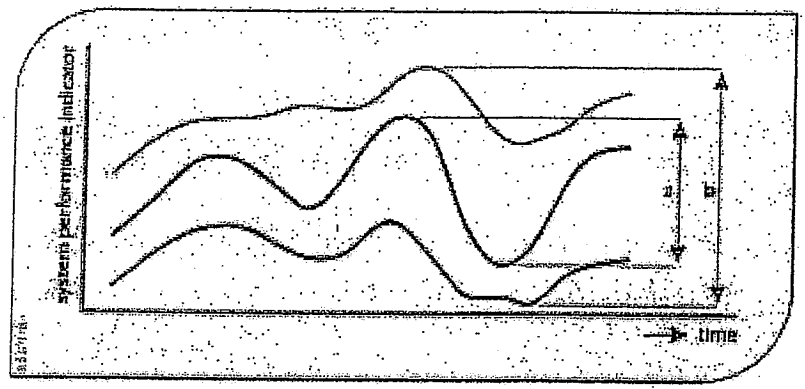


Figure 4. Time-series of model output or system performance showing variability over time. Range "a" results from the natural variability of input data over time. The extended range "b" results from the variability of natural input data as well as from imprecision in input data measurement, parameter value estimation, model structure and errors in model solution algorithms. The extent of this range will depend on the confidence level associated with that range.

What can occur in practice is a time-series of system performance indicator values that can range anywhere within or even outside the extended range, assuming the confidence level of that extended range is less than 100%. The confidence one can have that some future value of a time series will be within a given range is dependent on two factors. The first is the number of measurements used to compute the confidence limits. The second is on the assumption that those measurements are representative of - come from the same statistical or stochastic process yielding - future measurements. Figure 5 illustrates this point. Note that the time series may even contain values outside the range "b" defined in Figure 4 if the confidence level of that range is less than 100%. Confidence intervals associated with less than 100% certainty will not include every possible value that might occur.

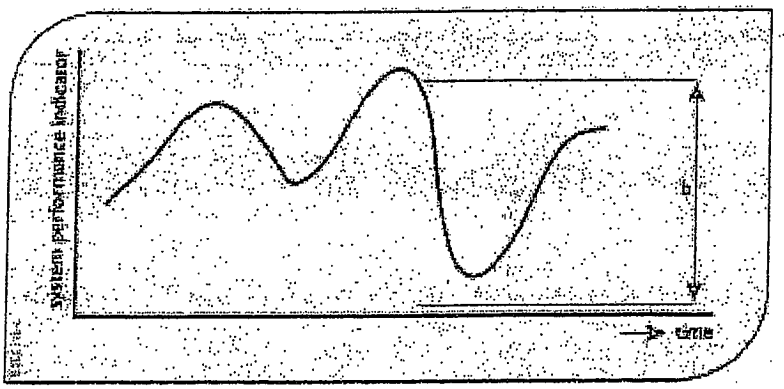


Figure 5. Typical time series of model output or system performance indicator values that are the result of input data variability and possible imprecision in input data measurement, parameter value estimation, model structure and errors in model solution algorithms.

3.2 Knowledge uncertainty

Referring to Figure 3, knowledge uncertainty includes model structure and parameter value uncertainties. First we consider parameter value uncertainty including boundary condition uncertainty, and then model and solution algorithm uncertainty.

3.2.1 Parameter value uncertainty

A possible source of uncertainty in model output results from uncertain estimates of various model parameter values. If the model calibration procedure were repeated using different data sets, different parameter values would result. Those values would yield different simulated system behavior, and thus different predictions. We can call this parameter uncertainty in the predictions because it is caused by imprecise parameter values. If such parameter value imprecision were eliminated, then the prediction would always be the same and so the parameter value uncertainty in the predictions would be zero. But this does not mean that predictions would be perfectly accurate.

In addition to parameter value imprecision, uncertainty in model output can result from imprecise specification of boundary conditions. These boundary conditions can be either fixed or variable. However, because they are not being computed based on the state of the system, their values can be uncertain. These uncertainties can affect the model output, especially in the vicinity of the boundary, in each time step of the simulation.

3.2.2 Model structural and computational errors

Uncertainty in model output can also result from errors in the model structure compared to the real system, and approximations made by numerical methods employed in the simulation. No matter how good our parameter value estimates, our models are not perfect and there is a residual model error. Increasing model complexity to more closely represent the complexity of the real system may not only add to the cost of data collection, but also introduce even more parameters, and thus even more potential sources of error in model output. It is not an easy task to judge the appropriate level of model complexity, and to estimate the resulting levels of uncertainty associated with various assumptions regarding model structure and solution methods. Kuczera (1988) provides an example of a conceptual hydrologic modeling exercise with daily time steps where model uncertainty dominated parameter value uncertainty.

3.3 Decision uncertainty

Uncertainty in model predictions can result from unanticipated changes in what is being modeled. These can include changes in nature, human goals, interests, activities, demands, and impacts. An example of this is the deviation from standard or published operating policies by operators of infrastructure such as canal gates, pumps, and reservoirs in the field, as compared to what is specified in documents and incorporated into the water systems models. Comparing field data with model data for model calibration may yield incorrect calibrations if operating policies actually implemented in the field differ significantly from those built into the models. What do operators do in times of stress? And can anyone identify a place where deviations from published policies do not occur?

What humans will want to achieve in the future may not be the same as what they want today. Predictions of what people will want in the future are clearly sources of uncertainty. A perfect example of this is in the very flat Greater Everglades region of south Florida in the US. Fifty years ago folks wanted the swampy region protected from floods and drained for agricultural and urban development. Today many want just the opposite at least where there are no human settlements. They want to return to a more natural hydrologic system with more wetlands and unobstructed flows, but now for ecological restoration objectives that were not a major concern or much appreciated some half a century ago. Once the mosquitoes return and if the sea level continues to rise, future populations who live there may want more flood control and drainage again. Who knows? Complex changing social and economic processes influence human activities and their demands for water resources and environmental amenities over time. Some of these processes reflect changes in local concerns, interests and activities, but population migration and many economic activities and social attitudes can also reflect changing national and international trends.

Sensitivity scenarios that include human activities can help define the affects of those activities within an area. It is important that careful attention go into the development of these alternative scenarios so that they realistically capture the forces or stresses that the system may face. The history of systems studies are full of examples where the issues studied were rapidly

overwhelmed by much larger social forces resulting from, for example, the relocation of major economic activities, an oil embargo, changes in national demand for natural resources, economic recession, sea-level rise, an act of terrorism, or even war. One thing is sure; the future will be different than the past, and no one is certain just how.

3.3.1 Surprises

Water resource managers may also want to consider how vulnerable a system is to undesirable environmental surprises. What havoc might an introduced species like the zebra mussel invading the Great Lakes of North America have in a particular watershed? Might some introduced disease suddenly threaten key plant or animal species? Might management plans have to be restructured to address the survival of some species such as salmon in the Rhine River in Europe or in the Columbia River in North America? Such uncertainties are hard to anticipate when by their nature they are truly surprises. But surprises should be expected. Hence system flexibility and adaptability should be sought to deal with changing management demands, objectives, and constraints.

4. Sensitivity and uncertainty analyses

An uncertainty analysis is not the same as a sensitivity analysis. An uncertainty analysis attempts to describe the entire set of possible outcomes, together with their associated probabilities of occurrence. A sensitivity analysis attempts to determine the relative change in model output values given modest changes in model input values. A sensitivity analysis thus measures the change in the model output in a localized region of the space of inputs. However, one can often use the same set of model runs for both uncertainty analyses and sensitivity analyses. It is possible to carry out a sensitivity analysis of the model around a current solution and then use it as part of a first order uncertainty analysis.

This discussion begins by focusing on some methods of uncertainty analysis. Then various ways of performing and displaying sensitivity analyses are reviewed.

4.1 Uncertainty Analyses

Recall that uncertainty involves the notion of randomness. If a value of a performance indicator or performance measure, or in fact any variable, like the phosphorus concentration or the depth of water at a particular location varies and this variation over space and time cannot be predicted with certainty, it is called a random variable. One cannot say with certainty what the value of a random variable will be but only the likelihood or probability that it will be within some specified range of values. The probabilities of observing particular ranges of values of a random variable are described or defined by a probability distribution. There are many types of distributions and each can be expressed in several ways as presented in Chapter III.

Suppose the random variable is X. If the observed values of this random variable can be only discrete values, the probability distribution of X can be expressed as a histogram, as shown in Figure 6a. The sum of the probabilities for all possible outcomes must equal 1. If the random variable is a continuous variable that can assume any real value over a range of values, the probability distribution of X can be expressed as a continuous distribution as shown in Figure 6b. The shaded area under the density function for the continuous distribution is 1. The area between two values of the continuous random variable, such as between u and v in Figure 6c, represents the probability that the observed value x of the random variable value X will be within that range of values.

The probability distribution, $P_X(x)$ shown in Figure 6 (a) is called a probability mass function. The probability distributions shown in Figure 6 (b and c) are called a probability density functions (pdf) and are denoted by $f_X(x)$. The subscript X of P_X and f_X represents the random variable, and the variable x is some value of that random variable X.

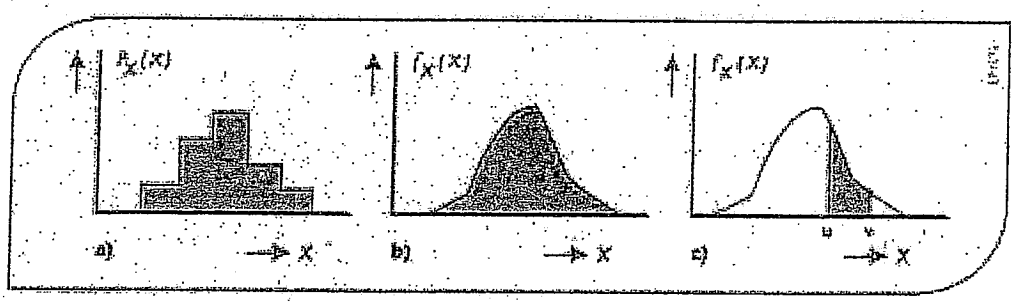


Figure 6. Probability distributions for a discrete or continuous random variable X. The area under the distributions (shaded areas in a and b) is 1, and the shaded area in c is the probability that the observed value x of the random variable X will be between u and v.

Uncertainty analyses involve identifying characteristics of various probability distributions of model input and output variables, and subsequently functions of those random output variables that are performance indicators or measures. Often targets associated with these indicators or measures are themselves uncertain.

A complete uncertainty analysis would involve a comprehensive identification of all sources of uncertainty that contribute to the joint probability distributions of each input or output variable. Assume such analyses were performed for two alternative project plans, A and B, and that the resulting probability density distributions for a specified performance measure were as shown in Figure 7. Figure 7 also identifies the costs of these two projects. The introduction of two performance criteria, cost and probability of exceeding a performance measure target (e.g., a pollutant concentration standard) introduces a conflict where a tradeoff must be made.

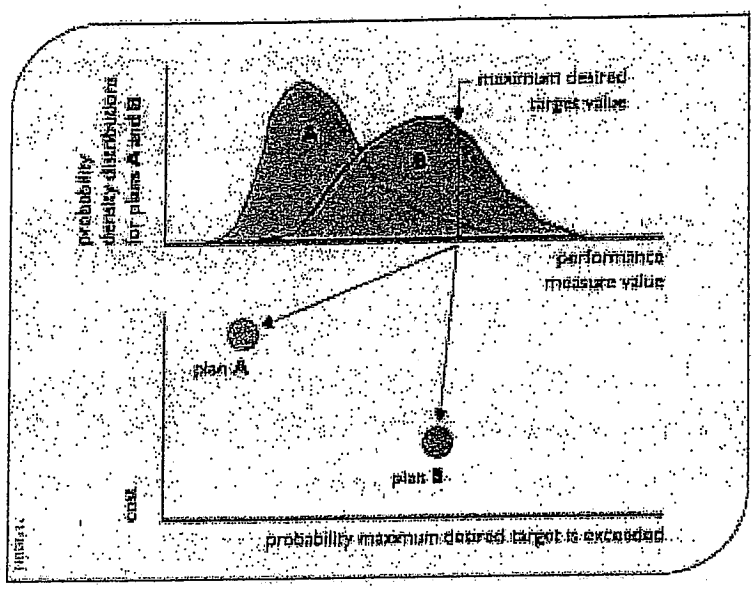


Figure 7. Tradeoffs involving cost and the probability that a maximum desired target value will be exceeded. In this illustration we want the lowest cost (*B* is best) and the lowest probability of exceedance (*A* is best).

4.1.1 Model and model parameter uncertainties

Consider a situation as shown in Figure 8, in which for a specific set of model inputs, the model outputs differ from the observed values, and for those model inputs, the observed values are always the same. Here nothing randomly occurs. The model parameter values or model structure needs to be changed. This is typically done in a model calibration process.

Given specific inputs, the outputs of deterministic models are always going to be the same each time those inputs are simulated. If for specified inputs to any simulation model the predicted output does not agree with the observed value, as shown in Figure 8, this could result from imprecision in the measurement of observed data. It could also result from imprecision in the model parameter values, the model structure, or the algorithm used to solve the model.

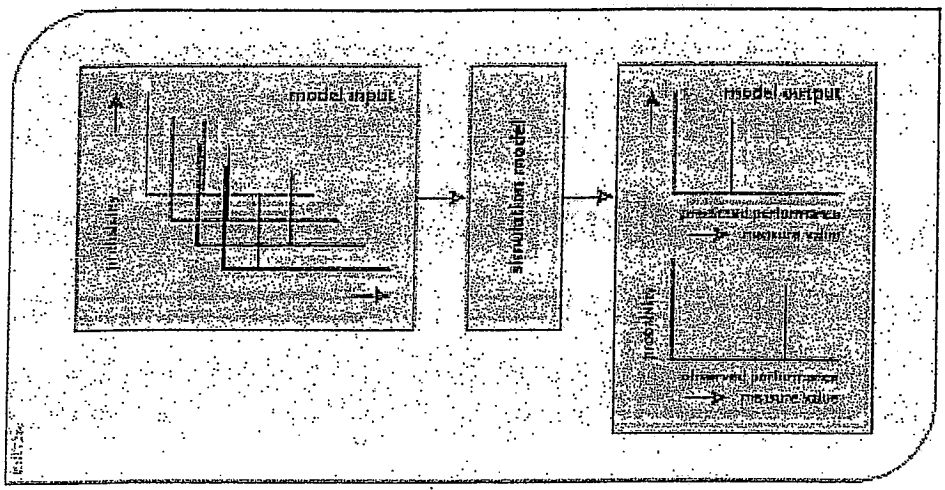


Figure 8. A deterministic system and a simulation model of that system needing calibration or modification in its structure. There is no randomness, only parameter value or model structure errors to be identified and corrected.

Next consider the same deterministic simulation model but now assume at least some of the inputs are random, i.e., not predictable, as may be case when random outputs of one model are used as inputs into another model. Random inputs will yield random outputs. The model input and output values can be described by probability distributions. If the uncertainty in the output is due only to the uncertainty in the input, the situation is similar to that shown in Figure 8. If the distribution of performance measure output values does not fit or is not identical to the distribution of observed performance measure values, then calibration of model parameter values or modification of model structure may be needed.

If a model calibration or 'identification' exercise finds the 'best' values of the parameters to be outside reasonable ranges of values based on scientific knowledge, then the model structure or algorithm might be in error. Assuming the algorithms used to solve the models are correct and observed measurements of system performance vary for the same model inputs, as shown in Figure 9, it can be assumed that the model structure does not capture all the processes that are taking place that impact the value of the performance measures. This is often the case when relatively simple and low-resolution models are used to estimate the hydrological and ecological impacts of water and land management policies. However, even large and complex models can fail to include or adequately describe important phenomena.

In the presence of informational uncertainties there may be considerable uncertainty about the values of the "best" parameters during calibration. This problem becomes even more pronounced with increases in model complexity.

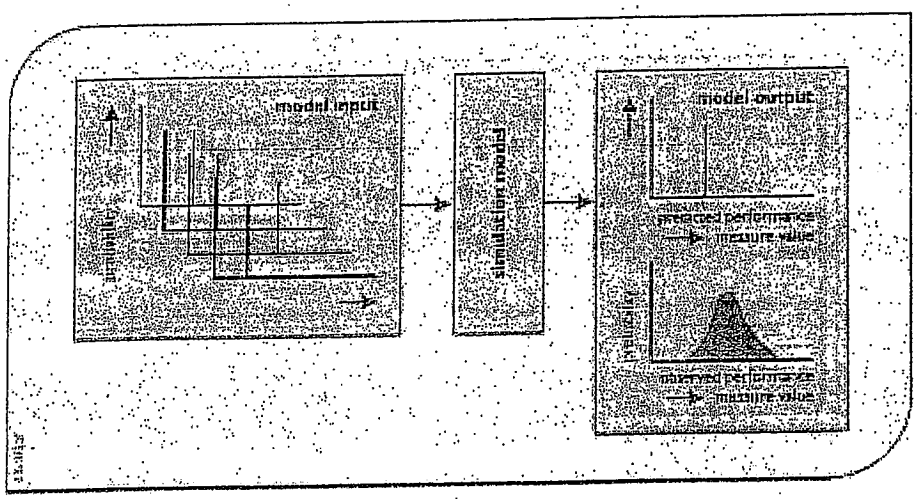


Figure A deterministic simulation model of a 'random or stochastic' system. To produce the variability in the model output that is observed in the real system, even given the same input values, the model's parameter values may need to vary over distributions of values and/or the model structure may need modification along with additional model inputs.

An example: Consider the prediction of a pollutant concentration at some site downstream of a pollutant discharge site. Given a streamflow Q (in units of 1000 m^3/day), the distance between the discharge site and the monitoring site, X (m), the pollutant decay rate constant k (day^{-1}), and the pollutant discharge W (Kg/day), we can use the following simplified model to predict the concentration of the pollutant C (g/m^3 = mg/l) at the downstream monitoring site:

$$C = (W/Q) \exp\{-k(X/U)\}$$

In the above equation assume the velocity U (m/day) is a known function of the streamflow Q.

In this case the observed value of the pollutant concentration C may differ from the computed value of C even for the same inputs of W, Q, k, X, and U. Furthermore, this difference varies in different time periods. This apparent variability, as illustrated in Figure 9, can be simulated using the same model but by assuming a distribution of values for the decay rate constant k. Alternatively the model structure can be modified to include the impact of streamflow temperature T on the prediction of C.

$$C = (W/Q) \exp\{-k\theta^{T-2}(X/U)\}$$

Now there are two model parameters, the decay rate constant k and the dimensionless temperature correction factor θ and an additional model input, the streamflow temperature, T. It could be that the variation in streamflow temperature was the sole cause of the first

equation's 'uncertainty' and that the assumed parameter distribution of k was simply the result of the distribution of streamflow temperatures on the term $k\theta^{T-20}$.

If the output were still random given constant values of all the inputs, then another source of uncertainty exists. This uncertainty might be due to additional random loadings of the pollutant, possibly from non-point sources. Once again the model could be modified to include these additional loadings if they are knowable. Assuming these additional loadings are not known, a new random parameter could be added to the input variable W or to the right hand side of the equations above that would attempt to capture the impact on C of these additional loadings. A potential problem, however, might be the likely correlation between those additional loadings and the streamflow Q.

While adding model detail removed some 'uncertainty' in the above example, increasing model complexity will not always eliminate or reduce uncertainty in model output. Adding complexity is generally not a good idea when the increased complexity is based on processes whose parameters are difficult to measure, the right equations are not known at the scale of application, or the amount of data for calibration is small compared to the number of parameters.

Even if more detailed models requiring more input data and more parameter values were to be developed, the likelihood of capturing all the processes occurring in a complex system is small. Hence those involved will have to make decisions taking this uncertainty into account. Imprecision will always exist due to less than a complete understanding of the system and the hydrologic processes being modeled. A number of studies have addressed model simplification, but only in some simple cases have statisticians been able to identify just how one might minimize modeling related errors in model output values.

The problem of determining the "optimal" level of modeling detail is particularly important when simulating the hydrologic events at many sites over large areas. Perhaps the best approach for these simulations is to establish confidence levels for alternative sets of models and then statistically compare simulation results. But even this is not a trivial or costless task. Increases in the temporal or spatial resolution typically require considerable data collection and/or processing, model recalibrations, and possibly the solution of stability problems resulting from the numerical methods used in the models. Obtaining and implementing alternative hydrologic simulation models will typically involve considerable investments of money and time for data preparation and model calibration.

What is needed is a way to predict the variability evident in the system shown in Figure 9. Instead of a fixed output vector for each fixed input vector, a distribution of outputs are needed for each performance measure based on fixed inputs (Figure 9) or a distribution of inputs (Figure 10.). Furthermore the model output distribution for each performance measure should 'match' as well as possible the observed distribution of that performance measure.

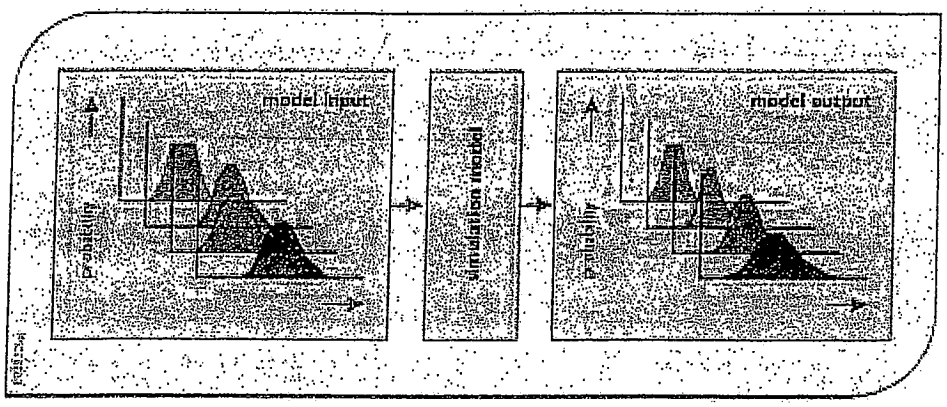


Figure 10. Simulating variable inputs to obtain probability distributions of predicted performance indices that match the probability distributions of observed performance values.

4.1.2 What uncertainty analysis can provide

An uncertainty analysis takes a set of randomly chosen input values (that can include parameter values), passes them through a model (or transfer function) to obtain the distributions (or statistical measures of the distributions) of the resulting outputs. As illustrated in Figure 11, the output distributions can be used to

- Describe the range of potential outputs of the system at some probability level.
- Estimate the probability that the output will exceed a specific threshold or performance measure target value.

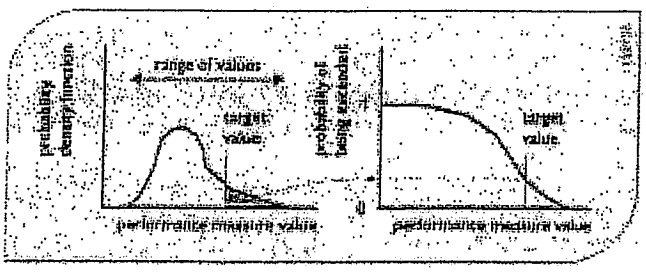


Figure 11. The distribution of performance measures defines range of potential values and the likelihood that a specified target value will be exceeded. The shaded area under the density function on the left represents the probability that the target value will be exceeded. This probability is shown in the probability of exceedance plot on the right.

Common uses for uncertainty analyses are to make general inferences, such as the following:

- Estimating the mean and standard deviation of the outputs.
- Estimating the probability the performance measure will exceed a specific threshold.
- Putting a reliability level on a function of the outputs, e.g., the range of function values that is likely to occur with some probability.
- Describing the likelihood of different potential outputs of the system.

Implicit in any uncertainty analysis are the assumptions that statistical distributions for the input values are correct and that the model is a sufficiently realistic description of the processes taking place in the system. Neither of these assumptions is likely to be entirely correct.

4.2 Sensitivity analyses

"Sensitivity analysis" is aimed at describing how much model output values are affected by changes in model input values. It is the investigation of the importance of imprecision or uncertainty in model inputs in a decision making or modeling process. The exact character of sensitivity analysis depends upon the particular context and the questions of concern. Sensitivity studies can provide a general assessment of model precision when used to assess system performance for alternative scenarios, as well as detailed information addressing the relative significance of errors in various parameters. As a result, sensitivity results should be of interest to the general public, federal and state management agencies, local watershed planners and managers, model users, and model developers.

Clearly, upper level management and the public may be interested in more general statements of model precision, and should be provided such information along with model predictions. On the other hand, detailed studies addressing the significance and interactions among individual parameters would likely be meaningful to model developers and some model users. They can use such data to interpret model results and to identify where efforts to improve models and their input values should be directed.

Initial sensitivity analysis studies could focus on two products:

(1) detailed results to guide research and assist model development efforts, and
(2) calculation of general descriptions of uncertainty associated with model predictions so that policy decisions can reflect both the modeling efforts best prediction of system performance and the precision of such predictions.

In the first case, knowing the relative uncertainty in model projections due to possible errors in different sets of parameters and input data should assist in efforts to improve the precision of model projections. This knowledge should also contribute to a better understanding of the relationships between model assumptions, parameters, data and model predictions.

For the second case, knowing the relative precision associated with model predictions should have a significant effect on policy development. For example, the analysis may show that, given data inadequacies, there are very large error bands associated with some model variables. When such large uncertainties exist, predictions should be used with appropriate skepticism.

Incremental strategies should be explored along with monitoring so that greater experience can accumulate to resolve some of those uncertainties.

Sensitivity analysis features are available in many linear and nonlinear programming (optimization) packages. They identify the changes in the values of the objective function and unknown decision variables given a change in the model input values, and a change in levels set for various constraints (Chapter V). Thus sensitivity analysis addresses the change in "optimal" system performance associated with changes in various parameter values, and also how "optimal" decisions would change with changes in resource constraint levels, or target output requirements. This kind of sensitivity analysis provides estimates of how much another unit of resource would be worth, or what "cost" a proposed change in a constraint places on the optimal solution. This information is of value to those making design decisions.

Various techniques have been developed to determine how sensitive model outputs are to changes in model inputs. Most approaches examine the affects of changes in a single parameter value or input variable assuming no changes in all the other inputs. Sensitivity analyses can be extended to examine the combined effects of multiple sources of error, as well.

Changes in particular model input values can affect model output values in different ways. It is generally true that only a relatively few input variables dominate or substantially influence the values of a particular output variable or performance indicator at a particular location and time. If the range of uncertainty of only some of the output data is of interest, then undoubtedly only those input data that significantly impact on the values of those output data need be included in the sensitivity analysis.

If input data estimates are based on repeated measurements, a frequency distribution can be estimated that characterizes natural variability. The shorter the record of measurements, the greater will be the uncertainty regarding the long-term statistical characteristics of that variability. If obtaining a sufficient number of replicate measurements is not possible, subjective estimates of input data ranges and probability distributions are often made. Using a mixture of subjective estimates and actual measurements does not affect the application of various sensitivity analysis methods that can use these sets or distributions of input values, but it may affect the conclusions that can be drawn from the results of these analyses.

It would be nice to have available accurate and easy-to-use analytical methods for relating errors in input data to errors in model outputs, and to errors in system performance indicator values that are derived from model output. Such analytical methods do not exist for complex simulation models. However methods based on simplifying assumptions and approximations can be used to yield useful sensitivity information. Some of these are reviewed in the remainder of this chapter.

4.2.1 Sensitivity coefficients

One measure of sensitivity is the sensitivity coefficient. This is the derivative of a model output variable with respect to an input variable or parameter. A number of sensitivity

analysis methods use these coefficients. First-order and approximate first-order sensitivity analyses are two such methods that will be discussed later. The difficulty of

1. obtaining the derivatives for many models,
2. needing to assume mathematical (usually linear) relationships when obtaining estimates of derivatives by making small changes of input data values near their nominal or most likely values, and
3. having large variances associated with most hydrologic process models have motivated the replacement of analytical methods by numerical and statistical approaches to sensitivity analysis.

Implicit in any sensitivity analysis are the assumptions that statistical distributions for the input values are correct and that the model is a sufficiently realistic description of the processes taking place in the system. Neither of these assumptions is likely to be entirely correct.

The importance of the assumption that the statistical distributions for the input values are correct is easy to check by using different distributions for the input parameters. If the outputs vary significantly, then the output is sensitive to the specification of the input distributions and hence they should be defined with care. A relatively simple deterministic sensitivity analysis can be of value here (Benaman, 2002). A sensitivity coefficient can be used to measure the magnitude of change in an output variable Q per unit change in the magnitude of an input parameter value P from its base value P_o. Let SI_{PQ} be the sensitivity index for an output variable Q with respect to a change ΔP in the value of the input variable P from its base value P_o. Noting that the value of the output $Q(P)$ is a function of P, the sensitivity index could be defined as

$$SI_{PQ} = [\, Q(P_o + \Delta P) - Q(P_o - \Delta P) \,] / 2\,\Delta P \qquad (1)$$

Other sensitivity indices could be defined (McCuen 1973). Letting the index i represent a decrease and j represent an increase in the parameter value from its base value P_o, the sensitivity index SI_{PQ} for parameter P and output variable Q is could be defined as

$$SI_{PQ} = \{\, |\, (Q_o - Q_i) / (P_o - P_i)\, | + |\, (Q_o - Q_j) / (P_o - P_j)\, |\, \} / 2 \qquad (2)$$

or

$$SI_{PQ} = \max \{\, |\, (Q_o - Q_i) / (P_o - P_i)\, |,\ |\, (Q_o - Q_j) / (P_o - P_j)\, |\, \} \qquad (3)$$

A dimensionless expression of sensitivity is the elasticity index, EI_{PQ}, that measures the relative change in output Q for a relative change in input P could be defined as

$$EI_{PQ} = [P_o / Q(P_o)]\, SI_{PQ} \qquad (4)$$

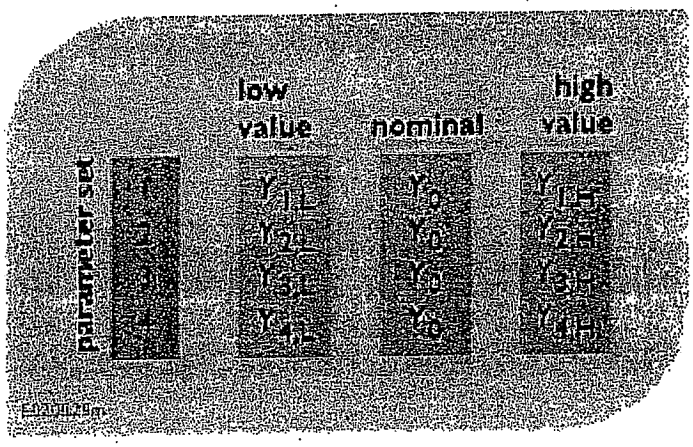
4.2.2 A simple deterministic sensitivity analysis procedure

This deterministic sensitivity analysis approach is very similar those most often employed in the engineering economics literature. It is based on the idea of varying one uncertain parameter value, or set of parameter values, at a time. The ideas are applied to a water quality example to illustrate their use.

The output variable of interest can be any performance measure or indicator. Thus one does not know if more or less of a given variable is better or worse. Perhaps too much and/or too little is undesirable. The key idea is that, whether employing physical measures or economic metrics of performance, various parameters (or sets of associated parameters) are assigned high and low values. Such ranges may reflect either the differences between the minimum and maximum values for each parameter, the 5 and 95 percentiles of a parameters distribution, or points corresponding to some other criteria. The system model is then run with the various alternatives, one at a time, to evaluate the impact of those errors in various sets of parameter values on the output variable.

Table 1 illustrates the character of the results that one would obtain. Here Y_0 is the nominal value of the model output when all parameters assume the estimated best values, and $Y_{i,L}$ and $Y_{i,H}$ are the values obtained by increasing or decreasing the values of the ith set of parameters.

Table 1. Sensitivity of model output Y to possible errors in four parameter sets containing a single parameter or a group of parameters that vary together.



A simple water quality example is employed to illustrate this deterministic approach to sensitivity analysis. The analysis techniques illustrated here are just as applicable to complex models. The primary difference is that more work would be required to evaluate the various alternatives with a more complex model, and the model responses might be more complicated.

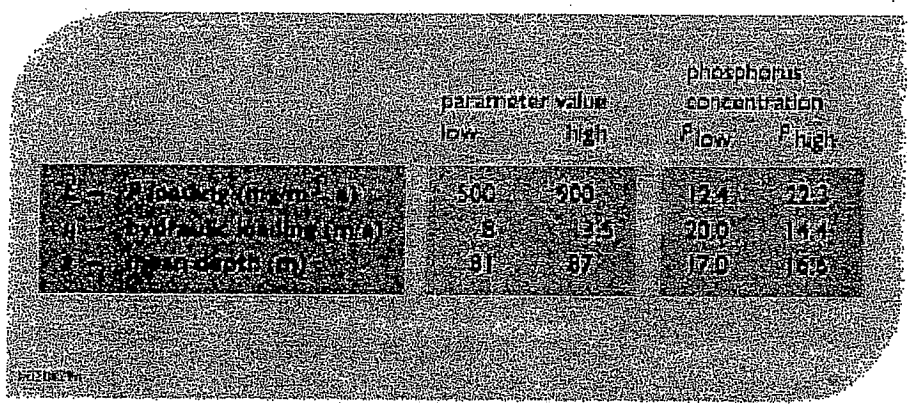
The simple water quality model is provided by Vollenweider's empirical relationship for the average phosphorus concentration in lakes (Vollenweider, 1976). He found that the phosphorus concentration, P (mg/m^3), is a function of the annual phosphorus loading rate, L (mg/m^2•a), the annual hydraulic loading, q (m/a or more exactly m^3/m^2•a), and the mean water depth, z (m).

$$P = (L/q) / [\, 1 + (z/q)^{0.5} \,] \qquad (5)$$

L/q and P have the same units; the denominator is an empirical factor that compensates for nutrient recycling and elimination within the aquatic lake environment.

Data for Lake Ontario in North America would suggest that reasonable values of the parameters are $L = 680$ mg/m^3; $q = 10.6$ m/a; and $z = 84$ m, yielding $P = 16.8$ mg/m^3. Values of phosphorus concentrations less than 10 mg/m^3 are considered oligotrophic, whereas values greater than 20 mg/m^3 generally correspond to eutrophic conditions. Reasonable ranges reflecting possible errors in the three parameters yield the values in Table 2.

Table 2. Sensitivity of estimates of phosphorus concentration (mg/m^3) to model parameter values. The two right most values in each row correspond to the Low and High values of the parameter, respectively



One may want to display these results so they can be readily visualized and understood. A tornado diagram (Eschenbach, 1992) would show the lower and upper values of P obtained from variation of each parameter, with the parameter with the widest limits displayed on top, and the parameter having smallest limits on the bottom. Tornado diagrams (Figure 12) are easy to construct and can include a large number of parameters without becoming crowded.

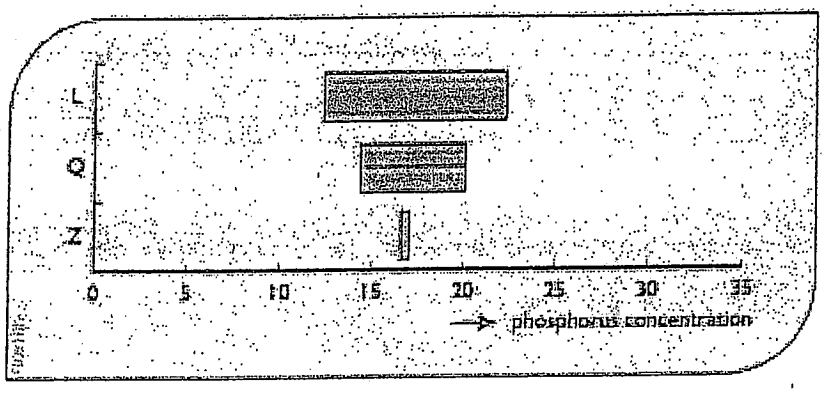


Figure 12. A Tornado diagram showing the range of the output variable representing phosphorus concentrations for high and low values of each of the parameter sets. Parameters are sorted so that the largest range is on top, and the smallest on the bottom.

An alternative to tornado diagrams is a Pareto chart showing the width of the uncertainty range associated with each variable, ordered from largest to smallest. A Pareto chart is illustrated in Figure 13.

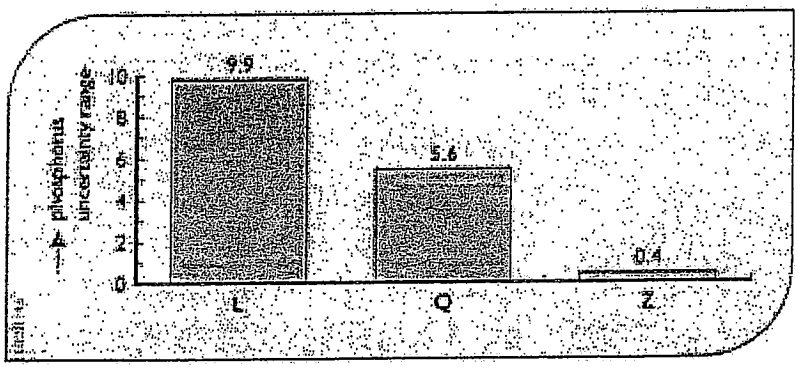


Figure 13. A Pareto Chart showing the range of the output variable representing phosphorus concentrations resulting from high and low values of each parameter set considered.

Another visual presentation is a spider plot showing the impact of uncertainty in each parameter on the variable in question, all on the same graph (Eschenback, 1992; DeGarmo, 1993, p. 401). A spider plot, Figure 14, shows the particular functional response of the output to each parameter on a common scale, so one needs a common metric to represent changes in all of the parameters. Here we use percentage change from the nominal or best values.

Spider plots are a little harder to construct than tornado diagrams, and can generally include only 4 - 5 variables without becoming crowded. However, they provide a more complete view of the relationships between each parameter and the performance measure. In particular, a spider plot reveals nonlinear relationships and the relative sensitivity of the performance measure to (percentage) changes in each variable.

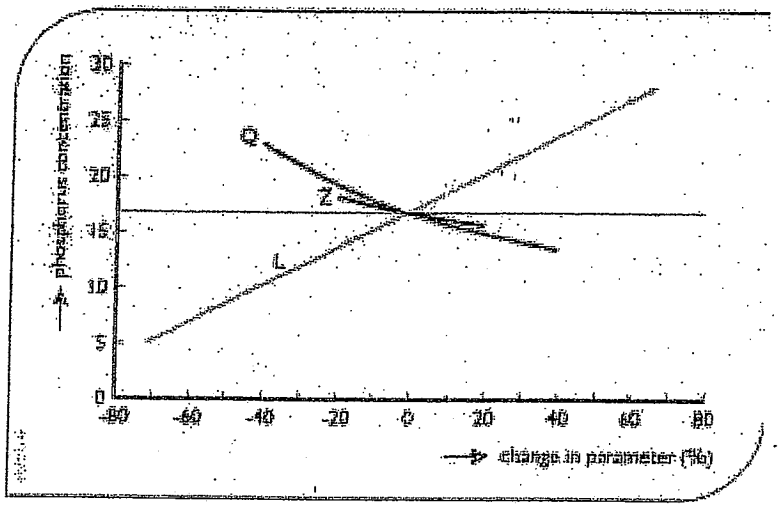


Figure 14. Spider Plot illustrates the relationships between model output describing phosphorus concentrations and variations in each of the parameter sets, expressed as a percentage deviation from their nominal values.

In the spider plot, the linear relationship between P and L and the gentle nonlinear relationship between P and q is illustrated. The range for z has been kept small given the limited uncertainty associated with that parameter.

4.2.3 Multiple errors and interactions

An important issue that should not be ignored is the impact of simultaneous errors in more than one parameter. Probabilistic methods directly address the occurrence of simultaneous errors, but the correct joint distribution needs to be employed. With simple sensitivity analysis procedures, errors in parameters are generally investigated one at a time, or in groups. The idea of considering pairs or sets of parameters is discussed here.

Groups of factors. It is often the case that reasonable error scenarios would have several parameters changing together. For this reason, the alternatives have been called parameter sets. For example, possible errors in water depth would be accompanied with corresponding variations in aquatic vegetation and chemical parameters. Likewise, alternatives related to changes in model structure might be accompanied with variations in several parameters. In other cases, there may be no causal relationship among possible errors (such as model structure

versus inflows at the boundary of the modeled region), but they might still interact to effect the precision of model predictions.

Combinations. If one or more non-grouped parameters interact in significant ways, then combinations of one or more errors should be investigated. However, one immediately runs into a combinatorial problem. If each of m parameters can have 3 values (high, nominal, and low) there are 3^m combinations, as opposed to 2m + 1 if each parameter is varied separately. [For m = 5, the differences are $3^5 = 243$ versus 2(5)+1 = 11.] These numbers can be reduced by considering instead only combinations of extremes so that only $2^m + 1$ cases need be considered [$2^5 + 1 = 33$], which is a more manageable number. However, all of the parameters would be at one extreme or the other, and such situations would be very unusual.

Two factors at a time. A compromise is to consider all pairs of two parameters at a time. There are m(m-1)/2 possible pairs of m parameters. Each parameter has a high and low value. Since there are 4 combinations of high and low values for each pair, there are a total of 2m(m-1) combinations. [For m = 5 there are 40 combinations of two parameters each having two values.]

The presentation of these results could be simplified by displaying for each case only the maximum error, which would result in m(m-1)/2 cases that might be displayed in a Pareto diagram. This would allow identification of those combinations of two parameters that might yield the largest errors and thus are of most concern.

For the water quality example, if one plots the absolute value of the error for all four combinations of high (+) and low (-) values for each pair of parameters, they obtain Figure 15.

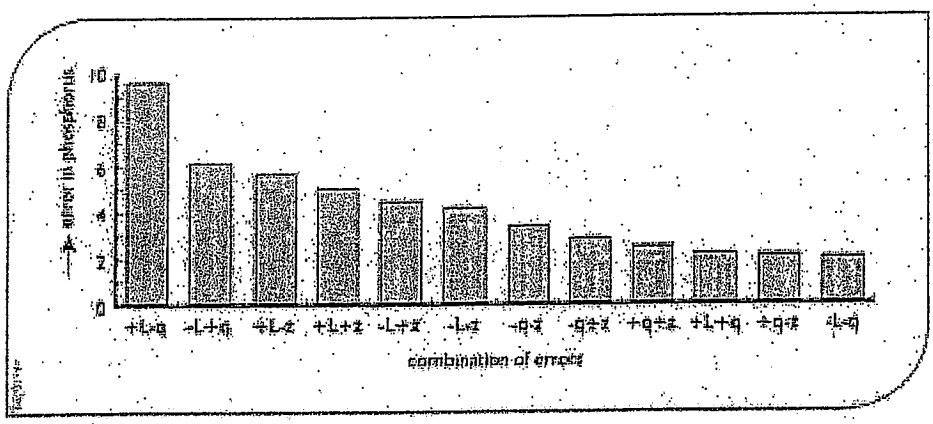


Figure 15. Pareto diagram showing errors in phosphorus concentrations for all combinations of pairs of input parameters errors. A + indicates a high value, and a - indicates a low value for indicated parameter. *L* is the phosphorus loading rate, *q* is the hydraulic loading, and *z* is the mean lake depth.

Considering only the worst error for each pair of variables yields Figure 16.

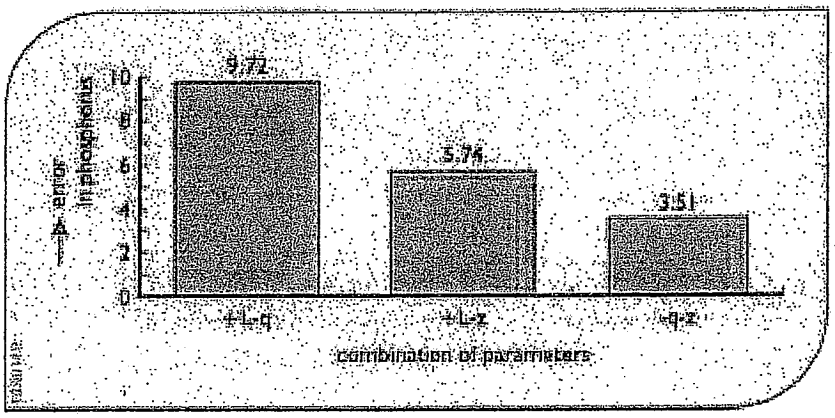


Figure 16. Pareto diagram showing worst error combinations for each pair of input parameters. A '+' indicates a high value, and a '–' indicates a low value for indicated parameter.

Here we see, as is no surprise, that the worst error results from the most unfavorable combination of L and q values. If both parameters have their most unfavorable values, the predicted phosphorus concentration would be 27 mg/m^3.

Looking for non-linearities. One might also display in a Pareto diagram the maximum error for each pair as a percentage of the sum of the absolute values of the maximum error from each parameter separately. The ratio of the joint error to the individual errors would illustrate potentially important nonlinear interactions. If the model of the system and the physical measure or economic metric were strictly linear, then the individual ratios should add to one.

4.2.4 First-order sensitivity analysis

The above deterministic analysis has trouble representing reasonable combinations of errors in several parameter sets. If the errors are independent, it is highly unlikely that any two sets would actually be at their extreme ranges at the same time. By defining probability distributions of the values of the various parameter sets, and specifying their joint distributions, a probabilistic error analysis can be conducted. In particular, for a given performance indicator, one can use multivariate linear analyses to evaluate the approximate impact on the performance indices of uncertainty in various parameters. As shown below, the impact depends upon the square of the sensitivity coefficients (partial derivatives) and the variances and covariances of the parameter sets.

For a performance indicator $I = F(Y)$, which is a function $F(\cdot)$ of model outputs Y, that are in turn a function $g(P)$ of input parameters P, one can use a multivariate Taylor series approximation of F to obtain the expected value and variance of the indicator:

$$E[I] = F(\text{ based on mean values of input parameters}) + (1/2)\ \{\Sigma_i\Sigma_j\ [\partial F^2/\partial P_i \partial P_j]\ \text{Cov}\ [P_i, P_j]\ \} \quad (6)$$

and

$$\text{Var}[I] = \Sigma_i\Sigma_j\ (\partial F/\partial P_i)(\partial F/\partial P_j)\ \text{Cov}\ [P_i, P_j] \quad (7)$$

where $(\partial F/\partial P_i)$ are the partial derivative of the function F with respect to P_i evaluated at the mean value of the input parameters P_i, and $\partial F^2/\partial P_i \partial P_j$ are the second partial derivatives. The covariance of two random input parameters P_i and P_j is the expected value of the product of differences between the values and their means.

$$\text{Cov}[P_i, P_j] = E[(P_i - E[P_i])(P_j - E[P_j])] \quad (8)$$

If all the parameters are independent of each other, and the second-order terms in the expression for the mean $E[I]$ are neglected, one obtains

$$E[I] = F(\text{ based on mean values of input parameters}) \quad (9)$$

and

$$\text{Var}\ [I] = \Sigma_i\ [\partial F/\partial P_i]^2\ \text{Var}\ [P_i] \quad (10)$$

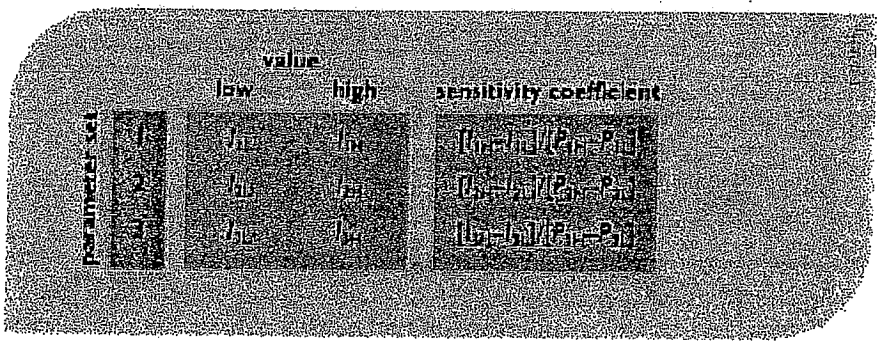
(Benjamin and Cornell, 1970). Equation 6 for $E[I]$ shows that in the presence of substantial uncertainty, the mean of the output from nonlinear systems is not simply the system output corresponding to the mean of the parameters (Gaven and Burges, 1981, p. 1523). This is true for any nonlinear function.

Of interest in the analysis of uncertainty is the approximation for the variance $\text{Var}[I]$ of indicator I. In Equation 10 the contribution of P_i to the variance of I equals $\text{Var}[P_i]$ times $[\partial F/\partial P_i]^2$, which are the squares of the sensitivity coefficients for indicator I with respect to each input parameter value P_i.

4.2.4.1 An example of first-order sensitivity analysis

It may appear that first-order analysis is difficult because the partial derivatives of the performance indicator I are needed with respect to the various parameters. However, reasonable approximations of these sensitivity coefficients can be obtained from the simple sensitivity analysis described in Table 3, as shown below. In that table, three different parameter sets, P_i, are defined in which one parameter of the set is at its high value, P_{iH}, and one is at its low value, P_{iL}, to produce corresponding values (called high, I_{iH}, and low, I_{iL}) of a system performance indicator I.

Table 3. Approximate parameter sensitivity coefficients.



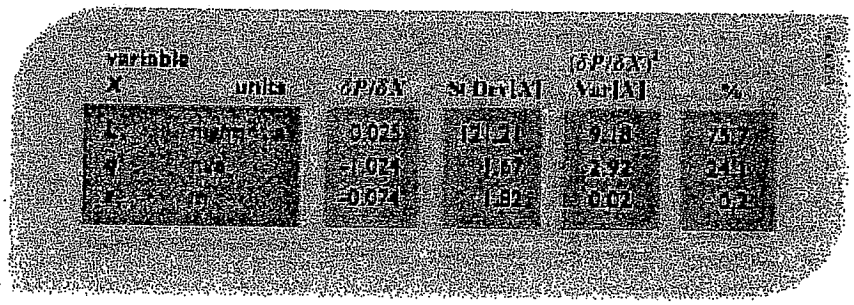
It is then necessary to estimate some representation of the variances of the various parameters with some consistent procedure. For a normal distribution, the distance between the 5 and 95 percentiles is 1.645 standard deviations on each side of the mean, or 2(1.645) = 3.3 standard deviations. Thus, if the high/low range is thought of as approximately a 5-95 percentile range for a normally distributed variate, a reasonable approximation of the variance might be

$$\mathrm{Var}[P_i] = \{ [P_{iH} - P_{iL}]/3.3 \}^2. \qquad (11)$$

This is all that is needed. Use of these average sensitivity coefficients is very reasonable for modeling the behavior of the system performance indicator I over the indicated ranges.

As an illustration of the method of first-order uncertainty analysis, consider the lake quality problem described above. The "system performance indicator" in this case is the model output, the phosphorus concentration P, and the input parameters, now denoted as $X = L$, q, and z. The standard deviation of each parameter is assumed to be the specified range divided by 3.3. Average sensitivity coefficients $\partial P/\partial X$ were calculated. The results are reported in the table below.

Table 4. Calculation of approximate parameter sensitivity coefficients.



Assuming the parameter errors are independent:

$$\text{Var}[P] = 9.18 + 2.92 + 0.02 = 12.12 \qquad (12)$$

The square root of 12.12 is the standard deviation and equals 3.48. This agrees well with a Monte Carlo analysis reported below.

Note that 100*(9.18/12.12), or about 76% of the total parameter error variance in the phosphorus concentration P is associated in the phosphorus loading rate L and the remaining 24% is associated with the hydrologic loading q. Eliminating the uncertainty in z would have a negligible impact on the overall model error. Likewise, reducing the error in q would at best have a modest impact on the total error.

Due to these uncertainties, the estimated phosphorus concentration has a standard deviation of 3.48. Assuming the errors are normally distributed, and recalling that ± 1.645 standard deviations around the mean define a 5-95 percentile interval, the 5-95 percentile interval would be about

$$16.8 \pm 1.645\ (3.48)\ \text{mg/m}^3 = 16.8 \pm 5.7\ \text{mg/m}^3 = 11.1 \text{ to } 22.5\ \text{mg/m}^3. \qquad (13)$$

These error bars indicate there is substantial uncertainty associated with the phosphorus concentration P, primarily due to uncertainty in the loading rate L.

The upper bound of 22.6 mg/m^3 is considerably less than the 27 mg/m^3 that would be obtained if both L and q had their most unfavorable values. In a probabilistic analysis with independent errors, such a combination is highly unlikely.

4.2.4.2 Warning on accuracy.

First-order uncertainty analysis is indeed an approximate method based upon a linearization of the response function represented by the full simulation model. It may provide inaccurate estimates of the variance of the response variable for nonlinear systems with large uncertainty in the parameters. In such cases Monte Carlo simulation (discussed below and in Chapter VII) or the use of higher-order approximation may be required. Beck (1987, p. 1426) cites studies that found that Monte Carlo and first-order variances were not appreciably different, and a few studies that found specific differences. Differences are likely to arise when the distributions used for the parameters are bimodal (or otherwise unusual), or some rejection algorithm is used in the Monte Carlo analysis to exclude some parameter combinations. Such errors can result in a distortion in the ranking of predominant sources of uncertainty. However, in most cases very similar results were obtained.

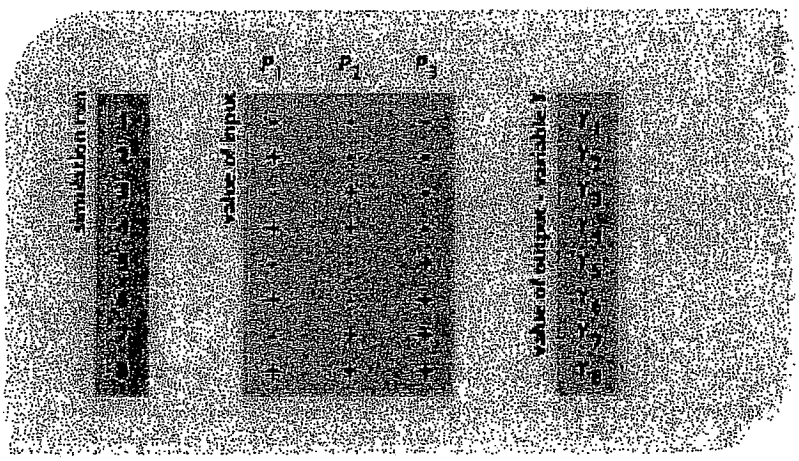
4.2.5 Fractional factorial design method

An extension of first-order sensitivity analysis would be a more complete exploration of the response surface using a careful statistical design. First consider a complete factorial design. Input data are divided into discrete "levels'. The simplest case is two levels. These two levels can be defined as a nominal value, and a high (low) value. Simulation runs are made for all combinations of parameter levels. For n different inputs, this would require 2^n simulation runs. Hence for a three-input variable or parameter problem, 8 runs would be required. If 4 discrete levels of each input variable or parameter were allowed to provide a more reasonable description of a continuous variable, the three-input data problem would require 4^3 or 64 simulation runs. Clearly this is not a useful tool for large regional water resources simulation models.

A fractional factorial design involves simulating only a fraction of what is required from a full factorial design method. The loss of information prevents a complete analysis of the impacts of each input variable or parameter on the output.

To illustrate the fractional factorial design method, consider the two-level with three-input variable or parameter problem. Table 5 below shows the 8 simulations required for a full factorial design method. The '+' and the '–' show the upper and lower levels of each input variable or parameter P_i where $i = 1, 2, 3$. If all 8 simulations were performed, seven possible effects could be estimated. These are the individual effects of the three inputs P_1, P_2, and P_3, the three two-input variable or parameter interactions, $(P_1)(P_2)$, $(P_1)(P_3)$, and $(P_2)(P_3)$, and the one three-input variable or parameter interaction $(P_1)(P_2)(P_3)$.

Table 5. A three-input factorial design.



Consider an output variable Y, where Y_j is the value of Y in the jth simulation run. Then an estimate of the effect, denoted $\delta(Y|P_i)$, that input variable or parameter P_i has on the output variable Y, is the average of the four separate effects of varying P_i:

For i = 1:

$$\delta(Y \mid P_1) = 0.25\ [\ (Y_2-Y_1)+(Y_4-Y_3)+(Y_6-Y_5)+(Y_8-Y_7)\ ] \qquad (14)$$

Each difference in parentheses is the difference between a run in which P_1 is at its upper level and a run in which P_1 is at its lower level, but the other two parameter values, P_2 and P_3, are unchanged. If the effect is equal to 0, then, in this case, P_1 has no impact on the output variable Y.

Similarly the effects of P_2 and P_3, on variable Y can be estimated as:

$$\delta(Y \mid P_2) = 0.25\ \{\ (Y_3-Y_1)+(Y_4-Y_2)+(Y_7-Y_5)+(Y_8-Y_6)\ \} \qquad (15)$$

and

$$\delta(Y \mid P_3) = 0.25\ \{\ (Y_5-Y_1)+(Y_6-Y_2)+(Y_7-Y_3)+(Y_8-Y_4)\ \} \qquad (16)$$

Consider next the interaction effects between P_1 and P_2. This is estimated as the average of the difference between the average P_1 effect at the upper level of P_2, and the average P_1 effect at the lower level of P_2. This is the same as the difference between the average P_2 effect at the upper level of P_1 and the average P_2 effect at the lower level of P_1:

$$\delta(Y \mid P_1, P_2) = (1/2)\ \{\ [\ (Y_8-Y_7) + (Y_4-Y_3)]/2 - [\ (Y_2-Y_1) + (Y_6-Y_5)]/2\ \}$$

$$= (1/4)\ \{\ [\ (Y_8-Y_6)+(Y_4-Y_2)] - [\ (Y_3-Y_1) + (Y_7-Y_5)]\ \} \qquad (17)$$

Similar equations can be derived for looking at the interaction effects between P_1 and P_3, and between P_2 and P_3 and the interaction effects among all three inputs P_1, P_2, and P_3.

Now assume only half of the simulation runs were performed, perhaps runs 2, 3, 5 and 8 in this example. If only outputs Y_2, Y_3, Y_5, and Y_8 are available, for our example:

$$\delta(Y \mid P_3) = \sqcup(Y \mid P_1, P_2) = 0.5\ \{\ (Y_8 - Y_3) - (Y_2 - Y_5)\ \} \qquad (18)$$

The separate effects of P_3 and of P_1P_2 are not available from the output. This is the loss in information resulting from fractional instead of complete factorial design.

4.2.6 Monte Carlo sampling methods

The Monte Carlo method of performing sensitivity analyses, illustrated in Figure 16, first selects a random set of input data values drawn from their individual probability distributions. These values are then used in the simulation model to obtain some model output variable values. This process is repeated many times, each time making sure the model calibration is

valid for the input data values chosen. The end result is a probability distribution of model output variables and system performance indices that results from variations and possible errors in all of the input values.

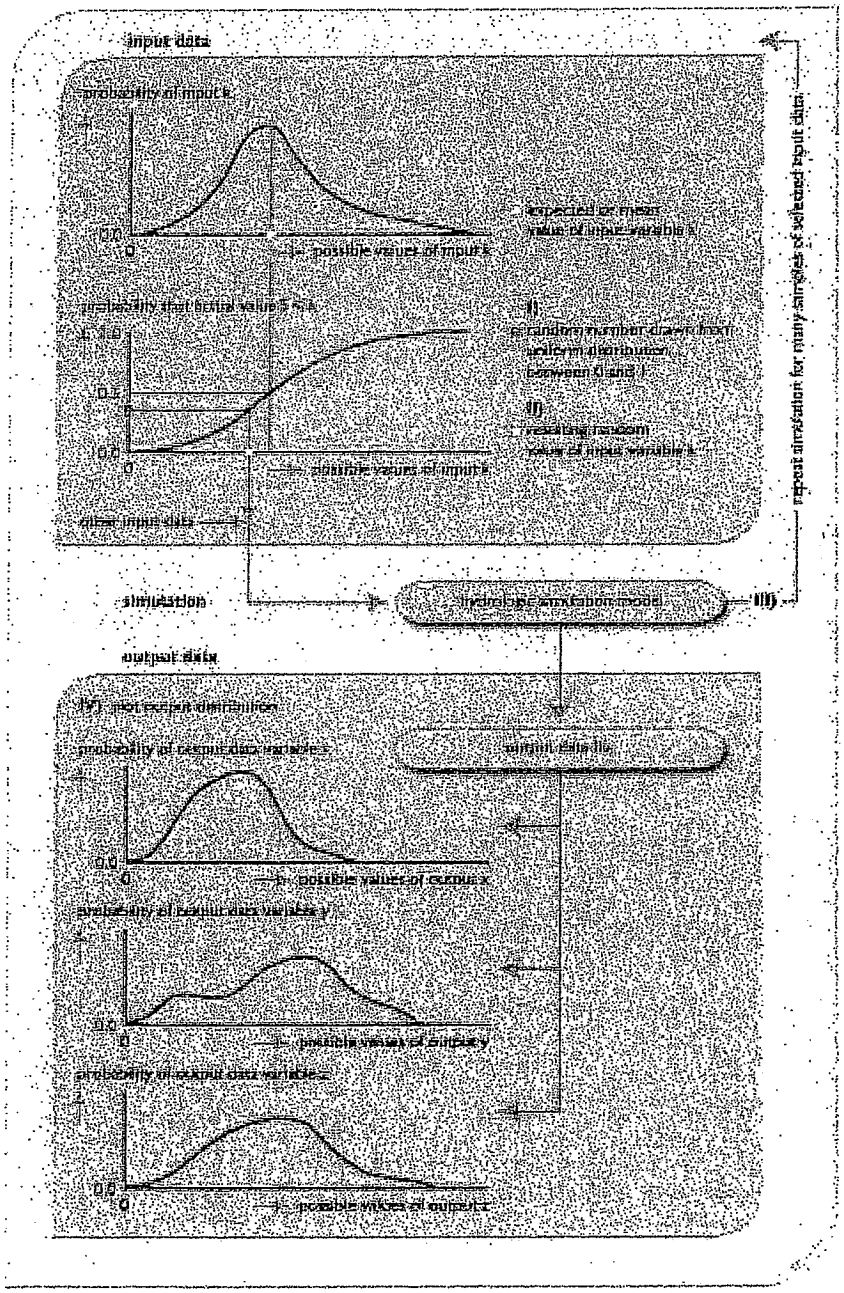


Figure 16. Monte Carlo sampling and simulation procedure for finding distributions of output variable values based on distributions, for specified reliability levels, of input data values. This technique can be applied to one or more uncertain input variables at a time. The output distributions will reflect the combined effects of this input uncertainty over the specified ranges.

Using a simple Monte Carlo analysis, values of all of the parameter sets are selected randomly from distributions describing the individual and joint uncertainty in each, and then the modeled system is simulated to obtain estimates of the selected performance indices. This must be done many times (often well over 100) to obtain a statistical description of system performance variability. The number of replications needed is generally not dependent on the number of parameters whose errors are to be analyzed. One can include in the simulation the uncertainty in parameters as well as natural variability. This method can evaluate the impact of single or multiple uncertain parameters.

A significant problem that arises in such simulations is that some combinations of parameter values result in unreasonable models. For example, model performance with calibration data sets might be inconsistent with available data sets. The calibration process places interesting constraints on different sets of parameter values. Thus, such Monte Carlo experiments often contain checks that exclude combinations of parameter values that are unreasonable. In these cases the generated results are conditioned on this validity check.

Whenever sampling methods are used, one must consider possible correlations among input data values. Sampling methods can handle spatial and temporal correlations that may exist among input data values, but the existence of correlation requires defining appropriate conditional distributions.

One major limitation of applying Monte Carlo methods to estimate ranges of risk and uncertainty for model output variable values, and system performance indicator values based on these output variable values, is the computing time required. To reduce the computing times needed to perform sensitivity analyses using sampling methods, some tricks and as well as stratified sampling methods are available. The discussion below illustrates the idea of a simple modification (or trick) using a "standardized" Monte Carlo analysis. The more general Latin Hypercube Sampling procedure is also discussed.

4.2.6.1 Simple Monte Carlo sampling

To illustrate the use of Monte Carlo sampling methods consider again Vollenweider's empirical relationship, Equation 5, for the average phosphorus concentration in lakes (Vollenweider, 1976). Two hundred values of each parameter were generated independently from normal distributions with the means and variances as shown in Table 6.

The table contains the specified means and variances for the generated values of L, q and z, and also the actual values of the means and variances of the 200 generated values of L, q, z and also of the 200 corresponding generated output phosphorus concentrations, P. Figure 17 displays the distribution of the generated values of P.

Table 6. Monte Carlo analysis of lake phosphorus levels.

parameter	L	q	z	P
specified means and standard deviations				
mean	680.00	0.60	84.00	
standard deviations	121.21	.67	1.82	
generated means and standard deviations				
mean	674.83	10.41	84.06	17.07
standard deviations	130.25	1.73	1.82	3.61

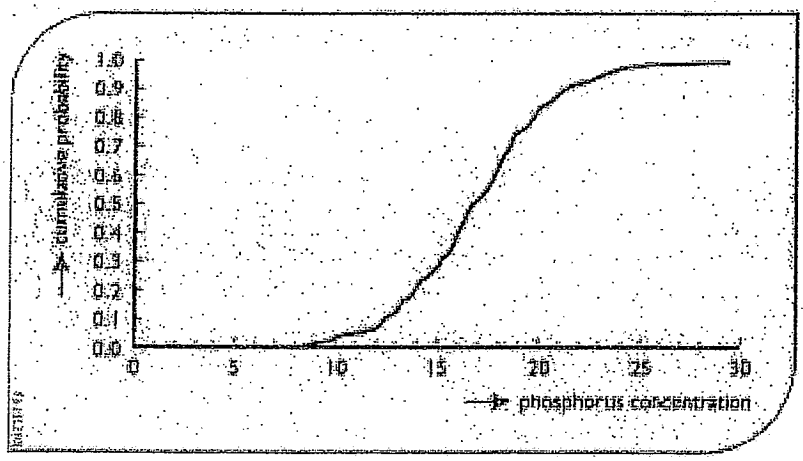


Figure 17. Distribution of lake phosphorus concentrations from Monte Carlo analysis

One can see that given the estimated levels of uncertainty, phosphorus levels could reasonably range from below 10 to above 25. The probability of generating a value greater than 20 mg/m^3 was 12.5%. The 5% to 95 percentile range was 11.1 to 23.4 mg/m^3. In the figure, the cumulative probability curve is rough because only 200 values of the phosphorus concentration were generated, but these are clearly enough to give a good impression of the overall impact of the errors.

4.2.6.2 Sampling uncertainty.

In this example, the mean of the 200 generated values of the phosphorus concentration, P, was 17.07. However a different set of random values would have generated a different set of P values as well. Thus it is appropriate to estimate the standard error, SE, of this average. The standard error equals the standard deviation of the P values divided by the square root of the sample size n:

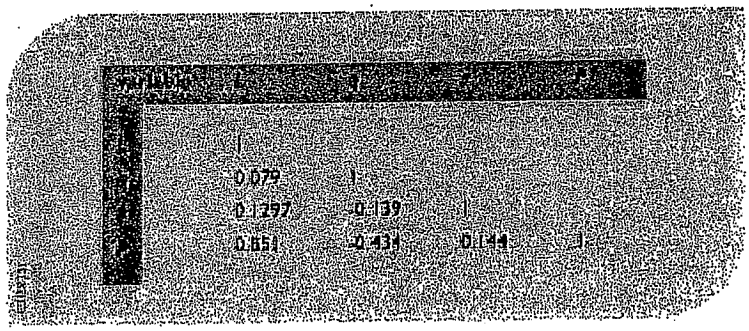
$$SE = \sigma/(n)^{0.5} = 3.61/(200)^{0.5} = 0.25. \qquad (19)$$

From the central limit theorem of mathematical statistics, the average of a large number of independent values should have very nearly a normal distribution. Thus, 95% of the time, the true mean of P should be in the interval $17.1 \pm 1.96\ (0.25)$, or 16.6 to 17.6 mg/m^3. This level of uncertainty reflects the observed variability of P and the fact that only 200 values were generated.

4.2.6.3 Making sense of the results.

A significant challenge with complex models is to determine from the Monte Carlo simulation which parameter errors are important. Calculating the correlation between each generated input parameter value and the output variable value is one way of doing this. As Table 7 below shows, based upon the magnitudes of the correlation coefficients, errors in L were most important, and those in q second in importance.

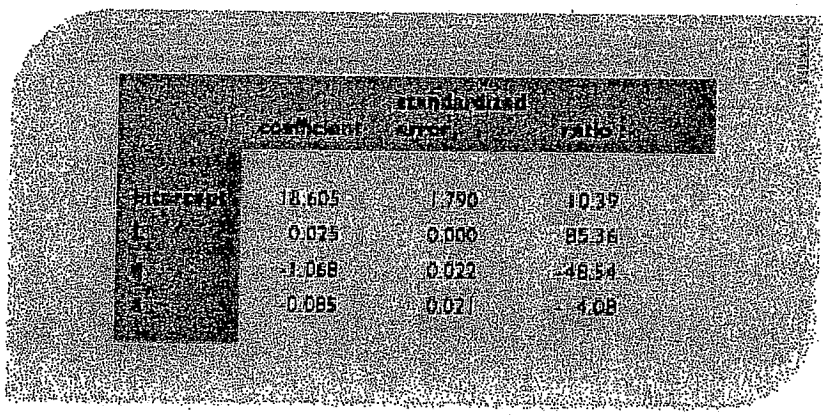
Table 7. Correlation analysis of Monte Carlo results.



One can also use regression to develop a linear model defining variations in the output based on errors in the various parameters. The results are shown in the Table 8. The fit is very good, and $R^2 = 98\%$. If the model for P had been linear, a R^2 value of 100% should have resulted. All of the coefficients are significantly different from zero.

Note that the correlation between P and z was positive in Table 7, but the regression coefficient for z is negative. This occurred because there is a modest negative correlation between the generated z and q values. Use of partial correlation coefficients can also correct for such spurious correlations among input parameters.

Table 8. Results of Regression Analysis on Monte Carlo Results



	coefficient	standardized error	ratio
intercept	18.605	1.790	10.39
L	0.075	0.000	85.36
Q	-1.068	0.022	-48.54
Z	0.085	0.021	4.08

Finally we display a plot, Figure 18, based on this regression model illustrating the reduction in the variance of P that is due to dropping each variable individually. Clearly L has the biggest impact on the uncertainty in P, and z the least.

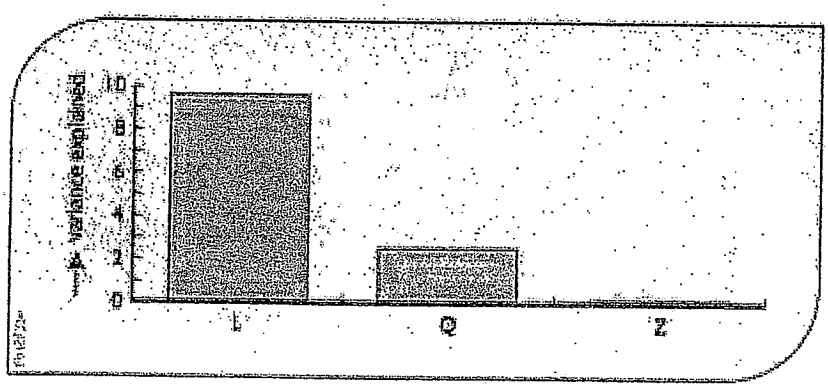
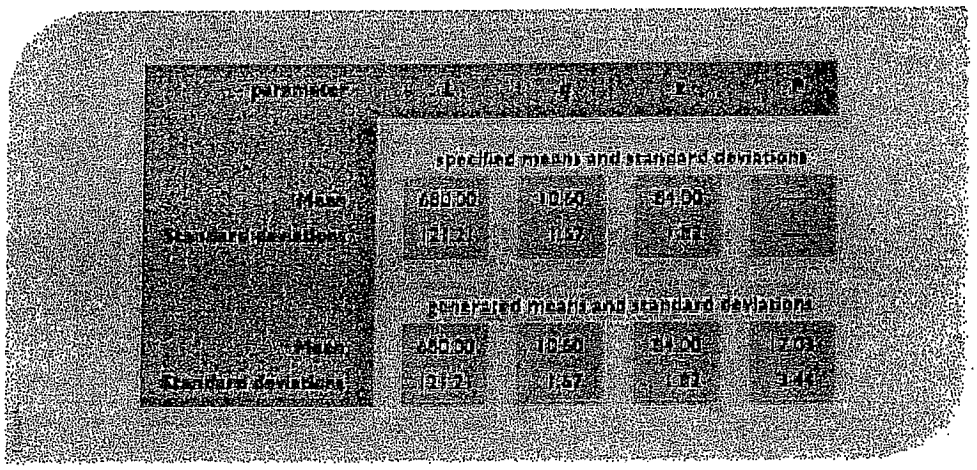


Figure 18. Reduction in the variance of P that is due to dropping from the regression model each variable individually. Clearly L has the biggest impact on the uncertainty in P, and z the least.

4.2.6.4 Standardized Monte Carlo analysis

Using a "standardized" Monte Carlo analysis, one could adjust the generated values of L, q and z above so that the generated samples actually have the desired mean and variance. While making that correction, one can also shuffle their values so that the correlations among the generated values for the different parameters are near zero, as is desired. This was done for the 200 generated values to obtain the statistics shown in Table 9.

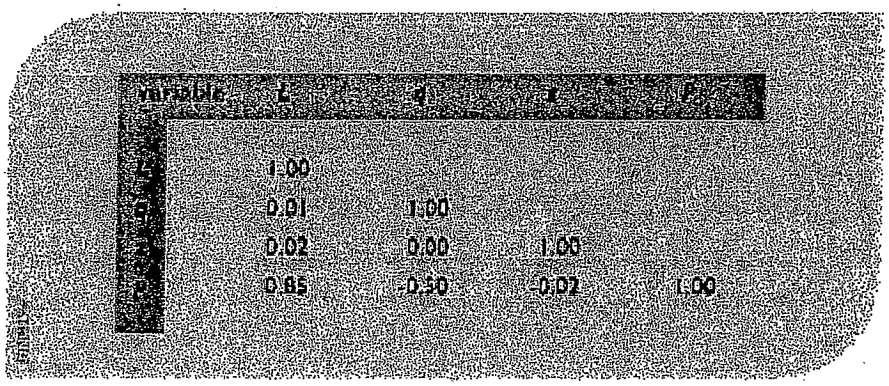
Table 9. Standardized Monte Carlo analysis of lake phosphorus levels



parameter	L	q	z	P
specified means and standard deviations				
Mean	660.00	10.00	34.00	
Standard deviation	21.21	1.67	1.41	
generated means and standard deviations				
Mean	660.00	10.00	34.00	2.03
Standard deviation	21.21	1.67	1.41	1.44

Repeating the correlation analysis from before (shown in Table 10) now yields much clearer results that are in agreement with the regression analysis. The correlation between P and both q and z are now negative as they should be. Because the generated values of the three parameters have been adjusted to be uncorrelated, the signal from one is not confused with the signal from another.

Table 10. Correlation analysis of standardized Monte Carlo results



Variable	L	Q	I	P
L	1.00			
Q	0.01	1.00		
I	0.02	0.00	1.00	
P	0.85	-0.50	-0.02	1.00

The mean phosphorus concentration changed very little. It is now 17.0 instead of 17.1 mg/m^3.

Using control variates with a linear predictive model in conjunction with the standardized Monte Carlo variates, the standard deviation of the errors associated with the 200 observations is only 0.45. Thus the standard error for this estimate of the mean of P is $0.45/(200)^{0.5}$ or just 0.03. Thus this is a highly accurate result. The regressions were also repeated and yielded very similar results. The only real difference was that the parameter estimates had small standard errors and were more significant because of the elimination of correlation between the generated parameters.

4.2.6.5 Generalized likelihood estimation

Beven (1993) and Binley and Beven (1991) suggest a Generalized Likelihood Uncertainty Estimation (GLUE) technique for assessment of parameter error uncertainty using Monte Carlo simulation. It is described as a "formal methodology for some of the subjective elements of model calibration" (Beven, 1989, p. 47). The basic idea is to begin by assigning reasonable ranges for the various parameters and then to draw parameter sets from those ranges using a uniform or some similar (and flat) distribution. These generated parameter sets are then used on a calibration data set so that unreasonable combinations can be rejected, while reasonable values are assigned a posterior probability based upon a likelihood measure which may reflect several dimensions and characteristics of model performance.

Let $L(P_i) > 0$ be the value of the likelihood measure assigned to the ith parameter set's calibration sequence. Then the model predictions generated with parameter set/combination P_i are assigned posterior probability, $p(P_i)$.

$$p(P_i) = L(P_i)/\Sigma_j L(P_j) \qquad (20)$$

These probabilities reflect the form of Bayes theorem, which is well supported by probability theory (Devore, 1991). This procedure should capture reasonably well the dependence or correlation among parameters, because *reasonable* sequences will all be assigned larger probabilities, whereas sequences that are unable to reproduce the system response over the calibration period will be rejected or assigned small probabilities.

However, in a rigorous probabilistic framework, the L would be the likelihood function for the calibration series for particular error distributions. (This could be checked with available goodness-of-fit procedures; for example, Kuczera, 1988.) When relatively ad hoc measures are adopted for the likelihood measure with little statistical validity, the $p(P_i)$ probabilities are best described as pseudo probabilities or "likelihood" weights.

Another concern with this method is the potential efficiency. If the parameter ranges are too wide, a large number of unreasonable or very unlikely parameter combinations will be generated. These will either be rejected or else will have small probabilities and thus little effect on the analysis. In this case the associated processing would be a waste of effort. A compromise is to use some data to calibrate the model and to generate a prior or initial distribution for the parameters that is at least centered in the best range (Beven 1993, p. 48). Then use of a different calibration period to generate the $p(P_i)$ allows an updating of those initial probabilities to reflect the information provided by the additional calibration period with the adopted likelihood measures.

After the accepted sequences are used to generate sets of predictions, the likelihood weights would be used in the calculation of means, variances and quantiles, rather than the customary procedure of giving all the generated realizations equal weight. The resulting conditional distribution of system output reflects the initial probability distributions assigned to parameters, the rejection criteria, and the likelihood measure adopted to assign "likelihood" weights.

4.2.7 Latin hypercube sampling

For the simple Monte Carlo simulations described above, with independent errors, a probability distribution is assumed for each input parameter or variable. In each simulation run, values of all input data are obtained from sampling those individual and independent distributions. The value generated for an input parameter or variable is usually independent of what that value was in any previous run, or what other input parameter or variable values are in the same run. This simple sampling approach can result in a clustering of parameter values and hence both redundancy of information from repeated sampling in the same regions of a distribution and lack of information from no sampling in other regions of the distributions.

A stratified sampling approach ensures more even coverage of the range of input parameter or variable values with the same number of simulation runs. This can be accomplished by dividing the input parameter or variable space into sections and sampling from each section with the appropriate probability.

One such approach, Latin hypercube sampling (LHS), divides each input distribution into sections of equal probability for the specified the probability distribution, and draws one observation randomly from each range. Hence the ranges of input values within each section actually occur with equal frequency in the experiment. These values from each interval for each distribution are randomly assigned to those from other intervals to construct sets of input values for the simulation analysis. Figure 19 shows the steps in constructing a LHS for six simulations involving three inputs P_j (P_1, P_2, and P_3) and six intervals of their respective normal, uniform and triangular probability distributions.

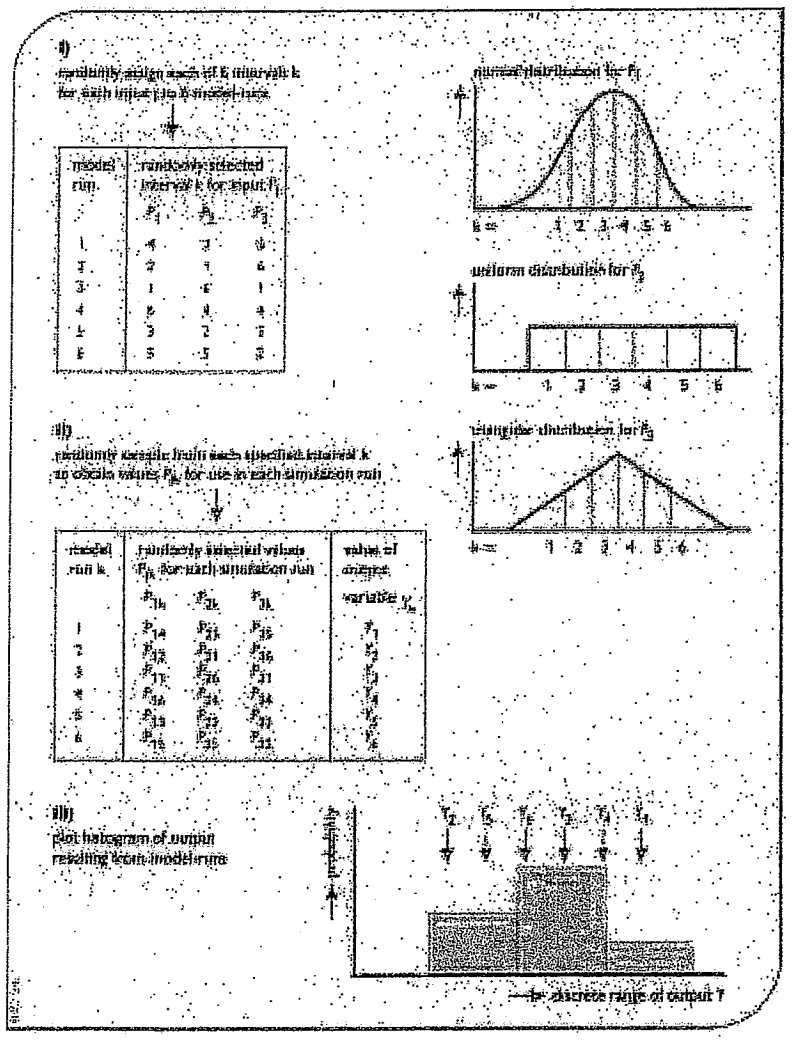


Figure 19. Schematic representation of a Latin hypercube sampling procedure for six simulation runs.

5. Performance indicator uncertainties

5.1 Performance measure target uncertainty

Another possible source of uncertainty is the selection of performance measure target values. For example, consider a target value for a pollutant concentration based on the effect of exceeding it in an ecosystem. Which target value is best or correct? When this is not clear, there are various ways of expressing the uncertainty associated with any target value. One such method is the use of fuzzy sets (Chapter VI). Use of 'grey' numbers or intervals instead of 'white' or fixed target values is another. When some uncertainty or disagreement exists over the selection of the best target value for a particular performance measure it seems to us the most direct and transparent way to do this is to subjectively assume a distribution over a range of possible target values. Then this subjective probability distribution can be factored into the tradeoff analysis, as outlined in Figure 20.

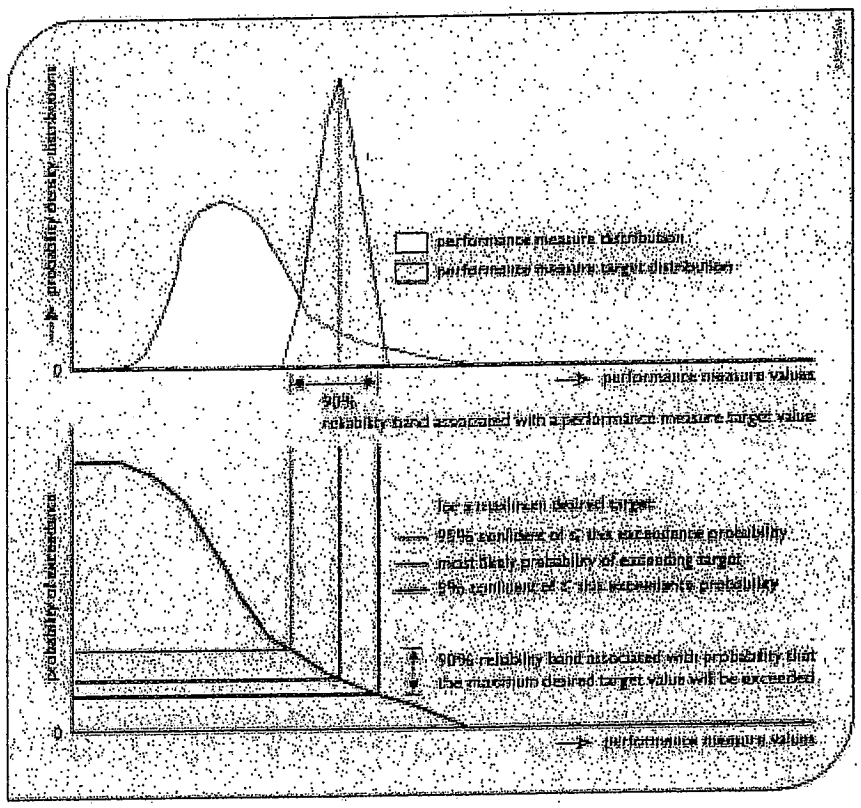


Figure 20. Combining the probability distribution of performance measure values with the probability distribution of performance measure target values to estimate the confidence one has in the probability of exceeding a maximum desired target value.

One of the challenges associated with defining and including in an analysis the uncertainty associated with a target or threshold value for a performance measure is that of communicating just what the result of such an analysis means. Referring to Figure 20, suppose the target value represents some maximum limit of a pollutant, say phosphorus, concentration in the flow during a given period of time at a given site or region, and it is not certain just what that maximum limit should be. Subjectively defining the distribution of that maximum limit, and considering that uncertainty along with the uncertainty (probability of exceedance function) of pollutant concentrations – the performance measure – one can attach a confidence to any probability of exceeding the maximum desired concentration value.

The 95% probability of exceedance shown on Figure 20, say $P_{0.95}$, should be interpreted as "we can be 95% confident that the probability of the maximum desired pollutant concentration being exceeded will be no greater than $P_{0.95}$." We can be only 5% confident that the probability of exceeding the desired maximum concentration will be no greater than the lower $P_{0.05}$ value. Depending on whether the middle line through the subjective distribution of target values in Figure 20 represents the most likely or median target value, the associated probability of exceedance is either the most likely, as indicated in Figure 20, or that for which we are only 50% confident.

Figure 21 attempts to show how to interpret the reliabilities when the uncertain performance targets are

- minimum acceptable levels that are to be maximized,
- maximum acceptable levels that are to be minimized or
- optimum levels.

An example of a minimum acceptable target level might be the population of wading birds in an area. An example of a maximum acceptable target level might be, again, the phosphorus concentration of the flow in a specific wetland or lake. An example of an optimum target level might be the depth of water most suitable for selected species of aquatic vegetation during a particular period of the year.

For performance measure targets that are not expressed as minimum or maximum limits but that are the 'best' values, referring to Figure 21, one can state that one is 90% confident that the probability of achieving the desired target is no more than B. The 90% confidence level probability of not achieving the desired target is at least A+C. The probability of the performance measure being too low is at least A and the probability of the performance measure being too high is at least C, again at the 90% confidence levels. As the confidence level decreases the bandwidth decreases, and the probability of not meeting the target increases.

Now, clearly there is uncertainty associated with each of these uncertainty estimations, and this raises the question of how valuable is the quantification of the uncertainty of each additional component of the plan in an evaluation process. Will plan evaluators and decision makers

benefit from this additional information, and just how much additional uncertainty information is useful?

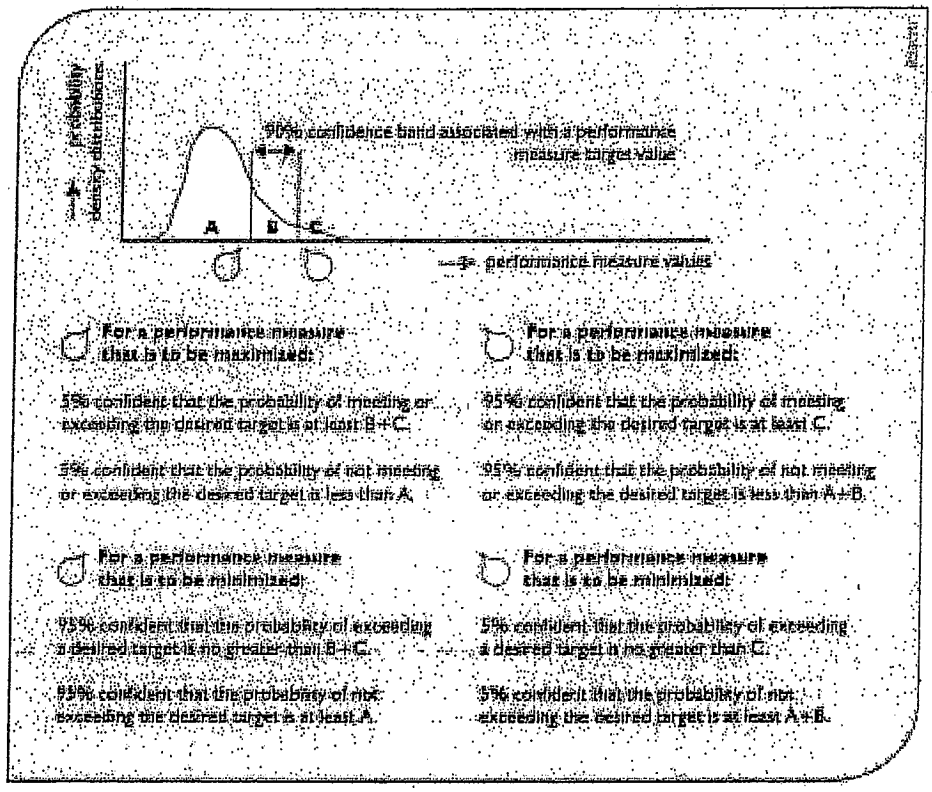


Figure 21. Interpreting the results of combining performance measure probabilities with performance measure target probabilities depends on the type of performance measure. The letters A, B, and C represent proportions of the probability density function of performance measure values. (Hence probabilities A + B + C = 1.)

Now consider again the tradeoffs that need to be made as illustrated in Figure 7. Instead of considering a single target value as shown on Figure 7, assume there is a 90% confidence range associated with that single performance measure target value. Also assume that the target is a maximum desired upper limit (e.g., of some pollutant concentration).

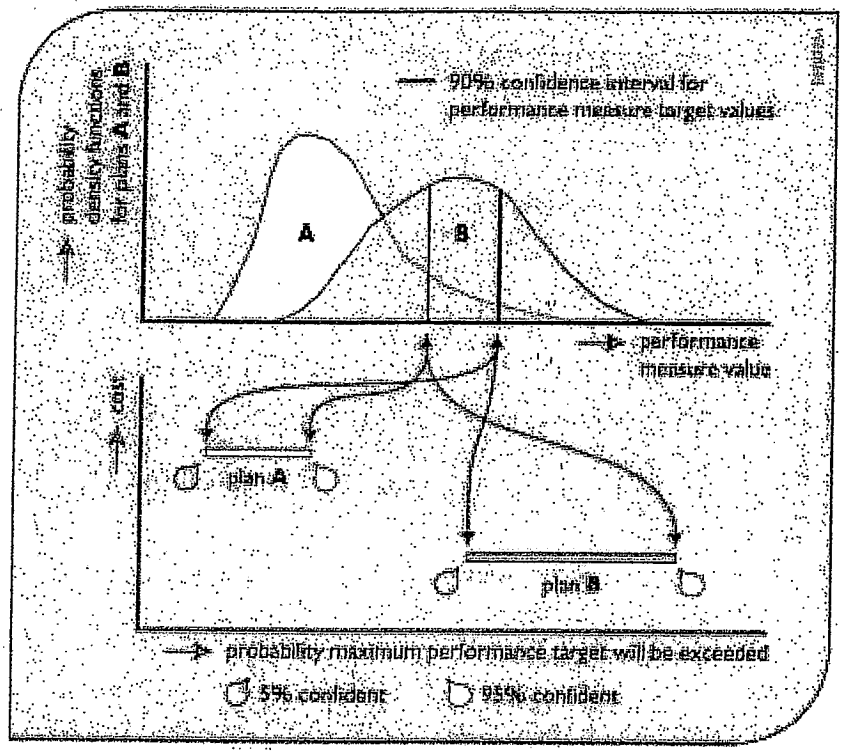


Figure 22. Two plans showing ranges of probabilities, depending on one's confidence, that an uncertain desired maximum (upper limit) performance target value will be exceeded. The 95% confidence levels are associated with the higher probabilities of exceeding the desired maximum target. The 5% confident levels are associated with the more desirable lower probabilities of exceeding the desired maximum target. Plan A with reduced probabilities of exceeding the upper limit costs more than Plan B.

In the case shown in Figure 22, the tradeoff is clearly between cost and reliability. In this example, no matter what confidence one chooses, Plan A is preferred to Plan B with respect to reliability, but Plan B is preferred to Plan A with respect to cost. The tradeoff is only between these two performance indicators or measures.

Consider however a third plan, as shown in Figure 23. This situation adds to the complexity of making appropriate tradeoffs. Now there are three criteria: cost, probability of exceedance (reliability) and the confidence in those reliabilities or probabilities. Add to this the fact that there will be multiple performance measure targets, each expressed in terms of their maximum probabilities of exceedance and the confidence in those probabilities.

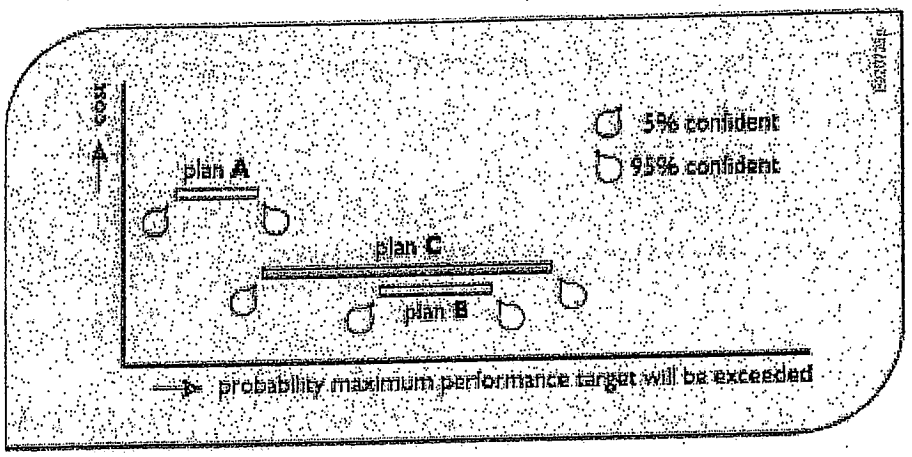


Figure 23. Tradeoffs among cost, reliabilities, and the confidence level of those reliabilities. The relative ranking of plans with respect to the probability of exceeding the desired (maximum limit) target may depend on the confidence given to that probability.

In Figure 23, in terms of cost the plans are ranked, from best to worst, B, C, and A. In terms of reliability at the 90 percent confidence level, they are ranked A, B, and C but at the 50 percent confidence level the ranking is A, C and B.

If the plan evaluation process has difficulty handling all this it may indicate the need to focus the uncertainty analysis effort on just what is deemed important, achievable, and beneficial. Then when the number of alternatives has been narrowed down to only a few that appear to be the better ones, a more complete uncertainty analysis can be performed. There is no need nor benefit in performing sensitivity and uncertainty analyses on all possible management alternatives. Rather one can focus on those alternatives that look the most promising, and then carry out additional uncertainty and sensitivity analyses only when important uncertain performance indicator values demands more scrutiny. Otherwise the work is not likely to affect the decision anyway.

5.2 Distinguishing differences between performance indicator distributions

Simulations of alternative water management infrastructure designs and operating policies require a comparison of the simulation outputs – the performance measures or indicators – associated with each alternative. A reasonable question to ask is are the observed differences statistically significant. Can one really tell if one alternative is better than another or are the observed differences explainable by random variations attributable to variations in the inputs and how the system responds?

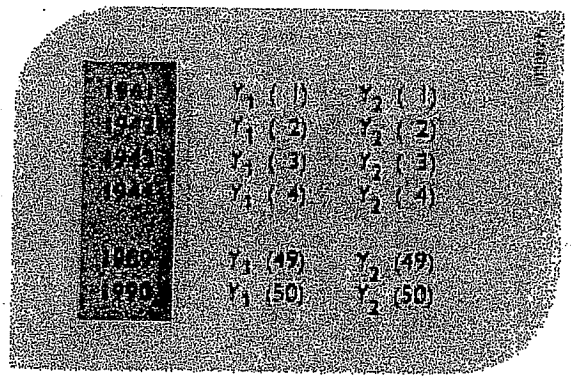
This is a common statistical issue that is addressed by standard hypothesis tests (Devore, 1991; Benjamin and Cornell, 1970). Selection of an appropriate test requires that one first resolve what type of change one expects in the variables. To illustrate, consider the comparison of two

different operating policies. Let Y_1 denote the set of output performance variable values with the first policy, and Y_2 the set of output performance variable values of the second policy. In many cases, one would expect one policy to be better than the other. One measure might be the difference in the mean of the variables; for example is $E[Y_1] < E[Y_2]$?. Alternatively one could check the difference in the median (50 percentile) of the two distributions.

In addition, one could look for a change in the variability or variance, or a shift in both the mean and the variance. Changes described by a difference in the mean or median often make the most sense and many statistical tests are available that are sensitive to such changes. For such investigations parametric and non-parametric tests for paired and unpaired data can be employed.

Consider the differences between "paired" and "unpaired" data. Suppose that the meteorological data for 1941-1990 is used to drive a simulation model generating data as described in Table 11:

Table 11. Possible flow data from a 50-year simulation



Here there is one sample, $Y_1(1)$ through $Y_1(50)$, for policy 1, and another sample, $Y_2(1)$ through $Y_2(50)$, for policy 2. However, the two sets of observations are not independent. For example, if 1943 was a very dry year, then we would expect both $Y_1(3)$ for policy 1 in that year and $Y_2(3)$ for policy 2 to be unusually small. With such paired data, one can use a paired hypothesis test to check for differences. Paired tests are usually easier than the corresponding unpaired tests that are appropriate in other cases. (For example, if one were checking for a difference in average rainfall depth between 1941-1960, and 1961-1990, they would have two sets of independent measurements for the two periods. With such data, one should use a two-sample unpaired test.)

Paired tests are generally based on the differences between the two sets of output, $Y_1(i) - Y_2(i)$. These are viewed as a single independent sample. The question is then are the differences

positive (say Y_1 tends to be larger then Y_2), or negative (Y_1 tends to be smaller), or are positive and negative differences are equally likely (there is no difference between Y_1 and Y_2).

Both parametric and non-parametric families of statistical tests are available for paired data. The common parametric test for paired data (a one-sample t test) assumes that the mean of the differences

$$X(i) = Y_1(i) - Y_2(i) \tag{21}$$

are normally distributed. Then the hypothesis of no difference is rejected if the t statistic is sufficiently large, given the sample size n.

Alternatively, one can employ a nonparametric test and avoid the assumption that the differences $X(i)$ are normally distributed. In such a case, one can use the Wilcoxon Signed Rank test. This nonparametric test ranks the absolute values $|X(i)|$ of the differences. If the sum S of the ranks of the positive differences deviates sufficiently from its expected value, $n(n+1)/4$ (were there no difference between the two distributions), one can conclude that there is a statistically significant difference between the $Y_1(i)$ and $Y_2(i)$ series. Standard statistical texts have tables of the distribution of the sum S as a function of the sample size n, and provide a good analytical approximation for $n > 20$ (for example, Devore, 1991). Both the parametric t test and the nonparametric Wilcoxon Signed Rank test require that the differences between the simulated values for each year be computed.

6. Communicating model output uncertainty

Spending money on reducing uncertainty would seem preferable to spending it on ways of calculating and describing it better. Yet attention to uncertainty communication is critically important if uncertainty analyses and characterizations are to be of value in a decision making process. In spite considerable efforts by those involved in risk assessment and management, we know very little about how to ensure effective risk communication to gain the confidence of stakeholders, incorporate their views and knowledge, and influence favorably the acceptability of risk assessments and risk-management decisions.

The best way to communicate concepts of uncertainty may well depend on what the audiences already know about risk and the various types of probability distributions (e.g., density, cumulative, exceedance) based on objective and subjective data, and the distinction between mean or average values and the most likely values. Undoubtedly graphical representations of these ways of describing uncertainty considerably facilitate communication.

The National Research Council (NRC 1994) addressed the extensive uncertainty and variability associated with estimating risk and concluded that risk characterizations should not be reduced to a single number or even to a range of numbers intended to portray uncertainty. Instead, the report recommended managers and the interested public should be given risk characterizations that are both qualitative and quantitative and both verbal and mathematical.

In some cases communicating qualitative information about uncertainty to stakeholders and the public in general may be more effective than quantitative information. There are, of course, situations in which quantitative uncertainty analyses are likely to provide information that is useful in a decision-making process. How else can tradeoffs such as illustrated in Figures 10 and 27 be identified? Quantitative uncertainty analysis often can be used as the basis of qualitative information about uncertainty, even if the quantitative information is not what is communicated to the public.

One should acknowledge to the public the widespread confusion regarding the differences between variability and uncertainty. Variability does not change through further measurement or study, although better sampling can improve our knowledge about variability. Uncertainty reflects gaps in information about scientifically observable phenomena.

While it is important to communicate uncertainties and confidence in predictions, it is equally important to clarify who or what is at risk, possible consequences, and the severity and irreversibility of an adverse effect should a target value, for example, not be met. This qualitative information is often critical to informed decision-making. Risk and uncertainty communication is always complicated by the reliability and amounts of available relevant information as well as how that information is presented. Effective communication between people receiving information about who or what is at risk, or what might happen and just how severe and irreversible an adverse effect might be should a target value not be met, is just as important as the level of uncertainty and the confidence associated with such predictions. A two-way dialog between those receiving such information and those giving it can help identify just what seems best for a particular audience.

Risk and uncertainty communication is a two-way street, It involves learning and teaching. Communicators dealing with uncertainty should learn about the concerns and values of their audience, their relevant knowledge, and their experience with uncertainty issues. Stakeholders' knowledge of the sources and reasons for uncertainty needs to be incorporated into assessment and management and communication decisions. By listening, communicators can craft risk messages that better reflect the perspectives, technical knowledge, and concerns of the audience.

Effective communication should begin before important decisions have been made. It can be facilitated in communities by citizen advisory panels. Citizen advisory panels can give planners and decision makers a better understanding of the questions and concerns of the community and an opportunity to test its effectiveness in communicating concepts and specific issues regarding uncertainty.

One approach to make uncertainty more meaningful is to make risk comparisons. For example, a ten parts per billion target for a particular pollutant concentration is equivalent to 10 seconds in over 31 years. If this is an average daily concentration target that is to be satisfied "99 percent," of the time, this is equivalent to an expected violation of less than one day every three months.

Many perceive the reduction of risk by an order of magnitude as though it were a linear reduction. A better way to illustrate orders of magnitude of risk reduction is shown in Figure 24, in which a bar graph depicts better than words that a reduction in risk from one in a 1,000 (10^{-3}) to one in 10,000 (10^{-4}) is a reduction of 90% and that a further reduction to one in 100,000 (10^{-5}) is a reduction 10-fold less than the first reduction of 90%. The percent of the risk that is reduced by whatever measures is a much easier concept to communicate than reductions expressed in terms of estimated absolute risk levels, such as 10^{-5}.

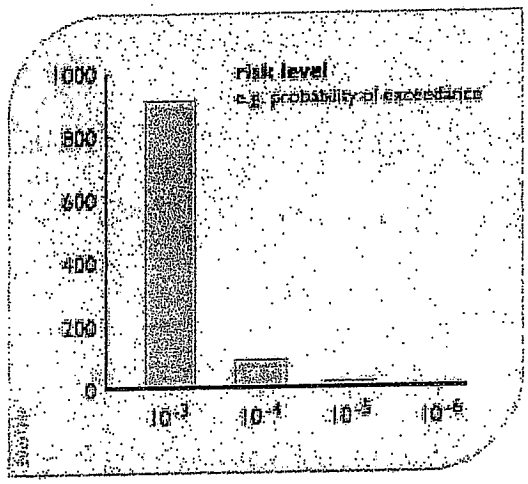


Figure 24. Reducing risk by orders of magnitude is not equivalent to linear reductions.

Risk comparisons can be helpful, but they should be used cautiously and tested if possible. There are dangers in comparing risks of diverse character, especially when the intent of the comparison is seen as minimizing a risk (NRC 1989). One difficulty in using risk comparisons is that it is not always easy to find risks that are sufficiently similar to make a comparison meaningful. How is someone able to compare two alternatives having two different costs and two different risk levels, for example, as is shown in Figure 7? One way is to perform an indifference analysis (Chapter X), but that can lead to different results depending who performs it. Another way is to develop utility functions using weights, where, for example reduced phosphorus load by half is equivalent to a 25 percent shorter hydroperiod in that area, but again each person's utility or tradeoff may differ.

At a minimum, graphical displays of uncertainty can be helpful. Consider the common system performance indicators that include:

- Time-series plots for continuous time-dependent indicators (Figure 25 upper left)
- Probability exceedance distributions for continuous indicators (Figure 25 upper right),
- Histograms for discrete event indicators (Figure 25 lower left), and
- Overlays on maps for space-dependent discrete events (Figure 25 lower right).

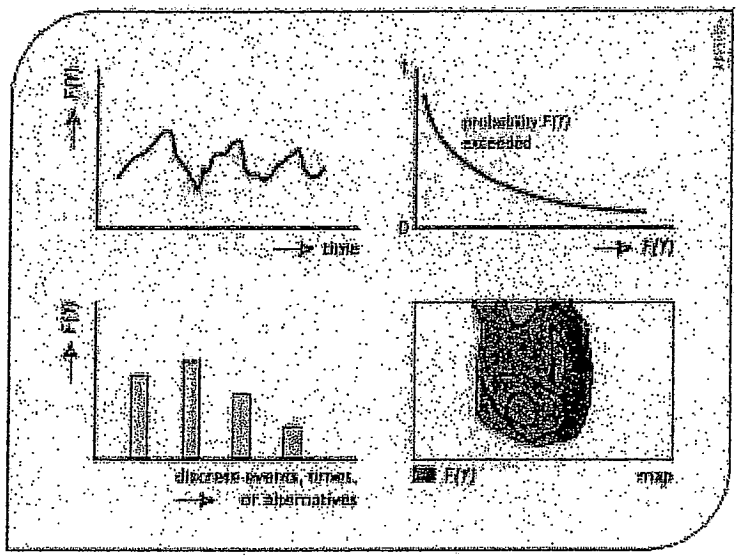


Figure 25. Different types of displays used to show model output Y or system performance indicator values $F(Y)$.

The first three graphs in Figure 25 could show, in addition to the single curve or bar that represents the most likely output, a range of outcomes associated with a given confidence interval. For overlays of information on maps, different colors could represent the spatial extents of events associated with different ranges of risk or uncertainty. Figure 26, corresponding to Figure 25, illustrates these approaches for displaying these ranges.

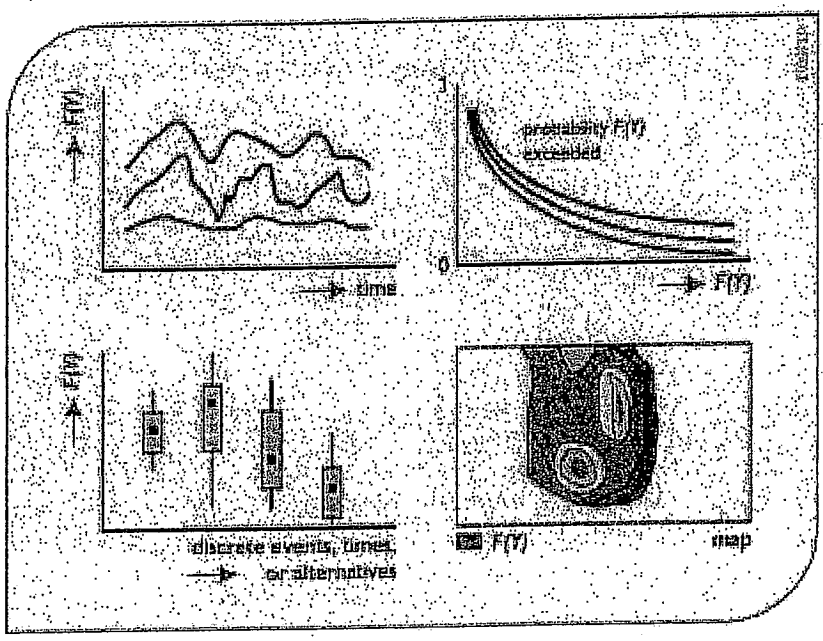


Figure 26. Plots of ranges of possible model output Y or system indicator values $F(Y)$ for different types of displays.

7. Conclusions

This chapter provides an overview of uncertainty and sensitivity analyses in the context of hydrologic or water resources systems simulation modeling. A broad range of tools are available to explore, display, and quantify the sensitivity and uncertainty in predictions of key output variables and system performance indices with respect to imprecise and random model inputs and to assumptions concerning model structure. They range from relatively simple deterministic sensitivity analysis methods to more involved first-order analyses and Monte Carlo sampling methods.

Because of the complexity of many watersheds or river basins, Monte Carlo methods for uncertainty analyses may be a very major and unattractive undertaking. Therefore it is often prudent begin with the relatively simple deterministic procedures. This coupled with a probabilistically based first-order uncertainty analysis method can help quantify the uncertainty in key output variables and system performance indices, and the relative contributions of uncertainty in different input variables to the uncertainty in different output variables and system performance indices. These relative contributions may differ depending upon which output variables and indices are of interest.

A sensitivity analysis can provide a systematic assessment of the impact of parameter value imprecision on output variable values and performance indices, and of the relative contribution of errors in different parameter values to that output uncertainty. Once the key variables are identified, it should be possible to determine the extent to which parameter value uncertainty can be reduced through field investigations, development of better models, and other efforts.

Model calibration procedures can be applied to individual catchments and subsystems, as well as to composite systems. Automated calibration procedures have several advantages including the explicit use of an appropriate statistical objective function, identification of those parameters that best reproduce the calibration data set with the given objective function, and the estimations of the statistical precision of the estimated parameters.

All of these tasks together can represent a formidable effort. However, knowledge of the uncertainty associated with model predictions can be as important to management decision and policy formulation as are the predictions themselves.

No matter how much attention is given to quantifying and reducing uncertainties in model outputs, uncertainties will remain. Professionals who analyze risk, managers and decision makers who must manage risk, and the public who must live with risk and uncertainty, have different information needs and attitudes regarding risk and uncertainty. It is clear that information needs differ among those who model or use models, those who make substantial investment or social decisions, and those who are likely to be impacted by those decisions. Meeting those needs should result in more informed decision making. But it comes at a cost that should be considered along with the benefits of having this sensitivity and uncertainty information.

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LETTER 4

ASSOCIATION OF CALIFORNIA WATER AGENCIES • SINCE 1910

ACWA NEWS

A Biweekly Newsletter for ACWA Members • Vol. 32, No. 12 • June 14, 2004

Levee Break Floods 12,000 Acres; State, Federal Officials Move to Protect Water Supplies

Governor Schwarzenegger on June 4 declared a state of emergency in San Joaquin County following a major levee failure in the Sacramento-San Joaquin River Delta. Hundreds of people were evacuated, up to 12,000 acres — nearly 20 square miles of agricultural land — were flooded, and ACWA members as well as state and federal water officials began monitoring water quality and water supply issues. Cost estimates related to the levee break are now estimated at $18 million. Repairs could take 45-60 days.

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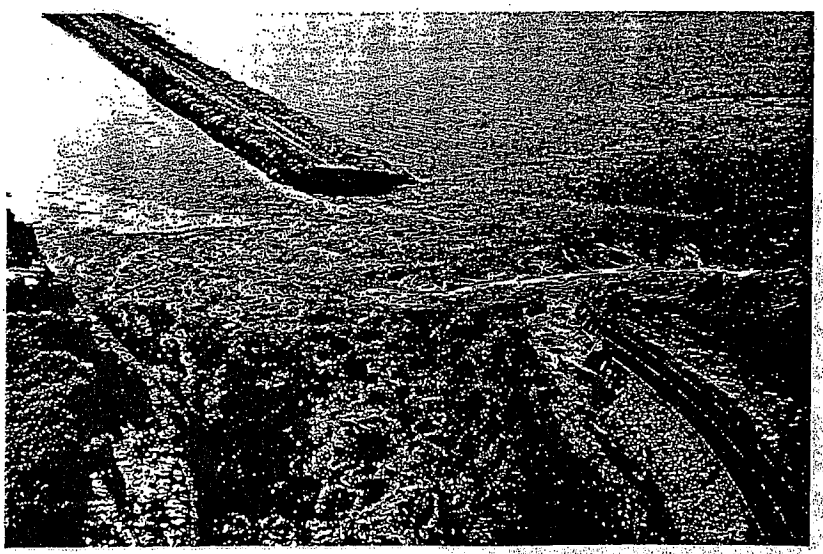

Photo by California Department of Water Resources

After a major levee gave way June 3 in the Sacramento-San Joaquin River Delta, Governor Schwarzenegger declared a state of emergency in San Joaquin County, and state and federal water officials, along with ACWA members, began coordinating efforts to ensure the maximum protection of water supplies for the State Water Project and Central Valley Project.

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Special District Community Issues Letters of Support to Legislators, Governor for Local Government Accord

In an unprecedented move to support Governor Schwarzenegger's local government financing reform package, the special district community has joined forces in a series of letters urging support for the package. The special district community issued a letter to legislative leadership, the Schwarzenegger Administration, and each association's membership outlining the importance of the package, stating that despite the short-term

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ACWA members and others have been warning lawmakers and local, state and federal water officials for years that the fragile levee system in the Delta was an accident waiting to happen. "California has not made the investment needed to properly secure these levees that are vital to the hub of the state's water system," said ACWA Executive Director Steve Hall. The Delta is the source of drinking water for two-thirds of the state's residents and irrigates thousands of acres of farmland.

On Thursday June 3, the state's San Joaquin Office of Emergency Services reported a levee break of 200-300 feet on the Middle River Levee, which protects the Delta island known as Jones Tract. The levee failed between the Woodward Island Ferry crossing and the railroad. The break, which soon grew to 500 feet wide and 20 feet deep, occurred in a privately owned levee that protects an island used to grow corn, asparagus and other crops. The levee is in Reclamation District 2039.

The failure point was approximately two miles northeast of Contra Costa Water District's Old River Pumping Station. As soon as the levee failed, the district began monitoring the Delta water quality.

Lower Jones Tract is described as a very large island, and is hydraulically connected to Upper Jones, another very large island. East Bay Municipal Utility District (EBMUD) has three aqueducts that cross this five-mile-wide island located just north of Highway 4 and about 10 miles west of Interstate 5 near Stockton. The aqueducts are large pipelines that deliver water from the Sierra Foothills to water treatment plants in the East Bay. The breach is about one mile south of EBMUD's aqueducts and the aqueducts do not appear to be in danger. Except for flooding around the aqueducts, the district anticipated no immediate impacts. EBMUD water quality is not affected by the flooding.

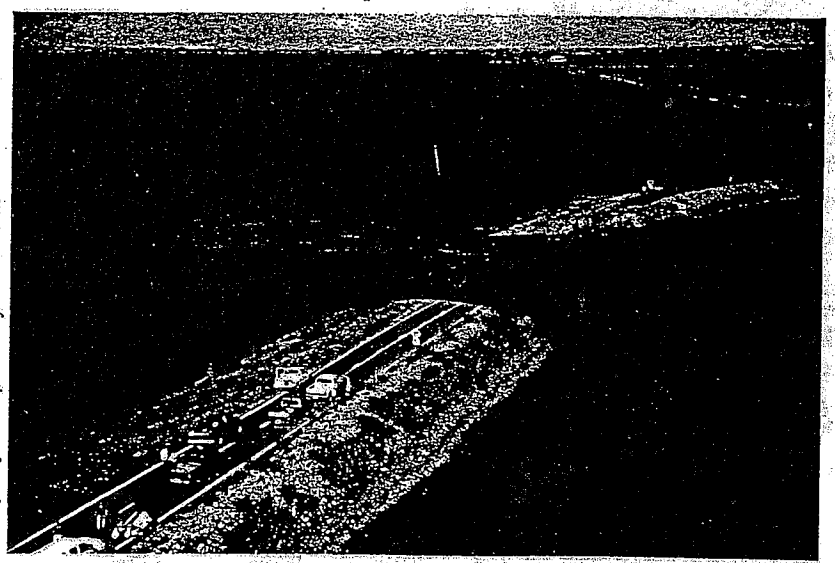

Photo by California Department of Water Resources

The San Joaquin Office of Emergency Services June 3 reported a levee break of 200-300 feet in the Sacramento-San Joaquin River Delta. Officials estimated the breach widened to as much as 500 feet.

State and federal water officials are coordinating efforts to ensure the maximum protection of water supplies for the State Water Project and Central Valley Project. After the break, the U.S. Bureau of Reclamation decreased water exports from the Sacramento-San Joaquin River Delta by 80% and increased freshwater flows from the Sacramento River. The state's pumps were down for maintenance.

Ronald R. Gastelum, chief executive officer of Metropolitan Water District of Southern California, said Southern California is expected to withstand the levee break. "Fortunately, Southern California has sufficient water supplies south of the Bay-Delta in Central Valley groundwater storage projects and state project facilities, including San Luis Reservoir, Castaic Lake and Lake Silverwood," Gastelum said.

As *ACWA News* went to press, the state was pumping at Banks Pumping Plant at 2,000 cubic feet per second (cfs) and the Bureau was pumping at 1,600 cfs at its Tracy Pumping Plant. The U.S. Fish and Wildlife Service reported that no major fish species were impacted yet. The U.S. Army Corps of Engineers is in charge of the levee repair work.

Governor's Proclamation

"I'm deeply concerned for those San Joaquin County farmers that have lost farmland as a result of this unfortunate flood," said Governor Schwarzenegger. "The state of California will work with local agencies to ensure that the levee is repaired and the water is removed from the Upper and Lower Jones Tracts.

"I've directed the Office of Emergency Services (OES) to ensure that all necessary state resources are brought to

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bear in both the response to and recovery from this emergency."

The governor's action will provide financial relief to the local governments and reclamation districts for the costs of repairing the levee and removing the water that has flowed through. At the governor's direction, OES will also be working with the U.S. Department of Agriculture's Farm Service Agency to see if farmers impacted by this flood may be eligible for emergency loans to help recover from production or physical losses.

Statement From State Water Resources Director

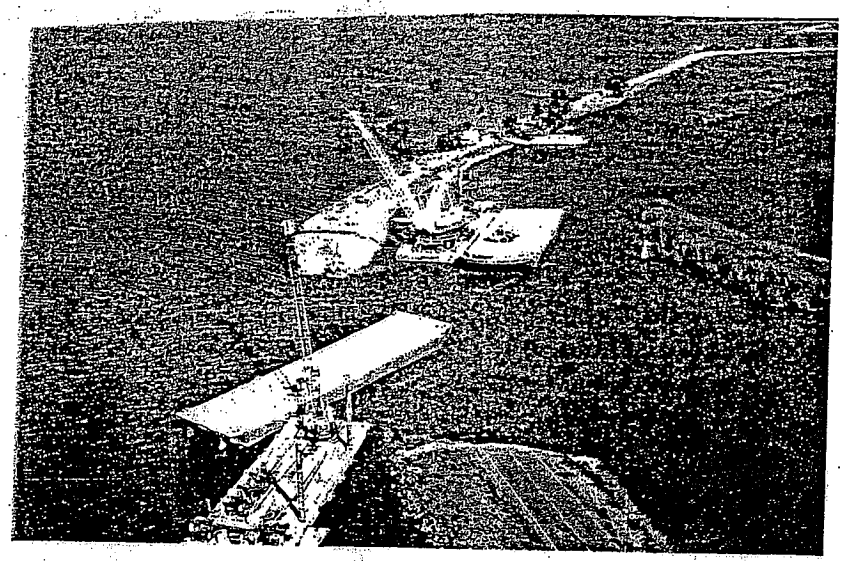
California Department of Water Resources Director Lester A. Snow June 4 issued a statement addressing water quality in the Delta following the levee break:

"I want to assure the public that receives water from the Delta that the Department of Water Resources and the U.S. Bureau of Reclamation are coordinating efforts to ensure the maximum protection of water supplies for the State Water Project (SWP) and the federal Central Valley Project (CVP).

"We are taking additional steps to closely monitor water quality conditions in the Delta. While recent high tides have likely caused a slight increase in salinity, we expect conditions to stabilize soon.

Actions Taken to Protect Water Quality

- The U.S. Bureau of Reclamation has increased releases of fresh water from Shasta Dam to help control salinity.
- The California Department of Water Resources and Bureau of Reclamation have reduced pumping at their South Delta export pumps to reduce the intrusion of seawater.
- Gates at the Delta Cross Channel have been opened to move Sacramento River water into the central Delta to repel seawater intrusion.
- The Department of Water Resources is monitoring Delta water quality at more than 20 sites.
- The Department of Water Resources is monitoring channel velocity changes in the Jones Tract area of the Delta.



The U.S. Army Corps of Engineers is heading the levee repair effort.

Levee System Integrity Among CALFED's Major Program Elements

The Bay-Delta Plan is a balanced, comprehensive approach to reduce conflicts over limited water supplies and to address the program's four objectives through 11 major program elements. Levee system integrity is among the major program elements. With its focus on improving Bay-Delta levees, CALFED is acting to protect water supplies needed for the environment, agriculture and urban uses by reducing the threat of levee failure and seawater intrusion. Delta levees also protect major interstates, roadways, cities, towns, agricultural lands, and environmental and aquatic habitat.

Goals

- Improve levees to a higher standard for greater flood protection
- Improve emergency response capabilities
- Ensure levee maintenance and habitat needs are met
- Improve coordination of permit processes
- Develop adequate and reliable funding for levee maintenance.

Source: CALFED Bay-Delta Program Web site at http://calwater.ca.gov

"The water projects are expected to return to normal operations next week. We will continue working around the clock to assure that CVP and SWP contractors can meet their needs while avoiding unnecessary reliance upon water in storage south of the Delta."

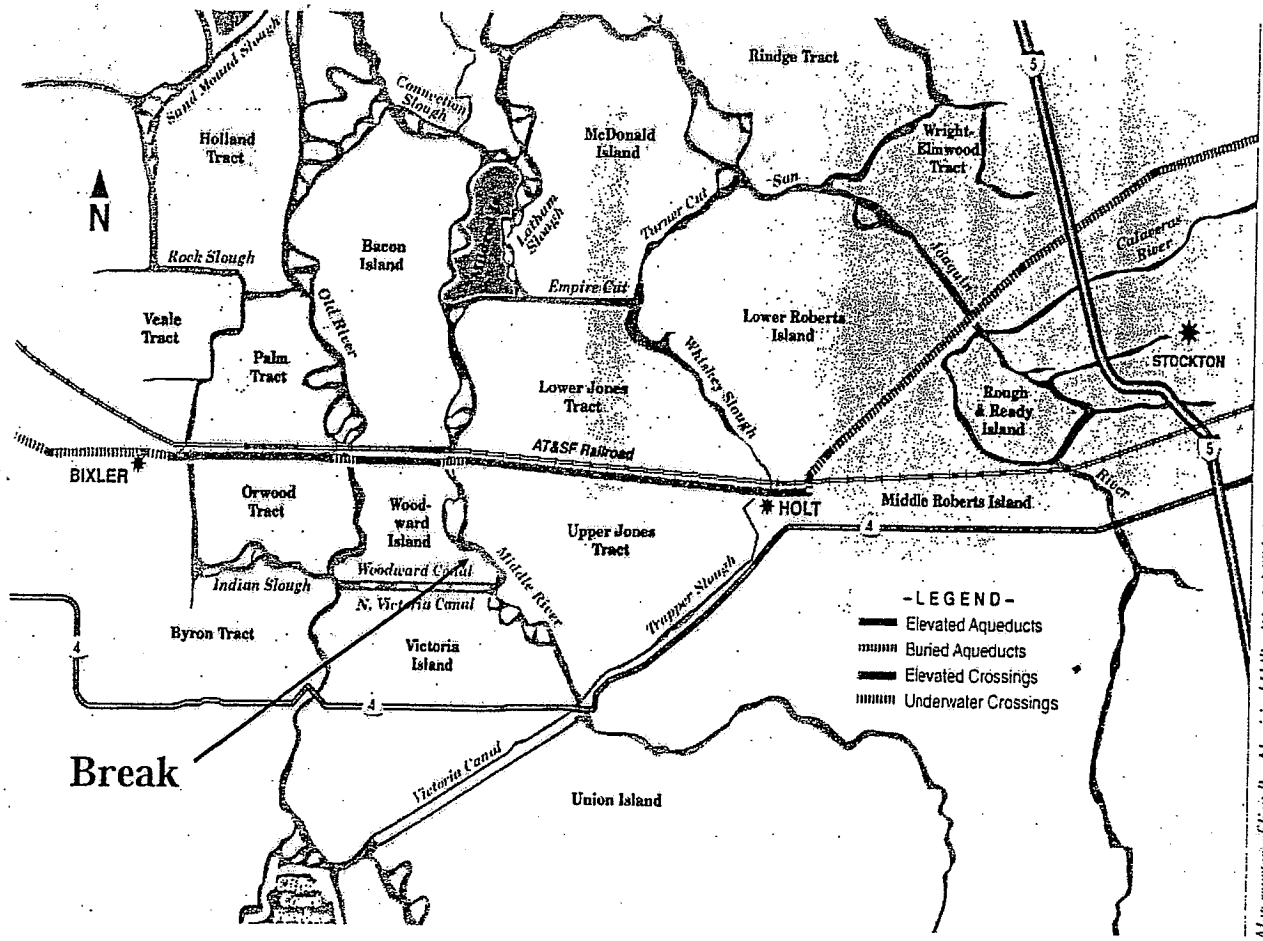
CALFED

Levee system integrity is among the major program elements of the CALFED Bay-Delta Program. As *ACWA News* went to press, the California Bay-Delta Authority was beginning a two-day meeting in Sacramento. Look for coverage from the meeting in the next *ACWA News* and also updates on the levee situation. www.acwanet.com will also feature updates.

Photo by California Department of Water Resources

The levee break in San Joaquin County flooded 12,000 acres in the Delta.

Coverage continued on next page



Map courtesy of East Bay Municipal Utility District's Web site

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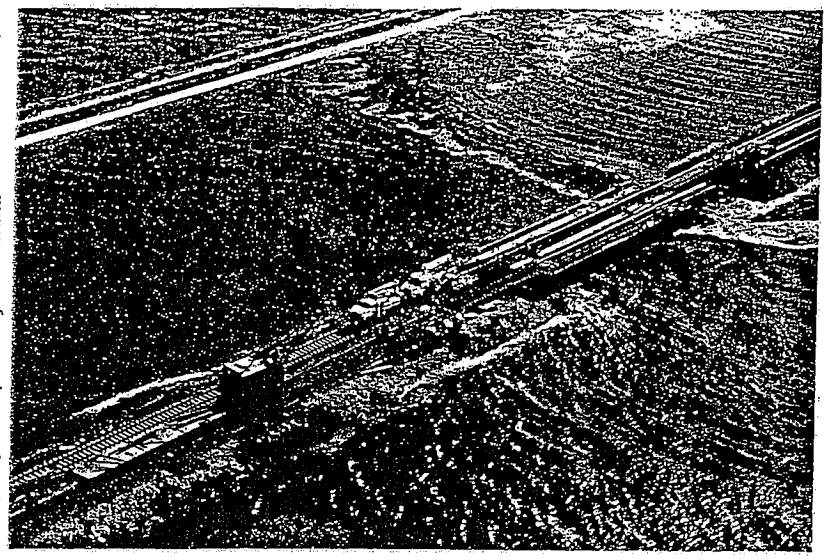


Photo by California Department of Water Resources

Flood waters lap against railroad tracks.

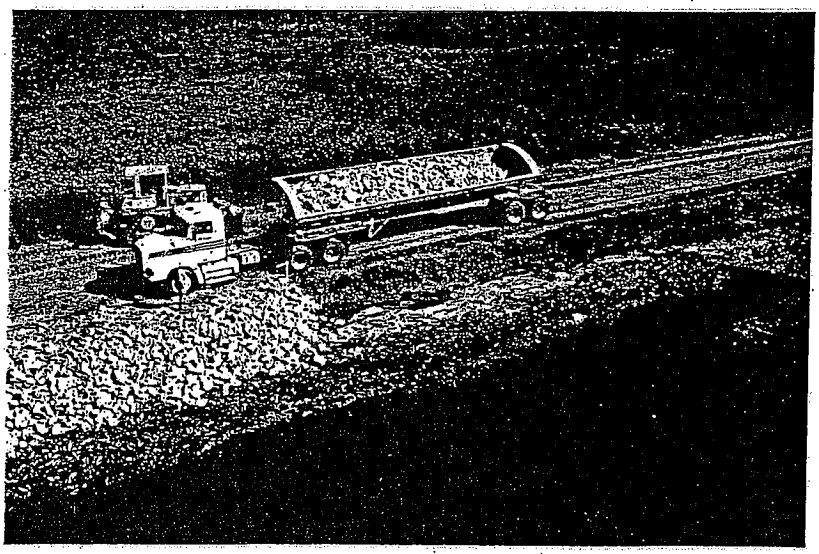


Photo by California Department of Water Resources

Repair work began quickly after a levee failed in the Sacramento-San Joaquin River Delta. The U.S. Army Corps of Engineers is in charge of the levee repair work. The latest cost estimate to repair the break is $18 million. Repairs are now estimated to take 45-60 days.

EBMUD Efforts to Protect Aqueduct System

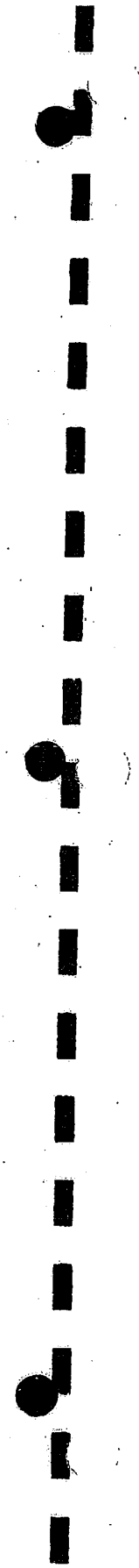
East Bay Municipal Utility District provided the following information on its Web site at www.ebmud.com:

Delta area levees were constructed in a non-engineered manner in the late 1800s and their vulnerability to failure is well known. Lower Jones Tract levees failed and both Upper and Lower Jones Tracts flooded in 1980. EBMUD efforts to protect the aqueduct system include ongoing funding for levee maintenance projects and the $39 million Mokelumne Aqueduct Seismic Upgrade Project currently underway.

The aqueduct seismic upgrades not only protect the aqueduct in the event of an earthquake affecting the Delta region, but also mitigates the hazards associated with a levee breach. The key hazard posed by a breach is fast-moving water eroding the foundation of the aqueducts (scour).

In 1999, EBMUD reinforced the levees where the aqueducts cross under the rivers and that work included both locations where the aqueducts enter and exit Upper Jones Tract. This strengthening substantially reduces the risk of a breach near the aqueduct thereby reducing the potential of scour to aqueduct foundations.

When a breach occurs away from the aqueduct, as it did on June 3, the flooding causes no hazard to the aqueduct other than to limit accessibility.



LETTER 4

Tri-County Watchdogs

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(661) 245-4119
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August 13, 2004

Castaic Lake Water Agency
attn. Marylou Cotton
27234 Bouquet Canyon Rd.
Saugus, CA 91350

About: 41,000 Acre Foot Water Transfer SCH# 1998041127

Dear Ms. Cotton:

It is our understanding that this environmental document is being re-circulated by Court Order because the program EIR on which it was based was set aside in the decision PCL v. DWR, 2000. In that decision the Court found that an individual contractor (Central Coast Water Agency) could not be the lead agency for a state wide project that had impacts to a wide geographical and social group of people. The decision found that the Department of Water Resources should be the correct lead agency. We would like to express our dismay that your agency is now proceeding once again in a manner contrary to law by circulating this document as the lead agency and before the Monterey Agreement EIR has been completed. We note that the same General Manager of Central Coast Water Agency, Dan Masnada, that was found to be in violation of CEQA for proceeding as the wrong lead agency, is now the general manager of Castaic Lake Water Agency. In that capacity, he is once again directing his agency to proceed as lead agency in violation of the law. 88

We believe that the Department of Water Resources must be the lead agency for the discussion of the statewide impacts of water transfers for the following reasons.

1. The published appellate decision in PCL v. DWR, 2000 stated "We agree with the trial court that DWR, not CCWA, has the statutory duty of assessing environmental consequences of projects involving the SWP [State Water Project]." (Pg. 1 of decision). We incorporate this decision by reference into the administrative record.
2. DWR is best suited to ensure that widespread notification of interested parties occur.
3. DWR is best suited to recognize environmental impacts that might be incurred to a wide spread area of the state as a result of this water transfer and to properly asses such impacts.
4. DWR, in its capacity as operations manager of the SWP, will be acquainted with other state projects that would affect or be affected by this transfer.

Many anomalies in the CEQA process have already occurred because the general Manager of Castaic lake Water Agency has chosen to proceed contrary to law and to the published appellate court decision in a case to which he was a party. This includes the fact that we were not notified of the circulation of this draft EIR, nor were others in water districts including Berenda Mesa and in other areas statewide. Further, it has recently come to our attention that Berenda Mesa has published a draft EIR to withdraw/divert approximately 70,000AF from local streams and ground water sources. Since the transfer of SWP surface water will affect ground water pumping sources, this EIR and its impacts must be included and addressed during the water transfer review process. We therefore believe this document must be included in the review process and incorporate it by reference. 89 90

The original purpose of the state water project was to provide a supplementary water source so that ground water would not be pumped in excess of sustainable levels. Now it appears that this water transfer will bring about the very situation one sought to avoid. We believe it is imperative that CLWA notify all interested parties in Berenda Mesa and other areas proposing increased ground water pumping, of their intention to make this transfer, because pumping 91

of ground water sources to replace state water transferred to other areas will have significant impacts on the Public Trust and the viability of farming operations. 91

Such impacts to ground water that affect both public trust surface flows and water for farming, should be addressed in the program EIR. It is therefore improper for CLWA to proceed before the completion of the Monterey Agreement EIR. 92

In conclusion we request that this document be withdrawn, that the document not be re-submitted for circulation until the Monterey agreement EIR is completed and certified and that all parties whose ground water may be impacted are properly notified when re-circulation occurs. 93

Thank you for your time.
Sincerely Yours,

Jan de Leeuw, Ph.D.

cc: Kern County Water Agency,
Wheeler Ridge Maricopa Water Storage District,
Department of Water Resources

LETTER 4

Castaic Lake Water Agency
attn. Marylou Cotton
27234 Bouquet Canyon Rd.
[illegible]us, CA 91350

LETTER 4

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UNITED WATER CONSERVATION DISTRICT

"Conserving Water Since 1927"

July 26, 2004

Ms Mary Lou Cotton
Water Resources Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

Re: Draft Environmental Impact Report California State Clearinghouse No. 4998041127 Castaic Lake Water Agency Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount

Dear Mary Lou,

United Water Conservation District has reviewed the Draft EIR for the proposed transfer of 41,000 acre-feet of State Water Project Table A Amount water from the Kern County Water Agency's member unit Wheeler Ridge-Maricopa Water Storage District to Castaic Lake Water Agency. This proposed transfer of SWP water is beneficial to the Santa Clara River Watershed and is fully endorsed by United Water. 94

The permanent transfer of 41,000 acre-feet of SWP water to the Castaic Lake Water Agency provides a valuable additional source of water for the Santa Clarita Valley. This additional water improves the potential for conjunctive-use of water within the valley. This is especially important given the urbanization of this area. Increased surface water supplies should provide water managers throughout the basin more flexibility with respect to the magnitude of additional groundwater pumping needed to meet the escalating M&I demand for water within the basin. 95

Although discussed in various sections within the Draft EIR, it should be reemphasized here that 41,000 acre-feet of SWP Table A Amount water doesn't guarantee this amount can be delivered every year. Hydrologic conditions and storage carryover in any particular year primarily dictate the annual allocation of water to the SWP Contractors. Historic deliveries to M&I Contractors should not be used to project future deliveries. The adoption of the Monterey Amendment (following the principles of the Monterey Agreement) will require that M&I Contractors and Agricultural Contractors more equitably share the pain of future water shortages. During the previous drought, allocations, as a percentage of Table A Amount (Entitlement), to Agriculture Contractors were significantly less than allocations to the M&I Contractors. 96

106 N. 8th Street • Santa Paula, California 93060 • Phone (805) 525-4431 • FAX: (805) 525-2661

LETTER 4

UNITED WATER CONSERVATION DISTRICT

As an ongoing general comment to all water purveyors within the Santa Clarita Valley, United Water has a very real interest in the continued health of the Santa Clarita Groundwater Basin and the flow of the Santa Clara River. United Water represents the collective interests of downstream residents that depend on the flow of the Santa Clara River for recharge to groundwater, surface water diversions, and environmental mandates. United Water's goal is that the quantity and water quality associated with the flow of the Santa Clara River into Ventura County not be diminished. The development and implementation of the inter-Agency regional monitoring program of groundwater levels, groundwater quality, surface water flows, and surface water quality should provide ongoing data with respect to the relative health of the Santa Clarita and downstream basins as well as surface water. In the event that surface water flow into Ventura County is diminished in either quantity or quality, and can be reasonably linked to over pumping of the aquifer systems and/or surface water discharges to the river within Santa Clarita Valley, United Water would seek to remedy the problem. 97

We appreciate the efforts of CLWA to appropriately plan and augment the water supplies of our watershed as represented by this water transfer project. If you should have questions please contact either Ken Turner or myself at (805) 525-4431.

Sincerely,

Dana L. Wisehart

Dana L. Wisehart
General Manager

Cc: BDRF
Ron Calkins, P.E., Public Works Director, City of San Buenaventura
Cliff Finley, P.E., Public Works Director, City of Santa Paula
Carrie Mattingly, Director of Utilities Services, City of Port Hueneme
Mike Miller, General Manager, Pleasant Valley County Water District
Ken Ortega, P.E., Water Superintendent, City of Oxnard
Lowell Preston Ph.D., Manager, Water Resources Division, Ventura County
Bert Rapp, P.E., City Engineer, City of Fillmore
Robert Sawyer, Santa Paula Basin Pumpers Association

File: Castaic Lake Water Agency
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LETTER 4

FROM : Arve PHONE NO. : AUG. 15 2004 10:21AM P1

FAX to (661) 297 1611

[redacted]y Lou Cotton
Water Resources Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Rd.
Santa Clarita, CA 91350

Dear Ms. Cotton:

Please accept these comments with the attachments in opposition to the proposed transfer. Besides being an arrogation of power by CLWA unto itself, it flies in the face of the present process at the State level to properly assess the environmental impacts of the Monterey Amendments as mandated by the Court of Appeals. What is particularly troubling is the adoption of material developed by DWR on SWP reliability which is demonstrably in-correct. As a member of the plaintiff committee presently engaged with DWR to fashion a new Monterey EIR, I am quite aware of the issues involved with the CALSIM II model, which is the model used to generate the incorrect information on SWP reliability. The attached analysis shows why the reliability information is incorrect and argues that until the CALSIM II model can correct its fundamental deficiencies it cannot be relied upon. Without this model's results the CLWA EIR is without any foundation for the claims made concerning the reliability of supplies that CLWA attaches to the SWP. In fact, one can make the argument on the same basis that present CLWA SWP supplies are already overtaxed. 98

Sincerely,

Arve R. Sjovold
186 Sierra Vista
Santa Barbara, CA
93108

ON THE ADEQUACY OF CALSIM II FOR ENVIRONMENTAL IMPACT ANALYSIS AND SWP RELIABILITY ANALYSIS

By: Arve R. Sjovold

August 12, 2004

Introduction:

The matter of application of CALSIM II to a variety of analyses has been questioned by many in water resources analyses, most notably by the scientific peer review team recently convened by the California Bay Delta Authority Science Program, Association of Bay Governments whose comments have been documented in a report dated December 4, 2003. In that report the peer review panel made many comments on the adequacy of CALSIM II which have yet to be acted upon. Several of the comments are directly related to the adequacy of CALSIM II to address the applications of environmental impact analyses and delivery reliability analyses of the SWP. The peer review was broad in reach and not directed toward any specific application. However, its comments regarding the applications cited above are very pertinent now that the Department of Water Resources (DWR) is moving ahead to use this model for purposes of assessing the environmental impacts of the Monterey Amendments to the SWP contracts and because the Castaic Lake Water Agency (CLWA) is also using the same model outputs for justifying its Urban Water Management Plan and a controversial action to claim as lawful a 41,000 acre-foot transfer of SWP entitlement from the Kern County Water Agency.

Because DWR has not acted on any of the peer review recommendations regarding deficiencies in CALSIM II, it is important that a clear statement be made regarding CALSIM II's adequacy to pursue both the environmental impact analysis of the Monterey Amendments and the CLWA proposed action. Because both environmental impact analysis and delivery reliability analyses require some measure of accuracy in their assessments it is vitally important to assess the accuracy of the CALSIM II calculated estimates. We and the peer review panel agree that calibration of the model is paramount if we are to make any confident statements of accuracy for this model. To date DWR has refused to do a timely calibration of the model even though they have been asked on many occasions over the past several years to do so. It is disingenuous on their part now to move ahead with production runs from this model arguing that they have insufficient time to do a proper calibration. Nevertheless, there are some definitive statements that can be made at this time based on the information made available by DWR in various documents.

Accuracy

Both the preliminary outputs for the environmental impact analysis and the documented outputs from the reliability assessment performed by DWR show levels of export from the Delta that average 50% higher than any estimates of actual average

exports evident to date. These predicted levels of export are not qualified by any statements of how accurate they may be based on comparisons to the historical record. In responses to comments received on their final report on delivery reliability they did include some comparisons to predicted and actual deliveries during the most recent drought (1987-1992). That report also reported actual delivery history through 2003. Although the comparison during the drought seems quite good, that same comparison shows that the SWP could not come close to requested deliveries (Demands) over that period. Additional information supplied by DWR in the appendices of that report also shows that even after the drought, actual deliveries showed large shortfalls below requests. Table 1 shows the data extracted from the DWR reports. (These data are for Table A requests and Table A deliveries.)

Table 1

COMPARISONS OF ACTUAL DELIVERIES AND REQUESTED DEMANDS (maf/yr) 1987 to 2002

Year	Requested Demands	Actual Deliveries
1987	2.7	2.14
1988	2.6	2.32
1989	3.0	2.71
1990	3.1	2.45
1991	3.5	0.55
1992	3.6	1.38
1993	2.75	2.10
1994	2.7	1.75
1995	3.15	1.87
1996	2.7	2.21
1997	3.0	2.29
1998	3.2	1.62
1999	3.2	2.52
2000	3.6	2.71
2001	4.05	1.39
2002	3.9	2.52

It is apparent that throughout this period the SWP had difficulty meeting requests. It is significant to note that the last several years bracket the year 2001, which is one of the parametric levels of development for which CALSIM II calculates expected deliveries. It is also noteworthy that the average delivery for the last 6 years in this series is virtually the same as the first 6 years, the acknowledged period of the drought. The series shows a trend whereby the requests slowly increase over time but in the last 6 years of the series the contractor requests are virtually at the same level as that parametrized for the CALSIM II 2001 run. Accordingly, it is difficult to see how DWR can state that the primary reason that past deliveries are not as high as the model now predicts for the 2001

run is "..that the contractors did not ask for enough in the past." These data clearly show that the SWP has difficulty averaging more than 2.0 maf independent of request levels. It also demonstrates why it is important to calibrate this model so that we can deduce why it fails to accurately reproduce the historical record by any ordinary accounting. We may conclude that the CALSIM II model, absent calibration, is inadequate for any application relying on the accuracy of its calculations. One may state that, based on the data record of requests and deliveries, that the CALSIM II model overestimates deliveries by at least 50% on average. We can further state that the SWP based on the history of actual deliveries can not be relied upon for more than 2.0 maf of total delivery, approximately 48% of Table A entitlements. The record also clearly shows that in the depths of a prolonged 6 year drought that the average reliable delivery is not more than 38%(See my analysis of the statistical analysis of the CALSIM II calculations; "ANALYSIS OF SWP RELIABILITY OF DELIVERY", November 11, 2003.) We may further state that without a peer reviewed calibration and appropriate documentation, that CALSIM II cannot be relied upon for the accuracy of its calculations. These are all important conclusions regarding, the adequacy of CALSIM II to support environmental impact analysis or for estimating SWP delivery reliability.

We also note that the charts presenting the results of the CALSIM II runs in support of the Monterey EIR seem to predict even higher deliveries overall than was shown in the DWR reliability report for ostensibly the same conditions and constraints. The reliability report presents 73 year average deliveries of approximately 3.1 to 3.2 maf for the 2020 scenario while the more recent runs are reporting 3.4 maf for the same scenario. A difference of this amount needs to be explained as to where the additional water is coming from.

Another factor affecting the accuracy and utility of CALSIM II calculations is the reconciliation of its optimal outputs with feasible SWP operational scenarios. It is a characteristic of an optimization methodology as used in CALSIM II to substitute the optimization algorithm for the detailed simulation of all the decision operations that properly depict the real system. In the particular optimization used in CALSIM II the set of solution weights is the surrogate for all the decision criteria that would ordinarily be simulated. In order to render the results of the optimization calculations useful, the set of solution weights must be reduced to a realistic, feasible set of decision criteria that can be implemented. Otherwise, there is no assurance that the optimization results are realizable.

Environmental Impact analysis

DWR has recently presented draft presentations of CALSIM II outputs in support of environmental impact analysis for the Monterey Amendments EIR. These calculations are performed on the same basis as those used in the SWP reliability of delivery analysis in that the model is not calibrated and the methodology is the same. However, the impact analysis proceeds on assumptions that may or may not be applied to previous calculations for reliability delivery. Most important, beyond the fundamental deficiency of an uncalibrated model, are the assumptions made on the priority of exports.

One of the fundamental scenarios in effect mandated by the Court of Appeals is to study the "no project alternative." This is the scenario where it is envisioned that DWR invokes Article 18(b) to address the chronic deficiency to deliver full entitlement

amounts as articulated in the SWP contracts. If Article 18(b) is invoked it requires that DWR reduce uniformly the stated Table A entitlements of all the contractors down to a level that reasonably conforms to the ability of the project to deliver those entitlements reliably. The data in Table 1 above suggest that this new level of aggregate entitlement should be about 2.0 maf or less compared to the original 4.23 maf of the original contracts. This represents a uniform lowering of contractor entitlements of approximately 47%. If DWR were to take this action, it would raise the question of how water exports would be managed when there is more water coming into the Delta than would seem necessary to meet entitlements, the so-called "surplus" water.

The calculations performed by DWR with CALSIM II assume that all the water that arrives in the Delta is available after meeting regulatory requirements in the Delta and after providing for Delta uses. The regulatory requirements that are assumed are those prevailing today. Therefore, the calculations simply treat the surplus water created by invoking Article 18(b) as water to be freely exported as before. In consequence, the amounts shown in the preliminary runs show nearly similar totals to those without invoking Article 18(b). The only significant difference between runs with and without Article 18(b) invoked is the label put on the water exported; the amounts are the same.

There are several things wrong with this assumption regarding surplus water. If indeed there is water that is surplus to regulatory constraints it does not necessarily mean that it is in the same entitlement category as entitlement water (i.e. Table A water). This is especially true when one considers that present operations have not redressed nor restored the Delta environment. If water is surplus beyond entitlement water its use to redress environmental damage in the Delta must be given priority over exports as surplus. At the very least, CALFED should not be required to pay for water to put in the environmental water account to offset costs to would-be entitlement exports when the SWP is mandated to stop pumping for protection of endangered species. In fact, export of so-called surplus water should be accorded lower priority than any watershed of origin claims. In other words, surplus water should be dedicated to protection of the environment in the watershed of origin before consideration is given to export to what are recognized as junior water rights holders. We cannot accept that export water has superior claim to water originating in the Sacramento and Trinity watersheds in analyzing environmental impacts of this project. The environmental impact analysis must consider the use of surplus water in fashioning an environmentally superior alternative to the assumed no-project alternative used in developing CALSIM II estimates. Furthermore, we must acknowledge that regulatory constraints established on the basis of existing operations, especially when considering the adversarial nature of the process of water rights hearings, cannot be considered as fixed limits on future operations that on their face propose to export at least 50% more water than the conditions that led to those constraints. Calculations that purport to show that 50% more water can be exported than present operations must be subjected to careful scrutiny as to the likelihood of even more damage to the environment than has already been sustained. We cannot simply assume that the existing constraints are satisfactory to de-limit environmental impacts in the face of increased exports. The calculations must reflect real considerations of more stringent constraints with increasing exports if they are to be used for environmental impact assessments.

In previous meetings of the EIR sub-committee on modeling, flow charts of the simulation network that is modeled were presented. At those meetings objections were raised concerning the lack of any fidelity in network representation for south-of-Delta operations. This especially concerns operations of the San Joaquin and Stanislaus rivers as well as the operations of the Kern Water Bank. We have since learned that detailed networks for the San Joaquin and Stanislaus systems have indeed been developed for other analyses. We see no reason why this detail should not be included in the CALSIM II model used for the Monterey Amendments EIR. We also note that even in this additional detail, no distinction is made between exports of entitlement and surplus water as far as priority of uses in the model calculations. We request that in all CALSIM II simulated systems in either the Sacramento or San Joaquin valleys carefully reflect that surplus water flows, where ever they may occur, should be represented as lower priority than water shed of origin uses, whether in-stream or diversions for beneficial use.

We have also learned that SWP and CVP contractor demand functions are used on their face to establish the amounts of exports that guide the optimization of the CALSIM II model, while the settlement contractors in the area-of-origin are modeled by simulation of actual applied water requirements based on land use. Since the water rights of export are necessarily junior to those of the settlement contractors we see no reason why export contractor demand, at a minimum, should not be modeled to the same degree as the settlement contractors. In fact, the modeling of settlement contractor demands based on land uses in the Sacramento and Feather River areas show that these diversions are approximately 1maf less than the maximum under the settlement contracts. This means that export amounts calculated by CALSIM II include in effect a "borrowing" of water that by right belongs to settlement contractors. Is it proper to include such water as entitlement water to exporters when it may in fact be taken by senior rights holders at some unspecified time?

We also note the export demand functions are assumed at Table A levels for all but the two largest contractors, MWD and KCWA, even though most of the contractors do not have sufficient storage to balance wet year deliveries with dry year deliveries. (See my analysis of the reliability report previously cited.) We also note that the SWP contractor demand functions for each contractor must be developed consistent with the ability of the contractor to accept SWP water when it is available. In many cases, without equalizing storage, a contractor cannot even accept his full annual entitlement because of capacity constraints. Our calculations on this limitation could limit the effective delivery of entitlement water to about 60% of the full Table A annual entitlement in some cases. The degree to which a specified contractor can avail himself of SWP deliveries depends critically on how he structures his priority of use of his different sources of supply. To maximize SWP entitlement deliveries, a contractor may often have to forego the use of a cheaper, local source and instead pay a little more to secure a higher reliability of delivery of SWP water. To our knowledge none of these considerations have been factored in to the assumptions of contractor demand and the preliminary calculations produced by CALSIM II cannot be taken as realistic.

Reliability of Delivery Analysis

For reliability of SWP deliveries it should be clear that only deliveries against Table A amounts can be accounted. Since the majority of SWP deliveries are designated as M&I, those uses, which entail fixed structures dependent on firm water supplies, cannot be tied to speculative deliveries associated with so-called "surplus" water. The calculations supplied by CALSIM II to date do not distinguish the importance of the delivery categories to the reckoning of reliability of supply. Even those contractors that have some level of equalizing storage by which they can store surplus wet year deliveries to be used in times of drought should have to demonstrate and implement a plan to use the deliveries in that way before any surplus deliveries can be accounted as firm supply, and the amounts of surplus delivery to be expected must meet all the requirements for environmental protection in the watersheds of origin as cited above.

We must also state that DWR's continued use of frequency charts to present the results of its calculations on reliability of delivery is unwarranted. There is no statistical basis presented by DWR to show why drought deliveries should be lumped with normal and wet year deliveries in a single frequency diagram. (Again see my analysis of delivery reliability cited above.) This flagrant misuse of statistics is now being seized upon by local planning authorities who adopt SWP reliabilities that cannot in fact be sustained. The consequence is that in all probability local land use plans are being based on erroneously high deliveries that are the epitome of "paper water." Irrespective of the accuracy and deficiencies of CALSIM II, DWR must provide more robust statistical analyses of CALSIM II outputs if they are to be useful to anyone.

The assessment of SWP delivery reliability must depend on calculations that meet stringent requirements of accuracy and proper statistical practice. Neither requirement is presently met by the CALSIM II model.

Conclusions

Because of the necessity of having accurate estimates of SWP deliveries under the scenarios cast for the EIR impact analyses, it is absolutely required that this model be calibrated and peer reviewed for that calibration. Based on the record to date of SWP operations there is no reason to believe that the CALSIM II calculations have any utility for EIR impact analyses.

The scenarios that have been cast must be reformulated to consider uses of so-called "surplus" water for environmental restorations and enhancement in the water sheds of origin. It cannot be taken as given that water identified by the SWP contracts as surplus to whatever level of Table A entitlements is free to be exported solely to the contractors.

The calculations of CALSIM II must be reported in more detail to deduce environmental impacts. At a minimum, estimates for delivery to each contractor must be reported by month and arrayed against each contractor's monthly requests. DWR must ascertain the validity of each contractor's water supply plan insofar as the use of SWP water is involved. Of particular concern is the availability of equalizing storage in each contractor's service area. This is to assure that no contractor is taking water for beneficial use that can be claimed by a superior right holder in the watersheds of origin.

DWR must provide for a more thorough and robust statistical analysis of CALSIM II's calculated outputs. The present portrayals are simply improper and not

deserving of the effort that has gone in to generating the outputs. The present outputs cannot be used to make any useful estimates of reliability of delivery.

DWR must show that the optimization results represent a feasible solution of realistic decision criteria by which the project can be operated.

ANALYSIS OF SWP RELIABILITY OF DELIVERY

**(Based on the DWR Report:
"The State Water Project Delivery Reliability Report, 2002, Final)**

BY ARVE R. SJOVOLD

November 11, 2003

Introduction

The California Department of Water Resources (DWR) released its final draft of a report presenting its analyses of the reliability of delivery of State Water Project (SWP). The analyses are based on a series of simulations performed with its CALSIM II model, which is a combination of two previously independent models, DWRSIM developed by DWR for the SWP, and PROSIM developed by the Bureau of Reclamation (BOR) for the Central Valley Project. It was deemed necessary to merge these two models because the joint operations in the Delta from which the water is exported have become very integrated.

The CALSIM II model is also being proposed as the primary analytic tool to evaluate the impacts of the SWP under the Monterey Amendments in an EIR now underway. The adequacy of this model is now under scrutiny as part of this EIR process and questions have been raised as to how accurate its calculations are and how well those calculations have been verified by model calibrations.

This analysis of SWP reliability is based on the calculations done with CALSIM II as reported in DWR's report as stated above. This analysis does not assume that those calculations are necessarily accurate but there still is much to be learned from those results even if their accuracy is in question.

This analysis first explores the character of the statistical output of the CALSIM II published results. Then we explore the kinds of interpretations that can be deduced from these results once we understand their statistical character. Some conclusions are then drawn about SWP delivery reliability in general and under varying circumstances that can be expected among the several SWP contractors receiving this water and what they can truly rely on. However, we must stress that even these conclusions are preliminary and still subject to change once the CALSIM II model has been properly calibrated and peer reviewed.

CALSIM Calculations

The basis for the statistical analysis in this report is the CALSIM II output record presented in the referenced report as Table B-3, "Study 2001 SWP Delta water delivery," which provides calculations of the annual export of SWP water over the 73-year period from 1922 to 1994. The reference to 2001 in the Table title refers to the condition that all actual hydrologic records for this period have been adjusted to reflect 2001 conditions of development. That is, the withdrawals of water in the Sacramento Valley are based on the level of development evident or reasonably expected to prevail at that time and the

system of dams and diversions are those expected to be in place at that time. The calculations also assume the level of State Water Resources Control Board (SWRCB) constraints that will exist at that time except for variable restrictions that may be imposed by the Endangered Species Act (ESA) to protect targeted species in the Delta.

The calculations also make assumptions about the level of demands from the SWP contractors to be supplied by water exported from the Delta by the project. The explicit demand functions for each contractor are not presented in the report but it is evident in Table B-3 that the demands are variable and near the maximum. The Table B-3 calculations present for each year, the level of demand sought by the contractors in the aggregate, the calculated deliveries against those demands (explained in the report to be the "Table A" demands called for in the contracts), the calculated percentage of the full "Table A" demands that the estimated delivery represents, and the calculated delivery of Article 21 water that would be expected to be delivered. (Article 21 water is essentially "surplus" water that is available only on certain conditions and cannot be assumed to be reliably available.) The Table B-3 is reproduced here as Table 1 for reference except the column for the percentage calculation in the original table was not included.

This statistical analysis deals only with the deliveries of Table A water that DWR is obligated to deliver when it is available to meet contractor requests. Reliability of delivery should be related solely to that water that DWR is obligated to deliver.

How is Reliability defined?

Reliability is not a precisely calculated attribute. It involves considerations of risk. For water supply, one normally establishes the level of risk for shortfalls in the supply at some level of probability. For "Safe Yield" calculations for reservoirs like Cachuma in Santa Barbara County, a reservoir dedicated primarily to urban supply, the risk level is established at a 5% chance of not delivering the stated "safe yield" in any given year if the worst drought of record is repeated. This is a relatively prudent choice if the record of runoff supplying the reservoir is sufficiently lengthy to provide confidence in the calculation. For Cachuma, the worst drought is probably the late 40s and early 50s and it establishes a six year period that the reservoir must carry-over water before it is refilled and spilling.

For SWP contractors, it is apparent that no one level can be chosen that will provide the same risks to all. Each contractor has different capabilities to withstand a drought depending on his particular mix of other water supplies. So it is important for each contractor to be able to deduce what level of deliveries he can utilize and rely on from the SWP so that he may be able to efficiently operate all of his sources in conjunction. Since the SWP is not operated to carry-over significant amounts of water for more than a year, it is important to characterize the level of deliveries that can be expected over a variety of conditions. In this manner, each contractor can deduce the reliable level of SWP deliveries appropriate to his system of water supplies.

Since periods of drought are the ones that stress water supplies, the calculation of reliability must focus strongly on the project's capability to deliver water in those periods. Contractors that have significant storage means may be able to take delivery of more water in preceding wet periods to be held in reserve for use in droughts. Thus such a contractor can improve his capability to serve demand during droughts. However, that

TABLE 1

CALSIM RESULTS, TOTAL SAMPLE=73

OBSERVATION		MODEL_DEM	CALSIM_DE	ART_21	*KEYWORDS
	1922	3407	3389	175	
	1923	3717	3727	143	
3	1924	3961	1014	0	
	1925	3940	1502	0	
	1926	3777	2951	0	
5	1927	3543	3504	220	
7	1928	3897	3337	155	
	1929	3952	1037	0	
	1930	3922	2697	92	
10	1931	3971	1141	0	
1	1932	3673	1620	199	
2	1933	3938	1663	134	
13	1934	3981	1689	0	
4	1935	3697	3439	81	
5	1936	3769	3638	0	
16	1937	3451	3297	87	
17	1938	3418	3438	470	
8	1939	3673	3475	227	
9	1940	3713	3544	102	
20	1941	3013	3036	100	
1	1942	3583	3599	513	
2	1943	3632	3545	447	
23	1944	3563	3449	0	
	1945	3612	3479	136	
5	1946	3710	3724	3	
26	1947	3954	2652	0	
27	1948	3959	2681	2	
8	1949	3864	2568	2	
9	1950	3812	2909	0	
30	1951	3779	3794	311	
1	1952	3078	3108	103	
2	1953	3790	3801	272	
33	1954	3833	3803	98	
34	1955	3761	1694	0	
5	1956	3639	3649	261	
6	1957	3759	3331	96	
37	1958	3481	3492	441	
8	1959	4055	3506	265	
9	1960	4115	1795	0	
40	1961	4115	2873	0	
41	1962	3689	3158	21	
2	1963	3634	3630	223	
43	1964	3907	3262	5	
44	1965	3586	3256	98	
5	1966	3722	3731	147	
6	1967	3439	3424	497	
47	1968	3792	3548	402	
8	1969	3157	3151	100	
	1970	3714	3727	406	
	1971	3837	3845	0	
51	1972	4012	3057	2	
2	1973	3611	3592	261	
3	1974	3649	3664	287	
54	1975	3720	3737	415	
5	1976	4014	3150	110	

CALSIM RESULTS, TOTAL SAMPLE=73 (Cont.)

	OBSERVATION	MODEL_DEM	CALSIM_DE	ART_21	*KEYWORDS
56	1977	3948	804	0	
57	1978	3126	3036	100	
58	1979	3527	3509	140	
59	1980	3197	3208	100	
60	1981	3834	3532	124	
61	1982	3451	3471	386	
62	1983	3007	3036	200	
63	1984	3692	3706	408	
64	1985	3753	3540	0	
65	1986	3345	3023	51	
66	1987	3904	2894	0	
67	1988	4026	967	0	
68	1989	4097	2902	0	
69	1990	3961	1101	0	
70	1991	3957	983	0	
71	1992	3880	1199	0	
72	1993	3559	3505	133	
73	1994	3739	3272	9	
74	*VARIABLES	DEM	DELKAF	ARTKAF	
75	*KEYWORDS				

capability for that contractor does not necessarily improve the prospects of those contractors without much storage who must rely on SWP.

The first step then is to examine the CALSIM II calculated output record in Table 1 to establish the temporal variations in expected deliveries.

Statistical Character of the 73 year record

Table 1 presents the results of the CALSIM II model for the 73 year period, 1922 to 1994. This record was analyzed using standard statistical techniques available in a software package called "COSTAT," which includes a variety of standard calculational routines for multiple regression as well as simple univariate data sets. Only the univariate capability was necessary to apply here.

The results of a univariate analysis of the entire 73 year sample are presented in Table 2 and in Figure 1. Table 2 shows the sample mean, variance, standard deviation, and other attributes of the data set. Figure 1 shows the histogram of the frequency of different levels of delivery. Figure 1 is most interesting in that it shows the sample to comprise two distinct domains, one constituting most of the sample showing the deliveries for what can be called normal or wet years and the other constituting the collection of dry years. There is a region in between these two domains, between 2100 and 2540 taf (thousands of acre-feet) for which there are no calculated deliveries. According to Table 2 the average of this 73 sample is 2961.8 taf which is not within the main mode of the normal/wet year data. Thus the sample average is not representative of any particular attribute of this bi-modal distribution.

Statistical tests were performed to determine whether or not these two subsets of the data, normal/wet and dry, can be considered to come from the same population. The answer is most definitely not. To perform this test the 73 year period was separated into the two nominal populations for which means and variances were calculated and tested for significant differences using a standardized "t-test." The probability that such a bi-modal distribution could be drawn from one population by chance is infinitesimally small. Accordingly, no confident statements can be made about probabilities of delivery by assuming the sample to come from one population. **As a consequence, the reported average and the use of the frequency charts in DWR's report are without statistical validity. No probabilistic statement of delivery reliability can be derived solely from the frequency charts presented in the report.**

If we examine the record of calculated deliveries shown in Table 1, it is quite evident that there are extensive dry periods, the worst of which is shown as that from 1929 through 1934. In fact, this is referred to as the historic worst drought. The drought most recently experienced, 1987 through 1992, also 6 years in duration, was almost as severe from a hydrologic standpoint. Each of these two periods has embedded one decent year that if it were not part of the drought episode would not be so significant. The fact that it is embedded is important because following a dry year or dry sequence the embedded year is not good enough to refill the two big SWP reservoirs, Oroville and San Luis, for the following year. Hence it is part of the drought sequence. (It would have been helpful to understanding SWP operations if the calculated record showed the end of water year storage levels for these two reservoirs.)

LETTER 4

TABLE 2
ANALYSIS, TOTAL SAMPLE

Data Set: SWP_REL.cst
Date & Time: 01-04-80 09:37 am

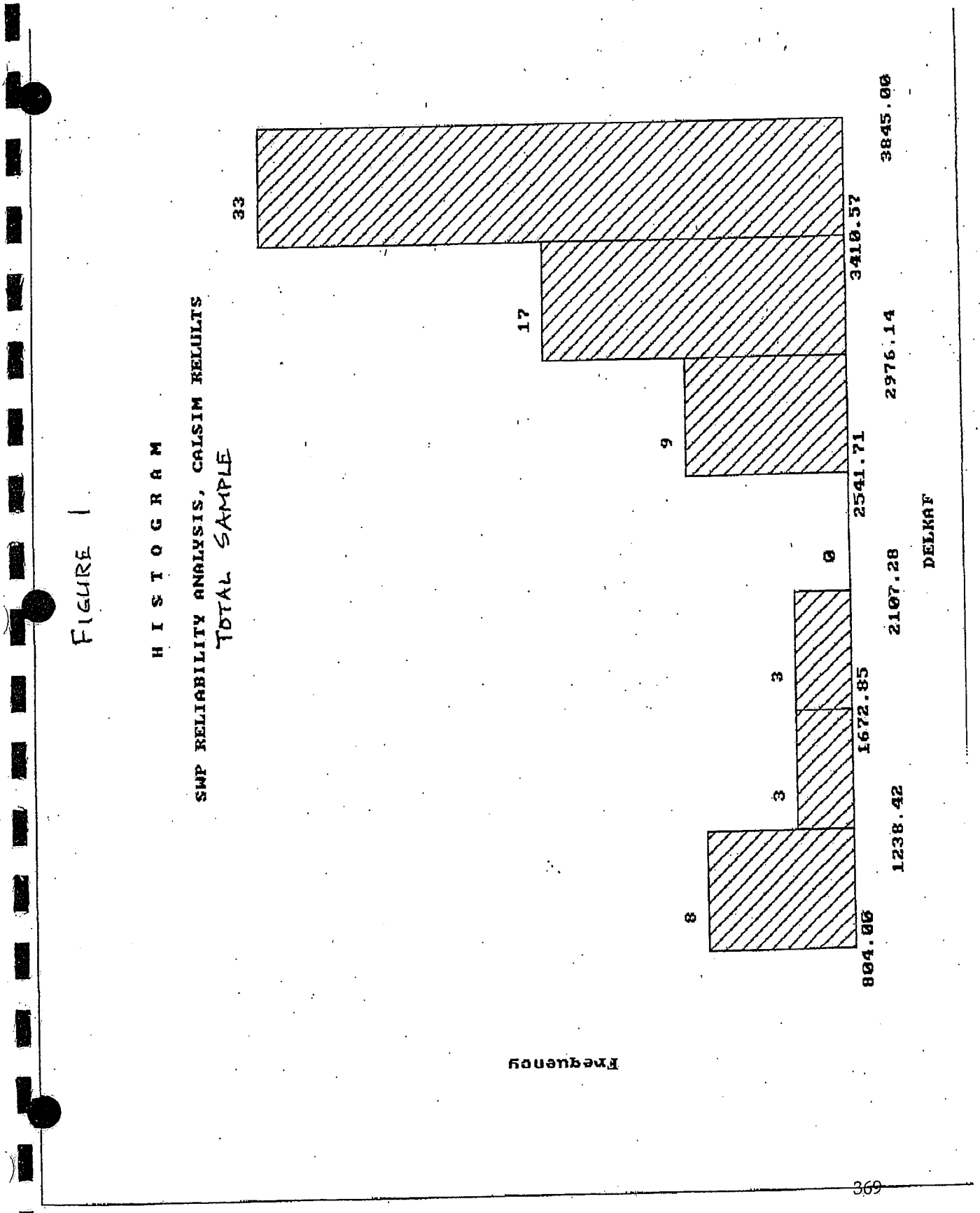
UNIVARIATE DATA ANALYSIS : (DELKAF)

Data Description		Descriptive Measures	
# of observations	: 73	Mean	: 2961.781
# of missing values	: 0	Std Dev(Sample)	: 878.175
Maximum	: 3845.000	RMS(Population)	: 872.139
Minimum	: 804.000	Median	: 3297.000
Range	: 3041.000	1st Quartile	: 2785.000
		3rd Quartile	: 3544.500
		Skewness	: -1.269

Inferential Values

Measures		Confidence Interval (95%)	
Mean	: 2961.781	Lower	: 2760.327
Std Error	: 102.783	Upper	: 3163.235

FIGURE 1


H I S T O G R A M
SWP RELIABILITY ANALYSIS, CALSIM RESULTS
TOTAL SAMPLE
Frequency
33
17
9
0
3
3
8
3845.00
3410.57
2976.14
2541.71
2107.28
1672.85
1238.42
804.00
DELKAF

SWP RELIABIITY ANALYSIS, DROUGHT YEARS

	OBSERVATION	MODEL_DEM	CALSIM_DE	ART_21	*KEYWORDS
1	1929	3952	1037	0	
2	1930	3922	2697	92	
3	1931	3971	1141	0	
4	1932	3673	1620	199	
5	1933	3938	1663	134	
6	1934	3981	1689	0	
7	1988	4026	967	0	
8	1989	4097	2902	0	
9	1990	3961	1101	0	
10	1991	3957	983	0	
11	1992	3880	1199	0	
12	*VARIABLES	DEM	DELKAF	ARTKAF	
13	*KEYWORDS				

TABLE 4
ANALYSIS, DROUGHT YEARS

Data Set: SWP_REL4.cst
Date & Time: 01-04-80 09:18 am

UNIVARIATE DATA ANALYSIS : (DELKAF)

Data Description		Descriptive Measures	
# of observations	: 11	Mean	: 1545.364
# of missing values	: 0	Std Dev(Sample)	: 678.004
Maximum	: 2902.000	RMS(Population)	: 646.452
Minimum	: 967.000	Median	: 1199.000
Range	: 1935.000	1st Quartile	: 1037.000
		3rd Quartile	: 1689.000
		Skewness	: 1.069

Inferential Values

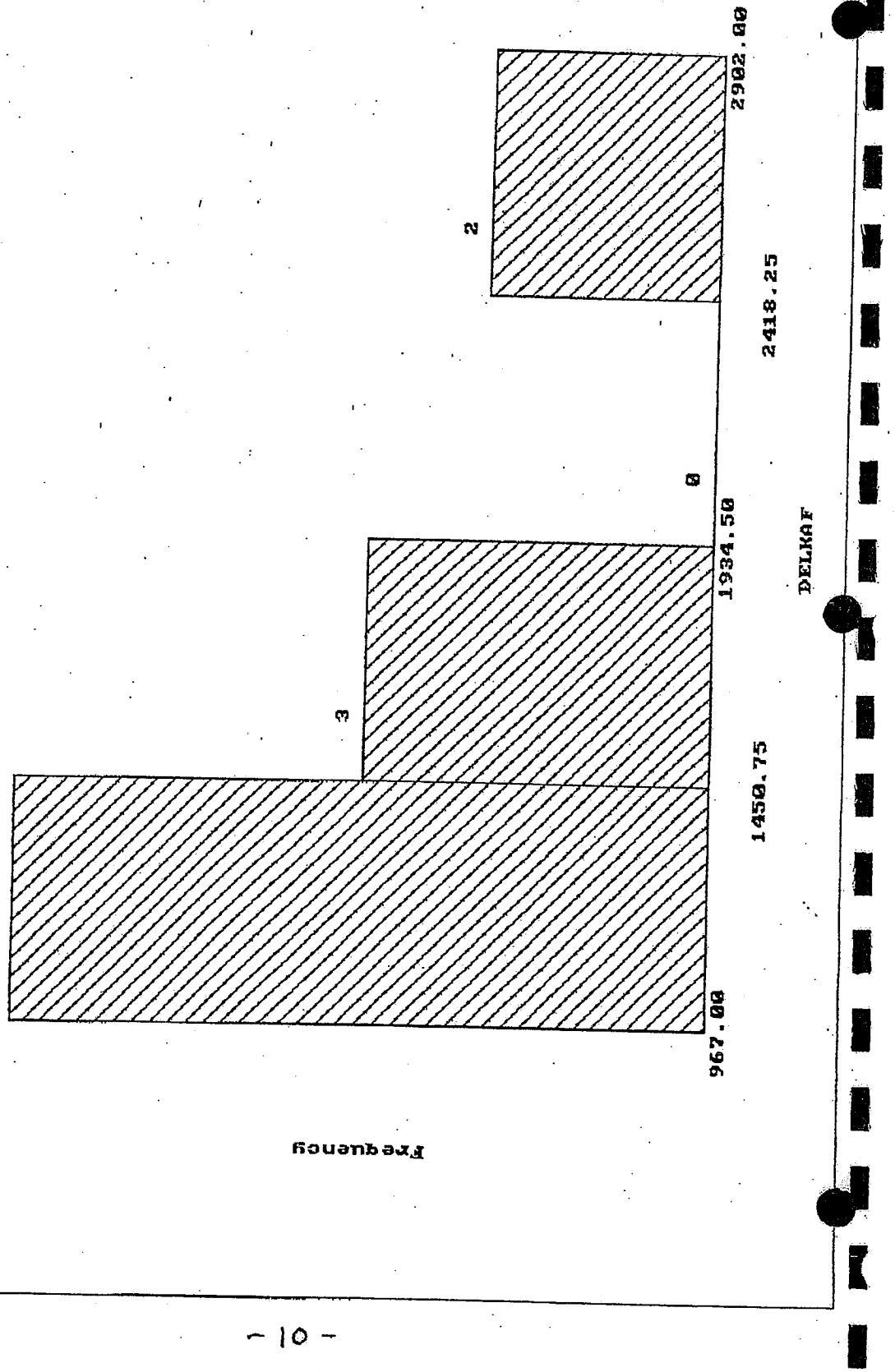
Measures		Confidence Interval (95%)	
Mean	: 1545.364	Lower	: 1089.903
Std Error	: 204.426	Upper	: 2000.825

FIGURE 2

HISTOGRAM

SWP RELIABILITY ANALYSIS, CALSIM RESULTS

DROUGHT YEARS



LETTER 4

SWP RELIABILITY ANALYSIS, NORMAL_WET YEARS

	OBSERVATION	MODEL_DEM	CALSIM_DE	ART_21	*KEYWORDS	W
1	1922	3407	3389	175		1
	1923	3717	3727	143		1
	1926	3777	2951	0		1
	1927	3543	3504	220		1
	1928	3897	3337	155		1
	1930	3922	2697	92		1
	1935	3697	3439	81		1
3	1936	3769	3638	0		1
	1937	3451	3297	87		1
0	1938	3418	3438	470		1
1	1939	3673	3475	227		1
2	1940	3713	3544	102		1
	1941	3013	3036	100		1
4	1942	3583	3599	513		1
5	1943	3632	3545	447		1
	1944	3563	3449	0		1
7	1945	3612	3479	136		1
8	1946	3710	3724	3		1
	1947	3954	2652	0		1
	1948	3959	2681	2		1
1	1949	3864	2568	2		1
2	1950	3812	2909	0		1
	1951	3779	3794	311		1
	1952	3078	3108	103		1
5	1953	3790	3801	272		1
	1954	3833	3803	98		1
	1956	3639	3649	261		1
8	1957	3759	3331	96		1
	1958	3481	3492	441		1
	1959	4055	3506	265		1
1	1961	4115	2873	0		1
2	1962	3689	3158	21		1
	1963	3634	3630	223		1
	1964	3907	3262	5		1
5	1965	3586	3256	98		1
	1966	3722	3731	147		1
	1967	3439	3424	497		1
8	1968	3792	3548	402		1
9	1969	3157	3151	100		1
	1970	3714	3727	406		1
1	1971	3837	3845	0		1
2	1972	4012	3057	2		1
	1973	3611	3592	261		1
	1974	3649	3664	287		1
5	1975	3720	3737	415		1
	1976	4014	3150	110		1
	1978	3126	3036	100		1
8	1979	3527	3509	140		1
9	1980	3197	3208	100		1
	1981	3834	3532	124		1
	1982	3451	3471	386		1
2	1983	3007	3036	200		1
	1984	3692	3706	408		1
	1985	3753	3540	0		1
5	1986	3345	3023	51		1

373

SWP RELIABILITY ANALYSIS, NORMAL_WET YEARS (Cont.)

	OBSERVATION	MODEL_DEM	CALSIM_DE	ART_21	*KEYWORDS	W
56	1987	3904	2894	0		1
57	1993	3559	3505	133		1
58	1994	3739	3272	9		1
59	*VARIABLES	DEM	DELKAF	ARTKAF	*KEYWORDS	*
60						
61	*KEYWORDS					

ANAYSIS, NORMAL-WET YEARS

Data Set: SWP_REL2.cst
Date & Time: 01-04-80 09:21 am

UNIVARIATE DATA ANALYSIS : (DELKAF)

Data Description		Descriptive Measures	
# of observations	: 58	Mean	: 3363.776
# of missing values	: 1	Std Dev(Sample)	: 324.661
Maximum	: 3845.000	RMS(Population)	: 321.850
Minimum	: 2568.000	Median	: 3460.000
Range	: 1277.000	1st Quartile	: 3139.500
		3rd Quartile	: 3606.750
		Skewness	: -0.659

Inferential Values

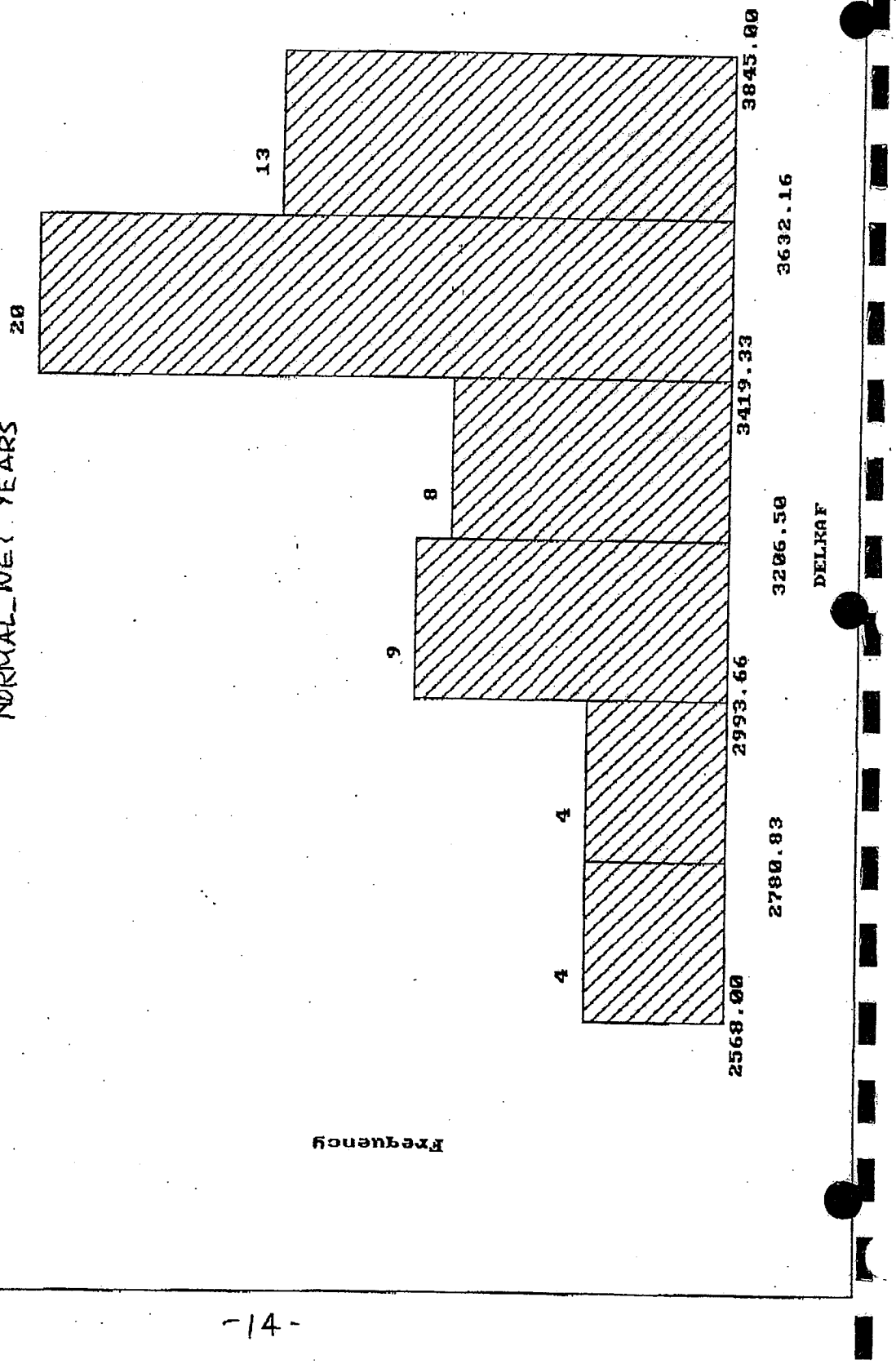
Measures		Confidence Interval (95%)	
Mean	: 3363.776	Lower	: 3278.516
Std Error	: 42.630	Upper	: 3449.036

FIGURE 3

HISTOGRAM

SWP RELIABILITY ANALYSIS, CALSIM RELULTS

NORMAL_WET YEARS



Further analyses were undertaken treating the two domains as independent populations. Because the dry year set comprises both the dry sequences of drought and several individual dry years sprinkled throughout the record, we have focused the dry year analyses on the drought periods. The two periods are combined into one population for analysis since their means and variances are reasonably consistent. However, we did exclude the beginning year, 1987, for the second period as it was not embedded in the sequence and could easily be classified as a fair to good year. Thus, we ended with a sample of 11 years, 6 years between 1929 and 1934 and 5 years between 1988 and 1992. The data set is shown in Table 3 and the resulting statistics are shown in Table 4.

Table 4 shows an average delivery of 1545 taf and a standard deviation of 678 taf. If the year 1987 were included the average would increase to approximately 1657 taf with not much change in the standard deviation. If the two embedded decent years, 1930 and 1989, are eliminated from the sample the average is decreased to 1267 taf with a standard deviation of 302 taf. These changes suggest that judged as separate occurrences these two years may not be statistically representative of the dry population. However, we will assume that the results shown in Table 4 are representative of the expectation for drought periods.

Lastly, we analyze the population for the normal/wet periods, a record of 58 years, not all in sequence. The years 1930 and 1987 were included in this sample and the individual dry years not part of either of the extended drought periods were excluded. Table 5 presents the data set used in the analysis and Table 6 shows the calculated statistics. Figure 2 shows the frequency histogram for this data set which clearly depicts a central maximum but still with some skewness. (Skewness is a term used to identify distributions that are not symmetric, that is distributions whose sample mean and median are significantly different.) Table 6 shows an average delivery of 3364 taf with a standard deviation of 325 taf. This then represents what is typical of periods of non-drought, an average that is about 81% of the full Table A value of delivery. The standard deviation represents 9.66% of the average delivery, showing a very consistent delivery for normal and wet periods.

How much delivery can we rely on?

As we stated before, what each contractor can rely on depends on the circumstances of his other sources of supply. However, we now have some valid statistical analyses upon which to base the level of delivery that can be relied on for specific circumstances.

First, we note that for any contractor without significant storage availability, the reliable level of delivery is dictated almost solely by drought conditions. If a particular contractor had no other supply to tap and wanted to pick a confident level of supply from the SWP, he would have to select from among the lowest individual years on record which could be as low as 804 taf, or 19.5% of the full Table A value. However, we assume that most SWP contractors have other sources available with which to operate conjunctively with SWP deliveries and the appropriate level of delivery would be the average value during a drought episode, approximately 38% of the full Table A value. If the average level is to be relied on, the other sources must make up the variation within the drought period. In other words, SWP deliveries would have to be taken at the

available level shown in the CALSIM II output and the other sources of supply available to the contractor would have to made dependent on the SWP deliveries. This might cause a rearrangement of priorities of when all the other local sources are brought in to play in a given year. Ordinarily, local purveyors operate on a least cost basis meaning that sources are used in the order of increasing marginal cost. Since SWP marginal costs are likely in some instances to be greater than some local sources, the requirement to use SWP as available may require it to supersede the priority of some local sources in order that the notion of a reliable average delivery is indeed fact. This switch in priorities would entail some cost increases depending on the differences in marginal costs.

If a contractor has significant storage available, he may be able to store some wet year deliveries to be held in reserve for drought periods thereby increasing his reliance on SWP during droughts. The normal/wet period deliveries at an average of 81% could be relied on with high confidence (95%) at the average minus 1.6 times the standard deviation. This 95% confidence level would then be 69% of the full Table A value. In other words, such a contractor could state with high confidence that in normal or wet periods he can rely on 69% of full Table A deliveries with the strong likelihood that in many years he could receive more if it can be utilized. Whether or not it can be utilized depends again on his willingness to reorder the priorities of use of all his sources with the expectation that such a reordering will increase overall costs of supply slightly.

Even if a highly confident 69% can be relied on for normal and wet periods, that leaves the question of what to do in drought periods. Clearly, there will be sufficient excess delivery from all the years greater than 69% that can be stored for drought use, but the level depends critically on the magnitude of storage. If it was desired to bring the drought level of SWP use up to the normal/wet year reliable level, 69%, enough storage would have to provided to make up the 31% of the Table A value represented by the difference between the drought period average and the 69% level. Thus, 31% per year for 6 years (the worst drought on record) of the contractor's Table A value would have to be kept in storage. This amounts to 1.86 times the contractor's Table A amount and there would have to be some allowance for storage losses, such that 2.5 times would be reasonable. Thus, for such a contractor to rely on 69% deliveries from the SWP through wet and dry periods, he would have to have available in magnitude 2.5 times or so his Table A amount dedicated to SWP storage. For the entire SWP contract in the aggregate, this amounts to 2.5 times 4130 taf or approximately 10 million acre-feet. This would have to be storage south of the Delta since the CALSIM already takes maximum advantage of the pumping capability of the project.

Clearly, the right level of reliance on SWP deliveries depends on the circumstances for each contractor. Because it is highly unlikely that the storage requirement to reach 69% can be achieved for many contractors, especially the larger ones, a level lower than 69% will have to be calculated. Each contractor will have to do so independently.

Some Conclusions

We have shown that the values for SWP delivery reliability presented in DWR's report are not statistically valid. The level of 76%, which represents the average calculated by CALSIM over the 73 year record, cannot be assumed without question by

any contractor and it is highly unlikely that such a level can be substantiated by any contractor. The DWR report does acknowledge that during the two 6 year drought periods, a level of only 39% to 40% can be relied on. However, that is the average for a six year drought period and still requires each contractor to analyze how he will adjust his priorities of use among all his sources. Even levels in wet years may stretch an individual contractor's capabilities given that there are capacity constraints in the aqueducts that prevent taking full deliveries in low demand months without significant means for equalizing storage between low and high demand periods. In all of this it is important to recognize that seizing on an "average" value implies that deliveries will follow the project's capability to pump the amounts calculated in the CALSIM II model. This means that in wet years the water must be taken and either used or stored if the average is to have any meaning. The DWR report is not candid on this aspect.

LETTER 4

The Swans

P. O. Box 1689
17409 Lockwood Valley Road
Frazier Park, CA 93225-1689
(661) 245-1011 or (818) 523-1461-Mobile
(661) 245-4119-Fax swan4us@home-ink.com

August 13, 2004

Castaic Lake Water Agency
Attn. Marylou Cotton
27234 Bouquet Canyon Rd.
Saugus, CA 91350

RE: 41,000 Acre Foot Transfer SCH# 1998041127

Dear Ms. Cotton,

It has come to our attention the Castaic Lake Water Agency is possibly planning to affect a position on the above captioned matter which, in our opinion, will gravely impact the Monterey Agreement EIR process. 99

We also wish to comment that we see a direct conflict of interest and possible injustice to the public and interference with the CEQA process by your agency's spearheading any effort to circumvent, delay, interfere, or otherwise impede the more appropriate participation of the Department of Water Resources, the agency we believe entitled to administrate on behalf of the general public of the State of California in this matter.

We, the below listed voters and community members raise our voices in writing in complete objection to any and all interference by the Castaic Lake Water Agency and formally request the immediate withdrawal of any and all past, present or future water transfer documents until the EIR is complete. Furthermore, we wish to be added to the list of mailings for any matters regarding this subject.

Thanking you in advance for acknowledging our request, we remain,

Sincerely,

Arnold Swan (etal)

Mr. & Mrs. Arnold D. Swan
Mr. & Mrs. Darrel Wildman
Mrs. Suzanne Spahn

(signed on behalf of parties listed)

Cc: TriCounty Watchdogs
P. O. Box 2458, Frazier Park, CA 93225-2458

LETTER 4

Tangerine Man, LLC
POB 426
Ojai, CA 93024

Aug 14th, 2004

Attn: Marylou Cotton

Castaic Lake Water Agency
27234 Bouquet Canyon Rd.
Saugus, Ca 91350
Fax 661 297-1611

Re: 41,000 AF Transfer of water from farmland to Santa Clarita, Northern LA County for urban expansion SCH#19908041127

Dear Ms Cotton:

Water transfers are a statewide issue that induce growth and reduce water for farming. Therefore I believe that your agency is the wrong lead agency for this project; I believe the correct lead agency is the Department of Water Resources, which is both indicated and qualified under state law to address statewide impacts. DWR will also notify all interested parties to the extent of their knowledge. 100

If such a major transfer is allowed to proceed under the lead agency status of a small regional water agency, it will set a precedent that will affect many major water decisions throughout the state of California. I believe it is imperative that such a major change in state policy receive full environmental review and comments from all affected parties. I therefore request that this project be re-noticed by the Dept. of Water Resources acting as lead agency as a project of statewide concern so that all impacts may be disclosed and properly addressed.

Sincerely,

Jim Churchill, Owner

LETTER 4

10,300

Stephan C. Volker
Joshua A.H. Harris

Law Offices of
STEPHAN C. VOLKER
436 14th Street, Suite 1300
Oakland, California 94612
TEL: 510/496-0600 ◆ FAX: 510/496-1366
e-mail: svolker@volkerlaw.com

August 16, 2004

Via Facsimile & Mail

(661)297-1611

Castaic Lake Water Agency
Attention: Marylou Cotton
27234 Bouquet Canyon Road
Saugus, CA 91350

Re: Comment on Draft EIR for 41,000 acre-foot water transfer (State Clearinghouse #1998041127)

Dear Ms. Cotton:

On behalf of California Water Impact Network and Friends of the Santa Clara River, we wish to incorporate by reference the comments submitted on the above DEIR by the Sierra Club. We wish to emphasize, in particular, that Castaic Lake Water Agency is not the correct "lead agency" for this project under the California Environmental Quality Act. As the Third District Court of Appeal made clear in *Planning and Conservation League v. Department of Water Resources*, 83 Cal.App.4th 892, 920 (2000), "DWR, with its expertise on the statewide impacts of water transfers," is the proper lead agency under CEQA for decisions regarding transfers of State Water Project water between SWP water contractors. 101

We also wish to incorporate by reference our Opening Trial Memorandum (filed August 21, 2003) and Reply Trial Brief (filed May 3, 2004) in the matter *California Water Network and Friends of the Santa Clara River v. Castaic Lake Water Agency*, Ventura Superior Court No. 215327. These memoranda point out the importance of recognizing DWR's lead agency status regarding transfers of State Water Project water.

Thank you for considering our comments on this important matter.

Very truly yours,

Stephan C. Volker
Attorney for California Water Impact Network and Friends of the Santa Clara River

SCV:taf

Castaic Lake Water Agency Meeting,)
July 28th, 2004. ")
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Meeting of Castaic Lake Water Agency, Public Comment Section, at 27234 Bouquet Canyon Road, Santa Clarita, California, Public Comment Section commencing at 7:12 p.m., Wednesday, July 28, 2004, before Lisa DiGiovanni, RPR, Certified Shorthand Reporter No. 11969.

INDEX

ATTACHMENTS FOR IDENTIFICATION

1 2-page Letter to Marylou Cotton from Dana Wisehart from United Water Conservation District dated July 26, 2004

2 1-page Letter to Dan Masnada from Ray Pearl and Terra Donion from BIA dated July 28, 2004

SANTA CLARITA, CALIFORNIA

WEDNESDAY, JULY 28, 2004; 7:12 P.M.

MR. KAVOUNAS: Next item on our agenda is Item 3.1, a public hearing of the draft EIR for the Agency's supplemental water transfer of 41,000 acre-feet of State Water Project Table A amount.

The purpose of this hearing is to give the public an additional opportunity to comment on this project and its environmental impacts for consideration by the board. As you will be advised by the staff and the presentation before the hearing, there will be further board proceedings on this draft EIR in the future.

The primary purpose of tonight's hearing is to give the public time to make comments on the draft EIR. The board and staff are not required to ask questions nor make comments or responses to the public's comments.

There will be time for the board's questions, comments and responses in future proceedings. The staff will prepare written responses to comments for the board's review and approval after the comment period ends. I will now turn the item over to Marylou Cotton, the Agency's

water resources manager.

Marylou.

MS. COTTON: Good evening, everyone. Thanks for coming. We have a team of people that are going to be making the presentations tonight on the EIR and setting up the public hearing process. We'll be having our general counsel, Russ Behrens, as one of the speakers. From SAIC, which is the Agency's environmental consultant, we'll have Rob Thomson, who is program manager for the EIR and Lorraine Woodman who's the EIR project manager, and Lorraine will be doing the bulk of the speaking tonight and then there will be me. I have a couple items to cover.

But next I'll turn it over to Russ.

MR. BEHRENS: Thank you, Marylou. I'm just going to give you a little background. As you recall, the previous EIR on the 41,000 acre-foot transfer was certified in 1999. And because that EIR mentioned and related to the Monterey EIR, the court held that because the PCL decision required the Monterey EIR to be decertified, the appellate court on our case held that since we were deemed to have tiered off that EIR, we had to decertify our EIR as well, even though the court stated in some

dictum in the case that and all other respects our EIR was appropriate.

Then after we finished that process on remand, there was a request by the plaintiffs in the case to enjoin us from utilizing in any way the 41,000 acre-foot transfer contracts. And the court, Judge Yaffie, refused to enjoin our use of the 41,000 contracts, but reserved jurisdiction to determine whether or not in the future we were using the 41,000 acre-foot contracts for any improper purpose.

No action was ever filed in front of Judge Yaffie in that regard, but the plaintiffs filed an appeal of Judge Yaffie's order on remand, and it went up to the appellate court and, again, the appellate court refused to enjoin the use by the Agency of the 41,000 acre-foot transfer. And this was further confirmed recently in the Network Groundwater Storage Project because one of the ways we do use our 41,000 acre-foot contract is we get an allocation of water from the State Water Project, which if we don't need, we have the opportunity to store in outside basins outside the agency such as the semitropic.

That case was challenged by Network and

recently the Superior Court of Ventura County refused to enjoin that project and held that it was properly processed with a negative declaration.

So we are now in the process of completing our current EIR. It's being prepared in accordance with all the requirements of law and the court judgments.

I'll now turn it over to Lorraine -- or to Rob to talk about how we process this EIR.

MR. THOMSON: Good evening. This is just a very quick reminder of the CEQA process, where we've been and where we are and where we're going.

Starting up here in the upper left, we -- this agency, following the decertification order, developed a new project description following the directives of the court and developed a new project, published a notice of preparation and a new initial study, and did that in January of 2003, held the 30-day requisite comment period, received comments. Both the NOP and those comments are in Appendix A of the document in total.

Those provided us the scope of the document and provided us with some direction towards the approach. From that we prepared the technical analyses and the administrative drafts of this

document, very complex with multiple iterations and baselines and so on.

After extensive review and analysis, we have now in front of you the draft EIR, and that comment period opened on June 17th. Because of the complexity of this document, the agency determined that it should have a 60-day review period rather than the statutorily mandated 45 days. Comment period will close on August 16th.

From there we'll take the comments that are received and provide responses and develop a final, which then your board will consider, and should you find it to be adequate and certify it and move forward.

With that, I think we go to Lorraine to do a quick review of the EIR itself.

MS. WOODMAN: Good evening.

MR. KAVOUNAS: Good evening.

MS. WOODMAN: The purpose of the project evaluated in this EIR is to meet the existing water demand in the CLWA service area and a portion of future water demand from anticipated growth. This would be accomplished by transferring an existing 41,000 acre-feet of State Water Project Table A amount to CLWA.

The term Table A amount refers to the annual maximum amount of water the State Water Project contractor can request. The Table A amount would be transferred to CLWA from the Kern County Water Agency and its member unit, the Wheeler Ridge-Maricopa Water Storage District.

Project water would be delivered to CLWA through existing State Water Project facilities located between the southern delta and Castaic Lake. No new construction would be required as a result of this project.

This EIR is being prepared by CLWA, which as the lead agency will evaluate and, if appropriate, exercise its discretion to certify the EIR, make findings, and approve the project.

CLWA has assumed the role of lead agency for a number of reasons: The water would be used by CLWA in its service area; it is the major project proponent; it is leading State Water Project water supply contract amendment efforts; it has the expertise to implement the project; and the project impacts only involve a limited geographic area, not the entire state.

Three responsible agencies have been identified. These are agencies other than the lead

agency that have the responsibility for carrying out or approving a project.

The responsible agencies for this EIR are the Department of Water Resources, because State Water Project water and facilities are involved, and the Kern County Water Agency and the Wheeler Ridge-Maricopa Water Storage District, because their Table A amount would be transferred to CLWA.

In compliance with CEQA requirements, these agencies have been active participants in preparing the EIR, and they will use the EIR in making decisions on this project.

This EIR is related to several other EIRs. As Russ noted, this project previously was evaluated in the supplemental water project EIR, which was certified in 1999 and decertified in 2002.

The 1999 EIR tiered from the Monterey Amendment Program EIR which also was decertified. Because the Monterey Amendment is once more undergoing environmental review, the present EIR considers impacts both with and without the Monterey Amendment in place.

The project also is evaluated programmatically in CLWA's capital program and water plan EIR.

The description of the environmental setting is usually based on conditions that are present at the time that the notice of preparation is issued. This project, however, was the subject of an earlier EIR and the transfer already has been implemented.

In order to capture any changes that could have resulted from the transfer, this EIR considers both the conditions that were present at the time that the original notice of preparation was issued, around 1998, as well as current conditions.

Information is provided for all three geographic areas evaluated in this EIR, including those associated with State Water Project facilities and the Wheeler Ridge and CLWA service areas.

No significant direct impacts were identified in the EIR. It was determined that the project would remove an obstacle to growth and that significant, indirect, growth-related impacts on all resources could occur in the CLWA service area.

Most of these impacts would be mitigable to less than significant, although impacts to aesthetics, air quality, biology, transportation, and solid waste disposal may be unavoidable.

This EIR looks at the cumulative impacts of

this project when added to other closely related projects in all three geographic areas. No significant cumulative impacts were associated with the State Water Project or the Wheeler Ridge service area.

Cumulative impacts in the CLWA service area were the same as the growth-related impacts since they would result from the same types of land development.

This EIR considers a variety of alternatives to the project, including: No project, increasing groundwater extractions, exchanging desalinated water for State Water Project water, transferring a smaller Table A amount, and transferring a larger Table A amount.

With the exception of transferring a smaller Table A amount, all of the alternatives would have greater direct impact than the proposed project. Transferring a smaller Table A amount would lessen the project's growth-related impacts, but would not meet the project objective related to augmenting CLWA's water supply to meet existing demand and a portion of future demand.

Thus, the proposed project is identified as the environmentally superior alternative.

Several areas of controversy have been identified. As mentioned earlier, the Monterey Amendment EIR is being revised. Because of the uncertainty surrounding this action, the present EIR evaluates impacts both with and without the Monterey Amendment in place.

Additionally, the potential for growth inducement from increased water supply is an area of known controversy, as is the amount of groundwater available to the Santa Clarita Valley.

I'm going to turn to back to Marylou Cotton.

MS. COTTON: As Lorraine mentioned and Rob mentioned, this is a extremely complex EIR, and has a couple of special features that we don't commonly find in other EIRs.

There are two additional appendices in the EIR. Appendix C is a study that was done by Northwest Economic Associates on the agricultural resources in the Wheeler Ridge-Maricopa Water Storage District service area. It explains the economic rationale for why certain member units of the Kern County Water Agency wish to sell part of their SWP Table A amounts in the first place, the reasons they wanted to do that. It discusses how

they came to that conclusion and any impacts that might be caused by that.

Appendix D is something I'll just say that we are rather proud up of. It's a technical data for hydrologic analysis appendix. It was done by a person named Nancy Clemm, who is a professional engineer. Very well known in the State Water Project family. It is a very complex analysis, as Lorraine mentioned, with and without the terms of the Monterey Amendment of the reliability of CLWAs (inaudible) supplies, the project in general and Wheeler Ridge's -- impacts of Wheeler Ridge's supplies. That appendix is something that is the underpain for some of the conclusions that are present in the EIR.

MR. BEHRENS: As you know, the public comment period ends August 16th. It opened on June 17th. We're going to be receiving these comments tonight. We have a court reporter here that's taking all these comments down that we receive. And the staff will then consider the responses to those comments and report to the board at a later time after the comment period ends, so we can collect not only the comments we received tonight, but those in writing that we receive prior to August 16th.

That report will then be put together, the comments analyzed, and responses to the comments formulated, a matrix prepared for you to review with the staff in a presentation at a future board meeting. We anticipate that the process will be completed, according to the staff's schedule anyway, in November and then for final consideration for certification in December.

That concludes our presentation, Mr. Chairman. And it would be appropriate at this time now to open up the public hearing.

MR. KAVOUNAS: Very well, Mr. Behrens. Thank you. And thank you to all the staff that worked to to prepare this presentation.

I now open the public hearing. I have cards from three speakers that wish to address the agency and the board. If anybody else would like to address the agency, please feel free to fill out a public comment card that is located on the table by the door.

I'd like to call a Ms. Lynne Plambeck.

MS. PLAMBECK: Hi. I'm here speaking as an individual citizen tonight. I'd just like to express my concern that this EIR is proceeding without completion of the Monterey Agreement. I

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think the court was fairly concise about the need for the programmatic EIR in both legal decisions, and they were also very -- very concerned about the lead agency, and Castaic Lake Water Agency is not the right lead agency. It was my understanding prior to this that the two EIRs were moving forward in tandem and they would be completed simultaneously. 102 103 104

And I just think that -- that the folks up north that challenged the EIR will probably continue to challenge the EIR and that they're going to be very concerned that this is proceeding in a manner that's not consistent with an appellate court decision that they won, and that means that even though you know that's there and you're going ahead and doing this anyway, and it sort of seems like a waste of taxpayer's money since there's already a published appellate court decision on it. 105

And so I would just ask you to keep that in mind and that it might be the better part of valor to move the two EIRs forward in tandem as I understood had been originally planned. Thank you.

MR. KAVOUNAS: Thank you, Ms. Flambeck.

Mr. Vince Bertoni for the City of Santa Clarita.

MR. BERTONI: Thank you. Vince Bertoni, interim director of planning and building services for the City of Santa Clarita here on behalf of the City of Santa Clarita.

First, I'd like to thank the board for providing us this opportunity to comment on the project, on the EIR. You have extended the public comment period beyond the normal 45 days to 60 days. You have also held the public hearing during your comment period, which is not required under CEQA, so you've gone above what's the minimum under CEQA and the City appreciates that and also appreciates being provided with all the documentation very quickly and promptly throughout the whole process. So first off, we'd like to thank you for that. 106

Second off, I noticed that by sharing on EIR for water transfer, it's not really the water transfer itself. In regards to the water transfer, I would just say that as we reviewed the EIR it appears that this EIR was prepared for water transfer that would allow to you a few things. One of them would be to provide more reliability in the existing water supply. The other would be to allow for growth that's already been anticipated under existing general plans for both of the City of Santa 107

Clarita and the County of Los Angeles.

So to that extent, the City is supportive of that. The City has always been supportive of additional water reliability and also to make sure that as we plan for our future growth, we will have water supplied for that.

This city has a couple very high-profile projects that it is very important to the City and the point being the City to have adequate water supply for that.

As you know, we're very -- a housing rich city. We are trying to balance that out to be as equally jobs rich and so things such as our employments such as the Center Point Business Park to the south of you or the Gate (inaudible) project in Newhall are very important for the City, very important for the City's goals.

So to the extent that this would provide water for that, that's an important City goal. Also, things such as the redevelopment of downtown Newhall and that revitalization would require some additional water. So the supply part of it, the City is supportive of that additional reliability of water supply.

We reviewed the EIR at the City and we

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reviewed it under the -- to see if it adequately addressed the potential environmental impact to the City of Santa Clarita, and our review indicated that it has. So at this time we have no comment on the EIR and would happy to answer any questions. Thank you. 108

MR. KAVOUNAS: Thank you, Mr. Bertoni. Thank you for taking the time.

Dana Wisehart, United Water Conservation District.

MS. WISEHART: Good evening. And as you've mentioned, I am Dana Wisehart, the general manager of the United Water Conservation District. I provided written comments, but if you don't mind, I'd just like to read some excerpts of the comments into the record.

MR. KAVOUNAS: Please.

MS. WISEHART: The United Water Conservation District has reviewed the draft EIR for the purpose -- for the proposed transfer of 41,000 acre-feet of state project water that will come from the Kern County Water Agency's member unit Wheeler Ridge-Maricopa Water Storage District to the Castaic Lake Water Agency. This proposed transfer of State Water Project water is beneficial to the Santa Clara 109

River Watershed and is fully endorsed by United Water. 109

The permanent transfer of 41,000 acre-feet of State Water Project water to the Castaic Lake Water Agency provides a valuable additional source of water for the Santa Clarita Valley. This additional water improves the potential for conjunctive use of water within the valley. This is especially important given the urbanization of this area. Increased surface water supplies should provide water managers throughout the basin more flexibility with respect to the magnitude of additional groundwater pumping needed to meet the escalating M&I demand for water within the basin. 110

As an ongoing general comment to all water purveyors within the Santa Clarita Valley, United Water has a very real interest in the continued health of the Santa Clarita groundwater basin and the flow of the Santa Clara River. United Water represents the collective interests of downstream residents that depend on the flow of the Santa Clara River for recharge to groundwater, surface water diversions, and environmental mandates.

United Water's goal is that the quantity and quality of water associated with the flow of the 111

Santa Clara River into Ventura County not be diminished. The development and implementation of the inter-agency regional monitoring program of groundwater levels, groundwater quality, surface water flows, and surface water quality -- and you know I am talking about the MOU agreement that we all signed with your upstream purveyors -- should provide ongoing data with respect to the relative health of the Santa Clarita and downstream basins as well as surface water. 111

In the event that surface water flow into Ventura County is diminished in either quantity or quality and can be reasonably linked to overpumping of the aquifer systems and/or surface water discharges to the river within the Santa Clarita Valley, United Water would seek to remedy the problem.

We appreciate the efforts of the Castaic Lake Water Agency to appropriately plan and augment the water supplies of our watershed as represented by this water transfer project.

As I said, my comments do have additional focus on the availability of the -- of the water, but that is covered in your EIR, so I'm not going to read it tonight. Thank you. 112

MR. KAVOUNAS: Thank you.

MR. BEHRENS: May the record show that the letter dated the July 26th from United Water Conservation District signed by Dana Wisehart is made part of the record of the proceedings tonight.

MR. KAVOUNAS: Thank you, Mr. Behrens.

MR. BEHRENS: Thank you, Mr. Chairman.

MR. KAVOUNAS: Mr. Ed Dunn.

MR. DUNN: My name is Ed Dunn. For those that don't know me, I was former I was former director of the Newhall County Water District and former director of this agency, and I remember when I was on this agency there was urban water event or plan that was done, and since then there have been various EIRs and I listened to the lady speak on the EIR tonight and she made mention that these transfers would be transported to the Santa Clarita Valley by way of the state aqueduct.

When talking to DWR and asking how that happened, because this agency used to have originally a 23,000 acre-feet per year allocation from the state, that the state DWR would transfer and transport to Castaic Lake for Castaic Lake Water Agency, but DWR also had allocations from many farmers and other water users in the San Joaquin

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Valley. DWR said that those allocations the CLWA had been subsequently purchasing were designed to take turn-outs in the San Joaquin Valley, and those acre-feet were to get off in the San Joaquin Valley.

In other words, they were telling me that the Tehachapi pumping station and the aqueduct, that is I guess mostly owned for use by the Metropolitan Water District, was not designed to transport those farmers' allocations here.

So I have asked when I was on the agency and I have asked as a public comment when I'm not on the agency what contracts do you have with Metropolitan Water District or DWR that says you can transport that water that you are purchasing, those additional purchases here? Doesn't matter if you've banked them up there. Some day you will want to transport them here, and I am told there are no such contracts.

We know now that since the Arizona and those people are cutting off MWD's allocations by way of Colorado River, MWD now has to rely more heavily on the DWR and their allocation in this aqueduct and the capacity in the aqueduct. Many unaware, even in our community, that Castaic Lake Water Agency only has 5,000 acre-foot of storage in

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the Castaic Lake. Many think we've got a real good reservoir here, and we'll really high and dry.

And so with the demand that MWD is going to have on the aqueduct now more so demand 'cause you can't get it from the Colorado River, and with the drought situations, and this agency has no contracts that they can transfer those additional allocations here, and I heard nothing in the words tonight just like it was going to be transferred. Nothing was in the Urban Water management plan. It kind of scares me that we're going to sit here in the drought situation and MWD is going to need their full capacity of Castaic Lake and their full capacity of the state aqueduct, and all this water you purchased you can't bring here.

I would like to see that addressed in the EIRs. I would like to see that addressed in the urban water management plans that you can bring this water here. Thank you.

MR. KAVOUNAS: Thank you, Mr. Dunn.

Next is Mr. Larry Manikin.

MR. MANIKIN: I have bolded my comment, and I still have to put my glasses on.

Thank you for the opportunity to make public comment on tonight's issue concerning the

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transfer and ultimate storage of potentially 41,000 acre-feet of State Water Project water.

First, I am Larry Manikin, and president of the Santa Clarita Valley Chamber of Commerce. Our organization is the largest business association in the region with, as of last week, nearly 1,700 business members. There is no issue more important in the future of this community than the availability of water. Having available water impacts almost every segment of this community business and consumer marketplace. Having water, as all of you know, is about planning. It's about, again, as all of you know, it's about having local agency being aggressive in the way they find and bring new water into the valley, and most importantly, it's about the economic future of the Santa Clarita Valley. 114

My job as president of the Chamber achieved spokesman of the business community is twofold. First, I work with companies from outside of the this market and try to encourage them to locate their company or business here. I am heavily involved in business recruitment.

Second, and probably more importantly, I am actively involved with working with local companies

to assure that they have the right kind of political, economic, and physical infrastructure in place to make it possible for them to grow their respective businesses.

Regional economic analysts have predicted -- and I heard this at a meeting this spring -- they predicted that we will generate some 4,700 new jobs here in the valley this year alone. I suspect we're ahead of that pace already.

In looking at specific projects, one project, Center Point Business Park which is now under construction will generate an estimate -- estimated 8,000 new jobs over the next few years.

Many other such project are either now on the books or have actually started development. There is no issue more important to many of these companies than knowing that one, two or ten years from now they can turn on a water facet and actually have water flow out of it.

The issue you are discussing this evening will provide these companies with some sense of security that water, in fact, can and will be available to them during times of drought.

I highly encourage you to continue to make the necessary decisions that can and will make these

new water resources available to both our existing business community and to those businesses that will soon call us home in the future. Thank you. 114

MR. KAVOUNAS: Thank you, Mr. Manikin.

The last comment card I have is from Mr. Terra Donlon.

MS. DONLON: Good evening. My name is Terra Donlon. I'm the director of government affairs for the building industry association.

On behalf of approximately 400 companies and their representative employees who make up the Greater L.A./Ventura chapter the BIA, thank you for your opportunity to comment this evening.

BIA is pleased to see that CLWA has produced a new EIR for the litigation pending on the transaction which can be resolved. The CLWA transfer of 41,000 acre-feet of water from Kern County in 1999 represented wise water planning at the time for the Santa Clarita Valley. Such planning and water management programs on the part of CLWA ensures that its current users as well as future users will be assured safe and reliable drinking water. 115

BIA would like to commend CLWA and its agency and staff for taking these preemptive actions

and we urge you to support and certify this EIR. 116

MR. KAVOUNAS: Thank you very much, Ms. Donlon.

MR. BEHRENS: Mr. Chairman, we have a letter here dated July 28, 2004 to Mr. Dan Masnada from BIA signed by Terra Donlon and Ray Pearl. I'd like to make this part of the record.

MR. KAVOUNAS: Very good.

MR. BEHRENS: Thank you, Mr. Chairman.

MR. KAVOUNAS: I have no other requests from anyone to speak to the board to comment on this draft EIR. And I see no hands from the audience. At this time I will close the hearing. And I'd like to thank everybody for coming out and giving us their thoughts and opinions on the EIR.

(Hearing concluded at 7:44 p.m.)

LETTER 4

ENDANGERED HABITATS LEAGUE
DEDICATED TO ECOSYSTEM PROTECTION AND SUSTAINABLE LAND USE

August 19, 2004

VIA FACSIMILE

Marylou Cotton
Castaic Lake Water Agency
27234 Bouquet Canyon Rd.
Saugus, Ca 91350
Fax 661 297-1611

Re: 41,000 AF Transfer of water from farmland to Santa Clarita (SCH#19908041127)

Dear Ms. Cotton:

Endangered Habitats League is concerned that your agency is the wrong lead agency for this project. Water transfers are a statewide issue that induce growth and reduce water for farming. They should be addressed by an agency that is qualified under state law to address statewide impacts and will notify all interested parties. In this case, this is the Department of Water Resources. 117

The impacts of this transfer are considerable and affect a wide variety of interest, yet sufficient notification has not occurred, for example to our group. 118

If such a major transfer is allowed to proceed under the lead agency status of a small regional water agency, it will set a precedent that will affect many major water decisions throughout the state of California. It is imperative that this major change in state policy receive full environmental review and comments from all affected parties. We therefore request that this project be re-noticed by the Dept. of Water Resources acting as lead agency as a project of statewide concern so that all impacts may be disclosed and properly addressed. 119

Sincerely,

Dan Silver, MD
Executive Director

8424-A SANTA MONICA BLVD., #592, LOS ANGELES, CA 90069-4267 ♦ WWW.EHLEAGUE.ORG ♦ PHONE 213.804.2750 ♦ FAX 323.654.1931

LETTER 4

County of Los Angeles Public Library
7400 East Imperial Hwy., P.O. Box 7011, Downey, CA 90241-7011
(562) 940-8461, TELEFAX (562) 803-3032

MARGARET DONNELLAN TODD
COUNTY LIBRARIAN

August 23, 2004

Mary Lou Cotton
Water Resources Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Rd
Santa Clarita, CA 91350

NOTICE OF COMPLETION FOR DRAFT ENVIRONMENTAL IMPACT REPORT CASTAIC LAKE WATER AGENCY SUPPLEMENTAL WATER PROJECT TRANSFER

Dear Ms Cotton:

This is in response to the Notice of Completion for the Draft Environmental Impact Report for the Castaic Lake Water Agency Supplemental Water Project Transfer. The County of Los Angeles Public Library has reviewed the document and determined that this project will not have an impact on library services. 120

If you have any questions, or need additional information, please feel free to call Malaisha Hughes at (562) 940-8455.

Sincerely,

Malou Rubio
Head, Staff Services

MR:MH
U:\STAFFSERVICES\DEVELOPER FEE\EIR\Castaic Lake Water Agency.doc

c: David Flint, Assistant Director, Finance and Planning

LETTER 4

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San Bernardino County: Paul Biane, San Bernardino County • Bill Alexander, Rancho Cucamonga • Edward Burgnon, Town of Apple Valley • Lawrence Dale, Barstow • Lee Ann Garcia, Grand Terrace • Susan Longville, San Bernardino • Gary Ovitt, Ontario • Deborah Robertson, Rialto

Ventura County: Judy Mikels, Ventura County • Glen Becerra, Simi Valley • Carl Morehouse, San Buenaventura • Toni Young, Port Hueneme

Orange County Transportation Authority: Charles Smith, Orange County

Riverside County Transportation Commission: Robin Lowe, Hemet

Ventura County Transportation Commission: Bill Davis, Simi Valley

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September 3, 2004

Ms. Mary Lou Cotton
Water Resources Manager
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

RE: **Comments on the Draft Environmental Impact Report for the Castaic Lake Water Agency Supplemental Water Project Transfer – SCAG No. I 20040379**

Dear Ms. Cotton:

Thank you for submitting the **Draft Environmental Impact Report for the Castaic Lake Water Agency Supplemental Water Project Transfer** to SCAG for review and comment. As areawide clearinghouse for regionally significant projects, SCAG reviews the consistency of local plans, projects, and programs with regional plans. This activity is based on SCAG's responsibilities as a regional planning organization pursuant to state and federal laws and regulations. Guidance provided by these reviews is intended to assist local agencies and project sponsors to take actions that contribute to the attainment of regional goals and policies.

It is recognized that the proposed Project considers the transfer of 41,000 acre feet of State Water Project Table A amount from Kern County Water Agency, and its member district the Wheeler Ridge-Maricopa Water Storage District, to the Castaic Lake Water Agency.

SCAG staff has evaluated the **Draft Environmental Impact Report for the Castaic Lake Water Agency Supplemental Water Project Transfer** for consistency with the Regional Comprehensive Plan and Guide and Regional Transportation Plan. The Draft EIR includes a discussion on the proposed Projects' consistency with SCAG policies and applicable regional plans, which were outlined in our February 19, 2003 letter on the Notice of Preparation (NOP) for this Draft EIR..

The Draft EIR, in Section 5.0, Consistency with Adopted Plans and Policies, cited SCAG policies and addressed the manner in which the proposed Project is consistent with applicable core policies and supportive of applicable ancillary policies. This approach to discussing consistency or support of SCAG policies is commendable and we appreciate your efforts. 121

Based on the information provided in the Draft EIR, we have no further comments. A description of the proposed Project was published in the June 16-30, 2004 Intergovernmental Review Clearinghouse Report for public review and comment.

If you have any questions, please contact me at (213) 236-1867. Thank you.

Sincerely,

JEFFREY M. SMITH, AICP
Senior Regional Planner
Intergovernmental Review

Section 3 – Responses to Comments

LETTER 4

3.0 RESPONSES TO COMMENTS

This section includes excerpted comments from the letters and public meeting transcript included in Section 2 and corresponding responses in tabular format. For ease of cross-referencing, the comments in the table have been numbered sequentially in the left-hand column. The acronyms used to define the commenters are as indicated in Section 2; comments provided during the public meeting on July 28, 2004 are indicated by "PM," and the name of the commenter is shown in parentheses. This section also includes a Master Response, which addresses similar issues raised by a number of commenters.

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Matrix of Comments on DEIR and Responses
CLWA - Supplemental SWP Table A Amount Transfer Project FEIR (41,000 AF)

No.	Commenter	Comment	Response
1	Caltrans	The Project would not involve construction or operational changes that could generate traffic or otherwise affect traffic conditions. Based on the information received, we have no comments at this time. Thank you for the opportunity to have reviewed this project. Any transportation of water which requires the use of oversize-transport vehicles on State highways will require a Caltrans transportation permit. We recommend that large size truck trips be limited to off-peak commute periods. Thank you for the opportunity to have reviewed this project.	This comment is noted; no text revisions are required. The Project does not involve the use of trucks to transport water.
2	DWR	The Department of Water Resources' (DWR) staff have reviewed the Draft Environmental Impact Report (DEIR) for the Castaic Lake Water Agency Supplemental Water Project Transfer of 41,000 Acre-Feet of Table A Amount (SCH No. 1998041127), and found that the document adequately and thoroughly discusses the proposed project and its impacts. The DEIR discusses the effects of the project on the environment and State Water Project (SWP) and uses baseline conditions consistent with those being considered for inclusion in the DEIR. DWR is currently preparing for the Monterey Amendment to the State Water Project Contracts (including Kern Water Bank Transfer and Other Contract Amendments and Associated Actions as Part of a Proposed Settlement Agreement in Planning and Conservation League v. Department of Water Resources (SCH No. 2003011118), referred to hereafter as "Monterey Plus."	This comment is noted; no text revisions are required. DWR, as a responsible agency for the DEIR and as lead agency for the new Monterey Amendment Program EIR, has reviewed the DEIR and has concluded that the DEIR adequately and thoroughly describes the Project and adequately analyzes all Project impacts on the environment and SWP system, using baseline conditions consistent with those DWR intends to use for its Monterey Amendment EIR. DWR's evidence refutes comments by members of the public which speculate that the DEIR will be inconsistent with the new Monterey Amendment Program EIR or that the DEIR fails to consider Project environmental effects which will be considered in the Monterey Amendment EIR.
3	DWR	The DEIR provides a good discussion of the relationship between the 41,000 acre-feet Table A transfer and the current Monterey Plus process. DWR will analyze the effects of all Table A transfers that were part of the Monterey Amendment to the SWP contracts in the Monterey Plus EIR. The proposed CLWA 41,000 acre-feet Table A transfer will be included in this analysis.	This comment is noted; no text revisions are required. DWR, as a responsible agency for the DEIR and as lead agency for the new Monterey Amendment Program EIR, has reviewed the DEIR and has concluded that the DEIR provides a good discussion of the relationship between the Project and the Monterey Amendment.

No.	Commenter	Comment	Response
4	DWR	One of the tools being used by DWR to assess potential impacts associated with these Table A transfers is the CALSIM II model. DWR acknowledges that CLWA used an earlier model, DWRSIM, to analyze the effect of the 41,000 acre-feet transfer; however, DWR will use the next generation model, CALSIM II, to assess potential impacts associated with all Table A transfers in its DEIR for Monterey Plus. The use of CALSIM II may cause slight changes in results, which may lead DWR to different conclusions than the conclusions made by Castaic Lake Water Agency in the current DEIR.	CLWA used DWRSIM model studies to assess potential future impacts of the Project because at the time the supply analyses were begun for the DEIR no CALSIM II studies were publicly available. At that time, the DWRSIM studies used in DEIR analyses were the most comprehensive studies that were publicly available. These studies were conducted by DWR for CALFED in 1998 and had received extensive public and technical review during the CALFED process. Additionally, these studies were consistent with the pre-Project baseline conditions in 1998 when CLWA approved the Project. (See DEIR Section 3.0 at p. 3.0-6, DEIR Section 3.15.2.2 at p. 3.15-31) CLWA's use of the DWRSIM model did not result in significantly different SWP delivery reliability results than would have been obtained using the CALSIM II model. Overall, the SWP delivery reliability results from DWRSIM studies prepared for CALFED were slightly higher than delivery reliability results from the CALSIM II studies that subsequently became available in the DWR SWP Delivery Reliability Report. Therefore, from an environmental impact assessment standpoint, the DEIR analyzed the worst-case scenario; i.e., the scenario that would result in greater direct and indirect impacts in both the CLWA and WRMWSD service areas. (See DEIR Appendix D, Section 2.2 and Figures 2-1 and 2-2 at pp. D-19 to D-21) A comparison of DWRSIM and CALSIM II results of total SWP deliveries shows a somewhat larger difference for the comparison at "existing" demand conditions than at 2020 demand conditions. (See DEIR Appendix D, Section 2.2 and Figures 2-1 and 2-2) The differences between the two model results at existing demand conditions are mainly attributable to the use of a different "existing" demand for each study. Both studies used DWR estimates of Contractor demands that were "existing" or current at the time the studies were conducted, i.e., 1998 for the DWRSIM study and 2001 for the CALSIM II study. The 2001 total SWP demand is higher than the 1998 total

No.	Commenter	Comment	Response
4 (cont)	DWR		SWP demand due to increased M&I Contractor demands. Because the models only make deliveries up to Contractor demands (as opposed to making deliveries up to the Contractors' maximum Table A Amounts), the deliveries shown in the wetter years, when adequate supply is usually available, are limited by demands. Therefore, for current conditions, the DWRSIM study shows lower deliveries than the CALSIM II study in the wetter years, not because supplies are not available, but because the lower Contractor demands used in the DWRSIM study limit deliveries. In addition, the lower demand can also result in more water being delivered in some dry years, if more water was left in storage at the end of the preceding year. The differences between the two model results at 2020 demand conditions are much smaller because both studies use the same demands. Differences in SWP deliveries between these two model studies result from other factors such as changes in assumptions for regulatory standards and operating criteria, and differences in certain algorithms used in the models. It should be noted that CLWA did use CALSIM II model results to estimate SWP water supplies for the current environmental setting. DWR's comment indicates that DWR will also use the CALSIM II model to assess potential impacts associated with Table A Amount transfers in its Monterey Amendment EIR. Thus, CLWA anticipates that the DEIR and the Monterey Amendment EIR will be consistent in their projections of impacts related to the Project. (See DEIR Section 3.15.2.2 at page 3.15-31 and DEIR Appendix D Section 6.1.2.2; See also DEIR Sections 6.3.1.5, 6.3.2.6 & 6.3.3.4)
5	DWR	As final comments, DWR notes that this DEIR adequately discusses the reliability of the SWP, pre- and post-Monterey Amendment conditions, future conditions, and SWP operations.	This comment is noted; no text revisions are required. DWR, as a responsible agency and as lead agency for the Monterey Amendments EIR, has reviewed the DEIR and has concluded that the DEIR adequately discusses SWP operations, SWP reliability, pre- and post-Monterey Amendment conditions, and future conditions as they relate to the Project. DWR's evidence refutes comments from other parties that speculate

No.	Commenter	Comment	Response
5 (cont)	DWR		that the DEIR fails to adequately discuss SWP operations, SWP reliability, pre- and post-Monterey Amendment conditions, and future conditions, and that speculate that such DEIR discussions are contrary to the discussions anticipated for the Monterey Amendment EIR.
6	DWR	Coordination between DWP and CLWA is essential to produce accurate environmental documentation that leads to informed decision-making and full public disclosure as the California Environmental Quality Act mandates. DWR appreciates inclusion and consultation in the early stages of preparation of this DEIR. Please ensure that DWR's Division of Environmental Services and SWP Analysis Office receive copies of the Final EIR.	DWR states that it was included and consulted in the early stages of preparation of the EIR in order to provide accurate environmental documentation leading to full public disclosure and informed decision-making. DWR's evidence refutes comments from other parties that speculate that, without DWR as the lead agency, the DEIR will not have the benefit of DWR statewide authority and expertise. As requested, CLWA will provide to DWR's Division of Environmental Services and to DWR's SWP Analysis Office copies of the FEIR for the Project.
7	CHP	In reviewing this project, our concern was what effect these projects will have on traffic. It is our opinion there should not have a significant impact.	This comment is noted and is consistent with the EIR analysis; no text revisions are required.
8	SWC	This letter provides comments on the Draft EIR entitled "Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount," on behalf of the State Water Contractors ("SWC"). As you know, the SWC represents nearly all contractors that receive water from the State Water Project ("SWP"). Thus, the SWC is vitally interested in the proper application of CEQA to water transfers under Articles 41 and 53 of the SWP water service contracts and, in general, with respect to operations of the SWP. The SWC commends Castaic Lake Water Agency ("Castaic") for going far beyond what is required by CEQA and the appellate court decision that invalidated Castaic's earlier EIR for the 41,000 acre foot water transfer. Both the trial court and the appellate court found that all of the environmental analyses contained in that first EIR complied with CEQA, except for reliance (through "tiering") on the original Monterey Amendment EIR which had later been found inadequate by the Third District Court of Appeal. Nevertheless, Castaic has taken	This comment is noted; no text revisions are required.

No.	Commenter	Comment	Response
8 (cont)	SWC	a comprehensive, fresh look at the transfer's potential impacts in a single document, when arguably a short supplement eliminating the references to the Monterey Amendment would have sufficed. By so doing, you have provided decision makers with a complete picture of the transfer and its impacts so they can make new informed decisions related to the project.	
9	SWC	During scoping, several parties made suggestions that this Supplemental EIR should not move forward until the new EIR for the Monterey Amendment has been completed. The SWC suggests that Castaic should respond more directly to these contentions. Those contentions overlook or intentionally mischaracterize a central element of the Monterey EIR litigation Settlement Agreement. The Settlement Agreement explicitly states that the SWP will operate under the Monterey Amendment while the new EIR is prepared. This includes operation under Article 53, pursuant to which the Kern County Water Agency consented to up to 130,000 acre feet of agriculture to urban transfers. Suggestions that consideration of such transfers must await completion of the new Monterey Plus EIR would render this element of the Settlement Agreement a nullity, contrary to the clear understanding of the signatories to that document.	CLWA concurs with these comments. Please refer to the Master Response, particularly Section V thereof.
10	SWC	Further, nothing in the Settlement Agreement affects the rights of contractors and DWR to agree to and proceed with implementing long-term transfers of Table A Amounts. In this respect, the draft Supplemental EIR contains a confusing statement to the effect that certain terms in the Settlement Agreement constitute a "specific exclusion" of the 41,000 acre foot transfer from "any prohibitions against transfers of Table A amounts by the Settlement Agreement." The Settlement Agreement does not contain any such prohibitory language. Thus, specific exclusions are not necessary. The final Supplemental EIR for the 41,000 acre foot transfer should point out that several other Table A transfers have been consummated since the Settlement Agreement was executed and that the Settlement Agreement contains no language that	The comment correctly points out that the Monterey Amendment Settlement Agreement, approved by the Sacramento County Superior Court, allows the Monterey Amendment to remain in effect until certification of a new Monterey Amendment Program EIR. Monterey Amendment provisions allowing long-term transfers of Table A Amounts remain valid. (See DEIR 1.2.2 and 1.4.2) Thus, the language contained at DEIR Page ES-4, lines 20-31, and at DEIR Page 1-4, lines 13-23, should be deleted and replaced with the following: "The Monterey Amendment Settlement Agreement does not require that the new Monterey Amendment Program EIR be certified before an EIR for this Project can be certified, nor does

No.	Commenter	Comment	Response
10 (cont)	SWC	could be interpreted as prohibiting such transactions or the 41,000 acre foot transfer.	it require that the EIR for this Project tier off the new Monterey Amendment Program EIR. Also, the Monterey Amendment Settlement Agreement does not require that the new Monterey Amendment Program EIR serve as the EIR for this Project. Section III(C)(4) of the Monterey Amendment Settlement Agreement only requires DWR to analyze the potential impacts resulting from this Project and other transfers as they relate to the potential environmental impacts of approving the Monterey Amendment. Section III(E) of the Monterey Amendment Settlement Agreement clarifies that the Section III(C)(4) analysis is limited by remedies or other actions of the Los Angeles County Superior Court in *Friends I*, stating: "With respect to Section III(C)(4)(b) regarding the Kern-Castaic Transfer, the Parties recognize that such water transfer is subject to pending litigation in the Los Angeles County Superior Court following remand from the second District Court of Appeal (*See Friends of the Santa Clara River v. Castaic Lake Water Agency 95 Cal.App.4th 1373, 116 Cal.Rptr.2d 54 (2002); review denied, April 17, 2002*). The Parties agree that jurisdiction with respect to that litigation should remain in that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation." Several transfers have taken place since the Monterey Amendment Settlement Agreement. All of those transfers have been approved pursuant to Article 41 of the State Water Project Contract. Those transfers evidence that it was not the intent of the parties to the Monterey Amendment Settlement Agreement to require certification of the Monterey Amendment EIR before transfers not listed as final in Attachment E to the Settlement Agreement could take place. Among non- Attachment E transfers that have taken place

No.	Commenter	Comment	Response
10 (cont)	SWC		since the Monterey Amendment Settlement Agreement are the following: • June 2, 2003: Tulare Lake Basin Water Storage District to Alameda County Flood Control and Water Conservation District, Zone 7, 400 acre-feet, effective 2003 • October 24, 2003: Metropolitan Water District of Southern California to Coachella Valley Water District, 88,100 acre-feet, effective 2005 • October 24, 2003: Metropolitan Water District of Southern California to Desert Water Agency, 11,900 acre-feet, effective 2005 • October 31, 2003: Belridge Water Storage District (KCWA) to Alameda County Flood Control and Water Conservation District, Zone 7, 2,219 acre-feet, effective 2004 • December 5, 2003: Tulare Lake Basin Water Storage District to County of Kings, 5,000 acre-feet, effective 2004 • February 23, 2004: Tulare Lake Basin Water Storage District to Coachella Valley Water District, 9,900 acre-feet, effective 2004
11	SWC	The SWC suggests that the final Supplemental EIR reference the July 14, 2004 trial court opinion in *California Water Network v. Castaic Lake Water Agency*, which discusses the proper lead agency for projects similar to the 41,000 acre foot transfer. In that case, the Court held that Castaic was the proper lead agency for a water banking project, stating "Castaic is the agency most deeply involved in the planning, and execution of this project." The trial court rejected the argument that DWR was the only proper lead agency when actions concerning the	This information is included in the Master Response. The comment regarding the knowledge and role of local agencies regarding local land use planning and local water supply issues is noted; local land use plans and their relationship to the Project and local water supply are discussed in the DEIR in sections 4.1 and 4.2.

No.	Commenter	Comment	Response
11 (cont)	SWC	SWP are involved. As in the *California Network Case*, Castaic is the agency promoting, planning, and primarily carrying out the 41,000 acre foot transfer. It is also the agency with the greatest knowledge about growth inducement and similar local issues. State government, including DWR, has no role in local land use planning and the local water supply issues that arise from planning decisions. The plenary role of local agencies in the land use arena should be pointed out in the final Supplemental EIR.	
12	SWC	The SWC has reviewed the water supply analysis set forth in the draft Supplemental EIR and believes it will provide valuable information for decision makers in determining how the 41,000 acre foot transfer will affect Castaic's ability to meet the future water needs engendered by Los Angeles County's and local cities' land use decisions. The SWC suggests that the final Supplemental EIR re-emphasize that urban water suppliers do not make the land use and growth decisions but instead, try to provide needed water supplies in the most economical and environmentally sound manner. From this standpoint, the draft Supplemental EIR provides the best information reasonably available from recognized scientific sources. More than that can not be asked of lead agencies dealing with highly complex natural and man made water systems.	CLWA concurs with these comments. The DEIR (sections 1.1 and 4.2) notes that CLWA is not a land use agency and does not control where and when growth will occur in its service area.
13	City SC	Thank you for allowing the City of Santa Clarita to comment on the Draft Environmental Impact Report for the Supplemental Water Project Transfer. At this time, the City of Santa Clarita has no comments on the draft document regarding the project.	This comment is noted; no text revisions are required.
14	LA DPR	Page 3.0-10 of the Draft EIR states that the "DWR's operation of these lakes (Quail, Pyramid, and Castaic) generally would not change with the Project, although the project would result in additional water transported through these lakes in about the same months the water is delivered to CLWA." Page 3.15-41 also confirms that "the amount of water stored at Castaic Lake would not be expected to change as a result of the Project." The	This comment is noted; no text revisions are required. As indicated, the Project would not change the operation of Castaic Lake.

No.	Commenter	Comment	Response
14 (cont)	LA DPR	optimum operating level of Castaic Lake is 1515 above sea level. Scheduling of the release of the SWP water should be done so to maintain this level. Assuming that this operating criterion and the physical conditions of the lake do not change as a result of the project, adverse impacts to Department facilities are not anticipated. The Department requests that any future changes in the operating criteria of the lake be coordinated directly with Mr. Dana Robertson, Parks Superintendent. Contact information is provided below: Mr. Dana Robertson, Parks Superintendent Castaic Lake Recreation Area 32132 Castaic Lake Drive Castaic, CA 91384 Phone (661) 257-4050/Fax (661) 257-3759	
15	LA DPR	Section 3.12.3 of the Draft EIR states that the implementation of the project will have no direct or indirect impacts to recreation within the CLWA. However, the potential development (Page 4-2) for 106, 700 new residents and 35,600 new units to house them may impact future recreation opportunities for those within the CLWA, and in turn, to future Castaic Lake operations.	With respect to impacts to recreation within CLWA, Section 3.12.3.3 of the DEIR states: "No direct significant impacts to recreational resources would occur; therefore no mitigation measures are required. Mitigation measures for indirect impacts are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts." (A direct impact is a direct physical change in the environment resulting from the Project; an indirect impact is a reasonably foreseeable physical change in the environment resulting from the Project. [See *Friends of the Eel River v. Sonoma County Water Agency* (2003) 108 Cal.App.4th 859, 876-877.]) Those mitigation measures are referenced in DEIR Section 4.2.12. DEIR Section 4.2.12 concludes that indirect significant impacts are avoidable with those mitigation measures. Sections 3.12.3.1 and 3.12.3.2 state that no direct or indirect impacts to recreational resources of the SWP or WRMWSD would occur as a result of the Project. Thus, DEIR Section 3.12.4 concludes that there are no unavoidable direct or indirect significant impacts to recreational resources resulting from the Project.

No.	Commenter	Comment	Response
16	LAFD	LAND DEVELOPMENT UNIT: The County of Los Angeles Fire Department, Land Development Unit appreciates the opportunity to comment on this project. However, this project does not propose structures or any other improvements that appear to have a significant impact that requires a comment from the Land Development Unit. Specific fire and life safety requirements for the construction phase will be addressed at the Building and Fire Safety plan check. There may be additional fire and life safety requirements during this time. Should any questions arise regarding subdivision, water systems or access, please contact Inspector Marvin Dorsey at (323) 890-4243.	This comment is noted; no text revisions are required.
17	LAFD	FORESTRY DIVISION: The statutory responsibilities of the County of Los Angeles Fire Department, Forestry Division include erosion control, watershed management, rare and endangered species, vegetation, fuel modification for Very High Fire Hazard Severity Zones or Fire Zone 4, archeological and cultural resources, and the County Oak Tree Ordinance. The areas germane to the statutory responsibilities of the Los Angeles County Fire Department, Forestry Division have been addressed.	This comment is noted; no text revisions are required.
18a	VRMA	None	No comments were submitted.
18b	VPWA	None.	No comments were submitted.
19	SCERC	The Stanislaus County Environmental Review Committee (ERC) has reviewed the subject project and has no comments at this time.	No comments were submitted.
20	BIA	CLWA's transfer of 41,000 acre-feet of water from Kern County in 1999 represented wise water planning for the Santa Clarita Valley. The BIA is pleased to see that the CLWA has produced this new EIR so that the litigation pending on the 1999 transaction can finally be resolved.	This comment is noted; no text revisions are required. Indeed, by augmenting CLWA's supplies, the Project serves to mitigate anticipated water resource shortages for existing land uses and for land uses projected by local general and specific plans.

No.	Commenter	Comment	Response
20 (cont)	BIA	We are in the midst of a housing shortage in our State, especially in the Los Angeles and Ventura County regions. With housing supply in high demand it is critical for agencies such as CLWA to plan for future infrastructure needs. The continuance of such planning and water management programs is designed to enable the agency to meet its mission of providing water for anticipated growth in the Santa Clarita Valley. We support the Agency board and staffing in continuing that mission. CLWA has taken the proper steps to insure that its current users as well as future users will be assured safe and reliable water. The Building Industry Association would like to commend the CLWA for taking these preemptive actions.	
21	C-WIN	**CLWA is the Wrong Lead Agency and Must Wait for DWR to Complete the new Monterey Plus EIR.** Under the principles articulated by the 3rd District Court of Appeal in the PCLvDWR case (#CO24576), CLWA is not the proper lead agency in this transaction which has tremendous statewide significance as it necessarily must address the Monterey Amendments. DWR is the only proper lead agency.	Please refer to the Master Response.
22	C-WIN	This transfer is not consistent with the PCLvDWR settlement, reached in May of 2003, under which DWR has already commenced its own statewide review of the Monterey Amendments. Until the new EIR, known as "Monterey Plus" is finalized and the project is approved, the only transfers recognized as final are those listed in attachment E of the settlement. This is not one of those transfers and therefore would be illegal until completion and certification of the new "Monterey Plus" EIR. The CLWA proposed EIR is potentially on a collision course with DWR's "Monterey Plus" EIR and could produce a result that is at odds with the court mandated EIR on the Monterey Amendments currently being produced by DWR. C-WIN incorporates the January 10, 2002 letter from attorney Robert H. Clark to then General Manager of CLWA Robert C.	Please refer to the Master Response and to Comments 2, 3, 5, 6, 8, 9 and 10 and the Responses thereto. This Project is consistent with the Monterey Amendment Settlement Agreement. Section II of the Monterey Amendment Settlement Agreement provides that the Monterey Amendment will remain in place during preparation of the new EIR for the Monterey Amendment. Nothing in the Monterey Amendment Settlement Agreement prevents transfers from continuing to occur under the Monterey Amendment while the new Monterey Amendment Program EIR is being prepared. Section III(C)(4) of the Monterey Amendment Settlement Agreement only requires the Monterey Amendment EIR to analyze past, present and future transfers as they relate to the potential environmental effects of the Monterey Amendment. The Monterey Amendment Settlement Agreement's recognition of certain transfers as final and immune from challenge did not state nor imply that other

No.	Commenter	Comment	Response
22 (cont)	C-WIN	Sagehorn where he points out this problem and warns, "Alternatively, CLWA may choose to create an EIR that does not rely in any way on Monterey Amendment provisions, and then complete the 41,000 AF water entitlement transfer outside of Monterey. There are adverse financial implementations to this course of action, and any water transfer outside of Monterey—assuming it might be acceptable to Kern County Water Agency and Wheeler Ridge—*could be made subject to agricultural water deficiency provisions in the same manner that the Devil's Den water entitlement transfer was originally made subject to those agricultural water deficiency provisions" (emphasis added)* (See Attachment A). C-WIN also incorporates a letter from attorney Alyse M. Lazar to DWR Director Lester Snow dated May 18, 2004 and the response from Mr. Snow's office dated June 17, 2004. In the response letter, Mr. Snow says, "DWR's treatment of the transfer of Table A amounts from Kern County Water Agency to Castaic Lake Water Agency will be governed by the Settlement Agreement. As provided in Paragraph III.C.4 of the Settlement Agreement, the EIR will include an "analysis of the potential environmental impacts relating to (a) the Attachment E transfers, and (b) the Kern-Castaic Transfer, in each case as actions that relate to the potential environmental impacts approving the Monterey Amendments." Section 1(0) of the Settlement Agreement defines the "Kern-Castaic Transfer" as "the transfer of 41,000 AF of water from Kern County Water Agency to the Castaic Lake Water Agency, approved by DWR on march 31, 1999." DWR has not completed any draft or final analysis regarding these transfers." (See Attachment B).	transfers are prevented from becoming final. In fact, Section II(E) of the Monterey Amendment Settlement Agreement recognized that this Project is not subject to the jurisdiction of the Sacramento Superior Court in the *PCL* case. Instead, the Monterey Amendment Settlement Agreement acknowledged that environmental review for this Project is subject to the jurisdiction of the Los Angeles Superior Court. Because the May 5, 2003 Monterey Amendment Settlement Agreement provides for the Monterey Amendment to remain in effect, the issue addressed in the prior January 10, 2002 letter of Robert Clark referenced in this comment about the transfer being subject to pre-Monterey Amendment agricultural deficiency provisions is moot. Please also refer to Comment 45 and to the Response thereto. As noted in the Response to Comment 45, CLWA would benefit from the Project under pre-Monterey Amendment agricultural water deficiency provisions. Regarding the letter from Alyse M. Lazar, the fact that the new Monterey Amendment Program EIR will analyze the Project and other past, present and future transfers as they relate to the potential environmental effects of the Monterey Amendment does not necessitate that CLWA await the Monterey Amendment EIR before it can approve the Project. Indeed, the new Monterey Amendment Program EIR could take months to complete, and CLWA is under mandate of the Los Angeles County Superior Court in *Friends of the Santa Clara River v. Castaic Lake Water Agency* ["*Friends I*"], Los Angeles Superior Court Case No. BS 056954, to certify an EIR that complies with CEQA and is consistent with the views expressed in the Court of Appeal opinion in *Friends I* contained at 95 Cal.App.4th 1373.

LETTER 4

No.	Commenter	Comment	Response
23	C-WIN	**The Proposed Transfer is Currently the Subject of Litigation.** The CLWA EIR states that CLWA has 95,200 AF of Table A SWP water. This is not accurate as the 41,000 AF from the sale by KCWA to CLWA under the old Monterey Amendments is the subject of ongoing litigation. Allowing development of new homes based on this challenged and uncertain source of water is not prudent or reasonable. C-WIN is currently a plaintiff in several cases against CLWA opposing proposed transfers that depend on the 41,000 AF transfer mentioned above. Any transfer that is dependent on a water source that is not free and clear is not reliable. C-WIN hereby incorporates our ongoing case against CLWA, the Department of Water Resources (DWR) and Semitropic Water Storage District , Civ No. 215327. Castaic is proposing to transfer 24,000 AF of its 2002 allocation of it's State Water Project (SWP) water, heavily relying on and siting the 41,000 AF transfer as complete to help justify the 24,000 AF transfer, and store it in the Semitropic Water Bank. This case is currently going to appeal.	The DEIR correctly states that the current CLWA Table A Amount is 95,200 AF. The judgment of the trial court on remand from the Court of Appeal in *Friends I* did not invalidate the 41,000 AF Project that is the subject of this DEIR. The trial court in that case did not enjoin any part of this Project. According to the trial court, "Respondent will not be prohibited from using the water to which it is entitled, but petitioner may renew its application for such prohibition based upon evidence of the actual use of such additional water for purposes it considers improper." In a subsequent appeal of the trial court's judgment on remand, in an unpublished opinion, the Court of Appeal affirmed that judgment. The comment states that the Project allows for the development of new homes. However, the Project does not constitute an approval for the development of new homes. As noted in DEIR Section 1.1, CLWA is not a land use agency that can approve new homes or other new development. That section appropriately cautions any land use agencies intending to rely on the Project for a water supply for development projects that "past water deliveries are not a guarantee of future water delivery rates." The delivery projections and reliability models mentioned in the DEIR are used to identify environmental impacts of this Project, not as environmental review for new development. The DEIR analyzes the indirect environmental effects of the Project—those impacts that could arise from future development using the water provided by the Project. The comment mentions the case of *California Water Network and Friends of the Santa Clara River v. Castaic Lake Water Agency* ["*Network*"], Ventura Superior Court No. 215327, wherein the Court refused to invalidate a water storage project. That 24,000 acre-foot storage project was a 10-year banking of water to firm up CLWA's water supply for existing uses, and was defined as not providing water to accommodate new development. (See DEIR Section 6.3.3.1) The trial court in *Network* upheld

No.	Commenter	Comment	Response
23 (cont)	C-WIN		CLWA's environmental review for the water banking project, and, as the comment indicates, the case is now on appeal. Nothing in the *Friends I* trial court judgment on remand or *Friends I* Court of Appeal opinion prevented the storage project addressed in *Network* from using a portion of the 41,000 acre-feet available in Year 2002.
24	C-WIN	As the EIR states, under current law, urban water suppliers must maintain updated water management plans (Urban Water Management Plans). CLWA's UWMP is currently being challenged in court for claiming to have more water than is actually available.	The Court of Appeal in *Friends of the Santa Clara River v. Castaic Lake Water Agency* (2004), 123 Cal.App.4th 1, ["*Friends II*"] ordered the trial court to vacate CLWA's approval of its UWMP based upon the Court's determination that the UWMP must address the timing for remediation of perchlorate contamination found in a limited portion of the groundwater basin. CLWA intends to adopt an amended or updated UWMP that fully discusses issues raised by the Court of Appeal. The invalidation of the UWMP does not constitute a new substantial environmental impact or an increase in the severity of an environmental impact for the Project. The DEIR does not tier off or rely on the UWMP for any information, including information regarding estimates of water supply, water use, water demand, or water supply reliability. As stated in DEIR Section 5.6, "Although information in the UWMP was considered in the analysis for the Project, an independent analysis and determination of environmental impacts was carried out for the Project." This Project is not a development project that would rely on the UWMP in the CEQA process. The "paper water" issue in *PCL* referred to misleading local land use planners as to how much water can be relied upon to serve the long-term needs of a development project. This DEIR does not use UWMP projections to determine the amount and reliability of this Project. DEIR Section 1.1 cautions any land use agencies intending to rely on the Project for a water supply for development projects that "past water deliveries are not a guarantee of future water delivery rates." The delivery

No.	Commenter	Comment	Response
24 (cont)	C-WIN		projections and reliability models mentioned in the DEIR are used to identify environmental impacts of this Project, not as environmental review for new development.
25	C-WIN	Public comments submitted on the recently finalized DWR "SWP Delivery Reliability Report" underscore the continuing problem that contractor estimates of reliability have frequently promised more water than is actually obtainable for building purposes. This EIR is representative of the "paper water" critically described in the 3rd District Appeal Court decision mentioned above. **Water Reliability as Stated in the Proposed EIR is Not Accurate.** This EIR, along with many other proposed developments in California, is dependent on the analysis by DWR and it's State Water Project Delivery Reliability Report, Final 2002, to give planners and the public accurate information on SWP water reliability. These numbers are critical because planners and the public count on them when considering water availability to meet future demand. This Reliability Report has been seriously criticized for overstating actual available supply, questionable modeling and simulations, and lack of proper peer review. C-WIN hereby incorporated this Final Report, including all of the published comment letters in Appendix B. Please make a special note of those letters submitted by Senator Michael Machado, Robert Wilkinson, Arve Sjovold, Joan Wells, Dr. Peter Gleick and myself. C-WIN also incorporates "A Strategic Review of CALSIM II and its Use for Water Planning, Management, and Operations in Central California" submitted by the California Bay Delta Authority Science Program Association of Bay Governments, December 4, 2003. This document raises significant questions about the accuracy of DWR's Delivery Reliability Report. In addition, C-WIN incorporates two letters, the first from Systems Analyst Arve R. Sjovold dated November 11, 2003, title, "Analysis of SWP Reliability of Delivery". (See	Please refer to Comments 4 and 5 and the Responses thereto. The "paper water" issue in *PCL* referred to misleading local land use planners as to how much water can be relied upon to serve the long-term needs of a development project. That issue might come up with reference to an EIR for a new development project or with reference to an urban water management plan upon which new development might rely. But it does not pertain to this DEIR that analyzes the environmental impacts of augmenting CLWA's existing water supply. Therefore, the reliability analysis for the DEIR helps determine the extent of environmental impacts (including indirect growth inducing impacts) to be analyzed, and nothing more. The delivery projections and reliability models mentioned in the DEIR are not used as environmental review for new development. DEIR Section 1.1 appropriately cautions any land use agencies intending to rely on the Project for a water supply for development projects that "past water deliveries are not a guarantee of future water delivery rates." The comment incorrectly states that the DEIR depends on DWR analysis from the 2002 Final State Water Project Delivery Reliability Report to give planners and the public accurate information on SWP water supply reliability. As set forth in DEIR Section 3.15.2.2 at pages 3.15-30 and 3.15-31, the DEIR assessed water supply reliability for this Project based instead on two independent model studies using the DWRSIM model conducted by DWR in 1998 for the 2000 CALFED Bay-Delta Program EIR. As set forth in the Response to Comment 4, the DWRSIM model studies provided the best estimates of SWP supply reliability that were available when DEIR supply analyses were conducted, and are consistent with the 1998 environmental setting used in this EIR.

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25 (cont)	C-WIN	Attachment C). The second is from PCL President Sage Sweetwood dated February 2, 2004 to Delores Brown of DWR raising grave concerns about the validity of the DWR model known as CALSIM II. (See Attachment D). C-WIN incorporates a table prepared by DWR dated 9/16/02 titled "Historical versus Modeled Table A Deliveries and Demands." This is a draft document released by DWR. The modeled deliveries are significantly above the actual historical deliveries...graphically showing what the Third District Court of Appeal was referred to when they sited the "paper water" in the system. (See Attachment E).	Since the DWRSIM studies were conducted, the modeling tool DWR uses to simulate operations has evolved (first to CALSIM I, and more recently to CALSIM II). However, while the modeling tool itself has changed, the criteria used in the models to simulate SWP operations have not significantly changed. While DWR has completed a more recent assessment of SWP reliability in its SWP Delivery Reliability Report using CALSIM II, the results of these new studies are comparable to the results of the DWRSIM studies (see DEIR Appendix D, Section 2.2 and Figures 2.1 and 2.2 for a comparison of these model study results). As set forth in the Response to Comment 4, the DWRSIM model SWP delivery reliability results were slightly higher than delivery reliability results from these CALSIM II studies. Therefore, from an environmental impact assessment standpoint, the DEIR analyzed the worst-case scenario, i.e., the scenario that would result in greater direct and indirect impacts in both the CLWA and WRMWSD service areas. DWRSIM, like CALSIM II, estimates the amount of water the SWP could deliver to Contractors in each month over the 73 years of operation, for a given set of facilities and operating constraints and for a given level of Contractor demand. The results are interpreted as the capability of the SWP to meet the assumed SWP demand, over a range of hydrologic conditions, for that assumed set of physical facilities and operating constraints. The DEIR uses results from the two DWRSIM studies to determine SWP water supplies for both the pre-Project environmental baseline and the Project environmental impact analysis. Results from the DWR SWP Delivery Reliability Report are only used in the DEIR to determine estimates of SWP water supplies for the current environmental setting. Because the DEIR only depends on the DWR SWP Delivery Reliability Report results to determine the current

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25 (cont)	C-WIN		environmental setting, criticisms of that Report referenced in the comment that are directed at assumed use of that Report and at use of the CALSIM II model for assessing water supply reliability are not valid. Nevertheless, CLWA has considered the letters referenced in the comment that refer to the DWR SWP Delivery Reliability Report, and the DWR responses thereto, and provides the following summary analysis of those comments. The DWR responses can be found at the same web site where the letters are located, www.swpdelivery.water.ca.gov. 10/21/02 Letter by Arve Sjovold of Citizens Planning Association and 3/24/03 DWR Response: The primary criticism of the 2003 DWR Report was that it did not calibrate results to historical delivery records. The DWR response provided information regarding why past deliveries cannot accurately be used to predict future deliveries and therefore, why calibrating CALSIM II to historical deliveries is not appropriate. 10/31/02 Letter by Robert Wilkinson and 4/2/03 DWR Response: The primary criticism of the 2003 DWR Report and CALSIM II model were that the model projects nearly a million acre-feet more than extracted from the Delta during the 1980s and 1990s. The Wilkinson letter asserts that the Report and model fail to take into account environmental and legal constraints. The DWR response refutes those contentions, explaining that current environmental regulations and Delta protection standards allow for more operational certainty of the SWP, giving an example of how CALSIM II accurately predicted the lower deliveries in the prior decades given prior legal and operational constraints. 08/29/02 Letter by Peter Gleick of Pacific Institute and 08/29/02 DWR Response: The Gleick letter raises concerns very similar to those raised by the Wilkinson letter.

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25 (cont)	C-WIN		10/30/02 Letter by Michael Machado of California State Senate and 3/11/03 DWR Response: The Machado letter attaches Nov. 1, 2002 comments by Dennis O'Connor of the California Research Bureau on the Report. The O'Connor comments describe five major concerns with the Report: 1) recent deliveries lower than the modeled 2001 conditions; (2) year 2021 studies do not seem to reflect growth in upstream use; (3) CALSIM II has not been calibrated or verified; (4) the results appear inconsistent with previous estimates and models; (5) CALSIM II is not being used as designed. In response, DWR explained the following: (1) the report used 2001 demand conditions that are higher than historical demand. Therefore, during wetter years when deliveries are limited by demand and not supply, the model will show higher deliveries than historically to meet that higher current demand. During dry periods when supplies are limited, the model's delivery results, when adjusted to reflect historic conditions, are quite comparable to historic deliveries; (2) the model does account for growth in upstream consumptive use; (3) DWR continually checks CALSIM II to determine if it reasonably simulates water operations in the system; (4) of two model examples cited, the first model used a daily and not a monthly time-step as used in CALSIM II. Regarding the second example, DWRSIM results in CLWA's UWMP, DWR stated: "DWR understands that the [UWMP] incorporates a more conservative interpretation of the results of the referenced DWRSIM study. DWR supports and encourages local water agencies to apply the level of SWP reliability they determine is appropriate for their areas, taking into account local supplies, other imported supplies, demand-management programs and

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25 (cont)	C-WIN		local planning criteria. The DWP Delivery Reliability report should serve as a reference document to help clarify decisions that are made at the local level"; (5) CALSIM studies are best used as comparative studies. 10/19/02 Letter by Carolee Krieger of Citizens Planning Association and DWR 3/24/03 Response: This letter raises issues similar to those in the Sjovold, Gleick and Wilkinson letters. In addition to the comment letters to the DWR SWP Delivery Reliability Report, CLWA has considered the information regarding the CALSIM II model referenced in this comment and has determined that CLWA's use of the CALSIM II model for the limited purpose set forth in the DEIR is appropriate. CLWA makes note of the following with regard to the documents referenced in the comment: December 4, 2003 "A Strategic Review of CALSIM II and its Use for Water Planning, Management and Operations in Central California." While the peer review panel did identify a number of areas for model improvement in this document, that was a primary purpose for commissioning their review. However, they did not characterize any of these areas as so flawed that the model's results could not be relied on. In fact, the peer review panel's conclusions regarding the CALSIM II model on page 2 of this document states: "We believe the use of an optimization engine for simulating the hydrology and for making allocation decisions is an appropriate approach and is in fact the approach many serious efforts of this kind are using. It is a substantial improvement of the previous modeling approaches and provides a basis for consensus among federal and state interests. The modeling approach addresses many of the complexities of the CVP-SWP system and its water management decisions." And on page 20, they go on to state: "Few, if any, modeling organizations in the country have consistently done as good a job on model development and

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25 (cont)	C-WIN		application for such a large, complex, and controversial system as the modeling group which developed CALSIM II." The August 2004 joint response of DWR and the Bureau of Reclamation to this document can be found at baydeltaoffice.water.ca.gov/modeling/index..cfm under "Peer Review Response." February 2, 2004 Sage Sweetwood Letter. This letter does not contain any independent evidence regarding CALSIM II. The letter merely restates the December 4, 2003 Report's suggestions for improvements to the model. The letter also acknowledges the 2003 Reports conclusions about the usefulness of the model. November 11, 2003 Analysis of SWP Reliability of Delivery. The Analysis reviews the DWR 2003 State Water Project Delivery Reliability Report. The Analysis is based on calculations using CALSIM II, and does not contain an independent analysis of the CALSIM II model. The Analysis uses CALSIM II model published results to question the reliability estimates for the SWP contained in the DWR 2002 Report. According to the Analysis, the 2002 Report 76% level of reliability for average years must take into account actual contractor practices and contractor specific situations. Thus, the Analysis contains information that is not germane to whether CALSIM II is an appropriate model. Draft September 16, 2002 Chart of Historical vs. Modeled Table A Deliveries. The Chart does not contain sufficient information about what model is used or what data set is used, or who prepared the chart. The Chart also indicates it is in draft, and not final form. Assuming the chart is prepared by DWR and refers to the DWR SWP Delivery Reliability Report, the chart shows that historic deliveries have been limited by historic contractor demand in most years, and that in many of those years there was adequate water available to meet the higher demand used in the model study.

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26	C-WIN	Significant Cumulative Impacts Not Recognized. CLWA is continuing to speculatively and irresponsibly approve proposed developments incrementally based on the hope that they will successfully acquire this 41,000 AF of SWP Table A allocation from the Kern County Water Agency. C-WIN hereby incorporates the following comment letters to show just how much is being proposed incrementally using this contended source as final. The cumulative impacts are not being considered. This is very significant when the true reliability numbers for the actual water supply are factored in as well. ▪ The C-WIN January 1, 2004 objection letter to the CLWA on the Negative Declaration for a proposed 35,000 AF transfer for a Groundwater Banking Project that depends on this same 41,000 AF transfer. ▪ The C-WIN February 3, 2004 objection letter to the LA County Regional Planning Department on the proposed West Creek Project #98-008 to build 2,545 residential units that depend on this same 41,000 AF transfer. ▪ The C-WIN February 26, 2004 objection letter to the County of Los Angeles Regional Planning Department regarding the proposed River Valley Project No. 00-196 to build 1,444 residential units, 1.5 million square feet of non-residential mixed-use space, along with a 7 acre elementary school and public recreational facilities; this project also relies on this 41,000 acre foot transfer. ▪ The C-WIN May 4, 2004 letter to the Planning and building Services Department of the City of Santa Clarita regarding the proposed River Park Project No. 02-175 to build 1,183 residential units, heavily relying on this same 41,000 AF transfer.	The cumulative impacts of the projects referenced in the comment are considered at Sections 6.3.3.1 (CLWA projects) and 6.3.3.2 (DMS projects) of the DEIR. CLWA does not approve new development, and the Project includes no approval of new development. As noted in DEIR Section 1.1, CLWA is not a land use agency that can approve new development. That section appropriately cautions any land use agencies intending to rely on the Project for a water supply for development projects that "past water deliveries are not a guarantee of future water delivery rates." The delivery projections and reliability models mentioned in the DEIR are used to identify environmental impacts of this Project, and are not intended or represented to constitute environmental review for new development. CLWA did not participate in any water supply assessment for either the West Creek or the River Village projects. The Riverpark project is listed in the Los Angeles County Development Monitoring System (DMS), as are the other two mentioned development projects. The River Village project did not rely on this Project for its water supply reliability analysis. The 35,000 acre-foot Groundwater Banking Project is now final and not subject to challenge, and is a one-time 10-year storage project that cannot, because it is short-term by its nature, cause or promote growth. (See DEIR Section 6.3.3.1).
27	C-WIN	This 41,000 AF water transfer should be rejected until the EIR for the new "Monterey Plus: has been finalized and adopted. When and if you do proceed, it is required that DWR be the lead agency.	Please refer to the Master Response and to Comments 9, 10, 11 and 22 and the Responses thereto.

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28	C-WIN	CWN hereby incorporates all other comments by reference opposing this transfer submitted on this CLWA EIR proposing to permanently transfer 41,000 AF of Table A allocation from the Kern County Water Agency to the Castaic Lake Water Agency.	This comment is noted; no text revisions are required.
29	FSCR I	As we noted in our response to the Notice of Preparation, the Castaic Lake Water Agency (CLWA) is not the proper Lead Agency to prepare an Environmental Impact Report (EIR) for this project under the California Environmental Quality Act.	Please refer to the Master Response.
30	FSCR I	The 1995 Monterey Agreement between the California Department of Water Resources (DWR) and water contractors of the State Water Project was put in place to control transfers of the type described in the subject document. There is at present no Monterey Agreement EIR because of the PCL decision of September 2000, which held that the Monterey Agreement EIR prepared by CCWA was inadequate. The court held that the DWR was the proper Lead Agency for this Agreement because only the DWR has the statewide perspective needed to evaluate the environmental impacts to the entire water distribution system.	Please refer to the Master Response and to Comments 9, 10 and 11 and the Responses thereto. The comment incorrectly states that the 1995 Monterey Amendment was necessary to control transfers of the type specified in this Project. The 1995 Monterey Amendment had as one of its purposes to help facilitate transfers between agricultural and urban contractors, but such transfers were not prohibited prior to execution of the Monterey Amendment. The Monterey Amendment Settlement Agreement explicitly states that the SWP will operate under the Monterey Amendment while the new Monterey Amendment Program EIR is prepared. This includes operation under Article 53, pursuant to which the Kern County Water Agency consented to up to 130,000 acre-feet of agriculture to urban transfers. Suggestions that consideration of such transfers must await completion of the new Monterey Amendment Program EIR would render this element of the Monterey Amendment Settlement Agreement a nullity, contrary to the clear understanding of the signatories to that document. As the comment notes, a new Monterey Amendment Program EIR has not yet been certified, but DWR is in the process of preparing that new EIR. This comment confuses this Project and the DEIR with the Monterey Amendment and its new Program EIR. As noted in the Response to Comment 10, several transfers have occurred since the September 2000 *PCL* decision.

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31	FSCR I	The EIR for the 41,000 acre-feet transfer must tier from a certified Monterey Agreement EIR, which does not currently exist. This was indeed suggested by the Second Appellate District Court decision of January 2002 in the case brought against CLWA by Friends of the Santa Clara River. Page 19 of this decision states that "Respondent may be able to cure the PCL problem by awaiting action by the state DWR complying with the PCL decision, then issuing a subsequent EIR, supplement to EIR, or Addendum to EIR (Guidelines 15162, 15163, 15164) tiering on a new Monterey Agreement EIR.	Please refer to the Master Response and to Comment 10 and the Response thereto. The statement by the Court of Appeal in *Friends I* was a suggestion, not a requirement. The Court of Appeal could not have intended to require CLWA to tier off a programmatic EIR when CEQA allows a lead agency for a project to choose whether or not to tier off an available programmatic EIR. CEQA does not require a lead agency to delay a project and to wait for a programmatic EIR to become available, even where a programmatic EIR is contemplated. (See 14 Cal. Code Regs. §§ 15160 & 15168)
32	FSCR I	Since CLWA cannot legally be the Lead Agency for the subject transfer, the only legitimate way for CLWA to proceed with EIR preparation is to await DWR's preparation and certification of a Monterey Agreement EIR. The subject DEIR is thus invalid and not in compliance with court decisions involving this transfer of state water.	Please refer to the Master Response.
33	FSCR II	Please include the following correspondence between our attorney and the Department of Water Resources and their response regarding the timeline for the completion of the Monterey Agreement Environmental Impact Report. Because this EIR must be tiered on the State wide impacts addressed in the Monterey Agreement EIR and could not proceed without this Agreement, your Agency must wait until the state wide document has been certified before certifying the EIR for this project.	Please refer to the Master Response. With regard to the attached 5/18/04 letter from Alyse M. Lazar and the 6/17/04 Lester Snow DWR response thereto, please refer to the Comment 22 and the Response thereto. There is no legal requirement that this EIR be tiered off the new Monterey Amendment Program EIR. Please refer to Comment 31 and the Response thereto.
34	FSCR II	We continue to protest that you may not approve this document because you are not the correct lead agency for a project with state-wide impacts. Since the Dept. of Water Resources was found to be the legitimate lead agency for such a transfer in the decision PCL v. DWR, 2000, we protest your disregard for legal precedent on this matter. We note that your current general manager, Dan Masnada, is the same person that proceeded illegally in the above case when he was general Manager of Central Coast Water Agency. He is well aware that your agency is not proceeding according to law.	Please refer to the Master Response. The identity of the CLWA manager is irrelevant to the issue of which agency is the appropriate lead agency for the Project.

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35	FSCR II	Further, we wish to state that none of these documents, nor the current EIR before you address the effects of an earthquake or levee break (such as recently occurred in the Sacramento Delta, news article attached). These emergencies were also not addressed in the Urban Water Management Plan 2000. We ask that you address how your agency intends to manage such a water emergency under current water availability scenarios and how water supply would be affected under such an emergency with the additional buildout this transfer would permit.	The potential for earthquakes or levee breaks to temporarily affect water supply is noted. These issues are more appropriately addressed in the updated Urban Water Management Plan, which is scheduled for release in 2005 and requires such analysis. The EIR focuses on the environmental impacts of the transfer of Table A Amount and evaluates the water supply that would be available to CLWA using an established model developed by DWR. While emergencies could occur and temporarily disrupt water supplies, these are not impacts of the Project, and the EIR evaluates reasonable scenarios and uses the worst-case scenario in terms of growth-related impacts. SWP and CLWA facilities are designed to resist damage upon the occurrence of a seismic event. CLWA maintains substantial reservoir storage for use should SWP deliveries be temporarily interrupted from any catastrophe. The potential for seismic or other catastrophic damage significant enough to interrupt CLWA water deliveries is low, but the concern expressed in the comment is noted. Any such damage could disrupt CLWA water deliveries temporarily, but any such temporary interruption would have a less than significant impact on the DEIR projections for the long-term reliability of the Table A Amount proposed to be transferred by this Project. The Project is intended to provide an augmented water supply, over the long term, to CLWA and its purveyors. Short-term disruptions in delivering this water supply will cause inconvenience to all those reliant on CLWA's supplies. That inconvenience could occur equally today with CLWA's present sources of supply, should a catastrophic event occur. CLWA's purveyors have made provision for use of groundwater in the event CLWA deliveries are interrupted.
36	FSCR II	We ask that you respond to the recommendations made recently by the two experts, Kathy Kelly and Jonas Minton who gave testimony regarding State Water project availability before the City of Santa Clarita Planning Commission on June 29th, 2004. They both suggested that the planners should	The DEIR focuses on the environmental impacts of the transfer of Table A Amount and evaluates the water supply that would be available to CLWA using an established model developed by DWR. Three hydrologic scenarios are analyzed. The average year supply is the average amount of water available

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36 (cont)	FSCR II	analyze the effect of cutbacks that would be required under the worse case historical delivery rate, 13% of Title A amounts in 1991, on existing businesses and residents in the Santa Clarita Valley. Since ground water sources are in the Santa Clarita Valley are fully utilized, substantial cutbacks would be required. This significant impact should be addressed.	based on DWRSIM model results over its entire period of hydrologic record. The multiple dry year period supply is the average amount of water available over the four consecutive drought years of 1988 through 1991 based on DWRSIM model results. The single dry year supply is the supply available in the single year with the lowest total SWP deliveries based on DWRSIM model results, which occurred in 1977. In this single dry year, the supply was about 22% of Table A Amounts, and the increase in SWP supply due to the Project was estimated to be 9,200 acre-feet. If instead the supply in a single year were 13% of Table A Amounts, then the increase in supply due to the Project would be reduced to 5,300 acre-feet. Any environmental impacts based on this lower supply amount would be less than those described in the DEIR. Use of the 22% supply amount results in analysis of the worst-case environmental impact assessment scenario. The Project would have a beneficial impact to water supply, including groundwater, because it would increase the amount of water available to the CLWA service area, and would not result in a potentially significant impact. The comment implies that CLWA approves development projects. CLWA does not have the authority to approve development projects. The DEIR includes an analysis of indirect impacts of the Project, focusing on growth-related impacts, but CLWA defers to the local agencies with land use authority to conduct site-specific and project-specific CEQA review of proposed development projects. Please refer to the response to Comment 26. The comment states incorrectly and includes no evidence that groundwater sources in the Santa Clarita Valley are fully utilized. As Section 3.15.1.3 of the DEIR indicates, at Page 3.15-18, average annual production from the Alluvial Aquifer is approximately 30,000 acre-feet, within or below the 30,000-40,000 acre feet per annum operational yield. In addition, Page 3.15-19 indicates that average annual production from the

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36 (cont)	FSCR II		Saugus Formation is 6,800 acre-feet, well below a conservative estimate of the operational yield at 15,000 acre-feet per annum. Those yields factor in the increased groundwater pumping that occurs in dry years, given the amount of State Project water available under the Project as calculated using DWR reliability studies. (See DEIR Table 3.15-7) The projected average water demand will be less than the projected water supply available for the foreseeable future. (See Table A-1 in Attachment A to Volume II of the FEIR) Thus, the DEIR indicates that groundwater use will not increase above average operational yield even with increased dependence on State Project water. As DEIR Section 3.15.1.3 notes, the prior importation of State Project water has increased the yield of the Alluvial Aquifer as a result of return flows. Thus, increased importation under the Project potentially could increase groundwater yields. The comment provides no evidence of a significant environmental impact on groundwater resources as a result of the Project.
37	PCL/CPA	This letter provides comments on the Draft EIR entitled *Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount*, on behalf of the Planning and Conservation League (PCL) and the Citizens Planning Association of Santa Barbara County (CPA). If finalized, that transfer would be the largest permanent agriculture-to-urban transfer under article 53 of the Monterey Amendments, with major implications for water resources and land use planning in Southern California. The environmental impacts of these amendments, including the instant transfer, remain to be addressed in DWR's pending "Monterey Plus" EIR review. The scoping comments submitted for that review (attached as Exhibit 1), including those of PCL, should be studied in connection with the present EIR review.	This comment is noted. Please refer to the Master Response. The commenter correctly identifies the Project as a large permanent transfer of SWP Table A Amount. However, the comment incorrectly implies that the new Monterey Amendment Program EIR will evaluate the specific environmental impacts of this Project. The Monterey Amendment Settlement Agreement provides that this Project is subject to the jurisdiction of the *Friends I* trial court, which court has ordered that CLWA certify a new EIR for this Project. The Monterey Amendment Settlement Agreement provides that the new Monterey Amendment Program EIR must analyze the environmental impacts of this Project and other transfers as they relate to the environmental impacts of approving the Monterey Amendment. The upcoming Monterey Amendment EIR will not analyze the local Project-related growth-inducing impacts in the same degree of detail for the CLWA service area, although the Monterey Amendment EIR will include the 41,000

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37 (cont)	PCL/CPA		acre-feet transfer in its analysis together with all other transfers of Table A Amounts. The DEIR analyzes the potential indirect environmental impacts of the Project, arising out of growth that may be served by this water supply, taking into account pre-Monterey Amendment baseline conditions, including those for agricultural State Project water. (See DEIR 3.0) The DEIR analyzes the Project impacts both with and without the Monterey Amendment. (See DEIR 3.15.2.2 & Table 3.15-5) As set forth in the Master Response, the choice of lead agency is not dictated by the size of the project, but by which agency has principal responsibility to approve and carry out the Project. Also, as described in the Master Response, CLWA, as the local agency principally approving and implementing the Project, not DWR, has more expertise and perspective to explore the implications for water resources and land use planning within CLWA's jurisdiction.
38	PCL/CPA	PCL and CPA were among the plaintiffs whose successful CEQA challenge set aside the Central Coast Water Authority's original 1995 Monterey Program EIR. That ruling led to decertification of the predecessor EIR for Castaic's transfer, which unlawfully relied upon that defective analysis. The instant Draft EIR, prepared by the same firm (SAIC) as the decertified Monterey EIR, provides a case of history repeating itself. It is legally insufficient in process and substance, failing Castaic's duty under CEQA to properly inform decision-makers and the public of the project's environmental consequences. The Draft EIR cannot be reconciled with the Monterey Amendments court decision (*Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892) and the settlement agreement later reached in that case. (The full Settlement Agreement appears on DWR's website at http://www.montereyamendments.water.ca.gov/.)	Please refer to the Master Response. The decertified Monterey Amendment EIR analyzed the potential environmental impacts of major amendments to the SWP contracts, with statewide implications. The "project" to be analyzed in the new Monterey Amendment Program EIR will differ significantly from the Project in this DEIR. This DEIR analyzes the potential environmental impacts of a local project. The lead agency and water supply reliability issues identified in *PCL* as not having been adequately analyzed in the decertified Monterey Amendment EIR, have been addressed in this DEIR to the extent those issues are relevant to the Project. In any event, the identity of the firm preparing the EIR is not relevant in establishing the issue of the adequacy of an EIR. The comment points to no substantive evidence of the inadequacy of the DEIR in support of its statement that the DEIR is insufficient in process and substance and fails CLWA's duty under CEQA.

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39	PCL/CPA	PCL and CPA submitted a comment letter on August 22, 2004. This letter, attached as exhibit 1, addressed both the instant transfer and a related proposal to transfer 16,000 acre-feet of Table A amounts from another of the Kern County Water Agency's member districts. PCL urged Castaic that it should "refrain from moving forward with these separate project reviews, which are premature and likely to operate at cross-purposes with DWR's statewide review" of the project referenced in the Monterey Amendments case settlement. PCL and CPA advised Castaic that if it prematurely attempted to proceed with separate EIRs on these permanent transfers, it would "lack the institutional authority and statewide accountability" to serve as CEQA lead agency. The DEIR simply ignores PCL's comments, and sidesteps similar ones made by other organizations.	Please refer to the Master Response and to Comments 2, 3, 5, 6 and 22 and the Responses thereto. The DEIR does not include an analysis of a 16,000 acre-foot transfer of Table A Amount as part of the Project because any such future transfer is speculative and is not linked to the Project. However, the DEIR does discuss the cumulative impacts of the 16,000 acre foot transfer in DEIR Section 6.3.3.1. CLWA issued an NOP for the 16,000 acre-foot transfer, but because the option agreement for the 16,000 acre-foot acquisition expired, CLWA has conducted no further environmental review. DWR's new Monterey Amendment Program EIR will not constitute an EIR for this Project. The Monterey Amendment Program EIR will analyze the potential impacts resulting from this Project and other transfers as they relate to potential environmental impacts of approving the Monterey Amendment. CEQA does not require that a lead agency delay a project to await a program EIR that will discuss the project as part of a broader analysis of similar projects. CEQA gives agencies the choice to prepare a project EIR in lieu of tiering off a program EIR. As the parties to the Monterey Amendment Settlement Agreement recognized, a transfer between two State Contractors is not a project for which DWR should be the lead agency. The EIR for this Project is being prepared by CLWA under the supervision and at the direction of the Los Angeles Superior Court. DWR does not have principal responsibility to approve or carry out the Project, and is acting as a responsible agency. The physical environmental impacts of a two party transfer are generally confined to the respective service areas of the two agencies involved (CLWA and WRMWSD, as a member agency of KCWA), although the DEIR analyzes potential impacts upon SWP facilities as well.

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40	PCL/CPA	PCL filed similar comment letters on several local projects contesting Castaic's improper and premature reliance on the 41,000 acre-feet transfer as an integral part of its reliable water supply. These comments (addressing, respectively, the West Creek Project, the River Village Project, and the Riverpark project) are attached as exhibits 2-4. They raise important questions affecting the adequacy of this EIS, as well as the prospect of possible cumulative impacts not addressed in Castaic's draft.	Please refer to the Response to Comment 26.
41	PCL/CPA	Castaic's so-called "stand-alone" Draft EIR is fraught with potential for inconsistency with DWR's upcoming environmental review and decision on the "Monterey Plus" project. That review will address the identical transfer from a statewide perspective, with an integrated analysis of that project in its entirety. Castaic lacks the expertise and authority to proceed based upon its isolated assessment of project impacts, alternatives, and mitigation, each of which may well be undermined by DWR's subsequent analysis and decision.	Please refer to the Master Response and to Comments 2 through 6 and the Responses thereto. The comment incorrectly suggests that the new Monterey Amendment Program EIR will address this Project in its entirety with an integrated analysis. The Los Angeles Superior Court in *Friends I* ordered CLWA, not DWR, to prepare the EIR for this Project. The Monterey Amendment Settlement Agreement requires DWR to prepare a new program EIR for the Monterey Amendment, not for this Project. The Monterey Amendment Settlement Agreement excludes the possibility that the new Monterey Amendment Program EIR could constitute an EIR for this Project because it states that the Los Angeles Superior Court retains jurisdiction over the environmental document for this Project. The Monterey Amendment Settlement Agreement only requires that DWR analyze the potential impacts resulting from this Project and other transfers as they relate to the potential environmental impacts of approving the Monterey Amendment. Attachment D of the Monterey Amendment Settlement Agreement recognizes that non-final individual transfer projects will be reviewed by DWR only as the responsible agency. There is no evidence that this DEIR will be undermined by DWR's new Monterey Amendment Program EIR. Both this DEIR and the Monterey Amendment DEIR use the same DWR model (CALSIM II) to evaluate potential impacts, and CLWA

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41 (cont)	PCL/CPA		has coordinated with DWR, acting as a responsible agency, to ensure that the DEIR will not undermine DWR's efforts in preparing the new EIR for the Monterey Amendment.
42	PCL/CPA	Two recent Second District Court of Appeals cases reinforce the point that Castaic Lake Water Agency (CLWA) should not pursue its own independent EIR on the 41,000 acre foot transfer in advance of the completion of DWR's tier-one "Monterey Plus" EIR. In *Friends of the Santa Clara River v. Castaic Lake Water Agency* (2002) 95 Cal.App.4th 1373, the Second District court of appeal ordered the decertification of the previous EIR Castaic prepared to support the instant transfer. The Friends group and other environmental organizations opposed the project decision on that Kern/Castaic transfer, citing environmental consequences in the Santa Clara River area and association with numerous sprawl development projects. In its CEQA assessment, the court recognized that the proposed 41,000 acre-feet transfer "is part of an overall larger scheme, analyzed on a programmatic basis in the Monterey Agreement EIR." (*Id.* at 1384.)	Please refer to the Master Response and to Comments 37, 39 and 41 and the Responses thereto. The possibility that the Project can be considered part of an overall larger scheme for purposes of tiering off a program EIR, instead of preparing a stand alone project EIR, does not mandate that the agency tier off a program EIR.
43	PCL/CPA	Another recent Second District appellate decision, *Santa Clarita Organization for Planning and the Environment (SCOPE) v, County of Los Angeles* (2003) 106 Cal.App.4th715, critically addressed Castaic's characterization of the 41,000 acre-feet transfer. In that case, the County of Los Angeles violated CEQA in its review of the West Creek development project that erroneously assumed that 100 per cent of Castaic's purported 41,000 acre-feet would be available in wet years and 50 per cent in drought years. Drawing on *Planning and Conservation League's* assessment of the historic disparity between Table A amounts and deliverable water, the court concluded that the EIR failed to undertake a "serious and detailed analysis" of State Water Project supplies, and observed that "[t]he dream of water entitlements for the incomplete State Water Project is no substitute for the reality of actual water the SWP can deliver." (*Id.* at pp. 723, 717.)	This comment is noted, but it is inapplicable to the DEIR. It is not a comment on the Supplemental Water Project EIR. The project that was the subject of the *SCOPE* litigation and EIR is distinguishable from this Project. In *SCOPE*, the EIR for a development project[1] was invalidated because its cumulative impacts analysis of past, present and future developments on the amount of water available relied heavily on SWP Table A Amounts in calculating the total available water supply. The EIR in *SCOPE* made no attempt to calculate or even discuss the differences between Table A Amounts and actual supply. The EIR in *SCOPE* did not contain estimates or past delivery history from DWR, the agency that manages the SWP, in projecting how much water the SWP can deliver in different types of years.

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43 (cont)	PCL/CPA		In contrast, this DEIR does not analyze a development project, but a transfer of SWP Table A Amount. CLWA's acquisition of an additional 41,000 acre-feet Table A Amount serves to firm up CLWA's SWP deliveries to meet CLWA's current demand and to help meet future demand projected in local land use agency planning documents. The DEIR for this Project contains a detailed calculation of the total available water supply and discusses in detail the differences between Table A Amounts and actual supply. The DEIR for this Project contains DWR reliability estimates using DWR models as to how much water DWR can deliver in different types of years. The DEIR in Section 1.1 also cautions any land use agencies intending to rely on the Project for a water supply for new development that "past water deliveries are not a guarantee of future water delivery rates." [1] *The EIR in SCOPE was not prepared by Castaic as suggested in the comment—CLWA does not approve development projects.*
44	PCL/CPA	The Courts have also emphasized that DWR must act as lead agency in performing Tier 1 environmental studies. If Castaic continues with its separate environmental reviews without awaiting DWR's assessment in the "Monterey Plus" EIR, it would violate CEQA's lead agency requirement based upon the well-established standards set forth in *Planning and Conservation League v. Department of Water Resources*. The court in that case could hardly have been clearer that *DWR* is the "state agency charged with the statewide responsibility to build, maintain, and operate" the State Water Project. (*Id.* at p. 906.; see also Wat. Code, §12930, *et seq.*) Finding that DWR was the only entity with the requisite statewide perspective and expertise to serve as lead agency, the court found it "incongruous to assert that any of the regional contractors" could "assume DWR's principal responsibility for managing the SWP." (*Id.*) The court-approved settlement agreement in *Planning and Conservation League* recognizes DWR's duty as "the	Please refer to the Master Response and to Comments 2, 3, 4, 5, 6, 8, 9, 10, 22 and 72 and the Responses thereto. The DEIR is not a Tier 1 environmental study. The Project does not encompass administering, building, maintaining, managing and operating the SWP. DWR's role in the Project is as a responsible agency, charged with responsibility of approval of a point of delivery agreement to facilitate the transfer. The Monterey Amendment Settlement Agreement recognizes the role of State Water Project contractors as lead agencies for two party transfers between contractors. The Monterey Amendment Settlement Agreement provides that the Monterey Amendment will remain in place during preparation of the new Monterey Amendment Program EIR, thus permitting contractor transfers of the 130,000 acre-feet identified in Section 53 the Monterey Amendment. CLWA, not DWR, has local expertise regarding anticipated future projects within CLWA for indirect and cumulative impacts analysis. DWR's statewide authority and experience has been utilized, to the extent appropriate, in evaluating the Project's potential environmental

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44 (cont)	PCL/CPA	State agency responsible for administration and operation of the SWP," as well as its continuing obligation to comply with applicable requirements of CEQA and the Water Code. (Settlement Agreement, Section X.B.) The transfer guidelines disclosed to contractors under the settlement agreement also recognize the continuing need to comply with all existing legal requirements, including CEQA, and to honor the lead agency principles identified in the Third District's decision in the Monterey Amendments case (see http://ceres.ca.gov/ceqa/cases/2000/PCLvDWR-2000.html). These principles apply clearly to the proposed permanent transfers of the Table A amounts referenced in the state project contracts, which require DWR's approval and presuppose the application of Monterey. They also concededly require changes in the amount of supplies available to several water agencies, the location and timing of project deliveries, and changed utilization of the project's conveyance and storage facilities. The transfers, which may require the fallowing of farmland in agricultural areas outside the jurisdiction of CLWA and are associated with proposed annexations linked to some of the more controversial development projects in California, demand the statewide authority and experience that only DWR can provide.	impacts, in that DWR has been consulted as a responsible agency. DWR's new Monterey Amendment Program EIR will not analyze the Project in its entirety. According to the Monterey Amendment Settlement Agreement, DWR will only analyze the potential environmental impacts resulting from this Project and other transfers as they relate to the potential environmental impacts of approving the Monterey Amendment. Oversight of the CEQA analysis for the Project falls within the jurisdiction of the Los Angeles Superior Court, as stated in the decision in the *Friends I* case and as acknowledged by the Monterey Amendment Settlement Agreement, Section III(E). There is no evidence that this DEIR will violate DWR's lead agency status in the preparation of the new Monterey Amendment Program EIR. The Monterey Amendment project description is substantially different from the description for the Project. The two environmental analyses share one common feature--both this DEIR and the Monterey Amendment EIR use the same DWR model (CALSIM II) to evaluate potential impacts. The Project does not require the fallowing of farmland and is not linked to any development project. Please refer to the Response to Comment 72 for a thorough discussion regarding the lack of need for fallowing resulting from the Project. Please also refer to the Responses to Comments 23 and 26.
45	PCL/CPA	Lastly, Castaic's hypothetical "non-Monterey" analysis of the transfers in the Draft EIR cannot substitute for DWR's new assessment of the Monterey changes. In *Friends*, Castaic unsuccessfully attempted to portray its transfer EIR as capable of standing alone, outside the Monterey Amendments program. Although transfers were available under Article 41 of the pre-Monterey State Water Project contracts subject to express DWR approval, DWR has neither reviewed nor conferred approval on the present transfer under Article 41.	Please refer to the Master Response and to Comments 3, 5 and 10 and the Responses thereto. As those comments from DWR note, DWR has approved of the DEIR's "non-Monterey" analysis. The *Friends I* court rejected CLWA's claim that the prior Project EIR stood alone because the prior Project EIR did not analyze the environmental impacts on the seller's lands under pre-Monterey Amendment conditions. However, the DEIR does analyze those impacts, as set forth in DEIR Section 3.2 and Appendix C. Therefore, the "straw man" problem of

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45 (cont)	PCL/CPA	Moreover, it is highly speculative whether agriculture-to-urban transfers such as the 41,000 acre foot transfer would even have taken place without the Monterey Amendments, since those Table A amounts would have been subject to "agriculture first" cutbacks under pre-Monterey article 18(a). Read in context, such maneuvers would amount to little more than the "straw man" argument considered and rejected in the *Friends* appeal. (95 Cal.App. 4th at p. 1387.)	referencing the Belridge EIR that did not address the impacts to the seller's lands, discussed in *Friends I*, has been resolved in the DEIR. To clarify, the Project could occur either pre- or post-Monterey Amendment and has been analyzed accordingly in this "stand alone" DEIR. The commenter fails to acknowledge that the Monterey Amendment Settlement Agreement provides that the Monterey Amendment remains in full force and effect, and that permanent Table A Amount transfers may occur under the Monterey Amendment, while DWR prepares the new Monterey Amendment EIR. As noted in DEIR Section 1.4.2, CLWA has 12,700 acre-feet of SWP agricultural contractor water previously purchased under the pre-Monterey Amendment condition. DEIR Table 3.15-17 illustrates that CLWA would obtain more of an advantage from the Project under imposition of pre-Monterey Amendment Article 18(b) in average and multiple dry years than it would under the Monterey Amendment. Therefore, the Project is potentially advantageous to CLWA even without the Monterey Amendment. That is because the remaining 41,500 of CLWA's 54,200 Table A Amount pre-existing the Project is designated as M&I contractor water and would benefit in years when agricultural contractor cutbacks would occur under pre-Monterey Article 18(b).
46	PCL/CPA	The instant Draft EIR, includes glaring errors. A piecemeal and startlingly inaccurate description of the Monterey case Settlement Agreement (ES 2-4) fails even to inform the reader that DWR's statewide review of the "Monterey Plus" project could affect the future of this transfer or of the Monterey Amendments themselves.	The description of the Settlement Agreement is accurate and contains the specific information relevant to the EIR analysis. Because the new Monterey Amendment EIR is still in preparation, the Supplemental Water Project EIR contains an analysis of environmental impacts that would occur both with and without the Monterey Amendments in place, consistent with CEQA Guidelines section 15144, which indicates that "while foreseeing the unforeseeable is not possible, an agency must use its best efforts to find out and disclose all it can." Trying to forecast what future changes to SWP Contracts might occur as a result of the new Monterey Amendment EIR, and

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46 (cont)	PCL/CPA		what the environmental impacts of such changes would be, is speculative and not required by CEQA (CEQA Guidelines section 15145). Because the Monterey Amendment Settlement Agreement provides that the Monterey Amendment will remain in full force and effect while DWR prepares a new EIR, it is appropriate that the environmental analysis for this Project include both the "with and without Monterey Amendment" conditions. The September 24, 2002 trial court judgment on remand in *Friends I* provided as follows with respect to the water transfer under this Project pending certification of an EIR that complies with CEQA and the Court of Appeal opinion: "Respondent will not be prohibited from using the water to which it is entitled, but petitioner may renew its application for such prohibition based upon evidence of the actual use of such additional water for purposes it considers improper." The Court of Appeal affirmed that judgment in a subsequent unpublished opinion. Please refer to the Master Response and to Comments 2-6 and the Responses thereto. The DEIR is not tiered off the new Monterey Amendment Program EIR. The new Monterey Amendment Program EIR is still pending and could take many months to complete. As noted by DWR, the approach to environmental analysis in the DEIR is not inconsistent with the approach that DWR is taking in preparing the new Monterey Amendment Program EIR. DWR is a responsible agency that must approve or disapprove the Project and will rely upon CLWA's certified EIR to perform that function.
47	PCL/CPA	The "Settlement Agreement underscores the non-finality of the 41,000 acre-feet transfer and the need for DWR's statewide review. For example: • Section III.D refers to a list of transfers listed in attachment E to the agreement, which the settling parties, without specifically endorsing or opposing them, recognize as	Please refer to the Master Response and to Comments 9, 10 and 22 and the Responses thereto. The Monterey Amendment Settlement Agreement does not state or imply that the new Monterey Amendment Program EIR must serve as the EIR or as a Tier 1 EIR for this Project. Section (III)(C)(4) of the Monterey Amendment Settlement Agreement only requires that the new Monterey Amendment Program EIR analyze the

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47 (cont)	PCL/CPA	"final" and agree not to challenge. This transfer is *not* included in that list. • Further evidence of the non-finality of the Castaic transfer is that section III.E singles out this transfer for a special acknowledgment recognizing that it is the subject of pending litigation in this Court.[fn.1] • Section III.C.4 recognizes DWR's commitment to provide in its forthcoming statewide programmatic EIR an "[a]nalysis of the potential environmental effects" relating to "the Kern-Castaic Transfer," identifying it as one of the actions "that relate to the potential environmental impacts of approving the Monterey Amendments." [Fn. 1 from letter:] The Draft EIR erroneously attempts to recast this provision as a "specific exclusion" of this transfer from "any prohibitions against transfers of Table A amounts by the Settlement Agreement." That is simply wrong. Section III.E recognizes that this transfer is "subject to pending litigation in the Los Angeles Superior Court following remand from the Second District Court of Appeal." It reflects a recognition that "jurisdiction with respect to that litigation should remain in the [Los Angeles] court," and the settling parties' concurrence that "nothing in this settlement agreement is intended to predispose the remedies or other actions that may occur in that pending litigation."	potential environmental impact of Monterey Amendment Settlement Agreement Attachment E transfers and this Project as actions that relate to the potential environmental impacts of approving the Monterey Amendments. Section III(E) of the Monterey Amendment Settlement Agreement, which recognizes that the Los Angeles County Superior Court in *Friends I* has jurisdiction over this Project, serves to limit the analysis required by Section III(C)(4). The Los Angeles County Superior Court in *Friends I* stated in its judgment on remand with respect to this Project: "Respondent will not be prohibited from using the water to which it is entitled, but petitioner may renew its application for such prohibition based upon evidence of the actual use of such additional water for purposes it considers improper." With respect to DEIR reference to a "specific exclusion," see the Response to Comment 10.
48	PCL/CPA	DWR has recently confirmed that this transfer remains subject to the Settlement Agreement and its future "Monterey Plus" EIR. As DWR Director Lester Snow wrote on June 17, 2004 to *Friends* case lead counsel Alyse Lazar, "DWR's treatment of the transfer of Table A amounts from Kern County Water Agency to Castaic Lake Water Agency will be governed by the Settlement Agreement. As provided in Paragraph IIIC4 of the Settlement Agreement, the EIR will include an "analysis of the potential environmental impacts relating to (a) the Attachment E transfers, and (b) the Kern-Castaic Transfer, in each case as	Please refer to the Master Response and to Comments 22, 33 and 47. The Snow letter does not state that the Project will be reviewed by DWR as a new project. In fact, the Snow letter reaffirms what the Settlement Agreement provides, i.e., that the Project and the Settlement Agreement Attachment E transfers will be reviewed only "as actions that relate to the potential environmental impacts of approving the Monterey Amendments."

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48 (cont)	PCL/CPA	actions that relate to the potential environmental impacts approving the Monterey Amendments." Section 1(0) of the Settlement Agreement defines the "Kern-Castaic Transfer" as "the transfer of 41,000 AF of water from Kern County Water Agency to the Castaic Lake Water Agency, approved by DWR on March 31, 1999." DWR has not completed any draft or final analysis regarding these transfers." Given both the required state leadership on an ongoing Tier 1 environmental study and the pending litigation, the future of the Castaic transfer and, indeed, the broader Monterey Amendments, cannot be assumed.	
49	PCL/CPA	The Draft EIR's assertion that the Settlement Agreement "did not change the substance of the Monterey Amendments" is also misleading. Although those amendments are part of the "Monterey Plus" project, the agreement also eliminates misleading references to "entitlements" from the state contracts and adds a new provision to the contracts imposing water reporting requirements. The agreement also imposes a host of other substantive changes in State Water Project operation that should be described in the Final EIR.	Section II of the Monterey Amendment Settlement Agreement authorizes the continued administration and operation of the SWP and Kern Water Bank in accordance with the Monterey Amendment and the amendment attached as Exhibit A to the Settlement Agreement. As the recitals and Section 8 of the Exhibit A amendment explains, the intent of most of the Exhibit A changes was "solely for clarification purposes" and to "not in any way change the rights, obligations or limitations on liability of the State or the District." The only other provision in the Exhibit A amendment was the addition of Article 58, which provides for biennial reporting by DWR of the delivery capability. Article 58 is a procedural, and not a substantive change. None of the Exhibit A changes or other provisions of the Settlement Agreement appear to alter the environmental impacts of the Monterey Amendment. In any event, the Monterey Amendment is an entirely different project from that analyzed in the DEIR for the Project. Under the Monterey Amendment Settlement Agreement, the Monterey Amendment remains in place, including Article 53 that provides for permanent agricultural to urban contractor transfers of 130,000 acre-feet of Table A Amounts from Kern County. This Project was a transfer that fell within that 130,000 acre-feet Table A Amount, but the Project could equally occur under Article 41 of the State Water Project contract without the Monterey Amendment in place. Section III(E) of the Settlement

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49 (cont)	PCL/CPA		Agreement confirms that the environmental analysis for this Project is subject to the jurisdiction of the Los Angeles County Superior Court, the venue for the *Friends I* case, and is not subject to the jurisdiction of the Sacramento County Superior Court, the venue for the challenge to the prior Monterey Amendment Program EIR.
50	PCL/CPA	Castaic's refusal to await DWR's "Monterey Plus" EIR would fatally compromise its ability to identify alternatives to the proposed transfer that might maximize its benefits and minimize its environmental impacts statewide prior to rendering the transfer a *fait accompli*. DWR's EIR will programmatically address Castaic's transfer in the context of statewide contract amendments. A major issue requiring assessment in that document will be the possible *alternative* dispositions of the 41,000 acre feet of Table A amounts to serve other uses. To list several possible examples, the alternative uses subject to statewide analysis might include ecological restoration, urban infill development in Los Angeles or San Diego, and relief from cutbacks of Colorado River deliveries in excess of the California's 4.4 million acre-feet in annual entitlement. (See *Arizona v. California* (1964) 376 U.S. 340 (Colorado River); fn. 7, *supra* p. 16).) In short, legally adequate assessment of these issues under CEQA will require DWR's "statewide perspective" rather than the provincial experience of a local water agency, and demands recognition that this transfer is an overall part of the Monterey program. (*Friends I*, 95 Cal.App.4th at p. 1384.)	Please refer to the Master Response. The comment misconstrues what the Monterey Amendment Settlement Agreement states regarding analysis of the Project in DWR's new Monterey Amendment Program DEIR. Section III(C)(4) of the Monterey Amendment Settlement Agreement states that DWR will analyze the potential environmental impacts of the Project as they relate to the potential environmental impacts of approving the Monterey Amendment. Thus, DWR's analysis of the Project in the new Monterey Amendment Program DEIR will be included as part of a broader analysis of past and future permanent transfers of Table A Amounts. But DWR's analysis of the Project impacts will not constitute the EIR for the Project and is not required to serve as a Tier 1 EIR for the Project. Section III(E) of the Monterey Amendment Settlement Agreement, which recognizes that the Los Angeles County Superior Court in *Friends* I has jurisdiction over this Project, serves to limit the analysis required by Section III(C)(4). The comment appears to confuse the appropriate environmental analysis of the Monterey Amendment with the appropriate analysis of the Project that is the subject of the DEIR. An EIR need only consider alternatives to the project described and analyzed in that EIR. The Court of Appeal in *Friends I* ordered the environmental review for the Project to be conducted by CLWA under the jurisdiction of the Los Angeles Superior Court. The Monterey Amendment Settlement Agreement acknowledges the jurisdiction of that court over the EIR for this Project. The alternatives suggested for analysis by this commenter are more appropriate suggestions for consideration in DWR's preparation of the DEIR for the Monterey Amendment, to the extent that the alternatives are

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50 (cont)	PCL/CPA		feasible or acceptable. None of the alternatives suggested by the commenter fit within the criteria for alternatives to the Project. None of the suggested alternatives would feasibly attain most of the basic objectives of the Project as required by CEQA. The objectives of the Project are to augment CLWA's Table A Amount to meet the water demands of existing users and anticipated future growth and to provide a means of delivery for the augmented water supplies. The DEIR includes analysis of a "No Project" alternative and a reasonable range of alternatives that will foster informed decision-making and public participation, including those alternatives that would feasibly attain most of the basic objectives of the Project but would avoid or substantially lessen any of the significant effects of the Project. As noted elsewhere in these responses to comments, DWR has provided its statewide perspective to the DEIR in DWR's role as a responsible agency. DWR is charged with analyzing the potential environmental impacts of the Project and other transfers as they relate to the potential environmental impacts of approving the Monterey Amendment because DWR has agreed to prepare its new Monterey Amendment Program EIR in accordance with the provisions of the Monterey Amendment Settlement Agreement.
51a	PCL/CPA	The Draft EIR's water supply assessment (especially in sections 3.15 and Appendix D) make highly problematic assumptions about state water reliability,	Please refer to response to comment 25.
51b	PCL/CPA	as well as the availability of "surplus" water under Article 21 of the state project contracts.	SWP surplus water is SWP water that can be made available to Contractors when water and capacity are available in excess of SWP storage needs and Table A supplies. The different types of surplus water, and surplus water terminology, both with and without the Monterey Amendment are described in Table A-2 of Attachment A to Volume II of the FEIR. This table is a sub-set of Table 3.15-3 on page 3.15-8 of the DEIR. The uses of surplus water in the DEIR's water supply assessment are described below for each category of surplus water. As described below, the assumptions for surplus water

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51b (cont)	PCL/CPA		made in the water supply assessment are consistent with the SWP Contracts, SWP operations and the availability of surplus water, and both WRMWSD's and CLWA's ability to take delivery of surplus waters. **Scheduled Surplus Water** Scheduled surplus water was included only in the With Article 18(b) Implemented allocation scenario. It was included in this scenario because with the reduction in Table A Amounts under that scenario, scheduled surplus water would have been available on a scheduled or more dependable basis similar to Table A supplies (i.e., Contractors could schedule deliveries of scheduled surplus water in advance, in a manner similar to their annual Table A requests). Because the overall availability of SWP supply is independent of the way water is allocated among Contractors, it was assumed that the SWP supply would remain the same under this scenario. However, because total Table A Amounts would be proportionally reduced to the "minimum project yield," there would be frequent occasions when water above this minimum project yield amount would be available as part of allocated supplies. For example, if DWR anticipates the available SWP supply to be 3.0 MAF in a particular year, and if all Contractors' Table A Amounts were reduced to a hypothetical new minimum project yield of 2.0 MAF, then the 1.0 MAF of available SWP supply above that minimum project yield could be scheduled, in advance, for delivery to Contractors similar to Table A supplies. This is consistent with the SWP Contracts, SWP operations and the availability of surplus water, and both WRMWSD's and CLWA's ability to take delivery of this water. Scheduled surplus water is assumed to be unavailable under the Without Monterey Amendment and With Monterey Amendment allocation scenarios because (1) for the Without Monterey Amendment allocation scenario, scheduled surplus water was generally available only during the early years of the

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51b (cont)	PCL/CPA		SWP, when total Contractor demands were low, and has not been available since the mid-1980s due primarily to increasing Contractor demands for Table A supplies, and (2) for the With Monterey Amendment allocation scenario, the category of scheduled surplus water was eliminated as part of the Monterey Amendment. This is consistent with the SWP Contracts, SWP operations and the availability of surplus water, and both WRMWSD's and CLWA's operations and facilities. **Unscheduled Surplus Water and Article 21 Water** As described on page 3.15-36 lines 33-40, unscheduled surplus water/Article 21 water was not included in the water supply analysis for any of the three water allocation scenarios. This was because unscheduled surplus water/Article 21 water is not available on a routine or predictable basis, and is generally only available for short periods of time during low demand months when most Contractors have a limited ability to use it. While unscheduled surplus water/Article 21 water is available under the SWP Contracts and SWP operations, it is only periodically and temporarily available and is not a reliable supply. Not including this water is consistent with WRMWSD's and CLWA's operations and facilities because both agencies have limited capacity to take delivery of this water when it is available (as compared to a few other SWP Contractors that have large surface and/or groundwater storage facilities and can take delivery of large amounts of unscheduled surplus water/Article 21 water when it is available and store the water for future use).
51c	PCL/CPA	DWR's record of deliveries to contractors under the SWP figured centrally in the Third District's conclusion that the 1995 EIR must be set aside. (See *PCL v. DWR*, 83 Cal. App. 4th at 908 (noting the "huge gap between what is promised and what can be delivered" and that "actual, reliable water supply" is "in the vicinity of 2 to 2.5 MAF of water annually" rather than the 4.23 MAF of Table A "entitlements"); 83 Cal. App. 4th at 913	CLWA has obtained and included in the DEIR a frank assessment of DWR's record of deliveries. In the DEIR, CLWA shows a record of historic SWP deliveries for 1990 through at least 2001, showing total SWP deliveries, SWP deliveries to WRMWSD, and SWP deliveries to CLWA (see Tables 3.15-2, 3.15-5, and 3.15-8, respectively). In addition to showing actual acre-feet of deliveries, these tables show the SWP allocation

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51c (cont)	PCL/CPA	(average actual deliveries under the SWP from 1980-1993 "were around 2.0 MAF"). A frank assessment of DWR's record of deliveries is essential to a wide variety of issues addressed in the EIR, including the no project alternative as well as the assessment of hydrologic impacts, land use and planning impacts, growth-inducing impacts, and cumulative impacts. Anticipating the importance of this issue, the Monterey Settlement Agreement required periodic SWP reporting on the reliability of SWP deliveries.	percentage for each year. These allocation percentages show the percentage of Contractors' requested Table A Amounts the SWP was able to meet. For example, while total SWP deliveries appear low in 1998, the allocation of 100 percent indicates that Contractors' SWP requests were completely met. Low deliveries that year were due to 1998 being a very wet year, which reduced Contractor demands for SWP water. Therefore, the low deliveries in 1998 were limited by demand, not by supply. In 2001, total SWP deliveries were only slightly less than in 1998. However, the allocation percentage that year was only 39 percent, indicating that SWP supplies were only able to meet 39 percent of Contractors' requested Table A Amounts. Clearly, the low SWP deliveries in 2001 were constrained by the amount of available supply. The *PCL* and *SCOPE* cases (*Planning & Conservation League v. Department of Water Resources* [2000] 83 Cal.App.4th 892 and *Santa Clarita Organization for Planning the Environment v. County of Los Angeles* [2003] 106 Cal.App.4th 715) do not require CLWA to prepare a study or model independent of DWR studies and models. Several commenters on the SWP Delivery Reliability Report questioned the reliability estimates in the report, based in part on the argument that historic deliveries were much lower than the report's estimates. However, at least one of these commenters (Dennis O'Connor) acknowledges in his comments that "while many try to compare the modeled 2001 reliability against historic SWP operations, it is not really appropriate for much of the period" (O'Connor 2002). This is because Contractors' contractual Table A Amounts and requests for SWP water were in a build-up phase during much of this period. Table A Amounts, which limit how much SWP water a Contractor may request, reached a maximum in 1990 for most Contractors; and delivery requests for most Contractors have only recently increased up to their Table A Amounts. In addition, the regulatory rules governing the Delta and SWP

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51c (cont)	PCL/CPA		operations have become more stringent over the years, with most of the current rules issued in 1995. Therefore, as O'Connor notes in his comments, "comparing modeled 2001 reliability against actual deliveries is somewhat misleading much beyond the last few years" (O'Connor 2002). DWR has responded to the comments of O'Connor and others on this issue (see letter from DWR to Senator Michael Machado dated March 11, 2003; DWR 2003c). In addition to providing information on historic SWP deliveries, the DEIR includes a detailed analysis of indirect and growth-related impacts of the Project (see Chapter 5). The DEIR also provides a summary of the effects of the Project with regard to local and regional Plans and Policies (see DEIR Chapter 4).
51d	PCL/CPA	The Draft EIR uses dubious modeling assumptions to claim an average of annual deliveries exceeding the historical record by approximately a million acre-feet. (See DEIR, 3.15-7.)	Please refer to Responses to Comments 25 and 51c.
51e	PCL/CPA	In part, Castaic's EIR relies upon dated studies employing an outmoded model (DWRSIM).	The differences between DWRSIM and CALSIM II model study results were considered and found to be so minimal as to not result in changes to the environmental impact determinations in this DEIR. Moreover, use of the slightly higher SWP supplies associated with the use of DWRSIM resulted in DEIR consideration of the worst-case scenario; i.e., the scenario that would result in greater direct and indirect impacts in both the CLWA and WRMWSD service areas. Direct impacts would remain less than significant regardless of the modeling tool used, and indirect impacts from growth-related development would remain significant regardless of the modeling tool used. No new environmental impacts would result from the use of CALSIM II instead of DWRSIM. As described on page 3.0-5 line 10 through page 3.0-6 line 27, page 3.15-31 line 15 through page 3.15-32 line 2, in Appendix D section 2, and in Responses to Comments 4 and 25, the environmental impact analysis was conducted using DWRSIM because these studies were consistent with the 1998 "pre-

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51e (cont)	PCL/CPA		Project" environmental setting used in the DEIR. Additionally, at the time the analysis was conducted for the DEIR, the DWRSIM studies from the CALFED Bay-Delta Program EIS/EIR provided the best available estimates of SWP deliveries, and were the most comprehensive, well-established, publicly available model studies available. The two DWRSIM studies used received extensive public and technical review as part of the CALFED process and formed the basis for the SWP and CVP water supply analysis for the CALFED Bay-Delta Program EIS/EIR. Once DWR released the CALSIM II studies conducted for DWR's SWP Delivery Reliability Report, the SWP deliveries from these studies were compared with the results from the DWRSIM studies used for this DEIR. While the modeling tool itself has changed, the criteria used in the models to simulate SWP operations have not significantly changed. The delivery results of DWR's more recent assessment of SWP reliability in its SWP Delivery Reliability Report using CALSIM II are comparable to the results of the DWRSIM studies (see Table A-3 of Attachment A to Volume II of the FEIR and Appendix D of the DEIR, Section 2.2 for a comparison of these model study results). As shown in Table 3, the results of the two modeling studies are similar; however, in general, the estimates of SWP supplies associated with the 41,000 AF of Table A Amount based on the SWP Delivery Reliability Report and CALSIM II are somewhat lower than the amounts under the DWRSIM studies for the comparable allocation scenario. Therefore, from an environmental impact assessment standpoint, the DEIR analyzed the worst-case scenario; i.e., the scenario that would result in greater direct and indirect impacts in both the CLWA and WRMWSD service areas. The reasons for these differences were discussed in the DEIR on page 3.15-31 line 29 through page 3.15-32 line 2 and are briefly summarized below: • The results in this EIR account for the variable demand used by DWR in its model studies (consistent with the way DWR actually has allocated water), while the results

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51e (cont)	PCL/CPA		as presented in DWR's delivery reliability report do not (i.e., in DWR's report, deliveries are presented as a percentage of Table A, regardless of the lower demands used in some years of the study); and, • The "existing" case in this EIR is based on 1998 SWP demand conditions, while the "existing" case in DWR's report is based on higher 2001 SWP demand conditions. The 2001 total SWP demand is higher than the 1998 demand due to increased M&I Contractor demands. A higher total demand can result in some years in less water being allocated to the same Table A Amount, so the higher 2001 demand results in a slightly lower quantity of water associated with the 41,000 AF of Table A Amount.
51f	PCL/CPA	To move beyond DWRSIM's obvious deficiencies, the Draft EIR also makes unwarranted extrapolations from DWR's 2003 reliability report.	The commenter refers to "unwarranted extrapolations from DWR's 2003 reliability report," but provides no further information regarding any specific "extrapolations" or what is "unwarranted." As discussed in more detail in Response to Comment 25, the SWP Delivery Reliability Report was used in the DEIR only to estimate SWP supplies for the current environmental setting. The pre-project 1998 environmental baseline and the project environmental impact analyses were based on separate model studies (DWRSIM model studies conducted by DWR for the CALFED Bay-Delta Program EIS/EIR), and not on model studies from the SWP Delivery Reliability Report. While the derivation of supply estimates in the DEIR for the current environmental setting is based on data from the SWP Delivery Reliability Report, the derivation method used is straightforward and was performed just as suggested by DWR in that report. In that report, DWR presents the probability of being able to meet total SWP deliveries as a percent of full Table A Amounts. DWR suggests that this information can be directly applied to individual Contractors by multiplying the total delivery percentages by an individual Contractor's Table A Amount. In the DEIR, supply estimates were derived for

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51f (cont)	PCL/CPA		three hydrologic conditions. Estimates of total SWP supplies under each of these hydrologic conditions were taken directly from Table B-3 of DWR's SWP Delivery Reliability Report. The delivery percentage under these conditions were determined by dividing these total SWP deliveries by total Table A Amounts of 4.133 million AF, and CLWA's share of that supply was determined by multiplying this percentage by CLWA's Table A Amount of 95,200 AF. For example, the average supply available to CLWA was estimated by starting with the average total SWP supply from DWR's Table B-3, which is 2.962 million AF. Dividing this supply by the total Table A Amounts of 4.133 million AF results in a delivery percentage of 71.7 percent. Multiplying this percentage by CLWA's Table A Amount of 95,200 AF results in an estimated average supply to CLWA of 68,300 AF. Supply estimates for the hydrologic conditions based on specific hydrologic years were derived in the same manner, starting with total SWP deliveries from DWR's Table B-3 for those specific years. These limited extrapolations, which were conducted just as suggested by DWR, are not "unwarranted." None of the environmental impact analyses performed for the DEIR were based on the particular data that were derived from the SWP Delivery Reliability Report.
51g	PCL/CPA	That report has faced significant controversy regarding its overall conclusions and the computer modeling that underpins its reliability projections. For instance, the reliability report constructs delivery probability charts for the SWP for two years, 2001 and 2021. As noted by several commenters, the median delivery identified in the report (3.297 MAF) is on the order of 50% greater than the actual record of historic deliveries to the SWP as reported by DWR. A detailed analysis by Dennis O'Connor for the California Research Bureau, referenced in the comment letter of Senator Machado [fn2], indicates that the draft reliability report provides no credible explanation for this disparity. O'Connor's analysis concludes that among other problems, the results are inconsistent with previous estimates	Please refer to Response to Comment 25.

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51g (cont)	PCL/CPA	and models, recent deliveries were lower than the modeled 2001 conditions, and 2021 does not reflect any growth in upstream consumptive use. His assessment also observes that CALSIM II is not calibrated or otherwise verified, and that the draft reliability report does not use the CALSIM II model as designed. Because the draft reliability report appears to overstate the supply reliability of the SWP, O'Connor's analysis warns that DWR's assessments of reliability should not replace the "paper water" problem with a new, simulation-based "cyber water" problem. Other comment letters, notably those of Robert C. Wilkinson, Peter Gleick, and Arve Sjovold, reach similar conclusions. (Please see http://swpdelivery.water.ca.gov/ and comments submitted regarding the instant EIR by Arve Sjovold.) [2][Fn 2 from letter]: See Appendix E page E-94 at http://swpdelivery.water.ca.gov/SWP%20Delivery%20Reliability.final.2002.pdf.	
51h	PCL/CPA	Controversy over the reliability report, on which this EIR relies, led to review of CALSIM II modeling by an External Review Panel including some of the world's leading experts on water resource systems. Their report, "Strategic Review of CALSIM II and its Use for Water Planning, Management, and Operations in Central California" was released on December 4, 2003. The Panel raised serious concerns regarding the application of the model to predicting reliable deliveries, especially as those deliveries related to particular contractors. Many of the Panel findings agree with concerns we have articulated throughout the Monterey EIR process. Notably, the Panel found that: • "Examination of the report "CALSIM II Simulation of Historical SWP/CVP Operations,' DWR (2003) indicates that the current formulation of CALSIM II: Overestimates water deliveries to SWP and CVP contractors..." (p. 11) • "Most successful applications of optimization [CALSIM's type of computer model] ...have calibrated	Please refer to Response to Comment 25.

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51h (cont)	PCL/CPA	• their objective functions…so that the model results correspond to what actually happens or would happen under a particular hydrologic and demand scenario…It does not appear that such a calibration of the objective function weights in CALSIM has yet been completed." (p. 4) • "…currently many users are not sure of the accuracy of the results. A sensitivity and uncertainty prediction capability and analysis is needed" (p. 8) • "In our opinion, CALSIM II has not yet been calibrated or validated for making absolute predictions values." (p. 9) • Regardless of how possible it is to match the model closely with observed behavior, statistics on the accuracy of the calibration run should be supplied to users to enable them to gauge the likely errors involved with using the model output. (page 9) • In CALSIM II, "Groundwater resources are assumed infinite, i.e., there is no upper limit to groundwater pumping." (p. 8) • "Realistic upper bounds to pumping from any of the aquifers represented in the model need to be developed and implemented." (p. 27) • "In general, the level of representation of groundwater in CALSIM II is not reasonable from the point of view of the reviewers." (p. 27) • "In many cases, it appears that water use and other hydrologic data inputs to CALSIM II are based on data collection and analyses that took place during the 1960's when DWRSIM and PROSIM were being constructed. It is important to ensure that data used for CALSIM II are up-to-date and consistent with the best current information." (p. 20). • In general, it appears that the developers of CALSIM II do not have a clear idea of how to define the scope of CALSIM II use and many of its applications are evolving in a reactionary manner. Model developers	

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51h (cont)	PCL/CPA	should identify clearly the desired uses for CALSIM II and then determine acceptable approaches for satisfying those desires. Developers should seek to improve data accuracy and overcome unrealistic assumptions to improve the confidence in model results. (page 25)	
52	PCL/CPA	Furthermore, as numerous CEQA cases have consistently held, local agencies such as CLWA have an independent responsibility to adequately assess reliability. Castaic therefore, and cannot rest its analysis solely on its old DWRSIM studies and the DWR Reliability Report.	The *PCL* and *SCOPE* cases (*Planning & Conservation League v. Department of Water Resources* [2000] 83 Cal.App.4th 892 and *Santa Clarita Organization for Planning the Environment v. County of Los Angeles* [2003] 106 Cal.App.4th 715) do not require CLWA to formulate an independent model to assess SWP supply reliability. DWR is the state agency that manages and operates the SWP. It is also the state agency responsible for development and periodic updates of the statewide water plan. As such, DWR is in the best situation to have the SWP-specific knowledge and operational experience necessary to estimate SWP supply reliability, as well as knowledge of the broader statewide water user information affecting future SWP reliability. The modeling tools that DWR has developed are based on this extensive experience and knowledge. CLWA and other SWP Contractors have participated in extensive discussions with DWR regarding the development, use and adequacy of the DWRSIM and CALSIM II models. While recognizing that no model is perfect, DWRSIM, the DWRSIM studies conducted for the CALFED Bay-Delta Program EIS/EIR, CALSIM II, and the CALSIM II studies contained the SWP Delivery Reliability Report provide the most comprehensive and accurate assessment of SWP reliability available. Additionally, in their comment letter on the DEIR, DWR stated that the DEIR "adequately discusses the reliability of the SWP, pre- and post-Monterey Amendment conditions, future conditions, and SWP operations." (See Response to Comment 5) The SWP is a very complex water system. Its operations are governed by river flow requirements, Delta regulatory and

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52 (cont)	PCL/CPA		water quality requirements, and facility constraints; its operations must be coordinated with the U.S. Bureau of Reclamation's (USBR) operation of the comparably complex Central Valley Project system; and all of these operations are affected by numerous other water users upstream of the Delta. Added to this system complexity is the more typical water supply uncertainty due to hydrologic variability. SWP supplies to an individual SWP Contractor are further affected by the demands of the other Contractors. Given the complexity of this entire system, CLWA relies on DWR to provide the best estimate of SWP supply reliability. Also, as directed by DWR, the SWP Contractors must factor their other available water supplies into their assessments of SWP supply reliability.
53	PCL/CPA	Without adequate review, the transfer would place available water in one of the places in California most likely to promote urban sprawl and destroy environmental habitat The Draft EIR's growth inducement section (Chapter 4) fails to appreciate the significance of this transfer as a linchpin of sprawl development. Following the *PCL* decision and through the Monterey EIR, the state has a responsibility and, as noted above is the only entity with the requisite resources and purview, to determine the environmental impacts, particularly including induced growth impacts, of transfers such as the 41,000 acre-foot transfer. Local agency analysis of these impacts prior to the Tier I Monterey EIR impermissibly and imprudently ignore the state's role in considering alternatives to that transfer which would, for example, meet existing shortfalls in developed Southern California dependent on diminishing Colorado River supplies, while avoiding "dumb growth" in the undeveloped frontier at the Los Angeles-Kern County border.	Please refer to the Master Response and to Comments 37 and 50 and the Responses thereto. CLWA has no jurisdiction over land use planning. Nonetheless, Chapter 4 of the DEIR analyzes the potential indirect (growth related) impacts of the Project. CEQA does not require CLWA to speculate that land use plans might lead to urban sprawl or destroy habitat. CEQA does not require CLWA to analyze growth inducing impacts that are not reasonably foreseeable. City and county land use plans are an appropriate benchmark for what constitutes a reasonably foreseeable impact. Any new project that proposes to rely upon the transferred Table A Amount will have to satisfy CEQA requirements to describe its environmental impacts, provide public notice and information, and mitigate its impacts. The Project, by its nature, does not create the kinds of impacts described in this comment, and it will be the job of appropriate planning agencies to ensure that future land use decisions do not promote urban sprawl or destroy environmental habitat. The DEIR analyzes the indirect environmental impacts of the Project, acknowledging that firming up and augmenting local water supplies will remove one obstacle to growth. CLWA has a responsibility to provide water for future

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53 (cont)	PCL/CPA		population and housing needs projected in local general and area plans to the extent feasible and consistent with law. The cities and counties have been charged by the California Legislature to govern issues of urban growth while addressing the environmental concerns resulting from growth. To that end, local agencies with land use authority have adopted general plan documents to appropriately plan for and mitigate the environmental impacts of future development within their respective jurisdictions. Each of the local general plans has a final environmental document that analyzes potential environmental impacts of the growth described in the document, and proposes mitigation measures for those impacts. The *PCL* decision concluded that DWR was the proper lead agency for a project that impacted SWP facilities, contracts and operations statewide. The *PCL* decision did not hold that if a project's environmental impacts relate to statewide issues that a state agency should be the lead agency. The key reason for DWR being designated by the *PCL* court as the appropriate lead agency was that the Monterey Amendments involved changes in the operation of statewide infrastructure, substantive changes in SWP contracts statewide and disposition of state-owned land. If *PCL* stands for the proposition that state agencies must be the lead agency where an environmental issue is a statewide issue, such as urban sprawl, then it would require state agency review of virtually every major local development project and would eviscerate CEQA statutory and regulatory provisions that require local lead agency environmental review. The new Monterey Agreement Program EIR will not analyze in detail growth inducing impacts on the Southern California region, and on the CLWA service area in particular, as suggested by the commenter. A programmatic EIR by its nature will focus on wider programmatic impacts of the Monterey Amendment, which impacts may include growth

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53 (cont)	PCL/CPA		inducing impacts in the urban areas of Southern California that receive permanent Table A transfers. Further, with respect to the suggestion that the DEIR should consider alternatives to the 41,000 acre-foot transfer, those are alternatives more appropriately suggested to DWR for consideration as it prepares its new Monterey Amendment Program DEIR, to the extent that the alternatives are feasible or acceptable. Those alternatives are not appropriate in the analysis of impacts of the Project.
54	PCL/CPA	Rather than squarely confronting the scope and mitigation of growth inducement, the Draft EIR improperly defers the issue to subsequent decisions of local agencies on individual projects. A "chicken and egg" problem emerges here. As reflected in PCL's comment letters on specific projects, local agencies are relying upon *Castaic* to inform them of the reliable water available to support specific proposed projects ranging in scope from small developments to Newhall Ranch. The Draft EIR is entirely speculative in its assumption that project-related growth can be mitigated to insignificance. This issue cannot be credibly reviewed in isolation from the statewide Monterey EIR.	Please refer to the Master Response and to Comments 12, 22, 23, and 53 and the Responses thereto. Please note that CLWA has worked closely with DWR (see Comments 2 through 6 and the Responses thereto) to ensure that the approach to analyzing impacts of the Project will be consistent with the approach taken by DWR in preparing its Monterey Amendment DEIR. CLWA's analysis of the indirect impacts of the Project, associated with growth, acknowledges that environmental impacts will occur and relies upon the local land use agencies to perform their analysis and mitigation of future projects consistent with CEQA. CLWA's reliance on local land use agencies is consistent with requirements by the California Legislature that the local land use agencies include a water supply assessment as part of its environmental impact analysis and mitigation for development projects. (See Water Code §§ 10910, 10911.) Contrary to the suggestion in the comment, CLWA does not assume that project-related growth can be mitigated to insignificance. CLWA has no land use regulatory authority and must rely upon local agencies to exercise their authority in a manner consistent with all applicable laws, including CEQA. CEQA does not require CLWA to implement mitigation measures that are outside CLWA's jurisdiction and that fall within the jurisdiction of local land use agencies. Each of the general and area plans adopted by land use agencies within CLWA's service area underwent CEQA review prior to adoption. Those environmental documents are final and not subject to challenge. This DEIR has relied upon those plans and their mitigation measures approved under

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54 (cont)	PCL/CPA		CEQA in projecting and addressing indirect growth inducing impacts of the Project.
55	Public Citizen	Public Citizen, a consumer rights organization that has been working to strengthen public oversight over water, urges Castaic Lake Water Agency to refrain from conducting the environmental review of permanent transfers of State Water Project Table Amounts. We believe that is unlawful for CLWA to be the lead agency under CEQA for this project because the Department of Water Resources is currently conducting its statewide review of the "Monterey Plus" Project. Please refer to the Sierra Club's August 15 letter for further reasoning why the DWR must be the lead agency.	Please refer to the Master Response.
56	Public Citizen	We request that this document be withdrawn and that the document not be re-submitted for circulation until the Monterey Agreement EIR is completed and certified.	Please refer to the Master Response.
57	SCOPE	As we stated in our NOP comments, we believe that Dept. of Water Resources must be the lead agency for the following reasons: ▪ The published appellate decision in PCL v. DWR, 2000 found that the Dept. of Water Resources should be the lead agency for this review. ▪ DWR is best suited to ensure that widespread notification of interested parties occur. ▪ DWR is best suited to recognize environmental impacts that might be incurred to a wide spread area of the state as a result of this water transfer and to properly assess such impacts. DWR, in its capacity as operations manager of the SWP, will be acquainted with other state projects that would affect or be affected by this transfer.	Please refer to the Master Response. The published decision in the *PCL* case did not concern this Project and made no finding with respect to the environmental review for this Project. The *PCL* case involved a programmatic EIR affecting the entire SWP system and all of its contractors. This Project involves a project EIR for a transfer between two SWP contractors. DWR and WRMWSD participated in helping CLWA identify parties to whom notice was given. The areas affected by the Project are the receiving and sending areas associated with this 41,000 acre-feet transfer. DWR is not the agency best suited to provide notice to those areas or to analyze potential site-specific impacts in those locales. A local agency has more knowledge of those parties who should receive notice and more information regarding potential localized impacts. As to those areas, CLWA has provided notice as required by CEQA, and CLWA can properly analyze the potential Project impacts in those areas. Notice to other areas under the jurisdiction of DWR is not necessary or required by CEQA. CLWA made a concerted effect to identify and notify potentially interested parties regarding this DEIR,

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57 (cont)	SCOPE		including parties who are outside CLWA's and WRMWSD's service areas, but who might have an interest in the DEIR and the Project. With respect to DWR knowledge of State projects that may have an effect on the Project, DWR's knowledge has been shared with CLWA in DWR's capacity as a responsible agency. See Comment 6 and the response thereto. With regard to WRMWSD knowledge of WRMWSD projects and localized impacts, WRMWSD's knowledge has been shared with CLWA in WRMWSD's capacity as a responsible agency.
58	SCOPE	Changes to water quality including increased chlorides, nitrates or other constituents of SWP project water, and how these constituents will affect the new TMDL requirements approved by Regional Water Quality Control Board approved subsequently to the previous EIR, should be discussed and mitigated. Increased pollution from Trihalomenthanes in public water supply due to higher percentage of reliance on SWP project water as main source should be disclosed. Trihalomenthanes now exceed the new MCL standards after filtration by CLWA due to the filtration method currently used.	The Project does not contemplate or cause a change in regulatory water quality compliance levels. The Project does not include or cause an increase in contaminant levels of Castaic's SWP water deliveries. New TMDL requirements approved by the Regional Water Quality Control Board are not part of or caused by the Project. As shown by DEIR Table 3.15-4 and as discussed on pages 3.15-8 through 3.15-9 and 3.15-25, the average water quality for SWP deliveries to CLWA is well below MCL (Maximum Contaminant Level) standards for chlorides, nitrates and other constituents. As shown by DEIR Table 3.15-10 water quality test results for drinking water within CLWA, including both SWP water and groundwater supplies, show typical values well below MCL standards for identified constituents, including chloride, nitrate and trihalomenthanes (THMs). The issue of chloride concentration deals with indirect impacts to local surface water from water discharges after use. As set forth on DEIR pages 3.15-24 and 3.15-25, the primary cause for high chloride concentration is water softeners. As DEIR page 3.15-25 notes, Sanitation Districts of Los Angeles County has adopted an ordinance that prohibits the installation and use of self-regenerating water softeners in the Santa Clarita Valley.

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58 (cont)	SCOPE		As DEIR Section 4.2.15 states, because all new development will be regulated by that ordinance, indirect chloride loading impacts to local surface water will be mitigated to a less than significant level. With respect to THMs, which can be produced under certain conditions by water treatment processes using chlorine, CLWA's Rio Vista Water Treatment Plant uses a treatment process that utilizes both chlorine and ozonation, and is in compliance with THM MCL standards. As noted in DEIR Section 6.3.3.1, CLWA is upgrading the Earl Schmidt Filtration Plant to comply with current and proposed water quality regulations. The Earl Schmidt Filtration Plant and the Rio Vista Water Treatment Plant will be in compliance with water quality standards by June 2005.
59	SCOPE	This document relies on transfers to the Semi-Tropic Water Banking project for supply reliability, but does not address potential water quality issues that could preclude groundwater from being pumped back into the aqueduct. This is an issue that would be addressed if DWR were the lead agency. We incorporate by reference all contracts between, DWR, CLWA, and Semitropic, particularly the pumpback agreements and sections of the EIR indicating high arsenic and radon levels in the Semi-tropic groundwater basin. There is no up to date water quality data from the groundwater in the Semi-Tropic area included in this report. If the Semi-tropic Water Storage program is going to be relied upon to increase water supply reliability, then water quality data should be made available for review.	The DEIR does not rely on either the 2002 or the 2003 CLWA Water Banking projects in its water supply reliability analysis. DEIR Sections 3.0 and 3.15 make clear that the DEIR relies on two 1998 studies using the DWRSIM model to assess water supply reliability. Those studies took place prior to the water banking projects. The 2002 and 2003 water banking projects are short term and are separate and independent from the Project. They are not intended to, and do not, provide long-term water supply upon which new development can rely. Those water banking projects are not transfers as suggested in the comment; each constitutes a temporary one-time storage of prior SWP deliveries to CLWA, as described in DEIR Section 6.3.3.1. This comment seeks to improperly apply to the Project the issue of potential water quality impacts of pump-back provisions for the water banking projects despite the finality of the environmental review for those two water banking projects. The 2003 water banking project negative declaration became final without any challenge having been filed within the statute of limitations period. The 2002 water banking project has already been litigated and the Ventura County Superior Court judgment in favor of CLWA is now on appeal.

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59 (cont)	SCOPE		The issue of groundwater quality impacts resulting from pump-back provisions was raised in the *Network* case; the trial court concluded that the negative declaration adequately analyzed the issue. As the July 14, 2004 Ventura Superior Court decision in *Network* explained, "Petitioners contend that the initial study was inadequate, particularly in its water quality component. The delivery agreement between DWR, Castaic and the Kern County Water Agency requires that ground water re-introduced into the aqueduct must meet the terms of the Semitropic Turn-in Agreement (AR 13:2573), the net effect of which is that water must meet DWR's then current water quality criteria (AR 12:2248). As such, there is no potential for an outdated water quality standard to be applied." The *Network* case is presently on appeal. The Administrative Record in the *Network* case, which can be found at the CLWA Administrative Office, showed that the Semitropic groundwater does not contain levels in excess of drinking water primary MCLs or in excess of imported (secondary) SWP water quality standards. (See *Network* Administrative Record 1:138, 139, 140; Tables 5-11 & 5-12; 8:1542-43, 1542-43.) That Administrative Record showed that water pumped by Semitropic under its Groundwater Banking Program has met DWR water quality standards. (See *Network* Administrative Record 47:2501.) In addition, the 1994 Semitropic Groundwater Banking Project EIR, which also can be found at the CLWA Administrative Office, included information showing that the groundwater sub-basin used for water banking creates a barrier against and prevents poor groundwater quality migration. (See *Network* Administrative Record 400)
60	SCOPE	In conclusion, we request that this document be withdrawn, that the document not be resubmitted for circulation until the Monterey Agreement EIR is completed and certified, and that all parties whose groundwater may be impacted are properly notified when re-circulation occurs.	Please refer to the Master Response.

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61	Sierra Club	In the notice of preparation for this project, the Castaic Lake Water Agency announced its intention to move forward within its own separate environmental review of permanent transfers of State Water Project Table A Amounts. The Sierra Club and others commented at that time that such a procedure would violate state law, several court decisions and the Monterey Agreement Settlement to which CLWA is a signatory. As you are aware, in the Monterey settlement agreement, which Castaic signed, the court-identified lead agency, the Department of Water Resources. DWR is already conducting a statewide environmental review of a new "Monterey Plus" project. We strongly urge Castaic to refrain from moving forward with this separate project review, which is premature and likely to operate at cross-purpose with DWR's statewide review.	Please refer to the Master Response. Please see Responses to Comments 10 and 44.
62	Sierra Club	Moreover, even if Castaic continues to proceed now with its own separate EIR on this transfer, it lacks the institutional authority and statewide accountability to serve as CEQA lead agency under the Planning and Conservation League decision.	Please refer to the Master Response. The reference in *PCL* to institutional authority and statewide accountability refers to facilities and territory of DWR, both of which were issues pertaining to the Monterey Amendment EIR, not to this Project-specific DEIR.
63	Sierra Club	The Sierra Club re-iterates the following legal issues put forward in January 2004 comment letter by the Planning and Conservation League. These issues were either ignored or inadequately addressed in the Environmental Impact Report now under review: The "Monterey Amendments" Problem. Under Planning and Conservation League and two sequel decisions addressing Castaic's transfer of Table A amounts, "tiering" or otherwise relying on that EIR would render the approval decision vulnerable to CEQA challenge. However, any attempts by Castaic to conduct a separate Monterey review in advance of DWR's, or to rely on its own hypothetical non-Monterey analysis, would shift rather than solve this fundamental CEQA problem. In *Planning and Conservation League*, the Third District Court of Appeal found that Central Coast Water Agency's 1995 EIR	Please refer to the Master Response and to Comment 43 and the Response thereto. This DEIR does not undertake to conduct a separate Monterey Amendment review in advance of DWR's new Monterey Amendment EIR. Contrary to the assertion in the comment, the *SCOPE* decision did not address CLWA's characterization of the transfer. The *SCOPE* case addressed the assumption made in the environmental analysis of the development project, conducted by the County of Los Angeles as lead agency, that 100% of CLWA's Table A Amount would be available for delivery in all years, without discussing DWR models, historic SWP deliveries, or valid projections for future SWP delivery reliability. The court rejected this assumption, finding that it

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63 (cont)	Sierra Club	"failed to meet the most important purpose of CEQA, to fully inform the decision makers and the public of the environmental impacts of the choices before them." (83 Cal.App.4th at 920.) CCWA improperly served as lead agency in place of DWR and prejudicially failed to analyze the enforcement of the pre-Monterey permanent shortage provision, article 18(b), prior to its elimination from the State Water Project contracts. The appellate court found it unnecessary to adjudicate the other CEQA deficiencies identified by the Monterey plaintiffs after analyzing the defects in the lead agency selection and no project assessment, observing that "DWR, with its expertise on the statewide impacts of water transfers, may choose to address those issues in a completely different and more comprehensive manner." (*Id.*) The court also noted that the deficiencies in the 1995 EIR might be related to the "provincial experience" of CCWA. (*Id.*) In *Friends of the Santa Clara River v. Castaic Lake Water Agency* (2002) 95 Cal.App.4th 1373, the Second District Court of Appeal ordered the decertification of an EIR prepared by Castaic, supporting its Monterey Amendments-based attempt to permanently acquire 41,000 acre-feet of State Water Project entitlements (now "Table A" amounts) from the Kern County Water Agency and its Wheeler Ridge member district. The appellate court found that Castaic's EIR violated CEQA by "tiering" from the invalidated Monterey EIR. This ruling involved precisely the same transfer that Castaic now attempts to address in its separate 41,000 NOP. That piecemeal approach, however, is in apparent defiance of the expectation of the court of the appeal in the Friends case that Castaic would await "action by the DWR complying with the PCL decision." (95 Cal.App.4th at p. 1388.) Another recent Second District appellate decision, *Santa Clarita Organization for Planning and the Environment (SCOPE) v. County of Los Angeles* (2003) 106 Cal.App.4th 715, critically addressed	was not based upon adequate evidence in the administrative record, and thus concluded that the environmental analysis was inadequate. In contrast, this DEIR uses DWR modeling to project reliability of the Table A Amount transferred for this Project. With regard to the cases addressing interim use of the water from the Project, none of those cases are relevant to the present environmental review of the Project. Therefore, they do not constitute evidence of a significant environmental impact resulting from the Project. Please also refer to Responses to Comments 23, 39, 46, and 47.

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63 (cont)	Sierra Club	Castaic's characterization of the 41,000 acre-feet transfer. In that case, the County of Los Angeles violated CEQA in its review of the West Creek development project that erroneously assumed that 100 percent of Castaic's purported 41,000 acre-feet would be available in wet years and 50 percent in drought years. Drawing on Planning and Conservation League's assessment of the historic disparity between Table A amounts and deliverable water, the court concluded that the EIR failed to undertake a "serious and detailed analysis' of State Water Project supplies, and observed that "[t]he dream of water entitlements for the incomplete State Water Project is no substitute for the reality of actual water the SWP can deliver." (*Id.* at pp. 723, 717.) The EIR appears to confuse the legitimacy of Castaic's separate review with the distinct issue of the interim operation of the 41,000 acre-feet transfer pending further environmental review. (See Public Resources Code section 21168.9; 41,000 NOP p.1) The trial court did not enjoin interim operation, but left the issue open to further demonstrations that could lead to interim prohibition. Various cases addressing the interim use of this water for new projects prior to the completion of CEQA review are now working their way through the Court system. The 41,000 acre-feet transfer is not on the list of Table A amount transfers recognized as "final" in the Monterey Amendments settlement agreement (Attachment E.). Such transfers cannot proceed without new environmental analysis satisfying CEQA. (Monterey Settlement Agreement, section VII.A.) That settlement agreement, while recognizing that the remedial issue remains before the Second District, also requires DWR's "Monterey Plus" EIR to analyze the 41,000 acre-feet transfer, as well as other transfers facilitated by Monterey Amendments provisions, such as other agriculture-to-urban transfers referenced in Article 53 of those amendments. (Section II.C.4.) If Castaic rushes to finality by continuing its separate	

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63 (cont)	Sierra Club	environmental reviews at this stage, without the benefit of DWR's statewide "Monterey Plus" EIR, its perspective would mirror the "provincial experience" criticized in the *Planning and Conservation League* decision. (83 Cal. App. 3d at 918.) Such an attempt would also create a substantial risk of final decisions based on local analysis that may well prove inconsistent with DWR's "Monterey Plus" EIR.	
64	Sierra Club	If Castaic continues with this separate environmental review without awaiting DWR's assessment in the "Monterey Plus" EIR, it would violate CEQA's lead agency requirement based upon the well-established standards set forth in Planning and Conservation League v. Department of Water Resources. The court in that case could hardly have been clearer that DWR is the "state agency charged with the statewide responsibility to build, maintain, and operate" the State Water Project. (Id. At p. 906.; see also Wat. Code, section 12930, et seq.) Finding that DWR was the only entity with the requisite statewide perspective and expertise to serve as lead agency, the court found it "incongruous to assert that any of the regional contractors" could "assume DWR's principal responsibility for managing the SWP." (Id.) Similarly, the court-approved settlement agreement in Planning and Conservation League expressly recognizes DWR's duty as "the State agency responsible for administration and operation of the SWP," as well as its continuing obligation to comply with applicable requirements of CEQA and the Water Code. (Agreement, Section X.B.) The transfer guidelines disclosed to contractors under the settlement agreement also recognize the continuing need to comply with all existing legal requirements, including CEQA, and to honor the lead agency principles identified in the Third District's decision in the Monterey Amendments case. (Agreement, Attachment C.) These principles apply clearly to the proposed permanent transfers of the Table A amounts referenced in the state project contracts, which require DWR's approval and presuppose the	Please refer to the Master Response. The transfer guidelines referenced by the commenter are included in the Monterey Amendment Settlement Agreement and state that the State Water Project contractor, and not DWR, shall be the lead agency for a two party transfer such as this Project. (The two parties are CLWA, the transferee, and WRMWSD, a KCWA member agency.) Because the Project could occur as a pre- or post-Monterey Amendment transfer, the non-Monterey Amendments analysis contained in the DEIR is precisely what the Court called for in the *PCL* case. The analysis addresses what supplies would have been available based on the "agriculture first" cutbacks under pre-Monterey article 18(a). (See DEIR section 3.15.2, including Table 3.15-15.) As DWR notes in its Comment 5, DWR would have provided this same analysis if it had been preparing the DEIR. The quote from the *PCL* case about the necessity for DWR lead agency expertise on statewide impacts of water transfers refers to a statewide program affecting all water transfers, not to an isolated contractor to contractor transfer as in this Project. With respect to the issues of transferring water from agriculture to urban use raised by this comment, please refer to Responses to Comments 44 and 45. The identity of the CLWA manager is not relevant to the adequacy of environmental review in this DEIR.

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64 (cont)		application of Monterey. They also concededly require changes in the amount of supplies available to several water agencies, the "location and timing" of project deliveries, and changed utilization of the project's "conveyance and storage facilities." The transfers, which may require the fallowing of farmland in agricultural areas and are associated with proposed annexations linked to some of the more controversial development projects in California, demand the statewide authority and experience that only DWR can provide. Neither the summary references to other project EIRs nor a hypothetical "non-Monterey" analysis of the transfers can substitute for DWR's new assessment of the Monterey changes based on its statewide expertise and authority. For example, although transfers with DWR approval were available under Article 41 of the pre-Monterey State Water Project contracts, it is highly speculative whether agriculture-to-urban transfers such as this proposal would even have taken place without the Monterey Amendments, since those Table A amounts would have been subject to "agriculture first" cutbacks under pre-Monterey article 18(a). Read in context, such maneuvers would amount to little more than "straw man" argument considered and rejected in the Friends appeal. (95 Cal.App.4th at p. 1387.) Lastly, we note that the same General Manager of Central Coast Water Agency, Dan Masnada, under whose guidance, CCWA proceeded in violation of CEQA as the wrong lead agency, is now the general manager of Castaic Lake Water Agency. In that capacity, he is once again directing his agency with full knowledge of the consequences, to proceed as lead agency in violation of the law.	

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65	Sierra Club	Communities, local organizations and agencies that would have the most knowledge of impacts surrounding these statewide issues, the accuracy of the environmental disclosure and the viability of proposed mitigation, were not notified. Failure to notice and receive input from interested parties deprives the decision-makers of a full disclosure of all impacts and deprives the affected community or public agency of its right to provide information during the public process. The DWR would be better equipped to ensure that all parties are properly noticed and involved in the project review.	Please refer to the Master Response. This comment provides no specifics and therefore no evidence that proper notice was not given. Please also refer to the responses to Comment 57 and to Attachment B of Volume II of the FEIR.
66	Sierra Club	This EIR purports to analysis statewide issues, including but not limited to, impacts to agricultural lands, sensitive species, the accuracy of the DWR CalSim model, air quality, etc., but since the EIR was not circulated on a statewide basis, the public and agencies from other areas may not have been informed of the release of the document, and thus did not have the opportunity to review its accuracy.	Please refer to the Master Response. CEQA does not require that an EIR that considers statewide issues have a state agency as its lead agency or give notice to all agencies that may have some interest in those issues. Please refer to the responses to Comments 53 and 57 and to Attachment B of Volume II of the FEIR.
67	Sierra Club	Impacts to DWR facilities – Castaic Lake Water Agency cannot presume to be the lead agency for State Water Project facilities.	Please refer to the Master Response. This Project does not impact all or even a majority of SWP facilities. The Project's potential impacts are primarily locale-specific, occurring primarily in Kern County (the sending site) and CLWA's service area (the receiving site), with a minor impact to a small portion of SWP facilities (from KCWA to CLWA)..
68	Sierra Club	Nor does it discuss the ability of the State Water Project facilities to accommodate this huge transfer now that the Metropolitan Water District will be requiring delivery of a greater amount, if not all of its Title A amount. Adequacy of facilities such as the Banks pumping station, effects of the ESA and CalFED Record of Decision, capacity in the San Luis Reservoir in light of recent sharing agreements are not discussed.	The vast majority of MWD deliveries proceed through the East Branch of the California Aqueduct, not the West Branch, through which CLWA receives its deliveries. (See DWR Bulletin 132-02, page 272-275 and 288. The tables on those pages show the large amount of MWD deliveries through the East Branch and show that West Branch deliveries are only at approximately one-half capacity) Amendment 18 to the CLWA SWP contract with DWR provides that DWR will modify the instantaneous rate of flow to CLWA through the West Branch from 99 to 150 cfs. That increase in instantaneous capacity will be more than sufficient to provide for the annualized increase in capacity shown as needed by CLWA for the Project on Exhibit A to Amendment 18.

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68 (cont)	Sierra Club		Increased deliveries by MWD through the West Branch combined with increased deliveries to CLWA under the Project will not overtax the delivery system because the Castaic Lake reservoir has sufficient capacity to handle those deliveries. As the DEIR explains at pages 3.15-41 and 3.15-42: "The amount of water stored at Castaic Lake would not be expected to change as a result of the Project. As discussed in section 3.15.1.2, Castaic Lake is the terminal reservoir on the West Branch of the California Aqueduct and is operated to help meet peak deliveries during the summer months for those SWP Contractors that receive deliveries from Castaic Lake and to provide an emergency water supply in case of a major supply system outage. Castaic Lake is also used for year-round recreational purposes. Under normal operations, the amount of storage that is withdrawn from Castaic Lake to make deliveries to Contractors over the summer (the amount withdrawn that exceed the amount delivered to the lake) is typically about 30,000 AF (or about 10 percent of the lake's volume). The amount of this storage withdrawal is small relative to total deliveries from the West Branch, which averaged about 403,000 AF from 1990 through 2000. In other words, most deliveries from the West Branch are conveyed through the California Aqueduct and Castaic Lake in about the same month the water is delivered to Contractors from the lake. In the future, DWR is expected to maintain this same general operation at Castaic Lake regardless of whether deliveries from the West Branch increase, and regardless of whether increased deliveries are due to Table A Amount transfers such as the Project."
69	Sierra Club	Impacts to Agricultural Resources – In a letter dates 5-19-98 from the Planning Department of Kern County to the original Notice of Preparation for this project, a request was made to ensure that the transfer of 130,000 acre feet from the Monterey Agreement was not exceeded. This Agency requested that acknowledgment of previous actions be made in the DEIR and that cumulative impacts of SWP capacity rights be analyzed.	Please find attached as Table A-4 in Attachment A of Volume II of the DEIR, a compilation of total transfers to date under the 130,000 acre-foot amount referenced in Article 53(a) of the Monterey Amendment. As Table A-4 demonstrates, this Project will not cause the amount of total transfers under that provision to exceed the 130,000 acre-foot amount. As noted in the Response to Comment 10, since the 1998 letter referenced

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69 (cont)	Sierra Club	We would like to re-state that request for this document and include that letter which you have in your possession by reference into these comments.	by the comment, there have been other transfers outside of the 130,000 acre-foot provision of Article 53(a) pursuant to the Monterey Amendment. As noted in the Response to Comment 49, the present Project was intended by CLWA and KCWA to be included in the 130,000 acre feet of Table A Amount to be made available for transfer from agricultural to urban SWP contractors, but the Project could equally occur under Article 41 of the State Water Project contract without the Monterey Amendment in place. Any agricultural to urban transfers from areas listed in Article 53(a) in excess of 130,000 acre-feet will be processed pursuant to other provisions of the State Water Project contract. Please refer to Comments 68 and 72 and the Responses thereto regarding SWP capacity.
70	Sierra Club	They also requested an analysis of the impacts on the land within the WRMWSD in Kern County including Agricultural Preserve Map 204, 220 and 220No. 4-12-19. Additionally, they requested a table showing "the ultimate potential amount of capacity that could be transferred how many acre feet would be converted to M&I allotment for urban users and as a condition of transfer, if any land in WRMWSD would be permanently fallowed, retired or detached from the District." This information is important because it allows the decision-makers to access the impacts that might be caused to agricultural land or the increase in pumping of groundwater that might be caused by this project.	The May 19, 1998 Kern County letter requests an analysis of Project impacts on the lands within the WRMWSD, including Williamson Act lands. DEIR Section 3.2.2.2.2 explains that because no new construction will occur, the Project will cause no direct losses of Important Farmland or conflicts with existing zoning or Williamson Act contracts. DEIR Section 3.2.2.2.2 also explains that the Project will not cause indirect impacts to agricultural resources within WRMWSD's service area. In years of average or greater than average SWP deliveries, water associated with the 41,000 AF Table A Amount would be in excess of WRMWSD's demands. In years of less than average SWP deliveries, WRMWSD water management actions, including participation in groundwater banking projects, will allow WRMWSD to provide other water resources within the district when SWP deliveries alone are not sufficient to meet demands. Table 3.2-3, which summarizes the change in acreage impacts on the WRMWSD land from 1998 to 2000, provides support for the Section 3.2.2.2.2 analysis. DEIR Section 3.2.1.2 also provides support for that analysis, by stating that there have been no agricultural zoning changes to WRMWSD lands that are part of the Project since 1998. As noted in DEIR Table 3.2-4 and Section 3.2.1.2, lands under

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70 (cont)	Sierra Club		Williamson Act contracts in Kern County have increased since 1998. The May 19, 1998 Kern County letter additionally requests analysis of the feasibility of the use of groundwater supplies and of the potential economic losses. DEIR Section 3.2.1.2 provides that analysis, noting that by the year 2001, WRMWSD had developed more than 88,000 acre feet of new annual supply, including groundwater and supplemental water from groundwater banking projects. As evidenced by the discussion in that section, the 1991 financial loss caused by the 1991 drought was reversed and/or offset by the subsequent acquisition of the new groundwater supplies and by the income generated from groundwater banking projects. Also, as noted in DEIR Section 3.2.2.2.2, the reduction in WRMWSD Table A Amount caused by this Project will help reduce financial costs and/or offset financial losses by reducing WRMWSD's share of fixed SWP costs. Alternative sources of water are available to the agricultural operations within WRMWSD's service area at lower overall costs than they would incur by retaining this Table A Amount. Thus agriculture is made more viable by reducing the overall cost of water and by transferring for value Table A Amounts no longer used by WRMWSD. Finally, the May 19, 1998 Kern County letter requests disclosure of the ultimate potential amount of WRMWSD capacity that could be converted to urban use and the amount of fallowing required by WRMWSD for that to happen. DEIR Section 3.2.2.2 demonstrates that the Project will not cause fallowing or conversion or agricultural land to urban uses within WRMWSD. Fallowing will not occur in average or above-average water years, and prior WRMWSD diversification of water sources provides sufficient alternative water supply in the absence of the 41,000 Table A Amount so as to not require fallowing. DEIR Section 3.15.1.2 estimates that under favorable economic conditions, demands within the contract lands are

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70 (cont)	Sierra Club		approximately 180,000 to 190,000 AF, and that demands will not increase because the suitable agricultural lands within the district are already in agricultural production. With regard to fallowing, DEIR Section 3.2.1.2 notes that fallowing of an annual average of 27,300 acres occurs regardless of the Project for economic reasons related to crop markets and prices and for agronomic reasons related to pests and disease. Under CEQA, the DEIR does not analyze fallowing or conversion of agricultural land to urban use because these are not foreseeable results of the Project.
71	Sierra Club	The EIR includes a report entitlement "Effects on Agricultural Production...etc." found in Appendix C. We note that this report, included for circulation in the DEIR is labeled as *DRAFT* report. We wonder why the Final Report was not included for circulation and request that CLWA state how they can base their assumptions on a draft report.	The final report has been substituted in place of the draft report. The final report is entirely consistent with the draft report.
72	Sierra Club	A chart found on page 15 of this report is apparently presented in response to the Kern Agency request. It appears to show water need already in excess of WRMWSD Title A amount even using 100% of the water entitlement, a situation that the Court has already found not to be tenable (see foot note 7, PCL v DWR, 2000). This chart is footnoted with the statement that it "Assumes supplies available regardless of source." There is no analysis as to whether this transfer will cause fallowing in future drought years, only the statement that it hasn't in the past. There is also no analysis as to whether overdraft is occurring or will occur in the next drought cycle, only a statement that the chart assumes supplies are available without any explanation of the impacts of over-pumping to make them available. There is no chart that shows how much water was used from what sources before the transfer in question and how much water will be needed and how it will be supplied *after the transfer*.	Please refer to Comment 70 and the Response thereto. The Table 4 chart found at page 15 of the DEIR Appendix C, referred to in the comment, does not show WRMWSD demand for SWP water in excess of WRMWSD's Table A Amount. Table 4 estimates the amount of water applied to various crops from various water sources, only one of which is SWP water. However, Table 4 overstates the amount of water applied to crops during limited SWP water supply years such as 1991. (See DEIR Appendix C, Page 14.) Table 4 reflects only actual SWP delivery amounts, not the WRMWSD Table A Amount. Therefore, Table 4 does not show WRMWSD demand in excess of WRMWSD's Table A Amount. The DEIR provides adequate information to determine that fallowing will not result from the Project. (See DEIR Section 3.2.) As indicated by DEIR Section 3.15.1.2, WRMWSD has several sources of water supply available, including but not limited to groundwater, groundwater banking, and surplus water. DEIR Table 3.15-5 shows the total available supply, and that amount significantly exceeds in recent years the peak demand of 180,000 to 190,000 AFA as set forth in DEIR Section

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72 (cont)	Sierra Club		3.15.1.2. As explained in Section 3.15.1.2, demands within the district are not anticipated to materially increase in the future because the suitable agricultural lands within the district's service area already are in agricultural production. As to overdraft, according to personal communication with W.Taube (WRMWSD General Manager), WRMWSD groundwater data and hydrographs indicate that since WRMWSD ceased use of the subject Table A Amount, groundwater levels have increased through time due to return flows from the importation of the current level of supplemental water deliveries, and there is no evidence of overdraft occurring in that portion of the Kern County Groundwater Basin in which WRMWSD is located. As to the use of various water supply sources caused by the Project, DEIR Section 3.2.2.2.2 explains that prior WRMWSD diversification will allow WRMWSD to continue to provide surface water within the district when SWP deliveries alone are not sufficient to meet demands. Also, as DEIR Section 3.15.2.2 explains, at page 3.15-46, economic decisions made by farmers whether to use local groundwater in-lieu of using imported water are not dictated by the Project. As explained in DEIR Section 3.15.1.2, even if transferred water were needed, and groundwater pumping were the sole source of replacement, the potential environmental impact to WRMWSD would be less than significant, given the significant volume of water in storage and the trend of increasing groundwater levels.
73	Sierra Club	The original purpose of the state water project was to provide a supplementary water source so that groundwater would not be pumped in excess of sustainable levels. Now it appears that this water transfer will bring about the very situation one sought to avoid. We believe it is imperative that CLWA notify all interested parties in surrounding areas of their intention to make this transfer, and of the possible increased need for groundwater pumping if this transfer occurs. Because pumping of groundwater sources to replace state water	Please refer to Comments 70 and 72 and to the Responses thereto. The Project will not require increased groundwater pumping in WRMWSD or KCWA because there are sufficient alternative available water sources, as explained in DEIR Section 3.2.2.2.2. Assuming that the amount transferred were needed by WRMWSD and that groundwater were the only source, Section 3.15.1.2 notes that groundwater production of that amount would have a less than significant impact because there is a vast amount of groundwater in storage, which

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73 (cont)	Sierra Club	transferred to other areas will have significant impacts on the Public Trust and the vitality of farming operations, we reiterate, the DWR should be the lead agency for this document.	amount has been increasing since the transfer began, as indicated by groundwater levels. The Project will not result in increased groundwater pumping in CLWA's service areas because the Project provides supplemental water to augment and firm up existing CLWA supplies. Please also refer to Comment 36 and the Response thereto. The public trust doctrine does not apply to the State Water Project, to transfers of SWP water, or to groundwater.
74	Sierra Club	The closing paragraphs of this report include a rather chilling understatement; ***"In a series of consecutive 'dry years', the unavailability of a proportional share of the SWP contract amount may contribute to a mismatch between water supply and demand."*** Have farmers been notified of this "mismatch"? How much fallowing will this cause, what will be the economic impacts to farmers, laborers and communities? Isn't this exactly the question that everyone has requested that the EIR address? Where is the answer? Given the substantial move away from annual row crops into permanent orchards of fruits, nuts and vineyards that require multiple years of investment (see Table 2 on pg. 6), dry years with insufficient state water will substantially damage these crops. *One should also note the increase in groundwater pumping indicated by this table.*	The comment takes out of context the sentence contained at page 22 of DEIR Appendix C. The remainder of that paragraph explains: "However, the effect depends on the annual reliable supply and costs of the water from district wells and other supplemental sources. If the supplies from the supplemental sources offset the reduced SWP entitlement, there should be a limited effect on water availability. Overall, the water supplies from the supplemental sources more than offset the reduced SWP Entitlement and, when the carrying cost of holding excess SWP Entitlement is considered, at a lower cost." This language has been slightly reworded in the final NEA Report, without changing the substance. (See FEIR Volume II, Section 4.) As set forth in the Response to Comment 72, WRMWSD has several different water supply options in a period of multiple dry years. Please also refer to the Response to Comment 70. Also, as set forth in the Response to Comment 72, personal communication with W. Taube indicates that groundwater levels are increasing and there is no evidence of overdraft.

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75	Sierra Club	Flooding and water quality changes – In a letter dated May 21st 1998 also from the previous EIR review, the Ventura County Flood Control Department notes that the NOP correctly identifies downstream flooding from increased effluent flows as a potential significant impact. There should be a discussion of the potential for this impact in the DEIR for the project before you.	The referenced letter states: "The initial study correctly identifies flooding as an unknown potentially significant impact. Potential development in eastern Ventura County with additional water allotments could increase the need for additional flood control facilities." The potential for growth-related development to increase flooding is addressed in section 4.2.15 of the DEIR. Also note that the letter from the Ventura County Flood Control Department on the current EIR (included in Appendix A) states that "the District has no comments with respect to flood control and NPDES issues."
76	Sierra Club	Changes to water quality including increased chlorides, nitrates or other constituents of SWP project water, and how those constituents will affect the new TMDL requirements approved by Regional Water Quality Control Board approved subsequently to the previous EIR, should be discussed and mitigated. Increased pollution from Trihalomenthanes in public water supply due to higher percentage of reliance on SWP project water as main source should be disclosed. (See attached news article.)	Please refer to the Response to Comment 58.
77	Sierra Club	This document purports to address statewide issues, but fails to discuss the impacts of the Bay-Delta water quality standards on this project. Again, this is but another example of why DWR must be the lead agency.	These standards are included as part of DWRSIM, the model that was used to identify Project impacts. Please refer to section 1.1 of Appendix D, which includes a description of water quality criteria applicable to the SWP Delta pumping. As discussed in section 3.15.2.2, the Project would have an imperceptible or minor impact on the water quality of the Delta, and all changes would be within applicable quality standards and agreements.
78	Sierra Club	This document relies on transfers to the Semi-Topic Water Banking project for supply reliability, but does not address potential water quality issues that could preclude groundwater from being pumped back into the aqueduct. This transfer project is currently being litigated.	Please refer to the Response to Comment 59.
79	Sierra Club	Growth Impacts – In a letter dated May 12th, 1998 from the City of Santa Clarita, the City states that "the DEIR should define current and anticipated water availability for the CLWA service area as compared to the ultimate buildout of the City of Santa Clarita General Plan, and the Santa Clarita Valley Areawide	Information regarding the existing versus new population that could be served by the Project is summarized in DEIR Section 3-0. As noted, this is dependent upon the availability of SWP water, which can vary from year to year. The population that could be served by the Project is compared to relevant growth

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79 (cont)	Sierra Club	Plan. This information was requested to clearly identify the need for the project, and should be included for the current project. The City's requests for disclosure in the areas of geology, growth inducement and impacts to Kern County groundwater and development monitoring system analysis should also be addressed for the current project.	projections in Section 5.3. The referenced letter from the City of Santa Clarita does not address impacts to Kern County. These issues were addressed in the DEIR, however, for both the CLWA and WRMWSD service areas. (The development monitoring system (DMS) is a list of proposed and approved projects that is maintained by the County of Los Angeles, and the analysis of cumulative impacts based on DMS projects is specific to the CLWA service area.)
80	Sierra Club	In response to this question, the CLWA relies, but pretends not to rely, in the Urban Water Management Plan that is being litigated. The issue under litigation is over-statement of water supply, particularly the reliance on the availability of polluted water from wells that are now closed because they exceed the MCL for ammonium perchlorate. The Sierra Club requests than an analysis of the impact of growth in a multiyear drought scenario in the Santa Clarita Valley be conducted as part of this EIR. Santa Clarita is now relying on state water as its primary source of supply (since the groundwater is either fully committed or polluted –see attachment). We believe it would be particularly important for decision makers to understand the impacts of the recurrence of the historical SWP worst-case scenario when only 13% of the contractors' Title A amounts were available. (See notes attached from presentation to Santa Clarita City Council, June 29, 2004. Transcript to be provided before Final EIR is released.)	Please refer to Response to Comment 24. The DEIR does not tier off nor rely on the UWMP for any information, including information regarding estimates of water supply, water use, water demand, or water supply reliability. DEIR Section 3.15.1.3 provides a discussion of the studies that were relied upon for its information. As a review of pages 3.15-19, 3.15-20 and 3.15-26, 3.15-27 and 3.15-28, the DEIR's analysis of the perchlorate issue is based on recent studies and reports, not the UWMP. As stated in DEIR Section 5.6, "Although information in the UWMP was considered in the analysis for the Project, an independent analysis and determination of environmental impacts was carried out for the Project." The analysis requested in the comment was performed in the DEIR (refer to section 3-0, "Population and Housing Impacts, Allocation of Project Water to Existing and Future Users;" section 3.10.2.2.3; and section 4.2). Three scenarios were identified, including a multiple dry year period (this supply is the average amount of water available over the four consecutive drought years of 1988 through 1991 based on DWRSIM model results). The single dry year supply is the supply available in the single year with the lowest total SWP deliveries based on DWRSIM model results, which occurred in 1977. In this single dry year, the supply was about 22% of Table A Amounts, and the increase in SWP supply due to the Project was estimated to be 9,200 acre-feet. If instead the supply in a single year were 13% of Table A Amounts, then the increase in supply due to the Project would be reduced to 5,300 acre-feet. Any environmental impacts based on this lower

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80 (cont)	Sierra Club		supply amount would be less than those described in the DEIR. Use of the 22% supply amount results in analysis of the worst-case environmental impact assessment scenario.
81	Sierra Club	Sensitive species – The current project is based on an EIR that does not address impacts to endangered species as a result of the entitlement transfer. Draw down of groundwater will result in reduction or elimination of surface water and may occur in both the transferring and receiving agencies (during drought periods when state water is unavailable) as a result of this project. Since species issues were not addressed in the Warm Springs/Maricopa/Belridge EIR, they should be addressed for the proposed project, as its implementation would cause significant impacts. These include impacts to endangered species impacted in both areas including but not limited to the San Joaquin Kit Fox in the WRMWSD and the Unarmored Three-Spine Stickleback in the Castaic Lake Water Agency. The Kit fox could be impacted by draw down of groundwater that impacts surface flows or diversion of surface flows required by lack of state water project supplies. The Stickleback could be affected by increased effluent flows that cause a change in surface water quality (this problem has already been identified as an area of concern by the Regional Water Quality Board) or increased pumping of groundwater required to make up for delivery cutbacks during a drought. Impacts and proposed mitigations should be discussed. We note that a section 4d consultation may be required if endangered species will be affected and request that the US Army Corps of Engineers be sent notification of this project since it appears that they have not been so notified.	The comment that the current project is based on an EIR that does not address impacts to endangered species as a result of the entitlement transfer analysis is not correct. The Supplemental Water Project EIR is a stand-alone document and is not based on any other EIR. Impacts to special status species are addressed in section 3.4, Biological Resources. No mitigation measures are identified, because no significant impacts would occur. Section 4d of the Endangered Species Act is not applicable to this project, because no impacts to threatened species would occur. A copy of the DEIR was sent to the Ventura Office of the U.S. Army Corps of Engineers (refer to Attachment B of Volume II of the FEIR), but no comments were received from that agency.
82	Sierra Club	The EIR includes a list of sensitive species in Appendix B, but does not discuss how these species will be affected when substantial over-draft occurs, either due to over-reliance on this SWP water in the Santa Clarita Valley without sufficient back up sources or over-draft in the farming areas due to transferring away to much of their supplemental SWP water supply.	Please refer to the Responses to Comments 36 and 72 for a discussion about groundwater supply. This Project is not a groundwater project. The Project augments CLWA's groundwater supply and will not result in groundwater draw down in the WRMWSD service area. Please refer to the Response to Comment 58 regarding the quality of water provided by CLWA to its purveyors. The comment presents no evidence of a groundwater drawdown that could significantly

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82 (cont)	Sierra Club		impact sensitive species. The DEIR analyzes impacts to groundwater and concludes that impacts to the CLWA service area would be beneficial and that impacts to WRMWSD would be less than significant (refer to section 3.15.2). The comment fails to provide factual evidence to support the presumption that overdraft or significant drawdown will occur in either the CLWA or WRMWSD service areas as a result of the Project. Consequently, these comments cannot constitute sufficient evidence of a significant effect upon the environment under Public Resources Code section 21082.2(c). (See Citizen Action To Serve All Students v. Thornley (1990) 222 Cal.App.3d 748 [speculation and generalizations about traffic, parking, economic effects, and earthquake safety did not constitute substantial evidence].)
83	Sierra Club	Further, it has recently come to our attention that Berrenda Mesa has published a draft EIR to withdraw/divert approximately 70,000 AF from local streams and groundwater sources. Since the transfer of SWP surface water will affect ground water pumping sources, this EIR and its impacts must be included and addressed during the water transfer review process. We therefore believe this document must be included in the review process and incorporate it by reference.	Any withdrawal of water proposed by Berrenda Mesa would be a separate project not connected to this EIR or any other CLWA program, nor would it affect the same environmental resources as the Project evaluated in the present EIR. The service areas of Berrenda Mesa and WRMWSD are approximately 50 miles apart, and the service areas of Berrenda Mesa and CLWA are approximately 150 miles apart.
84	Sierra Club	Air Quality – The effect of the project on increasing particulate matter from increased or overdraft use of groundwater in a PM10 non-attainment zone for this air pollution problem should also be addressed. THE EIR only addressed project specific impacts such as pumping facilities and grading for new pipes. It did not address fugitive dust created by dried up landscapes. CLWA is well aware of the problems created by dust due to draw down of Owens Lake and its impact on surrounding communities because one of its Directors helped negotiate the settlement on behalf of LADWP. This is an example of an impact that must be anticipated in both the transferring farmlands and the receiving Santa Clarita area. Santa Clarita is already in a non-attainment zone for PM10s as is the Central Valley. Clean Air Act compliance will be	The potential for fugitive dust emissions to occur due to changes in agricultural practices is considered in section 3.3.2.2.2. Since no changes in agricultural practices would occur, fugitive dust emissions would not increase. A reduction in water supply causing air quality concerns would not occur. Direct air quality impacts in the CLWA service area are addressed in section 3.3.3.3.4. Indirect impacts resulting from induced growth are addressed in section 4.2.3, and it is concluded that impacts may not be mitigable to less than significant. As addressed in the Responses to Comments 70 and 72 and in portions of the DEIR cited therein, the Project will not directly or indirectly cause drawdown or overdraft that might increase fugitive dust.

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84 (cont)	Sierra Club	necessary. A cut-back in water supply caused by air quality concerns as already occurred for the LA Dept. of Water and Power in the Owens Valley, would be much more appropriately dealt with in the planning process than after new building is already approved based on that water.	
85	Sierra Club	State Water Reliability – One of the most apparent reasons that the review must await completion of the Monterey "Plus" environmental review is that a new hydrological model "CalSim II" is being proposed for use in evaluating the reliability of water deliveries of the sate project supply. This information is obviously critical to all the above stated issues. There has been substantial criticism of the model (peer review attached). Among other circumstances, the model does not address climate change or levee breaks such as the substantial recent failure in the Jones tract (news article attached). The DWR must complete its environmental review of this issue and resolve discrepancies before reliability factors on which the Castaic EIR is based, can be assumed to be accepted. Again, tiering is based on a DWR document that has not been circulated for review, has not been through the public comment process and has not been certified.	Please refer to the Response to Comment 25 for a discussion of the use of models in the DEIR. Refer to the Master Response for further discussion regarding the comments that the Supplemental Water Project EIR must await completion of the Monterey Plus EIR. Also, please note that this EIR does not tier from the Monterey Plus or any other EIR. It is a stand-alone, project EIR.
86	Sierra Club	We believe that DWR must be the lead agency for the following reasons: ▪ The published appellate decision in PCL v. DWR, 2000 stated: *"We agree with the trial court that DWR, not CCWA, has the statutory duty of assessing environmental consequences of projects involving the SWP* [State Water Project]." (Pg. 1 of Decision). We incorporate this decision by reference into the administrative record. ▪ DWR is best suited to ensure that widespread notification of interested parties occur. ▪ DWR is best suited to recognize environmental impacts that might be incurred to a wide spread area of the state as a result of this water transfer and to properly asses such impacts. ▪ DWR, in its capacity as operations manager of the SWP, will be acquainted with other state projects that would	Please refer to the Master Response and to Comments 2, 3, 4, 5, 6, 53 and 57 and the Responses thereto. The *PCL* case cited in this comment involves a program EIR analyzing the impacts of a major amendment to the SWP contracts statewide, alterations to the operation of the State Water Project, and the state's transfer of the Kern Fan Element property. For all of those reasons, the court in *PCL* held that DWR must be the lead agency for the Monterey Amendments Program EIR. This Project is a transfer of Table A Amount from WRMWSD, through KCWA, to CLWA. The Project does not encompass all or even a major part of the various provisions of the Monterey Amendment, does not impact a substantial part of the SWP facilities, and does not interfere with or preempt the Monterey Amendment DEIR process. CLWA has consulted DWR, as a responsible agency, in the preparation of the Project DEIR.

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86 (cont)	Sierra Club	affect or be affected by this transfer. ▪ CLWA failed to address many issues of statewide concern in this document.	
87	Sierra Club	We therefore request that this document be withdrawn, that the document not be re-submitted for circulation until the Monterey Agreement EIR is completed and certified, and that all parties whose groundwater may be impacted are properly notified when re-circulation occurs.	Please refer to the Master Response.
88	TCW	It is our understanding that this environmental document is being re-circulated by Court Order because the program EIR on which it was based was set aside in the decision PCL v. DWR, 2000. In that decision the Court found that an individual contractor (Central Coast Water Agency) could not be the lead agency for a state wide project that had impacts to a wide geographical and social group of people. The decision found that the Department of Water Resources should be the correct lead agency. We would like to express our dismay that your agency is now proceeding once again in a manner contrary to law by circulating this document as the lead agency and before the Monterey Agreement EIR has been completed. We note that the same General Manager of Central Coast Water Agency, Dan Masnada, that was found to be in violation of CEQA for proceeding as the wrong lead agency, is now the general manager of Castaic Lake Water Agency. In that capacity, he is once again directing his agency to proceed as lead agency in violation of the law. We believe that the Department of Water Resources must be the lead agency for the discussion of the statewide impacts of water transfers for the following reasons: 1. The published appellate decision in PCL v. DWR, 2000 stated "We agree with the trial court that DWR, not CCWA, has the statutory duty of assessing environmental consequences of projects involving the SWP [State Water Project]." (Pg. 1 of decision). We incorporate this decision by reference into the administrative record. 2. DWR is best suited to ensure that widespread	Please refer to the Master Response and to Comments 57 and 86 and the Responses thereto. The comment incorrectly states that this DEIR is a re-circulation of the prior EIR for this Project. The trial court in *Friends I* set aside the certification of that prior EIR and ordered that CLWA certify a new EIR that complies with CEQA and is consistent with the view expressed by the Court of Appeal in *Friends I*. This DEIR is the environmental document prepared in response to the trial court's order. The identity of the lead agency's manager is irrelevant to the adequacy of the DEIR.

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88 (cont)	TCW	notification of interested parties occur. 3. DWR is best suited to recognize environmental impacts that might be incurred to a wide spread area of the state as a result of this water transfer and to properly asses such impacts. 4. DWR, in its capacity as operations manager of the SWP, will be acquainted with other state projects that would affect or be affected by this transfer.	
89	TCW	Many anomalies in the CEQA process have already occurred because the general Manager of Castaic Lake Water Agency has chosen to proceed contrary to law and to the published appellate court decision in a case to which he was a party. This includes the fact that they were not notified of the circulation of this draft EIR, nor were others in water districts including Berenda Mesa and in other areas statewide.	Please refer to the Master Response and to Attachment B of Volume II of the FEIR and to Comment 57 and the Response thereto. The Project's potential environmental impacts primarily occur in Kern County and CLWA's service area. The DEIR also analyzes potential impacts to SWP facilities. The Project effects will occur in limited areas, not statewide. CEQA does not require notice to unaffected areas..
90	TCW	Further, it has recently come to our attention that Berenda Mesa has published a draft EIR to withdraw/divert approximately 70,000 AF from local streams and groundwater sources. Since the transfer of SWP surface water will affect groundwater pumping sources, this EIR and its impacts must be included and addressed during the water transfer review process. We therefore believe this document must be included in the review process and incorporate it by reference.	Please refer to the Response to Comment 83.
91	TCW	The original purpose of the state water project was to provide a supplementary water source so that groundwater would not be pumped in excess of sustainable levels. Now it appears that this water transfer will bring about the very situation one sought to avoid. We believe it is imperative that CLWA notify all interested parties in Berenda Mesa and other areas proposing increased groundwater pumping, of their intention to make this transfer, because pumping of groundwater sources to replace state water transferred to other areas will have significant impacts on the Public Trust and the viability of farming operations.	Please refer to the Response to Comment 73.

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92	TCW	Such impacts to groundwater that affect both public trust surface flows and water for farming, should be addressed in the program EIR. It is therefore improper for CLWA to proceed before the completion of the Monterey Agreement EIR.	Impacts to groundwater, surface water, and agricultural resources are addressed in the DEIR (sections 3.2 and 3.15). Please refer to the Master Response and to Comments 2, 72 and 73 and the Responses thereto.
93	TCW	In conclusion we request that this document be withdrawn, that the document not be re-submitted for circulation until the Monterey agreement EIR is completed and certified and that all parties whose groundwater may be impacted are properly notified when re-circulation occurs.	Please refer to the Master Response and to Comments 73, 91 and 92 and the Responses thereto.
94	UWCD	United Water Conservation District has reviewed the Draft EIR for the proposed transfer of 41,000 acre-feet of State Water Project Table A Amount water from the Kern County Water Agency's member unit Wheeler Ridge-Maricopa Water Storage District to Castaic Lake Water Agency. This proposed transfer of SWP water is beneficial to the Santa Clara River Watershed and is fully endorsed by United Water.	This comment is noted; no text revisions are required.
95	UWCD	The permanent transfer of 41,000 acre-feet of SWP water to the Castaic Lake Water Agency provides a valuable additional source of water for the Santa Clarita Valley. This additional water improves the potential for conjunctive-use of water within the valley. This is especially important given the urbanization of this area. Increased surface water supplies should provide water managers throughout the basin more flexibility with respect to the magnitude of additional groundwater pumping needed to meet the escalating M&I demand for water within the basin.	This comment is noted; no text revisions are required.
96	UWCD	Although discussed in various sections within the Draft EIR it should be reemphasized here that 41,000 acre-feet of SWP Table A Amount water doesn't guarantee this amount can be delivered every year. Hydrologic conditions and storage carryover in any particular year primarily dictate the annual allocation of water to the S WP Contractors. Historic deliveries to M&I Contractors should not be used to project future deliveries. The adoption of the Monterey Amendment (following the principles of the Monterey Agreement) will require that M&I Contractors and Agricultural Contractors more equitably share the pain of future water shortages.	This comment is noted; no text revisions are required.

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96 (cont)	UWCD	During the previous drought, allocations, as a percentage of table A Amount (Entitlement), to Agriculture contractors were significantly less than allocations to the M&I Contractors.	
97	UWCD	As an ongoing general comment to all water purveyors within the Santa Clarita Valley, United Water has a very real interest in the continued health of the Santa Clarita Groundwater Basin and the flow of the Santa Clara River. United Water represents the collective interests of downstream residents that depend on the flow of the Santa Clara River for recharge to groundwater, surface water diversions and environmental mandates. United Water's goal is that the quantity and water quality associated with the flow of the Santa Clara River into Ventura County not be diminished. The development and implementation of the inter-Agency regional monitoring program of groundwater levels, groundwater quality, surface water flows, and surface water quality should provide ongoing data with respect to the relative health of the Santa Clarita and downstream basins as well as surface water. In the event that surface water flow into Ventura County is diminished in either quantity or quality, and can be reasonably linked to over pumping of the aquifer systems and/or surface water discharges to the river within Santa Clarita Valley, United Water would seek to remedy the problem.	This comment is noted; no text revisions are required.
98	Sjovold	Please accept these comments with the attachments in opposition to the proposed transfer. Besides being an arrogation of power by CLWA unto itself, it flies in the face of the present process at the State level to properly assess the environmental impacts of the Monterey Amendments as mandated by the Court of Appeals. What is particularly troubling is the adoption of material developed by DWR on SWP reliability which is demonstrably in-correct. As a member of the plaintiff committee presently engaged with DWR to fashion a new Monterey EIR, I am quite aware of the issues involved with the CALSIM II model, which is the model used to generate the incorrect information on SWP reliability. The attached analysis shows why the reliability information is incorrect and argues that until the CALSIM II model can	Please refer to the Master Response and to Comments 2 through 6 and 25 and the Responses thereto. The Project does not encompass the Monterey Amendment and does not interfere with or preempt the Monterey Amendment DEIR process. CLWA has consulted DWR, as a responsible agency, in the preparation of the Project DEIR. The analysis attached to the comment refers to the CALSIM II model, with the principal criticism that it overstates deliveries if applied to the last several years. The DEIR used CALSIM II results only in estimating SWP supplies for the current environmental setting. All other SWP supply analyses in the DEIR (i.e., for both the 1998 environmental setting and the environmental impact analyses) used DWRSIM model studies.

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98 (cont)	Sjovold	correct its fundamental deficiencies it cannot be relied upon. Without this model's results the CLWA EIR is without any foundation for the claims made concerning the reliability of supplies that CLWA attaches to the SWP. In fact, one can make the argument on the same basis that present CLWA SWP supplies are already overtaxed.	The analysis attached to the comment fails to identify any defect in these DWRSIM model studies used in this DEIR. As set forth in the Responses to Comments 4 and 25, the DWRSIM model studies provided the best estimates of SWP supply reliability that were available when the DEIR supply analyses were conducted, and are consistent with the 1998 environmental setting used in this EIR. Also, as set forth in the Response to Comment 4, the DWRSIM model SWP delivery reliability results were slightly higher than delivery reliability results from the CALSIM II studies that subsequently became available in the DWR SWP Delivery Reliability Report. Therefore, from an environmental impact assessment standpoint, the DEIR analyzed the worst-case scenario, i.e., the scenario that would result in greater direct and indirect impacts in both the CLWA and WRMWSD service areas.
99	Swans	It has come to our attention the Castaic Lake Water Agency is possible planning to affect a position on the above captioned matter which, in our opinion, will gravely impact the Monterey Agreement EIR process. We also wish to comment that we see a direct conflict of interest and possible injustice to the public and interference with the CEQA process by your agency's spearheading any effort to circumvent, delay, interfere, or otherwise impede the more appropriate participation of the Department of Water Resources, the agency we believe entitled to administrate on behalf of the general public of the State of California in this matter. We, the below listed voters and community members raise our voices in writing in complete objection to any and all interference by the Castaic Lake Water Agency and formally request the immediate withdrawal of any and all past, present or future water transfer documents until the EIR is complete. Furthermore, we wish to be added to the list of mailings for any matters regarding this subject.	Please refer to the Master Response and to Comments 2 through 6 and the Responses thereto. Beyond those responses, CLWA is unable to respond to the comment because the comment fails to note in what manner the commenter believes that the DEIR will "gravely impact" the Monterey Amendment DEIR preparation process and fails to explain in what manner the DEIR or CLWA actions "circumvent, delay, interfere or otherwise impede" DWR participation. The commenter has been added to the mailing list for this EIR.

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100	Churchill	Water transfers are a statewide issue that induce growth and reduce water for farming. Therefore I believe that your agency is the wrong lead agency for this project; I believe the correct lead agency is the Department of Water Resources, which is both indicated and qualified under state law to address statewide impacts. DWR will also notify all interested parties to the extent of their knowledge. If such a major transfer is allowed to proceed under the lead agency status of a small regional water agency, it will set a precedent that will affect many major water decisions throughout the state of California. I believe it is imperative that such a major change in state policy receive full environmental review and comments from all affected parties. I therefore request that this project be re-noticed by the Dept. of Water Resources acting as lead agency as a project of statewide concern so that all impacts may be disclosed and properly addressed.	Please refer the Master Response and to Comments 53, 54, 70 and 72 and the Responses thereto. The *PCL* decision concluded that DWR was the proper lead agency for a project that impacted SWP facilities and operations statewide, amendment of the SWP contracts statewide, and disposition of state-owned land. The commenter fails to explain how the Project will "set a precedent that will affect many major water decisions throughout the state of California." As explained in more detail in the Responses to Comments 70 and 72 and in the DEIR sections cited therein, the Project will not reduce water available for farming. As noted in the Responses to Comments 10 and 69, this Project is only one of the many recent permanent transfers of Table A Amounts. This Project sets no precedent. The commenter also suggests that the Project represents a major change in state policy. In so doing, the commenter appears to confuse the Monterey Amendment, which does represent a major change in state policy, with the Project, which is a simple transfer of Table A Amount that could occur with or without the Monterey Amendment.
101	Volker	On behalf of California Water Impact Network and Friends of the Santa Clara River, we wish to incorporate by reference the comments submitted on the above DEIR by the Sierra Club. We wish to emphasize, in particular, that Castaic Lake Water Agency is not the correct "lead agency" for this project under the California Environmental Quality Act. As the Third District Court of Appeal made clear in *Planning and Conservation League v. Department of Water Resources*, 83 Cal.App.4th 892, 920 (2000), "DWR, with its expertise on the statewide impacts of water transfers, " is the proper lead agency under CEQA for decisions regarding transfers of State Water Project water between SWP water contractors. We also wish to incorporate by reference our Opening Trial Memorandum (filed August 21, 2003) and Reply Trial Brief (filed May 3, 204) in the matter *California Water Network and Friends of the Santa Clara River v. Castaic Lake Water Agency*, Ventura Superior Court No. 215327. These memoranda point out the importance of recognizing DWR's lead agency status	Please refer to the Master Response. The *PCL* case cited in this comment involves a program EIR analyzing the impacts of a major amendment to the SWP contracts statewide, alterations to the operation of the State Water Project, and the state's transfer of the Kern Fan Element property. For all of those reasons, the court in *PCL* held that DWR must be the lead agency for the Monterey Amendments Program EIR. This Project is a transfer of Table A Amount from one State Water Project contractor to another. DWR and the petitioners in the *PCL* case all acknowledged in the Monterey Amendment Settlement Agreement, Attachment D, Paragraph 4, that a single contractor-to-contractor transfer is not the same as a program that facilitates transfers statewide. The language regarding transfers quoted from the *PCL* case is taken out of context and is inapplicable to a transfer between two contractors as contemplated by this Project. With respect to the unspecified arguments contained in the trial

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101 (cont)	Volker	regarding transfers of State Water Project water.	briefs in the case of *California Water Network and Friends of the Santa Clara River v. Castaic Lake Water Agency* [*Network*] Ventura Superior Court No. 215327, the ruling of the Superior Court in that case held: "Petitioners argue that the Department of Water Resources should be the lead agency and cite the court to *Planning and Conservation League v. Dept. of Water Resources*, 83 Cal.App.4th 892. The fact present here are sufficiently different from those present in *PCL* to make the finding in that case that the DWR was the lead agency inapplicable here. *PCL* involved the Monterey Agreement and the resolution of conflict between urban and agricultural allocations of water during times of shortage. The agreement was statewide in its scope and involved 29 agencies. The present circumstance is local in its character and involves the DWR in a much more passive and secondary role. The present project does not involve either a substantial restructuring of the distribution of water, [n]or does it involve water throughout the state. It does involve a diversion of Castaic's water to a water bank, and the subsequent withdrawal of that water. Castaic is the agency most deeply involved in the planning, and execution of this project. It is the appropriate lead agency as described in *PCL*, Public Resources Code section 21067, and 14 CCR 15051(a). DWR is involved, and is a responsible agency, but it is not the lead agency for the project." (Ruling, page 2, line 28 through page 3, line 18.).
102	PM (Plambeck)	I'd just like to express my concern that this EIR is proceeding without completion of the Monterey Agreement. I think the court was fairly concise about the need for the programmatic EIR in both legal decision....	Please refer to the Master Response.
103	PM (Plambeck)	...very concerned about the lead agency, and Castaic Lake Water Agency is not the right lead agency.	Please refer to the Master Response and to Comments 53 and 54 and the Responses thereto.
104	PM (Plambeck)	It was my understanding prior to this that the two EIRs were moving forward in tandem and they would be completed simultaneously.	Please refer to the Master Response.

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105	PM (Plambeck)	And I just think that – that the folks up north that challenged the EIR will probably continue to challenge the EIR and that they're going to be very concerned that this is proceeding in a manner that's not consistent with an appellate court decision that they won, and that means that even though you know that's there and you're going ahead and doing this anyway, and it sort of seems like a waste of taxpayer's money since there's already a published appellate court decision on it. And so I would just ask you to keep that in mind and that it might be the better part of valor to move the two EIRs forward in tandem as I understood had been originally planned.	Please refer to the Master Response. Please also refer to the responses to Comments 31, 46 through 48.
106	PM (Bertoni)	First, I'd like to thank the board for providing us this opportunity to comment on the project, on the EIR. You have extended the public comment period beyond the normal 45 days to 60 days. You have also held the public hearing during your comment period, which is not required under CEQA, so you've gone above what's the minimum under CEQA and the City appreciates that and also appreciates being provided with all the documentation very quickly and promptly throughout the whole process. So first off, we'd like to thank you for that.	This comment is noted; no text revisions are required.
107	PM (Bertoni)	Second off, I noticed that by sharing on EIR for water transfer, it's not really the water transfer itself. In regards to the water transfer, I would just say that as we reviewed the EIR it appears that this EIR was prepared for water transfer that would allow to you a few things. One of them would be to provide more reliability in the existing water supply. The other would be to allow for growth that's already been anticipated under existing general plans for both of the City of Santa Clarita and the County of Los Angeles. So to that extent, the City is supportive of that. The City has always been supportive of additional water reliability and also to make sure that as well plan for our future growth, we will have water supplied for that. This city has a couple very high-profile projects that it is very important to the City and the point being the City to have adequate water supply for that. As you know, we're very – a housing rich city. We are trying to	This comment is noted; no text revisions are required.

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107 (cont)	PM (Bertoni)	balance that out to be as equally jobs rich and so things such as our employments such as the Center Point Business Park to the south of you or the Gate (inaudible) project in Newhall are very important for the City, very important for the City's goals. So to the extent that this would provide water for that, that's an important City goal. Also, things such as the redevelopment of downtown Newhall and that revitalization would require some additional water. So the supply part of it, the City is supportive of that additional reliability of water supply.	
108	PM (Bertoni)	We reviewed the EIR at the City and we reviewed it under the – to see if it adequately addressed the potential environmental impact to the City of Santa Clarita, and our review indicated that it has. So at this time we have no comment on the EIR and would happy to answer any questions. Thank you.	This comment is noted; no text revisions are required.
109	PM (Wisehart)	The United Water Conservation District has reviewed the draft EIR for the purpose – for the proposed transfer of 41,000 acre-feet of state project water that will come from the Kern County Water Agency's member unit Wheeler Ridge-0Maricopy Water Storage District to the Castaic Lake Water Agency. This proposed transfer of State Water Project water is beneficial to the Santa Clara River Watershed and is fully endorsed by United Water.	This comment is noted; no text revisions are required.
110	PM (Wisehart)	The permanent transfer of 41,000 acre-feet of State Water Project water to the Castaic Lake Water Agency provides a valuable additional source of water for the Santa Clarita Valley. This additional water improves the potential for conjunctive use of water within the valley. This is especially important given the urbanization of this area. Increased surface water supplies should provide water managers throughout the basin more flexibility with respect to the magnitude of additional groundwater pumping needed to meet the escalating M&I demand for water within the basin. As an ongoing general comment to all water purveyors within the Santa Clarita Valley, United Water has a very real interest in the continued health of the Santa Clarita groundwater basin and the flow of the Santa Clara River. United Water represents the collective interests of downstream residents that depend on	This comment is noted; no text revisions are required.

No.	Commenter	Comment	Response
110 (cont)	PM (Wisehart)	the flow of the Santa Clara River for recharge to groundwater, surface water diversions, and environmental mandates.	
111	PM (Wisehart)	United Water's goal is that the quantity and quality of water associated with the flow of the Santa Clara River into Ventura County not be diminished. The development and implementation of the inter-agency regional monitoring program of groundwater levels, groundwater quality, surface water flows, and surface water quality – and you know I am talking about the MOU agreement that we all signed with your upstream purveyors – should provide ongoing data with respect to the relative health of the Santa Clarita and downstream basins as well as surface water. In the event that surface water flow into Ventura County is diminished in either quantity or quality and can be reasonably linked to over pumping of the aquifer system and/or surface water discharges to the river within the Santa Clarita Valley, United Water would seek to remedy the problem.	This comment is noted; no text revisions are required.
112	PM (Wisehart)	We appreciate the efforts of the Castaic Lake Water Agency to appropriately plan and augment the water supplies of our watershed as represented by this water transfer project.	This comment is noted; no text revisions are required.
113	PM (Dunn)	When talking to DWR and asking how that happened, because this agency used to have originally a 23,000 acre-feet per year allocation from the state, that the state DWR would transfer and transport to Castaic Lake for Castaic Lake Water Agency, but DWR also had allocations from many farmers and other water users in the San Joaquin Valley. DWR said that those allocations the CLWA had been subsequently purchasing were designed to take turn-outs in the San Joaquin Valley, and those acre-feet were to get off in the San Joaquin Valley. In other words, they were telling me that the Tehachapi pumping station and the aqueduct, that is I guess mostly owned for use by the Metropolitan Water District, was not designed to transport those farmers' allocations here. So I have asked when I was on the agency and I have asked as a public comment when I'm not on the agency what contracts	Please refer to Response to Comment 68. The vast majority of MWD deliveries proceed through the East Branch of the California Aqueduct, not the West Branch, through which Castaic receives its deliveries. Amendment 18 to the CLWA SWP contract with DWR provides that DWR will modify the instantaneous rate of flow to CLWA through the West Branch from 99 to 150 cfs. That increase in instantaneous capacity will be more than sufficient to provide for the annualized increase in capacity shown as needed by CLWA for the transfer on Exhibit A to Amendment 18.

No.	Commenter	Comment	Response
113 (cont)	PM (Dunn)	do you have with Metropolitan Water District or DWR that says you can transport that water that you are purchasing, those additional purchases here? Doesn't matter is you've banked them up there. Some day you will want to transport them here, and I am told there are no such contracts. We know now that since the Arizona and those people re cutting off MWD's allocations by way of Colorado River, MWD not has to rely more heavily on the DWR an their allocation in this aqueduct and the capacity in the aqueduct. Many unaware, even in our community, that Castaic Lake Water Agency only has 5,000 acre-foot of storage in the Castaic Lake, Many think we've got a real good reservoir here, and we'll really high and dry. And so with the demand that MWD is going to have on the aqueduct now more so demand 'cause you can't get it from the Colorado River, and with the drought situations, and this agency has no contracts that they can transfer those additional allocations here, and I heard nothing in the words tonight just like it was going to be transferred. Nothing was in the Urban Water Management Plan It kind of scares me that we're going to sit here in the drought situation and MWD is going to need their full capacity of Castaic Lake and their full capacity of the state aqueduct, and all this water you purchased you can't bring here. I would like to see that addressed in the EIRs. I would like to see that addressed in the urban water management plans that you can bring this water here.	
114	PM (Mankin)	There is no issue more important in the future of this community than the availability of water. Having available water impacts almost every segment of this community business and consumer marketplace. It's about, again, as all of you know, it's about having local agency being aggressive in the way they find and bring new water into the valley, and most importantly, it's about the economic future of the Santa Clarita Valley. My job as president of the Chamber achieved spokesman of the business community is twofold. First, I work with companies	This comment is noted; no text revisions are required.

No.	Commenter	Comment	Response
114 (cont)	PM (Mankin)	from outside of this market and try to encourage them to locate their company or business here. I am heavily involved in business recruitment. Second, and probably more important, I am actively involved with working with local companies to assure that they have the right kind of political, economic, and physical infrastructure in place to make it possible for them to grow their respective businesses. Regional economic analysts have predicted – and I heard this at a meeting this spring – they predicted that we will generate some 4,700 new jobs here in the valley this year alone. I suspect we're ahead of that pace already. In looking at specific projects, one project, Center Point Business Park which is now under construction will generate an estimate – estimated 8,000 new jobs over the next few years. Many other such project area either now on the books nor have actually started development. There is no issue more important to as many of these companies than knowing that one, two or ten ears from now they can turn on a water facet and actually have water flow out of it. The issue you are discussing this evening will provide these companies with some sense of security that water, in fact, can and will e available to them during times of drought. I highly encourage you to continue to make the necessary decisions that can and will make these new water resources available to both our existing business community and to those businesses that will soon call us home in the future.	
115	PM (Donlon)	BIA is pleased to see that CLWA has produced a new EIR for the litigation pending on the transaction which can be resolved. The CLWA transfer of 41,000 acre-feet of water from Kern County in 1990 represented wise water planning at the time for the Santa Clarita Valley. Such planning and water management programs on the part of CLWA ensures that its current users as well as future users will be assured safe and reliable drinking water. BIA would like to commend CLWA and its agency and staff for taking these preemptive actions.	This comment is noted; no text revisions are required.
116	PM (Donlon)	We urge you to support and certify this EIR.	This comment is noted; no text revisions are required.

No.	Commenter	Comment	Response
117	EHL	Endangered Habitats League is concerned that your agency is the wrong lead agency for this project. Water transfers are a statewide issue that induce growth and reduce water for farming. They should be addressed by an agency that is qualified under state law to address statewide impacts and will notify all interested parties. In this case, this is the Department of Water Resources.	Please refer to the Master Response and to Comments 2 through 6 and the Responses thereto. The Project has localized (in KCWA's service area, the sending site, and in CLWA's service area, the receiving site) and not statewide impacts. The choice of lead agency is determined by many factors (please refer to the Master Response and to the Responses to Comments 37, 39 and 53), not by nature of the environmental issues raised.
118	EHL	The impacts of this transfer are considerable and affect a wide variety of interest, yet sufficient notification has not occurred, for example to our group.	Please refer to Comment 57 and the Response thereto. CLWA made a good faith attempt to notify all interested parties of the EIR's release, sending approximately 250 copies of the DEIR to agencies (including water agencies), organizations, and individuals throughout the state. The distribution list is included in Attachment B of Volume II of the FEIR. CLWA also provided notices regarding the availability of the DEIR to the County Clerk's office of the affected counties. Additionally, the release of the DEIR was noticed in *The Signal* newspaper, and CLWA held a public meeting to present an overview of the EIR and to receive comments on July 28. The meeting notice was posted on CLWA's website, and the meeting was held at 7 P.M. to facilitate the attendance of the working members of the public. All Kern County member agencies were notified. Please see Attachment B of Volume II of the FEIR, the notice/distribution list.
119	EHL	If such a major transfer is allowed to proceed under the lead agency status of a small regional water agency, it will set a precedent that will affect many major water decisions throughout the state of California. It is imperative that this major change in state policy receive full environmental review and comments from all affected parties. We therefore request that this project be re-noticed by the Dept. of Water Resources acting as lead agency as a project of statewide concern so that all impacts may be disclosed and properly addressed.	Please refer to the Master Response. This comment fails to identify the "major state policy" to which it refers. That particular comment is too vague to allow for a substantive response. Please see the Response to Comment 100.

No.	Commenter	Comment	Response
120	Library	This is in response to the Notice of Completion for the Draft Environmental Impact Report for the Castaic Lake Water Agency Supplemental Water Project Transfer. The County of Los Angeles Public Library has reviewed the document and determined that this project will not have an impact on library services.	This comment is noted; no text revisions are required.
121	SCAG	The Draft EIR, in Section 5.0, Consistency with Adopted Plans and Policies, cited SCAG policies and addressed the manner in which the proposed Project is consistent with applicable core policies and supportive of applicable ancillary policies. This approach to discussing consistency or support of SCAG policies is commendable and we appreciate your efforts.	This comment is noted.

MASTER RESPONSE

TO ISSUES RAISED BY COMMENTERS REGARDING APPROPRIATE LEAD AGENCY TO PREPARE EIR AND THE RELATIONSHIP BETWEEN THIS EIR AND THE EIR FOR THE MONTEREY AMENDMENT

I. CLWA MUST BE THE LEAD AGENCY UNDER THE DOCTRINE OF THE LAW OF THE CASE.

The doctrine of the law of the case requires that CLWA be the lead agency for the Project. Under the doctrine of the law of the case, "Litigants are not free to continually reinvent their position on legal issues that have been resolved against them by an appellate court." (*Yu v. Signet Bank/Virginia* (2002) 103 Cal.App.4th 298, 312.)

The Court of Appeal held with respect to the prior EIR prepared by CLWA for the Project: "We have examined all of appellant's other contentions and find them to be *without merit*. If the *PCL*/tiering problem had not arisen, we would have affirmed the judgment." (*Friends of the Santa Clara River v. Castaic Lake Water Agency* ["*Friends*"] (2002) 95 Cal.App.4th 1373, 1387.) The Court of Appeal ordered that the trial court in that case retain jurisdiction over the Project and this subsequent EIR. (*Id.* at 1388.)

Thus, by deciding that there was no other legal defect with the prior Project EIR prepared by CLWA as the lead agency, and by retaining jurisdiction over this EIR in that case, the Court of Appeal resolved against subsequent legal challenges that CLWA is the proper lead agency for the Project. Indeed, the Court of Appeal ordered CLWA to act as the lead agency: "The trial court shall . . . retain jurisdiction until respondent certifies an EIR complying with CEQA . . .." (*Friends, supra*, 95 Cal.App.4th at 1388; See also the discussion of continuing jurisdiction of the court in Draft EIR ("DEIR") Section 1.2.1.)

II. CLWA MUST BE THE LEAD AGENCY BECAUSE IT HAS PRINCIPAL RESPONSIBILITY TO APPROVE AND CARRY OUT THE PROJECT.

CLWA must act as the lead agency because it has primary responsibility to carry out or approve the Project. The agency that has the primary responsibility to carry out or approve a project must be the lead agency, even if the project would be located within the jurisdiction of another public agency. (See Pub. Res. Code § 21067; 14 Cal. Code Regs. § 15051.) CLWA has the primary responsibility to carry out and approve the Project because CLWA will purchase, arrange for transport of, and use the Project water. (See DEIR Section 1.3 and Chapter 2.) The owner of the Project *res* is under mandate to act as the lead agency. (See *Friends of Cuyamaca Valley v. Lake Cuyamaca Recreation and Park Dist.* (1994) 28 Cal.App.4th 419, 428, *rev. denied.*) There is legal precedent for a local water agency acting as lead agency when it proposes to import supplemental water. (See *Temecula Band of Luiseno Mission Indians v. Rancho Cal. Water Dist.* (1996) 43 Cal.App.4th 425.)

As Section 1.1 of the DEIR indicates, CLWA has the principal responsibility for carrying out and approving the Project because a substantial portion of the Project occurs within CLWA's jurisdiction and substantially affects CLWA.

III. CLWA MUST BE THE LEAD AGENCY BECAUSE IT IS THE LOCAL AGENCY UNDERTAKING THE PROJECT.

CLWA must be the lead agency because it is the local agency undertaking the Project. The local agency undertaking a project must be the lead agency. (See Pub. Res. Code § 21152.) A local agency under CEQA is any public agency that is not a state agency, board or commission. (See Pub. Res. Code § 21062.) Thus, CLWA is a local agency. As explained in Sections 1.1 and 1.3 and Chapter 2 of the DEIR, CLWA will carry out the Project in that it is the major proponent of the Project and has assumed the primary task of effectuating the SWP water supply contract amendment.

Some of the comments to the DEIR suggest that CLWA lacks the institutional authority to undertake the Project because DWR must approve the delivery of the water through the SWP system. DWR is certainly a responsible agency because it must approve the transfer and execute amendments to the CLWA and KCWA SWP contracts. However, DWR cannot be the lead agency merely because it will approve the point of delivery for the Project. A state agency that has a role in approving or carrying out a local agency project must act as a responsible agency. (See *Bakman v. Department of Transportation* (1979) 99 Cal.App.3d 665, 678-679.)

In *Bakman*, the local agency submitting an application for a permit to expand an airport was held to be the lead agency, and the California Department of Transportation was held to be a responsible agency. It did not matter that the DOT had to consider the advantages and disadvantages to the public of the proposed expansion in acting to approve the airport.

DWR's role in the Project contrasts with DWR's role for the Monterey Amendment specified in *Planning and Conservation League v. Department of Water Resources* ["*PCL*"] (2000), 83 Cal.App.4th 892. In *PCL*, the Court of Appeal determined that the DWR was the appropriate lead agency for the Monterey Amendment because the Amendment involved major changes in DWR contracts with all 29 State Contractors, DWR changes in management and operation of the entire SWP system, DWR conveyance of the Kern Fan Element, and DWR facilitation of water transfers throughout the SWP system.

In contrast with *PCL*, the Project does not involve DWR conveying land, DWR changes in management and operation of the entire SWP system, major changes to statewide contracts, or DWR facilitating transfers among all contractors. As Sections 1.1, 1.3, 3.0 and Chapter 2 of the DEIR state, the Project, although requiring the use of SWP facilities, would involve a transfer to CLWA from WRMWSD through KCWA, its representative state contractor. The Project will take place within a limited geographic area and does not implicate the entire SWP water rights and supply framework. In this Project, DWR need only consider the capacity of a small portion of the SWP to deliver CLWA's newly purchased SWP contract water right.

The Project more closely resembles a recent water banking project between CLWA and Semitropic Water Storage District than the Monterey Amendment. Both the Project and the water banking project involve exchange of SWP water between two water contractors pursuant to a local project initiated and carried out by one of the State Contractors.

The recent Superior Court decision regarding that water banking project held that the local State Contractor agency, CLWA, was the appropriate lead agency under CEQA, even though DWR had a role in approving a point of delivery agreement and in facilitating the exchange through local changes in operation of the SWP. (See *California Water Network and the Friends of Santa Clara River v. Castaic Lake Water Agency* (2004), Ventura County Case No. CIV 215327.) The Superior Court in that case concluded: "Castaic is the agency most deeply involved in the planning and execution of this project. It is the appropriate lead agency as described in *PCL*, Public Resources Code Section 21067, and 14 Cal. Code Regs. 15014(a)." That case is currently on appeal.

IV. CLWA MUST BE THE LEAD AGENCY BECAUSE IT CANNOT DELEGATE ITS RESPONSIBILITY OVER ITS SWP CONTRACT RIGHTS.

Because CLWA is the party purchasing the SWP contract right pursuant to the Project, CLWA cannot delegate its review and consideration to another body. "Delegation is inconsistent with the purpose of the review and consideration function since it insulates the members of the council from public awareness and possible reaction to the individual members' environmental and economic values. Delegation is inconsistent with the purposes of the EIR itself." (*PCL*, 83 Cal.App.4th at 907, citing *Kliest v. City of Glendale* (1976) 56 Cal.App.3d 770, 779.)

In *PCL*, the Court of Appeal held that DWR could not delegate its responsibilities over execution of global, long term SWP contract amendments, Kern Fan Element conveyance, and statewide distribution of water because DWR had the appropriate statewide perspective and expertise for all of the elements of the Monterey Amendment. (*PCL*, 83 Cal.App.3d at 906.) In contrast, DWR is not primarily responsible for the elements of the Project, nor do all or even a majority of the Project elements require DWR's statewide perspective and expertise. CLWA has primary responsibility for purchasing, obtaining delivery of, and using the SWP contract rights pursuant to the Project. (See DEIR Chapter 2.) These are not matters requiring DWR statewide perspective and expertise, but are matters for which CLWA must stand accountable to its electorate.

As Section 1.1 of the DEIR indicates, CLWA has the expertise to implement the Project. CLWA has specific expertise to address growth inducement and growth-related impacts in its own service area, which are the primary impacts of the Project. CLWA is the agency with the greatest knowledge of local water supply issues and their relationship to planning decisions.

CLWA has been able to obtain the benefit of DWR's statewide perspective and expertise helpful to environmental analysis of the Project as a result of DWR's participation as a responsible agency. As responsible agencies, KCWA and WRMWSD have been actively involved in the development of the EIR and have provided input regarding baseline conditions and impacts to the WRMWSD service area, including impacts to agricultural resources, land use, air quality, water resources, and biological resources.

DWR comments on the DEIR confirm that DWR has been actively involved in the development of the DEIR: "DWR appreciates inclusion and consultation in the early stages of preparation of this DEIR." (Comment 5)

DWR comments on the DEIR also confirm that, from DWR's perspective, the DEIR has adequately addressed issues involving the SWP: "The [DWR] staff have reviewed the [DEIR] and found that the document adequately and thoroughly discusses the proposed project and its impacts. The DEIR provides a good discussion of the relationship between the 41,000 acre-feet Table A transfer and the current process for preparation of a new EIR for the Monterey Amendment. DWR notes that this DEIR adequately discusses the reliability of the SWP, pre- and post-Monterey Amendment conditions, future conditions, and SWP operations." (DWR Comments 1, 2 & 4)

With CLWA acting as lead agency, dissemination of information about the Project and the availability of the DEIR has been more extensive than CEQA requires. CLWA ensured that the DEIR, and notices of preparation of the DEIR, were widely distributed, sending approximately 250 copies to agencies (including water agencies), organizations, and individuals throughout the State. The notice and distribution list is included as Attachment A to this Master Response. DWR and WRMWSD cooperated with CLWA in the preparation of this notice/distribution list.

V. CLWA NEED NOT SUBORDINATE ITS LEAD AGENCY STATUS TO THE DWR PROGRAMMATIC ANALYSIS FOR THE NEW MONTEREY AMENDMENT EIR.

CLWA need not wait for or rely upon DWR's programmatic analysis in the new Monterey Amendment EIR. CEQA does not require a lead agency for a project to wait for another lead agency to prepare a programmatic EIR that is in the process of adoption; nor does CEQA require that a project EIR tier off a programmatic EIR. CEQA does not mandate that a program EIR be prepared even for a series of actions that can be characterized as one large project. (See 14 Cal Code Regs. 15168.)

The Court of Appeal in *Friends* did not require CLWA to tier off of or await adoption of DWR's new Monterey Amendment EIR. That Court of Appeal and appellant PCL merely suggested tiering as one course of action that CLWA could pursue if CLWA wanted to await action by DWR. (See *Friends, supra*, 95 Cal.App.4th at 1387-1388; See also DEIR Section 1.2.1.) The DEIR does not tier off either the old or new Monterey Amendment EIR. Except to the extent that it tiers off the 1988 CLWA Capital Program EIR, the DEIR stands alone as a project EIR.

There is no need for this project EIR to tier off the new Monterey Amendment EIR because the DEIR is for a stand alone project and because the DEIR contains thorough and independent analyses of the issues that *Friends* cited as lacking as a result of decertification of the original Monterey Amendment EIR. These issues include the potential environmental impacts that would arise as a result of KCWA transferring 130,000 acre-feet of Table A Amount, of which this 41,000 acre-feet transfer is a part. Unlike the 1999 Project EIR, the DEIR specifically identifies the environmental impacts to the SWP and associated facilities and to WRMWSD from the Project both with and without the Monterey Amendment. (See DEIR Sections 3.2, 3.4 & 3.15, particularly Section 3.15.2, and Appendices C & D.) Thus, the DEIR meets the requirements of CEQA to properly inform decision-makers and the public of the Project's environmental consequences.

The DEIR acknowledges use of a DWR modeling tool ("DWRSIM") that will generate slightly different water supply reliability estimates than would be generated from use of the more recent DWR modeling tool that DWR will use for the Monterey Amendment EIR ("CALSIM II"). Both models, however, use similar criteria to simulate SWP operations, and the results of both, while slightly different, are comparable for EIR purposes. (See DEIR Appendix D, Section 2.2.)

The DEIR publishes the water supply reliability results from both models and explains the differences and CLWA's reasons for using the DWRSIM model. (See DEIR Appendix D, Figures 2.1 & 2-2 and Section 2.2.) Thus, decision makers for this Project and public planning agencies interested in regional water planning are fully informed of the possible differences between modeling results as to the reliability of the amount transferred. In addition, the decision makers for this Project and public planning agencies are cautioned not to rely on past water deliveries as a guarantee of future deliveries. (See DEIR Section 1.1.)

The DEIR's use of the DWRSIM model to calculate the reliability of the transferred amount results in the DEIR considering slightly higher water supply reliability than would be the case if the CALSIM II model had been used. As a result, the DEIR analyzes slightly greater growth potential and environmental impacts than it would if the CALSIM II model had been used. However, these differences are not so significant as to cause a difference in analysis of significant impacts between DWR and CLWA (See Comments 2-6 by the DWR).

By using DWRSIM model results for its DEIR analyses, CLWA has used the model results that project the "worst case" growth rate (i.e., the greatest potential growth) and thereby the greatest potential environmental impacts. If one speculates that CALSIM II reliability figures will turn out to be more accurate, the need for the Project still remains, and the impacts will be less than described in the EIR. Thus, the public and decision makers are informed of the greatest possible environmental impact.

Because the DEIR does not rely on the CALSIM II model to project the reliability of the amount transferred, issues raised in various comments about the accuracy of the

CALSIM II model are not germane to this DEIR (those criticisms are discussed separately in the responses to particular comments).

However, the DEIR does use the CALSIM II model to calculate the current environmental setting. It was used for this purpose because it provides the best available estimate of SWP supplies at current levels of SWP demand. (See DEIR Section 3.15.2.2 and Appendix D, Section 6.1.2.2.)

The Settlement Agreement in *PCL* ("Monterey Settlement Agreement") does not require CLWA to wait for DWR certification of DWR's new Monterey Amendment EIR before CLWA can certify an EIR for the Project. (See DEIR 1.2.2.) Section III(C)(4) of the Monterey Settlement Agreement requires that the new Monterey Amendment EIR include, *inter alia*, analysis of the potential environmental effects relating to Attachment E Transfers and this Project.

Section III(C)(4) of the Monterey Settlement Agreement does not state that the new Monterey Amendment EIR must treat the Attachment E Transfers and this Project as new projects. Section III(C)(4) of the Settlement Agreement only states that the Monterey Amendment EIR must analyze the effects of the Attachment E Transfers and this Project "as actions that relate to the potential environmental impacts of approving the Monterey Amendments." Thus, Section III(C)(4) of the Settlement Agreement merely requires that the Monterey Amendment EIR consider the cumulative impacts of the Attachment E Transfers and the Project in its review of the Monterey Amendment.

Any claim that the Settlement Agreement requires either the Attachment E Transfers or this Project to be reviewed by the DWR as new projects as part of the new Monterey Amendment EIR is disavowed in the Settlement Agreement. Section III(D) states that the Attachment E Transfers are recognized as final. With respect to this Project and the *Friends* litigation that necessitated preparation of this EIR, Section III(E) of the Settlement Agreement states: "The Parties agree that jurisdiction with respect to that litigation should remain in that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation." One of the actions ordered by the Court of Appeal in "that pending litigation" was CLWA's certification of a new EIR (this EIR) for the Project. (See *Friends, supra*, 95 Cal.App.4th at 1388.) Thus, the Settlement Agreement is consistent with the present EIR process.

The parties to the Settlement Agreement acknowledged that DWR would not be required to act as the lead agency for the transfer of Table A Amounts between existing SWP Contractors. Sections I(D) and VII(D) incorporate by reference Attachment D Principles Regarding Public Participation Process in SWP Contract Negotiations. Paragraph 4 of the Attachment D Principles provides: "When DWR is a responsible agency, (e.g., when existing SWP Contractors agree to transfer entitlement between themselves), the public participation will be scheduled to facilitate coordination with the lead agency's CEQA process."

Section 4 – Changes to DEIR Text

LETTER 4

4.0 CHANGES TO THE DEIR TEXT

Executive Summary and Chapter 1, Introduction

The following text from DEIR Page ES-4, lines 20-31, and DEIR Page 1-4, lines 13-23, should be deleted:

"It should be noted at this point that the Settlement Agreement concerning the PCL Litigation creates a specific exclusion for this Project from any prohibitions against transfers of State Water Project Table A Amounts by the Settlement Agreement. The exclusion states:

> With respect to Section III(c)(4)(b) regarding the Kern-Castaic Transfer, the Parties recognize that such water transfer is subject to pending litigation in the Los Angeles County Superior Court following remand from the Second District Court of Appeal (See Friends of the Santa Clara River v. Castaic Lake Water Agency 95 Cal.App.4th 1373, 116 Cal.Rptr.2d 54 (2002); review denied, April 17, 2002). The Parties agree that jurisdiction with respect to that litigation should remain in that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation."

The above text should be replaced with the following:

"The Monterey Amendment Settlement Agreement does not require that the new Monterey Amendment Program EIR be certified before an EIR for this Project can be certified, nor does it require that the EIR for this Project tier off the new Monterey Amendment Program EIR. The Monterey Amendment Settlement Agreement does not require that the new Monterey Amendment Program EIR serve as the EIR for this Project. Section III(C)(4) of the Monterey Amendment Settlement Agreement only requires DWR to analyze the potential impacts resulting from this Project and other transfers as they relate to the potential environmental impacts of approving the Monterey Amendment. Section III(E) of the Monterey Amendment Settlement Agreement clarifies that the Section III(C)(4) analysis is limited by remedies or other actions of the Los Angeles County Superior Court in *Friends I*, stating:

> With respect to Section III(C)(4)(b) regarding the Kern-Castaic Transfer, the Parties recognize that such water transfer is subject to pending litigation in the Los Angeles County Superior Court following remand from the second District Court of Appeal (*See Friends of the Santa Clara River v. Castaic Lake Water Agency 95 Cal.App.4th 1373, 116 Cal.Rptr.2d 54 (2002); review denied, April 17, 2002*). The Parties agree that jurisdiction with respect to that litigation should remain in that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation."

Chapter 8, References

Page 8-8, line 21. The word "Draft" should be replaced with "Final."

Appendix C, Agricultural Resources

The May 23, 2003 report by Northwest Economic Associates should be replaced with the following final report dated May 28, 2003.

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LETTER 4

Quality Solutions to Complex Problems
Northwest Economic Associates
www.nwecon.com

November 19, 2004

Mary Lou Cotton, Water Resources Manager
Castaic Lake Water Agency
27234 Bouquet Road
Santa Clarita, CA 91350

Dear Ms. Cotton:

We have reviewed the draft economics report and now view that report as final. Please mark your records accordingly, and we will forward a copy of the final report to you. Thank you.

Sincerely yours,

Duane A. Paul

Duane A. Paul, Ph.D
Senior Consultant

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LETTER 4

LETTER 4

Effects on Agricultural Production from Transferring 41,000 Acre-Feet of State Water Project Entitlement from Wheeler Ridge-Maricopa Water Storage District

FINAL REPORT

Prepared for

Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, CA 91350

By

Northwest Economic Associates
P.O. Box 5129
Fair Oaks, CA 95628

May 28, 2003

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LETTER 4

Executive Summary

- Between 1990 and 1999, permanent crops increased from 30 percent to 38 percent of cropped land in Wheeler Ridge-Maricopa Water Storage District (WRMWSD). Between 1999 and 2001, they rose to 48 percent. Vineyards are the single most important permanent crop. Permanent cropped acreage has increased in both surface water and ground water service areas of the district.

- Because of the large capital costs for establishing a vineyard, grove, or orchard, the increase in permanent crop acreage suggests that farmers in the service area are confident that they will be able to consistently obtain the water necessary for their operations. The actions of WRMWSD have increased the reliability of water and helped offset the rising costs of SWP surface water. Growers are able to produce more labor-intensive, higher value crops.

- WRMWSD has diversified its water supply and management portfolio dramatically since the 1980s. The district's SWP entitlement remains an integral component of total supplies, but supplemental sources now provide a substantial drought buffer for the district.

- WRMWSD has invested in ground water recharge storage and recovery systems outside of the WRMWSD service area as well as distribution and pumping infrastructure in order to increase the reliability of water in dry years. Banking surface water when available or conjunctively using ground water in wet and normal years allows WRMWSD to have a more reliable water supply when normal demand exceeds supplies available from the SWP. This banking and reliability more than offsets any of the impacts of the 41,000 AF transfer of SWP surface water.

- The transfer of 41,000 AF of SWP water will have little or no impact on cropping patterns and production in WRMWSD. The district has taken adequate steps to insure that more reliable water supplies from various sources will be available at lower cost to offset the transfer. The transfer and resulting payment for the transferred water reduce the fixed costs of the unneeded SWP entitlement and thus reduce the financial burden to WRMWSD. The district is better able to continue to improve its water infrastructure and supply. Without this

infrastructure and reliable supply, more lands will likely be removed from production temporarily or permanently.

- During the last 12 years, WRMWSD has experienced a significant shift in agricultural cropping patterns. Farmed land in the WRMWSD has varied from a low of 60,370 acres in 1991, a severe drought year, to a high of 94,499 acres in 1998. Crop acreage fluctuated by an average of 11.6 percent each year between 1990 and 2001. The principal factors causing the variations likely have included water availability, crop rotations, and crop prices.

- Annual crop acreage has declined, while acreage in permanent crops has increased. Annual crop acreage fell by 13,376 acres in the WRMWSD surface water service areas from between 1990 and 1999 and by a further 9,068 acres between 1999 and 2001. In the surface water service areas, cotton acreage declined by 15,534 acres between 1990 and 1999 and by a further 1,528 acres between 1999 and 2001. Over the same two periods in the groundwater service areas, annual crop acreage increased by 8,668 and decreased by 5,128, respectively.

- Many economic factors influence cropping decisions and resultant cropping patterns. Changes in crop prices, particularly for cotton, and the total of variable costs (including water prices), as well as strong demands for grapes and citrus, appear to have influenced the decisions of farmers in the WRMWSD regarding crop choices.

- As overall production costs increase, including those for water, cotton growers find it harder and harder to stay in production. Rotation crops such as grain and hay do not even cover variable costs in some years. Growers are better off to fallow lands than to continue production of these crops.

- Fallowing has been a regular part of cropping patterns in WRMWSD. Between 1991 and 1998, the amount of fallowed land decreased by 34,000 acres. Since 1998, fallowed acreage has increased by 11,600 acres. Fallowing is attributable to many different factors, including crop prices, cultivation practices, production costs, and others. Fallowing thus varies widely between years. From 1990 through 2001, the amount of land fallowed fluctuated annually by 34.9 percent, or 9,651 acres.

- During the early 1990s drought period, it became apparent that Department of Water Resources (DWR) announced water shortages could become a reality and that water costs would soar when water was not delivered. Following this period of drought impacts, WRMWSD experienced a significant shift of acreage to higher value crops such as fruits and vegetables and a reduction of acreage in lower value crops such as cotton, hay, and other field crops. The last two to three years appears to be a period of leveling out of new perennial crop plantings and increased fallowing.

- Fallowing has increased since 1998 even though State Water Project (SWP) deliveries, with the exception of 2001, have been relatively high. The increase is probably due to market conditions, particularly for cotton, as well as other economic and agronomic reasons.

- Total applied agricultural water within WRMWSD averaged about 251,000 acre-feet (AF) annually between 1990 and 1999 and about 259,000 AF annually between 1999 and 2001. Over those two periods, total WRMWSD deliveries from all sources averaged 158,000 AF and 168,000 AF annually, respectively. The remainder was supplied by on-farm ground water pumping, user input, or other water supplies available to farmers in the WRMWSD area.

- Before the 41,000 AF transfer, WRMWSD held a water supply contract for about 238,000 AF of SWP water. After the transfer, the remaining 197,000 AF of contract amount, with supplemental supplies, should leave the district comfortably able to meet demands in normal and wet years. Neither cost nor availability should be adversely affected in those years, and the transfer should not, of itself, cause an increase in fallowing.

- The WRMWSD supplemental water supplies were developed primarily to help meet demands during dry years. Those sources will more than make up for any dry year shortfall incurred as a result of the 41,000 AF of water transferred.

Introduction

Agriculture is the main industry in the Wheeler Ridge-Maricopa Water Storage District (WRMWSD) service area. Agricultural lands in this area are among the most productive in Kern County and the entire state. Water is a key input to agriculture here, and has been instrumental in the production of a variety of crops destined for both domestic and international markets. The cost and availability of various water sources have significant effects on farm profitability and survivability.

Over time, farmers in the service area have changed cropping mixes, adopted different rotations, and used different water sources for their operations. These changes are an outgrowth of the many factors incorporated into the decision-making framework used by farmers, some unique to each farm, others common to all.

This report considers the farm-level impacts of the 41,000 acre-feet (AF) transfer of State Water Project (SWP) entitlement from WRMWSD to Castaic Lake Water Agency (CLWA). The focus of the analysis is on whether the transfer will cause changes in agricultural practices, including additional land fallowing within WRMWSD. The report is presented in three sections. The first is an assessment of pertinent existing conditions within WRMWSD, including information on components of water supply and uses. The discussion also incorporates a review of crop acreages and use of various water sources over time. The second section describes the decision-making framework which farmers seeking specific economic objectives follow in determining which crops to plant and which inputs, including water, to use on these crops. This development follows widely-accepted principles of farm management and agricultural economics. The third section discusses the relationship of the transfer on agricultural operations within WRMWSD.

Existing Conditions

Cropping Patterns[1]

Crops grown within the WRMWSD service area had a farm-level production value of nearly $283 million in 2001 (see Table 1).[2] Grapes provided the greatest dollar value, at 31 percent of the total, followed by mixed produce and melons at 26 percent, citrus at 25 percent, and cotton at seven percent. Total value in 2001 was 6 percent greater than the comparable value in 1999, and the value in 1999 was 23 percent higher than that in 1990. The allocation of value among crops has also changed a great deal since 1990, when grapes accounted for just 18 percent of the total, mixed produce and melons 36 percent, citrus 11 percent, and cotton 20 percent. Because of the 1987-92 drought that so severely impacted Kern County and the entire San Joaquin Valley, the value of crop production in WRMWSD fell between 1990 and 1992 and then rose to exceed the 1990 value only by 1995.

Since 1990, net farmed land[3] in WRMWSD has varied from a low of 60,370 acres in 1991 to a maximum of 94,499 acres in 1998 (see Table 2). For the 12 years shown, the normal annual variation in net farmed land was 11.6 percent,[4] or about 9,700 acres. As shown in Figure 1, the general trend in net cropped acreage was positive until about 1999.[5] Similarly,

1 Cropping information for WRMWSD is taken from annual crop reports provided by the district for the years 1990 through 2001.

2 Based on crop acreages reported by WRMWSD and average price and yield data reported for Kern County by the Kern County Department of Agriculture.

3 Measured as total cropped less double-cropped land.

4 Measured as the coefficient of variation, calculated as the standard deviation divided by the mean. See Snedecor and Cochran.

5 A two-period moving average is used to reduce variation typical between years.

the general trend in the acreage of annual crops was positive until about 1996, then notably negative. In 1990, annual crops accounted for 70 percent of cropped acres.[6] By 1999, the annual crop share had fallen to 62 percent and by 2001 to 52 percent. Cotton, historically the predominant annual crop in WRMWSD, represented 61 percent of annual cropped land in 1990, but only 36 percent in 1999 and 37 percent in 2001. From its peak in 1996, land in annual crops fell 9,011 acres by 1999 and an additional 14,196 acres by 2001. Cotton accounted for nearly 80 percent of that reduction. Conversely, the acreage shares of mixed produce and melons rose from 31 percent in 1990 to 38 percent in 1999 and fell to 35 percent in 2001. The share of irrigated grains increased from zero in 1990 to 18 percent in 1999 and fell to 14 percent in 2001.

The negative trend for annual crops has been offset almost completely by the increases in permanent crop acreage. In 1990, permanent crops accounted for 30 percent of cropped land, with vineyards comprising 40 percent of the total, deciduous nuts 26 percent, citrus 23 percent, and deciduous fruits eight percent. In 1999, permanent crops accounted for 38 percent of cropped land, with vineyards 43 percent of the total, deciduous nuts 23 percent, citrus 27 percent, and deciduous fruits five percent. By 2001, permanent crops represented 48 percent, with vineyards at 44 percent of the total, deciduous nuts 21 percent, citrus 30 percent, and deciduous fruits five percent.

Table 2 shows fallowed land[7] ranging from a maximum of 51,620 acres in 1991 to a minimum of 17,649 acres in 1998. The spike in fallowed land in 1991 was attributable largely to the ongoing drought in California and sharply-reduced water supplies, together with higher costs of water from virtually all sources. Because of its different water sources, which are even more diversified today, WRMWSD was able to provide some water to farmers in 1991. Subsequently, fallowed acreage declined sharply until 1998 and has risen since then (see Figure 2).

Farmers fallow land for many reasons, both agronomic and economic. Agronomic reasons include the use of fallowing as part of crop rotations. Economic reasons include such factors as the market conditions and prices for the crops typically grown on the land and the cost and availability of production inputs, including water.

Without information from individual landowners, it is very difficult to distinguish between land that is fallowed temporarily and land that is removed from production either permanently or for a long term. The California Department of Conservation, which monitors land use with aerial photos taken every two years, reports previously productive, but

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6 Calculated relative to total cropped land because some annual cropland is double cropped.

7 As shown in WRMWSD crop reports. Fallowing generally refers to temporarily removing land from production to conserve moisture or to control pests.

currently idle, land as fallowed for at least three monitoring cycles (that is, six years).[8] Ultimately, land may be fallowed for eight years before it is no longer considered to be in active agricultural use. Thus, it is not at all apparent that the increase in fallowed land with the WRMWSD service area since 1998 is attributable to a reduction in SWP entitlements within the district. Rather, the increase appears to be related more closely to crop markets and prices.

8 Molly Penberth, California Department of Conservation, April 30, 2003, personal communication.

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Table 1
Farm Level Value of Production, by Crop and Total, WRMWSD

Crop/Acres	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Cotton	$43,019,069	$16,689,629	$27,663,667	$33,714,831	$37,911,348	$34,831,452	$40,411,911	$38,485,118	$19,421,271	$26,461,166	$25,490,070	$18,582,103
Sugar Beets	$751,012	$672,471	$840,597	$862,677	$373,257	$466,458	$152,213	$0	$205,582	$0	$0	$0
Grain	$886,863	$953,001	$1,384,366	$2,017,655	$1,253,304	$3,138,780	$5,285,858	$3,058,269	$3,995,594	$4,101,029	$2,741,375	$2,808,474
Green Feeds	$1,396,620	$687,643	$705,721	$989,778	$1,415,864	$1,345,331	$1,415,121	$2,275,038	$1,968,264	$2,059,065	$1,980,664	$2,539,051
Mixed Produce	$77,196,114	$73,993,874	$37,366,098	$48,444,836	$41,735,435	$57,430,236	$49,788,591	$59,466,855	$54,425,094	$80,285,572	$72,435,938	$66,370,246
Melons	$0	$0	$15,178,882	$11,810,000	$17,527,192	$13,455,741	$13,424,661	$14,715,280	$13,970,325	$10,559,005	$8,968,780	$8,727,570
Vineyard	$38,927,352	$31,865,396	$37,027,240	$45,790,453	$45,763,512	$55,045,475	$64,192,513	$80,301,649	$73,479,669	$84,173,400	$84,581,368	$86,940,385
Deciduous Nuts	$18,754,834	$14,452,109	$12,384,408	$19,367,333	$16,053,249	$15,309,727	$18,210,636	$16,487,093	$16,267,367	$11,491,679	$13,021,446	$13,035,331
Deciduous Fruit	$11,206,519	$11,677,651	$7,492,311	$8,957,975	$7,888,785	$12,950,470	$11,608,728	$9,852,647	$10,991,313	$8,961,073	$14,345,391	$11,845,011
Citrus	$23,176,485	$10,233,881	$14,588,823	$31,144,607	$38,931,957	$39,672,318	$34,076,041	$55,669,042	$58,690,301	$37,264,234	$73,962,958	$71,330,901
Pomegranates	$375,112	$355,687	$917,011	$1,007,081	$1,324,308	$1,350,818	$1,408,974	$758,959	$647,472	$1,227,749	$454,063	$704,100
Eucalyptus	$15,437	$14,637	$36,576	$40,168	$22,638	$23,091	$76,269	$41,083	$36,396	$61,876	$22,884	$35,485
Jojoba	$997,211	$120,026	$519,901	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Value	$216,702,627	$161,716,007	$156,105,602	$204,147,394	$210,200,848	$235,019,897	$240,051,517	$281,111,032	$254,098,647	$266,645,848	$298,004,936	$282,918,657

Table 2
WRMWSD Annual and Permanent Crop and Other Acreage

Crop	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Annual												
Cotton	38,071	16,192	24,621	31,063	33,369	36,795	34,702	32,369	24,953	20,781	22,110	16,204
Sugar Beets	723	746	825	689	370	409	151	0	181	0	0	0
Grain	2,692	3,450	9,859	8,162	3,739	9,530	11,804	8,203	15,586	0	0	0
Grain, Irrigated	0	0	0	0	0	0	0	0	0	10,605	7,378	6,208
Grain, Dry Farmed	0	0	0	0	0	0	0	0	0	1,655	2,117	3,099
Green Feeds	1,836	1,146	1,206	1,442	1,514	2,002	1,737	2,923	2,938	3,340	2,933	2,924
Mixed Produce	19,504	17,469	12,971	12,414	13,618	13,333	14,770	16,408	14,553	17,783	16,889	13,246
Melons	0	0	4,064	3,361	3,832	4,073	3,965	3,924	3,845	3,954	2,350	2,241
Total Annual	62,826	39,003	53,546	57,131	56,442	66,142	67,129	63,827	62,056	58,118	53,777	43,922
Surface Water Service Areas	43,092	20,947	34,731	36,939	35,870	43,153	45,183	42,945	40,634	29,716	26,591	20,648
Ground Water Service Areas	19,734	18,056	18,815	20,192	20,572	22,989	21,946	20,882	21,422	28,402	27,186	23,274
Permanent												
Vineyard	10,719	9,883	9,633	9,708	9,778	10,774	12,547	14,222	15,315	15,745	17,387	17,701
Almonds	0	0	5,103	5,225	5,301	5,155	5,540	5,524	6,099	6,282	6,410	5,994
Pistachios & Walnuts	0	0	1,797	1,797	2,098	2,100	2,100	2,100	2,099	2,099	2,099	2,376
Deciduous Nuts	6,865	6,899	6,900	7,022	7,399	7,255	7,640	7,624	8,198	8,381	8,509	8,370
Deciduous Fruit	2,074	2,102	2,013	2,008	2,060	2,066	2,154	2,205	2,104	1,989	2,058	1,928
Citrus	6,212	6,233	6,675	6,932	7,241	7,471	7,870	8,482	9,011	9,737	11,123	12,029
Pomegranates	243	243	351	351	351	351	351	351	338	377	377	377
Eucalyptus	10	10	14	14	6	6	19	19	19	19	19	19
Jojoba	646	82	199	0	0	0	0	0	0	0	0	0
Total Permanent	26,769	25,452	25,785	26,035	26,835	27,923	30,581	32,903	34,985	36,248	39,473	40,424
Surface Water Service Areas	24,824	24,025	24,339	24,598	25,242	26,005	28,081	29,923	31,364	32,350	35,021	35,533
Ground Water Service Areas	1,945	1,427	1,446	1,437	1,593	1,918	2,500	2,980	3,621	3,898	4,452	4,891
Total Cropped	89,595	64,455	79,331	83,166	83,277	94,065	97,710	96,730	97,041	94,366	93,250	84,346
-Double Crop	5,314	4,085	3,525	4,510	4,233	4,663	5,092	5,441	2,542	3,155	2,622	1,541
Net Farmed	84,281	60,370	75,806	78,656	79,044	89,402	92,618	91,289	94,499	91,211	90,628	82,805
+Fallow Lands	27,588	51,620	36,031	33,189	32,980	22,523	19,584	20,949	17,649	20,855	21,659	29,291
Total Cultivated	111,869	111,990	111,837	111,845	112,024	111,925	112,202	112,238	112,148	112,066	112,287	112,096
Miscellaneous	6,840	6,847	6,839	6,843	6,849	6,841	6,859	6,860	6,856	6,850	6,864	6,852
Deferred Lands	1,659	1,659	1,659	1,659	1,659	1,659	1,659	0	0	0	0	0
Other Lands	668	738	880	968	919	1,073	1,098	1,129	1,183	1,270	1,361	1,257
Native Vegetation	25,626	25,428	25,405	25,305	25,169	25,122	24,802	26,393	26,434	26,434	26,434	26,739
Total District	146,662	146,662	146,620	146,620	146,620	146,620	146,620	146,620	146,621	146,620	146,946	146,944

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Figure 1
Annual, Permanent, and Net Crop Acreage, WRMWSD

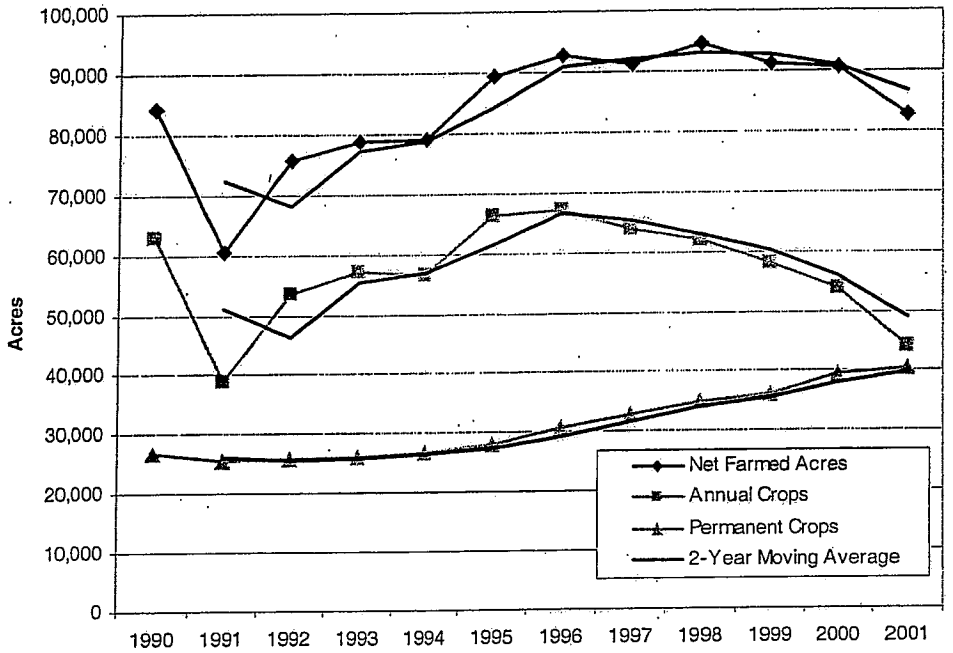
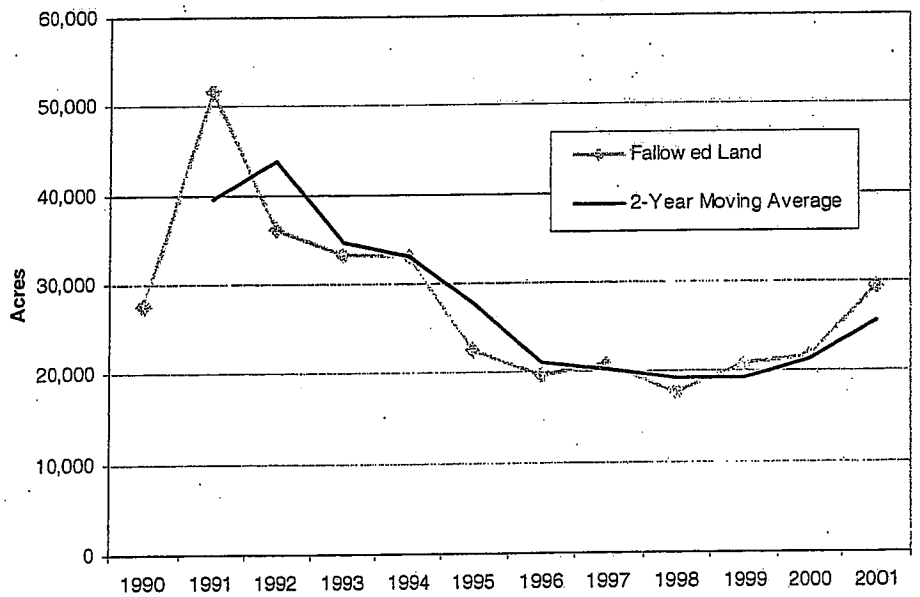


Figure 2
Fallowed Land, WRMWSD



Cropping Pattern Changes by Service Area

WRMWSD includes lands served by surface water or ground water or, in some cases, both. Cropped acreage in the surface water service areas (without exclusion of double cropping) fell by 5,850 acres between 1990 and 1999 and a further 5,885 acres between 1999 and 2001. Cropped land in the ground water areas increased 10,621 acres between 1990 and 1999 and fell 4,135 acres between 1999 and 2001.[9] The amount of annual crops in surface water areas fell by 13,376 acres between 1990 and 1999 and a further 9,068 acres between 1999 and 2001. For the two periods in the ground water areas, annual crop land increased by 8,668 acres and fell by 5,128 acres. The acreage of permanent crops rose in both surface water and groundwater service areas (see Figures 3 and 4).

The decline in annual crops and increase in permanent crops in surface water areas relates well to lower prices for some annual crops and higher water prices over the period. As discussed elsewhere in this section, cotton prices have fallen in both nominal and real terms since 1990, and it is no longer feasible to grow cotton in many parts of Kern County. Many cotton producers have been impacted by a "cost-price squeeze" quite common in agriculture.

The shift to permanent crops in the surface water service areas suggests that farmers in those areas are confident that they will be able to obtain water regularly either from within or outside WRMWSD, with or without the 41,000 AF of water under consideration. The capital investment for establishing an orchard, grove, or vineyard can easily exceed $8,000 per acre, excluding land, and farmers will not make those investments unless they are confident that they will be able to obtain adequate water for commercial production or, at minimum, keeping the trees or vines alive. While SWP water certainly remains an important part of the total WRMWSD supply, the SWP component of supply has been supplemented by the development and availability of several sources of supplemental water discussed elsewhere in this section.

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9 Wheeler Ridge-Maricopa Water Storage District, various years, "Crop and Land Use Summary," Bakersfield. The changes also reflect, in part, the reclassification of lands within WRMWSD.

Figure 3
Annual Crop Land in Surface and Ground Water Service Areas, WRMWSD

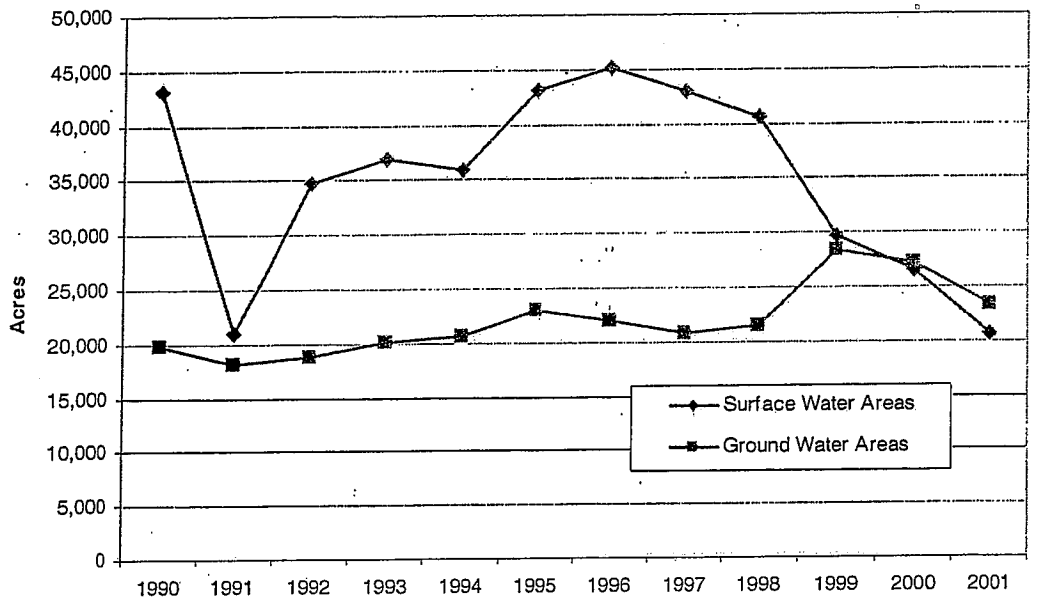
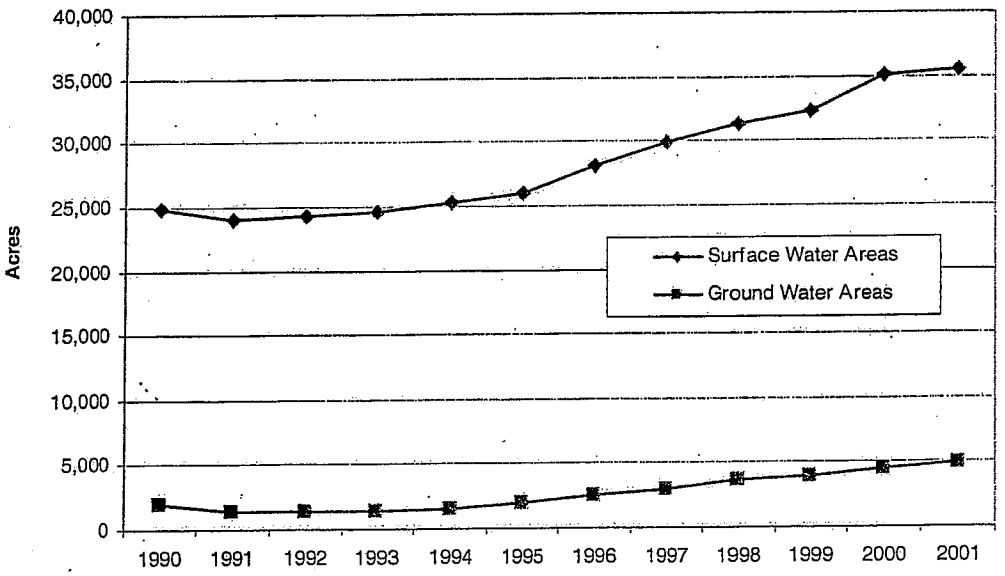


Figure 4
Permanent Crop Land in Surface and Ground Water Areas, WRMWSD



Factors Accounting for Cropping Pattern Changes

Changes in cropping patterns, whether from one type of annual crop to another or from annual crops to permanent crops, may be due to several factors. Some of the more important within WRMWSD may include:[10]

- Market conditions and crop prices;
- Input requirements and costs;
- Soil and micro-climate characteristics;
- Crop rotation requirements, including fallowing;
- Water availability and cost;
- Government programs; and
- Contracts with crop processors.

Absent detailed information from each farmer in an area, it is not possible to attribute changes in cropping patterns to any of these or other individual factors. However, changes in prices and production costs for key crops, particularly cotton, grapes, and citrus, and in water costs and availability appear to have played important roles.

Cotton prices have declined in both nominal and real terms since 1990. Acala cotton grown in Kern County[11] sold at an average farm price of $0.77 per pound in 1990. Yield averaged 1,200 pounds per acre, and gross revenue thus averaged $924 per acre.[12] In 2001, the last year for which data are currently available, the average farm price for Acala cotton grown in Kern County was $0.68 per pound. Yield averaged 1,342 pounds per acre, and gross revenue averaged $905 per acre.

While average per-acre gross revenue fell 2.1 percent between 1990 and 2001, costs of production have increased sharply and profitability has declined or disappeared for many growers. In 1995, average total costs to produce cotton in the San Joaquin Valley were estimated at $815 per acre, assuming a yield of 1,250 pounds of lint and application of 2.5

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10 These are discussed in more detail in the section on farm-level decision making.

11 Acala cotton has accounted for 76 to 93 percent of all Kern County cotton since 1990.

12 Kern County Department of Agriculture.

AF of water at $50 per AF.[13] The total cost figure excludes a payment for management or risk. Average gross revenue for cotton that year in Kern County was reported to be $815 per acre.[14] Thus, the average gross revenue for cotton in 1995 would just cover all costs, but not cover a payment to compensate for management and risk. Moreover, WRMWSD delivered water costs that year were between $58 and $193 per AF, depending on the zone of the district to which the water was delivered.[15] Thus, all other factors unchanged, cotton production in WRMWSD that year would have generated losses of between $20 and $483 per acre, disregarding any compensation for risk or management.[16]

Current published costs are $1,002 per acre for Acala cotton, assuming a lint yield of 1,250 pounds per acre and 2.5 AF of water at $60 per AF, but also excluding payments for risk and management.[17] Under these conditions and based on current cotton prices (assumed at $0.70 per pound, including loan deficiency payments), gross revenue would exceed total costs by $61 per acre, but without a return for management or risk. However, WRMWSD delivered water costs ranged from $89 to $230 per AF in 2001 and are expected to range from $101 to $260 per AF for all of 2002.[18] Clearly, cotton production is infeasible in parts of WRMWSD, and the result has been a continued shift from cotton to other, higher-profit crops

Many factors may affect the rate at which farmers change their crop mix. First, the market demands for fruits, nuts, and vegetable crops relative to supplies may signal that additional plantings of those crops would have adverse effects on prices. Second, processing capacity and the unavailability of processor contracts may limit the amount of vegetable crops such as tomatoes a farmer chooses to grow. Third, field and grain crops, while sometimes unprofitable in isolation, remain important parts of diversified crop rotations. Fourth, the crop history and risk characteristics of farmers may reduce the attraction of changing established cropping patterns.

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13 University of California Cooperative Extension, 1995.

14 Kern County Department of Agriculture.

15 Robert Kunde, WRMWSD, April 1, 2003, personal communication.

16 It is acknowledged that every farm is unique, characterized by soil type, debt levels, water sources and other factors. Moreover, acreage data show that cotton is clearly still profitable on some farms in WRMWSD. However, the sharp declines in cotton acreage since 1990 indicate that the crop is less profitable or unprofitable in many parts of the district.

17 University of California Cooperative Extension, 2003.

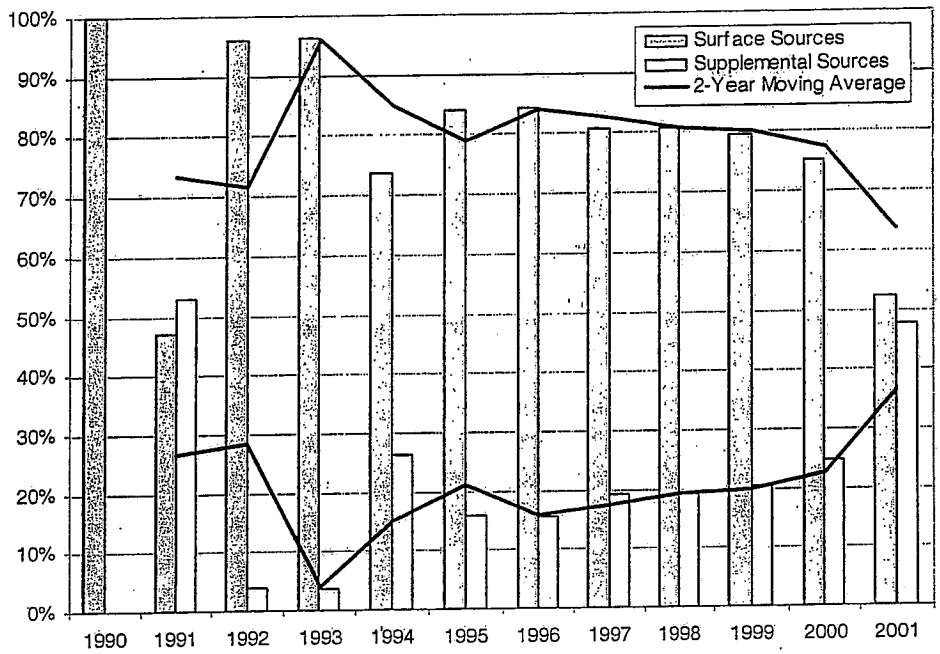
18 Robert Kunde, WRMWSD, April 1, 2003, personal communication.

Water Sources and Costs

WRMWSD has a contract for SWP water through Kern County Water Agency and regularly provides that water to farmers as supplies permit. However, WRMWSD has also developed district wells and has access to other water sources such that its "water portfolio" is much more diversified today than it was in the late 1980s or early 1990s. Much of this diversification was in response to the nearly complete abrogation of the State of California's responsibility to provide a reliable water supply from the State Water Project, aggravated by the effects of the 1987-92 drought.

Several individual sources collectively comprise the "supplemental water." These include district wells, Blanco Rosa Improvement District wells, Kern Water Bank, Pioneer Project, Berrenda Mesa project, and miscellaneous supplies. Figure 5 shows that these alternative sources have become an increasingly-important component of total WRMWSD potential water availability. The two-period moving average trend line is clearly upward sloping, while that for traditional surface sources is declining. It should be noted that the data on which the figure is based include potential surface and supplemental water supplies rather than actual deliveries. Potential surface supplies are calculated as the sum of Article 21 water, carryover, user input, and the product (SWP Entitlement * Percentage of SWP Allocation) for each year.

Figure 5
Surface and Supplemental Water Sources, WRMWSD



Water Use

WRMWSD maintains records for all water deliveries it makes each year. It does not obtain information on ground water pumping by individual farmers. Thus, total water use within the district for any given year is not a single number that can be taken from a report. Bookman-Edmonston Engineering developed average applied water requirements for crops grown in WRMWSD.[19] For this report, estimates of total applied water within WRMWSD were developed by using these figures and multiplying those rates by acreages taken from the annual WRMWSD crop reports. The application rates used are shown in Table 3. The estimated applications, total WRMWSD deliveries, and estimated water applied, but from other sources, are shown in Table 4.

For the period from 1990 through 1999, total annual deliveries by WRMWSD averaged 158,056 AF. From 1999 through 2001, they averaged 168,335 AF. Based on the application rates shown in Table 3 and the crop acreages shown in Table 2, WRMWSD deliveries accounted for about 63 percent of total water applied to crops in the service area from 1990 through 1999 and 65 percent from 1999 through 2001. It should be noted that the estimated applied water figures in Table 4 represent potential applications and assume that farmers were able to obtain all required water in each year. For years in which all water supplies were limited (e.g., 1991), the applied water figures shown overstate actual applications.

Table 3
Average Applied Water Requirements for Various Crops Grown in WRMWSD

Crop	Average Applied Water Requirement (Acre-feet per acre)
Cotton	3.00
Sugar beets	4.20
Grains	1.35
Green feeds	5.00
Mixed produce	2.20
Melons	2.20
Vineyards	2.80
Deciduous nuts	3.90
Deciduous fruits	3.90
Citrus	3.60
Pomegranates	3.60
Eucalyptus/jojoba	2.50

19 Bookman-Edmonston Engineering.

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Table 4
Estimated Applied Water, by Crop and Source, WRMWSD Service Area (Acre-Feet)

Crop	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Cotton	114,213	48,576	73,863	93,189	100,107	110,385	104,106	97,107	74,862	62,343	66,327	48,612
Sugar beets	3,037	3,133	3,465	2,894	1,554	1,718	634	0	760	0	0	0
Grain	3,634	4,658	13,310	11,019	5,048	12,866	15,935	11,074	21,041	16,551	12,820	12,566
Green feeds	9,180	5,730	6,030	7,210	7,570	10,010	8,685	14,615	14,685	16,700	14,665	14,620
Mixed produce	42,909	38,432	28,536	27,311	29,960	29,333	32,494	36,098	32,017	39,123	37,158	29,141
Melons	0	0	8,941	7,394	8,430	8,961	8,723	8,633	8,459	8,699	5,168	4,930
Vineyard	30,013	27,672	26,972	27,182	27,378	30,167	35,132	39,822	42,882	44,086	48,684	49,563
Deciduous Nuts	26,774	26,906	26,910	27,386	28,856	28,295	29,796	29,734	31,972	32,686	33,185	32,639
Deciduous Fruit	8,089	8,198	7,851	7,831	8,034	8,057	8,401	8,600	8,206	7,757	8,026	7,519
Citrus	22,363	22,439	24,030	24,955	26,068	26,896	28,332	30,535	32,436	35,053	40,043	43,308
Pomegranates	875	875	1,264	1,264	1,264	1,264	1,264	1,264	1,217	1,357	1,357	1,357
Eucalyptus/jojoba	1,640	230	533	35	15	15	48	48	48	48	48	48
Total estimated applied water [1/]	262,726	186,848	221,704	237,670	244,283	267,965	273,549	277,527	268,584	264,402	267,480	244,303
Total WRMWSD Deliveries	187,335	65,274	125,979	146,524	160,564	162,138	202,581	198,305	149,292	182,570	183,929	138,506
WRMWSD Deliveries/Total estimated applied water	71%	35%	57%	62%	66%	61%	74%	71%	56%	69%	69%	57%
Estimated Water Applied From Other Sources	75,391	121,574	95,725	91,146	83,720	105,827	70,968	79,222	119,292	81,832	83,551	105,797

1/ Assumes supplies available regardless of source.

Total water applied within the WRMWSD service area fell from an estimated 277,527 AF in 1997 to 244,303 AF in 2001. Applied water for cotton fell almost 49,000 AF, mixed produce fell 6,900 AF, and melons fell 3,700 AF, paralleling reported acreage declines for those crops. In contrast, applied water on all permanent crops except deciduous fruits increased.

Decision-Making by Farmers

The data shown in the previous section reflect the combined effects of innumerable decisions made by farmers in the WRMWSD service area each year. Farm-level decision making in WRMWSD and every other agricultural area is a continuous process that adheres to and at times departs from traditional economic theory and models.

Farmers operate, more than most other industries, in an environment closely aligned with the "purely competitive" model of economics.[20] Agriculture includes thousands of producing units all making decisions independent of each other, virtually all are price takers, all have access to good information about markets and prices, and all, or nearly all, are trying to earn as much profit as they can from their operations.

There are extensive domestic and international influences on agriculture. Domestically, the price of natural gas affects fertilizer prices, the price of crude oil affects costs of gasoline and diesel fuel, interest rates affect the cost of operating loans, and economic growth affects consumer demands for all types of products. Agriculture is also subject to many influences from the global economy, evident in the tariffs in the U.S. and other countries on agricultural imports, the increasing production of such crops as cotton and deciduous nuts in Asia, and fluctuating exchange rates.

The decision-making framework which farmers must employ for their operations therefore includes considerations well beyond the farm gate. The results are indicated by decisions such as:

- Crops to plant and when;
- Inputs used and in what combinations;
- When and how to acquire or sell resources;
- When and where to sell harvested crops; and
- When to adopt new technology.

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20 See Henderson and Quandt.

Profit Maximization

One of the key assumptions in agricultural economics and farm management is that farmers attempt to use resources in a way that will maximize the profit of their operations.[21] An expanded form of that assumption is that farmers, with limited capital, attempt to allocate resources to their land in order to maximize profit across all crops they grow. There are many combinations of inputs which farmers can use in their operations, reflecting opportunities and costs. For example, weeds can be controlled chemically or with manual labor. Seeding and harvesting can be accomplished mechanically or by hand. Land preparation and fertilizing can be undertaken by the farmer or performed by custom operators.

In attempting to maximize profits, farmers weigh the tradeoffs and combine inputs in such a way that, at the margin, the value of product produced with each unit of input is the same for all inputs. All other factors unchanged, so long as the "value of marginal product" is greater for one input than for others, it is rational for the farmer to use at least one more unit of that input because the revenue from the product produced with that unit will exceed the cost of the input.[22] It is reasonable to assume that this framework is applicable not only to such inputs as fertilizer and chemicals, but also to water.

Crop Rotations and Profit Maximization Over Time

The decision-making framework is somewhat more complicated for the more realistic situation of farming continuously over time rather than in many separate single-year periods. This is particularly true for trees and vines, which take several years to mature and then remain productive for many years. However, for farmers growing several annual crops, a realistic goal would be to maximize profits over a crop rotation. Rotations generally include a sequence which alternates a variety of crops. Rotations may involve several crops and cover a period of several years. Accordingly, crop rotations may have a direct effect on the cropping pattern data reported for a given area.

The purposes of rotations include rebuilding soil nutrient levels, reducing pest concentrations and disease problems, and enhancing soil organic matter. It has been demonstrated that continuously planting the same crop on land causes the population of soil borne pathogens to

21 See, for example, Heady and Kay and Edwards.

22 It is recognized that not all farmers are in business to maximize profits and do not have, at all times, the information possibly relevant to efficient decision making. However, given the unavailability of information on alternative goals, it is usually assumed that farmers are in business to maximize their profits. See Heady.

increase.[23] Planting crops that are not hosts helps to reduce the populations of those pathogens. Plants which belong to the same family or class of plants (e.g., broadleaf) often share similar pest problems. Thus, effective rotations must incorporate crops which are not closely related.

Some of the factors which affect the rotations used by farmers include the following:[24]

- Cropping history;
- Grower experience;
- Input requirements for crops;
- Compatibility of crops with existing equipment complement and with labor;
- Existing array of pests; and
- Value of crop and market conditions.

Cotton has traditionally been the core crop for rotations in many parts of Kern County. Historically, rotations included cotton and small grains, both grown for commercial sale.[25] More recently, however, small grains have not been grown as extensively for commercial sale because of low crop prices.[26] They are still grown for silage. Other crops more typically included in cotton rotations are tomatoes, onions, melons, carrots, and alfalfa. Typical rotations might include:

- Two years of cotton and one year of tomatoes or melons;
- Two years of cotton, one year of tomatoes or melons or onions, and three years of alfalfa; and
- One or two years of cotton, three years of alfalfa, one year of tomatoes or melons or onions or carrots, and one year of small grain.

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23 See Nunez.

24 University of California Cooperative Extension, 1995.

25 Brian Marsh, University of California Cooperative Extension, Bakersfield, March 26, 2003, personal communication.

26 Between 1996 and 2001, farm-level barley prices fell from $147 per ton to $84.40 per ton, while those for wheat fell from $168 per ton to $112 per ton. See Kern County Department of Agriculture.

By incorporating small grain and comparable crops into rotations, farmers sometimes appear to be growing economically-inefficient crops. However, the use of low-return crops such as small grains in rotations often reflects agronomic rather than purely economic considerations. The value from these crops would be reflected in better soil conditions and higher yields for other rotation crops in subsequent years. Thus, because of rotations, profit maximization must be viewed from a multi-year rather than a single-year perspective.

Fallowing may be an integral part of crop rotations. Fallowing, with a cover crop, may offer efficient opportunities to rebuild soil organic matter and conserve soil moisture. In addition, farmers may fallow some of their land in order to divert irrigation water usually used there to other, more productive parts of their farms. Farmers may also fallow land in order to be eligible for provisions of various government farm programs or as a component of reduced-tillage strategies.

Table 2 includes data on fallowed land, as reported by WRMWSD. Between 1990 and 2001, an average of 27,827 acres were fallowed within the district. Variation between years averaged plus or minus 9,651 acres, and that variation relative to the mean was 34.7 percent. Thus, over a three-year period, the change in the amount of land fallowed could range from (9,651) to 28,953 acres. Consequently, because so many independent farm-level decisions account for fallowed acreage for the entire district, it is impossible to attribute the increase shown since 1998 to any single factor, whether changes in water supplies, crop prices, input costs, or any other.

Effects of Water Costs and Availability

As noted previously, changes in measured cropping patterns for an area may be due to a variety of factors, such as market conditions, crop prices, government programs, contracts with crop processors, and soil and climate characteristics. For farmers in WRMWSD and throughout the San Joaquin Valley, the availability and cost of water are also critical factors in decisions on which crops to grow and thus in reported cropping patterns. As water reliability is reduced or water costs increase, economic theory as well as reported data suggest that farmers will adjust their crop and input choices to reflect the greater relative scarcity or cost of the resource.

For SWP water, both factors are likely important. Reliability of SWP water was addressed in a recently-completed report, which projected likely delivery capability of the system through 2021.[27] The key findings were that:

[27] California Department of Water Resources, 2002.

- In 75 percent of the years, the annual water delivery of the SWP is estimated to be at least 66 percent of full Table A deliveries
- In 50 percent of the years, annual water delivery is estimated to be at least 83 percent; and
- In 10 percent of the years, annual water delivery is estimated to be at least 98 percent.

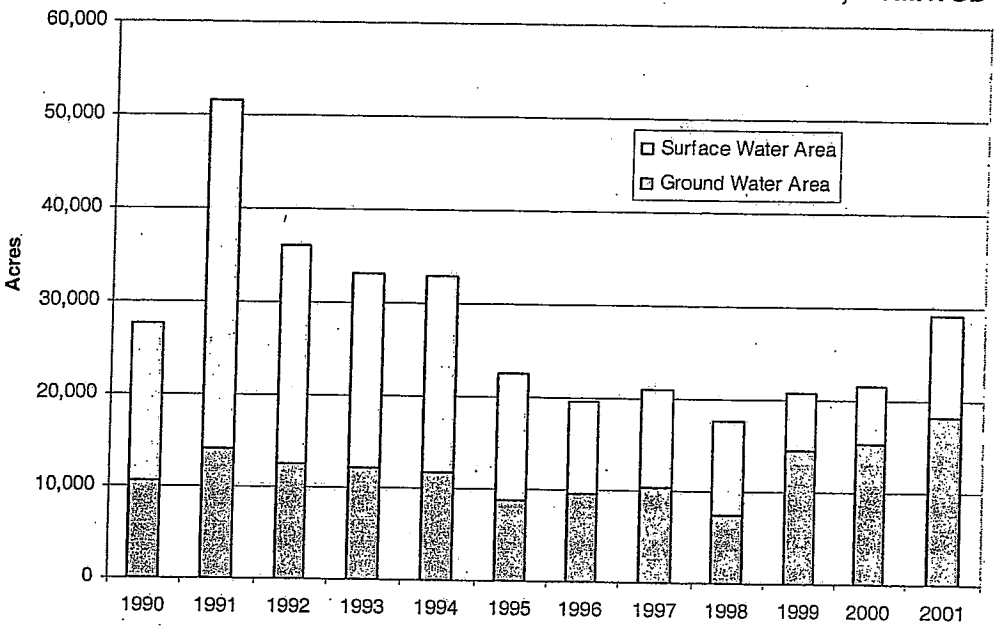
Moreover, costs of SWP water and other key inputs have risen, in some cases to the point that uncertainties over water deliveries, crop prices, and other key variables have caused some farmers to change their rotations and crop selection. The shift from annual crops, particularly cotton, to permanent crops in WRMWSD likely reflects this behavior. As discussed previously, cotton production is no longer feasible for many farmers. Similar shifts in ground water service areas likely reflect the increased costs of production, including higher energy costs for pumping.

Figure 6 shows the amount of fallowed land in WRMWSD. As shown, fallowed acreage peaked in 1991 because of severely-limited water supplies during the drought. By 1995, net cropped acreage had reached its 1990 level, and the amount of land fallowed had fallen to a more representative level. Prior to 1998, most of the fallowed land was in the surface water service areas. Since then, an increasing amount of fallowed land has been in ground water service areas. It is likely that some land has been fallowed for longer periods or idled in both surface water and groundwater service areas more recently because of low crop prices. In particular, the average Kern County price for Acala cotton fell from $0.84 per pound in 1995 to $0.68 per pound in 2001.[28] Over that same period, the average Kern County price for Pima cotton fell from $1.28 per pound to $0.86 per pound. Average Kern County prices for barley and wheat peaked in 1996, then fell, respectively, from $147 to $84.40 per ton; and from $168 to $112 per ton. Clearly, many farmers during this period realized that they would be unable to cover even variable production costs and very likely decided to fallow rather than plant crops.

There is no clear relationship between SWP water deliveries and fallowed land in WRMWSD. While SWP deliveries fell from 1996 to 1998, the amount of fallowed land in surface water areas decreased rather than increased. Between 1998 and 2000, SWP deliveries rose, yet the amount of fallowed land increased. Both sets of data indicate that fallowing decisions by farmers have not been based on SWP availability. If SWP water were the only irrigation source in WRMWSD, it would be only logical that as SWP deliveries fell, fallowing would increase. However, because of the diverse water supplies available to irrigators in the district, that relationship is not valid.

28 See Kern County Department of Agriculture.

Figure 6
Fallowed Land in Ground Water and Surface Water Service Areas, WRMWSD



Results

This section evaluates the expected effects on agricultural practices, including land fallowing, of the 41,000 AF transfer of SWP water from WRMWSD. It draws from the discussion of farm-level decision making and from a review of data presented throughout the report. The approach utilized to estimate the impacts relies on a review of long-term water demands in WRMWSD and of other data previously presented. Discussion includes the expected effects of the transfer during normal and wet years and in dry years on district supplies and costs and on farmer responses.

Table 4 shows that total WRMWSD deliveries of water from all sources since 1990 have varied from a minimum of about 65,000 AF in 1991 to a maximum of nearly 203,000 AF in 1996. Table 4 also shows that estimated total applied water requirements have ranged from about 187,000 AF in 1991 to nearly 278,000 AF in 1997. Estimated total water applied using all water sources fell by 13,125 AF between 1997 and 1999 and by an additional 20,099 AF between 1999 and 2001. Much of this decline is likely attributable to reductions in planted acreages of cotton and other annual crops for which prices dropped so dramatically beginning in the mid 1990s. From 1990 through 1999, WRMWSD deliveries accounted for an average of 63 percent of total applied water. From 1999 through 2001, they accounted for 65 percent.

Prior to the 41,000 AF transfer, WRMWSD had a water supply contract to Kern County Water Agency for Table A amount of about 238,000 AF of SWP water. In normal or wet years, the 41,000 AF is in excess of district needs. It is therefore reasonable to assume that in those years, the transfer would have no or minimal adverse effects on overall water supply. Moreover, the water is in excess of district needs in dry years because of the supplemental sources to which WRMWSD has access. Moreover, in wet, normal, or dry years, irrigator water costs would not be adversely affected by the transfer. .Therefore, because neither the quantity nor cost of district water should be affected adversely, the transfer should have very limited, if any, impacts on land fallowing..

In a critically-dry year or series of such years, the unavailability of part of the WRMWSD SWP contract amount may contribute to a minor mismatch between water supply and demand. If overall water costs increase, there may be some farm-level impacts. WRMWSD has jointly used several of its supplemental sources only in 2001. The variable and fixed costs (excluding capital costs) for that year did not differ substantially from SWP costs over the previous five years. If the costs in 2001 are representative, the incremental impacts of the transfer on delivered water costs to farmers should be minor. The amount of land fallowed in this dry year scenario, including the transfer, should not be materially different from the normal variation in cropped and fallowed acreage between years

Finally, it should be noted that the transfer discussed in this report is part of the broad WRMWSD strategy of increased efficiency and development and use of the sources of water which are most compatible with that strategy. In particular, by selling unneeded SWP water supplies, WRMWSD is able to avoid the carrying costs for that water even in years when it is not needed. Overall, the water supplies from the supplemental sources more than offset the reduced SWP Entitlement and, when the carrying cost of holding excess SWP entitlement is considered, at a lower cost.[29]

[29] William Taube, WRMWSD, May 23, 2002, personal communication.

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Attachment A - Tables Included in the Responses to Comments

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Table A-1. Projected Future Water Supplies and Demands in Average Hydrologic Conditions for the CLWA Service Area

(all values in AF)

Year	*Projected Total Average Year Supply (AF)*[1]	*Projected Total Average Demand*[2]	*Projected Total Average Supply Less Total Average Demand*
2005	114,300	75,100	39,200
2010	114,300	82,400	31,900
2015	114,300	91,600	22,700
2020	114,300	102,500	11,800

Note: Refer to Tables 3.15-7 and 3.15-9 in the Draft EIR for additional detail.

1. Includes Table A Amount, SWP flexible storage, Semitropic Storage (24,000 AF stored in 2002), and groundwater sources (Alluvial Aquifer and Saugus Formation). Does not include additional 35,000 AF of SWP Table A water stored in Semitropic in 2003. Table A values based on current Table A Amount of 95,200 AF (which includes the Project), and percentages for Table A deliveries from DWR's SWP Delivery Reliability Report (DWR 2003b). The average year supply is the average amount of water available based on DWRSIM model results over its entire period of hydrologic record.

2. Includes municipal and industrial, other demands including irrigated agriculture and miscellaneous uses, and projected conservation.

Table A-2. SWP Surplus Water[1] Types

Without Monterey Amendment (Including With Implementation of Article 18(b))	*With Monterey Amendment*
Scheduled surplus water - Water that DWR determined to be available, in addition to Table A supplies, which was scheduled for delivery throughout the year (in the same manner as Table A supplies). This water was generally available only during the early years of the SWP (when Contractor demands for Table A water were low).[2]	Category deleted as part of the Monterey Amendment. (Given increased Contractor demands through time, this water is physically no longer available.)
Unscheduled surplus water - Water that DWR made available when water and capacity were available in excess of SWP storage needs and Table A supplies. This water is only available for limited time periods, generally only in the winter or early spring when Contractors demands are low, and only under specific conditions that do not occur on an annual basis.	**Article 21 water** - Same as unscheduled surplus water. Article 21 water was defined under the Monterey Amendment as "interruptible water" but is more commonly referred to as "Article 21 water."

1. Surplus water is SWP water that can be made available to Contractors when water and capacity are available in excess of SWP storage needs and Table A supplies. See above for terminology for and descriptions of specific types of surplus water. Note that surplus water terminology changed with implementation of the Monterey Amendment.
2. Under the With Implementation of Article 18(b) scenario, scheduled surplus water would once again be available because, with Table A Amounts reduced to a new minimum project yield, water supplies would once again be available in excess of reduced Table A Amounts.

Table A-3. Comparison of DWRSIM Model Results with the SWP Delivery Reliability Report for the 41,000 AF Table A Amount

(All values in AF and rounded to the nearest 100 AF)

	Average Year[1]	*Single Dry Year*[1]	*Multiple Dry Year Period*[1]
Current Conditions (1998 or 2001)[2]			
DWRSIM Results (With Monterey Amendment)[3]	34,400	9,200	18,100
SWP Delivery Reliability Report[4]	29,400	8,000	14,800
Difference	**5,000**	**1,200**	**3,300**
Future Conditions (2020 or 2021)[2]			
DWRSIM Results (With Monterey Amendment)[5]	32,000	9,200	17,600
SWP Delivery Reliability Report[4]	30,600	8,200	15,000
Difference	**1,400**	**1,000**	**2,600**

1. The average year supply is the average amount of water available based on DWRSIM model results over its entire 73-year period of hydrologic record. The single dry year supply is the supply available in the single year with the lowest total SWP deliveries based on DWRSIM model results (1977). Multiple dry year period supply is the average amount of water available over the four consecutive drought years of 1988 through 1991 based on DWRSIM model results.
2. Current conditions for the DWRSIM model results and the SWP Delivery Reliability Report are 1998 and 2001 conditions, respectively. Future conditions for the DWRSIM model results and the SWP Delivery Reliability Report are 2020 and 2021, respectively.
3. Based on water deliveries from DWRSIM study 1995D06E-CALFED-771. This study used 1998 DWR estimates of then-existing SWP Contractor demands.
4. Values based on DWR SWP Delivery Reliability Report results and applying the same methodology suggested by DWR in its report.
5. Based on water deliveries from DWRSIM study 2020D09C-CALFED-786.

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Table A-4. Permanent Table A Transfers Completed Under the Monterey Amendment Provisions (Article 53)

From (Seller)	*To (Buyer)*	*Amount (AF)*	*Year Effective*	*CEQA Status*
COMPLETED TRANSFERS				
Berrenda Mesa Water District	Mojave Water Agency	25,000	1998	NOD – 11/1996
Belridge Water Storage District	Palmdale Water Agency	4,000	2000	NOD – 7/1998; NOD – 4/1999
Berrenda Mesa Water District	Alameda County Flood Control and Water Conservation District Zone 7	7,000	2000	NOD – 3/1996
Lost Hills Water District	Alameda County Flood Control and Water Conservation District Zone 7	15,000	2000	NOD – 7/1998
Belridge Water Storage District	Alameda County Flood Control and Water Conservation District Zone 7	10,000	2001	NOD – 7/1998; NOD – 4/1999
Belridge Water Storage District and Berrenda Mesa Water District	Solano County Water Agency	5,756	2001	NOD – 7/1998; NOD – 4/1999
Belridge Water Storage District and Berrenda Mesa Water District	Napa County Flood Control and Water Conservation District	4,025	2001	NOD – 12/2000
Subtotal		**70,781**		
ANTICIPATED TRANSFER				
Berrenda Mesa Water District	Undetermined	16,000	Unknown	NOP – July 2003; No further action taken
Subtotal		**16,000**		
Total		**86,781**		

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Attachment B – DEIR Mailing List

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MAILING LIST
DRAFT EIR FOR CLWA'S SUPPLEMENTAL WATER PROJECT TRANSFER OF 41,000 ACRE-FEET OF STATE WATER PROJECT TABLE A AMOUNT

Agency/Organization/ Company Name	*Contact Name*	*Title*	*City*	*State*
Alameda County (SC)	James Sorenson	Planning Director Planning Department	Hayward	CA
Alameda County Water District	Eric Cartwright	Water Resources Planning	Fremont	CA
Alameda County Flood Control and Water Conservation District, Zone 7	Dale Myers	General Manager	Pleasanton	CA
Amador County (SC)	Susan C. Grijalva	Planning Director	Jackson	CA
Antelope Valley-East Kern Water Agency	Russ Fuller	General Manager	Palmdale	CA
Audubon Society of California	Dan Taylor	Executive Director	Sacramento	CA
Beale Memorial Library	Nila G. Stearns		Bakersfield	CA
Belridge Water Storage District	Greg A. Hammett	General Manager	Bakersfield	CA
Berrenda Mesa Water District (R)	Harry O. Starkey	General Manager	Bakersfield	CA
Black & Veatch	Dave Argo		Irvine	CA
Buena Vista Water Storage District	Martin Milobar	Engineer-Manager	Buttonwillow	CA
Building Industry Association, Greater LA/Ventura Chapter	Ray Garcia		Calabasas	CA
Butte County (SC)	Yvonne Christopher	Director	Oroville	CA
Calaveras County (SC)	Kim Hansen	Planning Director Planning Department	San Andreas	CA
California Air Resources Board	James Morgester	Chief	Sacramento	CA
California Department of Fish & Game, Region 5 Headquarters (T)	Patricia Wolf	Regional Manager	Long Beach	CA
California Department of Fish & Game, Sacramento			Sacramento	CA
California Department of Health, Drinking Water Program	Wayne Hubbard		Sacramento	CA
California Department of Health, Sacramento	Dat Tran	Drinking Water Program	Sacramento	CA
California Department of Parks and Recreation(T)	Ruth Coleman	Director	Sacramento	CA
California Department of Transportation	Marta E. Frausto	Planning	Fresno	CA
California Department of Transportation, District 7	Stephan J. Buswell	IGR / CEQA Branch Chief	Los Angeles	CA

MAILING LIST
DRAFT EIR FOR CLWA'S SUPPLEMENTAL WATER PROJECT TRANSFER OF 41,000 ACRE-FEET OF STATE WATER PROJECT TABLE A AMOUNT

Agency/Organization/ Company Name	*Contact Name*	*Title*	*City*	*State*
California Department of Transportation, District 7	R.W. Sassaman	District Director	Los Angeles	CA
California Department of Water Resources, Glendale	Charles R. White	Chief Southern District	Glendale	CA
California Department of Water Resources, Sacramento(R)	Dan Flory	Chief SWP Analysis Office	Sacramento	CA
California Department of Water Resources, Sacramento(R)	Peggy Bernardy	Chief Counsel	Sacramento	CA
California Department of Water Resources, Sacramento(R)	Delores Brown	Division of Environmental Services	Sacramento	CA
California Division of Planning			Sacramento	CA
California Highway Patrol, Valencia			Valencia	CA
California Native Plant Society, Bakersfield	Ellen Cypher	President Kern County Chapter	Bakersfield	CA
California Native Plant Society, Sacramento			Sacramento	CA
California Public Utilities Commission	Environmental Review Team		San Francisco	CA
California Regional Water Quality Control Board, Central Valley Region	Loren Harlow	Executive Officer	Fresno	CA
California Regional Water Quality Control Board, Los Angeles (Region 4)	John Bishop	Director of Regional Programs	Los Angeles	CA
California State Clearinghouse	Governor's Office of Planning and Research		Sacramento	CA
California State University, Fullerton	South Central Coastal Information Center	Department of Anthropology	Fullerton	CA
California State Water Resources Control Board			Sacramento	CA
Casitas Municipal Water District	John Johnson		Oak View	CA
Castaic Lake State Recreation Area	Mika Yamamoto	Superintendent	Castaic	CA
Castaic Lake Water Agency	Mary Lou Cotton	Assistant to the General Manager	Santa Clarita	CA
Castaic Union School District	Mrs. Beverly Silsbee	Superintendent	Valencia	CA
Cawelo Water District	John Jones	District Manager	Bakersfield	CA
Central Coast Water Authority (CCWA)	Bill Brennan		Buellton	CA
City of Los Angeles	Vitaly Troyan	City Engineer	Los Angeles	CA

MAILING LIST
DRAFT EIR FOR CLWA'S SUPPLEMENTAL WATER PROJECT TRANSFER OF 41,000 ACRE-FEET OF STATE WATER PROJECT TABLE A AMOUNT

Agency/Organization/ Company Name	*Contact Name*	*Title*	*City*	*State*
City of Los Angeles, Environmental Affairs Department	Detrick B. Allen	General Manager	Los Angeles	CA
City of Santa Clarita	Vince Bertoni	Interim Director Planning and Building Services Department	Santa Clarita	CA
City of Santa Clarita	Ken Pulskamp	City Manager	Santa Clarita	CA
City of Yuba City		Public Works Director	Yuba City	CA
	Nancy Clemm		Los Angeles	CA
Coachella Valley Water District	Tom Levy	General Manager	Coachella	CA
Colusa County (SC)	Kent Johanns	Director Department of Planning and Building	Colusa	CA
Contra Costa County (SC)	Dennis Barry	Director of Community Development	Martinez	CA
County of Kings	Larry Spikes		Hanford	CA
Crestline-Lake Arrowhead Water Agency		General Manager	Crestline	CA
Desert Water Agency	Dan Ainsworth	General Manager	Palm Springs	CA
Dudley Ridge Water District		General Manager	Fresno	CA
Ecology Center of Southern California			Los Angeles	CA
El Dorado County (SC)	Conrad B. Montgomery	Planning Director Planning Department	Placerville	CA
Empire West Side Irrigation District		General Manager	Stratford	CA
Environmental Defense Fund	Tom Graff		Oakland	CA
Fresno County (SC)	Margie McHenry	Senior Staff Analyst Department of Public Works and Planning	Fresno	CA
Friends of the Santa Clara River		Chairman	Newbury Park	CA
Glenn County (SC)	Christy Leighton	Principal Planner Planning Department	Willows	CA
Hansen Consulting	David P. Hansen, PE		Palmdale	CA
Hatch & Parent	Susan Petrovich		Santa Barbara	CA
Henry Miller Water District	Joe Lutje	Manager	Bakersfield	CA
Imperial County (SC)	Jurg Heuberger	Director, Planning	El Centro	CA
Inyo County(SC) Planning Department		Planning Director	Independence	CA

MAILING LIST
DRAFT EIR FOR CLWA'S SUPPLEMENTAL WATER PROJECT TRANSFER OF 41,000 ACRE-FEET OF STATE WATER PROJECT TABLE A AMOUNT

Agency/Organization/ Company Name	*Contact Name*	*Title*	*City*	*State*
Kern Council of Governments	Roger Taylor	Principal Planner	Bakersfield	CA
Kern County(CC)	Rebecca Brownlee	County Clerk	Bakersfield	CA
Kern County(CC)	Ted James	Division Chief Department of Planning & Development	Bakersfield	CA
Kern County(CC)	David Price III	Director Department of Planning & Development	Bakersfield	CA
Kern County Board of Supervisors	Denise Pennell	Clerk of the Board	Bakersfield	CA
Kern County Water Agency(R)	Thomas N. Clark	General Manager	Bakersfield	CA
Kings County(SC)	Bill Zumwalt	Director of Planning Planning Department	Handord	CA
Kern Delta Water District	Mark Mulkay	Engineer-Manager	Bakersfield	CA
Kronick, Moskovitz, Tiedemann & Girard	Cliff Schulz		Sacramento	CA
Lake County (SC)	Mary Jane Fagalde	Director of Community Development	Lakeport	CA
Lassen County (SC)	Robert K. Sorvaag	Director Department of Community Development	Susanville	CA
Lennar Communities, Southern California Division	Bob Santos	Senior Vice President	Mission Viejo	CA
Littlerock Creek Irrigation District	Brad Bones		Littlerock	Ca
Local Agency Formation Commission, Los Angeles (R)			Glendale	CA
Local Agency Formation Commission, Los Angeles (R)	Attn: Waste Management Division	Public Works Department	Alhambra	CA
Local Agency Formation Commission, Los Angeles (R)	Attn: Land Development Division	Public Works Department	Alhambra	CA
Local Agency Formation Commission, Los Angeles (R)	Attn: Waterworks and Sewer Maintenance Division	Brian D. Hooper Public Works Department	Alhambra	CA
Local Agency Formation Commission, Los Angeles (R)	Attn: Planning Division	Public Works Department	Alhambra	CA
Local Agency Formation Commission, Los Angeles (R)	Creg David, Watershed Management Division	Public Works Department	Alhambra	CA

MAILING LIST
DRAFT EIR FOR CLWA'S SUPPLEMENTAL WATER PROJECT
TRANSFER OF 41,000 ACRE-FEET OF
STATE WATER PROJECT TABLE A AMOUNT

Agency/Organization/ Company Name	*Contact Name*	*Title*	*City*	*State*
Local Agency Formation Commission, Los Angeles (R)	James A. Noyes	Director of Public Works Public Works Department	Alhambra	CA
Los Angeles County Board of Supervisors	Violet Varona-Lukens	Executive Officer	Los Angeles	CA
Los Angeles County Department of Parks and Recreation	Timothy Gallagher	Director	Los Angeles	CA
Los Angeles County Department of Parks and Recreation	Lillie Lowery	Department Facilities Planner 1	Los Angeles	CA
Los Angeles County Fire Department	Lily Cusick	Forestry Division	Commerce	CA
Los Angeles County Fire Department	David Leininger	Chief, Forestry Division	"	"
Los Angeles County Public Library	Michele Mathieu		Downey	CA
Los Angeles County Public Library, Canyon Country Jo Anne Darcy Library	Susan Browman		Canyon Country	CA
Los Angeles County Public Library, Valencia	Dan Golden		Valencia	CA
Los Angeles County Public Library, Newhall	Judy Hist		Newhall	CA
Los Angeles County Regional Planning	Kerwin Chih	Impact Assessment Section Director	Los Angeles	CA
Los Angeles County Regional Planning, Recorder's Office(CC)	Conny B. McCormack	Registrar-Recorder/County Clerk	Norwalk	CA
Los Angeles County Sheriff's Office, Santa Clarita Valley Station	Attn: Operations		Valencia	CA
Los Angeles County Sheriff's Office, Department Headquarters	Leroy D. Baca	Sheriff	Monterey Park	CA
Los Angeles County, Bureau of Environmental Protection		Department of Health Services	Baldwin Park	CA
Los Angeles County, North Regional Office		Parks and Recreation Department	Castaic	CA
Lost Hills Water District	Phillip D. Nixon	General Manager	Bakersfield	CA
Madera County (SC)	Dave Merchan	Assistant Planning Director Planning Department	Madera	CA
Mariposa County (SC)	Eric Jay Toll	Director of Planning Planning Department	Mariposa	CA
McCormick, Kidman and Behrens LLP	Russell G. Behrens	Partner	Costa Mesa	CA

MAILING LIST
DRAFT EIR FOR CLWA'S SUPPLEMENTAL WATER PROJECT TRANSFER OF 41,000 ACRE-FEET OF STATE WATER PROJECT TABLE A AMOUNT

Agency/Organization/ Company Name	*Contact Name*	*Title*	*City*	*State*
Merced County (SC)	Paul Fillebrown	Director County Public Works Dept.	Merced	CA
Metropolitan Water District of Southern California	Dirk Marks	Water Resources	Los Angeles	CA
Metropolitan Water District of Southern California	Adam Kear	Legal	Los Angeles	CA
Mojave Water Agency	Kirby Brill	General Manager	Apple Valley	CA
Mono County (SC)	Scott Burns	Executive Director of Community Development Planning Department	Mammoth Lakes	CA
Monterey County(SC)	Scott Hennessy	Director Planning & Building Inspection Department	Salinas	CA
Napa County (SC)	Charlie Wilson	Director Conservation Development and Planning	Napa	CA
Napa County Flood Control and Water Conservation District		Department of Public Works	Napa	CA
National Audubon Society, California	J. William Yeates		Fair Oaks	CA
Natural Heritage Institute			Berkeley	CA
Natural Resources Defense Council			San Francisco	CA
Nevada County (SC)	Mark Tomich	Interim Planning Director Planning Department	Nevada City	CA
Newhall County Water District (R)	Ken Peterson	General Manager	Santa Clarita	CA
Newhall Land and Farming Company	Steve Zimmer	Assistant Vice President	Valencia	CA
Newhall School District	Marc Winger	Superintendent	Valencia	CA
Oak Flat Water District			Patterson	CA
Orange County(SC)	Tim Neeley	Manager Environmental Planning Services	Santa Ana	CA
Pacific Bell	Ron Tropcich	Director, External Affairs	Pasadena	CA
Pacific Gas & Electric Company			Fresno	CA
Pacific Institute for Studies in Development, Environment and Security	Peter Gleick	President	Oakland	CA
Palmdale Water District	Dennis LaMoreaux	General Manager	Palmdale	CA
Placer County (SC)	Fred Yeager	Director Planning Department	Auburn	CA

MAILING LIST
DRAFT EIR FOR CLWA'S SUPPLEMENTAL WATER PROJECT
TRANSFER OF 41,000 ACRE-FEET OF
STATE WATER PROJECT TABLE A AMOUNT

Agency/Organization/ Company Name	*Contact Name*	*Title*	*City*	*State*
Planning and Conservation League and Citizens Planning Association of Santa Barbara County			San Francisco	CA
Planning and Conservation League			Sacramento	CA
Plumas County (SC)	John S. McMorrow	Director Planning Department	Quincy	CA
Plumas County Flood Control and Water Conservation District		General Manager	Quincy	CA
	Keith Pritsker		Stevenson Ranch	CA
Public Utilities Commission			Los Angeles	CA
	R. Bruce Tepper Esq.		Beverly Hills	CA
Riverside County (SC)	Aleta J. Laurence	Director of Planning Transportation and Land Management Agency/Planning	Riverside	CA
Rossman and Moore			San Francisco	CA
Rosedale-Rio Bravo Water District	Hal Crossley	General Manager	Bakersfield	CA
Sacramento (SC)	Thomas W. Hutchings	Director of Planning Planning and Community Development Department	Sacramento	CA
Sacramento County	Maria Bell	Clerk-Recorder	Sacramento	CA
San Benito County (SC)	Rob Mendiola	Director Planning Department	Hollister	CA
San Bernardino County(SC)	Michael E. Hays	Director, Land Use Services	San Bernardino	CA
San Bernardino Valley Municipal Water District	Randy Vangelder	General Manager	San Bernardino	CA
San Diego County (SC)	Gary Pryor	Director of Planning and Land Use Department of Planning & Land Use	San Diego	CA
San Gabriel Valley Municipal Water District	Jim Frei	General Manager	Azusa	CA
San Gorgonio Pass Water Agency	Steve Stockton	General Manager	Beaumont	CA
San Joaquin County (SC)	Ben Hulse	Director of Community Development Department	Stockton	CA

MAILING LIST
DRAFT EIR FOR CLWA'S SUPPLEMENTAL WATER PROJECT TRANSFER OF 41,000 ACRE-FEET OF STATE WATER PROJECT TABLE A AMOUNT

Agency/Organization/ Company Name	*Contact Name*	*Title*	*City*	*State*
San Luis Obisbo County(SC)	Ellen Carroll,	Environmental Coordinator Planning and Building Department	San Luis Obisbo	CA
San Luis Obisbo County Flood Control and Water Conservation District	General Manager	General Manager	San Luis Obispo	CA
San Mateo County (SC)	Terry Burnes	Planning Administrator Planning and Building Division	Redwood City	CA
Santa Barbara County (SC)	Diane Meester	Interim Planning Director Planning and Development	Santa Barbara	CA
Santa Clara County (SC)	Hugh Graham	Principle Planner Department of Planning and Development	San Jose	CA
Santa Clara Valley Water District	Joan Maher	General Manager	San Jose	CA
Santa Clarita Community College District	Dennis Chuning	Vice President, Administrative Services	Santa Clarita	CA
Santa Clarita Oak Conservancy	Mike Lyons	Treasurer	Saugus	CA
Santa Clarita Parents' Lobby	Patricia Saletore		Saugus	CA
Santa Cruz County (SC)	Alvin James	Director of Planning Planning Department	Santa Cruz	CA
Santa Monica Mountains Conservancy			Malibu	CA
Saugus Union School District	Judy Fish	Superintendent	Santa Clarita	CA
SCOPE, Canyon Country	Pat Saletore		Canyon Country	CA
SCOPE, Castaic	Michael A. Kotch	President	Castaic	CA
Semitropic Water Storage District	Wilmar L. Boschman	General Manager	Wasco	CA
	Sharon L. Roden		Paso Robles	CA
Shasta County (SC)	James W. Cook	Planning Division Manager Department of Resource Management Planning Division	Redding	CA
Sierra Club, Angeles Chapter	Dr. Gordon LaBedz	Conservation Chair	Los Angeles	CA
Sierra Club, Santa Clarita Group	Martin Schlageter	Conservation Coordinator	Saugus	CA
Sierra Club, Santa Clarita Group	Henry Schultz	Chair	Saugus	CA
Sierra County (SC)	Tim H. Beals	Director of Planning and Building Department Department of Planning	Downieville	CA

MAILING LIST
DRAFT EIR FOR CLWA'S SUPPLEMENTAL WATER PROJECT TRANSFER OF 41,000 ACRE-FEET OF STATE WATER PROJECT TABLE A AMOUNT

Agency/Organization/ Company Name	*Contact Name*	*Title*	*City*	*State*
Solano County (SC)	Birgitta Corsello	Director Environmental Management	Fairfield	CA
Solano County Water Agency	David Okita	General Manager	Vacaville	CA
Sonoma County (SC)	Jennifer Barrett	Director of Planning Permit and Resource Management	Santa Rosa	CA
South Coast Air Quality Management District	Steve Smith		Diamond Bar	CA
Southern California Association of Governments	Jeffrey M. Smith, AICP	Senior Regional Planner, Intergovernmental Review	Los Angeles	CA
Southern California Edison Company, Valencia	Attn: Customer Service Planner		Valencia	CA
Southern California Gas Company	Jack Russo	Planning Associate, Northern Region	Chatsworth	CA
Southern California Gas Company, Valencia District			Valencia	CA
Stanislaus County (SC)	Ron Freitas	Director Department of Planning and Community Development	Modesto	CA
State Water Contractors	John Coburn	General Manager	Sacramento	CA
Sulphur Springs School District	Robert Nolet	Superintendent	Santa Clarita	CA
Summers Engineering Inc.	Joseph Summers		Hanford	CA
Sutter County (SC)	Tom Last	Principal Planner Community Services Department, Planning Program	Yuba City	CA
TC Collins & Associates	John Evans		Newport Beach	CA
Tehachapi-Cummings County Water District	Robert J. Jasper	Manager	Tehachapi	CA
Tehama County (SC)	George Robson	Director Planning Department	Red Bluff	CA
Tejon-Castac Water District	Dennis Mullins, Esquire	President	Lebec	CA
The Bay Institute	Grant Davis	Executive Director	Novato	CA
The Nature Conservancy	Graham Chisholm	State Director	San Francisco	CA
Tuolumne County (SC)	Bev Shane	Director of Planning Planning Department	Sonora	CA
Tulare County(SC)	Larry L. Awbrey	Ass. RMA Director	Visalia	CA

MAILING LIST
DRAFT EIR FOR CLWA'S SUPPLEMENTAL WATER PROJECT TRANSFER OF 41,000 ACRE-FEET OF STATE WATER PROJECT TABLE A AMOUNT

Agency/Organization/ Company Name	*Contact Name*	*Title*	*City*	*State*
Tulare Lake Basin Water Storage District	Brent Graham	General Manager	Corcoran	CA
United Water Conservation District	Dana L. Wisehart	General Manager	Santa Paula	CA
US Army Corps of Engineers, Ventura	Spencer MacNeil	Senior Project Manager	Ventura	CA
US Department of Agriculture	Ron Schultze		Davis	CA
US Department of Agriculture, Los Padres National Forest		National Forest Service	Frazier Park	CA
US Environmental Protection Agency, Region IX	Water Resources		San Francisco	CA
US Fish & Wildlife Service, Sacramento	Wayne White	Field Supervisor	Sacramento	CA
US Fish & Wildlife Service, Ventura	Diane Noda	Field Supervisor	Ventura	CA
US Forest Service	Laurie Fenwood	Director Ecosystems and Conservation Department	Vallejo	CA
Valencia Water Company	Robert J. DiPrimio	President	Valencia	CA
Ventura County(CC)	Chris Stephens	Planning Director	Ventura	CA
Ventura County(CC)	John C. Crowley	Deputy Director, Water Resources Dept.	Ventura	CA
Ventura County(CC)	Robert Gallagher	Director, Environmental Health Dept.	Ventura	CA
Ventura County(CC)	Richard Dean	County Clerk		CA
Ventura County(CC)	Jeff Pratt	Deputy Director, Public Works Flood Control Dept.	Ventura	CA
Ventura County(CC)	Thomas Berg	Resource Management Agency	Ventura	CA
Ventura County Flood Control District		General Manager	Ventura	CA
Ventura County Library	Starrett Kreissman	Director	Ventura	CA
West Kern Water District	Jerry Pearson	General Manager	Taft	CA
Water Association of Kern County	Loron Hodge	Manager	Bakersfield	CA
Wheeler Ridge - Maricopa Water Storage District	William A. Taube	Engineer-Manager	Bakersfield	CA
William S. Hart School District	Robert Lee	District Superintendent	Santa Clarita	CA

MAILING LIST
DRAFT EIR FOR CLWA'S SUPPLEMENTAL WATER PROJECT TRANSFER OF 41,000 ACRE-FEET OF STATE WATER PROJECT TABLE A AMOUNT

Agency/Organization/ Company Name	*Contact Name*	*Title*	*City*	*State*
Yolo County (SC)	David Morrison	Assistant Director of Planning Community Development Agency	Woodland	CA
Young Wooldridge	Ernest A. Conant		Bakersfield	CA
Yuba County (SC)	James P. Manning	Director Community Development Department	Marysville	CA

Notes:
(R)=Responsible Agency, (T)=Trustee Agency, (CC)=County Clerk to post NOP, (SC)=Surrounding County

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CLWA RETURN TO WRIT

EXHIBIT NO. 5

LETTER 4

Notice of Determination

To: ☒ Office of Planning and Research
1400 Tenth Street, Rm. 222
Sacramento, California 95812

☒ Kern County, County Clerk
1115 Truxtun Avenue
Bakersfield, California 93301-4639

☒ Los Angeles County, County Clerk
12400 Imperial Highway
Norwalk, California 90650

☒ Sacramento County, County Clerk
600 8th Street
Sacramento, California 95814

☒ Ventura County, County Clerk
800 S. Victoria Avenue
Ventura, California 93009

RECEIVED
DEC 23 2004
STATE CLEARING HOUSE

From: (Lead Agency)
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, California 91350
Mary Lou Cotton, Water Resources Manager
(661) 297-1600

SUBJECT: **Filing of Notice of Determination in compliance with Section 21108 or 21152 of the Public Resources Code.**

State Clearinghouse Number:
1998041127

Project Title:
Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount

Project Location:
The Project would use existing State Water Project (SWP) facilities located between the southern Sacramento-San Joaquin River Delta (Delta) facilities and Castaic Lake; these facilities include the SWP's southern Delta facilities (Clifton Court Forebay, the Banks Pumping Plant, and Bethany Reservoir); the San Luis Reservoir facilities (San Luis Reservoir, O'Neil Forebay, and the Gianelli Pumping-Generating Plant); and the California Aqueduct from the southern Delta to Castaic Lake, including pumping plants, a power plant, and storage facilities along the Aqueduct (Buena Vista, Teerink, Chrisman, Edmonston, and Oso pumping plants, Warne power plant, and Quail, Pyramid and Castaic lakes). These facilities are located in Alameda, Contra Costa, Fresno, Kern, Kings, Los Angeles, Merced, San Joaquin, and Stanislaus counties. The Project also could affect environmental resources located in the Castaic Lake Water Agency (CLWA) and Wheeler Ridge-Maricopa Water Storage District (WRMWSD) service areas. The CLWA service area is located in northern Los Angeles and eastern Ventura counties. The WRMWSD is located in the southern extent of the San Joaquin Valley in Kern County.

LETTER 4

Project Description:

The Project is the transfer of an existing 41,000 acre-feet (AF) of SWP Table A Amount from the Kern County Water Agency (KCWA) and its member unit in Kern County, WRMWSD, to CLWA. The Project also includes the use of SWP facilities from northern California to Los Angeles County for the delivery of SWP water to the CLWA service area, and use of this water within the CLWA service area. The Project water is transported from certain points of origin in the SWP system to the CLWA intake south of Castaic Lake via existing SWP facilities. The points of origin and delivery are identified in the 41,000 AF Transfer Agreement and the Point of Delivery Agreement. These and other documents referenced in the Final Environmental Impact Report (EIR) for the Project are available for public inspection at the CLWA offices at 27234 Bouquet Canyon Road, Santa Clarita, CA 91350, (661) 297-1600.

The Project currently is being implemented by an amendment to the SWP water supply contracts of CLWA and KCWA executed in 1999. The Project is to authorize CLWA to use water delivered from the 41,000 AF of SWP Table A Amount for water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area. The annual allocations of SWP water made by the California Department of Water Resources (DWR) are based on that year's hydrologic conditions, the amount of water in storage in the SWP system, and other SWP Contractors' requests for SWP supplies. Thus, the actual amount of water available for delivery to CLWA as a result of the 41,000 AF transfer would vary from year to year. Water would be requested by CLWA as needed to meet the demands of its service area, and the transfer of Table A Amount would be one of a number of projects implemented by CLWA (e.g., infrastructure improvements, groundwater banking programs, increased recycling and conservation, and expanded use of local groundwater sources) to increase water reliability. Those projects that are considered reasonably foreseeable and for which sufficient information is available are included in the cumulative impacts analysis contained in the Final EIR.

The Project does not include the construction of any additional SWP facilities or new facilities in the CLWA, KCWA, or WRMWSD service areas.

This is to advise that the Castaic Lake Water Agency has approved the above
☒ Lead Agency ☐ Responsible Agency
described project on December 22, 2004 and has made the following determinations regarding the above described project:

1. The project [☒ will ☐ will not] have a significant effect on the environment.
2. ☒ An Environmental Impact Report was prepared and certified for this project pursuant to the provisions of CEQA.
   ☐ A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures [☒ were ☐ were not] made a condition of the approval of the project.
4. A mitigation reporting or monitoring plan [☒ was ☐ was not] adopted for this project.
5. A statement of Overriding Considerations [☒ was ☐ was not] adopted for this project.
6. Findings [☒ were ☐ were not] made pursuant to the provisions of CEQA.

LETTER 4

LETTER 4

This is to certify that the final Environmental Impact Report with comments and responses and record of project approval is available to the General Public at:

Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, California 91350

Dan Masnada	General Manager	December 23, 2004
Castaic Lake Water Agency	*Title*	*Date*

Date received for filing at OPR: _____
(CDFG Filing Fee submitted to the Los Angeles County Clerk.)

LETTER 4

CLWA RETURN TO WRIT

EXHIBIT NO. 6

LETTER 4

Notice of Determination

ENDORSED

DEC 23 2004

MARK NORRIS, CLERK-RECORDER

To: ☒ Office of Planning and Research
1400 Tenth Street, Rm. 222
Sacramento, California 95812

☒ Kern County, County Clerk
1115 Truxtun Avenue
Bakersfield, California 93301-4639

☒ Los Angeles County, County Clerk
12400 Imperial Highway
Norwalk, California 90650

☒ Sacramento County, County Clerk
600 8th Street
Sacramento, California 95814

☒ Ventura County, County Clerk
800 S. Victoria Avenue
Ventura, California 93009

From: (Lead Agency) Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, California 91350
Mary Lou Cotton, Water Resources Manager
(661) 297-1600

SUBJECT: **Filing of Notice of Determination in compliance with Section 21108 or 21152 of the Public Resources Code.**

State Clearinghouse Number:
1998041127

Project Title:
Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount

Project Location:
The Project would use existing State Water Project (SWP) facilities located between the southern Sacramento-San Joaquin River Delta (Delta) facilities and Castaic Lake; these facilities include the SWP's southern Delta facilities (Clifton Court Forebay, the Banks Pumping Plant, and Bethany Reservoir); the San Luis Reservoir facilities (San Luis Reservoir, O'Neil Forebay, and the Gianelli Pumping-Generating Plant); and the California Aqueduct from the southern Delta to Castaic Lake, including pumping plants, a power plant, and storage facilities along the Aqueduct (Buena Vista, Teerink, Chrisman, Edmonston, and Oso pumping plants, Warne power plant, and Quail, Pyramid and Castaic lakes). These facilities are located in Alameda, Contra Costa, Fresno, Kern, Kings, Los Angeles, Merced, San Joaquin, and Stanislaus counties. The Project also could affect environmental resources located in the Castaic Lake Water Agency (CLWA) and Wheeler Ridge-Maricopa Water Storage District (WRMWSD) service areas. The CLWA service area is located in northern Los Angeles and eastern Ventura counties. The WRMWSD is located in the southern extent of the San Joaquin Valley in Kern County.

LETTER 4

Project Description:

The Project is the transfer of an existing 41,000 acre-feet (AF) of SWP Table A Amount from the Kern County Water Agency (KCWA) and its member unit in Kern County, WRMWSD, to CLWA. The Project also includes the use of SWP facilities from northern California to Los Angeles County for the delivery of SWP water to the CLWA service area, and use of this water within the CLWA service area. The Project water is transported from certain points of origin in the SWP system to the CLWA intake south of Castaic Lake via existing SWP facilities. The points of origin and delivery are identified in the 41,000 AF Transfer Agreement and the Point of Delivery Agreement. These and other documents referenced in the Final Environmental Impact Report (EIR) for the Project are available for public inspection at the CLWA offices at 27234 Bouquet Canyon Road, Santa Clarita, CA 91350, (661) 297-1600.

The Project currently is being implemented by an amendment to the SWP water supply contracts of CLWA and KCWA executed in 1999. The Project is to authorize CLWA to use water delivered from the 41,000 AF of SWP Table A Amount for water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area. The annual allocations of SWP water made by the California Department of Water Resources (DWR) are based on that year's hydrologic conditions, the amount of water in storage in the SWP system, and other SWP Contractors' requests for SWP supplies. Thus, the actual amount of water available for delivery to CLWA as a result of the 41,000 AF transfer would vary from year to year. Water would be requested by CLWA as needed to meet the demands of its service area, and the transfer of Table A Amount would be one of a number of projects implemented by CLWA (e.g., infrastructure improvements, groundwater banking programs, increased recycling and conservation, and expanded use of local groundwater sources) to increase water reliability. Those projects that are considered reasonably foreseeable and for which sufficient information is available are included in the cumulative impacts analysis contained in the Final EIR.

The Project does not include the construction of any additional SWP facilities or new facilities in the CLWA, KCWA, or WRMWSD service areas.

This is to advise that the Castaic Lake Water Agency has approved the above
☒ Lead Agency ☐ Responsible Agency
described project on December 22, 2004 and has made the following determinations regarding the above described project:

1. The project [☒ will ☐ will not] have a significant effect on the environment.
2. ☒ An Environmental Impact Report was prepared and certified for this project pursuant to the provisions of CEQA.
   ☐ A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures [☒ were ☐ were not] made a condition of the approval of the project.
4. A mitigation reporting or monitoring plan [☒ was ☐ was not] adopted for this project.
5. A statement of Overriding Considerations [☒ was ☐ was not] adopted for this project.
6. Findings [☒ were ☐ were not] made pursuant to the provisions of CEQA.

LETTER 4

This is to certify that the final Environmental Impact Report with comments and responses and record of project approval is available to the General Public at:

Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, California 91350

Dan Masnada	General Manager	December 23, 2004
Dan Masnada	*Title*	*Date*
Castaic Lake Water Agency		

Date received for filing at OPR: _____
(CDFG Filing Fee submitted to the Los Angeles County Clerk.)

LETTER 4

LETTER 4

CLWA RETURN TO WRIT

EXHIBIT NO. 7

Notice of Determination

To: ☒ Office of Planning and Research
1400 Tenth Street, Rm. 222
Sacramento, California 95812

COPY

☒ Kern County, County Clerk
1115 Truxtun Avenue
Bakersfield, California 93301-4639

☒ Los Angeles County, County Clerk
12400 Imperial Highway
Norwalk, California 90650

ORIGINAL FILED
DEC 2 3 2004
LOS ANGELES, COUNTY CLERK

☒ Sacramento County, County Clerk
600 8th Street
Sacramento, California 95814

☒ Ventura County, County Clerk
800 S. Victoria Avenue
Ventura, California 93009

From: (Lead Agency)
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, California 91350
Mary Lou Cotton, Water Resources Manager
(661) 297-1600

SUBJECT: **Filing of Notice of Determination in compliance with Section 21108 or 21152 of the Public Resources Code.**

State Clearinghouse Number:
1998041127

Project Title:
Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount

Project Location:
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LETTER 4

COPY

Notice of Determination

To:
- ☒ Office of Planning and Research, 1400 Tenth Street, Rm. 222, Sacramento, California 95812
- ☒ Kern County, County Clerk, 1115 Truxtun Avenue, Bakersfield, California 93301-4639
- ☒ Los Angeles County, County Clerk, 12400 Imperial Highway, Norwalk, California 90650
- ☒ Sacramento County, County Clerk, 600 8th Street, Sacramento, California 95814
- ☒ Ventura County, County Clerk, 800 S. Victoria Avenue, Ventura, California 93009

ORIGINAL FILED
DEC 2 8 2004
LOS ANGELES, COUNTY CLERK

From: (Lead Agency)
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, California 91350
Mary Lou Cotton, Water Resources Manager
(661) 297-1600

SUBJECT: Filing of Notice of Determination in compliance with Section 21108 or 21152 of the Public Resources Code.

State Clearinghouse Number:
1998041127

Project Title:
Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount

Project Location:
The Project would use existing State Water Project (SWP) facilities located between the southern Sacramento-San Joaquin River Delta (Delta) facilities and Castaic Lake; these facilities include the SWP's southern Delta facilities (Clifton Court Forebay, the Banks Pumping Plant, and Bethany Reservoir); the San Luis Reservoir facilities (San Luis Reservoir, O'Neil Forebay, and the Gianelli Pumping-Generating Plant); and the California Aqueduct from the southern Delta to Castaic Lake, including pumping plants, a power plant, and storage facilities along the Aqueduct (Buena Vista, Teerink, Chrisman, Edmonston, and Oso pumping plants, Warne power plant, and Quail, Pyramid and Castaic lakes). These facilities are located in Alameda, Contra Costa, Fresno, Kern, Kings, Los Angeles, Merced, San Joaquin, and Stanislaus counties. The Project also could affect environmental resources located in the Castaic Lake Water Agency (CLWA) and Wheeler Ridge-Maricopa Water Storage District (WRMWSD) service areas. The CLWA service area is located in northern Los Angeles and eastern Ventura counties. The WRMWSD is located in the southern extent of the San Joaquin Valley in Kern County.

LETTER 4

IIA - THE RESOURCES AGENCY
3H AND GAME
LING FEE CASH RECEIPT

223698

L.A. COUNTY RECORDER
/COUNTY CLERK
BUSINESS FILING & REC

12/23/04 1:28PM
000001#0050 XX35
HARNELL

#228698
EIR: $850.00
COUNTY FEE $25.00

XXXTOTAL
$875.00
CHECK $875.00
CHANGE $0.00

A
Los Angeles
Date: 12/23/04
Document No.:

Ry Lou COTTON
(661) 297-1600
1234 Bouquet Canyon Rd. Santa Clarita.
Phone Number:

riate box): Local Public Agency ☒ School District ☐ Other Special District ☐
State Agency ☐ Private Entity ☐

FEES:

npact Report	$850.00	$ 850.
ition	$1,250.00	$
Water Diversion *(State Water Resources Control Board Only)*	$850.00	$
to Certified Regulatory Programs	$850.00	$
rative Fee	$25.00	$ 25.
empt from fees		
	TOTAL RECEIVED	$ 875.

eiving payment: H. Harper

WHITE-PROJECT APPLICANT YELLOW-DFG/FASB PINK-LEAD AGENCY GOLDENROD-STATE AGENCY OF FILING

LETTER 4

CLWA RETURN TO WRIT

EXHIBIT NO. 8

Dec-23-04 01:42pm From-MCCORMICK, KIDMAN & BEHRENS, LLP 714-755-3110 T-001 P.04/06 F-588

20041223-0022316 Pg: 1 of 1
Ventura Co. Clerk Philip J. Schmit
File Date:12/23/2004 Fee#: $1380.00
PJ

Notice of Determination

To: ☒ Office of Planning and Research
1400 Tenth Street, Rm. 222
Sacramento, California 95812

☒ Kern County, County Clerk
1115 Truxtun Avenue
Bakersfield, California 93301-4639

☒ Los Angeles County, County Clerk
12400 Imperial Highway
Norwalk, California 90650

☒ Sacramento County, County Clerk
600 8th Street
Sacramento, California 95814

☒ Ventura County, County Clerk
800 S. Victoria Avenue
Ventura, California 93009

COPY

POSTED
DEC 23 2004
PHILIP J. SCHMIT, County Clerk
By: _____, Deputy

From: (Lead Agency) Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, California 91350
Mary Lou Cotton, Water Resources Manager
(661) 297-1600

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Project Description:

The Project is the transfer of an existing 41,000 acre-feet (AF) of SWP Table A Amount from the Kern County Water Agency (KCWA) and its member unit in Kern County, WRMWSD, to CLWA. The Project also includes the use of SWP facilities from northern California to Los Angeles County for the delivery of SWP water to the CLWA service area, and use of this water within the CLWA service area. The Project water is transported from certain points of origin in the SWP system to the CLWA intake south of Castaic Lake via existing SWP facilities. The points of origin and delivery are identified in the 41,000 AF Transfer Agreement and the Point of Delivery Agreement. These and other documents referenced in the Final Environmental Impact Report (EIR) for the Project are available for public inspection at the CLWA offices at 27234 Bouquet Canyon Road, Santa Clarita, CA 91350, (661) 297-1600.

The Project currently is being implemented by an amendment to the SWP water supply contracts of CLWA and KCWA executed in 1999. The Project is to authorize CLWA to use water delivered from the 41,000 AF of SWP Table A Amount for water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area. The annual allocations of SWP water made by the California Department of Water Resources (DWR) are based on that year's hydrologic conditions, the amount of water in storage in the SWP system, and other SWP Contractors' requests for SWP supplies. Thus, the actual amount of water available for delivery to CLWA as a result of the 41,000 AF transfer would vary from year to year. Water would be requested by CLWA as needed to meet the demands of its service area, and the transfer of Table A Amount would be one of a number of projects implemented by CLWA (e.g., infrastructure improvements, groundwater banking programs, increased recycling and conservation, and expanded use of local groundwater sources) to increase water reliability. Those projects that are considered reasonably foreseeable and for which sufficient information is available are included in the cumulative impacts analysis contained in the Final EIR.

The Project does not include the construction of any additional SWP facilities or new facilities in the CLWA, KCWA, or WRMWSD service areas.

This is to advise that the Castaic Lake Water Agency has approved the above
☒ Lead Agency ☐ Responsible Agency
described project on December 22, 2004 and has made the following determinations regarding the above described project:

1. The project [☒ will ☐ will not] have a significant effect on the environment.
2. ☒ An Environmental Impact Report was prepared and certified for this project pursuant to the provisions of CEQA.
   ☐ A Negative Declaration was prepared for this project pursuant to the provisions of CEQA.
3. Mitigation measures [☒ were ☐ were not] made a condition of the approval of the project.
4. A mitigation reporting or monitoring plan [☒ was ☐ was not] adopted for this project.
5. A statement of Overriding Considerations [☒ was ☐ was not] adopted for this project.
6. Findings [☒ were ☐ were not] made pursuant to the provisions of CEQA.

This is to certify that the final Environmental Impact Report with comments and responses and record of project approval is available to the General Public at:

Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, California 91350

Dan Masnada Castaic Lake Water Agency	General Manager *Title*	December 23, 2004 *Date*

Date received for filing at OPR: _____
(CDFG Filing Fee submitted to the Los Angeles County Clerk.)

LETTER 4

COUNTY CLERK AND RECORDER

PHILIP J. SCHMIT COUNTY CLERK AND RECORDER

OFFICIAL RECEIPT

Receipt Number: T20040019493
Date: 12/23/2004 Clerk: panoj

Customer Name :
CASTAIC LAKE WATER AGENCY

Transaction Detail

Document Type		Fees
NOTICE OF DETERMINATION 200412230022316	-	$ 50.00

Payment Information

Method of Payment	Payment Control ID	Authorized Agent	Amount
Check	058659 & 058660		$50.00

AMOUNT PAID:	**$50.00**
LESS AMOUNT DUE:	$50.00
CHANGE RECEIVED:	**$0.00**

County Clerk Office Hall of Admin., Main Plaza 800 S.Victoria Ave.Ventura, CA 93009 - 1260

LETTER 4

Transmittal Memorandum
Department of Fish & Game Environmental Filings

Please complete the information below and submit one (1) memorandum with each document to be filed with the **Ventura County Clerk's Office**. Thank you.

(for office use only)

20041223-0022316 Pg: 1 of 1
Ventura Co. Clerk Philip J. Schalit
File Date: 12/23/2004 Fees: $1368.00
PJ

Project Title: Supplemental Water Project Transfer of 41,000 AF of SWP Table A Amount

Name of Agency filing attached document: Castaic Lake Water Agency

The above named agency is filing as: ☒ Lead Agency ☐ Responsible Agency

Address of Filing Agency: 27234 Bouquet Canyon Road, Santa Clarita, California 91350

Document Type (check one): ☐ Negative Declaration ☒ Environmental Impact Report ☐ Exemption

☐ Other: _____

Project Applicant: Castaic Lake Water Agency

Project Applicant Address: 27234 Bouquet Canyon Road, Santa Clarita, California 91350

Project Applicant Phone Number: (661) 297-1600

Project Applicant is (check one):

☐ Local Public Agency ☐ School District ☒ Other Special District ☐ State Agency ☐ Private Entity

If the agency presenting this document is filing as the responsible agency, **provide a copy** of the Lead Agency's filed documents and complete the following:

Lead Agency: Same as above

Lead Agency's Project Title: _____

Lead Agency's State Receipt #: _____ Lead Agency's Document #: _____

Check Applicable Fees (check all that apply):

☐ Negative Declaration ($1,250.00)
☒ Environmental Impact Report ($850.00)
☐ County Administrative Fee ($25.00)
☐ De Minimus Impact (**EXEMPT - Provide a Certificate of Fee Exemption**)
☐ Filed by responsible agency, fees paid by lead agency (Attach a copy of Lead Agency's filing & receipt.)
☒ Fees have already been paid (Attach a copy of the prior filing and proof of payment.)

☐ Categorically Exempt
☐ Statutorily Exempt

Prepared by: Dan Masnada (Name) General Manager (Title)

Signature: _____ December 23, 2004 (Date) (661) 297-1600 (Phone #)

DO NOT WRITE BELOW THIS LINE – The following portion will be completed by the Ventura County Clerk's Office.

State Receipt #: _____ Document #: _____ Total $ received: 50.00

Signature of person receiving payment: **Josie Pano**, Deputy County Clerk

(09/2002) CC&R

Posted: DEC 23 2004 through ____/____/____

CLWA RETURN TO WRIT

EXHIBIT NO. 9

LETTER 4

RECEIPT #LA County

FILED
KERN COUNTY

Notice of Determination

DEC 27 2004

ANN K. BARNETT
AUDITOR-CONTROLLER-COUNTY CLERK
BY: _____ DEPUTY

COPY

To:
- ☒ Office of Planning and Research
  1400 Tenth Street, Rm. 222
  Sacramento, California 95812
- ☒ Kern County, County Clerk
  1115 Truxtun Avenue
  Bakersfield, California 93301-4689
- ☒ Los Angeles County, County Clerk
  12400 Imperial Highway
  Norwalk, California 90650
- ☒ Sacramento County, County Clerk
  600 8th Street
  Sacramento, California 95814
- ☒ Ventura County, County Clerk
  800 S. Victoria Avenue
  Ventura, California 93009

From: (Lead Agency)
Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, California 91350
Mary Lou Cotton, Water Resources Manager
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Notice of Environmental Document Posted by County Clerk on 12/27/04 and for 30 days thereafter. Pursuant to Section 21152(c), Public Resources Code

#1077

Project Description:

The Project is the transfer of an existing 41,000 acre-feet (AF) of SWP Table A Amount from the Kern County Water Agency (KCWA) and its member unit in Kern County, WRMWSD, to CLWA. The Project also includes the use of SWP facilities from northern California to Los Angeles County for the delivery of SWP water to the CLWA service area, and use of this water within the CLWA service area. The Project water is transported from certain points of origin in the SWP system to the CLWA intake south of Castaic Lake via existing SWP facilities. The points of origin and delivery are identified in the 41,000 AF Transfer Agreement and the Point of Delivery Agreement. These and other documents referenced in the Final Environmental Impact Report (EIR) for the Project are available for public inspection at the CLWA offices at 27234 Bouquet Canyon Road, Santa Clarita, CA 91350, (661) 297-1600.

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described project on December 22, 2004 and has made the following determinations regarding the above described project:

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6. Findings [☒ were ☐ were not] made pursuant to the provisions of CEQA.

LETTER 4

This is to certify that the final Environmental Impact Report with comments and responses and record of project approval is available to the General Public at:

Castaic Lake Water Agency
27234 Bouquet Canyon Road
Santa Clarita, California 91350

	General Manager	December 23, 2004
Dan Masnada Castaic Lake Water Agency	*Title*	*Date*

Date received for filing at OPR: _____
(CDFG Filing Fee submitted to the Los Angeles County Clerk.)

LETTER 4

PROOF OF SERVICE

STATE OF CALIFORNIA)
) ss
COUNTY OF LOS ANGELES)

I am employed in the aforesaid County, State of California; I am over the age of eighteen years and not a party of the within action; my business address is 1880 Century Park East, Suite 200, Los Angeles, California 90067-1602.

On December 30, 2004, I served the foregoing document described as **RETURN TO PEREMPTORY WRIT OF MANDATE** on all parties in this action by placing true copies thereof enclosed in a sealed envelope addressed as follows:

Alyse M. Lazar
Law Office of Alyse M. Lazar
3075 E Thousand Oaks Boulevard, Suite 100
Westlake Village, CA 91362
Attorneys for Petitioner and Appellant
FRIENDS OF THE SANTA CLARA RIVER

X BY MAIL: I caused such envelope to be deposited in the mail at Los Angeles, California. The envelope was mailed with postage thereon fully prepaid. I am "readily familiar" with this firm's practice of collection and processing correspondence for mailing. Under that practice it would be deposited with U.S. Postal Service on that same day with postage thereon fully prepaid at Los Angeles, California in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

___ BY PERSONAL SERVICE: I caused such envelope to be delivered by hand to the addressee at the above address.

___ BY FEDERAL EXPRESS (FedEx): I personally delivered such envelope on December 30, 2004, to a FedEx drop box or office in Los Angeles, California, marked for next day/overnight delivery.

___ BY FACSIMILE: I faxed such document to the addressee at the facsimile number listed for each addressee.

I declare that I am employed in the office of a member of the bar of this Court at whose direction the service was made.

I declare under penalty of perjury under the laws of the State of California, that the foregoing is true and correct and that this declaration was executed on December 30, 2004, at Los Angeles, California.

LYNN E. YUN

ATTORNEY OR PARTY WITHOUT ATTORNEY (Name and Address):
Alyse M. Lazar (S.B. [redacted]. 92796)
Law Office of Alyse M. Lazar
3075 E. Thousand Oaks Blvd, Suite 100
WEstlake Village, California 91362
TELEPHONE NO.: (805) 496-5390

FOR COURT USE ONLY

COPY

ORIGINAL FILED
FEB 04 2005
LOS ANGELES SUPERIOR COURT

ATTORNEYS FOR (Name): Friends of the Santa Clara River, Petitioner

Insert name of court and name of judicial district and branch court, if any:
Los Angeles County Superior Court, Central District, Stanley Mosk Courthouse

PLAINTIFF/PETITIONER:
Friends of the Santa Clara River

DEFENDANT/RESPONDENT:
Castaic Lake Water Agency

CASE NUMBER:
BS 056954

NOTICE OF ENTRY OF DISMISSAL AND PROOF OF SERVICE

- ☐ Personal Injury, Property Damage, or Wrongful Death ☐ Motor Vehicle ☐ Other
- ☐ Family Law
- ☐ Eminent Domain
- ☒ Other (specify): Petition for Writ of Mandate

By Fax

TO ATTORNEYS AND PARTIES WITHOUT ATTORNEYS: A dismissal was entered in this action by the clerk as shown on the Request for Dismissal. *(Attach a copy completed by the clerk.)*

Date: February 4, 2005

Alyse M. Lazar
(TYPE OR PRINT NAME OF ☒ ATTORNEY ☐ PARTY WITHOUT ATTORNEY)

(SIGNATURE)

PROOF OF SERVICE

1. I am over the age of 18 and not a party to this cause. I am a resident of or employed in the county where the mailing occurred. My residence or business address is:
   3075 East Thousand Oaks Blvd, Suite 100, Westlake Village, California 91362

2. ☒ I served a copy of the Notice of Entry of Dismissal and Request for Dismissal by mailing them, in a sealed envelope with postage fully prepaid, as follows:
   a. ☐ I deposited the envelope with the United States Postal Service.
   b. ☒ I placed the envelope for collection and processing for mailing following this business's ordinary practice with which I am readily familiar. On the same day correspondence is placed for collection and mailing, it is deposited in the ordinary course of business with the United States Postal Service.
   c. Date of deposit: Feburary 4, 2005
   d. Place of deposit *(city and state)*: Westlake Village, California
   e. Addressed as follows *(name and address)*:
      R. Bruce Tepper, 1880 Century Park East, Suite 200, Los Angeles, CA 90067-1602; and
      Russell Behrens, McCormick, Kidman & Behrens, 695 Town Center Drive, Suite 400, Costa Mesa, CA 92626

3. ☐ I served a copy of the Notice of Entry of Dismissal and Request for Dismissal by personally delivering copies to the person served as shown below:
   Name: Date: Time: Address:

4. I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Date: February 4 2005

Alyse M. Lazar
(TYPE OR PRINT NAME)

(SIGNATURE OF DECLARANT)

ATTORNEY OR PARTY WITHOUT ATTORNEY (Name and Address)
Alyse M. Lazar (S.B. No. 92796)
Law Office of Alyse M. Lazar
3075 E. Thousand Oaks Blvd, Suite 100
Westlake Village, California 91362
TELEPHONE NO.: (805) 496-5390
ATTORNEY FOR (Name): Friends of the Santa Clara River, Petitioner

FOR COURT USE ONLY

ORIGINAL FILED
FEB 01 2005
LOS ANGELES SUPERIOR COURT

Insert name of court and name of judicial district and branch court, if any:
Los Angeles County Superior Court, Central District, Stanley Mosk Courthouse

PLAINTIFF/PETITIONER:
Friends of the Santa Clara River

DEFENDANT/RESPONDENT:
Castaic Lake Water Agency

CASE NUMBER:
BS 056954

REQUEST FOR DISMISSAL

- ☐ Personal Injury, Property Damage, or Wrongful Death
  - ☐ Motor Vehicle
  - ☒ Other
- ☐ Family Law
- ☐ Eminent Domain
- ☐ Other (specify):

— A conformed copy will not be returned by the clerk unless a method of return is provided with the document. —

1. TO THE CLERK: Please dismiss this action as follows:
   a. (1) ☒ With prejudice (2) ☐ Without prejudice
   b. (1) ☐ Complaint (2) ☒ Petition
      (3) ☐ Cross-complaint filed by (name): on (date):
      (4) ☐ Cross-complaint filed by (name): on (date):
      (5) ☐ Entire action of all parties and all causes of action
      (6) ☒ Other (specify):* See attached

Date: 1/31/05

Alyse M. Lazar
(TYPE OR PRINT NAME OF ☒ ATTORNEY ☐ PARTY WITHOUT ATTORNEY)

(SIGNATURE)

Attorney or party without attorney for:
☒ Plaintiff/Petitioner ☐ Defendant/Respondent
☐ Cross-complainant

* If dismissal requested is of specified parties only, of specified causes of action only, or of specified cross-complaints only, so state and identify the parties, causes of action, or cross-complaints to be dismissed.

2. TO THE CLERK: Consent to the above dismissal is hereby given.**
Date:

(TYPE OR PRINT NAME OF ☐ ATTORNEY ☐ PARTY WITHOUT ATTORNEY)

(SIGNATURE)

Attorney or party without attorney for:
☐ Plaintiff/Petitioner ☐ Defendant/Respondent
☐ Cross-complainant

** If a cross-complaint - Response (Family Law) seeking affirmative relief - is on file, the attorney for cross-complainant (respondent) must sign this consent if required by Code of Civil Procedure section 581(i) or (j).

(To be completed by clerk)
3. ☒ Dismissal entered as requested on (date): FEB 01 2005
4. ☐ Dismissal entered on (date): as to only (name):
5. ☐ Dismissal not entered as requested for the following reasons (specify):
6. ☐ a. Attorney or party without attorney notified on (date):
   b. Attorney or party without attorney not notified. Filing party failed to provide
      ☐ a copy to conform ☐ means to return conformed

FEB 01 2005

Clerk, by H. KWON, Deputy

Date:

LETTER 4

ALYSE M. LAZAR (State Bar No. 92796)
LAW OFFICES OF ALYSE M. LAZAR
3075 E. Thousand Oaks Blvd., Ste. 100
Westlake Village, California 91362
phone: (805) 496-5390
fax: (805)496-7462

Attorney for Petitioner,
FRIENDS OF THE SANTA CLARA RIVER

SUPERIOR COURT OF THE STATE OF CALIFORNIA

FOR THE COUNTY OF LOS ANGELES

FRIENDS OF THE SANTA CLARA RIVER Petitioner, v. CASTAIC LAKE WATER, Respondent.	CASE NO. BS056954 (Second Dist, Div. Four Appellate Case No. B145283) Honorable David P. Yaffe **ATTACHMENT TO REQUEST FOR DISMISSAL [C.C.P. §581(m)]**

Petitioner, FRIENDS OF THE SANTA CLARA RIVER ("Friends") requests dismissal by the Clerk of the Court in Los Angeles Superior Court Case No. BS 056954 of the entire action as set forth in the Petition for Writ of Mandate filed on April 30, 1999 due to the entry of Judgment in favor of Petitioner filed October 25, 2002 based on Code of Civil Procedure Section 581 (m) pursuant to the Clerk of the Court's ministerial powers.

The Writ Petition which is the subject of the instant proceeding specifically challenged approval of a 1999 project by Castaic Lake Water Agency ("Castaic) for the transfer of 41,000 acre-feet annually of State Water Project water entitlements from the Kern County Water

Agency (KCWA) and its member agency the Wheeler Ridge-Maricopa Water Storage District (WRMWSD) based on an March 29, 1999 Final Environmental Impact Report prepared for and approved by Castaic ("1999 EIR"). On January 10, 2002, Division Four of the Second District California Court of Appeal, in case No. B145283, ordered the trial court to issue a writ of mandate vacating the certification of the 1999 EIR and ordering the trial court to retain jurisdiction until Castaic "certifies an EIR complying with CEQA consistent with the views expressed in this opinion."

On October 25, 2002, the Honorable David P. Yaffe, Judge of the Superior Court, issued a Judgment in favor of Petitioner that was dispositive of all issues raised by the parties in Case No. BS 056954. In conjunction with the Judgment, the Court issued a Peremptory Writ of Mandate requiring Castaic, to decertify its March 29, 1999 Final Environmental Impact Report, to certify a new Environmental Impact Report and to file a return on the writ.

On December 22, 2004, Castaic certified a new Environmental Impact Report for the Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount ("2004 EIR") which it claimed complied with CEQA and was consistent with the views expressed by the court of appeal. On January 24, 2005, pursuant to Public Resources Code Section 21168 and Code of Civil Procedure 1094.5, *et seq.*, two new writ proceedings were filed in Ventura County Superior Court challenging the certification of the 2004 EIR and Castaic's project approval based on the 2004 EIR. Ventura County Superior Court Case No. CIV 231588, was brought by Petitioner Planning and Conservation League against Castaic Lake Water Agency, Respondent, and Real Parties in Interest, the California Department of Water Resources, KCWA and WRMWSD. The second case was brought by Petitioner California Water Impact Network against Castaic Lake Water Agency, Respondent, and Real Parties in Interest, the California Department of Water Resources, KCWA and WRMWSD. Both cases are currently pending before the Superior Court in Ventura County. Castaic is a public agency doing business in both Ventura and Los Angeles Counties. Neither petition challenges the 1999 EIR, since the prior EIR was decertified and is null and void.

On or about December 30, 2004, Castaic filed a Return to Peremptory Writ of Mandate

in the present matter based on its certification of the 2004 EIR, requesting discharge of the writ of mandate. No hearing was requested by Castaic pursuant to C.C.P. §1108.

While Friends believes that the new Environmental Impact Report neither complies with the California Environmental Quality Act ("CEQA". Public Resources Code §21000 *et seq.*) nor with the views expressed by the Court of Appeal Opinion filed January 10, 2002, in Case No. B145283, Friends does not desire to initiate an entirely new legal challenge to the 2004 Environmental Impact Report due to limited funding of this not-for-profit organization, utilizing the case number of the prior concluded litigation.

No injunctive relief was imposed upon Castaic which would require further Court proceedings or action and Castaic did not seek hearing before this Court when filing its Return on the Writ thereby waiving any further Court determinations regarding the validity of the 2004 EIR.

Friends therefore requests dismissal of Los Angeles County Superior Court Case No. BS056954 by this Court due to the fact that the Judgment in favor of Petitioner is now final and binding and no outstanding issues remain within the jurisdiction of this Court.

THE LAW OFFICE OF ALYSE M. LAZAR

Dated: January 31, 2005

By _____

Alyse M. Lazar, Esq., Attorney for Petitioner

LETTER 4

PROOF OF SERVICE

FRIENDS OF THE SANTA CLARA RIVER V. CASTAIC LAKE WATER AGENCY

Los Angeles County Superior Court Case No. BS 056954

I am employed in the County of Ventura, State of California. I am over the age of eighteen years, and not a party to the within action. My business address is 3075 East Thousand Oaks Boulevard, Suite 100, Westlake Village, California 91362. On February 1, 2005, I served the within documents:

Request for Dismissal

__X__ by placing the document(s) listed above in a sealed envelope with postage thereon fully prepaid, in the United States mail at Westlake Village, California, addressed as set forth below.

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I am readily familiar with our office's practice for collection and processing of correspondence and other materials for mailing with the United States Postal Service. On February 1, 2005, I sealed the envelope(s) containing the above materials and place the envelope(s) for collection and mailing on this date at the address stated above, following our office's ordinary business practices. The envelope(s) will be deposited with the U.S. Postal Service on this date, in the ordinary course of business.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this Proof of Service was executed on February 1, 2005 at Westlake Village, California.

Alyse M. Lazar

LETTER 4

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FILED
LOS ANGELES SUPERIOR COURT

JUN 27 2006

JOHN A. CLARKE, CLERK

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California Water Impact Network v. Castaic Lake Water Agency
BS 098724

Tentative decision on demurrers: overruled

Respondents Castaic Lake Water Agency and Kern County Water Agency separately demur to the separate, consolidated petitions for writ of mandate of Petitioners California Water Impact Network ("CWIN") and Planning and Conservation League ("PCL"). Real Party in Interest California Department of Water Resources ("DWR") separately demurs to the petition of CWIN.[1] The court has read and considered the moving, opposition and reply papers, and renders the following tentative decision.

A. Statement of the Case

Petitioner CWIN commenced its petition for writ of mandate in Ventura County Superior Court on January 24, 2005.

CWIN's petition alleges that on December 23, 2004, the Castaic Lake Water Agency ("Castaic"), a public water agency and water wholesaler that treats and delivers water to water reailers in Los Angeles and Ventura Coutnies, approved the permanent transfer of 41,000 acre feet per year from the Kern County Water Agency ("Kern") and its member unit in Kern County, Wheeler Ridge-Maricopa Water Storage District ("Wheeler Ridge"), to Castaic (the "Kern water transfer"). Castaic also purported to certify the Environmental Impact Report ("EIR") for the project (the "2004 EIR"). Petitioner claims the Kern water transfer "threatens to promot large-scale urban sprawl in Ventura and Los Angeles Counties, while diverting water from important environmental and agricultural uses in Kern County forever." Petitioner alleges that the 2004 EIR is premature, and fails to comply with CEQA.

The petition's first cause of action is for violation of CEQA. The petition alleges that Castaic violated CEQA in that the DWR, not Castaic, should have been the lead agency for the 2004 EIR, which does not adeqautely describe the background on which the project is based, fails to disclose a reliance on an invalid Urban Water Management Plan, fails to adequately describe alterantives to the project, including a no project alternative, fails to discuss growth inducement, and inaccurately states the availability of water availability.

The second cause of action is for violation of the Urban Water Management Planning Act ("UWMPA") (Water Code §10620 *et seq.*). The petition alleges that UWMPA requires Castaic

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[1]DWR's demur to the petition of CWIN is based on the fact that the petition seeks to set aside Castaic's approvals of a 2004 EIR and makes no allegation or request for relief against DWR. DWR does not explain why a real party in interest to a petition has a right to demurrer. On the other hand, the petition purports to be "against" DWR. To the extent that DWR has the right to do so, the unopposed demurrer is sustained without leave to amend.

Real Party in Interest Wheeler Ridge purports to join in Castaic's demurrers. A "notice of joinder," at least absent a separate demurrer and memorandum of points and authorities incorporating by reference another party's arguments, is nothing more than a cheerleading effort that the moving party should prevail and has no legal effect. *See* Frazee v. Seely, (2002) 95 Cal.App.4th 627, 636 (a notice of joinder cannot be used to "join" another party's motion for summary judgment).

to adopt an urban water management plan that contains accurate information and analysis. Castaic's plan used to support the project is a deficient plan declared invalid in Friends of the Santa Clara River v. Castaic Lake Water Agency, (2004) 123 Cal.App.4th 1.

The third cause of action is for violation of the public trust doctrine. The public trust doctrine has its underpinnings in the State Constitution and statutory law, and imposes on Castaic a duty not to harm those who seek to enjoy the Santa Clara River. Castaic's approval of the project violates the doctrine because of inadequate environmental and hydrological reviews, an invalid EIR, the above violation of UWMPA, and the fact that the project poses an unreasonable risk to the water of the Santa Clara River.[2]

Also on January 24, 2005, Petitioner PCL filed its petition for writ of mandate against Castaic in Ventura County Superior Court. The PCL petition alleges a violation by Castaic in recording a notice of determination on December 23, 2004, certifying the 2004 EIR and rendering its approval of the Kern water transfer. The petition purports to allege five "causes of action" for violation of CEQA based on Castaic stealing DWR's duty to be the lead agency for the EIR, certification of a defective EIR, approval of inadequate findings, erroneous presentation of the project as already complete, and "prejudicial abuse of discretion."

On June 22, 2005, upon motion by Castaic, the Ventura County Superior Court (the Honorable Frederick H. Bysshe, Jr.) ordered the transfer of both petitions, which had been consolidated, to Los Angeles. On March 27, 2006, the case was reassigned to this court.

B. Applicable Law

Where pleadings are defective, a party may raise the defect by way of a demurrer or motion to strike or by motion for judgment on the pleadings. CCP §430.30(a); Coyne v. Krempels, (1950) 36 Cal.2d 257. The party against whom a complaint or cross-complaint has been filed may object by demurrer or answer to the pleading. CCP §430.10. A demurrer is timely filed within the 30-day period after service of the complaint. CCP § 430.40; Skrbina v. Fleming Companies, (1996) 45 Cal.App.4th 1353, 1364.

A demurrer may be asserted on any one or more of the following grounds: (a) The court has no jurisdiction of the subject of the cause of action alleged in the pleading; (b) The person who filed the pleading does not have legal capacity to sue; (c) There is another action pending between the same parties on the same cause of action; (d) There is a defect or misjoinder of parties; (e) The pleading does not state facts sufficient to constitute a cause of action; (f) The pleading is uncertain ("uncertain" includes ambiguous and unintelligible); (g) In an action founded upon a contract, it cannot be ascertained from the pleading whether the contract is written, is oral, or is implied by conduct; (h) No certificate was filed as required by CCP §411.35 or (i) by §411.36. CCP §430.10. Accordingly, a demurrer tests the sufficiency of a pleading, and the grounds for a demurrer must appear on the face of the pleading or from judicially noticeable matters. CCP §430.30(a); Blank v. Kirwan, (1985) 39 Cal.3d 311, 318.

In determining the sufficiency of a complaint against a demurrer, the court reads the

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[2]On CWIN's oral motion, the petition's second and third causes of action have been dismissed. As a result, both petitions solely concern Castaic's compliance with CEQA in the 2004 EIR.

complaint as including matters subject to judicial notice. Sirott v. Latts, (1992) 6 Cal.App.4th 923, 928. A demurrer can be based on facts judicially noticed, even if those facts contradict the allegations of the complaint. Shahvar v. Superior Court, (1994) 25 Cal.App.4th 653, 659, fn. 1. When court records which the court may judicially notice provide ground for objection to a complaint, a demurrer on that ground is proper. Ev.C §452(d); Britz, Inc. v. Dow Chemical Co., (1999) 73 Cal.App.4th 177, 180. However, even though judicial notice of the existence of another court's findings of fact and conclusions of law is appropriate, judicial notice of the truth of a judge's factual finding is inappropriate. Sosinsky v. Grant, (1992) 6 Cal.App.4th 1548, 1568-1569.

The sole issue on demurrer for failure to state a cause of action is whether the facts pleaded, if true, would entitle the plaintiff to relief. Garcetti v. Superior Court, (1996) 49 Cal.App.4th 1533, 1547; Limandri v. Judkins, (1997) 52 Cal.App.4th 326, 339. The question of plaintiff's ability to prove the allegations of the complaint or the possible difficulty in making such proof does not concern the reviewing court. Quelimane Co. v. Stewart Title Guaranty Co., (1998) 19 Cal.4th 26, 47. The ultimate facts alleged in the complaint must be deemed true, as well as all facts that may be implied or inferred from those expressly alleged. Marshall v. Gibson, Dunn & Crutcher, (1995) 37 Cal.App.4th 1397, 1403. Nevertheless, this rule does not apply to allegations expressing mere conclusions of law, or allegations contradicted by the exhibits to the complaint or by matters of which judicial notice may be taken. Vance v. Villa Park Mobilehome Estates, (1995) 36 Cal.App.4th 698, 709.

C. Judicial Notice

Castaic asks the court to judicially notice: (1) its Resolution 2041, dated March 29, 1999; (2) a petition for writ of mandate in Friends of the Santa Clarat River v. Castiac Lake Water Agency, BS056954 ("Friends"), (3) an October 25, 2002 Judgment granting Peremptory Writ of Mandate in Friends, (4) the court of appeal's December 1, 2003 decision in Friends, B164027, (5) a May 5, 2003 settlement agreement in Planning and Conservation League v. Department of Water Resources, Sacramento County Case Nol 95CSo3216, and the Order approving the settlement agreement, (6) the executive summary of Castaic's December 2004 EIR, (7) Castaic's December 30, 2004 Return to Peremptory Writ mandate in Friends, (8) the February 7, 2005 reporter's transcript in Friends, (9) the February 7, 2005 *ex parte* application to vacate entry of dismissal in Friends, and (10) a mailing list of Castaic's December 2004 EIR.

The court records are subject to judicial notice and the request is granted as to nos. 2, 3, 4, 5 (including the settlement agreement, which is attached to the order), 7, and 9. Ev. Code §452(d). The public agency resolution is also subject to judicial notice, and the request is granted as to 1. Ev. Code §452(b). The executive summary of the December 2004 EIR, the reporter's transcript, and the mailing list are not subject to judicial notice and the request is denied as to those items.

PCL asks the court to judicially notice (1) the February 1, 2005 dismissal and notice of entry of dismissal in Friends, (2) Castaic's March 5, 2005 petition for writ of mandate, filed in the court of appeal in Friends, (3) a March 9, 2005 letter to the Honorable Norma Epstein from Atty Alyse M. Lazar, Esq., seeking dismissal of Castaic's petition for writ of mandate in the appellate court of Friends, (4) an April 14, 2005 court of appeal order denying Castaic's petition, and (5) a May 17, 2005 appellate order dismissing the appeal in Friends.

The court takes judicial notice of the court records, items 1 (dismissal only), 2, 4, and 5. Ev. Code §452(d). The notice of entry of dismissal and letter to the court of appeal are not court records, and the request is denied as to those items.

Castaic filed a supplemental request for judicial notice on March 14, 2006, and asks the court to judicially notice the following: (1) PCL's September 29, 2003 application in the appellate court to file an *amicus* brief in Friends, (2) appellant's reply brief on appeal in Friends, (3) Castaic Water Agency law from Deerings, (3) Kern Water Agency law in Deerings, and (4) Senate Bill 231, the First Validation law.

Each of these items is subject to judicial notice, if relevant. The court takes judicial notice of their existence. Ev. Code §§ 452(a), (b), (d).

D. Statement of Facts

In 1951, the Legislature authorized construction of a state water storage and delivery system. Planning & Conservation League v. Department of Water Resources, (2000) 83 Cal.App.4th 892, 898. The Legislature subsequently authorized the State Water Project ("SWP"), a complex system of reservoirs, dams, power plants, pumping plants, canals and aqueducts to deliver 4.23 million acre-feet of water annually. DWR is a major developer of water resources in California. It builds and operates the facilities and manages the SWP.

In 1961, DWR entered into individual contracts with various agricultural and urban water suppliers in the State, referred to as State Water Contractors. The contracts entitled the contractors to receive an annual amount of water in exchange for a proportionate share of financing and maintaining the SWP facilities. There are 29 agencies or districts that currently are State Water Contractors, including Castaic, which is a special act district in North Los Angeles County, created by uncodified Cataic Lak Water Agency Law, and formed to provide a supplemental supply of water to the water purveyors of the Santa Clarita Valley.

In 1994, an agreement was reached between the State Water Contractors and and DWR (the "Monterey Agreement") in which the allocation was changed between agricultural and urban contractors of entitlements to SWP water. The principles of the Monterey Agreement were implemented through a separate amendment to each State Water Contractor's contract with DWR (the "Monterey Amendment"). The Monterey Amendment was approved in 1995 and went into effect in 1996. A program EIR analyzing the environmental impacts of the Monterey Agreement was prepared and certified in 1995.

In late 1995, a lawsuit was filed in Sacramento Superior Court challenging the program EIR entitled Planning & Conservation League v. Department of Water Resources, ("PCL")

Pursuant to the Monterey Amendment, in March 1999, Castaic resolved to purchase from Kern and its member unit in Kern County, Wheeler Ridge, an entitlement to 41,000 acre-feet per year of water (the Kern water transfer). Castaic acted as lead agency and on March 29, 1999 certified an EIR for the transfer which tiered off the 1995 Monterey Amendment program EIR.

In April 1999, Castaic's EIR for the Kern water transfer was challenged in Friends of the Santa Clara River v. Cataic Lake Water Agency, BS056954 ("Friends"). On August 16, 2000, the trial court entered judgment, denying the petition in its entiretly.

Also in 2000, the Third Appellate District found the program EIR for the Monterey Agreement to be indequate in Planning & Conservation League v. Department of Water Resources, ("PCL") (2000) 83 CalApp.4th 892. The PCL appellate court directed the

Sacramento Superior court to retain jurisdiction over the PCL action until a new EIR was prepared and certified.

Based on the Third District's PCL decision, on January 10, 2002, the Second Appellate District reversed the judgment in Friends and directed the trial court to issue a writ of mandate compelling Castaic to set aside certification of its EIR. The reversal was based on the fact that Castaic's EIR had been tiered upon the now inadequate Monterey Agreement EIR. The Second District, however, rejected all of the other challenges to Castaic's EIR, finding them to be without merit. The appellate court noted that Castaic may be able to cure the defect by waiting for DWR to comply with the Third District's directive in PCL by preparing a new program EIR. Castaic could issue a subsequent EIR, a supplement to EIR, or addendum to EIR, tiering upon the new Montery Agreement EIR.

The Friends appellate decision concluded as follows: "The judgment is reversed. The trial court shall issue a writ of mandate vacating the certification of the EIR, shall retain jurisdiction until Respondent certifies an EIR complying with CEQA consistent with the views expressed in this opinion, and shall consider such orders it deems appropriate under [Pub. Resources Code] section 21168.9."

On October 25, 2002, after remand from the court of appeal, the Friends trial court issued a Peremptory Writ of Mandate and Judgment on Remand, retaining jurisdiction until Castaic certifies an EIR that complies with CEQA and is consistent with the views expressed by the Second District. The trial court considered and denied the petitioner's request to enjoin Castaic from using any of the 41,000 acre feet of additional water alloted to it by the Kern water transfer.[3]

On June 6, 2003, the Sacramento Superior Court approved a settlement in PCL in which DWR agreed to prepare a new EIR for implementation of the Monterey Agreement, including the Kern water transfer (the "Settlement Agreement"). The Settlement Agreement also provided that the Monterey Amendment would remain in operation until the EIR is prepared. The Settlement Agreement expressly acknowledged the Friends litigation in Los Angeles Superior Court concerning Castaic's 1999 EIR for the Kern water transfer, with the parties agreeing that "jurisdiction with respect to [Friends] should remain in that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation." PCL Settlement Agreement at 12.

On December 30, 2004, Castaic filed its return to the peremptory writ of mandate in Friends. The return stated that Castaic had certified a new EIR (the 2004 EIR) on December 22, 2004 and approved the Kern water transfer.

CWIN and PCL did not intervene in Friends. Instead, on January 24, 2005, CWIN and PCL filed separate petitions for writ of mandate in Ventura County concerning Castaic's compliance with CEQA in the 2004 EIR, and other issues.

On February 1, 2005, Petitioner in Friends filed a dismissal with prejudice. On February 7, 2005, the trial court in Friends held a hearing on Castaic's *ex parte* application to vacate Petitioner's dismissal with prejudice and seeking an order discharging the writ of mandate.

[3]This decision was upheld by the court of appeal on December 1, 2003, in case no. B164027 ("Friends II"). PCL filed an *amicus* brief supporting the petitioner in Friends II.

Castaic argued that, by dismissing, Petitioner was attempting to get the clerk, through ministerial act, to divest the court of its continuing jurisdiction over the 2004 EIR prepared in response to the court's peremptory writ of mandate. Instead, Petitioner was passing the baton to CWIN and PCL, which initially filed the instant action in Ventura County, for a challenge to the 2004 EIR.

Castaic argued that the petitioner's dismissal violated the one judgment rule in that there had already been a judgment in the proceeding. Moreover, once Castaic filed its return, the trial court was required to "determine whether there had been adequate compliance with the previously issued writ." (Citation omitted.) Any order of discharge without a determination that the 2004 EIR complies with CEQA would be a material variance from the directions of the appellate court. Since any challenge to the 2004 EIR had to be made in the Friends action, and since Petitioner had failed to challenge it, Castaic was entitled to have the dismissal vacated and an order discharging the previously issued writ of mandate.

The trial court declined to set aside the dismissal, stating that whether the Ventura proceedings were a continuation of the Friends lawsuit was an issue of fact for the Ventura (now this) court.

On March 5, 2005, Cataic petitioned the Second Appellate District for a writ of mandate with respect to the trial court's refusal to vacate the dismissal, arguing that the trial court violated Pub. Resources Code section 21168.9 (stating that the trial court shall maintain jurisdiction over the agency's proceedings until the court has determined that the agency has complied with CEQA) because it had not yet determined that the 2004 EIR complied with CEQA Yet, under CEQA, a trial court that orders preparation of a new EIR must retain jurisdiction for a final determination of the EIR's validity.

On April 14, 2005, the Second Appellate District denied Castaic's petition for "failure to demonstrate that the 'retain jurisdiction' provision of Public Resources Code section 21168.9, subdivision (b), abrogates the entitlement to voluntary dismissal conferred by Code of Civil Procedure section 581, subdivision (b)(1)."[4]

C. Analysis

Respondents Castaic and Kern[5] demur to the separate petitions of CWIN and PCL. They contend that the petitions are collateral attacks on a final judgment in another case and are barred by the doctrine of *res judicata* and the applicable statutes of limitation.

1. Statute of Limitations

Castaic argues that the challenge is time-barred by the CEQA statute of limitations. It contends that, although both petitions "contain allegations of CEQA violations, both petitions clearly seek a judgment invalidating the contract documents between Castaic, DWR, Kern, and

[4]The Second District later dismissed Castaic's appeal from the Friends dismissal, finding that the voluntary dismissal was not appealable. *See* H.D. Arnaiz, Ltd. v. County of San Joaquin, (2002) 96 Cal.App.4th 1357, 1364-67.

[5]Kern's demurrer incorporates the points and authorities in Castaic's demurrer. For convenience, reference to Castaic's demurrer shall mean the demurrer of both Castaic and Kern.

Wheeler Ridge...." Castaic argues that the gravamen of the petitions is a reverse validation action challenging the validity of these contracts and, indeed, Petitioners cannot challenge the validity of the contracts any other way. Since the contracts were entered into in 1999, and no challenge was made to them, they have all been passively validated.

A validation action under CCP section 860 *et al.* is a lawsuit filed and prosecuted for the purpose of securing a judgment determining the validity of a particular local governmental decision or act. N.T. Hill, Inc. v. City of Fresno, (1999) 72 Cal.App.4th 977. The validation proceeding is *in rem* and is binding on the agency seeking the judgment and on all other parties. Id. The purpose of the validation statutes is to provide a simple and uniform method for testing the validity of government action. Embarcadero Municipal improvement Dist. v. County of Santa Barbara, (1998) 63 Cal.App.4th 781. The key objective of a validation action is to limit the extent to which delay due to litigation may impair a public agency's ability to operate. Friedland v. City of Long Beach, (1998) 62 Cal.App.4th 835.

In addition, any interested person can bring an action to challenge the validity of an agency's action under CCP section 860, known as a "reverse validation" action. Both a validation action and a reverse validation action must be filed within 60 days of the public agency's action. CCP §§ 860, 863. If neither a validation action by the agency nor a reverse validation action by an interested person is timely filed, the agency's action is deemed valid. *See* Hills for Everyone v. Local Agency Formation Commission of Orange County, (1980) 105 Cal.App.3d 461, 568 (passive validation is a third method of validating an agency action).

Castaic is correct that the Monterey Agreement, the Monterey Amendment, and the various contracts between DWR and the State Water Contractors, including Castaic, were never challenged. As such, they are deemed to be valid agreements. But CWIN and PCL petitions do not challenge the validity of the agreements, or even the 1999 EIR. The petitions only challenge Castaic's 2004 EIR as complying with CEQA.[6]

The remedy for a violation of CEQA is a writ of mandate to compel the agency to comply. This remedy does not affect the validity of Castaic's agreements, the contracts which led Castaic to issue the 2004 EIR. It is true, as CWIN argues, that Guideline section 15092 permits the lead agency to decide whether to even carry out the project after considering the final EIR. Such consideration may cause the agency to reach a different conclusion on whether or how to carry out the Kern water transfer. But the decision whether to perform the agreements will be the lead agency's decision, based on an appropriate EIR; that fact has no effect on the validity of existing agreements. The petitions of CWIN and PCL are not reverse validation actions, and have no direct effect on the validity of Castaic's 1999 contracts, all of which are deemed valid as a matter of law.

Castaic next argues that the statute of limitations has passed for petitions challenging the 2004 EIR under CEQA. The decision to appprove the Kern water transfer was made in 1999, and any CEQA challenge to the transfer was required at that time. Subsequent Castaic actions performing the Kern water transfer will not revive the limitations period.

In this regard, Castaic contends that the 2004 EIR was merely a return EIR complying

[6]Although CWIN's petition raised other claims, those claims have been dismissed. Both petitions raise only a CEQA challenge to the 2004 EIR.

with the Friends trial court's writ of mandate, and no legal challenges to this EIR could be made outside of the Friends action. Hence, CEQA does not apply to agency actions taken at the direction of a court. Guidelines, §15379.

Castaic's first argument again focuses on the wrong document. The petitions challenge the 2004 EIR, not the 1999 EIR. The CEQA statute of limitations for challenging an agency approval of a project for which an EIR was prepared is 30 days, beginning from the filing of the notice of determination required by Pub. Resources Code §21108(a). Pub. Resources Code §21167(c). Notices of Determination for the 2004 EIR were filed in various counties between December 23rd and December 27, 2004. The petitions in this case was filed on January 24, 2005, within the 30-day limitation period. The petitions are not time-barred under CEQA.

Castaic's second argument, that a return EIR can be challenged only in the pending case, misunderstands the nature of post-writ proceedings. A judgment in a CEQA proceeding orders the issuance of a peremptory writ that conforms to the limitations of CCP setion 1094.5. The principal function of the writ is to command the agency to set aside its decision. A "return" on the writ is the agency's formal notification of its action in response to the writ. The return can inform the court that it has (1) complied with the writ, (2) filed a notice of appeal, or (3) requested writ review in an appellate court. The trial court has continuing jurisdiction until the writ is satisfied. CCP §1097; County of Inyo v. City of Los Angeles, (1977) 71 Cal.App.3d 185. The court may issue any orders "necessary and proper for the complete enforcement of the writ." Id. at 205; California Trout, Inc. v. Superior Court, (1990) 218 Cal.App.3d 187, 202.

When the agency files a return demonstrating compliance with a peremptory writ, the petitioner may object to the adequacy of the return and the trial court may order a hearing on the objections. Sanders v. City of Los Angeles, (1970) 3 Cal.3d 252, 256. A petitioner may also challenge the agency's compliance with the writ in a new petition for writ of mandate or a supplemental petition (using the original action number). CCP §1097; City of Carmel-By-the-Sea v. Board of Supervisors, (1982) 137 Cal.App.3d 964, 971 (rejecting argument that violation of writ could be challenged only by new writ proceeding); County of Inyo, 71 Cal.App.3d at 188, 205 (retention of jurisdiction in appellate court until compliance with writ).[7]

Petitioners CWIN and PCL were not the petitioner in Friends. They apparently were "invited" to intervene in Friends, and could have done so. They chose not to do so. CWIN and PCL still may challenge the 2004 EIR, which was part of Castaic's return on the Friends writ, in a new writ proceeding. The statute of limitations for that challenge is 30 days from the filing of

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[7]Castaic contends that CEQA vests original and exclusive jurisdiction with the first action challenging a project under CEQA. Repy at 6. Castaic cites Pub. Resources Code section 21168.9(b) for the proposition that "[n]o new legal challenges to the [p]roject, including new challenges or objections to the [r]eturn EIR are permitted outside of that action."

Section 21168.9(b) does not say anything about exclusive jurisdiction, merely discussing the trial court's continuing jurisdiction to ensure compliance. Continuing jurisdiction says nothing about exclusivity. Indeed, Castaic's argument of exclusivity is directly contrary to City of Carmel-By-the-Sea (a petitioner can file a new petition in lieu of objecting to the return in the pending case). Duplicate challenges to an agency's EIR must be addressed through the common law principles of *res judicata* and *collateral estoppel.*

a notice of determination, and it is undisputed that the petitions were timely filed for purposes of a new proceeding. *See* Pub. Resources Code §21167(c).

2. Exclusive Jurisdiction

Castaic contends that the instant petitions are impermissible collateral attacks on the 2004 EIR because the PCL Settlement Agreement provided for exclusive jurisdiction in the Friends court over all legal challenges to the Kern water transfer. Since PCL involved a reverse validation claim, the Settlement Agreement is binding on the general public, including Petitioners herein. Petitioners' failure to raise a CEQA challenge in the Friends case bars them from doing so collaterally.

This argument is specious. First, the PCL Settlement Agreement did not purport to convey exclusive jurisdiction on the Friends court for the Kern water transfer. The Settlement Agreement merely noted that there was ongoing litigation concerning the Kern water transfer in Los Angeles Superior Court, and that the Settlement Agreement did not purport to interfere with that litigation. This acknowledgement that the PCL parties could not interfere with the Friends litigation is hardly startling. The Settlement Agreement could not intefere with the jurisdiction of the Friends court, and did not purport to do so. Nor could the Settlement Agreement purport to confer jurisdiction. Jurisdiction cannot be conferred by consent, waiver, or estoppel. 2 Witkin, California Procedure, (1996) §12, 556. Only the Legislature, bounded by constitutional principles, can confer jurisdiction.

Second, even if *arguendo* the parties did intend to convey to the Friends court jurisdiction for all challenges to the Kern water transfer, the Friends petitioner dismissed its case at a time when the CWIN and PCL petitions were pending in Ventura. That dismissal could not possibly foreclose jurisdiction over their claims that the 2004 EIR violates CEQA. At most, it would have required reopening of Friends and the transfer of the petitions to the reopened case.

In short, the Friends court did not have exclusive jurisdiction for a challenge to the 2004 EIR. CWIN and PCL had the option of intervening in Friends or filing a new petition. Instead of intervening, CWIN and PCL made the perfectly permissible election to file new petitions.[8]

3. Res Judicata

Castaic next argues that, even if Petitioners have the right to raise a CEQA challenge to

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[8]Castaic argues that the 2004 EIR is a "Return EIR" not suject to a "new cause of action" under CEQA. According to Castaic, a second EIR on the same project is either a return EIR prepared in response to a writ of mandate or a revised EIR if modified prior to certification. An EIR for an expanded or changed project is a supplement or addendum, or possibly a subsequent or supplemental EIR. Reply at 5.

While Castaic is generally correct about the different types of EIR, it presents no evidence on the scope of review of such documents. The court has no reason to believe that a second EIR, whatever it is called, should not be reviewed for compliance with CEQA on any new matter considered in the document, any old matter that was defective in the previous document, and any revision or new feature of the project. In any event, the scope of review of the 2004 EIR is not generally at issue in this demurrer.

the 2004 EIR in a separate proceeding, the instant petitions are impermissible collateral attacks on the 2004 EIR because the result in Friends is *res judicata* for the new petitions. Castaic argues that the purposes of CEQA are frustrated unless, as Pub. Resources Code section 21168.9(b) requires, subsequent environmental review of an EIR is limited to that which is necessary to bring the project into compliance. Therefore, the instant petitions are collateral attacks on the determination that the 2004 EIR complies with CEQA, and barred by *res judicata.*

In its narrowest form, *res judicata* "precludes parties or their privies from re-litigating a cause of action [finally resolved in a prior proceeding]." Teitelbaum Furs, Inc. v. Dominion Ins. Co., Ltd., (1962) 58 Cal. 2d 601, 604. "*Res judicata* describes the preclusive effect of a final judgment on the merits." Mycogen Corp. v. Monsanto Co., (2002) 28 Cal.4th 888, 896. (Italics added). "*Res judicata*, or claim preclusion, prevents relitigation of the same cause of action in a second suit between the same parties or parties in privity with them." Id. (Italics added). "*Collateral estoppel*, or issue preclusion, 'precludes relitigation of issues argued and decided in prior proceedings.'" Id. (Italics added) (quoting Lucido v. Superior Court, (1990) 51 Cal.3d 335, 341). "Under the doctrine of *res judicata*, if a plaintiff prevails in an action, the cause is merged into the judgment and may not be asserted in a subsequent lawsuit; a judgment for the defendant serves as a bar to further litigation of the same cause of action." Mycogen Corp., *supra*, 28 Cal.4th at 896-897 (italics added). "*Res judicata* precludes piecemeal litigation by splitting a single cause of action or relitigation of the same cause of action on a different legal theory or for different relief." Id. (Italics added) (quoting Weikel v. TCW Realty Fund II Holding Co., (1997) 55 Cal.App.4th 1234, 1245).

California's *res judicata* doctrine is based upon the primary right theory. Mycogen Corp., *supra*, 28 Cal.4th at 904. "The primary right theory is a theory of code pleading that has long been followed in California. It provides that a 'cause of action' is comprised of a 'primary right' of the plaintiff, a corresponding 'primary duty' of the defendant, and a wrongful act by the defendant constituting a breach of that duty." Crowley v. Katleman, (1994) 8 Cal.4th 666, 681-682. "The most salient characteristic of a primary right is that it is indivisible: the violation of a single primary right gives rise to but a single cause of action." Id. "As far as its content is concerned, the primary right is simply the plaintiff's right to be free from the particular injury suffered." Id. "It must therefore be distinguished from the *legal theory* on which liability for that injury is premised: 'Even where there are multiple legal theories upon which recovery might be predicated, one injury gives rise to only one claim for relief.'" (emphasis in original) Id. "The primary right must also be distinguished from the *remedy* sought: 'The violation of one primary right constitutes a single cause of action, though it may entitle the injured party to many forms of relief, and the relief is not to be confounded with the cause of action, one not being determinative of the other.'" (emphasis in original) Id. "The primary right theory . . . is invoked when a plaintiff attempts to divide a primary right and enforce it in two suits. The theory prevents this result by either of two means: (1) if the first suit is still pending when the second is filed, the defendant in the second suit may plead that fact in abatement [citations]; or (2) if the first suit has terminated in a judgment on the merits adverse to the plaintiff, the defendant in the second suit may set up that judgment as a bar under the principles of *res judicata*." Id. (Italics added).

Res judicata applies if (1) the decision in the prior proceeding is final and on the merits;

(2) the present preoceeding is on the same cause of action as the prior proceeding; and (3) the parties in the present proceeding or parties in privity with them were parties to the prior proceeding. Federation of Hillside & Canyon Assns. v. City of Los Angeles, (2004) 126 Cal.App.4th 1180, 1202.

The first factor for *res judicata* is that the prior proceeding is final and on the merits. Castaic argues that the dismissal with prejudice in Friends was a retraxit; that is, a final judgment in Castaic's favor that the 2004 EIR for Castaic's water transfer project complies with CEQA.

A voluntary dismissal with prejudice is a renunciation by a plaintiff in open court of his suit, and constitutes a retraxit. This is "equivalent to a judgment on the merits and as such bars further litigation on the same subject matter between the parties." Le Parc Community Ass'n. v. Workers' Comp. Appeals Bd., (2003) 110 Cal.App.4th 1161, 1169. Even a dismissal without prejudice, where it is filed in return for the consideration of a settlement, acts as a retraxit so that it bars further litigation on the same subject matter between the parties. Gates v. Superior Court, 178 Cal.App.3d 301, 311.

After prevailing on the 1999 EIR and obtaining a writ of mandate, the petitioner in Friends dismissed the remaining issues — that is, Castaic's return on the writ and compliance with CEQA. The dismissal was without consideration, but it was made with prejudice. Therefore, the Friends petitioner essentially renounced in open court its right to contest the remaining issues, including Castaic's return and 2004 EIR. This was a retraxit or a judgment on the merits. As between the Friends petitioner and Castaic, the issues necessarily determined by dismissal of the Friends action are (1) the invalidity of the 1999 EIR based soley on its tiering on the Monterey Agreement program EIR, and (2) the 2004 EIR's compliance with CEQA (because the petitioner waited to dismiss with prejudice until after the time passed to object to the 2004 EIR).[9]

The second factor for *res judicata* is whether the two proceedings concern the same cause of action. Two proceedings involve the same cause of action if they concern the same primary right. When a CEQA challenge is filed, the primary right asserted is the right of the public to be fully informed of the environmental consequences of a given project, with the corresponding duty of the public agency to provide that full disclosure. Laurel Heights Improvement Assn. v. Regents of the University of California, (1988) 47 Cal.3d 376, 391; Federation of Hillside & Canyon Assn's. v. City of Los Angeles, (2005) 126 Cal.App.4th 1180, 1203-1204.

Petitioners CWIN and PCL argue that the cause of action in Friends differs from the cause of action in their petitions because the two cases concern different EIRs. The trouble is that they don't. Castaic is correct that Friends concerned both the 1999 EIR and the 2004 EIR. The primary right in Friends was Castaic's alleged failure to comply with CEQA with respect to the water project, initially through the 1999 EIR and subsequently through the 2004 EIR. The primary right in the present proceeding is Castaic's failure to comply with CEQA with respect to

[9]This dismissal was outside the time within which the petitioner had to challenge the 2004 EIR. That is, the 2004 EIR and notices of determination for the 2004 EIR were filed between December 23 and 27, 2005. The Friends petitioner had the same 30 day period to object to the return as it had to file a new petition. By waiting more than 30 days before filing its dismissal, the Friends petitioner silently acknowledged the validity of the 2004 EIR.

the water project, currently only with respect to the 2004 EIR.[10] The primary right is the same in each case.

The third factor for *res judicata* is whether the same parties, or parties in privity with them, are in the second proceeding. Castaic points out that the modern concept of privity has been expanded for *res judicata* purposes to exist where (1) the new party has an identity of interest with the party in the prior proceeding (2) was adequately represented by the party in the first proceeding, and (3) should expect to be bound by the prior adjudication. Helfand v. National Union Fire Insurance Co., (1992) 10 Cal.App.4th 869, 902.

Applying these three factors, the parties are not in privity. The first factor certainly is present. CWIN and PCL are public interest groups that have a community of interest. Each wants to protect the local water resources, including the Santa Clara River watershed.

But the second factor is lacking. CWIN and PCL were not adequately represented by the petitioner in Friends. That petitioner did pursue and obtain the writ of mandate that compelled Castaic to decertify the 1999 EIR.[11] However, the Friends petitioner did not adequately represent PCL and CWIN's interests with respect to the 2004 EIR.

This fact is neatly demonstrated by the timing: PCL and CWIN filed their petitions on January 24, 2005, a week before the Friends petitioner dismissed. This timing shows that PCL and CWIN chose to represent themselves, and not rely on the Friends petitioner, with respect to the 2004 EIR. Friends was dismissed without the trial court's review of the 2004 EIR or administrative record. The trial court accepted the dismissal as the Friends petitioner's retraxit. CWIN and PCL were not adequately represented by the Friends petitioner's actions. *Cf.* Citizens for Open Acess v. Seadrift Assn., (1998) 60 Cal.App.4th 1053, 1072 (agency's successful prosecution and settlement of case consistuted adequate representation of private petitioner's interests for privity).

No doubt PCL and CWIN knew that the Friends petitioner was not going to pursue a challenge to the 2004 EIR. This may show collusion, as Castaic suggests, but it also shows that PCL and CWIN had no intention of relying on the Friends petitioner to pursue their claims for the 2004 EIR. Those claims concern who the lead agency should be for the EIR (CWIN and PCL contend that it should be DWR), and whether Castaic should have deferred it analysis of the 41,000 acre feet transfer until after the revised Monterey Amendment program EIR. When the Friends petitioner dismissed that case, it was not purusing these claims, and not representing the interests of PCL and CWIN.

The third factor — the new party should expect to be bound by the prior adjudication — also is missing. In filing their petitions before the Friends petitioner dismissed, CWIN and PCL plainly demonstrated that they did not intend to be bound by any adjudication with respect to the

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[10]The court uses the word "currently" because, if the 2004 EIR is found to be defective, Petitioners would want the right to challenge any subsequent EIR purporting to comply with a writ of mandate as part of this proceeding.

[11]This suggests that CWIN and PCL would be bound for purposes of *collateral estoppel* by the determination in Friends that the 1999 EIR was adequate if it tiered upon an adequate a DWR program EIR.

2004 EIR.

In sum, the dismissal of Friends would be *res judicata* for the Friends petitioner in a subsequently filed case. It is not, however, *res judicata* for PCL and CWIN.

4. Collateral Estoppel

Castaic argues that even if there is no privity between the Friends petitioner and CWIN and PCL, the latter can have no greater rights than the former. Specifically, had petitioners intervened in Friends they would have been "limited in their challenge" to the 2004 EIR.

This challenge is inappropriate for demurrer because it does not dispose of a cause of action. Nonetheless, the above discussion necessarily has included *collateral estoppel* principles, and the court will discuss the issue solely for the parties' benefit and convenience.

As stated above, *collateral estoppel*, or issue preclusion, "precludes relitigation of issues argued and decided in prior proceedings." Mycogen Corp. v. Monsanto Co., 28 Cal.4th at 896 (quoting Lucido v. Superior Court, (1990) 51 Cal.3d 335, 341). *Collateral estoppel* is intended to preserve the integrity of the judicial system, promote judicial economy, and protect litigants from harassment by vexatious litigation. Id. at 335, 343. *Collateral estoppel* applies to bar re-litigation of an issue if (1) the issue is identical to an issue litigated in the first action; (2) the issue was actually litigated and necessarily decided in the first action; (3) the party in the second action was a party or one in privity to a party in the first action; and (4) the decision in the first action was on the merits. McCutchen v. City of Montclair, (1999) 73 Cal. App. 4th 1138, 1145.

The Friends petitioner was in privity with CWIN and PCL on all aspects of the Friends litigation until it decided not to pursue objection to the 2004 EIR. Thus, Castaic is correct that CWIN and PCL are bound by the Second District's decision that the 1999 EIR was acceptable but for its tiering upon the Monterey Agreement program EIR. The three entities had a community of interest, the Friends petitioner adequately represented the interests of CWIN and PCL through that stage, and CWIN and PCL would.expect to be bound by the appellate decision. *See* Federation of Hillside & Canyon Assns. v. City of Los Angeles, (2005) 126 Cal.App.4th 1180, 1204. However, they are not bound by the Friends petitioner's actions on Castaic's return, including the 2004 EIR, because they are not in privity with that petitioner at that stage of the Friends action.

D. Conclusion

In sum, the court has jurisdiction over the petitions, which were timely filed. The doctrine of *res judicata* does not bar the petitions in this matter. However, principles of *collateral estoppel* bar them from re-raising issues resolved by the Second District with respect to the 1999 EIR. This fact does not make demurrer appropriate, however. The demurrers of Castaic and Kern are overruled.

JOHN COMINGO

LETTER 4

#12

California Water Impact Network v. Castaic Lake Water Agency
BS 098724

Tentative decision on motion for legal determination: denied

Respondent Castaic Lake Water Agency and Kern County moves for a legal determination that it is the proper lead agency for preparation of an Environmental Impact Report for the water transfer at issue in this action under CEQA. The court has read and considered the moving, opposition and reply papers, and renders the following tentative decision.

A. Statement of the Case

Petitioners California Water Impact Network ("CWIN") commenced its petition for writ of mandate in Ventura County Superior Court on January 24, 2005.

CWIN's petition alleges that on December 23, 2004, the Castaic Lake Water Agency ("Castaic"), a public water agency and water wholesaler that treats and delivers water to water reailers in Los Angeles and Ventura Counties, approved the permanent transfer of 41,000 acre feet per year from Real Party in Interest Kern County Water Agency ("Kern") and its member unit in Kern County, Wheeler Ridge-Maricopa Water Storage District ("Wheeler Ridge"), to Castaic (the "Kern water transfer"). Castaic also purported to certify the Environmental Impact Report ("EIR") for the project (the "2004 EIR"). Petitioner claims the Kern water transfer "threatens to promote large-scale urban sprawl in Ventura and Los Angeles Counties, while diverting water from important environmental and agricultural uses in Kern County forever." Petitioner alleges that the 2004 EIR is premature, and fails to comply with CEQA.

The petition alleges a cause of action for violation of CEQA in that Real Party in Interest California Department of Water Resources ("DWR"), not Castaic, should have been the lead agency for the 2004 EIR, which does not adequately describe the background on which the project is based, fails to disclose a reliance on an invalid Urban Water Management Plan, fails to adequately describe alternatives to the project, including a no project alternative, fails to discuss growth inducement, and inaccurately states the availability of water availability.[1]

On January 24, 2005, Planning and Conservation League ("PCL") filed its petition for writ of mandate against Castaic in Ventura County Superior Court. The PCL petition alleges a violation by Castaic in recording a notice of determination on December 23, 2004, certifying the 2004 EIR and rendering its approval of the Kern water transfer. The petition purports to allege five "causes of action" for violation of CEQA based on Castaic stealing DWR's duty to be the lead agency for the EIR, certification of a defective EIR, approval of inadequate findings, erroneous presentation of the project as already complete, and "prejudicial abuse of discretion."

On June 22, 2005, upon motion by Castaic, the Ventura County Superior Court (the Honorable Frederick H. Bysshe, Jr.) ordered the transfer of both petitions, which had been consolidated, to Los Angeles. On March 27, 2006, the case was reassigned to this court.

On June 27, 2006, the court heard the demurrers of Castaic and Real Party in Interest

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[1]On CWIN's oral motion, the petition's second and third causes of action have been dismissed. As a result, the petition solely concerns Castaic's compliance with CEQA in the 2004 EIR.

Kern to the petitions. The court ruled that the petitions were timely filed and were not barred under the doctrine of *res judicata*. However, principles of *collateral estoppel* barred Petitioners from re-raising issues resolved by the Second District with respect to the 1999 EIR. This conclusion did not make demurrer appropriate, and the demurrers were overruled.

B. Applicable Law

The court has inherent authority as well as statutory authority (CCP §187), to order any suitable process or mode of proceeding in handling an action before it. After discussion with the court, Castaic takes advantage of this authority in making a motion for legal determination.

C. Judicial Notice

Castaic asks the court to judicially notice: (1) the opening, reply, and supplemental reply briefs of Petitioner Friends of the Santa Clara River ("Friends") in Friends of the Santa Clara River v. Castiac Lake Water Agency, (2002) 95 Cal.App.4th 1373 (Superior Court nu. BS056954 ("Friends"), (2) Castaic's brief on remand in Friends dated September 12, 2002 requesting the trial court to permit the water transfer to remain intact pending completion of a new EIR, (3) Castaic's brief in Friends dated May 17, 2000 in opposition to the petition for writ of mandate, and (4) Friends brief in Friends filed August 23, 2002 in support of judgment and peremptory writ on remand.

All of these court records are subject to judicial notice. Ev. Code §452(d).

D. Statement of Facts

In 1951, the Legislature authorized construction of a state water storage and delivery system. Planning & Conservation League v. Department of Water Resources, (2000) 83 Cal.App.4th 892, 898. The Legislature subsequently authorized the State Water Project ("SWP"), a complex system of reservoirs, dams, power plants, pumping plants, canals and aqueducts to deliver 4.23 million acre-feet of water annually. DWR is a major developer of water resources in California. It builds and operates the facilities and manages the SWP.

In 1961, DWR entered into individual contracts with various agricultural and urban water suppliers in the State, referred to as State Water Contractors. The contracts entitled the contractors to receive an annual amount of water in exchange for a proportionate share of financing and maintaining the SWP facilities. There are 29 agencies or districts that currently are State Water Contractors, including Castaic, which is a special act district in North Los Angeles County, created by uncodified Castaic Lake Water Agency Law, and formed to provide a supplemental supply of water to the water purveyors of the Santa Clarita Valley.

In 1994, an agreement was reached between the State Water Contractors and and DWR (the "Monterey Agreement") in which the allocation was changed between agricultural and urban contractors of entitlements to SWP water. The principles of the Monterey Agreement were implemented through a separate amendment to each State Water Contractor's contract with DWR (the "Monterey Amendment"). The Monterey Amendment was approved in 1995 and went into effect in 1996. A program EIR analyzing the environmental impacts of the Monterey Agreement was prepared and certified in 1995.

In late 1995, a lawsuit was filed in Sacramento Superior Court challenging the program EIR entitled Planning & Conservation League v. Department of Water Resources, ("PCL")

Pursuant to the Monterey Amendment, in March 1999, Castaic resolved to purchase from Kern and its member unit in Kern County, Wheeler Ridge, an entitlement to 41,000 acre-feet per year of water (the Kern water transfer). Castaic acted as lead agency and on March 29, 1999 certified an EIR for the transfer which tiered off the 1995 Monterey Amendment program EIR.

In April 1999, Castaic's EIR for the Kern water transfer was challenged in Friends of the Santa Clara River v. Cataic Lake Water Agency, BS056954 ("Friends"). On August 16, 2000, the trial court entered judgment, denying the petition in its entiretly.

Also in 2000, the Third Appellate District found the program EIR for the Monterey Agreement to be indequate in Planning & Conservation League v. Department of Water Resources, ("PCL") (2000) 83 CalApp.4th 892. The PCL appellate court directed the Sacramento Superior court to retain jurisdiction over the PCL action until a new EIR was prepared and certified.

Based on the Third District's PCL decision, on January 10, 2002, the Second Appellate District reversed the judgment in Friends and directed the trial court to issue a writ of mandate compelling Castaic to set aside certification of its EIR. The reversal was based on the fact that Castaic's EIR had been tiered upon the now inadequate Monterey Agreement EIR. The Second District, however, rejected all of the other challenges to Castaic's EIR, finding them to be without merit. The appellate court noted that Castaic may be able to cure the defect by waiting for DWR to comply with the Third District's directive in PCL by preparing a new program EIR. Castaic could issue a subsequent EIR, a supplement to EIR, or addendum to EIR, tiering upon the new Montery Agreement EIR.

The Friends appellate decision concluded as follows: "The judgment is reversed. The trial court shall issue a writ of mandate vacating the certification of the EIR, shall retain jurisdiction until Respondent certifies an EIR complying with CEQA consistent with the views expressed in this opinion, and shall consider such orders it deems appropriate under [Pub. Resources Code] section 21168.9."

On October 25, 2002, after remand from the court of appeal, the Friends trial court issued a Peremptory Writ of Mandate and Judgment on Remand, retaining jurisdiction until Castaic certifies an EIR that complies with CEQA and is consistent with the views expressed by the Second District. The trial court considered and denied the petitioner's request to enjoin Castaic from using any of the 41,000 acre feet of additional water alloted to it by the Kern water transfer.[2]

On June 6, 2003, the Sacramento Superior Court approved a settlement in PCL in which DWR agreed to prepare a new EIR for implementation of the Monterey Agreement, including the Kern water transfer (the "Settlement Agreement"). The Settlement Agreement also provided that the Monterey Amendment would remain in operation until the EIR is prepared. The Settlement Agreement expressly acknowledged the Friends litigation in Los Angeles Superior Court concerning Castaic's 1999 EIR for the Kern water transfer, with the parties agreeing that "jurisdiction with respect to [Friends] should remain in that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in

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[2]This decision was upheld by the court of appeal on December 1, 2003, in case no. B164027 ("Friends II"). PCL filed an *amicus* brief supporting the petitioner in Friends II.

that pending litigation." PCL Settlement Agreement at 12.

On December 30, 2004, Castaic filed its return to the peremptory writ of mandate in Friends. The return stated that Castaic had certified a new EIR (the 2004 EIR) on December 22, 2004 and approved the Kern water transfer.

CWIN and PCL did not intervene in Friends. Instead, on January 24, 2005, CWIN and PCL filed separate petitions for writ of mandate in Ventura County concerning Castaic's compliance with CEQA in the 2004 EIR, and other issues.

On February 1, 2005, Petitioner in Friends filed a dismissal with prejudice. On February 7, 2005, the trial court in Friends held a hearing on Castaic's *ex parte* application to vacate Petitioner's dismissal with prejudice and seeking an order discharging the writ of mandate. Castaic argued that, by dismissing, Petitioner was attempting to get the clerk, through ministerial act, to divest the court of its continuing jurisdiction over the 2004 EIR prepared in response to the court's peremptory writ of mandate. Instead, Petitioner was passing the baton to CWIN and PCL, which initially filed the instant action in Ventura County, for a challenge to the 2004 EIR.

Castaic argued that the petitioner's dismissal violated the one judgment rule in that there had already been a judgment in the proceeding. Moreover, once Castaic filed its return, the trial court was required to "determine whether there had been adequate compliance with the previously issued writ." (Citation omitted.) Any order of discharge without a determination that the 2004 EIR complies with CEQA would be a material variance from the directions of the appellate court. Since any challenge to the 2004 EIR had to be made in the Friends action, and since Petitioner had failed to challenge it, Castaic was entitled to have the dismissal vacated and an order discharging the previously issued writ of mandate.

The trial court declined to set aside the dismissal, stating that whether the Ventura proceedings were a continuation of the Friends lawsuit was an issue of fact for the Ventura (now this) court.

On March 5, 2005, Cataic petitioned the Second Appellate District for a writ of mandate with respect to the trial court's refusal to vacate the dismissal, arguing that the trial court violated Pub. Resources Code section 21168.9 (stating that the trial court shall maintain jurisdiction over the agency's proceedings until the court has determined that the agency has complied with CEQA) because it had not yet determined that the 2004 EIR complied with CEQA Yet, under CEQA, a trial court that orders preparation of a new EIR must retain jurisdiction for a final determination of the EIR's validity.

On April 14, 2005, the Second Appellate District denied Castaic's petition for "failure to demonstrate that the 'retain jurisdiction' provision of Public Resources Code section 21168.9, subdivision (b), abrogates the entitlement to voluntary dismissal conferred by Code of Civil Procedure section 581, subdivision (b)(1)."[3]

C. Analysis

Castaic argues that Petitioners are barred by the doctrine of *collateral estoppel* from

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[3]The Second District later dismissed Castaic's appeal from the Friends dismissal, finding that the voluntary dismissal was not appealable. *See* H.D. Arnaiz, Ltd. v. County of San Joaquin, (2002) 96 Cal.App.4th 1357, 1364-67.

claiming that Castaic is not the proper lead agency for an EIR for the Kern water transfer.

"*Res judicata*, or claim preclusion, prevents relitigation of the same cause of action in a second suit between the same parties or parties in privity with them." Teitelbaum Furs, Inc. v. Dominion Ins. Co., Ltd., (1962) 58 Cal. 2d 601, 604.(Italics added). "*Collateral estoppel*, or issue preclusion, 'precludes relitigation of issues argued and decided in prior proceedings.'" Mycogen Corp. v. Monsanto Co., (2002) 28 Cal.4th 888, 896. (Italics added). (Italics added) (quoting Lucido v. Superior Court, (1990) 51 Cal.3d 335, 341). *Collateral estoppel* is intended to preserve the integrity of the judicial system, promote judicial economy, and protect litigants from harassment by vexatious litigation. Lucido, 51 Cal.3d at 335, 343. *Collateral estoppel* applies to bar re-litigation of an issue if (1) the issue is identical to an issue litigated in the first action; (2) the issue was actually litigated and necessarily decided in the first action; (3) the party in the second action was a party or one in privity to a party in the first action; and (4) the decision in the first action was on the merits. McCutchen v. City of Montclair, (1999) 73 Cal. App. 4th 1138, 1145.

In its June 27, 2006 ruling on the demurrers, the court held that CWIN and PCL are bound by the Second District's decision that the 1999 EIR was acceptable but for its tiering upon the Monterey Agreement program EIR. *See* Federation of Hillside & Canyon Assns. v. City of Los Angeles, (2005) 126 Cal.App.4th 1180, 1204. However, Petitioners are not bound by the Friends petitioner's actions on Castaic's return, including Friends' failure to attack the 2004 EIR, because they were not in privity with the Friends petitioner at that stage of the Friends litigation.

The issue on this motion is the extent to which Petitioners are *collaterally estopped* with respect to the 1999 EIR. The Friends petitioner made no argument that Castaic was the wrong lead agency for the 1999 EIR, and actually argued for remedies of a new EIR with Castaic as lead agency. The Second District in Friends, relying on the Third District opinion in PCL, expressly acknowledged that it had an obligation under Public Resources Code section 21005(c) to address all deficiencies in the 1999 EIR unless it found that the EIR was prepared by an improper lead agency. 95 Cal.App.4th at 1387.

Petitioners CWIN and PCL here contend that they are not foreclosed from arguing that Castaic cannot act as lead agency. They point out that they are challenging Castaic's 2004 EIR, not the 1999 EIR. They contend that the issue is whether Castaic wrongly usurped DWR's lead agency duties in preparing the 2004 EIR at a time when it knew, pursuant to the PCL decision and the subsequent court-approved settlement of that case, that DWR was the lead agency for preparing a new EIR for implementation of the Monterey Agreement, which includes analysis of the Kern water transfer as part of the "overall larger scheme" of the Monterey EIR. According to Petitioners, this issue could not have been litigated in Friends, and is not foreclosed by *collateral estopppel* principles.

CWIN and PCL expound on their position as follows. DWR is required to be the lead agency for the Monterey EIR, which will examine all water transfers on a program level. After the Monterey EIR is prepared, Castaic may act as lead agency for an EIR that tiers off the Monterey EIR. Any other procedure would be "inconsistent" with PCL's clear direction that DWR is the appropriate lead agency for a program-level environmental review of the water transfers in the Monterey Agreement, rendering the PCL court's directive that DWR assume the lead agency role a nullity. While the Friends decision did not preclude Castaic from serving as lead agency for a project level EIR for the Kern water transfer, this does not mean that Castaic

may serve as the lead agency for "first-level" environmental review of the water transfer.

The Friends court reversed the trial court's approval of the 1999 EIR solely because the 1999 EIR tiered upon the Monterey Agreement program EIR (an EIR which the PCL court found to be deficient in part because it was prepared by the Central Coast Water Agency, a State Water Contractor, not DWR). The Friends decision acknowledged that it was required to address all deficiencies in the EIR unless it made a finding of improper lead agency. Castaic's status as the improper lead agency for the 1999 EIR is a deficiency which the appellate court was obligated to address if it existed under Pub. Resources Code section 21005(c). The Friends court concluded that the only deficiency in the 1999 EIR was tiering off the defective Monterey Agreement program EIR, necessarily implying that Castaic was the proper lead agency for the 1999 EIR.

Thus, it is fair to conclude that the Friends court decided as a preliminary matter that Castaic was the proper agency for the 1999 EIR. Although the issue of lead agency was not expressly addressed, it was "necessarily decided" as a preliminary issue. In this regard, *collateral estoppel* will apply "even though some factual matter or legal arguments which could have been presented were not." Bleeck v. State Board of Optometry, (1971) 18 Cal.App.3d 415, 429.

However, in order for *collateral estoppel* to apply, the issue of lead agency must also have been "actually litigated." McCutchen v. City of Montclair, 73 Cal. App. 4th at 1145. It is hard to see how the issue could have been actually litigated since the Friends petitioner did not raise it. Castaic might argue that the answer lies in CEQA's scheme. Piecemeal attacks on an EIR are not permitted; the strictly enforced statutes of limitations under CEQA mean as a practical matter that any defect not raised in the petition is foreclosed. *See* Lee v. Lost Hills Water Dist., (1978) 78 Cal.App.3d 630, 634. Thus, the Friends petitioner's failure to contend that Castaic was an improper lead agency arguably means that the issue was "actually litigated" in Castaic's favor, even though not argued by the petitioner.

The court will assume *arguendo* that the issue of Castaic as the proper agency for the 1999 EIR was both "actually litigated and and necessarily decided," and that *collateral estoppel* will apply to prevent Petitioners CWIN and PCL from contending that Castaic is the improper lead agency for the 1999 EIR.

Of course, CWIN and PCL argue that they are not attacking the 1999 EIR, they are attacking the 2004 EIR. The question becomes whether estoppel from contending that Castaic cannot be the lead agency for the 1999 EIR affects Petitioners' position that Castaic is the improper lead agency for the 2004 EIR.

The 1999 EIR purported to tier off of the Monterey Agreement program EIR, and the answer depends on the definition of lead agency, the nature of program EIRs, and tiering under CEQA.

The lead agency under CEQA is the agency that carries out a project or has primary authority for approving a project. Guideline §15051; *see* PCL, 83 Cal.App.4th at 904 (DWR, not Central Coast Water Authority (a State Water Contractor), had principal responsibility for carrying out the Monterey Agreement and should have been lead agency for program EIR). Where two or more agencies meet the criteria to act as a CEQA lead agency, the agency that acts first on the project is the lead agency. Guideline §15051(c).

The purpose of a program EIR is is to document a series of actions so related that they can be characterized as one project. Friends, 95 Cal.App.4th at 1377. If the program EIR is

sufficiently comprehensive, the lead agency may dispense with further environmental review for later activities within the program that are adequately covered in the program EIR. Guidelines §15618(c).

Thus, the program EIR may be used to focuse or simplify later environmental review, or as the basis of a tiered EIR. "Tiering" means the coverage of genearal matters and environmental effects in an EIR prepared for a policy, plan, program or ordinance, followed by narrower or site-specific EIRs which incorporate by reference the discussion in the prior report. *See* Pub. Resources Code §§ 21068.5, 21093 and Guideline §§ 15152, 15385. Tiering is favored "whenever feasible, as determined by the lead agency." Publ Resources Code §21093(b). It is required where a prior EIR has been prepared and certified for a program, plan, or ordinance. Pub. Resources Code §21094(a).

As of this motion, the Monterey Agreement program EIR has been decertified and there is no program EIR (though one is apparently being prepared). There is nothing for Castaic to tier from at this time. Whether Castaic can act as lead agency for the 2004 EIR depends on whether the "project" for that EIR is properly defined as the Kern water transfer. It may be that the Monterey Agreement is a series of actions (including the Kern water transfer) so related that they should be characterized a single project. If so, then DWR may be required to be the lead agency for the 2004 EIR. On the other hand, the Kern water transfer may be the appropriate definition of "project" for the 2004 EIR. If so, then Castaic may serve as the lead agency.

This issue was not addressed in Friends, and Petitioners are not *collaterally estopped* from arguing it now. They are only foreclosed from contending that Castaic is the improper lead agency for any EIR on the Kern water project that is tiered off of a program EIR for the Monterey Agreement. The result sought by Castaic would mean that neither the Friends petitioner nor Petitioners would be able to contend that Castaic cannot be the lead agency on a Kern water transfer EIR that does not tier off a program EIR. Such a result does not accord with principles of *collateral estoppel* or with CEQA.[4]

D. Conclusion

The motion for legal determination is denied. Petitioners are not foreclosed either by *collateral estoppel* or their own admission from contending that Castaic is the improper lead agency on the 2004 EIR, which is an EIR for the Kern water transfer which does not tier from a Monterey Agreement program EIR.

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[4]Separate and apart from *collateral estoppel*, Petitioners are bound by a concession in their briefs that Castaic may act as lead agency *at some point* for the EIR on the Kern water transfer. But this concession is entirely consistent with the above argument that Castaic can act as lead agent on the Kern water transfer EIR tiered off a program EIR, but cannot do so for the Kern transfer without tiering off a program EIR.

California Water Impact Network v. Castaic Lake Water Agency
BS 098724

Statement of Decision on Petition for Writ of Mandate

FILED
LOS ANGELES SUPERIOR COURT
APR 0 2 2007
JOHN A. CLARKE, CLERK
A. Fajardo
BY A. FAJARDO, DEPUTY

Petitioners California Water Impact Network ("CWIN") and Planning and Conservation League ("PCL") petition for writ of mandate under California Environmental Quality Act ("CEQA"). The court has read and considered the moving papers, oppositions, and reply, heard oral argument, and renders the following decision.

A. Statement of the Case

Petitioner CWIN commenced its petition for writ of mandate in Ventura County Superior Court on January 24, 2005. The petition alleges that on December 23, 2004, the Castaic Lake Water Agency ("Castaic"), a public water agency and water wholesaler that treats and delivers water to water retailers in Los Angeles and Ventura Counties, approved the permanent transfer of 41,000 acre feet per year from Real Party in Interest Kern County Water Agency ("Kern") and its member unit in Kern County, Wheeler Ridge-Maricopa Water Storage District ("Wheeler Ridge"), to Castaic (the "Kern water transfer," the "Kern transfer," or the "transfer"). Castaic also purported to certify the Environmental Impact Report ("EIR") for the project (the "2004 EIR" or the "EIR"). Petitioner claims the Kern water transfer "threatens to promote large-scale urban sprawl in Ventura and Los Angeles Counties, while diverting water from important environmental and agricultural uses in Kern County forever." Petitioner alleges that the 2004 EIR is premature, and fails to comply with CEQA.

The petition alleges a cause of action for violation of CEQA in that Real Party in Interest California Department of Water Resources ("DWR"), not Castaic, should have been the lead agency for the 2004 EIR, which does not adequately describe the background on which the project is based, fails to disclose a reliance on an invalid Urban Water Management Plan, fails to adequately describe alternatives to the project, including a "no project" alternative, fails to discuss growth inducement, and inaccurately states the availability of water availability.[1]

On January 24, 2005, PCL filed its own petition for writ of mandate against Castaic in Ventura County Superior Court. The PCL petition alleges a violation by Castaic in recording a Notice of Determination on December 23, 2004, certifying the 2004 EIR and rendering its approval of the Kern water transfer. The petition purports to allege five "causes of action" for violation of CEQA in the 2004 EIR based on Castaic stealing DWR's duty to be the lead agency for the EIR, certification of a defective EIR, approval of inadequate findings, erroneous presentation of the project as already complete, and "prejudicial abuse of discretion."

On June 22, 2005, upon motion by Castaic, the Ventura County Superior Court (the Honorable Frederick H. Bysshe, Jr.) ordered the transfer of both petitions, which had been consolidated, to Los Angeles. On March 27, 2006, the case was reassigned to this court.

On June 27, 2006, the court heard the demurrers of Castaic and Real Party in Interest Kern to the consolidated petitions. The court ruled that the petitions were timely filed and were

[1]On CWIN's oral motion, the petition's second and third causes of action have been dismissed. As a result, CWIN's petition solely concerns Castaic's compliance with CEQA in the 2004 EIR.

not barred under the doctrine of *res judicata*. The court noted that the Kern water transfer agreements are valid. While principles of *collateral estoppel* barred Petitioners from re-raising issues resolved by the Second District with respect to the 1999 EIR, this conclusion did not foreclose the petitions and the demurrers were overruled.

On July 16, 2006, the court denied Castaic's motion for a legal determination under principles of *collateral estoppel* and party admission that Castaic is the proper lead agency for preparation of the EIR for the Kern water transfer. However, Petitioners are bound by their concession that Castaic may act as the lead agency at some point for an EIR on the Kern water transfer.

B. Preliminary Issues

1. Standing and Timeliness

Petitioner PCL alleges that it is a non-profit corporation devoted to environmental protection. PCL Pet. at ¶6-7. Some of PCL's members live in the area affected by the Kern water transfer. PCL Pet. at ¶8. Petitioner CWIN alleges that it is a nonprofit public benefit corporation the purpose of which is to protect California's environment. CWIN contends that it is impacted by the Kern water transfer because its members reside in and use the Santa Clara River watershed, which is impaired by the water transfer. CWIN Pet. at ¶9. Thus, Petitioners contend that they are impacted by the project and have standing to raise the issues herein. Respondents do not contest Petitioners' standing. *See* Waste Management of Alameda County, Inc. v. County of Alameda, (2000) 79 Cal.App.4th 1223, 1233-34.

The actions are timely on CEQA issues, each having been filed on January 24, 2005, within 30 days of Castaic's Notice of Determination that the 2004 EIR had been certified, filed in various counties between December 23 and December 27, 2004. *See* Pub. Res. Code §21167(c).

2. The Administrative Record

Castaic has certified the administrative record. Pub. Res. Code §21167.6; LASC 9.24(e). The record was received in evidence at trial.

Castaic and Kern, and DWR separately ask the court to judicially notice various records. Judicial notice is the acceptance by a court without formal proof of the existence of a matter of law or fact that is relevant to an issue in the case. People v. Rowland, (1992) 4 Cal.4th 238, 268, n.6. Certain documents are subject to judicial notice. Ev. Code §451, 452. Even where subject to judicial notice, however, a document must be relevant. Id.

The California Supreme Court decision in Western States Petroleum Assn. v. Superior Court, ("Western States") (1995) 9 Cal.4th 559, 573, n.4, provides that extrinsic evidence is generally not admissible for a traditional mandamus challenging a quasi-legislative agency action. The exclusion of extrinsic evidence in a traditional mandamus action is essentially the exclusion of irrelevant evidence. Extrinsic evidence is generally not admissible for a traditional mandamus challenging a quasi-legislative agency action. Id. Such evidence may be admissible in a narrowly construed exception in which (1) the evidence in question existed before the agency made the decision, and (2) the evidence could not have been presented to the agency in the first instance in the exercise of reasonable diligence. Id. at 578. The purpose of limiting extra-record evidence is that the free use of such evidence would invade the deference to which the legislative

branch is entitled under the constitutional separation of powers. If the courts freely considered extra-record evidence in mandamus cases, the highly deferential substantial evidence standard would be turned into a *de novo* standard where the courts in effect would decide not whether an administrative decision was supported by the evidence before the agency but instead whether it was the wisest and best decision according to the courts. Id. at 572.

Castaic asks the court to judicially notice: (1) the unpublished appellate decision in Friends of the Santa Clara River v. Castaic Lake Water Agency, 2003 Cal.App. Unpub. LEXIS 11239, dated December 1, 2003 ("Friends II"), and (2) the unpublished appellate decision in California Water Network v. Castaic Lake Water Agency, 2006 Cal.App. Unpub. LEXIS 2452, dated March 23, 2003.[2] The existence of these court decisions is subject to judicial notice. Ev. Code §452(d).[3]

DWR asks the court to judicially notice (1) Amendment No. 19 to the Water Supply Contract between it and Castaic dated May 28, 2003, and (2) Notice of Preparation of EIR for the Monterey Amendment dated January 24, 2003. DWR contends that these documents are official acts of a California agency subject to judicial notice under Ev. Code section 452(c) and (d). The Notice of Preparation is an official act of DWR and is judicially noticed. However, Amendment No. 19 is not. Official acts should be limited to regulations, public announcements, and other actions the existence of which is beyond dispute. A well informed person has no way of knowing whether Amendment No. 19 is authentic and valid. Nor is it a court record under section 452(d). DWR's request for judicial notice of Amendment No. 19 is denied.

C. Statement of Facts

1. SWP

In 1951, the Legislature authorized construction of a state water storage and delivery system. Planning & Conservation League v. Department of Water Resources, (2000) 83 Cal.App.4th 892, 898. The Legislature subsequently authorized the State Water Project ("SWP"), a complex system of 28 reservoirs and dams, 26 power and pumping plants, and 600 miles of canals and aqueducts to deliver 4.23 million acre-feet of water annually to Central and Southern California. The primary source for the SWP is the drainage of the Feather River, a tributary of the Sacramento River in Northern California (hereinafter, the "Delta").

DWR is the state agency charged with the statutory responsibility to build, manage, and operate the SWP. Essentially, DWR is the wholesale provider of water to middlemen agencies. In 1961, DWR entered into individual contracts with various agricultural and urban water suppliers in the State, referred to as State Water Contractors. *See* Water Code §12937. There are 29 agencies or districts that currently are State Water Contractors.

The SWP water contracts entitled the contractors to receive an annual amount of SWP

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[2]Castaic also supplied the court with copies of its decisions on demurrer and motion for legal determination in this case, which need not be judicially noticed.

[3]Real Party Wheeler purports to join in Castaic's request for judicial notice. In its ruling on the demurrers, the court informed Wheeler of the futility of a joinder as merely a cheerleading effort. No further discussion of the purported joinder is necessary.

water in exchange for a proportionate share of financing and maintaining the SWP facilities. Each water contract contains provisions for both allocation of the amount of water available each year and costs among the contractors. Each contract identifies a Table A amount, the annual maximum amount of water which DWR agrees to deliver, if available for delivery, to each SWP contractor on an annual basis. Delivery of the Table A amount is not assured, but rather provides the basis for proportional allocation of available water among contractors. The Table A amount is specified as either agricultural or urban (M&I). Each contract also includes Article 40, which permits water transfers between contractors, and Article 41, which requires DWR approval of any transfer subject to reasonable terms and conditions. AR 2356.

Each contractor annually submits a request to DWR for water delivery in the following year, up to the amount in Table A. In a year when DWR is unable to deliver the total of contractor requests, deliveries to all contractors will be reduced. The current Table A totals are 4.17 million acre-feet per year.[4] In fact, given existing facilities and contractor demands, the SWP can only deliver an average of 2.96 million acre-feet per year.

2. The Monterey Agreement

Historically, the delivery of less than Table A totals was not a significant problem because contractor demand was less than the Table A amounts. However, in the late 1980's and early 1990's, a drought led to SWP deliveries in amounts below that requested by contractors. Articles 18(a) and (b) of the SWP water contracts addressed DWR's temporary and permanent inability to deliver the water allocations listed in Table A of the contracts by requiring agricultural contractors to accept a reduction in water first before any remaining reduction was shared by urban contractors. In 1990, agricultural contractors received only half their requested water and none in 1991. Because contractors pay their proportionate share of fixed costs regardless of how much water is delivered, the agricultural contractors were paying for water they were not receiving and they were displeased. As a result, urban and agricultural water contractors clashed over DWR's delivery obligations and the proper interpretation of Article 18. AR 45-46.

In December 1994, five State Water Contractors and and DWR reached agreement on a broad set of fourteen principles (the "Monterey Agreement"). Among other things, the Monterey Agreement changed the allocation between agricultural and urban contractors of entitlements to SWP water. The Monterey Agreement eliminated Article 18 and specified that all SWP water was to be allocated in proportion to Table A amounts. Paragraph 24 of the Monterey Agreement provides for the permanent transfer of 130,000 acre-feet from certain willing agricultural contractors, including KWCA, to urban contractors, as implemented by individual agreement. AR 2515. It also provides that individual contractors may transfer entitlements among themselves beyond the 130,000 acre feet proposed, with DWR expeditiously executing any necessary documents and approving all such contracts. Other provisions of the Monterey Agreement include a revision of water allocations during shortages, eliminating the "agriculture first" provision, and retirement of 45,000 other acre-feet of entitlement by agricultural contractors.

[4]An "acre-foot" is the amount of water that would cover one acre one foot deep.

The Monterey Agreement provides that individual SWP contracts could be amended to conform to it. Over the next two years, 27 of the 29 Water Contractors amended their SWP contracts to implement the principles of the Monterey Agreement (collectively, the "Monterey Amendments").

In 1995, a State Water Contractor, Central Coast Water Authority ("Central"), acted as lead agency and certified a program EIR analyzing the environmental impacts of the Monterey Agreement. This program EIR also addressed Paragraph 24 (Article 53 in the Monterey Amendments) water transfers, including the Kern water transfer. In late 1995, PCL filed a lawsuit in Sacramento Superior Court challenging the program EIR, Planning & Conservation League v. Department of Water Resources, ("PCL").

3. The Kern Water Transfer Agreement

Castaic is a State Water Contractor created by the California Legislature. Its mandate is to purchase and deliver sufficient supplies of water to serve the needs of the Santa Clarita Valley. *See* Swanson v. Marin Municipal Water District, (1976) 56 Cal.App.3d 512, 524 (water district has obligation to augment available water to meet increasing demands). Castaic diverts its SWP water from the West Branch of the California Aqueduct. Castaic is one of the Water Contractors entering into the Monterey Amendments (Amendment 17 to Castaic's SWP contract).

Kern County Water Agency ("KCWA") is a special district formed by the Legislature in 1961. Wheeler Ridge is a special district formed in 1959 to provide supplemental water to agricultural lands in Kern County and is located immediately north and east of Castaic. KCWA has contracts with Wheeler Ridge and other member agencies, for KCWA's SWP water.[5]

In March 1999, Castaic entered into an agreement to purchase from Wheeler Ridge, subject to KCWA's consent, 41,000 acre-feet per year of SWP water (the Kern water transfer). The price for the transfer was $47 million in debt instruments purchased by private investors. The purpose of the transfer is to permit Castaic to serve the water demands of existing users, as well as meet a portion of future water demand from anticipated growth within the Castaic service area. AR 16. The Kern water transfer is the largest transfer under Article 53 of the Monterey Amendments, and it counts towards the 130,000 acre-feet limit. In their transfer agreement, both sides warranted that there was no pending or threatened litigation other than PCL that could affect the 41,000 acre feet SWP entitlement. AR 2562-63.[6]

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[5]In 1998, another KCWA member, Belridge Water Storage District, certified an EIR on the environmental effects of transferring 130,000 acre-feet of SWP water to unidentified purchasers. This EIR was not challenged.

[6]Castaic has been planning since 1987 to increase the supply of water to Santa Clarita Valley. At that time, Los Angeles County General Plan forecast substantial population growth in the Santa Clarita Valley. In 1988, Castaic adopted a Capital Program and Water Plan (the "Capital Program") to address the purchases, construction, and improvements necessary to meet the anticipated water demand. The Capital Program called for the purchase of SWP water from districts willing to sell, including Wheeler Ridge, and the storage of water for later use during drought conditions at Semitropic Groundwater Storage District's ("Semitropic") basins. AR

DWR's approval of the Kern water transfer was required under Articles, 15, 41, and 56 of the SWP contracts. On March 31, 1999, DWR approved the transfer by entering into Amendment 18 of Castaic's SWP contract. Amendment 18 adds Article 53(j), which provides that "in accordance with Article 53(a)" of the Monterey Amendments, Castaic's Table A annual entitlements were increased by 41,000 acre-feet. AR 2545-47. DWR and KCWA, which consented to the transfer of its water, also entered into Amendment 28 to KCWA's SWP contract, an amendment which reduced KCWA's entitlement by 41,000 acre-feet. Based on these amendments, DWR has allocated SWP water to Castaic since 1999 based on a total Table A amount of 95,000 acre-feet -- Castaic's original Table A 54,000 acre-feet plus the 41,000 acre-feet from the Kern water transfer.

On March 29, 1999, Castaic, acting as lead agency, certified an EIR for the Kern water transfer. This 1999 EIR tiered off the 1995 Monterey Amendment program EIR, the Belridge EIR, and Castaic's own 1988 EIR for the Capital Program. In April 1999, Castaic's EIR for the Kern water transfer was challenged in Friends of the Santa Clara River v. Cataic Lake Water Agency, BS056954 ("Friends"). On August 16, 2000, the trial court entered judgment, denying the petition in its entirety.

4. The PCL and Friends Decisions

In September 2000, the Third Appellate District in PCL found that DWR was the only entity with the "statewide perspective and expertise" to serve as lead agency for the Monterey Agreement program EIR. Because "the allocation of water to one part of the state has potential implications for distribution throughout the system," the court recognized DWR's principal responsibility to "facilitate the water transfers allowed under the Monterey Agreement." 83 Cal.App.4th at 907. The use of Central as lead agency for the Monterey Agreement program EIR was inappropriate. Id. at 907.

This lead agency error was not harmless because the EIR also was defective. Perhaps as a consequence of Central's lack of statewide expertise, the EIR failed to properly discuss a "no project" alternative, including the environmental impact of implementing the pre-Monterey Agreement Article 18(b)'s permanent water shortage provision. Id. at 918. This was particularly important because local land use planners rely on the "paper water" entitlements in Table A

41845.

Pursuant to the Capital Program, Castaic permanently acquired 12,700 acre-feet of SWP Table A water in 1991 from Devil's Den Water District, a SWP contractor immediately north of Castaic. This transfer was subject to DWR approval, which per Article 41 of the SWP contracts could not be unreasonably withheld. DWR approved the transfer, noting that the transferred water remained labeled for "agricultural purposes" for purposes of delivery shortages.

Also pursuant to the Capital Program, in 2002 Castaic entered into a groundwater storage or "banking" agreement with Semitropic. This action was challenged under CEQA on the basis that the Monterey Agreement required DWR to conduct an environmental review. The challenge was rejected by the appellate court, which held that DWR had no jurisdiction over Castaic's management of water; DWR merely schedules SWP water delivery to Castaic. Cal. Water Network v. Castaic Lake Water Agency, (2006) 206 Cal.App. Unpub. LEXIS 2452, 9.

rather than real, deliverable water. The question was what impacts were reasonably foreseeable from eliminating Article 18(b)'s solution to permanent water shortage? Id. at 914-15. The PCL court held that the EIR, which lacked simulation models and projections relating to land use planning and demand for water, did not adequately address this issue. Id. at 919. It directed the Sacramento Superior Court to retain jurisdiction over the action until a new EIR was prepared and certified.

Based on the Third District's PCL decision, on January 10, 2002, the Second Appellate District reversed the judgment in Friends and directed the trial court to issue a writ of mandate compelling Castaic to set aside certification of its EIR. Friends, (2002) 95 Cal.App.4th 1373. The reversal was based solely on the fact that Castaic's EIR had been tiered upon the now inadequate Monterey Agreement program EIR. The Second District rejected all of the other challenges to Castaic's EIR, finding them to be without merit. The appellate court noted that Castaic may be able to cure the defect by waiting for DWR to comply with the Third District's directive in PCL by preparing a new program EIR. Castaic could issue a subsequent EIR, a supplement to EIR, or addendum to EIR, tiering upon the new Monterey Agreement EIR.

The Friends appellate decision concluded as follows: "The judgment is reversed. The trial court shall issue a writ of mandate vacating the certification of the EIR, shall retain jurisdiction until Respondent certifies an EIR complying with CEQA consistent with the views expressed in this opinion, and shall consider such orders it deems appropriate under [Pub. Resources Code] section 21168.9."

On October 25, 2002, after remand from the court of appeal, the Friends trial court issued a Peremptory Writ of Mandate and Judgment on Remand, retaining jurisdiction until Castaic certifies an EIR that complies with CEQA and is consistent with the views expressed by the Second District. The trial court did not direct Castaic to set aside its approval of the Kern water transfer and denied the petitioner's request to enjoin Castaic from using any of the 41,000 acre feet of additional water allotted to it by the Kern water transfer. The trial court did state that the injunction request could be renewed upon a showing that the water was actually used for an improper purpose (irreversible new development).

5. Monterey Plus

On June 6, 2003, the Sacramento Superior Court approved a settlement between the parties in PCL. That settlement, known as "Monterey Plus," provides that the Monterey Agreement can proceed on an interim basis. In exchange, DWR agreed, among other things,[7] to prepare a new program EIR for implementation of the Monterey Agreement. This new EIR would include (1) information on water deliveries during the drought and recent historical period, (2) an analysis of a no project alternative, including the environmental impact of Article 18's water shortage provisions, (3) analysis of environmental impacts from changes in SWP operations and deliveries resulting from implementation of the Monterey Agreement, (4) analysis

[7]Some of the other provisions include biennial reports on project reliability, land use restrictions on the Kern Water Bank, new guidelines for permanent water transfers, new procedures for public involvement in contract changes, and funding for watershed restoration and new technical studies. AR 45048-49.

of environmental impacts of seven already completed water transfers from KWCA and member units totaling 70,000 acre-feet (Attachment E), which the parties recognized were "final," and of the Kern water transfer, which the parties acknowledged was being challenged in the pending Friends litigation in Los Angeles Superior Court, and (5) analysis of the environmental impacts from implementation of Monterey Plus. AR 48557-59. With respect to the Kern water transfer, the Monterey Plus parties agreed that "jurisdiction with respect to [Friends] should remain in that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation." The Monterey Plus did not require DWR to re-approve or disapprove any transfer.

6. The Friends II Decision

The Second District upheld the Friends trial court's decision not to grant injunctive relief for the Kern water transfer on December 1, 2003, in unpublished case no. B164027 ("Friends II"). PCL had filed an *amicus* brief supporting the petitioner in Friends II, pointing out that the Monterey Plus settlement now existed and arguing that the Friends decision required the trial court to rely on the status of PCL litigation, including the new Monterey Agreement program EIR DWR was to prepare, in deciding injunctive relief. The Friends II appellate court stated that PCL was wrong; it merely had suggested, not required, that the trial court could determine and rely on the status of the PCL case in deciding injunctive relief.

7. The 2004 EIR

After Friends, Castaic decided to prepare a revised EIR prior to DWR's preparation of a Monterey Amendment EIR. Castaic was driven by a concern that the Friends petitioner and others would use the decertification of its 1999 EIR to cloud its right to the transferred water, as well as Castaic's duty to its customers to complete the environmental documentation and finalize the Kern water transfer.

In June 2004, Castaic prepared and circulated a draft EIR that tiered only on Castaic's 1988 Capital Program EIR. Castaic concluded that it was the lead agency because it has the principal responsiblility for carrying out and implementing the project. Because the transfer is between neighboring SWP contractors, involving the withdrawal of water from a single branch of the Aqueduct, Castaic concluded that the transfer has no significant impacts on SWP operations or the water diverted from the Delta. *See* AR 13-14.

PCL served comments to the draft EIR on August 16, 2004. These comments criticized the use of Castaic as lead agency, arguing that Castaic's review was "premature" and "likely to operate at cross-purposes with DWR's statewide review." AR 1959. PCL contended that DWR, not Castaic, was required to be the lead agency under the PCL decision. Only DWR's expertise could analyze the changes in the amount of supplies available, the location and timing of deliveries, and changes in the SWP's conveyance and storage facilities for all of the proposed transfers, including the Kern water transfer. AR 1962. CWIN also timely expressed concern about Castaic's lack of authority to act as lead agency, and the potential for conflict with DWR's role. AR 578-580.

DWR, acting as a responsible agency under CEQA, commented on the draft EIR. It stated that the "document adequately and thoroughly discusses the proposed project and its

impacts. The [draft]EIR discusses the effects of the project on the environment and State Water Project (SW) and uses baseline conditions consistent with those being considered for inclusion in [DWR's EIR]. The draft also "adequately discusses the reliability of the SWP, pre- and post-Monterey Amendment conditions, future conditions, and SWP operations." DWR acknowledged that Castaic's EIR uses a model, DWRSIM, to assess the potential impact associated with the Kern transfer and that DWR's EIR will use a newer model, CALSIM II. DWR indicated that the use of a different computer model may cause slight changes in results, which may lead DWR to different conclusions than those made by Castaic in its EIR. Despite this fact, DWR concluded that the draft EIR adequately discusses the reliability of SWP, pre- and post- Monterey Amendments conditions, future conditions, and SWP operations. AR 564-65.

Castaic rejected Petitioners' concerns, and relied on DWR's comments to refute objections that its draft EIR will be inconsistent with the yet to be prepared DWR program EIR. AR 961-4. Castaic adopted findings, a mitigation monitoring program and statement of overriding considerations and certified a final EIR (the 2004 EIR).[8] The 2004 EIR describes Castaic's water program for the future needs of Santa Clarita Valley, the procedural history of the project (including the 1999 EIR), and the fact that the Kern water transfer has been implemented and ongoing since 1999. It uses two separate baselines for the project setting and evaluates environmental impacts of the Kern water transfer on the SWP, Castaic, and Wheeler Ridge. In discussing these impacts, the 2004 EIR considers three SWP scenarios: (a) with the Monterey Agreement, (b) without the Monterey Agreement, and (c) without the Monterey Agreement and with Article 18(b) permanent shortages. The EIR uses the DWRSIM model and concludes no significant direct environmental impacts will occur as a result of the project. There would, however, be indirect growth impacts as a result of water provided by the project.

8. The Petitioners Take Over from the Friends Petitioner

On January 24, 2005, CWIN and PCL filed separate petitions for writ of mandate in Ventura County concerning Castaic's compliance with CEQA in the 2004 EIR, and other issues.

On February 1, 2005, the Friends petitioner dismissed the action with prejudice. On February 7, 2005, the trial court in Friends held a hearing on Castaic's *ex parte* application to vacate the dismissal with prejudice and to discharge the writ of mandate. Castaic argued that, by dismissing, the petitioner was attempting to get the clerk, through ministerial act, to divest the court of its continuing jurisdiction over the 2004 EIR prepared in response to the court's peremptory writ of mandate. Instead, the Friends petitioner was passing the baton to CWIN and PCL for a challenge to the 2004 EIR. The trial court declined to set aside the dismissal, stating that whether the Ventura proceedings were a continuation of the Friends lawsuit was an issue of fact for the Ventura (now this) court.

On March 5, 2005, Castaic petitioned the Second Appellate District for a writ of mandate with respect to the trial court's refusal to vacate the dismissal, arguing that the trial court violated Pub. Resources Code section 21168.9 (stating that the trial court shall maintain jurisdiction over the agency's proceedings until the court has determined that the agency has complied with

[8]On December 30, 2004, Castaic filed its return to the peremptory writ of mandate in Friends.

CEQA) because it had not yet determined that the 2004 EIR complied with CEQA Yet, under CEQA, a trial court that orders preparation of a new EIR must retain jurisdiction for a final determination of the EIR's validity.

On April 14, 2005, the Second Appellate District denied Castaic's petition for "failure to demonstrate that the 'retain jurisdiction' provision of Public Resources Code section 21168.9, subdivision (b), abrogates the entitlement to voluntary dismissal conferred by Code of Civil Procedure section 581, subdivision (b)(1)."[9]

D. CEQA

1. Standard of Review

A party may seek to set aside an agency decision for failure to comply with CEQA by petitioning for either a writ of administrative mandamus (CCP §1094.5) or of traditional mandamus. CCP §1085. A petition for administrative mandamus is appropriate when the party seeks review of a "determination, finding, or decision of a public agency, made as a result of a proceeding in which by law a hearing is required to be given, evidence is required to be taken and discretion in the determination of facts is vested in a public agency, on the grounds of noncompliance with [CEQA]." Pub. Res. Code §21168. This is generally referred to as an "adjudicatory" or "quasi-judicial" decision. Western States Petroleum Assn. v. Superior Court, ("Western States") (1995) 9 Cal.4th 559, 566-67. A petition for traditional mandamus is appropriate in all other actions "to attack, review, set aside, void or annul a determination, finding, or decision of a public agency on the grounds of noncompliance with [CEQA]." Where an agency is exercising a quasi-legislative function, such as by adopting a rule or entering into a contract, it is properly viewed as a petition for traditional mandamus. Id. at 567; Pub. Res. Code §21168.5.

At issue here is a CEQA challenge to a quasi-legislative action recorded by Castaic in a December 23, 2004 Notice of Determination approving the project, certifying the 2004 EIR, and adopting findings, a mitigation monitoring program, and a statement of overriding considerations. This procedural setting, where no administrative hearing was held or required, is governed by traditional mandamus. In determining whether to grant a petition for traditional mandamus in a CEQA case, the court may consider only whether there was a prejudicial abuse of discretion. Public entities abuse their discretion under CEQA if the agency has not proceeded in a manner required by law or if its determination or decision is not supported by substantial evidence. Western States, 9 Cal.4th at 568; Pub. Res. Code §21168.5.[10]

This requires "scrutiny of the alleged defect" depending on whether the claim is predominately "improper procedure or dispute over the facts." Vineyard Area Citizens for

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[9]The Second District later dismissed Castaic's appeal from the Friends dismissal, finding that the voluntary dismissal was not appealable. *See* H.D. Arnaiz, Ltd. v. County of San Joaquin, (2002) 96 Cal.App.4th 1357, 1364-67.

[10]The standard of review for traditional mandamus in a non-CEQA case is governed by an "arbitrary and capricious" standard, not a "prejudicial abuse of discretion" standard. The CEQA standard is the more stringent inquiry. Western States, 9 Cal.4th at 574.

Responsible Growth v. City of Rancho Cordova, ("Vineyard") (2007) 40 Cal.4th 412, 435. Whether Castaic is the proper lead agency is an procedural issue of law for the court. PCL, 83 Cal.App.4th at 905-06. Similarly, as Petitioners argue (Pet. Supp. Resp. Br. at 5), whether Castaic's 2004 EIR failed to provide certain required information and, as a result, presents uncertainties about the finality of the Kern water transfer is failing "to proceed in a manner required by CEQA" and an issue of law. Vineyard, 40 Cal.4th at 435. These issues require "a critical consideration, in a factual context, of legal principles and their underlying values." Harustak v. Wilkins, (2000) 84 Cal.App.4th 208, 212.

On the other hand, whether Castaic abused its discretion in the 2004 EIR's findings must be answered with reference to the evidence in the administrative record. This standard requires deference to the agency's factual and environmental conclusions based on conflicting evidence, but not to issues of law. Laurel Heights Improvement Assn. v. Regents of University of California, ("Laurel Heights") (1988) 47 Cal.3d 376, 393, 409. Argument, speculation, and unsubstantiated opinion or narrative will not suffice.[11] Guidelines, 15384(a), (b). The findings must be supported by "substantial evidence," defined as "enough relevant information and reasonable inferences from this information that a fair argument can be made to support a conclusion, even though other conclusions might also be reached. CEQA Guidelines §15384(a). The question whether substantial evidence exists is a question of law. *See* California School Employees Association v. DMV, (1988) 203 Cal.App.3d 634, 644.

2. CEQA

The purpose of CEQA (Pub. Res. Code §21000 *et seq.*) is to maintain a quality environment for the people of California both now and in the future. Pub. Res. Code §21000(a). "[T]he overriding purpose of CEQA is to ensure that agencies regulating activities that may affect the quality of the environment give primary consideration to preventing environmental damage." Save Our Peninsula Committee v. Montery County Board of Supervisors, (2001) 87 Cal.App.4th 99, 117. CEQA must be interpreted "so as to afford the fullest, broadest protection to the environment within reasonable scope of the statutory language." Friends of Mammoth v. Board of Supervisors, (1972) 8 Cal.3d 247, 259. Public agencies must regulate both public and private projects so that "major consideration is given to preventing environmental damage, while providing a decent home and satisfying living environment for every Californian." Pub. Res. Code §21000(g).

The Legislature chose to accomplish its environmental goals through public environmental review processes designed to assist agencies in identifying and disclosing both environmental effects and feasible alternatives and mitigations. Pub. Res. Code §21002.

Under CEQA, a "project" is defined as any activity which may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment (1) undertaken directly by any public agency, (2) supported through contracts, grants, subsidies, loans or other public assistance, or (3) involving the issuance of a lease, permit,

[11]As an aid to carrying out the statute, the State Resources Agency has issued regulations called "Guidelines for the California Environmental Quality Act ("Guidelines"), contained in Code of Regulations, Title 14, Division 6, Chapter 3, beginning at section 15000.

license, certificate, or other entitlement for use by a public agency. Pub. Res. Code §21065. The word "may" in this context means a reasonable possibility. Citizen Action to Serve All Students v. Thornley, (1990) 222 Cal.App.3d 748, 753. "Environment" means the physical conditions which exist within the area which will be affected by a proposed project, including land, air, water, minerals, flora, fauna, noise, objects of historic or aesthetic significance. Guidelines, §21060.5.

The "project" is the whole of the action, not simply its constituent parts, which has the potential for resulting in either direct or reasonably foreseeable indirect physical change in the environment. Guidelines §15378. An indirect physical change must be considered if that change is a reasonably foreseeable impact which may be caused by the project. On the other hand, a change that is "speculative or unlikely to occur is not reasonably foreseeable." Guidelines §15064(d)(3). The term "project" may include several discretionary approvals by government agencies; it does not mean each separate government approval. Guidelines §15378(c).

The EIR is the "heart" of CEQA, providing agencies with in-depth review of projects with potentially significant environmental effects. Laurel Heights, 6 Cal.4th at 1123. An EIR describes the project and its environmental setting, identifies the potential environmental impacts of the project, and identifies and analyzes mitigation measures and alternatives that may reduce significant environmental impacts. Id. Using the EIR's objective analysis, agencies "shall mitigate or avoid the significant effects on the environment... whenever it is feasible to do so. Pub. Res. Code §21002.1. The EIR serves to "demonstrate to an apprehensive citizenry that the agency has in fact analyzed and considered the ecological implications of its actions." No Oil, Inc. v. City of Los Angeles, (1974) 13 Cal.3d 68, 86. It is not required to be perfect, merely that it be a good faith effort at full disclosure. Kings County Farm Bureau v. City of hanford, (1990) 221 Cal.App.3d 692, 711-12. A reviewing court passes only on its sufficiency as an informational document and not the correctness of its environmental conclusions. Laurel Heights, 47 Cal.3d at 392. An EIR will be upheld if it suffices as an informational document; mandate will issue only if it fails to include relevant information which precludes informed decision-making and informed public participation.

"Choosing the precise time for CEQA compliance involves a balancing of factors. EIRs... should be prepared as early as feasible in the planning process to enable environmental considerations to influence project program and design and yet late enough to provide meaningful information for environmental assessment." Guidelines, §15004(b). As a general rule, public agencies shall not undertake actions concerning a proposed project that would have a significant adverse effect or limit the choice of alternatives or mitigation measures before completion of CEQA compliance. Guidelines, §15004(b)(2). "[I]n order to achieve the salutary objectives of CEQA the determination of the earliest feasible time to [prepare the CEQA document] is to be made initially by the agency itself, which decision must be respected in the absence of manifest abuse." Mount Sutro Defense Committee v. Regents of University of California, (1978) 77 Cal.App.3d 20, 36, 40.

E. Analysis

CWIN and PCL argue that DWR is required to be the lead agency for the Monterey Amendments project EIR, which will examine all water transfers on a program level. The Kern

water transfer is part of the Monterey Amendments project. Therefore, DWR is the correct lead agency to conduct the environmental review of the Kern water transfer. According to Petitioners, while Castaic may not serve as the lead agency for "first-level" environmental review of the water transfer, it may serve as lead agency for a project level EIR for the Kern water transfer.

1. Validity of the Transfer

At the outset, the court must make clear an issue greatly discussed at hearing. Petitioners contend, and Castaic and Wheeler Ridge strongly dispute, that DWR may "invalidate" the Kern water transfer when it performs the program EIR.

Under contract and validation law, the Kern water transfer contract, entered into in 1999, is valid, has been approved by DWR, and Castaic has paid Wheeler Ridge for it. Neither the parties nor DWR can terminate the Kern transfer contract. Nothing in CEQA permits a public agency to void a contract.

In Kenneth Mebane Rranches v. Superior Court, (1992) 10 Cal.App.4th 276, a flood control district sought to condemn land outside its territory in order to mitigate the environmental impact of a project within its boundaries. The appellate court held that CEQA only requires mitigation of environmental impacts where it is feasible to do so. Where mitigation is infeasible, an agency can always approve a project notwithstanding environmental impacts if it issues a statement of overriding interests. But it cannot take actions that are not legal, and hence infeasible. 10 Cal.App. at 291-92.

Thus, in evaluating the environmental effects of the Monterey Agreement, DWR may impose mitigations that are legal. But it cannot invalidate the Kern transfer. The imposition of illegal mitigations would be infeasible. *See also* Pub. Res. Code §21004 (in mitigating significant environmental impact, agency may only employ powers provided by law).[12]

This does not mean that DWR's Monterey Amendments EIR cannot affect the Kern water transfer. DWR's EIR will consider the environmental impacts of the Kern water transfer in conjunction with the Attachment E transfers which the parties in Monterey Plus agreed were completed and final. DWR conceivably could conclude that these transfers have significant environmental impacts. As a consequence, DWR might have to impose feasible mitigation measures, adopt alternatives, or make a finding of infeasibility and adopt a statement of overriding considerations.[13] If mitigations/alternatives are adopted, they could significantly impact Castaic and Wheeler Ridge. As DWR states, "the contract amendments that effectuated the transfers under the Monterey Amendment[s] do not preclude DWR in its choice of

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[12]The parties disagree on whether the Monterey Amendments are valid and final. That is, they disagree on whether the amendments can be challenged in a reverse validation action separate and apart from CEQA. Resolution of this issue is unnecessary to the court's decision.

[13]At hearing, Petitioners' counsel stated that the parties to Monterey Agreement entered into a joint statement of the possible impacts from the Amendments, citing AR 48628-29. The joint statement at those pages of the record does not discuss possible mitigations; it merely summarizes the terms of Monterey Plus.

alternatives in the Monterey Amendment[s] EIR or mitigation measures that may need to be imposed to reduce significant impacts to less than significant." DWR Br. at 20. DWR gives an example of reducing the amount of SWP water to protect water quality standards for fish in the Delta. Id. at 20. These mitigations could undermine the Kern water transfer.[14] But DWR will not be considering whether the Kern water transfer is valid; it simply does not have the authority to void that transfer. *See* Kenneth Mebane Ranches v. Superior Court, (1994) 10 Cal.App.4th 276, 292.

2. Lead Agency Law

The lead agency under CEQA is the agency that carries out a project or has primary authority for approving a project. Pub. Res. Code 121067; Guidelines §15051; *see* PCL, 83 Cal.App.4th at 904 (DWR, not Central (a State Water Contractor), had principal responsibility for carrying out the Monterey Agreement and should have been lead agency for program EIR). The role and responsibility of the lead agency is "fundamental to the CEQA process as a whole." Guidelines §15050. The identification of the proper lead agency plays a "crucial role" in the division of responsibilities among public agencies reviewing a project. PCL, 83 Cal.App.4th at 903. When determining the appropriate lead agency, the courts look to determine which agency has principal responsibility for the core project activity. Friends of Cuyamaca Valley v. Lake Cuyamaca, (1994) 28 Cal.App.4th 419, 427. The lead agency responsibility is placed upon the agency with power to approve or disapprove the project. Lexington Hills v. State of California, (1988) 200 Cal.App.3d 415, 433. Though one agency has substantial responsibility for a project, it cannot act as lead agency if another agency bears final responsibility. *See* Fullerton Joint Union High School District v. Board of Education, (1982) 32 Cal.3d 779, 795, n.15 (State Board of Education, not county, had final responsibility for school district plan). Where the project is local, such as land use decisions, the agency that has general governmental power over a project is almost always the lead agency. Where two or more agencies are involved in a project, the agency that will carry out the project shall be the lead agency. Guidelines §15051(a).

3. The Impact of the PCL Decision

Petitioners contend that the PCL decision left no doubt that DWR is the appropriate lead agency for a program-level environmental review of the water transfers in the Monterey Agreement, contrasting DWR's statewide expertise with CCWA's "provincial experience." The Monterey Amendments restructure water distribution throughout the state, and the "allocation of water to one part of the state has potential implications for distribution throughout the system." Only DWR has principal responsibility for implementation of the Monterey Amendments. Op. Br. at 11-12; *see* PCL, 83 Cal.App.4th at 904, 908. Since the Kern water transfer is part of the Monterey Amendments, DWR must perform any EIR concerning the Kern water transfer.

Petitioners' argument is a *non-sequitur*. Nothing in PCL requires DWR to perform the environmental review for the Kern water transfer. Certainly, the PCL decision requires that DWR prepare the program EIR for the Monterey Amendments, now Monterey Plus. The

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[14]The close cooperation between DWR and Castaic on the 2004 EIR reduces, but does not eliminate, the prospect that DWR will impose alternatives or mitigations.

appellate court's reason for committing this task to DWR is that CEQA requires the lead agency to be the agency with principal responsibility for the project, the project is the environmental review of the Monterey Agreement, and DWR, not CCWA, has principal responsibility for implementing the Monterey Agreement. The decision pointed out that DWR manages the SWP, and has the statewide expertise and perspective to conduct the environmental review of the Monterey Agreement, which statewide project. While CCWA may have had a substantial stake in seeing the Monterey Agreement implemented, it did not have principal responsibility for it. DWR did, and DWR is required to perform the EIR for the Monterey Agreement. 83 Cal.App.4th at 906.

However, the PCL decision does not commit DWR to conduct the EIR for the Kern water transfer, or for any site specific project conducted pursuant to the Monterey Amendments. The PCL decision plainly requires DWR to prepare the program EIR for the Monterey Amendments, and its permanent transfer of 130,000 acre feet of SWP water. But it does not even mention the Kern water transfer, which is a local water transfer of Wheeler Ridge water to a point 60 miles further south in Santa Clarita Valley. The local nature of the project makes Castaic the logical choice to act as lead agency of this transfer, and nothing in PCL requires Castaic to wait for DWR's program EIR. The Kern water transfer is simply a different project from the Monterey Amendments.

Petitioners' concession that at some point Castaic can and should act as the lead agency for the Kern water transfer EIR undermines their argument that PCL committed this task to DWR. The concession shows that Petitioners really are concerned about the timing of this project specific EIR, and not whether it was committed to DWR in the PCL decision. Petitioners contend that Castaic must wait for DWR's Monterey Amendments program EIR and tier off of it for the Kern water transfer EIR. This argument is, as Castaic describes it, that Castaic "jumped the gun" by preparing the 2004 EIR. But the argument implicitly concedes that PCL did not commit the transfer EIR to DWR.

4. The Agency with Principal Responsibility

Even if PCL did not commit environmental review of the Kern water transfer to DWR, Petitioners argue that the Kern water transfer is an integral part of the Monterey Amendments project. This is shown by Monterey Plus, which excludes the Kern water transfer from the list of transfers designated as "final" and recognizes DWR's responsibility to assess its environmental impacts as part of the programmatic review. The Kern water transfer contract itself expressly relies on the Monterey Amendments, using its provisions as authority to accomplish the Kern water transfer. Even Wheeler Ridge's amendment to its SWP contract identifies the outcome of PCL as a factor that could impact the Kern water transfer's effectiveness. All of these facts, Petitioners argue, mean that the transfer is part of the Monterey Amendments environmental review.

Petitioners further argue that the nature of a program EIR supports their position. This purpose "is to document a series of actions so related they can be characterized as one project." Friends, 95 Cal.App.4th at 1377. The Monterey Amendments, including its transfer provisions, qualify as a "series of actions so related that they can be characterized as one project." An integrated review of the entire program may provide occasion for a more exhaustive

consideration of effects and alternatives than would be practical in an EIR on an individual action, ensure consideration of cumulative actions that might be slighted on a case-by-case analysis, avoid duplicative reconsideration of basic policy considerations, and allow the lead agency to consider broad policy alternatives and program-wide mitigation measures at an early time when the agency has greater flexibility to deal with basis problems or cumulative impacts. Id. at 1377. These factors are all borne out by the 2004 EIR, which presents a series of issues (the amount of supplies available to several water agencies, the location and timing of SWP deliveries, and use of SWP conveyance and storage facilities) on which DWR has superior expertise and greater accountability than Castaic. DWR may not delegate to Castaic its responsibility to prepare the environmental review for the Kern water transfer.

Under lead agency law, Castaic may act as lead agency and prepare an EIR for the Kern water transfer. The Kern water transfer is a project separate in time from the Monterey Amendments, now Monterey Plus. The core of the project is a local transfer of water between Castaic and Wheeler Ridge. Castiac alone had the responsibility to determine the water needs of its service area and to obtain the necessary water for those needs. Castaic negotiated and entered into the transfer contract with Wheeler Ridge. Castaic performed the contract by obtaining private investors who paid $47 million to Wheeler Ridge's water, and by taking delivery from DWR. The transfer is valid and cannot be challenged. Thus, Castaic has the general governmental power over the transfer, and is presumptively the lead agency for its own project. Bakman v. Dept. of Transportation, (1979) 99 Cal.App.3d 665, 678-79. Indeed, the environmental review of water transfers is generally performed by a local, not state, agency. County of Amador v. El Dorado County Water Agency, (1999) 76 Cal.App.4th 931 (local agency's analysis of water transfer project); Save Our Carmel River v. Monterey Peninsula Water Management District, (2006) 141 Cal.App.4th 677, 701 (city was lead agency as recipient of water transfer); Friends of the Eel River v. Sonoma County Water Agency, (2003) 108 Cal.Appp.4th 859 (local agency's EIR for plan to increase diversions of water from river); Sierra Club v. West Side Irrigation District, (2005) 128 Cal.App.4th 690 (local agency's environmental review of two projects to transfer water rights).[15]

It is true that DWR has an overall interest in promoting effective water management on a statewide basis. Pursuant to this interest, DWR had the right to approve the Kern water transfer, and it did so. This does not equate to principal responsibility, however. DWR is required by statute to "facilitate" the voluntary transfer of water between local agencies. Water Code §109.

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[15]The Friends court implicitly decided that Castaic may act as lead agency for the Kern water transfer. The Friends court acknowledged that it was required to address all deficiencies in the EIR unless it made a finding of improper lead agency. Pub. Res. Code §21005(c). If Castaic was the improper lead agency for the 1999 EIR, the appellate court was obligated to say so. The Friends court concluded that the 1999 EIR's only deficiency was that it tiered from the defective Monterey Agreement program EIR. Thus, the decision necessarily implied that Castaic was the proper lead agency for the 1999 EIR.

Of course, this case concerns the 2004 EIR, not the 1999 EIR, and the court previously held that Petitioners were not bound by the Friends court's implied determination. But the project is the same, and the implicit appellate determination is entitled to weight.

Per the SWP contracts, DWR's approval of the Kern water transfer could not be unreasonably withheld. Thus, DWR's involvement in the transfer is to facilitate the transfer by approving it and providing the SWP schedule delivery. Moreover, the SWP is intended as a supplement, not the exclusive supply, of water. Water supply decisions must be made by local Water Contractors, who obtain water both from SWP and other sources.[16]

Given that the decision to enter into the Kern water transfer belonged solely to Castaic and Wheeler-Ridge, and that DWR's approval is necessary merely to facilitate the transfer, Casataic had principal responsibility for the transfer.[17]

5. Project Definition

Petitioners contend for the first time in their Supplemental Vineyard Reply and at oral argument that the correct project definition is not the Kern water transfer, but is really the Monterey Amendments, citing the court's earlier ruling on Castaic's motion for legal determination that the key issue is whether the Amendments are a "series of actions (including the Kern water transfer) so related that they should be characterized as a single project." Pet. Supp. Reply at 5.

The correct definition of the project -- whether it is the Monterey Amendments or the Kern water transfer -- is a different issue than whether Castaic can act as lead agency for the project. Although the court did allude to project definition in ruling on the earlier motion, Petitioners never raised this issue in their opening brief or reply. Instead, they raise it for the first time in a reply brief on the application of Vineyard to this case. On appeal, an issue raised without analysis or authority lacks foundation and need not be addressed. City of Arcadia v. State Water Resources Control Board, ("Arcadia") (2006) 135 Cal.App.4th 1392, 1429, 1431. Similarly, an issue raised for the first time in supplemental reply deprives the opposing party of an opportunity to analyzing the issue and defend their position. Petitioners have waived the correct project definition as an issue by not raising it earlier.

Assuming *arguendo* that the issue has not been waived, a project under CEQA includes an activity directly undertaken by a public agency which may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment. Pub. Res. Code §21065(a). The "project" must be broadly defined, so as to ensure against avoiding environmental review by "chopping a larger project into little ones" or "piecemealing." Bozung v. Local Agency Formation Commission, (1975) 13 Cal.3d 263, 283-84. The project includes "the whole of an action" that has a potential for resulting in a direct or indirect physical change in the environment. Guidelines §15378. An accurate project description is necessary for an intelligent evaluation of the potential environmental effects of a

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[16]As Wheeler Ridge points out, DWR was not the lead agency for the 1991 Devils Den transfer or any of the Attachment E transfers listed in the Monterey Agreement.

[17]Given that DWR's approval may not be unreasonably withheld, cases holding that a state agency should prepare the EIR where it has final authority to approve a project are simply inapposite. *See* Fullerton v. State Board of Education, (1982) 32 Cal.3d 779, 795, n.15 (State Board of Education had final authority to submit plan to voters for new unified school district).

proposed activity. Mcqueen v. Board of Directors, (1988) 202 cal.App.3d 1136, 1143. The agency must avoid "piecemealing" or splitting a project into two or more segments. Otherwise, the cumulative environmental impacts of each piece may not be fairly analyzed. Burbank-Glendale-Pasadena Airport Authority v Hensler, (1991) 233 Cal.App.3d 577, 592. On the other hand, CEQA was not intended to and cannot reasonably be construed to make a project of every activity of a public agency, regardless of the nature and objective of such activity...." Simi Valley Recreation & Park District v. Local Agency Formation Commission, (1975) 51 Cal.App.3d 648, 663.

In San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus, (1994) 27 Cal.App.4th 713, 731-32, the court held that the project description in an EIR was improperly restricted to a 633 single family residential units, a 40,500 square foot commercial center, and a 14 acre park, failing to include sewer expansion which the EIR acknowledged would be required as part of the development. Although a separate EIR was prepared for the sewer expansion, neither it nor the development project EIR referred to the growth-inducing effects of the two projects considered together. This failure to address cumulative impacts was a separate failure of the development EIR. 27 Cal.App.4h at 733. "[t]he danger of filing separate environmental documents for the same project is that considration of the cumulative impact on the environment of the two halves of the project may not occur. This danger was here realized." Id. at 734 (citation omitted). Because the EIR did not "adequately apprise all interested parties of the true scope of the project for intelligent weighing of the environmental consequences of the project" informed decision-making was precluded, the EIR was inadequate. Id.

The lesson from San Joaquin and other project definition cases is that the project should be defined broadly to ensure a complete analysis of impacts resulting from future expansion or continuation of other phases of the project.

In this case, DWR is the lead agency for the Monterey Amendments program EIR. DWR's description of its project is to improve the management of SWP supplies and operations through the Monterey Amendments. Thus, the Monterey Amendments EIR is broad in scope. The EIR will look at changing the allocation of all SWP water supplies (including deletion of agriculture first shortage provisions), retiring 45,000 acre feet of agricultural water, and establishing more efficient use of SWP facilities. As part of the analysis, it will analyze the potential impacts from permanently transferring 130,000 acre feet of water from agricultural to urban contractors per the Monterey Agreement. This analysis will look at the individual transfers, including the Kern water transfer, as they fit the entire Monterey Amendments. But DWR does not intend to consider each transfer individually; it intends to evaluate the impact of all the Attachment E transfers and the Kern water transfer as a whole. DWR Br. at 17.

Castaic's 2004 EIR project description concerns the impacts of the Kern water transfer alone. Castaic's EIR does look at cumulative impacts of the project with other projects, including the Monterey Amendments, but does not purport to assess the environmental impacts of the Monterey Amendments independent of the Kern water transfer. AR 141-42.

Castaic relies on the independent utility test to argue that the Kern water transfer is a separate project the environmental impact of which may be separately analyzed from the Monterey Amendments. The "independent utility" test has been developed in NEPA cases to determine whether multiple actions are connected so as to require an agency to consider them in

a single environmental review. Wetlands Action Network v. United Sates Army Corps. Engineers, (9th Cir. 2000) 222 F.3d 1105, 1118.[18] Pursuant to the independent utility test, where each of two projects would have taken place with or without the other, each has "independent utility" and the two are not considered so connected that an agency must consider them in a single environmental review. Native Ecosystems Council v. Dombeck, (9th Cir. 2002) 304 F.3d 886, 894. *See also* DelMar Terrace Conservancy, Inc. v. City Council of the City of San Diego, (1992) 10 Cal.App.4th 712 (freeway segment was separate project serving a viable purpose even if long-term, multi-segment plan to expand freeway never occurred, and had independent utility under CEQA).

Castaic argues that it has contemplated the Kern water transfer since 1988, when it included a transfer with Kern in its 1988 Capital Program for the Santa Clarita Valley's future water needs. For economic reasons, Wheeler Ridge, too, sought to transfer its SWP water rights since approximately 1985. Castaic concludes that the Kern water transfer would have occurred with or without the Monterey Amendments. Articles 40 and 41 of the SWP contract permitted transfers between Water Contractors, subject to DWR approval. Article 53, added to the SWP contracts by the Monterey Amendments and concerning the transfer of 130,000 acre-feet, did not "enlarge, restrict, or otherwise impact" Castaic's right to acquire water from Wheeler Ridge under Articles 40 and 41. Instead, it was merely a blanket approval of certain contemplated transfers. Castaic Op. Br. at 21. The Kern water transfer was completed, paid for, and operating since 1999. Nothing about it is tied to the outcome of the Monterey Amendments. Thus, while the transfer is part of a larger scheme (the Monterey Amendments), it is a long-planned site specific project with independent utility from the Monterey Amendments.

The court cannot conclude that the Kern water transfer would have taken place without the Monterey Amendments. True, Castaic has wanted Wheeler Ridge's SWP allocation of water since the late 1980's, and Wheeler Ridge was willing to provide it. Yet, it did not happen until after the Monterey Amendments. The contract between Castaic and Wheeler Ridge states that the transfer was taking place "in accordance with" Article 53 of the Monterey Amendments, and those Amendments change the way SWP water is allocated in California. It does not say that the transfer is being made under Article 41. Petitioners contend, and the court agrees, that only through conjecture can one conclude that Castaic and Wheeler Ridge would have entered into the transfer without the Monterey Amendments, and with Article 18's agriculture first provisions in place.[19]

Though the court cannot conclude that the Kern water transfer would have occurred without the Monterey Amendments, it can conclude that the transfer will remain in effect even if the Monterey Amendments are not approved or otherwise are mitigated under CEQA. The court

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[18]Since CEQA was modeled on the federal NEPA statute, federal decisions on NEPA are persuasive authority on CEQA issues. No Oil, Inc. v. Los Angeles, (1974) 13 Cal.3d 68, 86.

[19]When Petitioners commented on the draft EIR that any pre-Monterey Amendments transfer would be subject to Article 18's agriculture first provisions, Castaic did not say that the Kern transfer would have occurred without the Monterey Amendments. It merely responded that the transfer "could occur" either pre- or post- Monterey Amendments. AR 993.

already has indicated that the Kern water transfer is final. The parties to the transfer stated at hearing that they have no intention of rescinding it even if the Monterey Amendments are mitigated and Article 18's agriculture first provisions are in effect. This position is supported by the fact that the 2004 EIR evaluates the water supply impacts of just such a pre-Monterey Amendment Article 18 scenario. AR 186. As such, it is compelling evidence that the transfer will stand.[20]

Plainly, then, the Kern water transfer is final and will remain in place whatever happens to the Monterey Amendments. As such, the transfer has "independent utility" for purposes of environmental review. It is not so connected to the larger Monterey Amendments that the two must must be considered in a single environmental review. *See* Native Ecosystems Council v. Dombeck, 304 F.3d at 894.

6. EIR Timing

Petitioners' real argument seems to be that, whenever a program EIR is anticipated, the agency preparing an EIR for a specific project must wait for the program EIR.

This is not the law. Nothing in CEQA requires Castaic to wait for DWR's program EIR. Indeed, as a general proposition, the environmental review process should be undertaken early enough in the planning process to impact planning decisions, with the timing committed to the agency's discretion. City of Vernon v. Board of Harbor, (1988) 63 Cal.App.4th 677, 690-91. The Kern water transfer occurred almost eight years ago. It has been paid for and operating for a number of years. Castaic tried to conduct a timely environmental review, but that EIR was set aside in Friends. It is not an abuse of discretion for Castaic to want to complete the environmental review and obtain finality for the transfer without waiting for DWR's program EIR of the Monterey Amendments, now Monterey Plus.

Nor does this decision frustrate the law concerning program EIRs and tiering. The purpose of a program EIR is to document a series of actions so related that they can be characterized as one project. Friends, 95 Cal.App.4th at 1377. If the program EIR is sufficiently comprehensive, the lead agency may dispense with further environmental review for later activities within the program that are adequately covered in the program EIR. Guidelines §15618(c). Thus, the program EIR may be used to focus or simplify later environmental review, or as the basis of a tiered EIR. "Tiering" means the coverage of general matters and environmental effects in an EIR prepared for a policy, plan, program or ordinance, followed by narrower or site-specific EIRs which incorporate by reference the discussion in the prior report. *See* Pub. Resources Code §§ 21068.5, 21093 and Guideline §§ 15152, 15385. Tiering is favored "whenever feasible, as determined by the lead agency." Pub. Resources Code §21093(b). It is required where a prior EIR has been prepared and certified for a program, plan, or ordinance. Pub. Resources Code §21094(a). However, tiering is only required "where a prior environmental report has been prepared and certified for a program." Friends, 95 Cal.App.4th at 1383. It is not required, and in fact is prohibited, where the program EIR has yet to be prepared. Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova, ("Vineyard") (2007) 40 Cal.4th 412

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[20]Petitioners think so too, for their principal argument is premised on the 2004 EIR's assumption that the transfer is final for all purposes.

EIR cannot tier off of *future* environmental document).

7. Vineyard

In Vineyard, the Supreme Court addressed a county prepared EIR for a large land use development project known as "Sunrise Douglas." The principal issue was the availability of long-term water supply for the project, and the environmental impacts and mitigation for such supply. The Supreme Court analyzed the various water supply cases and distilled several principles. First, the EIR for a land use project must present sufficient facts to evaluate the pros and cons of supplying the amount of water the project will need, and not simply ignore or assume a water supply solution will be found for a development project. Second, an adequate EIR for a large project must show water supply for the entire project. It is not enough to show available water for early stages. While the agency may tier and defer analysis of certain details of later phases of long-term or complex projects, deferring analysis through tiering is appropriate when the impacts or mitigation measures are not determined by the first-tier approval and are specific to later phases. Third, the future water supplies identified and analyzed must bear a likelihood of actually being available. Finally, where there is some uncertainty about availability, CEQA requires some discussion of possible replacement sources or alternatives, and their environmental consequences.

Of particular use herein, the Supreme Court discussed the EIR's reliance on an anticipated local Water Board's master plan update, which would discuss the availability of long-term water supplies to the area and their environmental impact. The Court held that the county's EIR cannot tier from a *future* environmental document. If the environmental analysis from the Water Board's anticipated master plan update was important to understanding the long-term water supply for Sunrise Douglas, it should have been performed in the Sunrise Douglas EIR even though that might result in subsequent duplication by the Water Board's master plan update. Or, the county could have deferred analysis and approval of Sunrise Douglas until the Water Board's master plan update, then tiered the Sunrise Douglas EIR from the programmatic analysis performed by the Water Board.

The Vineyard decision shows that the timing of Castaic's project specific EIR in relation to DWR's program EIR is up to Castaic. It may either wait for DWR's program EIR and tier off of it, or prepare its own EIR for the Kern water transfer first. If it chooses the latter, Castaic may not tier off an environmental document that does not yet exist. Instead, Castaic must analyze all necessary environmental impacts and mitigations. If analysis of some portion of the Monterey Amendments is important to understanding the environmental impacts of the Kern water transfer, then analysis of that issue must be included in Castaic's EIR. But if Castaic's EIR does so, it is irrelevant that the document duplicates some of what DWR would do, or even that it may be inconsistent with DWR's analysis.[21] As DWR contends, CEQA's goal is to ensure sufficient information; it contains no prohibition against too much information. DWR Br. at 21. The timing of Castaic's EIR for the Kern water transfer is up to Castaic and Castaic alone.

[21] As previously stated, the prospect of inconsistencies between Castaic's EIR and DWR's program EIR is diminished by Castaic's use of DWR modeling, DWR's comments and input into the 2004 EIR, and the general cooperation and coordination between the two agencies.

F. Contents of the 2004 EIR

Apart from the proper lead agency, Petitioners argue that the 2004 EIR is inadequate. Initially, the court believed that Castaic could have real problems on this issue. It is one thing for Castaic to act as lead agency on a water transfer before the program EIR is prepared; Vineyard and other case law say that Castaic may do so. But the EIR must be adequate and complete. Vineyard teaches that if analysis of some portion of the Monterey Amendments is important to understanding the environmental impacts of the Kern water transfer, then that analysis must be included in Castaic's EIR. PCL held that the "no project" alternative was particularly important for the Monterey Amendments, and the public was entitled to know what would happen if the Amendments were not approved and Article 18 was implemented in the event of water shortage. Commentators particularly wanted to know whether imposition of Article 18 might eliminate the "paper water" entitlements in the water contracts, reduce land planning decisions based on that paper water, and ultimately reduce growth and construction of additional SWP facilities. PCL, 83 Cal.App.4th at 892-3.

The court wondered whether Castaic would have the expertise to perform any analysis of the Monterey Amendments or the "no project" alternative that would be required in the 2004 EIR. However, the parties' briefs, and oral argument at hearing, have demonstrated that, with one exception, the 2004 EIR's contents are sufficiently presented. Indeed, Petitioners barely criticize the 2004 EIR's adequacy, except as it impacts the lead agency issue.

1. "Deception"

Petitioners' principal argument about content is that the 2004 EIR is deceptive in failing to make clear that the Kern water transfer is not "final." They contend that the 2004 EIR's project definition treats the Kern water transfer as an immutable *fait accompli* which fails to disclose that the "final status" of the transfer depends on the DWR's forthcoming review. According to Petitioners, the EIR improperly relies on the interim availability of the water to predict that DWR will "leave it in place," a point which the court in California Oak Foundation v. City of Santa Clarita, ("California Oak") (2005) 133 Cal.App.4th 1219, 1238, n.16 had no trouble dispatching, and also improperly states that it would be unnecessary and speculative to consider what the DWR might do to change the transfer (*See* AR 994). Pet. Op. Br. at 19-20. This false assumption that the transfer is immutable may result in land use decision-makers approving projects based on water availability "worth little more than a wish and a prayer." Id. at 20-21.

The court has determined that the transfer is final as a matter of law. Therefore, the EIR is not wrong in saying so. What Petitioners really contend is that the Kern water transfer, though final, can be affected by the DWR's program EIR through mitigations and imposition of alternatives. Yet, the EIR proceeds as if the transfer cannot be altered. As counsel described the issue at hearing, the 2004 EIR "talks about risk, but never directly informed the public about the fact that the transfer may be unwound through the Monterey Amendment EIR process." Thus, the EIR refers to the transfer as of an "*existing* 41,000 " acre feet of SWP Table A water (AR 15, 35) and states that "no permits or *other approvals* would be required other than" certification of the

EIR. AR 16.[22]

The EIR is the method for disclosure of environmental issues. Rural landowners Assn. V City Council, 43 Cal.App.3d 1013, 1020. CEQA's purpose is to compel agencies to make decisions with environmental consequences in mind, but CEQA does not and cannot guarantee that these decisions will always favor environmental concerns. Laurel Heights, 47 Cal.3d at 393. The EIR should provide sufficient analysis to allow decision-makers to make intelligent judgments about environmental consequences. Guidelines §15151. The evaluation of environmental effects need not be exhaustive, but the EIR's sufficiency is reviewed in the light of what is reasonably foreseeable. Id. Perfection is not required, but adequacy, completeness, and a good faith effort at full disclosure is. Id.

In California Oak, the court addressed the proposed development of a 584 acre industrial park project in the Santa Clarita. The City's EIR relied on the Kern water transfer for water supply, and the appellate court held that it did not adequately address the uncertainty in that water delivery. 133 Cal.App.4th at 1236. The City's comments "did little more than dismiss project opponents' concerns about water supply" and the EIR failed to discuss the adequacy and availability of water supply absent the Kern water transfer. Appendix K to the EIR did acknowledge uncertainty in the Kern water transfer, but this was insufficient in part because inforamtion "scattered here and there in EIR appendices" or a report "buried in an appendix" is not a substitute for good faith reasoned analysis. Id. at 1239 (citation omitted). Moreover, Appendix K contained no facts and analysis about the likelihood of deficit or alternative sources of supply, and was misleading about the fact that Castaic had an SWP "entitlement" without explaining that the entitlement consisted in part of "paper water." Id. at 1239-40. Hence the EIR failed as an informational document on water supply issues.

Castaic contends, and the other Respondents agree, that the 2004 EIR fully addresses the uncertainty of what DWR will do. At hearing, they contended that Petitioners really are arguing that the 2004 EIR is misleading because it does not anticipate Petitioners' argument.[23]

The EIR explains that planning for water supply to meet demands requires consideration of reliability of SWP supplies, because historical and statistical analysis show that the full Table A amount will not be available in some years. AR 41. The EIR explains that Castaic's Table A amount is the maximum SWP amount, and the amount of SWP water actually available to it varies from year to year. Id. The EIR acknowledges that DWR's allocations are based on that year's hydrological conditions, the amount of water stored in the SWP system, and contractor requests for water. AR 16. The EIR discusses the Monterey Agreement (AR 46-47), PCL and Monterey Plus. AR 17-18, 47. The EIR cautions land use planners who might rely on the EIR to predict future water supplies, that while Castaic will implement all feasible measures to obtain water "past water deliveries are not a guarantee of future delivery rates." AR 13.

The EIR considers the environmental impact of the project based on water allocation

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[22]At trial, Petitioners' counsel made plain that this issue of deception is distinct from the reliability of water delivery by DWR.

[23]Respondents' contention sounds like an argument that Petitioners failed to exhaust their administrative remedies. However, no failure to exhaust claim was made in their briefs.

scenarios of pre-Monterey Amendments without Article 18 cutbacks, pre-Monterey Amendments with Article 18 cutbacks, and post-Monterey Amendments. AR 56. The EIR argues that the project could have been authorized under Article 41, but instead was implemented under Article 53 of the Monterey Agreement. It adds that DWR is preparing a new EIR for the Monterey Amendment.

Since the Monterey Amendments change the way in which SWP water is allocated among contractors, the 2004 EIR provides three separate analyses of the project's impacts to water supply. AR 186-89. The EIR goes to great lengths to discuss the uncertainties in the Article 18 allocations. AR 187-89. For each scenario, the EIR estimates reliability based on wet, dry, and extended dry year conditions. AR 183-91. The EIR addresses direct impacts to water supply and water quality under the three water allocation scenarios. AR 202-05. It discusses indirect impacts from the growth-inducing effect of the project, and mitigations of these impacts through implementation of existing agency policies. AR 207-224. It discusses the cumulative impact of the project and other projects inside and outside the project area. AR 278-89. Finally, it addresses alternatives to the project, including a no project alternative. AR 293-300.

The EIR clearly demonstrates the variability of SWP deliveries, and covers what could happen as a result of the Monterey Amendments EIR. But Petitioners are correct that the EIR has a hole in it. The EIR does not directly explain that the project may be impacted by the outcome of the Monterey Amendments EIR. Instead, the 2004 EIR assumes there are three possible water delivery scenarios without any discussion of why or how they would occur: "Since the Monterey Amendments change the way in which SWP water is allocated among contractors, the 2004 EIR provides three separate analyses of the project's impacts to water supply." The reader is left to interpret how these allocations could come about, and must conclude on his or her own that they are three possible outcomes of challenges to the Monterey Amendments. Nor does the EIR explain how such challenges could cause these allocations to occur.

An EIR is an informational document which is supposed to provide the reader with the "analytic route the...agency traveled from evidence to action."Citizens of Goleta Valley v. Board of Supervisors, ("Goleta") (1990) 52 Cal.3d 553, 568. This means that the EIR must contain facts and analysis, not just the agency's bare conclusions or opinions. Castaic is not required to predict the outcome of litigation, and may not be able to discuss the likelihood of each of the three allocations. However, it should have at least explained why the three scenarios are relevant and how they would occur.[24] The failure to do so leaves the reader wondering why they are pertinent. Consequently, the 2004 EIR fails to provide the analytic route by which the three alternatives are relevant.

Non-compliance with the disclosure requirements of CEQA may constitute a prejudicial abuse of discretion regardless of whether the agency would have taken the same action had it complied with CEQA. Pub. Res. Code §21005(a). Still, CEQA is subject to the established principle that there is no presumption of prejudicial error. Pub. Res. Code §21005(b). Only if the manner in which the agency failed to follow the law is prejudicial must the decision be set aside. Sierra Club v. State Board of Forestry, (1994) 7 Cal.4th 1215, 1236.

[24]For example, the court has no idea how a pre-Monterey Amendments without Article 18 cutbacks would occur.

The issue is whether Castaic's failure to supply the analytical route for its consideration of the three allocations is prejudicial. Prejudice depends on whether the failure to include this information makes "any meaningful assessment" of the project's environmental effects impossible, in which case prejudice is presumed. Sierra Club v. State Board of Forestry, (1994) 7 Cal.4th 1215, 1236 (agency approved timber harvesting plans without requiring necessary environmental information in them).[25] Even under this standard, not every CEQA failure is prejudicial. An EIR will be upheld if the error *de minimus* or clerical in nature (Save San Francisco Bay Association v. San Francisco Bay Conservation and Development Commission (1992) 10 Cal.App.4th 908, 935), the EIR analysis is comprehensive, if not perfect, despite the error (Schaeffer Land Trust v. San Jose City Council, (1989) 215 Cal.App.3d 612, 627-28), and information which should have been included to make the EIR accurate nonetheless has no material effect on informed decision-making or informed public participation (Al Larson Boat Shop, Inc. v. Board of Harbor Commissioners, (1993) 18 Cal.App.4th 729, 747-50).

The Vineyard court reiterated that the reviewing court must focus on the nature of the defect, depending on whether the claim is predominantly one of improper procedure or a dispute over facts. Where the agency has employed the correct procedures, greater deference is given to the agency's factual conclusions, which are reviewed for substantial evidence. 40 Cal.4th at 435.

The 2004 EIR's non-compliance concerns its analytic route – why and how the three allocations are pertinent. This is not a fact issue to be supported by substantial evidence. Instead, it is a failure affecting the public's ability to make a "meaningful assessment" of the project's environmental effects. As such, it is prejudicial. *See also* Rural Land Owners Assn. v. Lodi City Council, (1983) 143 Cal.App.3d 1013, 1023 (whenever failure to comply with CEQA results in a subversion of its purposes by omitting information from the environmental review process, the error is prejudicial).[26]

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[25]One appellate court, Resource Defense Fund v. Local Agency Formation Commission, (1987) 191 Cal.App.3d 886, 897-98 has stated that "[f]ailure to comply with CEQA is necessarily prejudicial." This does not appear to be the consensus approach. *See* Dusek v. Anaheim Redevelopment Agency, (1985) 173 Cal.App.3d 1029, 1040-42 ("a minor CEQA sin or two" constituting technical defects where the public had not been misled or defrauded is not enough for prejudice).

[26]Petitioners also argue that the 2004 EIR finesses the non-final nature of the project by jumping the gun and analyzing pre-Monterey Amendments. According to Petitioners, Castaic performed a "mini-programmatic review" at AR 155-06 and App. D (AR 468-550). The charts at AR 184 and 506 show this. According to Petitioners, this is not just factual overlap; this is usurpation of DWR's responsibilities.

DWR correctly points out that Petitioners are complaining about too much information, something that CEQA does not proscribe. Petitioners have no complaint about the content of the mini-program review. To the extent that Castaic performed a task that DWR is obligated to perform, DWR may either use Castaic's analysis or perform a new one. The cooperation of DWR and Castaiac suggests that the overlapping environmental analysis will be consistent. Even if inconsistent, DWR's analysis will control for the Monterey Amendments. There is no

2. Modeling

Petitioners contend that Castaic used an obsolete DWR model, DWRSIM, for making predictions about the amount of SWP water that could be available as a result of the Kern water transfer. DWR has used CALSIM II for modeling SWP deliveries since 2000. While the EIR uses CALSIM II to look at the environmental setting, it only uses DWRSIM to look at environmental impacts. According to Petitioners, Castaic's rationale for doing so -- that DWRSIM should be used for the 1998 environmental setting -- makes no sense. Modeling is for future results, not historical analysis.

Petitioners argue that Castaic's use of an old model prejudicially overstates the reliability of SWP water delivery. App.D, Table 2-2 compares the projected 2020 deliveries based on the two different models. AR 493. The graph shows a discrepancy between the two models, particularly in the 50-70% supply range, and most glaringly in the range of drought conditions. Although the EIR does not quantify these differences, Castaic's responses to public comments presents a table that does. The table shows that the two models can differ by as much as 5000 acre-feet. Pet. Op. Br. at 23. According to Petitioners, this is not the "slight discrepancy" DWR states it is.

When a challenge is brought to studies on which an EIR is based, "the issue is not whether the studies are irrefutable or whether they could have been better. The relevant issue is only whether the studies are sufficient credible to be considered as part of the total evidence that supports the" agency's decision. Laurel Heights, 47 Cal.3d at 409 (lead agency entitled to choose and rely on expert opinion even though others may disagree). Expert testimony constitutes substantial evidence and an agency is entitled to rely on it. Uhler v. City of Encinitas, (1991) 227 Cal.App.3d 795, 805. Even where experts disagree, the agency is entitled to choose one expert's opinion over another. Laurel Heights, 47 Cal.3d at 409. The party challenging the EIR bears the burden of demonstrating that the studies on which the EIR is based "are clearly inadequate or unsupported." State Water Resources Control Board Cases, (2006) 136 Cal.App.4th 674, 795.

CEQA requires Castaic to reasonably inform the reader about the amount of water available. The EIR states that all environmental impacts from the project are driven by the amount of water delivered and the timing of delivery. AR 55. Castaic analyzed the amount of SWP water available for delivery through hydrologic modeling with computer simulations that predict the amount of water available under various hydrologic conditions. To do so, the EIR, like all EIR's had to have an environmental setting for the project. This environmental setting describes the conditions of the project as they exist at the time the Notice of Preparation is published or, if there is none, at the time the environmental analysis is commenced. This setting will normally constitute the baseline physical conditions by which an agency determines whether an impact is significant. Guidelines §15125(a).

The 2004 EIR states that its baseline 1998 environmental setting used DWRSIM, which is a model simulating the operations of the SWP, "because this is the modeling tool that was available during 1998." AR 55. DWR had used DWRSIM in 2000 to conduct a reliability study for another project. The 2004 EIR does use CALSIM II for the current environmental setting of

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usurpation of responsibility.

the project. CALSIM II was available because DWR performed a SWP Delivery Reliability Report in 2003 using CALSIM II as its model. AR 56. Although the modeling tools are different, the criteria used to input into the computer simulation has not changed significantly. Id.

The question raised by Petitioners is why use an older computer simulation model (DWRSIM) for the 1998 baseline when a newer model (CALSIM II) was available? Appendix D of the 2004 EIR, entitled "Technical Data for Hydrologic Analysis," explains that Castaic had to do so because it did not perform any model analysis of its own. Instead, Castaic relied upon DWR's expertise, and its existing model studies. *See* AR 491. DWR used DWRSIM in its 2000 study and CALSIM II in its 2003 study; Castaic relied upon those same studies and same models.

Castaic's reliance on DWR's existing studies and its expertise is an explanation, but the issue becomes whether it is an adequate one.

The answer is in Appendix D, which explains that DWRSIM has a database of monthly runoff based on historic hydrologic data for a 73 year period from 1922-74. DWRSIM takes this data and, depending on the input variables of operating constraints and water contractor demand, estimates the amount of water SWP can deliver each month over that 75 year period. Assuming that hydrologic conditions repeat, the operator can predict the amount of water available under that particular hydrologic condition and with a particular demand and operating condition. AR 491.

Appendix D then shows that DWRSIM and CALSIM II predict similar outcomes, and that the differences in their predictions can be explained. In Figures 2-1 and 2-2 of Appendix D, Castaic compares the two models' prediction of SWP water deliveries at existing demand and at predicted 2020 demand levels. AR 493. The "existing demand" for the DWRSIM model is 1998 demand. The "existing demand" for the CALSIM II model is 2001 estimated demand. The 2001 demand is higher than the 2000 demand. Consistent with reality, the model will only show delivery up to the amount of demand; SWP will not deliver more water than is asked for even if it is available. This difference in demand explains why CALSIM II shows more delivery in wet years than DWRSIM; the lower demand in 1998 limits the amount of delivery.

The difference in demand also explains in part why CALSIM II predicts a higher delivery in extremely dry conditions; 1998's lower demand means more water is left in storage from the preceding year and is available for delivery in a dry year. Appendix D says that the proof is in the pudding: comparison of DWRSIM and CALSIM II in Figure 2-2, for the year 2020 with the same level of demand for each model, shows very close prediction of SWP delivery for both models. AR 492-93.

Castaic concludes that the two models predict "generally comparable" results and their differences are minimal. AR 491, 1003. Castaic argues that, if anything, the slightly higher supplies predicted by the DWRSIM model provide a worst case scenario for purposes of growth inducing impacts; the more water the more developers will grow the Santa Clarita Valley. AR 1003-04, 1009.

Contrary to Petitioners' argument, the use of DWRSIM and not CALSIM II in the 1998 baseline study does not affect the conclusion that the study constitutes substantial evidence. Petitioners do not present expert opinion that the use of DWRSIM results in any error. They merely rely on the differences in Figures 2-1 and 2-2 of Appendix D, and Appendix D explains

the reason for the differences. As Castaic points out, Petitioners cannot point to any environmental significance to the use of DWRSIM and not CALSIM II. Therefore, Petitioners have not met their burden of demonstrating that use of DWRSIM for the 1998 baseline in the 2004 EIR was "clearly inadequate or unsupported."[27]

3. Cumulative Impacts

Petitioners contend that the 2004 EIR attempts to assess the project's impacts on the SWP without discussion why Castaic is competent to do so. As an example, the EIR rejects any significant project impact on the Delta, even though it acknowledges that differences in timing in the use of water for urban (Castaic) rather than agricultural (Wheeler Ridge) purposes would change the timing of deliveries. AR 192. Petitioners argue that the Delta is "in crisis" and there is great potential for conflict between Castaic's and DWR's respective environmental analysis. Pet. Op. Br. at 23-4.

An EIR must contain a cumulative impacts analysis of the project's environmental impact when considered in conjunction with other projects (Guidelines §15130) in order to ensure that "the entire relevant environmental picture" has been adequately considered. Laupheimer v. State of California, (1988) 200 Cal.App.3d 440, 462. A cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts. Guidelines §15130(a)(1). The EIR should not discuss impacts which do not result at least in part from the project being evaluated. Id. The analysis should reflect the severity and likelihood of occurrence of the impact. Guidelines §15130(b). In every case, there should be at least a preliminary search for potential cumulative environmental effects and a preliminary assessment of their significance. Laupheimer, 200 Cal.App.3d at 462-63. The detail required in a cumulative impacts discussion need not be as great as provided for the environmental impacts attributable to the project alone. Guidelines §15130(b). Generally, the EIR should list the projects producing cumulative impacts or provide a summary of projections contained in a prior certified or adopted environmental document which describe the regional conditions contributing to the cumulative impact. Guidelines §15130(b)(1). The 2004 EIR uses the list approach to discuss cumulative impacts of the project's environmental impact when considered in conjunction with other projects. AR 241-289.

Castaic argues that everything that happens with respect to the Kern water transfer happens south of the Delta, and the EIR thoroughly discusses that, including the impact of the timing of deliveries. AR 193-06. Thus, the EIR's conclusion that the project will have no direct

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[27]Castaic does not have statewide expertise on SWP reliability, but its consultants and DWR do. In commenting on Castaic's draft EIR, DWR stated that the differences between CALSIM II and DWRSIM "may cause slight changes in results, which may lead DWR to different conclusions....[in DWR's Monterey Amendments EIR]" AR 564. However, DWR also found that the draft EIR adequately and thoroughly discussed the project and its impacts, including the effects of the project on the environment and the SWP, using appropriate baseline conditions, and had a good discussion of the relationship between the Kern water transfer and Monterey Plus. DWR concluded that the draft EIR a "adequately discusses the reliability of the SWP, pre- and post- Monterey Amendment conditions, and SWP operations." AR 564-65.

significant impact on the SWP or related facilities is fully supported. Castaic contends that Petitioners really are attacking its ability to act as lead agent for a local project if the project has the potential for statewide impact. According to Castaic, this argument goes to the lead agency issue, and is incorrect as a matter of law. Castaic is qualified and required by CEQA to assess impacts that occur outside of its borders in evaluating the Kern water transfer. Citizens of Goleta Valley v. Board of Supervisors, (1990) 52 Cal.3d 553, 573.

The court does not know whether Petitioners really are attacking Castaic's expertise or the adequacy of its assessment of SWP impacts from the Kern transfer. The reason is that Petitioners' arguments are conclusionary and unsupported by analysis, authority, or many facts. Petitioners' obligation was to point out what is wrong with the analysis, or what has been omitted that was required. An issue raised without analysis or authority lacks foundation and need not be addressed. Arcadia, 135 Cal.App.4th at 1429, 1431. The court has no obligation to search the EIR's cumulative analysis section to look for defects. Their general objection requires only a general response that Castaic's cumulative impacts analysis is adequate.

4. The "No Project" Alternative

Petitioners argue that the 2004 EIR fails to address the "no project" alternative, an issue particularly important because it was the principal defect in the PCL Monterey Agreement EIR. As the PCL court stated, a "no project" alternative must discuss "existing conditions" and "what would reasonably be expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services." 83 Cal.App.4th at 912. The Monterey Agreement EIR did not discuss the projections related to land planning, demand for water, and other impacts of reducing entitlements pursuant to Article 18(b). Id. at 919. Petitioners contend that the 2004 EIR does discuss the water supply reliability impacts of invoking Article 18(b), but not the statewide impacts the PCL court found so crucial.

The short answer to Petitioners contention is that 2004 EIR addresses a different project than the Monterey Amendments. The "no project" alternative for any EIR requires a comparison of the impacts of approving the project with the effect of not doing so. Guidelines §15126.6.(e)(1); Mira Mar Mobile Community v. City of Oceanside, (2004) 119 Cal.App.4th 477, 488-89. The only "no project alternative" that Castaic is obligated to consider is the alternative of "no Kern water transfer." Castaic has addressed this alternative by discussing groundwater sources of water and a possible moratorium. AR 291-4. Petitioners do not quibble with this analysis. But Castaic had no obligation to consider "no Monterey Amendments" as a no project alternative.[28] Indeed, it would make no sense to evaluate "no Monterey Amendments" as an alternative to the Kern water transfer.[29]

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[28]Of course, the 2004 EIR is obligated to consider invocation of Article 18(b) as a reasonably foreseeable environmental impact, and the adequacy of it doing so has been discussed.

[29]For a similar reason, Castaic need not analyze alternative uses of the SWP water in a "no project" alternative. CEQA does not require consideration of alternatives that do not meet the project objective; *i.e.*, delivery of water to Castaic's customers. *See* Guidelines §15126.6(c).

5. Post-Hoc Rationalization

Petitioners also suggest that the 2004 EIR is a post-hoc rationalization for "a decision already made." Pet. Op. Br. at 18. Pre-judging environmental decisions in order to accomplish a project is prohibited under CEQA. An agency may not commit to a project before CEQA review is completed because a fundamental purpose of an EIR is to provide decision-makers with information they can use in deciding whether to approve a project. Therefore, post-approval environmental review has been condemned. Laurel Heights, 47 Cal.3d at 394. *See* Residents Ad Hoc Stadium Com. v. Board of Trustees, (1979) 89 Cal.App.4th 274, 285. Of course, an agency contemplating a project may be presumed to favor the project, and CEQA assumes this to be inevitable. Therefore, it builds in procedural protections to insure that the decision-maker does not fail to note the facts and arguments by opponents to the EIR. Id. at 285.

Castaic had completed the transfer and performed under it for several years prior to preparing the 2004 EIR. Plainly, it desires to keep the transfer and not change it. When the 1999 was found deficient, Castaic was required under CEQA to perform a "fresh look" at the transfer's environmental impacts. With the exception of the analytical hole discussed above, it has done so. *See* City of Vernon v. Board of Harbor, (1998) 63 Cal.App.4th 677, 1523 (adequacy of EIR overcomes contention that it was a post-hoc rationalization).

G. Conclusion

Castaic may act as the lead agency for the Kern water transfer. The 2004 EIR was properly prepared except for one defect – it fails to show the analytic route as to how and why the three allocations of pre-Monterey Amendments, pre-Monterey Amendments without Article 18, and post-Monterey Amendments are relevant and would occur. The court offers no opinion on whether this failure must be rectified by addendum (Guidelines §15164), a subsequent EIR, a supplement to EIR, or a new EIR. That determination is Castaic's to make in the first instance.

The Petition for Writ of Mandate is granted in part. A writ shall issue commanding Castaic to set aside its approval of the 2004 EIR and comply with CEQA, either through the preparation of a new EIR or other environmental documentation, such as an addendum, addressing the analytic route of the three water allocations. Castaic is not directed to set aside the Kern water transfer. Judgment shall be entered in favor of Petitioners solely on this issue.

This shall serve as the court's proposed statement of decision in compliance with CRC 232(c). If there are no written objections filed, the statement shall be final. As Respondents have prevailed on all but one issue, Castaic's council is ordered to prepare a writ of mandate and judgment consistent with this decision, and serve it on all other counsel for approval as to form. After 10 days, Castaic may file the proposed writ and judgment with the court, along with a declaration stating the nature and extent of any objections received. An OSC re: judgment shall be set for April 23, 2007.

Dated: April 2, 2007

J. Chalfant

Superior Court Judge
JAMES C. CHALFANT

LETTER 4

ORIGINAL

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CIVIL OPERATIONS

IN THE SUPERIOR COURT OF THE STATE OF CALIFORNIA

COUNTY OF LOS ANGELES, CENTRAL DISTRICT

PLANNING AND CONSERVATION LEAGUE,

Petitioner,

vs.

CASTAIC LAKE WATER AGENCY,

Respondent,

CALIFORNIA DEPARTMENT OF WATER RESOURCES, KERN COUNTY WATER AGENCY, WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT,

Real Parties in Interest.

CALIFORNIA WATER IMPACT NETWORK,

Petitioner,

vs.

CASTAIC LAKE WATER AGENCY,

Respondent,

CALIFORNIA DEPARTMENT OF WATER RESOURCES, KERN COUNTY WATER AGENCY, WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT,

Real Parties in Interest.

CASE NO.: BS 098724

Assigned for All Purposes:
Honorable James Chalfant
Department 13

(Consolidated Cases)
[Transferred from Ventura County Master File No. CIV 231588 (consolidated with Ventura County Case No. CIV 231606)]

~~[PROPOSED]~~ **JUDGMENT GRANTING PEREMPTORY WRIT OF MANDATE**

Action Filed: January 24, 2005
Action Transferred: August 8, 2005

The above-entitled consolidated matter came on regularly for hearing on March 19, 2007, before the Honorable James C. Chalfant. Petitioner, Planning and Conservation League ("PCL") appeared by and through Antonio Rossman and Roger B. Moore of Rossman & Moore, LLP. Petitioner, California Water Impact Network ("CWIN") appeared by and through Babak Naficy of the Law Offices of Babak Naficy. Respondent, Castaic Lake Water Agency ("Castaic") appeared by and through David D. Boyer of McCormick, Kidman & Behrens, LLP; R. Bruce Tepper of R. Bruce Tepper, ALC; and James G. Moose of Remy, Thomas, Moose and Manley, LLP. Real Party in Interest California Department of Water Resources ("DWR") appeared by and through Deputy Attorney General Marilyn H. Levin, and Deputy Attorney General Deborah A. Wordham. Real Party in Interest Kern County Water Agency ("Kern") appeared by and through Clifford W. Schulz of Kronick, Moskovitz, Tiedmann & Girard, APC. Real Party in Interest Wheeler Ridge-Maricopa Water Storage District ("Wheeler-Ridge") appeared by and through Steven M. Torigiani of the Law Offices of Young Wooldridge, LLP.

At that time the Court heard arguments of counsel and examined key portions of the Administrative Record certified by Castaic and submitted by the parties. After considering the filings of all parties, the oral arguments of counsel, and the records and files in this case, the court took the matter under submission. After further deliberations and further review of applicable legal authorities and key documents in the Administrative Record, the Court prepared a proposed Statement of Decision, which was filed and served by the Court on April 2, 2007. The Court entered its final Statement of Decision (attached hereto as Exhibit "A," and incorporated herein by reference) on May 22, 2007, after reviewing Petitioners' April 17, 2007 objections to the proposed Statement of Decision.

IT IS THEREFORE ORDERED that:

1. The 2004 EIR having been properly prepared in all other respects, Judgment shall be entered in favor of Petitioners in this proceeding solely on the issue of the failure of the EIR to show the analytic route as to how and why the three allocations of pre-Monterey Amendments without Article 18(b) cutbacks, pre-Monterey Amendments with Article 18 (b) cutbacks and post-Monterey Amendments are relevant and would occur.

2. A Peremptory Writ of Mandate shall issue commanding Castaic to set aside its

certification of its 2004 EIR and to comply with CEQA consistent with the Statement of Decision.

3. The Peremptory Writ of Mandate shall not direct Castaic to set aside the Kern Water Transfer, nor shall it limit or control the discretion legally vested in Castaic to determine the appropriate manner to comply with CEQA .

3. The Court retains jurisdiction over this matter by way of return to the Peremptory Writ of Mandate.

DATED: 5/22/07

HONORABLE JAMES CHALFANT
JUDGE OF THE SUPERIOR COURT

Presented by: McCORMICK, KIDMAN & BEHRENS, LLP
Russell G. Behrens,
David D. Boyer

DAVID D. BOYER
Attorneys for Respondent
CASTAIC LAKE WATER AGENCY

California Water Impact Network v. Castaic Lake Water Agency
BS 098724

Statement of Decision on Petition for Writ of Mandate

FILED
LOS ANGELES SUPERIOR COURT
APR 02 2007
JOHN A. CLARKE, CLERK
A. Zapardo
BY ANDREA ZAPARDO, DEPUTY

Petitioners California Water Impact Network ("CWIN") and Planning and Conservation League ("PCL") petition for writ of mandate under California Environmental Quality Act ("CEQA"). The court has read and considered the moving papers, oppositions, and reply, heard oral argument, and renders the following decision.

A. Statement of the Case

Petitioner CWIN commenced its petition for writ of mandate in Ventura County Superior Court on January 24, 2005. The petition alleges that on December 23, 2004, the Castaic Lake Water Agency ("Castaic"), a public water agency and water wholesaler that treats and delivers water to water retailers in Los Angeles and Ventura Counties, approved the permanent transfer of 41,000 acre feet per year from Real Party in Interest Kern County Water Agency ("Kern") and its member unit in Kern County, Wheeler Ridge-Maricopa Water Storage District ("Wheeler Ridge"), to Castaic (the "Kern water transfer," the "Kern transfer," or the "transfer"). Castaic also purported to certify the Environmental Impact Report ("EIR") for the project (the "2004 EIR" or the "EIR"). Petitioner claims the Kern water transfer "threatens to promote large-scale urban sprawl in Ventura and Los Angeles Counties, while diverting water from important environmental and agricultural uses in Kern County forever." Petitioner alleges that the 2004 EIR is premature, and fails to comply with CEQA.

The petition alleges a cause of action for violation of CEQA in that Real Party in Interest California Department of Water Resources ("DWR"), not Castaic, should have been the lead agency for the 2004 EIR, which does not adequately describe the background on which the project is based, fails to disclose a reliance on an invalid Urban Water Management Plan, fails to adequately describe alternatives to the project, including a "no project" alternative, fails to discuss growth inducement, and inaccurately states the availability of water availability.[1]

On January 24, 2005, PCL filed its own petition for writ of mandate against Castaic in Ventura County Superior Court. The PCL petition alleges a violation by Castaic in recording a Notice of Determination on December 23, 2004, certifying the 2004 EIR and rendering its approval of the Kern water transfer. The petition purports to allege five "causes of action" for violation of CEQA in the 2004 EIR based on Castaic stealing DWR's duty to be the lead agency for the EIR, certification of a defective EIR, approval of inadequate findings, erroneous presentation of the project as already complete, and "prejudicial abuse of discretion."

On June 22, 2005, upon motion by Castaic, the Ventura County Superior Court (the Honorable Frederick H. Bysshe, Jr.) ordered the transfer of both petitions, which had been consolidated, to Los Angeles. On March 27, 2006, the case was reassigned to this court.

On June 27, 2006, the court heard the demurrers of Castaic and Real Party in Interest Kern to the consolidated petitions. The court ruled that the petitions were timely filed and were

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[1]On CWIN's oral motion, the petition's second and third causes of action have been dismissed. As a result, CWIN's petition solely concerns Castaic's compliance with CEQA in the 2004 EIR.

EXHIBIT "A"

not barred under the doctrine of *res judicata*. The court noted that the Kern water transfer agreements are valid. While principles of *collateral estoppel* barred Petitioners from re-raising issues resolved by the Second District with respect to the 1999 EIR, this conclusion did not foreclose the petitions and the demurrers were overruled.

On July 16, 2006, the court denied Castaic's motion for a legal determination under principles of *collateral estoppel* and party admission that Castaic is the proper lead agency for preparation of the EIR for the Kern water transfer. However, Petitioners are bound by their concession that Castaic may act as the lead agency at some point for an EIR on the Kern water transfer.

B. Preliminary Issues

1. Standing and Timeliness

Petitioner PCL alleges that it is a non-profit corporation devoted to environmental protection. PCL Pet. at ¶6-7. Some of PCL's members live in the area affected by the Kern water transfer. PCL Pet. at ¶8. Petitioner CWIN alleges that it is a nonprofit public benefit corporation the purpose of which is to protect California's environment. CWIN contends that it is impacted by the Kern water transfer because its members reside in and use the Santa Clara River watershed, which is impaired by the water transfer. CWIN Pet. at ¶9. Thus, Petitioners contend that they are impacted by the project and have standing to raise the issues herein. Respondents do not contest Petitioners' standing. *See* Waste Management of Alameda County, Inc. v. County of Alameda, (2000) 79 Cal.App.4th 1223, 1233-34.

The actions are timely on CEQA issues, each having been filed on January 24, 2005, within 30 days of Castaic's Notice of Determination that the 2004 EIR had been certified, filed in various counties between December 23 and December 27, 2004. *See* Pub. Res. Code §21167(c).

2. The Administrative Record

Castaic has certified the administrative record. Pub. Res. Code §21167.6; LASC 9.24(e). The record was received in evidence at trial.

Castaic and Kern, and DWR separately ask the court to judicially notice various records. Judicial notice is the acceptance by a court without formal proof of the existence of a matter of law or fact that is relevant to an issue in the case. People v. Rowland, (1992) 4 Cal.4th 238, 268, n.6. Certain documents are subject to judicial notice. Ev. Code §451, 452. Even where subject to judicial notice, however, a document must be relevant. Id.

The California Supreme Court decision in Western States Petroleum Assn. v. Superior Court, ("Western States") (1995) 9 Cal.4th 559, 573, n.4, provides that extrinsic evidence is generally not admissible for a traditional mandamus challenging a quasi-legislative agency action. The exclusion of extrinsic evidence in a traditional mandamus action is essentially the exclusion of irrelevant evidence. Extrinsic evidence is generally not admissible for a traditional mandamus challenging a quasi-legislative agency action. Id. Such evidence may be admissible in a narrowly construed exception in which (1) the evidence in question existed before the agency made the decision, and (2) the evidence could not have been presented to the agency in the first instance in the exercise of reasonable diligence. Id. at 578. The purpose of limiting extra-record evidence is that the free use of such evidence would invade the deference to which the legislative

branch is entitled under the constitutional separation of powers. If the courts freely considered extra-record evidence in mandamus cases, the highly deferential substantial evidence standard would be turned into a *de novo* standard where the courts in effect would decide not whether an administrative decision was supported by the evidence before the agency but instead whether it was the wisest and best decision according to the courts. Id. at 572.

Castaic asks the court to judicially notice: (1) the unpublished appellate decision in Friends of the Santa Clara River v. Castaic Lake Water Agency, 2003 Cal.App. Unpub. LEXIS 11239, dated December 1, 2003 ("Friends II"), and (2) the unpublished appellate decision in California Water Network v. Castaic Lake Water Agency, 2006 Cal.App. Unpub. LEXIS 2452, dated March 23, 2003.[2] The existence of these court decisions is subject to judicial notice. Ev. Code §452(d).[3]

DWR asks the court to judicially notice (1) Amendment No. 19 to the Water Supply Contract between it and Castaic dated May 28, 2003, and (2) Notice of Preparation of EIR for the Monterey Amendment dated January 24, 2003. DWR contends that these documents are official acts of a California agency subject to judicial notice under Ev. Code section 452(c) and (d). The Notice of Preparation is an official act of DWR and is judicially noticed. However, Amendment No. 19 is not. Official acts should be limited to regulations, public announcements, and other actions the existence of which is beyond dispute. A well informed person has no way of knowing whether Amendment No. 19 is authentic and valid. Nor is it a court record under section 452(d). DWR's request for judicial notice of Amendment No. 19 is denied.

C. Statement of Facts

1. SWP

In 1951, the Legislature authorized construction of a state water storage and delivery system. Planning & Conservation League v. Department of Water Resources, (2000) 83 Cal.App.4th 892, 898. The Legislature subsequently authorized the State Water Project ("SWP"), a complex system of 28 reservoirs and dams, 26 power and pumping plants, and 600 miles of canals and aqueducts to deliver 4.23 million acre-feet of water annually to Central and Southern California. The primary source for the SWP is the drainage of the Feather River, a tributary of the Sacramento River in Northern California (hereinafter, the "Delta").

DWR is the state agency charged with the statutory responsibility to build, manage, and operate the SWP. Essentially, DWR is the wholesale provider of water to middlemen agencies. In 1961, DWR entered into individual contracts with various agricultural and urban water suppliers in the State, referred to as State Water Contractors. *See* Water Code §12937. There are 29 agencies or districts that currently are State Water Contractors.

The SWP water contracts entitled the contractors to receive an annual amount of SWP

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[2]Castaic also supplied the court with copies of its decisions on demurrer and motion for legal determination in this case, which need not be judicially noticed.

[3]Real Party Wheeler purports to join in Castaic's request for judicial notice. In its ruling on the demurrers, the court informed Wheeler of the futility of a joinder as merely a cheerleading effort. No further discussion of the purported joinder is necessary.

water in exchange for a proportionate share of financing and maintaining the SWP facilities. Each water contract contains provisions for both allocation of the amount of water available each year and costs among the contractors. Each contract identifies a Table A amount, the annual maximum amount of water which DWR agrees to deliver, if available for delivery, to each SWP contractor on an annual basis. Delivery of the Table A amount is not assured, but rather provides the basis for proportional allocation of available water among contractors. The Table A amount is specified as either agricultural or urban (M&I). Each contract also includes Article 40, which permits water transfers between contractors, and Article 41, which requires DWR approval of any transfer subject to reasonable terms and conditions. AR 2356.

Each contractor annually submits a request to DWR for water delivery in the following year, up to the amount in Table A. In a year when DWR is unable to deliver the total of contractor requests, deliveries to all contractors will be reduced. The current Table A totals are 4.17 million acre-feet per year.[4] In fact, given existing facilities and contractor demands, the SWP can only deliver an average of 2.96 million acre-feet per year.

2. The Monterey Agreement

Historically, the delivery of less than Table A totals was not a significant problem because contractor demand was less than the Table A amounts. However, in the late 1980's and early 1990's, a drought led to SWP deliveries in amounts below that requested by contractors. Articles 18(a) and (b) of the SWP water contracts addressed DWR's temporary and permanent inability to deliver the water allocations listed in Table A of the contracts by requiring agricultural contractors to accept a reduction in water first before any remaining reduction was shared by urban contractors. In 1990, agricultural contractors received only half their requested water and none in 1991. Because contractors pay their proportionate share of fixed costs regardless of how much water is delivered, the agricultural contractors were paying for water they were not receiving and they were displeased. As a result, urban and agricultural water contractors clashed over DWR's delivery obligations and the proper interpretation of Article 18. AR 45-46.

In December 1994, five State Water Contractors and and DWR reached agreement on a broad set of fourteen principles (the "Monterey Agreement"). Among other things, the Monterey Agreement changed the allocation between agricultural and urban contractors of entitlements to SWP water. The Monterey Agreement eliminated Article 18 and specified that all SWP water was to be allocated in proportion to Table A amounts. Paragraph 24 of the Monterey Agreement provides for the permanent transfer of 130,000 acre-feet from certain willing agricultural contractors, including KWCA, to urban contractors, as implemented by individual agreement. AR 2515. It also provides that individual contractors may transfer entitlements among themselves beyond the 130,000 acre feet proposed, with DWR expeditiously executing any necessary documents and approving all such contracts. Other provisions of the Monterey Agreement include a revision of water allocations during shortages, eliminating the "agriculture first" provision, and retirement of 45,000 other acre-feet of entitlement by agricultural contractors.

[4]An "acre-foot" is the amount of water that would cover one acre one foot deep.

The Monterey Agreement provides that individual SWP contracts could be amended to conform to it. Over the next two years, 27 of the 29 Water Contractors amended their SWP contracts to implement the principles of the Monterey Agreement (collectively, the "Monterey Amendments").

In 1995, a State Water Contractor, Central Coast Water Authority ("Central"), acted as lead agency and certified a program EIR analyzing the environmental impacts of the Monterey Agreement. This program EIR also addressed Paragraph 24 (Article 53 in the Monterey Amendments) water transfers, including the Kern water transfer. In late 1995, PCL filed a lawsuit in Sacramento Superior Court challenging the program EIR, Planning & Conservation League v. Department of Water Resources, ("PCL").

3. The Kern Water Transfer Agreement

Castaic is a State Water Contractor created by the California Legislature. Its mandate is to purchase and deliver sufficient supplies of water to serve the needs of the Santa Clarita Valley. *See* Swanson v. Marin Municipal Water District, (1976) 56 Cal.App.3d 512, 524 (water district has obligation to augment available water to meet increasing demands). Castaic diverts its SWP water from the West Branch of the California Aqueduct. Castaic is one of the Water Contractors entering into the Monterey Amendments (Amendment 17 to Castaic's SWP contract).

Kern County Water Agency ("KCWA") is a special district formed by the Legislature in 1961. Wheeler Ridge is a special district formed in 1959 to provide supplemental water to agricultural lands in Kern County and is located immediately north and east of Castaic. KCWA has contracts with Wheeler Ridge and other member agencies, for KCWA's SWP water.[5]

In March 1999, Castaic entered into an agreement to purchase from Wheeler Ridge, subject to KCWA's consent, 41,000 acre-feet per year of SWP water (the Kern water transfer). The price for the transfer was $47 million in debt instruments purchased by private investors. The purpose of the transfer is to permit Castaic to serve the water demands of existing users, as well as meet a portion of future water demand from anticipated growth within the Castaic service area. AR 16. The Kern water transfer is the largest transfer under Article 53 of the Monterey Amendments, and it counts towards the 130,000 acre-feet limit. In their transfer agreement, both sides warranted that there was no pending or threatened litigation other than PCL that could affect the 41,000 acre feet SWP entitlement. AR 2562-63.[6]

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[5]In 1998, another KCWA member, Belridge Water Storage District, certified an EIR on the environmental effects of transferring 130,000 acre-feet of SWP water to unidentified purchasers. This EIR was not challenged.

[6]Castaic has been planning since 1987 to increase the supply of water to Santa Clarita Valley. At that time, Los Angeles County General Plan forecast substantial population growth in the Santa Clarita Valley. In 1988, Castaic adopted a Capital Program and Water Plan (the "Capital Program") to address the purchases, construction, and improvements necessary to meet the anticipated water demand. The Capital Program called for the purchase of SWP water from districts willing to sell, including Wheeler Ridge, and the storage of water for later use during drought conditions at Semitropic Groundwater Storage District's ("Semitropic") basins. AR

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DWR's approval of the Kern water transfer was required under Articles, 15, 41, and 56 of the SWP contracts. On March 31, 1999, DWR approved the transfer by entering into Amendment 18 of Castaic's SWP contract. Amendment 18 adds Article 53(j), which provides that "in accordance with Article 53(a)" of the Monterey Amendments, Castaic's Table A annual entitlements were increased by 41,000 acre-feet. AR 2545-47. DWR and KCWA, which consented to the transfer of its water, also entered into Amendment 28 to KCWA's SWP contract, an amendment which reduced KCWA's entitlement by 41,000 acre-feet. Based on these amendments, DWR has allocated SWP water to Castaic since 1999 based on a total Table A amount of 95,000 acre-feet -- Castaic's original Table A 54,000 acre-feet plus the 41,000 acre-feet from the Kern water transfer.

On March 29, 1999, Castaic, acting as lead agency, certified an EIR for the Kern water transfer. This 1999 EIR tiered off the 1995 Monterey Amendment program EIR, the Belridge EIR, and Castaic's own 1988 EIR for the Capital Program. In April 1999, Castaic's EIR for the Kern water transfer was challenged in Friends of the Santa Clara River v. Cataic Lake Water Agency, BS056954 ("Friends"). On August 16, 2000, the trial court entered judgment, denying the petition in its entirety.

4. The PCL and Friends Decisions

In September 2000, the Third Appellate District in PCL found that DWR was the only entity with the "statewide perspective and expertise" to serve as lead agency for the Monterey Agreement program EIR. Because "the allocation of water to one part of the state has potential implications for distribution throughout the system," the court recognized DWR's principal responsibility to "facilitate the water transfers allowed under the Monterey Agreement." 83 Cal.App.4th at 907. The use of Central as lead agency for the Monterey Agreement program EIR was inappropriate. Id. at 907.

This lead agency error was not harmless because the EIR also was defective. Perhaps as a consequence of Central's lack of statewide expertise, the EIR failed to properly discuss a "no project" alternative, including the environmental impact of implementing the pre-Monterey Agreement Article 18(b)'s permanent water shortage provision. Id. at 918. This was particularly important because local land use planners rely on the "paper water" entitlements in Table A

41845.

Pursuant to the Capital Program, Castaic permanently acquired 12,700 acre-feet of SWP Table A water in 1991 from Devil's Den Water District, a SWP contractor immediately north of Castaic. This transfer was subject to DWR approval, which per Article 41 of the SWP contracts could not be unreasonably withheld. DWR approved the transfer, noting that the transferred water remained labeled for "agricultural purposes" for purposes of delivery shortages.

Also pursuant to the Capital Program, in 2002 Castaic entered into a groundwater storage or "banking" agreement with Semitropic. This action was challenged under CEQA on the basis that the Monterey Agreement required DWR to conduct an environmental review. The challenge was rejected by the appellate court, which held that DWR had no jurisdiction over Castaic's management of water; DWR merely schedules SWP water delivery to Castaic. Cal. Water Network v. Castaic Lake Water Agency, (2006) 206 Cal.App. Unpub. LEXIS 2452, 9.

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rather than real, deliverable water. The question was what impacts were reasonably foreseeable from eliminating Article 18(b)'s solution to permanent water shortage? Id. at 914-15. The PCL court held that the EIR, which lacked simulation models and projections relating to land use planning and demand for water, did not adequately address this issue. Id. at 919. It directed the Sacramento Superior Court to retain jurisdiction over the action until a new EIR was prepared and certified.

Based on the Third District's PCL decision, on January 10, 2002, the Second Appellate District reversed the judgment in Friends and directed the trial court to issue a writ of mandate compelling Castaic to set aside certification of its EIR. Friends, (2002) 95 Cal.App.4th 1373. The reversal was based solely on the fact that Castaic's EIR had been tiered upon the now inadequate Monterey Agreement program EIR. The Second District rejected all of the other challenges to Castaic's EIR, finding them to be without merit. The appellate court noted that Castaic may be able to cure the defect by waiting for DWR to comply with the Third District's directive in PCL by preparing a new program EIR. Castaic could issue a subsequent EIR, a supplement to EIR, or addendum to EIR, tiering upon the new Monterey Agreement EIR.

The Friends appellate decision concluded as follows: "The judgment is reversed. The trial court shall issue a writ of mandate vacating the certification of the EIR, shall retain jurisdiction until Respondent certifies an EIR complying with CEQA consistent with the views expressed in this opinion, and shall consider such orders it deems appropriate under [Pub. Resources Code] section 21168.9."

On October 25, 2002, after remand from the court of appeal, the Friends trial court issued a Peremptory Writ of Mandate and Judgment on Remand, retaining jurisdiction until Castaic certifies an EIR that complies with CEQA and is consistent with the views expressed by the Second District. The trial court did not direct Castaic to set aside its approval of the Kern water transfer and denied the petitioner's request to enjoin Castaic from using any of the 41,000 acre feet of additional water allotted to it by the Kern water transfer. The trial court did state that the injunction request could be renewed upon a showing that the water was actually used for an improper purpose (irreversible new development).

5. Monterey Plus

On June 6, 2003, the Sacramento Superior Court approved a settlement between the parties in PCL. That settlement, known as "Monterey Plus," provides that the Monterey Agreement can proceed on an interim basis. In exchange, DWR agreed, among other things,[7] to prepare a new program EIR for implementation of the Monterey Agreement. This new EIR would include (1) information on water deliveries during the drought and recent historical period, (2) an analysis of a no project alternative, including the environmental impact of Article 18's water shortage provisions, (3) analysis of environmental impacts from changes in SWP operations and deliveries resulting from implementation of the Monterey Agreement, (4) analysis

[7]Some of the other provisions include biennial reports on project reliability, land use restrictions on the Kern Water Bank, new guidelines for permanent water transfers, new procedures for public involvement in contract changes, and funding for watershed restoration and new technical studies. AR 45048-49.

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of environmental impacts of seven already completed water transfers from KWCA and member units totaling 70,000 acre-feet (Attachment E), which the parties recognized were "final," and of the Kern water transfer, which the parties acknowledged was being challenged in the pending Friends litigation in Los Angeles Superior Court, and (5) analysis of the environmental impacts from implementation of Monterey Plus. AR 48557-59. With respect to the Kern water transfer, the Monterey Plus parties agreed that "jurisdiction with respect to [Friends] should remain in that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation." The Monterey Plus did not require DWR to re-approve or disapprove any transfer.

6. The Friends II Decision

The Second District upheld the Friends trial court's decision not to grant injunctive relief for the Kern water transfer on December 1, 2003, in unpublished case no. B164027 ("Friends II"). PCL had filed an *amicus* brief supporting the petitioner in Friends II, pointing out that the Monterey Plus settlement now existed and arguing that the Friends decision required the trial court to rely on the status of PCL litigation, including the new Monterey Agreement program EIR DWR was to prepare, in deciding injunctive relief. The Friends II appellate court stated that PCL was wrong; it merely had suggested, not required, that the trial court could determine and rely on the status of the PCL case in deciding injunctive relief.

7. The 2004 EIR

After Friends, Castaic decided to prepare a revised EIR prior to DWR's preparation of a Monterey Amendment EIR. Castaic was driven by a concern that the Friends petitioner and others would use the decertification of its 1999 EIR to cloud its right to the transferred water, as well as Castaic's duty to its customers to complete the environmental documentation and finalize the Kern water transfer.

In June 2004, Castaic prepared and circulated a draft EIR that tiered only on Castaic's 1988 Capital Program EIR. Castaic concluded that it was the lead agency because it has the principal responsiblility for carrying out and implementing the project. Because the transfer is between neighboring SWP contractors, involving the withdrawal of water from a single branch of the Aqueduct, Castaic concluded that the transfer has no significant impacts on SWP operations or the water diverted from the Delta. *See* AR 13-14.

PCL served comments to the draft EIR on August 16, 2004. These comments criticized the use of Castaic as lead agency, arguing that Castaic's review was "premature" and "likely to operate at cross-purposes with DWR's statewide review." AR 1959. PCL contended that DWR, not Castaic, was required to be the lead agency under the PCL decision. Only DWR's expertise could analyze the changes in the amount of supplies available, the location and timing of deliveries, and changes in the SWP's conveyance and storage facilities for all of the proposed transfers, including the Kern water transfer. AR 1962. CWIN also timely expressed concern about Castaic's lack of authority to act as lead agency, and the potential for conflict with DWR's role. AR 578-580.

DWR, acting as a responsible agency under CEQA, commented on the draft EIR. It stated that the "document adequately and thoroughly discusses the proposed project and its

impacts. The [draft]EIR discusses the effects of the project on the environment and State Water Project (SW) and uses baseline conditions consistent with those being considered for inclusion in [DWR's EIR]. The draft also "adequately discusses the reliability of the SWP, pre- and post-Monterey Amendment conditions, future conditions, and SWP operations." DWR acknowledged that Castaic's EIR uses a model, DWRSIM, to assess the potential impact associated with the Kern transfer and that DWR's EIR will use a newer model, CALSIM II. DWR indicated that the use of a different computer model may cause slight changes in results, which may lead DWR to different conclusions than those made by Castaic in its EIR. Despite this fact, DWR concluded that the draft EIR adequately discusses the reliability of SWP, pre- and post- Monterey Amendments conditions, future conditions, and SWP operations. AR 564-65.

Castaic rejected Petitioners' concerns, and relied on DWR's comments to refute objections that its draft EIR will be inconsistent with the yet to be prepared DWR program EIR. AR 961-4. Castaic adopted findings, a mitigation monitoring program and statement of overriding considerations and certified a final EIR (the 2004 EIR).[8] The 2004 EIR describes Castaic's water program for the future needs of Santa Clarita Valley, the procedural history of the project (including the 1999 EIR), and the fact that the Kern water transfer has been implemented and ongoing since 1999. It uses two separate baselines for the project setting and evaluates environmental impacts of the Kern water transfer on the SWP, Castaic, and Wheeler Ridge. In discussing these impacts, the 2004 EIR considers three SWP scenarios: (a) with the Monterey Agreement, (b) without the Monterey Agreement, and (c) without the Monterey Agreement and with Article 18(b) permanent shortages. The EIR uses the DWRSIM model and concludes no significant direct environmental impacts will occur as a result of the project. There would, however, be indirect growth impacts as a result of water provided by the project.

8. The Petitioners Take Over from the Friends Petitioner

On January 24, 2005, CWIN and PCL filed separate petitions for writ of mandate in Ventura County concerning Castaic's compliance with CEQA in the 2004 EIR, and other issues.

On February 1, 2005, the Friends petitioner dismissed the action with prejudice. On February 7, 2005, the trial court in Friends held a hearing on Castaic's *ex parte* application to vacate the dismissal with prejudice and to discharge the writ of mandate. Castaic argued that, by dismissing, the petitioner was attempting to get the clerk, through ministerial act, to divest the court of its continuing jurisdiction over the 2004 EIR prepared in response to the court's peremptory writ of mandate. Instead, the Friends petitioner was passing the baton to CWIN and PCL for a challenge to the 2004 EIR. The trial court declined to set aside the dismissal, stating that whether the Ventura proceedings were a continuation of the Friends lawsuit was an issue of fact for the Ventura (now this) court.

On March 5, 2005, Castaic petitioned the Second Appellate District for a writ of mandate with respect to the trial court's refusal to vacate the dismissal, arguing that the trial court violated Pub. Resources Code section 21168.9 (stating that the trial court shall maintain jurisdiction over the agency's proceedings until the court has determined that the agency has complied with

[8]On December 30, 2004, Castaic filed its return to the peremptory writ of mandate in Friends.

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CEQA) because it had not yet determined that the 2004 EIR complied with CEQA Yet, under CEQA, a trial court that orders preparation of a new EIR must retain jurisdiction for a final determination of the EIR's validity.

On April 14, 2005, the Second Appellate District denied Castaic's petition for "failure to demonstrate that the 'retain jurisdiction' provision of Public Resources Code section 21168.9, subdivision (b), abrogates the entitlement to voluntary dismissal conferred by Code of Civil Procedure section 581, subdivision (b)(1)."[9]

D. CEQA

1. Standard of Review

A party may seek to set aside an agency decision for failure to comply with CEQA by petitioning for either a writ of administrative mandamus (CCP §1094.5) or of traditional mandamus. CCP §1085. A petition for administrative mandamus is appropriate when the party seeks review of a "determination, finding, or decision of a public agency, made as a result of a proceeding in which by law a hearing is required to be given, evidence is required to be taken and discretion in the determination of facts is vested in a public agency, on the grounds of noncompliance with [CEQA]." Pub. Res. Code §21168. This is generally referred to as an "adjudicatory" or "quasi-judicial" decision. Western States Petroleum Assn. v. Superior Court, ("Western States") (1995) 9 Cal.4th 559, 566-67. A petition for traditional mandamus is appropriate in all other actions "to attack, review, set aside, void or annul a determination, finding, or decision of a public agency on the grounds of noncompliance with [CEQA]." Where an agency is exercising a quasi-legislative function, such as by adopting a rule or entering into a contract, it is properly viewed as a petition for traditional mandamus. Id. at 567; Pub. Res. Code §21168.5.

At issue here is a CEQA challenge to a quasi-legislative action recorded by Castaic in a December 23, 2004 Notice of Determination approving the project, certifying the 2004 EIR, and adopting findings, a mitigation monitoring program, and a statement of overriding considerations. This procedural setting, where no administrative hearing was held or required, is governed by traditional mandamus. In determining whether to grant a petition for traditional mandamus in a CEQA case, the court may consider only whether there was a prejudicial abuse of discretion. Public entities abuse their discretion under CEQA if the agency has not proceeded in a manner required by law or if its determination or decision is not supported by substantial evidence. Western States, 9 Cal.4th at 568; Pub. Res. Code §21168.5.[10]

This requires "scrutiny of the alleged defect" depending on whether the claim is predominately "improper procedure or dispute over the facts." Vineyard Area Citizens for

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[9]The Second District later dismissed Castaic's appeal from the Friends dismissal, finding that the voluntary dismissal was not appealable. *See* H.D. Arnaiz, Ltd. v. County of San Joaquin, (2002) 96 Cal.App.4th 1357, 1364-67.

[10]The standard of review for traditional mandamus in a non-CEQA case is governed by an "arbitrary and capricious" standard, not a "prejudicial abuse of discretion" standard. The CEQA standard is the more stringent inquiry. Western States, 9 Cal.4th at 574.

Responsible Growth v. City of Rancho Cordova, ("Vineyard") (2007) 40 Cal.4th 412, 435. Whether Castaic is the proper lead agency is an procedural issue of law for the court. PCL, 83 Cal.App.4th at 905-06. Similarly, as Petitioners argue (Pet. Supp. Resp. Br. at 5), whether Castaic's 2004 EIR failed to provide certain required information and, as a result, presents uncertainties about the finality of the Kern water transfer is failing "to proceed in a manner required by CEQA" and an issue of law. Vineyard, 40 Cal.4th at 435. These issues require "a critical consideration, in a factual context, of legal principles and their underlying values." Harustak v. Wilkins, (2000) 84 Cal.App.4th 208, 212.

On the other hand, whether Castaic abused its discretion in the 2004 EIR's findings must be answered with reference to the evidence in the administrative record. This standard requires deference to the agency's factual and environmental conclusions based on conflicting evidence, but not to issues of law. Laurel Heights Improvement Assn. v. Regents of University of California, ("Laurel Heights") (1988) 47 Cal.3d 376, 393, 409. Argument, speculation, and unsubstantiated opinion or narrative will not suffice.[11] Guidelines, 15384(a), (b). The findings must be supported by "substantial evidence," defined as "enough relevant information and reasonable inferences from this information that a fair argument can be made to support a conclusion, even though other conclusions might also be reached. CEQA Guidelines §15384(a). The question whether substantial evidence exists is a question of law. *See* California School Employees Association v. DMV, (1988) 203 Cal.App.3d 634, 644.

2. CEQA

The purpose of CEQA (Pub. Res. Code §21000 *et seq.*) is to maintain a quality environment for the people of California both now and in the future. Pub. Res. Code §21000(a). "[T]he overriding purpose of CEQA is to ensure that agencies regulating activities that may affect the quality of the environment give primary consideration to preventing environmental damage." Save Our Peninsula Committee v. Montery County Board of Supervisors, (2001) 87 Cal.App.4th 99, 117. CEQA must be interpreted "so as to afford the fullest, broadest protection to the environment within reasonable scope of the statutory language." Friends of Mammoth v. Board of Supervisors, (1972) 8 Cal.3d 247, 259. Public agencies must regulate both public and private projects so that "major consideration is given to preventing environmental damage, while providing a decent home and satisfying living environment for every Californian." Pub. Res. Code §21000(g).

The Legislature chose to accomplish its environmental goals through public environmental review processes designed to assist agencies in identifying and disclosing both environmental effects and feasible alternatives and mitigations. Pub. Res. Code §21002.

Under CEQA, a "project" is defined as any activity which may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment (1) undertaken directly by any public agency, (2) supported through contracts, grants, subsidies, loans or other public assistance, or (3) involving the issuance of a lease, permit,

[11]As an aid to carrying out the statute, the State Resources Agency has issued regulations called "Guidelines for the California Environmental Quality Act ("Guidelines"), contained in Code of Regulations, Title 14, Division 6, Chapter 3, beginning at section 15000.

license, certificate, or other entitlement for use by a public agency. Pub. Res. Code §21065. The word "may" in this context means a reasonable possibility. Citizen Action to Serve All Students v. Thornley, (1990) 222 Cal.App.3d 748, 753. "Environment" means the physical conditions which exist within the area which will be affected by a proposed project, including land, air, water, minerals, flora, fauna, noise, objects of historic or aesthetic significance. Guidelines, §21060.5.

The "project" is the whole of the action, not simply its constituent parts, which has the potential for resulting in either direct or reasonably foreseeable indirect physical change in the environment. Guidelines §15378. An indirect physical change must be considered if that change is a reasonably foreseeable impact which may be caused by the project. On the other hand, a change that is "speculative or unlikely to occur is not reasonably foreseeable." Guidelines §15064(d)(3). The term "project" may include several discretionary approvals by government agencies; it does not mean each separate government approval. Guidelines §15378(c).

The EIR is the "heart" of CEQA, providing agencies with in-depth review of projects with potentially significant environmental effects. Laurel Heights, 6 Cal.4th at 1123. An EIR describes the project and its environmental setting, identifies the potential environmental impacts of the project, and identifies and analyzes mitigation measures and alternatives that may reduce significant environmental impacts. Id. Using the EIR's objective analysis, agencies "shall mitigate or avoid the significant effects on the environment... whenever it is feasible to do so. Pub. Res. Code §21002.1. The EIR serves to "demonstrate to an apprehensive citizenry that the agency has in fact analyzed and considered the ecological implications of its actions." No Oil, Inc. v. City of Los Angeles, (1974) 13 Cal.3d 68, 86. It is not required to be perfect, merely that it be a good faith effort at full disclosure. Kings County Farm Bureau v. City of hanford, (1990) 221 Cal.App.3d 692, 711-12. A reviewing court passes only on its sufficiency as an informational document and not the correctness of its environmental conclusions. Laurel Heights, 47 Cal.3d at 392. An EIR will be upheld if it suffices as an informational document; mandate will issue only if it fails to include relevant information which precludes informed decision-making and informed public participation.

"Choosing the precise time for CEQA compliance involves a balancing of factors. EIRs... should be prepared as early as feasible in the planning process to enable environmental considerations to influence project program and design and yet late enough to provide meaningful information for environmental assessment." Guidelines, §15004(b). As a general rule, public agencies shall not undertake actions concerning a proposed project that would have a significant adverse effect or limit the choice of alternatives or mitigation measures before completion of CEQA compliance. Guidelines, §15004(b)(2). "[I]n order to achieve the salutary objectives of CEQA the determination of the earliest feasible time to [prepare the CEQA document] is to be made initially by the agency itself, which decision must be respected in the absence of manifest abuse." Mount Sutro Defense Committee v. Regents of University of California, (1978) 77 Cal.App.3d 20, 36, 40.

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E. Analysis

CWIN and PCL argue that DWR is required to be the lead agency for the Monterey Amendments project EIR, which will examine all water transfers on a program level. The Kern

water transfer is part of the Monterey Amendments project. Therefore, DWR is the correct lead agency to conduct the environmental review of the Kern water transfer. According to Petitioners, while Castaic may not serve as the lead agency for "first-level" environmental review of the water transfer, it may serve as lead agency for a project level EIR for the Kern water transfer.

1. Validity of the Transfer

At the outset, the court must make clear an issue greatly discussed at hearing. Petitioners contend, and Castaic and Wheeler Ridge strongly dispute, that DWR may "invalidate" the Kern water transfer when it performs the program EIR.

Under contract and validation law, the Kern water transfer contract, entered into in 1999, is valid, has been approved by DWR, and Castaic has paid Wheeler Ridge for it. Neither the parties nor DWR can terminate the Kern transfer contract. Nothing in CEQA permits a public agency to void a contract.

In Kenneth Mebane Rranches v. Superior Court, (1992) 10 Cal.App.4th 276, a flood control district sought to condemn land outside its territory in order to mitigate the environmental impact of a project within its boundaries. The appellate court held that CEQA only requires mitigation of environmental impacts where it is feasible to do so. Where mitigation is infeasible, an agency can always approve a project notwithstanding environmental impacts if it issues a statement of overriding interests. But it cannot take actions that are not legal, and hence infeasible. 10 Cal.App. at 291-92.

Thus, in evaluating the environmental effects of the Monterey Agreement, DWR may impose mitigations that are legal. But it cannot invalidate the Kern transfer. The imposition of illegal mitigations would be infeasible. *See also* Pub. Res. Code §21004 (in mitigating significant environmental impact, agency may only employ powers provided by law).[12]

This does not mean that DWR's Monterey Amendments EIR cannot affect the Kern water transfer. DWR's EIR will consider the environmental impacts of the Kern water transfer in conjunction with the Attachment E transfers which the parties in Monterey Plus agreed were completed and final. DWR conceivably could conclude that these transfers have significant environmental impacts. As a consequence, DWR might have to impose feasible mitigation measures, adopt alternatives, or make a finding of infeasibility and adopt a statement of overriding considerations.[13] If mitigations/alternatives are adopted, they could significantly impact Castaic and Wheeler Ridge. As DWR states, "the contract amendments that effectuated the transfers under the Monterey Amendment[s] do not preclude DWR in its choice of

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[12]The parties disagree on whether the Monterey Amendments are valid and final. That is, they disagree on whether the amendments can be challenged in a reverse validation action separate and apart from CEQA. Resolution of this issue is unnecessary to the court's decision.

[13]At hearing, Petitioners' counsel stated that the parties to Monterey Agreement entered into a joint statement of the possible impacts from the Amendments, citing AR 48628-29. The joint statement at those pages of the record does not discuss possible mitigations; it merely summarizes the terms of Monterey Plus.

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alternatives in the Monterey Amendment[s] EIR or mitigation measures that may need to be imposed to reduce significant impacts to less than significant." DWR Br. at 20. DWR gives an example of reducing the amount of SWP water to protect water quality standards for fish in the Delta. Id. at 20. These mitigations could undermine the Kern water transfer.[14] But DWR will not be considering whether the Kern water transfer is valid; it simply does not have the authority to void that transfer. *See* Kenneth Mebane Ranches v. Superior Court, (1994) 10 Cal.App.4th 276, 292.

2. Lead Agency Law

The lead agency under CEQA is the agency that carries out a project or has primary authority for approving a project. Pub. Res. Code 121067; Guidelines §15051; *see* PCL, 83 Cal.App.4th at 904 (DWR, not Central (a State Water Contractor), had principal responsibility for carrying out the Monterey Agreement and should have been lead agency for program EIR). The role and responsibility of the lead agency is "fundamental to the CEQA process as a whole." Guidelines §15050. The identification of the proper lead agency plays a "crucial role" in the division of responsibilities among public agencies reviewing a project. PCL, 83 Cal.App.4th at 903. When determining the appropriate lead agency, the courts look to determine which agency has principal responsibility for the core project activity. Friends of Cuyamaca Valley v. Lake Cuyamaca, (1994) 28 Cal.App.4th 419, 427. The lead agency responsibility is placed upon the agency with power to approve or disapprove the project. Lexington Hills v. State of California, (1988) 200 Cal.App.3d 415, 433. Though one agency has substantial responsibility for a project, it cannot act as lead agency if another agency bears final responsibility. *See* Fullerton Joint Union High School District v. Board of Education, (1982) 32 Cal.3d 779, 795, n.15 (State Board of Education, not county, had final responsibility for school district plan). Where the project is local, such as land use decisions, the agency that has general governmental power over a project is almost always the lead agency. Where two or more agencies are involved in a project, the agency that will carry out the project shall be the lead agency. Guidelines §15051(a).

3. The Impact of the PCL Decision

Petitioners contend that the PCL decision left no doubt that DWR is the appropriate lead agency for a program-level environmental review of the water transfers in the Monterey Agreement, contrasting DWR's statewide expertise with CCWA's "provincial experience." The Monterey Amendments restructure water distribution throughout the state, and the "allocation of water to one part of the state has potential implications for distribution throughout the system." Only DWR has principal responsibility for implementation of the Monterey Amendments. Op. Br. at 11-12; *see* PCL, 83 Cal.App.4th at 904, 908. Since the Kern water transfer is part of the Monterey Amendments, DWR must perform any EIR concerning the Kern water transfer.

Petitioners' argument is a *non-sequitur*. Nothing in PCL requires DWR to perform the environmental review for the Kern water transfer. Certainly, the PCL decision requires that DWR prepare the program EIR for the Monterey Amendments, now Monterey Plus. The

[14]The close cooperation between DWR and Castaic on the 2004 EIR reduces, but does not eliminate, the prospect that DWR will impose alternatives or mitigations.

appellate court's reason for committing this task to DWR is that CEQA requires the lead agency to be the agency with principal responsibility for the project, the project is the environmental review of the Monterey Agreement, and DWR, not CCWA, has principal responsibility for implementing the Monterey Agreement. The decision pointed out that DWR manages the SWP, and has the statewide expertise and perspective to conduct the environmental review of the Monterey Agreement, which statewide project. While CCWA may have had a substantial stake in seeing the Monterey Agreement implemented, it did not have principal responsibility for it. DWR did, and DWR is required to perform the EIR for the Monterey Agreement. 83 Cal.App.4th at 906.

However, the PCL decision does not commit DWR to conduct the EIR for the Kern water transfer, or for any site specific project conducted pursuant to the Monterey Amendments. The PCL decision plainly requires DWR to prepare the program EIR for the Monterey Amendments, and its permanent transfer of 130,000 acre feet of SWP water. But it does not even mention the Kern water transfer, which is a local water transfer of Wheeler Ridge water to a point 60 miles further south in Santa Clarita Valley. The local nature of the project makes Castaic the logical choice to act as lead agency of this transfer, and nothing in PCL requires Castaic to wait for DWR's program EIR. The Kern water transfer is simply a different project from the Monterey Amendments.

Petitioners' concession that at some point Castaic can and should act as the lead agency for the Kern water transfer EIR undermines their argument that PCL committed this task to DWR. The concession shows that Petitioners really are concerned about the timing of this project specific EIR, and not whether it was committed to DWR in the PCL decision. Petitioners contend that Castaic must wait for DWR's Monterey Amendments program EIR and tier off of it for the Kern water transfer EIR. This argument is, as Castaic describes it, that Castaic "jumped the gun" by preparing the 2004 EIR. But the argument implicitly concedes that PCL did not commit the transfer EIR to DWR.

4. The Agency with Principal Responsibility

Even if PCL did not commit environmental review of the Kern water transfer to DWR, Petitioners argue that the Kern water transfer is an integral part of the Monterey Amendments project. This is shown by Monterey Plus, which excludes the Kern water transfer from the list of transfers designated as "final" and recognizes DWR's responsibility to assess its environmental impacts as part of the programmatic review. The Kern water transfer contract itself expressly relies on the Monterey Amendments, using its provisions as authority to accomplish the Kern water transfer. Even Wheeler Ridge's amendment to its SWP contract identifies the outcome of PCL as a factor that could impact the Kern water transfer's effectiveness. All of these facts, Petitioners argue, mean that the transfer is part of the Monterey Amendments environmental review.

Petitioners further argue that the nature of a program EIR supports their position. This purpose "is to document a series of actions so related they can be characterized as one project." Friends, 95 Cal.App.4th at 1377. The Monterey Amendments, including its transfer provisions, qualify as a "series of actions so related that they can be characterized as one project." An integrated review of the entire program may provide occasion for a more exhaustive

consideration of effects and alternatives than would be practical in an EIR on an individual action, ensure consideration of cumulative actions that might be slighted on a case-by-case analysis, avoid duplicative reconsideration of basic policy considerations, and allow the lead agency to consider broad policy alternatives and program-wide mitigation measures at an early time when the agency has greater flexibility to deal with basis problems or cumulative impacts. Id. at 1377. These factors are all borne out by the 2004 EIR, which presents a series of issues (the amount of supplies available to several water agencies, the location and timing of SWP deliveries, and use of SWP conveyance and storage facilities) on which DWR has superior expertise and greater accountability than Castaic. DWR may not delegate to Castaic its responsibility to prepare the environmental review for the Kern water transfer.

Under lead agency law, Castaic may act as lead agency and prepare an EIR for the Kern water transfer. The Kern water transfer is a project separate in time from the Monterey Amendments, now Monterey Plus. The core of the project is a local transfer of water between Castaic and Wheeler Ridge. Castiac alone had the responsibility to determine the water needs of its service area and to obtain the necessary water for those needs. Castaic negotiated and entered into the transfer contract with Wheeler Ridge. Castaic performed the contract by obtaining private investors who paid $47 million to Wheeler Ridge's water, and by taking delivery from DWR. The transfer is valid and cannot be challenged. Thus, Castaic has the general governmental power over the transfer, and is presumptively the lead agency for its own project. Bakman v. Dept. of Transportation, (1979) 99 Cal.App.3d 665, 678-79. Indeed, the environmental review of water transfers is generally performed by a local, not state, agency. County of Amador v. El Dorado County Water Agency, (1999) 76 Cal.App.4th 931 (local agency's analysis of water transfer project); Save Our Carmel River v. Monterey Peninsula Water Management District, (2006) 141 Cal.App.4th 677, 701 (city was lead agency as recipient of water transfer); Friends of the Eel River v. Sonoma County Water Agency, (2003) 108 Cal.Appp.4th 859 (local agency's EIR for plan to increase diversions of water from river); Sierra Club v. West Side Irrigation District, (2005) 128 Cal.App.4th 690 (local agency's environmental review of two projects to transfer water rights).[15]

It is true that DWR has an overall interest in promoting effective water management on a statewide basis. Pursuant to this interest, DWR had the right to approve the Kern water transfer, and it did so. This does not equate to principal responsibility, however. DWR is required by statute to "facilitate" the voluntary transfer of water between local agencies. Water Code §109.

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[15]The Friends court implicitly decided that Castaic may act as lead agency for the Kern water transfer. The Friends court acknowledged that it was required to address all deficiencies in the EIR unless it made a finding of improper lead agency. Pub. Res. Code §21005(c). If Castaic was the improper lead agency for the 1999 EIR, the appellate court was obligated to say so. The Friends court concluded that the 1999 EIR's only deficiency was that it tiered from the defective Monterey Agreement program EIR. Thus, the decision necessarily implied that Castaic was the proper lead agency for the 1999 EIR.

Of course, this case concerns the 2004 EIR, not the 1999 EIR, and the court previously held that Petitioners were not bound by the Friends court's implied determination. But the project is the same, and the implicit appellate determination is entitled to weight.

Per the SWP contracts, DWR's approval of the Kern water transfer could not be unreasonably withheld. Thus, DWR's involvement in the transfer is to facilitate the transfer by approving it and providing the SWP schedule delivery. Moreover, the SWP is intended as a supplement, not the exclusive supply, of water. Water supply decisions must be made by local Water Contractors, who obtain water both from SWP and other sources.[16]

Given that the decision to enter into the Kern water transfer belonged solely to Castaic and Wheeler-Ridge, and that DWR's approval is necessary merely to facilitate the transfer, Casataic had principal responsibility for the transfer.[17]

5. Project Definition

Petitioners contend for the first time in their Supplemental Vineyard Reply and at oral argument that the correct project definition is not the Kern water transfer, but is really the Monterey Amendments, citing the court's earlier ruling on Castaic's motion for legal determination that the key issue is whether the Amendments are a "series of actions (including the Kern water transfer) so related that they should be characterized as a single project." Pet. Supp. Reply at 5.

The correct definition of the project -- whether it is the Monterey Amendments or the Kern water transfer -- is a different issue than whether Castaic can act as lead agency for the project. Although the court did allude to project definition in ruling on the earlier motion, Petitioners never raised this issue in their opening brief or reply. Instead, they raise it for the first time in a reply brief on the application of Vineyard to this case. On appeal, an issue raised without analysis or authority lacks foundation and need not be addressed. City of Arcadia v. State Water Resources Control Board, ("Arcadia") (2006) 135 Cal.App.4th 1392, 1429, 1431. Similarly, an issue raised for the first time in supplemental reply deprives the opposing party of an opportunity to analyzing the issue and defend their position. Petitioners have waived the correct project definition as an issue by not raising it earlier.

Assuming *arguendo* that the issue has not been waived, a project under CEQA includes an activity directly undertaken by a public agency which may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment. Pub. Res. Code §21065(a). The "project" must be broadly defined, so as to ensure against avoiding environmental review by "chopping a larger project into little ones" or "piecemealing." Bozung v. Local Agency Formation Commission, (1975) 13 Cal.3d 263, 283-84. The project includes "the whole of an action" that has a potential for resulting in a direct or indirect physical change in the environment. Guidelines §15378. An accurate project description is necessary for an intelligent evaluation of the potential environmental effects of a

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[16]As Wheeler Ridge points out, DWR was not the lead agency for the 1991 Devils Den transfer or any of the Attachment E transfers listed in the Monterey Agreement.

[17]Given that DWR's approval may not be unreasonably withheld, cases holding that a state agency should prepare the EIR where it has final authority to approve a project are simply inapposite. *See* Fullerton v. State Board of Education, (1982) 32 Cal.3d 779, 795, n.15 (State Board of Education had final authority to submit plan to voters for new unified school district).

proposed activity. Mcqueen v. Board of Directors, (1988) 202 cal.App.3d 1136, 1143. The agency must avoid "piecemealing" or splitting a project into two or more segments. Otherwise, the cumulative environmental impacts of each piece may not be fairly analyzed. Burbank-Glendale-Pasadena Airport Authority v Hensler, (1991) 233 Cal.App.3d 577, 592. On the other hand, CEQA was not intended to and cannot reasonably be construed to make a project of every activity of a public agency, regardless of the nature and objective of such activity...." Simi Valley Recreation & Park District v. Local Agency Formation Commission, (1975) 51 Cal.App.3d 648, 663.

In San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus, (1994) 27 Cal.App.4th 713, 731-32, the court held that the project description in an EIR was improperly restricted to a 633 single family residential units, a 40,500 square foot commercial center, and a 14 acre park, failing to include sewer expansion which the EIR acknowledged would be required as part of the development. Although a separate EIR was prepared for the sewer expansion, neither it nor the development project EIR referred to the growth-inducing effects of the two projects considered together. This failure to address cumulative impacts was a separate failure of the development EIR. 27 Cal.App.4h at 733. "[t]he danger of filing separate environmental documents for the same project is that considration of the cumulative impact on the environment of the two halves of the project may not occur. This danger was here realized." Id. at 734 (citation omitted). Because the EIR did not "adequately apprise all interested parties of the true scope of the project for intelligent weighing of the environmental consequences of the project" informed decision-making was precluded, the EIR was inadequate. Id.

The lesson from San Joaquin and other project definition cases is that the project should be defined broadly to ensure a complete analysis of impacts resulting from future expansion or continuation of other phases of the project.

In this case, DWR is the lead agency for the Monterey Amendments program EIR. DWR's description of its project is to improve the management of SWP supplies and operations through the Monterey Amendments. Thus, the Monterey Amendments EIR is broad in scope. The EIR will look at changing the allocation of all SWP water supplies (including deletion of agriculture first shortage provisions), retiring 45,000 acre feet of agricultural water, and establishing more efficient use of SWP facilities. As part of the analysis, it will analyze the potential impacts from permanently transferring 130,000 acre feet of water from agricultural to urban contractors per the Monterey Agreement. This analysis will look at the individual transfers, including the Kern water transfer, as they fit the entire Monterey Amendments. But DWR does not intend to consider each transfer individually; it intends to evaluate the impact of all the Attachment E transfers and the Kern water transfer as a whole. DWR Br. at 17.

Castaic's 2004 EIR project description concerns the impacts of the Kern water transfer alone. Castaic's EIR does look at cumulative impacts of the project with other projects, including the Monterey Amendments, but does not purport to assess the environmental impacts of the Monterey Amendments independent of the Kern water transfer. AR 141-42.

Castaic relies on the independent utility test to argue that the Kern water transfer is a separate project the environmental impact of which may be separately analyzed from the Monterey Amendments. The "independent utility" test has been developed in NEPA cases to determine whether multiple actions are connected so as to require an agency to consider them in

a single environmental review. Wetlands Action Network v. United Sates Army Corps. Engineers, (9th Cir. 2000) 222 F.3d 1105, 1118.[18] Pursuant to the independent utility test, where each of two projects would have taken place with or without the other, each has "independent utility" and the two are not considered so connected that an agency must consider them in a single environmental review. Native Ecosystems Council v. Dombeck, (9th Cir. 2002) 304 F.3d 886, 894. *See also* DelMar Terrace Conservancy, Inc. v. City Council of the City of San Diego, (1992) 10 Cal.App.4th 712 (freeway segment was separate project serving a viable purpose even if long-term, multi-segment plan to expand freeway never occurred, and had independent utility under CEQA).

Castaic argues that it has contemplated the Kern water transfer since 1988, when it included a transfer with Kern in its 1988 Capital Program for the Santa Clarita Valley's future water needs. For economic reasons, Wheeler Ridge, too, sought to transfer its SWP water rights since approximately 1985. Castaic concludes that the Kern water transfer would have occurred with or without the Monterey Amendments. Articles 40 and 41 of the SWP contract permitted transfers between Water Contractors, subject to DWR approval. Article 53, added to the SWP contracts by the Monterey Amendments and concerning the transfer of 130,000 acre-feet, did not "enlarge, restrict, or otherwise impact" Castaic's right to acquire water from Wheeler Ridge under Articles 40 and 41. Instead, it was merely a blanket approval of certain contemplated transfers. Castaic Op. Br. at 21. The Kern water transfer was completed, paid for, and operating since 1999. Nothing about it is tied to the outcome of the Monterey Amendments. Thus, while the transfer is part of a larger scheme (the Monterey Amendments), it is a long-planned site specific project with independent utility from the Monterey Amendments.

The court cannot conclude that the Kern water transfer would have taken place without the Monterey Amendments. True, Castaic has wanted Wheeler Ridge's SWP allocation of water since the late 1980's, and Wheeler Ridge was willing to provide it. Yet, it did not happen until after the Monterey Amendments. The contract between Castaic and Wheeler Ridge states that the transfer was taking place "in accordance with" Article 53 of the Monterey Amendments, and those Amendments change the way SWP water is allocated in California. It does not say that the transfer is being made under Article 41. Petitioners contend, and the court agrees, that only through conjecture can one conclude that Castaic and Wheeler Ridge would have entered into the transfer without the Monterey Amendments, and with Article 18's agriculture first provisions in place.[19]

Though the court cannot conclude that the Kern water transfer would have occurred without the Monterey Amendments, it can conclude that the transfer will remain in effect even if the Monterey Amendments are not approved or otherwise are mitigated under CEQA. The court

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[18]Since CEQA was modeled on the federal NEPA statute, federal decisions on NEPA are persuasive authority on CEQA issues. No Oil, Inc. v. Los Angeles, (1974) 13 Cal.3d 68, 86.

[19]When Petitioners commented on the draft EIR that any pre-Monterey Amendments transfer would be subject to Article 18's agriculture first provisions, Castaic did not say that the Kern transfer would have occurred without the Monterey Amendments. It merely responded that the transfer "could occur" either pre- or post- Monterey Amendments. AR 993.

already has indicated that the Kern water transfer is final. The parties to the transfer stated at hearing that they have no intention of rescinding it even if the Monterey Amendments are mitigated and Article 18's agriculture first provisions are in effect. This position is supported by the fact that the 2004 EIR evaluates the water supply impacts of just such a pre-Monterey Amendment Article 18 scenario. AR 186. As such, it is compelling evidence that the transfer will stand.[20]

Plainly, then, the Kern water transfer is final and will remain in place whatever happens to the Monterey Amendments. As such, the transfer has "independent utility" for purposes of environmental review. It is not so connected to the larger Monterey Amendments that the two must must be considered in a single environmental review. *See* Native Ecosystems Council v. Dombeck, 304 F.3d at 894.

6. **EIR Timing**

Petitioners' real argument seems to be that, whenever a program EIR is anticipated, the agency preparing an EIR for a specific project must wait for the program EIR.

This is not the law. Nothing in CEQA requires Castaic to wait for DWR's program EIR. Indeed, as a general proposition, the environmental review process should be undertaken early enough in the planning process to impact planning decisions, with the timing committed to the agency's discretion. City of Vernon v. Board of Harbor, (1988) 63 Cal.App.4th 677, 690-91. The Kern water transfer occurred almost eight years ago. It has been paid for and operating for a number of years. Castaic tried to conduct a timely environmental review, but that EIR was set aside in Friends. It is not an abuse of discretion for Castaic to want to complete the environmental review and obtain finality for the transfer without waiting for DWR's program EIR of the Monterey Amendments, now Monterey Plus.

Nor does this decision frustrate the law concerning program EIRs and tiering. The purpose of a program EIR is to document a series of actions so related that they can be characterized as one project. Friends, 95 Cal.App.4th at 1377. If the program EIR is sufficiently comprehensive, the lead agency may dispense with further environmental review for later activities within the program that are adequately covered in the program EIR. Guidelines §15618(c). Thus, the program EIR may be used to focus or simplify later environmental review, or as the basis of a tiered EIR. "Tiering" means the coverage of general matters and environmental effects in an EIR prepared for a policy, plan, program or ordinance, followed by narrower or site-specific EIRs which incorporate by reference the discussion in the prior report. *See* Pub. Resources Code §§ 21068.5, 21093 and Guideline §§ 15152, 15385. Tiering is favored "whenever feasible, as determined by the lead agency." Pub. Resources Code §21093(b). It is required where a prior EIR has been prepared and certified for a program, plan, or ordinance. Pub. Resources Code §21094(a). However, tiering is only required "where a prior environmental report has been prepared and certified for a program." Friends, 95 Cal.App.4th at 1383. It is not required, and in fact is prohibited, where the program EIR has yet to be prepared. Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova, ("Vineyard") (2007) 40 Cal.4th 412

[20]Petitioners think so too, for their principal argument is premised on the 2004 EIR's assumption that the transfer is final for all purposes.

EIR cannot tier off of *future* environmental document).

7. Vineyard

In Vineyard, the Supreme Court addressed a county prepared EIR for a large land use development project known as "Sunrise Douglas." The principal issue was the availability of long-term water supply for the project, and the environmental impacts and mitigation for such supply. The Supreme Court analyzed the various water supply cases and distilled several principles. First, the EIR for a land use project must present sufficient facts to evaluate the pros and cons of supplying the amount of water the project will need, and not simply ignore or assume a water supply solution will be found for a development project. Second, an adequate EIR for a large project must show water supply for the entire project. It is not enough to show available water for early stages. While the agency may tier and defer analysis of certain details of later phases of long-term or complex projects, deferring analysis through tiering is appropriate when the impacts or mitigation measures are not determined by the first-tier approval and are specific to later phases. Third, the future water supplies identified and analyzed must bear a likelihood of actually being available. Finally, where there is some uncertainty about availability, CEQA requires some discussion of possible replacement sources or alternatives, and their environmental consequences.

Of particular use herein, the Supreme Court discussed the EIR's reliance on an anticipated local Water Board's master plan update, which would discuss the availability of long-term water supplies to the area and their environmental impact. The Court held that the county's EIR cannot tier from a *future* environmental document. If the environmental analysis from the Water Board's anticipated master plan update was important to understanding the long-term water supply for Sunrise Douglas, it should have been performed in the Sunrise Douglas EIR even though that might result in subsequent duplication by the Water Board's master plan update. Or, the county could have deferred analysis and approval of Sunrise Douglas until the Water Board's master plan update, then tiered the Sunrise Douglas EIR from the programmatic analysis performed by the Water Board.

The Vineyard decision shows that the timing of Castaic's project specific EIR in relation to DWR's program EIR is up to Castaic. It may either wait for DWR's program EIR and tier off of it, or prepare its own EIR for the Kern water transfer first. If it chooses the latter, Castaic may not tier off an environmental document that does not yet exist. Instead, Castaic must analyze all necessary environmental impacts and mitigations. If analysis of some portion of the Monterey Amendments is important to understanding the environmental impacts of the Kern water transfer, then analysis of that issue must be included in Castaic's EIR. But if Castaic's EIR does so, it is irrelevant that the document duplicates some of what DWR would do, or even that it may be inconsistent with DWR's analysis.[21] As DWR contends, CEQA's goal is to ensure sufficient information; it contains no prohibition against too much information. DWR Br. at 21. The timing of Castaic's EIR for the Kern water transfer is up to Castaic and Castaic alone.

[21] As previously stated, the prospect of inconsistencies between Castaic's EIR and DWR's program EIR is diminished by Castaic's use of DWR modeling, DWR's comments and input into the 2004 EIR, and the general cooperation and coordination between the two agencies.

F. Contents of the 2004 EIR

Apart from the proper lead agency, Petitioners argue that the 2004 EIR is inadequate. Initially, the court believed that Castaic could have real problems on this issue. It is one thing for Castaic to act as lead agency on a water transfer before the program EIR is prepared; Vineyard and other case law say that Castaic may do so. But the EIR must be adequate and complete. Vineyard teaches that if analysis of some portion of the Monterey Amendments is important to understanding the environmental impacts of the Kern water transfer, then that analysis must be included in Castaic's EIR. PCL held that the "no project" alternative was particularly important for the Monterey Amendments, and the public was entitled to know what would happen if the Amendments were not approved and Article 18 was implemented in the event of water shortage. Commentators particularly wanted to know whether imposition of Article 18 might eliminate the "paper water" entitlements in the water contracts, reduce land planning decisions based on that paper water, and ultimately reduce growth and construction of additional SWP facilities. PCL, 83 Cal.App.4th at 892-3.

The court wondered whether Castaic would have the expertise to perform any analysis of the Monterey Amendments or the "no project" alternative that would be required in the 2004 EIR. However, the parties' briefs, and oral argument at hearing, have demonstrated that, with one exception, the 2004 EIR's contents are sufficiently presented. Indeed, Petitioners barely criticize the 2004 EIR's adequacy, except as it impacts the lead agency issue.

1. "Deception"

Petitioners' principal argument about content is that the 2004 EIR is deceptive in failing to make clear that the Kern water transfer is not "final." They contend that the 2004 EIR's project definition treats the Kern water transfer as an immutable *fait accompli* which fails to disclose that the "final status" of the transfer depends on the DWR's forthcoming review. According to Petitioners, the EIR improperly relies on the interim availability of the water to predict that DWR will "leave it in place," a point which the court in California Oak Foundation v. City of Santa Clarita, ("California Oak") (2005) 133 Cal.App.4th 1219, 1238, n.16 had no trouble dispatching, and also improperly states that it would be unnecessary and speculative to consider what the DWR might do to change the transfer (*See* AR 994). Pet. Op. Br. at 19-20. This false assumption that the transfer is immutable may result in land use decision-makers approving projects based on water availability "worth little more than a wish and a prayer." Id. at 20-21.

The court has determined that the transfer is final as a matter of law. Therefore, the EIR is not wrong in saying so. What Petitioners really contend is that the Kern water transfer, though final, can be affected by the DWR's program EIR through mitigations and imposition of alternatives. Yet, the EIR proceeds as if the transfer cannot be altered. As counsel described the issue at hearing, the 2004 EIR "talks about risk, but never directly informed the public about the fact that the transfer may be unwound through the Monterey Amendment EIR process." Thus, the EIR refers to the transfer as of an "*existing* 41,000 " acre feet of SWP Table A water (AR 15, 35) and states that "no permits or *other approvals* would be required other than" certification of the

EIR. AR 16.[22]

The EIR is the method for disclosure of environmental issues. Rural landowners Assn. V City Council, 43 Cal.App.3d 1013, 1020. CEQA's purpose is to compel agencies to make decisions with environmental consequences in mind, but CEQA does not and cannot guarantee that these decisions will always favor environmental concerns. Laurel Heights, 47 Cal.3d at 393. The EIR should provide sufficient analysis to allow decision-makers to make intelligent judgments about environmental consequences. Guidelines §15151. The evaluation of environmental effects need not be exhaustive, but the EIR's sufficiency is reviewed in the light of what is reasonably foreseeable. Id. Perfection is not required, but adequacy, completeness, and a good faith effort at full disclosure is. Id.

In California Oak, the court addressed the proposed development of a 584 acre industrial park project in the Santa Clarita. The City's EIR relied on the Kern water transfer for water supply, and the appellate court held that it did not adequately address the uncertainty in that water delivery. 133 Cal.App.4th at 1236. The City's comments "did little more than dismiss project opponents' concerns about water supply" and the EIR failed to discuss the adequacy and availability of water supply absent the Kern water transfer. Appendix K to the EIR did acknowledge uncertainty in the Kern water transfer, but this was insufficient in part because inforamtion "scattered here and there in EIR appendices" or a report "buried in an appendix" is not a substitute for good faith reasoned analysis. Id. at 1239 (citation omitted). Moreover, Appendix K contained no facts and analysis about the likelihood of deficit or alternative sources of supply, and was misleading about the fact that Castaic had an SWP "entitlement" without explaining that the entitlement consisted in part of "paper water." Id. at 1239-40. Hence the EIR failed as an informational document on water supply issues.

Castaic contends, and the other Respondents agree, that the 2004 EIR fully addresses the uncertainty of what DWR will do. At hearing, they contended that Petitioners really are arguing that the 2004 EIR is misleading because it does not anticipate Petitioners' argument.[23]

The EIR explains that planning for water supply to meet demands requires consideration of reliability of SWP supplies, because historical and statistical analysis show that the full Table A amount will not be available in some years. AR 41. The EIR explains that Castaic's Table A amount is the maximum SWP amount, and the amount of SWP water actually available to it varies from year to year. Id. The EIR acknowledges that DWR's allocations are based on that year's hydrological conditions, the amount of water stored in the SWP system, and contractor requests for water. AR 16. The EIR discusses the Monterey Agreement (AR 46-47), PCL and Monterey Plus. AR 17-18, 47. The EIR cautions land use planners who might rely on the EIR to predict future water supplies, that while Castaic will implement all feasible measures to obtain water "past water deliveries are not a guarantee of future delivery rates." AR 13.

The EIR considers the environmental impact of the project based on water allocation

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[22]At trial, Petitioners' counsel made plain that this issue of deception is distinct from the reliability of water delivery by DWR.

[23]Respondents' contention sounds like an argument that Petitioners failed to exhaust their administrative remedies. However, no failure to exhaust claim was made in their briefs.

scenarios of pre-Monterey Amendments without Article 18 cutbacks, pre-Monterey Amendments with Article 18 cutbacks, and post-Monterey Amendments. AR 56. The EIR argues that the project could have been authorized under Article 41, but instead was implemented under Article 53 of the Monterey Agreement. It adds that DWR is preparing a new EIR for the Monterey Amendment.

Since the Monterey Amendments change the way in which SWP water is allocated among contractors, the 2004 EIR provides three separate analyses of the project's impacts to water supply. AR 186-89. The EIR goes to great lengths to discuss the uncertainties in the Article 18 allocations. AR 187-89. For each scenario, the EIR estimates reliability based on wet, dry, and extended dry year conditions. AR 183-91. The EIR addresses direct impacts to water supply and water quality under the three water allocation scenarios. AR 202-05. It discusses indirect impacts from the growth-inducing effect of the project, and mitigations of these impacts through implementation of existing agency policies. AR 207-224. It discusses the cumulative impact of the project and other projects inside and outside the project area. AR 278-89. Finally, it addresses alternatives to the project, including a no project alternative. AR 293-300.

The EIR clearly demonstrates the variability of SWP deliveries, and covers what could happen as a result of the Monterey Amendments EIR. But Petitioners are correct that the EIR has a hole in it. The EIR does not directly explain that the project may be impacted by the outcome of the Monterey Amendments EIR. Instead, the 2004 EIR assumes there are three possible water delivery scenarios without any discussion of why or how they would occur: "Since the Monterey Amendments change the way in which SWP water is allocated among contractors, the 2004 EIR provides three separate analyses of the project's impacts to water supply." The reader is left to interpret how these allocations could come about, and must conclude on his or her own that they are three possible outcomes of challenges to the Monterey Amendments. Nor does the EIR explain how such challenges could cause these allocations to occur.

An EIR is an informational document which is supposed to provide the reader with the "analytic route the...agency traveled from evidence to action."Citizens of Goleta Valley v. Board of Supervisors, ("Goleta") (1990) 52 Cal.3d 553, 568. This means that the EIR must contain facts and analysis, not just the agency's bare conclusions or opinions. Castaic is not required to predict the outcome of litigation, and may not be able to discuss the likelihood of each of the three allocations. However, it should have at least explained why the three scenarios are relevant and how they would occur.[24] The failure to do so leaves the reader wondering why they are pertinent. Consequently, the 2004 EIR fails to provide the analytic route by which the three alternatives are relevant.

Non-compliance with the disclosure requirements of CEQA may constitute a prejudicial abuse of discretion regardless of whether the agency would have taken the same action had it complied with CEQA. Pub. Res. Code §21005(a). Still, CEQA is subject to the established principle that there is no presumption of prejudicial error. Pub. Res. Code §21005(b). Only if the manner in which the agency failed to follow the law is prejudicial must the decision be set aside. Sierra Club v. State Board of Forestry, (1994) 7 Cal.4th 1215, 1236.

[24]For example, the court has no idea how a pre-Monterey Amendments without Article 18 cutbacks would occur.

The issue is whether Castaic's failure to supply the analytical route for its consideration of the three allocations is prejudicial. Prejudice depends on whether the failure to include this information makes "any meaningful assessment" of the project's environmental effects impossible, in which case prejudice is presumed. Sierra Club v. State Board of Forestry, (1994) 7 Cal.4th 1215, 1236 (agency approved timber harvesting plans without requiring necessary environmental information in them).[25] Even under this standard, not every CEQA failure is prejudicial. An EIR will be upheld if the error *de minimus* or clerical in nature (Save San Francisco Bay Association v. San Francisco Bay Conservation and Development Commission (1992) 10 Cal.App.4th 908, 935), the EIR analysis is comprehensive, if not perfect, despite the error (Schaeffer Land Trust v. San Jose City Council, (1989) 215 Cal.App.3d 612, 627-28), and information which should have been included to make the EIR accurate nonetheless has no material effect on informed decision-making or informed public participation (Al Larson Boat Shop, Inc. v. Board of Harbor Commissioners, (1993) 18 Cal.App.4th 729, 747-50).

The Vineyard court reiterated that the reviewing court must focus on the nature of the defect, depending on whether the claim is predominantly one of improper procedure or a dispute over facts. Where the agency has employed the correct procedures, greater deference is given to the agency's factual conclusions, which are reviewed for substantial evidence. 40 Cal.4th at 435.

The 2004 EIR's non-compliance concerns its analytic route – why and how the three allocations are pertinent. This is not a fact issue to be supported by substantial evidence. Instead, it is a failure affecting the public's ability to make a "meaningful assessment" of the project's environmental effects. As such, it is prejudicial. *See also* Rural Land Owners Assn. v. Lodi City Council, (1983) 143 Cal.App.3d 1013, 1023 (whenever failure to comply with CEQA results in a subversion of its purposes by omitting information from the environmental review process, the error is prejudicial).[26]

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[25]One appellate court, Resource Defense Fund v. Local Agency Formation Commission, (1987) 191 Cal.App.3d 886, 897-98 has stated that "[f]ailure to comply with CEQA is necessarily prejudicial." This does not appear to be the consensus approach. *See* Dusek v. Anaheim Redevelopment Agency, (1985) 173 Cal.App.3d 1029, 1040-42 ("a minor CEQA sin or two" constituting technical defects where the public had not been misled or defrauded is not enough for prejudice).

[26]Petitioners also argue that the 2004 EIR finesses the non-final nature of the project by jumping the gun and analyzing pre-Monterey Amendments. According to Petitioners, Castaic performed a "mini-programmatic review" at AR 155-06 and App. D (AR 468-550). The charts at AR 184 and 506 show this. According to Petitioners, this is not just factual overlap; this is usurpation of DWR's responsibilities.

DWR correctly points out that Petitioners are complaining about too much information, something that CEQA does not proscribe. Petitioners have no complaint about the content of the mini-program review. To the extent that Castaic performed a task that DWR is obligated to perform, DWR may either use Castaic's analysis or perform a new one. The cooperation of DWR and Castaiac suggests that the overlapping environmental analysis will be consistent. Even if inconsistent, DWR's analysis will control for the Monterey Amendments. There is no

2. Modeling

Petitioners contend that Castaic used an obsolete DWR model, DWRSIM, for making predictions about the amount of SWP water that could be available as a result of the Kern water transfer. DWR has used CALSIM II for modeling SWP deliveries since 2000. While the EIR uses CALSIM II to look at the environmental setting, it only uses DWRSIM to look at environmental impacts. According to Petitioners, Castaic's rationale for doing so -- that DWRSIM should be used for the 1998 environmental setting -- makes no sense. Modeling is for future results, not historical analysis.

Petitioners argue that Castaic's use of an old model prejudicially overstates the reliability of SWP water delivery. App.D, Table 2-2 compares the projected 2020 deliveries based on the two different models. AR 493. The graph shows a discrepancy between the two models, particularly in the 50-70% supply range, and most glaringly in the range of drought conditions. Although the EIR does not quantify these differences, Castaic's responses to public comments presents a table that does. The table shows that the two models can differ by as much as 5000 acre-feet. Pet. Op. Br. at 23. According to Petitioners, this is not the "slight discrepancy" DWR states it is.

When a challenge is brought to studies on which an EIR is based, "the issue is not whether the studies are irrefutable or whether they could have been better. The relevant issue is only whether the studies are sufficient credible to be considered as part of the total evidence that supports the" agency's decision. Laurel Heights, 47 Cal.3d at 409 (lead agency entitled to choose and rely on expert opinion even though others may disagree). Expert testimony constitutes substantial evidence and an agency is entitled to rely on it. Uhler v. City of Encinitas, (1991) 227 Cal.App.3d 795, 805. Even where experts disagree, the agency is entitled to choose one expert's opinion over another. Laurel Heights, 47 Cal.3d at 409. The party challenging the EIR bears the burden of demonstrating that the studies on which the EIR is based "are clearly inadequate or unsupported." State Water Resources Control Board Cases, (2006) 136 Cal.App.4th 674, 795.

CEQA requires Castaic to reasonably inform the reader about the amount of water available. The EIR states that all environmental impacts from the project are driven by the amount of water delivered and the timing of delivery. AR 55. Castaic analyzed the amount of SWP water available for delivery through hydrologic modeling with computer simulations that predict the amount of water available under various hydrologic conditions. To do so, the EIR, like all EIR's had to have an environmental setting for the project. This environmental setting describes the conditions of the project as they exist at the time the Notice of Preparation is published or, if there is none, at the time the environmental analysis is commenced. This setting will normally constitute the baseline physical conditions by which an agency determines whether an impact is significant. Guidelines §15125(a).

The 2004 EIR states that its baseline 1998 environmental setting used DWRSIM, which is a model simulating the operations of the SWP, "because this is the modeling tool that was available during 1998." AR 55. DWR had used DWRSIM in 2000 to conduct a reliability study for another project. The 2004 EIR does use CALSIM II for the current environmental setting of

usurpation of responsibility.

the project. CALSIM II was available because DWR performed a SWP Delivery Reliability Report in 2003 using CALSIM II as its model. AR 56. Although the modeling tools are different, the criteria used to input into the computer simulation has not changed significantly. Id.

The question raised by Petitioners is why use an older computer simulation model (DWRSIM) for the 1998 baseline when a newer model (CALSIM II) was available? Appendix D of the 2004 EIR, entitled "Technical Data for Hydrologic Analysis," explains that Castaic had to do so because it did not perform any model analysis of its own. Instead, Castaic relied upon DWR's expertise, and its existing model studies. *See* AR 491. DWR used DWRSIM in its 2000 study and CALSIM II in its 2003 study; Castaic relied upon those same studies and same models.

Castaic's reliance on DWR's existing studies and its expertise is an explanation, but the issue becomes whether it is an adequate one.

The answer is in Appendix D, which explains that DWRSIM has a database of monthly runoff based on historic hydrologic data for a 73 year period from 1922-74. DWRSIM takes this data and, depending on the input variables of operating constraints and water contractor demand, estimates the amount of water SWP can deliver each month over that 75 year period. Assuming that hydrologic conditions repeat, the operator can predict the amount of water available under that particular hydrologic condition and with a particular demand and operating condition. AR 491.

Appendix D then shows that DWRSIM and CALSIM II predict similar outcomes, and that the differences in their predictions can be explained. In Figures 2-1 and 2-2 of Appendix D, Castaic compares the two models' prediction of SWP water deliveries at existing demand and at predicted 2020 demand levels. AR 493. The "existing demand" for the DWRSIM model is 1998 demand. The "existing demand" for the CALSIM II model is 2001 estimated demand. The 2001 demand is higher than the 2000 demand. Consistent with reality, the model will only show delivery up to the amount of demand; SWP will not deliver more water than is asked for even if it is available. This difference in demand explains why CALSIM II shows more delivery in wet years than DWRSIM; the lower demand in 1998 limits the amount of delivery.

The difference in demand also explains in part why CALSIM II predicts a higher delivery in extremely dry conditions; 1998's lower demand means more water is left in storage from the preceding year and is available for delivery in a dry year. Appendix D says that the proof is in the pudding: comparison of DWRSIM and CALSIM II in Figure 2-2, for the year 2020 with the same level of demand for each model, shows very close prediction of SWP delivery for both models. AR 492-93.

Castaic concludes that the two models predict "generally comparable" results and their differences are minimal. AR 491, 1003. Castaic argues that, if anything, the slightly higher supplies predicted by the DWRSIM model provide a worst case scenario for purposes of growth inducing impacts; the more water the more developers will grow the Santa Clarita Valley. AR 1003-04, 1009.

Contrary to Petitioners' argument, the use of DWRSIM and not CALSIM II in the 1998 baseline study does not affect the conclusion that the study constitutes substantial evidence. Petitioners do not present expert opinion that the use of DWRSIM results in any error. They merely rely on the differences in Figures 2-1 and 2-2 of Appendix D, and Appendix D explains

the reason for the differences. As Castaic points out, Petitioners cannot point to any environmental significance to the use of DWRSIM and not CALSIM II. Therefore, Petitioners have not met their burden of demonstrating that use of DWRSIM for the 1998 baseline in the 2004 EIR was "clearly inadequate or unsupported."[27]

3. Cumulative Impacts

Petitioners contend that the 2004 EIR attempts to assess the project's impacts on the SWP without discussion why Castaic is competent to do so. As an example, the EIR rejects any significant project impact on the Delta, even though it acknowledges that differences in timing in the use of water for urban (Castaic) rather than agricultural (Wheeler Ridge) purposes would change the timing of deliveries. AR 192. Petitioners argue that the Delta is "in crisis" and there is great potential for conflict between Castaic's and DWR's respective environmental analysis. Pet. Op. Br. at 23-4.

An EIR must contain a cumulative impacts analysis of the project's environmental impact when considered in conjunction with other projects (Guidelines §15130) in order to ensure that "the entire relevant environmental picture" has been adequately considered. Laupheimer v. State of California, (1988) 200 Cal.App.3d 440, 462. A cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts. Guidelines §15130(a)(1). The EIR should not discuss impacts which do not result at least in part from the project being evaluated. Id. The analysis should reflect the severity and likelihood of occurrence of the impact. Guidelines §15130(b). In every case, there should be at least a preliminary search for potential cumulative environmental effects and a preliminary assessment of their significance. Laupheimer, 200 Cal.App.3d at 462-63. The detail required in a cumulative impacts discussion need not be as great as provided for the environmental impacts attributable to the project alone. Guidelines §15130(b). Generally, the EIR should list the projects producing cumulative impacts or provide a summary of projections contained in a prior certified or adopted environmental document which describe the regional conditions contributing to the cumulative impact. Guidelines §15130(b)(1). The 2004 EIR uses the list approach to discuss cumulative impacts of the project's environmental impact when considered in conjunction with other projects. AR 241-289.

Castaic argues that everything that happens with respect to the Kern water transfer happens south of the Delta, and the EIR thoroughly discusses that, including the impact of the timing of deliveries. AR 193-06. Thus, the EIR's conclusion that the project will have no direct

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[27]Castaic does not have statewide expertise on SWP reliability, but its consultants and DWR do. In commenting on Castaic's draft EIR, DWR stated that the differences between CALSIM II and DWRSIM "may cause slight changes in results, which may lead DWR to different conclusions....[in DWR's Monterey Amendments EIR]" AR 564. However, DWR also found that the draft EIR adequately and thoroughly discussed the project and its impacts, including the effects of the project on the environment and the SWP, using appropriate baseline conditions, and had a good discussion of the relationship between the Kern water transfer and Monterey Plus. DWR concluded that the draft EIR a "adequately discusses the reliability of the SWP, pre- and post- Monterey Amendment conditions, and SWP operations." AR 564-65.

significant impact on the SWP or related facilities is fully supported. Castaic contends that Petitioners really are attacking its ability to act as lead agent for a local project if the project has the potential for statewide impact. According to Castaic, this argument goes to the lead agency issue, and is incorrect as a matter of law. Castaic is qualified and required by CEQA to assess impacts that occur outside of its borders in evaluating the Kern water transfer. Citizens of Goleta Valley v. Board of Supervisors, (1990) 52 Cal.3d 553, 573.

The court does not know whether Petitioners really are attacking Castaic's expertise or the adequacy of its assessment of SWP impacts from the Kern transfer. The reason is that Petitioners' arguments are conclusionary and unsupported by analysis, authority, or many facts. Petitioners' obligation was to point out what is wrong with the analysis, or what has been omitted that was required. An issue raised without analysis or authority lacks foundation and need not be addressed. Arcadia, 135 Cal.App.4th at 1429, 1431. The court has no obligation to search the EIR's cumulative analysis section to look for defects. Their general objection requires only a general response that Castaic's cumulative impacts analysis is adequate.

4. The "No Project" Alternative

Petitioners argue that the 2004 EIR fails to address the "no project" alternative, an issue particularly important because it was the principal defect in the PCL Monterey Agreement EIR. As the PCL court stated, a "no project" alternative must discuss "existing conditions" and "what would reasonably be expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services." 83 Cal.App.4th at 912. The Monterey Agreement EIR did not discuss the projections related to land planning, demand for water, and other impacts of reducing entitlements pursuant to Article 18(b). Id. at 919. Petitioners contend that the 2004 EIR does discuss the water supply reliability impacts of invoking Article 18(b), but not the statewide impacts the PCL court found so crucial.

The short answer to Petitioners contention is that 2004 EIR addresses a different project than the Monterey Amendments. The "no project" alternative for any EIR requires a comparison of the impacts of approving the project with the effect of not doing so. Guidelines §15126.6.(e)(1); Mira Mar Mobile Community v. City of Oceanside, (2004) 119 Cal.App.4th 477, 488-89. The only "no project alternative" that Castaic is obligated to consider is the alternative of "no Kern water transfer." Castaic has addressed this alternative by discussing groundwater sources of water and a possible moratorium. AR 291-4. Petitioners do not quibble with this analysis. But Castaic had no obligation to consider "no Monterey Amendments" as a no project alternative.[28] Indeed, it would make no sense to evaluate "no Monterey Amendments" as an alternative to the Kern water transfer.[29]

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[28]Of course, the 2004 EIR is obligated to consider invocation of Article 18(b) as a reasonably foreseeable environmental impact, and the adequacy of it doing so has been discussed.

[29]For a similar reason, Castaic need not analyze alternative uses of the SWP water in a "no project" alternative. CEQA does not require consideration of alternatives that do not meet the project objective; *i.e.*, delivery of water to Castaic's customers. *See* Guidelines §15126.6(c).

LETTER 4

5. Post-Hoc Rationalization

Petitioners also suggest that the 2004 EIR is a post-hoc rationalization for "a decision already made." Pet. Op. Br. at 18. Pre-judging environmental decisions in order to accomplish a project is prohibited under CEQA. An agency may not commit to a project before CEQA review is completed because a fundamental purpose of an EIR is to provide decision-makers with information they can use in deciding whether to approve a project. Therefore, post-approval environmental review has been condemned. Laurel Heights, 47 Cal.3d at 394. *See* Residents Ad Hoc Stadium Com. v. Board of Trustees, (1979) 89 Cal.App.4th 274, 285. Of course, an agency contemplating a project may be presumed to favor the project, and CEQA assumes this to be inevitable. Therefore, it builds in procedural protections to insure that the decision-maker does not fail to note the facts and arguments by opponents to the EIR. Id. at 285.

Castaic had completed the transfer and performed under it for several years prior to preparing the 2004 EIR. Plainly, it desires to keep the transfer and not change it. When the 1999 was found deficient, Castaic was required under CEQA to perform a "fresh look" at the transfer's environmental impacts. With the exception of the analytical hole discussed above, it has done so. *See* City of Vernon v. Board of Harbor, (1998) 63 Cal.App.4th 677, 1523 (adequacy of EIR overcomes contention that it was a post-hoc rationalization).

G. Conclusion

Castaic may act as the lead agency for the Kern water transfer. The 2004 EIR was properly prepared except for one defect – it fails to show the analytic route as to how and why the three allocations of pre-Monterey Amendments, pre-Monterey Amendments without Article 18, and post-Monterey Amendments are relevant and would occur. The court offers no opinion on whether this failure must be rectified by addendum (Guidelines §15164), a subsequent EIR, a supplement to EIR, or a new EIR. That determination is Castaic's to make in the first instance.

The Petition for Writ of Mandate is granted in part. A writ shall issue commanding Castaic to set aside its approval of the 2004 EIR and comply with CEQA, either through the preparation of a new EIR or other environmental documentation, such as an addendum, addressing the analytic route of the three water allocations. Castaic is not directed to set aside the Kern water transfer. Judgment shall be entered in favor of Petitioners solely on this issue.

This shall serve as the court's proposed statement of decision in compliance with CRC 232(c). If there are no written objections filed, the statement shall be final. As Respondents have prevailed on all but one issue, Castaic's council is ordered to prepare a writ of mandate and judgment consistent with this decision, and serve it on all other counsel for approval as to form. After 10 days, Castaic may file the proposed writ and judgment with the court, along with a declaration stating the nature and extent of any objections received. An OSC re: judgment shall be set for April 23, 2007.

Dated: April 2, 2007

J. Chalfant

Superior Court Judge
JAMES C. CHALFANT

PROOF OF SERVICE

STATE OF CALIFORNIA)
COUNTY OF ORANGE)

I am employed in the County of Orange, State of California. I am over the age of eighteen (18) years and not a party to the within action; my business address is: 695 Town Center Drive, Suite 400, Costa Mesa, California 92626.

On May 14, 2007, I served the foregoing document described as: **[PROPOSED] JUDGMENT GRANTING PEREMPTORY WRIT OF MANDATE** on the interested parties in this action by placing a true copy thereof enclosed in a sealed envelope addressed to all parties as indicated on the attached mailing list:

SEE ATTACHED LIST

[XX] (BY MAIL) I am "readily familiar" with the firm's practice of collection and processing correspondence by mailing. Under that practice it would be deposited with U.S. postal service on that same day with postage fully prepaid at Costa Mesa, California in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

[ ] (BY OVERNIGHT MAIL) I caused such document to be delivered by overnight mail to the offices of the addressee(s).

[ ] (BY PERSONAL DELIVERY) I caused such envelope to be delivered by hand to the offices of the addressee.

[ ] (BY FACSIMILE) I transmitted said document by fax transmission to the fax number(s) indicated

[**XX**] (BY E-MAIL) I transmitted said document by e-mail transmission to the e-mail addresses indicated

[**XX**] (STATE) I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

Executed on May 14, 2007, at Costa Mesa, California.

Victoria A. Robinson
VICTORIA A. ROBINSON

PROOF OF SERVICE

STATE OF CALIFORNIA)
COUNTY OF ORANGE)

I am employed in the County of Orange, State of California. I am over the age of eighteen (18) years and not a party to the within action; my business address is: 695 Town Center Drive, Suite 400, Costa Mesa, California 92626.

On May 18, 2007, I served the foregoing document described as: **[PROPOSED] JUDGMENT GRANTING PEREMPTORY WRIT OF MANDATE** on the interested parties in this action by placing a true copy thereof enclosed in a sealed envelope addressed to all parties as indicated on the attached mailing list:

SEE ATTACHED LIST

[XX] (BY MAIL) I am "readily familiar" with the firm's practice of collection and processing correspondence by mailing. Under that practice it would be deposited with U.S. postal service on that same day with postage fully prepaid at Costa Mesa, California in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

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[ ] (BY PERSONAL DELIVERY) I caused such envelope to be delivered by hand to the offices of the addressee.

[ ] (BY FACSIMILE) I transmitted said document by fax transmission to the fax number(s) indicated

[XX] (BY E-MAIL) I transmitted said document by e-mail transmission to the e-mail addresses indicated

[XX] (STATE) I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

Executed on May 18, 2007, at Costa Mesa, California.

Monifa Wilson

MONIFA WILSON

MAILING LIST
Los Angeles County Superior Court Case No. BS 098724

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LETTER 4

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ORIGINAL

FILED
LOS ANGELES SUPERIOR COURT
MAY 22 2007
JOHN A. CLARKE, CLERK
A. Fajardo
BY A. FAJARDO, DEPUTY

RECEIVED
MAY 18 2007
CIVIL OPERATIONS

IN THE SUPERIOR COURT OF THE STATE OF CALIFORNIA

COUNTY OF LOS ANGELES, CENTRAL DISTRICT

PLANNING AND CONSERVATION LEAGUE,

Petitioner,

vs.

CASTAIC LAKE WATER AGENCY,

Respondent,

CALIFORNIA DEPARTMENT OF WATER RESOURCES, KERN COUNTY WATER AGENCY, WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT,

Real Parties in Interest.

CALIFORNIA WATER IMPACT NETWORK,

Petitioner,

vs.

CASTAIC LAKE WATER AGENCY,

Respondent,

CALIFORNIA DEPARTMENT OF WATER RESOURCES, KERN COUNTY WATER AGENCY, WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT,

Real Parties in Interest.

CASE NO.: BS 098724

Assigned for All Purposes:
Honorable James Chalfant
Department 13

(Consolidated Cases)
[Transferred from Ventura County Master File No. CIV 231588 (consolidated with Ventura County Case No. CIV 231606)]

~~[PROPOSED]~~ PEREMPTORY WRIT OF MANDATE

Action Filed: January 24, 2005
Action Transferred: August 8, 2005

LETTER 4

THE PEOPLE OF THE STATE OF CALIFORNIA

To Castaic Lake Water Agency, Respondent:

Judgment having been entered in this proceeding ordering that a peremptory writ of mandate be issued from this Court based on the Statement of Decision,

YOU ARE HEREBY COMMANDED within 30 days of service of this Writ to:

1. Set aside your December 22, 2004 certification of the Final Environmental Impact Report ("EIR") for a Supplemental Water Project Transfer of 41,000 acre-feet per year ("afy") of State Water Project ("SWP") Table A Amount ("2004 EIR"), ~~but only with respect to addressing the analytic route of the three water allocations in the 2004 EIR, *i.e.*, pre-Monterey Amendments without Article 18(b) cutbacks, pre-Monterey Amendments with Article 18 (b) cutbacks and post-Monterey Amendments~~.
2. Comply with the California Environmental Quality Act [Public Resources Code § 21000, *et seq.* ("CEQA")] in the preparation of additional environmental documentation consistent with the Statement of Decision addressing the analytic route of the three water allocations in the 2004 EIR, *i.e.*, pre-Monterey Amendments without Article 18(b) cutbacks, pre-Monterey Amendments with Article 18 (b) cutbacks and post-Monterey Amendments.
3. Nothing in this Writ shall be construed as commanding Castaic to set aside the Kern Water Transfer.

Nothing in this Writ, except for the commands set forth in paragraphs 1, 2 and 3, shall be construed to limit or control the discretion legally vested in you to determine the appropriate manner to comply with CEQA.

YOU ARE FURTHER COMMANDED to make and file a return to this Writ, setting forth what you have done to comply. This Court shall retain jurisdiction over your proceedings by way of that return until this Court has determined that you have complied with the commands and directions set forth in this Writ.

DATED: 5/22/07

CLERK OF THE SUPERIOR COURT

Let the forgoing writ issue.

J. Chalfant

HONORABLE JAMES CHALFANT
JUDGE OF THE SUPERIOR COURT

Presented by: McCORMICK, KIDMAN & BEHRENS, LLP
Russell G. Behrens,
David D. Boyer

DAVID D. BOYER
Attorneys for Respondent
CASTAIC LAKE WATER AGENCY

PROOF OF SERVICE

STATE OF CALIFORNIA)
COUNTY OF ORANGE)

I am employed in the County of Orange, State of California. I am over the age of eighteen (18) years and not a party to the within action; my business address is: 695 Town Center Drive, Suite 400, Costa Mesa, California 92626.

On May 14, 2007, I served the foregoing document described as: **[PROPOSED] PEREMPTORY WRIT OF MANDATE** on the interested parties in this action by placing a true copy thereof enclosed in a sealed envelope addressed to all parties as indicated on the attached mailing list:

SEE ATTACHED LIST

[XX] (BY MAIL) I am "readily familiar" with the firm's practice of collection and processing correspondence by mailing. Under that practice it would be deposited with U.S. postal service on that same day with postage fully prepaid at Costa Mesa, California in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

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[**XX**] (BY E-MAIL) I transmitted said document by e-mail transmission to the e-mail addresses indicated

[**XX**] (STATE) I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

Executed on May 14, 2007, at Costa Mesa, California.

Victoria A. Robinson

VICTORIA A. ROBINSON

MAILING LIST
Los Angeles County Superior Court Case No. BS 098724

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LETTER 4

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SUPERIOR COURT OF THE STATE OF CALIFORNIA

COUNTY OF LOS ANGELES, CENTRAL DISTRICT

PLANNING AND CONSERVATION LEAGUE, a California non-profit corporation;

Petitioner,

v.

CASTAIC LAKE WATER AGENCY, a public agency under the laws of California;
Respondent;

KERN COUNTY WATER AGENCY, a public agency under the laws of California; WHEELER-RIDGE MARICOPA WATER STORAGE DISTRICT, a public agency under the laws of California; DEPARTMENT OF WATER RESOURCES, a public agency of the State of California
Real Parties in Interest.

No. BS098724
(transferred from Ventura County, CIV231588 c/w CIV231606)

PETITIONERS' NOTICE OF PARTIAL APPEAL

Dept.: 13
Judge: Honorable James Chalfant
(assigned for all purposes)

Action filed: January 24, 2005
Action transferred: August 8, 2005
Trial date: March 19, 2007

LETTER 4

CALIFORNIA WATER IMPACT NETWORK, a California non-profit corporation;

Petitioner,

v.

CASTAIC LAKE WATER AGENCY, a public agency under the laws of California;
Respondent;

KERN COUNTY WATER AGENCY, a public agency under the laws of California; WHEELER-RIDGE MARICOPA WATER STORAGE DISTRICT, a public agency under the laws of California; DEPARTMENT OF WATER RESOURCES, a public agency of the State of California
Real Parties in Interest.

Please take notice that the petitioners in the above-referenced action, Planning and Conservation League and California Water Impact Network, appeal from the following severable parts of the this Court's Judgment Granting Writ of Mandate filed on May 22, 2007 ("judgment") and served on all parties in respondents' May 23, 2007 notice of entry of judgment:

1. The part of the Court's judgment (Judgment, page 1, lines 23-26) holding that respondent Castaic Lake Water Agency's 2004 EIR for the "Kern water transfer" project identified in the Court's statement of decision (Judgment, exh. A, page 1) was "properly prepared in all other respects" besides the issue identified as the basis for entry of judgment for petitioners in the Court's decision ("the failure of the EIR to show the analytic route as to how and why the three allocations of pre-Monterey Amendments without Article 18(b) cutbacks, pre-Monterey Amendments with Article 18(b) cutbacks and post-Monterey Amendments are relevant and would occur").

2. The part of the Court's judgment (Judgment, page 1, lines 19-21) adopting its April 2, 2007 proposed statement of decision as its final decision, to the extent the statement of decision fails to honor petitioners' objections to that proposed statement filed on April 17, 2007.

3. The part of the Court's judgment (Judgment, page 2, lines 2-3), not directing respondent Castaic Lake Water Agency to set aside the Kern Water Transfer.

Petitioners do not appeal the Court's judgment in any other respect.

Dated: July 9, 2007

LETTER 4

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DAVID R. OWEN

By: _____
Roger B. Moore
Attorneys for Petitioner PLANNING AND CONSERVATION LEAGUE

LAW OFFICES OF BABAK NAFICY

By: _____
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Attorney for Petitioner CALIFORNIA WATER IMPACT NETWORK

LETTER 4

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[EXEMPT FROM FILING AND OTHER FEES, GOV. CODE § 6103]

IN THE SUPERIOR COURT OF THE STATE OF CALIFORNIA

COUNTY OF LOS ANGELES, CENTRAL DISTRICT

PLANNING AND CONSERVATION LEAGUE,

Petitioner,

vs.

CASTAIC LAKE WATER AGENCY,

Respondent,

CALIFORNIA DEPARTMENT OF WATER RESOURCES, KERN COUNTY WATER AGENCY, WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT,

Real Parties in Interest.

CALIFORNIA WATER IMPACT NETWORK,

Petitioner,

vs.

CASE NO.: BS 098724

Assigned for All Purposes:
Honorable James C. Chalfant
Department 13

(Consolidated Cases)
[Transferred from Ventura County Master File No. CIV 231588 (consolidated with Ventura County Case No. CIV 231606)]

NOTICE OF CROSS-APPEAL

Action Filed: January 24, 2005
Action Transferred: August 8, 2005

LETTER 4

CASTAIC LAKE WATER AGENCY,

Respondent,

CALIFORNIA DEPARTMENT OF WATER RESOURCES, KERN COUNTY WATER AGENCY, WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT,

Real Parties in Interest.

TO THE CLERK OF THE ABOVE-ENTITLED COURT:

NOTICE IS HEREBY GIVEN that Respondent Castaic Lake Water Agency cross-appeals from the Judgment Granting Peremptory Writ of Mandate, as well as the Peremptory Writ of Mandate, entered on May 22, 2007, in the above entitled court.

Petitioners Planning and Conservation League and California Water Impact Network filed a Notice of Partial Appeal [*sic*] on July 12, 2007.

A full and complete copy of the Judgment is attached as Exhibit 1 to this Notice.

A full and complete copy of the Peremptory Writ of Mandate is attached as Exhibit 2 to this Notice.

Dated: July 19, 2007

McCORMICK, KIDMAN & BEHRENS, LLP
REMY, THOMAS, MOOSE AND MANLEY, LLP
R. BRUCE TEPPER, ALC

By: _____
DAVID D. BOYER
Attorneys for Respondents
CASTAIC LAKE WATER AGENCY

LETTER 4

ORIGINAL

FILED
LOS ANGELES SUPERIOR COURT
MAY 22 2007 F.D.
JOHN A. CLARKE, CLERK
A. Fajardo
BY A. FAJARDO, DEPUTY

RECEIVED
MAY 18 2007
CIVIL OPERATIONS

IN THE SUPERIOR COURT OF THE STATE OF CALIFORNIA

COUNTY OF LOS ANGELES, CENTRAL DISTRICT

PLANNING AND CONSERVATION LEAGUE,

Petitioner,

vs.

CASTAIC LAKE WATER AGENCY,

Respondent,

CALIFORNIA DEPARTMENT OF WATER RESOURCES, KERN COUNTY WATER AGENCY, WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT,

Real Parties in Interest.

CALIFORNIA WATER IMPACT NETWORK,

Petitioner,

vs.

CASTAIC LAKE WATER AGENCY,

Respondent,

CALIFORNIA DEPARTMENT OF WATER RESOURCES, KERN COUNTY WATER AGENCY, WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT,

Real Parties in Interest.

CASE NO.: BS 098724

Assigned for All Purposes:
Honorable James Chalfant
Department 13

(Consolidated Cases)
[Transferred from Ventura County Master File No. CIV 231588 (consolidated with Ventura County Case No. CIV 231606)]

~~[PROPOSED]~~ JUDGMENT GRANTING PEREMPTORY WRIT OF MANDATE

Action Filed: January 24, 2005
Action Transferred: August 8, 2005

EXHIBIT 1

The above-entitled consolidated matter came on regularly for hearing on March 19, 2007, before the Honorable James C. Chalfant. Petitioner, Planning and Conservation League ("PCL") appeared by and through Antonio Rossman and Roger B. Moore of Rossman & Moore, LLP. Petitioner, California Water Impact Network ("CWIN") appeared by and through Babak Naficy of the Law Offices of Babak Naficy. Respondent, Castaic Lake Water Agency ("Castaic") appeared by and through David D. Boyer of McCormick, Kidman & Behrens, LLP; R. Bruce Tepper of R. Bruce Tepper, ALC; and James G. Moose of Remy, Thomas, Moose and Manley, LLP. Real Party in Interest California Department of Water Resources ("DWR") appeared by and through Deputy Attorney General Marilyn H. Levin, and Deputy Attorney General Deborah A. Wordham. Real Party in Interest Kern County Water Agency ("Kern") appeared by and through Clifford W. Schulz of Kronick, Moskovitz, Tiedmann & Girard, APC. Real Party in Interest Wheeler Ridge-Maricopa Water Storage District ("Wheeler-Ridge") appeared by and through Steven M. Torigiani of the Law Offices of Young Wooldridge, LLP.

At that time the Court heard arguments of counsel and examined key portions of the Administrative Record certified by Castaic and submitted by the parties. After considering the filings of all parties, the oral arguments of counsel, and the records and files in this case, the court took the matter under submission. After further deliberations and further review of applicable legal authorities and key documents in the Administrative Record, the Court prepared a proposed Statement of Decision, which was filed and served by the Court on April 2, 2007. The Court entered its final Statement of Decision (attached hereto as Exhibit "A," and incorporated herein by reference) on May 22, 2007, after reviewing Petitioners' April 17, 2007 objections to the proposed Statement of Decision.

IT IS THEREFORE ORDERED that:

1. The 2004 EIR having been properly prepared in all other respects, Judgment shall be entered in favor of Petitioners in this proceeding solely on the issue of the failure of the EIR to show the analytic route as to how and why the three allocations of pre-Monterey Amendments without Article 18(b) cutbacks, pre-Monterey Amendments with Article 18 (b) cutbacks and post-Monterey Amendments are relevant and would occur.

2. A Peremptory Writ of Mandate shall issue commanding Castaic to set aside its

certification of its 2004 EIR and to comply with CEQA consistent with the Statement of Decision.

3. The Peremptory Writ of Mandate shall not direct Castaic to set aside the Kern Water Transfer, nor shall it limit or control the discretion legally vested in Castaic to determine the appropriate manner to comply with CEQA .

3. The Court retains jurisdiction over this matter by way of return to the Peremptory Writ of Mandate.

DATED: 5/22/07

HONORABLE JAMES CHALFANT
JUDGE OF THE SUPERIOR COURT

Presented by: McCORMICK, KIDMAN & BEHRENS, LLP
Russell G. Behrens,
David D. Boyer

DAVID D. BOYER
Attorneys for Respondent
CASTAIC LAKE WATER AGENCY

13

California Water Impact Network v. Castaic Lake Water Agency
BS 098724

Statement of Decision on Petition for Writ of Mandate

FILED
LOS ANGELES SUPERIOR COURT
APR 02 2007
JOHN A. CLARKE, CLERK
A. Izquierdo
K. RICHARDS, DEPUTY

Petitioners California Water Impact Network ("CWIN") and Planning and Conservation League ("PCL") petition for writ of mandate under California Environmental Quality Act ("CEQA"). The court has read and considered the moving papers, oppositions, and reply, heard oral argument, and renders the following decision.

A. Statement of the Case

Petitioner CWIN commenced its petition for writ of mandate in Ventura County Superior Court on January 24, 2005. The petition alleges that on December 23, 2004, the Castaic Lake Water Agency ("Castaic"), a public water agency and water wholesaler that treats and delivers water to water retailers in Los Angeles and Ventura Counties, approved the permanent transfer of 41,000 acre feet per year from Real Party in Interest Kern County Water Agency ("Kern") and its member unit in Kern County, Wheeler Ridge-Maricopa Water Storage District ("Wheeler Ridge"), to Castaic (the "Kern water transfer," the "Kern transfer," or the "transfer"). Castaic also purported to certify the Environmental Impact Report ("EIR") for the project (the "2004 EIR" or the "EIR"). Petitioner claims the Kern water transfer "threatens to promote large-scale urban sprawl in Ventura and Los Angeles Counties, while diverting water from important environmental and agricultural uses in Kern County forever." Petitioner alleges that the 2004 EIR is premature, and fails to comply with CEQA.

The petition alleges a cause of action for violation of CEQA in that Real Party in Interest California Department of Water Resources ("DWR"), not Castaic, should have been the lead agency for the 2004 EIR, which does not adequately describe the background on which the project is based, fails to disclose a reliance on an invalid Urban Water Management Plan, fails to adequately describe alternatives to the project, including a "no project" alternative, fails to discuss growth inducement, and inaccurately states the availability of water availability.[1]

On January 24, 2005, PCL filed its own petition for writ of mandate against Castaic in Ventura County Superior Court. The PCL petition alleges a violation by Castaic in recording a Notice of Determination on December 23, 2004, certifying the 2004 EIR and rendering its approval of the Kern water transfer. The petition purports to allege five "causes of action" for violation of CEQA in the 2004 EIR based on Castaic stealing DWR's duty to be the lead agency for the EIR, certification of a defective EIR, approval of inadequate findings, erroneous presentation of the project as already complete, and "prejudicial abuse of discretion."

On June 22, 2005, upon motion by Castaic, the Ventura County Superior Court (the Honorable Frederick H. Bysshe, Jr.) ordered the transfer of both petitions, which had been consolidated, to Los Angeles. On March 27, 2006, the case was reassigned to this court.

On June 27, 2006, the court heard the demurrers of Castaic and Real Party in Interest Kern to the consolidated petitions. The court ruled that the petitions were timely filed and were

[1] On CWIN's oral motion, the petition's second and third causes of action have been dismissed. As a result, CWIN's petition solely concerns Castaic's compliance with CEQA in the 2004 EIR.

EXHIBIT "A"

not barred under the doctrine of *res judicata*. The court noted that the Kern water transfer agreements are valid. While principles of *collateral estoppel* barred Petitioners from re-raising issues resolved by the Second District with respect to the 1999 EIR, this conclusion did not foreclose the petitions and the demurrers were overruled.

On July 16, 2006, the court denied Castaic's motion for a legal determination under principles of *collateral estoppel* and party admission that Castaic is the proper lead agency for preparation of the EIR for the Kern water transfer. However, Petitioners are bound by their concession that Castaic may act as the lead agency at some point for an EIR on the Kern water transfer.

B. Preliminary Issues

1. Standing and Timeliness

Petitioner PCL alleges that it is a non-profit corporation devoted to environmental protection. PCL Pet. at ¶6-7. Some of PCL's members live in the area affected by the Kern water transfer. PCL Pet. at ¶8. Petitioner CWIN alleges that it is a nonprofit public benefit corporation the purpose of which is to protect California's environment. CWIN contends that it is impacted by the Kern water transfer because its members reside in and use the Santa Clara River watershed, which is impaired by the water transfer. CWIN Pet. at ¶9. Thus, Petitioners contend that they are impacted by the project and have standing to raise the issues herein. Respondents do not contest Petitioners' standing. *See* Waste Management of Alameda County, Inc. v. County of Alameda, (2000) 79 Cal.App.4th 1223, 1233-34.

The actions are timely on CEQA issues, each having been filed on January 24, 2005, within 30 days of Castaic's Notice of Determination that the 2004 EIR had been certified, filed in various counties between December 23 and December 27, 2004. *See* Pub. Res. Code §21167(c).

2. The Administrative Record

Castaic has certified the administrative record. Pub. Res. Code §21167.6; LASC 9.24(e). The record was received in evidence at trial.

Castaic and Kern, and DWR separately ask the court to judicially notice various records. Judicial notice is the acceptance by a court without formal proof of the existence of a matter of law or fact that is relevant to an issue in the case. People v. Rowland, (1992) 4 Cal.4th 238, 268, n.6. Certain documents are subject to judicial notice. Ev. Code §451, 452. Even where subject to judicial notice, however, a document must be relevant. Id.

The California Supreme Court decision in Western States Petroleum Assn. v. Superior Court, ("Western States") (1995) 9 Cal.4th 559, 573, n.4, provides that extrinsic evidence is generally not admissible for a traditional mandamus challenging a quasi-legislative agency action. The exclusion of extrinsic evidence in a traditional mandamus action is essentially the exclusion of irrelevant evidence. Extrinsic evidence is generally not admissible for a traditional mandamus challenging a quasi-legislative agency action. Id. Such evidence may be admissible in a narrowly construed exception in which (1) the evidence in question existed before the agency made the decision, and (2) the evidence could not have been presented to the agency in the first instance in the exercise of reasonable diligence. Id. at 578. The purpose of limiting extra-record evidence is that the free use of such evidence would invade the deference to which the legislative

branch is entitled under the constitutional separation of powers. If the courts freely considered extra-record evidence in mandamus cases, the highly deferential substantial evidence standard would be turned into a *de novo* standard where the courts in effect would decide not whether an administrative decision was supported by the evidence before the agency but instead whether it was the wisest and best decision according to the courts. Id. at 572.

Castaic asks the court to judicially notice: (1) the unpublished appellate decision in Friends of the Santa Clara River v. Castaic Lake Water Agency, 2003 Cal.App. Unpub. LEXIS 11239, dated December 1, 2003 ("Friends II"), and (2) the unpublished appellate decision in California Water Network v. Castaic Lake Water Agency, 2006 Cal.App. Unpub. LEXIS 2452, dated March 23, 2003.[2] The existence of these court decisions is subject to judicial notice. Ev. Code §452(d).[3]

DWR asks the court to judicially notice (1) Amendment No. 19 to the Water Supply Contract between it and Castaic dated May 28, 2003, and (2) Notice of Preparation of EIR for the Monterey Amendment dated January 24, 2003. DWR contends that these documents are official acts of a California agency subject to judicial notice under Ev. Code section 452(c) and (d). The Notice of Preparation is an official act of DWR and is judicially noticed. However, Amendment No. 19 is not. Official acts should be limited to regulations, public announcements, and other actions the existence of which is beyond dispute. A well informed person has no way of knowing whether Amendment No. 19 is authentic and valid. Nor is it a court record under section 452(d). DWR's request for judicial notice of Amendment No. 19 is denied.

C. Statement of Facts

1. SWP

In 1951, the Legislature authorized construction of a state water storage and delivery system. Planning & Conservation League v. Department of Water Resources, (2000) 83 Cal.App.4th 892, 898. The Legislature subsequently authorized the State Water Project ("SWP"), a complex system of 28 reservoirs and dams, 26 power and pumping plants, and 600 miles of canals and aqueducts to deliver 4.23 million acre-feet of water annually to Central and Southern California. The primary source for the SWP is the drainage of the Feather River, a tributary of the Sacramento River in Northern California (hereinafter, the "Delta").

DWR is the state agency charged with the statutory responsibility to build, manage, and operate the SWP. Essentially, DWR is the wholesale provider of water to middlemen agencies. In 1961, DWR entered into individual contracts with various agricultural and urban water suppliers in the State, referred to as State Water Contractors. *See* Water Code §12937. There are 29 agencies or districts that currently are State Water Contractors.

The SWP water contracts entitled the contractors to receive an annual amount of SWP

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[2]Castaic also supplied the court with copies of its decisions on demurrer and motion for legal determination in this case, which need not be judicially noticed.

[3]Real Party Wheeler purports to join in Castaic's request for judicial notice. In its ruling on the demurrers, the court informed Wheeler of the futility of a joinder as merely a cheerleading effort. No further discussion of the purported joinder is necessary.

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water in exchange for a proportionate share of financing and maintaining the SWP facilities. Each water contract contains provisions for both allocation of the amount of water available each year and costs among the contractors. Each contract identifies a Table A amount, the annual maximum amount of water which DWR agrees to deliver, if available for delivery, to each SWP contractor on an annual basis. Delivery of the Table A amount is not assured, but rather provides the basis for proportional allocation of available water among contractors. The Table A amount is specified as either agricultural or urban (M&I). Each contract also includes Article 40, which permits water transfers between contractors, and Article 41, which requires DWR approval of any transfer subject to reasonable terms and conditions. AR 2356.

Each contractor annually submits a request to DWR for water delivery in the following year, up to the amount in Table A. In a year when DWR is unable to deliver the total of contractor requests, deliveries to all contractors will be reduced. The current Table A totals are 4.17 million acre-feet per year.[4] In fact, given existing facilities and contractor demands, the SWP can only deliver an average of 2.96 million acre-feet per year.

2. The Monterey Agreement

Historically, the delivery of less than Table A totals was not a significant problem because contractor demand was less than the Table A amounts. However, in the late 1980's and early 1990's, a drought led to SWP deliveries in amounts below that requested by contractors. Articles 18(a) and (b) of the SWP water contracts addressed DWR's temporary and permanent inability to deliver the water allocations listed in Table A of the contracts by requiring agricultural contractors to accept a reduction in water first before any remaining reduction was shared by urban contractors. In 1990, agricultural contractors received only half their requested water and none in 1991. Because contractors pay their proportionate share of fixed costs regardless of how much water is delivered, the agricultural contractors were paying for water they were not receiving and they were displeased. As a result, urban and agricultural water contractors clashed over DWR's delivery obligations and the proper interpretation of Article 18. AR 45-46.

In December 1994, five State Water Contractors and and DWR reached agreement on a broad set of fourteen principles (the "Monterey Agreement"). Among other things, the Monterey Agreement changed the allocation between agricultural and urban contractors of entitlements to SWP water. The Monterey Agreement eliminated Article 18 and specified that all SWP water was to be allocated in proportion to Table A amounts. Paragraph 24 of the Monterey Agreement provides for the permanent transfer of 130,000 acre-feet from certain willing agricultural contractors, including KWCA, to urban contractors, as implemented by individual agreement. AR 2515. It also provides that individual contractors may transfer entitlements among themselves beyond the 130,000 acre feet proposed, with DWR expeditiously executing any necessary documents and approving all such contracts. Other provisions of the Monterey Agreement include a revision of water allocations during shortages, eliminating the "agriculture first" provision, and retirement of 45,000 other acre-feet of entitlement by agricultural contractors.

[4] An "acre-foot" is the amount of water that would cover one acre one foot deep.

The Monterey Agreement provides that individual SWP contracts could be amended to conform to it. Over the next two years, 27 of the 29 Water Contractors amended their SWP contracts to implement the principles of the Monterey Agreement (collectively, the "Monterey Amendments").

In 1995, a State Water Contractor, Central Coast Water Authority ("Central"), acted as lead agency and certified a program EIR analyzing the environmental impacts of the Monterey Agreement. This program EIR also addressed Paragraph 24 (Article 53 in the Monterey Amendments) water transfers, including the Kern water transfer. In late 1995, PCL filed a lawsuit in Sacramento Superior Court challenging the program EIR, Planning & Conservation League v. Department of Water Resources, ("PCL").

3. The Kern Water Transfer Agreement

Castaic is a State Water Contractor created by the California Legislature. Its mandate is to purchase and deliver sufficient supplies of water to serve the needs of the Santa Clarita Valley. *See* Swanson v. Marin Municipal Water District, (1976) 56 Cal.App.3d 512, 524 (water district has obligation to augment available water to meet increasing demands). Castaic diverts its SWP water from the West Branch of the California Aqueduct. Castaic is one of the Water Contractors entering into the Monterey Amendments (Amendment 17 to Castaic's SWP contract).

Kern County Water Agency ("KCWA") is a special district formed by the Legislature in 1961. Wheeler Ridge is a special district formed in 1959 to provide supplemental water to agricultural lands in Kern County and is located immediately north and east of Castaic. KCWA has contracts with Wheeler Ridge and other member agencies, for KCWA's SWP water.[5]

In March 1999, Castaic entered into an agreement to purchase from Wheeler Ridge, subject to KCWA's consent, 41,000 acre-feet per year of SWP water (the Kern water transfer). The price for the transfer was $47 million in debt instruments purchased by private investors. The purpose of the transfer is to permit Castaic to serve the water demands of existing users, as well as meet a portion of future water demand from anticipated growth within the Castaic service area. AR 16. The Kern water transfer is the largest transfer under Article 53 of the Monterey Amendments, and it counts towards the 130,000 acre-feet limit. In their transfer agreement, both sides warranted that there was no pending or threatened litigation other than PCL that could affect the 41,000 acre feet SWP entitlement. AR 2562-63.[6]

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[5]In 1998, another KCWA member, Belridge Water Storage District, certified an EIR on the environmental effects of transferring 130,000 acre-feet of SWP water to unidentified purchasers. This EIR was not challenged.

[6]Castaic has been planning since 1987 to increase the supply of water to Santa Clarita Valley. At that time, Los Angeles County General Plan forecast substantial population growth in the Santa Clarita Valley. In 1988, Castaic adopted a Capital Program and Water Plan (the "Capital Program") to address the purchases, construction, and improvements necessary to meet the anticipated water demand. The Capital Program called for the purchase of SWP water from districts willing to sell, including Wheeler Ridge, and the storage of water for later use during drought conditions at Semitropic Groundwater Storage District's ("Semitropic") basins. AR

DWR's approval of the Kern water transfer was required under Articles, 15, 41, and 56 of the SWP contracts. On March 31, 1999, DWR approved the transfer by entering into Amendment 18 of Castaic's SWP contract. Amendment 18 adds Article 53(j), which provides that "in accordance with Article 53(a)" of the Monterey Amendments, Castaic's Table A annual entitlements were increased by 41,000 acre-feet. AR 2545-47. DWR and KCWA, which consented to the transfer of its water, also entered into Amendment 28 to KCWA's SWP contract, an amendment which reduced KCWA's entitlement by 41,000 acre-feet. Based on these amendments, DWR has allocated SWP water to Castaic since 1999 based on a total Table A amount of 95,000 acre-feet -- Castaic's original Table A 54,000 acre-feet plus the 41,000 acre-feet from the Kern water transfer.

On March 29, 1999, Castaic, acting as lead agency, certified an EIR for the Kern water transfer. This 1999 EIR tiered off the 1995 Monterey Amendment program EIR, the Belridge EIR, and Castaic's own 1988 EIR for the Capital Program. In April 1999, Castaic's EIR for the Kern water transfer was challenged in Friends of the Santa Clara River v. Castaic Lake Water Agency, BS056954 ("Friends"). On August 16, 2000, the trial court entered judgment, denying the petition in its entirety.

4. The PCL and Friends Decisions

In September 2000, the Third Appellate District in PCL found that DWR was the only entity with the "statewide perspective and expertise" to serve as lead agency for the Monterey Agreement program EIR. Because "the allocation of water to one part of the state has potential implications for distribution throughout the system," the court recognized DWR's principal responsibility to "facilitate the water transfers allowed under the Monterey Agreement." 83 Cal.App.4th at 907. The use of Central as lead agency for the Monterey Agreement program EIR was inappropriate. Id. at 907.

This lead agency error was not harmless because the EIR also was defective. Perhaps as a consequence of Central's lack of statewide expertise, the EIR failed to properly discuss a "no project" alternative, including the environmental impact of implementing the pre-Monterey Agreement Article 18(b)'s permanent water shortage provision. Id. at 918. This was particularly important because local land use planners rely on the "paper water" entitlements in Table A

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Pursuant to the Capital Program, Castaic permanently acquired 12,700 acre-feet of SWP Table A water in 1991 from Devil's Den Water District, a SWP contractor immediately north of Castaic. This transfer was subject to DWR approval, which per Article 41 of the SWP contracts could not be unreasonably withheld. DWR approved the transfer, noting that the transferred water remained labeled for "agricultural purposes" for purposes of delivery shortages.

Also pursuant to the Capital Program, in 2002 Castaic entered into a groundwater storage or "banking" agreement with Semitropic. This action was challenged under CEQA on the basis that the Monterey Agreement required DWR to conduct an environmental review. The challenge was rejected by the appellate court, which held that DWR had no jurisdiction over Castaic's management of water; DWR merely schedules SWP water delivery to Castaic. Cal. Water Network v. Castaic Lake Water Agency, (2006) 206 Cal.App. Unpub. LEXIS 2452, 9.

rather than real, deliverable water. The question was what impacts were reasonably foreseeable from eliminating Article 18(b)'s solution to permanent water shortage? Id. at 914-15. The PCL court held that the EIR, which lacked simulation models and projections relating to land use planning and demand for water, did not adequately address this issue. Id. at 919. It directed the Sacramento Superior Court to retain jurisdiction over the action until a new EIR was prepared and certified.

Based on the Third District's PCL decision, on January 10, 2002, the Second Appellate District reversed the judgment in Friends and directed the trial court to issue a writ of mandate compelling Castaic to set aside certification of its EIR. Friends, (2002) 95 Cal.App.4th 1373. The reversal was based solely on the fact that Castaic's EIR had been tiered upon the now inadequate Monterey Agreement program EIR. The Second District rejected all of the other challenges to Castaic's EIR, finding them to be without merit. The appellate court noted that Castaic may be able to cure the defect by waiting for DWR to comply with the Third District's directive in PCL by preparing a new program EIR. Castaic could issue a subsequent EIR, a supplement to EIR, or addendum to EIR, tiering upon the new Monterey Agreement EIR.

The Friends appellate decision concluded as follows: "The judgment is reversed. The trial court shall issue a writ of mandate vacating the certification of the EIR, shall retain jurisdiction until Respondent certifies an EIR complying with CEQA consistent with the views expressed in this opinion, and shall consider such orders it deems appropriate under [Pub. Resources Code] section 21168.9."

On October 25, 2002, after remand from the court of appeal, the Friends trial court issued a Peremptory Writ of Mandate and Judgment on Remand, retaining jurisdiction until Castaic certifies an EIR that complies with CEQA and is consistent with the views expressed by the Second District. The trial court did not direct Castaic to set aside its approval of the Kern water transfer and denied the petitioner's request to enjoin Castaic from using any of the 41,000 acre feet of additional water allotted to it by the Kern water transfer. The trial court did state that the injunction request could be renewed upon a showing that the water was actually used for an improper purpose (irreversible new development).

5. Monterey Plus

On June 6, 2003, the Sacramento Superior Court approved a settlement between the parties in PCL. That settlement, known as "Monterey Plus," provides that the Monterey Agreement can proceed on an interim basis. In exchange, DWR agreed, among other things,[7] to prepare a new program EIR for implementation of the Monterey Agreement. This new EIR would include (1) information on water deliveries during the drought and recent historical period, (2) an analysis of a no project alternative, including the environmental impact of Article 18's water shortage provisions, (3) analysis of environmental impacts from changes in SWP operations and deliveries resulting from implementation of the Monterey Agreement, (4) analysis

[7] Some of the other provisions include biennial reports on project reliability, land use restrictions on the Kern Water Bank, new guidelines for permanent water transfers, new procedures for public involvement in contract changes, and funding for watershed restoration and new technical studies. AR 45048-49.

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of environmental impacts of seven already completed water transfers from KWCA and member units totaling 70,000 acre-feet (Attachment E), which the parties recognized were "final," and of the Kern water transfer, which the parties acknowledged was being challenged in the pending Friends litigation in Los Angeles Superior Court, and (5) analysis of the environmental impacts from implementation of Monterey Plus. AR 48557-59. With respect to the Kern water transfer, the Monterey Plus parties agreed that "jurisdiction with respect to [Friends] should remain in that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation." The Monterey Plus did not require DWR to re-approve or disapprove any transfer.

6. The Friends II Decision

The Second District upheld the Friends trial court's decision not to grant injunctive relief for the Kern water transfer on December 1, 2003, in unpublished case no. B164027 ("Friends II"). PCL had filed an *amicus* brief supporting the petitioner in Friends II, pointing out that the Monterey Plus settlement now existed and arguing that the Friends decision required the trial court to rely on the status of PCL litigation, including the new Monterey Agreement program EIR DWR was to prepare, in deciding injunctive relief. The Friends II appellate court stated that PCL was wrong; it merely had suggested, not required, that the trial court could determine and rely on the status of the PCL case in deciding injunctive relief.

7. The 2004 EIR

After Friends, Castaic decided to prepare a revised EIR prior to DWR's preparation of a Monterey Amendment EIR. Castaic was driven by a concern that the Friends petitioner and others would use the decertification of its 1999 EIR to cloud its right to the transferred water, as well as Castaic's duty to its customers to complete the environmental documentation and finalize the Kern water transfer.

In June 2004, Castaic prepared and circulated a draft EIR that tiered only on Castaic's 1988 Capital Program EIR. Castaic concluded that it was the lead agency because it has the principal responsibility for carrying out and implementing the project. Because the transfer is between neighboring SWP contractors, involving the withdrawal of water from a single branch of the Aqueduct, Castaic concluded that the transfer has no significant impacts on SWP operations or the water diverted from the Delta. *See* AR 13-14.

PCL served comments to the draft EIR on August 16, 2004. These comments criticized the use of Castaic as lead agency, arguing that Castaic's review was "premature" and "likely to operate at cross-purposes with DWR's statewide review." AR 1959. PCL contended that DWR, not Castaic, was required to be the lead agency under the PCL decision. Only DWR's expertise could analyze the changes in the amount of supplies available, the location and timing of deliveries, and changes in the SWP's conveyance and storage facilities for all of the proposed transfers, including the Kern water transfer. AR 1962. CWIN also timely expressed concern about Castaic's lack of authority to act as lead agency, and the potential for conflict with DWR's role. AR 578-580.

DWR, acting as a responsible agency under CEQA, commented on the draft EIR. It stated that the "document adequately and thoroughly discusses the proposed project and its

impacts. The [draft]EIR discusses the effects of the project on the environment and State Water Project (SW) and uses baseline conditions consistent with those being considered for inclusion in [DWR's EIR]. The draft also "adequately discusses the reliability of the SWP, pre- and post-Monterey Amendment conditions, future conditions, and SWP operations." DWR acknowledged that Castaic's EIR uses a model, DWRSIM, to assess the potential impact associated with the Kern transfer and that DWR's EIR will use a newer model, CALSIM II. DWR indicated that the use of a different computer model may cause slight changes in results, which may lead DWR to different conclusions than those made by Castaic in its EIR. Despite this fact, DWR concluded that the draft EIR adequately discusses the reliability of SWP, pre- and post- Monterey Amendments conditions, future conditions, and SWP operations. AR 564-65.

Castaic rejected Petitioners' concerns, and relied on DWR's comments to refute objections that its draft EIR will be inconsistent with the yet to be prepared DWR program EIR. AR 961-4. Castaic adopted findings, a mitigation monitoring program and statement of overriding considerations and certified a final EIR (the 2004 EIR).[8] The 2004 EIR describes Castaic's water program for the future needs of Santa Clarita Valley, the procedural history of the project (including the 1999 EIR), and the fact that the Kern water transfer has been implemented and ongoing since 1999. It uses two separate baselines for the project setting and evaluates environmental impacts of the Kern water transfer on the SWP, Castaic, and Wheeler Ridge. In discussing these impacts, the 2004 EIR considers three SWP scenarios: (a) with the Monterey Agreement, (b) without the Monterey Agreement, and (c) without the Monterey Agreement and with Article 18(b) permanent shortages. The EIR uses the DWRSIM model and concludes no significant direct environmental impacts will occur as a result of the project. There would, however, be indirect growth impacts as a result of water provided by the project.

8. The Petitioners Take Over from the Friends Petitioner

On January 24, 2005, CWIN and PCL filed separate petitions for writ of mandate in Ventura County concerning Castaic's compliance with CEQA in the 2004 EIR, and other issues.

On February 1, 2005, the Friends petitioner dismissed the action with prejudice. On February 7, 2005, the trial court in Friends held a hearing on Castaic's *ex parte* application to vacate the dismissal with prejudice and to discharge the writ of mandate. Castaic argued that, by dismissing, the petitioner was attempting to get the clerk, through ministerial act, to divest the court of its continuing jurisdiction over the 2004 EIR prepared in response to the court's peremptory writ of mandate. Instead, the Friends petitioner was passing the baton to CWIN and PCL for a challenge to the 2004 EIR. The trial court declined to set aside the dismissal, stating that whether the Ventura proceedings were a continuation of the Friends lawsuit was an issue of fact for the Ventura (now this) court.

On March 5, 2005, Castaic petitioned the Second Appellate District for a writ of mandate with respect to the trial court's refusal to vacate the dismissal, arguing that the trial court violated Pub. Resources Code section 21168.9 (stating that the trial court shall maintain jurisdiction over the agency's proceedings until the court has determined that the agency has complied with

[8] On December 30, 2004, Castaic filed its return to the peremptory writ of mandate in Friends.

CEQA) because it had not yet determined that the 2004 EIR complied with CEQA Yet, under CEQA, a trial court that orders preparation of a new EIR must retain jurisdiction for a final determination of the EIR's validity.

On April 14, 2005, the Second Appellate District denied Castaic's petition for "failure to demonstrate that the 'retain jurisdiction' provision of Public Resources Code section 21168.9, subdivision (b), abrogates the entitlement to voluntary dismissal conferred by Code of Civil Procedure section 581, subdivision (b)(1)."[9]

D. CEQA

1. Standard of Review

A party may seek to set aside an agency decision for failure to comply with CEQA by petitioning for either a writ of administrative mandamus (CCP §1094.5) or of traditional mandamus. CCP §1085. A petition for administrative mandamus is appropriate when the party seeks review of a "determination, finding, or decision of a public agency, made as a result of a proceeding in which by law a hearing is required to be given, evidence is required to be taken and discretion in the determination of facts is vested in a public agency, on the grounds of noncompliance with [CEQA]." Pub. Res. Code §21168. This is generally referred to as an "adjudicatory" or "quasi-judicial" decision. Western States Petroleum Assn. v. Superior Court, ("Western States") (1995) 9 Cal.4th 559, 566-67. A petition for traditional mandamus is appropriate in all other actions "to attack, review, set aside, void or annul a determination, finding, or decision of a public agency on the grounds of noncompliance with [CEQA]." Where an agency is exercising a quasi-legislative function, such as by adopting a rule or entering into a contract, it is properly viewed as a petition for traditional mandamus. Id. at 567; Pub. Res. Code §21168.5.

At issue here is a CEQA challenge to a quasi-legislative action recorded by Castaic in a December 23, 2004 Notice of Determination approving the project, certifying the 2004 EIR, and adopting findings, a mitigation monitoring program, and a statement of overriding considerations. This procedural setting, where no administrative hearing was held or required, is governed by traditional mandamus. In determining whether to grant a petition for traditional mandamus in a CEQA case, the court may consider only whether there was a prejudicial abuse of discretion. Public entities abuse their discretion under CEQA if the agency has not proceeded in a manner required by law or if its determination or decision is not supported by substantial evidence. Western States, 9 Cal.4th at 568; Pub. Res. Code §21168.5.[10]

This requires "scrutiny of the alleged defect" depending on whether the claim is predominately "improper procedure or dispute over the facts." Vineyard Area Citizens for

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[9]The Second District later dismissed Castaic's appeal from the Friends dismissal, finding that the voluntary dismissal was not appealable. *See* H.D. Arnaiz, Ltd. v. County of San Joaquin, (2002) 96 Cal.App.4th 1357, 1364-67.

[10]The standard of review for traditional mandamus in a non-CEQA case is governed by an "arbitrary and capricious" standard, not a "prejudicial abuse of discretion" standard. The CEQA standard is the more stringent inquiry. Western States, 9 Cal.4th at 574.

Responsible Growth v. City of Rancho Cordova, ("Vineyard") (2007) 40 Cal.4th 412, 435. Whether Castaic is the proper lead agency is an procedural issue of law for the court. PCL, 83 Cal.App.4th at 905-06. Similarly, as Petitioners argue (Pet. Supp. Resp. Br. at 5), whether Castaic's 2004 EIR failed to provide certain required information and, as a result, presents uncertainties about the finality of the Kern water transfer is failing "to proceed in a manner required by CEQA" and an issue of law. Vineyard, 40 Cal.4th at 435. These issues require "a critical consideration, in a factual context, of legal principles and their underlying values." Harustak v. Wilkins, (2000) 84 Cal.App.4th 208, 212.

On the other hand, whether Castaic abused its discretion in the 2004 EIR's findings must be answered with reference to the evidence in the administrative record. This standard requires deference to the agency's factual and environmental conclusions based on conflicting evidence, but not to issues of law. Laurel Heights Improvement Assn. v. Regents of University of California, ("Laurel Heights") (1988) 47 Cal.3d 376, 393, 409. Argument, speculation, and unsubstantiated opinion or narrative will not suffice.[11] Guidelines, 15384(a), (b). The findings must be supported by "substantial evidence," defined as "enough relevant information and reasonable inferences from this information that a fair argument can be made to support a conclusion, even though other conclusions might also be reached. CEQA Guidelines §15384(a). The question whether substantial evidence exists is a question of law. *See* California School Employees Association v. DMV, (1988) 203 Cal.App.3d 634, 644.

2. CEQA

The purpose of CEQA (Pub. Res. Code §21000 *et seq.*) is to maintain a quality environment for the people of California both now and in the future. Pub. Res. Code §21000(a). "[T]he overriding purpose of CEQA is to ensure that agencies regulating activities that may affect the quality of the environment give primary consideration to preventing environmental damage." Save Our Peninsula Committee v. Montery County Board of Supervisors, (2001) 87 Cal.App.4th 99, 117. CEQA must be interpreted "so as to afford the fullest, broadest protection to the environment within reasonable scope of the statutory language." Friends of Mammoth v. Board of Supervisors, (1972) 8 Cal.3d 247, 259. Public agencies must regulate both public and private projects so that "major consideration is given to preventing environmental damage, while providing a decent home and satisfying living environment for every Californian." Pub. Res. Code §21000(g).

The Legislature chose to accomplish its environmental goals through public environmental review processes designed to assist agencies in identifying and disclosing both environmental effects and feasible alternatives and mitigations. Pub. Res. Code §21002.

Under CEQA, a "project" is defined as any activity which may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment (1) undertaken directly by any public agency, (2) supported through contracts, grants, subsidies, loans or other public assistance, or (3) involving the issuance of a lease, permit,

[11] As an aid to carrying out the statute, the State Resources Agency has issued regulations called "Guidelines for the California Environmental Quality Act ("Guidelines"), contained in Code of Regulations, Title 14, Division 6, Chapter 3, beginning at section 15000.

license, certificate, or other entitlement for use by a public agency. Pub. Res. Code §21065. The word "may" in this context means a reasonable possibility. Citizen Action to Serve All Students v. Thornley, (1990) 222 Cal.App.3d 748, 753. "Environment" means the physical conditions which exist within the area which will be affected by a proposed project, including land, air, water, minerals, flora, fauna, noise, objects of historic or aesthetic significance. Guidelines, §21060.5.

The "project" is the whole of the action, not simply its constituent parts, which has the potential for resulting in either direct or reasonably foreseeable indirect physical change in the environment. Guidelines §15378. An indirect physical change must be considered if that change is a reasonably foreseeable impact which may be caused by the project. On the other hand, a change that is "speculative or unlikely to occur is not reasonably foreseeable." Guidelines §15064(d)(3). The term "project" may include several discretionary approvals by government agencies; it does not mean each separate government approval. Guidelines §15378(c).

The EIR is the "heart" of CEQA, providing agencies with in-depth review of projects with potentially significant environmental effects. Laurel Heights, 6 Cal.4th at 1123. An EIR describes the project and its environmental setting, identifies the potential environmental impacts of the project, and identifies and analyzes mitigation measures and alternatives that may reduce significant environmental impacts. Id. Using the EIR's objective analysis, agencies "shall mitigate or avoid the significant effects on the environment... whenever it is feasible to do so. Pub. Res. Code §21002.1. The EIR serves to "demonstrate to an apprehensive citizenry that the agency has in fact analyzed and considered the ecological implications of its actions." No Oil, Inc. v. City of Los Angeles, (1974) 13 Cal.3d 68, 86. It is not required to be perfect, merely that it be a good faith effort at full disclosure. Kings County Farm Bureau v. City of hanford, (1990) 221 Cal.App.3d 692, 711-12. A reviewing court passes only on its sufficiency as an informational document and not the correctness of its environmental conclusions. Laurel Heights, 47 Cal.3d at 392. An EIR will be upheld if it suffices as an informational document; mandate will issue only if it fails to include relevant information which precludes informed decision-making and informed public participation.

"Choosing the precise time for CEQA compliance involves a balancing of factors. EIRs... should be prepared as early as feasible in the planning process to enable environmental considerations to influence project program and design and yet late enough to provide meaningful information for environmental assessment." Guidelines, §15004(b). As a general rule, public agencies shall not undertake actions concerning a proposed project that would have a significant adverse effect or limit the choice of alternatives or mitigation measures before completion of CEQA compliance. Guidelines, §15004(b)(2). "[I]n order to achieve the salutary objectives of CEQA the determination of the earliest feasible time to [prepare the CEQA document] is to be made initially by the agency itself, which decision must be respected in the absence of manifest abuse." Mount Sutro Defense Committee v. Regents of University of California, (1978) 77 Cal.App.3d 20, 36, 40.

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E. Analysis

CWIN and PCL argue that DWR is required to be the lead agency for the Monterey Amendments project EIR, which will examine all water transfers on a program level. The Kern

water transfer is part of the Monterey Amendments project. Therefore, DWR is the correct lead agency to conduct the environmental review of the Kern water transfer. According to Petitioners, while Castaic may not serve as the lead agency for "first-level" environmental review of the water transfer, it may serve as lead agency for a project level EIR for the Kern water transfer.

1. Validity of the Transfer

At the outset, the court must make clear an issue greatly discussed at hearing. Petitioners contend, and Castaic and Wheeler Ridge strongly dispute, that DWR may "invalidate" the Kern water transfer when it performs the program EIR.

Under contract and validation law, the Kern water transfer contract, entered into in 1999, is valid, has been approved by DWR, and Castaic has paid Wheeler Ridge for it. Neither the parties nor DWR can terminate the Kern transfer contract. Nothing in CEQA permits a public agency to void a contract.

In Kenneth Mebane Rranches v. Superior Court, (1992) 10 Cal.App.4th 276, a flood control district sought to condemn land outside its territory in order to mitigate the environmental impact of a project within its boundaries. The appellate court held that CEQA only requires mitigation of environmental impacts where it is feasible to do so. Where mitigation is infeasible, an agency can always approve a project notwithstanding environmental impacts if it issues a statement of overriding interests. But it cannot take actions that are not legal, and hence infeasible. 10 Cal.App. at 291-92.

Thus, in evaluating the environmental effects of the Monterey Agreement, DWR may impose mitigations that are legal. But it cannot invalidate the Kern transfer. The imposition of illegal mitigations would be infeasible. *See also* Pub. Res. Code §21004 (in mitigating significant environmental impact, agency may only employ powers provided by law).[12]

This does not mean that DWR's Monterey Amendments EIR cannot affect the Kern water transfer. DWR's EIR will consider the environmental impacts of the Kern water transfer in conjunction with the Attachment E transfers which the parties in Monterey Plus agreed were completed and final. DWR conceivably could conclude that these transfers have significant environmental impacts. As a consequence, DWR might have to impose feasible mitigation measures, adopt alternatives, or make a finding of infeasibility and adopt a statement of overriding considerations.[13] If mitigations/alternatives are adopted, they could significantly impact Castaic and Wheeler Ridge. As DWR states, "the contract amendments that effectuated the transfers under the Monterey Amendment[s] do not preclude DWR in its choice of

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[12]The parties disagree on whether the Monterey Amendments are valid and final. That is, they disagree on whether the amendments can be challenged in a reverse validation action separate and apart from CEQA. Resolution of this issue is unnecessary to the court's decision.

[13]At hearing, Petitioners' counsel stated that the parties to Monterey Agreement entered into a joint statement of the possible impacts from the Amendments, citing AR 48628-29. The joint statement at those pages of the record does not discuss possible mitigations; it merely summarizes the terms of Monterey Plus.

alternatives in the Monterey Amendment[s] EIR or mitigation measures that may need to be imposed to reduce significant impacts to less than significant." DWR Br. at 20. DWR gives an example of reducing the amount of SWP water to protect water quality standards for fish in the Delta. Id. at 20. These mitigations could undermine the Kern water transfer.[14] But DWR will not be considering whether the Kern water transfer is valid; it simply does not have the authority to void that transfer. *See* Kenneth Mebane Ranches v. Superior Court, (1994) 10 Cal.App.4th 276, 292.

2. Lead Agency Law

The lead agency under CEQA is the agency that carries out a project or has primary authority for approving a project. Pub. Res. Code 121067; Guidelines §15051; *see* PCL, 83 Cal.App.4th at 904 (DWR, not Central (a State Water Contractor), had principal responsibility for carrying out the Monterey Agreement and should have been lead agency for program EIR). The role and responsibility of the lead agency is "fundamental to the CEQA process as a whole." Guidelines §15050. The identification of the proper lead agency plays a "crucial role" in the division of responsibilities among public agencies reviewing a project. PCL, 83 Cal.App.4th at 903. When determining the appropriate lead agency, the courts look to determine which agency has principal responsibility for the core project activity. Friends of Cuyamaca Valley v. Lake Cuyamaca, (1994) 28 Cal.App.4th 419, 427. The lead agency responsibility is placed upon the agency with power to approve or disapprove the project. Lexington Hills v. State of California, (1988) 200 Cal.App.3d 415, 433. Though one agency has substantial responsibility for a project, it cannot act as lead agency if another agency bears final responsibility. *See* Fullerton Joint Union High School District v. Board of Education, (1982) 32 Cal.3d 779, 795, n.15 (State Board of Education, not county, had final responsibility for school district plan). Where the project is local, such as land use decisions, the agency that has general governmental power over a project is almost always the lead agency. Where two or more agencies are involved in a project, the agency that will carry out the project shall be the lead agency. Guidelines §15051(a).

3. The Impact of the PCL Decision

Petitioners contend that the PCL decision left no doubt that DWR is the appropriate lead agency for a program-level environmental review of the water transfers in the Monterey Agreement, contrasting DWR's statewide expertise with CCWA's "provincial experience." The Monterey Amendments restructure water distribution throughout the state, and the "allocation of water to one part of the state has potential implications for distribution throughout the system." Only DWR has principal responsibility for implementation of the Monterey Amendments. Op. Br. at 11-12; *see* PCL, 83 Cal.App.4th at 904, 908. Since the Kern water transfer is part of the Monterey Amendments, DWR must perform any EIR concerning the Kern water transfer.

Petitioners' argument is a *non-sequitur*. Nothing in PCL requires DWR to perform the environmental review for the Kern water transfer. Certainly, the PCL decision requires that DWR prepare the program EIR for the Monterey Amendments, now Monterey Plus. The

[14]The close cooperation between DWR and Castaic on the 2004 EIR reduces, but does not eliminate, the prospect that DWR will impose alternatives or mitigations.

appellate court's reason for committing this task to DWR is that CEQA requires the lead agency to be the agency with principal responsibility for the project, the project is the environmental review of the Monterey Agreement, and DWR, not CCWA, has principal responsibility for implementing the Monterey Agreement. The decision pointed out that DWR manages the SWP, and has the statewide expertise and perspective to conduct the environmental review of the Monterey Agreement, which statewide project. While CCWA may have had a substantial stake in seeing the Monterey Agreement implemented, it did not have principal responsibility for it. DWR did, and DWR is required to perform the EIR for the Monterey Agreement. 83 Cal.App.4th at 906.

However, the PCL decision does not commit DWR to conduct the EIR for the Kern water transfer, or for any site specific project conducted pursuant to the Monterey Amendments. The PCL decision plainly requires DWR to prepare the program EIR for the Monterey Amendments, and its permanent transfer of 130,000 acre feet of SWP water. But it does not even mention the Kern water transfer, which is a local water transfer of Wheeler Ridge water to a point 60 miles further south in Santa Clarita Valley. The local nature of the project makes Castaic the logical choice to act as lead agency of this transfer, and nothing in PCL requires Castaic to wait for DWR's program EIR. The Kern water transfer is simply a different project from the Monterey Amendments.

Petitioners' concession that at some point Castaic can and should act as the lead agency for the Kern water transfer EIR undermines their argument that PCL committed this task to DWR. The concession shows that Petitioners really are concerned about the timing of this project specific EIR, and not whether it was committed to DWR in the PCL decision. Petitioners contend that Castaic must wait for DWR's Monterey Amendments program EIR and tier off of it for the Kern water transfer EIR. This argument is, as Castaic describes it, that Castaic "jumped the gun" by preparing the 2004 EIR. But the argument implicitly concedes that PCL did not commit the transfer EIR to DWR.

4. The Agency with Principal Responsibility

Even if PCL did not commit environmental review of the Kern water transfer to DWR, Petitioners argue that the Kern water transfer is an integral part of the Monterey Amendments project. This is shown by Monterey Plus, which excludes the Kern water transfer from the list of transfers designated as "final" and recognizes DWR's responsibility to assess its environmental impacts as part of the programmatic review. The Kern water transfer contract itself expressly relies on the Monterey Amendments, using its provisions as authority to accomplish the Kern water transfer. Even Wheeler Ridge's amendment to its SWP contract identifies the outcome of PCL as a factor that could impact the Kern water transfer's effectiveness. All of these facts, Petitioners argue, mean that the transfer is part of the Monterey Amendments environmental review.

Petitioners further argue that the nature of a program EIR supports their position. This purpose "is to document a series of actions so related they can be characterized as one project." Friends, 95 Cal.App.4th at 1377. The Monterey Amendments, including its transfer provisions, qualify as a "series of actions so related that they can be characterized as one project." An integrated review of the entire program may provide occasion for a more exhaustive

consideration of effects and alternatives than would be practical in an EIR on an individual action, ensure consideration of cumulative actions that might be slighted on a case-by-case analysis, avoid duplicative reconsideration of basic policy considerations, and allow the lead agency to consider broad policy alternatives and program-wide mitigation measures at an early time when the agency has greater flexibility to deal with basis problems or cumulative impacts. Id. at 1377. These factors are all borne out by the 2004 EIR, which presents a series of issues (the amount of supplies available to several water agencies, the location and timing of SWP deliveries, and use of SWP conveyance and storage facilities) on which DWR has superior expertise and greater accountability than Castaic. DWR may not delegate to Castaic its responsibility to prepare the environmental review for the Kern water transfer.

Under lead agency law, Castaic may act as lead agency and prepare an EIR for the Kern water transfer. The Kern water transfer is a project separate in time from the Monterey Amendments, now Monterey Plus. The core of the project is a local transfer of water between Castaic and Wheeler Ridge. Castiac alone had the responsibility to determine the water needs of its service area and to obtain the necessary water for those needs. Castaic negotiated and entered into the transfer contract with Wheeler Ridge. Castaic performed the contract by obtaining private investors who paid $47 million to Wheeler Ridge's water, and by taking delivery from DWR. The transfer is valid and cannot be challenged. Thus, Castaic has the general governmental power over the transfer, and is presumptively the lead agency for its own project. Bakman v. Dept. of Transportation, (1979) 99 Cal.App.3d 665, 678-79. Indeed, the environmental review of water transfers is generally performed by a local, not state, agency. County of Amador v. El Dorado County Water Agency, (1999) 76 Cal.App.4th 931 (local agency's analysis of water transfer project); Save Our Carmel River v. Monterey Peninsula Water Management District, (2006) 141 Cal.App.4th 677, 701 (city was lead agency as recipient of water transfer); Friends of the Eel River v. Sonoma County Water Agency, (2003) 108 Cal.Appp.4th 859 (local agency's EIR for plan to increase diversions of water from river); Sierra Club v. West Side Irrigation District, (2005) 128 Cal.App.4th 690 (local agency's environmental review of two projects to transfer water rights).[15]

It is true that DWR has an overall interest in promoting effective water management on a statewide basis. Pursuant to this interest, DWR had the right to approve the Kern water transfer, and it did so. This does not equate to principal responsibility, however. DWR is required by statute to "facilitate" the voluntary transfer of water between local agencies. Water Code §109.

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[15]The Friends court implicitly decided that Castaic may act as lead agency for the Kern water transfer. The Friends court acknowledged that it was required to address all deficiencies in the EIR unless it made a finding of improper lead agency. Pub. Res. Code §21005(c). If Castaic was the improper lead agency for the 1999 EIR, the appellate court was obligated to say so. The Friends court concluded that the 1999 EIR's only deficiency was that it tiered from the defective Monterey Agreement program EIR. Thus, the decision necessarily implied that Castaic was the proper lead agency for the 1999 EIR.

Of course, this case concerns the 2004 EIR, not the 1999 EIR, and the court previously held that Petitioners were not bound by the Friends court's implied determination. But the project is the same, and the implicit appellate determination is entitled to weight.

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Per the SWP contracts, DWR's approval of the Kern water transfer could not be unreasonably withheld. Thus, DWR's involvement in the transfer is to facilitate the transfer by approving it and providing the SWP schedule delivery. Moreover, the SWP is intended as a supplement, not the exclusive supply, of water. Water supply decisions must be made by local Water Contractors, who obtain water both from SWP and other sources.[16]

Given that the decision to enter into the Kern water transfer belonged solely to Castaic and Wheeler-Ridge, and that DWR's approval is necessary merely to facilitate the transfer, Casataic had principal responsibility for the transfer.[17]

5. Project Definition

Petitioners contend for the first time in their Supplemental Vineyard Reply and at oral argument that the correct project definition is not the Kern water transfer, but is really the Monterey Amendments, citing the court's earlier ruling on Castaic's motion for legal determination that the key issue is whether the Amendments are a "series of actions (including the Kern water transfer) so related that they should be characterized as a single project." Pet. Supp. Reply at 5.

The correct definition of the project -- whether it is the Monterey Amendments or the Kern water transfer -- is a different issue than whether Castaic can act as lead agency for the project. Although the court did allude to project definition in ruling on the earlier motion, Petitioners never raised this issue in their opening brief or reply. Instead, they raise it for the first time in a reply brief on the application of Vineyard to this case. On appeal, an issue raised without analysis or authority lacks foundation and need not be addressed. City of Arcadia v. State Water Resources Control Board, ("Arcadia") (2006) 135 Cal.App.4th 1392, 1429, 1431. Similarly, an issue raised for the first time in supplemental reply deprives the opposing party of an opportunity to analyzing the issue and defend their position. Petitioners have waived the correct project definition as an issue by not raising it earlier.

Assuming *arguendo* that the issue has not been waived, a project under CEQA includes an activity directly undertaken by a public agency which may cause either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment. Pub. Res. Code §21065(a). The "project" must be broadly defined, so as to ensure against avoiding environmental review by "chopping a larger project into little ones" or "piecemealing." Bozung v. Local Agency Formation Commission, (1975) 13 Cal.3d 263, 283-84. The project includes "the whole of an action" that has a potential for resulting in a direct or indirect physical change in the environment. Guidelines §15378. An accurate project description is necessary for an intelligent evaluation of the potential environmental effects of a

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[16]As Wheeler Ridge points out, DWR was not the lead agency for the 1991 Devils Den transfer or any of the Attachment E transfers listed in the Monterey Agreement.

[17]Given that DWR's approval may not be unreasonably withheld, cases holding that a state agency should prepare the EIR where it has final authority to approve a project are simply inapposite. *See* Fullerton v. State Board of Education, (1982) 32 Cal.3d 779, 795, n.15 (State Board of Education had final authority to submit plan to voters for new unified school district).

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proposed activity. Mcqueen v. Board of Directors, (1988) 202 cal.App.3d 1136, 1143. The agency must avoid "piecemealing" or splitting a project into two or more segments. Otherwise, the cumulative environmental impacts of each piece may not be fairly analyzed. Burbank-Glendale-Pasadena Airport Authority v Hensler, (1991) 233 Cal.App.3d 577, 592. On the other hand, CEQA was not intended to and cannot reasonably be construed to make a project of every activity of a public agency, regardless of the nature and objective of such activity...." Simi Valley Recreation & Park District v. Local Agency Formation Commission, (1975) 51 Cal.App.3d 648, 663.

In San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus, (1994) 27 Cal.App.4th 713, 731-32, the court held that the project description in an EIR was improperly restricted to a 633 single family residential units, a 40,500 square foot commercial center, and a 14 acre park, failing to include sewer expansion which the EIR acknowledged would be required as part of the development. Although a separate EIR was prepared for the sewer expansion, neither it nor the development project EIR referred to the growth-inducing effects of the two projects considered together. This failure to address cumulative impacts was a separate failure of the development EIR. 27 Cal.App.4h at 733. "[t]he danger of filing separate environmental documents for the same project is that considration of the cumulative impact on the environment of the two halves of the project may not occur. This danger was here realized." Id. at 734 (citation omitted). Because the EIR did not "adequately apprise all interested parties of the true scope of the project for intelligent weighing of the environmental consequences of the project" informed decision-making was precluded, the EIR was inadequate. Id.

The lesson from San Joaquin and other project definition cases is that the project should be defined broadly to ensure a complete analysis of impacts resulting from future expansion or continuation of other phases of the project.

In this case, DWR is the lead agency for the Monterey Amendments program EIR. DWR's description of its project is to improve the management of SWP supplies and operations through the Monterey Amendments. Thus, the Monterey Amendments EIR is broad in scope. The EIR will look at changing the allocation of all SWP water supplies (including deletion of agriculture first shortage provisions), retiring 45,000 acre feet of agricultural water, and establishing more efficient use of SWP facilities. As part of the analysis, it will analyze the potential impacts from permanently transferring 130,000 acre feet of water from agricultural to urban contractors per the Monterey Agreement. This analysis will look at the individual transfers, including the Kern water transfer, as they fit the entire Monterey Amendments. But DWR does not intend to consider each transfer individually; it intends to evaluate the impact of all the Attachment E transfers and the Kern water transfer as a whole. DWR Br. at 17.

Castaic's 2004 EIR project description concerns the impacts of the Kern water transfer alone. Castaic's EIR does look at cumulative impacts of the project with other projects, including the Monterey Amendments, but does not purport to assess the environmental impacts of the Monterey Amendments independent of the Kern water transfer. AR 141-42.

Castaic relies on the independent utility test to argue that the Kern water transfer is a separate project the environmental impact of which may be separately analyzed from the Monterey Amendments. The "independent utility" test has been developed in NEPA cases to determine whether multiple actions are connected so as to require an agency to consider them in

a single environmental review. Wetlands Action Network v. United Sates Army Corps. Engineers, (9th Cir. 2000) 222 F.3d 1105, 1118.[18] Pursuant to the independent utility test, where each of two projects would have taken place with or without the other, each has "independent utility" and the two are not considered so connected that an agency must consider them in a single environmental review. Native Ecosystems Council v. Dombeck, (9th Cir. 2002) 304 F.3d 886, 894. *See also* DelMar Terrace Conservancy, Inc. v. City Council of the City of San Diego, (1992) 10 Cal.App.4th 712 (freeway segment was separate project serving a viable purpose even if long-term, multi-segment plan to expand freeway never occurred, and had independent utility under CEQA).

Castaic argues that it has contemplated the Kern water transfer since 1988, when it included a transfer with Kern in its 1988 Capital Program for the Santa Clarita Valley's future water needs. For economic reasons, Wheeler Ridge, too, sought to transfer its SWP water rights since approximately 1985. Castaic concludes that the Kern water transfer would have occurred with or without the Monterey Amendments. Articles 40 and 41 of the SWP contract permitted transfers between Water Contractors, subject to DWR approval. Article 53, added to the SWP contracts by the Monterey Amendments and concerning the transfer of 130,000 acre-feet, did not "enlarge, restrict, or otherwise impact" Castaic's right to acquire water from Wheeler Ridge under Articles 40 and 41. Instead, it was merely a blanket approval of certain contemplated transfers. Castaic Op. Br. at 21. The Kern water transfer was completed, paid for, and operating since 1999. Nothing about it is tied to the outcome of the Monterey Amendments. Thus, while the transfer is part of a larger scheme (the Monterey Amendments), it is a long-planned site specific project with independent utility from the Monterey Amendments.

The court cannot conclude that the Kern water transfer would have taken place without the Monterey Amendments. True, Castaic has wanted Wheeler Ridge's SWP allocation of water since the late 1980's, and Wheeler Ridge was willing to provide it. Yet, it did not happen until after the Monterey Amendments. The contract between Castaic and Wheeler Ridge states that the transfer was taking place "in accordance with" Article 53 of the Monterey Amendments, and those Amendments change the way SWP water is allocated in California. It does not say that the transfer is being made under Article 41. Petitioners contend, and the court agrees, that only through conjecture can one conclude that Castaic and Wheeler Ridge would have entered into the transfer without the Monterey Amendments, and with Article 18's agriculture first provisions in place.[19]

Though the court cannot conclude that the Kern water transfer would have occurred without the Monterey Amendments, it can conclude that the transfer will remain in effect even if the Monterey Amendments are not approved or otherwise are mitigated under CEQA. The court

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[18]Since CEQA was modeled on the federal NEPA statute, federal decisions on NEPA are persuasive authority on CEQA issues. No Oil, Inc. v. Los Angeles, (1974) 13 Cal.3d 68, 86.

[19]When Petitioners commented on the draft EIR that any pre-Monterey Amendments transfer would be subject to Article 18's agriculture first provisions, Castaic did not say that the Kern transfer would have occurred without the Monterey Amendments. It merely responded that the transfer "could occur" either pre- or post- Monterey Amendments. AR 993.

already has indicated that the Kern water transfer is final. The parties to the transfer stated at hearing that they have no intention of rescinding it even if the Monterey Amendments are mitigated and Article 18's agriculture first provisions are in effect. This position is supported by the fact that the 2004 EIR evaluates the water supply impacts of just such a pre-Monterey Amendment Article 18 scenario. AR 186. As such, it is compelling evidence that the transfer will stand.[20]

Plainly, then, the Kern water transfer is final and will remain in place whatever happens to the Monterey Amendments. As such, the transfer has "independent utility" for purposes of environmental review. It is not so connected to the larger Monterey Amendments that the two must must be considered in a single environmental review. *See* Native Ecosystems Council v. Dombeck, 304 F.3d at 894.

6. EIR Timing

Petitioners' real argument seems to be that, whenever a program EIR is anticipated, the agency preparing an EIR for a specific project must wait for the program EIR.

This is not the law. Nothing in CEQA requires Castaic to wait for DWR's program EIR. Indeed, as a general proposition, the environmental review process should be undertaken early enough in the planning process to impact planning decisions, with the timing committed to the agency's discretion. City of Vernon v. Board of Harbor, (1988) 63 Cal.App.4th 677, 690-91. The Kern water transfer occurred almost eight years ago. It has been paid for and operating for a number of years. Castaic tried to conduct a timely environmental review, but that EIR was set aside in Friends. It is not an abuse of discretion for Castaic to want to complete the environmental review and obtain finality for the transfer without waiting for DWR's program EIR of the Monterey Amendments, now Monterey Plus.

Nor does this decision frustrate the law concerning program EIRs and tiering. The purpose of a program EIR is to document a series of actions so related that they can be characterized as one project. Friends, 95 Cal.App.4th at 1377. If the program EIR is sufficiently comprehensive, the lead agency may dispense with further environmental review for later activities within the program that are adequately covered in the program EIR. Guidelines §15618(c). Thus, the program EIR may be used to focus or simplify later environmental review, or as the basis of a tiered EIR. "Tiering" means the coverage of general matters and environmental effects in an EIR prepared for a policy, plan, program or ordinance, followed by narrower or site-specific EIRs which incorporate by reference the discussion in the prior report. *See* Pub. Resources Code §§ 21068.5, 21093 and Guideline §§ 15152, 15385. Tiering is favored "whenever feasible, as determined by the lead agency." Pub. Resources Code §21093(b). It is required where a prior EIR has been prepared and certified for a program, plan, or ordinance. Pub. Resources Code §21094(a). However, tiering is only required "where a prior environmental report has been prepared and certified for a program." Friends, 95 Cal.App.4th at 1383. It is not required, and in fact is prohibited, where the program EIR has yet to be prepared. Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova, ("Vineyard") (2007) 40 Cal.4th 412

[20]Petitioners think so too, for their principal argument is premised on the 2004 EIR's assumption that the transfer is final for all purposes.

EIR cannot tier off of *future* environmental document).

7. Vineyard

In Vineyard, the Supreme Court addressed a county prepared EIR for a large land use development project known as "Sunrise Douglas." The principal issue was the availability of long-term water supply for the project, and the environmental impacts and mitigation for such supply. The Supreme Court analyzed the various water supply cases and distilled several principles. First, the EIR for a land use project must present sufficient facts to evaluate the pros and cons of supplying the amount of water the project will need, and not simply ignore or assume a water supply solution will be found for a development project. Second, an adequate EIR for a large project must show water supply for the entire project. It is not enough to show available water for early stages. While the agency may tier and defer analysis of certain details of later phases of long-term or complex projects, deferring analysis through tiering is appropriate when the impacts or mitigation measures are not determined by the first-tier approval and are specific to later phases. Third, the future water supplies identified and analyzed must bear a likelihood of actually being available. Finally, where there is some uncertainty about availability, CEQA requires some discussion of possible replacement sources or alternatives, and their environmental consequences.

Of particular use herein, the Supreme Court discussed the EIR's reliance on an anticipated local Water Board's master plan update, which would discuss the availability of long-term water supplies to the area and their environmental impact. The Court held that the county's EIR cannot tier from a *future* environmental document. If the environmental analysis from the Water Board's anticipated master plan update was important to understanding the long-term water supply for Sunrise Douglas, it should have been performed in the Sunrise Douglas EIR even though that might result in subsequent duplication by the Water Board's master plan update. Or, the county could have deferred analysis and approval of Sunrise Douglas until the Water Board's master plan update, then tiered the Sunrise Douglas EIR from the programmatic analysis performed by the Water Board.

The Vineyard decision shows that the timing of Castaic's project specific EIR in relation to DWR's program EIR is up to Castaic. It may either wait for DWR's program EIR and tier off of it, or prepare its own EIR for the Kern water transfer first. If it chooses the latter, Castaic may not tier off an environmental document that does not yet exist. Instead, Castaic must analyze all necessary environmental impacts and mitigations. If analysis of some portion of the Monterey Amendments is important to understanding the environmental impacts of the Kern water transfer, then analysis of that issue must be included in Castaic's EIR. But if Castaic's EIR does so, it is irrelevant that the document duplicates some of what DWR would do, or even that it may be inconsistent with DWR's analysis.[21] As DWR contends, CEQA's goal is to ensure sufficient information; it contains no prohibition against too much information. DWR Br. at 21. The timing of Castaic's EIR for the Kern water transfer is up to Castaic and Castaic alone.

[21] As previously stated, the prospect of inconsistencies between Castaic's EIR and DWR's program EIR is diminished by Castaic's use of DWR modeling, DWR's comments and input into the 2004 EIR, and the general cooperation and coordination between the two agencies.

F. Contents of the 2004 EIR

Apart from the proper lead agency, Petitioners argue that the 2004 EIR is inadequate. Initially, the court believed that Castaic could have real problems on this issue. It is one thing for Castaic to act as lead agency on a water transfer before the program EIR is prepared; Vineyard and other case law say that Castaic may do so. But the EIR must be adequate and complete. Vineyard teaches that if analysis of some portion of the Monterey Amendments is important to understanding the environmental impacts of the Kern water transfer, then that analysis must be included in Castaic's EIR. PCL held that the "no project" alternative was particularly important for the Monterey Amendments, and the public was entitled to know what would happen if the Amendments were not approved and Article 18 was implemented in the event of water shortage. Commentators particularly wanted to know whether imposition of Article 18 might eliminate the "paper water" entitlements in the water contracts, reduce land planning decisions based on that paper water, and ultimately reduce growth and construction of additional SWP facilities. PCL, 83 Cal.App.4th at 892-3.

The court wondered whether Castaic would have the expertise to perform any analysis of the Monterey Amendments or the "no project" alternative that would be required in the 2004 EIR. However, the parties' briefs, and oral argument at hearing, have demonstrated that, with one exception, the 2004 EIR's contents are sufficiently presented. Indeed, Petitioners barely criticize the 2004 EIR's adequacy, except as it impacts the lead agency issue.

1. "Deception"

Petitioners' principal argument about content is that the 2004 EIR is deceptive in failing to make clear that the Kern water transfer is not "final." They contend that the 2004 EIR's project definition treats the Kern water transfer as an immutable *fait accompli* which fails to disclose that the "final status" of the transfer depends on the DWR's forthcoming review. According to Petitioners, the EIR improperly relies on the interim availability of the water to predict that DWR will "leave it in place," a point which the court in California Oak Foundation v. City of Santa Clarita, ("California Oak") (2005) 133 Cal.App.4th 1219, 1238, n.16 had no trouble dispatching, and also improperly states that it would be unnecessary and speculative to consider what the DWR might do to change the transfer (*See* AR 994). Pet. Op. Br. at 19-20. This false assumption that the transfer is immutable may result in land use decision-makers approving projects based on water availability "worth little more than a wish and a prayer." Id. at 20-21.

The court has determined that the transfer is final as a matter of law. Therefore, the EIR is not wrong in saying so. What Petitioners really contend is that the Kern water transfer, though final, can be affected by the DWR's program EIR through mitigations and imposition of alternatives. Yet, the EIR proceeds as if the transfer cannot be altered. As counsel described the issue at hearing, the 2004 EIR "talks about risk, but never directly informed the public about the fact that the transfer may be unwound through the Monterey Amendment EIR process." Thus, the EIR refers to the transfer as of an "*existing* 41,000 " acre feet of SWP Table A water (AR 15, 35) and states that "no permits or *other approvals* would be required other than" certification of the

EIR. AR 16.[22]

The EIR is the method for disclosure of environmental issues. Rural landowners Assn. V City Council, 43 Cal.App.3d 1013, 1020. CEQA's purpose is to compel agencies to make decisions with environmental consequences in mind, but CEQA does not and cannot guarantee that these decisions will always favor environmental concerns. Laurel Heights, 47 Cal.3d at 393. The EIR should provide sufficient analysis to allow decision-makers to make intelligent judgments about environmental consequences. Guidelines §15151. The evaluation of environmental effects need not be exhaustive, but the EIR's sufficiency is reviewed in the light of what is reasonably foreseeable. Id. Perfection is not required, but adequacy, completeness, and a good faith effort at full disclosure is. Id.

In California Oak, the court addressed the proposed development of a 584 acre industrial park project in the Santa Clarita. The City's EIR relied on the Kern water transfer for water supply, and the appellate court held that it did not adequately address the uncertainty in that water delivery. 133 Cal.App.4th at 1236. The City's comments "did little more than dismiss project opponents' concerns about water supply" and the EIR failed to discuss the adequacy and availability of water supply absent the Kern water transfer. Appendix K to the EIR did acknowledge uncertainty in the Kern water transfer, but this was insufficient in part because inforamtion "scattered here and there in EIR appendices" or a report "buried in an appendix" is not a substitute for good faith reasoned analysis. Id. at 1239 (citation omitted). Moreover, Appendix K contained no facts and analysis about the likelihood of deficit or alternative sources of supply, and was misleading about the fact that Castaic had an SWP "entitlement" without explaining that the entitlement consisted in part of "paper water." Id. at 1239-40. Hence the EIR failed as an informational document on water supply issues.

Castaic contends, and the other Respondents agree, that the 2004 EIR fully addresses the uncertainty of what DWR will do. At hearing, they contended that Petitioners really are arguing that the 2004 EIR is misleading because it does not anticipate Petitioners' argument.[23]

The EIR explains that planning for water supply to meet demands requires consideration of reliability of SWP supplies, because historical and statistical analysis show that the full Table A amount will not be available in some years. AR 41. The EIR explains that Castaic's Table A amount is the maximum SWP amount, and the amount of SWP water actually available to it varies from year to year. Id. The EIR acknowledges that DWR's allocations are based on that year's hydrological conditions, the amount of water stored in the SWP system, and contractor requests for water. AR 16. The EIR discusses the Monterey Agreement (AR 46-47), PCL and Monterey Plus. AR 17-18, 47. The EIR cautions land use planners who might rely on the EIR to predict future water supplies, that while Castaic will implement all feasible measures to obtain water "past water deliveries are not a guarantee of future delivery rates." AR 13.

The EIR considers the environmental impact of the project based on water allocation

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[22]At trial, Petitioners' counsel made plain that this issue of deception is distinct from the reliability of water delivery by DWR.

[23]Respondents' contention sounds like an argument that Petitioners failed to exhaust their administrative remedies. However, no failure to exhaust claim was made in their briefs.

scenarios of pre-Monterey Amendments without Article 18 cutbacks, pre-Monterey Amendments with Article 18 cutbacks, and post-Monterey Amendments. AR 56. The EIR argues that the project could have been authorized under Article 41, but instead was implemented under Article 53 of the Monterey Agreement. It adds that DWR is preparing a new EIR for the Monterey Amendment.

Since the Monterey Amendments change the way in which SWP water is allocated among contractors, the 2004 EIR provides three separate analyses of the project's impacts to water supply. AR 186-89. The EIR goes to great lengths to discuss the uncertainties in the Article 18 allocations. AR 187-89. For each scenario, the EIR estimates reliability based on wet, dry, and extended dry year conditions. AR 183-91. The EIR addresses direct impacts to water supply and water quality under the three water allocation scenarios. AR 202-05. It discusses indirect impacts from the growth-inducing effect of the project, and mitigations of these impacts through implementation of existing agency policies. AR 207-224. It discusses the cumulative impact of the project and other projects inside and outside the project area. AR 278-89. Finally, it addresses alternatives to the project, including a no project alternative. AR 293-300.

The EIR clearly demonstrates the variability of SWP deliveries, and covers what could happen as a result of the Monterey Amendments EIR. But Petitioners are correct that the EIR has a hole in it. The EIR does not directly explain that the project may be impacted by the outcome of the Monterey Amendments EIR. Instead, the 2004 EIR assumes there are three possible water delivery scenarios without any discussion of why or how they would occur: "Since the Monterey Amendments change the way in which SWP water is allocated among contractors, the 2004 EIR provides three separate analyses of the project's impacts to water supply." The reader is left to interpret how these allocations could come about, and must conclude on his or her own that they are three possible outcomes of challenges to the Monterey Amendments. Nor does the EIR explain how such challenges could cause these allocations to occur.

An EIR is an informational document which is supposed to provide the reader with the "analytic route the...agency traveled from evidence to action." Citizens of Goleta Valley v. Board of Supervisors, ("Goleta") (1990) 52 Cal.3d 553, 568. This means that the EIR must contain facts and analysis, not just the agency's bare conclusions or opinions. Castaic is not required to predict the outcome of litigation, and may not be able to discuss the likelihood of each of the three allocations. However, it should have at least explained why the three scenarios are relevant and how they would occur.[24] The failure to do so leaves the reader wondering why they are pertinent. Consequently, the 2004 EIR fails to provide the analytic route by which the three alternatives are relevant.

Non-compliance with the disclosure requirements of CEQA may constitute a prejudicial abuse of discretion regardless of whether the agency would have taken the same action had it complied with CEQA. Pub. Res. Code §21005(a). Still, CEQA is subject to the established principle that there is no presumption of prejudicial error. Pub. Res. Code §21005(b). Only if the manner in which the agency failed to follow the law is prejudicial must the decision be set aside. Sierra Club v. State Board of Forestry, (1994) 7 Cal.4th 1215, 1236.

[24]For example, the court has no idea how a pre-Monterey Amendments without Article 18 cutbacks would occur.

The issue is whether Castaic's failure to supply the analytical route for its consideration of the three allocations is prejudicial. Prejudice depends on whether the failure to include this information makes "any meaningful assessment" of the project's environmental effects impossible, in which case prejudice is presumed. Sierra Club v. State Board of Forestry, (1994) 7 Cal.4th 1215, 1236 (agency approved timber harvesting plans without requiring necessary environmental information in them).[25] Even under this standard, not every CEQA failure is prejudicial. An EIR will be upheld if the error *de minimus* or clerical in nature (Save San Francisco Bay Association v. San Francisco Bay Conservation and Development Commission (1992) 10 Cal.App.4th 908, 935), the EIR analysis is comprehensive, if not perfect, despite the error (Schaeffer Land Trust v. San Jose City Council, (1989) 215 Cal.App.3d 612, 627-28), and information which should have been included to make the EIR accurate nonetheless has no material effect on informed decision-making or informed public participation (Al Larson Boat Shop, Inc. v. Board of Harbor Commissioners, (1993) 18 Cal.App.4th 729, 747-50).

The Vineyard court reiterated that the reviewing court must focus on the nature of the defect, depending on whether the claim is predominantly one of improper procedure or a dispute over facts. Where the agency has employed the correct procedures, greater deference is given to the agency's factual conclusions, which are reviewed for substantial evidence. 40 Cal.4th at 435.

The 2004 EIR's non-compliance concerns its analytic route – why and how the three allocations are pertinent. This is not a fact issue to be supported by substantial evidence. Instead, it is a failure affecting the public's ability to make a "meaningful assessment" of the project's environmental effects. As such, it is prejudicial. *See also* Rural Land Owners Assn. v. Lodi City Council, (1983) 143 Cal.App.3d 1013, 1023 (whenever failure to comply with CEQA results in a subversion of its purposes by omitting information from the environmental review process, the error is prejudicial).[26]

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[25]One appellate court, Resource Defense Fund v. Local Agency Formation Commission, (1987) 191 Cal.App.3d 886, 897-98 has stated that "[f]ailure to comply with CEQA is necessarily prejudicial." This does not appear to be the consensus approach. *See* Dusek v. Anaheim Redevelopment Agency, (1985) 173 Cal.App.3d 1029, 1040-42 ("a minor CEQA sin or two" constituting technical defects where the public had not been misled or defrauded is not enough for prejudice).

[26]Petitioners also argue that the 2004 EIR finesses the non-final nature of the project by jumping the gun and analyzing pre-Monterey Amendments. According to Petitioners, Castaic performed a "mini-programmatic review" at AR 155-06 and App. D (AR 468-550). The charts at AR 184 and 506 show this. According to Petitioners, this is not just factual overlap; this is usurpation of DWR's responsibilities.

DWR correctly points out that Petitioners are complaining about too much information, something that CEQA does not proscribe. Petitioners have no complaint about the content of the mini-program review. To the extent that Castaic performed a task that DWR is obligated to perform, DWR may either use Castaic's analysis or perform a new one. The cooperation of DWR and Castaiac suggests that the overlapping environmental analysis will be consistent. Even if inconsistent, DWR's analysis will control for the Monterey Amendments. There is no

the project. CALSIM II was available because DWR performed a SWP Delivery Reliability Report in 2003 using CALSIM II as its model. AR 56. Although the modeling tools are different, the criteria used to input into the computer simulation has not changed significantly. Id.

The question raised by Petitioners is why use an older computer simulation model (DWRSIM) for the 1998 baseline when a newer model (CALSIM II) was available? Appendix D of the 2004 EIR, entitled "Technical Data for Hydrologic Analysis," explains that Castaic had to do so because it did not perform any model analysis of its own. Instead, Castaic relied upon DWR's expertise, and its existing model studies. *See* AR 491. DWR used DWRSIM in its 2000 study and CALSIM II in its 2003 study; Castaic relied upon those same studies and same models.

Castaic's reliance on DWR's existing studies and its expertise is an explanation, but the issue becomes whether it is an adequate one.

The answer is in Appendix D, which explains that DWRSIM has a database of monthly runoff based on historic hydrologic data for a 73 year period from 1922-74. DWRSIM takes this data and, depending on the input variables of operating constraints and water contractor demand, estimates the amount of water SWP can deliver each month over that 75 year period. Assuming that hydrologic conditions repeat, the operator can predict the amount of water available under that particular hydrologic condition and with a particular demand and operating condition. AR 491.

Appendix D then shows that DWRSIM and CALSIM II predict similar outcomes, and that the differences in their predictions can be explained. In Figures 2-1 and 2-2 of Appendix D, Castaic compares the two models' prediction of SWP water deliveries at existing demand and at predicted 2020 demand levels. AR 493. The "existing demand" for the DWRSIM model is 1998 demand. The "existing demand" for the CALSIM II model is 2001 estimated demand. The 2001 demand is higher than the 2000 demand. Consistent with reality, the model will only show delivery up to the amount of demand; SWP will not deliver more water than is asked for even if it is available. This difference in demand explains why CALSIM II shows more delivery in wet years than DWRSIM; the lower demand in 1998 limits the amount of delivery.

The difference in demand also explains in part why CALSIM II predicts a higher delivery in extremely dry conditions; 1998's lower demand means more water is left in storage from the preceding year and is available for delivery in a dry year. Appendix D says that the proof is in the pudding: comparison of DWRSIM and CALSIM II in Figure 2-2, for the year 2020 with the same level of demand for each model, shows very close prediction of SWP delivery for both models. AR 492-93.

Castaic concludes that the two models predict "generally comparable" results and their differences are minimal. AR 491, 1003. Castaic argues that, if anything, the slightly higher supplies predicted by the DWRSIM model provide a worst case scenario for purposes of growth inducing impacts; the more water the more developers will grow the Santa Clarita Valley. AR 1003-04, 1009.

Contrary to Petitioners' argument, the use of DWRSIM and not CALSIM II in the 1998 baseline study does not affect the conclusion that the study constitutes substantial evidence. Petitioners do not present expert opinion that the use of DWRSIM results in any error. They merely rely on the differences in Figures 2-1 and 2-2 of Appendix D, and Appendix D explains

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the reason for the differences. As Castaic points out, Petitioners cannot point to any environmental significance to the use of DWRSIM and not CALSIM II. Therefore, Petitioners have not met their burden of demonstrating that use of DWRSIM for the 1998 baseline in the 2004 EIR was "clearly inadequate or unsupported."[27]

3. Cumulative Impacts

Petitioners contend that the 2004 EIR attempts to assess the project's impacts on the SWP without discussion why Castaic is competent to do so. As an example, the EIR rejects any significant project impact on the Delta, even though it acknowledges that differences in timing in the use of water for urban (Castaic) rather than agricultural (Wheeler Ridge) purposes would change the timing of deliveries. AR 192. Petitioners argue that the Delta is "in crisis" and there is great potential for conflict between Castaic's and DWR's respective environmental analysis. Pet. Op. Br. at 23-4.

An EIR must contain a cumulative impacts analysis of the project's environmental impact when considered in conjunction with other projects (Guidelines §15130) in order to ensure that "the entire relevant environmental picture" has been adequately considered. Laupheimer v. State of California, (1988) 200 Cal.App.3d 440, 462. A cumulative impact consists of an impact which is created as a result of the combination of the project evaluated in the EIR together with other projects causing related impacts. Guidelines §15130(a)(1). The EIR should not discuss impacts which do not result at least in part from the project being evaluated. Id. The analysis should reflect the severity and likelihood of occurrence of the impact. Guidelines §15130(b). In every case, there should be at least a preliminary search for potential cumulative environmental effects and a preliminary assessment of their significance. Laupheimer, 200 Cal.App.3d at 462-63. The detail required in a cumulative impacts discussion need not be as great as provided for the environmental impacts attributable to the project alone. Guidelines §15130(b). Generally, the EIR should list the projects producing cumulative impacts or provide a summary of projections contained in a prior certified or adopted environmental document which describe the regional conditions contributing to the cumulative impact. Guidelines §15130(b)(1). The 2004 EIR uses the list approach to discuss cumulative impacts of the project's environmental impact when considered in conjunction with other projects. AR 241-289.

Castaic argues that everything that happens with respect to the Kern water transfer happens south of the Delta, and the EIR thoroughly discusses that, including the impact of the timing of deliveries. AR 193-06. Thus, the EIR's conclusion that the project will have no direct

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[27]Castaic does not have statewide expertise on SWP reliability, but its consultants and DWR do. In commenting on Castaic's draft EIR, DWR stated that the differences between CALSIM II and DWRSIM "may cause slight changes in results, which may lead DWR to different conclusions....[in DWR's Monterey Amendments EIR]" AR 564. However, DWR also found that the draft EIR adequately and thoroughly discussed the project and its impacts, including the effects of the project on the environment and the SWP, using appropriate baseline conditions, and had a good discussion of the relationship between the Kern water transfer and Monterey Plus. DWR concluded that the draft EIR a "adequately discusses the reliability of the SWP, pre- and post- Monterey Amendment conditions, and SWP operations." AR 564-65.

5-2057-097

significant impact on the SWP or related facilities is fully supported. Castaic contends that Petitioners really are attacking its ability to act as lead agent for a local project if the project has the potential for statewide impact. According to Castaic, this argument goes to the lead agency issue, and is incorrect as a matter of law. Castaic is qualified and required by CEQA to assess impacts that occur outside of its borders in evaluating the Kern water transfer. Citizens of Goleta Valley v. Board of Supervisors, (1990) 52 Cal.3d 553, 573.

The court does not know whether Petitioners really are attacking Castaic's expertise or the adequacy of its assessment of SWP impacts from the Kern transfer. The reason is that Petitioners' arguments are conclusionary and unsupported by analysis, authority, or many facts. Petitioners' obligation was to point out what is wrong with the analysis, or what has been omitted that was required. An issue raised without analysis or authority lacks foundation and need not be addressed. Arcadia, 135 Cal.App.4th at 1429, 1431. The court has no obligation to search the EIR's cumulative analysis section to look for defects. Their general objection requires only a general response that Castaic's cumulative impacts analysis is adequate.

4. The "No Project" Alternative

Petitioners argue that the 2004 EIR fails to address the "no project" alternative, an issue particularly important because it was the principal defect in the PCL Monterey Agreement EIR. As the PCL court stated, a "no project" alternative must discuss "existing conditions" and "what would reasonably be expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services." 83 Cal.App.4th at 912. The Monterey Agreement EIR did not discuss the projections related to land planning, demand for water, and other impacts of reducing entitlements pursuant to Article 18(b). Id. at 919. Petitioners contend that the 2004 EIR does discuss the water supply reliability impacts of invoking Article 18(b), but not the statewide impacts the PCL court found so crucial.

The short answer to Petitioners contention is that 2004 EIR addresses a different project than the Monterey Amendments. The "no project" alternative for any EIR requires a comparison of the impacts of approving the project with the effect of not doing so. Guidelines §15126.6.(e)(1); Mira Mar Mobile Community v. City of Oceanside, (2004) 119 Cal.App.4th 477, 488-89. The only "no project alternative" that Castaic is obligated to consider is the alternative of "no Kern water transfer." Castaic has addressed this alternative by discussing groundwater sources of water and a possible moratorium. AR 291-4. Petitioners do not quibble with this analysis. But Castaic had no obligation to consider "no Monterey Amendments" as a no project alternative.[28] Indeed, it would make no sense to evaluate "no Monterey Amendments" as an alternative to the Kern water transfer.[29]

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[28]Of course, the 2004 EIR is obligated to consider invocation of Article 18(b) as a reasonably foreseeable environmental impact, and the adequacy of it doing so has been discussed.

[29]For a similar reason, Castaic need not analyze alternative uses of the SWP water in a "no project" alternative. CEQA does not require consideration of alternatives that do not meet the project objective; *i.e.*, delivery of water to Castaic's customers. *See* Guidelines §15126.6(c).

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5. Post-Hoc Rationalization

Petitioners also suggest that the 2004 EIR is a post-hoc rationalization for "a decision already made." Pet. Op. Br. at 18. Pre-judging environmental decisions in order to accomplish a project is prohibited under CEQA. An agency may not commit to a project before CEQA review is completed because a fundamental purpose of an EIR is to provide decision-makers with information they can use in deciding whether to approve a project. Therefore, post-approval environmental review has been condemned. Laurel Heights, 47 Cal.3d at 394. *See* Residents Ad Hoc Stadium Com. v. Board of Trustees, (1979) 89 Cal.App.4th 274, 285. Of course, an agency contemplating a project may be presumed to favor the project, and CEQA assumes this to be inevitable. Therefore, it builds in procedural protections to insure that the decision-maker does not fail to note the facts and arguments by opponents to the EIR. Id. at 285.

Castaic had completed the transfer and performed under it for several years prior to preparing the 2004 EIR. Plainly, it desires to keep the transfer and not change it. When the 1999 was found deficient, Castaic was required under CEQA to perform a "fresh look" at the transfer's environmental impacts. With the exception of the analytical hole discussed above, it has done so. *See* City of Vernon v. Board of Harbor, (1998) 63 Cal.App.4th 677, 1523 (adequacy of EIR overcomes contention that it was a post-hoc rationalization).

G. Conclusion

Castaic may act as the lead agency for the Kern water transfer. The 2004 EIR was properly prepared except for one defect – it fails to show the analytic route as to how and why the three allocations of pre-Monterey Amendments, pre-Monterey Amendments without Article 18, and post-Monterey Amendments are relevant and would occur. The court offers no opinion on whether this failure must be rectified by addendum (Guidelines §15164), a subsequent EIR, a supplement to EIR, or a new EIR. That determination is Castaic's to make in the first instance.

The Petition for Writ of Mandate is granted in part. A writ shall issue commanding Castaic to set aside its approval of the 2004 EIR and comply with CEQA, either through the preparation of a new EIR or other environmental documentation, such as an addendum, addressing the analytic route of the three water allocations. Castaic is not directed to set aside the Kern water transfer. Judgment shall be entered in favor of Petitioners solely on this issue.

This shall serve as the court's proposed statement of decision in compliance with CRC 232(c). If there are no written objections filed, the statement shall be final. As Respondents have prevailed on all but one issue, Castaic's council is ordered to prepare a writ of mandate and judgment consistent with this decision, and serve it on all other counsel for approval as to form. After 10 days, Castaic may file the proposed writ and judgment with the court, along with a declaration stating the nature and extent of any objections received. An OSC re: judgment shall be set for April 23, 2007.

Dated: April 2, 2007

J. Chalfant

Superior Court Judge
JAMES C. CHALFANT

PROOF OF SERVICE

STATE OF CALIFORNIA)
COUNTY OF ORANGE)

I am employed in the County of Orange, State of California. I am over the age of eighteen (18) years and not a party to the within action; my business address is: 695 Town Center Drive, Suite 400, Costa Mesa, California 92626.

On May 14, 2007, I served the foregoing document described as: **[PROPOSED] JUDGMENT GRANTING PEREMPTORY WRIT OF MANDATE** on the interested parties in this action by placing a true copy thereof enclosed in a sealed envelope addressed to all parties as indicated on the attached mailing list:

SEE ATTACHED LIST

[XX] (BY MAIL) I am "readily familiar" with the firm's practice of collection and processing correspondence by mailing. Under that practice it would be deposited with U.S. postal service on that same day with postage fully prepaid at Costa Mesa, California in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

[ ] (BY OVERNIGHT MAIL) I caused such document to be delivered by overnight mail to the offices of the addressee(s).

[ ] (BY PERSONAL DELIVERY) I caused such envelope to be delivered by hand to the offices of the addressee.

[ ] (BY FACSIMILE) I transmitted said document by fax transmission to the fax number(s) indicated

[XX] (BY E-MAIL) I transmitted said document by e-mail transmission to the e-mail addresses indicated

[XX] (STATE) I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

Executed on May 14, 2007, at Costa Mesa, California.

VICTORIA A. ROBINSON

PROOF OF SERVICE

STATE OF CALIFORNIA)
COUNTY OF ORANGE)

I am employed in the County of Orange, State of California. I am over the age of eighteen (18) years and not a party to the within action; my business address is: 695 Town Center Drive, Suite 400, Costa Mesa, California 92626.

On May 18, 2007, I served the foregoing document described as: **[PROPOSED] JUDGMENT GRANTING PEREMPTORY WRIT OF MANDATE** on the interested parties in this action by placing a true copy thereof enclosed in a sealed envelope addressed to all parties as indicated on the attached mailing list:

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[XX] (STATE) I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

Executed on May 18, 2007, at Costa Mesa, California.

Monifa Wilson

MONIFA WILSON

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LETTER 4

COPY

ORIGINAL FILED

MAY 22 2007

LOS ANGELES SUPERIOR COURT

IN THE SUPERIOR COURT OF THE STATE OF CALIFORNIA

COUNTY OF LOS ANGELES, CENTRAL DISTRICT

PLANNING AND CONSERVATION LEAGUE,

Petitioner,

vs.

CASTAIC LAKE WATER AGENCY,

Respondent,

CALIFORNIA DEPARTMENT OF WATER RESOURCES, KERN COUNTY WATER AGENCY, WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT,

Real Parties in Interest.

CALIFORNIA WATER IMPACT NETWORK,

Petitioner,

vs.

CASTAIC LAKE WATER AGENCY,

Respondent,

CALIFORNIA DEPARTMENT OF WATER RESOURCES, KERN COUNTY WATER AGENCY, WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT,

Real Parties in Interest.

CASE NO.: BS 098724

Assigned for All Purposes:
Honorable James Chalfant
Department 13

(Consolidated Cases)
[Transferred from Ventura County Master File No. CIV 231588 (consolidated with Ventura County Case No. CIV 231606)]

~~[PROPOSED]~~ **PEREMPTORY WRIT OF MANDATE**

Action Filed: January 24, 2005
Action Transferred: August 8, 2005

EXHIBIT 2

THE PEOPLE OF THE STATE OF CALIFORNIA

To Castaic Lake Water Agency, Respondent:

Judgment having been entered in this proceeding ordering that a peremptory writ of mandate be issued from this Court based on the Statement of Decision,

YOU ARE HEREBY COMMANDED within 30 days of service of this Writ to:

1. Set aside your December 22, 2004 certification of the Final Environmental Impact Report ("EIR") for a Supplemental Water Project Transfer of 41,000 acre-feet per year ("afy") of State Water Project ("SWP") Table A Amount ("2004 EIR"), ~~but only with respect to addressing the analytic route of the three water allocations in the 2004 EIR, *i.e.*, pre-Monterey Amendments without Article 18(b) cutbacks, pre-Monterey Amendments with Article 18 (b) cutbacks and post-Monterey Amendments~~.
2. Comply with the California Environmental Quality Act [Public Resources Code § 21000, *et seq.* ("CEQA")] in the preparation of additional environmental documentation consistent with the Statement of Decision addressing the analytic route of the three water allocations in the 2004 EIR, *i.e.*, pre-Monterey Amendments without Article 18(b) cutbacks, pre-Monterey Amendments with Article 18 (b) cutbacks and post-Monterey Amendments.
3. Nothing in this Writ shall be construed as commanding Castaic to set aside the Kern Water Transfer.

Nothing in this Writ, except for the commands set forth in paragraphs 1, 2 and 3, shall be construed to limit or control the discretion legally vested in you to determine the appropriate manner to comply with CEQA.

YOU ARE FURTHER COMMANDED to make and file a return to this Writ, setting forth what you have done to comply. This Court shall retain jurisdiction over your proceedings by way of that return until this Court has determined that you have complied with the commands and directions set forth in this Writ.

DATED: MAY 22 2007

CLERK OF THE SUPERIOR COURT

Let the forgoing writ issue.

/s/ JAMES C. CHALFANT
HONORABLE JAMES CHALFANT
JUDGE OF THE SUPERIOR COURT

Presented by: McCORMICK, KIDMAN & BEHRENS, LLP
Russell G. Behrens,
David D. Boyer

DAVID D. BOYER
Attorneys for Respondent
CASTAIC LAKE WATER AGENCY

PROOF OF SERVICE

STATE OF CALIFORNIA)
COUNTY OF ORANGE)

I am employed in the County of Orange, State of California. I am over the age of eighteen (18) years and not a party to the within action; my business address is: 695 Town Center Drive, Suite 400, Costa Mesa, California 92626.

On May 14, 2007, I served the foregoing document described as: **[PROPOSED] PEREMPTORY WRIT OF MANDATE** on the interested parties in this action by placing a true copy thereof enclosed in a sealed envelope addressed to all parties as indicated on the attached mailing list:

SEE ATTACHED LIST

[XX] (BY MAIL) I am "readily familiar" with the firm's practice of collection and processing correspondence by mailing. Under that practice it would be deposited with U.S. postal service on that same day with postage fully prepaid at Costa Mesa, California in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

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[XX] (STATE) I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

Executed on May 14, 2007, at Costa Mesa, California.

Victoria A. Robinson

VICTORIA A. ROBINSON

MAILING LIST
Los Angeles County Superior Court Case No. BS 098724

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PROOF OF SERVICE

Planning and Conservation League v. CLWA
LOS ANGELES SUPERIOR COURT Case No.: BS 098724

STATE OF CALIFORNIA)
) ss
COUNTY OF LOS ANGELES)

I am employed in the aforesaid County, State of California; I am over the age of eighteen years and not a party of the within action; my business address is 1880 Century Park East, Suite 615, Los Angeles, California 90067-1622.

On May 25, 2007, I served the foregoing document described as: **NOTICE OF RULINGS RE: OSC RE: JUDGMENT/WRIT OF MANDATE** on all parties in this action by placing true copies thereof enclosed in a sealed envelope addressed as follows:

SEE ATTACHED SERVICE LIST

X BY MAIL: I caused such envelope to be deposited in the mail at Los Angeles, California. The envelope was mailed with postage thereon fully prepaid. I am "readily familiar" with this firm's practice of collection and processing correspondence for mailing. Under that practice it would be deposited with U.S. Postal Service on that same day with postage thereon fully prepaid at Los Angeles, California in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

____ BY PERSONAL SERVICE: I caused such envelope to be delivered by hand.

____ BY FEDERAL EXPRESS (FedEx): I personally delivered such envelope on May 25, 2007, to a FedEx drop box or office in Los Angeles, California, marked for next day/overnight delivery.

____ BY FACSIMILE: I faxed such document to the addressee at the facsimile number listed for each addressee.

I declare that I am employed in the office of a member of the bar of this Court at whose direction the service was made.

I declare under penalty of perjury under the laws of the State of California, that the foregoing is true and correct and that this declaration was executed on May 25, 2007, at Los Angeles, California.

SARAH BLACKWELL

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PROOF OF SERVICE

STATE OF CALIFORNIA)
COUNTY OF ORANGE)

I am employed in the County of Orange, State of California. I am over the age of eighteen (18) years and not a party to the within action; my business address is: 650 Town Center Drive, Suite 100, Costa Mesa, California 92626.

On July 20, 2007, I served the foregoing document described as: **NOTICE OF CROSS-APPEAL** on the interested parties in this action by placing a true copy thereof enclosed in a sealed envelope addressed to all parties as indicated on the attached mailing list: **SEE ATTACHED LIST**

[X] (BY MAIL) I am "readily familiar" with the firm's practice of collection and processing correspondence by mailing. Under that practice it would be deposited with U.S. postal service on that same day with postage fully prepaid at Costa Mesa, California in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

[ ] (BY OVERNIGHT MAIL) I caused such document to be delivered by overnight mail to the offices of the addressee(s) on the attached list.

[ ] (BY PERSONAL DELIVERY) I caused such envelope to be delivered by hand to the offices of the addressee.

[ ] (BY FACSIMILE) I transmitted said document by fax transmission to the fax number(s) indicated

[X] (BY E-MAIL) I transmitted said document by e-mail transmission to the e-mail . to addresses indicated below.

[X] (STATE) I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

Executed on July 20, 2007, at Costa Mesa, California.

Alla Vainberg

ALLA VAINBERG

LETTER 4

MAILING LIST
Los Angeles County Superior Court Case No. BS 098724

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[EXEMPT FROM FILING FEE - GOV'T CODE § 6103]

IN THE SUPERIOR COURT OF THE STATE OF CALIFORNIA

COUNTY OF LOS ANGELES, CENTRAL DISTRICT

PLANNING AND CONSERVATION LEAGUE, a California non-profit corporation,

Petitioner,

vs.

CASTAIC LAKE WATER AGENCY, a public Agency under the laws of California,

Respondent,

KERN COUNTY WATER AGENCY, a public Agency under the laws of California; WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT, a public agency under the laws of California; DEPARTMENT OF WATER RESOURCES, a public agency of the State of California,

Real Parties in Interest.

CALIFORNIA WATER IMPACT NETWORK, a California non-profit corporation,

Petitioner,

vs.

CASE NO.: BS 098724

(Consolidated Cases)
(transferred from Ventura County, CIV231588 c/w CIV231606)

Assigned for All Purposes:
Honorable James C. Chalfant
Department 13

NOTICE OF CROSS-APPEAL

Action Filed: January 24, 2005
Action Transferred: August 8, 2005

FILED BY FACSIMILE

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LETTER 4

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CASTAIC LAKE WATER AGENCY, a public agency under the laws of California

Respondent,

KERN COUNTY WATER AGENCY, a public Agency under the laws of California; WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT, a public agency under the laws of California; DEPARTMENT OF WATER RESOURCES, a public agency of the State of California,

Real Parties in Interest.

TO THE CLERK OF THE ABOVE-ENTITLED COURT:

NOTICE IS HEREBY GIVEN that Real Party In Interest, Wheeler Ridge-Maricopa Water Storage District, cross-appeals from the Judgment Granting Peremptory Writ of Mandate, as well as the Peremptory Writ of Mandate, entered on May 22, 2007, in the above-entitled court.

Petitioners Planning and Conservation League and California Water Impact Network filed a Notice of Partial Appeal on July 12, 2007.

Respondent Castaic Lake Water Agency filed a Notice of Cross-Appeal on or about July 20, 2007, which included a full and complete copy of said Judgment attached as Exhibit "1" thereto, and a full and complete copy of said Peremptory Writ of Mandate attached as Exhibit "2" thereto. Said exhibits are incorporated herein by reference.

DATED: July 27, 2007

The Law Offices of
YOUNG WOOLDRIDGE, LLP

By: Steve Torigiani
STEVEN M. TORIGIANI,
Attorneys for Real Party In Interest,
WHEELER RIDGE-MARICOPA
WATER STORAGE DISTRICT

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PROOF OF SERVICE

STATE OF CALIFORNIA)
COUNTY OF KERN)

I, BETH A. GASTINEAU, am employed in the County of Kern, State of California. I am over the age of eighteen (18) years and not a party to the within action; my business address is: 1800 30th Street, Fourth Floor, Bakersfield, CA 93301

On July 27, 2007, I served the foregoing document described as: **NOTICE OF CROSS-APPEAL** on the interested parties in this action by placing a true copy thereof enclosed in a sealed envelope addressed to all parties as indicated below:

SEE ATTACHED SERVICE LIST

[XX] **(BY MAIL)** I am "readily familiar" with the firm's practice of collection and processing correspondence by mailing. Under that practice it would be deposited with U.S. postal service on that same day with postage fully prepaid at Bakersfield, California in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

[ ] (BY OVERNIGHT MAIL) I caused such document to be delivered by overnight mail to the offices of the addressee(s).

[ ] (BY PERSONAL DELIVERY) I caused such envelope to be delivered by hand to the offices of the addressee.

[ ] (BY FACSIMILE) I transmitted said document by fax transmission to the fax number(s) indicated on the attached service list.

[XX] **(BY E-MAIL)** I caused said document to be delivered by electronically transmitting to the e-mail addresses as indicated on the attached service list.

[XX] **(STATE)** I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

Executed on July 27, 2007, at Bakersfield, California.

Beth A. Gastineau

BETH A. GASTINEAU

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Los Angeles County Superior Court Case No. BS 098724

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LETTER 4

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[EXEMPT FROM FILING FEE GOV'T CODE § 6103]

SUPERIOR COURT OF THE STATE OF CALIFORNIA

COUNTY OF LOS ANGELES, CENTRAL DISTRICT

PLANNING AND CONSERVATION LEAGUE,

Petitioner,

v.

CASTAIC LAKE WATER AGENCY,

Respondent,

CALIFORNIA DEPARTMENT OF WATER RESOURCES, KERN COUNTY WATER AGENCY, WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT,

Real Parties in Interest.

CALIFORNIA WATER IMPACT NETWORK,

Petitioner,

v.

CASTAIC LAKE WATER AGENCY,

CASE NO.: BS 098724

Assigned for All Purposes:
Honorable James C. Chalfant
Department 13

(Consolidated Cases)
[Transferred from Ventura County Master File No. CIV 231588 (consolidated with Ventura County Case No. CIV 231606)]

KERN COUNTY WATER AGENCY'S NOTICE OF CROSS-APPEAL

Action Filed: January 24, 2005
Action Transferred: August 8, 2005

Respondent,

CALIFORNIA DEPARTMENT OF WATER RESOURCES, KERN COUNTY WATER AGENCY, WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT,

Real Parties in Interest.

TO THE CLERK OF THE ABOVE-ENTITLED COURT:

NOTICE IS HEREBY GIVEN that Real Party in Interest, Kern County Water Agency cross-appeals from the Judgment Granting Peremptory Writ of Mandate as well as the Peremptory Writ of Mandate, entered on May 22, 2007 in the above entitled court.

Petitioners Planning and Conservation League and California Water Impact Network filed a Notice of Partial Appeal on July 12, 2007.

A full and complete copy of the Judgment is attached as Exhibit 1 to this Notice.

A full and complete copy of the Peremptory Writ of Mandate is attached as Exhibit 2 to this Notice.

Dated: July 26, 2007

Respectfully submitted,

KRONICK, MOSKOVITZ, TIEDEMANN & GIRARD
A Law Corporation

By Clifford W. Schulz
Clifford W. Schulz
Attorneys for Real Party in Interest
Kern County Water Agency

PROOF OF SERVICE

I, Lorraine Lippolis, declare:

I am a resident of the State of California and over the age of eighteen years, and not a party to the within action; my business address is 400 Capitol Mall, 27th Floor, Sacramento, CA 95814-4416. On July 26, 2007, I served the within documents:

KERN COUNTY WATER AGENCY'S NOTICE OF CROSS APPEAL

☐ by transmitting via facsimile from (916) 321-4555 the above listed document(s) without error to the fax number(s) set forth below on this date before 5:00 p.m. A copy of the transmittal/confirmation sheet is attached.

☒ by placing the document(s) listed above in a sealed envelope with postage thereon fully prepaid, in the United States mail at Sacramento, California addressed as set forth below.

☒ by transmitting the document(s) by e-mail transmission to the e-mail address(es) set forth below.

☐ by causing personal delivery by messenger of the document(s) listed above to the person(s) at the address(es) set forth below.

☐ by placing the document(s) listed above in a sealed Federal Express envelope and affixing a pre-paid air bill, and causing the envelope to be delivered to a Federal Express agent for delivery

☐ by personally delivering the document(s) listed above to the person(s) at the address(es) set forth below.

Please see attached Service List

I am readily familiar with the firm's practice of collection and processing correspondence for mailing. Under that practice it would be deposited with the U.S. Postal Service on that same day with postage thereon fully prepaid in the ordinary course of business. I am aware that on motion of the party served, service is presumed invalid if postal cancellation date or postage meter date is more than one day after date of deposit for mailing in affidavit.

I declare under penalty of perjury under the laws of the State of California that the above is true and correct.

Executed on July 26, 2007, at Sacramento, California.

Lorraine Lippolis

LETTER 4

Service List
Los Angeles County Superior Court Case No. BS 098724

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4 of 18 DOCUMENTS

SANTA CLARITA ORGANIZATION FOR PLANNING THE ENVIRONMENT et al., Plaintiffs and Appellants, v. COUNTY OF LOS ANGELES, Defendant and Respondent; NEWHALL LAND AND FARMING COMPANY et al., Real Parties in Interest and Respondents.

No. B189116

COURT OF APPEAL OF CALIFORNIA, SECOND APPELLATE DISTRICT, DIVISION SIX

157 Cal. App. 4th 149; 2007 Cal. App. LEXIS 1938

November 26, 2007, Filed

PRIOR HISTORY: [*1]

Superior Court of Santa Barbara County, No. 1043805, James W. Brown, Judge.

Santa Clarita Organization for Planning the Environment v. County of Los Angeles, 155 Cal. App. 4th 660, 66 Cal. Rptr. 3d 559, 2007 Cal. App. LEXIS 1605 (Cal. App. 2d Dist., 2007)

DISPOSITION: The judgment is affirmed. Costs on appeal are awarded to respondents and real parties in interest.

SUMMARY:

CALIFORNIA OFFICIAL REPORTS SUMMARY

The trial court denied a petition for writ of administrative mandate challenging a county's recertification, after remand and revision, of an environmental impact report (EIR) for a residential subdivision. A previous EIR was found inadequate because it relied on water entitlements instead of actual water in analyzing water availability. The county revised the water supply analysis to include a water transfer as part of the permanent supply for the entire project. Although pending litigation could affect the water transfer, the EIR concluded that the transfer was unlikely to be invalidated. (Superior Court of Santa Barbara County, No. 1043805, James W. Brown, Judge.)

The Court of Appeal affirmed, concluding that the EIR provided an adequate analysis of future water supplies and that it complied with the requirements of the California Environmental Quality Act (Pub. Resources Code, § 21000 et seq.). The record contained substantial evidence demonstrating a reasonable likelihood that water from the transfer would be available; thus, an analysis of alternative sources was not required. The court's previous opinion regarding the original EIR did not preclude certification of the revised EIR under the doctrine of law of the case because that opinion did not address the water transfer. The EIR did not have to discuss funding of mitigation measures for contaminated wells because very few wells were contaminated and there was no indication that mitigation measures would not be implemented. (Opinion by Gilbert, P. J., with Coffee and Perren, JJ., concurring.)

HEADNOTES

CALIFORNIA OFFICIAL REPORTS HEADNOTES

(1) Appellate Review § 156--Scope--Law of the Case--Principle Necessary to Decision.--Where an appellate court states in its opinion a principle or rule of law necessary to its decision, that principle or rule becomes the law of the case. The law of the case must be adhered to both in the lower court and upon subsequent appeal. This is true even if the court that issued the opinion becomes convinced in a subsequent consideration that the former opinion is erroneous.

(2) Pollution and Conservation Laws § 2.6--California Environmental Quality Act--Impact Reports--Contents and Sufficiency--Future Water

Supplies.--The informational purposes of the California Environmental Quality Act (Pub. Resources Code, § 21000 et seq.) are not satisfied by an environmental impact report that simply ignores or assumes a solution to the problem of supplying water to a proposed land use project. Decision makers must, under the law, be presented with sufficient facts to evaluate the pros and cons of supplying the amount of water that the project will need.

(3) Pollution and Conservation Laws § 2.6--California Environmental Quality Act--Impact Reports--Contents and Sufficiency--Future Water Supplies.--An adequate environmental impact analysis for a large project, to be built and occupied over a number of years, cannot be limited to the water supply for the first stage or the first few years. While proper tiering of environmental review allows an agency to defer analysis of certain details of later phases of long-term linked or complex projects until those phases are up for approval, the demand of the California Environmental Quality Act (Pub. Resources Code, § 21000 et seq.) for meaningful information is not satisfied by simply stating information will be provided in the future.

(4) Pollution and Conservation Laws § 2.6--California Environmental Quality Act--Impact Reports--Contents and Sufficiency--Future Water Supplies.--The future water supplies identified and analyzed must bear a likelihood of actually proving available; speculative sources and unrealistic allocations (paper water) are insufficient bases for decisionmaking under the California Environmental Quality Act (Pub. Resources Code, § 21000 et seq.). An environmental impact report (EIR) for a land use project must address the impacts of likely future water sources, and the EIR's discussion must include a reasoned analysis of the circumstances affecting the likelihood of the water's availability.

(5) Pollution and Conservation Laws § 2.6--California Environmental Quality Act--Impact Reports--Contents and Sufficiency--Future Water Supplies.--Where, despite a full discussion, it is impossible to confidently determine that anticipated future water sources will be available, the California Environmental Quality Act (Pub. Resources Code, § 21000 et seq.) requires some discussion of possible replacement sources or alternatives to use of the anticipated water, and of the environmental consequences of those contingencies. The law's informational demands may not be met, in this context, simply by providing that future development will not proceed if the anticipated water supply fails to materialize. But when an environmental impact report makes a sincere and reasoned attempt to analyze the water sources the project is likely to use, but acknowledges the remaining uncertainty, a measure for curtailing development if the intended sources fail to materialize may play a role in the impact analysis.

(6) Pollution and Conservation Laws § 2.6--California Environmental Quality Act--Impact Reports--Contents and Sufficiency--Future Water Supplies.--An environmental impact report (EIR) for a residential subdivision adequately addressed water supply issues. The record contained substantial evidence demonstrating a reasonable likelihood that water would be available for the project's near-term and long-term needs. The record also showed that the county proceeded in a manner required by the California Environmental Quality Act (Pub. Resources Code, § 21000 et seq.). The EIR neither improperly used tiering to defer all analysis of supplies to future stages of the project, nor relied upon demonstrably illusory supplies.

[Manaster & Selmi, Cal. Environmental Law & Land Use Practice (2007) ch. 22, § 22.04; Cal. Forms of Pleading and Practice (2007), ch. 418, Pollution and Environmental Matters, § 418.35.]

COUNSEL: Law Office of Alyse M. Lazar and Alyse M. Lazar for Plaintiffs and Appellants Santa Clarita Organization for Planning the Environment and Friends of the Santa Clara River.

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JUDGES: Opinion by Gilbert, P. J., with Coffee and Perren, JJ., concurring.

OPINION BY: Gilbert

OPINION

GILBERT, P. J.--In *Santa Clarita Organization for Planning the Environment v. County of Los Angeles* (2003) 106 Cal.App.4th 715 [131 Cal. Rptr. 2d 186] (*Scope I*), we held that the water service portion of an environmental [*2] impact report (EIR) must analyze the actual amount of water that will be available for a project. In *Scope I*, the EIR for the West Creek residential subdivision did not comply with the California Environmental Quality Act (CEQA) (Pub. Resources Code, § 21000 et seq.). [1] It relied on contractual entitlements to water. Because this water is not of the "wet" variety, it has been called "paper water."

1 All statutory references are to the Public Resources Code unless otherwise stated.

After remand, the County of Los Angeles (County) revised and recertified the West Creek EIR. Santa Clarita Organization for Planning the Environment (SCOPE) again challenges the water services portion of the EIR. This time, SCOPE focuses on the EIR's analysis of a water transfer agreement and remediation costs for perchlorate contamination of water wells. The trial court denied SCOPE's petition for writ of administrative mandate.

After the trial court denied SCOPE's petition, our Supreme Court decided *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412 [53 Cal. Rptr. 3d 821, 150 P.3d 709] (*Vineyard*). *Vineyard* states four principles governing the analysis of the water services portion of an EIR. We [*3] conclude the West Creek EIR satisfies all four principles.

FACTS

Background

In the 1950's, the Legislature and the voters approved the State Water Project (SWP). It was designed to deliver 4.23 million acre-feet of water annually. It is managed by the Department of Water Resources (DWR).

The DWR contracted to deliver water to water agencies throughout the state. The contracts entitle the agencies to specified amounts of water calculated on the designed capacity of the SWP. Only half of the SWP was constructed. The completion of the SWP was an expectation that has not grown beyond a hope. There is no reasonable expectation that the original plan will ever be completed. This leaves a vast difference between the amount of water to which the local agencies are entitled, and the amount of water the SWP can actually deliver.

A drought in the 1990's highlighted the disparity between water entitlements and actual water. Agricultural and urban agencies disputed how shortfalls in water delivery would be allocated. The interested parties met in Monterey, and produced the "Monterey Agreement."

Under the Monterey Agreement, the DWR and the contracting water agencies agreed to a statement of 14 principles. [*4] One principle provided for the permanent sale of water among agencies. The Castaic Lake Water Agency (Castaic) purchased 41,000 acre-feet per year (afy) from the Kern County Water Agency. Castaic serves the Santa Clarita Valley area, and the 41,000 afy constitutes over 40 percent of the 95,200 afy available to Castaic.

The Monterey Agreement scuttled the term "entitlement" to describe the amount of water the SWP has contracted to deliver to local water agencies. Instead, the agreement uses the term "Table A Amount." Table A of the agreement lists the contracting agencies and the amount of water the SWP has contracted to deliver. The change is not substantive.

In *Planning & Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892 [100 Cal. Rptr. 2d 173] (*PCL*), the court ordered the EIR for the Monterey Agreement decertified. The court determined that the EIR was prepared by the wrong lead agency, a water agency instead of the DWR, and failed to consider the "no project" alternative. Because the EIR for the Kern-Castaic 41,000 afy transfer was "tiered" on the Monterey Agreement EIR, the EIR for the Kern-Castaic transfer was also ordered decertified. (*Friends of the Santa Clara River v. Castaic Lake Water Agency* (2002) 95 Cal.App.4th 1373, 1387 [116 Cal. Rptr. 2d 54] [*5] (*Friends*).) Although the EIR's for the Monterey Agreement and the Kern-Castaic transfer were decertified, the projects were not enjoined. The agreements remain in effect to this day.

On July 22, 2002, the parties to the *PCL* litigation that decertified the Monterey Agreement EIR entered into a settlement agreement approved by the Sacramento County Superior Court. The settlement agreement requires the DWR as the lead agency to prepare a new EIR for the Monterey Agreement. The settlement agreement acknowledges that certain water transfers listed in attachment E to the settlement agreement are final, and the parties agree not to challenge those transfers. The Kern-Castaic transfer is not listed in attachment E. Instead, the settlement agreement provides:

"*Acknowledgement and Agreement Regarding Kern-Castaic Transfer.* With respect to ... the Kern-Castaic Transfer, the Parties recognize that such water transfer is subject to pending litigation in the Los Angeles County Superior Court following remand from the Second District Court of Appeal (See *Friends of the Santa Clara River v. Castaic Lake Water Agency*,[*supra*,] 95 Cal.App.4th 1373 [116 Cal.Rptr.2d 54] ... ; *review denied* April 17, 2002). The [*6] Parties agree that jurisdiction with respect to that litigation should remain in that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation."

In 2004, Castaic certified a revised EIR for the Kern-Castaic transfer. This EIR is not tiered on the Monterey Agreement EIR. SCOPE's opening brief states that Castaic's EIR is being challenged in Los Angeles County Superior Court by environmental groups.

West Creek

West Creek is a proposed mixed residential and commercial development in the Santa Clarita Valley area of northern Los Angeles County. The project includes 2,545 housing units, 180,000 square feet of commercial retail space and 46 acres of community facilities. The County served as the lead agency in preparing the EIR for the project. The project developers are The Newhall Land and Farming Company and Valencia Corporation (hereafter collectively Newhall).

SCOPE challenges the County's certification of the West Creek EIR. The trial court denied SCOPE's petition for a writ of administrative mandate. We reversed on the ground that the EIR's evaluation of the availability of the water supply was [*7] inadequate. (*Scope I*, *supra*, 106 Cal.App.4th 715.) The EIR relied on water entitlements instead of actual water in analyzing water availability. (*Ibid.*)

The County revised the water supply analysis, and recertified the EIR. SCOPE challenges the water supply analysis in the recertified EIR. This time it opposes the 41,000 afy Kern-Castaic water transfer.

The recertified EIR states that Castaic's total maximum SWP water allocation is 95,200 afy. The Kern-Castaic transfer accounts for 41,000 afy of that. The EIR acknowledges that the EIR for the Monterey Agreement and the original EIR for the Kern-Castaic transfer were decertified.

With regard to the status of the Kern-Castaic transfer, the EIR states:

"The [Kern-Castaic] transfer of SWP Table A Amount was the type of water transfer that fell within the provisions of the Monterey Agreement. As stated above, under the Monterey Agreement, certain SWP agricultural contractors agreed that 130,000 AF of their Table A Amount could be transferred to urban contractors. The [Castaic] 41,000-AF acquisition was a part of the 130,000 AF of SWP Table A Amount, which has been transferred under the Monterey Agreement.

"... The Monterey Agreement provides [*8] ... for those transfers by the participating SWP contractors, thus facilitating transfers of Table A Amounts from agricultural to urban SWP contractors. As stated above, the environmental documentation for the Monterey Agreement has been decertified. However, the ... legal proceedings (*Planning and Conservation League v. Department of Water Resources*[, *supra*,] 83 Cal.App.4th 892 [PCL litigation]) did not invalidate ... the Monterey Agreement or enjoin[] either the Monterey Agreement or further implementation of the Monterey Agreement.

"In addition, the subsequent Settlement Agreement in the PCL litigation did not invalidate or otherwise enjoin the Monterey Agreement.

"Even in the absence of the Monterey Agreement, [Castaic's] permanent acquisition of an additional 41,000 AF of SWP Table A Amount could occur under existing SWP water supply contract provisions, subject to appropriate environmental review.

"Nothing in the existing SWP water supply contracts, or applicable law, prohibit such water transfers with or

without the Monterey Agreement. The Monterey Agreement simply provides a specific vehicle for accomplishing transfers of SWP Table A Amounts from agricultural to urban SWP [*9] contractors; the amendments under the Monterey Agreement are not the exclusive means by which that Amount may be transferred. In support of that fact, in 1981 (almost 15 years before the Monterey Agreement), the entire SWP Table A Amount of the Hacienda Water District was permanently transferred to the Tulare Lake Basin Water Storage District, pursuant to an agreement approved by DWR.

"The acquisition could proceed as a water transfer under existing law. See, e.g., Water Code §§ 382, 383 (authority for transferring surplus water) and Water Code §§ 1745, et seq. (authority for transferring non-surplus water). The Kern County Water Agency has reaffirmed its willingness to allow transfers of up to 130,000 AF of SWP table A Amounts under pre-Monterey Agreement conditions and/or under the terms of the Settlement Agreement. ...

"Finally, [Castaic] is not a party to the pending Monterey Agreement litigation (*Planning Conservation League v. Department of Water Resources*[, *supra*,] 83 Cal.App.4th 892). Although not a party, an adverse final judgment invalidating the Monterey Agreement could affect [Castaic's] completed acquisition of the 41,000 AF, which could in turn impair [Castaic's] supply [*10] of SWP water through its contracts with DWR and other SWP contractors. Nevertheless, [Castaic] believes that an adverse outcome in the Monterey Agreement litigation is not likely to adversely affect [Castaic's] water supplies over the long-term because (a) [Castaic] believes that such a result is unlikely to 'unwind' executed and completed agreements with respect to the permanent transfer of SWP water amounts; (b) existing SWP water supply contract provisions allow such transfers (without the need for the Monterey Agreement); and (c) existing law enables [Castaic] to enter into contracts outside the context of the Monterey Agreement."

The EIR also discloses that there is perchlorate contamination in six water wells that will comprise part of the water service for West Creek. The EIR identifies remediation measures, but does not identify any source of funding for those measures.

DISCUSSION

I

Newhall contends the doctrine of law of the case bars SCOPE's Kern-Castaic transfer arguments.

(1) Where an appellate court states in its opinion a principle or rule of law necessary to its decision, that principle or rule becomes the law of the case. (*Clemente v. State of California* (1985) 40 Cal.3d 202, 211 [219 Cal. Rptr. 445, 707 P.2d 818].) [*11] The law of the case must be adhered to both in the lower court and upon subsequent appeal. (*Ibid.*) This is true even if the court that issued the opinion becomes convinced in a subsequent consideration that the former opinion is erroneous. (*Ibid.*)

But our former opinion in this case (*Scope I*) stated no principle or rule of law bearing on the adequacy of the West Creek EIR's discussion of the Kern-Castaic transfer. Newhall attempts to turn silence into positive effect by citing section 21005, subdivision (c). The subdivision requires that our opinion discuss all the alleged grounds for noncompliance with CEQA. Newhall concludes that because we did not discuss the Kern-Castaic transfer in *Scope I*, we approved the transfer.

Newhall cites no authority, however, for the proposition that not discussing an issue as required by section 21005, subdivision (c), transforms that issue into law of the case. In *Friends*, *supra*, 95 Cal.App.4th at page 1387, on which Newhall relies, after finding one of appellant's contentions meritorious, the court expressly stated it considered all of appellant's other contentions and found them without merit. (*Ibid.*) *Friends* does not discuss the effect of a failure [*12] to consider an issue, and does not even mention the doctrine of law of the case. If Newhall believed we failed to discuss an issue raised in *Scope I*, its remedy was a timely petition for rehearing. (Cal. Rules of Court, rule 8.268 (formerly cited as rule 25).) The time for such a petition has long since passed.

Moreover, we discussed all issues raised in *Scope I*. SCOPE mentioned the Kern-Castaic transfer in its opening brief, but SCOPE did not raise the transfer as an issue. In fact, Newhall argued that we could not consider *Friends*, the decision that decertified the Kern-Castaic transfer EIR, because it occurred after the County approved the West Creek project. Newhall pointed out that once a project is approved, new information does not require reopening the approval. (*Scope I*, *supra*, 106

Cal.App.4th at p. 723.) SCOPE replied that it cited *Friends* only to show that SWP entitlements cannot be taken at face value. (*Ibid.*) Thus, at Newhall's urging, we did not consider in *Scope I* the issues SCOPE now raises. They arose after the County's initial approval of the project. Newhall cites no authority that prevents us from considering issues that arose prior to the recertification of the [*13] EIR. [2]

2 SCOPE contends the EIR's failure to properly analyze the Kern-Castaic transfer violated the terms of the remittitur in *Scope I*. It follows from what we have said that the contention has no merit. We did not consider the Kern-Castaic transfer in *Scope I*, and it was not within the terms of our remittitur in that case.

II

Newhall contends SCOPE waived its perchlorate contamination arguments by failing to appeal them. Newhall argues SCOPE's claim is waived because it is essentially identical to that denied by the trial court in the first challenge to the project's EIR.

But SCOPE's first challenge to the project's EIR concerned disclosure of the extent of perchlorate contamination of local water wells. SCOPE did not appeal the trial court's denial of that challenge. Here SCOPE is not challenging the EIR's disclosure of the extent of perchlorate contamination. Instead, it is challenging the mitigation measures suggested by the EIR. That issue is not substantially identical to the issue raised in the first challenge. There has been no waiver.

III

We now consider SCOPE's challenge to the West Creek EIR. An EIR approved by the appropriate governmental agency is presumed adequate, and the [*14] party challenging the EIR has the burden of showing otherwise. (*Barthelemy v. Chino Basin Mun. Water Dist.* (1995) 38 Cal.App.4th 1609, 1617 [45 Cal. Rptr. 2d 688] (*Barthelemy*).) A party may challenge an EIR by showing the agency has abused its discretion either by reaching factual conclusions unsupported by substantial evidence or by failing to proceed in the manner CEQA provides. (*Vineyard*, *supra*, 40 Cal.4th at p. 435.)

In evaluating an EIR for CEQA compliance, we must adjust our scrutiny to the nature of the alleged defect. (*Vineyard*, *supra*, 40 Cal.4th at p. 435.) Where the alleged defect is that the agency's conclusions are not supported by substantial evidence, we must accord deference to the agency's factual conclusions. (*Ibid.*) We may not weigh conflicting evidence to determine who has the better argument. (*Ibid.*) Thus we may not set aside an agency's approval of an EIR on the ground that an opposite conclusion would have been equally or more reasonable. (*Ibid.*)

Where the alleged defect is that the agency has failed to proceed in a manner provided by CEQA, our review is de novo. (*Vineyard*, *supra*, 40 Cal.4th at p. 435.) An agency that fails to require an applicant to disclose information mandated by CEQA [*15] and to include that information in the EIR, fails to proceed in a manner prescribed by CEQA. (*Vineyard*, at p. 435.) Where a party challenges an EIR because it fails to disclose evidence that conflicts with its conclusions, the party must show that the failure to disclose the conflicting evidence precludes informed decision making or informed public participation. (*Barthelemy*, *supra*, 38 Cal.App.4th at p. 1617.)

IV

SCOPE challenges the adequacy of the EIR's water supply analysis as it relates to the Kern-Castaic transfer.

Recently, our Supreme Court in *Vineyard* articulated four principles for analysis of future water supplies under CEQA:

(2) "First, CEQA's informational purposes are not satisfied by an EIR that simply ignores or assumes a solution to the problem of supplying water to a proposed land use project. Decision makers must, under the law, be presented with sufficient facts to 'evaluate the pros and cons of supplying the amount of water that the [project] will need.' [Citation.]" (*Vineyard*, *supra*, 40 Cal.4th at pp. 430-431.)

(3) "Second, an adequate environmental impact analysis for a large project, to be built and occupied over a number of years, cannot be limited to the water supply for the first stage [*16] or the first few years. While proper tiering of environmental review allows an agency to defer analysis of certain details of later phases of long-term linked or complex projects until those phases are up for approval, CEQA's demand for meaningful

information 'is not satisfied by simply stating information will be provided in the future.' [Citation.]" (*Vineyard, supra*, 40 Cal.4th at p. 431.)

(4) "Third, the future water supplies identified and analyzed must bear a likelihood of actually proving available; speculative sources and unrealistic allocations ('paper water') are insufficient bases for decisionmaking under CEQA. [Citation.] An EIR for a land use project must address the impacts of *likely* future water sources, and the EIR's discussion must include a reasoned analysis of the circumstances affecting the likelihood of the water's availability. [Citation.]" (*Vineyard, supra*, 40 Cal.4th at p. 432.)

(5) "Finally, where, despite a full discussion, it is impossible to confidently determine that anticipated future water sources will be available, CEQA requires some discussion of possible replacement sources or alternatives to use of the anticipated water, and of the environmental consequences [*17] of those contingencies. [Citation.] The law's informational demands may not be met, in this context, simply by providing that future development will not proceed if the anticipated water supply fails to materialize. But when an EIR makes a sincere and reasoned attempt to analyze the water sources the project is likely to use, but acknowledges the remaining uncertainty, a measure for curtailing development if the intended sources fail to materialize may play a role in the impact analysis. [Citation.]" (*Vineyard, supra*, 40 Cal.4th at p. 432.)

The West Creek EIR does not simply ignore or assume a solution to the problem of supplying water to the project. It identifies specific water sources, including the Kern-Castaic transfer. Nor is the EIR's water supply analysis limited to the first stage or the first few years of the project. The EIR analyzes the Kern-Castaic transfer as part of the permanent supply for the entire project.

SCOPE's concerns center on the third principle articulated in *Vineyard*, that "the future water supplies identified and analyzed must bear a likelihood of actually proving available ... ." (*Vineyard, supra*, 40 Cal.4th at p. 432.)

SCOPE challenges the EIR's conclusion [*18] that an adverse outcome in the Monterey Agreement litigation is unlikely to affect Castaic's water supplies over the long term. The EIR supports this conclusion by stating that an adverse outcome in the Monterey Agreement litigation is unlikely to "unwind" existing agreements for permanent transfer of SWP water amounts, and that existing law and contracts allow transfers without the need for the Monterey Agreement.

SCOPE argues the EIR fails to disclose that the Kern-Castaic transfer is not final and permanent. SCOPE points out that the Kern-Castaic transfer is not included among the water transfers listed as final and permanent in the Monterey Settlement Agreement.

But the Monterey Settlement Agreement makes it clear that the Kern-Castaic transfer is not listed among the final transfer agreements because its EIR is subject to pending litigation in the Los Angeles Superior Court. (Citing *Friends, supra*, 95 Cal.App.4th 1373.) SCOPE points to no evidence that the parties to the Monterey Settlement Agreement consider the transfer as anything other than permanent now that the revised EIR for the transfer has been certified. The Monterey Settlement Agreement did not make the Kern-Castaic [*19] transfer temporary. A disclosure that the Monterey Settlement Agreement does not include the Kern-Castaic transfer on its list of final transfer agreements adds nothing substantial to an understanding of water availability.

In *California Oak Foundation v. City of Santa Clarita* (2005) 133 Cal.App.4th 1219, 1237-1238 [35 Cal. Rptr. 3d 434], the court reviewed the adequacy of the discussion of the Kern-Castaic transfer contained in an EIR for an unrelated project. The court determined the EIR was inadequate because it failed to discuss the legal uncertainty of the Kern-Castaic transfer; specifically, the uncertainty created by the decertification of the transfer's original EIR.

In contrast, here the EIR discloses that the Monterey Agreement litigation makes the Kern-Castaic transfer legally uncertain. The EIR states that a judgment invalidating the Monterey Agreement could affect Castaic's acquisition of the 41,000 acre feet of water. The EIR concludes, however, that as a practical matter an adverse outcome in the Monterey Agreement litigation is unlikely to "unwind" the transfer agreement. Contrary to SCOPE's argument, this conclusion is supported by reasoned analysis. The EIR points out that the Kern-Castaic [*20] transfer is intended to be permanent, and that the transfer can be valid even without the Monterey Agreement.

SCOPE argues the Monterey Agreement is necessary

to validate the Kern-Castaic transfer because all transfers of SWP water require the DWR's consent. SCOPE cites no authority that expressly requires the DWR's consent for water transfers. Instead, SCOPE reasons the DWR's consent is required because it controls the SWP facilities necessary for delivery of the water. Assuming DWR's consent is necessary, SCOPE cites no authority that the consent must come through the Monterey Agreement. In fact, the EIR discloses that the transfer of surplus and nonsurplus water is authorized by statute. (Wat. Code, §§ 382, 383, 1745 et seq.) The EIR also notes that at least one Table A Amount of water was permanently transferred with the DWR's consent almost 15 years prior to the Monterey Agreement.

Quite aside from the Monterey Agreement, the legislative policy of this state is to facilitate water transfers. (See Wat. Code, §§ 475, 480 et seq.) SCOPE points to no evidence whatsoever that the DWR has any inclination to disapprove the Kern-Castaic transfer even if the Monterey Agreement is ultimately [*21] invalidated.

SCOPE points to a letter from the DWR to Castaic dated July 30, 2004. The letter is in an appendix to the West Creek EIR. The letter states that the DWR staff has reviewed the draft EIR for the Kern-Castaic transfer and found that the document "adequately and thoroughly discusses the proposed project and its impacts," and provides a good discussion of the relationship between the Kern-Castaic transfer and the current Monterey Agreement process. The letter also states that the DWR is using a new model to assess the potential impacts of Table A transfers in preparing the revised Monterey Agreement EIR. It acknowledges that Castaic used an earlier model to analyze the effect of the Kern-Castaic transfer. It states that the use of the new model "may cause slight changes in results, which may lead DWR to different conclusions than the conclusions made by [Castaic] in the current EIR." Nevertheless, the letter states Castaic's draft EIR adequately discusses SWP reliability and pre- and post-Monterey Agreement conditions.

SCOPE argues the West Creek EIR is deficient in that it fails to include or discuss information that a new water model may lead the DWR to different conclusions [*22] than those made by Castaic and its draft EIR. But the letter describes any possible change in result as "slight." The letter does not state that the slight change in results will probably lead to different conclusions; it says only that it "may" lead to unspecified different conclusions. It is highly improbable that a slight change in results will lead to radically different conclusions. In fact, the letter praises the draft EIR's discussion of the proposed project and its impacts. The information contained in the letter adds nothing substantial to West Creek's EIR.

SCOPE argues the EIR is devoid of any factual discussion of the impacts of the *PCL* decision on the West Creek project. But the EIR discloses that a final judgment invalidating the Monterey Agreement could impair Castaic's supply of SWP water. The EIR goes on to state that such a result is unlikely because the Kern-Castaic transfer can be validated outside the Monterey Agreement. SCOPE cites no authority for the proposition that the West Creek EIR must discuss the factors the DWR will be required to consider in preparing a revised Monterey Agreement EIR. The Kern-Castaic transfer is not dependent on the Monterey Agreement. [*23] Such a discussion is not necessary for informed decision making or public participation.

SCOPE cites *Vineyard, supra*, 40 Cal.4th at page 440, for the proposition that it is improper for an EIR to tier from an environmental document that will be completed in the future. SCOPE points out that West Creek's EIR was certified without waiting for the DWR to complete its revised EIR for the Monterey Agreement. But West Creek's EIR was not tiered on future Monterey Agreement environmental documents. In fact, West Creek's water supply analysis is based on the premise that the Monterey Agreement litigation is unlikely to affect the Kern-Castaic transfer.

(6) West Creek's EIR satisfies the third principle of analysis stated in *Vineyard.* The record contains substantial evidence demonstrating a reasonable likelihood that water from the Kern-Castaic transfer will be available for the project's near- and long-term needs. (See *Vineyard, supra*, 40 Cal.4th at p. 437.) The record also shows the County proceeded in a manner required by CEQA. The EIR neither improperly used tiering to defer all analysis of supplies to future stages of the project, nor relied upon demonstrably illusory supplies. (40 Cal.4th at p. 437.)

SCOPE argues [*24] that West Creek's EIR is deficient because it fails to analyze the project's water supply in the absence of the 41,000 afy Kern-Castaic

transfer. When first published, *Vineyard*'s fourth principle was slightly different than the one stated in the subsequent modified opinion. Principle four then stated that an EIR requires analysis of replacement or alternative water sources where "a full discussion leaves some uncertainty regarding actual availability of the anticipated future water sources ... ." Principle four in the modified version of *Vineyard* allows slightly more flexibility in determining the issue of available future water sources. It requires analysis of replacement or alternative sources only if it is "impossible to confidently determine" that anticipated future water sources will be available.

Here West Creek's EIR acknowledges there is at least some legal uncertainty about the Kern-Castaic transfer. The EIR states in part: "An adverse final judgment invalidating the Monterey Agreement could affect [Castaic's] completed acquisition of the 41,000 AF, which could in turn impair [Castaic's] supply of SWP water through its contracts with DWR and other SWP contractors."

Some would [*25] argue it is certain that the outcome of litigation is seldom certain. But whatever the outcome of the *PCL* litigation, it is highly unlikely it will affect the Kern-Castaic water transfer. The water is now available, and for years has been available for the project under executed agreements. The recertified EIR notes that the Kern-Castaic transfer can legally occur without the Monterey Agreement. Suffice it to say, however the Monterey Agreement litigation is eventually decided, the Kern-Castaic transfer will likely not be affected. Per principle four, we can confidently determine that the water will be available.

V

SCOPE contends West Creek's EIR is deficient in that it fails to discuss the impact of the lack of funding to remediate perchlorate contamination of local water wells. SCOPE has no quarrel with the EIR's discussion of perchlorate contamination of local wells. Its contention is limited to the lack of funding for remediation measures.

In addition to SWP water, two local aquifers will serve as part of the project's water supply, the Alluvial Aquifer and the Saugus Aquifer. SCOPE argues there are 67 wells owned by water companies in these aquifers and an undisclosed number of private [*26] wells. SCOPE points to evidence that the estimated cost of remediation is $500,000 per well. No source of funding is identified in the EIR to pay for the equipment necessary for remediation.

SCOPE relies on *Federation of Hillside & Canyon Associations v. City of Los Angeles* (2000) 83 Cal.App.4th 1252, 1261-1262 [100 Cal. Rptr. 2d 301] (*Federation*). There the city adopted a general plan framework (GPF) as part of its general plan. The GPF identified mitigation measures, including a transportation plan designed to mitigate the transportation impacts of the GPF's growth policies. The transportation plan acknowledged that to implement the mitigation measures would require the cooperation of various public agencies, that the city's portion of the costs would exceed its revenues, and that there is "great uncertainty" whether the mitigation measures would ever be funded or implemented. Although the city adopted the mitigation measures, it made no effort to ensure they will actually be implemented or enforceable. The court determined that the city's approval of the GPF must be vacated for failing to ensure that feasible mitigation measures will actually be implemented. (*Id.* at p. 1261, citing §§ 21002.1, subd. (b), [*27] 21081.)

Here, although water agencies may have 67 wells, only six of them have been identified as being contaminated with perchlorate. Unlike the city in *Federation*, here the County did not acknowledge there is great uncertainty that mitigation measures would ever be funded or implemented. To the contrary, the EIR states in part: "Due to the high value of this local water resource, the purveyors have placed a high priority on replacing the impacted groundwater capacity by installing wellhead treatment and the construction of new wells." Here, unlike *Federation*, there is nothing to suggest the mitigation measures will not be implemented. Finally, SCOPE points to nothing in *Federation* or any other case that requires the EIR to discuss funding for mitigation measures.

DISPOSITION

The judgment is affirmed. Costs on appeal are awarded to respondents and real parties in interest.

Coffee, J., and Perren, J., concurred.

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AUG 14 2006
LOS ANGELES
SUPERIOR COURT

SUPERIOR COURT OF CALIFORNIA

COUNTY OF LOS ANGELES

SIERRA CLUB, et al., Petitioner, vs. CITY OF SANTA CLARITA, et al., Respondent.	CASE NO. BS 098 722 DECISION ON SUBMITTED MATTER
NEWHALL LAND AND FARMING, Real Party in Interest.	

Having taken the matter under submission on May 31, 2005, having considered all the evidence admitted and the parties' oral and written arguments, the Court rules as follows:

Petitioners Sierra Club, Center for Biological Diversity, Friends of the Santa Clarita River, and California Water Impact Network ("Petitioners") seek a Writ of Mandate commanding Respondents City of Santa Clarita and Santa Clarita City Council ("City" or "Respondents") to set aside its decision certifying the Final Environmental Impact Report ("FEIR") and approving the Project known as Riverpark in favor of Real Party in Interest Newhall Land and Farming ("Newhall").

The Riverpark project is located on a 695.4-acre site. Originally, Riverpark proposed 1,183 residential units, consisting of 439 single-family homes and 744 apartments, and 40,000 square feet of commercial development, a trail system, a 29-acre active/passive park along the Santa Clara River, and approximately 442 acres of open space area, including most of the Santa Clara River. (2 AR, Tab 4, 340-42 [Draft EIR, § 1.0, Project Description].) Through the public hearing process, the project was revised by converting the apartments to condominiums or townhouses, reducing to 1,123 the residential units and to 16,000 square feet commercial development, and preserving additional areas of the Santa Clara River and its south fork. (10 AR, Tab 12, 11742-44 [FEIR, Project Revisions and Additional Information].) Further hearings in 2005 reduced the residential units to 1,089, consisting of 432 single family homes and 657 condominium/townhouses, and provided for the preservation of more land and river areas, totaling 788 acres (470-acres on-site) for recreation and open space. (10 AR 11742-44; 9 AR, Tab 11, 11418-22.) Included among the 318 off-site acres are the remaining portions of the south fork of the Santa Clara River owned by RPI, and 37 acres of the Santa Clara River significant ecological area ("SEA").

Project approvals included a General Plan Amendment, a Zone Change, a vesting tentative tract map, a conditional use permit to build in excess of two stories and a maximum of 50-feet, Hillside Innovative Application, a permit for vehicular gating, a variance to reduce setback requirements and to build sound walls in excess of 7 feet, Hillside Development Application, and an Oak Tree Permit. (1 AR, Tab 2, 9-114; 2 AR 259.)

The Planning Commission held 9 hearings and on 12/21/04 recommended that the City Council certify the EIR and adopt a Statement of

Overriding Considerations for impacts that could not be mitigated to a less than significant level. (1 AR, Tab 2, 9-22 [App. Reso.]; 7:2 AR, Tab 9, 8079-81 [12/21/04 Hearing Transcript]; 73 AR, Tab 652, 51639-43 [12/21/04 Staff Report].)

The City Council held 3 hearings and certified the EIR on 5/24/05, unanimously approving the project on 6/14/05. (1 AR, Tab 2, 22-26; 1 AR, Tab 3, 115-229.)

Petitioner filed within Petition for Writ of Mandate alleging non-compliance with CEQA.

To establish violation of the California Environmental Quality Act ("CEQA"), Petitioner must show an abuse of discretion in that the County either failed to proceed in the manner required by law or the determination or decision is not supported by substantial evidence. (Code Civ. Proc., § 1094.5(b); Pub. Resources Code, §§ 21168, 21168.5.) When CEQA non-compliance is alleged, the Court reviews the entire record to see if substantial evidence supports the challenged determinations.

"Substantial evidence" is defined as "enough relevant information and reasonable inferences from this information that a fair argument can be made to support a conclusion, even though other conclusions might also be reached." (14 Cal. Code Regs., § 15384(a); Laurel Heights Improvement Assn. v. Regents of University of California (1988) 47 Cal.3d 376, 393.) Substantial evidence may include facts, reasonable assumptions predicated upon facts, and expert opinion supported by facts, but not argument, speculation, unsubstantiated opinion, or clearly erroneous evidence. (Pub. Resources Code, §§ 21080(e)(1)(2), 21082.2(c).)

"[I]n applying the substantial evidence standard, the reviewing court must resolve reasonable doubt in favor of the administrative

finding and decision. As such, if there are conflicts in the evidence, their resolution is for the agency." (River Valley Preservation Project v. Metropolitan Transit Development Board (1995) 37 Cal. App. 4th 154, 168.) Determinations in an EIR must be upheld if supported by substantial evidence, and the mere presence of conflicting evidence in the administrative record does not invalidate them. (Chaparral Greens v. City of Chula Vista (1996) 50 Cal.App.4th 1134, 1143.) An agency's approval of an EIR may not be set aside on the ground that an opposite conclusion would have been equally or more reasonable. (Laurel Heights Improvement Assn. v. Regents of University of California (1988) 47 Cal.3d 376, 393.) The Court's role is not to substitute its judgment for that of the local agency representatives, but to enforce legislatively mandated CEQA requirements. (Citizens of Goleta Valley v. Board of Supervisors (1990) 52 Cal.3d 553, 564.) The Court passes only upon the EIR's sufficiency as an informative document, not upon the correctness of its environmental conclusions. (Laurel Heights at 392.)

I. City Properly Relied on the 41,000 AFY Water Transfer for Planning Purposes

Petitioners contend that the City is legally precluded from relying on water from the transfer of 41,000 AFY acre feet per year ("AFY") of State Water Project ("SWP") water to the local SWP wholesaler, Castaic Lake Water Agency ("CLWA") ("41,000 AFY transfer") for planning purposes, and the EIR's reliance on water supplies is not supported by substantial evidence.

The water for the Riverpark project is to be supplied by CLWA.

In 1999, CLWA entered into a contract with the Kern Delta Water District for transfer of 41,000 acre feet per year (AFY) as part of the

"Monterey Agreement."[1] The CLWA certified an EIR for the 41,000 AFY transfer tiered on the earlier program EIR that had been prepared for the Monterey Agreement.

In Planning and Conservation League v. Dept. of Water Resources (2000) 83 Cal.App.4th 892 ("PCL"), the PCL challenged the Monterey Agreement program EIR. The Court of Appeal held that the EIR should have been prepared by DWR as the lead agency, rather than by one of the contractors, and that a new EIR must be prepared and certified by DWR. The Court did not invalidate the Monterey Agreement or enjoin the water transfers effected thereunder, but directed the trial court to consider under CEQA section 21168.9 whether the Monterey Agreement should remain in place pending preparation of DWR's new EIR, and to retain jurisdiction pending certification of DWR's EIR.

In Friends of Santa Clara River v. CLWA (2002) 95 Cal.App.4th 1373 ("Friends I"), the Court of Appeal ordered CLWA's EIR decertified because it had been tiered from the Monterey Agreement EIR, adjudged inadequate: "We have examined all of appellant's other contentions and find them to be without merit. If the PCL/tiering problem had not arisen, we would have affirmed the judgment." (Friends, supra, at 1387.) The Court did not issue any ruling affecting CLWA's ability to continue to use and rely on water supplies from the 41,000 AFY Transfer, leaving it to the trial court's discretion whether to enjoin CLWA's use of the water pending its completion of a new EIR. (Friends, supra, at 1388.)

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[1]An excellent history of the SWP and the role of Department of Water Resources ("DWR") in the management of the SWP, the Monterey Agreement and amendments, and relevant litigation is set forth in Calif. Oak Foundation v. Santa Clarita, 133 Cal.App.4th 1219 (2005).

In September 2002, on remand to the Los Angeles County Superior Court, the Friends petitioners applied under CEQA section 21168.9 to enjoin CLWA from continuing to use and rely on water from the 41,000 AFY Transfer. The trial court rejected that request, and in December 2003, the Court of Appeal affirmed the trial court's ruling allowing CLWA to continue to use and rely on water from the 41,000 AFY Transfer pending completion of its new EIR. (Id.; see also, Friends of the Santa Clara River v. Castaic Lake Water Agency, 2003 WL 22839353 ("Friends II"] at Tab 7, 5 AR 4180-97.)

Meanwhile, on 5/5/03, before the trial court acted on remand, the parties to the PCL litigation entered into the Monterey Settlement Agreement.[2] Section II of that agreement provides that SWP would continue to be administered and operated in accord with both the Monterey Amendments and the terms of the Monterey Settlement Agreement. (5:1 AR, Tab 7, 4367.) The Monterey Settlement Agreement did not invalidate or vacate the Monterey Amendments, or any water transfer effected under them.

A. PCL, Friends of the Santa Clara River and California Oak do not preclude reliance on the 41,000 AFY Water Transfer

Petitioners contend that legal uncertainties surrounding the 41,000 AFY transfer due to the PCL and Friends lawsuits preclude the City from relying on water from that transfer for planning purposes. Specifically, Petitioners contend that because PCL requires the Department of Water Resources ("DWR") to prepare an EIR analyzing the

[2]On 6/6/03, the Sacramento County Superior Court issued its Order under CEQA section 21168.9, approving both the Monterey Settlement Agreement, and the continued operation of the SWP pursuant to the Monterey Amendment and the approved Monterey Settlement Agreement. (See 6 AR, Tab 8, 6557; 8 AR, Tab 10, 9775-78 [Order].)

effects of the eight SWP water transfers completed under the Monterey Agreement, none of those transfers, including the 41,000 AFY transfer, can be relied on for planning purposes until DWR has completed and certified that EIR. Moreover, Petitioners contend that the Court of Appeal so held in California Oak Foundation v. City of Santa Clarita (2005) 133 Cal.App.4th 1219.

PCL, Friends and California Oak (discussed infra) do not preclude reliance on the 41,000 AFY transfer for planning purposes.

While the Courts of Appeal could have simply said that all EIRs requiring reliance on the 41,000 AFY transfer, must await the certification of a new FEIR by DWR (and resolution of any litigation challenging such FEIR), they have not done that.

Although the Court in Friends and California Oak observed that CLWA "may be able to cure the PCL problem by awaiting action by the [DWR] complying with the PCL decision, then issuing a subsequent EIR, supplement to EIR, or addendum . . . tiering upon a newly certified Monterey Agreement EIR" (California Oak, supra, 133 Cal.App.4th at 1230, n.6), neither court said that the CLWA and City of Santa Clarita must await the DWR FEIR.

CLWA certified a new EIR on the 41,000 AFY Transfer on 12/22/04. (Tab 10, 8:2 AR 10441-480 [CLWA Resolution certifying the EIR]; see also Tab 637, 63 AR 43468-44683 [CLWA FEIR]; Tab 12, 10 AR 11750 [Final Riverpark EIR Project Revisions and Additional Information.) This new EIR analyzes the effects of the 41,000 AFY Transfer without tiering from the Monterey Agreement EIR.[3] Although CLWA's EIR is currently being

[3]The CLWA EIR concludes that the Monterey Settlement Agreement neither requires that DWR's new EIR be certified before CLWA can certify its new EIR for the 41,000 AFY Transfer, nor requires that DWR's new EIR

challenged, CEQA requires that the EIR be conclusively presumed to comply with CEQA, until a court has judged it deficient. (See. e.g., CEQA, § 21167.3(b), CEQA Guidelines, § 15231; see also, Barthelemy v. Chino Basin Water Dist., supra, 38 Cal.App.4th 1609, 1617.)

Since the prior CLWA EIR for the 41,000 AFY Transfer was overturned solely because it tiered from a later-decertified Monterey Agreement EIR, and CLWA has now certified an EIR approving the 41,000 AFY Transfer without tiering from the Monterey Agreement EIR,[4] the City reasonably included water from the 41,000 AFY Transfer in CLWA's supplies, after considering at length the current status of all litigation.[5]

B. The 41,000 AFY transfer is sufficiently certain and the Monterey Settlement Agreement does not preclude Respondents from relying on said transfer in its EIR pending DWR's preparation of its EIR.

As argued by Respondents, three provisions in the Monterey Settlement Agreement, read together, refute Petitioners' argument that the 41,000 AFY Transfer was excluded from Attachment E because it was a non-permanent transfer, which may not be used for planning purposes.

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serve as the EIR for that Transfer. (Tab 637.63 AR 43987-92 [CLWA Master Response to Comments].) These conclusions are consistent with Friends II, that the 41,000 AFY Transfer is *not* legally bound to the PCL litigation or to DWR's new EIR. (Tab 7, 5:1 AR 4195-4196.)

[4]Although DWR is in the process of certifying its own EIR pursuant to PCL and the Monterey Settlement Agreement, DWR approved CLWA's preparation of its EIR in a comment letter on the Draft EIR, and noted that CLWA's Draft EIR "adequately and thoroughly discusses the proposed project and its impacts," and "adequately discusses the reliability of the SWP, pre- and post-Monterey Amendment conditions, future conditions and SWP operations." (Tab 637, 63 AR 43482-83.)

[5]Respondents' Riverpark EIR discusses the prior litigation and devotes 8 pages to discussion of the litigation surrounding CLWA's EIR on the 41,000 AFY Transfer in its response to comments alone. (Tab 8, 6 AR 6551-6559.)

Section III(C)(4) requires DWR to conduct an "[a]nalysis of the potential environmental impacts relating to" all eight of the completed water transfers, not just of the 41,000 AFY Transfer (Tab 7. 5:1 AR 4368-69) and to analyze all of the transfers in the same manner, even though seven of them, defined in the Agreement as the "Attachment E Transfers," were beyond challenge. (Id. [Section III(C)(4)j; Tab 7, 5:1 AR 4370 [Sections III(D), III(E)].) Section III(D) precludes challenges to the Attachment E Transfers, which had been litigated in other forums or had become final without challenge by the expiration of limitation periods. (Tab 7. 5:1 AR 4370.) Section III(E) acknowledges the jurisdiction of Los Angeles Superior Court over the then-ongoing Friends litigation challenging CLWA's EIR on the 41,000 AFY Transfer (Tab 7, 6 5:1 AR 4370) pending completion of CLWA's new EIR, but does not distinguish the 41,000 AFY Transfer from the Attachment E transfers otherwise.

The Monterey Settlement Agreement does not prohibit reliance on the 41,000 AFY Transfer. All of the water transfers were effected as permanent transfers under the Agreement and are to be analyzed in the same way in DWR's new EIR, as required by Section III(C)(4).

Petitioner contends that the continued availability of the 41,000 AFY transfer is uncertain until DWR has concluded its EIR and that under California Oak, the City may not presume that the outcome of DWR's environmental review will be the continued availability of the 41,000 AFY.

DWR, however, has recognized the 41,000 AFY Transfer as a permanent transfer under the Monterey Agreement by entering into Amendment No. 18 to CLWA's agreement, which increases its Table A Amount by 41,000 AFY (Tab 10, 8:1 AR 9212-14), and has since consistently allocated water

supplies to CLWA based on that entitlement (Tab 4, 2:2 AR 1015-17 [DEIR]). Furthermore, as noted supra, DWR also submitted positive comments on CLWA's Draft EIR. (Tab 637, 63 AR 43482-83).

DWR's analysis of the 41,000 AFY Transfer in its new EIR will be part of a broader analysis of past and future permanent transfers of Table A Amounts, and will not constitute the EIR for the 41,000 AFY transfer. (5:1 AR, Tab 7, 4369.) As noted supra, PCL, Friends and the Monterey Settlement Agreement do not prohibit CLWA's preparation of its new EIR addressing the impacts of the 41,000 AFY transfer. (Tab 637, 63 AR 43987-92 [CLWA Master Response to Comments].)

California Oak, being most recent, deserves further discussion. In California Oak, the Court struck down the City's certification of an earlier EIR for an industrial project because it did not address the legal uncertainties surrounding the 41,000 AFY Transfer. California Oak did not bar the use of water from the 41,000 AFY transfer for all planning purposes. It criticized the City's failure to explain its reasoning for relying on the 41,000 AFY transfer, but held that it was up to the City to determine whether or not to rely on the 41,000 AFY transfer in its planning. The Court stated: "*[T]he question is whether the entitlement should be used for purposes of planning future development*, since its prospective availability is legally uncertain. *Although this decision must be made by the City*, the EIR is intended to serve as an informative document to make government action transparent. Transparency is impossible without a clear and complete explanation of the circumstances surrounding the reliability of the water supply." (Id. at 1237-38; emphasis supplied.) Before relying on water from the 41,000 AFY transfer for planning purposes, the City must "present a reasoned analysis of the significance . . . [or insignificance] of the

decertification of the EIR for the Castaic purchase; how demand for water would be met without the 41,000 AFY entitlement; or why it is appropriate to rely on the 41,000 AFY transfer in any event." (Id. at 1244.)

The Court in California Oak ruled that the EIR contained an inadequate discussion, in fact no discussion at all, of the uncertainty regarding the 41,000 AFY transfer in the EIR itself, but only references to it in the appendices, and responses to comments. The text of the EIR did not mention the decertification of the CLWA EIR, or that "entitlements are not really entitlements, but only 'paper' water." (California Oak, supra, 133 Cal.App.4th at 1236.) From the EIR, the Court could only assume that City concluded the 41,000 AFY would continue to be available, but found that the lack of a forthright discussion of a significant factor that could affect water supplies was antithetical to the purpose of an EIR to reveal to the public the basis on which officials approve or reject environmental action. (Id. at 1237-38). Thus, the Court held that the EIR failed to inform the public of the litigation uncertainties surrounding the 41,000 AFY transfer, and substantial evidence did not support the City's decision to rely on water from that transfer for planning purposes.

Here, by contrast, the City discussed the 41,000 AFY transfer and its uncertainties at considerable length, both in the EIR and throughout the review process. (See infra, pp. 12-16.) The PCL, Friends, Friends II, and California Oak decisions were all discussed. The City concluded that it was likely that the 41,000 AFY would be available for the project. By the time the City Council held it first Riverpark hearing on 1/25/05, the City also had before it CLWA's certified new EIR for the 41,000 AFY transfer, which was not the case in California Oak.

The Riverpark EIR adequately discloses the uncertainties regarding the 41,000 AFY transfer and discusses them forthrightly.

C. Substantial evidence supports reliance on 41,000 AFY water transfer and the EIR's analysis of the transfer is not flawed

Petitioners contend that substantial evidence does not support the City's decision to rely on water from the 41,000 AFY Transfer.

As noted, California Oak held that, as long as the city has analyzed the uncertainties surrounding this water supply, it is within the City's province to decide whether to rely on the 41,000 AFY Transfer for planning purposes.

The EIR and the Administrative Record contain substantial evidence supporting the City's decision that water from the 41,000 AFY Transfer can be relied on as part of CLWA's supplies.

CLWA, the SWP and the reliability of its water supplies, the Monterey Agreement, the PCL litigation, the Monterey Settlement Agreement, CLWA's Table A Amounts, and the Friends litigation are all extensively discussed in the EIR. The City specifically discloses that a future adverse judgment invalidating the Monterey Agreement could affect CLWA's ability to use water from the 41,000 AFY transfer and adversely affect CLWA's water supplies over the long term, but that, based on the information discussed, CLWA (the experts concerning water supply) believed that such a result "is unlikely to >unwind' executed and completed agreements with respect to the permanent transfer of SWP Water Amounts." (Tab 4,2:2 AR 1014-15; see also, Tab 8,6:2 AR 6551-59 [TR-3].) Further, the EIR notes the 41,000 AFY Transfer was completed in 1999, CLWA has paid approximately $47 million for the additional Table A Amount, the monies have been delivered, the sales price has been financed through CLWA by tax-exempt bonds, and DWR has increased CLWA's

SWP maximum Table A Amount and delivered or made available to CLWA the 95,200 AFY because it was a permanent transfer/reallocation of SWP Table A entitlement between SWP contractors." (Tab 4, 2:2 AR 1013.) Included in the EIR's Appendices and referenced in the EIR, are the 19 documents supporting the EIR's analyses, including the PCL decision, the Monterey Settlement Agreement, the Sacramento County Superior Court's "Order Pursuant to Public Resources Code Section 21168.9," the Friends decision, the Los Angeles County Superior Court's Judgment on remand in the Friends litigation, CLWA's final EIR for the 41,000 AFY Transfer, and CLWA's Resolution certifying that EIR.

The City responded to numerous comments challenging the EIR's conclusion that CLWA could rely on the 41,000 AFY Transfer for planning purposes. Due to the number of comments, and the amount of information required to respond, the City prepared a "master" response on this subject, TR-3 (Tab 8, 6:2 AR 6551-59). TR-3 reviews the information disclosed in the EIR's Water Services section regarding the 41,000 AFY Transfer and the Friends litigation, then responds to comments asserting that: (i) the PCL litigation and Monterey Settlement Agreement preclude CLWA from using or relying on that water transfer, and (ii) because the Monterey Settlement Agreement requires DWR to prepare a new EIR on the Monterey Agreement, CLWA cannot rely on the water transfer until that new EIR is completed. The City also prepared responses to individual comment letters on the 41,000 AFY Transfer[6] All of these comments and

[6]See, for example, responses to comments from the Santa Clarita Organization for Planning and the Environment (Tab 8, 6 AR 5962-66, 6689-6717), Petitioners Sierra Club (Tab 8, 6 AR 6194-6201, 6370, 6737-66, 6829-30), California Water Impact Network (Tab 8, 6 AR 6273-74, 6767-75), Friends (Tab 8, 6 AR 6387, 6835-36), and from a law firm involved in the PCL litigation (Tab 8, 6 AR 6275-78, 6776-83).

responses are included in the Riverpark Final EIR.

The City's Planning Commission also held a study session on the subject of the reliability of available water supplies. (Tab 9, 7 AR 7480-92.)

Ultimately, the City reviewed all of this information, and the views expressed in the EIR, by CLWA, and by commentators opposed to the City considering the 41,000 AFY Transfer, and determined it was appropriate for the City to rely on those SWP supplies. (Tab 2, 1 AR 9-114 [App. Reso]; Tab 3. 1 AR 174-220 [CEQA Findings].) The City explained that its determination to allow Riverpark to rely on the 41,000 AFY Transfer was supported by the information in the EIR for four main reasons: (i) nothing in the Monterey Settlement Agreement or in any court decision precludes that reliance; (ii) nothing in the Monterey Settlement Agreement precludes CLWA from preparing and certifying its revised EIR for that transfer as instructed by the Court of Appeal in the Friends decision and, in fact, the Settlement Agreement was carefully crafted to leave that EIR and any required remedies to the Los Angeles County Superior Court; (iii) the fact that DWR is preparing an EIR that will analyze all of the water transfers under the Monterey Agreement does not preclude CLWA from preparing and certifying its revised EIR, as instructed by Friends; and (iv) CLWA's Final EIR re-approving the transfer had been certified without tiering from the Monterey Agreement EIR. (Tab 8, 6:2 AR 6558-59 [TR-3]; Tab 10, 8:2 AR 10441-10480; Tab 12, 10 AR 11750.)

As directed by California Oak, the City here has analyzed in considerable detail the uncertainties surrounding the AFY water transfer and explained the basis for its reliance on that transfer. The City's

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determinations are not an abuse of discretion, but supported by substantial evidence.

Petitioners' contention that the City makes false statements about the transfer (OB 7-9) is not borne out by the record.

The City's statement reads: "Because the 41,000 AF was a permanent water transfer, because DWR includes the 41,000 AF in calculating CLWA's share of SWP Table A Amount, and because the courts have not prohibited CLWA from using or relying on those additional SWP supplies, the City has determined that it remains appropriate for the Riverpark project to include those water supplies in its water supply and demand analysis, while acknowledging and disclosing uncertainty created by litigation." (Tab 8, 6:2 AR 6768-69.)

This statement is qualified and explained by the City's extensive discussion of the legal uncertainties arising from litigation, supra, and is not misleading. The statement cannot be taken out of context and must be read in light of other statements and evidence in the record. As regards "reliance on the fact that DWR counts the 41,000 AFY in Table A amounts, DWR has acknowledged the 41,000 AFY Transfer by continuously delivering SWP water, including water from the Transfer, to CLWA for many years. The Monterey Settlement Agreement treats the 41,000 AFY Transfer identically to the Appendix E Transfers. The City's discussion of the reliability of SWP water supplies, including the 41,000 AFY Transfer water, is a discussion relating to the ability of the SWP to deliver only such supplies as are available on a year-to-year basis. (See, e.g., Tab 4, 2:2 AR 1022-30.) The City discussed the reliability of available SWP supplies under average, dry and critical dry years, and that there would be sufficient supplies to meet Riverpark's demand and cumulative demand. (Id. at 1051-70.)

Unlike California Oak, the record shows that the City considered the 41,000 AFY transfer in the EIR, including the legal uncertainties, the reliability of available supplies of SWP water in general, and concluded, based on substantial evidence, that it was appropriate to rely on those supplies for planning purposes. The City also considered and responded to numerous comments. After 12 hearings before the Planning Commission and City Council, the City certified the EIR and approved Riverpark, knowing that water supplies from the 41,000 AFY Transfer were to some degree uncertain, but explaining the reasoning for its determinations and the evidence that supported it. That is all that CEQA and California Oak require.

II. Impacts on Biological Resources were Appropriately Evaluated

Petitioner contends that the project's impact on three special-status species, the western spadefoot toad ("Toad"), the San Diego back-tailed jackrabbit ("Jackrabbit") and the holly-leaf cherry woodlands ("Holly-Leaf") must be considered significant because they are "rare" within the meaning of CEQA, the EIR's responses to comments by Department of Fish and Game ("DFG") were inadequate, as were mitigation measures for the Toad and Jackrabbit.

CEQA Guidelines section 15065(a) provides: "A lead agency shall find that a project may have a significant effect on the environment and thereby require an EIR to be prepared for the project where there is substantial evidence, in light of the whole record, that . . . : (1) The project has the potential to . . . substantially reduce the number or restrict the range of an endangered, rare or threatened species . . . ." (Guidelines, § 15065(a); 51 AR 33996.)

Here, an EIR was prepared and the impacts on the Toad, Jackrabbit, and Holly-Leaf considered. Petitioner contends that, to assess the

significance of the project impacts on the Toad, Holly-Leaf, and Jackrabbit, the EIR was required to determine whether the species are "rare" under Guidelines section 15380(b)(2)(A), which defines "rare" as "[a]lthough not presently threatened with extinction, the species is existing in such small numbers throughout all or a significant portion of its range that it may become endangered if its environment worsens."

The EIR's conclusions with regard to these species are supported by substantial evidence.

Toad

The EIR concluded that impacts on the Toad would be significant and unavoidable (Tab 7, 5:2 AR 5774, 5827).

The EIR describes the Toad as a special-status species (Tab 7, 5:2 AR 5720-5730, 5737, 5831-36; see also Tab 9, 7:2 AR 8572 [Revised Draft EIR ("RDEIR")]), and defines "special-status wildlife" to include rare species, that is, State Species of Special Concern and Federal Species of Concern. (Tab 7, 5:2 AR 5728.) The EIR notes that Toads were found in three seasonal rainpools created by human disturbances in the middle of areas planned for development: in the right-of-way for the extension of Newhall Ranch Road, in the middle of Planning Area A-1, and in the middle of Planning Area B (Tab 7, 5:2 AR 5832-34). The potential impacts on the Toad were analyzed in accordance with CEQA and City thresholds and found to be significant (id. at 5750-53, 5774). Mitigation was recommended in the form of pre-construction surveys, preparation of a Resource Management and Monitoring Plan ("RMMP"), design and construction of new enhanced Toad habitat and implementation of a capture and relocation and monitoring program. Ultimately the EIR concluded that the impacts would remain significant and unavoidable, because such measures have not yet been proven to he highly effective,

and because of the possibility that not all of the individual Toads could be successfully captured and relocated (id. at 5811).

The City's responses to comments and its actions addressed DFG's concerns (Tab 8, 6:1 AR 5880-86 [DFG letter], Tab 8, 6:2 AR 6621-30 [response]), and those of other commentators (see, e.g., Tab 8, 6:1 AR 5876-77 [Santa Monica Mountains Conservancy letter], Tab 8, 6:2 AR 6610-14 [response]). The City followed DFG's recommendations, the City's "Western Spadefoot Toad Habitat Enhancement and Mitigation Plan" ("Toad Plan") was created by the City's expert biologist in consultation with DFG and was ultimately approved by DFG.

Substantial evidence in the record supports the City's decision to mitigate the impacts on the Toad rather than reconfigure the Project. Such evidence included opinion of City's expert biologist that the Toad Plan was likely to succeed, and DFG's approval of that Plan. It properly exercised its discretion to consider the remaining impacts on the Toad to be significant and unavoidable, and adopted a Statement of Overriding Considerations for the Toad. (Tab 3, 1 AR 145-150, 155-163, esp. 159 [SOC].) Arguments similar to Petitioners' arguments here were rejected in Defend the Bay v. City of Irvine (2004) 119 Cal.App.4th 1261, 1276-77.

Jackrabbit

For the Jackrabbit, the Revised DEIR determined that "[b]ecause this species is not state or federally listed as Endangered or Threatened, because it is considered relatively abundant in suitable habitat areas within its range, and because the direct loss of individual jackrabbits is expected to be low, it is expected that the regional population would not drop below a self-sustaining level with the implementation of this project," the loss of any individual

jackrabbits would not be considered a significant impact. (Tab 7, 5:2 AR 5775.)

The EIR identifies the Jackrabbit as a State and federal special-status species, and determined the significance of impacts on that species based on CEQA and City thresholds that recognize substantial adverse effects on special-status species and substantial reduction of habitat as being significant impacts (Tab 7. 5:2 AR 5750-53). Based on field surveys (see, e.g., Tab 7, 5:2 AR 5707-08 [RDEIR, § 4.6; Tab 6, 4 AR 4153-54), the EIR reported that Jackrabbits. which occur in a variety of habitats, had been sighted on-site in the riverbed, open terraces and disked fields, but that because those areas are disturbed, the overall quality of the habitat on site suitable for Jackrabbits was only moderate. (Tab 7, 5:2 AR 5735, 5739, 5775; Tab 9, 7:2 AR 8572 [RDEIR].) The EIR noted that the Project had been designed to include all NRMP applicable mitigation measures for the areas in and adjacent to the Santa Clara River (Tab 7. 5:2 AR 5754-61, and 5789-5800 [RDEIR, § 4.61; Tab 9, 7:2 AR 8576 [RDEIR]), including preconstruction surveys, capture and relocation, and riparian habitat creation enhancement. (Id. at 5757-5759, and 5793-95 [RDEIR, § 4.6]; see also, Tab 9, 7:2 AR 8541-42 [RDEIR]).

The EIR concluded that project-level impacts would be less than significant, not just because Jackrabbit is not a listed species and does not require heightened protection, but also because the species is abundant where it occurs, and, since it is mobile and would likely disperse to nearby better habitat rather than be killed as the site is developed, few individuals would be lost due to development of the site. (Tab 7, 5:2 AR 5775.) Nevertheless mitigation including preparation of an RMMP and preconstruction surveys of areas outside the NRMP areas for

the potential capture and relocation of special-status species was recommended. (Tab 7, 5:2 AR 5800-01, 5809-10; Tab 9,7:2 AR 8543-45, 8584-85 [RDEIR pages].) The EIR also concluded that the project-level and cumulative impacts on an aggregate of 280 acres of habitat, in general, necessarily including that for Jackrabbits, would be significant and unavoidable even after mitigation (Tab 7, 5:2 AR 5761-62, 5811, 5825-26, 5827). A Statement of Overriding Considerations was adopted for these impacts. (Tab 3, 1 AR 145-163.)

The City did not ignore DFG's comments, but in response to DFG, stated that it had considered the NRMP and its EIS/EIR, which had earlier analyzed impacts on the Jackrabbit within the NRMP area (in and adjacent to the Santa Clara River), and found those impacts to be significant and imposed mitigation to reduce them to a less than significant level. (Tab 8, 6:2 AR 6622-23.) Those mitigation measures, the City explained, had been incorporated into the Project as design features, and that Riverpark scaled back the activities permitted by the NRMP, so that the activities within the NRMP area would have even less of an impact on the Jackrabbit than the NRMP EIS/EIR had determined. (Tab 8, 6:2 AR 6622-24.)

Development was moved further back from the Santa Clara River to protect riparian resources, including Jackrabbit habitat (including bank stabilization in a portion of the site). A public trail that had been proposed in the riverbed was moved out to join the pedestrian/bike bridge over the Aqueduct. (Tab 8, AR 6623-24; see also Tab 2, Tab 4, Tab 12 [FEIR, Final Project Revisions]; Tab 11) The City also explained that the mitigation requiring preconstruction surveys and capture and relocation was more definitive than DFG described B more than simply forcing individuals to disperse. As to cumulative impacts, the City

noted that because the NRMP's mitigation measures had been imposed on all of the land between the eastern border of Riverpark vest to Castaic Creek, and because Riverpark had been revised to preserve even more upland, the EIR had concluded that cumulative impacts on the species would be less than significant. (Tab 8, AR 6624.)

DFG disputed the EIR's conclusions without challenging the City's survey methodology. (Tab 8, AR 5882.) As the City's response to DFG's comment letter shows, the City considered DFG's comments, but disagreed with them. The City's response did not assert that the EIR relied solely upon the NRMP EIS/EIR's analysis of impacts on the Jackrabbit. (Tab 8, AR 6622-24.) Rather, the EIR conducted its own independent analysis. (Tab 7 [RDEIR, § 4.6]; Tab 6 [survey report]; Tab 9 [RDEIR].) The City's responses to DFG contained a reasoned explanation based on scientific information. (See CEQA Guideline ' 15088.) The City was not required to accept DFG's opinions over those of its own expert. (Assn. of Irritated Residents, supra, at 1394-97; Laurel Heights I, supra, 47 Cal.3d at 393-93.)

Substantial evidence supports the EIR's conclusions on the Jackrabbit. The evidence shows the EIR conducted its own analysis of the impacts on the Jackrabbit, and did not rely solely upon the NRMP EIS/EIR for that analysis.

Holly-Leaf Cherry Scrub

The surveys conducted by the Project's expert botanist concluded that the plant community identified was not "holly-leaf cherry woodlands," but "holly-leaf cherry scrub" ("HLCS"), which is different and one not specified in DFG's List of California Terrestrial Natural Communities recognized by the California Natural Diversity Data Base (i.e. without any State or federal protection). (Tab 7, AR 5716-17; Tab

416, 53 AR 37223, 37247 and Tab 6, 4 AR 3363, 3387 [DEIR appendices, 2003 and 2002 rare plant surveys Tab 8, 6:2 AR 6627 [response to DFG comments].)

Based on the evidence, including the rare plant surveys conducted in 2002 and 2003, and supporting evidence (Tab 6, AR 3359-82, 3383-95), the EIR reported the expert botanist's identification of the plant community on-site as HLCS (Tab 7, 5:2 AR 57 16-17). The EIR properly defined the class of plants that were considered to be "special status plants" (Tab 7, 5.2 AR 5722), and did not include HLCS within that class based on the botanist's expert opinion. Based on CEQA and City thresholds, the EIR concluded that the permanent disturbance of 3.6 acres of HLCS, which did not support special-status plant or wildlife species and is not considered to be sensitive by the resource agencies, was not significant (Tab 7. 5.2 AR 5767). As noted before, the EIR concluded that the project-level and cumulative impacts from disturbing an aggregate of 280 acres of habitat, in general, necessarily including HLCS, would be a significant impact, and unavoidable even after mitigation, and, a Statement of Overriding Considerations was adopted as to this impact (Tab 3, AR 145-163).

The City's response to DFG's comments on the HLCS was not "dismissive." The City responded that based on scientific and other information the identified plant community was not "holly-leafed cherry woodland," but HLCS, because the canopy did not amount to a woodland canopy, and that DFG does not include HLCS within its list of special status plant communities. Also because only 3.6 acres of habitat would be permanently impacted by the Project, and HLCS "stand of trees" was not considered a sensitive plant community as identified by the DFG, the

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loss of the 3.6 acres would be less than significant under CEQA. (Tab 8, AR 6627.)

Substantial evidence supports the conclusions that the HLCS on site was not a special status species, and that impacts to it alone would not be significant.

III. Description of the Project and Mitigation Measures

Petitioners contend that the EIR fails as an informational document to adequately describe the project or the mitigation measures, misstates the public and agency concerns raised in comment letters, and fails to meaningfully respond to them.

The EIR adequately describes impact on the Santa Clara River and is not misleading

Petitioners contend the project will damage the river and the EIR and the City's staff reports mislead by "perpetuat[ing] the myth that the project will improve the condition of the river," (OB 16-17) and by the statement in Final EIR that the project "has been designed to preserve the Santa Clara River corridor." (AR 28.)

A review of the record discloses extensive discussion in the EIR and staff reports concerning the encroachment into the Santa Clara River and the impacts to it. Among other things, the EIR discloses that the Project would install buried bank stabilization in the western portion of the site, but not the eastern portion where the river corridor would remain substantially undisturbed up to the eastern boundary where the Newhall Ranch Road Golden Valley Road Bridge would be built. (See Tabs 4, 5, 7, 11, 12.) There is evidence that buried bank stabilization is less harmful to the river and its resources than traditional cement stabilization, yet protects adjacent development adequately (Tab 11, 9 AR 10739-47 [FEIR, App. C. Functional AssessmentC Summary], 10877-90

[id., Hybrid Functional Assessment/Riverpark], 11180-97 [FEIR, App. G, Additional Hydrology and Water Quality Analyses], 11202-19 [id., Addendum No. 1], 11405-17 [id., App. J, Additional Flood and Floodplain Modifications data]). Furthermore, revisions to the Project would lessen intrusion into the SEA and protect mature riparian resources that serve as habitat (id., esp. Tab 11, 9 AR 11419-22, 11516 [FEIR App. K. Project Revisions and Additional Information]; Tab 12, 10 AR 11741-61 [FEIR Final Project Revisions]; Tab 11, 9 AR 11224-35 [FEIR App. 1. 7/20/04 Staff Report]). Other evidence shows that the overall (temporary and permanent) intrusion into the SEA was reduced from the original 37 acres to 32.1 acres, and the permanent intrusion from 24 to 16.9 acres. (Tabs 11, 12.) The Project was also revised to dedicate approximately 318 off-site acres, including the approximately 141-acre "Round Mountain" site containing 37 acres of Santa Clara River SEA, which will in part further offset the Project's impacts on biological resources and the floodplain (Tab 12). The City nevertheless still considered the Project's intrusion into the Santa Clara River SEA to be a significant and unavoidable impact, and included it in the Statement of Overriding Considerations (Tab 7.)

Thus, the City did not "ignore Riverpark's encroachment into the river." It considered at great length the Project's impacts on the river and adjacent areas and required changes in the Project to reduce those impacts.

The EIR adequately describes the project setting and is not misleading

The City found that "the proposed project is appropriate for the subject property," "proposes considerably lower densities than existing nearby developments," and that "[b]y proposing a maximum of 1,089

residential units and approximately 16,000 square feet of commercial space, the project proposes development that would be substantially less dense and less intense than those that both the current and the proposed land use classifications would allow." (1 AR 30.)

Petitioners contend the finding is incorrect, because the City "never actually calculated the number of residential units that can actually be built on the site," and the site's physical characteristics, such as topography, constrain the number of units that can be built on any given parcel.

The findings relating to the project setting are adequate under CEQA and not misleading. Prior to the approval of the General Plan Amendment and Zone Change proposed by the Project, the City's General Plan designations for the site permitted development more dense and intense than the now-approved designations. (See, e.g., Tab 4, 2:1 AR 346-48 [DEIR, § 1.0, Project Description], 830-837 [Id., § 4.7, Land Use]; Tab 4, 18 2:2 AR 947-52.)

There is no requirement the City must calculate exact number of units which actually can be built.

The EIR adequately describes on-site and off-site dedications to the City

Petitioners contend the EIR does not "adequately describe both the on-and off-site [land] dedications, which the City considers a significant benefit, and has identified as one main bases [sic] for over-riding the project's significant adverse impacts," and City staff and the EIR do not discuss in an Agenda Report to the City Council a Planning Commissioner's comments during a debate on whether the Commission would consider the Project's proposed dedication of portions of the South Fork of the Santa Clara River to be a benefit under the

City's Ridgeline Preservation and Hillside Development Ordinance (OB 24-28.)

Preliminarily, these issues were not raised during the administrative process and, consequently, are now barred. (CEQA, § 21177(a); see Park Area Neighbors v. Town of Fairfax (1994) 29 Cal.App.4th 1442, 1447-48.) Moreover, the dedications were not offered as mitigation measures, but as benefits in connection with the City's issuance of a Statement of Overriding Considerations and the Hillside Development Application. (Tab 3. 1 AR 147-1 50.)

In any case, CEQA requires that an EIR analyze a project's adverse environmental impacts, not its benefits. (See, e.g., CEQA, § 21002.1(a).) Dedication of on-site and off-site open space to the City to be preserved in perpetuity does not create adverse environmental impacts. Even so, the EIR does discuss the attributes of these land dedications. The on-site land to be dedicated was discussed extensively in the Draft EIR (see. e.g., Tab 4, AR 367 [DEIR, § 1.0, Project Description]; Tab 4, 2:2 AR 1214-44 [id., § 4.12, Parks and Recreation]; Tab 7, 5:2 AR 5689-5827 [RDEIR, § 4.6, Biological Resources]), as well as in City staff reports (Tab 604,61 AR 42947-42953; Tab 652, 73 AR 51639-51650; Tab 652, 73 AR 51651-51811; Tab 666, 74 AR 51913-51925; Tab 674, 74 AR 52073-52085; Tab 2-3, 1 AR 9-227) and in Planning Commission hearings (Tab 3, 1 AR 147-150). The attributes and benefits of the off-site land dedications are discussed in the Final EIR (see, e.g., Tab 12. 10 AR 11742-61 [FEIR. Final Project Revisions]; Tab 11, 9 AR 11419-22, 11516 [FEIR. App. K, map, land use table, new SEA chart]).

Failure to discuss comments in the agenda report is not fatal here. The Planning Commission debated which Project attributes should be considered as benefits in connection with their decision whether to

recommend approval of the Hillside Development Application, for which Newhall had submitted its Innovative Application Compliance Report. The EIR analyzed the land being dedicated to the extent necessary to inform the City and the public, and based on that information, the Planning Commission ultimately voted on which Project benefits it viewed as supporting the Hillside Development Application, including, without limitation, the on- and off-site land dedications (Tab 9,7:2 AR 8079-81 [12/21/04 HT]; Tab 652, 73 AR 51639-45, esp. 51643 [12/21/04 Staff Report]; Tab 2, 1 AR 15-18 [App. Reso.]). All of this information was before the City Council.

The EIR adequately describes on and off-site dedications and does not fail as an informational document in other respects.

IV. Alternatives Were Considered as Required by CEQA

An EIR's alternatives analysis must include a reasonable range of alternatives to the project that would feasibly obtain the basic objectives of the project and evaluate the comparative merits of the alternatives. (Guidelines, § 15126.6(a).)

Petitioners contend that the City's rejection of Alternative 2, the Santa Clara River Reduced Bank Stabilization Alternative, in the EIR and in its Findings was "disingenuous and pretextual, and therefore contrary to the mandates of CEQA" and not supported by substantial evidence.

Substantial evidence supports the determinations made by the City in rejecting Alternative 2 and finding that, due to the revisions to the Project, that alternative was no longer environmentally superior.

The City rejected Alternative 2 for multiple reasons.

After analyzing Alternative 2's impacts as compared to those of the Project as originally proposed, the EIR concluded that, while this alternative would reduce impacts in certain environmental areas

(including biological resources) and create similar impacts in other areas, it would create greater impacts on population/housing/employment and parks and recreation, and would not meet five of the project objectives. (Tab 4, 2:2 AR 1490-1500.) The EIR noted that the project objectives of (1) providing a substantial number of new housing units adjacent to existing and planned infrastructure, service, transit and transportation corridors and employment areas to accommodate projected growth, and (2) developing a range of housing types accommodating a range of incomes and commercial opportunities, would not be met due to the reduction in residential units (all of which were single-family units). (Tab 4, AR 1499.) The objective of providing adequate flood protection, including bank stabilization where necessary, would not he met because the alternative does not provide for bank stabilization. The objectives of providing sufficient parks to satisfy park dedication requirements and meet regional needs, and of providing a range of active/passive recreational opportunities, would not be met due to the reduction in the size of the flatter, active portion of the proposed 29-acre park. (Id.; see also 1497.)

As noted above, the original Project was substantially revised over the course of the 24 public hearings. The Project as revised and approved: (1) Moved all development back to the resource line established by the Planning Commission, which reduced the Project's intrusion into the SEA and protected mature riparian resources that serve as habitat (Id.. esp. Tab 11, 9 AR 11419-22, 11516 [FEIR App. K, Project Revisions and Additional Information]; Tab 12, 10 AR 11741-61 [FEIR, Final Project Revisions]; Tab 11,9 AR 11224-35 IFEIR App. 1,7/20/04 Staff Report]), (2) Moved the equestrian trail out of the river (Id. esp. Tab 12, 10 AR 11741-61 [FEIR, Final Project Revisions]),

(3) Reduced the Project's overall (temporary and permanent) intrusion into the SEA from the original 37 acres to 32.1 acres, and its permanent intrusion from 24 to 16.9 acres, 7.5 of which are attributable to the construction of Newhall Ranch Road and one of which is attributable to the Santa Clara River Trail (Id. esp. Tab 11, 9 AR 11516 [FEIR App. K, new SEA chart]; Tab 12, 10 AR 11741-61 [FEIR. Final Project Revisions]), (4) Was conditioned on an absolute prohibition of construction of any lots within the new FEMA floodplain boundaries (Tab 11, 9 AR 11406-09 [CLOMR]: Tab 12, 10 AR 11756, 11757-58 [FEIR, Final Project Revisions].) (5) Relocated the Newhall Ranch Road/Golden Valley Road Bridge abutments farther out of the active channel of the river, resulting in reduced impacts to biological resources in those riparian areas (Tab 11, 9 AR 11410-17 [FEIR App. J, Technical Memorandum Hydraulic Design and Analysis]; Tab 12, 10 AR 11758 [FEIR, Final Project Revisions]) and (6) Dedicated approximately 318 off-site acres, including, inter alia, the ARound Mountain" site containing 37 acres of Santa Clara River SEA, which further offset the Project's impacts on biota and the floodplain (Tab 12, 10 AR 11741-58 [FEIR, Final Project Revisions]).

Based on the evidence as regards the revised project, the City Council found that, as compared with the Project as approved, Alternative 2 was no longer environmentally superior because the new Project design reduced development, and thus impacts, in areas not affected by the revisions contemplated by Alternative 2, that although the approved Project would afford the City 94 fewer residential units, it still preserved a greater mix of housing opportunities than did Alternative 2, which reduced the number of single-family lots, and that

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the approved Project would donate substantial off-site acreage. (Tab 3, AR 139-140 [Alternatives Findings]; see also 156 & 3,156-159.)

The findings as to Alternative 2 are supported by substantial evidence and the record shows that the City Council considered and balanced all of the competing factors, and chose to approve the Project with those factors in mind.

V. City Properly Found that the Project is Consistent with General Plan Goals and Policies of Protecting Significant Natural Resources

Government Code section 66473.5 provides that "[n]o local agency shall approve a tentative tract map . . . unless . . . [it] is consistent with the general plan."

It is within the City's province, to balance the competing interests reflected in its General Plan policies, and the City has broad discretion to construe those policies in light of the plan's purposes. (San Franciscans Upholding the Downtown Plan, supra, at 678.) A reviewing court, therefore, may only ascertain whether the lead agency "considered the applicable policies and the extent to which the proposed project conforms with those policies" (id.) by considering whether, as a whole, the "'project is compatible with, and does not frustrate, the general plan's goals and policies" (Napa Citizens for Honest Government v. Napa County Board of Supervisors (2001) 91 Cal.App.4th 342, 355.) A project must be in agreement or in harmony with the applicable General Plan, "not in rigid conformity with every detail thereof." (San Franciscans Upholding the Downtown Plan, supra.)

A lead agency's determination that a project is consistent with its general plan "can be reversed only if based on evidence from which no reasonable person could have reached the same conclusion." (A Local and Regional Monitor v. City of Los Angeles (1993)16 Cal.App.4th 630, 648;

see also San Franciscans Upholding the Downtown Plan v. City and County of San Francisco (2002) 102 Cal.App.4th 656, 6771.) In approving the Project, the City considered its General Plan policies and the Project conformance to them.

Petitioners contend that the Project is inconsistent with the City's General Plan goals and policies to protect significant natural resources because its intrusions into the SEA and the floodplain are inconsistent with the General Plan requiring the developer to "enhance and preserve the SEA," and the EIR's conclusion that the project is consistent with Land Use Policy Element 5.3 by "not proposing development within the river" (2 AR 891) is not supported by the evidence in the record.

The EIR analyzes the original Project's consistency with the City's General Plan and concludes that the Project as originally proposed was consistent with Policy 1.1 of Goal I of the City's Open Space and Conservation Element because the Project preserves the Santa Clara River and much of its significant vegetation as open space (Tab 4, 2:2 AR 859-60) as shown by evidence noted above as to other issues. Furthermore, as discussed supra, the Project was later revised, further reducing the Project's overall intrusion into the SEA from 37 to 32.1 acres, and dedicating 37 undeveloped acres of SEA in the Round Mountain property.

The EIR also concludes that the Project as originally proposed was consistent with Policies 3.3 and 3.7 of Goal 3 of the City's Open Space and Conservation Element, because the EIR identifies areas of significant ecological value and natural riparian habitat and mitigates impacts to the extent possible (Tab 4, 2:2 AR 861-62: see also Tab 7. 5:2 AR 5689-5827 [RDEIR, § 4.6, Biological Resources]). Also, as

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discussed supra, the Project as approved further reduces impacts to the SEA and other sensitive resources.

The original Project was also found to be consistent with Policy 5.3 of Goal 5 to require new development to be sensitive to SEAs through creative planning techniques that avoid and minimize disturbance in these areas for these same reasons (Tab 4, 2:2 AR 890-91), a conclusion supported by the same substantial evidence that supports consistency with Goal 1, Policy 1.1 of the Open Space and Conservation Element.

Petitioners' arguments that the Project impermissibly intrudes into the SEA restate their CEQA arguments. The same evidence in the record supports the consistency findings. The Project was revised to limit intrusion into the SEA. The City's decision after circulation of the Draft EIR to protect the riparian resources and habitat by setting the resource line in the western portion of the site and moving the equestrian trail out of the river bed further ensured that the Project as approved was consistent with the General Plan policies. The Project always proposed placing 15 lots within the already disturbed SEA area next to Planning Area A-2. (See, e.g., Tab 7, 5:2 AR 5785.) Also, as revised Section 4.6 explains, even the permanent loss of 24 acres of habitat, now reduced to 16.9, is not expected to detract from the overall integrity and value of the SEA, and the Project will preserve and enhance various amounts of upland habitat in Planning Area B to serve as a buffer between the riparian habitat and development and to mitigate adverse impacts to riparian plant communities within the SEA. (Id.) The benefits of the Project's enhancements to the banks of the Santa Clara River and to its main drainage in the 29-acre park are confirmed by the Final EIR's Hybrid Functional Assessment for Riverpark (Tab 11, 9 AR 10877-90).

Substantial evidence supports the finding of consistency with the City's General Plan.

The Petition for Writ of Mandate is denied.

Counsel for Respondent is ordered to prepare, serve and lodge in Department 85 a proposed Judgment Denying the Petition for Writ of Mandate on or before August 21, 2006.

DATED: August 14, 2006

DZINTRA I. JANAVS

Dzintra I. Janavs
Judge of the Superior Court

FILED
LOS ANGELES SUPERIOR COURT
AUG 0 3 2007
JOHN A. CLARKE, CLERK
BY S. BARRETT, DEPUTY

SUPERIOR COURT OF CALIFORNIA

COUNTY OF LOS ANGELES

CALIFORNIA WATER IMPACT NETWORK and FRIENDS OF THE SANTA CLARA RIVER, Petitioners/Plaintiffs, vs. CASTAIC LAKE WATER AGENCY; NEWHALL COUNTY WATER DISTRICT; CLWA SANTA CLARITA WATER DIVISION; VALENCIA WATER COMPANY; and DOES 1-20, inclusive, Respondents/Defendants, Real Parties in Interest.	Case No. BS 103 295 STATEMENT OF DECISION [Transferred from Ventura County Superior Court, Case No. CIV 239 359] Assigned for all purposes to: Honorable Dzintra I. Janavs Department 85 Complaint Filed: February 27, 2006

Having taken the matter under submission on June 25, 2007, having considered all the evidence admitted and the parties' oral and written arguments, the Court rules as follows:

Petitioners, California Water Impact Network ("CWIN") and Friends of the Santa Clara River ("Friends") (collectively referred to as "Petitioners") seeks a peremptory writ of mandate, declaratory judgment, and preliminary and permanent injunctions setting aside, enjoining, and restraining the approval by Respondents, Castaic Lake Water Agency ("CLWA"), Newhall County Water District ("NCWD"), and Valencia Water

Company ("VWC") collectively referred to as "Respondents") of their 2005 Urban Water Management Plan ("2005 UWMP" or "Plan").[1]

The 2005 UWMP is a detailed water supply management plan, which describes the water demand, water supply, water conservation, water recycling, and water reliability planning for the CLWA service area. (AR[2] 1:1-425.) The 2005 UWMP was prepared pursuant to the Urban Water Management Planning Act ("UWMP Act" or "Act") (Wat. Code, §§ 10610-10656), which requires every urban water supplier to prepare and adopt an urban water management plan. (Wat. Code, § 10620.) As encouraged by the UWMP Act, Respondents jointly prepared the 2005 UWMP as a cooperative regional plan for the CLWA service area. (Wat. Code, § 10620, subd. (d); *see also* AR 1:13.) In addition, numerous water resource specialists with expertise in water management planning were retained to assist Respondents in preparing the Plan. (AR 4:2479.) As required by the Act, the 2005 UWMP was approved and adopted separately by each Respondent. (AR 2:578-591.)

The 2005 UWMP covers the CLWA service area, which generally encompasses the Santa Clarita Valley. (AR 1:16-19.) Total water supply available to meet demands in the Valley is comprised of a combination of imported water, local groundwater, and local recycled water. (AR 1:8-9.) The groundwater source is supplemented with imported supplies. (AR 1:8-9, 37-38, and 42-47.) Imported water includes State Water Project

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[1]Petitioners also identify CLWA Santa Clarita Water Division as a Respondent. CLWA Santa Clarita Water Division, however, is the retail division of CLWA and is not a separate public entity.

[2]The Administrative Record will be cited as AR [Volume Number]:[Start Bates Page]-[End Bates Page].

("SWP") Table A water[3] and stored water. (AR 1:37.) Local groundwater is extracted from two different aquifer systems that comprise the local groundwater Basin, the Alluvium Aquifer and the Saugus Formation.[4] (AR 1:42.) The Alluvium Aquifer generally underlies the Santa Clara River and its several tributaries; the Saugus Formation underlies essentially the entire Upper Santa Clara River Area. (*Ibid.*)

Petitioners CWIN and FSCR are non-profit public benefit corporations formed under the laws of the State of California. Petitioners dispute the sufficiency of the analysis contained in the 2005 UWMP, as well as the various conclusions reached in the Plan. Specifically, Petitioners assert that the Plan "(1) fails to accurately estimate future demand; (2) overstates supply; and (3) fails to address alternatives to bridge the gap between supply and demand." (Petitioners' Opening Brief ["POB"] 1:6-7.) Petitioners contend that these alleged failings in the Plan constitute a violation of the Act, as well as a violation of the Public Trust Doctrine. (POB 1:6-7.)

Respondents contend that they exceeded the procedural requirements of the Act in adopting their Plan. Beginning in April 2005, Respondents held various public community workshops in the CLWA service area. (AR 1:128, 5:2953-3001 and 3279-3305.) On July 27, 2005, a preliminary draft of the 2005 UWMP was released to the public to solicit public input. (AR 5:3011-3278.) The draft 2005 UWMP was released on August 31, 2005, at a public community workshop, and was subsequently posted on CLWA's

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[3]The SWP Table A Amount is an annual contractual right to SWP water, named for the "Table A" in each SWP contractor's Water Supply Contract.

[4]This groundwater Basin is identified in the DWR Bulletin 118, 2003 Update, as the Santa Clara River Valley Groundwater Basin, East Subbasin. (AR 1:42.)

website. (AR 2:578, 4:2535-2590 and 2608-2952.) Copies were also delivered to the three area public libraries, to the City of Santa Clarita, and to the Counties of Los Angeles and Ventura. (AR 2:578.) This was followed by a six-week written public comment period. (AR 1:135.) On September 28, 2005, and October 26, 2005, joint public hearings were held, during which time Respondent's respective Boards heard staff and consultants describe the contents of the draft Plan, additional public comments were received, and staff and consultants responded to public comments. (AR 2:1150-1257 and 4:2299-2476.)

On November 3, 2005, Respondents circulated the Revised Final Draft 2005 UWMP. (AR 2:579 and 772-1149.) On November 9, 2005, CLWA and NCWD held a joint meeting at which time each Board reviewed and adopted the Revised Final Draft 2005 UWMP. (AR 2:578-586 and 611-696.) Respondent VWC adopted the Revised Final Draft 2005 UWMP on December 14, 2005. (AR 2:587-591.)

Petitioners filed a verified petition for writ of mandate and complaint for declaratory and injunctive relief in the Ventura county Superior Court on February 27, 2006. The action was ordered transferred to the Los Angeles County Superior Court on May 18, 2006.

To establish a violation of the UWMP Act, Petitioners must establish a prejudicial abuse of discretion by showing that Respondents either failed to proceed in the manner required by law in their preparation and adoption of the 2005 UWMP or Respondents' decisions to adopt the 2005 UWMP were not supported by substantial evidence. (Wat. Code, § 10651.) At issue here is a challenge to a quasi-legislative action, which is governed by traditional mandamus. This requires "scrutiny of the nature of the alleged defect" depending upon whether Petitioners' claim is predominantly "one of improper procedure or a

dispute over the facts." (*Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* ("*Vineyard*") (2007) 40 Cal.4th 412, 435.) As explained by the California Supreme Court in *Vineyard*, "while we determine *de novo* whether the agency has employed the correct procedures, . . . we accord greater deference to the agency's substantive factual conclusions," for a court's task "is not to weigh conflicting evidence and determine who has the better argument." (*Ibid.*)

"Substantial evidence" has been defined as "enough relevant information and reasonable inferences from this information that a fair argument can be made to support a conclusion, even though other conclusions might also be reached." (*Laurel Heights Improvement Assn. Of San Francisco, Inc. v. The Regents of the University of California* (1988) 47 Cal.3d 376, 393, citing Cal. Code Regs., tit. 14, § 15384, subd. (a).) This is the same "highly deferential substantial evidence standard of review" as prescribed for appellate review of trial court decisions. (*Western States Petroleum Assn. v. Super. Ct.* (1995) 9 Cal.4th 559, 572.) This review standard was recognized by the Court of Appeal in *Friends of the Santa Clara River v. Castaic Lake Water Agency* (2004) 123 Cal.App.4th 1, 9 ("[a]s it is not our function to reweigh the evidence, but to determine if there is substantial evidence to support the findings of the UWMP, the plaintiffs must fail if there is such substantial evidence"). Accordingly, this Court will uphold Respondent's decision to adopt the 2005 UWMP if substantial evidence supports that decision. In addition, this "deferential standard" requires the court to presume the correctness of the agency decision, as all reasonable doubts must be resolved in favor of it. (*Ryan v. Cal. Interscholastic Federation -- San Diego Section* (2001) 94 Cal.App.4th

1048, 1077-1078.) There is an exception to this deferential standard, when a court reviews the record and statutes to determine what is "required by law," and whether the agency has employed the correct procedures, which is subject to *de novo* review. (*Vineyard, supra,* 40 Cal.4th at p. 435; *People ex rel. Lockyer v. Shamrock Foods Co.* (2000) 24 Cal.4th 415, 432.)

The proper standard of review to be applied to Petitioners' public trust claim is the "abuse of discretion" standard. (*Baldwin v. City of Los Angeles* (1999) 70 Cal.App.4th 819, 836 [applying the abuse of discretion standard in mandamus action specifically to public trust issues].) In such cases, the Court should "determine only whether the action taken was arbitrary, capricious, or entirely lacking evidentiary support, or whether it failed to conform to procedures required by law." (*Ibid.*) Further, "[t]he inquiry into arbitrariness or capriciousness is like substantial evidence review in that both require reasonable basis for the decision."

I. The Plan's Water Use Projections and Estimate of Water Conservation Savings Meet The Requirements of the UWMP Act and Are Supported by Substantial Evidence

Petitioners argue that the 2005 UWMP's "conservation measures are unsubstantiated," and that because Respondents have relied upon 10 percent water savings to reach an "*ultimate conclusion*" that "adequate water exists for all future needs," the 2005 UWMP does not adequately quantify current water use and projected water use, as required by the UWMP Act. (POB 9, and Petitioners' Reply Brief ("PRB") 8:24-28 and 9:20-22.) Petitioner's arguments on this issue are without merit.

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A. The Plan Provides Adequate Support and Explanation For the 10 Percent Conservation Savings Estimate

The 10 percent conservation savings provided in the 2005 Plan is an estimate. Petitioners claim that the UWMP Act does not permit such an estimate of conservation savings. (PRB 7:23-24.) That is not so, as the Act specifically permits such an estimate. (Wat. Code, § 10631, subd. (f)(4) [requires a plan to provide a "[a]n *estimate*, if available, of existing conservation savings on water use within the supplier's service area, and the effect of the savings on the supplier's ability to further reduce demand"], emphasis added.)

Table 2-2 meets this requirement in that it provides such an estimate of existing conservation savings and demonstrates the effect of the savings on the suppliers' ability to further reduce demand by comparing it to the projected water demands. (AR 1:26.)

In addition, the UWMP Act does not require description and evaluation of water demand management measures for members of the California Urban Water Conservation Council. (Wat. Code, § 10631, subd. (j).) Instead, the Act simply requires that Council members include in their plans copies of the annual reports they submit to the Council. (*Ibid.*) As Respondents are each members of the Council, and as copies of their annual submitted reports are attached to the Plan, they are in compliance with subdivisions (f) and (g) of Section 10631 of the Act. (Wat. Code, § 10631, subd. (j).) (*See also* AR 1:235-384.)[5]

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[5]Moreover, because Respondents are members of the Conservation Council, the 2005 UWMP need not comply with that provision of the UWMP Act because section 10631, subdivision (h), of the UWMP Act also exempts members of the Conservation Council from the provisions of Section 10631, subdivision (f). (Wat. Code, § 10631, subd. (j).)

In this case, the estimate of conservation savings is supported by empirical data, based on the 1987-1992 drought and the results of *voluntary* conservation efforts. (AR 1:34 [explaining that past extreme conservation measures resulted in a 20 percent reduction in water demand (despite an expected 10 percent *increase* in water needs due to dry weather, overall water requirements actually *decreased* by more than 10 percent as a result of extraordinary conservation measures)]).

B. The Plan Provides Substantial Evidence to Support Its Conclusion That There Is Sufficient Water To Meet Future Demands

Petitioners claim that the 10 percent reduction due to conservation measures skews the Plan's ultimate conclusion that Respondents have identified enough water to meet future demands and point to a deficiency in future water supply identified in Tables 6-3 and 6-4 without the 10 percent reduction. (PRB 8:18-12:4.) Tables 6-2 through 6-4 summarize the supplies and demand for projected average/normal years, single-dry years, and multiple-dry years, respectively. (AR 1:95-97.) In average/normal years, the 10 percent reduction due to conservation measures is not relied upon to meet demands. (AR 1:95.) Only in dry years is the conservation amount necessary to meet demands (AR 1:96-97); however, the conservation estimates cannot be read without an understanding of the water shortage contingency plan outlined in Section 8.6 of the 2005 UWMP, which provides for *mandatory* conservation measures that could be reactivated, pursuant to local ordinances during dry years (AR 1:115-116); and Section 8.7, which provides for mandatory rationing or consumptive reduction measures (AR 1:116-117). Such mandatory conservation measures would be implemented and would ensure a conservation savings of 10 percent. Thus, in a dry year, with the implementation of such mandatory conservation measures, the 10 percent

conservation estimate is more certain than in an average/normal year, in which only voluntary conservation measures may be relied upon.

The 2005 UWMP has identified adequate supplies to meet future demands.

II. The Plan's Identification and Quantification of Surface Water Supplies Meets The Requirements Of The UWMP Act and Is Supported By Substantial Evidence

The UWMP Act requires that an urban water management plan identify and quantify existing and planned sources of water available to the supplier in five-year increments for the entire planning period, which is defined as the next 20 years. (Wat. Code, § 10631, subd. (b).) The Act further requires that a plan describe the reliability and vulnerability of the water supply. (*Id.*) at subd. (c)(1).) For any water source identified that may not be available at a consistent level of use, "given specific legal, environmental, water quality, or climatic factors," the Act requires that a plan include a description of any proposed alternative sources or water demand management measures "to the extent practicable." (*Id.* at subd. (c)(2).)

Chapter 3 of the Plan identifies and quantifies Respondents' current and planned sources of water. (AR 1:35-61.) Current supplies include CLWA's SWP Table A supplies, Flexible Storage Accounts in Castaic Lake, Semitropic Water Bank, and local groundwater. (AR 1:36, Table 3-1.) In addition, the Plan identifies near term future sources of water supply, including Rosedale-Rio Bravo Water Storage District Water Banking and Buena Vista Water Storage District/Rosedale-Rio Bravo Water Storage District Water Storage and Recovery Program. (AR 1:36, Table 3-1; see also AR 1:58-59.)

Chapter 3 in the Plan also contains an explanation of the reasons Respondents must rely on DWR in order to accurately assess the impacts

of varying conditions on SWP supply reliability -- an assessment that is required by the Act. (AR 1:39 & 90.) (See also Wat. Code, § 10620, subd. (d)(2); AR 6:3543.) As regards these supplies, DWR publishes every two years a reliability report that contains data concerning the reliability of current and projected SWP deliveries in conformance with the Act. (AR 1:90.) This reliability data is generated from CALSIM II, DWR's computer simulation model of SWP and Central Valley Project ("CVP") operations. (AR 3:1284, 4:2364-2367, 16:6988 & 6997-7002; *see also* Respondents' Request for Judicial Notice, Exhibit 1, pp. 9-11.)

In preparing its Plan, Respondents relied upon DWR's "Excerpts from the Working Draft of 2005 State Water Project Delivery Reliability" ("Draft 2005 Report"), as directed by DWR. The Draft 2005 Report contained DWR's most recent and authoritative projections of deliveries of the SWP. According to the Draft 2005 Report, the existing SWP facilities operated under current regulatory and operational constraints and, with all contractors requesting delivery of their full Table A Amounts in most years, could deliver 77 percent of total Table A Amounts on a long-term average basis. (AR 1:39 and 12:5398-5418.)

Chapter 6 of the Plan addresses in detail the reliability of Respondents' current and future water supply, including CLWA's SWP Table A supplies. (AR 1:91 and 93-97.) In describing the reliability of the water supply, the UWMP Act requires that a plan provide data for specific hydrologic scenarios: (1) an average year, (2) a single-dry year, and (3) multiple-dry years. (Wat. Code, § 10631, subd. (c)(1).) The discussion in Chapter 6 of the 2005 UWMP addresses each of these hydrologic scenarios and, using DWR's 2005 Draft Report, concludes that: (1) in an average water year, SWP delivery reliability will be 71 percent in 2010, and 77 percent in 2025/2030; (2) in a single-dry year,

SWP delivery reliability will be four percent in 2010, and five percent in 2010 and (3) in multiple-dry years, SWP delivery reliability will be 32 percent in 2010, and 33 percent in 2025/2030. (AR 1:40 and 95-97.)

Chapter 6 of the Plan also contains a comparison of current and future supply and demand for Respondents' service areas under the same three hydrologic scenarios. (AR 1:95-97.) That discussion includes the identification of various potential alternative supplemental and replacement supply sources and demand management measures for those supply sources that may vary between the three hydrologic scenarios. (AR 1:90-93.)

Petitioners contend that the 2005 UWMP overstates the quantity of surface water supplies and their reliability, contending that the Plan: (1) relies upon water supply sources that are the subject of pending litigation; (2) inflates SWP delivery numbers; (3) relies upon a flawed SWP delivery model; and (4) fails to consider other relevant factors that will impact the future reliability of SWP Table A deliveries. Contrary to these contentions, substantial evidence supports each of the Plan's conclusions regarding water supply and reliability.

A. The Plan Adequately Considers Pending Litigation

1. Kern-Castaic Transfer

CLWA's current SWP Table A Amount of 95,200 acre feet per year ("afy") includes 41,000 afy that is a result of the Kern-Castaic Transfer. (*See, Cal. Oak Foundation v. City of Santa Clarita* ("*California Oak*") (2005) 133 Cal.App.4th 1219, 1229-1230.) This transfer was completed in 1999, and is memorialized in a purchase agreement and in amendments to CLWA's and Kern County Water Agency's Water Supply Contracts with DWR. (*See, Friends of Santa Clara River v. Castaic Lake Water Agency* ("*Friends 1*") (2002) 95 Cal.App.4th 1373,

1379-1380.) The Environmental Impact Report ("EIR") for the transfer was challenged in 1999, in *Friends of the Santa Clara River v. Castaic Lake Water Agency* (Los Angeles County Superior Court Case No. BS056954) ("Friends Action"). (*Id.* at 1381.) Although CLWA was ultimately ordered to revise its EIR, no court has ever enjoined implementation of the Kern-Castaic Transfer Project, nor suggested that it should be unwound. (*California Oak, supra,* 133 Cal.App.4th at pp. 1228-1229.)

Under the jurisdiction of the Los Angeles County Superior Court in the Friends Action, CLWA prepared and circulated a revised EIR for the transfer, adopted the revised EIR, and lodged the revised EIR with the Los Angeles County Superior Court as part of its Return to the Peremptory writ of mandate in the Friends Action. Thereafter, the petition was dismissed with prejudice. In January 2005, two new challenges to CLWA's environmental review for the Kern-Castaic Transfer were filed in the Ventura County Superior Court by Planning and Conservation League ("PCL") and by California Water Impact Network ("CWIN"). Those cases were consolidated, transferred to the Los Angeles County Superior Court (Case No. BS098724), and were pending in Department 13 at the time Respondents adopted the 2005 Plan. (AR 1:41.)

All of the above is described in detail in the 2005 UWMP. (AR 1:41-42 and 91.)[6] The 2005 UWMP also identifies in detail the

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[6]The Los Angeles County Superior Court has since ruled that the dismissal with prejudice of Petitioner Friends' earlier CEQA petition challenging the original Kern-Castaic EIR is a retraxit and bars Friends from raising issues concerning the validity of the Kern-Castaic Transfer or the sufficiency of its environmental documents. (*See,* Respondents' RJN, Exhibit "4.") Therefore, Petitioner Friends is barred by the doctrines of retraxit and res judicata from challenging the validity of the Kern-Castaic Transfer (which includes asserting that the Kern-Castaic Transfer could be unwound) in this action. (*Le Parc Community Assn. v. Workers' Comp. Appeals Bd.* (2003) 110 Cal.App.4th 1161, 1169,

substantial evidence that supports its determination that the Kern-Castaic Transfer remains a valid and reliable water source. (AR 1:41-42.) This evidence includes the following: (1) the Kern-Castaic Transfer was completed in 1999, and DWR has allocated and annually delivered the water in accordance with the completed transfer; (2) the Court of Appeal held that the only defect in the 1999 EIR was that it tiered from the Monterey Agreement EIR, which was later decertified. (*Friends 1, supra*, 95 Cal.App.4th at p. 1387); (3) the defect has been remedied by the preparation of a revised EIR that did not tier from the Monterey Agreement EIR; (4) the Monterey Amendments settlement agreement expressly authorized the operation of the SWP in accordance with the Monterey Amendments, which facilitated the Kern-Castaic Transfer; (5) the Court of Appeal refused to enjoin the Kern-Castaic Transfer, and instead rquired preparation of a revised EIR; and (6) the Kern-Castaic Transfer contracts remain in full force and effect, and no court has ever enjoined the use of this portion of CLWA's SWP Table A Amount.

Petitioners cite the *California Oak* decision, in which the Court of Appeal set aside the EIR for its failure to explain the reasons it was appropriate to rely on the Kern-Castaic Transfer despite pending litigation. (*California Oak, supra*, 133 Cal.App.4th at p. 1240.) Here, however, the 2005 UWMP contains a detailed explanation of such reasons.

Substantial evidence supports including the Kern-Castaic Transfer amount as part of CLWA's total SWP table A Amount.

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quoting *Torrey Pines Bank v. Superior Court* (1989) 216 Cal.App.3d 813, 820 and *Rice v. Crow* (2000) 81 Cal.App.4th 725, 733-734.) Additionally, the Court in *CWIN v. CLWA* (LASC Case No. BS098724) recently entered Judgment ruling that the Kern-Castaic Transfer and its underlying contract documents are valid and not subject to being unwound or set aside.

2. Semitropic Groundwater Bank

In 2002, CLWA stored 24,000 acre-feet ("af") of its Table A Amount in an account in Semitropic's Banking Program ("2002 Groundwater Banking Project").[7] (AR 12:5419-5422, 5449.) Prior to opening its account, CLWA adopted a negative declaration under CEQA. (*Ibid.*) CWIN and Friends filed a CEQA action in the Ventura County Superior Court challenging CLWA's adoption of the negative declaration for the 2002 Groundwater Banking Project (*Cal. Water Network v. Castaic Lake Water Agency* [(Ventura County Superior Court Case No. CIV 215327]) ("Network Action"). (AR 1:57.) (Respondents' RJN, Exhibit 5.) Shortly thereafter, Petitioners filed essentially the identical action in the Sacramento County Superior Court (*Friends of the Santa Clara River v. State of California Department of Water Resources* [Sacramento County Superior Court Case No. 03CS00258]) ("Sacramento Action"). (*See*, Petitioners' Joshua Harris Declaration, Exhibit 2.) The *Sacramento Action* challenged the same negative declaration, involved the same parties, and asserted the same violations as the *Network Action*. (*Ibid.*) As the *Network Action* was filed first, the *Sacramento Action* was stayed until judgment was entered in the *Network Action*. (*See*, Petitioners' Joshua Harris Declaration, Exhibit 3.)

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[7]In 2004, CLWA stored 32,522 af of its 2003 Table A Amount in another account in Semitropic's program ("2003 Groundwater Banking Project"). (AR 12:5449-5484.) Only CLWA's 2002 Groundwater Banking Project was legally challenged. (AR 1:57.) Therefore, the 2003 Groundwater Banking Project is conclusively presumed to comply with CEQA. (Pub. Resources Code, § 21167.2.)

On July 14, 2004, the trial court in the *Network Action* entered judgment in favor of CLWA. (AR 1:57; *see also*, Respondents' RJN, Exhibit 6.) Petitioners appealed, and that appeal was pending at the time the 2005 UWMP was adopted. (AR 1:57.)

Petitioners contend that the Plan erroneously relies upon CLWA's 24,000 af of water banked at the Semitropic Storage District since that banking project was still under legal challenge when the 2005 UWMP was adopted. However, as the CLWA was the prevailing party in the trial court at the time of the adoption of the Plan[8], substantial evidence existed to support the Plan's reliance upon the banked water supplies. (*See, e.g.*, Publ. Resources Code, § 21167.3, subd. (b); Cal. Code Reg., tit. 14, § 15231; *see also, Barthelemy v. Chino Basin Mun. Water Dist.* (1995) 38 Cal.App.4th 1609, 1617 [agency actions are presumed to comply with applicable law, until proof is presented to the contrary].) Furthermore, the Plan's reliance on this water supply is limited. The 2002 Groundwater Banking Project has a term of ten years for the water to be withdrawn and delivered to CLWA. It is limited in the Plan for use in a dry year, and only for short-term reliability purposes (*i.e.*, prior to 2013).

Petitioners also claim that there is "contamination in the Semitropic aquifer," and that "water pumped into Semitropic may not meet DWR standards for water wheeling back into the California Aqueduct." (POB 15:5-8.) The record, however, establishes that water transported in SWP facilities would be required to meet DWR pump-in requirements for water quality and would meet all applicable drinking water standards and water quality criteria. (AR 15:6938.) Furthermore, this claim has

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[8]The Second District Court of Appeal subsequently affirmed the trial court's judgment. (*See*, Respondents' RJN, Exhibit 7.)

already been rejected both by the trial court and by the Court of Appeal in the Network Action. Contamination of the Semitropic Basin creates no water quality problems for CLWA or its retailers since, under the terms of the 2002 Groundwater Banking Project, CLWA may recover its water stored at Semitropic by either: (1) having Semitropic pump the water from the groundwater bank and transporting it to CLWA via the California Aqueduct, or (2) requesting an "in lieu exchange" (*i.e.*, that an equivalent amount of Semitropic's SWP water for a particular year be delivered directly to CLWA). (AR 12:5438 and 5452.) (*See also*, Respondents' RJN, Exhibit 6.)

B. The Plan Does Not Rely Upon Inflated SWP Delivery Numbers

Petitioners contend that Respondents improperly relied on DWR's projections for the reliability of the SWP.

DWR is responsible for the delivery of water to 29 state contractors throughout California; which water is then provided to hundreds of intermediate suppliers, the overwhelming proportion of whom have to prepare urban water management plans. (*See*, Wat. Code, §§ 10620 [requiring urban water management plans], and 10617 [defining "urban water supplier" as "a supplier, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually. An urban water supplier includes a supplier or contractor for water."]) The notion underlying Petitioners' argument -- that each of these hundreds of urban water suppliers should conduct their own SWP reliability analysis -- has no support in the UWMP Act and, in fact, would render the purposes of the Act unachievable.

Requiring urban water suppliers to conduct their own analysis of SWP reliability would also be contrary to the court-approved settlement

in connection with *PCL*. That settlement requires DWR to prepare SWP delivery reliability reports every two years commencing 2003 and contemplates each SWP contractor's reliance on the data generated in them. (AR 6:3543 and 16:7248.)

Petitioners' claim that SWP deliveries to contractors will never exceed 50 percent is based mainly on dicta from *PCL*. (POB 17:6-20.) Dicta cannot serve as factual support for such argument. (*Fireman's Fund Ins. Co. v. Maryland Casualty Co.* (1998) 65 Cal.App.4th 1279, 1301 ["In every case, it is necessary to read the language of an opinion in the light of its facts and the issues raised, in order to determine which statements of law were necessary to the decision, and therefore binding precedent, and which were general observations unnecessary to the decision. The latter are dicta, with no force as precedent."].)

PCL involved a challenge to an EIR that was certified in 1996, long before DWR had any type of computer modeling tool at the level of sophistication of CALSIM II. The dicta from *PCL* quoted by Petitioners describes the historical "gap" between SWP deliveries and SWP Table A entitlements prior to implementation of the Monterey Amendment to the SWP contracts in 1996. (*PCL, supra,* 83 Cal.App.4th at pp. 901-903.) The Monterey Amendment was intended to narrow that gap. (*Ibid.*) That amendment has been in effect since 1996, and *PCL* does not and could not have analyzed the impacts (positive or negative) of the Monterey Amendment upon the reliability of SWP deliveries.

PCL, however, does defer to the expertise of DWR with respect to SWP operations, which includes projecting SWP capacity and delivery reliability. (*PCL, supra,* 83 Cal.App.4th at pp. 906-907), and the Court of Appeal in *Santa Clarita Organization for Planning the Environment v. County of Los Angeles* (2003) 106 Cal.App.4th 715, citing *PCL*, held that

data from DWR concerning SWP reliability is the standard for planning. (*Id.* at p. 22.)

Furthermore, in asserting that the SWP facilities are incapable of ever delivering supplies to contractors in excess of 50 percent of Table A Amounts, Petitioners demonstrate their misunderstanding of the difference between the actual current capacity of SWP storage facilities and the actual current capacity of SWP conveyance facilities. As explained in the 2005 UWMP, while there are limitations on SWP storage capacity, similar limitations do not exist for its conveyance facilities (AR 1:37-38.)

Petitioners also claim internal inconsistencies in the 2005 UWMP with respect to SWP deliveries and SWP reliability. They argue that Table 3-2 in Chapter 3 of the Plan establishes that "[i]n 2004, CLWA received approximately 50 percent of its Table A allocation, or 47,205 af . . . . In all years prior, it received even less." (POB 16:21-23.) Petitioners contrast what they characterize as "unpredictable allotment schedule and low historical delivery numbers" with the Plan's conclusions regarding reliability of SWP deliveries. (*Id.* at 16:25.)

Petitioners are incorrect. Table 3-2 does not identify the historical total SWP deliveries *to* CLWA, but the historical total SWP deliveries delivered *by* CLWA to the retail water agencies in the Santa Clarita Valley. (AR 1:38.) As Respondents explain, this is not a distinction without a difference. As an example, Table 3-2 indicates that in 2002, CLWA delivered to its retailers 41,768 af of SWP water. 41,768 af, however, is not the total amount of SWP water deliveries received by CLWA in 2002. In addition to the amount reflected Table 3-2 as delivered in 2002, CLWA also stored an additional 24,000 af of its SWP deliveries at Semitropic's Groundwater Bank as part of its 2002

Groundwater Banking Project. (AR 1:57 and 12:5419-5422.) Thus, in 2002, CLWA's SWP deliveries exceeded 65,000 af.

Similarly, in addition to the 44,419 af of SWP water that CLWA delivered to its retailers in 2003, CLWA also stored an additional 32,522 af of its SWP deliveries at Semitropic Groundwater Bank as part of its 2003 Groundwater Banking Project. (AR 1:57 and 12:5449-5454.) Thus, in 2003, CLWA's SWP deliveries were approximately 76,000 af.

Further, while CLWA delivered only 47,205 af of SWP supplies to its retailers in 2004, this has no relationship to the actual amount of SWP supplies delivered to CLWA in 2004, which was approximately 65 percent of its total Table A Amount, or 61,880 af. (AR 11:4642-4643.) (*See also*, Respondents' RJN, Exhibit 2.)

It should also be noted that when reviewing Table 3-2, although the Kern-Castaic Transfer contract documents were executed in 1999, CLWA did not see an increase in its SWP Table A allocation as a result of the Transfer until 2001. Prior to 2000, CLWA's SWP Table A Amount was 53,700 af. Thus, in 2000, CLWA's total SWP deliveries were 60 percent of its total SWP Table A Amount.

Nor is the declaration executed by CLWA's General Manager Dan Masnada, on September 12, 2002, in other litigation inconsistent with the DWR's 2005 Draft Report. (POB 18:14-18.) In that declaration, Mr. Masnada questions the ability of the SWP to maintain high delivery percentages on a yearly basis "in the near term given current hydrologic conditions and existing SWP facilities in operation." (AR 1:760.) Masnada's statement is not inconsistent with the 2005 Draft Report. First, said statements were made concerning the reliability percentage that would be required immediately in the absence of the Kern-Castaic Transfer. (*Ibid.*) Second, as reflected in Table 3-4 of the Plan,

average/normal year near-term SWP delivery reliability for year 2010 is 71 percent, and will increase by the year 2025, to 77 percent. (AR 1:40.) The Plan, however, projects single-dry year reliability to be five percent and multiple-dry year reliability to be 33 percent in year 2025. (AR 1:40 and 96-97.) Thus, the Plan is not projecting 77 percent reliability for SWP deliveries every year, even in year 2025. (*Ibid.*)

Substantial evidence supports Respondents' reliance upon DWR's projections for the reliability of SWP delivery numbers, and such reliance is permitted under the UWMP Act.

C. The Plan Does Not Rely Upon A Flawed SWP Delivery Model

Petitioners argue that DWR's SWP analysis is unreliable because it is based upon the "flawed" "CALSIM II" model. (POB 19:20-21.) Petitioners contend that these "flaws" are identified in the Strategic Review of CALSIM II and its Use for Water Planning, Management, and Operation in Central California. (POB 19:22-26, citing AR 3:1438.)

The Strategic Review, however, acknowledges that CALSIM II was a "substantial improvement" over the previous models that DWR had used for that work, was comparable to other state of the art models for projecting deliveries, and was "admirable" for its "openness and availability." (AR 3:1439.) While the reviewers made suggestions for future improvement of the model and noted that it was of limited use in predicting deliveries in any one year, to date there is no other model that does a better job of predicting deliveries -- nor have Petitioners identified one.

The case that Petitioners cite as undercutting the validity of the CALSIM II model -- *Planning and Conservation League v. U.S. Bureau of Reclamation*, No. C05-3527 (N.D. Cal. Feb. 14, 2006) (hereafter, the "Intertie Case"), Order on Preliminary Injunction -- recognizes that the

model is the best one presently available for projecting water supplies: "CALSIM II is not a perfect model; no model is. But its use alone [does not make out a violation of the National Environmental Policy Act ("NEPA")]." (See Respondents' Request for Judicial Notice, filed October 2, 2006, Exhs. "2" & "3.") While Petitioners cite the Intertie Case as supporting a conclusion that CALSIM II is flawed, the Court's Order simply supports a conclusion that the Bureau of Reclamation's use of CALSIM II for purpose of conducting abbreviated environmental review under NEPA was not warranted. (*Ibid.*) This case does not present that question, and the Intertie Case preliminary injunction ruling is not relevant.

Respondents made use of the best information available to them regarding SWP deliveries. In doing so, they complied with the UWMP Act.

D. The Plan Adequately Considers All Other Relevant Factors That Will Impact The Future Reliability Of SWP Table A Deliveries

The UWMP Act requires that urban water suppliers identify "[a]ctions to be undertaken . . . to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster." (Wat. Code, § 10632, subd. (c).) Respondents described in the 2005 UWMP the effects of a levee failure impacting its SWP water supply for a six-month period. (AR 1:106-121.) Citing a newspaper article's misquote of the statements of DWR Director Lester Snow published after the Draft 2005 UWMP had been published and circulated, Petitioners argue that the six-month anticipated outage is not long enough for contingency planning purposes, and that Respondents should have anticipated a five-year interruption in supply. (POB 21:17-18, citing AR 2:731.)

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Respondents point out, the "five year" statement was, in fact, a misreport of Director Snow's testimony, and Director Snow stated that a levee failure could take at least 15 months to repair. (AR 1:768.) In any case, though, Director Snow's testimony came after the final draft of the 2005 UWMP was issued and the voters subsequently approved bonds to provide for levee strengthening that would address this issue, Respondents provided analysis in support of the 2005 UWMP showing that an interruption of up to *three years* could be accommodated. (*See* AR 1:630-634, 658-659, and 768.) The UWMP Act does not require suppliers to include this analysis in their plan; it simply requires that the analysis be conducted, which has been done here. (Wat. Code, § 10632, subd. (c).)

Petitioners next argue that the Bay-Delta Plan, as enforced in the *State Water Resources Control Board Cases* (2006) 136 Cal.App.4th 674, 777, will require reduced SWP deliveries. The ruling post-dates Respondents' approval of the Plan. Furthermore, Petitioners have not made an adequate record in this Court on the point, nor have they demonstrated that they exhausted their administrative remedies.

Petitioners also contend that the Plan "fails to adequately address the known, foreseeable declines in SWP deliveries due to global warming, despite undisputed evidence documenting accelerating declines in summer Sierra Nevada snow pack and reservoir storage." (POB 22:8-12.)

Projections related to climate change and its potential impact(s) on future SWP deliveries are among the issues DWR will need to address in the future. The record establishes that no conclusion had been reached by DWR at the time of adoption of the 2005 Plan. The material cited by those commenting on the Plan makes clear their belief that Respondents must follow DWR's lead on this issue. (See AR 6:3657,

1:657.) It was appropriate for Respondents to rely on DWR's most recent water supply projections.

III. The 2005 Plan Adequately Assesses Water Quality Issues and Any Impacts on Water Availability

Petitioners contend that the 2005 UWMP fails to comport with the Act by failing to address various water quality issues and by failing to provide alternative or supplemental water sources as a result of those claimed limitations. (POB 25:21 - 31:4.) Petitioners assert that the 2005 UWMP: (1) overstates the quantity and quality of groundwater that can be delivered from the Alluvial Aquifer; (2) inadequately discloses the spread of perchlorate in the groundwater basin and does not identify "alternative water sources"; and (3) inadequately addresses the likelihood that the Newhall Ranch planned community may not be able to convert to potable use the groundwater from the Alluvial Aquifer historically used for its agricultural operations, due to allegedly "excessive" levels of total dissolved solids ("TDS"). (*Ibid.*)

Substantial evidence supports Respondents' contrary conclusions and findings on each issue.

A. Groundwater Overdraft and Excessive Nitrate and Chloride Recharge from SWP Water

Petitioners assert that Respondents' planned pumping from the Alluvial Aquifer represents a "two-fold increase," "threatens to reduce surface flows into the Santa Clara River," and will result in "higher levels of nitrates and increased chlorides due to recharge from SWP supply." (POB 26:12-16, citing AR 3:1850.) The record, however, does not show that Respondents plan a "two-fold increase" in pumping, because the figure they claim has doubled does not reflect historical agricultural and miscellaneous uses of this aquifer. (*See*, AR 1:46.)

Rather, planned pumping from the Alluvial Aquifer is approximately the same as historical pumping, which has ranged from between 20,000 afy to slightly more than 43,000 afy. (*Ibid.*; *see also*, AR 1:169-176 and 11:4634-4637.)

At these levels of pumping, the Alluvia Aquifer "shows no signs of water level-related overdraft." (AR 11:4637.) The groundwater component of overall water supply in the Santa Clarita Valley derives from a groundwater operating plan developed over the last 20 years to meet water requirements while maintaining the groundwater basin in a sustainable condition. (AR 1:45.) The 2005 UWMP's conclusions with respect to the availability of groundwater supplies are based on the groundwater operating plan and the sustainability analyses of two formal reports prepared to analyze the groundwater flow and sustainability (AR 1:45); the groundwater operating plan is summarized in Table 3-6. (AR 1:46.) When overall groundwater pumping is maintained in accordance with the groundwater operating plan, sustainable groundwater conditions will be maintained to support groundwater use on an ongoing basis. (AR 1:47.)

Respondents' conclusion that the planned yield from the groundwater basin is sustainable is supported by substantial evidence. (*See*, AR 1:51.)

The assertion that any "increase in Alluvial pumping" will "result in 'higher levels of nitrates and increased chlorides due to recharges from SWP supply'" also has no support in the record. As an initial matter, there is no nexus between an increase in Alluvial pumping and higher levels of nitrates or chlorides due to recharges from SWP supply. Assuming, however, that there were an "increase" in pumping levels (which is not the plan), and assuming that this would lead to increased

recharge from SWP supply, there is no basis in the record for concluding that this would lead to increased chlorides. To the contrary, the most recent evidence suggests that groundwater "may . . . contain higher concentrations of nitrates and chlorides when compared to SWP water." (AR 1:76; *see also*, AR 1:75 [noting that the chloride content in SWP water varies from below 40 mg/l to over 100 mg/l and does not pose a human health risk, and noting that the nitrate content of SWP water is very low], AR 2:657 & 1218 [General Manager and consultant statement on this point].)

B. The 2005 UWMP Adequately Discloses the Nature of Perchlorate Contamination, Remediation Efforts, and Their Effect on Groundwater

Petitioners generally contend that the 2005 UWMP fails to address adequate and timely remediation of the groundwater basin, and specifically assert that "the reactivation of [the] Q2 [Well] will draw the perchlorate plume towards the Santa Clara River and potentially cause long-term contamination of the river," and that the Plan "fails to adequately address and assure the timely remediation of the growing contamination of the Saugus Formation." (POB 27:9-17.) Each of these assertions, lacks evidentiary support from the record.[9]

As to Petitioners' assertions concerning the Q2 Well, the 2005 UWMP discloses that the well was returned to service in October 2005, after

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[9]In addition, these are not proper arguments for consideration here, as the Act exempts the preparation and adoption of an urban water management plan from CEQA. (Wat. Code, § 10652.) Conversely, the 2005 UWMP's identification of projects, like groundwater banking projects, does not render those projects exempt from CEQA. (*Ibid.*) As a result, while the environmental impacts of an identified project listed in an urban water management plan are not required to be analyzed in the plan, all potentially significant impacts resulting from implementation of such a project must be assessed in the environmental documents for that particular project at the time of its implementation.

the installation of wellhead treatment and after the completion of environmental review related thereto; although, as the Plan acknowledges, that well was not necessary for the anticipated production from the Alluvial Aquifer. (AR 1:48-49 and 78.) More importantly, the 2005 UWMP explains (and Figure 5-1 of the 2005 UWMP illustrates) that the two-year groundwater capture zone analysis of Alluvial wells suggests that inflow to those wells will either be upgradient of the contamination site or will be from Alluvium beyond where perchlorate is to be transported. (AR 1:79-80; *see also*, AR 10:4598-4599 [describing the results of the Alluvial production wells] and AR 16:7177.) Therefore, it does not appear that the Q2 Well will draw that perchlorate plume towards the Santa Clara River. With respect to Petitioners' latter two assertions, the Groundwater Perchlorate Contamination Amendment to the 2000 UWMP and 2005 UWMP belie their assertions, as the documents contain substantial evidence to support the conclusion that adequate non-impacted water is available from the Alluvial Aquifer (AR 1:77 and 195-209; AR 10:4464-4605); that a plan for containing the contamination has been prepared and is being implemented; and that contamination clean-up is planned under the direction of the Department of Toxic Substances Control. (AR 1:81-87.)

Finally, Petitioners argue that the 2005 UWMP should have analyzed alternative sources of water that can be used in place of contaminated supplies "if" remediation plans fail. (POB 28.) Substantial evidence in the record, however, supports the conclusion in the 2005 UWMP that alternative water sources are *not* needed.

The 2005 UWMP assessed the adequacy and availability of groundwater supplies in both the Alluvial Aquifer and Saugus Formation. (AR 1:45-54.) As to the Alluvial Aquifer, the 2005 UWMP disclosed that the

combined active Alluvial groundwater source capacity of non-impacted municipal wells is approximately 58,000 afy. (AR 1:48.) It concluded that this capacity is "more than sufficient to meet the municipal, or urban, component of groundwater supply from the Alluvium, which is currently 20,000 to 25,000 afy of the total planned Alluvial pumping of 30,000 to 40,000 afy." (*Ibid.*) As to the Saugus Formation, the 2005 UWMP found that the combined active Saugus groundwater source capacity for municipal wells is 24,000 afy, which is "more than sufficient to meet the planned use of Saugus groundwater in normal years of 7,500 to 15,000 afy." (AR 1:52.) The 2005 UWMP also addressed Saugus capacity in the near-term:

> During the currently scheduled two-year time frame for restoration of impacted Saugus capacity (as discussed further in Chapter 5), this currently active capacity is more than sufficient to meet water demands, in combination with other sources, if both of the next two years are dry. At that time, the combination of currently active capacity and restored impacted capacity, through a combination of treatment at two of the impacted wells and replacement well construction, will provide sufficient total Saugus capacity to meet the planned use of Saugus groundwater during multiple dry-years of 35,000 af, if that third year is also a dry year. (AR 1:52.)

The Plan further identified that in actual practice, however, pumping from the Saugus Formation was *only* about 6,500 af in 2004; and, on average, Saugus pumping has been *only* about 7,000 afy since 1980. (AR 11:4615.) Because groundwater supplies are both adequate and available, even after accounting for the perchlorate-impacted municipal supply wells, there is no legal requirement to assess "alternative" sources of supply under the UWMP Act or any other law or regulation.

C. The Groundwater for the Newhall Ranch Project and TDS

Petitioners also contend that the 2005 UWMP is inadequate because it does not address a particular development project's (*i.e.*, Newhall

Ranch's) potential for not being able to convert its agricultural water supplies to urban uses due to TDS levels. (POB 28:17-21.)

Petitioners offer no evidence to support the claim that TDS levels are "excessive," and only rely on two comment letters that essentially repeat the same point. (*See* AR 3:1331 and 1852.) As reported in the 2005 UWMP, "all groundwater meets or exceeds drinking water standards." (AR 1:76.) Similarly, the 2004 Santa Clarita Valley Water Report, upon which the 2005 UWMP relies, "CLWA produces water that meets drinking water standards set by [the U.S. Environmental Protection Agency] and [the California Department of Health Services]." (AR 11:4644.) In any case, the UWMP Act does not require an urban water management plan to evaluate specific development projects. (Wat. Code, § 10652.) At the project level, all development projects are required to perform the necessary environmental review under CEQA, and this review will necessarily address project-specific water quality issues, if any.

IV. The UWMP Act Does Not Require Cumulative Impacts Analysis

Petitioners argue that the 2005 UWMP fails to address the cumulative impacts of urbanization on local water resources. (POB 29-31.) Specifically, Petitioners claim that the 2005 UWMP: (1) *fails* to address impacts such as decreased recharge due to decreasing percolation rates caused by the increase in the acreage of impervious surface area; and (2) *fails* to catalogue private groundwater well pumping. (POB 29-31; PRB 30:21-24.)

There is, however, no legal requirement in the UWMP Act for an urban water management plan to discuss "cumulative impacts." The analysis of cumulative impacts is a CEQA requirement only.[10] (Wat. Code,

[10]CEQA requires that an EIR discuss cumulative impacts if a project's incremental environmental effects, combined with the effects

§ 10652.) Cumulative impacts are not *mentioned* in the UWMP Act. Water Code section 10631, subdivision (c)(2) reads: "For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to supplement or replace that source with alternative sources or water demand management measures, to the extent practicable." Therefore, the 2005 UWMP is not inadequate and Respondents did not abuse their discretion for failing to discuss cumulative impacts.

As previously stated, substantial evidence supports the water supply projections in the 2005 UWMP. That is all that is required.

V. The Public Trust Doctrine

Petitioners argue that the 2005 UWMP violates the Public Trust Doctrine, because the 2005 UWMP will "encourage" local governments to approve urban growth, which *may* cause lower flows in the Santa Clara River. (POB 31-34.)

Petitioners' Public Trust doctrine cause of action fails to state a claim.

An urban water management plan is merely a planning document, and itself has no direct impact on public trust resources. For that reason, urban water management plans are specifically exempt from the application of the CEQA. (Wat. Code, § 10652.) Furthermore, a Public Trust Doctrine claim is not ripe unless and until an agency takes an action that has the potential to harm the public trust. (*See, Santa Teresa Citizen Action Group v. City of San Jose* (2003) 114 Cal.App.4th 689, 707-709 [nuisance and public trust causes of action not ripe where alleged injury to water supply depended on the assumption that city

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of other projects, are "cumulatively considerable." (Cal. Code Regs., tit. 14, § 15130, subd. (a).)

would approve uses for recycled water that posed a significant risk to the aquifer from which petitioners obtained their drinking water].)

In view of these conclusions, the Court need not reach the other Public Trust issues raised by Petitioners.

VI. Conclusion

The Court finds that Respondents proceeded in the manner required by law and that the actions by Respondents were supported by substantial evidence. The Petition for Writ of Mandate is denied and the Court rules in favor of Respondents on the Complaint for Declaratory Relief.

As the prevailing parties, Respondents are entitled to costs pursuant to Code of Civil Procedure section 1032.

Objections, if any, to this Statement of Decision shall be filed in Department 85 on or before August 20, 2007.

DATED: August 3, 2007

Dzintra I. Janavs
Judge of the Superior Court

DIJ:dl

LETTER 4

FILED
LOS ANGELES SUPERIOR COURT
AUG 15 2007
JOHN A. CLARKE, CLERK
BY S. BARRETT, DEPUTY

SUPERIOR COURT OF THE STATE OF CALIFORNIA

FOR THE COUNTY OF LOS ANGELES

SANTA CLARITA OAK CONSERVANCY, CALIFORNIA OAK FOUNDATION and SANTA CLARITA ORGANIZATION FOR PLANNING THE ENVIRONMENT, Plaintiffs and Petitioners, vs. CITY OF SANTA CLARITA, a municipal corporation, SANTA CLARITA CITY COUNCIL, and DOES 1-25, inclusive, Defendants and Respondents.	CASE NO. BS 084677 **STATEMENT OF DECISION**
GATE KING PROPERTIES, et al., Real Parties in Interest.	

Having taken the matter under submission on August 9, 2007, after parties' submission of proposed Statements of Decision, having considered all the evidence admitted and the parties' oral and written arguments, the Court rules as follows:

Petitioners Santa Clarita Oak Conservancy, California Oak Foundation, and Santa Clarita Organization for Planning the Environment ("Petitioners") seek a Writ of Mandate commanding Respondents City of Santa Clarita and Santa Clarita City Council ("City" or "Respondents") to set

aside its decision certifying the recirculated Final Additional Analysis ("FAA") to the Environmental Impact Report ("EIR") for the Gate King Industrial Park. The Gate-King Project is a research and development/industrial park, consisting of approximately 106 lots on 508.2 acres, of which 68 lots on 170.1 acres will be used for industrial development. The remainder will be retained in open space. (Supplemental Administrative Record ("SAR") volume 24: page 6324) The project's water demand is estimated to be 386 acre feet per year ("afy"). (SAR 10:2620; 24:6341.)

The City originally certified an EIR for the Gate-King Industrial Park Project ("Gate King") in June of 2003 and approved the project which is the subject of this action. (SAR 10:2619.) The 2003 Gate King EIR included a discussion of available water supplies, including the City's reliance on the availability of 41,000 afy of surface water transferred from the Kern County Water Agency to the Castaic Lake Water Agency ("CLWA") in 1999 ("41,000 afy Transfer"). (*Id.*) CLWA is the "wholesale" water agency to the Newhall County Water District ("NCWD"). NCWD has agreed to annex the project and supply water to it. (SAR 10:2620; 24:6324). Various parties challenged the certification of the Gate King EIR, which was upheld by this Court. (*Id.*)

On appeal, the Court of Appeal reversed and directed this Court to issue a writ of mandate vacating the City's certification of the 2003 EIR on the grounds that the EIR failed to contain substantial evidence of sufficient water supplies. (*California Oak Foundation v. City of Santa Clarita* (2005) 133 Cal.App.4th 1219 ("*California Oak*").) The Court of Appeal held that the Gate King EIR did not sufficiently address uncertainties relating to CLWA's entitlement to the 41,000 afy Transfer. (*Id.*) The Court of Appeal found no other defects in the 2003 EIR. (*Id.* at 1236-41.) On February 15, 2006, this Court issued a Writ of Mandate ordering the City to "certify a Final Environmental Impact Report complying with CEQA consistent with the Court of Appeal's opinion in *California Oak* []."

On March 28, 2006, the City recirculated a "Draft Additional Analysis to the Final Environmental Impact Report for the Gate-King Project" ("DAA"), which "completely replace[d]" the water analysis presented in the 2003 EIR. (SAR 10:2615 – 25:6725.) As required under Public Resources Code section 21151.9 and Water Code section 10910, the DAA included a Water Supply Analysis ("WSA") prepared by NCWD. The WSA analyzed the sufficiency of water supplies for the project and concluded that: (1) the project had been included in NCWD's and CLWA's most recent

2005 Urban Water Management Plan ("UWMP") (SAR 24:6321-6351); (2) that, "[b]ased on the analysis set forth in this WSA and as supported by the documents relied on for its preparation, NCWD's total projected water supplies available during the ensuing twenty years will meet the projected water demands associated with the Gate-King Project and existing and other planned uses within NCWD's service area" (SAR 24:6351); and (3) that, based on a number of factors, including the Department of Water Resources ("DWR")'s and the court's treatment of the 41,000 afy to date, it is "unlikely" that DWR's on-going preparation of an EIR and any litigation arising out of it will "unwind" a completed and executed water transfer of 41,000 afy. (SAR 24:6331.) NCWD also based its conclusion about the sufficiency of water on State Water Project ("SWP") water reliability projections provided by DWR in its State Water Project Delivery Reliability Report. (SAR 24:6329.)

Further, the DAA discussed other concerns affecting the reliability of SWP water, providing information about climate change, the reliability of the CALSIM II model (one of DWR's water reliability modeling tools), and other SWP water issues, such as salinity in the Bay Delta. The DAA also acknowledged DWR's on-going ability to curtail Table A water deliveries of SWP water, including the 41,000 afy based on "environmental considerations." (SAR 10:2628, 2657; 31:8038-8040.) After acknowledging that these factors could affect the reliability of SWP deliveries, the DAA evaluated the likelihood that these factors in fact would significantly undermine DWR's, CLWA's and NCWD's water supply reliability projections. The DAA concluded that

> these events do not significantly affect the reliability of the transfer amount, and therefore, it is still appropriate for the City of Santa Clarita to conclude that CLWA and NCWD properly included the transfer amount as part of CLWA's 95,200 afy Table A Amount [].

(SAR 10:2662.)

The City held a public comment period to receive comments on the DAA from March 31, 2006 through May 8, 2006, and the City's Planning Commission held a public hearing on May 2, 2006 to receive public testimony on the DAA. (SAR 10:2612; 28:7240.) On May 25, 2006, the City published the "Final Additional Analysis to the Environmental Impact Report for the Gate-King

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Industrial Park" ("FAA"). (SAR 28:7234 – 37:9677.)[1] The FAA responded to comments regarding the reliability of the 41,000 afy Transfer, and affirmed the finding that, despite some uncertainty, it was appropriate for the City to conclude that the 41,000 afy Transfer was sufficiently reliable to consider it to be an available water source for planning purposes. (SAR 31:8047-8075.) On June 6, 2006, the City's Planning Commission adopted a resolution recommending re-certification of the Gate King EIR with the FAA. (SAR 38:9699-9702.) On July 11, 2006 the City Council adopted a resolution recertifying the Gate King EIR with the FAA. (SAR 38:9944-9949.) The City issued a Notice of Determination regarding the recertification on July 13, 2006. (SAR 38:9950-9951.)

On August 16, 2006, the City filed a Return to Peremptory Writ of Mandate and Request for Discharge ("Return") with this Court. On October 2, 2006, Petitioners filed an Objection to Return to Peremptory Writ and Request for Discharge.

Standard of Review

To establish a violation of the California Environmental Quality Act ("CEQA"), Petitioners must show an abuse of discretion in that the City either failed to proceed in the manner required by law or the determination or decision is not supported by substantial evidence. (*Vineyard Area Citizens for Responsible Growth v. City of Rancho Cordova* ("Vineyard") (2007) 40 Cal. 4th 412, 426, Code Civ. Proc. § 1094.5(b); Pub. Resources Code §§ 21168, 21168.5.) This requires "scrutiny of the nature of the alleged defect" depending upon whether petitioners' claim is predominantly "one of improper procedure or a dispute over the facts." (*Vineyard,* 40 Cal.4th 412, 435.) As explained by the California Supreme Court in *Vineyard*, "while we determine *de novo* whether the agency has employed the correct procedures, . . . we accord greater deference to the agency's substantive factual conclusions," for a court's task "is not to weigh conflicting evidence and determine who has the better argument." (*Id.*)

"Substantial evidence" is defined as "enough relevant information and reasonable inferences from this information that a fair argument can be made to support a conclusion, even though other

[1] As the final CEQA document, the FAA includes the DAA plus responses to comments and modifications to the text of the DAA where required. (14 Cal. Code of Regs. § 15362 (b); hereafter "CEQA Guidelines."

conclusions might also be reached." CEQA Guidelines § 15384(a); *Laurel Heights Improvement Ass'n v. Regents of Univ. of Cal.* (1988) 47 Cal.3d 376, 393.) Substantial evidence may include facts, reasonable assumptions predicated upon facts, and expert opinion supported by facts, but not argument, speculation, unsubstantiated opinion, or clearly erroneous evidence. (Pub. Res. Code §§ 21080(e)(1)(2), 21082.2(c).)

"[I]n applying the substantial evidence standard, the reviewing court must resolve reasonable doubt in favor of the administrative finding and decision. As such, if there are conflicts in the evidence, their resolution is for the agency." (*River Valley Preservation Project v. Metropolitan Transit Dev. Bd.* (1995) 37 Cal.App.4th 154, 168.) Determinations in an EIR must be upheld if supported by substantial evidence, and the mere presence of conflicting evidence in the administrative record does not invalidate them. (*Chaparral Greens v. City of Chula Vista* (1996) 50 Cal.App.4th 1134, 1143.) An agency's approval of an EIR may not be set aside on the ground that an opposite conclusion would have been equally or more reasonable. (*Laurel Heights Improvement Ass'n v. Regents of Univ. of Cal.* (1988) 47 Cal.3d 376, 393.) The Court passes only upon the EIR's sufficiency as an informative document, not upon the correctness of its environmental conclusions. (*Laurel Heights* at 392.) An EIR's informational content needs to be adequate to fulfill its informational purpose. It need not be perfect: "CEQA requires an EIR to reflect a good faith effort at full disclosure; it does not mandate perfection, nor does it require an analysis to be exhaustive. The absence of information in an EIR does not per se constitute a prejudicial abuse of discretion." (*Dry Creek Citizens Coalition v. County of Tulare* (1999) 70 Cal.App.4th 20, 26.)

"As with all substantial evidence challenges, an appellant challenging an EIR for insufficient evidence must lay out the evidence favorable to the other side and show why it is lacking. Failure to do so is fatal. A reviewing court will not independently review the record to make up for appellant's failure to carry his burden." (*Defend the Bay v. City of Irvine* (2004) 119 Cal.App.4th 1261, 1266; *see also Environmental Council of Sacramento v. City of Sacramento* (2006) 142 Cal.App.4th 1018 at 1029 ["plaintiffs bear the burden of proving a prejudicial abuse of discretion by establishing that the agencies' decisions are not supported by substantial evidence or that they failed to proceed in a manner required by law"].)

A. The City Was Not Legally Precluded From Relying on the 41,000 afy Transfer Pending Completion of Litigation Surrounding the Monterey Agreement and DWR's Programmatic EIR.

Petitioners contend that the City is precluded from relying on the 41,000 afy Transfer for planning purposes. The argument rests predominantly on the relationship between the 41,000 afy Transfer and on-going proceedings involving the Monterey Agreement, summarized hereafter.

In 1999, CLWA entered into a contract with the Kern Delta Water District for transfer of 41,000 afy. The CLWA certified an EIR for the 41,000 afy Transfer tiered on the earlier program EIR that had been prepared for the Monterey Agreement, a multi-party agreement among SWP contractors setting forth allocations and other provisions concerning SWP deliveries.

In *Planning and Conservation League v. Dept. of Water Resources* (2000) 83 Cal.App.4th 892 ("*PCL*"), the PCL successfully challenged the Monterey Agreement program EIR. The Court of Appeal held that the EIR should have been prepared by DWR as the lead agency, rather than by one of the contractors, and that a new EIR must be prepared and certified by DWR. The Court did not invalidate the Monterey Agreement or enjoin the water transfers effected thereunder, but directed the trial court to consider whether the Monterey Agreement should remain in place pending preparation of DWR's new EIR, and to retain jurisdiction pending certification of DWR's EIR.

In *Friends of Santa Clara River v. CLWA* (2002) 95 Cal.App.4th 1373 ("Friends I"), the Court of Appeal ordered CLWA's EIR for the 41,000 afy Transfer decertified because it had been tiered from the Monterey Agreement EIR, adjudged inadequate: "We have examined all of appellant's other contentions and find them to be without merit. If the PCL/tiering problem had not arisen, we would have affirmed the judgment" (*Friends, supra*, at 1387.) The Court did not issue any ruling affecting CLWA's ability to continue to use and rely on water supplies from the 41,000 afy Transfer, leaving it to the trial court's discretion whether to enjoin CLWA's use of the water pending its completion of a new EIR. (*Friends, supra*, at 1388.)

In September 2002, on remand to the Los Angeles County Superior Court, the *Friends* petitioners applied under CEQA section 21168.9 to enjoin CLWA from continuing to use and rely on water from the 41,000 afy Transfer. The trial court rejected that request, and in December 2003, the Court of Appeal affirmed the trial court's ruling allowing CLWA to continue to use and rely on water

from the 41,000 afy Transfer pending completion of its new EIR. (*Id.*; *see also Friends of the Santa Clara River v. Castaic Lake Water Agency*, 2003 WL 22839353 ("*Friends II*") at SAR 34:8741.)

Meanwhile, in May 2003, before the trial court acted on remand, the parties to the PCL litigation entered into the Monterey Settlement Agreement. Section II of that Agreement provides that SWP would continue to be administered and operated in accord with both the Monterey Amendments and the terms of the Monterey Settlement Agreement. (SAR 34:8832.) The Monterey Settlement Agreement did not invalidate or vacate the Monterey Amendments, or any water transfer effected under them. The Agreement called for DWR to prepare a programmatic EIR for the Monterey Amendment and to evaluate the environmental impacts of eight completed water transfers, including the 41,000 afy Transfer, within the broad context of the Monterey Agreement.

In December, 2004, CLWA certified a new EIR for the 41,000 afy which did not tier off of the Monterey Agreement EIR. DWR did not object to CLWA acting as lead agency for the 41,000 afy Transfer and, in fact, commented favorably on the CLWA's EIR. (SAR 31:8049-8050.) That EIR was again subsequently challenged. (*California Water Impact Network v. Castaic Lake Water Agency*, LASC Case No. BS 098724.)

In March, 2007, the California Supreme Court decided *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412. In *Vineyard*, plaintiff challenged the EIR for a large, residential development project on the basis that the project's projected water supply was so uncertain that the EIR effectively failed to identify the source of the water needed to supply the project in the long term.[2] According to the petitioner, this failure of the EIR could not be cured since the EIR improperly deferred analysis of the project's true water supply impacts.

The Sunrise Douglas EIR projected water supplies to come from two sources: groundwater supplies in the near-term and additional surface water sources in the long-term. With respect to long-term supplies, the court held that the EIR had failed to proceed in accordance with law for failure to provide sufficient information. It leaves "too great a degree of uncertainty regarding the long-term availability of water for this project. Factual inconsistencies and lack of clarity in the [analysis] leave

[2] The Sunrise Douglas project would demand approximately 22,000 afy based on a projected build-out of 22,000 units of housing, housing approximately 60,000 people.

the reader[,] and the decision-maker[,] without substantial evidence for concluding that sufficient water is, in fact, likely to be available for the Sunrise Douglas project at full buildout." (*Vineyard,* 40 Cal.4th at 439.) With respect to the need to identify replacement supplies, the court held that, "[w]here, despite a full discussion, it is impossible to confidently determine that anticipated future water sources will be available, CEQA requires some discussion of possible replacement sources or alternatives to use of the anticipated water, and of the environmental consequences of those contingences." (*Vineyard,* 40 Cal.4th at 432.)

On the other hand, the court upheld as adequate the Sunrise Douglas EIR's analysis of near-term groundwater supplies and held that the EIR's conclusions should not be set aside if supported by substantial evidence. Despite *some uncertainty* about the availability of the near-term supplies, which had been specifically identified but were subject to competing demands, the court held that substantial evidence supported the city's determination that the supplies were sufficiently reliable to be used for planning purposes and did not require an analysis of replacement sources. (*Vineyard,* 40 Cal.4th at 436-438; see also *Western Placer Citizens for an Agric. and Rural Env't v. County of Placer* (2006) 144 Cal.App.4th 890, 908 [an EIR need not identify a "guaranteed" source of water; "if an EIR were required to identify a guaranteed source of water, then no EIR would ever be sufficient."].)

In April, 2007, Department 13 of the Los Angeles Superior Court issued a Statement of Decision in Case No. BS 098724 (the second challenge to CLWA's 2004 EIR referred to above) and ruled that (1) the 41,000 afy Transfer was final and not subject to invalidation; (2) that CLWA was the proper lead agency to have prepared the EIR on the 41,000 afy and; (3) that CLWA was not required to await preparation of DWR's programmatic EIR on the Monterey Agreements before it could certify its own EIR.[3] The court nonetheless identified an analytical "hole" in CLWA's EIR based on its failure to explain the relationship between DWR's ability to impact the 41,000 afy Transfer as a result of its programmatic EIR and the three future water supply scenarios CLWA studied in its EIR. However, like all other courts that have faced this issue, the court refused to invalidate the Transfer or set it aside pending correction of this analytical defect.

[3] The court grants Petitioner's Request for Judicial notice of the trial court's Statement of Decision in *California Water Impact Network v. Castaic Lake Water Agency,* Case No. BS 098724.

1. *PCL, Friends of the Santa Clara River* and *California Oak* Do Not Preclude Reliance on the 41,000 afy Transfer

Petitioners contend that legal uncertainties surrounding the 41,000 afy Transfer due to the *PCL* and *Friends* lawsuits and the on-going preparation by DWR of a programmatic EIR preclude the City from relying on water from that transfer for planning purposes. Specifically, Petitioners contend that because *PCL* requires the Department of Water Resources ("DWR") to prepare an EIR analyzing the effects of the eight SWP water transfers completed under the Monterey Agreement, none of those transfers, including the 41,000 afy Transfer, are sufficiently reliable for planning purposes until DWR has completed and certified that EIR.

PCL, Friends and *California Oak* do not preclude reliance on the 41,000 afy Transfer for planning purposes. While the Courts of Appeal could have simply said that all EIRs requiring reliance on the 41,000 afy Transfer must await the certification of a new FEIR by DWR (and resolution of any litigation challenging such FEIR), they have not done that. In fact, no court has said that.

Although the Court in *Friends* and *California Oak* observed that CLWA "may be able to cure the PCL problem by awaiting action by the [DWR] complying with the PCL decision, then issuing a subsequent EIR, supplement to EIR, or addendum . . . tiering upon a newly certified Monterey Agreement EIR" (*California Oak, supra*, 133 Cal.App.4th at 1229," n.6), neither court said that local water or planning agencies must await the DWR Programmatic EIR. In fact, the *California Oak* court made it clear that as long as the basis for the decision was transparent and reasoned, it was *up to the City* to decide whether the 41,000 afy is sufficiently reliable for planning purposes. (*Id.* at 1237-38, emphasis added.)

2. The Monterey Settlement Agreement and DWR's Pending EIR Does Not Preclude Reliance on the Transfer.

The Monterey Settlement Agreement does not prohibit local agencies from relying on the 41,000 afy Transfer. Rather, the Settlement Agreement simply requires DWR to conduct an "[a]nalysis of the potential environmental [impacts] relating to" several undisputedly final and completed water transfers, not just of the 41,000 afy Transfer (SAR 34:8834) and to analyze all of the transfers in the same manner, even though seven of them, defined in the Agreement as the

"Attachment E Transfers," were beyond challenge. (*Id.*) All of the water transfers were effected as permanent transfers under the Agreement and are to be analyzed in the same way in DWR's new EIR and no material distinction is made between them. Nothing in the Settlement Agreement requires cities and counties to stop land use planning efforts until the DWR's EIR is certified, and no court has so held.

Nor is the fact of DWR's pending programmatic EIR a bar to the City's reliance on the 41,000 afy. While it is possible that DWR's EIR could impact the Transfer (a fact disclosed in the FAA), the preparation of that EIR by DWR is not a legal prerequisite for the approval of this Project by the City. Further, NCWD, the expert water agency that prepared the WSA for the Gate-King project, determined that it is "unlikely" that DWR's on-going preparation of an EIR and any litigation arising out of it will "unwind" completed and executed water transfers, such as the 41,000 afy Transfer. (SAR 24:6331.) The City's reliance on this conclusion was reasonable, based on evidence that showed (1) that DWR has treated and continues to treat the 41,000 afy as a valid, final transfer (SAR 31:8046); (2) that the 41,000 afy Transfer was memorialized in a 1999 supply contract amendment approved by DWR (SAR 31:8050); (3) that DWR has allocated and delivered the water in accordance with the transfer since 2000, seven years ago and increased CLWA's SWP maximum Table Amount by that amount (*Id.*); (4) that CLWA has paid $47 million for the water, monies which have been delivered and which were financed by tax-exempt bonds (*Id.*); (5) that DWR has always treated the transfer as a "permanent" and final Table A transfer and has stated that it is consistent with the implementation of the Monterey Amendments (*Id.*); (6) that DWR praised CLWA's 2004 EIR as a comprehensive and thorough analysis (SAR 10:2672); (7) that no court has ever set aside the Transfer pending preparation of CLWA's EIR or SWR's programmatic EIR; and (8) that DWR included the 41,000 afy in its most recent SWP Reliability Projections. (SAR 10:2671; 31:8050-8051.) These factors support the City's conclusion that neither the DWR (nor the courts) are likely to significantly disturb the 41,000 afy Transfer.

In summary, contrary to Petitioners' arguments, no *legal* bar exists to the City's reliance on the 41,000 afy Transfer for planning purposes. *California Oak* held that it was up to *the City* to determine whether or not to rely on the 41,000 afy Transfer in its planning pending the completion of the

litigation. The Court stated: "*[T]he question is whether the entitlement should be used for purposes of planning future development*, since its prospective availability is legally uncertain. *Although this decision must be made by the City*, the EIR is intended to serve as an informative document to make government action transparent. Transparency is impossible without a clear and complete explanation of the circumstances surrounding the reliability of the water supply." (*Id.* at 1237-38; emphasis supplied.)

The City's recirculated FAA transparently discussed the uncertainties related to the 41,000 afy Transfer, including disclosing the possibility that future actions by DWR could adversely impact the Transfer. Based on the evidence before it, the City reasonably concluded that it was unlikely that the 41,000 afy would cease to be available to serve this project and other projects.

3. The Invalidation of CLWA's EIR Does Not Undermine the City's EIR.

Petitioners contend that the April 2007 Statement of Decision invalidating of CLWA's EIR for the 41,000 afy Transfer in *California Water Impact Network v. Castaic Lake Water Agency* (Case No. BS 098724) undermines the adequacy of the City's FAA, which was certified in July, 2006. But as recognized by the *California Oak* court:

> It is well-established that once a project is approved, new information does not require reopening the approval. (*SCOPE, supra*, 106 Cal.App.4th at p. 723; Cal.Code Regs., tit. 14, § 15162, subd. (c).) Gate King is thus correct that it is "simply too late to raise this [the invalidation of the UWMP 2000] as an issue." (133 Cal.App.4th at 1243.)

As with the invalidation of the 2000 UWMP in the *California Oak* case, the setting aside of CLWA's EIR nearly a year after the City's certification of the FAA cannot re-open the validity of that certification. When the City certified the Gate King FAA in July, 2006, it was entitled to assume that the CLWA's certified EIR was adequate to support CLWA's approval of the 41,000 afy Transfer. (*State of California v. Superior Ct.* (1990) 222 Cal.App.3d 1416, 1419.)

But in any event, the City's FAA anticipated the possibility that CLWA's EIR might be invalidated, but concluded that the Transfer was still likely to prove reliable. The City's FAA said:

> "[T]he City has determined that it is reasonable to conclude that *even if a court finds that the CLWA 2004 EIR legally deficient*, that court, like all others before it, will again refuse to enjoin the permanent 41,000 afy water transfer, and instead require further revisions to the EIR." (SAR 31:8052 (emphasis added).)

That is what happened. Although the court in Department 13 found an "analytical hole" in CLWA's EIR, it refused to set aside the Transfer.

Finally, Petitioners suggest that the City's FAA suffers from the same "analytical hole" as identified in CLWA's EIR, namely that the FAA should have predicted how the outcome of DWR's programmatic EIR might affect the three allocation scenarios examined in the CLWA's EIR—namely (1) a pre-Monterey Amendments scenario without Article 18 cutbacks, (2) a pre-Monterey Amendments scenario with Article 18 cutbacks and (3) a post-Monterey Amendments scenario.

The defect identified in the CLWA EIR does not apply to the FAA. First, Petitioners' failure to exhaust their administrative remedies with respect to these arguments bars them from raising them for the first time now. (Pub. Res. Code § 21177(a); *Sierra Club v. California Coastal Comm'n* (2005) 35 Cal.4th 839, n. 20; *Central Delta Water Agency v. State Water Res. Control Bd.* (2004) 124 Cal.App.4th 245, 274.)

Assuming *arguendo,* that Petitioners' arguments are not barred, CEQA imposes on the City no duty to examine in its project EIR the three "Monterey" allocation scenarios assessed in CLWA's EIR for the 41,000 afy. Public Resources Code § 21002.1 provides that "[t]he purpose of an [EIR] is to identify the significant effects on the environment *of* [*the*] *project* . . . ." (emphasis added.) In CLWA's EIR, the "project" was a 41,000 afy Transfer. In the City's FAA, the "project" was a local industrial park project. None of the Monterey allocation scenarios are a direct or indirect environmental consequence of approval of *this* project. Petitioners stretch CEQA beyond its limits to suggest that the City's FAA should have contained a detailed environmental assessment of the 41,000 afy Transfer, a project under the jurisdiction of a different agency, and with very different environmental ramifications.

Rather, under CEQA, the FAA was required to contain a reasoned and adequate assessment of whether there will be sufficient water to serve *the project* and, to the extent water is deemed *not* available, the environmental impacts of acquiring needed water. (*California Oaks* at 448, *Vineyard* at 432.) In this case, the FAA contained a reasoned, good faith analysis, identified specific, available water supplies, and discussed the reliability of those supplies. Acknowledging potential uncertainties (including DWR's ability to curtail Table A deliveries in the future based on "environmental

considerations,") of the available supplies, the FAA nonetheless concludes that DWR's future activities are "unlikely to 'unwind' [a] completed and executed...transfer[]." (SAR 24:6331) There is no "analytical hole" here. The FAA identifies water available to serve the project, discusses the degree of uncertainty related to those identified supplies, and based on substantial evidence, concludes that the supplies are *sufficiently* reliable to use for planning purposes.

4. The FAA was not required to identify supplies to replace the 41,000 afy

Petitioners claim that *California Oak* and *Vineyard* required the City to identify permanent replacement water supplies to serve the project, should the 41,000 afy Transfer at some point cease to be available. Petitioners misread *California Oak* and *Vineyard*. Rather, *California Oak* requires that the City explain why it can rely on the 41,000 afy Transfer, despite the legal uncertainties, ***or*** identify additional water supplies for the project. (*California Oak, supra*, 133 Cal.App.4th at 1242 [emphasis added].) It does not require that the City do both. (See also *id.* at 1244 calling for the EIR to demonstrate how "demand for water would be met without the 41,000 afy entitlement, ***or*** of why it is appropriate to rely on the 41,000 afy Transfer in any event." (*Id.* at 1242 [emphasis added].) "Whether the [41,000 afy] entitlement should be used for purposes of planning future development" is a decision that "must be made by the City." (*Id.* at 1237-1238.)

In the FAA, the City chose to rely upon the continued availability of 41,000 afy Transfer in its water supply analysis and to explain why. As ordered by the Court of Appeal, it provided a reasoned analysis based on substantial evidence as to why it was appropriate to do so. (SAR 10:2615 – 25:6726; SAR 28:7234 – 37:9677.) Having done so, the City was not required to also identify water supplies to replace the 41,000 afy.

Nor does *Vineyard Area Citizens* require the City to identify replacement sources of water. In *Vineyard*, the Supreme Court held that "where, despite a full discussion, it is *impossible to confidently determine* that anticipated future water sources will be available, CEQA requires some discussion of possible replacement sources or alternatives to use of the anticipated water, and of the environmental consequences of those contingences." (*Vineyard*, 40 Cal.4th at 432.) Here, it was *not* impossible to confidently determine that the 41,000 afy would continue to be available based on the record before the City. While *some* uncertainty existed, there was sufficient certainty for the City to confidently

predict that water supplies would in fact continue to be available. The *Vineyard* court does not require a *guarantee* of certainty for an EIR's water analysis to be considered adequate, just a "likelihood of actually proving available." (*Id.*)

In fact, whether a specifically identified source, such as the 41,000 afy, is *sufficiently* reliable is the kind of factual dispute that *Vineyard Area Citizens* cautioned should be subject to deference as long as the City's conclusion is supported by substantial evidence. (*Vineyard Area Citizens*, 40 Cal.4th at 436.) In *Vineyard,* the court applied this deferential approach to City's conclusion about the reliability of near-term groundwater supplies (5,000 afy). Although the 5,000 afy was specifically identified as available to serve the development, the EIR acknowledged there were competing demands for it. (*Id.*) "*While much uncertainty remains*," the court said, "the record contains substantial evidence demonstrating *a reasonable likelihood* that a water source the provider plans to use for the Sunrise Douglas project . . . will indeed be available at least in substantial part to supply the Sunrise Douglas project's near-term needs." (*Id.* at 437, emphasis added.) The *Vineyards* court did not require either a guarantee of availability or an analysis of replacement sources for the 5,000 afy of near-term supplies.

Here, as in *Vineyards,* the FAA discloses "potential uncertainty" over the 41,000 afy, but also explains why the City concluded that this specifically identified source was not *so* uncertain as to not "bear a likelihood of actually proving available" or to require identification of replacement sources. Under well-established principles, this Court must defer to the City's factual conclusion.

Finally, *Vineyard* recognizes that CEQA does not require the city to "reinvent the water planning wheel" each time it approves an individual development project if a water planning agency has already included the project in its most recently adopted Urban Water Management Plan. (UWMP) (*Vineyard*, 40 Cal.4th at 434.)[4] "The analysis in an individual project's CEQA evaluation may incorporate [an UWMP's] previous overall water planning projections," and need not "reinvent the wheel." (*Id.* at 434; see also Water Code §10910 (c)(1), (2) and (3), allowing incorporation of an UWMP analysis into an EIR) In *Vineyard,* the Sunrise Douglas project was *not* accounted for in the

[4] A UWMP must describe estimated past, present and future water sources, supply and demand for at least 20 years into the future. (Water Code §§ 10610-10656)

applicable UWMP. Here, in contrast, the Gate King project was fully accounted for in NCWD's most recently adopted UWMP, and this information was incorporated into the FAA. (SAR 10:2621; 24:6326.) Under CEQA and the Water Code, the City was entitled to incorporate the UWMP's projections of available water supplies, which included the 41,000 afy, into its water supply analysis. This is what it did.

B. Substantial evidence supports City's reliance on 41,000 afy water transfer

As noted, *California Oak* held that, as long as the City's conclusions were supported by substantial evidence, it is within the City's province to decide whether to rely on the 41,000 afy Transfer for planning purposes. (*California Oak, supra*, 133 Cal.App.4th at 1237-38.)

The FAA, here, contains a discussion of *why* the City chose to rely on the 41,000 afy as a reliable source, despite the identified uncertainties. While disclosing that future activities by DWR involving SWP water (including its programmatic EIR) *could* affect the 41,000 afy Transfer, the FAA concludes that such DWR's future activities were "unlikely" to "unwind" executed and completed agreements with respect to the permanent transfer of SWP Water Amounts." (SAR 10:2661-2664.) To support this conclusion, the FAA explains that the 41,000 afy Transfer was completed in 1999; CLWA has paid approximately $47 million for the additional Table A Amount, the monies have been delivered, the sales price has been financed through CLWA by tax-exempt bonds, and DWR has increased CLWA's SWP maximum Table A Amount and delivered or made available to CLWA the 95,200 afy because it was a permanent transfer/reallocation of SWP Table A entitlement between SWP contractors. (SAR 31:8046-8050.)[5]

The FAA also explains that DWR itself lists the 41,000 afy as part of CLWA's allocation in its published "Notices to State Water Project Contractors" (SAR 31:8046); treats the transfer as a permanent and final transfer (*Id.*); did not object to CLWA's preparation of its own EIR for the 41,000

[5] Included in the DAA's and FAA's Appendices are the necessary documents to support the FAA's analyses, including the Water Supply Assessment prepared by NCWD PCL decision (SAR 34:8916-8936), the Monterey Settlement Agreement (SAR 34:8816-8897), the Sacramento County Superior Court's "Order Pursuant to Public Resources Code Section 21168.9" (SAR 36:9410-9413), the *Friends* decision (SAR 34:8771-8779), the Los Angeles County Superior Court's Judgment on remand in the *Friends* litigation (SAR 34:8781-8791), CLWA's final EIR for the 41,000 afy Transfer (SAR 16:4029 – 19:5126), and CLWA's Resolution certifying that EIR (SAR 33:8522-8527).

afy (SAR 31:8051) and expressly allocates the 41,000 afy as part of Castaic Lake Water Agency's 95,200 afy in its 2005 State Water Project Delivery Reliability Report (SAR 22:05930), which contains "DWR's current information regarding the annual water delivery reliability of [SWP] for existing and future levels of development . . . , assuming historical patterns of precipitation." (SAR 22:5874.) This evidence—unrefuted by Petitioners—supports the City's determination that, although *possible*, it is *unlikely* that DWR will impose conditions on the Transfer that will significantly impair DWR's own projections about its reliability. (SAR 24:6331.) While the City's determinations about the reliability of the 41,000 afy contain a degree of projection, "[d]rafting an EIR . . . necessarily involves some degree of forecasting." (CEQA Guidelines 15144.) Where an agency uses its best efforts to disclose and forecast all that it reasonably can about the reasonable likelihood of future activities, it has complied with CEQA. (*Id.*)

Importantly also, Petitioners have not produced substantial evidence that DWR *will* significantly change DWR's own projections concerning the reliability of SWP water. Rather, Petitioners simply speculate that DWR might do so. Nor have Petitioners shown why the evidence relied on by the City to conclude such a result is "unlikely" is insubstantial, incorrect or flawed. Petitioners' failure to explain why the evidence favorable to the City's determination is lacking is "fatal" to its case. A reviewing court will not make up for appellant's failure to carry its burden. (*Defend the Bay, supra*, 119 Cal.App.4th 1261 at 1266.)

The City reviewed the evidence provided by the expert water agencies, NCWD, CLWA and DWR, as well as the views of commentators opposed to the City considering the 41,000 afy Transfer, and determined that the 41,000 afy was *sufficiently* reliable to be able to confidently use it for planning purposes. This determination is supported by substantial evidence in the record, and thus, comports with CEQA. (*Vineyard Area Citizens*, 40 Cal.4th at 436.)

C. The FAA properly relied on data developed by DWR using the CalSim II model.

Petitioners' criticize the City's reliance on DWR's use of the CALSIM II model and contend that other experts have said the model does not reliably predict water supplies. However, as stated in CEQA Guidelines section 15151 "[d]isagreement among experts does not make an EIR inadequate." Rather, section 15151 provides that "[an] EIR should summarize the main points of disagreement

among the experts. The courts have looked not for perfection but for adequacy, completeness, and a good faith effort at full disclosure." (*Association of Irritated Residents v. County of Madera* (2003) 107 Cal. App. 4th 1383, 1390-91) The City, after disclosing and discussing the expert controversy, appropriately chose to rely upon DWR's Reliability Report, which includes water supply availability data developed using the CALSIM II model. Substantial evidence in the record supports City's determination that DWR, the state's expert agency on water supplies, reasonably employed CALSIM II as the best available tool for assessing water supplies in California.

Petitioners focus on the "Strategic Review of CALSIM II and its Use for Water Planning, Management and Operations in Central California" ("Strategic Review") contending that the Strategic Review supports their contention that CALSIM II should not be used for absolute predictions. (SAR 35:9107-9150.) In relying on DWR's Reliability Report, the City acknowledged the Strategic Review, recognized that it identified some weaknesses with the model, but concluded – as did the Strategic Review – that CALSIM II is a valuable tool for planning purposes. (SAR 31:8074; 35:9110.) In fact, the Strategic Review viewed CALSIM II as "a very impressive modeling effort on the part of all those involved with its development and application," (SAR 35:9110, 9132) and concluded: "Few, if any, modeling organizations in the country have consistently done as good a job on model development and application for such a large, complex, and controversial system as the modeling group which developed CALSIM II. . . . Most areas and suggestions for improvement . . . are meant to aid the model developers in moving further and faster in the direction they are already heading." (SAR 35:9127.) That same experts believe the model can be improved does not detract from it being the best available currently.

Petitioners suggest that the use of CALSIM II for making absolute predictions about future SWP water deliveries conflicts with DWR's and the United States Bureau of Reclamation position on the model, but DWR and the Bureau of Reclamation's ("Bureau") primary position paper on this issue: "Peer Review Response: A Report by DWR/Reclamation in Reply to the Peer Review of the CALSIM II Model" ("Peer Review Response") does not support this. (SAR 37:9592-9660.) The Peer Review Response, which responds to the Strategic Review, states that the CALSIM II Model *can* be

used to make absolute predictions in certain circumstances, including for "local planning efforts by project contractors and local agencies." (SAR 37:9619.)

Petitioners further argue that in an unpublished U.S. District Court opinion, *Planning and Conservation League v. U.S. Bureau of Reclamation*, ("*PCL/Bureau*") the Bureau "essentially admitted that the model is too unreliable for making absolute predictions." But the decision only highlights a fact which is not in dispute, and which the City prominently disclosed in the FAA: there are perceived shortcomings to the CALSIM II model. The *PCL/Bureau* decision (discussed in the FAA, included in the FAA's appendices), did not restrict "the Bureau or any other agency from using or relying on the CalSim-II model but, rather, stated that the Bureau could rely on the model, provided it disclosed relevant shortcomings in the data or model itself." (SAR 31:8074; *see also* 34:8938-8955.) The FAA did disclose these shortcomings.

Finally, the City's responses to comments by the Planning and Conservation League and California Water Impact Network were appropriate. (*See* SAR 31:8097-8098, 8102-8103.) In those responses the City recognized that the CALSIM II model has shortcomings, but concluded that it may still be relied on, as it is relied upon by experts DWR and the Bureau. (*Id.*) CEQA requires nothing more. (*See Greenbaum v. City of Los Angeles* (1984) 153 Cal.App.3d 391, 412-13 [agency has discretion to determine what methodology to use].)

D. The FAA properly evaluated the potential impact of global warming on water supplies.

The FAA appropriately concluded, based on adequate review of global warming literature and relevant studies, that the impact of climate change on water supplies was too speculative to conduct further meaningful quantitative review.

The FAA reviewed literature on global climate change, and has a seven-page discussion of the issue in Topical Response 3. (SAR 31:8076-8082.) The FAA recognizes that a broad consensus has concluded that the global climate is warming and that this change may adversely impact California's water supplies. (*Id.*) After reviewing the relevant studies, however, the FAA determined that the timing and extent of any impact to water supplies remains highly uncertain. (*Id.*) While DWR and other agencies and institutions continue to study the implications of global warming on water supplies, the FAA notes that DWR itself has determined that the science "has not reached a level at which it can

be quantitatively incorporated into delivery projections of the SWP." (SAR 31:8077.) The FAA states that the City reviewed these studies and DWR's approach and independently determined that it would be speculative to try to quantify the effects of climate change on water supply reliability at this point. (SAR 31:8082.)

CEQA permits such an approach. Given DWR's expert opinion that the quantitative impact of global warming on water supplies is speculative, CEQA did not require further analysis of those impacts. CEQA Guidelines § 15145 provides: "If, after thorough investigation, a lead agency finds that a particular impact is too speculative for evaluation, the agency should note its conclusion and terminate discussion of the impact." (*See also Marin Municipal Water Dist. v. KG Land California Corp.* (1991) 235 Cal.App.3d 1652, 1662-63 [upholding approach in which EIR investigated potential long-term impacts, but found analysis would be speculative].)

Petitioners argue that the City was required to make a "good faith effort to analyze the potential impacts on supply reliability based on the available data." It did. FAA Topical Response 3 contains an adequate discussion of global warming, including a summary of the various studies which examine the potential impact on water supplies in California. (SAR 31:8076-8082.) It recognizes that some studies have concluded that less water will be available as a result of global warming. (SAR 31:8078, 8080.) However, the FAA also reviewed studies that found that global warming may result in more water for California. (*Id.*) After summarizing the main points of these studies, the City exercised its discretion as lead agency, and chose to adopt DWR's expert opinion that quantifying the impact of global warming on water supplies at this time would be speculative:

> [B]ased on the above data, the City agrees with DWR that it would be speculative at this time to quantify the effects of climate changes on the reliability of the SWP . . . [a]t this time, the City believes it is appropriate to terminate any further analysis of potential future climatic changes, consistent with Section 15145 of the California Environmental Quality Act Guidelines.

(SAR 31:8082.)

Climate change is clearly an issue of vital importance, particularly to water supplies in California. DWR, the state agency with the most expertise on water supplies in California, has determined that the science on global warming has not reached a point where it can be "quantitatively

incorporated into delivery projections of the SWP." (SAR 31:8077.) The City Council of the City of Santa Clarita is in no better position to do so and CEQA does not require it to do so.

1. The FAA adequately addressed State Water Resources Control Board Order 2006-0006.

The FAA adequately addresses the State Water Resources Control Board's Order 2006-0006 ("Order")[6] concerning the maintenance of salinity standards in the Sacramento Bay Delta. Petitioners argue that the City must forecast the "extent to which meeting the salinity standard in DWR's State Water Board permit may result in reductions to SWP deliveries." However, as explained by the FAA, there are a variety of overlapping methods by which DWR may comply with the Order. (SAR 31:8070-8071.) After examining these methods and considering the current efforts underway by DWR to meet the salinity standards, as well as noting that, even if DWR were to be found in violation of the Order, a reduction in water deliveries is not required. The City's conclusion that the Order does not result in a reduction of State Water Program supplies to the DWR is supported by the evidence.

As described in the FAA, in the event that DWR or the Bureau projects that there may be a "potential exceedance in the salinity objectives" of the Board Order the "two agencies are required to immediately inform the State Board . . . and describe the corrective actions they are initiating to avoid the exceedance." The 'corrective actions' may include, but are not limited to:

> [A]dditional releases from upstream [CVP] facilities or south of the Delta [SWP] or CVP facilities, modification in the timing of releases from Project facilities, reduction in exports, recirculation of water through the San Joaquin River, purchases or exchanges of water under transfers from other entities, modified operations of temporary barriers, reductions in highly saline drainage from upstream sources, or alternative supplies to Delta farmers (including overland supplies).

(SAR 31:8070.) The FAA finds that, "While the reduction of exports is listed as one means of improving salinity concentrations, it is only one of many such methods. As noted above, implementation of a barrier program is another means for improving salinity concentrations and, in fact, DWR and the Bureau are working on such a program." (*Id.*)

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[6] Although the text of the Order itself was not included in the Administrative Record, it is apparent the City had access to the Order as part of its deliberations, as the City's FAA contains a detailed analysis of it. It appears to have been inadvertently omitted from the Supplemental Administrative Record. The Court grants Real Parties' Request for Judicial Notice of SWRCB Order 2006-0006 under Evidence Code §452.

The FAA further notes that, even if there was an "exceedance," an enforcement action would not be automatic, as the Executive Director of the State Water Board would first have to consider if any action was appropriate and whether the "non-compliance was beyond DWR's or the Bureau's control." (SAR 31:8071.) Given the variety of methods available to DWR and the Bureau to meet the salinity standards, the current efforts towards implementation of a barrier program, and the administrative provisions of the Order, the FAA appropriately concludes that "nowhere does the Order mandate that DWR and the Bureau shut down their pumps." (*Id.*) Analyzing the impacts of speculative future enforcement actions is not required under CEQA.

CONCLUSION

As directed by *California Oak*, the City has adequately analyzed the uncertainties surrounding the 41,000 afy water Transfer and explained in good faith the basis for its reliance on that Transfer. That analysis need not be exhaustive, but with a sufficient degree of analysis to make a decision which intelligently takes account of environmental consequences. (CEQA Guidelines § 15151.) Perfection is not required: adequacy, completeness and a good faith effort at full disclosure are. The City's determinations are not an abuse of discretion, but supported by substantial evidence.

The Court accepts the City's Return to the Writ of Mandate and the Final Additional Analysis to the Environmental Impact Report for the Gate-King Industrial Park as adequate and, accordingly, IT IS SO ADJUDGED that the Peremptory Writ of Mandate is DISCHARGED.

Counsel for respondent shall prepare, serve and lodge in Department 85 a proposed order/judgment discharging the writ on or before August 21, 2007.

Objections to this Statement of Decision and proposed order and judgment shall be served and filed on or before August 31, 2007.

DATED: August 15, 2007

Dzintra I. Janavs
Judge of the Superior Court

LETTER 5

Leo Trujillo
Chairman

Fred Lemere
Vice Chairman

William J. Brennan
Executive Director

Hatch & Parent
General Counsel

Member Agencies

City of Buellton

Carpinteria Valley
Water District

City of Guadalupe

City of Santa Barbara

City of Santa Maria

Goleta Water District

Montecito Water District

Santa Ynez River Water
Conservation District,
Improvement District #1

Associate Member

La Cumbre Mutual
Water Company

January 14, 2008

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
901 P Street
Sacramento, CA 95814

Dear Ms. Brown:

This letter is submitted by the Central Coast Water Authority, a public agency that contracts with the State of California, through the Department of Water Resources (Department), for water supplies from the State Water Project (SWP), and whose customers pay for and benefit from the water supplies provided by the SWP.

The Department has prepared the Draft Environmental Impact Report on the Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement (Monterey Plus DEIR). The Monterey Plus DEIR re-evaluates the environmental effects of the Monterey Amendments, which have been in operation for over a decade.

The Monterey Amendment amended the 1960s-era SWP contracts between the Department and each of the 29 public agencies that contract with it for SWP supplies. The Monterey Amendment, implemented in 1996, updated a number of contract provisions to reflect the change in real-world conditions that had occurred by that time, and incorporated opportunities for modern, more progressive water management. The Monterey Amendment accomplished a number of significant things, including: 5-1

- **Settled dispute over allocations** – The amended water allocation provisions eliminate the agriculture-first shortage requirement for contract water supplies (i.e., Table A water) as well as the agricultural priority to surplus water, and instead require that all water be allocated in proportion to contractors' contract amounts. In exchange, the agricultural contractors agreed to permanently retire a portion of their contract amounts and permanently transfer an additional portion to urban contractors.

- **Gave contractors more flexibility in managing limited SWP supplies** – The amended water management provisions promote contractor banking of water in underground water storage during wet periods for their later use during dry times, and improve contractor opportunities to get more beneficial use out of existing SWP facilities.

- **Increased rate stability and funding for local investment in water management programs** – The amended financial provisions use contractor money originally committed for additional SWP facilities to instead help contractors stabilize their water rates and increase their funding for local development of water conservation, water recycling, conjunctive use, and other water management programs.

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The added flexibility provided by the Monterey Amendment has allowed the SWP contractors to weather the most recent drought without enduring the substantial hardships of the drought of the early 1990s, despite increased water demands that have occurred since that time and increasing pressures on SWP operations.

The Monterey Plus DEIR includes an exhaustive analysis of the environmental effects of the Monterey Amendment and Settlement Agreement. The Central Coast Water Authority believes that the Monterey Plus DEIR, which was drafted with the advisory collaboration of DWR, the State Water Contractors, Planning and Conservation League, Citizens Planning Association of Santa Barbara, and Plumas County Flood Control and Water Conservation District, adequately describes the environmental effects of the Amendment. The analysis in the DEIR shows that:

- There have been no significant environmental impacts resulting from the Monterey Amendment from 1996 through today.

- Moving into the future, environmental impacts from the Monterey Amendment in almost all resource categories are at less-than-significant levels. Those few areas where potentially significant impacts were identified are for a provision analyzed under a worst-case scenario that is unlikely to ever occur, or for certain future projects that would all be subject to additional, project-level CEQA review.

The Central Coast Water Authority supported implementation of the Monterey Amendment in 1996, and supports its continued implementation into the future. The Central Coast Water Authority commends the Department for having prepared this thorough and significant document.

5-1 (con't.)

Sincerely,

William J. Brennan
Executive Director

WJB

LETTER 6

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CENTRAL DELTA WATER AGENCY
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January 14, 2008

Via Email: delores@water.ca.gov
and First Class Mail.

Attn: Delores Brown, Chief
Office of Environmental Compliance
Division of Environmental Services
California Department of Water Resources
Post Office Box 942836
Sacramento, CA 94236-0001

Re: Comments on the Draft Environmental Impact Report for the "Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement) (Monterey Plus)"

Dear Ms. Delores:

The Central Delta Water Agency joins in the comments on this project submitted by the South Delta Water Agency and hereby supplements those comments with the following additional comments.

1. **Legal Feasibility of the Proposed Project.**

It is implicit in CEQA that the "proposed project" (as well as the decision makers' ultimate chosen course of action), must be *legally* "feasible," i.e., "capable of being accomplished in a successful manner within a reasonable period of time, taking into account . . . *legal* . . . factors." (Guidelines, § 15364, emphasis added.) The legal feasibility of the proposed project is particularly relevant to the decision makers' determination of which course of action to pursue after considering the EIR's reasonable range of alternatives to the proposed project. Since "[t]he range of potential alternatives to the proposed project shall include those that could *feasibly accomplish* most of the basic objectives of the project . . ." (Guidelines, § 15126.6, subd. (c), emphasis added), a proposed project that cannot feasibly accomplish such objectives would not and should not fare well in that ultimate determination. In any event, the DEIR should thoroughly discuss the feasibility, i.e., legality, of the various components of the proposed project and all of the alternatives where, as here, such legality is not obvious and called into question.

6-1

a. **Increased Exports from the Delta Watershed.**

The DEIR states at page ES-6:

"The Department estimates the water supply management practices that are a part of the proposed project would result in an annual increase of around 50,000 AF in diversion of water from the Delta by the SWP."

Thus far, the DEIR has failed to demonstrate that such anticipated increases in diversions from the Delta pursuant to the proposed project are consistent with the Watershed Protection Act (Wat. Code, § 11460 et seq.) or Delta Protection Act (Wat. Code, § 12200 et seq.). Both of those acts seek to ensure that only "surplus" water is exported from the Delta Watershed.

If the DEIR preparers believe the additional water which the SWP is anticipated to export pursuant to the proposed project is water that is not needed for any environmental or other beneficial need within the Delta Watershed and is water that is truly surplus to such needs, then the DEIR must better explain, with facts and analysis, why it believes that to be the case. Such an explanation, should include, among other things, an examination of whether any releases from storage to facilitate such increases in exports are potentially needed to be held in storage (i.e., "carried over") to meet the needs of the Delta Watershed in future years.

Some pertinent provisions of the Watershed Protection Act and Delta Protection Act which should be discussed include the following: 6-2

- Section 11460 of the Watershed Protection Act which prohibits the SWP from "directly or indirectly" depriving the Delta Watershed of water from that watershed which is "reasonably required to adequately supply the beneficial needs of [that] watershed . . . ." (Wat. Code, § 11460.)

- Sections 12204 and 12202 of the Delta Protection Act which provide that "no water shall be exported [from the Delta] which is necessary to" enable the SWP to perform its "function[of] . . . provi[ding] salinity control and an adequate water supply for the users of water in the [Delta]." (Wat. Code, §§ 12204 & 12202.)

- Section 12205 of the Delta Protection Act which provides: "It is the policy of the State that the operation and management of releases from storage into the Sacramento-San Joaquin Delta [by the SWP] of water for use outside the area in which such water originates shall be integrated to the maximum extent possible in order to permit the fulfillment of the objectives of this part [which include the SWP's provision of salinity control and an adequate water supply for the users of water in the Delta]."

///

b. **Elimination of Article 18(b).**

At page 4-5 the DEIR explains that "[t]he Monterey Amendment eliminated Article 18(b) of the SWP long-term water supply contracts." Embedded in Article 18(b) is the recognition and protection of "area of origin" contractors's prior and paramount rights to SWP water over non-area of origin contractors.

For starters, the DEIR must better explain why such recognition and protection was eliminated. The DEIR at page 4-5 states:

> "The reason for eliminating Article 18(b) is not described in the Monterey Agreement. However, once the agriculture first shortage provision was eliminated, it would no longer be needed to protect agricultural water users from excessive shortages. With the elimination of the agricultural first shortage provisions, it no longer mattered whether a shortage was a temporary one or a permanent one, since the allocation of the available supply would be the same in either situation."

That explanation does not intelligibly explain why the area of origin recognition and protection was eliminated. While the area of origin contractor's paramount rights are recognized in Article 18, subdivision *(c)*, that recognition is in an entirely different context than in subdivision *(b)*. For example, subdivision (c) relates to the situation whether an area of origin contract causes a permanent shortage in SWP supplies whereas subdivision (b) refers to "any" cause which "threatens" a permanent shortage. 6-3

While, again, the reason for such elimination is unclear, such elimination would appear to be contrary to the Watershed Protection Act. The Watershed Protection Act is a direct limitation of the powers of the Department and specially states that the Department "shall not" deprive area of origin water users their prior right to SWP water. (Wat. Code, § 11460.) It further provides in Water Code section 11461 that "[i]n no other way than by purchase or otherwise as provided in this part shall water rights of a watershed . . . be impaired or curtailed by the department . . . ."

In the DEIR's future as well as historic analysis of the proposed project, it appears the area of origin contractors water rights were *not* given a priority. Instead, their allocations of SWP water were proportionally cut back to the same extent as non-area of origin contractors. Such historical and future disregard for their priority appears to be contrary to the Watershed Protection Act. Even if the area of origin contractors were agreeable to giving up their priority, it is not clear that they have such ability nor is it clear that such priority was given up pursuant to the proper procedures (see e.g., Wat. Code, § 11461).

Among other considerations, the DEIR should thoroughly explain (1) the ramifications of the elimination of subdivision (b) so that the potential environmental impacts from such elimination can be thoroughly and meaningfully investigated and discussed; and (2) the reasons

why area of origin contractors are not always receiving 100% of their requested supplies and whether the proposed project which seeks to continue depriving such contractors 100% of their requested supplies is legal and, hence, feasible.

6-3 (con't.)

c. **Transfer of the Kern Fan Element.**

The DEIR states at page 4-7:

"The Monterey Amendment added Article 52 to the long-term water supply contracts. Article 52 required the Department to convey the KFE property including all fixtures to KCWA. In addition, as part of the ongoing development of groundwater banking programs during the 1980s/1990s, the Department had stored SWP water as part of the Berrenda Mesa Demonstration Program and had acquired groundwater for the SWP through the La Hacienda Water Purchase Program. Article 52 also required that one-half of such water in these two programs be relinquished to KCWA. Article 52 also provides that, subject to KCWA approval, other SWP contractors may be provided access to, and use of the property, for groundwater storage and later recovery for delivery to their service are as."

6-4

Water Code section 11464 provides:

"No water right, reservoir, conduit, or facility for the generation, production, transmission, or distribution of electric power, acquired by the department shall ever be sold, granted, or conveyed by the department so that the department thereby is divested of the title to and ownership of it."

Thus far, the DEIR has failed to explain how Article 52, and each of its various aspects, are consistent with Water Code section 11464. On its face, it appears that the Department has indeed "divested [itself] of the title to and ownership of" items which section 11464 expressly prohibits it from so divesting.

2. **Project Description**.

As noted above with regard to Article 18(b), the DEIR has failed to adequately explain why the various changes to the Department's allocation of Table A Water and Article 21 Water pursuant to the proposed project were ultimately sought by the Department and the contractors. Without a full disclosure of the underlying basis and rationale for such changes neither the public nor the decision makers have been provided with the information necessary to fully understand the potential ramifications of such amendments, environmentally or otherwise (e.g., in connection with feasibility considerations), nor can the public or decision makers meaningfully determine whether the lead agency "has, in fact, analyzed and considered the [full] ecological implications of its actions." (Guidelines, § 15003, subd. (d).)

6-5

Accordingly, the DEIR should be redrafted with such information and recirculated to afford the public a meaningful opportunity to comment on such information. 6-5 (con't.)

3. **Fishery Impacts.**

The DEIR at page 7.3-69 states:

> "Based on the analysis, increased future pumping due to the proposed project under 2020 conditions could change Delta flow patterns, disrupt movement of species of fish, and increase entrainment losses of adult delta smelt, longfin smelt, splitail, striped bass, and salmonid smolts."

A few pages later, at page 7.3-71, the DEIR states:

> "As compared to baseline conditions, potential exists for the proposed project to have an adverse impact on Delta fish species by increasing salvage at the Skinner facility as a result of higher pumping at Banks during certain periods when San Luis Reservoir would otherwise be full. This impact is *potentially significant*."

The DEIR should clarify precisely what species it believes may be subject to potentially significant impacts. The DEIR should also clarify precisely what are the sources of such potentially significant impacts, i.e., is the source solely "increased salvage" or do the proposed project's "change[s in] Delta flow patterns" and "disrupt[ions of] movement of species of fish" also constitute potentially significant impacts? 6-6

Moreover, with regard to the DEIR's conclusions of the proposed project's impacts on fishery species, the DEIR should discuss the SWRCB's finding in its 1978 Water Right Decision, Decision 1485, at page 13, wherein it stated:

> "To provide full mitigation of project impacts on all fishery species now would require the virtual shutting down of the project export pumps."

In particular, the DEIR should discuss what has changed since the SWRCB's 1978 Decision 1485 which would lead them to fairly conclude that, at the present time and into the future, not only are the SWP's existing levels of export pumping not detrimental to any fishery species, but neither are the proposed increases in such pumping pursuant to the proposed project.

a. **Mitigation of Fishery Impacts.**

The DEIR at page 7.3-71 states: 6-7

> "Implementation of the following mitigation measures in combination with environmental programs already in place or forthcoming that are relevant to the

SWP would reduce this impact to a *less than significant level.*"

(Underscoring added.)

First, as noted above, the DEIR must clearly specify precisely what species this mitigation measure is intended to apply to and precisely what impacts it is intended to reduce to a less than significant level.

Second, CEQA requires that mitigation measures "must be fully enforceable through permit conditions, agreements, or other legally-binding instruments." (CEQA Guidelines, § 15126.4(a)(2).) The DEIR references and describes eleven (11) "environmental programs either already in place or forthcoming that are relevant to the SWP" which it contends will purportedly help reduce the identified impacts to a less than significant level. To the extent the DEIR is relying on the implementation of all of those program to mitigate the project's impacts on fishery resources, which it apparently is, the DEIR must explain how each of those programs meet the "fully enforceable" criteria.

6-7 (con't.)

To be "fully enforceable" mitigation measures must provide something that can be meaningfully enforced. If increased exports pursuant to the proposed project are contingent on the implementation of each of those programs, then the DEIR must specifically describe what such implementation consists of so that such implementation can be fully enforced.

Moreover, the DEIR's reliance on programs that are "forthcoming" constitutes an improper deferral of mitigation measures. Without knowing the specific actions that result from such programs and without the ability to assess the effectiveness of such actions, such future programs cannot be relied upon to mitigate the impacts at issue. If mitigation of such impacts depends on those programs, then the proposed project is not ripe for approval and must await the development and implementation of such programs and the evaluation of their effectiveness at mitigating those impacts.

With regard to the DEIR's mitigation measure which it adds to the above-referenced programs, the DEIR describes that measure as follows on page 7.3-72:

> "The Department shall implement operational assets that could be deployed through a continuation of the EWA, through an equivalent type of program, or through another program that would replace the EWA and provide the fish protection required by the court and the Biological Opinions on delta smelt and Chinook salmon that would limit any adverse impact resulting from the proposed project on special status Delta fish species as a result of higher pumping at Banks during periods when San Luis Reservoir, absent of the proposed project, would be full."

6-8

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This mitigation measures suffers from the same problems as the above-referenced programs. For starters the EWA has not yet been approved for 2008 and beyond, hence, reliance on the EWA is unwarranted. Reliance on a program that is equivalent to the EWA or "through another program" is inadequate, among other reasons, because such a program does not yet exist, is not yet defined and, needless to say, its ability to mitigate (or contribution to the mitigation of) the impacts to a less than significant level has not been demonstrated. To the extent the DEIR is relying on this mitigation measure, the proposed project is clearly not ripe for approval. Neither the decision makers, nor the public, can fairly conclude or be assured that the proposed project's impacts on fishery reasons will be effectively mitigated to a less than significant level.

This mitigation measure, as well as the other above-referenced programs, also lack any meaningful performance standards. It is not clear precisely what the DEIR preparers believe will constitute effective mitigation. For example, precisely how much impairment to the fishery resources does the DEIR believe is acceptable and would constitute a "less than significant level" of impairment? Without providing any answer to that question, the effectiveness of the proposed, or any other, mitigation measures cannot be meaningfully evaluated nor can they be meaningfully enforced.

6-8 (con't.)

For similar reasons, reliance on the yet-to-be-developed Biological Opinions, potential purchases of water from Yuba County Water Agency and any other mitigation measure that may or may not be brought into fruition and may or may not effectively mitigate the project's impacts, cannot be fairly relied upon to mitigate the project's impacts on fishery resources. If the decision makers ultimately desire to increase exports from the Delta, it is clear that any such increase would be highly premature at this time and should await the development, implementation and evaluation of the effectiveness of all of those future events which this DEIR is relying on to address the impacts from such increases.

4. **Alternative Analysis.**

CEQA Guidelines section 15126.6, subdivision (a), provides:

> "An EIR shall describe a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project, and evaluate the comparative merits of the alternatives."

6-9

While "there is no ironclad rule governing the nature or scope of the alternatives to be discussed in an EIR, other than the rule of reason" (Citizens of Goleta Valley v. Board of Supervisors (1990) 52 Cal.3d 553, 576), the mandatory "range" is not just any range, it must be an objectively "reasonable" range. (Id., p. 566.)

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The instant "range" of alternatives in the DEIR is not objectively reasonable. While the instant range purports to consist of a single alternative, i.e., "Alternative 5," by the DEIR's own admission that alternative does not meet both criteria in Guidelines section 15126.6, subdivision (a). As the DEIR explains at page 11-3: "None of the alternatives suggested met all the screening criteria but one alternative ["Alternative 5"] was [nevertheless] selected for detailed analysis."

If the DEIR is relying on the various "no project" alternatives to supply the mandatory range of alternatives to the proposed project, such reliance is misplaced. "No project" alternatives are *in addition* to the alternatives in the reasonable range and, by definition, do not meet most of the basic objectives of the project. (See Guidelines, § 15126.6, subd. (e).)

The purpose of the mandatory range of alternatives is to present the decision makers as well as the public with a genuine "choice" among alternative courses of action which the decision makers could ultimately choose. To make that choice meaningful, such alternatives must be capable of meeting most of the projects' basic objectives, otherwise such alternatives would be dead on arrival and have no chance of actually being adopted.

There is a fundamental problem with CEQA when the DEIR preparers conclude that neither they nor the public have come up with any alternatives to the proposed project that have to the potential to feasibly meet most of the projects' basic objectives. In such a case, it is clear that the projects' basic objectives are either far too narrowly defined or are being far too narrowly interpreted. In either case, CEQA's mandatory alternative analysis is substantially thwarted.

6-9 (con't.)

The DEIR states at page 11-34:

> "There are doubts about the institutional feasibility of Alternative 5 because the Monterey Amendment was approved as an integrated package of amendments to the long-term water supply contracts that balanced the interests of the signatories in an acceptable manner. If some elements of the package were removed it is unlikely that it would acceptable to all signatories."

The forgoing statement is unacceptable under CEQA. The forgoing statement evidences a take-it-or-leave it approach and completely undermines CEQA's alternative analysis, as well as CEQA as a whole.

It is contrary to CEQA to structure a proposed project such that anything other than the proposed project would "unlikely" be deemed feasible. To avoid such a structuring, CEQA requires that all projects have one or more "basic" objectives. And, as noted above, those objectives cannot be defined so narrowly that only one course of action can be said to fairly meet that objective or most of those objectives.

///

To the DEIR preparers' credit, the DEIR does provide some basic objectives of the project and defines them in a manner that gives rise to a broad variety of alternative courses of action which could meet most of those objectives. (See DEIR, pp. 4.1 & 4.2.) Where the DEIR preparers fall fundamentally astray is when they fail to use those basic objectives to screen proposed alternatives for inclusion in the EIR's mandatory range and, instead, seemingly use *the proposed project itself* as a basis for screening such alternatives with the absurd result that anything other than the proposed project is "unlikely" to meet most of those basic objectives.

6-9 (con't.)

Moreover, the DEIR's statement that the Monterey Amendment and the Settlement Agreement were "package deal[s] of negotiated concessions that required achieving *all* of the [project's basic] objectives" (DEIR, p. 4-1 & 4-2), does not, and cannot under CEQA, mean that to be eligible for inclusion in the EIR's mandatory range of alternatives, every other proposed course of action must likewise meet "all" of the those objectives. To the contrary, CEQA makes it clear that such alternatives need only meet "most" of those objectives. (See e.g., Guidelines, § 15126.6, subd. (a).)

The proposed project involves the cardinal sin of CEQA, i.e., it involves the locking-in-place of a proposed course of action *prior to* the environmental review of that action. CEQA is premised on the fact that a proposed course of action may very well be altered when it is feasible to do so for the sake of the environment. If it is determined at the outset, as it seemingly was in this case, that any deviation from the proposed project will be deemed infeasible, then the entirety of the CEQA process has be fundamentally undermined.

This error cannot be easily cured since it suggests in reality that the project proponents are indeed committed to the notion that there is no meaningful flexibility in what they have proposed regardless of the environmental impacts of the proposal. They are essentially stating that no matter what those impacts are, we have already negotiated the details of the proposed project and anything other than the implementation of each and everyone of those details will be deemed infeasible. Such is a fatal flaw under CEQA which infects the entirety of the DEIR and public EIR process as a whole.

6-10

While it is seemingly clear, based on the forgoing, that the decision makers will reject any alternative other than the proposed project, assuming that such reality can be ignored, the DEIR must include a reasonable "range" of alternatives that meet the two criteria in Guidelines section 15126.6, subdivision (a). As noted above, so far, the DEIR has zero alternatives in that range.

Since none of the project's basic objectives is to "increase" total annual SWP exports from the Delta (and, even if there was such an objective, alternatives need only meet "most" of the objectives and not "all" of them), there should be at least one alternative which is designed to not increase and/or designed to reduce such total annual exports. While Alternative 5 may have that effect as a result of eliminating the various "water supply management practices" (DEIR, p. 11-3), the DEIR has essentially stated that such elimination would be infeasible. (See e.g., DEIR, p. 11-34.)

If the entire elimination of those management practices will render the alternative infeasible, then the DEIR preparers should in good faith develop a "reduced or non-increased" export alternative that *can* feasibly meet at least most of the project's basic objectives. For example, any additional exports pursuant to such management practices could be offset by reductions at other times so as to ensure there is no net increase in annual exports from the Delta. If the DEIR preparers so choose, such an alternative could be designed such that any such offsets are themselves offset by increases in non-Delta water supplies to the areas experiencing a reduction in export supplies pursuant to such an alternative.

In light of the well-recognized problems associated with exports, and, in particular, in light of the DEIR's finding that increased exports will have a potentially significant impact on fishery resources, it is unacceptable and "unreasonable" for the EIR's range of alternatives to not include such a potentially feasible "reduced or non-increased" export alternative. It is not only an obvious alternative but one that could actually help, rather than exacerbate, the problems within the Delta and the Delta Watershed while also helping to meet the water needs of project proponents. It is also likely to be the only alternative that is *legally* feasible in light of the Watershed Protection Act and Delta Protection Act discussed above.

6-10 (con't.)

In the end, given the relatively broad objectives of the proposed project, the EIR's range should be comprised of at least a handful of good faith and meaningful alternatives to the proposed project. That range should provide a sufficient variety of courses of action to allow for a "reasoned choice" among them and "to foster meaningful public participation and informed decision making." (Guidelines, § 15126.6, subd. (f).)

Finally, for each of the suggested alternatives which were rejected for inclusion in the EIR's mandatory range, the DEIR should explain in more detail why such alternatives do not have at least the "potential" to feasibly attain "most" of the project's basic objectives listed on pages 4.1 and 4.2. (Guidelines, § 15126.6, subd. (a).) Each of those particular objectives should be discussed for each of those alternatives. The DEIR should further explain what it deems to constitute "most" of those objectives. For any alternative that the DEIR preparers believe cannot feasibly meet most of those objectives, the DEIR should explain why such alternatives could not be restructured or combined with other features, etc. such that they do have the potential to feasibly meet most of those objectives.

5. **Impact Analysis**:

a. **Surface Water Hydrology, Water Quality and Water Supply.**

6-11

The DEIR should more clearly discuss whether the various analyses of the proposed projects' impacts assumed full compliance with the southern delta "interior" agricultural salinity standards. (See DEIR, p. 7.1-25.) One or more of such standards were violated in 2007. (See attached letter from the SWRCB to DWR dated November 28, 2007.) If full compliance is not anticipated, then, the DEIR should discuss methods by which the SWP could facilitate the release

of previously exported water to the San Joaquin River from San Luis Reservoir or otherwise to help meet those standards since the SWP's right to export water from the Delta is contingent on compliance with such standards pursuant to its water right permits (as well as other laws). 6-11 (con't.)

b. **Water Levels in the South Delta.** 6-12

It does not appear that the DEIR considered the proposed project's impacts on water *levels* in the southern Delta. Since water levels have been a historic and ongoing problem, the proposed project's potential to exacerbate such levels should be thoroughly discussed.

c. **Growth-Inducing Impacts:** 6-13

At page 8-6, the DEIR states:

"The Monterey Amendment and Settlement Agreement would not be expected to have any effect on natural increase or net migration to the State and thus would have no effect on statewide population."

The DEIR should provide facts and analysis to support that conclusion, especially with regard to net migration to the State.

The DEIR concludes that the proposed project "could support additional [population] growth" and that "[i]ncreases in population can result in new development that causes adverse impacts to the environment." (DEIR, pp. 8-14 & 8-15.) The DEIR then states, "This study concludes that some of the impacts are potentially significant and cannot be avoided." The DEIR has failed to adequately explain why such impacts "cannot be avoided." For example, why are there no potentially feasible mitigation measures or alternatives that could avoid such impacts or lessen them to a less than significant level? 6-14

Since alternatives need only meet "most" of the project's basic objectives, even if supporting population growth was one of the objectives, which it plainly is not, the DEIR must thoroughly explain why such population could not be lessened or avoided by an alternative that lessens or avoids such impacts while still meeting at least "most" of the project's basic objectives.

Moreover, at page ES-7, the DEIR states: 6-15

"Neither the Department nor the contractors make local decisions regarding growth or where it will occur. Cities and counties in the contractors' service areas affected by the increased population are responsible for considering the environmental effects of their growth and land use decisions. Therefore, mitigation measures of these impacts are subject to local agencies decision making."

To the extent the DEIR is suggesting that the consideration of mitigation measures and alternatives to mitigate the proposed projects' growth-inducing impacts is the responsibility of local agencies and not the lead agencies for the proposed project, the DEIR is mistaken. Whether and to what extent such impacts will occur directly depend on what course of action is chosen by the decision makers to meet most of the basic objectives of the project, and, accordingly, the mitigation of such impacts is the direct responsibility of the lead agencies preparing this DEIR. Furthermore, the Department and the contractors obviously *do* have substantial control over "where [growth] will occur." They can amend the contracts in any number of ways to avoid or minimize such project-induced growth or even direct the locations, generally or otherwise, to which such growth can occur.

6-15 (con't.)

d. **Reliability of Water Supplies and Growth.**

At page 9-11, the DEIR states:

> "Table A amounts now serve primarily as a way of allocating certain SWP costs and water shortages and surplus among the contractors. Reducing the Table A amount through invocation of Article 18(b) is not relevant given current day operations and planning based on water delivery reliability curves."

There is obviously a reason why the project proponents do not want to reduce the Table A amounts through invocation of Article 18(b), however, the DEIR has failed to adequately disclose that reason. Among other things, DEIR should explain why the "allocati[on] of certain SWP costs and water shortages and surplus among the contractors" cannot be effectively accomplished with a reduction in the Table A amounts through invocation of 18(b).

6-16

Without a thorough disclosure and understanding of why each of the amendments to the contracts are sought, neither the public nor the decision makers have been provided with the information necessary to fully understand the potential ramifications of such amendments, environmentally or otherwise (e.g., in connection with feasibility considerations) and to be assured that the lead agency "has, in fact, analyzed and considered the ecological implications of its actions." (Guidelines, § 15003, subd. (d).)

e. **Cumulative Environmental Impacts:**

At page 10.1-21, the DEIR states:

> ""No significance determination was made with respect to cumulative flow changes in the Sacramento and Feather rivers or for the flow changes produced by the proposed project. However, the proposed project's contribution to flow changes would not be considerable."

6-17

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"No significance determination was made with respect to cumulative flow changes in the Delta or for the flow changes in the Delta produced by the proposed project. However, the proposed project's contribution to flow in the Delta would not be cumulatively considerable."

6-17 (con't.)

The DEIR fails to explain why no such significance determinations were made. Making such determinations is the very purpose of CEQA's mandatory cumulative analysis. (Moreover the conclusion with regard to the flow changes in the Sacramento and Feather rivers is not the correct conclusion. It should be "would not be *cumulatively* considerable" if that is what the DEIR so concludes.)

i. **Growth-Inducement**:

At page 10.1-52, the DEIR states:

"The additional water supply that would be made available by cumulative water development projects, including the proposed project, would support projected state-wide population growth. . . . [¶] Increases in population can result in new development that causes adverse impacts to the environment. This discussion concludes that some of the impacts are potentially significant and cannot be avoided."

6-18

As with the *individual* growth inducing impacts discussed above, the DEIR has likewise failed to adequately explain why such *cumulative* impacts "cannot be avoided." (See above discussion of individual growth inducing impacts.)

f. **Significant and Unavoidable Impacts:**

At page 10.2-1, the DEIR states:

"These impacts are unavoidable because it has been determined that either no mitigation, or only partial mitigation, is feasible."

While the DEIR has not adequately explained why these impacts cannot be fully avoided or lessened via the implementation of mitigation measures, the DEIR appears to have overlooked the potential to avoid or substantially lessen such impacts via *alternative courses of action* to the proposed project as opposed to the implementation of such measures. As noted above, alternatives need not meet all of the projects basic objectives, only "most" of them. Accordingly, the DEIR must thoroughly explain with facts and analysis why each one of those "unavoidable" impacts cannot be at least lessened to a level of insignificance by any alternative design of the proposed project that still meeting most of the project's basic objectives.

6-19

Moreover, the DEIR has failed to explain and demonstrate that such impacts have been

lessened to the maximum extent feasible via mitigation measures and/or alternatives even if such lessening does not lessen them to a level of insignificance.

6-19 (con't.)

6. **Project Verus Program Analysis.**

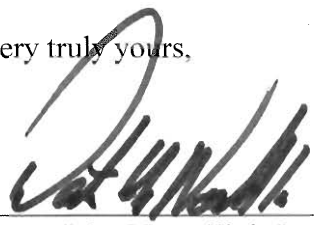
The DEIR at page 1-1 states that "[t]his EIR serves as both a Project EIR and a Program EIR under CEQA." To avoid any confusion as to what actions the lead agencies, and ultimately the decision makers, believe are 100% covered by this EIR and require no further CEQA review, the DEIR should describe all of those actions in detail. Elsewhere, the DEIR readily acknowledges that various transfers of "Table A amounts" and other actions will result in various local impacts, from growth inducement or otherwise. Accordingly, it is not yet clear which, if any, of the various actions set forth in Chapter 4 or elsewhere, are deemed to be 100% covered by this EIR.

6-20

7. **Conclusion.**

Thank you for your consideration of these comments.

Very truly yours,



Dante John Nomellini, Jr.
Attorney for the Central Delta Water Agency

DJR/djr
Enclosure

LETTER 6

State Water Resources Control Board

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MEMORANDUM

TO: Gerald E. Johns, Deputy Director
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FROM: Dorothy Rice
Executive Director
EXECUTIVE OFFICE

DATE: NOV 28 2007

SUBJECT: SOUTHERN DELTA WATER QUALITY OBJECTIVES FOR AGRICULTURAL USES AND JOINT POINTS OF DIVERSION

This memorandum responds to your memorandum to Victoria A. Whitney, Chief of the State Water Resources Control Board's (State Water Board) Division of Water Rights, dated September 11, 2007, regarding use of Joint Points of Diversion (JPOD) while exceedances of the interior southern Delta salinity objectives were occurring this past irrigation season.

Regarding the exceedances of the salinity objectives, I have reviewed the information that the Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (USBR) have submitted regarding actions that were taken to attempt to meet the objectives this year, including modified operations of the temporary southern Delta agricultural barriers and recirculation activities. Based on this information and the dry conditions in the San Joaquin River basin this year, I will not recommend that the State Water Board take enforcement action at this time. This in no way implies that I will not recommend, or that the State Water Board will not consider, enforcement action in future years. Accordingly, DWR should take all reasonable actions to attempt to meet the interior southern Delta salinity objectives in the future. The State Water Board will continue to review the southern Delta salinity objectives and their implementation to determine what if any changes should be made to either. The State Water Board appreciates DWR's support with this effort and will continue to coordinate regarding needed assistance.

Regarding use of JPOD, you indicate that you believe that State Water Board Decision 1641 (D-1641) authorizes DWR and USBR to utilize JPOD when the interior southern Delta salinity objectives are being exceeded if the exceedances are beyond the reasonable control of DWR or USBR. You cite State Water Board Executive Director Celeste Cantu's letter of October 13, 2006, to support your conclusions. However, as stated in Ms. Whitney's August 21, 2007

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letter, D-1641 and Order WR 2006-0006 only allow USBR and DWR to conduct JPOD diversions if they are, at the time of diversion, in compliance with all of the conditions of their water right permits and license, including meeting the salinity objectives at the interior southern Delta stations. Ms. Cantu's letter in no way changes those requirements.

Of course, DWR and USBR may petition the State Water Board to change the permit and license requirements applicable to their use of JPOD. If DWR or USBR are considering submitting such a change petition, I suggest that they submit it as soon as possible to assure that the matter can be considered prior to any need for JPOD diversions next year. The State Water Board will then consider the petition and determine whether to modify DWR's and USBR's permit/license conditions.

If you have any questions or would like to discuss this matter further, please contact Diane Riddle; the Environmental Scientist assigned to this issue, at (916) 341-5297 or Erin Mahaney, Senior Staff Counsel, at (916) 341-5187.

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Mid-Pacific Regional Office
Bureau of Reclamation
2800 Cottage Way
Sacramento, CA 95825-1898

LETTER 7

ESTABLISHED IN 1918 AS A PUBLIC AGENCY

COACHELLA VALLEY WATER DISTRICT

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ASST. GENERAL MANAGER
JULIA HERNANDEZ, SECRETARY
DAN PARKS, ASST. TO GENERAL MANAGER
REDWINE AND SHERRILL, ATTORNEYS

January 4, 2008

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
901 P Street
Sacramento, CA 95814

Dear Ms. Brown:

Coachella Valley Water District (CVWD) supports continued implementation of the 1996 Monterey Amendment and commends the Department of Water Resources (DWR) on its thorough preparation of the Monterey Plus Draft Environmental Impact Report (DEIR).

CVWD is one of the 29 public agencies that contract with the state through the DWR for State Water Project water. Our customers are among those who benefit from and help pay the costs of maintaining the State Water Project and the delivery of its water. The Monterey Amendment was a crucial accord between the state and state water contractors to ensure that contracts reflected the reality of operating the State Water Project and changes that had occurred since the agreements were signed in the 1960s.

CVWD concurs with the findings of the DEIR that there have been no significant impacts resulting from the Monterey Amendment between its 1996 adoption and today; and in the future environmental impacts in almost all resource categories are at less-than-significant levels. Where there are exceptions, those are present only within worst-case scenarios, are unlikely to occur or, in the case of some future projects, will be addressed in future CEQA review. 7-1

The Monterey Amendment continues to be vital to the ability of State Water Contractors to delivery water to millions of residents and businesses and hundreds of thousands of acres of farmland. The accord settled disputes regarding allocations, gave contractors greater flexibility in managing limited State Water Project supplies and helped to stabilize water rates and increase the availability of funds for development of local conservation, recycling, conjunctive use and other management programs.

The flexibility given to contractors because of this agreement helped the state weather recent drought conditions much more effectively than was possible in the early 1990s, before the accord was in place.

Again, CVWD applauds your efforts ands those of your staff and the other public and private agencies and organizations that have worked so tirelessly on developing this DEIR.

Yours very truly,

Steve Robbins,
General Manager-Chief Engineer

cc: SWC, ACWA, CMUA

LETTER 8

CONTRA COSTA WATER DISTRICT

1331 Concord Avenue
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Concord, CA 94524
(925) 688-8000 FAX (925) 688-8122

January 14, 2008

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Karl L. Wandry

Walter J. Bishop
General Manager

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
3251 S Street
Sacramento, CA 95816

Subject: Monterey Amendment to the State Water Project Contracts Draft EIR

Dear Ms. Brown:

Contra Costa Water District (CCWD) appreciates this opportunity to comment on the October 2007 draft Environmental Impact Report (EIR) for the proposed Monterey Amendment to the State Water Project Contracts.

In comments submitted in response to the Notice of Preparation for the EIR on February 24, 2003, CCWD requested water quality at each of CCWD's three intakes be examined for impacts. However, the EIR analysis does not examine Delta water quality beyond the measures incorporated in the modeling to meet water quality standards. As recognized by the State Water Resources Control Board, "significant water quality degradation can occur in the absence of standards violations"[1]. The impacts of any water quality degradation should be evaluated in the EIR. 8-1

Additionally, we would like to clarify the characterization of CCWD diversions in the EIR. The 190,000 acre-feet per year cited in the EIR[2] as average annual CCWD ***diversions*** is actually average annual CCWD service area ***demand***, based on CCWD's 1998 Future Water Supply Implementation EIR. CCWD diversions are less than total demand due to improved water use efficiency and use of other water sources, such as recycled water and groundwater. While there is no material effect on the EIR analyses, the text should be modified to accurately reflect CCWD operations. 8-2

If you have any questions regarding CCWD's comments, please call me at (925) 688-8083.

Sincerely,

Leah Orloff
Senior Water Resources Specialist

[1] See attached July 28, 2004, letter from Victoria Whitney (State Water Resources Control Board) to Chester Bowling (U.S. Bureau of Reclamation) and Carl A. Torgersen (Department of Water Resources) regarding the Water Quality Response Plan for the operation of the Joint Points of Diversion.
[2] Pages 7.1-9 and 7.1-17

LETTER 8

State Water Resources Control Board

Division of Water Rights
1001 I Street, 14th Floor ♦ Sacramento, California 95814 ♦ 916.341.5300
Mailing Address: P.O. Box 2000 ♦ Sacramento, California 95812-2000
FAX: 916.341.5400 ♦ www.waterrights.ca.gov

Terry Tamminen
Secretary for Environmental Protection

Arnold Schwarzenegger
Governor

July 28, 2004

Chester Bowling, Operations Manager
U.S. Bureau of Reclamation
Central Valley Operations Office
3310 El Camino Ave. Suite 300
Sacramento, CA 95821

Carl A. Torgersen, Chief
SWP Operations Control Office
Department of Water Resources
3310 El Camino Avenue, Suite 300
Sacramento, CA 95821

Dear Mr. Bowling and Mr. Torgersen:

WATER QUALITY RESPONSE PLAN PURSUANT TO DECISION 1641

This letter responds to your letter dated July 1, 2004 submitting the Water Quality Response Plan (WQRP) for Stage 1 and Stage 2 Joint Points of Diversion (JPOD) operations pursuant to State Water Resources Control Board (SWRCB) Decision 1641 (D-1641). Prior to use of each other's points of diversion in the Delta (referred to as JPOD), D-1641 (condition 5 on pages 150 and 151 and condition 5 on page 156) requires the California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (USBR) to develop a response plan with input from Contra Costa Water District (CCWD) that is acceptable to the Chief of the Division of Water Rights (Division). The plan is required to ensure that water quality in the southern and central Delta will not be significantly degraded through operations of JPOD to the injury of water users in the southern and central Delta.

Previously, DWR and USBR (the Projects) submitted a draft of the WQRP for my approval. However, I did not approve that plan because there was inadequate information concerning the potential impacts on water quality related to JPOD diversions and CCWD and the Projects disagreed concerning whether the previous plan provided adequate protection. By letter dated March 19, 2004, I requested that you conduct modeling analyses to determine the impacts on water quality at CCWD's intakes related to JPOD at times when CCWD is authorized to divert water under its own water rights. I asked that you analyze potential impacts by comparing hydrological conditions absent JPOD under SWRCB Decision 1485 (D-1485) criteria to conditions that occur with JPOD under SWRCB Decision 1641 (D-1641) criteria. I directed you to use the information derived from the modeling to prepare a draft WQRP with recommendations to the SWRCB regarding whether any modeled impacts would be significant and suggesting appropriate mitigation for any potentially significant water quality impacts. I indicated that the Projects are not required to propose mitigation for impacts that may occur to

water quality when CCWD is diverting under its Central Valley Project (CVP) contract or rediverting transferred water, as long as the water quality objectives will be met.

Pursuant to my request you prepared modeling of potential water quality impacts and a WQRP. You state that in most cases, the modeling analyses show water quality conditions under D-1641 with JPOD to be better than conditions under D-1485 without JPOD. You state that in a few instances where a rise in salinity occurs, it is only slight or it does not raise the salinity to a level that makes the water unusable to CCWD. You point out that salinity remains well below the water quality objectives for municipal and industrial uses contained in D-1641. As a result, you state that any possible increases in salinity resulting from JPOD do not meet the criteria for injury under the Water Code.

The WQRP includes four basic conditions similar to conditions included in the previous plan. The first condition states that DWR and USBR will meet water quality objectives (included in D-1641 and required by their permits) for western Delta agricultural beneficial uses, and for Delta municipal and industrial (M&I) beneficial uses "assuring that no change in water quality will rise to the level that would cause injury to water users in the southern and central Delta." The second condition states that DWR and USBR will assess carriage water costs to third parties for water transfers in order to maintain water quality objectives included in D-1641 and to protect DWR's and USBR's water supplies. The Projects note that during JPOD operations, DWR and USBR supply the carriage water to meet any additional water costs associated with JPOD diversions. The third condition states that DWR will provide CCWD with seasonal forecasts of JPOD operations and water transfers. The fourth condition states that DWR and USBR will meet with CCWD to determine the extent to which the quantities of water diverted to CCWD pursuant to its CVP contract should be adjusted to compensate CCWD for any changes in allowable diversions related to changes from excess to balanced[1] conditions related to JPOD diversions[2].

CCWD provided comments on May 26, 2004 based on a draft of the WQRP. In your letter, you address those comments. You state that some of the changes suggested by CCWD were made, while others were not. Following submission of the final WQRP, CCWD provided additional comments by letter dated July 23, 2004 in addition to an analysis requested by SWRCB staff of how changes in salinity affect CCWD's operations. Following is a discussion of the positions held by the Projects and CCWD.

---

[1] Balanced water conditions means periods when DWR and USBR agree that releases from upstream reservoirs plus unregulated flow approximately equal the water supply needed to meet Sacramento Valley inbasin uses, plus exports. Excess water conditions means periods when DWR and USBR agree that releases from upstream reservoirs plus unregulated flow exceed Sacramento Valley inbasin uses, plus exports (i.e., additional water is available in the system).

[2] CCWD is not authorized to divert water under its own water rights during balanced conditions.

Chester Bowling
Carl L. Torgersen

July 28, 2004

CCWD requests that the first condition of the WQRP be modified to acknowledge that water quality impacts may occur even when the Projects are meeting the water quality objectives. CCWD suggests the language be changed as follows:

> *Reclamation and the Department will meet D-1641 standards required by their water right permits for western Delta agricultural beneficial uses and for Delta municipal and industrial beneficial uses AND WILL ASSURE ~~assuring~~ that no change in water quality will rise to the level that would cause injury to water users in the southern and central Delta.*

In addition, CCWD requests that the following condition be added to the WQRP:

> *Prior to using JPOD during excess conditions when CCWD's Los Vaqueros water rights permit conditions are met, the Projects will provide modeling results to CCWD and consult with CCWD regarding operational changes to ensure impacts are avoided.*

The Projects disagree with CCWD's claim that JPOD will degrade water quality significantly to the point of injury. The Projects argue that beneficial use objectives are the measure for determining if water quality is adequate for the intended beneficial use. The Projects state that because the M&I water quality objectives will be met during JPOD operations, and because CCWD is an M&I water user, it will not be injured. CCWD argues that it may be injured even if water quality objectives are met. The Projects state that to accept this claim would in essence create a new water quality objective in the Delta for CCWD's rights.

CCWD's water rights are senior in priority to approval of JPOD. Consequently, DWR and USBR are responsible for preventing significant degradation to the quality of water diverted by CCWD under its own water rights. As I stated in my letter of March 19, 2004, significant degradation of water quality may occur in the absence of violation of water quality objectives in cases where the degradation impairs a senior water right of water of a usable quality. CCWD claims that any degradation in water quality impairs its ability to divert and use water under its water rights. CCWD may reasonably expect to receive a water quality similar to what existed under the regulatory conditions that existed when CCWD obtained its water right permits from the SWRCB. At that time, DWR and USBR were required to operate their projects pursuant to D-1485 requirements. Consequently, impacts to CCWD's water rights may occur if use of JPOD pursuant to D-1641 causes average annual degradation in water quality below that which would have occurred under D-1485 without JPOD. Whether or not these impacts are considered significant depends upon how the change in water quality affects CCWD's operations.

As requested by SWRCB staff, CCWD provided an analysis concerning the effects of changes in water quality on CCWD's operations. CCWD states that average year round increases in chloride levels of 0.4 mg/l, 0.5 mg/l, and 3.2 mg/l would result in an effective loss of 2,500 acre-feet, 3,000 acre-feet, and 10,000 acre-feet of Los Vaqueros Reservoir storage respectively based on CCWD's own criteria for operations of Los Vaqueros. Modeling conducted by the Projects comparing water quality under D-1485 with water quality under D-1641 with JPOD indicates

that water quality may either improve or worsen on an average annual basis. However, JPOD diversions typically occur at times when CCWD is not authorized to divert under its Los Vaqueros water rights. Consequently, potential impacts to CCWD resulting from JPOD are infrequent.

In addition to CCWD's claim that it may be impacted when it is diverting under its own water rights, CCWD also makes the argument that it has made previously that it should be protected against all significant water quality impacts at its intakes whether CCWD is diverting water under its own water right or its CVP contract. As indicated in my letter of March 19, 2004, DWR and USBR are not required to mitigate for impacts that may occur to water quality when CCWD is diverting under its CVP contract or rediverting transferred water as long as the water quality objectives will be met. This is due to the fact that USBR is the water right holder when CCWD is diverting under its CVP contract and any transferor is the water right holder when transferred water is diverted. Water use by CCWD under these circumstances occurs under a private agreement between CCWD and the parties holding the water rights. As such, CCWD is not entitled to the same protection that it is entitled to when it is diverting under its own water rights. Water quality objectives to protect beneficial uses provide protection for those uses.

In addition to the issues discussed above, South Delta Water Agency (SDWA) also raised water quality concerns associated with JPOD during consideration of the Water Level Response Plan for JPOD. The Projects responded that these concerns were more appropriately addressed in the WQRP. However, because D-1641 does not require the Projects to consult with SDWA regarding the WQRP, the Projects have not yet coordinated with SDWA to address these issues.

Based on the remaining uncertainty regarding potential water quality impacts to members of SDWA, which have not yet been addressed, this plan is only approved until August 1, 2005. This temporary approval is subject to the following terms and conditions to prevent injury to CCWD's water rights and to assess potential injury to SDWA's rights. While I have not included the two changes requested by CCWD as written, I have addressed these issues to the extent appropriate in the following conditions.

1. DWR and USBR shall meet the requirements included in the WQRP dated July 1, 2004 and shall meet the further conditions in this temporary approval. Stage 1 and Stage 2 JPOD diversions pursuant to the July 1, 2004, WQRP are authorized until August 1, 2005. JPOD diversions are not authorized pursuant to this WQRP unless the water quality objectives to protect municipal and industrial beneficial uses, agricultural beneficial uses, and fish and wildlife beneficial uses included in Tables 1, 2, and 3 of D-1641 (pages 181 through 184) are being met. Upon violation of any water quality objectives, JPOD diversions shall cease until such time as the water quality objectives are met.

2. Prior to commencing JPOD diversions during excess conditions when CCWD is authorized to divert water under its Los Vaqueros water rights, DWR and USBR shall conduct water

quality modeling to determine annual average potential changes in water quality at CCWD's intakes associated with planned JPOD diversions in comparison to conditions that would have existed under D-1485 conditions. If modeling indicates that there may be an annual average increase in chloride levels as a result of JPOD operations, DWR and USBR shall consult with CCWD to determine whether an agreement may be reached regarding JPOD diversions. If the Projects and CCWD are unable to agree on operations of JPOD, the Projects shall contact the Chief of the Division for a determination regarding required mitigation if any, for potential water quality impacts associated with JPOD diversions. In order to substantiate an allegation of potential harm, CCWD should submit detailed information concerning how the change in chloride levels would impact CCWD's operations (including potential health concerns, treatment costs, blending ability, and availability of water to meet environmental and customer demands).

3. DWR and USBR shall consult with SDWA to determine potential water quality impacts to southern Delta diverters related to Stage 1 and Stage 2 JPOD diversions. Based on that consultation, DWR and USBR shall submit a revised WQRP to the Chief of the Division prior to March 1, 2005 that addresses potential water quality impacts to SDWA's members associated with JPOD diversions.

4. This approval is based on the continuation of the facilities, Clifton Court Forebay (CCF) operational criteria, and regulatory restrictions on exports that exist as of the date of this letter. If facilities, CCF operations or export restrictions change, then DWR and USBR shall consult with the Chief of the Division to determine whether the WQRP requires changes and further approval.

5. I retain continuing authority over my approval of the WQRP for the purpose of requiring changes as needed to meet the conditions in the water rights of the DWR and the USBR on use of Stages 1 and 2 JPOD and to protect the public welfare, protect public trust uses, and prevent waste, unreasonable use, unreasonable method of use, or unreasonable method of diversion of the water involved.

With the above conditions, the proposed WQRP meets the requirements of D-1641 and is approved until August 1, 2005, subject to DWR and USBR meeting the above conditions and the commitments in the WQRP.

If any interested party objects to my decision, the interested party may submit a petition for reconsideration in accordance with Sections 768 and 769 of Title 23 of the California Code of

Chester Bowling
Carl L. Torgersen

July 28, 2004

Regulations. A petition for reconsideration must be submitted in writing within 30 days from the date of this letter to:

Mr. Arthur G. Baggett, Jr., Chair
State Water Resources Control Board
P.O. Box 100
Sacramento, CA 95812-0100

If you have any questions regarding this matter, please contact Diane Riddle, Environmental Scientist, at (916) 341-5297, or Barbara Leidigh, Staff Counsel IV, at 341-5190.

Sincerely,

ORIGINAL SIGNED BY

Victoria A. Whitney
Division Chief

cc: Gregory Gartrell
Contra Costa Water District
P.O. Box H2O
Concord, CA 94524

John Herrick
Alex Hildebrand
South Delta Water Agency
4255 Pacific Avenue, Suite 2
Stockton, CA 95207

Curtis Creel
SWP Operations
Bureau of Reclamation
3310 El Camino Ave., Suite 300
Sacramento, CA 95821

(Continued next page.)

cc: (Continuation page.)

Paul Fujitani

Chester Bowling
Carl L. Torgersen

July 28, 2004

Central Valley Operations
Bureau of Reclamation
3310 El Camino Ave, Suite 300
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Brent L. Graham
General Manager
Tulare Lake Basin Water Storage District
1001 Chase Ave.
Corcoran, CA 93212

bcc: Harry Schueller, Vicky Whitney, Jim Kassel, Gita Kapahi, Barbara Leidigh

DKR:llvl 07/28/04
U:\Herdrv\DRiddle\2004 WQRP approval 2.doc

LETTER 9

DUDLEY RIDGE WATER DISTRICT

DIRECTORS
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LARRY RITCHIE, VICE PRESIDENT
STEVEN D. JACKSON, SECRETARY
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DALE K. MELVILLE
ASSESSOR-COLLECTOR-TREASURER
RICK BESECKER
LEGAL COUNSEL
GARY W. SAWYERS

January 9, 2008

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
901 P Street
Sacramento, CA 95814

Dear Ms. Brown:

This letter is submitted by Dudley Ridge Water District (DRWD), a public agency that contracts with the State of California, through the Department of Water Resources (Department), for water supplies from the State Water Project (SWP), and whose customers pay for and benefit from the water supplies provided by the SWP.

The Department has prepared the Draft Environmental Impact Report on the Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement (Monterey Plus DEIR). The Monterey Plus DEIR re-evaluates the environmental effects of the Monterey Amendments, which have been in operation for over a decade.

The Monterey Amendment amended the 1960s-era SWP contracts between the Department and each of the 29 public agencies that contract with it for SWP supplies. The Monterey Amendment, implemented in 1996, updated a number of contract provisions to reflect the change in real-world conditions that had occurred by that time, and incorporated opportunities for modern, more progressive water management. The Monterey Amendment accomplished a number of significant things, including: 9-1

- **Settled dispute over allocations** – The amended water allocation provisions eliminate the agriculture-first shortage requirement for contract water supplies (i.e., Table A water) as well as the agricultural priority to surplus water, and instead require that all water be allocated in proportion to contractors' contract amounts. In exchange, the agricultural contractors agreed to permanently retire a portion of their contract amounts and permanently transfer an additional portion to urban contractors.

- **Gave contractors more flexibility in managing limited SWP supplies** – The amended water management provisions promote contractor banking of water in underground water storage during wet periods for their later use during dry times, and improve contractor opportunities to get more beneficial use out of existing SWP facilities.

- **Increased rate stability and funding for local investment in water management programs** – The amended financial provisions use contractor money originally committed for additional SWP facilities to instead help contractors stabilize their water rates and increase their funding for local development of water conservation, water recycling, conjunctive use, and other water management programs.

The added flexibility provided by the Monterey Amendment has allowed the SWP contractors to weather the most recent drought without enduring the substantial hardships of the drought of the early 1990s, despite increased water demands that have occurred since that time and increasing pressures on SWP operations.

The Monterey Plus DEIR includes an exhaustive analysis of the environmental effects of the Monterey Amendment and Settlement Agreement. The District feels that the Monterey Plus DEIR, which was drafted with the advisory collaboration of DWR, the State Water Contractors, Planning and Conservation League, Citizens Planning Association of Santa Barbara, and Plumas County Flood Control and Water Conservation District, adequately describes the environmental effects of the Amendment. The analysis in the DEIR shows that:

9-1 (con't.)

- There have been no significant environmental impacts resulting from the Monterey Amendment from 1996 through today.

- Moving into the future, environmental impacts from the Monterey Amendment in almost all resource categories are at less-than-significant levels. Those few areas where potentially significant impacts were identified are for a provision analyzed under a worst-case scenario that is unlikely to ever occur, or for certain future projects that would all be subject to additional, project-level CEQA review.

DRWD supported implementation of the Monterey Amendment in 1996, and supports its continued implementation into the future. DRWD commends the Department for having prepared this thorough and significant document.

Respectfully,

Laura Sales

for Dale K. Melville, Manager-Engineer

cc: Terry Erlewine, State Water Contractors

LETTER 10

150.4

January 14, 2008

Directors:

Fred L. Starrh
President
Division 1

Terry Rogers
Division 2

Peter Frick
Division 3

Michael Radon
Division 4

Adrienne J. Mathews
Division 5

Lawrence P. Gallagher
Vice President
Division 6

Gene A. Lundquist
Division 7

James M. Beck
General Manager

Amelia T. Minaberrigarai
General Counsel

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
901 P Street
Sacramento, CA 95814

Dear Ms. Brown:

The Kern County Water Agency (Agency) is a public agency that contracts with the State of California, through the California Department of Water Resources (DWR), for water supplies from the State Water Project (SWP).

DWR has prepared the Draft Environmental Impact Report on the Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement (Monterey Plus DEIR). The Monterey Plus DEIR re-evaluates the environmental effects of the Monterey Amendments, which have been in operation for over a decade.

The Monterey Amendment amended the 1960s-era SWP contracts between DWR and each of the 29 public agencies that contract with it for SWP supplies. The Monterey Amendment, implemented in 1996, updated a number of contract provisions to reflect the change in real-world conditions that had occurred by that time, and incorporated opportunities for modern, more progressive water management. The Monterey Amendment accomplished a number of significant milestones that: 10-1

- **Settled disputes over allocations** – The amended water allocation provisions eliminate the agriculture-first shortage requirement for contract water supplies (i.e., Table A water) as well as the agricultural priority to surplus water, and instead require that all water be allocated in proportion to the SWP contractors' (Contractors) contract amounts. In exchange, the agricultural contractors agreed to permanently retire a portion of their contract amounts and permanently transfer an additional portion to urban contractors. In addition, all Contractors were given equal priority, based upon their Table A contract amounts, to surplus water when available.

661/634-1400

Mailing Address
P.O. Box 58
Bakersfield, CA 93302-0058

Street Address
3200 Rio Mirada Dr.
Bakersfield, CA 93308

- **Gave contractors more flexibility in managing limited SWP supplies** – The amended water management provisions promote banking of water in underground water storage during wet periods for later use by Contractors during dry times; thus, improving contractor opportunities to get more beneficial use out of existing SWP facilities.

- **Increased rate stability and funding for local investment in water management programs** – The amended financial provisions use Contractor money originally committed for additional SWP facilities to instead help Contractors stabilize their water rates and increase their funding for local development of water conservation, water recycling, conjunctive use, and other water management programs.

The added flexibility provided by the Monterey Amendment has allowed the Contractors to weather the most recent drought without enduring the substantial hardships of the drought of the early 1990s, despite increased water demands that have occurred since that time and increasing pressures on SWP operations.

The Monterey Plus DEIR includes an exhaustive analysis of the environmental effects of the Monterey Amendment and Settlement Agreement. The Agency believes that the Monterey Plus DEIR, which was drafted with the advisory collaboration of DWR, the Contractors, Planning and Conservation League, Citizens Planning Association of Santa Barbara, and Plumas County Flood Control and Water Conservation District, adequately describes the environmental effects of the Amendment. The analysis in the DEIR shows:

10-1 (con't.)

- There have been no significant environmental impacts resulting from the Monterey Amendment from 1996 through today.

- That environmental impacts from the Monterey Amendment in almost all resource categories are at less-than-significant levels. Those few areas where potentially significant impacts were identified are for a provision analyzed under a worst-case scenario that is unlikely to ever occur, or for certain future projects that would be subject to additional, project-level California Environmental Quality Act review.

The Agency supported implementation of the Monterey Amendment in 1996, and supports its continued implementation into the future. The Agency commends DWR for having prepared this thorough and significant document.

If you have any questions regarding this matter, please feel free to contact me at (661) 634-1400 or Curtis Creel of my staff at (661) 634-1414.

Sincerely,

James M. Beck
General Manager

LETTER 11

KERN WATER BANK AUTHORITY

5500 Ming Avenue, Suite 490
Bakersfield, CA 93309

Phone: (661) 398-4900
Fax: (661) 398-4959

January 14, 2008

Via Email (delores@water.ca.gov) and U.S. Mail

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
901 "P" Street
Sacramento, CA 95814

Re: Kern Water Bank Authority Comments on DEIR for Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement (Monterey Plus), by DWR, dated October, 2007. (SCH#: 2003011118)

Dear Ms. Brown:

I. INTRODUCTION

These comments are submitted on behalf of the Kern Water Bank Authority ("KWBA"), a public agency, and its Member Entities,[1] in regard to the Draft Environmental Impact Report entitled "Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement (Monterey Plus)" (hereinafter, "Monterey Plus DEIR" or simply "DEIR"), dated October, 2007, prepared by the Department of Water Resources ("DWR").

11-1

II. BACKGROUND

After execution of the Monterey Amendment, KWBA acquired title to the Kern Water Bank Lands ("KWB Lands") consisting of about 20,000 acres immediately after the lands were acquired by Kern County Water Agency ("KCWA") from DWR. KWBA constructed and began operating and administering a water banking project, known as the "Kern Water Bank," on the KWB Lands under a Habitat Conservation Plan/National Community Conservation Plan ("HCP/NCCP") and other environmental permits (collectively,

[1] KWBA's Member Entities are: Dudley Ridge Water District, Kern County Water Agency – Improvement District No. 4, Semitropic Water Storage District, Tejon-Castac Water District, Westside Mutual Water Company, and Wheeler Ridge-Maricopa Water Storage District.

"Kern Environmental Permits").[2] In 1997, KWBA filed a Notice of Determination ("NOD") for the project based on its Initial Study and Addendum to the Monterey Agreement EIR ("Addendum"), prepared in accordance with CEQA, which evaluated and addressed the potential environmental impacts of the project's construction, operation and administration. The Addendum provides for implementation of various mitigation measures by KWBA including a Memorandum of Understanding ("KWB MOU") entered into on October 26, 1995, between KWBA, its member entities and the following entities adjoining the KWB Lands ("Adjoining Entities"): Buena Vista Water Storage District, Rosedale-Rio Bravo Water Storage District, Kern Delta Water District, Henry Miller Water District and West Kern Water District.[3]

11-1 (con't.)

In 2003, KWBA executed the above-mentioned Settlement Agreement arising out of litigation challenging the Monterey Amendment known as PCL v. DWR. The Settlement Agreement addresses the KWB Lands and various matters related to the Monterey Amendment. With respect to the KWB Lands, the Settlement Agreement provides that KWBA shall retain title to, and operate and administer, the KWB Lands including the Kern Water Bank, but proposes new "Restrictions on Use of KWB Lands" including non-development of about 490 acres otherwise commercially developable under the HCP/NCCP (Sections V.A. & V.B.).[4] The Settlement Agreement provides further that the parties agree

[2] Prior to acquisition by KWBA, the KWB Lands were known as the "Kern Fan Element property," property purchased by DWR for its planned development of the "Kern Fan Element," a proposed groundwater banking project that was a part of a larger proposed groundwater banking project, known as the "Kern Water Bank." (Appendix E, p. 5 fn. 1.) That Kern Water Bank project (not to be confused with KWBA's subsequent Kern Water Bank project) consisted of the Kern Fan Element and several local elements, none of which were developed or implemented. (Id.)

[3] A copy of the NOD, Addendum and KWB MOU are enclosed. Appendix E states, at page 18, that "[t]he overall objective of the KWB MOU parties (KWBA, its Member Entities, and the districts surrounding the property [Adjoining Entities]) is that the '… design, operation and monitoring of the [Kern Water Bank] Project be conducted and coordinated in a manner to insure that the beneficial effects of the Project to the Project Participants [KWBA Member Entities] are maximized but that the Project does not result in significant adverse impacts to water levels, water quality or land subsidence within the boundaries of Adjoining Entities.' " As more fully described in Appendix E, the KWB MOU provides for various measures to protect local water levels and water quality, and provides for the establishment of the Kern Fan Monitoring Committee (consisting of the KWB MOU parties) to oversee project banking operations and review an extensive monitoring program. (Appendix E, pp. 18-19.) The MOU also requires that all disputes concerning operation of the Kern Water Bank project shall first be submitted to the Monitoring Committee for review and analysis and, if not resolved, to arbitration. There are no disputes currently pending before the Monitoring Committee for resolution and no party has ever submitted any dispute to arbitration.

[4] Nothing in these comments is intended to suggest that KWBA's right, title or interest in and to the KWB Lands or the Kern Water Bank is only interim or provisional due to the Settlement Agreement or otherwise. KWBA recognizes that the KWB Lands are covered by the interim implementation order provided for in the Settlement Agreement. However, that does not mean and the Settlement Agreement does not provide, nor was it the intention, that KWBA's title was prior to the Settlement Agreement, is now or will in the future become provisional or interim in the absence of the Settlement Agreement, the order or otherwise. On the other hand, KWBA

not to challenge the Addendum and that the Settlement Agreement shall not affect the continuing effectiveness of the Kern Environmental Permits which include the KWB MOU. (Section III.F.) Rather, the new EIR required by the Settlement Agreement is to include a study of the Kern Water Bank "in light of the Kern Environmental Permits." (Id.)

III. GENERAL COMMENTS

The Monterey Plus DEIR includes an exhaustive analysis of the environmental effects of the Monterey Plus project -- the Monterey Amendment and Settlement Agreement. The DEIR was drafted with the advisory collaboration of DWR, the State Water Contractors, Planning and Conservation League, Citizens Planning Association of Santa Barbara, and Plumas County Flood Control and Water Conservation District. The analysis in the Monterey Plus DEIR concludes, among other things, that:

- There have been no significant environmental effects resulting from implementation of the Monterey Amendment from 1996 to present.

- In particular, transfer of the Kern Water Bank Lands to, and development, operation and administration of the Kern Water Bank by, KWBA did not result in any significant effects on the environment.

- Moving into the future, with KWBA's continued implementation of the mitigation measures as required by the existing CEQA Addendum and HCP/NCCP, further development, operation and administration of the Kern Water Bank will not result in any significant effects on the environment.

KWBA supported implementation of the Monterey Amendment in 1996 and the Settlement Agreement in 2003, and supports their continued implementation into the future. KWBA commends the Department for having prepared this thorough and significant document. Below please find specific comments on matters in the DEIR that KWBA feels are in need of clarification, further explanation and/or revision in connection with preparation the final EIR. In addition, attached as Exhibit "A" hereto are comments of a more technical nature for your consideration. Finally, the State Water Contractors' comments on the DEIR are incorporated herein by this reference.

11-1 (con't.)

IV. SPECIFIC COMMENTS

11-2

A. THE FINAL EIR SHOULD EXPLAIN THAT, IN EXCHANGE FOR THE KWB LANDS, EACH KWBA MEMBER CONTRIBUTED TO THE

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recognizes that the Settlement Agreement provides that the "Restrictions on Use of KWB Lands" (Section V.B.) are interim and will become final only if certain conditions occur as provided in the Settlement Agreement (Section V.F.) (see also, Comment IV.E. below).

RETIREMENT OF 45,000 ACRE-FEET OF AGRICULTURAL TABLE A AMOUNTS

The DEIR explains that Article 52 of the Monterey Amendment provided for transfer of the Kern Fan Element property (DEIR, § 4.4.3). The DEIR explains that Article 53 required Kern County Water Agency ("KCWA") and Dudley Ridge Water District ("Dudley Ridge WD"), both agricultural contractors, to collectively permanently retire 45,000 acre-feet of Table A amount (DEIR, § 4.4.2). The DEIR on page 4-7 (the 2nd sentence of the 1st paragraph) states that Article 52 of the Monterey Amendment required the Department to convey the Kern Fan Element property to KCWA without any explanation why. To be more accurate and more complete, the final EIR should include the following two statements where appropriate.

First, the final EIR should include a statement to the effect that the transfer of the KFE property was "in exchange for" the retirement of the 45,000 acre-feet.

Principle 3 of the Monterey Agreement – Statement of Principles between the State Water Contractors and DWR, dated December 1, 1994 ("Monterey Agreement") (enclosed), later implemented by the Monterey Amendment[5], states:

> "The Kern Fan Element property …will be sold…to designated Ag Contractors. In exchange, 45,000 acre-feet of Ag water entitlements will be transferred to DWR and retired." (Emphasis added.) (Monterey Agreement, p. 2, ¶ 3.)

11-2 (con't.)

Consistently, the "Agreement for the Exchange of the Kern Fan Element of the Kern Water Bank by and between The Department of Water Resources of the State of California and Kern County Water Agency, dated December 13, 1995," ("Exchange Agreement") on file with DWR, states:

> "Article 52 of the Monterey Amendments provides that the Department of Water Resources shall convey to agricultural contractors, which includes the Kern County Water Agency, the Property which constitutes the Kern Fan Element of the Kern Water Bank. Agency will procure and deliver 45,000 acre feet of annual agricultural entitlements to the State. The exchange of those water entitlements and other provisions of the Monterey Amendments shall be the consideration for the transfer of the Property." (Exchange Agreement, p. 1.) (Emphasis added.)

[5] The Monterey Amendment specifically required KCWA to relinquish 40,670 acre-feet and Dudley Ridge WD to relinquish 4,330 acre-feet. (See DEIR, Volume II, Appendices, Amendment No. 23 (The Monterey Amendment) to Water Supply Contract between the State of California Department of Water Resources and Kern County Water Agency, pp. 35-43.) Consistent with Principle 3, the Monterey Amendment also reflects the relationship between the Kern Fan Element property transfer and the retirements. (Id., ¶ 29(e), pp. 62-63.)

Also, Appendix E to the DEIR similarly states:

> "In accordance with the Monterey Amendment, the Department conveyed the KFE property to KCWA in exchange for KCWA and DRWD [Dudley Ridge WD] permanently retiring a total of 45,000 AF of agricultural Table A amounts." (DEIR, Appendix E, p. 11.) (Emphasis added.)

Second, where appropriate, the final EIR should include a statement to the effect that (consistent with the foregoing) each member of the KWBA (which entity acquired the Kern Fan Element property from KCWA and now operates the KWB Lands) in fact caused the retirement of Table A amounts totaling 45,000 acre-feet.[6]

11-2 (con't.)

We think that, in addition to providing greater factual accuracy and completeness, including the two suggested additional statements in the body of the final EIR will hopefully correct a misimpression about the transfer of the Kern Fan Element property to KWBA that has apparently arisen and is held by some members of the public. That is, that the Monterey Amendment provides for the Kern Fan Element property to be "given away" or "gifted" to private interests, as some public comments on the DEIR stated or suggested.[7] The fact is: the Kern Fan Element property was transferred to KCWA and then KWBA, a public entity, in exchange for retirement of 45,000 acre-feet of Table A amount by the agricultural water users that formed the KWBA and other provisions of the Monterey Amendment. Each side gave something up in exchange for the benefits it received, and the Table A demands on the SWP system as a whole were reduced by the permanent retirements by agricultural contractors.

B. THE FINAL EIR SHOULD CLARIFY THAT, WITH KWBA'S CONTINUED IMPLEMENTATION OF MITIGITION MEASURES REQUIRED BY A PRE-EXISTING CEQA ADDENDUM AND HCP/NCCP, THE PROJECT ACTIVITIES RELATIVE TO THE KERN WATER BANK WILL NOT RESULT IN SIGNIFICANT IMPACTS, THUS NO MITIGATION MEASURES ARE REQUIRED BY CEQA

11-3

Under the project, Kern Water Bank operations are to continue in accordance with the Addendum and Kern Environmental Permits including the HCP/NCCP (Settlement Agreement, III.F. & V.B.). KWBA previously

[6] The precise amounts retired by each KWBA member are shown in Table 3 on page 17 of Appendix E.

[7] For example, see the enclosed press release on the DEIR by the Planning and Conservation League and the transcripts from the public hearings conducted by DWR on the DEIR. There were also public comments in the public hearings on the DEIR stating or suggesting that the Monterey Amendment transfers the Kern Fan Element from "public" to "private" ownership, thereby privatizing a public asset, for operation "behind closed doors." To correct this erroneous view, the final EIR might also benefit from a statement about KWBA explaining that the KWBA is a "public" agency subject to opening meeting and other laws applicable to public agencies generally.

implemented and is already required to continue implementation of the mitigation measures provided for by the Addendum and the HCP/NCCP.

1. Chapter 7.4-3 Re: Terrestrial Biological Resources.

With respect to the 1996-2003 period analysis, the DEIR concludes KWBA's implementation of the mitigation measures reduce potential impacts on terrestrial biological resources to a "less than significant" level and, thus, no mitigation is required (DEIR, p. 7.4-26). With respect to the future analysis, the DEIR describes the same mitigation measures and assumes, correctly, that in the future KWBA will continue to implement those same mitigation measures and less than significant impacts will result (DEIR, pp. 7.4-27-31). Because, in the future, the project will not result in significant impacts to terrestrial biological resources with continued operation and administration of the Kern Water Bank by KWBA under pre-existing already implemented mitigation measures, the future analysis in the final EIR should also conclude that no mitigation is required.[8]

2. Chapter 7.13-3 Re: Cultural and Paleontological Resources.

Similarly, with respect to the 1996-2003 period analysis, the DEIR concludes KWBA's implementation of the mitigation measures reduce potential impacts on cultural and paleontological resources to a "less than significant" level and, thus, no mitigation is required (DEIR, p. 7.13-21). With respect to the future analysis, the DEIR describes the same mitigation measures and assumes, correctly, that in the future KWBA will continue to implement those same mitigation measures and less than significant impacts will result (DEIR, p. 7.12-22). Because, in the future, the project will not result in significant impacts to cultural and paleontological resources with continued operation and administration of the Kern Water Bank by KWBA under pre-existing already implemented mitigation measures, the future analysis in the final EIR should also conclude that no mitigation is required (see footnote 8).

11-3 (con't.)

C. NO PROJECT ALTERNATIVES 1, 3 AND 4 SHOULD RECOGNIZE THAT THE KERN FAN ELEMENT PROPERTY MAY HAVE BEEN USED FOR SOMETHING OTHER THAN A STATE-OWNED WATER BANK, IF THE PROJECT HAD NOT BEEN IMPLEMENTED

11-4

[8] By definition, mitigation measures are changes or alterations to the proposed project required to mitigate or avoid significant effects on the environment (Public Resources Code § 21081(a)(1); see also, Public Resources Code § 21081.6(a)(1) (reporting or monitoring program is only for changes to the project to mitigate or avoid significant project impacts).) KWBA has implemented and must continue implementation of the pre-existing mitigation measures pursuant to a separate CEQA document, the Addendum, and the HCP/NCCP, and, with such implementation, no significant effects will result from Kern Water Bank operations under the proposed project. Thus, no changes or alterations to the project are necessary to mitigate or avoid environmental impacts and further mitigation measures are not warranted by CEQA.

No project alternatives 1, 3 and 4 assume that the Kern Fan Element property would have been developed by the state and operated as a state-owned water bank, if the project had not been implemented in 1996. The purpose of describing and analyzing a no project alternative is to allow decisionmakers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project.[9] The no project alternative can include future actions, but only if they are "reasonably expected to occur in the foreseeable future if the project was not approved."[10] In selecting a no project alternative, CEQA also provides that "where failure to proceed with the project will not result in preservation of existing environmental conditions, the analysis should identify the practical result of the project's non-approval and not create and analyze a set of artificial assumptions that would be required to preserve the existing physical environment."[11]

Appendix E to the DEIR explains in detail that, before the Monterey Amendment, DWR concluded that several impediments made development of a state-owned water bank on the Kern Fan Element "infeasible" (Appendix E, p. 4). These impediments included, but were not limited to, the fact that DWR and KCWA could not reach agreement "on measures to comply with Water Code Section 11258, which required approval of local agencies for development of" a state-owned water bank in Kern County (Appendix E, p. 4). Based on the DEIR, there is still no reason to believe that a state-owned water bank on the Kern Fan Element property would have been reasonably expected to occur if the project had not been implemented in 1996. At a minimum, Chapter 11 (perhaps in paragraph 11.6 and endnote 1) of the final EIR should recognize and explain the various reasons why DWR previously concluded a state-owned water bank was infeasible including that it was not able to comply with Water Code section 11258, before both the Monterey Agreement and the Monterey Amendment.

11-4 (con't.)

D. POTENTIAL ENVIRONMENTAL EFFECTS RESULTING FROM A STATE-OWNED WATER BANK SHOULD BE ADDRESSED FURTHER OR CLARIFIED IN THE FINAL EIR

The DEIR at least suggests that the Monterey Amendment provision consenting to contractors' storage of Article 21 and/or other SWP water outside their respective service areas (Article 56), in the future, may contribute to reduction of Delta outflow and have a significant effect on Delta fishery resources (DEIR, 7.3-55). This raises the following question: is this also the case for a state-owned water bank which, presumably, may be used to store some Article 21 and/or other SWP water outside contractors' service areas and, if not, why? The answer to this question is not clear to us from our reading of the DEIR and

11-5

[9] CEQA Guidelines § 15126.6(e)(1).
[10] CEQA Guidelines § 15126.6(e)(2).
[11] CEQA Guidelines § 15126.6(e)(3)(B).

the question should be addressed further or clarified in the final EIR.[12] The public and decisionmakers should be fully informed of the environmental effects of a state-owned water bank (if it remains a part of no project alternatives 1, 3 or 4), in comparison to environmental effects of the project.

11-5 (con't.)

E. FOR ALTERNATIVES THAT ASSUME THE SETTLEMENT AGREEMENT WOULD NOT TAKE PLACE, THE FINAL EIR SHOULD RECOGNIZE THE POTENTIAL FOR COMMERCIAL DEVELOPMENT OF 490 ACRES OF KWB LANDS, AS PERMITTED BY THE HCP/NCCP

No project alternative 2 ("NPA2") assumes the transfer of the Kern Fan Element property to KCWA, but that the "Settlement Agreement…would not take place."[13] (DEIR, p. 11-1.) The Settlement Agreement prohibits development of 490 acres of the KWB Lands that are otherwise commercially developable under the HCP/NCCP. Thus, wherever the DEIR assumes that the Settlement Agreement would not take place (e.g., NPA2), then the final EIR should at least recognize that up to 490 acres of the KWB Lands may be commercially developed in the future. Again, the public and decisionmakers need to be aware of this potential environmental consequence if the project were not approved.

11-6

F. THE FINAL EIR SHOULD CLARIFY ALTERNATIVE 5 MAY BE LEGALLY INFEASIBLE

The DEIR provides that alternative 5 is the same as the proposed project except that the Monterey water supply management practices would not be implemented (DEIR, p. 11-3). The DEIR then recognizes that "there is doubt about the institutional feasibility" of the alternative (DEIR, 11-3, and endnote 2). We think the final EIR should clarify further that there is also considerable doubt about the "legal" feasibility of alternative 5,[14] and that CEQA does not require a lead agency to consider or authorize it to implement legally infeasible alternatives.[15]

11-7

V. TECHNICAL AND OTHER COMMENTS

For convenience, our more technical comments are included in Exhibit "A," attached hereto and incorporated herein by this reference. Also, the State Water Contractors' comments on the DEIR are incorporated herein by this reference and made a part of these comments.

11-8

[12] The DEIR should also address how DWR would comply with Water Code section 11258 and how that would affect operation of a state-owned water bank.
[13] The DEIR does not state whether the Settlement Agreement would remain in place under alternative 5.
[14] The DEIR does not explain how alternative 5 would or could legally be implemented in light of the existing water supply contracts. This should also be clarified in the final EIR.
[15] See *Kenneth Mebane Ranches v. Superior Court* (1992) 10 Cal.App.4th 276, 291; CEQA Guidelines § 15126.6(a).

VI. CONCLUSION

Once again, KWBA and its member entities support the continued implementation of the Monterey Amendment and Monterey Settlement Agreement and appreciate DWR's efforts in preparation of the DEIR for the Monterey Plus project. KWBA and its member entities also appreciate the opportunity to comment and hope these comments are constructive and helpful in preparing the final EIR for project. If you have any questions or comments, please do not hesitate to contact us.

11-8 (con't.)

Sincerely,

Jonathan Parker
General Manager

Enclosures

EXHIBIT "A"

TECHNICAL COMMENTS TO KWBA COMMENTS ON MONTEREY PLUS DEIR

Page ES-37, Table ES-1, Impact 7.8-3
The second sentence is not accurate and should be revised to state: "Between 1996 and 2003, an additional 4,080 acres were …" instead of 1,665 acres. (Appendix E, p. 21.)

Page 6-22
The 1st sentence of the 2nd paragraph is not correct and the last portion of it should be revised to state: "…agricultural contractors to M&I contractors (Article 53)." (Monterey Amendment, Article 53.)

Pages 7.4-5 through 7.4-10, Table 7.4-2
Comment: Northern harrier (*Circus cyaneus*), osprey (*Pandion haliaetus*), and white-tailed (black-shouldered) kite (*Elanus leucurus*) are regularly seen on the KWB Lands (formerly Kern Fan Element). However, surveys by the ESRT have not identified Buena Vista Lake shrew (*Sorex ornatus relictus*) on such lands. Thus, Table 7.4-2 on page 7.4-9 should delete the "X" from the Buena Vista Lake Shrew with respect to the Kern Fan Element.

Page 7.4-11, 2nd paragraph, and
Page 7.5-3, 2nd paragraph
The text from Appendix E, page 6, paragraph 3, more accurately describes the fallowing of land on the Kern Fan Element, as follows: "A Memorandum of Understanding was signed between the Department and KCWA on March 25, 1987, that provided for the phase out of all agricultural production on the KFE property by the end of 1993. In fact, one of the tenants' leases was terminated in 1989. Then in 1991, at the peak of the drought, all the remaining tenant leases were terminated, and thereafter the agricultural lands were fallowed."

Page 7.4-25
The Kern Water Bank HCP/NCCP establishes permanent mitigation lands on the KWB Lands. This includes a DWR Mitigation Parcel of 530 acres, and a KWBA Mitigation Parcel of 635 acres (Appendix E, p. 23). The DEIR refers to the 530-acre conservation easement set aside for the Department of Water Resources, but does not mention the 635-acre conservation easement set aside for the KWBA. The KWBA 635-acre conservation easement should be mentioned here.

Page 7.4-27, Mitigation Measures
The following statement, which is included on page 7.13-22 for cultural resources, should be included in this section to clarify the status of mitigation measures for the KWB Lands: "Under the Settlement Agreement, the parties recognize that the Addendum has been completed and agree not to challenge the mitigation measures (Settlement Agreement, III.F).

Page 7.5-13, 1996-2003
The first paragraph in section 7.5-3 contains some inaccurate acreage numbers and should be revised to state: "At the end of 1995, approximately 3,034 acres of shallow percolation ponds existed in the Kern Fan Element. The KWBA subsequently constructed the Kern Water Bank Canal, a six-mile long earthen canal extending from the Kern River to the California Aqueduct. Between 1996 and 2003, an additional 4,080 acres were converted to shallow percolation ponds, for a total of 7,114 acres in 2003 in the Kern Fan Element." (See Appendix E, pp. 21-22.)

Page 7.5-13, Future Impacts
As noted above, between 1996 and 2003, the KWBA built approximately 4,080 acres of percolation ponds, not 1,665 acres.

Page 7.7-10, Future Impacts
As noted above, between 1996 and 2003, the KWBA built approximately 4,080 acres of percolation ponds, not 4,700 acres.

Page 7.8-9, 1996-2003
The first paragraph in section 7.8-3 contains some inaccurate acreage numbers and other information and should be revised to state: "Prior to 1996, approximately 3,034 acres of shallow percolation ponds existed in the Kern Fan Element. The KWBA also constructed the Kern Water Bank Canal, a six-mile long earthen canal extending from the Kern River to the California Aqueduct. Between 1996 and 2003, an additional 4,080 acres were converted to shallow percolation ponds, for a total of 7,114 acres in 2003 in the Kern Fan Element." (See Appendix E, pp. 21-22.)

Page 7.10-3, 1996-2003
In the 3rd paragraph in section 7.10-1, the "and" between "Kern Water Bank Canal" and "a six-mile long earthen canal…" should be deleted. They are the same facility. (See Appendix E, p. 22.)

Page 7.10-5
Endnote 3 is missing.

Page 7.11-5
The 2nd paragraph in section 7.11-1 contains some inaccurate acreage numbers and other information and should be revised to state: "As mentioned previously,

3,034 acres of recharge ponds existed in the Kern Fan Element. Kern Water Bank Authority (KWBA) also constructed the Kern Water Bank Canal, a six-mile long earthen canal extending from the Kern River to the California Aqueduct. Between 1998 and 2003, an additional 4,080 acres were converted to shallow recharge basins, for a total of 7,114 acres in 2003 in the Kern Fan Element." (See Appendix E, pp. 21-22.)

Page 7.12-6
The Kern Fan Element property consists of 19,900 acres (not 20,526 acres) located in Kern County southwest of Bakersfield. (In fact, KFE property includes a portion of the Kern River.) In 1995, there were no major structures on Kern Fan Element except for I-5, the Cross Valley Canal, and some abandoned tanks and other oil field equipment.

Page 7.12-13, 1996-2003
The DEIR includes the following statement in the 1st paragraph of section 7.12-3, which should be revised to more accurately state: "The Monterey Amendment calls for ownership of the Kern Fan Element to be transferred from the Department to the KCWA. The transfer agreement was entered in 1995 and the transfer closed escrow in 1996."

The DEIR also states in the same paragraph that: "The KCWA then transferred ownership to a new agency, the KWBA. The KWBA built a groundwater storage facility, the Kern Water Bank, to take advantage of a provision of the Monterey Amendment that enables SWP contractors to store water outside their service areas." The last, highlighted portion of the sentence is largely inaccurate and misleading. In fact, the Kern Water Bank is within the service area of all its member entities but for one, Dudley Ridge WD. Accordingly, the primary reason for KWBA's acquisition of the KWB Lands and construction of a Kern Water Bank was not to take advantage of Article 56 of the Monterey Amendment. Rather, KWBA acquired the KWB Lands and constructed the Kern Water Bank primarily to ensure a more reliable water supply for its member entities, that is, storage of water during times of surplus in service area for later recovery during times of shortage and use in service area (see primary water conservation objective of HCP/NCCP)).

Finally, the 2nd paragraph is not accurate and should be revised to state: "Between 1996 and 2003, as part of the Kern Water Bank, approximately 4,080 acres …."

Page 7.13-21
In the 3rd paragraph in section 7.13-3, the "and" between "Kern Water Bank Canal" and "a six-mile long earthen canal…" should be deleted. They are the same facility. (See Appendix E, p. 22.)

Page 7.15-2, Kern Fan Element
The text from Appendix E, page 6, paragraph 3, more accurately describes the fallowing of land on the Kern Fan Element. We recommend the following change to the 2nd paragraph of section 7.15.2.1:

"The Kern Fan Element consists of 19,900 acres of land located in Kern County southwest of Bakersfield. The Kern Fan Element was farmed for many years until the mid-1980s. A Memorandum of Understanding was signed between the Department and KCWA on March 25, 1987, that provided for the phase out of all agricultural production on the KFE property by the end of 1993. In fact, one of the tenants' leases was terminated in 1989. Then in 1991, at the peak of the drought, all the remaining tenant leases were terminated, and thereafter the agricultural lands were fallowed" (Appendix E, p. 6.)

Page 7.15-9, 1996-2003
In the 1st paragraph in section 7.15-3 on page 7.15-9, the "and" between "Kern Water Bank Canal" and "a six-mile long earthen canal…" should be deleted. They are the same facility. (See Appendix E, p. 22.)

Miscellaneous:

In various instances throughout the DEIR, the DEIR refers to the Kern Fan Element or KFE property when the reference should instead be to the Kern Water Bank or KWB lands and visa versa. In these comments, KWBA has not attempted to identify or suggest revisions in all such instances. However, to be accurate, the property should be called the Kern Fan Element property when owned by DWR and the property should be called the KWB Lands after it was acquired by KWBA. The Final EIR should make necessary corrections in this regard.

LETTER 11

Notice of Determination

To:

County Clerk
County of Kern
1115 Truxtun Avenue
Bakersfield, CA 93301

cc:

Office of Planning and Research
1400 Tenth Street, Room 121
Sacramento, CA 95814

From: Kern Water Bank Authority
c/o YOUNG WOOLDRIDGE
1800 30th Street, Fourth Floor
Bakersfield, CA 93301

Subject: Filing of Notice of Determination in Compliance with Section 21108 or 21152 of the Public Resources Code.

Project Title: Implementation of the Kern Water Bank - Kern Water Bank Habitat Conservation Plan/Natural Community Conservation Plan. This is an addendum to the Monterey Agreement EIR certified by Central Coast Water Authority on October 26, 1995.

State Clearinghouse Number: 95023035

Lead Agency: Kern Water Bank Authority

Contact Person: Ernest A. Conant, Counsel

Phone: (805) 327-9661

Project Location and Description:

The Project Area is the Kern Fan Element of the Kern Water Bank, located west of the City of Bakersfield, Kern County.

This Addendum to the previously certified Monterey Agreement EIR only relates to the Kern Water Bank and does not affect any other matters covered by the Monterey Agreement EIR. This Addendum provides for implementation of measures outlined in the Monterey Agreement EIR relative to the Kern Water Bank by providing technical details as to how the Kern Water Bank will be implemented. In particular, it addresses and provides for implementation of a Habitat Conservation Plan/Natural Community Conservation Plan which has been developed by the Kern Water Bank Authority in cooperation with the California Department of Fish & Game and the U. S. Fish & Wildlife Service.

LETTER 11

This is to advise that the Board of Directors of Kern Water Bank Authority on June 3, 1997 approved the Project and has made the following determinations with respect to the Kern Fan Element:

1. The entire project, as revised by the mitigation measures, will have no significant effect on the environment.

2. An Addendum to the Monterey Agreement EIR was prepared for this project pursuant to the provisions of CEQA and the Board of Directors of the Kern Water Bank Authority reviewed and considered the Addendum prior to approving the project.

3. Mitigation measures were made a condition of the approval of the Project.

4. A statement of overriding considerations was not adopted for this project. However, the findings include a statement of benefits of the program and the project that override potentially significant environmental impacts had there been any.

5. Findings were made pursuant to the provisions of CEQA.

This is to certify that the Addendum and record of project approval are available at YOUNG WOOLDRIDGE, 1800 30th Street, Bakersfield, California 93301 to the attention of Ernest A. Conant, Counsel.

6-3-97
Date:

By: PEGGY POOR
Secretary to the Board

Date Received for Posting by County

Clerk _____

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BEFORE THE BOARD OF DIRECTORS

OF THE

KERN WATER BANK AUTHORITY

Resolution No. 97-01

In the matter of:

RESOLUTION MAKING FINDINGS
AND ADOPTING MITIGATION MEASURES
PURSUANT TO THE CALIFORNIA
ENVIRONMENTAL QUALITY ACT -
IMPLEMENTATION OF KERN WATER BANK

WHEREAS, certain disputes had arisen among various State Water Contractors, and between certain State Water Contractors and the State. Those disputes were the subject of intensive negotiations among the interested parties, and in December 1994 those negotiations culminated in an agreed upon set of principles upon which a settlement of those disputes could be achieved, commonly referred to as the Monterey Agreement. Among the principles agreed to was the exchange of 45,000 acre-feet of SWP entitlement from the SWP Agricultural Contractors for the Kern Fan Element of the Kern Water Bank Property ("KFE"); and

WHEREAS, a Final Program Environmental Impact Report was prepared on the Monterey Agreement ("Monterey Agreement EIR"), which this Board approved on October 30, 1995 as a responsible agency, following which the Monterey Agreement was implemented, including transfer of the KFE to the Kern Water Bank Authority; and

WHEREAS, the Authority staff and consultants have prepared and the Board has received and reviewed an "Initial Study and Addendum to Monterey Agreement EIR for the Kern Water Bank Authority - Kern Water Bank Habitat Conservation Plan/Natural Community Conservation Plan" ("KWB Addendum EIR"), which is incorporated by this reference;

WHEREAS, attached to this Resolution as Exhibit A are Findings and Mitigation Measures for Implementation of the Kern Water Bank;

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Kern Water Bank Authority that:

1. The Findings pursuant to the California Environmental Quality Act of 1970, attached hereto as Exhibit A, are hereby adopted and determined to be true.

2. The Authority's Secretary is hereby authorized and directed to file all required Notices of Determination pursuant to CEQA for the KWB Addendum EIR.

3. This Resolution shall take effect immediately.

ALL OF THE FOREGOING being on motion of Director Bellue, seconded by Director Boschman, was authorized by the following vote, to wit:

AYES: Directors Phillimore, Leon, Boschman, Bellue, Hamilton, Johns & Dmohowski

NOES: None

ABSTAIN: None

ABSENT: None

I HEREBY CERTIFY that the foregoing Resolution is a Resolution of said Board as duly passed and adopted by said Board of Directors on the 3rd day of June, 1997.

WITNESS my hand and seal of said Board of Directors this 3rd day of June, 1997.

Secretary of the Board of Directors

[DISTRICT SEAL]

EXHIBIT A

KERN WATER BANK AUTHORITY

FINDINGS AND MITIGATION MEASURES

IMPLEMENTATION OF KERN WATER BANK - KERN WATER BANK HABITAT CONSERVATION PLAN/ NATURAL COMMUNITY CONSERVATION PLAN

I. PROJECT DESCRIPTION

The Initial Study and Addendum to the Monterey Agreement EIR of the Kern Water Bank Authority ("KWB Addendum EIR") analyzes potential environmental impacts associated with implementation of the Kern Water Bank Habitat Conservation Plan/Natural Community Conservation Plan (the "Project"). The KWB Addendum EIR is incorporated by this reference. The Project includes the construction, operation and maintenance of the Kern Water Bank (KWB), a water recharge and recovery, farming and conservation bank project and related habitat conservation activities proposed for 19,900 acres of land in Kern County, California. The Kern Water Bank is owned and will be operated by the Kern Water Bank Authority (KWBA), a California joint powers authority.

The effects of the Project were previously evaluated in a Program Environmental Impact Report entitled Final Program Environmental Impact Report, Implementation of the Monterey Agreement Statement of Principles by the State Water Contractors and the State of California, Department of Water Resources for Potential Amendments to the State Water Supply Contracts (the "Monterey Agreement EIR"). (State Clearinghouse No. 95023035.) The Monterey Agreement EIR was approved by KWBA as a responsible agency.

Environmental review under the California Environmental Quality Act (CEQA) is required for any project undertaken directly by a public agency. (Public Resources Code, section 21065, subdivision (a).) The CEQA Guidelines provide that "subsequent activities in the program must be examined in the light of the program EIR to determine whether an additional environmental document must be prepared." (CEQA Guidelines, § 15158.) The Guidelines indicate that, prior to the approval of activities within the program, the agency should evaluate whether a subsequent EIR is required as provided in Guidelines Section 15162.

Section 15162, in turn, prohibits agencies from requiring a subsequent EIR unless the agency determines:

1. Substantial changes are proposed in the project which will require major revisions of the previous EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects;

2. Substantial changes occur with respect to the circumstances under which the project is undertaken which will require major revisions of the previous EIR; or

3. New information of substantial importance which was not known and could not have been known shows (i) that the project will have one or more significant effects not discussed in the prior EIR, (ii) significant effects previously examined will be substantially more severe, (iii) mitigation or alternatives previously determined to be not feasible and found to be feasible, or (iv) mitigation measures or alternatives which are considerably different would substantially reduce the significant effects of the project and the project proponent declines to adopt the mitigation measure.

Section 15164 of the Guidelines provides that it is appropriate to prepare an addendum to a prior EIR where (a) conditions described at Section 15162 of the Guidelines have not occurred (see above), (b) the project involves technical changes and additions to carry out the project of the prior EIR and (c) changes and additions in the addendum do not raise important new issues concerning significant effects on the environment.

The Project incorporates mitigation and compensation for impacts to wildlife habitat and other natural resources resulting from implementation of the Project. Approximately 10,349 acres, or over 52% percent, of the Project area will be set aside and limited to uses that are compatible with the habitat values of the property. These lands will be protected and managed for their wildlife habitat values throughout the life of the Project. Certain lands will be protected from development in perpetuity upon the approval of the Project. Other lands will be protected in perpetuity upon the use of conservation credits established by the Project.

As part of the Project, and as more particularly described in the KWB Addendum EIR, KWBA has applied for two permits pursuant to the federal Endangered Species Act from the United States Fish and Wildlife Service (USFWS) to take endangered and threatened species incidental to the operation of the Project, and two management authorizations from the California Department of Fish and Game (CDFG) pursuant to the California Endangered Species Act and the Natural Community Conservation Planning Act to allow the

management and operation of the Project in accordance with the incidental take of endangered, threatened and certain other species (listed species). One permit and one management authorization (the Project Permit/Authorization) relates to the Project. The other permit and management authorization (the Master Permit/Authorization), relating to the conservation bank, will allow the incidental take of listed species by qualified third parties for activities that take place within Kern County, the Allensworth area of Tulare County, and the Kettleman Hills area of Kings County. Both Permits and both Master Authorizations are for a period of 75 years. A habitat conservation plan / natural community conservation plan ("HCP/NCCP"), an implementation agreement ("IA"), and a federal environmental assessment ("EA")have been prepared as part of the permit/authorization process. These documents are hereby incorporated by reference.

As more particularly described in the KWB Addendum EIR, the Monterey Agreement EIR described the KWB in considerable detail. The land uses under the Project are similar to Scenario B analyzed in the Monterey Agreement EIR but provide more environmental benefits than Scenario B.

Of the 19,900 acres that constitute the KWB property, 5,900 acres will be used for routine recharge and 481 acres will be used for permanent water banking facilities. Between the basins will be areas that will never be purposely flooded. Some of these areas have existing populations of listed plants. These plants will be preserved in special areas totaling 960 acres. Other areas between basins totaling 5,592 acres will revert to habitat. Additionally, 530 acres will be preserved and managed for mitigation of DWR projects. Of the remaining land, 3,170 acres will be used for farming and 3,267 acres will be used as a conservation bank (to be used as potential mitigation for activities by third parties within designated areas of the Southern San Joaquin Valley). Of the 3,267 acres in the conservation bank, KWBA may use up to 490 acres for commercial development.

The following chart summarizes such land uses, the uses for which are more particularly described in the Addendum EIR:

LAND USE SUMMARY	AREA IN ACRES
Recharge Basins	5,900*
Other Water Banking Facilities	481
Compatible Habitat	5,592*
Sensitive Habitat	960
DWR Mitigation Land	530
Farming	3,170
Conservation Bank	3,267**
TOTAL	19,900

* KWBA Mitigation Land - 146 acres of Recharge Basins and 489 acres of Compatible Habitat totaling 635 acres will be covered by a conservation easement.

** KWBA may sell up to 490 acres out of the conservation bank for commercial development purposes. The 490 acres is indicated on Map 2 as the Commercial Development Zone.

II. CEQA FINDINGS

A. The Board of Directors of the KWBA hereby finds and certifies:

1. It is appropriate to prepare an Addendum to the Monterey Agreement EIR, consistent with Section 15164 of the Guidelines, because (a) the conditions described in Section 15162 of the Guidelines relating to subsequent EIR's have not occurred, (b) this Project involves technical changes and additions to carry out operation of the KWB as outlined in the Monterey Agreement EIR, and (c) the changes in the KWB Addendum EIR do not raise important new issues about significant effects on the environment.

2. The Board of Directors considers the Monterey Agreement EIR together with the KWB Addendum EIR to be adequate under CEQA for the Authority's approval of the Project.

3. The Board of Directors has reviewed and considered the information within the KWB Addendum EIR prior to approving the Project;

4. The KWB Addendum EIR reflects the Board of Directors' independent judgment; and,

5. No further mitigation measures beyond those described below are necessary and appropriate for the KWBA's approval of the Project.

B. CEQA requires analysis not only of direct or primary environmental impacts, but also of indirect or secondary impacts that may be caused by the project or program are are later in time or are further removed in distance, but are reasonably foreseeable. The KWB Addendum EIR analyzes both direct and indirect environmental impacts from implementation of the Project, to the extent these impacts are reasonably foreseeable and presently ascertainable.

C. The KWB Addendum EIR also includes an analysis of the potential cumulative impacts that may arise from projects undertaken as part of the program and from other potential projects and programs that could occur at the same time the Project is being implemented or in the same geographical area.

D. CEQA requires the evaluation of reasonable and feasible alternatives to the project or program, as well as the evaluation of the environmental impacts which would result if the project or program were not implemented (the "No Project" alternative). The Monterey Agreement EIR previously analyzed the "No Project" alternative as well as scenarios that could occur, and alternatives that might be implemented in lieu of the Monterey Agreement Principles.

E. The Project before the KWBA is limited to approval of the Project. This approval includes the condition that KWBA adopts the mitigation measures described below that is within the Authority's jurisdiction.

F. Although the Project has potential for adverse environmental impacts, the program benefits, described below, outweigh these adverse impacts.

G. The Project will help provide and promote a safe and reliable water source to the Member Entities of the KWBA.

H. The KWBA finds and determines that the requirements of CEQA have been satisfied for KWBA's approval of this Project.

III. CEQA FINDINGS RE CUMULATIVE IMPACTS

The only cumulative impacts from the Project should be beneficial impacts. The KWB was transferred from DWR to KCWA and then to KWBA as part of the Monterey Principles. Implementation of the Monterey Principles, including the operation of the Project, should lead to fewer and smaller shortages of deliveries of water from the State Water Project ("SWP") to certain SWP contractors in drought years. Reducing the impact of droughts should result in beneficial impacts to the environment.

The possible beneficial and adverse impacts to the environment due to the implementation of the Monterey Principles was studied at length in the Monterey Agreement EIR. That analysis is incorporated herein by this reference.

Implementation of the conservation bank and sale of conservation credits to qualified third parties should have minimal cumulative impacts. Even under

the worst-case analysis, use of the conservation bank could lead to habitat loss of 3,000 acres within the Master Permit Credit Area. Moreover, activities using conservation credits will be limited to areas with limited habitat value, and will qualify for the use of conservation credits only with the approval of the Resource Agencies.

IV. MITIGATION MEASURES

The Project approved by the KWBA includes the following mitigation measures, further discussion of which is contained in the KWB Addendum EIR:

Mitigation Measure B-1. Biological Monitor

A qualified biologist shall monitor all ground-disturbing activities during construction in the Sensitive Habit Sector and will oversee measures undertaken to reduce take of listed species.

Mitigation Measure B-2. Construction Practices

a. Delineation of Disturbance Areas

During construction, KWBA shall clearly delineate disturbance area boundaries by stakes, flagging, or by reference to terrain features, as directed by CDFG and USFWS, to minimize degradation or loss of adjacent wildlife habitats during operation.

b. Signage

During construction, KWBA shall post signs and/or place fencing around construction sites to restrict access of vehicles and equipment unrelated to site operations.

c. Resource Agency Notification

At least 20 working days prior to initiating ground disturbance for project facilities in designated salvage/relocation areas, KWBA shall notify the Fresno Field Office of CDFG and the Sacramento Field Office of USFWS of its intention to begin construction activities at a specific location and on a specific date. The Agencies will have 10 working days to notify the KWBA of their intention to salvage or relocate listed species in the construction area. If KWBA is notified, it will wait an additional five days to allow the salvage/relocation to take place.

d. Salvage and Relocation

KWBA will allow time and access to USFWS and/or CDFG, or their designees, to relocate listed species, at the Resource Agencies' expense, from construction areas prior to disturbance of areas that have been identified by the

Resource Agencies as having known populations of the listed species they wish to salvage or relocate.

e. Construction Site Review

All construction pipes, culverts, or similar structures with a diameter of three inches or greater that are stored at a construction site on the Kern Water Bank for one or more overnight periods shall be thoroughly inspected for trapped kit foxes and other animals before the subject pipe is subsequently buried, capped, or otherwise used or moved in any way. Pipes laid in trenches overnight shall be capped. If during construction a kit fox or other animal is discovered inside a pipe, that section of pipe will not be moved or, if necessary, will be moved only once to remove it from the path of construction activity until the animal has escaped.

f. Employee Orientation

An employee orientation program for construction crews, and others who will work on-site during construction, shall be conducted and shall consist of a brief consultation in which persons knowledgeable in endangered species biology and legislative protection explain endangered species concerns. The education program shall include a discussion of the biology of the listed species, the habitat needs of these species, their status under FESA and CESA, and measures being taken for the protection of these species and their habitats as a part of the project. The orientation program will be conducted on an as needed basis prior to any new employees commencing work on the Kern Water Bank. Every two years or at the beginning of construction for the Supply/Recovery canal, a refresher course will be conducted for employees previously trained. A fact sheet conveying this information shall also be prepared for distribution to all employees. Upon completion of the orientation, employees shall sign a form stating that they attended the program and understand all protection measures. These forms shall be filed at KWBA's offices and shall be accessible by CDFG and USFWS.

g. Standards for Construction of Canals

Concrete lined canals will have a side slope of 1.5 to 1 or less and the sides will have a concrete finish which will assist in the escape of animals. If canals are determined by CDFG or USFWS to be substantial impediments to kit fox movement, plank or pipe crossings will be provided across concrete canals in areas identified as having high kit fox activity.

Mitigation Measure B-3. On-Going Practices

a. Equipment Storage

All equipment storage and parking during site development and operation shall be confined to the construction site or to previously disturbed off-site areas that are not habitat for listed species.

b. Traffic Control

KWBA's project representative shall establish and issue traffic restraints and signs to minimize temporary disturbances. All construction related vehicle traffic shall be restricted to established roads, construction areas, storage areas, and staging and parking areas. Project related vehicles shall observe a 25 MPH speed limit in all project areas except on county roads and state and federal highways.

c. Food Control

All food-related trash items such as wrappers, cans, bottles, and food scraps generated both during construction and during subsequent facility operation shall be disposed of in closed containers and shall be regularly removed from the site. Food items may attract kit foxes onto a project site, consequently exposing such animals to increased risk of injury or mortality.

d. Dog Control

To prevent harassment or mortality of kit foxes or destruction of kit fox dens or predation on this species, no domestic dogs or cats, other than hunting dogs, shall be permitted on-site.

e. Pesticide Use

Use of rodenticides and herbicides on the site shall be permitted in accordance with the Vegetation Management Plan, which incorporates by reference the Interim Measures for Use of Rodenticides in Kern County, and which will incorporate by reference any other applicable laws, rules and regulations regarding use of pesticides as they take effect.

Mitigation Measure B-4. Project Representatives

KWBA shall designate a specific individual as a contact representative between KWBA, USFWS, and CDFG to oversee compliance with protection measures detailed herein. KWBA shall provide written notification of the contact representative to CDFG and USFWS within 30 days of issuance of the Permits and the Management Authorizations. Written notification shall also be provided by KWBA to CDFG and USFWS in the event that the designee is changed.

Mitigation Measure B-5. Notification Regarding Dead, Injured or Entrapped Listed Animals

Any employee or agent of KWBA who kills or injures a San Joaquin kit fox, blunt-nosed leopard lizard, Tipton kangaroo rat, San Joaquin antelope squirrel, or other listed species listed as a threatened or endangered animal under FESA or CESA, or who finds any such animal either dead, injured, or entrapped on the Kern Water Bank shall report the incident immediately to KWBA's representative who shall, in turn, report the incident or finding to USFWS and CDFG. In the event that such observations are of entrapped animals, escape ramps or structures shall be installed immediately to allow the animal(s) to escape unimpeded. In the event that such observations are of injured or dead animals, KWBA shall immediately notify USFWS and CDFG by telephone or other expedient means. KWBA shall then provide formal notification to USFWS and CDFG, in writing, within three working days of the finding of any such animal(s). Written notification shall include the date, time, location, and circumstances of the incident.

The USFWS contact for this information shall be the Chief, Endangered Species Division, Sacramento Field Office. The CDFG contact shall be the Environmental Services Supervisor at the San Joaquin Valley-Southern Sierra Region Headquarters.

USFWS or CDFG will be notified within 3 days if any listed, proposed, candidate, or other species covered by the HCP is found dead or injured.

Mitigation Measure B-6. Construction of Supply/Recovery Canal

Before the Supply/Recovery Canal is constructed, KWBA shall conduct a limited SJKF survey to identify any kit fox dens in the construction zone. If any kit fox dens or other individuals or populations of covered species are found, KWBA shall notify USFWS and CDFG and allow them access to the area for relocation or salvage.

Mitigation Measure B-7. Take Avoidance Protocol for Fully-Protected Species.

Existing data on the blunt-nosed leopard lizard (BNLL) at the Kern Water Bank indicates that populations occur within habitat set asides (either sensitive, compatible, or conservation bank habitat). Thus the likelihood of take from project construction, operation and maintenance is negligible. However, in the future adaptive management measures may expand to areas of suitable habitat.

Until such time that the KWBA obtains appropriate authorization for take of the State designated Fully Protected blunt-nosed leopard lizard by the Fish and Game Commission, the following take advoidance protocol shall apply in any areas that contain suitable habitat of the BNLL:

1) A qualified biologist shall survey any areas for project related disturbance that contain suitable habitat for the blunt-nosed leopard lizard to determine the likelihood of presence. Suitable habitat consists of valley and foothill grasslands, saltbush scrub land, iodine bush grassland, and alkali flats.

2) If BNLL's are found to occur in areas proposed for project facilities construction or maintenance, consideration of avoidance should take place first. If avoidance is not practicable, then the BNLL will be trapped and relocated prior to disturbance at KWBA's expense in accordance with the applicable annual management plan. This work must be done by or under the direction of USFWS staff by persons with appropriate experience and with their own take for scientific purposes permits. This procedure will avoid any violation of state law.

Three other species which may be found on the Kern Water Bank are also State designated Fully Protected species. American peregrine falcon, Greater sandhill crane, and White-tailed kite. The likelihood of the take of any of these species from project construction, operation, and maintenance is negligible due to their mobility and preferred habitats. However, to avoid any take of these species, the same take avoidance protocol as set out for the BNLL shall apply to each of these three species.

Mitigation Measure C-1. Implementation of MOU

The Project will be operated subject to the October 26, 1995 Memorandum of Understanding between the KWBA and its member entities and surrounding agencies.

The KWBA MOU requires all the parties thereto to operate their projects in a manner to maintain and, when possible, enhance groundwater quality. If significant adverse effects are detected due to the operation of the Kern Water Bank, KWBA will curtail and/or relocate the recharge and recovery operations as necessary to avoid the impacts, consistent with the KWBA MOU. The KWBA MOU establishes a monitoring committee which bears the responsibility of ensuring that the parties meet their obligations under the KWBA MOU.

Mitigation Measure C-2. Hydrocarbon Contamination Monitoring

KWBA will continue to monitor the remediation of the current and any future hydrocarbon contamination. The Regional Water Quality Control Board has assumed jurisdiction of the Wait-Midway Pipeline, owned by Chevron Pipeline Company.

Mitigation Measure E-1. A watering truck will be used to minimize fugitive dust generated during grading when conditions require, such as on dry, windy days.

Mitigation Measure F-1. Location of Recharge and Recovery Facilities.

The location of the proposed basins and canals will be established to avoid conflicts with existing and future known mineral activities.

Mitigation Measure G-1. Implementation of Cultural Resources Report.

KWBA will comply with the mitigation procedures set forth in the Cultural Resources Assessment and Plan For the Kern Water Bank Authority Project Near Bakersfield, Kern County California, summarized below and incorporated by this reference, which are expected to reduce any impact to cultural resources within the KIWB to a level of insignificance.

A. Prior to any ground-disturbing work on the KWB, anthropologists or other qualified individuals from TG&S shall engage in pedestrian surveys of the areas to be impacted, with the survey reconaissance to be at 5- to 15-meter transects.

B. Any cultural resources found during the survey process will be recorded, mapped, evaluated and mitigated prior to the ground-disturbing activity, pursuant to Section 106 of the National Historic Preservation Act.

C. The eight recorded archeological sites on the KWB will be evaluated and mitigated pursuant to Section 106.

D. If any human remains are found at any time on the KWB, work will be halted in the area of the discovery, and the Kern County coroner will be notified.

Mitigation Measure P-1. Implementation of Mosquito Abatement Plan.

In accordance with the Mosquito Abatement Plan, KWBA will engage in the following procedures which are expected to reduce any impact due to the breeding of mosquitoes in the recharge basins to insignificance:

A. KWBA will notify staff of the Mosquito Vector Districts of planned use of recharge basins.

B. KWBA will implement a water edge road construction pilot program to determine whether KWBA can successfully give Mosquito Vector District spray vehicles access to the recharge basins. If the pilot program is successful, KWBA will build further water edge roads as mutually agreed between KWBA and the Mosquito Vector District staff. If the program is unsuccessful, KWBA and Mosquito Vector District staff will develop an alternative program.

C. Ponding in certain sections will be phased out. In these sections, KWBA will cycle the spreading process to keep water moving.

D. KWBA will develop a mosquito fish breeding program in conjunction with Mosquito Vector District staff.

E. Roads on the KWB will be kept in a reasonable condition to allow the districts access to the KWB.

F. KWBA will include district staff in adaptive management planning to review the success of mosquito control techniques and to develop improved mosquito control techniques.

Mitigation Measure P-2. Avoidance of Valley Fever.

All construction workers at risk of inhaling dust shall wear masks with filters designed to trap spores of the size of valley fever fungus.

V. CEQA FINDING UNDER PUBLIC RESOURCES CODE SECTION 21081

There are no potentially significant environmental impacts of the Project that fall within the KWBA's jurisdiction. Alternatively, in the event it were determined there were significant impacts of the Project within the KWBA's jurisdiction, it is noted that such impacts have been mitigated to avoid significant effects as set forth at Section IV hereof, all consistent with Section 21081(a).

It is noted that the Project should have a number of benefits to the environment, including the following:

- The Project will have the following environmental benefits:The historic ground water recharge on the property will be continued.
- Diverse types of habitat including upland, riparian and intermittent wetland/rangeland will be preserved and restored on an ecosystem basis.
- In addition to preserving the two above mentioned types of habitat, special areas to protect sensitive native habitat are planned.
- Upland habitat suitable for the Tipton kangaroo rat, the blunt-nosed leopard lizard, and the San Joaquin kit fox will be preserved and enhanced by adaptive land management.
- Intermittent wetland/rangeland habitat which is scarce in the Southern San Joaquin Valley, and was lost with the introduction of intensive farming, will be restored on the property with benefits to a wide variety of waterfowl and other species.
- The preservation of Compatible Habitat, the natural design of the recharge basins and periodic flooding ensures terrestrial species have the opportunity to migrate thus facilitating genetic diversity.
- Areas adjacent to the Kern River habitat corridor will be preserved.
- Areas adjacent to the ARCO Coles Levee Ecosystem Preserve will be protected as upland habitat and be offered as habitat mitigation to third parties.
- Large areas of intensive agriculture on the KWB have been removed from production and will be set aside as Compatible Habitat.
- In addition to preserving two broad types of habitat, sensitive areas of native habitat are protected.
- Fewer and smaller water shortages to KWBA member entities and any others who participate in the Project.

INITIAL STUDY AND

ADDENDUM TO MONTEREY AGREEMENT EIR

OF THE

KERN WATER BANK AUTHORITY

KERN WATER BANK HABITAT CONSERVATION PLAN/NATURAL COMMUNITY CONSERVATION PLAN

June 3, 1997

I. INTRODUCTION

A. Evaluation of Activities Previously Evaluated in a Program EIR.

This Initial Study and Addendum analyzes potential environmental impacts associated with the implementation of the Kern Water Bank Habitat Conservation Plan/Natural Community Conservation Plan (the "Project"). The Project includes the construction, operation and maintenance of the Kern Water Bank (KWB), a water recharge and recovery, farming and conservation bank project and related habitat conservation activities proposed for 19,900 acres of land in Kern County, California. The Kern Water Bank is owned and will be operated by the Kern Water Bank Authority (KWBA), a California joint powers authority.

The effects of the Project were previously evaluated in a Program Environmental Impact Report entitled Final Program Environmental Impact Report, Implementation of the Monterey Agreement Statement of Principles by the State Water Contractors and the State of California, Department of Water Resources for Potential Amendments to the State Water Supply Contracts (the "Monterey Agreement EIR"). (State Clearinghouse No. 95023035.)

Environmental review under the California Environmental Quality Act (CEQA) is required for any project undertaken directly by a public agency. (Public Resources Code, section 21065, subdivision (a).) The CEQA Guidelines provide that "subsequent activities in the program must be examined in the light of the program EIR to determine whether an additional environmental document must be prepared." (CEQA Guidelines, § 15158.) The Guidelines indicate that, prior to the approval of activities within the program, the agency should evaluate whether a subsequent EIR is required as provided in Guidelines Section 15162. Section 15162, in turn, **prohibits** agencies from requiring a subsequent EIR unless the agency determines:

1. Substantial changes are proposed in the project which will require major revisions of the previous EIR due to the involvement of new significant environmental effects or a substantial increase in the severity of previously identified significant effects;

2. Substantial changes occur with respect to the circumstances under which the project is undertaken which will require **major** revisions of the previous EIR; or

3. New information of substantial importance which was not known and could not have been known shows (i) that the project will have one or more significant effects not discussed in the prior EIR, (ii) significant effects previously examined will be substantially more severe, (iii) mitigation or alternatives previously determined to be not feasible and found to be feasible, or (iv) mitigation measures or alternatives which are

considerably different would substantially reduce the significant effects of the project **and** the project proponent declines to adopt the mitigation measure.

The Project incorporates mitigation and compensation for impacts to wildlife habitat and other natural resources resulting from implementation of the Project. Approximately 10,349 acres, or over 52% percent, of the Project area will be set aside and limited to uses that are compatible with the habitat values of the property. These lands will be protected and managed for their wildlife habitat values throughout the life of the Project. Certain lands will be protected from development in perpetuity upon the approval of the Project. Other lands will be protected in perpetuity upon the use of conservation credits established by the Project.

As part of the Project, KWBA has applied for two permits pursuant to the federal Endangered Species Act from the United States Fish and Wildlife Service (USFWS) to take endangered and threatened species incidental to the operation of the Project. KWBA has also applied for two management authorizations from the California Department of Fish and Game (CDFG) pursuant to the California Endangered Species Act and the Natural Community Conservation Planning Act to allow the management and operation of the Project in accordance with the incidental take of endangered, threatened and certain other species (listed species). One permit and one management authorization (the Project Permit/Authorization) relates to the Project. The other permit and management authorization (the Master Permit/Authorization), relating to the conservation bank, will allow the incidental take of listed species by qualified third parties for activities that take place within Kern County, the Allensworth area of Tulare County, and the Kettleman Hills area of Kings County. Both Permits and both Master Authorizations are for a period of 75 years. A habitat conservation plan / natural community conservation plan ("HCP/NCCP"), an implementation agreement ("IA"), and a federal environmental assessment ("EA") have been prepared as part of the permit/authorization process. These documents are hereby incorporated by reference. These documents are summarized herein. Copies of these documents are available from KWBA at the following address:

Kern Water Bank Authority
P.O. Box 80607
Bakersfield, CA 93380-0607
Tel: (805) 399-8735
Fax: (805) 399-9751

B. Monterey Principles and Evaluation of Project in Monterey Agreement EIR.

On December 1, 1994, the water contractors of the State of California and others entered into the Monterey Principles, a mediated agreement to change a number of provisions of the contracts governing the administration of the State of California water project (SWP). Pursuant to the Monterey Principles, DWR transferred KWB to Kern County Water Agency (KCWA) on August 9, 1996 in exchange for 45,000 acre feet of SWP entitlement. KCWA subsequently transferred KWB to KWBA.

The environmental effects of the Monterey Principles were analyzed in the Monterey Agreement EIR. The Monterey Agreement EIR analyzes the environmental effects of the Project. Where appropriate and applicable, this Initial Study and Addendum will refer to and incorporate by reference the Monterey Agreement EIR.

The Monterey Agreement EIR described the Kern Water Bank in considerable detail. The Monterey Agreement EIR identified three alternative scenarios for the development of the KWB (in addition to the No Project Alternative) and evaluated the environmental effects of the three scenarios for the Kern Water Bank. The table below describes the components of the scenarios evaluated in the Monterey Agreement EIR and compares them to the proposed Project.

	Scenario A	**Scenario B**	**Scenario C**	**Project**
Recharge Facilities	3,258	5,258	7,758	5,900
Irrigated Farmland	0	0	0	3,170
Native/Dist Veget.	2,000	4,500	7,100	10,349[1/]
Prev. Irrigated/Undesig	14,798	10,298	5,198	0
Other	490	490	490	481

The various land use categories of the proposed Project are well within the land use components of the three scenarios evaluated in the Monterey Agreement EIR. The proposed Project will have less impacts and more environmental benefits than Scenario C. The land uses proposed for the Project are similar to those evaluated for Scenario B, but provide more environmental benefits than Scenario B.

While Scenario B assumed that 4,500 acres would remain as open space and not devoted to ponds or other recharge facilities, the proposed Project would set aside

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1/ Includes 5,592 acres of Compatible Habitat, 960 acres of Sensitive Habitat, 530 acres of DWR Mitigation Land, and 3,267 acres of Conservation Bank lands.

10,349 acres for various habitat conservation purposes. In summary, the proposed Project is consistent with the KWB project as described in the Monterey Agreement EIR. It would not require major revisions to the Monterey Agreement EIR or otherwise require the preparation of a subsequent EIR under the standards set forth in Section 15162 of the CEQA Guidelines.

The sections below (1) describe the Project in greater detail, (2) describe the environmental setting, (3) evaluate the environmental effects of the Project, and (4) compare those effects to the effects of the Project evaluated in the Monterey Agreement EIR.

II. PROJECT DESCRIPTION

A. Location

The Project is located on 19,900 acres of property located in Kern County, California about 20 miles west of Bakersfield and 10 miles south of Buttonwillow (see Maps 1 and 2). Interstate 5 bisects the Project, as does the Kern River.

B. Background

Prior to agricultural development of the KWB, much of the land was flooded periodically by high flows on the Kern River. The area is unique in the State in its ability to absorb water at an extremely high rate and to retain it in aquifers. Prior to agricultural development the intermittent wetland supported a variety of plants and wildlife.

In the 1880's, earthen canals and levees were constructed to aid the spreading of water, the resulting feed being used for cattle grazing. Land on the west side of the property was developed for farming during the late 1930's through the early 1950's. During this same period much of the property was explored for oil and gas resulting in a number of wells being drilled and pipelines constructed. From about 1960 to the early 1970's most of the remainder of the property was developed for agriculture. Throughout this time the land was still flooded in wet years to recharge water into the underground aquifer. This was done in a free form manner with the water being herded by bulldozers. In 1988 the land was purchased by the Department of Water Resources (DWR). DWR ceased most of the farming by 1991 in order to preserve water during a severe drought.

In 1995, the Kern County Water Agency (KCWA) received permits/authorizations from the USFWS and CDFG to initiate an interim water banking project as a result of the high availability of water from a heavy snow pack in the Sierras. The interim project was carried out in two stages:

Stage 1 resulted in the rehabilitation of disused canals and inundation of approximately 1518 acres of former agricultural land. Preconstruction surveys of the Stage 1 area revealed poor habitat values throughout the area and no suitable habitat for the listed species. Therefore, Stage 1 activities were expected not to result in a take of listed species. Stage 2 resulted in inundation of an estimated 1516 acres of grassland and fallow agricultural land. Based on planned Stage 2 flooding, there was a potential for the take of listed species. Therefore, biological surveys for listed species were conducted in all areas proposed to be disturbed by construction of facilities (levees, roads, boxes) or flooded.

The recharge basins were constructed by building low earth berms, approximately three feet in height, along natural contours of the land using soil adjacent to the berms. The bottom of the basins were left in a natural condition thus allowing vegetation to continue to grow. Vegetation on the basin bottoms is believed to enhance the basins' ability to recharge water.

In 1995, maintenance of the Project area included repairs to levees and the removal of tumbleweed from roads, canals and basins. For more information refer to the Interim Water Recharge Project Biological Monitoring Report for the Period April 1995-March 31, 1996 which is incorporated herein by reference. A copy of the Biological Monitoring Report is available at the offices of KWBA listed above.

KCWA received two extensions on the interim permits/authorizations for 1996 and is authorized to carry out the Stage 1 and 2 banking activities that may result in incidental take of listed species through July 31,1997. In 1996 the basins constructed the previous year were utilized for water recharge.

C. Land Use

Of the 19,900 acres that constitute the KWB property, 5,900 acres are proposed for routine recharge and 481 acres will be used for permanent water banking facilities. Between the basins will be areas that will never be purposely flooded. Some of these areas have existing populations of listed plants. These plants will be preserved in special areas totaling 960 acres. Other areas between basins totaling 5,592 acres will revert to habitat. Additionally, 530 acres will be preserved and managed for mitigation of DWR projects. Of the remaining land, 3,170 acres will be used for farming and 3,267 acres will be used as a conservation bank (to be used as potential mitigation for activities by third parties within designated areas of the Southern San Joaquin Valley). Of the 3,267 acres in the conservation bank, KWBA may use up to 490 acres for commercial development.

TABLE 1 - LAND USE SUMMARY

LAND USE SUMMARY	AREA IN ACRES
Recharge Basins	5,900*
Other Water Banking Facilities	481
Compatible Habitat	5,592*
Sensitive Habitat	960
DWR Mitigation Land	530
Farming	3,170
Conservation Bank	3,267**
TOTAL	19,900

* KWBA Mitigation Land - 146 acres of Recharge Basins and 489 acres of Compatible Habitat totaling 635 acres will be covered by a conservation easement.

** KWBA may sell up to 490 acres out of the conservation bank for commercial development purposes. The 490 acres is indicated on Map 2 as the Commercial Development Zone.

a) Water Recharge Facilities. Permanent operation of the banking facilities will include the flooding of basins, construction of facilities for recovery of the water from underground aquifers, and maintenance of all project facilities. In all, about 6,381 acres of land comprising the recharge basins, surrounding levees and other banking facilities will be developed as part of the permanent recharge project.

b) Water Recovery and Other Banking Facilities. Recovery of the water recharged will be through a system of water wells, pipelines and canals. This system, when built-out, may include up to 132 wells and would be spread over the entire property to allow flexibility in the recovery of water. There are 66 existing agricultural wells on the property which could be utilized for water recovery. DWR, through the "Ground Water Extraction Operations at the Kern Fan Element" rehabilitated 28 of these wells and constructed pipelines and canals. The remaining 38 existing wells may be rehabilitated. Approximately 66 additional wells may be drilled and conveyance pipelines and small canals may be constructed for water recovery.

c) Supply/Recovery Canal Project. A supply/recovery canal or canals located within the Supply/Recovery Canal Zone as shown on Map 2 (Permitted Area) may be constructed to facilitate water delivery to and from the California Aqueduct. The canal or canals would be lined with concrete and would utilize pump stations to lift the water as required. Turnouts may be constructed to deliver water to the recharge areas. Recovery pipelines and small canals from the water wells may be connected to the canals.

d) Kern River Reverse Flow Canal Project. The Kern River channel may be utilized to deliver water from the California Aqueduct to the project. By constructing earth berms and pump stations, water could be lifted up the river channel for conveyance to the recharge areas. If KWBA decides to implement the Reverse Flow Canal project, KWBA will engage in the necessary environmental analysis and obtain such permits as may be required pursuant to state and federal environmental laws.

e) Compatible Habitat. A total of 5,592 acres of compatible habitat will be preserved and managed around the banking facilities. Much of this area is higher ground between the basins and will provide upland habitat for the San Joaquin kit fox and other upland species.

f) KWBA Mitigation Land. To compensate for the 481 acres that may be permanently impacted by the Project, the KWBA will grant a conservation easement to CDFG on a 515 acre parcel comprised of 369 acres of Compatible Habitat and 146 acres of Recharge Basins surrounding the DWR Mitigation land. The KWBA will manage this land as compatible habitat in perpetuity.

g) Sensitive Habitat. Three areas containing remnant native saltbush and valley sink scrub habitat have been identified on the KWB. These areas, comprising 960 acres, have been designated as sensitive habitat and will be protected throughout the life of the Project Permit/Authorization. Populations of listed plant species occur in some of the sensitive habitat.

h) DWR Mitigation Land Conservation Easement. This 530-acre area is covered by a conservation easement which was recorded in mitigation of projects carried out by DWR. Management of this easement will be carried out by the KWBA in accordance with an existing management plan for the area (refer to the "Agreement regarding Assumption of Mitigation Responsibility and Consent to Transfer of Kern Water Bank Lands"). KWBA acknowledges that this mitigation obligation is a separate obligation and is not considered mitigation for the Project. Mitigation obligations which will be conducted on this parcel are contained in Exhibit B to the KWB HCP Implementation Agreement. The mitigation obligations will continue in perpetuity.

i) Farming. 3,170 acres of the project site may be farmed in a manner appropriate to the soil conditions found on site. Crops historically grown in the area include cotton, grapes, etc. This land may also be used for any other permitted activity covered in this HCP, including water recharge.

j) Conservation Bank. The remaining 3,267 acres on the Project site will be used as a conservation bank. Under the Master Permit/Authorization, qualified third parties may acquire conservation credits from KWBA in order to mitigate for impacts to Covered Species caused by the third parties on their projects. Each credit represents one acre of land in the conservation bank. The Conservation Credits created through the establishment of the Conservation Bank may be utilized to mitigate for impacts by third parties conducting low impact activities within the Master Permit Credit Area shown on Exhibit C to the Conservation Bank Agreement. The use of Conservation

Credits will be limited to activities that would qualify for a low effect habitat conservation plan under the Habitat Conservation Plan Handbook approved by the U.S. Fish and Wildlife Service. In addition, in order to further ensure that the Conservation Credits would not result in significant impacts, activities could only utilize Conservation Credits with the agreement of the Fish and Wildlife Service (with regard to impacts to federally listed species) and the California Department of Fish and Game (with regard to state-listed species). Prior to authorizing the use of the Conservation Credits, third parties would have to demonstrate to the satisfaction of FWS and /or DFG that the use of the Credits as mitigation is appropriate under the standards described in Section G below.

If the FWS and/or DFG approved the use of the Conservation Credits for third parties, on an annual basis, KWBA will convey a conservation easement to CDFG representing the number of credits sold in the conservation bank. KWBA will bear the obligation in perpetuity of maintaining the land in the conservation bank on which a conservation easement has been recorded.

D. Construction of KWB

To achieve its water management objectives, the KWBA constructed recharge basins, and will construct additional basins, water conveyance facilities and water wells. The existing basins were created by constructing low levees along contours. This approach created minimal disturbance of the ground surface compared to other alternatives. The basin bottoms were left, as much as possible, in their natural condition. Future basins will be constructed in a similar manner.

Existing and future recharge basins will be formed by creating approximately 55 miles of levees approximately 3 feet in height. 66 water wells currently exist on the property and more wells may be added before the project is complete. Several canals exist on and run along side the property to facilitate water conveyance and new canals are proposed that would provide linkage among the spreading areas, wells, Kern River Canal and the California Aqueduct. The existing and proposed construction is set forth below in the "Table 2 - Acreage Breakdown".

TABLE 2 - ACREAGE BREAKDOWN

	Unit	Quantity	Width feet	Area acre	Total acre
Recharge Facilities					
Existing Basins					3,034
Proposed Basins					2,866
Total					5,900
Permanent Water Banking Facilities (1)					
Recovery Facilities					
Wells - Existing Hooked Up	ea	28		0.5	14

Wells - Existing Not Hooked Up	ea	38		0.5	19
Wells - Proposed New	ea	66		0.5	33
Conveyance Facilities					
Proposed - Lined	mi	18	40		87
Existing - Unlined	mi	31	60		225
Supply/Recovery Canal	mi	6	100		73
Pump Stations	ea	4		3	12
Kern River Reverse Flow					
Earthwork	mi	1	30		4
Pump Stations					
River	ea	2		5	10
City 2800 Acres	ea	4		1	4
Total					481
Temporarily Disturbed Areas					
Canal Construction	mi	6	100		73
Pipelines - Proposed	mi	30	60		218
Total	mi	30	60		291

(1) Includes new roads where required

Recharge Basin Construction. The recharge basins will be built utilizing the natural topography by constructing low earth berms to serve as levees along contours of the land. The levee will be built utilizing soil adjacent to the levee inside the basin. Typical construction includes pad clearing, soil moving and soil compaction.

Recharge Conveyance Canal Construction. The conveyance canals will be sized as required to convey water from the turnout structures to the recharge areas. Canals will have associated turnouts, weirs, flow control, measurement structures and road crossings as required.

Existing Water Well Rehabilitation. Rehabilitating water wells consists of cleaning motors, pumps and electrical panels, and checking out equipment to evaluate if service is required.

Construction of New Wells. The following construction activities will be typical for installation of new wells: digging sumps for retention of water used for drilling and discharge of drill cuttings; setting up drilling rigs and drilling pipe trailers at well sites; and installation of casing, gravel, concrete seals, pumps, motors, concrete pads, electrical equipment and discharge piping.

Construction of Underground Recovery Pipelines. Lateral pipeline construction consists of clearing, trenching, pipe delivery, unloading, pipe installation, backfilling and final grading. The initial operation will include clearing of the proposed alignment of the pipeline. Trenching will be accomplished using either an excavator or trencher. Spoil piles will be located directly adjacent to the trench. Pipe will be delivered by trucks and unloaded using a crane or forklift along the trench in position for pipe laying activities. A crane will hoist and position the pipe in the trench. A loader will

move soil excavated from the trench to backfill the pipe. Compaction equipment will be utilized to achieve required compaction. After backfilling is complete the pipeline corridor will be final graded with the excess material being mounded over the pipe to allow for settlement.

Construction of Recovery Canals. Concrete lined recovery canals will connect recovery pipelines and recovery wells to off site conveyance facilities. The canals will be constructed similar to the recharge canals described above but will have a concrete lining.

Supply/Recovery Canal Construction. The supply/recovery canal will convey water to the recharge areas and from the recovery wells. It may be a single concrete-lined canal or it may be two parallel canals, an earthen canal for supply with a parallel smaller concrete-lined canal for recovery. The determination of the exact design will be made at a future date. Construction for the canal will be similar to the construction of the recovery canals. The supply/recovery canal will be located within the zone as shown on the Map 2 (Project Permit/Authorization Area).

Recovery Pump Stations. Where necessary, recovery pump stations will be constructed. Pump station sites will be cleared, grubbed and moisture conditioned. Excavation will be required to allow for construction of retaining walls, foundations, and concrete. Pumps, motors and electrical panels will be installed. This effort will require cranes, delivery trucks, water trucks, compactors, excavators and graders.

Kern River Reverse Flow. The Kern River channel will be utilized to convey water from the California Aqueduct to the recharge areas. At two or more locations along the existing river bed sand earth berms would be constructed utilizing scrapers, water trucks, bulldozers and graders. At these locations, pumps and bypass pipelines will be installed. Pile drivers will install piles for support of pump platforms. Piping, pumps and motors will be installed using cranes, delivery trucks and back hoes. Control structures will be constructed using similar equipment.

E. Management of Operations and Maintenance

Recharge Basins. The recharge basins will be managed to maximize the use of available water supplies and to minimize cost for conveyance and operation. The basins will be designed into several systems and will be located on the property to take advantage of the different sources of available water. A hierarchy of basin filling will be established so when water is recharged, specific basin systems will be utilized frequently, while others may only be filled on an occasional basis.

Within each system the water will flow from basin to basin through an interbasin structure which will control the water level in the proceeding basin and the flow rate to the next basin in the chain. To prevent impacts on nesting birds, the basins, to the extent possible for the period March through July, shall be kept at a

constant level, except for the basins at the end of a chain which will accommodate fluctuating flows.

If a basin has been idle for more than two years, subsequent filling shall be done slowly if possible, mimicking heavy rainfall, so that any listed species that may have inhabited the basin bottoms or sides may escape before drowning occurs.

Flooding Frequency. Flooding frequency of recharge basins is dependent upon seasonal precipitation rates. Although models have been prepared to predict water availability over a long period of time, final operations will depend on actual rain and snowfall totals each year. During normal rainfall years, annual flooding would take place. During above normal years the basins will be flooded to their full capacity. The frequency in which the basins will be used for recharge is projected to vary; infrequently (1 year in 10) 5,900 acres are estimated to be flooded; on a intermediate basis (2 years in 10) 4,830 acres are estimated to be flooded; and on a frequent basis (5 years in 10) 2,110 acres are expected to be flooded. The duration of flooding each year will vary depending on weather conditions (see Map 4, Recharge Frequency Plan).

Canal and Basin Bank Management. Seasonal release, conveyance and storage of water results in emerging wetland vegetation in canals and basins. Tall growth of this vegetation impairs water flow and recharge capability, reduces the ability to control mosquitoes, and therefore must be managed. Vegetation management methods under consideration for canals and basins bank vegetation include hand control, use of light weight equipment (weed eaters), grazing, mowing, and burning. Mowing is proposed to maintain seasonal wetland vegetation that inhabit the basin edges adjacent to roads. Riparian vegetation on promontories, peninsulas, and islands will be allowed to achieve full canopy cover. When basins are to remain dry for extended periods of up to five years, prescribed burning may be used for weed control. Silt removal from canals and recharge basins will be done using excavators, backhoes or loaders.

Canals for water recharge or recovery will be located according to the topography and location of existing facilities. The present network of internal access roads would be extended across a new canal to provide short, infrequently traveled bridges which would serve for connectivity for even small vertebrates during those periods when the canal was not dry. The bottom of recovery canals would be concrete lined to retard water loss and would not require management for Russian thistle as do earthen canals in the area. Canal side slopes would be shallow enough to allow animals to escape from the interior.

Roads and Levees. Maintenance work on roads and levees will be based on routine inspections during operating periods and periodically during non-operating periods. Typical work will include: clearing vegetation; grading roads and levees; mowing of vegetation; repair and replacement of weak sections of levees; removal of silt and repair of erosion.

F. Project Permit/Authorization

The Project may result in the take of listed species. However the Project will result in a substantial increase of habitat for the listed species compared to the conditions prior to the date the Kern Water Bank lands were acquired by DWR. KWBA will return some of the Kern Water Bank to its historic intermittent rangeland/wetland habitat. The Project Permit/Authorization will authorize incidental take of the following species (the listed species) and the species listed on Exhibit D hereto, incorporated herein by this reference. The species on Exhibit D are those species for which it is expected that the species may come to occupy the KWB and that the species may become listed due to its current known population and range.

TABLE 3 - COVERED SPECIES

		Status (1)		
Scientific Name (2)	**Common Name (3) and Plant Community Associations (6)**	**Federal**	**State**	**Other**
Federally Listed Species				
Plants				
Caulanthus californicus	California jewelflower (4) VSG	E	E	CNPS 1B
Eremalche parryi ssp. kernensis	Kern mallow (4) VSS, VSG, GVMS	E		CNPS 1B
Eriastrum hooveri	Hoover's eriastrum (5) VSS, VSG	T		CNPS 1B
Lembertia congdonii	San Joaquin woolly-threads (5) VSS, VSG, NNG	E		CNPS 1B
Opuntia basilaris var. *treleasei*	Bakersfield cactus (4) MFS, NNG	E	E	CNPS 1B
Birds				
Branta canadensis leucopareia	Aleutian Canada goose Wetlands	E		MBTA
Falco peregrinus anatum	American peregrine falcon (4) ALL	E	E	MBTA
Invertebrates				
Branchinecta conservatio	Conservancy fairy shrimp Wetlands	E		
Branchinecta lynchi	Vernal pool fairy shrimp Wetlands	T		
Branchinecta	Longhorn fairy shrimp	E		

longiantenna	Wetlands			
Lepidurus packardi	Vernal pool tadpole shrimp Wetlands	E		
Desmocerus californicus dimorphus	Valley elderberry longhorn beetle (4) MFS, GVCRF	T		
Reptiles				
Gambelia sila	Blunt-nosed leopard lizard (5) VSS, VSG, GVMS	E	E	
Thamnophis gigas	Giant garter snake Wetlands	T	T	
Mammals				
Dipodomys ingens	Giant kangaroo rat (4) VSS, VSG, NNG, GVMS	E	E	
Dipodomys nitratoides nitratoides	Tipton kangaroo rat (5) VSS, VSG, NNG, GVMS	E	E	
Vulpes macrotis mutica	San Joaquin kit fox (5) ALL	E	T	
Species Listed Only by the State of California				
Plants				
Atriplex tularensis	Bakersfield saltbush (4) VSS, GVMS	C1	E	CNPS 1B
Birds				
Buteo swainsoni	Swainson's hawk (4) ALL		T	MBTA
Grus canadensis tubida	Greater sandhill crane Wetlands			MBTA
Mammals				
Ammospermophilus nelsoni	San Joaquin antelope squirrel (5) VSS, VSG, NNG	C1	T	
Other Species of Concern				
Plants				
Atriplex cordulata	Heart-leaved saltbush (4) VSS, GVMS			CNPS 11B
Atriplex miniscula	Lesser saltbush (4) VSS, GVMS			CNPS 11B
Atriplex vallicola	Lost Hills saltbush (4) VSS, GVMS			CNPS 1B
Cirsium crassicaule	Slough thistle (5) MFS, GVCRF			CNPS 2C
Cordylanthus mollis ssp. hispidus	Hispid bird's-beak (4) Saline Marshes and Flats			CNPS 1B
Delphinium recurvatum	Recurved larkspur (5)			CNPS 1B

	VSS, VSG, GVMS			
Hemizonia pallidus	Kern tarplant (4) VSS, VSG, NNG			CNPS 4
Layia leucopappa	Comanche Point layia (4) VSG			CNPS 1B
Calochortus striatus	Alkaki mariposa lily (4) VSG			
Amphibian				
Scaphiopus hammondi	Western spadefoot toad (5) VSS, VSG, NNG, MFS		SSC	
Reptiles				
Clemmys marmorata marmorata and/or C. m. pallida	Western pond turtle (4) Wetlands		SSC	
Birds				
Agelaius tricolor	Tricolored blackbird (4) Wetlands, NNG		SSC	MBTA
Athene cunicularia	Burrowing owl (5) VSG, NNG		SSC	MBTA
Buteo regalis	Ferruginous hawk (4) ALL		SSC	MBTA
Charadrius alexandrinus nivosus	Western snowy plover (4) Wetlands		SSC	MBTA
Charadrius montanus	Mountain plover (4) VSG, NNG		SA	MBTA
Lanius ludovicianus	Loggerhead shrike (5) GVCRF		SSC	MBTA
Plegadis chihi	White-faced ibis Wetlands		SSC	MBTA
Toxostoma lecontei	Le Conte's thrasher (4) Saltbush Scrub		SSC	
Mammals				
Eumops perotis californicus	Greater western mastiff bat (4) Cliffs, crevices, tunnels		SSC	
Plecotus townsendii	Pacific western big-eared bat (4) Cliffs, crevices, tunnels		SSC	
Sorex ornatus relictus	Buena Vista Lake shrew (4) Wetlands, MFS, GVCRF	C1	SSC	
Taxidea taxus	American badger (5) ALL		SSC	

Notes:
(1) Federal: E = endangered; T = threatened; C1 = taxa for which there is substantial information to propose listing, based on species vulnerability and threats.

State: E = endangered; T = threatened; SSC = species of special concern.
Other: CNPS = California Native Plant Society;
CNPS 1B = plants rare and endangered in California and elsewhere,
CNPS 2 = plants rare, threatened or endangered in California, but more common elsewhere;
CNPS 4 = not rare, but of limited distribution;
CNDDB SA = California Natural Diversity Data Base Special Animal;
MBTA = bird protected under the Federal Migratory Bird Treaty Act.

(2) Species are listed in alphabetical order by scientific name, within taxonomic groups.
(3) Plant common names follow CNPS nomenclature.
(4) Sensitive species that may move into the HCP area after implementation of the project.
(5) Sensitive species known to occur on Kern Water Bank land.
(6) Associated Plant Communities
VSS = Valley Saltbush Scrub
Wetlands = recharge basins and canals
VSG = Valley Sacaton Grassland
NNG = Non-native Grassland
MFS = Mule Fat Scrub
GVMS = Great Valley Mesquite Scrub
GVCRF = Great Valley Cottonwood Riparian Forest
ALL = Associated with all plant communities

Source: DWR 1993, Thomas Reid Associates 1996

Pursuant to section 10(a)(2) of the federal Endangered Species Act of 1973 (ESA), and sections 2081 and 2835 of the California Fish and Game Code, KWBA has submitted a Natural Communities Conservation Plan / Habitat Conservation Plan (HCP) with the Project Permit/Authorization applications to USFWS and CDFG. The HCP, a statutory requirement of the Project Permit/Authorization applications, estimates the level of incidental take expected to occur during the proposed activities and specifies how the impacts of the taking will be minimized and mitigated. In addition, KWBA has requested that the USFWS and CDFG enter into an Implementing Agreement (IA) that addresses any currently unlisted species, pursuant to KWBA's HCP, should they become listed under ESA and/or California ESA in the future.

The purpose for issuing the Project Permit/Authorization and implementing the associated HCP is to authorize incidental taking of the federally and state listed species listed above, during the construction, operation, and management of the Kern Water Bank as well as for third-party projects within the Master Permit Credit Area. Such authorization is necessary because activities associated with the proposed action may result in take of any of the federally and/or state listed species despite the comprehensive mitigation program proposed by KWBA in the HCP. The proposed Kern Water Bank Project may affect other species, and KWBA has requested that the IA between the USFWS, CDFG and it provide assurances that, should the currently unlisted species be subsequently listed, the HCP would be deemed adequate and no further mitigation would be required.

G. Conservation Bank / Master Permit/Authorization

The conservation bank can be used by third parties that require USFWS and/or CDFG take authorization or that require mitigation as a result of a Section 7 consultation with the USFWS (projects requiring federal permits). The conservation bank can also be used by a third party that already has take authorizations, such as the City of Bakersfield, and needs to provide mitigation land to meet the requirements of its HCP.

Third-party projects that lie within the Master Permit Credit Area are eligible to obtain take authorization protection under the Kern Water Bank if land lost, either temporarily or permanently, as a result of project implementation:

1) Contains habitat of comparable value to the replacement habitat found in the conservation bank,

2) Is occupied or has the potential to be occupied by San Joaquin kit fox, Tipton kangaroo rat, blunt-nosed leopard lizard, and/or San Joaquin antelope squirrel; and

3) The impacts of the activity would qualify for a low effect habitat conservation plan in accordance with the HCP Handbook.

Third parties seeking to use conservation bank lands for listed species whose presence is then undocumented on the conservation bank land, such as giant kangaroo rat, would have to provide proof that the species is found on the conservation bank lands.

Eligible projects would be those having minor or negligible effects on federally listed, proposed, or candidate species and their habitats, and minor or negligible effects on other environmental values or resources.

The USFWS and CDFG will require a Landowner/Applicant to provide a biological survey of the project area and discuss specific impacts of the proposed project. The USFWS and CDFG will ultimately make decisions on whether a project lying within the Master Permit Credit Area is eligible to be covered by the Master Permit/Authorization, and whether any additional environmental assessment is necessary.

The conservation bank comprises 3,267 acres. Using typical mitigation ratios of USFWS and CDFG for compensable habitat within the Master Permit Credit Area, use of the conservation bank could result in the following impacts:

For projects with temporary disturbance, such as oil and gas projects where disturbed vegetation is restored, the USFWS and CDFG typically require a 1.1:1 replacement ratio (habitat replaced to habitat lost). Thus, if all 3,267 acres of the conservation bank were purchased to mitigate projects with temporary disturbance,

then as much as 2,940 acres of temporary disturbance could occur within the Master Permit Credit Area.

For permanent mitigation of compensable habitat the USFWS and CDFG typically require a 3:1 replacement ratio. Thus the 3,267 acres could accommodate up to 1,089 acres of permanent disturbance in the Master Permit Credit Area. However, it is more likely that a combination of both permanent and temporary disturbance would take place, such that anywhere between 1,000 to 3,000 acres could be disturbed in the Master Permit Credit Area through the 75 year life of the Master Permit/Authorization.

Impacts on species will depend on the loss of habitat resulting from each eligible project and what measures, if any, are required to minimize on-site impacts (such as allowing animals to escape, or through trapping and relocation).

The Master Permit/Authorization will result in the loss of listed species in the Master Permit Credit Area through ground disturbance to construct buildings, roads, pipelines, and other facilities. For the Tipton kangaroo rat, San Joaquin kit fox, and San Joaquin antelope squirrel, ground disturbance could cause take through collapsing of burrows, crushing by grading equipment, and harassment.

The mitigation of impacts of activities of third parties through the conservation bank has a number of environmental benefits including the following:

1. The lands within the conservation bank will be managed, along with the other lands within the Kern Water Bank, in a coordinated fashion for the benefit of the Covered Species.

2. The conservation bank lands will be protected from development activities in advance of any impacts to Covered Species that occur as a result of third party activities.

3. Because the conservation bank lands are part of the 19,900 acres of the Kern Water Bank, the benefits to Covered Species will be greater than the mitigation of third party activity impacts through piecemeal, project-by-project mitigation that often results in isolated habitat reserves.

4. The KWB HCP/NCCP Area is close to other large natural areas that have been protected from development (i.e., the Coles Levee Ecosystem Preserve). The conservation bank lands are also in close proximity to the Elk Hills Naval Petroleum Reserve which has been managed by the Department of Energy in accordance with the terms of Section 7 consultations under the Federal ESA to provide substantial benefits to a number of the Covered Species. The KWB HCP/NCCP Area is also in close proximity to the areas proposed for substantial conservation in the Kern County Valley Floor Habitat Conservation Plan ("VFHCP"). The VFHCP has identified the areas in the Valley Floor area of Kern County that have the highest conservation values and that are appropriate for

long-term conservation (the "red zones" and "green zones"). Only limited development activities would be allowable under the VFHCP within the red and green zones. The VFHCP sets a limit on development of 10 percent of the lands in the red zones and 25 percent of the lands in the green zones. Collectively, the KWB HCP/NCCP, the VFHCP, and the Coles Levee Reserve will result in the long-term conservation of a large percentage of the remaining natural lands in western Kern County.

5. Through the establishment of the HCP/NCCP, one of the largest remaining natural areas in the Southern San Joaquin Valley will be protected from urban and other development activities.

6. Because the habitat found within the Master Permit Credit Area is expected to be of a lesser conservation value than the habitat found within the KWB HCP Area, it is anticipated that the conservation and restoration of the lands in the HCP/NCCP area will contribute to the survival and recovery of the Covered Species. This is particularly the case because the HCP/NCCP will result in the implementation of a key component of the conservation strategy developed by the Resource Agencies for the San Joaquin Valley.

H. Conclusion

The Project will have the following environmental benefits:

- The historic ground water recharge on the property will be continued.
- Diverse types of habitat including upland, riparian and intermittent wetland/rangeland will be preserved and restored on an ecosystem basis.
- In addition to preserving the two above mentioned types of habitat, special areas to protect sensitive native habitat are planned.
- Upland habitat suitable for the Tipton kangaroo rat, the blunt-nosed leopard lizard, and the San Joaquin kit fox will be preserved and enhanced by adaptive land management.
- Intermittent wetland/rangeland habitat which is scarce in the Southern San Joaquin Valley, and was lost with the introduction of intensive farming, will be restored on the property with benefits to a wide variety of waterfowl and other species.
- The preservation of Compatible Habitat, the natural design of the recharge basins and periodic flooding ensures terrestrial species have the opportunity to migrate thus facilitating genetic diversity.
- Areas adjacent to the Kern River habitat corridor will be preserved.
- Areas adjacent to the ARCO Coles Levee Ecosystem Preserve will be protected as upland habitat and be offered as habitat mitigation to third parties.

- Large areas of intensive agriculture on the KWB have been removed from production and will be set aside as Compatible Habitat.
- In addition to preserving two broad types of habitat, sensitive areas of native habitat are protected.

III. ENVIRONMENTAL SETTING

A. Vegetation

Prior to 1988 when DWR purchased the Kern Water Bank project area, approximately 17,068 acres of the property was utilized for intensive agriculture. The remainder of the property was leased for oil recovery facilities and contained 1,515 acres of isolated native plant communities (saltbush scrub, mesquite savanna, and valley sacaton grassland), and 1,317 acres of non-native grassland. Except for canals used to convey water for agriculture, no wetland habitat occurred on the KWB prior to the DWR purchase.

The Kern Water Bank recharge facilities were designed to avoid the majority of existing native plant communities. As a result, virtually all of the remnant saltbush scrub, mesquite savannah and valley sacaton grassland plant communities are primarily located in the sensitive habitat with the remaining occurrences found in portions of the compatible habitat and the conservation bank property. See Table 4 for a list of the location and land use status of the native plant communities in the Kern Water Bank. In addition, approximately 90% of the non-native grassland plant community is included in the conservation bank.

TABLE 4 - LOCATIONS OF COVERED PLANT COMMUNITIES

LOCATION		
T30S R25E		
Section 12 NE QS	Saltbush	Sensitive
Section 12 SE QS	Saltbush	Compatible
Section 13 NW QS	Mesquite and Saltbush	Compatible
Section 14 North Half	Mesquite and Saltbush	Sensitive
Section 15 NE QS	Mesquite and Saltbush	Compatible and Sensitive
Section 19 South Half	Mesquite and Saltbush	Compatible
Section 20 South Half	Mesquite, Saltbush, Grassland	Compatible
Section 23 NW QS	Saltbush	Compatible
Section 23 NE QS	Grassland	Compatible
Section 24 SW QS	Mesquite and Saltbush	Compatible
Section 25 SW QS	Mesquite	Sensitive
Section 25 SE QS	Mesquite	Conservation Bank
Section 27 NW QS	Saltbush	Compatible
Section 28 NE QS	Saltbush	Compatible/Recharge Basin
Section 36 NE QS	Mesquite and Saltbush	Sensitive
Section 36 NW QS	Mesquite and Saltbush	Compatible/Recharge Basin
T30S R26E		
Section 7 NW QS	Mesquite and Saltbush	Sensitive
Section 8 SW QS	Mesquite and Saltbush	Compatible
Section 28 South Half	Mesquite and Saltbush	Conservation Bank
Section 31 NW QS	Saltbush	Conservation Bank

QS = quarter section

Valley saltbush scrub is generally found in the southwestern San Joaquin Valley on dissected alluvial fans with flat to gently rolling relief. Soils are sandy and loamy soils without surface alkalinity. This community is dominated by gray-green or blue-green shrubs of the Goosefoot family (*Chenopodiaceae*) with a sparse understory of short, annual herbaceous vegetation. Stands of valley saltbush scrub range from open to more dense (10 to 40 percent shrub cover).

Characteristic perennial shrub species of valley saltbush scrub include valley saltbush (*Atriplex polycarpa*), spiny saltbush *(Atriplex spinifera*), alkali heath (*Frankenia grandifolia* var. *campestris*), and pale-leaf golden bush (*Haplopappus acradenius*

bracteosus). Except for saltbush, most of these perennials flower from May to September. Valley saltbush scrub understory typically consists of annual species such as common tarplant (*Hemizonia pungens*), birds-eye gilia (*Gilia tricolor*), goldfields (*Lasthenia* spp.), filaree (*Erodium* spp.), fescue (*Vulpia* spp.), and peppergrass (*Lipidium* spp.). These annuals flower from January to April.

Great valley mesquite scrub is an open or savanna dominated by mesquite *(Prosopis glandulosa torreyana*) and valley saltbush. In many ways, this community is very similar to valley saltbush scrub and non-native grassland with the addition of mesquite. Even where mesquite is present, it may occur in densities as low as two to three per acre. This community occurs on sandy loams of alluvial origin. Since mesquite is a deep-rooted plant dependent on groundwater rather than direct rainfall, it requires a high water table. Understories, grassy in years of adequate rainfall, are usually dominated by non-native annuals. The grassy understory is comparable to non-native grassland. Typical species of this community include mesquite, valley saltbush, red brome, and pale-leaf golden bush.

Valley sacaton grassland is a medium height (39 inches) native grassland dominated by the tussock-forming bunchgrass, alkali sacaton (*Sporobolus airoides*). Valley sacaton grassland and the more widespread non-native grassland both occur on fine-textured soils, but sites supporting valley sacaton grassland are poorly drained, and are usually characterized by alkaline soils. Most sites have seasonally high water tables or are overflowed during winter and spring flooding.

Typical species in this community include saltgrass (*Distichlis spicata*), alkali barley (*Hordeum depressum*), and alkali sacaton (*Sporobolus airoides*).

Non-native grassland is found throughout most of California, primarily below 3,000 feet in elevation on fine-textured, usually clay soils. Non-native grassland is dominated by introduced annual grasses in association with many species of showy-flowered native forbs ("wildflowers"), especially in years of abundant rainfall.

Characteristic non-native species typically present in this plant community are red brome, soft chess (*Bromus mollis*), ripgut brome *(Bromus diandrus*), hare barley (*Hordeum leporinum*), wild oats (*Avena* spp.), Italian ryegrass (*Lolium multiflorum*), Arabian schismus (*Schismus arabicus*), rat-tail fescue (*Vulpia myuros*), filaree, and bur-clover (*Medicago polymorpha*). Native plant species found in the non-native grassland include few-flowered fescue (*Vulpia microstachys*), fiddleneck (*Amsinckia* spp.), goldfields, peppergrass, various species of tarplant (*Hemizonia* spp.), lupine (*Lupinus* spp.), gilia (*Gilia* spp.), owl's clover, and phacelia.

These grasses and flowers germinate with the onset of late fall and winter rains. Growth, flowering, and seed-set occur from winter through spring. Most annuals in this community die by summer and persist as seeds until the winter rains return.

The isolated native plant communities support two federally listed plant species: the San Joaquin woolly-threads (*Lembertia congdonii*), and Hoover's eriastrum (or

woolly-star)(*Eriastrum hooveri*). Two others species have the potential to occur in the saltbush and mesquite plant communities, but have not been documented on the Kern Water bank: the Kern mallow *(Eremalche kernensis*), and California jewelflower (*Caulanthus californicus*), both federally listed as endangered.

San Joaquin Woolly-threads (*Lembertia congdonii*)

The San Joaquin woolly-threads is an annual herb belonging to the sunflower family (Asteraceae) which produces several, frequently-branching stems arising from the base and small yellow disk-flowers from March to April.

The USFWS report supporting federal endangered species status for *Lembertia congdonii* in the Federal Register 19 July 1990 states:

> Associated with the valley saltbush scrub, only 12 populations of [the San Joaquin woolly-threads] remain in the San Joaquin Valley and adjoining foothills from the vicinity of Panoche Pass (San Benito County) southeasterly to Caliente Creek, east of Bakersfield (Kern County) (Taylor 1987). Another seven populations occur to the southwest in the Cuyama Valley (San Luis Obispo and Santa Barbara Counties) and Carrizo Plain (San Luis Obispo County). Primarily as a result of ag-land conversion, 33 populations or 63% of the 52 historical populations of the species have been lost (Taylor 1987).

Known populations occur in the Kettleman and Panoche Hills, Lost Hills, and the Carrizo and Elkhorn Plains (Mitchell 1991). Within the Kern County Valley floor area, this species is known from at least eight widely scattered isolated populations: south of Blackwell's Corner; southeast of Lost Hills; between the Semitropic Preserve and Kern National Wildlife Refuge; west of Bakersfield near Highway 43 and Rosedale Highway; and southeast of Bakersfield at Sand Ridge in Caliente Creek area near its junction with Highway 58.

The plant is found in drifted sand or clayey, often alkaline soil in areas of annual grassland and saltbush scrub at elevations between 250 to 2500 feet. It is possible that it grows only in years of more than normal rainfall.

Within the Kern Water Bank, populations of the woolly-threads are known to occur in T30S, R26E, southwest quarter section of Section 8, and T30S, R25E northeast quarter of Section 12.

Hoover's Eriastrum (*Eriastrum hooveri*)

Hoover's woolly-star, an annual herb of the phlox family (Polemoniaceae), produces many wire-like branches and small white flowers from February to May (Abrams 1940). It is endemic to the southern San Joaquin Valley and adjoining South Coast Ranges, including the Elkhorn Plain, Carrizo Plain, Cuyama Valley from Kern to

Fresno County, and east to San Luis Obispo County. Historical distribution of the species is discontinuous, i.e. there are no documented occurrences of *E. hooveri* in Kings or Tulare Counties.

Hoover's woolly-star grows in the sandy soils of rolling plains of valley saltbush scrub and valley sink scrub below 500 feet. Northern populations (Fresno County) are located on more alkaline soils than southern populations (Kern County). Distribution on alkali sinks is patchy. Colonies are often located only within the patches of cryptogamic soils.

Twelve of the 39 historical and extant populations of the species have been extirpated due to habitat loss (Taylor and Davilla 1986). More recently conducted surveys have both confirmed the status of existing populations as well as previously unrecorded populations on the lands of Naval Petroleum Reserve #1 within the Elk Hills and adjacent lands including the Buena Vista Valley and Buena Vista Hills (EG&G 1988; Russ Lewis pers. comm. 9 September 1989 to USFWS). These two surveys brought the total of remaining populations of *Eriastrum hooveri* to 118. However, of these 118 known populations, 100 are currently threatened by oil and gas development, ag-land conversion, urbanization or reservoir construction. One population is within a preserve, the Nature Conservancy's Paul Paine/Semitropic Ridge Preserve.

Within the Kern Water Bank Hoover's eriastrum has been documented as occurring in T30S, R25E, northeast quarter of Section 12, in the north half of Section 14, in the southeast quarter of Section 25, in the northeast quarter and south half of Section 36, and in T30S, R26E in the southwest quarter of Section 8, and the southwest quarter of Section 28.

Kern Mallow (*Eremalche kernensis*)

Kern mallow is a small erect annual plant that is branched from the base with stems from 2 to 4 inches tall. The stems have scattered stellate hairs and support three-to five-lobed leaves that are 0.5 to 1.5 inches long and about as wide. Petioles may be as long as 1 inch. Bractlets are filiform and taper gradually to a slender tip. Flowers are white or lavender-pinkish and appear in early spring (March to April). Fruits resemble small segmented wheels of cheese.

The extant distribution of Kern mallow is restricted to the dry open clay flats between 600 and 900 feet above mean sea level that are found in the southwestern portion of the lower San Joaquin Valley. The habitat for Kern mallow consists of saltbush scrub vegetation, with an approximate saltbush shrub canopy cover of 20 percent. Shrub canopy cover is commonly provided by either Valley saltbush and/or spiny saltbush. Within this habitat, Kern mallow grows in areas where the annual grass cover is low, such as old tire tracks or small exposed "balds" with cryptogamic crusts. Soils tend to be silty loams and are classed somewhere between the heavily alkaline sinks and the non-saline soils now largely converted to agricultural uses on the floor of the San Joaquin Valley (Taylor and Davilla 1986).

The systematic position of this plant, as either a full species or subspecies of Parry's mallow (*E. parryi*) is not clear. Research suggests that two or more subspecies may be present in the San Joaquin Valley. In the strict sense, white-flowered plants in Kern County are called Kern mallow (Bates 1993).

California Jewelflower (*Caulanthus californicus*)

The California jewelflower is an annual herb of the mustard family (Brassicaceae), usually one foot tall, with several flower branches. The lower leaves of the jewelflower are dry, oblanceolate and lobed with wavy margins. The base of the lower leaves cling to the stem of the plant and are egg-shaped or oblong. The flowers are translucent white with purple tips that turn green at full bloom (Taylor and Davilla 1986). Thin, narrow seed pods up to one inch long are one of the factors which distinguish this plant from related species (USFWS 1989).

Historically, the California jewelflower was distributed in the general area bounded by the present-day cities or communities of Coalinga and Fresno in Fresno County, New Cuyama in Santa Barbara County and Bakersfield in Kern County (Taylor and Davilla 1986). The jewelflower was extirpated from most of its former range as a result of the expansion of agriculture and livestock grazing coupled with the conversion of San Joaquin Valley grasslands from native annual plants to European annual plants (Taylor and Davilla 1986).

Today, the California jewelflower is represented by approximately twenty populations at four locations along the western edge of its range. These locations include the foothills of southwestern Fresno County, two sites on the Carrizo Plain in San Luis Obispo County, and in the Cuyama Valley of Santa Barbara County. The latter locations supports the largest populations of this species, but is privately-owned (CDFG 1992, Skinner and Pavlik 1994).

The California jewelflower is thought to be extirpated from Kern County. A transplanted population is being maintained in alkali grassland at The Nature Conservancy's Semitropic Ridge Preserve in Kern County. The U.S. Forest Service is attempting to establish new populations of this species on public lands (CDFG 1992).

The introduced population grows, in wet years, on the alkali plains in The Nature Conservancy's Paul Paine/Semitropic Ridge Preserve. Historical records indicate the jewelflower was found on the floor of the San Joaquin Valley in sandy, grassland type habitat (Taylor and Davilla 1986) and on slopes under 3000 feet on the surrounding foothills (Munz 1973).

There are no documented occurrences of the California jewelflower on the Kern Water Bank.

Wetlands.

Although the baseline condition of the Kern Water Bank was dry land when DWR acquired it, activities carried out by the Kern Water Bank Authority have and will continue to convert some dry land to wetlands. The following types of wetlands may emerge.

Open water aquatic habitat is found where standing or slow moving water is at least 5 to 6 feet deep. Within the study area this may include sloughs, canals, and ditches that do not dry up in the summer as well as the large open water recharge basins. The vegetation supported in this habitat includes pondweeds (*Potamogeton sp.)*, duckweed (*Lemna sp.)*, *Elodea sp.*, mare's tail (*Hippuris vulgaris)*, yellow water-weed (*Jussiaea repens)*, water milfoil (*Myriophyllum sp.)*, and smartweed (*Polygonum amphibium, P. sp.)*.

This habitat provides cover, food and oxygen for the invertebrates (crayfish, clams, etc.), amphibian larvae and juvenile fish that become prey items for the higher trophic levels including giant garter snakes, larger game and non-game fish, and migratory waterfowl.

Emergent marsh is found in areas where the water depths do not exceed 6.5 feet. They are typically associated with the channels, ditches, sloughs and basins either as narrow bands along the edge or spreading out from sloping margins. The vegetation that dominates these permanently to semi-permanently submerged areas are cattails (*Typha latifolia)*, tules (*Scirpus acutus)* and rushes (*Juncus sp.)* toward the lower margins and river bulrush (*S. fluvialtilis*), sedges (*Carex sp., Cyperus sp.)*, and vervain (*Verbena hastata)* in the upper margins. The tricolored blackbird (*Agelaius tricolor)*, a federal species of concern, occurs in this habitat.

Emergent marshes are important to both resident and migratory species. These areas are used for nesting or spawning, foraging, and protection from predators. Birds sighted in these habitats include great egret, great blue heron, green-backed heron, night crowned heron, American coot, greater yellowlegs, pied-billed grebe, belted kingfisher, common yellowthroat and song sparrow.

Riparian scrub-shrub habitat is characterized by thickets of woody shrubs, seedlings and sapling trees growing along the upland margins of canals, sloughs, and ditches. Periodic disturbances such as mowing, discing, burning and spraying have prevented young trees of various species -- valley oak (*Quercus lobata)*, walnut (*Juglans californica var. hindsii)*, cottonwood (*Populus fremonti)*, maple (*Acer negundo*), and willow (*Salix gooddingii*) -- from maturing into a riparian woodland. The dominant shrubs of this habitat include button willow (*Cephalanthus occidentalis*), blackberry (*Rubus ursinus*), arroyo willow (*Salix lasiolepis)*, sandbar willow (*Salix hindsiana*) poison oak (*Toxicodendron diversilobum)*, wild rose (*Rosa californica*), and elderberry (*Sambucus mexicana*).

The disturbance regime normally found in riparian scrub-shrub also facilitates an aggressive herbaceous component typically found in ruderal fields and non-native grasslands. Red brome (*Bromus rubens*), wild oat (*Avena fatua*), bermuda grass (*Cynodon dactylon)*, ryegrass (*Lolium perenne*), wild mustard (*Brassica campestris*), star thistle (*Centaurea solstitialis*), horseweed (*Conyza canadensis*), fennel (*Foeniculum vulgare)*, dock (*Rumex sp.)*, knotweed (*Polygonum sp.)*, and chicory (*Cichorium intybus)* intergrade with the more mesic understory of the riparian scrub-shrub: smartweed (*Polygonum amphibium)*, sedge (*Carex barbarae, Carex sp.)*, nutsedge (*Cyperus egrostis)* mugwort (*Artemesia douglasiana)* and creeping spikerush (*Eleocharis palustris).*

Although not as structurally complex as the riparian forest, and therefore less biologically diverse, this habitat will support the valley elderberry longhorn beetle *(Desmocerus californicus dimorphus*), a federally listed threatened species.

The following table shows the disposition of land proposed by the project.

TABLE 5 - HABITAT STATUS

Pre-Project	acres
Upland Habitat	
Sensitive Plants (1)	1,515
Non-native Grassland	1,317
Non-Habitat	
Farmland/Disturbed	17,068
Total	19,900

1991 DWR	acres
Upland Habitat	
Sensitive Plants (1)	1,515
Non-native Grassland	1,317
Fallow - Occupied	6,880
Non-Habitat	
Fallow - Not Occupied	10,188
	19,900

KWB HCP	acres
Upland Habitat	
Compatible Habitat	5,592
(Sensitive Plants - 240)	
(Fallow - 5,352)	
Sensitive Habitat (2)	960
(Sensitive Plants - 960)	
DWR Mitigation	530
(Fallow - 530)	
Conservation bank	2,777
(Sensitive Plants - 315)	
(Non-native grassland -1,177)	
(Fallow - 1,285)	
Intermittent Wetland Habitat (4)	
Recharge Basins	5,900
(Fallow - 5,900)	
Non-Habitat	
Other Facilities	481
(Fallow - 481)	
Commercial Development (3)	490
(Non-native grassland - 140)	
(Fallow - 350)	
Farming	3,170
(Fallow - 3,170)	
	19,900

(1) Gross area that contains known populations of covered plant species.

(2) Contains all known populations of San Joaquin woolly-threads on the KWB.

(3) Assumes KWBA sells or develops 490 acres. Can also be sold as mitigation credits.

(4) Habitat potentially suitable for species such as western pond turtle, Buena Vista lake shrew.

B. Wildlife

Numerous species of wildlife are supported by habitat found on the Kern Water Bank. Three of the species are federally listed as threatened or endangered species; these are the blunt-nosed leopard lizard (*Gambelia silus*), Tipton kangaroo rat (*Dipodomys nitratiodes*), and San Joaquin kit fox (*Vulpes macrotis mutica*), and one is a state listed threatened species: the San Joaquin antelope squirrel (*Ammospermorphilus nelsoni*). The federally-listed giant kangaroo rat (*Dipodomys ingens*) is not documented on the Kern Water Bank, but there are known populations just to the south.

San Joaquin Kit Fox (*Vulpes macrotis mutica*)

The kit fox species, *Vulpes macrotis*, represents the smallest of the four species of foxes found in North America. Of the various subspecies of kit fox, San Joaquin kit fox (*Vulpes macrotis mutica*) is the largest in size (USFWS 1983). Adult kit fox are slender, weighing 1.4 to 2.7 kg (3 to 6 pounds). Head and body length is 38 to 51 cm (15 to 20 inches) with a 23 to 30 cm (9 to 12 inch) cylindrical, bushy, black-tipped tail. The inner side of their exceptionally large ears are covered with dense, stiff white hairs (USFWS 1983). Pelage color ranges from a pale grey with rust colors to a buffy yellow; the belly is whitish (Burt and Grossenheider 1976). The underfur is heavy and slightly harsh in texture while overhairs are scattered and meagerly developed (Grinnell et al. 1937).

Kit foxes are primarily nocturnal, emerging at sunset to hunt. Primary prey species are kangaroo rats (*Dipodomys ingens, Dipodomys nitratoides, Dipodomys heermanni*). Black-tailed jackrabbits (*Lepus californicus*), desert cottontails (*Sylvilagus auduboni)* and California ground squirrel (*Spermophilus beecheyi*) may be primary prey species in some areas and secondary prey species to the kangaroo rat in others (Zoellick et al. 1987; O'Farrell and Scrivner 1987).

Dens are usually found in areas of low to moderate relief in loose textured soils (O'Farrell and McCue 1981, O'Farrell et al. 1980, cited by USFWS 1983). Man-made structures such as culverts, well casings, irrigation pipes and man-made dens constructed specifically for the San Joaquin kit fox have been used by kit foxes for both transient and natal dens (Egoscue 1956, 1962 and Morrell 1972, cited by McGrew 1979; Knapp 1978; O'Farrell and Scrivner 1987).

Prior to the introduction of irrigated agriculture in the valley, the prime habitat for the San Joaquin kit fox is thought to have been in the valley saltbush scrub, alkali sink and lower Sonoran grassland ecological communities. Today, within Kern County, kit foxes still inhabit valley saltbush, valley scrub, non-native grassland and valley sink scrub communities. They have been found to disperse through various types of disturbed habitat including agriculture fields, oil fields, highways, aqueducts and canals (Kato 1982). In the Bakersfield area, railroad tracks and canals are used by kit fox to travel from one habitat area to another. Habitat suitable for the San Joaquin kit fox is found throughout the Kern Water Bank.

Historically, this fox occurred throughout the San Joaquin Valley and western portions of the Sacramento Valley from Contra Costa County south to southern Kern County, as well as the arid valleys, plains and lower foothills of the Inner Coast Range (Carizzo Plain, Salinas Valley, Temblor Range, Cholame Hills, Elkhorn Plain and Elk Hills). The original range was estimated to be approximately 5,570,000 acres (O'Farrell 1983). Today, Central Valley kit fox populations are highly fragmented and restricted to the remaining native vegetation associations of the Valley floor and surrounding foothills from near Los Banos, Merced County southward to southern Kern County (CDFG 1992).

The Kern County Valley floor area harbors some of the highest densities of kit fox. These areas occur along the west side of the Valley floor, from the Lokern Area southward to Maricopa. Elsewhere, occurrences are highly fragmented, with low to moderate densities south and east of the Kern National Wildlife Refuge and north and east of the City of Bakersfield. The latter populations are connected to the populations on the west side of the Valley by a series of small populations inhabiting the Kern River flood plain.

Preserves for the San Joaquin kit fox should be able to support an average of 1.4 animals per square mile (USFWS 1983), be composed of native communities or non-native grasslands, support prey populations, contain adequate denning sites, and have few human intrusions, particularly roads. Corridors should be wide enough to provide safety to migrating animals. The Recovery Plan calls for the protection and/or acquisition of 35,000 acres (55 square miles) of kit fox habitat in areas mapped as first priority for protection in order to meet interim plan objectives of halting the decline of the species and increase population size above 1981 levels. Meeting these interim objectives could result in the changing of the San Joaquin kit fox status from federally "endangered" to "threatened".

The DWR 91 data shows scattered occurrences of the San Joaquin kit fox (SJKF) on the Kern Water Bank throughout the idle agricultural lands.

Wildlife surveys conducted for the interim recharge project found 69 potential kit dens but monitoring of these sites showed no signs of activity and they were closed prior to 1995 construction.

Night spotlight wildlife surveys were conducted on a 55 mile route within the boundaries of the Kern Water Bank on June 18, 19, and 27, and July 3, 7, and 10, 1996. Also set up were twenty-five scent stations throughout the water bank during 7 days in August 1996. San Joaquin kit fox prints were noted at three of the scent stations (2 in the south half of Section 20 of T30S, R25E, and 1 in the south half of Section 19, T30S, R26E). The scent stations also revealed sign of 6 coyotes and 3 striped skunks. During the spotlighting, one SJKF was sighted in the southeast quarter section of Section 12, T30S, R25E. Other species sighted were: 67 barn owls, 18 burrowing owls, 9 coyotes, and 6 striped skunk.

Blunt-nosed Leopard Lizard (*Gambelia silus*)

The blunt-nosed leopard lizard (BNLL) is a relatively large and long-lived lizard. It is so-named because of its short, broad skull and blunt snout. The robust body and long tail display a prominent pattern of dark spots and pale cross-bars. Adult males range from 90 mm to 120 mm (3.5 to 4.8 inches) in the body (snout-to-vent length) and are slightly larger than adult females which average 85 to 107 mm SV (3.4 to 4.2 in) (USFWS 1985). If severed, the lizard's tail is able to regenerate itself.

The leopard lizard does not dig its own burrow for escape, cover, shelter, or as egg-laying sites. Instead, it uses existing small mammal burrows, made by kangaroo rats, ground squirrels, pocket gophers, pocket mice and other rodents. Leopard lizard may prefer burrows in pond loam and clay loam soils on sparsely vegetated slopes of less than 30%, canyon floors, low foothills, especially in large washes and arroyos (Montanucci 1965, Chesemore 1980 cited by Uptain et al. 1985; Uptain et al. 1985).

Prey of the leopard lizard includes insects, spiders and occasionally other lizards as well as other leopard lizards (Dick 1977). Due to its foraging habits, the lizard prefers areas of relatively sparse ground cover which is more prevalent during the dry seasons and in dry years. Chesemore (1980) suggests that 15 to 30% bare ground may be the optimum openness for the blunt-nosed leopard lizard, and a site with 50% or more open ground may not be suitable for the species. Conversely, dense vegetative cover appears to interfere with running and hunting ability, thermoregulatory behavior and visibility of potential mates during the breeding season (Snow 1972; Montanucci 1965; Stebbins 1966).

The leopard lizard's historic range extended from Stanislaus County south to the southern edge of Kern County and included San Joaquin Valley, Kettleman Plain, Carrizo Plain and Cuyama Valley (Montanucci 1965, Smith 1946, Tollestrup 1979, cited by USFWS 1985).

Populations of BNLL on the Valley floor have been dramatically reduced in size and area, due to loss of habitat. Extant Valley floor populations are severely fragmented. Within the Kern County Valley floor area, small, isolated populations are scattered north and northeast of Bakersfield and between Elk Hills, bordering the southwestern side of the Valley floor, between Maricopa and Highway 33. BNLL are also common in grazed grasslands between the Pleito Hills and Wheeler Ridge, and elsewhere in the southern and southwestern portions of the Kern County Valley floor (Van Denburgh 1922, The Planning Center 1991, Weintraub 1991).

Blunt-nosed leopard lizards are known to occur in valley and foothill grassland, saltbush (*Atriplex*) scrub land, iodine bush (*Allenrolfea*) grassland, *Sueda* flats. They are most numerous where large *Atriplex* and *Isomeris* bushes were numerous and widespread. Chesemore (1980) found a correlation between the presence of the blunt-nosed leopard lizard and *Schismus arabicus* (Arabian grass) which could not be reconfirmed in later studies (Uptain et al. 1985). Blunt-nosed leopard lizards were

observed in areas totaling approximately 720 acres of the Kern Water Bank (DWR, 1991).

The Blunt-nosed Leopard Lizard Revised Recovery Plan (USFWS 1985) recommends that populations should meet or exceed a level of one blunt-nosed leopard lizard per acre average density to maintain a viable population. While Tollestrup 1976 suggested that one square mile (640 acres) of good habitat might meet minimum area requirements for perpetuating a leopard lizard population, this estimate has not been substantiated by other studies. To disperse from one area to another, the leopard lizards require natural, undisturbed washes or dirt roads with shrub vegetation along the edges for cover. The Recovery Plan identifies a minimum of 30,000 acres of essential habitat be protected within five distinct areas of the blunt-nosed leopard lizard range before the species may be re-classified as threatened, rather than endangered.

The DWR 1991 study also showed very few documented occurrences of the blunt-nosed leopard lizard on the Kern Water Bank. Occurrences were restricted to areas of poor soil type associated with very sparse vegetation and areas of open ground. The DWR 1991 documented occurrences of BNLL are almost exclusively located in areas designated as either sensitive habitat (NW quarter of Section 7, T30S, R26E and SW quarter of Section 36, T30S, R25E), or compatible habitat (S half of Section 6, SW quarter of Section 5, NE quarter of Section 7, NW quarter of Section 8, SE quarter of Section 20, T30S, R25E, and NW quarter of Section 20, T30S, R26E).

Tipton Kangaroo Rat (*Dipodomys nitratoides*)

The Tipton kangaroo rat, whose head and body measure from 100 to 110 mm long (3.9 to 4.3 inches), is a subspecies of the smallest species of kangaroo rat, *Dipodomys nitratoides* (Williams 1985). Its tail is longer than its body length and ranges from 125 - 130 mm (4.9 to 5.1 inches). It weighs an average of 36.5 grams (1.3 ounces) (Grinnell 1920) and is slightly larger than *Dipodomys nitratoides exilis* but smaller than *D. n. brevinasus*.

Like all kangaroo rats, the Tipton is adapted for bipedal locomotion (jumping), having greatly enlarged hind limbs, a long thickened tail, a short neck and a large head. The ears and eyes are on the upper sides of the head. Fur-lined cheek pouches hold seeds and other food for transport to caches which the animal locates close to its burrow. The forelimbs of the Tipton Kangaroo Rat are short, with long, stout claws and four dexterous finger-like toes.

The Tipton kangaroo rat commonly digs burrows on elevated spots which are not subject to flooding. Sometimes, areas which are flooded in winter and spring are colonized during the dry seasons. Preferred habitat for Tipton burrows are within alluvial fans and flood plains and include highly alkaline fine sands and, to a lesser degree, alkaline sandy loams. The animal is most commonly associated with Alkali Sink Scrub and Valley Saltbush Scrub on the floor of the Tulare Basin. These communities provide a habitat of sparsely scattered shrubs and a scant-to-moderate groundcover of grasses and forbs.

Historic populations of the Tipton kangaroo rat are roughly estimated to have been 17,164,800 individuals (CDFG 1990). Habitat loss from agricultural conversion of lands after the completion of the Central Valley Project is the main cause of the decline of the species. Tipton kangaroo rats were formerly occupied a range that included the Tulare Lake Basin in parts of Fresno, Kings, Tulare and Kern counties. The former range of approximately 1,716,500 acres has been reduced to 63,400 acres or 3.7 percent of the original range (CDFG 1990).

Tipton kangaroo rats are associated with habitats on the floor of the Tulare Subbasin. Typically, this species occupies scrub and grassland communities in level or near-level terrain with alluvial fan-flood plain soils (alkaline fine sands and sandy loams) and sparse grasses and woody vegetation such as iodine bush, saltbush, sea blite, and mesquite. These areas generally have a high water table. In areas subjected to seasonal flooding, Tipton kangaroo rats construct burrows on elevated ground (Grinnell 1933, Williams 1985 & 1986, Williams and Kilburn 1992).

Within the Kern County Valley floor area, known occurrences of Tipton kangaroo rats are highly disjunct. Because of agricultural conversion of valley floor habitats, populations are now restricted to isolated parcels of native habitat, primarily east of the California Aqueduct (Williams 1985). Populations are concentrated east and south of the Kern National Wildlife Refuge, to Delano on the east and Maricopa on the south along the western edge of the Valley floor. The Kern River flood channel between Highway 99 southwest of the mouth at the site of historic Buena Vista Lake, north of Pixley National Wildlife Refuge, and within and west of the City of Bakersfield, were expected by Williams (1985) to support this subspecies. Approximately 200 acres of habitat supporting Tipton kangaroo rats still remained along the western border of Buena Vista Lake bed, and the site north of Pixley National Wildlife Refuge may have contained over 2,500 acres of habitat for the Tipton kangaroo rat.

The DWR 91 data shows scattered occurrences of the Tipton kangaroo rat throughout the idle agricultural lands of the Kern Water Bank.

San Joaquin Antelope Squirrel (*Ammospermophilus nelsoni*)

The San Joaquin antelope squirrel has a yellowish-brown pelage with a creamy white line on each side of the back extending from shoulder to hip and a tail with a white underside. The head and body are 152 to 165 mm (6 to 6.5 inches) long and tail length is 64 to 76 mm (2.5 to 3 inches) (Burt and Grossenheider 1976). It weighs from 84 to 154 grams (3 to 5.5 ounces).

The squirrel is omnivorous mainly feeding on grass and forb seeds as well as insects (CDFG 1990). It will co-occupy giant kangaroo rat precincts and digs burrows in road cuts and arroyos (Williams 1979; 1985). Williams (1979) states that the range of the antelope squirrel most nearly coincides with the range of the giant kangaroo rat, but its microhabitats are different.

The historic range of the San Joaquin antelope squirrel included the western and southern portions of the Tulare Basin, San Joaquin Valley and areas to the west including the Cuyama Valley, Carrizo Plain and Elkhorn Plain. The western half of the range extended north to western Merced County. San Joaquin antelope squirrel were found the San Joaquin valley floor in Kern County and along the Valley's eastern edge north to Tipton in Tulare County (CDFG 1990).

In Kern County the San Joaquin antelope squirrel was distributed throughout the valley floor (Williams and Kilburn 1992). The squirrel was apparently naturally unevenly distributed throughout this region, occurring in abundance at only a few localities (Williams 1980, Williams and Kilburn 1992, citing Grinnell and Dixon 1918). Populations are currently restricted to approximately 102,000 acres of marginal habitats in the foothills along the western edge of the Tulare Subbasin. The Elk Hills region, between Buttonwillow and Taft, contains the only substantial populations of the species remaining within the Kern County valley floor area. Elsewhere, viable populations are also found on the Carrizo and Elkhorn plains in San Luis Obispo County (Williams and Kilburn 1992).

The San Joaquin antelope squirrel is found in flat to sloping terrain with loam or sandy loam soils in the western and southern portions of the Tulare Basin. The antelope squirrel could be found in association with the Interior Coast Range saltbush scrub, upper Sonoran subshrub scrub, non-native grassland and valley sink scrub. The habitat normally consists of species such as salt bush (*Atriplex* spp.), ephreda (*Ephreda viridis*), bladder pod (*Isomeris arborea*), goldenbush (*Haplopappus* spp.) and snakeweed (*Gutierrezia californica*). Grinnell and Dixon (1918) and Hawbecker (1953) observed that it more rarely occurred in valley floor habitats with alkaline soils (i.e. ephemerally flooded with a high water table) dominated by iodine bush (*Allenrolfea occidentalis*) and spiny salt bush (*Atriplex spinifera*). It has been observed in the non-native grassland community (Hawbecker 1958).

The home range of the San Joaquin antelope squirrel is thought to be approximately 10 to 50 acres with an average of 35.5 acres (CDFG 1990). The squirrel has a high affinity with its home range and remains there from year to year. However, each animal covers up to half of its range per day (Hawbecker 1958).

The San Joaquin antelope squirrel has had only one documented occurrence at the Kern Water Bank, which was in an area designated as sensitive habitat (E half of Section 36, T30S, R25E). This area will be maintained as a habitat preserve throughout the life of the permit. If populations expand into recharge basin areas, loss of individuals may occur from levee and canal maintenance activity, flooding and project related traffic.

Giant Kangaroo Rat (*Dipodomys ingens*)

The giant kangaroo rat is the largest of the all the kangaroo rats and measures a total length of 311 to 348 mm (12.2 to 13.7 inches). Compared to other kangaroo rats, the ears and tail of the giant kangaroo rat are short in relation to its total body length. It is also the heaviest of the species weighing from 131 to 180 g (4.6 to 6.4 ounces) with males somewhat heavier than females. The fifth toe appears only on the hind foot and is diagnostic for the giant kangaroo rat. Other kangaroo rat within the range of the giant kangaroo have four toes on the hind foot and are smaller in weight as adults (CDFG 1988).

The giant kangaroo rat prefers to dig its burrows in open areas on flat to gently sloping terrain, usually less than 10 percent slopes. The soil in these areas is fine sandy loams with a covering of annual grasses and herbs. The giant kangaroo rat usually does not occur in areas of highly alkaline soils and seasonal flooding (Grinnell 1932, Williams 1981 cited by CDFG 1988).

Original habitat of the giant kangaroo rat may have been 1,303,700 acres from Merced County south to Kern County, west to eastern San Luis Obispo County and northern Santa Barbara County (Williams in prep, cited by CDFG 1988). Of this original habitat, an estimated 97-98% has been lost to agricultural conversion of natural lands (CDFG 1988).

The last relatively large blocks of suitable habitat are at the southern edge of the historic range of the species, in the upper Buena Vista Valley of western Cuyama Valley of northern Santa Barbara County. Most of the extant populations are small, ranging from fewer than 10 to several hundred individuals. Despite successful translocation efforts to protected lands in the Carrizo Plain, populations of this species are considered to be declining due primarily to continued habitat loss and the use of rodenticides to control California ground squirrels (CDFG 1992).

There are no documented occurrences of the giant kangaroo rat on the Kern Water Bank.

C. Climate

The San Joaquin Valley has a Mediterranean climate of cool, moist winters and hot, dry summers. Summer daytime high temperatures frequently exceed 100 degrees. Mean annual temperature is 65 degrees. With less than six inches of rainfall annually, much of the Valley is classified as desert. Precipitation normally occurs from September through April. A dense persistent, ground fog known as "Tule Fog" can develop during the winter months resulting in overcast, damp, cool weather (THC 1984).

D. Topography

The Project site is located in the southern San Joaquin Valley trough on the Kern River Fan. This trough, bounded by the Sierra Nevada to the east, the Tehachapi Mountains to the south, and the Coast Range to the west, follows a northwest to southeast course and forms the valley floor.

The Project location is characterized by a gently sloping land surface with a maximum relief of about 120 feet. Land surface elevations over the Project facilities range from 280 feet to 340 feet above sea level.

E. Hydrology

The western slopes of the Sierra Nevada Mountains are the source of the numerous rivers and streams that cross the San Joaquin Valley. The Valley is divided into two distinct sub-basins: the San Joaquin Sub-basin to the north and the Tulare Sub-basin to the south. Rivers of the San Joaquin Sub-basin join the San Joaquin River as it drains into the Sacramento River flowing into San Francisco Bay. The rivers of the Tulare Sub-basin have no natural perennial surface outlet and, in the past, formed large temporary, shallow inland lakes (Katibah 1984). The Tulare Sub-basin contains roughly 2.5 million acres of nearly flat valley floor (USFWS 1989).

The Kern River, which bisects the Project area, is the most southern of the major rivers draining into the Tulare Sub-basin. The river is now regulated by Lake Isabella, a reservoir created in 1954 to protect the City of Bakersfield and agricultural lands down stream from flooding. The waters from Lake Isabella are used primarily for irrigation, recreation and power generation.

F. Soils

Soils within the Project area range from highly permeable, course sandy soils to silty loam with very low permeability. Generally, most of the 19,900 acres can be characterized as having deep, well-drained sandy loam soils. These soils usually have moderate to rapid permeability with low water-holding capacity. A few pockets of clay loam soils also can be found on the far west side of the Project lands. These soils have low permeability and are often associated with saline-alkali conditions (DWR 1986).

The Project property east of I-5 are characterized by Cajon sandy loam soils. These soils have moderate permeability and low available water holding capacity. Kimberlina fine sandy loam soils also found in this area have characteristics similar to the Cajon soils but have slightly lower permeability. The dominant soil south of the Kern River is the Excelsior sandy loam. These deep, well-drained soil has moderate permeability and moderate available water holding capacity (DWR 1986).

North and south of State Highway 119 (Taft Highway), the saline-alkali, Kimberlina fine sandy loam is predominate. This soil is characterized by a moderately

low permeability and a low available water holding capacity. Isolated pockets of poorly drained Panoche clay loam with low permeability can be found in this area north of Taft Highway and south of Panama Lane (DWR 1986).

ENVIRONMENTAL IMPACTS CHECKLIST

(*Explanation for all "yes" and "maybe" responses are provided on attached sheets.* Beneficial impacts shown in parenthesis: (x))

Issue Area	Potential Impact? Yes	Maybe	No	Is it Significant? Yes	Maybe	No
1. **Geology, Soils, and Topography.** *Will the proposal result in:*						
a. Change in topography or ground surface relief features?	X	—	—	—	—	X
b. Disruptions, displacements, Compaction or overcovering of of soil?	X	—	—	—	—	X
c. Unstable earth conditions or in changes in geological substructures?	—	—	X	—	—	—
d. The destruction, covering or modification of any unique geological, paleontological or physical features?	—	X	—	—	—	X
e. Any increase in wind or water erosion of soils, either on or off the site?	—	X	—	—	—	X
f. Exposure of people or property to geological hazards such as earthquakes, landslides, fault ruptures, high seismicity, subsidence, liquefaction, expansive soils, mudslides, ground failure, or similar hazards?	—	—	X	—	—	—
g. Changes in deposition or erosion of beach sands, or changes in siltation, deposition or erosion which may modify the channel of a river or stream or bed of the ocean or any bay, inlet or lake?	—	—	X	—	—	—
2. **Water Resources.** *Will the proposal result in:*						
a. Changes in currents, or the course of direction of water movements, in either marine or fresh waters?	—	—	X	—	—	—

Issue Area	Potential Impact? Yes	Maybe	No	Is it Significant? Yes	Maybe	No
b. Changes in absorption rates, drainage patterns, or the rate and amount of surface runoff?	(X)					X
c. Alteration to the course or level of flood waters?		(X)				X
d. Exposure of people or property to water related hazards such as flooding or tidal waves?			X			
e. Change in the amount of surface water in any water body?			X			
f. Discharge into surface waters, or any alteration of surface water quality?		(X)				X
g. Change in the quantity of ground waters, through additions, withdrawals, change in recharge area, or through exposure of an aquifer by cuts or excavations?	(X)					X
h. Change in ground water quality?		X				X
i. Alteration of the direction or rate of the flow of ground waters?	X					X
j. Reduction in the amount of water otherwise available for public water supplies?			X			
3. Air Quality. *Will the proposal result in:*						
a. Air emissions or deteriorations of ambient air quality?	X					X
b. The creation of objectionable odors?		X				X
c. Alteration of air movement, moisture, or temperature, or any change in climate, either locally or regionally?		X				X
4. Botanical Resources. *Will the proposal result in:*						
a. Change in the diversity of species, or number of any species of plants?	(X)					X
b. Reduction of the numbers of habitat of any rare, endangered, or otherwise sensitive species of plants?		X				X

Issue Area	Potential Impact? Yes	Maybe	No	Is it Significant? Yes	Maybe	No
c. Disturbance of any sensitive plant community or valuable tree specimens?	___	X	___	___	___	X
d. Introduction of new species of plants into an area, or an impediment to the normal reproductive and growth of existing species?	___	X	___	___	___	X
5. **Fish and Wildlife.** *Will the proposal result in:*						
a. Alteration or loss of fish or wildlife habitat?	(x)	___	___	___	___	X
b. Change in the diversity of species, or numbers of any species of animals (mammals, birds, amphibians, reptiles, fish, shellfish, benthic organisms or insects)?	(X)	___	___	___	___	X
c. Reduction of the numbers or habitat of any endangered or otherwise sensitive species?	X	___	___	___	___	X
d. Introduction of new species of fish or wildlife into an area, or result in a barrier to the migration or movement of species?	(X)	___	___	___	___	X
6. **Agriculture.** *Will the proposal result in:*						
a. Reduction in acreage or production of any agricultural crop?	___	___	X	___	___	___
b. Disruption of agricultural activities, including cropping and grazing?	___	___	X	___	___	___
c. Use of Williamson Act lands for non-agricultural uses?	___	___	X	___	___	___
7. **Natural Resources.** *Will the proposal result in:*						
a. Increase in the rate of extraction and use of any natural resources?	___	___	X	___	___	X
8. **Cultural Resources.** *Will the proposal result in:*						
a. Alteration or destruction of a prehistoric or historic archaeological site?	___	X	___	___	___	X

Issue Area	Potential Impact? Yes	Maybe	No	Is it Significant? Yes	Maybe	No	
b. Adverse physical or aesthetic effects to a prehistoric or historic building, structure, or object?	__	__	X	__	__	__	
c. A physical change which would affect unique ethnic cultural values?	__	__	X	__	__	__	
d. Restrict existing religious or sacred uses within the potential impact area?	__	__	X	__	__	__	
9. **Land Use and General Plan Consistency.** *Will the proposal result in:*							
a. Conflicts with existing land uses and community character?	__	__	X	__	__	__	
b. Conflicts with future planned land uses and community character?	__	__	X	__	__	__	X
c. Inconsistency with General Plan polices?	__	__	X	__	__	X	
10. **Recreation.** *Will the proposal result in:*							
a. Impact upon the quality or quantity of existing and future recreational opportunities?	__	(X)	__	__	__	X	
11. **Aesthetics.** *Will the proposal result in:*							
a. Obstruction of any scenic vista or view open to the public, or will the proposal result in the creation of an aesthetically offensive site open to public view?	__	__	X	__	__	__	
12. **Light and glare.** *Will the proposal result in:*							
a. New light or glare?	__	__	X	__	__	__	
13. **Noise.** *Will the proposal result in:*							
a. Increases in existing noise levels?	__	__	X	__	__	__	
b. Exposure of people to disturbing noise levels?	__	__	X	__	__	__	
14. **Population.** *Will the proposal result in:*							
a. Alteration of the location, distribution, density, or growth rate of the human population of an area?	__	__	X	__	__	__	
15. **Housing.** *Will the proposal result in:*							
a. Affect existing housing, or create a demand for additional housing?	__	__	X	__	__	__	

Issue Area	Potential Impact? Yes	Maybe	No	Is it Significant? Yes	Maybe	No
16. **Transportation/Circulation.** *Will the proposal result in:*						
a. Generation of additional vehicular movement and traffic volume?	X					X
b. Impact upon existing automobile transportation systems and circulation patterns?			X			
c. Effects on existing parking facilities, or demand for new parking?			X			
d. Alteration to waterborne, rail or air traffic?			X			
e. Increase in traffic hazards to motor vehicles, bicycles or pedestrians?			X			
17. **Public Services.** *Will the proposal have an effect upon, or result in a need for new or altered government services in any of the following areas:*						
a. Fire protection?		X				X
b. Police protection?			X			
c. Schools?			X			
d. Parks or any other recreational facilities?			X			
e. Maintenance of public facilities, including roads?			X			
f. Other governmental services?	X					X
18. **Utilities.** *Will the proposal result in:*						
a. A need for new systems, or substantial alterations to public utilities?			X			
19. **Human Health.** *Will the proposal result in:*						
a. Creation of any health hazard or potential health hazard (excluding mental health)?		X				X
b. Exposure of people to potential health hazards?		X				X

Issue Area	Potential Impact? Yes	Maybe	No	Is it Significant? Yes	Maybe	No
20. **Risk of Upset**. *Will the proposal result in:*						
a. A risk of an explosion or the release of hazardous substances (including, but not limited to, oil, pesticides, chemicals or radiation) in the event of an accident or upset condition?	—	—	X	—	—	—
21. **Energy**. *Will the proposal result in:*						
a. Use of substantial amounts of fuel or energy?	—	—	X	—	—	—
22. **Mandatory Findings of Significance.** *Will the proposal result in:*						
a. Potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	—	X	—	—	—	X
b. Potential to achieve short-term, to the disadvantage of long-term, environmental goals? (A short-term impact on the environment in one which occurs in a relatively brief, definitive period of time while long-term impacts will endure well into the future.)	—	—	X	—	—	—
c. Impacts which are individually limited, but cumulatively considerable? (A project may impact on two or more separate resources where the impact on each resource is relatively small, but where the effect of the total of those impacts on the environment is significant.)	—	—	X	—	—	—
d. Environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	—	—	X	—	—	—

IV. ENVIRONMENTAL CONSEQUENCES

A. Geology, Soils, and Topography

The Project involves construction of recharge basins and levees. Construction of these facilities will require grading of local topography. However, the maximum extent of excavation and/or levee construction is expected to be less than three feet. In addition, basin levees will be constructed along existing contours to blend in with the landscape. Accordingly, the activity is not considered to change the topography or ground surface significantly. (Checklist, Item 1(a).)

Construction of the basins and levees will require only minor grading compaction of local surface soils at the location of the Project facilities. The Project will not uncover or expose any unstable earth conditions and/or unstable geologic substructures. (Checklist, Item 1(b).)

The Project site contains very deep alluvial materials and is not expected to contain significant paleontological resources in the upper soil where grading would occur. (Checklist, Item 1(d).)

No major faults are located at the site. However, potential seismic impacts could occur from strong ground motion of the deep unconsolidated sediments at the Project site, resulting in liquefaction and subsidence. This condition could be exacerbated by the increase in ground water storage and ground water elevation at the site. However, this action is not expected to be significantly different than other adjacent lands upon which ground water recharge projects or farming are carried out and therefore the Project is not considered likely to significantly degrade the environment.

The Project is located in a closed basin with no drainage to the ocean.

The Monterey Agreement EIR, at Section 4.1 relating to the Kern Fan Element, analyzed possible impacts to geology and soils of the KWB due to the Project. The Monterey Agreement EIR found no adverse impact and no mitigation measures would be required. This Initial Study incorporates by reference this analysis, set forth at pages 4-1 to 4-3 of the Monterey Agreement EIR. (Checklist, Item 1.)

B. Vegetation and Wildlife

While incidental take of some listed species and other unlisted species is expected to occur during construction, operation and maintenance, through collapsed burrows, being run over, crushed by grading equipment, harassment, habitat loss, drowning, etc., the Project will provide a net increase of habitat for the species compared to pre-DWR purchase conditions. The construction of proposed facilities will be phased. If all of the proposed facilities are built 481 total acres of habitat will be

disturbed for permanent facilities and 291 acres disturbed temporarily for construction of underground pipelines.

The operation of the recharge facilities will be cyclical. Depending of the availability of water and the basin flooding frequency, some basins may lie unused for periods of a few to several years. Based on historic hydrology and projected requirements (see Map 4, Recharge Frequency Plan) a prediction of recharge basin utilization shows that a large percentage of the time areas designated for recharge basins will be available for habitat. During the time these basins are idle, they may become colonized by the listed species resulting in recurring habitat change as well as potential take of individuals once flooding begins again.

The potential impact on these transient colonies and any individuals disturbed by construction will be mitigated by preservation and management of the adjacent compatible habitat as permanent refugium for source populations of listed species. To minimize loss of individuals from flooding, to the extent practical, the basins will be filled slowly, so that any animals using the idle basins can escape to higher ground.

The analysis in the Monterey Agreement EIR regarding impacts to biological resources on the Kern Fan Element due to the Project, set forth at section 4.4, pages 4-38 to 4-50 and 4-62 to 4-66, is incorporated herein by this reference.

The use of the Conservation Bank could also result in impacts to listed and un-listed species in the Master Permit Credit Area. The maximum loss of total habitat loss in the entire Master Permit Credit Area, consisting of Kern County, the Allensworth area of Tulare County and the Kettleman Hills area of Kings County, as a result of the operation of the Conservation Bank is likely to be 3,000 acres. This is considered to be a worst-case assessment for the following reasons:

1. Activities using conservation credits will be limited to areas with limited habitat value, and will qualify for the use of the credits only with the approval of the Resource Agencies.

2. The Resource Agencies have historically required 3:1 compensation for activities on undeveloped lands within the Valley Floor. At a 3:1 compensation ratio, the use of the bank would result in a loss of 1,089 acres of habitat. This loss is anticipated to be offset through the permanent protection and management of the lands in the conservation bank.

(Checklist, Items 4 & 5.)

Mitigation Measure B-1. Biological Monitor

A qualified biologist shall monitor all ground-disturbing activities during construction in the Sensitive Habit Sector and will oversee measures undertaken to reduce take of listed species.

Mitigation Measure B-2. Construction Practices

a. Delineation of Disturbance Areas

During construction, KWBA shall clearly delineate disturbance area boundaries by stakes, flagging, or by reference to terrain features, as directed by CDFG and USFWS, to minimize degradation or loss of adjacent wildlife habitats during operation.

b. Signage

During construction, KWBA shall post signs and/or place fencing around construction sites to restrict access of vehicles and equipment unrelated to site operations.

c. Resource Agency Notification

At least 20 working days prior to initiating ground disturbance for project facilities in designated salvage/relocation areas, KWBA shall notify the Fresno Field Office of CDFG and the Sacramento Field Office of USFWS of its intention to begin construction activities at a specific location and on a specific date. The Agencies will have 10 working days to notify the KWBA of their intention to salvage or relocate listed species in the construction area. If KWBA is notified, it will wait an additional five days to allow the salvage/relocation to take place.

d. Salvage and Relocation

KWBA will allow time and access to USFWS and/or CDFG, or their designees, to relocate listed species, at the Resource Agencies' expense, from construction areas prior to disturbance of areas that have been identified by the Resource Agencies as having known populations of the listed species they wish to salvage or relocate.

e. Construction Site Review

All construction pipes, culverts, or similar structures with a diameter of three inches or greater that are stored at a construction site on the Kern Water Bank for one or more overnight periods shall be thoroughly inspected for trapped kit foxes and other animals before the subject pipe is subsequently buried, capped, or otherwise used or moved in any way. Pipes laid in trenches overnight shall be capped. If during construction a kit fox or other animal is discovered inside a pipe, that section of pipe will not be moved or, if necessary, will be moved only once to remove it from the path of construction activity until the animal has escaped.

f. Employee Orientation

An employee orientation program for construction crews, and others who will work on-site during construction, shall be conducted and shall consist of a brief consultation in which persons knowledgeable in endangered species biology and legislative protection explain endangered species concerns. The education program

shall include a discussion of the biology of the listed species, the habitat needs of these species, their status under FESA and CESA, and measures being taken for the protection of these species and their habitats as a part of the project. The orientation program will be conducted on an as needed basis prior to any new employees commencing work on the Kern Water Bank. Every two years or at the beginning of construction for the Supply/Recovery canal, a refresher course will be conducted for employees previously trained. A fact sheet conveying this information shall also be prepared for distribution to all employees. Upon completion of the orientation, employees shall sign a form stating that they attended the program and understand all protection measures. These forms shall be filed at KWBA's office and shall be accessible by CDFG and USFWS.

g. Standards for Construction of Canals

Concrete lined canals will have a side slope of 1.5 to 1 or iess and the sides will have a concrete finish which will assist in the escape of animals. If canals are determined by CDFG or USFWS to be substantial impediments to kit fox movement, plank or pipe crossings will be provided across concrete canals in areas identified as having high kit fox activity.

Mitigation Measure B-3. On-Going Practices

a. Equipment Storage

All equipment storage and parking during site development and operation shall be confined to the construction site or to previously disturbed off-site areas that are not habitat for listed species.

b. Traffic Control

KWBA's project representative shall establish and issue traffic restraints and signs to minimize temporary disturbances. All construction related vehicle traffic shall be restricted to established roads, construction areas, storage areas, and staging and parking areas. Project related vehicles shall observe a 25 MPH speed limit in all project areas except on county roads and state and federal highways.

c. Food Control

All food-related trash items such as wrappers, cans, bottles, and food scraps generated both during construction and during subsequent facility operation shall be disposed of in closed containers and shall be regularly removed from the site. Food items may attract kit foxes onto a project site, consequently exposing such animals to increased risk of injury or mortality.

d. Dog Control

To prevent harassment or mortality of kit foxes or destruction of kit fox dens or predation on this species, no domestic dogs or cats, other than hunting dogs, shall be permitted on-site.

e. Pesticide Use

Use of rodenticides and herbicides on the site shall be permitted in accordance with the Vegetation Management Plan, which incorporates by reference the Interim Measures for Use of Rodenticides in Kern County, and which will incorporate by reference any other applicable laws, rules and regulations regarding the use of pesticides as they take effect.

Mitigation Measure B-4. Project Representatives

KWBA shall designate a specific individual as a contact representative between KWBA, USFWS, and CDFG to oversee compliance with protection measures detailed herein. KWBA shall provide written notification of the contact representative to CDFG and USFWS within 30 days of issuance of the Permits and the Management Authorizations. Written notification shall also be provided by KWBA to CDFG and USFWS in the event that the designee is changed.

Mitigation Measure B-5. Notification Regarding Dead, Injured or Entrapped Listed Animals

Any employee or agent of KWBA who kills or injures a San Joaquin kit fox, blunt-nosed leopard lizard, Tipton kangaroo rat, San Joaquin antelope squirrel, or other listed species listed as a threatened or endangered animal under FESA or CESA, or who finds any such animal either dead, injured, or entrapped on the Kern Water Bank shall report the incident immediately to KWBA's representative who shall, in turn, report the incident or finding to USFWS and CDFG. In the event that such observations are of entrapped animals, escape ramps or structures shall be installed immediately to allow the animal(s) to escape unimpeded. In the event that such observations are of injured or dead animals, KWBA shall immediately notify USFWS and CDFG by telephone or other expedient means. KWBA shall then provide formal notification to USFWS and CDFG, in writing, within three working days of the finding of any such animal(s). Written notification shall include the date, time, location, and circumstances of the incident.

The USFWS contact for this information shall be the Assistant Field Supervisor for Endangered Species, Sacramento Field Office. The CDFG contact shall be the Environmental Services Supervisor at the San Joaquin Valley-Southern Sierra Region Headquarters.

USFWS or CDFG will be notified if any other animal which is otherwise a listed species is found dead or injured.

Mitigation Measure B-6. Construction of Supply/Recovery Canal

Within sixty days prior to the construction of the supply/recovery canal within the zone marked within the Map of the Kern Water Bank, KWBA shall conduct a limited survey within the area of the Kern Water Bank which will be affected by that construction, with the sole goal of identifying potential San Joaquin kit fox dens. KWBA shall contact USFWS and CDFG pursuant to the salvage procedures set forth above if any kit fox dens are found.

Mitigation Measure B-7. Take Avoidance Protocol for Fully-Protected Species

Existing data on the blunt-nosed leopard lizard (BNLL) at the Kern Water Bank indicates that populations occur within habitat set asides (either sensitive, compatible, or conservation bank habitat). Thus the likelihood of take from project construction, operation, and maintenance is negligible. However, in the future adaptive management measures may expand to areas of suitable habitat.

Until such time that the KWBA obtains appropriate authorization for take of the State designated Fully Protected blunt-nosed leopard lizard by the Fish and Game Commission, the following take avoidance protocol shall apply in any areas that contain suitable habitat of the BNLL:

1) A qualified biologist shall survey any areas proposed for project related disturbance that contain suitable habitat for the blunt-nosed leopard lizard to determine the likelihood of presence. Suitable habitat consists of valley and foothill grasslands, saltbush scrub land, iodine bush grassland, and alkali flats.

2) If BNLLs are found to occur in areas proposed for project facilities construction or maintenance, consideration of avoidance should take place first. If avoidance is not practicable, then the BNLL will be trapped and relocated prior to disturbance at KWBA's expense in accordance with the applicable annual management plan. This work must be done by or under the direction of USFWS staff by persons with appropriate experience and with their own take for scientific purposes permits. This procedure will avoid any violation of state law.

Three other species which may be found on the Kern Water Bank are also State designated Fully Protected species: American peregrine falcon, Greater sandhill crane, and White-tailed kite. The likelihood of the take of any of these species from project construction, operation, and maintenance is negligible due to their mobility and preferred habitats. However, to avoid any take of these species, the same take avoidance protocol as set out for the BNLL shall apply to each of these three species.

C. *Water Resources*

1. Off-Site Impacts

a) State Water Project Water

Consistent with existing biological opinions, SWP entitlement and interruptible entitlement water will be available for recharge. During this Project, some member entities and others may have entitlement water excess to their immediate in-district demand. In the past, such water was sold to other districts through a KCWA pool or turned back to the State. The Project contemplates that to the extent compatible with the Project, such water could be recharged in the Project area.

b) Central Valley Project Water

In the past, the Kern Water Bank Authority ("Authority") and others have purchased Section 215 (Reclamation Reform Act of 1982) water from the Central Valley Project ("CVP") via the Friant-Kern Canal through temporary contracts with the United States Department of the Interior, Bureau of Reclamation. Such water may be available for this Project. This water is not subject to the ownership and acreage limitations of Federal Reclamation law and can be made available on short notice.

In addition, consistent with existing biological opinions, CVP water may be available for recharge by CVP contractors via the Friant-Kern Canal or the California Aqueduct either directly or by exchange or transfer according to contract provisions with the Bureau of Reclamation.

c) Kern River Water

The Kern River interests encourage every effort to maximize the recharge of Kern River water into the ground water basin. To prevent significant property and flood damage, flood waters are diverted to the Kern River and to the California Aqueduct Intertie facilities. Since 1978, over 1,000,000 acre-feet of Kern River water has flowed through the Kern River-California Aqueduct Intertie. During the same period an additional 430,000 acre-feet of Kern River water bypassed the Intertie via the Kern River flood channel. These generally represent flood waters which exceeded the available capacity of recharge facilities in Kern County since the Intertie was constructed in 1977. In the event of a very wet year during this Project, it is anticipated that significant quantities of flood waters that otherwise would be diverted into the Intertie will be available for recharge in the Project area. At other times other Kern River water may be available from Kern River water right holders, which rights are generally pre-1914 appropriative rights, for recharge in the Project area.

d) Local Stream Groups Interconnected to the Friant-Kern Canal

The flows of the Kaweah, Tule and Kings Rivers stream groups on the east side of the San Joaquin Valley can be diverted and conveyed via the Friant-Kern Canal to its terminus and enter either into the Kern River channel or by interconnection into the Cross Valley Canal and transported further west. Each of these stream groups, like the rest of the State, may experience significant above-normal precipitation and snowpack during this Project. Heavy snowmelt which if not diverted into the Friant-Kern Canal and conveyed south could cause significant property damage downstream. This potential exists and by diverting water into the Friant-Kern Canal for recharge onto the Project, flooding can be reduced and water supplies will be conserved.

2. On-Site Impacts

Historical ground water level measurement in the Project area have been collected and will continue to be utilized to monitor Project operations and to determine depths to ground water and how ground water levels change during wet years. Project water quality, ground water monitoring and ground water recharge losses will be addressed consistent with the Memorandum Of Understanding, dated October 26, 1995, between KWBA, its members, and certain adjoining entities regarding operation and monitoring of the KWB ground water banking program (the "KWBA MOU"), a copy of which is attached hereto as Exhibit A. (Checklist, Item 2(g).)

The quality of water to be used for recharge purposes is very good and is not expected to increase the total dissolved solids and organic constituent concentrations in the local ground water. However, the quality of water for recharge will vary and must be monitored in order to avoid degradation of local water quality and exacerbation of negative salt balance in the region. Areas of soil contamination from previous oil and agricultural operations occur at or near several proposed recharge areas. These areas will be avoided to prevent percolation through these soils which could adversely affect ground water quality. Hydrocarbon contamination has been detected as deep as 70 feet along the Wait-Midway Pipeline owned by Chevron Pipeline Company to the northeast of the Property. This same pipeline also traverses the Property. Although no new recharge basins will be located immediately over this pipeline, KWBA will hold Chevron accountable so that KWBA can utilize the KWB. Remediation of this contamination will be coordinated by the Regional Water Quality Control Board, which has assumed jurisdiction of this matter. Several other pipelines exist in the Project area in addition to the Chevron pipeline. These alignments have been investigated by boring holes with a hand auger along the alignments at 100 foot spacings without encountering hydrocarbon soil contamination. (Checklist, Item 2(h).)

The Project will cause an increase in the diversion of surface water from the Kern River channel to adjacent recharge basins under certain circumstances. The water will be diverted to new recharge basins outside the Kern River Channel when river flows are high. (Checklist, Item 2(f).)

During recharge periods, the Project will change the absorption rate and pattern at the project because water will be impounded to maximize conservation of water within the Project area. (Checklist, Item 2(b).)

The Project facilities will have a beneficial impact on flood levels in the area because flood waters will be diverted from the Kern River under high flow conditions. (Checklist, Item 2(c).)

The basins will not create flood hazards under Project conditions because there are no private structures, buildings, or properties near the basins that could be adversely affected.

The Project will have no impact on the water level or surface area of any existing pond, lake or reservoir.

Temporary erosion and sedimentation associated with construction activities may occur; however, this impact would be localized, incidental and short-term. (Checklist, Item 1(e).)

The Project will increase the amount of ground water at the Project site during recharge periods. The Project is designed and intended significantly to enhance local ground water supplies by conserving surplus surface water supplies.

The Project may cause local mounding of ground water during extended periods of recharge. This activity would result in lower cost of pumping and may result in changes in the direction and movement of ground water.

The Project will increase the amount and reliability of public water supplies provided by the Agency. Overall, the Project is considered to have a net beneficial impact on public water supplies.

The Monterey Agreement EIR found no substantial impact to either to surface water or to groundwater due to the Project. This Initial Study hereby incorporates that analysis by reference. See Monterey Agreement EIR section 4.2, at pp. 4-4, 4-8, and 4-31 - 4-32.

Mitigation Measure C-1. Implementation of MOU

The KWBA MOU requires all the parties thereto to operate their projects in a manner to maintain and, when possible, enhance groundwater quality. If significant adverse effects are detected due to the operation of the Kern Water Bank, KWBA will curtail and/or relocate the recharge and recovery operations as necessary to avoid the impacts, consistent with the KWBA MOU. The KWBA MOU establishes a monitoring committee which bears the responsibility of ensuring that the parties meet their obligations under the KWBA MOU.

Mitigation Measure C-2. Hydrocarbon Contamination Monitoring

KWBA will continue to monitor the remediation of the current and any future hydrocarbon contamination. The Regional Water Quality Control Board has assumed jurisdiction of the Wait-Midway Pipeline, owned by Chevron Pipeline Company..

D. Air Quality

Slight increases in wind generated fugitive dust may occur during initial grading; however, this impact can be minimized by the use of a watering truck. The Project site has very little relief and therefore, an increase in local water erosion from surface water runoff resulting in increased off-site sedimentation is not expected to occur.

The Project will result in increased air emissions from vehicles and equipment during the operation and construction period. However, the emissions will be short term and will be in compliance with all applicable standards. These emissions will be non-recurring and in any event would be approximately equal to the emissions normally associated with agricultural activities on similarly sized parcels. (Checklist, Item 3(a).)

The Project may result in the generation of objectionable odors, due to the decomposition of organic matter within the basins. This impact is not expected to be significant, however, because no sensitive receptors should be within range of any objectionable odor. (Checklist, Item 3(b).)

The Project has the potential to increase the levels of humidity at the Project site during periods of recharge due to the presence of extensive surface water. (Checklist, Item 3(c).)

The analysis in the Monterey Agreement EIR regarding impacts to air quality on the Kern Fan Element caused by the Project, set forth at section 4.3, pages 4-36 to 4-38, is incorporated herein by this reference.

Mitigation Measure E-1. A watering truck will be used to minimize fugitive dust generated during grading when conditions require, such as on dry, windy days.

E. Agriculture

The Kern Water Bank Project was purchased by DWR in 1988. Agricultural activities on the land have been phased out by DWR due to drought in 1990/1991, as such, the proposed water banking facilities will occur on lands no longer under production, and therefore will not cause a reduction in agricultural acreage. Some land fallowed by DWR will be returned to agriculture usage. The Project will increase the amount and reliability of agricultural water supplies, and contribute beneficially to agricultural production in the region.

None of the lands at the Project site are under a Williamson Act contract.

The analysis in the Monterey Agreement EIR regarding impacts to land use on the Kern Fan Element caused by the Project, set forth at section 4.6, pages 4-76 to 4-83, is incorporated herein by this reference.

F. Natural Resources

There are mineral interests over a significant portion of the Project site which are not owned by KWBA.

Mitigation Measure F-1. Location of Recharge and Recovery Facilities.

The location of the proposed basins and canals will be established to avoid conflicts with existing and future known mineral activities.

G. Cultural Resources

A number of prehistoric sites have been recorded at or near the Project site, several of which appear to be significant due to their potential to yield important information about prehistory and because some of the sites may contain burials. Preliminary field reconnaissance surveys indicate that other sites are present in areas of slightly higher elevation. Generally, areas of higher elevation are not suitable for recharge and will not be inundated.

No historic or prehistoric buildings or structures are present at the sites. Based on information developed to date, no unique ethnic resources are present at the sites. Based on information developed to date, the sites have not been used for religious purposes. KWBA has retained Three Girls & a Shovel (TG&S) to prepare an initial report and develop procedures for constructing KWB facilities so as to mitigate impacts on cultural resources. A copy of this report is incorporated herein as Exhibit B. (Checklist, Item 8(a).)

The analysis in the Monterey Agreement EIR regarding impacts to cultural resources on the Kern Fan Element caused by the Project, set forth at section 4.5, pages 4-66 to 4-76, is incorporated herein by this reference.

Mitigation Measure G-1. Implementation of Cultural Resources Report.

KWBA will comply with the mitigation procedures set forth in the Cultural Resources Assessment and Plan For the Kern Water Bank Authority Project Near Bakersfield, Kern County California, summarized below and incorporated by this reference, which are expected to reduce any impact to cultural resources within the KWB to a level of insignificance:

A. Prior to any ground-disturbing work on the KWB, anthropologists or other qualified individuals from TG&S shall engage in pedestrian surveys of the areas to be impacted, with the survey reconnaissance to be at 5- to 15-meter transects.

B. Any cultural resources found during the survey process will be recorded, mapped, evaluated and mitigated prior to the ground-disturbing activity, pursuant to Section 106 of the National Historic Preservation Act.

C. The eight recorded archeological sites on the KWB will be evaluated and mitigated pursuant to Section 106.

D. If any human remains are found at any time on the KWB, work will be halted in the area of the discovery, and the Kern County coroner will be notified.

H. Recreation

The KWB Project is located near the Buena Vista Aquatic Recreation Area and the Tule Elk Preserve. In addition, the Kern River traverses the Project. The upstream portions of the Kern River in the 2010 Planning Area are designated as recreational and open space areas in which land uses are regulated by the joint City of Bakersfield and the Kern County Kern River Plan. This plan includes the development of a future bikeway from Bakersfield to the Buena Vista Aquatic Recreational Area. Development of basins and canals will not impede these plans because the bikeways can be routed through the Project site in the long term. There is a potential for private hunting clubs on the Project site using portions of the new recharge basins. (Checklist, Item 10(a).)

The analysis in the Monterey Agreement EIR regarding impacts to recreation on the Kern Fan Element caused by the Project, set forth at section 4.7, pages 4-83 and 4-89, is incorporated herein by this reference.

The Project is expected to have a beneficial impact on recreation.

I. Aesthetics

The establishment of basins will enhance the visual setting of the project site, particularly from Highway 5. No obstruction of any scenic vista or view open to the public will occur.

J. Light and Glare

No nighttime lighting will be permanently installed as part of the proposed Project.

K. Noise

Construction of new facilities will temporarily increase local noise levels due to construction equipment. However, there are no noise-sensitive land uses in proximity to the proposed facilities that could be affected.

L. Population

The proposed Project will not displace any residents. Construction will be accomplished with existing local contractors and will not require the importation of workers. The Project recovers water during dry years and will regulate existing water supplies and not create new water supplies.

M. Transportation

During construction, there will be additional vehicular and truck traffic on local roads and highways, and on dirt roads within the Project site. However, the volume of this short-term traffic is expected to be very low and readily accommodated by available capacity on local public roads and highways. (Checklist, Item 16(a).)

The Project will not alter existing public road systems or circulation patterns because no public road will be closed or re-aligned as a result of the Project. Construction of the Project will increase the number and location of private access roads within the Project area.

All parking during construction of the Project will occur on site and will have no effect on public facilities.

Construction-related traffic will be routed along public roads according to state requirements and is not expected to increase the level of hazards along nearby public roads.

N. Public Services

The proposed Project will not:

- increase the level of fire hazard in the area,
- increase the need for patrols by the Sheriffs Department,
- result in greater population and need for schools,
- increase the need for public recreational facilities, or
- increase the need for maintenance of public facilities including roads.

(Checklist, Item 17.)

O. Utilities

Pumps to convey water to and from the site and, to a limited degree to move water on the site, could be powered by electricity and natural gas and provided by

Pacific Gas and Electric and by temporary, diesel powered pumps. Electrical power will be delivered within the site by a system of low-voltage wooden power poles.

P. Human Health

Ponding of water for recharge may result in potential mosquito concerns. However, this vector will be controlled by the local mosquito abatement district and no adverse human health hazard is expected. As a mitigation measure, the KWBA has submitted a written mosquito abatement plan to both West Kern Mosquito Vector District and the Kern Mosquito Vector District. A copy of the plan is attached hereto as Exhibit C and incorporated by this reference. (Checklist, Item 19.)

Construction and maintenance workers may be exposed to valley fever during earth moving activities by inhaling spores, if the fungus is present in the soils. No cases of valley fever were reported following construction of the first 3000 acres of basins. When appropriate, masks to avoid inhaling dust, as is customary in the industry.

The analysis in the Monterey Agreement EIR regarding impacts to human health on the Kern Fan Element caused by the Project, set forth at section 4.9, pages 4-103 to 4-104, is incorporated herein by this reference.

Mitigation Measure P-1. Implementation of Mosquito Abatement Plan.

In accordance with the Mosquito Abatement Plan, KWBA will engage in the following procedures which are expected to reduce any impact due to the breeding of mosquitoes in the recharge basins to insignificance:

A. KWBA will notify staff of the Mosquito Vector Districts of planned use of recharge basins.

B. KWBA will implement a water edge road construction pilot program to determine whether KWBA can successfully give Mosquito Vector District spray vehicles access to the recharge basins. If the pilot program is successful, KWBA will build further water edge roads as mutually agreed between KWBA and the Mosquito Vector District staff. If the program is unsuccessful, KWBA and Mosquito Vector District staff will develop an alternative program.

C. Ponding in certain sections will be phased out. In these sections, KWBA will cycle the spreading process to keep water moving.

D. KWBA will develop a mosquito fish breeding program in conjunction with Mosquito Vector District staff.

E. Roads on the KWB will be kept in a reasonable condition to allow the districts access to the KWB.

F. KWBA will include district staff in adaptive management planning to review the success of mosquito control techniques and to develop improved mosquito control techniques.

Mitigation Measure P-2. Avoidance of Valley Fever.

All construction workers at risk of inhaling dust shall wear masks with filters designed to trap spores of the size of valley fever fungus.

Q. Secondary Impacts

Any secondary impacts, such as growth-inducing impacts, from the Project should be minimal.

The Project is expected to have a maximum storage capacity of about 1.1 million acre feet of water, and a maximum recovery rate of about 300,000 acre feet of water per year. However, the amount of water that will be in the KWB at any time and therefore available for recovery is entirely speculative. Since the availability of water at any time in the future will be always be speculative, it is highly unlikely that any new growth, either urban or agricultural, will develop as a result of the Project.

One likely use of water from the Project is to increase the availability and therefore lower the price of SWP water during drought years. Since, according to the Monterey Agreement EIR, the cumulative annual entitlement of all SWP contractors exceeds 4 million acre feet annually, the availability of an additional 300,000 acre feet represents only another 7%. This small increase is not likely, of itself, to lead to any growth-inducing impacts.

R. Cumulative Impacts

The only cumulative impacts from the Project should be beneficial impacts. As discussed above in Section II.C, the KWB was transferred from DWR to KCWA and then to KWBA as part of the Monterey Principles. Implementation of the Monterey Principles, including the operation of the Project, should lead to fewer and smaller shortages of deliveries of water from the SWP to certain SWP contractors in drought years. Reducing the impact of droughts should result in beneficial impacts to the environment.

The possible beneficial and adverse impacts to the environment due to the implementation of the Monterey Principles was studied at length in the Monterey Agreement EIR. That analysis is incorporated herein by this reference.

Implementation of the conservation bank and sale of conservation credits to qualified third parties should have minimal cumulative impacts. Even under the worst-case analysis, use of the conservation bank could lead to habitat loss of 3,000 acres

within the Master Permit Credit Area. Moreover, activities using conservation credits will be limited to areas with limited habitat value, and will qualify for the use of conservation credits only with the approval of the Resource Agencies.

V. LAND USE AND GENERAL PLAN CONSISTENCY

The lands at the Kern Water Bank site were acquired by KWBA for the express purpose of recharge and recovery. Secondary land uses will include wildlife habitat and oil development in between recharge facilities. The proposed Project will be consistent with these land uses. The proposed uses are consistent with existing land uses on Project lands outside the Kern Water Bank.

The Kern County General Plan use designations at the Project site include Intensive Agriculture (8.1) and Mineral and Petroleum Development (8.5). Water storage is a compatible land use with Intensive Agriculture designation, but is not specifically identified as an allowable use in Mineral and Petroleum areas.

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EXHIBIT A

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A CULTURAL RESOURCES ASSESSMENT AND PLAN FOR THE KERN WATER BANK AUTHORITY PROJECT NEAR BAKERSFIELD, KERN COUNTY, CALIFORNIA

Prepared by:

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INTRODUCTION

At the request of Peggy J. Poor representing the Kern Water Bank Authority, Three Girls and a Shovel (see Appendix III for qualifications) located at 2820 Alta Vista, Bakersfield, California requested a records search on the project area south of the city of Bakersfield in eastern Kern County. The Kern Water Bank Authority is preparing to drill wells and build percolation ponds for the purpose of banking water in the southern San Joaquin Valley. The project will involve digging for installation of new water wells and earth moving to build berms behind which water will stand in ponds to be percolated into the ground increasing the natural water table levels. The basins will be constructed using the natural contours of the land, leaving the basin bottoms as natural as possible, thereby, creating minimal disturbance to the ground. By selecting low-lying depression areas, the projects will possibly avoid the mounds and hillocks historically preferred by the prehistoric Native American inhabitants of the land.

Historically, most of the project area has been used as farmland for cotton, grains, alfalfa, and other crops. Possibly future farming may be permitted as a secondary land use within the subject area. It should be noted here that agriculture does not destroy archaeological sites. Murphy (1990) notes that plowing and ripping disturb and move surface artifacts but the cultural deposit is not physically removed from the site. Therefore, important data remain.

Present oil extraction activities on the project area will continue.

The purpose of this study was to satisfy CEQA requirements for the identification and protection of archaeological resources on lands proposed for development and to satisfy Federal regulations related to the National Environmental Policy Act (NEPA) concerning the identification and protection of significant cultural resources. The assessment must find that the project will not result in adverse effects to any cultural resource properties eligible for listing in the National Register of Historic Places, pursuant to Section 106 of the National Historic Preservation Act as outlined in the Code of Federal Regulations (36 CFR 800).

In order for potential impacts to cultural resources to be considered significant under federal law, the resources in question must be found to be eligible or potentially eligible for listing in the National Register of Historic Places (NRHP) according to criteria for eligibility published in 36-CFR 60.4.

EXECUTIVE SUMMARY

A cultural resources assessment and a proposed phased work program was prepared by Three Girls and a Shovel (TG&S) for the Kern Water Bank Authority (KWBA) of Bakersfield, Kern County, California. The KWBA is proposing a water banking and management program to be located on a 19,900 acre site southwest of Bakersfield. The program would require the construction of recharge basins, water conveyance facilities, and water wells.

This assessment consists of a required records search prepared by the Southern San Joaquin Valley Information Center located at the California State University, Bakersfield, and a proposed management plan for completing the archaeological requirements as set forth in the California Environmental Quality Act (CEQA). The assessment includes a discussion of the records search, an ethnography of the Southern Valley Yokuts, a statement of policy regarding confidentiality of archaeological sites, an outline of standard archaeological procedures, a scope of work for the management plan, and recommendations for the protection of any cultural resources that may be found on the project area. No field work was conducted at this time.

The project area is archaeologically sensitive. There are numerous recorded archaeological sites on and adjacent to the project area.

The criteria for eligibility for listing in the NRHP as indicated in 36 CFR 60.4 are as follows:

> The quality of significance in American History, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects of State and Local importance that possess integrity of location, design, setting, materials, workmanship, feeling and association, and:
>
> (a) that are associated with events that have made a significant contribution to the broad patterns of our history, or
>
> (b) that are associated with the lives of persons significant in our past; or
>
> (c) that embody the distinctive characteristics of a type, period, method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack distinction; or
>
> (d) that have yielded, or may be likely to yield, information important to prehistory or history.

PROJECT LOCATION

The project area is located in the southern end of the San Joaquin Valley, south of Bakersfield, and further, south of Taft Highway. The project area occupies part or all of Sections 1, 12, 13, 24, 25, 26, T. 30 S., R. 25 E., MDBM, as shown on the USGS Stevens, California 7.5' series topographic quadrangle, part or all of Sections 6, 7, 17, 18, 19, 20, 28, 31, 32, 33, T. 30 S., R. 26 E., MDBM, as shown on the USGS Stevens, California 7.5' series topographic quadrangle, and part or all of Sections 12, 13, 24, 5, 7, 18, 19, 8, 17, 20, 4, 9, 16, 21, 3, 10, 15, 22, 27, 34, 11, 14, 23, 26, and 35, T. 30 S., R. 25 E., as shown on the USGS Tupman, California 7.5' series topographic quadrangle (Fig. 1).

RECORDS SEARCH

A Records Search of the subject property, and the area immediately surrounding it, was conducted at the Southern San Joaquin Valley Archaeological Information Center at California State University, Bakersfield (CSUB) (Appendix I). The records search indicated there are eight recorded sites, one reported site, and two isolate finds on the subject property. Two of the

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recorded sites have been test excavated. There are over 30 recorded sites within a mile radius of the project area. There have been four surveys conducted on the project area and fifteen surveys on land immediately adjacent or within two miles of the project area.

CA-KER-667 is a prehistoric site consisting of a scatter of shell and milling tool fragments including a steatite bowl fragment. a sandstone metate fragment and a mano fragment.

CA-KER-2076 is a prehistoric site consisting of flake scatter of chert, chalcedony, basalt, and obsidian debitage.

CA-KER-2279 is a prehistoric site consisting of one northern side-notch point base of obsidian, one rhyolite core, one chalcedony core, and chert, chalcedony and basalt flakes.

CA-KER-2080 is a low mound where a flake of chert, a flake of basalt, and fresh water clam shells were observed.

CA-KER-2281 is a prehistoric site consisting of several chert and basalt flakes.

CA-KER-2282 is a prehistoric site consisting of a mano fragment, flakes, fire affected rock, and burnt bone. A test excavation was conducted on a portion of this site off KWBA property.

CA-KER-3073 (CA-KER-3089) is a prehistoric site consisting of 50 plus chert and chalcedony flake tools, 20 basalt flake tools, jasper flakes, a basalt core, retouched flakes and flake debris, fire affected groundstone fragment and other groundstone fragments. Originally recorded as two separate sites, it was subsequently determined that this was one large site area. Test excavation was conducted on this site.

CA-KER-3280 is a prehistoric site consisting of a flake scatter and groundstone fragments.

The reported site is called the fire department site and has not been formally recorded. Located on an east/west trending mound, artifacts are reported to be found every time the fire department conducts subsurface activities on the mound.

The records search also shows a number of archaeological sites recorded on property immediately adjacent to the KWBA project area. Adjacent on the west is the Tule Elk Preserve. This area is unique in the valley in that the terrain is virtually unmodified. Natural mound and slough areas exist

intact, with archaeological sites undamaged by farming or construction activities.

Twelve archaeological sites are recorded on the Tule Elk Preserve, including three that touch the KWBA project boundary and two others that are within 200 meters of the boundary.

Immediately adjacent on the east is McAllister Ranch. One mound site, CA-KER-2283, lies on both KWBA property and McAllister Ranch property. Eleven other sites are recorded on McAllister Ranch within one mile of the KWBA project.

One of these eleven sites is CA-KER-668, also known as the Dance House Site. This site was originally recorded in 1979 and has been the subject of additional studies within the last three years. The site lies on a long mound and surface artifacts include the typical flakes, goundstone, and shell beads. However, unique to the site are the remains of a large semi-subterranean structure. The remains form a large depression measuring approximately 20 meters across.

Originally there would have been wooden supports and a roof, probably of tule thatch or mats. The roof and supports are long since gone, the sides presently slope inward, and a hard packed floor is visible. Cremation remains are eroding out of the floor of the structure. Full interments are known to exist on other areas of the mound.

It is called the Dance House because it is a large structure and was probably used for ceremonial purposes. Such dance house structural remains are common in northern California. However, this is the only dance house remains known in southern California. It is remarkable that these remains still exist relatively undisturbed. The mound remains untouched except for a subsurface pipeline constructed through one end. The land to the north is in agriculture, and, oil field activities are located to the south.

Because of the eight recorded sites on the project area and the numerous sites on adjacent property, this project area is considered to be archaeologically sensitive.

ENVIRONMENTAL BACKGROUND

The project area lies in the extreme southern end of the San Joaquin Valley at an elevation of about 300 to 325' and supports a typical desert plant community. Plants known in the area are saltbush, sage, buckwheat, and Mormon tea. The terrain is flat with a generally southerly slope. There is some evidence of alluvial action.

PREHISTORIC ENVIRONMENTAL SETTING

A recounting of the prehistoric environment of California and the San Joaquin Valley is presented in Michael J. Moratto's "California Archaeology " (1984). The following is excerpted and paraphrased from that source.

The pre-contact Native Americans were completely reliant upon their natural resources. They had extensive knowledge about habitats and animals, plants, climate, rocks, and minerals. They knew how to place villages to maximize the environmental surroundings. Their cultures were strongly influenced by natural conditions and it is necessary to understand California's environmental setting to understand it's pre-historic inhabitants and interpret the later archaeological record.

California covers approximately 157,207 square miles and includes many geomorphic provinces. With such a large area, including a long coast line, mountains, and deserts, there is great variety and contrast in the state's physiography, geology, climate, flora, and fauna. Of special concern here is the Great Central Valley, consisting of the Sacramento Valley, the Delta, and the San Joaquin Valley.

The floor of the valley is 750 km long and 30-80 km wide and is enclosed by the Siskiyou, Sierra Nevada, Tehachapi, and Coast Mountain ranges. It is underlain, mainly, by Sierran stream sediments up to 17 km deep. Elevation ranges from sea level to 100 m, broken only by the 600 m high Sutter Buttes. The Sacramento and San Joaquin River systems drain the valley and merge into the channels and marshes of the Sacramento-San Joaquin Delta. The waters later pass through a gap in the Coast Range and empty into San Pablo Bay.

Over the centuries the valley experienced many dramatic environmental changes, including: faunal extinctions and replacement at the end of the Pleistocene, the emergence of wetlands, flooding, massive siltation, cyclical appearance and evaporation of shallow lakes, and biogeographic shifts in response to climatic fluctuations.

In ancient times lakes, marshes, and sloughs covered more than 5,000 square km in the San Joaquin Valley alone. The largest lake, Tulare, occupied a structural basin created by downwarping. Additionally, Tulare and Buena Vista Lakes were partially contained by alluvial fans reaching into the valley from the King's River and Los Gatos Creek. These coalesced into a ridge and lands to the south were so arid that runoff was often not able to maintain a discharge through the alluvium. This natural dam thus contributed to the impoundment of Tulare Lake

and its swampy basin. A similar projection from the Kern River fan westward to the McKittrick Hills formed a second dam behind which lie Kern and Buena Vista Lakes. At flood levels the Buena Vista and Tulare Lakes spilled into a single basin and with the waters of the Kern Kaweah, and King's Rivers, flowed into the San Joaquin River system. The lakes are now mostly dry due to historic drainage projects.

The Central Valley was attractive to the early inhabitants. The climate was locally varied, but generally pleasant. Precipitation was also variable and in the southern San Joaquin Valley, where it was scant, the water was supplemented by the snow melt from the mountains. The Central Valley's plains and wetlands had abundant game and vegetal foods. The bottomlands produced lush swamp vegetation valued for food, fiber, and building materials. Riparian woodlands grew along the watercourses. The waterways also provided the habitats for river mussels and many species of fish. Steatite and asphaltum occurred in the southern part of the valley and salt deposits were found in the north. With so many abundancies, resources that were lacking, such as obsidian, were easily obtainable through trade with outside areas. With such an abundance of resources and comfortable living conditions, the eighteenth century aboriginal population was 105,000, with 53,000 people in the Sacramento Valley and 52,000 in the San Joaquin.

During the long prehistory of the Central Valley there have been diverse and changing environments, along with many population movements, waves of cultural influences from neighboring groups, and a complex interplay between local and regional cultural forces. The oldest evidence for occupation of the valley comes from Tracy, Tulare, and Buena Vista Lakes and dates to about 11,500-7,500 years ago. Since the floor of the valley is covered with a thick layer of alluvium, it is likely that most of the earliest habitation evidence lies buried beneath it. This would account for the modest antiquity of artifacts, especially in the valley lowlands of the San Joaquin and Sacramento River drainages. In these areas 10 m of sediments have accumulated just during the past 5,000-6,000 years.

ETHNOGRAPHY
SOUTHERN VALLEY YOKUTS

The Yokuts have been broken into three geographical divisions, the Northern, Foothill, and Southern Valley Yokuts. The project area lies within the territory of the Southern Valley Yokuts. The following information is excerpted from "Southern Valley Yokuts" by William J. Wallace (1978).

The territory of the Southern Valley Yokuts included Tulare, Buena Vista, and Kern Lakes, their connecting sloughs, and the lower portion of the Kings, Kaweah, Tule, and Kern Rivers. The area consisted of extensive swamps and marshlands which provided an enormous variety and abundance of wildlife and aquatic flora. The southern San Joaquin Valley received only 5-10 inches of rain annually and was dependent upon the additional water being brought in from the melting snows of the Sierra Nevadas. As the Yokuts adapted to this abundance of subsistence resources they developed a culture of comparatively greater material wealth and tended to live in large, more permanent settlements. It is estimated that this way of life lasted approximately 2,000 years. At the beginning of the historic period 15 different Yokuts groups were identified in the area.

Adapting to their environment, the southern Valley Yokuts developed a mixed economy subsistence pattern. It emphasized fishing, hunting waterfowl, and collecting shellfish, roots, and seeds. Most of their region was treeless except for the cottonwoods, sycamores, and willows that lined the river channels and sloughs. Oaks did not extend very far onto the valley floor and, therefore, acorns were not readily available. They were generally obtained by trade with neighboring groups.

Small land mammals and birds were only a small portion of the native diet and the Southern Valley Yokuts rarely ventured into the open country to capture antelope and elk. They did, however, capture many of the larger mammals when they came to the lakes and sloughs for water.

Various cooking methods were employed. Tule roots and seeds were ground into meal, mixed with water, and stone-boiled in baskets. Fish and meat were broiled and roasted on coals and ashes. Small earth ovens were used to bake both vegetable and animal foods. Salt grass was used for seasoning. Firewood was at a premium and dried tules were usually substituted.

Single family residences were constructed by using long poles, limbs, or sticks with one end set on the ground in an oval pattern, and the other ends brought together at the top to form a frame that was then covered with mats made from tule reeds. Some groups, using the same materials, built a distinctive long, steep-roofed communal house. This structure would shelter ten or more families. Each family would have a fireplace and outside door. Along the front of the house a long open shade porch was constructed and many of the domestic activities, such as cooking, were performed there. Additionally, each village had a communally-owned sweathouse. The men did their daily sweating and occasionally slept there.

Clothing worn by the Southern Valley Yokuts was minimal. Males were either naked or used a breechcloth. Females wore a narrow fringed apron in front and a larger back piece. In cold weather both sexes wrapped themselves in skin cloaks. Generally feet were bare, though simple skin moccasins were used when travelling over rocky, brushy terrain. The hair was worn long by men and women and held in place by a string tied around the forehead. Women, who bore the heaviest burdens, wore basketry caps to protect the forehead from the tumpline band when carrying heavy burdens. Men carried loads in net backpacks held by a chest strap. Simple design tattooing was worn mainly by women. The design consisted of lines, zigzags, and rows of dots down the chin and across from the corners of the mouth. Children had their earlobes and nasal septa pierced for insertion of an ornament.

The Yokuts technology was also shaped by the source of raw materials available. The very important tule provided the basis for their highest technological skill - basket weaving. The baskets varied in shape and use and included bowl-shaped cooking containers, conical burden baskets, flat winnowing trays, seed beaters, and a unique necked water bottle. Wood and stone crafts were quite undistinguished. Wood and many lithic materials were imported. Even stone mortars and pestles were obtained by trade. marine shells were secured from trade with coastal peoples and used for currency and personal adornment.

Canoe-shaped rafts were constructed of dried tules and constituted the Yokuts favored mode of travel. The rafts could hold six people and their belongings.

The basic domestic and economic unit in southern Valley Yokuts society was the nuclear family. The families were grouped into patrilineal totemic lineages. A totem, an animal or bird, was a symbol representing the father's line. The totem was dreamed about, prayed to, and forbidden to kill or eat by that lineage. The lineage was a mechanism for transmitting offices, performing certain ceremonial duties, and creating mutual loyalties. These lineages were further organized into two moieties, or groups. The moieties had little to do with day-to-day like, but did serve certain functions. They would serve as opposing teams for games and as reciprocal groups in mourning rites and first-fruits ceremonies. Moiety exogamy was customary but not absolute.

There was no overall political unity among the tribes. They were split into self-governing local groups. Each group had a name, spoke a different dialect, and had a territory that was collectively owned. Some official positions were filled through

patrilineal inheritance. In the Tachi tribe each settlement had a chief for each moiety and the pair shared equal authority.

Generally Yokuts groups were peaceful, but occasional warfare did break out. Fighting was on a small scale and very little ritual was attached to warfare.

There were four occasions regarded as significant and crucial in the like of each Yokuts: birth, a girl's puberty, marriage, and death. Each of these periods required special care, attention, and ceremony.

One of the most important ceremonies was the ritual honoring the tribal dead. This usually took place annually, lasted six days, and included outside local groups. Guests came by the hundreds for the festival. The shamans were the only religious specialists of the Yokuts. They also served as "doctors".

Many rituals were accompanied by songs and instrumental music. Musical instruments included the cocoon rattle, bone and wood whistle, flute, musical bow, and a cleft-stick rattle. The major artistic accomplishment of the Southern Valley Yokuts was the decorative patterns woven into their baskets.

No significant number of Southern Valley Yokuts came under the control of the coastal Franciscan missionaries, however, significant impact to their culture resulted from infiltration of escaped natives from the missions. The runaways introduced foreign practices from their cultures which had suffered greatly from non-practice and practices acquired from the missions. Complete cultural breakdown and near-total disappearance of native peoples from the San Joaquin Valley came with the annexation of California by the United States. The land passed quickly into the hands of the settlers. The process was relatively easy since the native peoples offered little effective resistance.

Because of the early and rapid decimation of the Southern Valley Yokuts and the rapid collapse of their culture, there is relatively little published literature regarding them, and ethnographic descriptions obtained from aged informants is certainly incomplete.

STATEMENT OF CONFIDENTIALITY

Only general information about archaeological sites and artifacts can be released to the public. The information contained in the site records and site location maps is exempt under the Freedom of Information Act due to the sensitive nature of the data. Therefore, all site records and site location maps

should be maintained in a separate appendix and not included in documents distributed to the public.

SCOPE OF WORK

Standard archaeological procedures involve three phases:

Phase I: Phase I consists of a records search and a field survey. The records search is prepared by or obtained from the Southern San Joaquin Valley Information Center, housed at California State University, Bakersfield. The field survey is an on-foot survey conducted by an archaeologist. If sites are found on the project area, then the procedure moves into Phase II.

Phase II. Phase II consists of a testing program to determine the "importance" of the site, based on the California Environmental Quality Act Guidelines. One or more of the following means are usually employed: test unit excavations, surface collecting, trenching, auguring, and archival research.

After testing, if the site is deemed "unimportant" the testing in Phase II is sufficient mitigation and the procedure stops. If, however, the site is considered "important", then Phase III must be undertaken.

Phase III: Phase III consists of mitigation measures. Usually this is salvage excavation, some form of preservation, or a combination of the two.

The proposed Phase I scope of work includes:

(1) Records search. (Completed)

(2) Pedestrian survey of all areas to be impacted either by primary or secondary land use. Due to the archaeological sensitivity of the area, all survey reconnaissance is to be intensive (5 to 15 meter transects).

(3) Recordation of archaeological sites discovered during Phase I reconnaissance, to include Section 106 review.

(4) Report, with ongoing addenda, as the work progresses, project by project.

(5) Recommendations for mitigation measures to reduce any impacts to cultural resources to an acceptable level of insignificance.

RECOMMENDATIONS

1) Phase I survey and report must be completed prior to any ground disturbing activities.

2) Cultural resources discovered during Phase I survey will be recorded, mapped, evaluated, and mitigated prior to ground disturbing activities.

3) Recommendations apply equally to both primary and secondary land use.

4) The eight previously recorded archaeological sites to be evaluated under Section 106.

5) Should human remains be discovered on the project area at any time, work must halt in the area of the area of the discovery and the Kern County coroner must be notified. (In Kern County the coroner is the sheriff.)

6) Any artifacts collected during archaeological activities belong to the landowner. However, it is recommended that any artifacts be curated at the Kern County Museum.

7) Local Native American groups should be contact regarding any concerns they may have for this project (see Appendix II).

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APPENDIX I: RECORDS SEARCH

LETTER 11

California
chaeological
Inventory

FRESNO
KERN
KINGS
MADERA
TULARE

Southern San Joaquin Valley
Information Center
California State University, Bakersfield
9001 Stockdale Highway
Bakersfield, California 93311-1099
805/664-2289 FAX 805/664-2415

To: Catherine Pruett, Archaeologist (RS# 96-547)
Three Girls & A Shovel (T G & S)
2820 Alta Vista Drive
Bakersfield, CA 93305

RE: Kern Water Bank Authority Project

County: Kern

Map(s): Stevens and Tupman 7.5's

The Information Center is under contract to the State Office of Historic Preservation and is responsible for the local management of the California Historical Resources Inventories. The Center is funded solely by research fees, and a grant from the State Office of Historic Preservation. The Information Center does not conduct fieldwork and is not affiliated with any archaeological consultants who conduct fieldwork.

CULTURAL RESOURCES RECORDS SEARCH

The following are the results of a search of the cultural resources site files at the Southern San Joaquin Valley Information Center. These files include known and recorded archaeological and historic sites, inventory and excavation reports filed with this office, and properties listed on the National Register of Historic Places (9/96), the California Historical Landmarks, The California Inventory of Historic Resources, and The California Points of Historical Interest.

The following summarizes the current information available on the subject property based on the records outlined above.

PRIOR CULTURAL RESOURCE INVENTORIES OF THE SUBJECT PROPERTY AND SURROUNDING AREAS

There have been four previous archaeological surveys conducted within the project area. There has been two archaeological surveys conducted on the immediately adjacent property. There have been eight surveys conducted within a mile of the project boundaries. Survey locations and references are enclosed.

KNOWN CULTURAL RESOURCES ON THE SUBJECT PROPERTY AND SURROUNDING AREAS

There are nine recorded sites in the project area. There are four recorded sites on the immediately adjacent property whose boundaries cross over into the project area. See the enclosed map for details.

(RS# 96-547)

There are 31 recorded sites within a mile of the project area boundaries. This project area is adjacent to the McAlister Ranch project and the Dance House Site, CA-KER-668.

There have been excavations conducted on various sites, three of which are within the project boundaries.

There are no resources in the project area that are listed on the National Register of Historic Places, The California Historical Landmarks, The California Inventory of Historic Resources, or California Points of Historical Interest.

COMMENTS

For additional information regarding this project, the Native American Heritage Commission in Sacramento will, upon request, supply you with a list of Native American individuals/organizations who may have concerns regarding resources in this vicinity. The NAHC will also consult their "Sacred Lands Inventory" file in order to determine if such resources are in this project area and the way in which these resources should be dealt with.

Survey locations and bibliographic references are plotted on the enclosed map. Enclosed are copies of the site records, survey reports, excavation reports and the materials relating to McAlister Ranch as you requested. If you need any additional information for this project, please don't hesitate to contact me at (805) 664-2289.

By: Adele Baldwin

Adele Baldwin
Assistant Coordinator

Date: December 16, 1996

Fee: $90.00/hr.

Invoice # 6937

c: Larry Myers, Executive Secretary
Native American Heritage Commission

APPENDIX II: NATIVE AMERICAN CORRESPONDENCE

LETTER 11

Three Girls and a Shovel

Specializing in archaeological assessments and excavations in the San Joaquin Valley, Mojave Desert, Central and Southern Sierra Nevada/Tehachapi Mts.

Fax (805) 325-0307

Catherine Pruett (805) 861-8711

Peggy B. Murphy (805) 325-0307

Dorothy Fleagle (805) 323-5728

Larry Meyers
Native American Heritage Commission
915 Capitol Mall, Room 364
Sacramento, California 95814

January 6, 1997

Dear Mr. Meyers,

We are under contract with the Kern Water Bank Authority (KWBA) to provide a cultural resources assessment for their EIR. We have conducted a records search at the Southern San Joaquin Valley Information Center and are aware that nine prehistoric sites are currently recorded within KWBA property. We are also aware of the numerous prehistoric sites immediately adjacent to KWBA property and consider much of the KWBA project area is be archaeologically sensitive.

Enclosed is a map of KWBA property. The property is located on the Stevens and Tupman 7.5' topographic maps, within Township 30S, Range 25E and 26E.

Please review your Sacred Lands File and provide us with any information pertinent to this project. Also, please send us your list of Most Likely Descendants for the Southern San Joaquin Valley.

Sincerely,

Catherine Lewis Pruett

LETTER 11

Three Girls and a Shovel

Specializing in archaeological assessments and excavations in the San Joaquin Valley, Mojave Desert, Central and Southern Sierra Nevada/Tehachapi Mts.

Fax (805) 325-0307

Catherine Pruett (805) 861-8711

Peggy B. Murphy (805) 325-0307

Dorothy Fleagle (805) 323-5728

J.R. Manuel
Native American Heritage Preservation Council
Route 7, Box 251
Porterville, CA 93257

January 6, 1997

Dear J.R.,

We are under contract with the Kern Water Bank Authority (KWBA) to provide a cultural resources assessment for their EIR. We have conducted a records search at the Southern San Joaquin Valley Information Center and are aware that nine prehistoric sites are currently recorded within KWBA property. We are also aware of the numerous prehistoric sites immediately adjacent to KWBA property and consider much of the KWBA project area is be archaeologically sensitive.

Enclosed is a map of KWBA property. The property is located on the Stevens and Tupman 7.5' topographic maps, within Township 30S, Range 25E and 26E.

Please let us known is you, or any members of the NAHPC have information, questions, or concerns regarding this project. Feel free to contact me if you would like to discuss this project further.

Very truly yours,

Catherine Lewis Pruett

APPENDIX III: QUALIFICATIONS OF PROJECT PERSONNEL

Catherine Lewis Pruett
2820 Alta Vista Drive
Bakersfield, California 93305

EDUCATION

1987	MA	Behavioral Science, CSU Bakersfield
1984	BA	Anthropology, CSU Bakersfield
1977	AA	Anthropology, Bakersfield College

SPECIALTY: Archaeology of southern California, in particular the southern Sierra Nevada/Tehachapi Mountains, the southern San Joaquin Valley, and the western Mojave Desert.

AREAS OF FIELDWORK: Active in archaeological investigations since 1978. Experience in the central and southern San Joaquin Valley, the southern Sierra Nevada/Tehachapi Mountains, the Temblor and Coast Ranges, and the Mojave Desert.

SUMMARY OF EXPERIENCE: Twenty years of field experience in central and southern California, participation in over 200 surveys and excavations, 14 years as Assistant Coordinator and three years as Coordinator of the Southern San Joaquin Valley Archaeological Information Center. Two years as Assistant Director of the Cultural Resource Facility, California State University, Bakersfield. One year as a private consultant.

A complete vita is available upon request.

Dorothy Fleagle
822 Niles St.
Bakersfield, California 93305

EDUCATION

1996	MA Behavioral Science, California State University, Bakersfield (in progress)
1990	BA Anthropology, California State University, Bakersfield
1988	AA Anthropology, Bakersfield College

SPECIALTY: Archaeology of the southern Sierra Nevada Mountains, Great Basin pertaining to Tubatulabal, and California pertaining to Tubatulabal, and contemporary Tubatulabal specifically.

AREAS OF FIELDWORK: Experience in the southern Sierra Nevada/Tehachapi Mountains, the southern San Joaquin Valley, the San Bernardino Mountains, and the western and Mojave Desert.

SUMMARY OF EXPERIENCE: Seven years of field experience in southern and central California, participation in over 75 surveys and excavations. Six years as staff archaeologist with the Cultural Resource Facility, California State University, Bakersfield. One year as a private consultant.

A complete vita is available upon request.

Peggy Murphy
205 Hagin Street
Bakersfield, California 93309

EDUCATION

1989	BA Anthropology, California State University, Bakersfield

SPECIALTY: Archaeology of southern California, in particular the southern Sierra Nevada, Tehachapi Mountains, the southern San Joaquin Valley, and the western Mojave Desert.

AREAS OF FIELDWORK: Active in field investigations since 1985. Experience in the southern Sierra Nevada Mountains, the southern San Joaquin Valley, and the Mojave Desert.

SUMMARY OF EXPERIENCE: Ten years of field experience in southern and central California, participation in over 75 surveys and excavations. Seven years as staff archaeologist with the Cultural Resource Facility, California State University, Bakersfield, two years as a private consultant.

A complete vita is available upon request.

EXHIBIT B

MEMORANDUM OF UNDERSTANDING

REGARDING OPERATION AND MONITORING OF THE KERN WATER BANK GROUNDWATER BANKING PROGRAM

This Memorandum of Understanding is entered into the 26th day of October, 1995, by and among DUDLEY RIDGE WATER DISTRICT, KERN COUNTY WATER AGENCY, SEMITROPIC WATER STORAGE DISTRICT, TEJON CASTAC WATER DISTRICT & WESTSIDE MUTUAL WATER COMPANY, LLC, and WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT, which have collectively formed the KERN WATER BANK AUTHORITY ("KWBA") hereinafter collectively referred to as "Project Participants," and BUENA VISTA WATER STORAGE DISTRICT ("BVWSD"), ROSEDALE-RIO BRAVO WATER STORAGE DISTRICT ("RRBWSD"), KERN DELTA WATER DISTRICT ("KDWD"), HENRY MILLER WATER DISTRICT ("HMWD"), and WEST KERN WATER DISTRICT ("WKWD"), hereinafter collectively referred to as "Adjoining Entities."

R E C I T A L S

WHEREAS, Project Participants expect title to that certain real property more particularly shown on the map attached hereto as Exhibit "A" and incorporated herein by this reference ("Project Site") to be transferred to the KWBA as provided for in the "Statement of Principles . . . for the Development, Operation and Maintenance of the Kern Fan Element of the Kern Water Bank" ("Statement of Principles") agreed to March 30, 1995; and

WHEREAS, the KWBA intends to develop and improve the Project Site as necessary to permit the importation, percolation and storage of water in underground aquifers for later extraction, transportation and use for the benefit of Project Participants, all as more fully described in Exhibit "B" attached hereto and incorporated herein by this reference ("Project"); and

WHEREAS, Adjoining Entities encompass lands and/or operate existing projects lying adjacent to the Project Site as shown on said Exhibit A; and

WHEREAS, in recent years, water banking, extraction and transfer programs in Kern County have become increasingly numerous and complex; and

WHEREAS, it is appropriate and desirable to mitigate or eliminate any short-term and long-term significant adverse impacts of new programs upon potentially affected projects and landowners within the boundaries of Adjoining Entities; and

WHEREAS, Adjoining Entities and Project Participants desire that the design, operation and monitoring of the Project be conducted and coordinated in a manner to insure that the beneficial effects of the Project to the Project Participants are maximized but that the Project does not result in significant adverse impacts to water levels, water quality or land subsidence within the boundaries of Adjoining Entities, or otherwise interfere with the existing and ongoing programs of Adjoining Entities;

NOW THEREFORE, BE IT RESOLVED that, based upon the mutual covenants contained herein, the parties hereto agree as follows:

1. Project Design and Construction. Project Participants have completed a preliminary design of the Project described in Exhibit B hereto representing the maximum facilities for the Project. Said preliminary design has been reviewed and approved by the Parties hereto. The KWBA intends to, and if it does so will, construct all or a portion of the Project

consistent with such preliminary design. Any major modifications of the facilities and or significant changes from that described in Exhibit B and in the environmental documentation for the Project will be subject to additional environmental review pursuant to CEQA and will be subject to review of the Monitoring Committee prior to implementation.

2. Project Operation. The Project shall be operated to achieve the maximum water storage and withdrawal benefits for Project Participants consistent with avoiding, mitigating or eliminating, to the greatest extent practicable, significant adverse impacts resulting from the Project. To that end, the Project shall be operated in accordance with the Statement of Principles and the following Project Objectives and the Minimum Operating Criteria:

a. Project Objectives. Consistent with the Project Description, the Project Participants will make a good faith effort to meet the following objectives, which may or may not be met:

(1) The Parties should operate their projects in such manner as to maintain and, when possible, enhance the quality of groundwater within the Project Site and the Kern Fan Area, as shown at Exhibit C.

(2) If supplies of acceptable recharge water exceed recharge capacity, all other things being equal, recharge priority should be given to the purest or best quality water.

(3) Each project within the Kern Fan Area should be operated with the objective that the average concentration of total dissolved salts in the recovered water will exceed the average concentration of total dissolved salts in the recharged water, at a minimum, by a percentage equal to or greater than the percentage of surface recharge losses. The average shall be calculated from the start of each Project.

(4) To maintain or improve groundwater quality, recovery operations should extract poorer quality groundwater where practicable. Blending may be used to increase

extraction of lesser quality groundwater unless doing so will exacerbate problems by generating unfavorable movement of lesser quality groundwater. It is recognized that the extent to which blending can help to resolve groundwater quality problems is limited by regulatory agency rules regarding discharges into conveyance systems used for municipal supplies, which may be changed from time to time.

(5) All groundwater pumpers should attempt to control the migration of poor quality water. Extensive monitoring will be used to identify the migration of poor quality water and give advance notice of developing problems. Problem areas may be dealt with by actions including, but not limited to:

(a) limiting or terminating extractions that tend to draw lesser quality water toward or into the usable water areas;

(b) increasing extractions in areas that might generate a beneficial, reverse gradient;

(c) increasing recharge within the usable water area to promote favorable groundwater gradients.

(6) It is intended that all recovery of recharged water be subject to the so-called "golden rule." In the context of a banking project, the "golden rule" means that, unless acceptable mitigation is provided, the banker may not operate so as to create conditions that are worse than would have prevailed absent the project giving due recognition to the benefits that may result from the project, all as more fully described at paragraph 2(b)12 below.

(7) The Project should be developed and operated so as to prevent, eliminate or mitigate significant adverse impacts. Thus, the Project shall incorporate mitigation measures as necessary. Mitigation measures to prevent significant adverse impacts from occurring include but are not limited to the following: (i) spread out recovery area; (ii) provide

buffer areas between recovery wells and neighboring overlying users; (iii) limit the monthly, seasonal, and/or annual recovery rate; (iv) provide sufficient recovery wells to allow rotation of recovery wells or the use of alternate wells; (v) provide adequate well spacing; (vi) adjust pumping rates or terminate pumping to reduce impacts, if necessary; (vii) impose time restrictions between recharge and extraction to allow for downward percolation of water to the aquifer; and (viii) provide recharge of water that would otherwise not recharge the Kern Fan Basin. Mitigation measures that compensate for unavoidable adverse impacts include but are not limited to the following: (i) with the consent of the affected overlying user, lower the pump bowls or deepen wells as necessary to restore groundwater extraction capability to such overlying user; (ii) with the consent of the affected overlying user, provide alternative water supplies to such overlying user; and (iii) with the consent of the affected overlying user, provide financial compensation to such overlying user.

b. Minimum Operating Criteria.

(1) The Monitoring Committee shall be notified prior to the recharge of potentially unacceptable water, such as "produced water" from oilfield operations, reclaimed water, or the like. The Monitoring Committee shall review the proposed recharge and make recommendations respecting the same as it deems appropriate. Where approval by the Regional Water Quality Control Board is required, the issuance of such approval by said Board shall satisfy this requirement.

(2) Recharge may not occur in, on or near contaminated areas, nor may anyone spread in, on or near an adjoining area if the effect will be to mound water near enough to the contaminated area that the contaminants will be picked up and carried into the uncontaminated groundwater supply. When contaminated areas are identified within or adjacent to the Project, the KWBA and the Project Participants shall also:

(a) participate with other groundwater pumpers to investigate the source of the contamination;

(b) work with appropriate authorities to ensure that the entity or individual, if any, responsible for the contamination meets its responsibilities to remove the contamination and thereby return the Project Site to its full recharge and storage capacity;

(c) operate the Project in cooperation with other groundwater pumpers to attempt to eliminate the migration of contaminated water toward or into usable water quality areas.

(3) Operators of projects within the Kern Fan Area will avoid operating recharge projects in a fashion so as to significantly diminish the natural, normal and unavoidable recharge of water native to the Kern Fan Area as it existed in a pre-project condition. If and to the extent this occurs as determined by the Monitoring Committee, the parties will cooperate to provide equivalent recharge capacity to offset such impact.

(4) The mitigation credit for fallowed Project land shall be .3 acre-feet per acre per year times the amount of fallowed land included in the Project Site in the year of calculation (which for the present approximately 19,890 acre Project Site is 5,967 acre-feet per year).

(5) The lands described in Exhibit A (19,883 acres) may be utilized for any purpose consistent with the Statement of Principles, by the KWBA provided, however, the use of said property shall not cause or contribute to overdraft of the groundwater basin. In this connection, any consumptive use of water on the Property which exceeds .3 acre-feet per acre (i.e., the mitigation credit) on a acre by acre basis shall be provided from supplemental sources that do not create or contribute to overdraft.

(6) Each device proposed to measure recharge water to be subsequently recovered and/or recovery of such water will be initially evaluated and periodically reviewed by the Monitoring Committee. Each measuring device shall be properly installed, calibrated, rated, monitored and maintained by and at the expense of the owner of the measuring device.

(7) It shall be the responsibility of the user to insure that all measuring devices are accurate and that the measurements are provided to the Monitoring Committee at the time and in the manner required by the Monitoring Committee.

(8) A producer's flow deposited into another facility, such as a transportation canal, shall be measured into such facility by the operator thereof and the measurement reported to the Monitoring Committee at the time and in the manner required by such Monitoring Committee.

(9) The Monitoring Committee or its designee will maintain official records of recharge and recovery activities, which records shall be open and available to the public. The Monitoring Committee will have the right to verify the accuracy of reported information by inspection, observation or access to user records (i.e., P.G.&E. bills). The Monitoring Committee will publish or cause to be published annual reports of operations.

(10) Losses shall be assessed as follows:

(a) Surface recharge losses shall be fixed and assessed at a rate of 6% of water diverted for recharge.

(b) To account for all other actual or potential losses (including migration losses), a rate of 4% of water placed in a bank account shall be deducted to the extent that the Project Participant has been compensated within three (3) years following the end of the calendar year in which the water was banked at the SWP Delta Water Rate charged by DWR at

the time of payment; provided further, however, that the water purchased and subtracted from a groundwater bank account pursuant to this provision shall only be used for overdraft correction.

(c) An additional 5% loss shall be assessed against any water diverted to the Project Site for banking by, for, or on behalf of any out-of-County person, entity or organization and/or against any banked water sold or transferred to any out-of-County person, entity or organization (except current SWP Ag Contractors).

(d) All losses provided for herein represent amounts of water that are non-bankable and non-recoverable by Project Participants.

(11) Recovery of banked water shall be from the Project Site and recovery facilities shall be located therein. Recovery from outside the Project Site may be allowed with the consent of the District or entity having jurisdiction over the area from which the recovery will occur and upon review by the Monitoring Committee.

(12) Recovery of banked water may not be allowed if not otherwise mitigated if it will result in significant adverse impacts to surrounding overlying users. "Adverse impacts" will be evaluated using data applicable in zones including the area which may be affected by the Project of approximately five miles in width from the boundaries of the Project as designated by the Monitoring Committee. In determining "adverse impacts," as provided at this paragraph and elsewhere in this MOU, consideration will be given to the benefits accrued over time during operation of the Project to landowners surrounding the Project Site including higher groundwater levels as a result of operation of the Project;. In determining non-Project conditions vs Project conditions, credit toward mitigation of any otherwise adverse impacts shall be recognized to the extent of the 4% loss and 5% loss recognized under paragraphs 2.b.(10) (b) and (c), for the mitigation credit recognized under paragraph 2.b.(4), if any, and to the extent of recharge on the Project Site for overdraft correction.

(13) To the extent that interference, other than insignificant interference, with the pumping lift of any existing active well as compared to non-Project conditions, is attributable to pumping of any wells on the Project Site, KWBA will either stop pumping as necessary to mitigate the interference or compensate the owner for such interference, or any combination thereof. The Monitoring Committee will establish the criteria necessary to determine if well interference, other than insignificant interference, is attributable to pumping of Project wells by conducting pumping tests of Project wells following the installation of monitoring wells (if not already completed) and considering hydrogeologic information.

(14) The Kern Fan Element Groundwater Model, with input from the Project Participants and Adjoining Entities, and utilizing data from a comprehensive groundwater monitoring program, may be used by the Monitoring Committee as appropriate to estimate groundwater impacts of the Project.

3. Project Monitoring. Adjoining Entities agree to participate in a comprehensive monitoring program and as members of a Monitoring Committee, as hereinafter more particularly described, in order to reasonably determine groundwater level and water quality information under Project and non-Project conditions. The monitoring program will more particularly require the following:

a. Monitoring Committee. A Monitoring Committee shall be established, comprised of one representative of each of the Adjoining Entities (initially 5) and one representative of each of the Project Participants (initially 6). The Committee shall:

(1) Engage the services of a suitable independent professional groundwater specialist who shall, at the direction of the Committee, provide assistance in the performance of the tasks identified below;

(2) Meet and confer monthly or at other intervals deemed to be appropriate in furtherance of the monitoring program;

(3) Establish a groundwater evaluation methodology or methodologies;

(4) Prepare a monitoring plan and two associated maps, "Well Location, Water Quality Network," and "Well Location, Water Level Network," which plan and maps depict the location and types of wells anticipated to be used in the initial phase of groundwater monitoring (said plan and maps are expected to be modified from time to time as the monitoring program is developed and operated);

(5) Specify such additional monitoring wells and ancillary equipment as are deemed to be necessary or desirable for the purposes hereof;

(6) Prepare annual water balance studies and other interpretive studies, which will designate all sources of water and the use thereof within the study area;

(7) Develop criteria for determining whether excessive mounding or withdrawal is occurring or is likely to occur in an area of interest;

(8) Annually or as otherwise needed determine the impacts of the Project on each of the Adjoining Entities by evaluating with and without Project conditions; and

(9) Develop procedures, review data, and recommend Project operational criteria for the purpose of identifying, verifying, avoiding, eliminating or mitigating, to the extent practicable, the creation of significant imbalances or significant adverse impacts.

b. Collection and Sharing of Data. The Adjoining Entities will make available to the Monitoring Committee copies of all relevant groundwater level, groundwater quality, and other monitoring data currently collected and prepared by each. KWBA shall annually report, by areas of interest, water deliveries for banking and other purposes and groundwater withdrawals.

c. Monitoring Costs.

(1) The cost of constructing monitoring wells and ancillary equipment, as identified in Exhibit B, shall be borne by Project Participants. The cost of any additional monitoring wells and ancillary equipment shall be borne as may be determined by separate agreement of the Project Participants and Adjoining Entities.

(2) Each of the parties shall be responsible for the personnel costs of its representative on the Monitoring Committee. In addition, the Adjoining Entities shall be responsible for all costs of monitoring operations and facilities within their respective boundaries and the Project Participants shall be responsible for all costs of monitoring operations and facilities within the Project Site.

(3) All other groundwater monitoring costs, including employment of the professional groundwater specialist, collection, evaluation and analyses of data as adopted by the Monitoring Committee, shall be allocated among and borne by the parties as follows: Project Participants = 50%; Adjoining Entities = 50%. Cost sharing among Project Participants shall be as agreed by them. Cost sharing among Adjoining Entities shall be as agreed by them. Any additional monitoring costs shall be determined and allocated by separate agreement of those parties requesting such additional monitoring.

(4) It is intended that one Monitoring Committee shall deal with all projects operating within the Kern Fan Area. If, as and when existing or additional projects are brought within the purview of the Monitoring Committee, the participants in said projects and the adjoining entities for said projects may join the Monitoring Committee and, upon doing so, shall share in the costs of monitoring operations on the same basis as provided herein for the original parties.

4. Modification of Project Operations. The Monitoring Committee may make recommendations to the KWBA and Project Participants, including without limitation recommendations for modifications in Project operations based upon evaluation(s) of data which indicate that excessive mounding or withdrawal is occurring or is likely to occur in an area of interest. The Monitoring Committee and its members shall not act in an arbitrary, capricious or unreasonable manner.

5. Dispute Resolution.

a. Submission to Monitoring Committee. All disputes regarding the operation of the Project or the application of this agreement, or any provision hereof, shall first be submitted to the Monitoring Committee for review and analysis. The Monitoring Committee shall meet and review all relevant data and facts regarding the dispute and, if possible, recommend a fair and equitable resolution of the dispute. The Monitoring Committee and its members shall not act in an arbitrary, capricious or unreasonable manner. In the event that (1) the Monitoring Committee fails to act as herein provided, (2) any party disputes the Monitoring Committee's recommended resolution or (3) any party fails to implement the Monitoring Committee's recommended resolution within the time allowed, any party to this agreement may seek any legal or equitable remedy available as hereinafter provided.

b. Arbitration. If all of the parties agree that a factual dispute exists regarding any recommendation of the Monitoring Committee made pursuant hereto, or implementation thereof, such dispute shall be submitted to binding arbitration before a single neutral arbitrator appointed by unanimous consent and, in the absence of such consent, appointed by the presiding judge of the Kern County Superior Court. The neutral arbitrator shall be a registered civil engineer, preferably with a background in groundwater hydrology. The arbitration shall be called and conducted in accordance with such rules as the contestants shall agree upon, and, in the

absence of such agreement, in accordance with the procedures set forth in California Code of Civil Procedure section 1282, et seq. Any other dispute may be pursued through a court of competent jurisdiction as otherwise provided by law.

c. Burden of Proof. In the event of arbitration or litigation under this Agreement, all parties shall enjoy the benefit of such presumptions as are provided by law but, in the absence thereof, neither party shall bear the burden of proof on any contested legal or factual issue.

d. Landowner Remedies. Nothing in this agreement shall prevent any landowner within the boundaries of any party from pursuing any remedy at law or in equity in the event such landowner is damaged as a result of projects within the Kern Fan Area.

6. Term. This agreement shall commence on the day and year first above written and shall continue in force and effect until terminated by (1) operation of law, (2) unanimous consent of the parties, or (3) abandonment of the Project and a determination by the Monitoring Committee that all adverse impacts have been fully eliminated or mitigated as provided in this agreement.

7. Complete Agreement/Incorporation Into Banking Agreements. This agreement constitutes the whole and complete agreement of the parties regarding Project operation, maintenance and monitoring. Project Participants shall incorporate this agreement by reference into any further agreement they enter into respecting banking of water in or withdrawal of water from the Project Site.

8. Future Projects. With respect to any future project within the Kern Fan Area, the Parties hereto shall use good faith efforts to negotiate an agreement substantially similar in substance to this MOU.

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9. Notice Clause. All notices required by this agreement shall be sent via first class United States mail to the following and shall be deemed delivered three days after deposited in the mail:

Project Participants

Dale Melville
Dudley Ridge Water District
286 W. Cromwell Avenue
Fresno, California 93711-6162

William Taube
Wheeler Ridge-Maricopa
Water Storage District
P.O. Box 9429
Bakersfield, CA 93389-9429

Tom Clark
Kern County Water Agency
P.O. Box 58
Bakersfield, California 93312

Bill Phillimore
Westside Mutual Water Company
33141 Lerdo Highway
Bakersfield, California 93302-0058

Will Boschman
Semitropic Water District
P.O. Box Z
Wasco, California 93280

Dennis Mullins
Tejon-Castac Water District
P.O. Box 1000
Lebec, CA 93243

Bill Phillimore, Chairman
Kern County Water Bank Authority
c/o YOUNG WOOLDRIDGE
1800 - 30th Street, Fourth Floor
Bakersfield, CA 93301

Adjoining Entities

Martin N. Milobar
Buena Vista Water Storage District
P.O. Box 756
Buttonwillow, CA 93206

Hal Crossley
Rosedale-Rio Bravo
Water Storage District
P.O. Box 867
Bakersfield, CA 93302-0867

L. Mark Mulkay
Kern Delta Water District
501 Taft Highway
Bakersfield, CA 93307

Joe Lutje
Henry Miller Water District
P.O. Box 9759
Bakersfield, CA 93389

Jerry Pearson
West Kern Water District
P.O. Box MM
Taft, CA 93268-0024

Notice of changes in the representative or address of a Party shall be given in the same manner.

10. California Law Clause. All provisions of this agreement and all rights and obligations of the parties hereto shall be interpreted and construed according to the laws of the State of California.

11. Amendments. This agreement may be amended by written instrument executed by all of the parties. In addition, recognizing that the parties may not now be able to contemplate all the implications of the Project, the parties agree that on the tenth anniversary of implementation of the Project, if facts and conditions not envisioned at the time of entering into this agreement are present, the parties will negotiate in good faith amendments to this agreement. If the parties cannot agree on whether conditions have changed necessitating an amendment and/or upon appropriate amendments to the agreement, such limited issues shall be submitted to an arbitrator or court, as the case may be, as provided above.

12. Successors and Assigns. This agreement shall bind and inure to the benefit of the successors and assigns of the parties.

13. Severability. The rights and privileges set forth in this agreement are severable and the failure or invalidity of any particular provision of this agreement shall not invalidate the other provisions of this agreement; rather all other provisions of this agreement shall continue and remain in full force and effect notwithstanding such partial failure or invalidity.

14. Force Majeure. All obligations of the parties shall be suspended for so long as and to the extent the performance thereof is prevented, directly or indirectly, by earthquakes, fires, tornadoes, facility failures, floods, drownings, strikes, other casualties, acts of God, orders of court or governmental agencies having competent jurisdiction, or other events or causes beyond the control of the parties. In no event shall any liability accrue against a party, or its

officers, agents or employees, for any damage arising out of or connected with a suspension of performance pursuant to this paragraph.

IN WITNESS WHEREOF the parties have executed this agreement the day and year first above written at Bakersfield, California.

PROJECT PARTICIPANTS

DUDLEY RIDGE WATER DISTRICT

BY: _____
Dale Melville, Manager

BY: _____

WHEELER RIDGE-MARICOPA WATER STORAGE DISTRICT

BY: _____
William Taube, Engineer/Manager

BY: _____

SEMITROPIC WATER STORAGE DISTRICT

BY: _____
Bill Boschman, Engineer/Manager

BY: _____

KERN COUNTY WATER AGENCY

BY: _____
Adrienne J. Mathews, President

BY: October 26, 1995

WESTSIDE MUTUAL WATER COMPANY

BY: _____
Bill Phillimore, Executive Vice-President

BY: _____

TEJON-CASTAC WATER DISTRICT

BY: _____
Dennis Mullins, President

BY: _____

KERN WATER BANK AUTHORITY

BY: _____
Bill Phillimore, Chairman

BY: _____

ADJOINING ENTITIES

BUENA VISTA WATER STORAGE DISTRICT

BY: _____
Martin Milobar, Engineer-Manager

BY: _____

WEST KERN WATER DISTRICT

BY: _____
Bob G. Bledsoe, President

BY: _____

ROSEDALE RIO BRAVO WATER STORAGE DISTRICT

BY: _____
Hal Crossley, Manager

BY: _____

KERN DELTA WATER DISTRICT

BY: _____
L. Mark Mulkay, Engineer-Manager

BY: _____

HENRY MILLER WATER DISTRICT

BY: _____
Joe Lutje, Manager

BY: _____

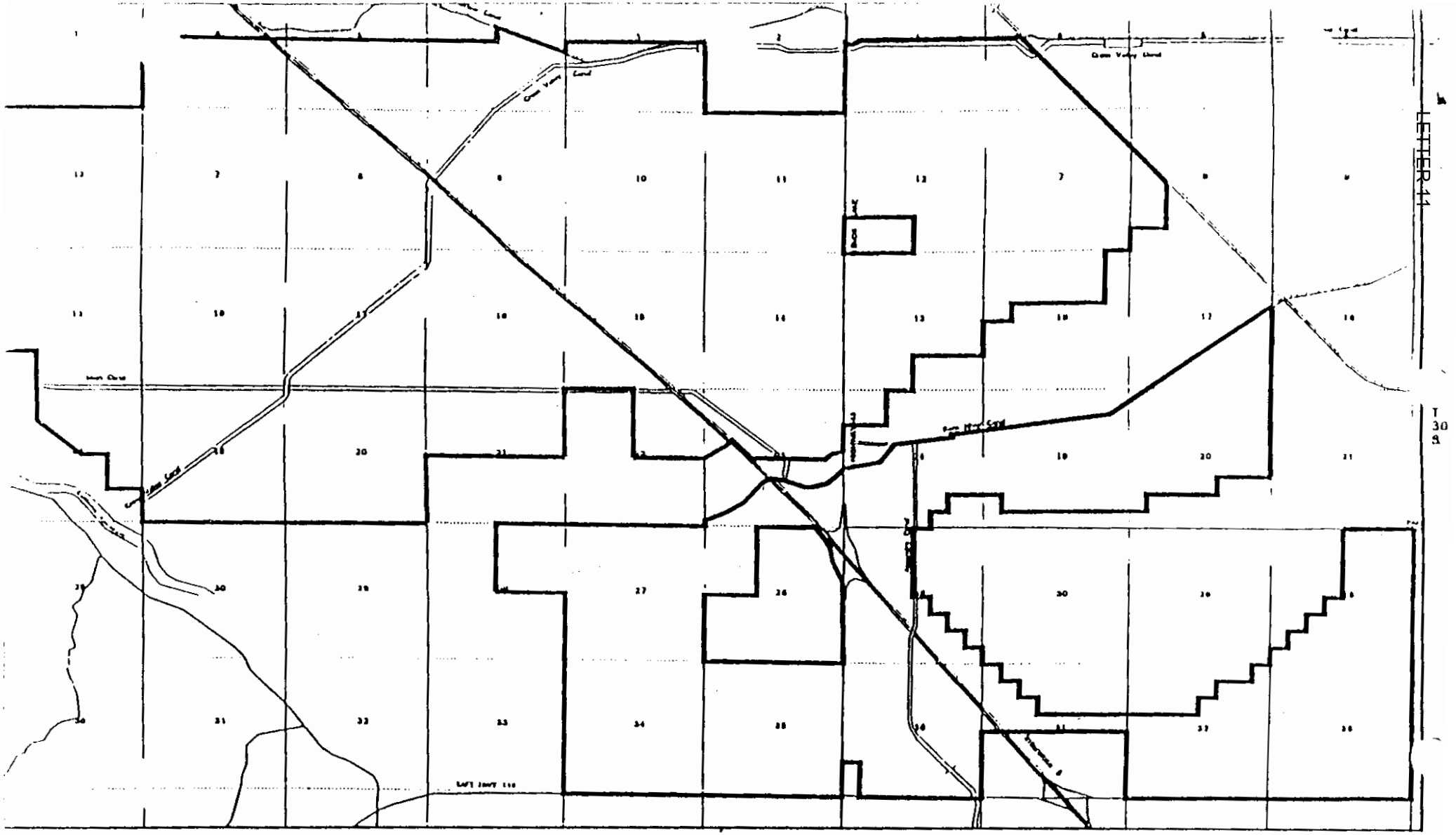

EXHIBIT A

Kern Water Bank Project Site

PROJECT DESCRIPTION

Purposes

The primary water management objective of the Kern Water Bank (KWB) is to enhance water supplies for SWP contractors and entities in Kern County. Water would be stored in aquifers during times of surplus and either recovered during times of shortage or remain in the ground to assist with overdraft correction.

Sources of Water

It is anticipated that water from numerous sources will be recharged on the property in cooperation with the water rights holders and the approval of the necessary authorities. Such sources include: the Kern River, Friant-Kern, SWP, CVP, flood water and other sources that may be available from time to time.

Facilities

To achieve its water management objectives, the KWB will require the construction of recharge ponds, water conveyance facilities, and water wells. The ponds will be created by constructing low levees along contours. The ponds bottoms would be left, as far as possible, in their natural condition. The habitat surrounding and between ponds may be modified and enhanced depending on the outcome of negotiations with resources agencies and other habitat management objectives.

Of the 19,883 acres that presently constitute the Kern Water Bank property, approximately 5,000 acres are proposed for routine recharge, although, during high flow conditions, additional acreage may be utilized which would also serve to prevent flooding elsewhere in the Valley. In the wettest of years, it is hoped that close to a million acre feet can be recharged on the property. The ponds would be formed by constructing approximately 35 miles of levees with a maximum height of 3 feet.

It is proposed that water would be conveyed to and from the property using available capacity in any of the canals and conveyance facilities that may serve the property including: the Cross Valley Canal, the Friant Kern Canal, the California Aqueduct, the Pioneer Canal, the River Canal, the Kern River, Buena Vista's Main Canal and the Alejandro Canal. In each case the permission of the relevant authority will be sought for the use of each facility. It is also proposed to build a new canal that would link the River Canal to the California Aqueduct and would convey water to and from the property. Additionally, it is proposed that a diversion and conveyance facility be constructed that would divert water from the Kern River to the eastern end of the property. Such a conveyance facility would probably cross the north Pioneer property and, as such, is subject to approval from the KCWA and the City of Bakersfield.

Fifty-seven water wells currently exist on the property. Another 43 may be added before the project is complete to provide adequate recovery capacity and the necessary operational flexibility to avoid or minimize adverse impacts. Once build out of the recovery facilities is complete, the

recovery capacity will be maintained by constructing new wells to replace the capacity of older wells as they fail. New wells shall be placed no closer than one third mile from any functioning wells off the property. Wells on the property shall be located and operated so as to prevent significant non-mitigable adverse impacts to neighboring land owners.

Operation

The project shall be managed by the Kern Water Bank Authority. Day-to-day operation of the project may be contracted to other parties. Operation of the project shall be coordinated with adjoining projects.

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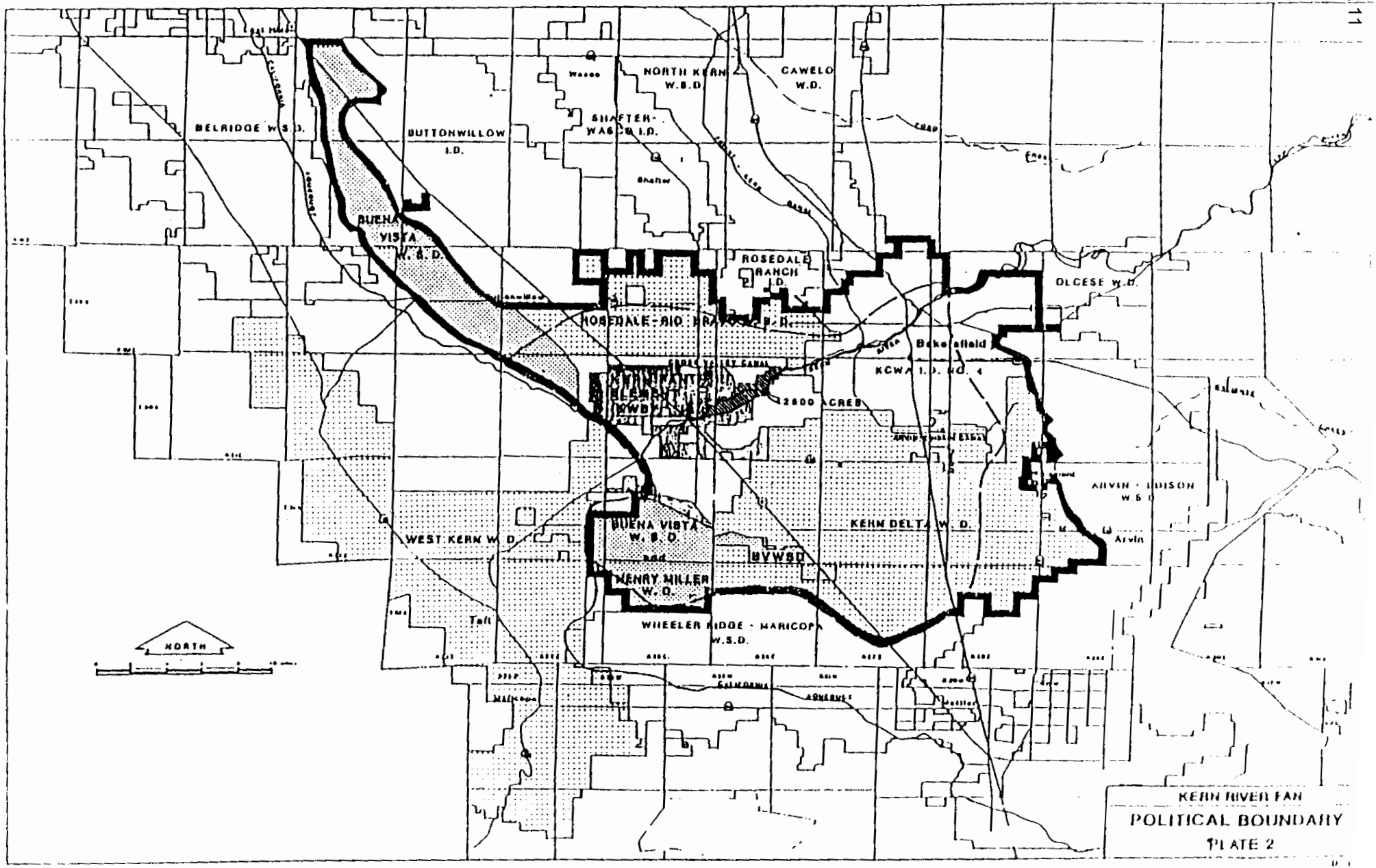
BELRIDGE W.S.D.
BUTTONWILLOW I.D.
NORTH KERN W.S.D.
CAWELO W.D.
SHAFTER-WASCO I.D.
BUENA VISTA W.S.D.
ROSEDALE RANCH I.D.
ROSEDALE-RIO BRAVO W.S.D.
OLCESE W.D.
Bakersfield
KCWA I.D. No. 4
2800 ACRE
ARVIN-EDISON W.S.D.
Arvin
KERN DELTA W.D.
WEST KERN W.D.
BUENA VISTA W.S.D.
BVWSD
HENRY MILLER W.D.
WHEELER RIDGE - MARICOPA W.S.D.
Taft
NORTH
KERN RIVER FAN
POLITICAL BOUNDARY
PLATE 2

EXHIBIT C

KERN WATER BANK AUTHORITY
MOSQUITO ABATEMENT PROGRAM

KWBA proposes an adaptive management approach to their cooperative efforts with the Mosquito Vector Districts, to reduce the mosquito breeding habitat on the Kern Water Bank property. This adaptive management approach recognizes the commitments and requirements imposed on the Kern Water Bank Authority by the Resource Agencies [California Department of Fish & Game and the United States Fish & Wildlife Service] in the formation of the Habitat Conservation Plan (HCP) on the overall project of the Kern Water Bank Authority.

1) KWBA staff will notify Mosquito Vector staff of anticipated flooding, pond usage and duration of water.

2) KWBA will, over a three year period, construct water edge roads on some of the existing ponds. All newly constructed ponds will have the water edge roads built in. KWBA will first construct the water edge roads on ponds S-3, S-4, S-5, S-6, S-7, S-10, and S-11 to determine whether the construction is successful in meeting the goals of allowing mosquito district vehicles access to the ponds for spraying. The roads will be constructed in 15' - 20' widths, raising the road elevation approximately 6" from the water line. The roads will be created only on sides that need access. Prior to any further road construction, KWBA and the Mosquito Vector Districts will analyze the first phase water edge roads to determine if they accomplished their objective of allowing access to the ponds and if not, to develop an alternative plan for pond spraying.

3) The informal ponding occurring in Sections 7, 8, 13, & 18 (west of the Cross Valley Canal) will be gradually phased out and until completely phased out, KWBA will cycle the spreading of water when possible so water is kept moving.

4) KWBA will work with the staff of the Vector Districts to design a mosquito fish breeding pond and will then start discussions with surrounding recharge districts for a joint construction and use of the pond. KWBA will supply and control the water in the ponds; the Vector Districts will manage and operate the pond and mosquito fish.

5) KWBA will maintain roads in a reasonable condition to allow Vector District vehicles access to the ponds.

6) KWBA will manage the pond bottom vegetation as allowed by the HCP Vegetation plan which includes burning and grazing. These methods will be used as pond bottom conditions dictate appropriate.

7) Prior to the commencement of each mosquito breeding season, KWBA staff would tour the ponds with staff of the Vector Districts to review the adaptive management program for the prior season and outline any necessary changes for the upcoming mosquito breeding season.

EXHIBIT D

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SUMMARY OF PROJECT IMPACTS ON SECONDARY COVERED PLANT SPECIES

Plant species listed here are species that either have special status, or could potentially reach special status. They have ranges which overlap with the Kern Water Bank project site, or are found in the surrounding region. Included are species that could colonize or be introduced into the created marsh and/or existing grassland and scrub habitats.

Scientific Name	Common Name and Habitat Associations *	Impacts of Project
Plants. Potentially sensitive plant species which could colonize or be introduced to Kern Water Bank during the life of the permit. List is composed of species found in grassland and/or wetland habitat types in Kern County.		
Wetland species that could colonize created marsh habitats on Kern Water Bank		
Azolla mexicana	Mexican Mosquito Fern Marshes and swamps CNPS List 4, RED 1-2-1	Negligible or Beneficial. Deliberate introductions would be restricted to managed wetlands. If any of these species expand to non-managed ponds, some loss could occur through routine maintenance activities or through the cessation of deliberate flooding.
Lasthenia glabrata ssp. coulteri	Coulter's goldfields Marshes and swamps Fed C2, CNPS List 1B, RED 2-3-2	
Mimulus microphyllus	Small-leaved Monkeyflower Meadows CNPS List 4, RED 1-1-3	
Myosurus minimus ssp. apus	Little Mousetail Vernal pools Fed C2, CNPS List 3, RED 2-3-2	
Psilocarphus tenellus var. globiferus	Round Woolly-marbles Coastal dunes, Vernal pools CNPS List 4, RED 1-2-1	
Psorothamnus arborescens var. arborescens	Mojave Indigo-bush Riparian scrub Fed C3c, CNPS List 4, RED 1-1-1	
Sagittaria sanfordii	Sanford's Arrowhead Marshes and Swamps Fed C2, CNPS List 1B, RED 2-2-3	
Grassland and scrubland plants that could colonize upland habitats on Kern Water Bank		
Atriplex coronata var. coronata	Crownscale Chenopod scrub, Valley and foothill grassland, Vernal pools Fed C2, CNPS List 4, RED 1-2-3	Negligible or Beneficial. Deliberate introductions of any of these species would occur in permanent habitat preserves only.
Atriplex depressa	Brittlescale Chenopod scrub, Valley and foothill grassland, Vernal pools CNPS List 1B, RED 2-2-3	

Scientific Name	Common Name and Habitat Associations *	Impacts of Project
Clarkia temblorensis ssp. calientensis	Vasek's Clarkia Valley and foothill grassland Fed C1, CNPS List 1B, RED 3-3-3	Negligible or Beneficial. Deliberate introductions of any of these species would occur in permanent habitat preserves only.
Convulvulus simulans	Small-flowered Morning-glory Valley and foothill grassland CNPS List 4, RED 1-2-2	
Eriogonum gossypinum	Cottony Buckwheat Chenopod scrub, Valley and foothill grassland Fed C3c, CNPS List 4, RED 1-2-3	
Eriogonum temblorense	Temblor Buckwheat Valley and foothill grassland Fed C2, CNPS List 4, RED 1-1-3	
Eschscholzia lemmonii ssp. kernensis	Tejon Poppy Valley and foothill grassland, other CNPS 1B, RED 3-3-3	
Fritallaria agrestis	Stinkbells Valley and foothill grassland, other Fed C3c, CNPS List 4, RED 1-2-3	
Fritallaria striata	Striped Adobe-lily Valley and foothill grassland, other State CT, Fed PT, CNPS List 1B, RED 3-3-3 Valley and foothill grassland, other	
Goodmania luteola	Golden goodmania Valley and foothill grassland, other CNPS List 4, RED 1-2-2	
Lasthenia leptalea	Salinas Valley Goldfields Valley and foothill grassland, other Fed C3c, CNPS List 4, RED 1-1-3	

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Scientific Name	Common Name and Habitat Associations *	Impacts of Project
Layia heterotricha	Pale-yellow Layia Valley and foothill grassland, other Fed C2, CNPS List 1B, RED 3-3-3	Negligible or Beneficial. Deliberate introductions of any of these species would occur in permanent habitat preserves only.
Layia munzii	Munz's Tidy-tips Chenopod scrub, Valley and foothill grassland CEQA, CNPS List 1B, RED 2-2-3	
Lepidium jaredii ssp. jaredii	Jared's Pepper Grass Valley and foothill grassland Fed C2, CNPS List 1B, RED 3-2-3	
Linanthus grandiflorus	Large-flower Linanthus Valley and foothill grassland CNPS List 4, RED 1-2-3	
Madia radiata	Showy Madia Valley and foothill grassland, other CNPS List 1B, RED 2-3-3	
Mucronea californica	California spineflower Valley and foothill grassland, other CNPS List 4, RED 1-2-3	
Nemacladus gracilis	Slender nemacladus Valley and foothill grassland, other CNPS List 4, RED 1-1-3	
Perideridia gairdneri ssp. gairdneri	Gairdner's Yampah Valley and foothill grassland, Vernal pools Fed C2, CNPS List 4, RED 1-2-3	
Stylocline citroleum	Oil Neststraw Chenopod scrub, other Fed C2, CNPS List 1B, RED 3-3-3	
Stylocline masonni	Mason's Neststraw Chenopod scrub, other Fed C2, CNPS List 1B, RED 3-3-3	
Trichostoma ovatum	San Joaquin Bluecurls Valley and Foothill Grassland CNPS List 4, RED 1-2-3	

ABBREVIATIONS

State CT: State-listed threatened
Fed PT: Federally-proposed, threatened
C1: Enough data are on file to support federal listing
C2: Threat and/or distribution data are insufficient to support federal listing.
C3c: Too widespread and/or not threatened

CEQA: Indicates CEQA consideration is mandatory

CNPS List 1B: Plants Rare, Threatened or Endangered in California and Elsewhere.
List 4: Plants of Limited Distribution- a Watch List.

CNPS R-E-D Code (Rarity, Endangerment, Distribution)

Rarity
1 Rare, but found in sufficient numbers and distributed widely enough that the potential for extinction is low at this time.
2 Distributed in a limited number of occurrences, occasionally more if each occurrence is small.
3 Distributed in one to several highly restricted occurrences, or present in such small numbers that it is seldom reported.

Endangerment
1 Not endangered
2 Endangered in a portion of its range
3 Endangered throughout its range

Distribution
1 More or less widespread outside California
2 Rare outside California
3 Endemic to California

Source: California Native Plant Society's Inventory of Rare and Endangered Vascular Plants of California. February 1994. Special Publication No. 1. Fifth edition. Published by The California Native Plant Society, Sacramento, CA.

REFERENCES:

California Natural Diversity Database (CNDDB). Species elements for Kern County. California Department of Fish and Game

LSUMMARY OF PROJECT IMPACTS ON SECONDARY COVERED ANIMAL SPECIES

Animal species listed here are species that either have special status, or could potentially reach special status. They have ranges which overlap with the Kern Water Bank project site, or are found in the surrounding region. Included are species that could move in to use the created marsh habitats, as well as species that could be found in the existing grassland and shrubland habitats. This table does not list all potential species that could utilize the Kern Water Bank.

Scientific Name	Common Name/Habitat/ Status	Impacts of Project
Mammals. Though these species' distribution is currently distant from the Kern Water Bank, during the lifetime of the permit they may expand or be introduced into the water bank as a result of habitat improvements.		
Lutra canadensis	River Otter large rivers, lakes and estuaries	Negligible. Species may colonize or be introduced into the Kern River in future. The Kern Water Bank lands may provide potential habitat for river otters.
Castor canadensis subaruratus	Golden Beaver rivers, streams, lakes, ponds	
Mammals. Species whose current distribution overlaps with, or is near, the Kern Water Bank.		
Bassariscus astutus	Ringtail riparian forest CSC	Negligible. Suitable habitat for ringtails along the Kern River will be preserved.
Felis concolor	Mountain Lion all CPS	Negligible. The project will not reduce available habitat for Mountain lions.
Felis rufus	Bobcat riparian forest, brush and scrublands	Negligible. The project will not reduce available habitat for Bobcats.
Cervus elaphus nannodes	Tule Elk brush and scrublands, grassland	Negligible. Species may colonize or be introduced into the Kern Water Bank lands in the future. Species reside on adjacent preserved areas.
Antilocapra americana	Pronghorn brush and scrublands, grassland	
Mustela frenata xanthogenys	Yellow-cheeked Weasel grassland	Negligible. No records of these species on Kern Water Bank lands, but they could colonize preserved upland habitat areas.
Mustela frenata pulchra	Buttonwillow Weasel arid grassland, savannah	
Myotis yumanensis oxalis	San Joaquin Myotis all	
Euderma maculatum	Spotted Bat arid grassland, coniferous forest CSC	
Antrozous pallidus	Pallid Bat all CSC	

Scientific Name	Common Name/Habitat/ Status	Impacts of Project
Perognathus inornatus inornatus	San Joaquin Pocket Mouse grasslands	
Perognathus inornatus neglectus	McKittrick Pocket Mouse grasslands, desert shrub	
Onychomys torridus tularensis	Tulare Grasshopper Mouse grassland desert-shrub CSC	
Thomomys bottae ingens	Buena Vista Lake Pocket Gopher grassland, desert shrub	Negligible. No records of these species on Kern Water Bank lands, but they could colonize preserved upland habitat areas.
Dipodomys nitratoides brevinasus	Short-nosed Kangaroo Rat grassland, desert shrub CSC	
Dipodomys heermanni tularensis	Tulare Kangaroo Rat grassland, desert-shrub	
Dipodomys heermanni swarthi	Carrizo Plain Kangaroo Rat grassland, desert-shrub	
Birds — Raptors. Avian raptor species which may utilize Kern Water Bank ponds or preserved uplands as foraging and/ or nesting habitat..		
Aquila chrysaetos	Golden Eagle grasslands, shrublands CSC	
Haliaeetus leucocephalus	Bald Eagle large lakes and rivers FT, SE	
Accipiter gentilis	Northern Goshawk coniferous and riparian forest CSC	
Accipiter striatus	Sharp-shinned Hawk riparian forest CSC	Beneficial or Negligible. Species may utilize created ponds and/or preserved upland habitat. Pond refilling and vegetation removal will be prohibited in any areas where birds are nesting.
Accipiter cooperii	Cooper's Hawk riparian forest CSC	
Buteo lineatus	Red-shouldered Hawk riparian forest	
Falco columbarius	Merlin grasslands, marshes CSC	
Falco mexicanus	Prairie Falcon grasslands, scrublands CSC	

Scientific Name	Common Name/Habitat/ Status	Impacts of Project
Circus cyaneus	Northern Harrier marshes CSC	
Asio otis	Long-eared Owl riparian forest CSC	
Asio flammeus	Short-eared Owl grasslands, marshes CSC	Beneficial or Negligible. Species may utilize created ponds and/or preserved upland habitat. Pond refilling and vegetation removal will be prohibited in any areas where birds are nesting.
Tyto alba	Common Barn Owl grassland, shrubland, riparian forest	
Pandion haliaetus	Osprey Large lakes and rivers CSC	
Gymnogyps californianus	California Condor grassland, savannah, desert scrub FE, SE	Negligible. Kern Water Bank lands are within historic range, and species could utilize preserved upland habitat as a result of reintroduction efforts.
Birds -- Songbirds and other terrestrial birds. Species which may utilize riparian and adjacent habitats within the Kern Water Bank.		
Progne subis	Purple Martin montane and riparain forest CSC	Beneficial or Negligible. Species may utilize preserved upland habitat areas and/ or created ponds.
Riparia riparia	Bank Swallow riparian, coastal cliffs ST	
Cypseloides niger	Black Swift Rugged coastlines and canyons CSC	
Chordeiles minor	Common Nighthawk montane and coastal grasslands and freshwater wetlands	
Chordeiles acutipennis	Lesser Nighthawk desert scrub, desert riparian, grasslands	
Picoides villosus	Hairy Woodpecker coniferous and riparian forests	
Melanerpes lewis	Lewis's Woodpecker oak savannah, coniferous forest	
Guiraca caerulea	Blue Grosbeak riparian forest, grassland	
Dendroica petechia brewsteri	Yellow Warbler riparian, shrublands CSC	

Scientific Name	Common Name/Habitat/ Status	Impacts of Project
Piranga rubra	Summer Tanager desert riparian woodland CSC	
Icteria virens	Yellow-breasted Chat riparian forest CSC	
Vireo bellii pusillum	Least Bell's Vireo desert riparian woodland FE, SE	
Coccyzus americanus occidentalis	Western Yellow-billed Cuckoo riparian forest SE	Beneficial or Negligible. Species may utilize preserved upland habitat areas and/ or created ponds.
Empidonax traillii	Willow flycatcher montane riparian forest SE	
Birds - Waterfowl. Migratory birds who could potentially use Kern Water Bank as winter refuge habitat.		
Phalacrocorax auritus	Double-crested Cormorant estuaries, lakes, large rivers CSC	
Gavia immer	Common Loon large lakes and estuaries CSC	
Aechmophorus occidentalis	Western Grebe estuaries, lakes	
Aechmophorus clarkii	Clark's Grebe estuaries, Lakes	Beneficial. Ponds will create winter refuge habitat for these species.
Aythya valisineria	Canvasback estuaries, lakes, marshes	
Numenius americanus	Long-billed Curlew marshes CSC	
Birds - Waterfowl. Potentially resident waterfowl who require trees for nesting.		
Casmerodius albus	Great Egret grasslands, marshes	
Ardea herodias	Great Blue Heron grasslands, marshes	
Butorides striatus	Green-backed Heron riparian forest, marshes	Beneficial. Ponds will create foraging habitat for these species.
Aix sponsa	Wood duck riparian forest	
Birds - Waterfowl. Potential resident waterfowl which could nest on shorelines, islands, or in reeds within Kern Water Bank lands		

Scientific Name	Common Name/Habitat/ Status	Impacts of Project
Egretta thula	Snowy Egret marshes	Beneficial. Ponds will create foraging and nesting habitat for these species. Pond refilling and vegetation removal will be prohibited in any areas where birds are nesting.
Pelecanus erythrorhynchos	American White Pelican large lakes, salt ponds CSC	
Ixobrychus exilis	Least Bittern marshes F2, CSC	Beneficial. Ponds will create foraging and nesting habitat for these species. Pond refilling and vegetation removal will be prohibited in any areas where birds are nesting.
Nycticorax nycticorax	Black Crowned Night Heron marshes	
Botaurus lentiginosus	American Bittern marshes	
Dendrocygna bicolor	Fulvous Whistling-duck freshwater marshes F2, CSC	
Rallus limicola	Virginia Rail marshes	
Porzana carolina	Sora Rail marshes	
Chlidonias niger	Black Tern estuaries, marshes F2, CSC	
Sterna caspia	Caspian Tern estuaries, marshes	
Amphibians. Species whose historic range may have included the Kern Water Bank, but where existing populations are distant from the Kern Water Bank. These species may expand or be introduced to the Water Bank during the life of the permit as a result of the long-term management of wetland habitat.		
Ambystoma tigrinum	California Tiger Salamander Ponds, grasslands F2, CSC	Negligible or Beneficial. Deliberate introduction would be confined to permanently managed wetlands established under cooperative agreement with CDFG, USFWS, and KWBA.
Batrachoseps simatus	Kern Canyon Slender Salamander woodlands, chapparal F2, ST	
Batrachoseps stebbinsi	Tehachipi Slender Salamander coniferous and riparian forest F2, ST	
Batrachoseps pacificus relictus	Relictual Slender Salamander woodlands CSC	
Rana aurora draytonii	California Red-legged Frog ponds, streams FE	

LETTER R

Scientific Name	Common Name/Habitat/ Status	Impacts of Project
Reptiles. Species whose historic range may included the Kern Water Bank, but where existing populations are distant from the Kern Water Bank. These species may expand or be introduced to the Water Bank during the life of the permit as a result of the long-term management of upland habitat.		
Anniella pulchra	California Legless Lizard valley-foothill chaparral, other CSC	Negligible or Beneficial. Deliberate introduction would be confined to permanently managed uplands established under cooperative agreement with CDFG, USFWS, and KWBA
Phrynosoma coronatum frontale	California Horned Lizard coniferous and riparian forests, other CSC	
Charina bottae umbratica	Southern Rubber Boa montane forests, chaparral F2, ST	
Masticophis flagellum ruddocki	San Joaquin Coachwhip grassland, desert, scrub CSC	
Arizona elegans	California Glossy Snake desert, chaparral, other	
Tantilla hobartsmithi	Southwestern black-headed Snake grassland, chaparral, other	
Coluber constrictor mormon	Western Yellow-bellied Racer grassland, other	
Salvadora hexalepis	Western Patch-nosed Snake chaparral, desert scrub F2, CSC	
Fish		
Lampetra hubbsi	Kern Brook Lamprey F2, CSC	Negligible. Kern Water Bank will not remove or provide suitable habitat for these species.
Oncorhynchus mykiss gairdneri	Kern River Rainbow Trout F2, CSC	
Invertebrates. Terrestrial insects of special concern which are known to occur in Kern County, but which are not currently known from the Kern Water Bank		
Lytta moesta	Moestan Blister Beetle meadows F2	Negligible or Beneficial. These insects may benefit from upland habitat enhancement at Kern Water Bank.
Lytta morrisoni	Morrison's Blister Beetle meadows F2	
Lytta hoppingi	Hopping's Blister Beetle meadows F2	
Danaus plexippus	Monarch Butterfly cismontane meadows	

Scientific Name	Common Name/Habitat/ Status	Impacts of Project
Euproserpinus euterpe	Kern Primrose Sphinx Moth desert scrub FT	Negligible or Beneficial. These insects may benefit from upland habitat enhancement at Kern Water Bank.
Helminthoglypta callistoderma	Kern Shoulderband riparian F2	

Abbreviations

FE: Federally Endangered
FT: Federally Threatened
F2: Category 2 candidate for listing
SE: State Endangered
ST: State Threatened
CSC: California Species of Special Concern
CPS: California Protected Species

References:

California Natural Diversity Database (CNDDB). Species elements for Kern County. California Department of Fish and Game

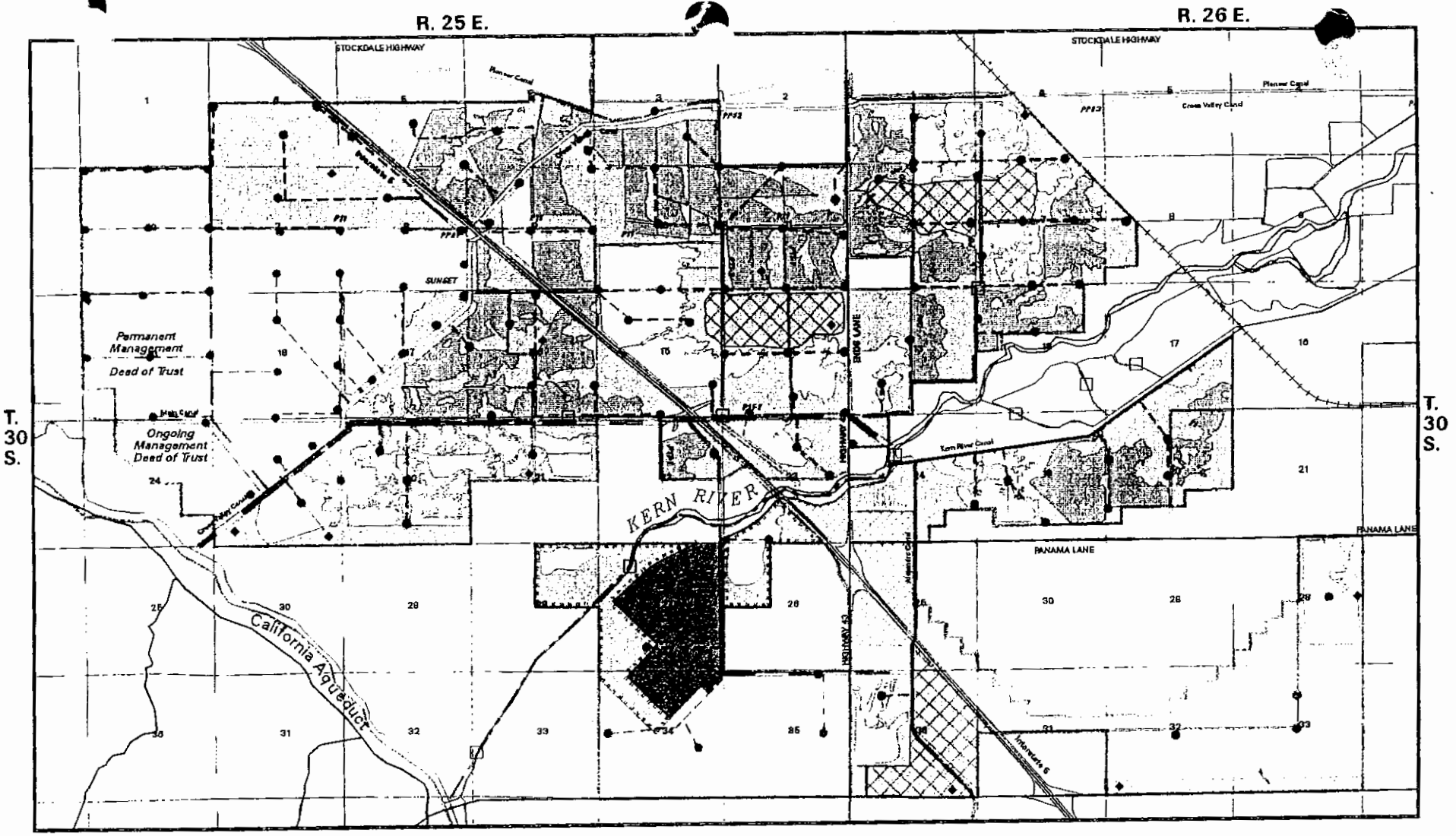
Mammals Species of Special Concern in California. State of California, The Resources Agency, Department of Fish and Game.,

Amphibians and Reptiles Species of Special Concern in California. 1994. California Department of Fish and Game, Inland Fisheries Division.

California's Wildlife: Volumes I, II, and III. 1990. State of California, The Resources Agency, Department of Fish and Game, Sacramento, California.

Kern County Audubon Society List of Sensitive Birds and Mammals, in Metropolitan Bakersfield Habitat Conservation Plan, Appendix A. July 1991, prepared by Thomas Reid Associates.

Endangered and Sensitive Species of the San Joaquin Valley, California, Their Biology, Management, and Conservation. 1992. Published by California Energy Commission © The Wildlife Society, Western Section.



Kern Water Bank Land Use Plan

- Compatible Habitat
- Existing Recharge Basin
- Proposed Recharge Basin
- Conservation Bank
- Farming
- DWR Mitigation Easement
- Sensitive Habitat
- Potential Commercial Development
- KWB Mitigation Easement
- Existing Water Well
- Existing Monitoring Well
- Existing Canal
- Existing Recovery Pipeline
- Existing Recovery Canal
- Proposed Water Well
- Proposed Underground Pipeline
- Proposed Canal
- Proposed Kern River Reverse Flow
- Proposed Pump Station

Kern Water Bank Authority

1" = 1 mile

Map A

05/05/97 LMetzger-kfmap/SECTIOMAP.cmf

December 1, 1994

THE MONTEREY AGREEMENT -- STATEMENT OF PRINCIPLES

by the

STATE WATER CONTRACTORS

and the

STATE OF CALIFORNIA, DEPARTMENT OF WATER RESOURCES

FOR POTENTIAL AMENDMENTS TO THE STATE WATER SUPPLY CONTRACTS

INTRODUCTION

State Water Project ("SWP") shortages in recent years have prompted both Agricultural Contractors ("Ag Contractors"), and Municipal and Industrial Contractors ("Urban Contractors"), (collectively, the "Contractors") to consider amendments to their water supply contracts with the State of California, Department of Water Resources ("DWR"). Some of the Contractors have considered litigation to resolve differences over water allocations. To avoid litigation, and to make the SWP operate more effectively for all Contractors, the parties, including DWR, have engaged in mediated negotiations toward a settlement of their disputes.

This document contains an agreed Statement of Principles that is the foundation for an agreement among the Contractors and DWR that will settle their disputes over water allocations and certain operational aspects of the SWP. The undersigned negotiators pledge their good faith efforts to work diligently toward a final written agreement. The Contractor negotiators further pledge to obtain ratification of these Principles by their respective Contractor groups and the Boards of Directors that they individually represent.

STATEMENT OF PRINCIPLES

A written agreement with contract amendments and other implementing documents will contain provisions in accord with the following principles:

1. **Water allocations.** The SWP contracts shall be amended to provide that all future allocations of project water from existing project facilities are to be based on entitlements.

2. **Water allocations when requests exceed available supply.**

a. The water contracts will be amended to provide that each Contractor will be allocated the portion of total available project water supply equivalent to the ratio of its annual entitlement irrespective of type of use, as identified in its Table A, to the total annual entitlements of all Contractors as identified in Table A. If a Contractor declines allocated water, such water will be allocated in the same manner among other Contractors. The Contracts will further provide that the only permitted exceptions to this requirement are those necessary to comply with (i) a valid order of a court or the state water resources control board, or (ii) a valid declaration of emergency by the Governor pursuant to the Emergency Services Act in order to meet minimum demands for domestic supply, fire protection, or sanitation during the year.

b. Article 18(b) through the end of subparagraph (1) will be deleted.

3. **Kern Water Bank.** The Kern Fan Element property and related assets of the Kern Water Bank will be sold or leased on a long-term basis by DWR to designated Ag Contractors. In exchange, 45,000 acre-feet of Ag water entitlements will be transferred to DWR and retired. All fixed conservation and transportation charges for the transferred and retired entitlements will be added to the Contractors' Delta Water Charges. Subject to the approval of designated Ag Contractors, Urban Contractors may be provided access to and use of Kern Fan Element property and related assets of the Kern Water Bank for water storage.

Any project water remaining in the Kern Water Bank at the time of transfer of the property will split 50% to the project and 50% to be transferred with the property. The schedule and costs of delivery will be addressed in the implementation documents.

4. **Permanent Sales of Entitlement.**

a. **Ag-to-Urban entitlement transfers.**

i. Ag Contractors will make available for permanent transfer to Urban Contractors on a willing buyer-willing seller basis 130,000 acre-feet of annual entitlements, with Kern County Water Agency ("KCWA") being responsible for any portion of this amount not made available by other Ag Contractors. This provision will apply only to those transfer contracts executed prior to January 1,

2011.

ii. Ag Contractors and DWR will expeditiously approve such sales. As a condition of KCWA's approval of sales from within its service area, KCWA shall be entitled to receive a percentage of the gross sales price determined by that portion of the total SWP costs paid by KCWA's Zones of Benefit or other KCWA resources.

iii. KCWA member units shall have 90 days to exercise a right of first refusal to purchase any entitlement being offered to Urban Contractors by agreeing to pay the same price offered by the Urban purchaser. Such sales to KCWA member units will not diminish the 130,000 acre-foot obligation of KCWA.

b. **Ag-to-Non-Contractor transfers.** Any permanent transfers of entitlement by Ag Contractors to parties who are not Urban Contractors, including transfers to KCWA urban member units or to KCWA's Improvement District No. 4, will be considered a part of the 130,000 acre-feet to be made available to Urban Contractors pursuant to subsection (a), above, provided that Urban Contractors have been allowed 90 days to exercise a right of first refusal to purchase such entitlement at the price being offered by the prospective purchaser without conditions.

c. **Other Water transfers.** DWR will expeditiously approve permanent sales of entitlements among Contractors, including between Urban Contractors.

5. **Restructuring to ensure financial integrity of the SWP.** The SWP Contractors and DWR will develop financial programs involving funds related to State Water Project operations and payment of debt service on bonds to (i) bring the obligations of the parties into line with current market and regulatory circumstances facing the SWP, DWR and the Contractors; (ii) ensure the continuing financial viability of the SWP and improve security for bondholders; and (iii) provide for more efficient use of project water and facilities. These programs shall include:

a. In 1995, DWR will establish a general capital operating fund of $15 million to be made available from bond reserves that are no longer required by bond covenants.

b. It is expected that new capital projects will be financed with revenue bonds, consistent with past practice. The definition of Water System Facilities in the Water Supply Contracts will be expanded to include a State Water Project Corporation Yard and a Project Operation Center and to allow DWR to finance these facilities with water system revenue bonds if DWR decides to build them. These facilities are estimated to cost $35 million and $45 million, respectively, in 1995 dollars. DWR will fully consult with the Contractors prior to issuing each series of water system revenue bonds for defined project facilities.

c. When DWR pays off its obligation to the California Water Fund in 1997, additional moneys that become available will be dedicated to rate payment and other programs for Contractors. In 1997, $14 million will be available for these purposes and will be applied as follows: $10 million will be placed into a separate DWR trust fund ("Trust Fund") for stablizing payments for Ag Contractors, and $4 million will be distributed directly to Urban Contractors, as directed by the Urban Contractors for their management.

d. In 1998, $7.7 million will be placed in the DWR capital operating fund, bringing the balance to $22.7 million. An additional $17 million will be used as follows: $10 million will be placed in the Trust Fund, and $7 million will be distributed to Urban Contractors, as they direct.

e. In 1999, $32 million in additional funds will be used as follows: $10 million will be placed in the Trust Fund and $22 million will be distributed to Urban Contractors, as they direct.

f. In 2000, funds will be used as follows: $10 million will be placed in the Trust Fund and $23 million will be distributed to Urban Contractors, as they direct.

g. In 2001 when funds available exceed $40.5 million, $10 million will be placed in the Trust Fund, and $30.5 million will be distributed to Urban Contractors, as they direct. The Director of DWR, in consultation with Contractors, will review the financial requirements of the SWP to determine if the amounts over $40.5 million should be retained or whether such amounts can be applied to the Trust Fund and Urban Contractor disbursements on a 24.7%-75.3% basis, respectively. If amounts in excess of $40.5 million are not retained by DWR, up to the first $2 million will be disbursed to Urban Contractors, then the remaining amounts, if any, in excess of $40.5 million will be applied to the Trust Fund and Urban Contractor disbursements on a 24.7%-75.3% basis respectively. Urban Contractors will receive up to the first $2 million in excess of $40.5 million every year until it has received a total of $19.3 million, then all amounts in excess of $40.5 million will be split between the Trust Fund and Urban Contractor disbursements on a 24.7%-75.3% basis. The Director of DWR and the Contractors will review this arrangement every five years after the initial review.

h. The numbers and percentages in this Principle reflect certain estimates of dollars and sharing of revenue. The actual numbers may vary slightly from the numbers described above. These calculations shall be completed before and used in the implementing documents.

i. The attached Exhibit A worksheet illustrates the estimated amounts and use of funds described above.

j. Approval of these Principles is subject to the satisfactory resolution of issues relating

to the allocation of Urban refunds among Urban Contractors.

6. **Terminal Reservoirs - Points of Delivery.**

DWR commits to develop, in cooperation with Contractors participating in repayment of the costs of Perris and Castaic Reservoirs, ways to utilize the respective capacities and stored water to increase the reservoirs' potentials for more effective utilization in conjunction with local water supply facilities. As part of this process, DWR will analyze the impacts on the contractors and on SWP operations. Subject to terms and conditions to be negotiated, Contractors participating in repayment of the costs of these terminal reservoirs will be provided the opportunity to directly utilize the respective capacities in order to optimize the operation of both local and SWP facilities.

Access to such capacity will be provided in a manner designed to ensure that any resulting changes in flow regimes into the reservoirs do not cause a significant adverse effect upon the manner in which these reservoirs were designed to function pursuant to the state water contracts and statutory requirements. The objective of this process is to provide additional flexibility and water management benefits to participating contractors consistent with the usage of such reservoirs as transportation facilities in the overall SWP operations.

DWR will attempt to work out similar arrangements for Del Valle Reservoir.

7. **Interruptible Water Service Program.**

a. Present Surplus (including unscheduled), Wet Weather and 12(d) water will be replaced by Interruptible water service. Whenever DWR has project water available for delivery to Contractors that is not needed for fulfilling entitlement delivery requests or meeting the project operational commitments, including storage goals for the current or following years, DWR will offer such water to Contractors in proportion to their annual entitlements for that year and Contractors taking such water will pay to DWR the Melded Power Rate for power costs incurred by DWR for such service.

b. Implementation would be in substantial conformance with the attached Exhibit B entitled "Possible Implementation of an Interruptible Water Service Program" dated December 1, 1994.

8. **Non-project water transport.** Contractors shall have the right to transport non-project water in project facilities. Power charges for non-project water delivered to Contractors shall be the same as for project water. Priority for conveyance of non-project water shall be as set forth in Principle 7.

9. **Water storage outside service area.**

a. Water stored outside a Contractor's service area is reserved exclusively for use in the

storer's service area. Such water cannot be sold.

b. "Storer" vs. "seller" alternative tracks: in any water year, a Contractor may elect to be a storer or seller, but not both.

i. Storing Contractors will not be allocated water beyond their total demand, including storage.

c. Existing carryover rules under Article 12(e) will be maintained. If a Contractor uses Article 12(e), the Contractor cannot sell water in the next year pursuant to Principle 10. If a Contractor follows the storage track, the Contractor cannot sell water, pursuant to Principle 10, in the year in which it adds to storage. The timing of the election will be determined during implementation.

d. There will be no limits on the amount of ground water storage outside a Contractor's service area in an existing and operational ground water storage program. Contractors will cooperate to develop or establish ground water storage programs.

e. The annual water supply allowed to be stored in current SWP surface conservation facilities and non-SWP surface water storage facilities located outside a Contractor's service area shall be limited, per Contractor, as follows: A floor of 25% of annual Table A entitlement, not to exceed 100,000 acre-feet/year in any year in which DWR can meet less than 50% of requests. In any year in which DWR can meet 75% or more of requests, a maximum of 50% of annual Table A entitlement, not to exceed 200,000 acre-feet/year. There will be a sliding scale between 50% and 75% of requests from the floor to the maximum on a straight-line basis. In a year when DWR can meet 100% of requests, there will be no limit on surface water storage in non-project facilities. Storage capacity will be allocated on the basis of entitlements.

f. The storage constraints in Principle 9e shall not apply to any new South-of-Delta off-stream storage facilities involving SWP Contractor(s).

g. Bona fide exchanges (as distinguished from sales) will be defined during implementation.

h. Carryover water in project surface water conservation facilities is subject to "spill" in the following priority:

i. water stored for non-SWP Contractor;
ii. water stored for a SWP Contractor above its proportional share of available storage capacity based on Table A annual entitlement;
iii. water stored for a SWP Contractor within its proportional share of available storage capacity based on Table A annual entitlement.
iv. project water.

Determination of the allocation of spill will be made during implementation.

10. **Turn-back water pool sales.** There will be a turn-back water pool sales mechanism. For Contractors following the "seller" track, allocations of entitlement water not required by a Contractor will be sold according to the following priorities:

a. Contractors will be encouraged to amend downward their Table A build-up schedule consistent with their actual needs. All Contractors will cooperate in such amendments, and DWR will process amendments expeditiously.

b. An annual entitlement water pool will be formed by DWR for willing SWP sellers and buyers and priced as follows.

i. For water offered on or before:

February 15 -- the seller will receive 50% of Delta Rate for water sold;

March 15 -- the seller will receive 25% of Delta Rate for water sold.

c. On the dates above, SWP Contractors will have first priority to purchase the water. If water is not sold by March 1, an offering Contractor can cancel its offer by March 1 or it will be considered re-offered on March 15.

d. On the dates above, water offered but not sold to other Contractors may be purchased by DWR at the same price as in item a, above, for the purpose of providing additional carryover storage for the SWP Contractors. DWR will consult with Contractors regarding such purchases.

e. In the March 15 market, water offered but not sold under the first two priorities may be offered to non-Contractors at market price, subject to a right of first refusal for SWP Contractors.

f. Sellers must elect to either store or sell. Sellers will not be permitted to store pursuant to Principle 10 during any year in which they have elected to sell water, except that under the short term provisions of Art. 12(e) they can carryover water during the last three months of the year, but cannot elect to sell in the subsequent year.

11. **Conforming contract amendments.** SWP contracts will be amended as appropriate to conform to this Statement of Principles.

12. **Project improvements.** DWR reaffirms its obligation under Article 6(c) of the water supply contracts, subject to the availability of funds, to make all reasonable efforts consistent with sound fiscal policies and proper operating procedures to complete the project facilities and other water management programs necessary for delivery of project water to the Contractors in

the total amounts designated in each contract's Table A.

13. **Integrated package.** Contractors will participate in all of the provisions of these Principles or none. A Contractor who chooses not to participate shall receive none of the benefits provided in these Principles.

14. **No precedent.** If the parties do not enter into the amendments, the parties agree not to utilize this document in any court proceedings relating to matters addressed in this agreement.

IMPLEMENTATION

The Contractors agree to expeditiously obtain preliminary determinations from their respective Boards of Directors as to whether this Statement of Principles is acceptable. The parties set March 31, 1995, as the goal for reaching final agreement.

Nothing in this Statement of Principles is intended to be, nor shall it be interpreted as, a waiver by any party of its rights in law or equity.

EXHIBIT A

STATE WATER PROJECT
PAYMENT MANAGEMENT PROGRAM

(Millions of Dollars)

			Contractor Payment Management Program		
	(1)	(2)	(4)	(5)	(6)
	[1] Revenue	SWP [2] Capital Resources	Funds Available Col 1-2	Ag Contractors 24.7%	Urban Contractors 75.3%
1995	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0
1997	14.0	0.0	14.0	10.0	4.0
1998	23.0	6.0	17.0	10.0	7.0
1999	38.0	6.0	32.0	10.0	22.0
2000	39.0	6.0	33.0	10.0	23.0
	Consultation with DWR and SWC's to discuss use of funds above $40.5 million				
2001	45.0	4.5	40.5	10.0	30.5
2002	45.0	4.5	40.5	10.0	30.5
2003	45.0	4.5	40.5	10.0	30.5
2004	45.0	4.5	40.5	10.0	30.5
2005	44.0	3.5	40.5	10.0	30.5
2006	44.0	3.5	40.5	10.0	30.5
2007	45.0	4.5	40.5	10.0	30.5
2008	45.0	4.5	40.5	10.0	30.5
2009	44.0	3.5	40.5	10.0	30.5
2010	45.0	4.5	40.5	10.0	30.5
2011	47.0	6.5	40.5	10.0	30.5
2012	49.0	8.5	40.5	10.0	30.5
2013	48.0	7.5	40.5	10.0	30.5
2014	51.0	10.5	40.5	10.0	30.5
2015	56.0	15.5	40.5	10.0	30.5
2016 to 2035	56.0 [3]	15.5	40.5	10.0	30.5

[1] Data from Bulletin 132-93

[2] DWR to create a Capital Resources Account of $22.7 million from Bond Reserve Funds separate from the amounts shown.

[3] Initial estimate

Executed this 1st day of December, 1994:

Kern County Water Agency

by _____

General Manager

Department of Water Resources

by _____

Director

Tulare Lake Basin Water Storage District

by _____

Member, Board of Directors

Coachella Valley Water District

by _____

General Manager

Metropolitan Water District of Southern California

by _____

General Manager

Central Coast Water Authority

by _____

General Counsel

Solano County Water Agency

by _____

General Manager

Exhibit B

POSSIBLE IMPLEMENTATION

of an

INTERRUPTIBLE WATER SERVICE PROGRAM

* Present Surplus, Wet Weather and 12(d) water replaced by Interruptible water service. Any existing priorities to delivery of water beyond scheduled entitlement is eliminated; all Contractors will have equal priority to Interruptible water in proportion to entitlements.

Delivery Priority:

1. scheduled entitlement deliveries;
2. interruptible up to Table A;
3. non-project up to Table A;
4. all additional interruptible; and
5. all additional non-project water.

* Existing balances of the above water types eliminated.

* All Scheduled delivery allocations to be based on contractual Table A.

* Interruptible available only as determined by DWR after Scheduled deliveries and operational commitments are met.

* Interruptible allocations based on Table A for that year.

* Interruptible plus Scheduled entitlement may add up to more than a Contractor's Table A for that year.

* Submit request for Scheduled deliveries, if Interruptible water is available, then anything over Scheduled deliveries considered Interruptible as long as it's available.

* Interruptible water may not be carried over.

* Conveyance charges for interruptible deliveries same as Scheduled deliveries, even if the total amount goes over Table A for that year.

* Interruptible available to all reasonable, beneficial uses. (Not restricted to storage or recharge programs.)

* Delivery of Interruptible water in one year does not impact a Contractor's Table A or the allocation in the next year.

* Contractor can adjust delivery schedule for Interruptible at any time but can only adjust Scheduled Entitlement deliveries weekly.

* DWR will use best effort to avoid economic impacts due to inability to Contractors to take water during wet periods (specific language to be developed during implementation).

December 1, 1994

LETTER 11

President
John Van de Kamp

President Emeritus
Sage Sweetwood

First Vice President
Bill Yeates

Senior Vice President
Kevin Johnson

Secretary/Treasurer
Bill Center

PLANNING AND CONSERVATION LEAGUE

Regional Vice Presidents
Elisabeth Brown
Jan Chatten-Brown
Dorothy Green
Phyllis Faber
Rick Frank
Rick Hawley
Doug Linney
David Mogavero
Lynn Sadler
Teresa Villegas

FOR IMMEDIATE RELEASE
October 26, 2007

Mindy McIntyre
Water Program Manager
mmcintyre@pcl.org
office: 916-313-4518
mobile: 916-541-8825

PRESS STATEMENT

State proposes to give away water resources
Monterey Amendments Draft EIR Released

Sacramento- Despite the recent crisis in the Delta and the Governor's push for new dams, last week the Department of Water Resources (DWR) proposed to give away the largest water storage facility in the state and to eliminate drought safeguards for urban areas in California.

DWR's draft decision, revealed in the Monterey Plus Environmental Impact Report (EIR) (http://www.des.water.ca.gov/mitigation_restoration_branch/rpmi_section/projects/index.cfm), would require the State to permanently adopt State Water Project contract amendments, called the "the Monterey Amendments," negotiated in secret by DWR in 1994. The original behind closed doors deal was successfully challenged in a lawsuit by the Planning and Conservation League, the Citizens Planning Association of Santa Barbara, and Plumas County Flood Control and Water Conservation District *(Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal.App.3d). While DWR has been allowed to operate under the Monterey Amendments provisionally since 1995, the PCL lawsuit forced DWR to analyze the impact of the amendments and to decide whether or not permanently to adopt the Monterey Amendments or to modify the proposed contract changes based on that analysis.

If permanently adopted, the Monterey Amendments would fundamentally change how the State Water Project (SWP) operates. Specifically, the Monterey Amendments would:

- Eliminate contract provisions that provide drought safeguards for urban areas. DWR's own analysis shows that in dry years like 2001, water supplies for homes and businesses in urban areas will **be reduced by over 400,000 acre-feet,** (a reduction of 26% of total urban water deliveries from the SWP), if the Monterey Amendments are adopted.

- Give away the State owned Kern Water Bank, the largest water storage facility in the State.

- Eliminate the common-sense provision in the original contract which required DWR to determine the realistic yield of the SWP. Without a knowing the actual capacity of the SWP, DWR will continue to promise to deliver "paper water," water which actually does not exist in the real world. Already, the promise of paper water has lead to over-

reliance on the water from the fragile Bay-Delta, over-pumping, inevitable cutbacks in water supplies, and ultimately decreased water supply reliability.

- Transfer millions of dollars in costs to the taxpayers, while rebating millions to individual water agencies.

- Encourage the over-pumping of Delta water in the winter and spring months, which has already, under the provisional use of the Monterey Amendments, contributed to the massive decline of the Delta smelt and other Bay Delta fish populations.

PCL has long held that DWR's provisional operations under the Monterey Amendments are directly related to the declines in the health of the Delta, and decreases in water supply reliability across the State. If permanently adopted, the Monterey Amendments would strip urban areas, including homes and businesses of their drought safeguards, forcing those areas to depend on delivery of "surplus" water from the Delta in wetter years. The recent fish declines in the Delta and the resulting ruling from Judge Oliver W. Wanger of the U.S. District Court in Fresno, demonstrate that the "surplus" water urban areas now dependent on is actually just "paper water" that cannot be delivered in the future.

"PCL is outraged that despite the obvious impacts on California, DWR is proposing to adopt the Monterey Amendments on a permanent basis, stripping urban areas of their drought safeguards and giving away the State's largest storage facility," said Mindy McIntyre, Water Program Director at the Planning and Conservation League. "This is a terrible decision for California that will exacerbate the water problems we are already facing today."

The Planning and Conservation League is a nonpartisan, nonprofit alliance of individuals and conservation organizations working at the state, local, and national levels to protect and restore California's natural environment, and to promote and defend the public health and safety of the people of California.

End

LETTER 12

Mojave Water Agency

22450 Headquarters Drive ♦ Apple Valley, California 92307
Phone (760) 946-7000 ♦ Fax (760) 240-2642 ♦ www.mojavewater.org

January 3, 2008

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
901 P Street
Sacramento, CA 95814

Dear Ms. Brown:

This letter is submitted by Mojave Water Agency, a public agency that contracts with the State of California, through the Department of Water Resources (Department), for water supplies from the State Water Project (SWP), and whose customers pay for and benefit from the water supplies provided by the SWP.

The Department has prepared the Draft Environmental Impact Report on the Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement (Monterey Plus DEIR). The Monterey Plus DEIR re-evaluates the environmental effects of the Monterey Amendments, which have been in operation for over a decade.

The Monterey Amendment amended the 1960s-era SWP contracts between the Department and each of the 29 public agencies that contract with it for SWP supplies. The Monterey Amendment, implemented in 1996, updated a number of contract provisions to reflect the change in real-world conditions that had occurred by that time, and incorporated opportunities for modern, more progressive water management. The Monterey Amendment accomplished a number of significant things, including: 12-1

- **Settled dispute over allocations –** The amended water allocation provisions eliminate the agriculture-first shortage requirement for contract water supplies (i.e., Table A water) as well as the agricultural priority to surplus water, and instead require that all water be allocated in proportion to contractors' contract amounts. In exchange, the agricultural contractors agreed to permanently retire a portion of their contract amounts and permanently transfer an additional portion to urban contractors.

- **Gave contractors more flexibility in managing limited SWP supplies –** The amended water management provisions promote contractor banking of water in underground water storage during wet periods for their later use during dry times, and improve contractor opportunities to get more beneficial use out of existing SWP facilities.

- **Increased rate stability and funding for local investment in water management programs –** The amended financial provisions use contractor money originally

committed for additional SWP facilities to instead help contractors stabilize their water rates and increase their funding for local development of water conservation, water recycling, conjunctive use, and other water management programs.

The added flexibility provided by the Monterey Amendment has allowed the SWP contractors to weather the most recent drought without enduring the substantial hardships of the drought of the early 1990s, despite increased water demands that have occurred since that time and increasing pressures on SWP operations.

The Monterey Plus DEIR includes an exhaustive analysis of the environmental effects of the Monterey Amendment and Settlement Agreement. Mojave Water Agency feels that the Monterey Plus DEIR, which was drafted with the advisory collaboration of DWR, the State Water Contractors, Planning and Conservation League, Citizens Planning Association of Santa Barbara, and Plumas County Flood Control and Water Conservation District, adequately describes the environmental effects of the Amendment. The analysis in the DEIR shows that: 12-1 (con't.)

- There have been no significant environmental impacts resulting from the Monterey Amendment from 1996 through today.

- Moving into the future, environmental impacts from the Monterey Amendment in almost all resource categories are at less-than-significant levels. Those few areas where potentially significant impacts were identified are for a provision analyzed under a worst-case scenario that is unlikely to ever occur, or for certain future projects that would all be subject to additional, project-level CEQA review.

Mojave Water Agency supported implementation of the Monterey Amendment in 1996, and supports its continued implementation into the future. The Mojave Water Agency commends the Department for having prepared this thorough and significant document.

Sincerely,

Kirby Brill
General Manager

dwr ltr monterey plus 010308.doc/kirby/vt

LETTER 13

PLUMAS COUNTY FLOOD CONTROL & WATER CONSERVATION DISTRICT

January 9, 2008

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
Post Office Box 942836
Sacramento, CA 94236-0001

Re: Comments on Monterey Plus Draft EIR

Dear Ms. Brown:

Please accept the following comments of the Plumas County Flood Control and Water Conservation District and the County of Plumas (collectively, "Plumas") on the Monterey Plus draft environmental impact report ("DEIR").

Climate Change Considerations

Page 12-1 of the DEIR states that "[d]eveloping evidence indicates global climate change will have a marked effect on water resources in California." Table 12-1 presents an inventory of potential effects of climate change, including:

- loss of 5 million acre-feet or more of average water storage in the snowpack
- increased reservoir challenges to balance flood protection and water supply
- increased storm intensity and flooding
- increased potential for droughts
- changes in the intensity and timing of runoff
- critical water temperature effects on endangered species

13-1

Most of the DEIR's discussion of climate change focuses on the potential impacts to California's water supply and water project operations. However, to ensure the decision maker and the public are fully informed, the DEIR should also explain the proactive steps that DWR has taken as part of Monterey Plus to mitigate climate change impacts through its support of the Plumas Watershed Forum and the Feather River Watershed Management Strategy.

Feather River Watershed Management Strategy

Plumas County encompasses most of the Upper Feather River watershed, which is the watershed for the State Water Project's primary storage facility at Lake Oroville. As part of the Monterey Settlement Agreement, DWR, Plumas, and the State Water Project Contractors created the Plumas Watershed Forum to implement watershed management and restoration activities for the

benefit of the State Water Project. One of the Forum's first steps was to create the Feather River Watershed Management Strategy,[1] laying out a plan to accomplish the Forum's goals of:

- improving storage of water for augmented baseflow in streams
- improving water quality (reduced sedimentation) and streambank protection
- improving upland vegetation management
- improving groundwater retention and storage in major aquifers

The majority of the projects sponsored by the Plumas Watershed Forum over the past four years have focused on restoring the historic water tables on a small portion of the 250,000 acres of meadows in the Upper Feather River watershed. Most of the meadow areas in the watershed have suffered from deeply incised stream channels as a result of various human activities over the past 150 years. The degraded conditions separate the streams from their historic floodplains and eliminate the meadows' historic ability to store water in the winter and spring and release it in the summer and fall.

Through physical intervention in degraded meadows, the Plumas Watershed Forum projects have restored the streams to their historic elevations and allowed the meadows to return to their traditional role as sponges in the watershed. As a result, in the winter and spring the meadows hold back water and reduce flood peaks at the very time downstream reservoirs may have to be spilling water to meet their flood control reservations.[2] Then, in the summer and fall, the meadows gradually drain back into the streams, providing instream flow and cold water when it is needed most and delivering it to downstream reservoirs when it can be held in storage or put to use.[3] ***All of the benefits provided by the meadow restoration projects directly counteract climate change impacts and substitute for the function of the historic snowpack.***

13-1 (con't.)

Attached are four pages of charts and photographs providing examples of the effectiveness of the type of meadow restoration projects sponsored by the Plumas Watershed Forum. All three projects provided as examples are in the Upper Feather River watershed and drain to Lake Oroville.

Figure 1 presents monitoring data from the Cottonwood Creek restoration project, reflecting the change from an intermittent stream to a near-perennial stream – even against a backdrop of declining precipitation in the immediate post-project period (1995 to 1999).

Figure 2 presents monitoring data from the Clarks Creek restoration project, reflecting the ability of a restored meadow system to store water until later in the season and then still release that stored water back into the stream system. Rather than the brief "peaking" storage in the pre-project period, after construction the groundwater level is shown holding in storage plateaus.

Figures 3, 4, and 5 are pre- and post-project photos of the Last Chance Creek and Cottonwood Creek restoration projects, showing the deeply incised and degraded

channels prior to the projects, as well as the reconnected floodplains and restored water storage capacity following completion of the projects.

Watershed Reinvestment for Water Storage

Unfortunately, funding for the Plumas Watershed Forum's meadow restoration work has been suspended at least for the time being. Under the Monterey Settlement Agreement, DWR agreed to fund the Plumas Watershed Forum for four years, from 2003 until 2006. The settlement provides that an additional four years of funding will be provided once a new EIR is completed successfully, including withstanding any legal challenges. However, the settlement also gives DWR the discretion to continue funding for the program before the new EIR is completed if the watershed work is deemed successful. To help inform DWR's decision in that regard, the Plumas Watershed Forum is currently undergoing a third-party review which will produce a report evaluating the effectiveness of the program and its benefit to the State Water Project. Assuming the conclusions are favorable, Plumas hopes DWR will resume funding for the Plumas Watershed Forum's watershed work in the Upper Feather River region.

However, regardless of the future of the Plumas Watershed Forum under the Settlement Agreement, the general consensus over climate change impacts to California's water supply warrants a long-term program of watershed reinvestment, particularly in the State Water Project's own watershed. The Feather River watershed stands at a relatively low elevation, meaning climate change impacts to the historic snowpack will be felt there first and most severely. As controversy persists over surface water storage and Delta conveyance, and in the face of the ongoing flood threat in the Sacramento Valley and to Delta levees, common-sense projects with broad stakeholder support should proceed. Whatever the ultimate water supply solutions may be below the dams, all beneficial uses of water are enhanced by the low-hanging fruit of upper watershed improvements.

13-1 (con't.)

There is a longstanding challenge to overcome "institutional incapacities" (as described in the Sierra Nevada Ecosystem Project (SNEP) Report[4]) to address fragmented control of the watershed among different authorities, jurisdictions, and ownerships; the absence of exchange mechanisms to sustain investment and collaborative management; and the disconnect between those who benefit from a resource and those who own, manage, and control it. The Plumas Watershed Forum created a mechanism to address all of these challenges, and ongoing funding for this program outside of the Monterey Settlement would provide an effective, collaborative, and enduring means of watershed reinvestment for the State Water Project.

Environmental Justice

The State Water Project's reinvestment in the Upper Feather River watershed also provides multiple opportunities to address environmental justice concerns. Based on income levels, Plumas County as a whole is considered an economically disadvantaged community under the California Water Code. On a community level, 21 out of the 33 "Census-designated places" in Plumas County are economically disadvantaged, including the towns of Chester, Greenville, La

13-2

Porte, Quincy, Portola, and Taylorsville. Watershed reinvestment creates valuable economic opportunities (including economic multipliers from the direct investment) for the residents of the Upper Feather River region.

Also, as part of environmental justice outreach conducted in implementing the Upper Feather River Integrated Regional Water Management Plan, strategies have been identified to benefit minority interests, including:

- Recovery of riparian wetland areas, including culturally important flora such as grey willow and camas
- Mercury sequestration to reduce exposure to tribal members and minority groups with above-average reliance on subsistence fishing
- Fuels reduction in the wildland-urban interface to promote black oak recovery and protect low-income communities from destruction and displacement from catastrophic wildfire
- Flood attenuation to help protect low-income communities in the flood-prone areas below Oroville

All of these actions are consistent with the objectives of the Plumas Watershed Forum and the Feather River Watershed Management Strategy.

13-2 (con't.)

Carbon Footprint and Forest Management

The DEIR includes some discussion of the State Water Project's large use of electricity and attendant greenhouse gas emissions and acknowledges that AB32 and other factors will require DWR to eventually address the issue of reducing or offsetting its carbon footprint. Plumas would like to encourage DWR to fully explore the potential for cumulative benefits that can be achieved by addressing carbon sequestration in the State Water Project's own watershed and by supporting forest management protocols such as those that have begun to be implemented under the Herger-Feinstein Quincy Library Group Pilot Project. The benefits of such actions are many fold:

- U.S. Forest Service research related to the Herger-Feinstein pilot project shows a one acre-foot increase in water yield for every ten acres of forest fuels treatment, based on evapotranspiration savings alone.[5]
- Forest fuels reduction projects dramatically decrease the risk of catastrophic wildfires and their release of greenhouse gases, while preventing post-fire flooding and sedimentation problems.[6,7]
- Actively managed public and private forest stands in California remove and store significantly greater amounts of carbon than unmanaged forests.[8]

13-3

Also, in addition to the substantial research that has already been conducted on the forest-carbon relationship, Plumas is currently funding promising research related to the carbon sequestration

benefits of restoring meadows from sagebrush flats to willow/meadow sod condition. On an acre-per-acre basis, the carbon sequestration potential of restored meadows may far exceed the potential "additionality" from modified forest management practices. Initial results from this research should be available by late summer 2008.

13-3 (con't.)

Conclusion

Thank you for considering these comments on the Monterey Plus draft EIR. If there are any questions or if the Department would like additional information, you may always contact our General Manager, Brian Morris, at (530) 283-6243 or brianmorris@countyofplumas.com.

Sincerely,

Rose Comstock

Rose Comstock
Chair, Plumas County Board of Supervisors
Plumas County Flood Control & Water Conservation District

Notes

[1] Plumas Watershed Forum. Feather River Watershed Management Strategy, available at http://www.des.water.ca.gov/mitigation_restoration_branch/rpmi_section/projects/docs/FeatherRiverStrategy.pdf

[2] Kavvas, M.L.; Chen, Z. Q.; Anderson, M.; Liang, L.; Ohara, N. Assessment of the Restoration Activities on Water Balance and Water Quality at Last Chance Creek Watershed Using Watershed Environmental Hydrology (WEHY) Model, available at http://www.waterboards.ca.gov/nps/docs/conference2005/presentations/m1015a3_kavvas.pdf.

[3] Loheide, S.; Gorelick, S. Quantifying Stream-Aquifer Interactions through the Analysis of Remotely Sensed Thermographic Profiles and In Situ Temperature, available at http://www.feather-river-crm.org/publications/pdf/LoheideGorelick2006EST.pdf.

[4] Center for Water and Wildland Resources, University of California, Davis. Summary of the Sierra Nevada Ecosystem Project Report (page 4), available at http://ceres.ca.gov/snep/pubs/web/PDF/exec_sum.pdf.

[5] Troendle, C.A.; Nankervis, J.M.; Peavy, A. The Herger-Feinstein Quincy Library Group Project - Impacts of Vegetation Management on Water Yield, available at http://www.fs.fed.us/r5/hfqlg/monitoring/resource_reports/2007/Water_Yield_May07_exec_summ.pdf.

[6] U.S. Forest Service, Pacific Southwest Research Station. Effects of Prescribed Fire and Thinning on Wildfire Severity: The Cone Fire, Blacks Mountain Experimental Forest, available at http://www.fs.fed.us/psw/programs/ecology_of_western_forests/projects/cone_fire_new/FireSeverity/Effects/.

[7] Culver, S.; Dean, C.; Patten, F.; Thinnes, J. Upper South Platte Watershed Protection and Restoration Project, available at http://www.fs.fed.us/rm/pubs/rmrs_p022/rmrs_p022_110_117.pdf.

[8] S. Mader. Carbon Sequestration and Storage by California Forests and Forest Products, Technical Memorandum, CH2M Hill, Inc., 2007.

Fig. 1 - Cottonwood Creek Restoration Project – Days of Flow

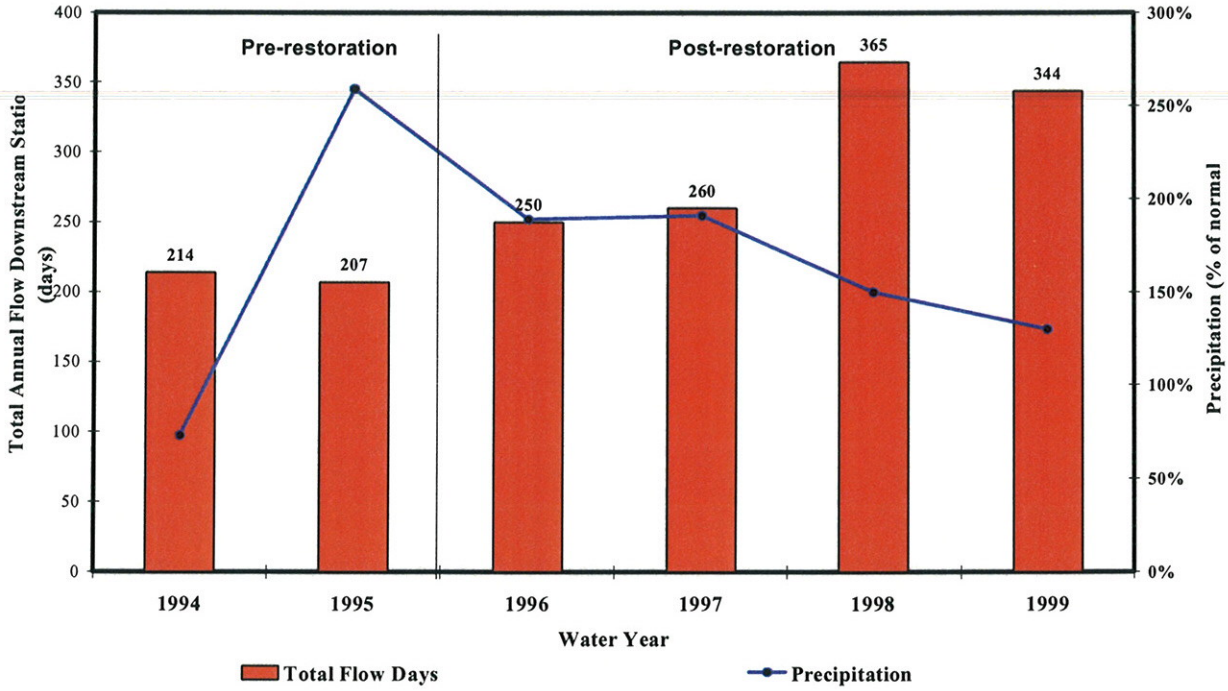


Fig. 2 - Clarks Creek Restoration Project – Groundwater Level

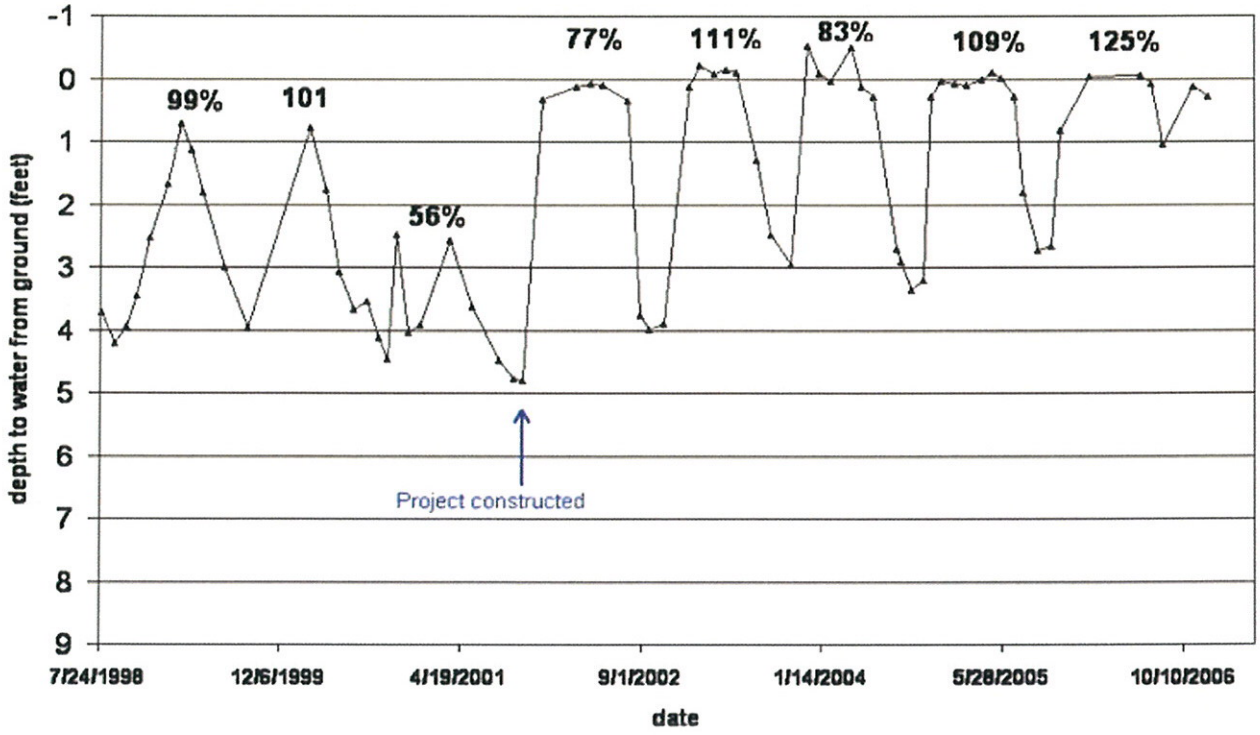


Fig. 3 – Last Chance Creek Pre- and Post-Project Conditions

Fig. 4 – Last Chance Creek Pre- and Post-Project Conditions

Fig. 5 – Cottonwood Creek (Big Flat) Pre- and Post-Project Conditions

LETTER 14

ROSEDALE-RIO BRAVO
WATER STORAGE DISTRICT

Wes Selvidge
President

Hal Crossley
General Manager

Terry Chicca
President

Martin N. Milobar
Engineer-Manager

BUENA VISTA WATER STORAGE DISTRICT

January 14, 2008

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
901 "P" Street
Sacramento, California 95814

Re: Draft Environmental Impact Report
Monterey Plus Project
SCH # 2003011118

Dear Ms. Brown:

This letter is written on behalf of Buena Vista Water Storage District and Rosedale-Rio Bravo Water Storage District.[1] Said entities appreciate the opportunity to comment on the DRAFT ENVIRONMENTAL IMPACT REPORT for the project described as MONTEREY AMENDMENT TO THE STATE WATER SUPPLY CONTRACTS (INCLUDING KERN WATER BANK TRANSFER) AND ASSOCIATED ACTIONS AS PART OF A SETTLEMENT AGREEMENT (MONTEREY PLUS). Our comments are as follows:

GENERAL COMMENTS

1. Monterey Settlement Supported

We support the Monterey Settlement, the amendment to the State Water Supply Contracts consistent therewith, and other associated actions taken in furtherance thereof, including the transfer of the Kern Water Bank (KWB) lands to local interests. We are, however, concerned with the past, present and potential future use and operation of the KWB lands. Our comments are, therefore, focused on those portions of the DEIR dealing with the past, present and potential future use and operation of said lands, particularly Appendix E (App-E).

14-1

[1] Two of the entities identified as surrounding the Kern Water Bank. [App-E, pp. 2-3, 15].

2. Scope of DEIR

A Notice of Preparation (NOP) for the Monterey Plus project was published on January 24, 2003. In that document it is stated:

> In general, the EIR will serve as a Project EIR (CEQA Guidelines Section 15161). That is, the EIR will address the SWP contract amendments and the settlement actions at a project-level of detail where no subsequent actions are expected and/or where sufficient information on subsequent actions are known or can be generated.
>
> In some cases, subsequent actions that stem from the contract amendments or settlement actions may require additional environmental review prior to implementation. In these cases, the EIR will serve as a program EIR (CEQA Guidelines Section 15168) and will provide information and analysis that could provide a foundation for subsequent, site-specific environmental review. [NOP, p. 1].

We understand that the DEIR is intended to cover the potential "environmental and economic effects" of the transfer of the KWB lands. [DEIR, p. ES-2]. However, it is also stated that the Monterey Settlement Agreement (MSA) requires "…an independent study of some Kern Water Bank operations." [DEIR, p. ES-3]. Our question is this: is the DEIR a project EIR or a program EIR with respect to past, present and/or potential future use and operation of the KWB lands? If the latter, what additional CEQA review may be expected from the current owners prior to continuation of KWB operations?

14-2

3. Project Description Inadequate

We believe the project description is inadequate because we are unable to determine from the DEIR what the KWB project actually is or consists of. Of course, it is impossible to assess the environmental impacts of the project without knowing the nature and scope of the project. For example, when the KWB lands were transferred to the project participants we understood that the KWB lands would be used as a groundwater banking project to provide dry-year water supplies to participating entities

14-3

to support ongoing, local[2] primarily agricultural operations. This opinion is bolstered by the following:

- Appendix E states that the KWB lands were transferred to KCWA and then to the KWBA "…for local agency development and use as a groundwater bank" [App-E, pp. 1, 7];

- the property was to be developed and improved "…for the importation, percolation and storage of water in underground aquifers for later extraction, transportation, and, for the beneficial use of Project Participants" [App-E, p. 9];

- the Statement of Principles (SOP) governing KWB operations is said to contain a "key" provision which states that the "…KWB's primary purpose is to augment water supplies for KWB participants" in Kern County [App-E, p. 14];

- during the late 1990s and early 2000s, KWB participants "…appeared to be setting aside the stored water for use in dry periods…." [App-E, p. 47];

- "The primary water conservation objective is the storage of water in aquifers during times of surplus for later recovery during times of shortage" [App-E, p. 51]; and

- in a 2001 KCWA memo we were told "…existing groundwater banking programs had been established for the primary purpose of providing a dry year supply to the project participants with sales of stored groundwater to third parties anticipated to be only a small portion of the project operations to assist in financing the projects…."

14-3 (con't.)

Notwithstanding the foregoing, it appears that the KWB has been operated primarily for water marketing purposes. The DEIR shows that, from 1995 to 2005, fully seventy-five percent (75%) of banked water recovered from the project has been for water sales to third parties. [App-E, p. 27]. To our knowledge, no environmental review has ever been conducted with respect to the use and operation of the KWB lands as a water marketing project, particularly with respect to out-of-county sales, and no such review is provided in the DEIR. If the KWB lands will be used in the future for water marketing purposes, the

14-4

[2] With the exception of Dudley Ridge Water District which is an out-of-county participant.

DEIR should clearly identify this fact, should define the parameters of the water marketing program, and should analyze the actual and potential environmental effects thereof.[3]

14-4 (con't.)

The project description is further inadequate for the reason that the DEIR does not include an operating plan for the KWB which identifies realistic recharge and recovery parameters and/or which identifies resources (lands, bank accounts, etc.) devoted to marketing and those resources devoted to meeting the dry-year requirements of KWB participants. The project description/operating plan should include, without limitation, the following:

- A forecast of the expected minimum, maximum and average annual recharge and recovery operations (rates, volumes, sources, and durations) on behalf of project participant water supplies through the year 2035 for all waters other than unregulated, high-flow waters.

- A forecast of the expected minimum, maximum and average annual recharge and recovery operations (rates, volumes, sources, and durations) on behalf of 3rd party water supplies (i.e., non-participant banking operations) through the year 2035.

- A forecast of the long-term predicted high-flow water recharge and recovery events (rates, volumes, sources, and durations) through the year 2035.

- A forecast of the projected or desired minimum, maximum and average annual in-county and out-of-county water sales (rates, volumes, sources, and durations) and out-of-county water transfers through the year 2035.

- A forecast of the estimated facilities and estimated time periods during which the project can be made available to second-priority right holders.

- Operating limits based on sustainable, non-impacting criteria (which may be significantly less than the physical capacity of the facilities that are over-built for operational flexibility).

14-5

[3] It is particularly important that the parameters of the marketing program be defined because such definition affects second priority rights to use the KWB lands, i.e., according to the SOP use of KWB recharge and/or recovery facilities for in-county purposes by second priority right holders is paramount to use thereof for out-of-county marketing purposes.

- Expected minimum, maximum and annual recharge and recovery scenarios including rates, durations, critical limits, and trigger conditions for impact avoidance.

- A priority-of-use schedule for all facilities and all scenarios so that water level and water quality impacts from discretionary extraction does not occur under adverse circumstances.

- The magnitude of KWB recharge and recovery operations to date are unprecedented and largely unanticipated. Accordingly, water level, water quality, interzonal flow, and subsidence impact analyses related to the full range of recharge and/or recovery operations are needed.

14-5 (con't.)

4. Errata

Reference is made to Figure 9.2-1, Figure 9.2-2, and Table 16 but the same could not be found in the document.

14-6

Again, we reiterate that we support the Monterey Settlement, the amendment to the State Water Supply Contracts consistent therewith, and other associated actions taken in furtherance thereof, including the transfer of KWB lands to local interests. Our comments are directed at that portion of the DEIR dealing with the past, present and potential future operation and use of the KWB lands and should not be otherwise construed. Thank you for the opportunity to provide these comments. If you have any questions, please advise.

14-7

Very truly yours,

BUENA VISTA WATER STORAGE DISTRICT

By: _____
Terry Chicca, President
Board of Directors

ROSEDALE-RIO BRAVO WATER STORAGE DISTRICT

By: _____
Wes Selvidge, President
Board of Directors

:gm

cc: William D. Phillimore, KWB
Ernest Conant, KWB
Jon Parker, KWB
Jim Beck, KCWA
Amelia Minaberrigarai, KCWA
Curtis Creel, KCWA
Gene R. McMurtrey, Esq.

LETTER 14

LETTER 15

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January 14, 2008

Via Email (delores@water.ca.gov) and U.S. Mail

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
901 "P" Street
Sacramento, CA 95814

Re: Semitropic Water Storage District Comments on DEIR for Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement (Monterey Plus), by DWR, dated October, 2007. (SCH#: 2003011118)

Dear Ms. Brown:

These comments are submitted on behalf of the Semitropic Water Storage District, a California water storage district, and its improvement districts (collectively, "Semitropic"),[1] in regard to the Draft Environmental Impact Report entitled "Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement (Monterey Plus)" (hereinafter, "Monterey Plus DEIR" or simply "DEIR"), dated October, 2007, prepared by the Department of Water Resources ("DWR").

15-1

Semitropic is a public agency that contracts, through the Kern County Water Agency ("KCWA"), for water supplies from the State Water Project ("SWP"). Semitropic also operates a water banking and exchange program referred to herein as the "Semitropic Water Bank" or "Program." The Semitropic Water Bank was initially approved to operate as a one million acre-feet ("MAF") banking program pursuant to an EIR prepared by Semitropic as lead agency, along with Metropolitan Water District of Southern California ("MWDSC") as responsible agency, and certified under CEQA in 1994 ("1994 EIR").[2] The 1994 EIR contemplated MWDSC's participation as a banking

[1] Buttonwillow Improvement District, Pond-Poso Improvement District and Semitropic Improvement District.

[2] In or about 2000, Semitropic prepared and certified a Final Supplemental EIR and, in or about 2002, prepared an addendum, which addressed the Program with greater than 1 MAF of capacity with the addition of a Stored Water Recovery Unit.

partner in the Program up to 1 MAF and, in 1995 before the Monterey Amendment, MWDSC contracted to potentially utilize up to the full 1 MAF under certain conditions.

Semitropic believes that the DEIR includes an exhaustive analysis of the environmental effects of the Monterey Plus project -- the Monterey Amendment and Settlement Agreement. The Monterey Plus DEIR was drafted with the advisory collaboration of DWR, the State Water Contractors, Planning and Conservation League, Citizens Planning Association of Santa Barbara, and Plumas County Flood Control and Water Conservation District. The analysis in the DEIR concludes, among other things, that:

- There have been no significant environmental effects resulting from implementation of the Monterey Amendment from 1996 to present.

- In the future, the environmental impacts from the Monterey Amendment in almost all resource categories are at less-than-significant levels. Those few areas where potentially significant impacts were identified assume a worst-case scenario and are unlikely to ever occur.

Semitropic supported implementation of the Monterey Amendment in 1996, supported the Monterey Plus project, and supports their continued implementation into the future. Semitropic commends the Department for having prepared this thorough and significant document.

15-1 (con't.)

That said, please find the following specific comments on a matter in the DEIR related to the Semitropic Water Bank that Semitropic feels may not be accurate or is in need of clarification, further explanation and/or revision in connection with preparation of the final EIR. Semitropic also hereby incorporates herein and makes a part of these comments the Kern Water Bank Authority's comments and the State Water Contractors' comments on the DEIR.

A. THE 1 MAF SEMITROPIC WATER STORAGE DISTRICT WATER BANKING PROGRAM, APPROVED AS SUCH BEFORE THE MONTEREY AMENDMENT, SHOULD BE PART OF THE BASELINE AND/OR THE NO PROJECT ALTERNATIVES

15-2

The DEIR states that the Semitropic Water Storage District developed an in-lieu water banking program in Kern County with a capacity of one million AF in the early 1990s. (DEIR, pp. 6-10, 6-55.) In this regard, the DEIR should also state that Semitropic, as lead agency, prepared (along with MWDSC as responsible agency) and certified an EIR and took other actions required by CEQA, including adoption of "Findings and Mitigation Monitoring Plan" with respect to the Semitropic Water Bank, in 1994 before the Monterey Amendment.[3]

[3] See SID Resolution No. 94-7 (enclosed).

The DEIR also states that, because Metropolitan Water District of Southern California received DWR's approval to store water in the Semitropic Water Bank before the Monterey Amendment, the Semitropic Water Bank is included in the baseline. (DEIR, pp. 5-4 (Table 5-1), 6-55.) The DEIR states that the baseline conditions that existed in 1995 were adjusted to include events expected to occur over time unrelated to the Monterey Amendment or the Settlement Agreement (DEIR, p. 5-2). The DEIR should clarify whether the baseline includes the Semitropic Water Bank operating as a 1 MAF program. There are several reasons why that would be appropriate. First, the full 1 MAF Semitropic Water Bank program was approved based on the 1994 EIR that evaluated the entire program's potential environmental effects with MWDSC's participation up to the full 1 MAF, before the Monterey Amendment. Second, DWR gave permission to MWDSC to store SWP water in the Semitropic Water Bank, before the Monterey Amendment (DEIR, p. 6-55). Third, the pre-Monterey Amendment SWP contracts did not prohibit storage of SWP water outside contractor's service areas, and DWR approved such storage by MWDSC on a policy basis (pursuant to Article 15(a)[4]), before the Monterey Amendment (DEIR, p. 6-10; Appendix E, p. 48). Finally, the (enclosed) banking agreement between Semitropic and MWDSC, entered into on December 12, 1994, before the Monterey Amendment, and incorporated into the August 21, 1995, change in point of delivery agreement between DWR, KCWA and MWDSC, before the Monterey Amendment, provided for MWDSC's use of up to the full 1 MAF program capabilities under certain terms and conditions. Inclusion of the Semitropic Water Bank operating as a 1 MAF program as a part of the baseline is potentially significant because a lesser assumption could: serve to create an artificially low baseline; thereby potentially overstating (and thus identifying illusory) impacts attributable to the Monterey Amendment provision that provides contractual assurance for storage outside contractors' service areas (Article 56); and thereby requiring greater mitigation.[5] To our knowledge, CEQA does not require project mitigation for baseline impacts.

15-2 (con't.)

In addition and/or alternatively, the no project alternatives should assume and recognize that operation of the Semitropic Water Bank as a 1 MAF program if the project were not approved. CEQA requires that the "no-project" analysis include discussion of "what would be reasonably expected to occur in the foreseeable future if the project were not approved...."[6] DWR gave permission to MWDSC to store SWP water outside its service area in the Semitropic Water Bank based on pre-Monterey Amendment contracts

15-3

[4] See enclosed Point of Delivery Agreement between DWR, MWDSC and KCWA, dated August 21, 1995, and Agreement between MWDSC and Semitropic WD and its Improvement Districts for a Metropolitan-Semitropic Water Banking and Exchange Program, dated December 12, 1994.

[5] Conditions at the time of the NOP normally constitute the baseline. (CEQA Guidelines, § 15125(a).) The NOP was issued in 2003, by which time MWDSC and various other banking partners had contracted to use the full 1 MAF capacity of the Semitropic Water Bank. In addition, as provided in Fairview Neighbors v. County of Ventura (1999) 70 Cal.App.4th 238 (where maximum level of operations authorized by prior permit, subjected to prior CEQA review, was treated as the appropriate baseline for evaluating expansion of project), the DEIR baseline could or should include Semitropic Water Bank operating at its full 1 MAF capacity.

[6] CEQA Guidelines § 15126.6(e)(2). See also, CEQA Guidelines § 15126.6(e)(3)(b) (requiring that no-project alternative address "predictable actions" by others and identify "practical result" if project not approved).

that did not prohibit outside service area storage but, rather, allowed for that to occur with DWR's permission pursuant to Article 15(a). Even though the practice of temporarily storing SWP water outside contractors' service areas may not have been common or approved on a case-by-case basis (DEIR § 6.2.5), there is nothing in the DEIR indicating DWR has ever refused any similar requests or that it would likely do so in the future especially after providing permission to MWDSC for the Monterey Amendment. Rather, the DEIR strongly suggests that due to a number of factors that practice was likely to continue in the foreseeable future after implementation of the Monterey Amendment, including increasing water demands, fewer opportunities to store SWP water within contractors' service areas and concerns about delivery reliability in dry years (e.g., DEIR § 6.2.5). We submit that the DEIR should assume that, after implementation the Monterey Amendment in 1996, DWR would have approved other urban contractors' requests to store SWP water in the Semitropic Water Bank, collectively up to 1 MAF, as it had done previously for MWDSC, if the project was not approved.

15-3 (con't.)

Once again, Semitropic supports the continued implementation of the Monterey Amendment and Monterey Plus project and appreciates DWR's efforts in preparation of the DEIR. Semitropic also appreciates the opportunity to comment and intends its comments to be constructive and helpful in preparing the final EIR for project. If you have any questions or comments, please do not hesitate to contact the undersigned.

15-4

Sincerely,

Wilmar Boschman
General Manager

Enclosures

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

POINT OF DELIVERY AGREEMENT AMONG DEPARTMENT OF WATER RESOURCES, STATE OF CALIFORNIA, METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA AND KERN COUNTY WATER AGENCY

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

POINT OF DELIVERY AGREEMENT AMONG
DEPARTMENT OF WATER RESOURCES, STATE OF CALIFORNIA,
METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA
AND
KERN COUNTY WATER AGENCY

THIS AGREEMENT is made this 21 day of August, 1995, pursuant to the provisions of the California Water Resources Development Bond Act, and other applicable laws of the State of California, among the Department of Water Resources, herein referred to as the "DEPARTMENT," the "Kern County Water Agency" herein referred to as the "AGENCY," a political subdivision of the State of California created by an Act of the California State Legislature (Statute 1961 Ch 1003 or as amended), and the "Metropolitan Water District of Southern California," herein referred to as "METROPOLITAN".

RECITALS

A. METROPOLITAN has entered into an agreement with the Semitropic Water Storage District, herein referred to as "Semitropic," a member unit of the AGENCY, entitled "Agreement Between the Metropolitan Water District of Southern California and Semitropic Water Storage District and its Improvement Districts for a Metropolitan-Semitropic Water Banking and

Exchange Program," dated December 12, 1994 and attached hereto as Exhibit A. Said agreement provides for terms and conditions between METROPOLITAN and Semitropic for storage and recovery of METROPOLITAN's water in the ground water basin within Semitropic, herein referred to as the "MWD/ST Banking Program Agreement."

B. The DEPARTMENT, AGENCY and Semitropic have entered into an agreement entitled "Agreement Among Department of Water Resources, State of California, Kern County Water Agency and Semitropic Water Storage District for Introduction of Local Water into the California Aqueduct" dated May 2, 1995 and Amendment No. 1 both attached hereto as Exhibit B. Said agreement, herein referred to as the "Semitropic Turn-in Agreement" provides for the terms and conditions between the DEPARTMENT, AGENCY and Semitropic for the introduction of Local Water into the California Aqueduct. Under certain circumstances, such Local Water may be used to return previously stored water to METROPOLITAN.

C. Pursuant to Article 15(a) of METROPOLITAN's water supply contract with the DEPARTMENT, the DEPARTMENT finds that the delivery and temporary storage of water outside METROPOLITAN's service area under the MWD/ST Banking Program Agreement and this Agreement will not materially impair METROPOLITAN's capacity to make payments to the DEPARTMENT as provided in its water supply contract with the DEPARTMENT.

AGREEMENT

A portion of METROPOLITAN's SWP entitlement and other water supplies may be delivered for storage and later recovery within Semitropic's ground water basin in accordance with the MWD/ST Banking Program Agreement, the Semitropic Turn-in Agreement, and under the following terms and conditions:

1. PURPOSE

The purpose of this Agreement is to set forth provisions governing the delivery of Metropolitan's water for storage in the ground water basin underlying Semitropic and for the return of such water from either Semitropic's turnout in Reach 10A and/or by exchange of METROPOLITAN's stored water for a like amount of Semitropic's SWP entitlement.

2. TERM

Provisions for delivery of METROPOLITAN's water into storage under this Agreement shall terminate on November 4, 2035. Provisions for the return of METROPOLITAN's stored water shall terminate on November 4, 2035 or on the date when all stored water is returned to METROPOLITAN whichever date occurs later. In the event that METROPOLITAN and the AGENCY do not execute by December 31, 1996, amendments to their long-term SWP water supply contracts addressing the issues covered by the "Monterey Agreement-Statement of Principles," the provisions of this Agreement allowing METROPOLITAN to store water in the AGENCY's service area shall be suspended until such time as such amendments are executed or the suspended provisions are re-negotiated. Notwithstanding the previous provisions of

this paragraph, this Agreement shall terminate at such time as the METROPOLITAN/Semitropic Banking Program is terminated.

3. PRIOR DELIVERIES TO STORAGE

a. 1993 Delivery: By agreement dated April 21, 1993 between the DEPARTMENT, the AGENCY, and METROPOLITAN, 45,377.2 acre-feet of METROPOLITAN's 1992 SWP carryover entitlement was placed in storage within Semitropic in anticipation of executing a long-term MWD/ST Banking Program Agreement and this long-term Point of Delivery Agreement. It is agreed that upon execution of this contract, the terms and conditions of this Agreement shall govern the water stored in 1993, and the April 21, 1993 agreement shall terminate.

b. 1995 Delivery: An amount of METROPOLITAN's 1995 SWP entitlement water, totaling 50,000 acre-feet, has been scheduled for delivery to Semitropic in 1995. It is agreed that the terms and conditions of this Agreement shall govern that 1995 scheduled delivery.

4. USE OF STORED WATER

Water delivered by the DEPARTMENT on behalf of METROPOLITAN under this Agreement will not be sold to Semitropic but will be temporarily stored for later delivery to METROPOLITAN's service area. The specific provisions for storage and recovery of METROPOLITAN's water within Semitropic is governed by the MWD/ST Banking Program Agreement. As provided in Article 4 of said agreement, 90 percent of METROPOLITAN's water delivered to Semitropic for storage will be returned to METROPOLITAN for use

in its service area in future years, unless it is determined that actual losses are different than the assumed 10 percent.

5. USE OF CALIFORNIA AQUEDUCT CAPACITY FOR STORED/RETURN WATER

The DEPARTMENT will deliver METROPOLITAN's SWP entitlement and other water supplies under this Agreement in accordance with a schedule which has been reviewed and approved by the DEPARTMENT at times consistent with the overall operations of the SWP. Although any available California Aqueduct capacity may be utilized, deliveries under this Agreement may be scheduled when the sum of deliveries under this Agreement plus approved SWP entitlement deliveries to METROPOLITAN do not exceed the quantities on which the proportionate use of facility factors and excess capacity paid for by METROPOLITAN are based pursuant to its Water Supply Contract with the DEPARTMENT. To the extent other available capacity is utilized, the DEPARTMENT shall not be obligated to convey such water for storage or return at times when such delivery would adversely impact SWP operations or facilities, other SWP contractors' water deliveries or costs, or delivery of SWP entitlement or other water supplies to the AGENCY. In the event there is a conflict between schedules for delivering SWP entitlement to other SWP Contractors or water supplies to the Agency's service area and delivering METROPOLITAN's SWP entitlement or other water supplies under this Agreement, SWP entitlement and water deliveries to other SWP contractors and water supplies to the AGENCY shall receive higher priority. METROPOLITAN shall be responsible for any adverse impacts that may result from deliveries under this

agreement as determined by the Department. To the extent METROPOLITAN's SWP demands increase as a result of this Agreement, which increased demands are permitted under the amendments that implement the Monterey Principles, such increased demands shall not be considered as an adverse impact.

6. DELIVERY SCHEDULES FOR STORED WATER

a. Department Approval of Delivery Schedules: In coordination with and with the approval of the AGENCY, METROPOLITAN shall be responsible for scheduling delivery of the water with the DEPARTMENT. All water delivery schedules and revisions shall be in accordance with Article 12 of METROPOLITAN's Water Supply Contract with the DEPARTMENT.

b. Agency Approval of Delivery Schedules: As part of coordinating delivery schedules with the AGENCY, METROPOLITAN shall submit a delivery schedule to the AGENCY and Semitropic for review and approval. The AGENCY and Semitropic shall review the proposed schedule with METROPOLITAN, and after consultation with Semitropic, the AGENCY agrees to inform METROPOLITAN of its decision to either approve, propose modifications, or withhold approval as promptly as possible. The AGENCY agrees that it shall not arbitrarily withhold approval or propose modifications. The AGENCY may withhold approval or propose modifications to the delivery schedule if the proposed deliveries would interfere with the AGENCY's water management activities including its finances, water supply, or operations. The AGENCY may deny approval of, or propose modification to

METROPOLITAN's deliveries under this Agreement if, on the basis of a with and without analysis, the AGENCY determines that such deliveries would adversely impact the AGENCY's water management activities, finances, water supply or operations, and METROPOLITAN or Semitropic do not agree to mitigate for such impacts. The base case (without analysis) shall be those conditions estimated to occur in the absence of the MWD/ST Banking Program. To the extent METROPOLITAN's SWP demands increase as a result of this Agreement, which increased demands are permitted under the amendments that implement the Monterey Principles, such increased demands shall not be considered as an adverse impact. Upon receipt of the AGENCY's approval, METROPOLITAN shall submit the delivery schedule to the DEPARTMENT.

c. Increased Capacity: Historically, Semitropic's annual capacity to deliver surface water has been approximately 220,000 acre-feet per year. Under the MWD/ST Banking Program Agreement, Semitropic proposes to increase the district's delivery capacity above the 220,000 acre-feet per year utilizing revenues provided by METROPOLITAN, herein referred to as "Increased Capacity." Notwithstanding provisions of paragraph 6(b), the AGENCY agrees that it shall not withhold approval of the delivery schedule or propose modifications for the sole purpose of gaining access to said Increased Capacity for local purposes.

7. ENTITLEMENT ALLOCATION

Water returned to METROPOLITAN under this agreement, shall not be considered by the DEPARTMENT in the determination of approved annual entitlement deliveries or allocation of other SWP water to METROPOLITAN under Article 18 of METROPOLITAN's contract with the State for water service.

8. DELIVERY SCHEDULES FOR RETURN WATER

METROPOLITAN and Semitropic shall, as soon as practicable, submit a schedule to the AGENCY specifying the quantity of METROPOLITAN's previously stored water to be returned by exchange of Semitropic's allocation of SWP entitlement and the quantity of such stored water that will be returned by direct pumpback into the California Aqueduct. Said schedule shall also specify the amount of and date when such return water was previously stored. The AGENCY may propose modifications to the proposed schedule for the return of METROPOLITAN's previously stored water if, on the basis of a with and without analysis, the AGENCY determines that such scheduled deliveries will adversely impact the AGENCY's finances, water supply or operations, and METROPOLITAN or Semitropic do not agree to mitigate for such impacts. The base case (without analysis) shall be those conditions estimated to occur in the absence of the MWD/ST Banking Program.

9. RETURN WATER DELIVERED INTO AQUEDUCT

Return water pumped from Semitropic's ground water basin and returned to METROPOLITAN shall meet the DEPARTMENT's water

quality standards in effect when water is returned and shall be in compliance with the Semitropic Turn-in Agreement.

10. STORED/RETURN WATER RECORDS

METROPOLITAN shall certify to the DEPARTMENT's SWP Analysis Office by January 31, of each year the following information for the previous calendar year:

a. The quantity of water delivered and stored under this Agreement.

b. The quantity of stored water that will be available for return to METROPOLITAN.

The DEPARTMENT will maintain records accounting for the delivery of METROPOLITAN's SWP and other water supplies for storage in Semitropic's ground water basin and return water delivered from Semitropic to METROPOLITAN.

11. CHARGES

a. Water delivered to storage: Charges to METROPOLITAN for power resources (including on-aqueduct, off-aqueduct and any other power), used for pumping water through Harvey O. Banks Delta Pumping Plant and Dos Amigos Pumping Plant for delivery into storage shall be calculated in the same manner as charges for power resources used for pumping entitlement water finally delivered to the Semitropic turnout in Reach 10A in the year such deliveries are made.

b. Water delivered from storage: The DEPARTMENT will deliver water returned from Semitropic to METROPOLITAN to a turnout in METROPOLITAN's service area. Charges to METROPOLITAN for power resources (including on-aqueduct, off-aqueduct and any

other power) used in the transportation of such water calculated from the Semitropic turnout at Reach 10A or from any other mutually agreed to point where water is returned to the Aqueduct for further delivery to a turnout designated by METROPOLITAN in METROPOLITAN's service area shall be calculated in the same manner as charges are calculated for entitlement water being moved through the same reaches. Charges shall be determined in accordance with the provisions of METROPOLITAN's Water Supply Contract with the DEPARTMENT for SWP entitlement deliveries applicable in the year the water is returned.

c. Additional Charges: In addition to the charges identified above, METROPOLITAN agrees to pay any additional identified increased non-power costs that the DEPARTMENT or other SWP contractors would otherwise incur as a result of the DEPARTMENT providing service under this Agreement and a one-time administrative fee of $2,000 to cover the DEPARTMENT's costs for the preparation and execution of this Agreement.

d. Monthly Fees: METROPOLITAN shall pay a monthly administration fee of $200 for any month water is scheduled for delivery to Semitropic's ground water basin or return water is scheduled for delivery to METROPOLITAN.

e. Payment: Upon execution of this agreement by METROPOLITAN, the DEPARTMENT will bill METROPOLITAN the administrative fee. Payment will be due 60 days after date of billing. Payment terms for all other charges due under this Agreement

shall be in accordance with METROPOLITAN's Water Supply Contract with the DEPARTMENT.

12. APPROVALS

The delivery of water under this Agreement shall be contingent on and subject to any necessary approvals and shall be governed by the terms and conditions of such approvals and any other applicable regulations. METROPOLITAN shall be responsible for complying with all applicable laws and regulations and for securing any required consent, permit, or order. METROPOLITAN shall furnish to the DEPARTMENT copies of all approvals acquired for the delivery and storage of water under this Agreement.

13. LIABILITY

a. The DEPARTMENT shall provide water delivery service only and assumes no liability beyond the point of delivery from the California Aqueduct to storage in Semitropic's ground water basin, or when water is returned to METROPOLITAN from Semitropic's ground water basin to a turn-in facility on the California Aqueduct.

b. In the event of claim of liability against the DEPARTMENT or the AGENCY or their officers or their employees, individually or severally, arises as a result of this Agreement or other related agreements, METROPOLITAN shall defend, indemnify, and hold the AGENCY, the DEPARTMENT, and any of their officers or employees harmless from any such claim.

14. NO MODIFICATION OF WATER SUPPLY CONTRACTS

This Agreement shall not be interpreted to modify the terms or conditions of either the amended Water Supply Contracts between the DEPARTMENT and the AGENCY dated November 15, 1963, the DEPARTMENT and METROPOLITAN dated November 4, 1960, as both are amended up to and including the date of the amendments referred to in paragraph 3.

15. WORKER'S COMPENSATION

The AGENCY and METROPOLITAN affirm that they are aware of the provisions of Section 3700 of the California Labor Code which require every employee to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that Code, and the AGENCY and METROPOLITAN affirm that they will comply with such provisions before commencing the performance of the work under this Agreement.

16. CLAIMS DISPUTE

In the event of dispute regarding interpretation or implementation of this Agreement, or if the Parties are unable to agree upon a matter as to which their agreement is provided for hereunder, the Director of the DEPARTMENT and General Managers of METROPOLITAN and the AGENCY shall endeavor to resolve the dispute by meeting within 30 days after the request of a Party. If the dispute is unresolved, the parties shall use the service of a mutually acceptable consultant in an effort to resolve the dispute. The fees and expenses of the consultant shall be shared equally by the Parties. If a consultant cannot

be agreed upon, or if the consultant's recommendations are not acceptable to the Parties, and unless the Parties otherwise agree, the matter may be resolved by litigation and any Party may at its option be entitled to injunctive relief, if so determined by the Court.

17. NONDISCRIMINATION

During the performance of this Agreement, the AGENCY and METROPOLITAN shall not deny the contract's benefits to any person on the basis of religion, color, ethnic group identification, sexual orientation, sex, age, physical or mental disability, nor shall they discriminate unlawfully against any employee or applicant for employment because of race, religion, color, sexual orientation, national origin, ancestry, physical handicap, mental disability, medical condition, marital status, age (over 40), or sex. The AGENCY and METROPOLITAN shall insure that the evaluation and treatment of employees and applicants for employment are free of such discrimination. The AGENCY and METROPOLITAN shall comply with the provisions of the Fair Employment and Housing Act (Government Code Section 12900 et seq.), the regulations promulgated thereafter (California Administrative Code, Title 2, Sections 7285.0 et seq.), the provisions of Article 9.5, Chapter 1, Part 1, Division 3, Title 2 of the Government Code (Government Code Sections 11135 - 11139.5), and the regulations of standards adopted by the DEPARTMENT to implement such article. The AGENCY and METROPOLITAN shall permit access by representatives of the DEPARTMENT of Fair

Employment and Housing and the DEPARTMENT upon reasonable notice at any time during the normal business hours, but in no case less than 24 hours notice, to such of its books, records, accounts, other sources of information and its facilities as the DEPARTMENT of Fair Housing or the DEPARTMENT shall require to ascertain compliance with this clause. The AGENCY and METROPOLITAN shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement. The AGENCY and METROPOLITAN shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under this Agreement.

18. ASSIGNMENT OF AGREEMENT

Without the written consent of the DEPARTMENT, AGENCY and METROPOLITAN, this Agreement is not assignable by the AGENCY or METROPOLITAN in whole or in part.

19. PARAGRAPH HEADINGS

The paragraph headings of this Agreement are for the convenience of the Parties and shall not be considered to limit, expand, or define the contents of the respective paragraphs.

20. TERMS TO BE REASONABLE

Where the terms of this Agreement provide for actions to be based upon the opinion, judgment, approval, review, or determination of any party, such terms are to be construed as providing that such opinion, judgment, approval, review, or determination be reasonable.

21. SIGNATURE CLAUSE

The signatories represent that they have been appropriately authorized to enter into this Agreement on behalf of the party for whom they sign. Certified copies of resolutions authorizing the AGENCY and METROPOLITAN to enter into this Agreement shall be delivered to the DEPARTMENT before water may be introduced into the California Aqueduct under this Agreement.

IN WITNESS WHEREOF, the Parties hereto have entered into this Agreement.

Approved as to legal form and Sufficiency

Susan N. Weber
Chief Counsel
DEPARTMENT OF WATER RESOURCES

8/16/95
Date

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

Director

8-21-95
Date

KERN COUNTY WATER AGENCY

Name

General Manager
Title

August 8, 1995
Date

METROPOLITAN WATER DISTRICT
OF SOUTHERN CALIFORNIA

Name

Deputy General Manager
Title

August 4 , 1995
Date

APPROVED AS TO FORM
N. [illegible]
C[illegible]

BY JAMES H. ROBERTS

James Roberts

EXHIBIT A

AGREEMENT BETWEEN THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA AND SEMITROPIC WATER STORAGE DISTRICT AND ITS IMPROVEMENT DISTRICTS FOR A METROPOLITAN-SEMITROPIC WATER BANKING AND EXCHANGE PROGRAM

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AGREEMENT BETWEEN THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA AND SEMITROPIC WATER STORAGE DISTRICT AND ITS IMPROVEMENT DISTRICTS FOR A METROPOLITAN-SEMITROPIC WATER BANKING AND EXCHANGE PROGRAM

THIS AGREEMENT (this "**Agreement**"), dated as of December 12, 1994, is entered into by and between **THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA** ("**Metropolitan**"), and the **SEMITROPIC WATER STORAGE DISTRICT** and **SEMITROPIC IMPROVEMENT DISTRICT, BUTTONWILLOW IMPROVEMENT DISTRICT** and **POND-POSO IMPROVEMENT DISTRICT of the SEMITROPIC WATER STORAGE DISTRICT** (collectively called "**Semitropic**"). Metropolitan and Semitropic may be referred to individually as Party or collectively as Parties.

RECITALS

A. Metropolitan obtains water from the State Water Project ("**SWP**") through its contract with the California Department of Water Resources ("**DWR**"), executed on November 4. 1960, and presently providing for a total contract entitlement of 2,011,500 acre-feet per year. From time-to-time, Metropolitan will have water available that it desires to deliver to Semitropic for storage and eventual return or other disposition pursuant to this Agreement.

B. Semitropic obtains water from the SWP through its contracts with the Kern County Water Agency ("**Agency**") under the Agency's master contract with DWR, executed on November 15, 1963, and presently providing for a total contract entitlement of 1,153,400 acre-feet per year. Semitropic's contracts with the Agency were originally executed December 9, 1976 (Buttonwillow Improvement District), December 9, 1976 (Pond-Poso Improvement District), and January 9, 1969 (Semitropic Water Storage District) and provide for a combined contract entitlement of 158,000 acre-feet per year. Semitropic Improvement District was formed in 1991, its boundaries are coterminous with the boundaries of Buttonwillow Improvement District and Pond Poso Improvement District and, among other things, it serves as agent for Buttonwillow Improvement District and Pond-Poso Improvement District. A total of approximately 136,370 acres of land within Semitropic is irrigated with a total annual demand of approximately 477,000 acre-feet based on current cropping patterns and irrigation practices. Semitropic has entered into contracts with individual landowners comprising 42,328 acres of land which is designated as the Surface Water Service Area ("**SWSA**"). Semitropic has commitments to deliver 145,240 acre-feet per year to the SWSA. Additional lands outside the SWSA, in the amount of approximately 24,500 acres, have also been connected to Semitropic's distribution system so such lands may receive surface water when available. These additional lands are designated as the Temporary Water Service Area ("**TWSA**"), and may sometimes be referred to as the Non-Contract Service Area. Total landowner demand within the SWSA and TWSA for surface water supplies is greater than water available under Semitropic's entitlement for Agency SWP water and other surface water supplies. The construction of additional distribution facilities by Semitropic, as contemplated by this Agreement, will allow Semitropic to take delivery of additional imported water delivered to Semitropic by Metropolitan pursuant to this Agreement.

C. Semitropic has constructed a seventy-eight inch (78") pumpback pipeline that is capable of conveying water withdrawn from the groundwater basin underlying the area within Semitropic's boundaries (the "**Semitropic Basin**") directly to the California Aqueduct at a maximum rate of 300 cubic feet per second ("**CFS**") upon installation of additional pumps by Semitropic, as contemplated by this Agreement. Pumpback operations to return stored water will take place primarily during the "off-peak" irrigation season, when groundwater pumping and conveyance capacity are available. Semitropic has also constructed an energy project, including, but not limited to, a hydroelectric generator, gas generators, and a 12 kilovolt transmission system, to provide a portion of the electric power required for Semitropic's pumping operations.

D. Metropolitan and Semitropic find that it will be mutually advantageous to enter into a groundwater banking and exchange program whereby Semitropic will hold in trust for Metropolitan the water deposited by Metropolitan hereunder (or its equivalent), together with (i) an easement and right to withdraw from lands owned or controlled by Semitropic an amount of water equal to Metropolitan's Stored Water on deposit with Semitropic, and (ii) an easement and right to transport such water from the Semitropic Basin to the California Aqueduct for delivery to Metropolitan, all in accordance with the terms of this Agreement. This Agreement will provide additional groundwater storage for Metropolitan, resulting in better utilization of its SWP supplies, and will provide improved reliability of supplies and overall higher groundwater levels for Semitropic.

E. This Agreement is consistent with the goal of making optimum use of water and facilities and is consistent with conservation objectives of Metropolitan, Semitropic, Agency and DWR.

F. Consistent with the California Environmental Quality Act ("**CEQA**"), Semitropic, acting as lead agency, and Metropolitan, acting as a responsible agency, have jointly completed an environmental impact report concerning the proposed water banking and exchange program (the "**EIR**"). Semitropic's Board of Directors, on July 13, 1994, certified the EIR as being in compliance with CEQA, and Metropolitan's Board of Directors on August 19, 1994, reviewed and considered the EIR. Semitropic will also be responsible for implementing and monitoring the mitigation measures defined in "Findings and Mitigation Monitoring Plan" dated July 1994, adopted as part of the Final EIR.

G. Semitropic has also entered into a Memorandum of Understanding ("**MOU**") with neighboring districts, dated September 14, 1994, to implement in part said monitoring and mitigation measures, which this Agreement is subject to. The MOU is on file with both Metropolitan and Semitropic.

H. The Semitropic Water Banking and Exchange Program authorized in the above-referenced EIR (the "**Program**") has a defined total storage capacity of 1,000,000 acre-feet. The estimated absorptive capacity, based on the approximately 23,000 acres of In-Lieu Service Area (as defined in Article 1 below) and the current cropping patterns and irrigation efficiencies, is 80,500 acre-feet per year. An estimated additional 10,000 acre-feet per year of absorptive capacity

is anticipated as a result of Semitropic improving the delivery capability of the distribution system to the existing SWSA and TWSA, as contemplated by the Program. The estimated withdrawal capacity is 90,000 acre-feet per year, at a maximum flow rate of 300 CFS, through the pumpback facility. In addition, Stored Water (as defined in Article 1) may be returned from any Semitropic SWP Entitlement Water allocation in excess of 25,000 acre-feet, as described in Exhibit A hereto. Facilities necessary to accomplish the foregoing will increase the absorptive and withdrawal capabilities of Semitropic over and above the pre-Program conditions. Metropolitan's participation may not fully utilize these capacities. Therefore, Semitropic has developed and will be offering other potential Banking Partners (as defined in Article 1) the opportunity to participate in the Program on substantially the same terms and conditions as Metropolitan. Metropolitan has reviewed the terms and conditions of that certain document entitled "Semitropic Groundwater Banking Program Payment and Banking Capacity Rights Options" dated August 1, 1994, setting forth the terms on which other parties may participate in the Program as Banking Partners (the "**Program Options**"). A copy of that document is on file with both Semitropic and Metropolitan. Metropolitan has agreed that anyone who is a party to an agreement with Semitropic which includes one or more of options 1 through 4 of the Program Options and which does not violate any of the requirements of this Agreement will be a Banking Partner.

I. As a part of this Agreement, Semitropic, as trustee, will hold in trust for Metropolitan, in accordance with the terms of this Agreement, the water deposited by Metropolitan (or its equivalent), together with the right to withdraw it and to deliver it to the California Aqueduct. The parties create this trust relationship for the purpose of protecting Metropolitan's ability to recover Stored Water, and Semitropic's fiduciary duty is limited to Semitropic's

responsibilities as set forth in this Agreement. In addition, Semitropic, in a non-fiduciary capacity, will provide such water resource management services as are necessary to implement and operate the Program. Semitropic's non-fiduciary obligations include taking such actions, including the construction of facilities, securing agreements and entering into operational arrangements, as are necessary to receive from Metropolitan water delivered by Metropolitan for storage hereunder and to return equivalent water to Metropolitan in accordance with the terms of the Agreement. The Program, as implemented with respect to Metropolitan by this Agreement, when combined with other necessary actions undertaken by Metropolitan, will thus allow the delivery of Stored Water to Metropolitan during Metropolitan's peak demand periods. When such services are provided by Semitropic, Metropolitan will make payments to Semitropic, as provided for in this Agreement, to compensate Semitropic for its services and expenses. These include: payments when water is stored, as provided in Section 6.2; payments under certain conditions when water is left in storage for more than five years, as provided in Section 6.4; payments when water is returned from storage, as provided in Section 6.3; payments with respect to energy used to recover water from the groundwater basin and to deliver that water to the California Aqueduct, as provided in Section 6.3; and payments for operation and maintenance expenses under certain circumstances, as provided in Section 6.7.

Although Metropolitan does not guarantee its level of participation in the Program, it is anticipated that Metropolitan will acquire at least 35 percent of the Program's capabilities, rights and capacities described in Recital H and elsewhere in this Agreement. Until that has occurred (that is, until such time as Metropolitan's Permanent Storage Allocation is Fully Vested (as those terms are defined in Section 1.7)), Metropolitan will pay $90 per acre-foot to store water,

and such payments shall continue to the extent that Metropolitan has elected to acquire additional Permanent Storage Allocation as provided in Section 6.6. After Metropolitan's Permanent Storage Allocation is Fully Vested, Metropolitan will pay $50 per acre-foot to store water. Until Metropolitan has recovered all of the water it stored at $90 per acre-foot, Metropolitan will pay $40 per acre-foot for water recovered. After all such water has been recovered, Metropolitan will pay $50 per acre-foot for water recovered. In addition, until Metropolitan's Permanent Storage Allocation is Fully Vested, Metropolitan will pay $20 per acre-foot for water left in storage for more than five years, and such payments shall continue to the extent that Metropolitan has elected to acquire additional Permanent Storage Allocation as provided in Section 6.6. Thereafter, Metropolitan will no longer pay this cost for water left in storage. If, after the first 10 years of this Agreement, Metropolitan's Permanent Storage Allocation has not become Fully Vested, and Semitropic elects to no longer provide interim Program capabilities, capacities and rights as described below, Metropolitan will pay $50 per acre-foot for any additional water stored by Metropolitan and thereafter Metropolitan will not pay the $20.00 fee provided for in Section 6.4.

Metropolitan will acquire a proportionate share of total Program capabilities, capacities and rights for the term of this Agreement as Metropolitan's Permanent Storage Allocation "vests," as provided in Section 1.7 (the amounts credited for purposes of determining Metropolitan's Permanent Storage Allocation including: (i) all payments for the storage of water made pursuant to Section 6.2.1 (the "**$90 Per Acre-Foot Storage Payments**"), (ii) all payments made pursuant to Section 6.4 with respect to certain water stored for more than five years (the "**$20 Per Acre-Foot Long-Term Storage Payments**"), and (iii) an amount (the "**Withdrawal Credit**") equal to the amount that has been paid and will be due pursuant to Section 6.3.1 when

Stored Water for which $90 Per Acre-Foot Storage Payments was made is returned. After Metropolitan's Permanent Storage Allocation is Fully Vested, as provided in Section 1.7, Metropolitan may increase its vested Permanent Storage Allocation by continuing to pay for the storage and return of water at the rates set forth in the immediately preceding sentence, as provided for in Section 6.6.

For the first ten years of the Agreement, Semitropic will allocate interim Program capabilities, capacities and rights to Metropolitan sufficient to make available to Metropolitan at least: (i) 35 percent of Semitropic's then existing capability to store water using then existing facilities, (ii) 35 percent of Semitropic's then existing ability to return water through State Water Project entitlement exchange available, and (iii) a minimum capacity of 31,500 acre-feet per year to return water pumped from the Semitropic Basin directly to the California Aqueduct through Semitropic's facilities.

Under the terms of this Agreement, those amounts which result in the acquisition by Metropolitan of Permanent Storage Allocation (that is, the $90 Per Acre-Foot Storage Payments, the $20 Per Acre-Foot Long-Term Storage Payments and the Withdrawal Credits for amounts payable pursuant to Section 6.3.1 upon the return of Stored Water) are to be adjusted using the Engineering News Record Index, and all other amounts which are to be adjusted will be adjusted using the Consumer Price Index, as hereinafter provided.

J. The trust relationship between Metropolitan, as settlor and beneficiary, and Semitropic, as trustee, created by this Agreement and described in these Recitals, is entered into

by the Parties solely for the purpose of protecting Metropolitan's interest in water delivered by Metropolitan to Semitropic hereunder for storage, and the right of Metropolitan, also held in trust by Semitropic for Metropolitan to recover from the Semitropic Basin, water in a quantity sufficient to return to Metropolitan, a quantity equal to Metropolitan's Storage Account Balance, such right to be exercised by Semitropic, as trustee, through the lands, facilities, rights and interests of Semitropic, or by its successor in interest in and to the trust property, all in accordance with the terms of this Agreement. Semitropic acknowledges and agrees that all water delivered to it by Metropolitan hereunder will be received, held, exchanged, accounted for, and returned or otherwise disposed of by Semitropic in its capacity as trustee for Metropolitan with respect to such water and the easements and rights relating thereto provided for herein. Metropolitan has herein authorized Semitropic, as trustee, to commingle, exchange or otherwise dispose of the water delivered by Metropolitan hereunder. In exchange for those rights and for water delivered hereunder, Semitropic has granted, and does hereby grant, to Metropolitan the right to an equal quantity of water from the lands, facilities, rights and interests of Semitropic (subject, however, to the loss provisions of Article 4), together with such easements and other rights as are necessary to transport the recovered water to the California Aqueduct for delivery to Metropolitan therein, all upon, and subject to the provisions of, this Agreement (all which rights and easements may be referred to herein, collectively, as the "**Trust Property**"). Metropolitan has granted, and does hereby grant, to Semitropic said Trust Property, in trust, for the use and benefit of Metropolitan. The trust relationship created by this Agreement is not otherwise intended to apply to or effect the obligations of Semitropic or Metropolitan hereunder, or the remedies in the event of default; it being expressly understood and agreed that Semitropic's obligations hereunder to, among other things, construct facilities and enter into agreements with others in furtherance of the Program shall

not be fiduciary in nature. Notwithstanding creation of a trust under this Agreement, Semitropic may benefit from the Program set forth in this Agreement.

K. Metropolitan has previously delivered 45,377.2 acre-feet of water to Semitropic pursuant to the February 1, 1993, "Temporary Agreement for a Metropolitan-Semitropic Water Banking and Exchange Program." Metropolitan and Semitropic desire that such water hereafter be held and disposed of by Semitropic for the benefit of Metropolitan under this Agreement, as hereinafter provided.

DECLARATION OF TRUST

Metropolitan hereby appoints Semitropic to hold, and Semitropic hereby accepts such appointment and agrees to hold, in trust, for the use and benefit of Metropolitan, as beneficiary, Metropolitan's Stored Water (as hereinafter defined), together with all of the other Trust Property (as defined in Recitals J and K above), upon the terms set forth in this Agreement. The trust created under this paragraph exists only for the purposes described in Recitals I, J and K above, relating to protection of Metropolitan's ability to recover its Stored Water if Semitropic fails or refuses to do so when required to do so by this Agreement, and only with respect to the Stored Water and the other Trust Property. The creation of a trust under this paragraph does not otherwise enlarge or reduce the rights or obligations of the Parties. If and to the extent Semitropic performs its obligations as provided in this Agreement, Semitropic will not be deemed or construed to have breached any fiduciary duty to Metropolitan arising out of the trust provided for in this Agreement.

ARTICLE 1. DEFINITIONS

As used in this Agreement, each of the following terms shall have the respective meaning given to it in this Article 1 unless expressly stated to the contrary where such term is used. Further, each provision in this Article or in the Recitals which is stated in declarative form (for example, "will be adjusted") or is otherwise stated as an agreement between the Parties, rather than as a statement of their intent or purpose, shall be construed to be an operative part of this Agreement and shall be enforceable.

1.1 **"Agreement"** means, as of any particular time, this Agreement for a Metropolitan-Semitropic Water Banking and Exchange Program, as amended or supplemented by the Parties through that time.

1.2 **"Banking Partner"** means, as of any particular time, Metropolitan and any other entity which is then a party to a water banking and exchange agreement with Semitropic which includes one or more of options 1 through 4 of the Program Options and which does not violate to the requirements of this Agreement. The term "Banking Partner" does not include a Lower Priority Banking Partner.

1.3 **"In-Lieu Service Area"** means lands which have at least a five year history of cultivation using groundwater, the owners of which have executed surface water service contracts with Semitropic acknowledging and agreeing to cooperate with Semitropic in fulfilling its obligation to carry out the Program, that provide for the reasonable and beneficial use of water made available to Semitropic for banking and other purposes on that land in lieu of pumping

groundwater, and whose on-farm systems have been connected to Semitropic's surface water distribution system to receive water delivered to Semitropic for storage purposes. It is estimated that, upon completion of all Program facilities, the In-Lieu Service Area will be 23,000 acres.

1.4 **"Interim Storage Allocation"** means, as of any particular time, and with respect to any particular Banking Partner, that portion of the total 1,000,000 acre-foot Program storage capacity then allocated to that Banking Partner which has not yet become Permanent Storage Allocation of a Banking Partner. As Permanent Storage Allocation is acquired by a Banking Partner, as provided in Section 1.7, the Interim Storage Allocation of that Banking Partner is reduced by an identical amount.

1.5 **"Lower Priority Banking Partner"** means an entity which is not a Banking Partner and which enters into an agreement with Semitropic to utilize all or part of Program Delivery Capability, Unused Semitropic Delivery Capability, Program Pumpback Capacity or Program Entitlement Exchange Rights during such time period when not required to be available for use by Semitropic or Banking Partners.

1.6 **"Metropolitan's Share of Total Program Capital Cost"** means, until December 31, 1995, $46,900,000.00 (which is thirty-five percent (35%) of the Total Program Capital Cost as of the date of this Agreement). As of January 1, 1996, and annually thereafter, until the time when the sum of all payments made by Metropolitan under Sections 6.2.1, 6.3.1 and 6.4 and any payments creditable for this purpose under Section 5.10 (collectively, the **"Prior Payments"**) equals Metropolitan's Share of Total Program Capital Costs (as redetermined pursuant to this

Section through that time), Metropolitan's Share of Total Program Capital Cost shall be redetermined for, respectively, calendar year 1996, and for each such subsequent calendar year, by adding the Unpaid Portion (defined and adjusted as provided below) of Metropolitan's Share of Total Program Capital Costs as of the beginning of that calendar year to the sum of Metropolitan's Prior Payments with respect to the period from the date of this Agreement through the end of the prior calendar year, using the following formula (such redetermination to be made in each calendar year when Metropolitan has paid all amounts due under Sections 5.10, 6.2.1, 6.3.1 and 6.4 through the end of the prior calendar year):

$$MS_{cy} = \left\{ \sum_{n=94}^{cy-1} P_n \right\} + UP_{cy}$$

where:

"$_{cy}$" refers to the calendar year with respect to which the redetermination is being made;

"$_{cy-1}$" refers to the calendar year prior to the calendar year with respect to which the redetermination is being made (that is, 1995 with respect to the redetermination for use in 1996; 1996 for 1997; and so on);

"MS_{cy}" means Metropolitan's Share of Total Program Capital Cost for the calendar year with respect to which the redetermination is being made (the first such calendar year being 1996; the second 1997; and so on), such redetermination being made by using the formula set forth above;

$\sum_{n=94}^{cy-1} P_n$ means the sum of all annual payments (P as defined below) from the calendar year 1994 through the calendar year immediately preceding the calendar year with respect to which the redetermination is being made.

"P_n" (or Payments by Metropolitan to Semitropic with respect to a particular year) means the sum of the following amounts paid by Metropolitan with respect to that year, whether paid during or after that year:

(a) All amounts paid with respect to that calendar year pursuant to Section 6.2.1 for Stored Water delivered by Metropolitan to Semitropic; plus

(b) All amounts paid with respect to that calendar year pursuant to Section 6.3.1 for Stored Water theretofore delivered to Metropolitan; plus

(c) All amounts paid with respect to that calendar year pursuant to Section 6.4; plus

(d) All amounts paid with respect to that calendar year pursuant to Section 5.10 that are creditable against Metropolitan's Share of Total Program Capital Cost under Section 5.10.

"UP_{cy} (or Metropolitan's Adjusted Unpaid Share of Total Program Capital Cost as of the beginning of the calendar year with respect to which the redetermination is being made) means: (i) with respect to the redetermination of Metropolitan's Share of Total Program Capital Cost for calendar year 1996, $46,900,000 minus the sum of P_n (as defined above) determined for 1994 ("P_{94}") plus P_n determined for 1995 ("P_{95}"); and (ii) for each subsequent year, the amount determined for such year using the following formula:

$$UP_{cy} = AI_{cy} \times \{ UP_{cy-1} - P_{cy-1} \}$$

where in addition to the above definition:

"$\mathbf{AI_{cy}}$" (the "**Adjustment Index**" for the calendar year with respect to which the redetermination is being made) means a fraction, the numerator of which is the Construction Costs Index for Los Angeles published by the Engineering News Record (the "**Construction Costs Index**") for December of the calendar year immediately preceding the calendar year with respect to which the determination is being made (that is, for December 1995 with respect to the determination of Metropolitan's Share of Total Program Capital Cost for 1996; December 1996 for 1997; and so on), and the denominator of which is the Construction Costs Index for December of the calendar year which is two years prior to the calendar year with respect to which the determination is being made (provided, however, that for the determination of Metropolitan's Share of Total Program Capital Cost for 1996, the denominator shall be the Construction Costs Index for June 1994, which the parties agree is 6,550.36 based on a 1913 value of 100) (that is, the denominator shall be the Construction Costs Index for December 1995 with respect to the determination of Metropolitan's Share of Total Project Capital Cost for 1997; December 1996 for 1998; and so on). If Construction Costs Index ceases to be published or if the base year for the Construction Costs Index or the methodology by which the Construction Costs Index is determined is modified, then the Construction Costs Index to be used in the calculations required by this Section 1.6 shall be modified as provided for in Section 6.2.3.

"$\mathbf{UP_{cy-1}}$" means $\mathbf{UP_{cy}}$ as determined for the immediately preceding calendar year (that is, in determining $\mathbf{UP_{cy}}$ for 1996 ("$\mathbf{UP_{96}}$"), $\mathbf{UP_{cy-1}}$ for that redetermination means the $\mathbf{UP_{cy}}$ determined for 1995 ("$\mathbf{UP_{95}}$"); in determining $\mathbf{UP_{cy}}$ for 1997 ("$\mathbf{UP_{97}}$"), $\mathbf{UP_{cy-1}}$ for that redetermination means the $\mathbf{UP_{cy}}$ determined for 1996 ("$\mathbf{UP_{96}}$"); and so on);

" P_{cy-1}" means P_n (as previously defined) with respect to the calendar year immediately preceding the calendar year with respect to which the redetermination is being made (that is, in determining UP_{96}, P_{cy-1} for that redetermination means the P_n determined for 1995 ("P_{95}")) in determining UP_{97}, P_{cy-1} for that redetermination means the P_n determined for 1996 ("P_{96}"); and so on); and

If, pursuant to Section 2.5, Metropolitan's Interim Storage Allocation is eliminated, Metropolitan's Share of Total Program Capital Cost thereafter shall mean an amount equal to the sum of payments made pursuant to Sections 6.2.1 and 6.4 and payments made and payments which, upon the return of water, would be due pursuant to Section 6.3.1.

1.7 **"Permanent Storage Allocation"** means, with respect to any particular Banking Partner and as of any particular time ("$_t$"), the portion of the total 1,000,000 acre-foot Program storage capacity which is allocated to that Banking Partner as of that time. Until the earlier of the time when Metropolitan's Permanent Storage Allocation equals 350,000 acre-feet or any remaining portion of Metropolitan's Interim Storage Allocation is eliminated by Semitropic pursuant to Section 2.5, Metropolitan's Permanent Storage Allocation as of any particular time shall be determined using the following formula:

$$MPSA_t = \left\{ \frac{P_p + P_t}{TPCC_{cy}} + \sum_{n=94}^{cy-1} \frac{P_n}{TPCC_n} \right\} \times 1{,}000{,}000 \text{ acre-feet}$$

where:

"$MPSA_t$" means Metropolitan's Permanent Storage Allocation as of the particular time with respect to which it is being determined, measured in acre feet;

"P_p" means all amounts that would be due to Semitropic pursuant to Section 6.3.1 if all of the water in Metropolitan's Storage Account at that time was delivered to Metropolitan at that time;

"P_t" means all amounts paid, and all amounts then payable unless delinquent, by Metropolitan under Sections 6.2.1, 6.3.1 and 6.4 with respect to the period from the beginning of the calendar year during which that particular time (,) occurs and that particular time, plus any payments creditable and all amounts which, when paid, will be creditable under Section 5.10 for purposes of determining Metropolitan's Permanent Storage Allocation for the period from the beginning of the calendar year during which that particular time (,) occurs and that particular time;

"$TPCC_{cy}$" means Total Program Capital Cost, as defined in Section 1.15, for the calendar year during which that particular time occurs (that is, if **MPSA** is being determined as of April 1, 1999, $TPCC_{cy}$ means $TPCC_{99}$);

"P_n" has the meaning given to that term in Section 1.6;

$\sum_{n=94}^{cy-1} \frac{P_n}{TPCC_n}$ means the sum of the percentages which result from dividing the payments P_n for a given year by the TPCC for that same year, from calendar year 1994 through the calendar immediately preceding the calendar year in which **MPSA**, is being determined; and

"$TPCC_n$" means Total Program Capital Cost, as defined in Section 1.15, for the same calendar year as P_n (that is, when P_n is P_{99}, $TPCC_n$ means $TPCC_{99}$).

At the earlier of the time (which time may be referred to herein as the "**Time of Full Vesting**") when: (i) MPSA equals 350,000 acre-feet, or (ii) any remaining portion of Metropolitan's Interim Storage Allocation is eliminated by Semitropic pursuant to Section 2.5, Metropolitan's Permanent Storage Allocation shall be deemed to be "**Fully Vested**" and, thereafter, Metropolitan's Permanent

Storage Allocation shall be equal to Metropolitan's Permanent Storage Allocation at the Time of Full Vesting, subject, however to the provisions of Sections 2.6, 6.5 and 6.6 (which permit Metropolitan to acquire additional Permanent Storage Allocation as therein provided). An example showing the acquisition of Permanent Storage Allocation by Metropolitan is attached as Exhibit B.

1.8 **"Program"** means those facilities, agreements and operational activities, described in Recital H and elsewhere, necessary for Semitropic to provide the water storage, management, pumpback and exchange services specified in this Agreement and in other water banking and storage agreements contemplated by this Agreement.

1.9 **"Program Delivery Capability"** means the capability to deliver water for storage made available as a result of the construction of Program facilities, agreements and operational activities. The absorptive capability of the proposed 23,000 acre In-Lieu Service Area plus improvements in the delivery capability to the existing SWSA and TWSA are currently estimated to be 90,500 acre-feet per year, based on current cropping patterns and irrigation efficiencies. The estimated total annual and monthly quantities of Metropolitan's Program Delivery Capability upon completion of all Program facilities is shown at Exhibit C hereto.

1.10 **"Program Entitlement Exchange Rights"** means the rights of Banking Partners to exchange an amount of Stored Water through entitlement exchange for an equal amount of Semitropic's allocation of Agency's SWP Entitlement Water from the California Aqueduct pursuant to this Agreement or other similar agreements between Semitropic and other Banking Partners. Upon completion of such an exchange by Metropolitan, Metropolitan's beneficial interest in the

Stored Water that was the subject of the exchange shall vest in Semitropic and the quantity so exchanged shall be deducted from Metropolitan's Storage Account Balance. Upon completion of necessary Program facilities, the total amount of Program Entitlement Exchange Rights available to Banking Partners will be equal to Semitropic's SWP Entitlement allocation less the first 25,000 acre-feet. If the nature or description of Semitropic's allocation of the Agency's SWP Entitlement Water is modified, such alternative supply from the SWP shall to such extent be substituted for Semitropic's allocation of Agency's SWP Entitlement Water. Alternative supplies shall include water purchases by the SWP or from sources generally available to State water contractors, as well as water from facilities participation in which is generally made available to State water contractors. Nothing in the preceding sentence shall obligate Semitropic to participate in such programs. When all necessary Program facilities are constructed, the maximum Program Entitlement Exchange Rights of the Banking Partners at any time will be 158,000 acre-feet minus 25,000 acre-feet (133,000 acre-feet) times the sum of all Banking Partners Interim and Permanent Storage Allocation divided by 1,000,000 acre-feet. Assuming Metropolitan's Permanent Storage Allocation is 350,000 acre-feet, Metropolitan's maximum share of Program Entitlement Exchange Rights thus would be 46,550 acre-feet. Exhibit A specifies the maximum Program Entitlement Exchange Rights as Banking Partners' Permanent Storage Allocation is accumulated.

1.11 **"Program Pumpback Capacity"** means the capacity, measured in acre-feet per year and CFS, to return Stored Water to the California Aqueduct. Upon completion of all necessary Program facilities, the minimum annual Program Pumpback Capacity shall be 90,000 acre-feet per year at a maximum instantaneous flow rate of 300 CFS. Exhibit C establishes the

minimum Program Pumpback Capacity available as the Banking Partners' accumulate Permanent Storage Allocation.

1.12 **"SWP Entitlement Water"** means entitlement water as provided for in the state water contracts, as well as the alternative supplies provided for in the definition of Program Entitlement Exchange Rights.

1.13 **"Storage Account Balance"** means, with respect to a particular Banking Partner, that Banking Partner's accumulated total Stored Water less the accumulated withdrawals of Stored Water by that Banking Partner. Records of these accounts shall be maintained by Semitropic and they shall be subject to audit, review and approval by the Banking Partners, at the expense of the auditing or reviewing Banking Partner, on an annual basis.

1.14 **"Stored Water"** means, with respect to any particular Banking Partner, water delivered for storage by that Banking Partner as measured at Semitropic's turnout in Reach 10A of the California Aqueduct, less losses deducted in accordance with Article 4, which losses shall be accounted for concurrently with the delivery of water to Semitropic for storage. Semitropic acknowledges that the 45,377.2 acre-feet of water described in Recital K above will be included in Metropolitan's Stored Water as provided in Section 5.10. Metropolitan acknowledges that Metropolitan's Stored Water may be commingled with other water. At all times during the term of this Agreement, an amount of water available to Semitropic in the Semitropic Basin equal to the amount of the Metropolitan Storage Account Balance shall be deemed to be Metropolitan's Stored Water. So long as water in the amount of Metropolitan's Storage Account Balance remains

in the Semitropic Basin, Semitropic, as trustee, shall be deemed to remove Metropolitan's Stored Water from storage only as and when requested by Metropolitan pursuant to the terms of this Agreement and any other removal of water by Semitropic from the Semitropic Basin shall be deemed to be the removal of water that is not Metropolitan's Stored Water. If at any time the amount of water in the Semitropic Basin is less than the sum of the Storage Account Balances of the Banking Partners (an event which the parties believe is extremely unlikely), any additional water subsequently available to Semitropic from the Semitropic Basin without interfering with the rights of landowners or other public agencies, shall be shared by the Banking Partners in proportion to their respective Storage Account Balances, until such time as the amount of water so available to Semitropic from the Semitropic Basin equals or exceeds the total of the Storage Account Balances of the Banking Partners.

1.15 **"Total Program Capital Cost"** means $134,000,000.00 in 1994 dollars, which amount shall be adjusted annually, as of the first day of each calendar year for such calendar year, beginning January 1, 1996, said $134,000,000.00 shall be adjusted on the same basis as in Section 6.2.1.

1.16 **"Unused Semitropic Delivery Capability"** means that portion of Semitropic's pre-Program Delivery Capability (i.e., approximately 220,000 acre-feet per year plus approximately 10,000 acre-feet per year of direct percolation capability) which is not used for delivery of Semitropic's SWP Entitlement Water, Agency Pool Water, Shafter-Wasco Irrigation District deliveries pursuant to Section 5.9 or other water available to be used by Semitropic for non-banking purposes.

ARTICLE 2.
ALLOCATION AMONG BANKING PARTNERS

2.1 Banking Partners shall have the first priority to utilize their shares of Program Delivery Capability, Program Pumpback Capacity and Program Entitlement Exchange Rights as described in this Agreement. Banking Partners in all cases shall have the first priority to use any Program Delivery Capability, Unused Semitropic Delivery Capability, Program Pumpback Capacity or Program Entitlement Exchange Rights during such time periods when not required for use by other Banking Partners. Semitropic shall notify each Banking Partner not using its respective share of said Program capability, capacity or right, when other entities including Banking Partners desire to utilize it and of any use made of it.

2.2 Semitropic shall not enter into any other water banking programs or other agreements which would interfere with the Program benefits and rights of the Banking Partners.

2.3 Then existing Banking Partners will be given an opportunity to review the terms and conditions of proposed agreements with potential Banking Partners and Lower Priority Banking Partners and to review Semitropic's records regarding administration of the Program. Such Lower Priority Banking Partners' agreements and activities shall not adversely impact Banking Partners' ability to utilize any benefits under this Agreement. If Semitropic or one or more then existing Banking Partners believe that other potential Banking Partners' proposed agreements or potential Lower Priority Banking Partners' proposed agreements violate any of the provisions of this Agreement or other such Agreement, any Party may seek dispute resolution pursuant to Article 9

concerning such matter. In this event, Semitropic shall only enter into agreements in conformity with the result of the dispute resolution.

2.4 At no time under this Program shall the sum of all Banking Partners' Interim and Permanent Storage Allocations exceed 1,000,000 acre-feet.

2.5 For a period of ten (10) years, commencing with the date of execution of this Agreement, Metropolitan's maximum Interim Storage Allocation shall be 350,000 acre-feet, subject to the provisions of Sections 2.6, 6.5 and 6.6. In order to convert all of such Interim Storage Allocation to an equivalent Permanent Storage Allocation, the total of Payments, Actual and Prospective (as defined in Section 1.7), by Metropolitan to Semitropic within said 10 years must equal or exceed Metropolitan's Share of Total Program Capital Costs. Effective on or after the termination of this ten-year period, Semitropic may eliminate any remaining Interim Storage Allocation which has not been converted to Permanent Storage Allocation by Metropolitan as provided in Section 1.7.

2.6 With the exception of agreements which Semitropic enters into with agencies or districts within Kern County, Semitropic shall offer Metropolitan a right of first refusal for any agreement which Semitropic proposes to enter into with a Lower Priority Banking Partner. Further, after five years from the date of execution of this Agreement, if Semitropic negotiates an agreement with another potential Banking Partner, Semitropic shall offer Metropolitan a right of first refusal for the Interim and Permanent Storage Allocation provided for in such agreement and on the same terms and conditions, irrespective of the maximum amount specified in Section 2.5.

Metropolitan must notify Semitropic in writing of its intent to exercise such options within forty-five (45) days of receiving written notice from Semitropic transmitting the proposed agreement.

ARTICLE 3.
DELIVERY OF WATER BY BANKING PARTNERS TO SEMITROPIC

3.1 Each Banking Partner, at its sole cost and expense, may deliver a portion of its SWP Entitlement Water, or water from any other available sources mutually agreed upon by the respective Banking Partner with Semitropic, to the Semitropic turnout in Reach 10A of the California Aqueduct. Each Banking Partner shall notify Semitropic of its intent as early in the year as possible, preferably no later than April 15. Such water will be scheduled and delivered to Semitropic at times and rates of delivery acceptable to Semitropic, the Agency and the Banking Partner and shall not exceed the Program Delivery Capability and Unused Semitropic Delivery Capability nor shall it exceed the available capacity of Semitropic's distribution system.

3.2 Semitropic will take control and possession at the Semitropic turnout in Reach 10A of the California Aqueduct of water delivered to Semitropic by any Banking Partner for storage, and will credit the Storage Account Balance of that Banking Partner with Stored Water in an amount equal to the water so delivered less the deduction for losses provided for in Article 4 with respect to such water (the "Stored Water"). At the time Semitropic takes control and possession of water delivered by Metropolitan, legal title to Metropolitan's water, together with the right to withdraw from the Semitropic Basin an amount sufficient to return to Metropolitan the Stored Water, shall vest in Semitropic, as trustee for Metropolitan. Upon taking control and possession

of water delivered hereunder for storage by Metropolitan, Semitropic, at its sole cost and expense, will do either of the following: (i) transport and store such water by direct percolation; or (ii) exchange that water for an interest in and right to withdraw from the Semitropic Basin an amount of water sufficient to return to Metropolitan the Stored Water (which interest and right shall thereafter be Trust Property). In either case, Semitropic shall thereafter hold and return or otherwise dispose of the Trust Property as provided for in this Agreement. Upon crediting Metropolitan's Storage Account Balance for the amount of any water exchanged as described in clause (ii) above, Semitropic may deliver the exchanged water to water users for surface water service in lieu of pumping groundwater. Semitropic shall retain the right to use its facilities to deliver water supplies made available to it by Banking Partners and acquired by Semitropic by exchange pursuant to clause (ii) above as it deems appropriate.

3.3 Program Delivery Capability shall be allocated among Banking Partners in accordance with the ratio of the Banking Partner's portion of Permanent Storage Allocation to the sum of all Banking Partners' Permanent Storage Allocations.

3.4 If, due to hydrologic conditions, changes in cropping patterns or other reasons, Program Delivery Capability is reduced, the Banking Partners may request, and Semitropic shall provide, information accounting for such reduction. If such reduction is not due to temporary conditions, Semitropic shall take all actions necessary to comply with Exhibit C.

3.5 Unused Semitropic Delivery Capability shall be allocated among the Banking Partners requesting the use of such Unused Semitropic Delivery Capability according to the ratio

of the sum of such Banking Partner's Interim and Permanent Storage Allocation, to the sum of all such Banking Partners' Interim and Permanent Storage Allocations.

3.6 If, after reasonable efforts by Semitropic to accommodate the Banking Partners' storage scheduling requests, such requests nevertheless exceed the instantaneously available Program Delivery Capability and Unused Semitropic Delivery Capability, Semitropic shall allocate available capacities in proportion to the total of each Banking Partners' Interim and Permanent Storage Allocations.

ARTICLE 4. LOSSES AND STORED WATER

Semitropic's distribution system, evaporative and aquifer losses, for purposes of this Agreement and similar agreements between Semitropic and other Banking Partners, are collectively assumed to be ten percent (10%) of the amount of water furnished by Banking Partners for storage as measured at Semitropic's turnout in Reach 10A of the California Aqueduct. This amount and the Storage Account Balance shall be modified in the future, if the results of studies to be conducted jointly by Metropolitan, other Banking Partners and Semitropic establish the actual loss to be different than the assumed ten percent (10%) losses. The Storage Account Balance shall be adjusted accordingly and resulting adjustments in compensation payments shall be in accordance with Section 6.11.

ARTICLE 5.

RETURN OF WATER BY SEMITROPIC TO METROPOLITAN

5.1 In any year, upon request by Metropolitan, Semitropic shall return Stored Water to Metropolitan by the method set forth in Section 5.1.1 or the method set forth in Section 5.1.2 or both.

5.1.1 Semitropic may exchange an amount of Metropolitan's Stored Water for an equal amount of Semitropic's SWP Entitlement Water. Metropolitan hereby consents to such an exchange and Semitropic will be deemed to have effected such an exchange by delivering a portion of its SWP Entitlement Water to Metropolitan at the Semitropic turnout. Upon completion of such an exchange, Metropolitan's beneficial interest in the Stored Water that was the subject of the exchange and the right to withdraw such water shall be vested in Semitropic in its individual capacity, and Semitropic may thereafter deliver such water to its water users who would otherwise have received the portion of Semitropic's SWP Entitlement Water that was delivered to Metropolitan as a result of the exchange.

5.1.2 Semitropic may return Metropolitan's Stored Water to Metropolitan by pumping water from the groundwater basin back to the Aqueduct for delivery to Metropolitan.

5.2 The return of Stored Water by Semitropic to Metropolitan shall be subject to the following terms and conditions:

5.2.1 Subject to the provisions of this Agreement, for each acre-foot of Stored Water held by Semitropic for Metropolitan, Semitropic shall ultimately return one acre-foot of water to Metropolitan.

5.2.2 Subject to the provisions of this Agreement, when Metropolitan requests the return of Stored Water, Semitropic shall return at a minimum the quantities of water calculated in accordance with the following, using its reasonable efforts to accommodate Metropolitan's delivery schedule:

5.2.2.1 Program Pumpback Capacity shall be allocated among Banking Partners according to the ratio of each Banking Partner's combined Interim and Permanent Storage Allocations divided by 1,000,000 acre-feet. For the first ten (10) years, however, Metropolitan shall receive a minimum guarantee of 31,500 acre-feet of Program Pumpback Capacity. Each Banking Partner shall have a right to any then existing Program Pumpback Capacity not used by other Banking Partners, subject to mitigation of impacts to other Banking Partners pursuant to Section 5.6. If requests by Banking Partners for unused Program Pumpback Capacity exceed such capacity, then the unused Program Pumpback Capacity shall be allocated to each Banking Partner according to the ratio of its combined Interim and Permanent Storage Allocations, divided by the sum of the combined Interim and Permanent Storage Allocations of all Banking Partners wishing to use the unused capacity times the amount of unused Program Pumpback Capacity.

5.2.2.2 Program Entitlement Exchange Rights shall be allocated to each Banking Partner according to the ratio of its combined Interim and Permanent Storage

Allocations divided by 1,000,000 acre-feet times the Program Entitlement Exchange Rights to be allocated. Each Banking Partner shall have a right to any Program Entitlement Exchange Rights not required for use by other Banking Partners, subject to mitigation of impacts to other Banking Partners pursuant to Section 5.6. If requests by Banking Partners for unused Program Entitlement Exchange Rights exceed such rights, then the unused Program Entitlement Exchange Rights shall be allocated to each Banking Partner according to the ratio of its combined Interim and Permanent Storage Allocations, divided by the sum of the combined Interim and Permanent Storage Allocations of all Banking Partners wishing to use the unused Program Entitlement Exchange Rights times unused Program Entitlement Exchange Rights.

5.2.3 In the event it is determined in the future that the minimum annual Program Pumpback Capacity is less than 90,000 acre-feet per year but greater than 31,500 acre-feet per year and/or the maximum Program Entitlement Exchange Rights are less than 133,000 acre-feet per year but greater than 46,550 acre-feet per year on a permanent basis, and Metropolitan's Permanent Storage Allocation is Fully Vested (as defined in Section 1.7), and, during the first ten (10) years of this Agreement, whether or not Metropolitan's Permanent Storage Allocation is fully vested, Metropolitan's minimum guarantee of 31,500 acre-feet per year of Program Pumpback Capacity and its maximum of 46,550 acre-feet per year (133,000 acre-feet per year times 35 percent) of Program Entitlement Exchange Rights shall not be reduced. In the event said capacity and rights are less than Metropolitan's minimum guarantee of 31,500 acre-feet per year and less than 46,550 acre-feet per year of Program Entitlement Exchange Rights, and if Metropolitan's Permanent Storage Allocation is Fully Vested, and, during the first ten (10) years of this Agreement, whether or not Metropolitan's Permanent Storage Allocation is fully vested, Metropolitan shall be allocated

all of said capacity and rights. If, however, pursuant to Section 2.5, Metropolitan's Permanent Storage Allocation is reduced, such Program Pumpback Capacity and Program Entitlement Exchange Right shall be reduced to its vested rights. Temporary reductions in said capacity and rights are subject to Section 5.5.

5.3 Metropolitan shall notify Semitropic of its intent to take delivery of Stored Water as early in the year as possible, but no later than May 1 of the same year. If such notification is provided after May 1, Semitropic, at its sole discretion, may make reasonable efforts to comply with Metropolitan's request. In the event of an emergency need for water by Metropolitan, Semitropic shall endeavor to return Stored Water to Metropolitan to the maximum extent feasible.

5.4 Semitropic shall be responsible for obtaining approval from DWR to deliver Stored Water by pumpback to the California Aqueduct. In addition it shall be Semitropic's responsibility to notify the Agency, each Banking Partner, and DWR, as to the amount of Program Entitlement Exchange Rights and Program Pumpback Capacity for that year. When Stored Water is returned by pumpback, it shall be returned during Semitropic's off-peak irrigation season and other periods which Semitropic determines to be operationally feasible, on a schedule acceptable to the respective Banking Partner, Agency and DWR and at varying rates of delivery. Banking Partner shall be responsible for all necessary approvals and costs once the Stored Water is returned to the California Aqueduct at the Semitropic turnout by either Program Pumpback or Program Entitlement Exchange.

5.5 Notwithstanding any other provision of this Agreement, Semitropic will temporarily reduce or terminate groundwater pumping for the purpose of returning Stored Water to Banking Partners to the extent required pursuant to the MOU referenced above in Recital G. However, to the extent possible, Semitropic shall change the timing and location of pumping to avoid reduction or termination in the return of Stored Water pursuant to the MOU. Semitropic shall construct adequate facilities and/or secure agreements and/or operational arrangements to obtain the long term levels of service provided for in Exhibit A. Such long term levels of service may only be reduced to the extent required by the MOU referenced above in Recital G.

5.6 If the use by other Banking Partners, Lower Priority Banking Partners or Semitropic of unused Program Pumpback Capacity or unused Program Entitlement Exchange Rights referenced in Sections 5.2.2.1 and 5.2.2.2 interferes with the recovery of Metropolitan's or any other Banking Partner's Stored Water by causing a reduction or termination of pumping pursuant to the MOU, the Party or Parties responsible for the action(s) which impacts Metropolitan or any other Banking Partner shall reduce its withdrawal of Stored Water to make up Metropolitan's or other Banking Partner's loss and, to the extent reductions in the withdrawal of Stored Water are insufficient, shall provide, at the election of the impacted Banking Partner, an equivalent water supply in that year or cash in the amount of the replacement cost of such water, such water or cash to be for the benefit of and to be immediately distributed to the impacted Banking Partners. Semitropic shall adjust the Banking Partners' accounts to reflect any such water exchange.

5.7 Wells within Semitropic can currently produce water that will meet DWR's water quality standards to return water to the California Aqueduct. Semitropic shall take no direct action

which would knowingly cause the quality of recovered groundwater to not meet such water quality standards in effect. The preceding sentence shall not apply to delivery of water under non-banking programs or otherwise operating under this Program. In the event that future water quality standards change, or the quality of groundwater from Semitropic wells is such that Semitropic cannot meet acceptable DWR water quality requirements for pumping into the California Aqueduct, Stored Water shall be returned to Banking Partners by Program Entitlement Exchange or alternative methods satisfactory to the affected Banking Partners. Such alternative methods may include, but are not necessarily limited to: purchases, exchanges with others, and/or by improving Stored Water quality to acceptable standards for direct pumpback, with the additional costs of any such methods being paid by Banking Partners accepting such alternative methods. Semitropic's operations and financial situation shall not be adversely impacted as a result of these alternative methods.

5.8 This Agreement shall be subject to the "Agreement Between the Department of Water Resources of the State of California, Kern County Water Agency and Semitropic Water Storage District for 1990 Demonstration Semitropic Local Element," dated May 1, 1990, which provides for Semitropic to return all banked water to DWR solely by entitlement exchange. Said agreement expires when all banked water is withdrawn, or on December 31, 2010, whichever first occurs. Until such expiration, DWR has priority over Banking Partners in any year water is to be returned by entitlement exchange. The amount owed to DWR is 50,164 acre-feet as of January 1, 1994. After December 31, 1994, DWR can withdraw a maximum of 10,033 acre-feet per year. Any amendment to such agreement shall be subject to this Agreement and the review of the Banking Partners.

5.9 Metropolitan also recognizes that Semitropic has entered into an "Agreement Between Shafter-Wasco Irrigation District and Semitropic Improvement District of Semitropic Water Storage District Providing for Construction and Operation of an Intertie Pipeline," dated December 6, 1993, which implements a water banking and exchange program. Semitropic has committed to return water to Shafter-Wasco by delivery of either surface water in excess of its needs from any available source or by pumping groundwater. The agreement with Shafter-Wasco is based on the use of existing Semitropic facilities for the delivery of water to storage and for the withdrawal or return of water. Shafter-Wasco, therefore, has priority over Banking Partners in the use of existing facilities. Semitropic's obligation under said agreement does not require commitment of SWP entitlement nor the use of pumpback facilities required for the return of Banking Partners' Stored Water.

5.10 When the conditions set forth in clause (a) through (d) of Article 8 (the "**Article 8 Conditions**") have been satisfied and provided that this Agreement has not previously been terminated: (i) the 45,377.2 acre-feet of water currently in the Metropolitan storage account under the February 1, 1993, "Temporary Agreement for a Metropolitan-Semitropic Water Banking and Exchange Program" (the "**Temporary Agreement**") or so much thereof as has not been withdrawn, shall be transferred to Metropolitan's Storage Account under this Agreement, and (ii) the provisions of this Agreement shall supersede said Temporary Agreement and the 45,377.2 acre-feet shall be considered Stored Water under this Agreement, except that no additional payment pursuant to Section 6.2.1 is required. Such water will be subject to charges pursuant to Sections 6.3.1, 6.3.3, 6.4 and 6.7, as applicable. Payments made pursuant to Sections 6.3.1 and 6.4 shall be credited to Metropolitan's Share of Total Program Capital Costs. If, prior to satisfaction of the Article 8

Conditions, Metropolitan has withdrawn water stored under the Temporary Agreement and has paid (or has been or will be billed for) the return of such water at the rates provided in the Temporary Agreement, then Metropolitan may pay to Semitropic the difference between the sum of all payments made by Metropolitan with respect to withdrawal of such water under Article 4.2 of the Temporary Agreement other than the power component and the amount which would have been due pursuant to Section 6.3.1 if the water had been withdrawn under this Agreement, and the total amount paid with respect to withdrawal of such water under both the Temporary Agreement and this Agreement shall be credited pursuant to Section 1.6 and 1.7, as applicable, in determining Metropolitan's Share of Total Capital Costs and Metropolitan's Permanent Storage Allocation.

ARTICLE 6. COMPENSATION

Metropolitan shall make the payments set forth below to compensate Semitropic for (i) its services as trustee under this Agreement, (ii) costs and expenses incurred by Semitropic in connection with its obligations under this Agreement.

6.1 Semitropic commits to utilize Metropolitan's payments and other Semitropic funds, and to maintain such adequate financial flexibility, as it reasonably determines to be necessary to construct facilities needed to provide Metropolitan with Program Pumpback Capacity and Program Entitlement Exchange Rights in a timely manner as described in Exhibit A hereto and, as payments of Metropolitan's Share of Total Program Capital Cost are made, provide increases in Program Delivery Capability to Metropolitan's share of Program Delivery Capability as described in Exhibit C, all in accordance with this Agreement.

Metropolitan shall pay the following for services provided by Semitropic for storage and withdrawal of water. Semitropic shall pay all other costs not specified herein, and Semitropic shall not create and impose any other charges or fees upon Metropolitan.

6.2 Storage Payments.

6.2.1 Until Metropolitan has actually paid Metropolitan's Share of Total Program Capital Cost, Metropolitan shall pay to Semitropic Ninety Dollars ($90.00) per acre-foot for all Stored Water credited to Metropolitan's Storage Account Balance for calendar years 1994 and 1995. Subsequent to calendar year 1995, the Ninety Dollars ($90.00) per acre-foot shall be adjusted at the beginning of each year as provided in this Section 6.2.1, and the adjusted amount shall apply to all Stored Water credited to Metropolitan's Storage Account Balance for that year. The adjusted amount for any particular calendar year after 1995 shall be the amount equal to Ninety Dollars ($90.00) multiplied by a fraction, the numerator of which is the Construction Costs Index (as defined in Section 1.6) for December of the calendar year immediately preceding the calendar year with respect to which the adjusted amount is being determined (that is, for December 1995 with respect to the adjusted amount for 1996; December 1996 for 1997; and so on), and the denominator of which shall be the Construction Costs Index for June 1994.

6.2.2 From and after the time when Metropolitan has paid Metropolitan's Share of Total Program Capital Cost, Metropolitan shall pay Fifty Dollars ($50.00) per acre-foot for any additional Stored Water credited to Metropolitan's Storage Account Balance, adjusted at the beginning of each year as provided in this Section 6.2.2, and the adjusted amount shall apply to

all Stored Water credited to Metropolitan's Storage Account Balance for that year and to which this Section 6.2.2 is applicable. The adjusted amount under this Section 6.2.2 for any particular calendar year shall be the amount equal to Fifty Dollars ($50.00) multiplied by a fraction, the numerator of which is the Consumer Price Index, All Urban Consumers, All Items Index, Western Cities with populations of 50,000 to 330,000 (the "**CPI**") for December of the calendar year immediately preceding the calendar year with respect to which the adjusted amount is being determined (that is, for December 2000 with respect to the adjusted amount for 2001; December 2001 for 2002; and so on), and the denominator of which shall be the CPI for June 1994 (which, the Parties agree, is 148.6 (based on 1982-84 index).

6.2.3 If publication of either of the indexes referred to in Section 6.2.1 or 6.2.2 ceases or if the basis for such indexes is substantially modified, the Parties shall negotiate and mutually agree on an alternative but equivalent index or, in the absence of agreement, the matter shall be resolved pursuant to Article 9.

6.3 Withdrawal Payments.

6.3.1 Metropolitan shall pay to Semitropic Forty Dollars ($40.00) per acre-foot, for each acre-foot of water with respect to which storage payments have been made pursuant to Section 6.2.1, when such water is returned to Metropolitan. Said charge shall be adjusted on the same basis as in Section 6.2.1.

6.3.2 Metropolitan shall pay Fifty Dollars ($50.00) per acre-foot, for each acre-foot of water with respect to which storage payments have been made pursuant to Section 6.2.2, when such water is returned to Metropolitan. Said charge shall be adjusted on the same basis as in Section 6.2.2. No water shall be deemed or construed to be subject to the charge provided in this Section 6.3.2 until all water which is subject to the charge provided in Section 6.3.1 has been returned.

6.3.3 In addition to payment under Sections 6.3.1 and 6.3.2, when water is returned, Metropolitan shall pay the average unit power costs then actually incurred by Semitropic to pump such water from the groundwater basin for either direct delivery to the California Aqueduct or for entitlement exchange. In the case of direct delivery to the California Aqueduct, Metropolitan also shall pay the average unit power cost then actually incurred by Semitropic to convey the returned water through the distribution system and to pump such water into the California Aqueduct at the Semitropic turnout in Reach 10A. Said power costs shall be computed based on the amount of energy consumed to withdraw and when applicable to convey to the California Aqueduct Metropolitan's Stored Water in a given month times Semitropic's average actual unit power cost for the same pumping period. For ease in billing, Semitropic shall establish an estimated power rate for each calendar year with respect to which Metropolitan requests such information and shall provide Metropolitan with such estimate, including back-up documentation to justify the rate, within fourteen (14) days of the request. Such estimated rate shall be used for billing purposes for the following year and then the billing will be adjusted to actual by March 1 of the year following the estimated rate year, or as soon as possible thereafter. Once the variance amount has been agreed to by the Parties, any amount due by either Party shall be billed

immediately and paid in accordance with Section 6.8. Semitropic has its own power production and distribution facilities and the unit cost of power shall be based upon the cost of Semitropic's energy project including, but not limited to, debt service for the energy project, fuel, operation and maintenance for the energy project, replacements, reserve deposit for the energy project, utility billings, and the cost of production and distribution of such power. The Parties agree that the initial calculation shall be consistent with the calculation in Exhibit D. For all Stored Water returned by Semitropic's exercise of Program Entitlement Exchange Rights, Semitropic shall pay all applicable SWP costs to the Semitropic turnout in Reach 10A.

6.3.4 Exhibit D may be revised from time to time by written consent of the Parties, which consent shall not be unreasonably withheld. The intent of Exhibit D is to provide Semitropic with sufficient revenue to recover the power costs incurred by Semitropic for Metropolitan's withdrawal of Stored Water and to allow Semitropic flexibility to change the calculation based on experience and the changing electric utility industry.

6.4 During the period in which Metropolitan has Interim Storage Allocation, if Metropolitan has not paid Metropolitan's Share of Total Program Capital Cost, Metropolitan shall pay Semitropic $20.00 per acre-foot for any water remaining in Metropolitan's Storage Account Balance for more than five years (determined with respect to water stored under the Temporary Agreement beginning on the date of this Agreement), which payment shall be due each year. Withdrawal of water under the Agreement shall be accounted for on a first-in-first-out basis. The above fee shall be adjusted based on the index referenced in Section 6.2.1 above.

6.5 If Metropolitan has not stored and withdrawn 350,000 acre-feet and if payments made pursuant to Sections 6.2.1, 6.3.1 and 6.4 result in Metropolitan paying to Semitropic an amount in excess of Metropolitan's Share of Total Program Capital Cost, then the amount of such excess shall increase Metropolitan's Permanent Storage Allocation and related rights under the Program. The amount of such increase shall be determined monthly, once Metropolitan has paid an excess amount, by dividing the sum theretofore paid in excess of Metropolitan's Share of Total Program Capital Cost as of the last day of the prior calendar month by Total Program Capital Cost as of that same date and multiplying that quotient by 1,000,000 acre-feet.

6.6 When Metropolitan's Permanent Storage Allocation is Fully Vested, at Metropolitan's election and Semitropic's concurrence, Metropolitan may continue to deliver water for storage and make payments under Sections 6.2.1, 6.3.1 and 6.4, and such election and payments will result in an increase in Metropolitan's Permanent Storage Allocation to the extent the sum of all Banking Partners' Permanent and Interim Storage Allocation does not exceed 1,000,000 acre-feet. The amount of such increase shall be determined pursuant to Section 1.7.

6.7 Except as otherwise provided at Sections 6.7.1 or 6.7.2, Metropolitan shall be allocated an annual operations and maintenance fee (the "**O&M Fee**") of $3.98 (the "**Base Amount**") per acre-foot of Permanent Storage Allocation held by Metropolitan. The Base Amount shall be adjusted in the same manner described and using the same index referenced in Section 6.2.2. The annual O&M Fee shall start in January 1, 1995, for water stored in 1993 and 1994.

6.7.1 In any year, Metropolitan shall pay in total, an amount equal to the greater of the sum of payments required under Sections 6.2.2 and 6.3.2 or the annual O&M Fee otherwise required under Section 6.7. The annual O&M Fee shall be billed on January 1 of each year. Any amounts due during that year under Section 6.2.2 and Section 6.3.2 shall be compared with the O&M fee. No payments due under Sections 6.2.2 and 6.3.2 shall be payable until the amount owed under Sections 6.2.2 and 6.3.2 is greater than the O&M fee. Thereafter, only the amount payable under Sections 6.2.2 and 6.2.3 that is greater than the O&M fee paid that year is then due and payable to Semitropic.

6.7.2 If Semitropic or other Banking Partners use Program Delivery Capability, Program Pumpback Capacity or Program Entitlement Exchange Rights allocated to Metropolitan, such entity using said capacity shall pay the share of Metropolitan's O&M Fee under this Section 6.7 that is represented by its use. The payment made for the use of Metropolitan's unused capacity rights shall be deducted from the next payment due from Metropolitan under this Agreement.

6.7.3 If Metropolitan uses another Banking Partner's unused Program Delivery Capability, Program Pumpback Capacity or Program Entitlement Exchange Rights, Metropolitan shall pay the share of the other Banking Partner's O&M Fee under this Section 6.7 that is represented by its use.

6.8 Semitropic may bill Metropolitan no more than monthly for payments under Sections 6.2.1 or 6.2.2, 6.3.1 or 6.3.2, 6.3.3, 6.7.1 and 6.7.3 hereof and annually for payments under Section 6.4, which payments shall be due Semitropic and shall become delinquent forty-five (45) days after

Metropolitan receives the invoice under the terms of this Agreement. In addition to other remedies available, delinquent payments shall bear interest at the rate of one percent (1%) per month. Data supporting the amounts invoiced shall be provided upon the reasonable request of Metropolitan. Semitropic shall correct any erroneous billing promptly upon discovery of the error. If Metropolitan has been underbilled, payment of the underbilled amount shall be due and become delinquent forty-five (45) days after Metropolitan receives the corrective invoice and data justifying the change. Overpayments by Metropolitan shall be refunded to Metropolitan within forty-five days of discovery, together with interest thereon at the average investment yield of Metropolitan's investments as reported monthly by Metropolitan's Treasurer.

6.9 Semitropic shall require in other Banking Partners agreements that Semitropic shall collect from such other Banking Partners sufficient funds to reimburse Metropolitan for a portion of its expenses in developing the Program. Metropolitan's reimbursement shall be equal to the proportion of other Banking Partners Interim and Permanent Storage Allocation to 1,000,000 acre-feet times Metropolitan's cost of $300,000, adjusted in the same manner as in Section 6.2.2. Semitropic shall pay Metropolitan such reimbursement within twelve (12) months of execution of the Banking Partner's Agreement.

6.10 In order to design essential facilities for the benefit of Metropolitan and which will need to be constructed during Semitropic's 1994-95 off-peak period, Metropolitan will make an advance payment of $1,350,000 within thirty (30) days of execution of this Agreement. This amount, plus $225,000.00 which is Semitropic's share of preparing the EIR, will be deducted from amounts due from Metropolitan to Semitropic pursuant to Section 6.2.1, beginning with the first

payment due during the second calendar year in which Metropolitan delivers water into storage, and continuing each year until the total advance payment has been repaid to Metropolitan by such offsets. Before invoicing Metropolitan for water delivered into storage, the amount due from Semitropic shall be deducted. If this Agreement is terminated by either Party by reason of a failure to obtain satisfaction of all of the Article 8 conditions (either Party having the right to terminate this Agreement at any time prior to the time all of the Article 8 Conditions are satisfied by giving written notice of such termination to the other), or if this Agreement is involuntarily terminated pursuant to Section 12.3, for reasons beyond the control of Semitropic and Metropolitan, said amount of $1,350,000 will be repaid to Metropolitan within thirty (30) days of exercise of a right of first refusal pursuant to Section 8(d), otherwise within ten (10) years of execution of this Agreement, without interest.

6.11 In the event there is an adjustment in Metropolitan's Storage Account Balance as provided at Section 4, applying the first-in-first-out method of accounting for water in the Storage Account Balance, previous payments shall be adjusted based on the payment charged in the year the quantity of water to be adjusted was delivered with no further adjustments using the applicable indexes cited in Section 6.2.1 or Section 6.2.2. In addition no interest shall be payable on the amount of money required for said adjustment. Financial obligations shall occur as follows:

6.11.1 To the extent the Storage Account Balance is reduced (i.e., losses are determined to exceed ten percent (10%)), Semitropic shall reimburse Metropolitan for the charges paid under Sections 6.2.1, 6.2.2 and 6.4 within one year of such determination.

6.11.2 To the extent the Storage Account Balance is increased (i.e., losses are determined to be less than ten percent (10%)), Metropolitan shall pay Semitropic for charges that would have been paid under Sections 6.2.1, 6.2.2 and 6.4 for such additional water determined to be in the Metropolitan Storage Account Balance within one year of such determination.

6.12 It is recognized that changes in Semitropic's actual costs of operating the Program may occur on or after the date this Agreement is executed as a result of enactments, amendments, changes in implementation or interpretation, or repeal of any federal or state law, rule, regulation or ordinance (each, a "**Regulatory Change**"). If either Party determines that a Regulatory Change has occurred that would result in a material change (upward or downward) in Semitropic's costs for storing, recovering or transporting water pursuant to the terms of this Agreement, which change in Semitropic's costs is not reflected in the adjustments in the payments due from Metropolitan to Semitropic pursuant to Article 6 or other provision of this Agreement (including, but not limited to, this Section 6.12), such Party shall promptly inform the other Party of the nature and extent of such alleged Regulatory Change and of the reason why that party believes an adjustment pursuant to this Section 6.12 is warranted in the payments due from Metropolitan to Semitropic. Promptly thereafter, Semitropic shall provide Metropolitan with its calculation of the costs or cost savings associated with such Regulatory Change and the facts and assumptions underlying that calculation. Upon agreement by the parties hereto (i) that a charge or credit affecting any payment due from Metropolitan to Semitropic should be made as a result of a Regulatory Change, (ii) of the amount of such charge or credit, (iii) as to whether such charge or credit is to affect the basic payment amount or is to be separately accounted for (and, if so, in what manner), and (iv) as to the period during which such charge or credit is to apply, such charge or credit shall be incorporated into an

amendment to this Agreement setting forth the foregoing and other particulars necessary to implement that adjustment. If such agreement cannot be reached within forty-five (45) days after Semitropic has provided the required notice and information to Metropolitan, the matter shall be resolved pursuant to Article 9, the qualified third party or arbitration panel being charged with determining (x) whether a Regulatory Change has occurred (if that is in dispute), (y) the amount of change, if any, in Semitropic's costs resulting from the Regulatory Change, and (z) the manner in which the payments due from Metropolitan to Semitropic are to be adjusted to fairly and equitably reflect that change in Semitropic's costs (it being the intent of the parties that no windfall or unwarranted compensation or benefit should result to any party as a result of any adjustment made pursuant to this Section 6.12). Any adjustment to the payments due from Metropolitan to Semitropic made pursuant to this Section 6.12 shall be effective as of the first day such Regulatory Change affects Semitropic's operations hereunder unless the parties otherwise agree and may be reconsidered thereafter at any time, at the request of any party, if the adjustment is unjustly undercompensating or overcompensating any party.

ARTICLE 7. DIVISION OF RISK RESPONSIBILITIES

Semitropic and Metropolitan agree to cooperate, and Semitropic shall require other Banking Partners to cooperate, in reducing, to the greatest extent practicable, the risk from claims arising against any of the Parties from implementation of this Agreement. In the event of claims by third parties relating to this Agreement, the responsibilities of Semitropic, whether acting in its individual and/or trustee capacity, Metropolitan and the other Banking Partners shall be divided as follows:

7.1 Semitropic shall defend, indemnify and hold harmless Metropolitan and the other Banking Partners, and their respective directors, officers, agents and employees against any and all losses, claims, demands and causes of action (herein collectively referred to as "**claims**") and shall assume responsibility for payment of any settlements, judgements, costs and attorneys' fees arising from claims concerning the following:

(a) Control, carriage, handling, use, disposal, or distribution of water in Semitropic's facilities;

(b) Any contest or dispute by any landowner or water user within the service area of, or otherwise served by, Semitropic concerning the allocation of benefits among or the assessment of charges to Semitropic landowners or water users;

(c) Construction, repair, modification, or replacement of any Semitropic facilities;

(d) Semitropic's operation of the Program or Semitropic facilities or the actions of its officers, employees or agents; and

(e) Any other activities under Semitropic's exclusive control.

If Metropolitan is named in any such action, it may submit its defense to Semitropic, which shall bear the full cost of defense, except to the extent that Metropolitan utilizes its own counsel for such defense. Notwithstanding the foregoing, the responsibility for any claims challenging the validity, underlying authority or enforceability of the Program under this Agreement shall be as provided at Section 7.3.

7.2 Each Banking Partner (including Metropolitan) shall defend, indemnify and hold harmless Semitropic and the other Banking Partners, and their respective directors, officers, agents and employees, against any and all claims and shall assume responsibility for payment of any settlements, judgements, costs or attorneys' fees arising from claims concerning the following:

(a) Control, carriage, handling, use, disposal or distribution of Stored Water in facilities of that Banking Partner or in SWP facilities, to the extent that the claim relates to use of SWP facilities to implement this Agreement with respect to that Banking Partner;

(b) Any claim by a landowner, resident, public agency or other entity within the service area of, or otherwise served by, that Banking Partner challenging the appropriateness of that Banking Partner entering into this Agreement;

(c) Construction, repair, modification or replacement of any of the facilities of that Banking Partner;

(d) Operation of the facilities of or the actions of the officers, employees or agents (other than Semitropic) of that Banking Partner; and

(e) Any other activities under the exclusive control of that Banking Partner.

If Semitropic is named in any such action, it may submit its defense to the Banking Partner involved, which Banking Partner shall bear the full cost of defense, except to the extent Semitropic utilizes its own counsel for such defense. Notwithstanding the foregoing, the responsibility for any claims challenging the validity, underlying authority or enforceability of the Program under this Agreement shall be as provided at Section 7.3. Semitropic shall not be entitled to any indemnification from Metropolitan except as set forth in this Section 7.

7.3 As for any claims by a third party with respect to the Program which are not otherwise provided for at Sections 7.1 or 7.2, including any claims challenging the underlying authority for or the validity or enforceability of the Program under this Agreement, each Banking Partner shall be responsible for payment of its allocable share of any settlements or judgments to which it is a party with respect to such claims. If Semitropic is named in any action with respect to such a claim, it may submit its defense to the Banking Partners which are parties to that action with respect to that claim and those Banking Partners shall bear the full cost of defense, except to the extent Semitropic utilizes its own counsel for such defense.

7.4 At the request of Metropolitan and/or other Banking Partners, Semitropic shall join in the defense of any claim which is not adverse to Semitropic's water supply or financial interests

in which case the requesting Party shall reimburse Semitropic for all of its costs of defense. However, with respect to claims in which one or more of the plaintiffs resides or does business in Kern County challenging the recovery of groundwater under this Agreement, and with respect to any third party claim challenging this Agreement or the right of Metropolitan to the return of its Stored Water in accordance with the terms of this Agreement, Metropolitan may demand that Semitropic join in the defense of claims. In such case, Semitropic must comply with any such demand, the Parties shall jointly manage the litigation, and Metropolitan and other Banking Partners who are parties to such litigation shall pay one-half of Semitropic's defense costs, if one or more of the plaintiff resides or does business in Kern County; and in other such cases, shall reimburse Semitropic for all of its costs of defense.

7.5 In all other water banking and exchange agreements involving Semitropic and any Banking Partner, the division of risk and indemnification responsibilities between and among Semitropic and the Banking Partner(s) shall be identical to the responsibilities provided in Sections 7.1, 7.2, 7.3, 7.4 and 7.6. In particular:

7.5.1 Each Banking Partner shall be required to assume the duty to defend, indemnify and hold harmless Semitropic and the other Banking Partners from claims arising from or otherwise concerning the activities described in Section 7.2 of that Banking Partner.

7.5.2 Each Banking Partner shall be required to assume the duty to pay its allocable share of any claims of the type described in Section 7.3. Unless otherwise provided in the settlement or judgment, each Banking Partner's share of such settlements, judgments, or

attorney fees as provided at Section 7.3 shall be determined according to the ratio of that Banking Partner's combined Interim and Permanent Storage Allocation divided by the sum of all involved Banking Partners' combined Interim and Permanent Storage Allocations.

7.6 In the event that payments are made in settlement of a claim, in satisfaction of a judgment or for defense costs where the claim arises from issues applying to both Semitropic and one or more Banking Partners, payments shall be divided in proportion to the relative liability of each arising from the common claim. If the Parties cannot agree on the proportion, then the share to be paid by each of Semitropic and the Banking Partners shall be submitted to arbitration as provided at Article 9 hereof.

ARTICLE 8. REQUIRED FOR IMPLEMENTATION

Implementation of this Agreement is contingent upon the following:

(a) An agreement among DWR, Agency and Metropolitan for a Metropolitan point of delivery at the Semitropic turnout in Reach 10A of the California Aqueduct.

(b) An agreement between DWR, Agency and Semitropic for a turn-in to the California Aqueduct in Reach 10A.

(c) An agreement between DWR and Metropolitan to convey Stored Water from Semitropic's turnout to Metropolitan.

(d) No entity within Kern County exercising its right of first refusal under the same terms and conditions provided to Metropolitan in this Agreement within forty-five (45) days after execution of this Agreement.

Semitropic will promptly notify Metropolitan when condition (d) has been met and the Parties will keep each other informed concerning the satisfaction of the other Article 8 Conditions.

ARTICLE 9. DISPUTE RESOLUTION

9.1 In the event of dispute regarding interpretation or implementation of this Agreement, or if the parties are unable to agree upon a matter as to which their agreement is provided for hereunder, the Parties will endeavor to resolve the dispute by using the service of a mutually acceptable consultant. The fees and expenses of the consultant shall be shared equally by the Parties.

9.2 If a consultant cannot be agreed upon, or if the consultant's recommendations are not acceptable to the Parties, and unless the Parties otherwise agree, the matter shall be resolved by arbitration as provided in this Article 9 and in the California Arbitration Act (Part 3 [commencing with § 1280], Tit. 9, Calif. Code Civ. Proc.), including Section 1283.05. The Parties agree to be bound by the majority decision of a three-member panel to be selected as follows:

(a) One member shall be selected by Metropolitan (or if the dispute is between various Banking Partners and Semitropic, by the Banking Partners involved, collectively; provided, however that if they are unable to agree on a member, any one Banking Partner may petition the court to appoint a member pursuant to Code of Civil Procedures Section 1281.6);

(b) One member shall be selected by Semitropic; and

(c) The third member shall be selected by the other two (2) members.

If the two (2) members selected by the Banking Partner(s) and Semitropic are unable to agree on the selection of a third member, either Party may petition a court to appoint the third member pursuant to Code of Civil Procedure Section 1281.6. Each Party shall be responsible for any fees and expenses of the member of the panel appointed by that Party, and the fees and expenses of the third member of the panel shall be shared fifty percent (50%) by Semitropic with the remainder to be equally among the other Parties participating in the dispute resolution process.

If a Party asserts that another Party has breached obligations under this Agreement, it may request that the arbitration panel order the other Party to comply with this Agreement. Upon the panel finding that a Party has in fact breached this Agreement, the panel shall order compliance. The panel may order any other equitable relief permitted by California law, including declaratory or injunctive relief, applicable to the matter before the panel for resolution. If termination is sought by a party pursuant to the terms hereof, the panel may determine the issues of whether a

default has occurred or other condition precedent to the termination alleged has been satisfied and, if so, may issue orders implementing that termination. The orders of the panel shall be judicially enforceable. The panel may order that the effective date of its order be the date of the breach, if appropriate. If Metropolitan has suspended payments under Section 11.1.2, it shall reimburse Semitropic for any monies withheld and then due to Semitropic as soon as Semitropic again fully complies with this Agreement. The panel may not order any damages (including consequential or punitive damages) beyond those provided for or permitted under this Agreement.

ARTICLE 10. TERM OF AGREEMENT

Unless this Agreement is earlier terminated pursuant to this Article 10 or pursuant to Sections 11.1.3, 11.2, 11.3, 12.2 or 12.3, this Agreement shall terminate on November 4, 2035, the date of termination of the Agency's Long-Term Water Supply Contract; *provided, however,* that, if Metropolitan has timely requested return of Stored Water pursuant to Article 5 at such a time and in such a manner that Metropolitan's Stored Water could have been returned prior to November 4, 2035 but, because of conditions beyond the control of Metropolitan, all of Metropolitan's Stored Water has not been returned by that date, the provisions of Articles 1, 5, 6, 7, 9, 11, 12 and 13 of this Agreement shall continue in full force and effect for such additional period of time as is necessary for Metropolitan to receive its Stored Water as requested; and *provided, further,* that if a claim arising under or with respect to the terms of this Agreement has not been resolved when this Agreement terminates, or if such a claim is brought after this Agreement has terminated but within the period of time for bringing such a claim under California law (such a claim being referred to herein as a "**Late Arising Claim**"), the provisions of Articles 1, 7, 9 and 13 of this

Agreement shall continue in full force and effect for such additional period of time as is necessary to resolve such claim and to satisfy the rights and obligations of the Parties hereto with respect to it pursuant to such Articles. This Agreement may be renewed by mutual agreement of the parties, which renewal shall unless otherwise agreed effect a continuation of Semitropic's duties under this Agreement. Metropolitan may elect to terminate this Agreement at any time by giving written notice to Semitropic of Metropolitan's intent to terminate not less than one year in advance of the termination date selected by Metropolitan and specified in the notice and by conveying its beneficial interest in the amount of Metropolitan's Stored Water in Metropolitan's Storage Account Balance on that termination date to Semitropic. Upon Metropolitan's conveyance of such beneficial interest, this Agreement shall be fully terminated except as provided in this Article 10 with respect to Late Arising Claims.

ARTICLE 11. REMEDIES

11.1 Remedies in Event of Semitropic's Voluntary Failure to Perform.

11.1.1 If Metropolitan alleges that Semitropic has not substantially performed according to the terms of this Agreement (including, but not limited to, by failing to construct adequate Program facilities and/or securing agreements or operational arrangements, all as necessary to provide those levels of capabilities, capacities and rights described in Exhibits A and C, or by causing (or, if within Semitropic's jurisdiction, permitting) other entities or persons to interfere with Program operation, or by attempting to resign its obligations as trustee under this Agreement or by failing to accept or return water as and when required by this Agreement), or if

Semitropic has otherwise breached its obligations under this Agreement, which failure to perform or breach is not subject to Section 12.3, and notice has been provided to Semitropic pursuant to Section 13.4 and Semitropic has failed to cure the alleged breach within the time provided in Section 13.4, Metropolitan may, at any time thereafter while the default is continuing, advise Semitropic of the remedy or remedies provided in Article 9 (Dispute Resolution), and Sections 11.1.2 and 11.1.3 below which Metropolitan intends to pursue with respect to such default. Semitropic may challenge at any time, through Article 9, whether in fact there has been a breach of or default under this Agreement by Semitropic.

11.1.2 In the event of an alleged breach as to which Metropolitan has given notice to Semitropic pursuant to Section 11.1.1, Metropolitan may elect to suspend any payment obligations it may have under Article 6 of this Agreement until Semitropic complies with the terms of this Agreement and cures such breach or default or is determined, pursuant to Article 9, not to have violated the Agreement. Notwithstanding such suspension of Metropolitan's payment obligations, this Agreement shall remain in effect unless and until Metropolitan elects to terminate the Agreement under Section 11.1.3 or Article 10, in which case termination shall occur in accordance with and as provided in such provision. Notwithstanding an election by Metropolitan under this Section 11.1.2 to suspend payment obligations, Metropolitan or Semitropic may thereafter also seek relief under Article 9.

11.1.3 If, pursuant to Section 11.1.1, Metropolitan elects to terminate this Agreement, Semitropic will purchase the amount of Metropolitan's Stored Water in its Storage Account Balance for an amount equal to Metropolitan's previous payments with respect to such

Stored Water plus any unrefunded portion of monies described in Section 6.9, all adjusted based on the index referenced at Section 6.2.2, plus twenty percent (20%) of said payments, all payable within one (1) year of said election by Metropolitan to terminate. Once such payment has been fully made, this Agreement shall be fully terminated except for Articles 1 (Definitions); 7 (Division of Risk Responsibilities); 9 (Dispute Resolution); and Article 13 (Miscellaneous Provisions). Upon payment in full by Semitropic as provided above, Metropolitan's beneficial interest in the amount of Metropolitan's Stored Water in Metropolitan's Storage Account Balance shall vest in Semitropic and Semitropic shall be entitled to produce and use such water for its own account.

11.2 **Remedies in the Event of Metropolitan's Voluntary Failure to Perform.**

If Metropolitan has not substantially performed according to the terms of this Agreement, and notice has been provided to Metropolitan pursuant to Section 13.4 and Metropolitan has failed to cure the alleged breach within the time provided in Section 13.4, Semitropic may at its election, at any time thereafter while the default is continuing, either (1) suspend further performance (except that Semitropic shall continue to hold the trust property in trust) and thereafter seek relief under Article 9, and shall recommence performance once Metropolitan complies with the Agreement, or (2) terminate this Agreement, except that Articles 1, 7, 9 and 13 shall remain in effect. If Semitropic elects to terminate this Agreement, Semitropic will either purchase the amount of Metropolitan's Stored Water in Metropolitan's Storage Account Balance in the manner and for the price provided in Section 12.3 or will deliver to Metropolitan that amount of water in the manner provided in Section 12.2. Metropolitan may challenge at any time, through Article 9, whether in fact there has been a breach of this Agreement by Metropolitan.

11.3 **Remedies in Event of Failure of Certain Other Remedies.**

If: (i) Semitropic has breached or defaulted in the performance of its obligations under this Agreement, and (ii) Metropolitan has given notice of the breach or default pursuant to Section 11.1.1, and (iii) Semitropic has failed to cure that breach or default within thirty (30) days as required by Section 13.4, and (iv) Metropolitan has elected a remedy for that breach or default pursuant to Section 11.1.1, and (v) Semitropic has agreed to such remedy or, if Semitropic has not so agreed, Metropolitan has obtained a judgment or court order against Semitropic (whether based on an order of an arbitration panel under Article 9 or otherwise) which judgment or court order Semitropic has failed or refused to perform, *then* Metropolitan may notify Semitropic that Metropolitan is entitled to and intends to exercise its right to appointment of a successor trustee in place of Semitropic and, thereafter, Metropolitan may apply to a court of competent jurisdiction for such appointment of a successor trustee who shall be charged with performing the duties of the trustee pursuant to the terms of this Agreement. The successor trustee, when appointed, shall be entitled to exercise only and all rights theretofore held by Semitropic as trustee for Metropolitan, including, without limitation, those under or relating to the Trust Property (excepting, however, the right to receive additional water for storage hereunder), until such time as the successor trustee has collected and recovered water from the property of Semitropic in an amount sufficient to return water in an amount equal to the amount of Metropolitan's Stored Water in Metropolitan's Storage Account Balance and has transported that water to the California Aqueduct at Reach 10A. Upon the receipt by Metropolitan at Reach 10A of the California Aqueduct of water in an amount equal to Metropolitan's Storage Account Balance pursuant to the exercise by such successor trustee of its rights in the Trust Property, this Agreement shall be fully terminated except for Articles 1

(Definitions); 7 (Division of Risk Responsibilities); 9 (Dispute Resolution); and 13 (Miscellaneous Provisions), all in accordance with the terms of this Agreement.

ARTICLE 12. EARLY TERMINATION

12.1 **Resignation of Semitropic.** Because Semitropic is uniquely situated for performing its duties as trustee, Semitropic may not resign its duties and obligations under this Agreement for the term of this Agreement except as permitted by Sections 11.2, 12.2 and 12.3, and any other attempt by Semitropic to resign shall be deemed to be a breach of its obligations hereunder.

12.2 **Voluntary Termination.** If after ten (10) years from the execution of the Agreement Metropolitan's Program activities have ceased to provide benefits to Semitropic because Metropolitan has not made payments under Section 6.4 or either has not requested to store or withdraw significant quantities of water for a period of five (5) years and has a Storage Account Balance of less than 100,000 acre-feet, Semitropic may elect to terminate Articles 3, 5 and 6 of this Agreement. Upon such election, Semitropic must either (i) purchase the amount of Metropolitan's Stored Water in Metropolitan's Storage Account Balance for an amount equal to Metropolitan's previous payments for any water remaining in the Metropolitan Storage Account plus twenty percent (20%) of said payments, all payable within one year of such termination, or (ii) exchange Metropolitan's Stored Water for an amount of water equal to the remaining water in Metropolitan's Storage Account Balance, such water to be delivered to Metropolitan, at the Semitropic Turnout in the California Aqueduct or another location acceptable to the Parties, within five (5) years of such termination upon a schedule mutually acceptable to the Parties (or, if the

Parties fail to agree upon such schedule, the matter shall be resolved pursuant to Article 9). If payment is made or exchange water is provided by Semitropic as provided above, Metropolitan's beneficial interest in Metropolitan's Stored Water shall vest in Semitropic as and to the extent such payment or delivery is made. Once either the payment referred to above has been fully made or the water in Metropolitan's Storage Account Balance has been returned to Metropolitan in full, this Agreement shall be fully terminated except for Articles 1 (Definitions); 7 (Division of Risk Responsibilities); 9 (Dispute Resolution); this Section 12.1 and Article 13 (Miscellaneous Provisions). Upon the termination of this Agreement pursuant to this Section 12.2, Semitropic shall retain the right to offer the benefits of this Program to other entities without interference from Metropolitan.

12.3 **Involuntary Termination.** Notwithstanding Article 11, in the event that Semitropic is unable to perform its obligations under this Agreement for reasons beyond its control, and that inability to perform includes the inability of Semitropic to return Stored Water which remains in the Metropolitan Storage Account Balance, Semitropic will purchase the Stored Water which Semitropic is unable to return for an amount equal to the costs which Semitropic would have incurred to purchase such water as entitlement water under its Member Unit contracts with the Agency referenced at Recital B (including all fixed and variable costs for delivery of such entitlement water to the Semitropic Turnout in Reach 10A) in the year Metropolitan delivered such Stored Water to Semitropic. "Reasons beyond its control" as used in the aforesaid sentence shall not include any reasons caused by Semitropic's breach of its obligations under this Agreement or other failure to comply with any of its legal obligations. Such payment by Semitropic to Metropolitan upon involuntary termination under this Section 12.3 shall be financed over time upon

terms mutually agreeable to Metropolitan and Semitropic. If Metropolitan and Semitropic are unable to agree on such terms in a reasonable period of time, they shall resolve their disagreement pursuant to Article 9. Once such payments have been fully made, this Agreement shall be fully terminated except for Articles 1 (Definitions); 7 (Division of Risk Responsibilities); 9 (Dispute Resolution); this Section 12.2 and Article 13 (Miscellaneous Provisions). If payment is made as provided above, the beneficial interest in the amount of Metropolitan's Stored Water in Metropolitan's Storage Account Balance which Semitropic is unable to return shall vest in Semitropic.

In addition to such payment, if, subsequent to such involuntarily termination, Semitropic is able to negotiate another arrangement or program with another entity which utilizes Program Delivery Capacity which was developed as a result of payments by Metropolitan pursuant to this Agreement, and which capacity would have been available to Metropolitan absent such involuntary termination, the Parties shall negotiate a payment schedule to reimburse Metropolitan for the undepreciated balance of capital costs which Metropolitan has paid, deducting payments made or to be made by Semitropic as provided above, and which does not render such new program infeasible. Attached as Exhibit E are the assumptions to be used in such calculation. If Metropolitan and Semitropic are unable to agree on the terms of a payment schedule in a reasonable period of time, they shall resolve their disagreement pursuant to Article 9.

ARTICLE 13. MISCELLANEOUS PROVISIONS

13.1 **Successors and Assigns.** This Agreement shall bind and inure to the benefit of the successors and assigns of the Parties; provided, however, neither Party shall assign any of their rights or obligations under this Agreement without the prior written consent of the other. Any successor to Semitropic shall be a successor Trustee hereunder. Nothing in this Agreement is intended to confer any right or remedy under this Agreement on any person other than the parties to this Agreement and their respective successors and permitted assigns, or to relieve or discharge any obligation or liability of any person to any party to this Agreement, or to give any person any right of subrogation or action over or against any party to this Agreement.

13.2 **Allocation Among Semitropic Improvement Districts.** Semitropic shall allocate the rights and obligations under this Agreement between the water users and landowners of Semitropic Water Storage District, Semitropic Improvement District, Buttonwillow Improvement District and Pond-Poso Improvement District as it deems appropriate, so long as Metropolitan's and the other Banking Partners right to obtain the return of Stored Water is not adversely impacted. Regardless of such allocations, Semitropic shall remain the trustee under this Agreement.

13.3 **No Modification of Existing Contracts.** This Agreement shall not be interpreted to modify the terms or conditions of either the water supply contracts between the DWR and the Agency or Metropolitan or the water supply agreements between the Agency and Semitropic.

13.4 **Waiver/Cure of Defaults.** The failure of any Party to enforce against the other a provision of this Agreement shall not constitute a waiver of that Party's right to enforce such a provision at a later time. No Party shall be deemed to be in default of any provision of this Agreement unless the other Party has given written notice specifically stating the alleged default and the Party in default fails to cure the default within thirty (30) days of receipt of such written notice.

13.5 **Construction of Agreement.** The language in all parts of this Agreement shall be in all cases construed simply according to its fair meaning and not strictly for or against any of the parties hereto and Section 1654 of the Civil Code has no application to interpretation of this Agreement. Headings at the beginning of Sections, paragraphs and subparagraphs of this Agreement are solely for the convenience of the parties, are not a part of this Agreement and shall not be used in construing it. The preamble, recitals and all exhibits and schedules to this Agreement are part of this Agreement and are incorporated herein by this reference. When required by the context: whenever the singular number is used in this Agreement, the same shall include the plural, and the plural shall include the singular; and the masculine gender shall include the feminine and neuter genders and vice versa. Unless otherwise required by the context (or otherwise provided herein): the words "**herein**," "**hereof**" and "**hereunder**" and similar words shall refer to the Agreement generally and not merely to the provision in which such term is used; the word "**person**" shall include individual, partnership, corporation, limited liability company, business trust, joint stock company, trust, unincorporated association, joint venture, governmental authority and other entity of whatever nature; each of the words "**Metropolitan**" and "**Semitropic**" shall include the respective representatives, successors and permitted assigns, if any, of such person; the

words "**including**," "**include**" or "**includes**" shall be interpreted in a non-exclusive manner as though the words "but [is] not limited to" or "but without limiting the generality of the foregoing" immediately followed the same; the word "**month**" shall mean calendar month; and the term "**business day**" shall mean any day other than a Saturday, Sunday or legal holiday. If the day on which performance of any act or the occurrence of any event hereunder is due is not a business day, the time when such performance or occurrence shall be due shall be the first business day occurring after the day on which performance or occurrence would otherwise be due hereunder. All times provided in this Agreement for the performance of any act will be strictly construed, time being of the essence of this Agreement.

13.6 **Entire Agreement.** This Agreement and other documents expressly referenced herein constitute the entire agreement between the Parties pertaining to the matters provided for herein and, except as herein provided, supersedes all prior and/or contemporaneous agreements and understanding, whether written or oral pertaining between the Parties relating to the matters provided for herein (it being expressly understood and agreed, however, that the Temporary Agreement shall continue in full force and effect until the earliest of the following to occur: (i) satisfaction of the Article 8 Conditions, or (ii) withdrawal by Metropolitan of all of the water stored pursuant to the Temporary Agreement, or (iii) January 1, 2010).

13.7 **Severability**. In the event that a court of competent jurisdiction or a arbitration panel as provided at Article 9 determines that a provision included in this Agreement is legally invalid or unenforceable and such decision becomes final, the Parties to this Agreement shall use their best efforts to (i) within thirty (30) days of the date of such final decision identify by mutual

agreement the provisions of this Agreement which must be revised, and (ii) within three (3) months thereafter promptly agree on the appropriate revision(s). The time periods specified above may be extended by mutual agreement of the Parties. Pending the completion of the actions designated above, to the extent it is reasonably practical and can be done without violating any applicable provisions of law, the provisions of this Agreement which were not found to be legally invalid or unenforceable in the final decision shall continue in effect. If the Parties cannot agree on appropriate revisions, this Agreement shall be involuntarily terminated in accordance with Section 12.3.

13.8 **Force Majeure.** All obligations of the Parties other than monetary or payment obligations shall be suspended for so long as and to the extent the performance thereof is prevented, directly or indirectly, not to exceed one year, by earthquakes, fires, tornadoes, facility failures, floods, drownings, strikes, other casualties, acts of God, orders of court or governmental agencies having competent jurisdiction, or other events or causes beyond the control of the Parties. In no event shall any liability accrue against a Party, to its officers, agents or employees, for any damage arising out of or connected with a suspension of performance pursuant to this Section 13.8. In event of such an occurrence of duration in excess of one year, Section 12.3 shall control, unless the Parties otherwise agree.

13.9 **Notices.** All notices, requests and demands hereunder ("**Notices**") shall be in writing and shall be deemed to have been duly given when delivered (or, if mailed, postage prepaid, on the third business day after mailing, if that date is earlier than actual delivery). Notices shall be sent to a Party at the address of that Party set forth below or, if such Party has furnished notice

of a change of that address as herein provided, to the address of that Party most recently so furnished. Notices for Semitropic shall be sent to the General Manager of Semitropic at Post Office Box Z, Wasco, California 93280, if mailed, and otherwise to the General Manager at 1017 Central Avenue, Wasco, California 93280. Notices for Metropolitan shall be sent to the General Manager of Metropolitan at Post Office Box 54153, Los Angeles, CA 90054-0153 if mailed, and otherwise to the General Manager at the offices of Metropolitan at 350 S. Grand Avenue, Los Angeles, California 90071. Each Party hereto (a "**Recipient**") who receives from another Party hereto (a "**Sender**") by electronic facsimile transmission (telecopier) any writing which appears to be signed by that Sender is authorized to rely and act upon that writing in the same manner as if the original signed writing was in the possession of the Recipient upon oral confirmation of that Sender to the Recipient that the writing was signed by that Sender and is intended by that Sender to be relied upon by the Recipient. Each Party transmitting any writing to any other Party by electronic facsimile transmission agrees to forward immediately to that Recipient, by expedited means (for next day delivery, if possible), or by first class mail if the Recipient so agrees, the signed hard copy of that writing, unless the Recipient expressly agrees to some other disposition of the original by the Sender.

13.10 **Further Assurances.** Each party hereto, upon the request of the other, agrees to perform such further acts and to execute and deliver such other documents as are reasonably necessary to carry out the provisions of this instrument.

13.11 **Counterparts.** This Agreement, and any document or instrument entered into, given or made pursuant to this Agreement or authorized hereby, and any amendment or supplement

thereto may be executed in two or more counterparts, and by each party on a separate counterpart, each of which, when executed and delivered, shall be an original and all of which together shall constitute one instrument, with the same force and effect as though all signatures appeared on a single document. Any signature page of this Agreement or of such an amendment, supplement, document or instrument may be detached from any counterpart without impairing the legal effect of any signatures thereon, and may be attached to another counterpart identical in form thereto but having attached to it one or more additional signature pages. In proving this Agreement or any such amendment, supplement, document or instrument, it shall not be necessary to produce or account for more than one counterpart thereof signed by the party against whom enforcement is sought.

13.12 **Recording of Memorandum.** A memorandum of this Agreement in the form attached hereto as Exhibit F shall be recorded in the Office of the County Recorder, County of Kern.

Executed the day and year first hereinabove written.

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

By: _____
John R. Wodraska
General Manager

APPROVED AS TO FORM:

N. Gregory Taylor
General Counsel

By: _____
Jarlath Oley
Senior Deputy General Counsel

SEMITROPIC WATER STORAGE DISTRICT

By: _____
Vido G. Fabbri, President

By: _____
Wilmar L. Boschman, Assistant Secretary

SEMITROPIC IMPROVEMENT DISTRICT OF SEMITROPIC WATER STORAGE DISTRICT

By: _____
Vido G. Fabbri, President

By: _____
Wilmar L. Boschman, Assistant Secretary

BUTTONWILLOW IMPROVEMENT DISTRICT
OF SEMITROPIC WATER STORAGE DISTRICT

By: _____
Vido G. Fabbri, President

By: _____
Wilmar L. Boschman, Assistant Secretary

POND-POSO IMPROVEMENT DISTRICT
OF SEMITROPIC WATER STORAGE DISTRICT

By: _____
Vido G. Fabbri, President

By: _____
Wilmar L. Boschman, Assistant Secretary

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BUILDUP SCHEDULE
FOR
PROGRAM ENTITLEMENT EXCHANGE RIGHTS
AND
PROGRAM PUMPBACK CAPACITY

Sum of All Banking Partners' Deliveries or Funds Paid to Establish "Program Pumpback" Permanent Storage Allocations (acre-feet)	[1]Maximum "Program Entitlement Exchange Rights" at Full Entitlement Allocation (acre-feet per year)	[1]Minimum Capacity (acre-feet per year)
100,000	40,000	31,500
150,000	45,000	90,000[2]
200,000	50,000	90,000
300,000	60,000	90,000
400,000	70,000	90,000
500,000	80,000	90,000
600,000	90,000	90,000
700,000	100,000	90,000
800,000	110,000	90,000
900,000	120,000	90,000
1,000,000	133,000	90,000

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1 Applies in the year after the Permanent Storage Allocation reaches the indicated amount, subject to the provisions of this Agreement.

2 Maximum instantaneous flowrate at this level is 300 cfs.

EXHIBIT A

LETTER 15

METROPOLITAN'S PAYMENTS TO SEMITROPIC FOR STORED AND RETURNED WATER

HYPOTHETICAL DELIVERY SCHEDULE				PAYMENTS WHICH CONTRIBUTE TO METROPOLITAN ACQUIRING A SHARE OF PROGRAM									NON-CONTRIBUTING PAYMENTS					
				Payments for Storing Water ($90 Payment Under Section 6.2.1)			Payments for Return of Water ($40 Payment Under Section 6.3.1)			Payments for Water Stored More than Five Years ($20 Payment Under Section 6.4)			Total Annual Payments Contributing to Metropolitan Acquiring Program Share	Payments for Storing Water ($50 Payment Under Section 6.2.			Payments for Return of Water ($50 Payment Under Section 6.3.2)		
Year	Quantity Stored in Year	Quantity Returned in Year	Storage Account Balance	Water Stored	$90/AF Adjusted per ENR Index	Payments for Storing Water	Returned Water	$40/AF Adjusted per ENR Index	Payments for Return of Water	Water Stored < 5 yrs	$20/AF Adjusted per ENR Index	Payment for Water in Storage More than 5 yrs.		Water Stored	$50/AF Adjusted per CPI Index	Payments for Storing Water	Returned Water	$50/AF Adjusted per CPI Index	Payments for Return of Water
	AF	AF	AF	AF	$/AF		AF	$/AF		AF	$/AF			AF	$/AF		AF	$/AF	
1993	45,377.20		45,377.20	45,377.20															
1994	0.00		45,377.20	0.00	90.00	$0	0.00	40.00		NA	20.00	$0	$0	0.00	50.00	$0	0.00	50.00	$0
1995	0.00	45,377.20	0.00	0.00	90.00	$0	45,377.20	40.00	$1,815,088	NA	20.00	$0	$1,815,088	0.00	50.00	$0	0.00	50.00	$0
1996	100,000.00		100,000.00	100,000.00	97.34	$9,734,400	0.00	43.26	$0	NA	21.63	$0	$9,734,400	0.00	53.05	$0	0.00	53.05	$0
1997	100,000.00		200,000.00	100,000.00	101.24	$10,123,776	0.00	44.99	$0	NA	22.50	$0	$10,123,776	0.00	54.64	$0	0.00	54.64	$0
1998	100,000.00		300,000.00	100,000.00	105.29	$10,528,727	0.00	46.79	$0	0.00	23.40	$0	$10,528,727	0.00	56.28	$0	0.00	56.28	$0
1999	0.00		300,000.00	0.00	109.50	$0	0.00	48.67	$0	0.00	24.33	$0	$0	0.00	57.96	$0	0.00	57.96	$0
2000	0.00		300,000.00	0.00	113.88	$0	0.00	50.61	$0	0.00	25.31	$0	$0	0.00	59.70	$0	0.00	59.70	$0
2001	0.00		300,000.00	0.00	118.43	$0	0.00	52.64	$0	100,000.00	26.32	$2,631,864	$2,631,864	0.00	61.49	$0	0.00	61.49	$0
2002	0.00		300,000.00	0.00	123.17	$0	0.00	54.74	$0	200,000.00	27.37	$5,474,276	$5,474,276	0.00	63.34	$0	0.00	63.34	$0
2003	0.00		300,000.00	0.00	128.10	$0	0.00	56.93	$0	300,000.00	28.47	$8,539,871	$8,539,871	0.00	65.24	$0	0.00	65.24	$0
2004	0.00	50,000.00	250,000.00	0.00	133.22	$0	50,000.00	59.21	$2,960,489	250,000.00	29.60	$6,046,668	$9,007,156	0.00	67.20	$0	0.00	67.20	$0
2005	0.00	50,000.00	200,000.00	0.00	138.55	$0	50,000.00	61.58	$3,078,908	0.00	30.79	$0	$3,078,908	0.00	69.21	$0	0.00	69.21	$0
2006	0.00	50,000.00	150,000.00	0.00	144.09	$0	50,000.00	64.04	$3,202,064	0.00	32.02	$0	$3,202,064	0.00	71.29	$0	0.00	71.29	$0
2007	0.00	0.00	150,000.00	0.00	149.86	$0	0.00	66.60	$0	0.00	33.30	$0	$0	0.00	73.43	$0	0.00	73.43	$0
2008	50,000.00	0.00	200,000.00	0.00	155.85	$0	0.00	69.27	$0	0.00	34.63	$0	$0	50,000.00	75.63	$3,781,474	0.00	75.63	$0
2009	50,000.00		250,000.00	0.00	162.08	$0	0.00	72.04	$0	0.00	36.02	$0	$0	50,000.00	77.90	$3,894,919	0.00	77.90	$0
2010	0.00	100,000.00	150,000.00	0.00	168.57	$0	100,000.00	74.92	$7,491,925	0.00	37.46	$0	$7,491,925	0.00	80.24	$0	0.00	80.24	$0
2011	0.00	50,000.00	100,000.00	0.00	175.31	$0	50,000.00	77.92	$3,895,801	0.00	38.96	$0	$3,895,801	0.00	82.64	$0	0.00	82.64	$0
2012		50,000.00	50,000.00	0.00	182.32	$0	0.00	81.03	$0	0.00	40.52	$0	$0	0.00	85.12	$0	50,000.00	85.12	$4,256,083
2013		50,000.00	0.00	0.00	189.62	$0	0.00	84.27	$0	0.00	42.14	$0	$0	0.00	87.68	$0	50,000.00	87.68	$4,383,765
2014			0.00	0.00	197.20	$0	0.00	87.64	$0	0.00	43.82	$0	$0	0.00	90.31	$0	0.00	90.31	$0
2015			0.00	0.00	205.09	$0	0.00	91.15	$0	0.00	45.58	$0	$0	0.00	93.01	$0	0.00	93.01	$0
2016			0.00	0.00	213.29	$0	0.00	94.80	$0	0.00	47.40	$0	$0	0.00	95.81	$0	0.00	95.81	$0
2017			0.00	0.00	221.82	$0	0.00	98.59	$0	0.00	49.29	$0	$0	0.00	98.68	$0	0.00	98.68	$0
2018			0.00	0.00	230.70	$0	0.00	102.53	$0	0.00	51.27	$0	$0	0.00	101.64	$0	0.00	101.64	$0
2019			0.00	0.00	239.93	$0	0.00	106.63	$0	0.00	53.32	$0	$0	0.00	104.69	$0	0.00	104.69	$0
2020			0.00	0.00	249.52	$0	0.00	110.90	$0	0.00	55.45	$0	$0	0.00	107.83	$0	0.00	107.83	$0
2021			0.00	0.00	259.50	$0	0.00	115.33	$0	0.00	57.67	$0	$0	0.00	111.06	$0	0.00	111.06	$0
2022			0.00	0.00	269.88	$0	0.00	119.95	$0	0.00	59.97	$0	$0	0.00	114.40	$0	0.00	114.40	$0

Notes:
Exhibit does not show energy payments required to return water under Article 6.3.3 or operation and maintenance fee under Article 6.7.
Assumes Engineering News Record (ENR) Index increases four percent annually.
Assumes Consumer Price Index increases three percent annually.
Share means Metropolitan's share of Total Project Capital Costs. (as defined in Article 1.6)
Adjustments are not applied retroactively to water previously delivered, returned and or remaining in storage more than five years.

EXHIBIT B

LETTER 15

METROPOLITAN'S PROGRAM STORAGE ALLOCATIONS

Year	Met's Payments During Calendar Year	METS UNPAID SHARE OF TOTAL PROGRAM CAPITAL COSTS: Previous Year's Unpaid Portion	Previous Years Payments	Difference Between Previous Unpaid Portion and Previous Yrs. Payment	Adjustment Factor for Calendar Year	Beg. of Calendar Year Unpaid Share	Cumulative Payments from Previous Years	Beg. of Year Share Total Project Capital Cost	METROPOLITAN'S STORAGE ALLOCATION: Total Program Capital Cost (Adjusted)	Annual Payments Divided Total Program Capital Cost	Cumulative % Paid by Met	Prospective Payments Pursuant under Section 6.3.1	Total % Paid (Actual and Prospec-tive)	Permanent Storage Allocation AF	Interim Storage Allocation (Initially 350,000 AF) AF	Total Permanent and Interim Storage Allocation AF
1993	$0															
1994	$0	$46,900,000	$0	$46,900,000	1.00	$46,900,000	$0	$46,900,000	$134,000,000	0.00%	0.00%	1.35%	1.35%	13,545	336,455	350,000
1995	$1,815,088	$46,900,000	$0	$46,900,000	1.00	$46,900,000	$0	$46,900,000	$134,000,000	1.35%	1.35%	0.00%	1.35%	13,545	336,455	350,000
1996	$9,734,400	$46,900,000	$1,815,088	$45,084,912	1.08	$48,763,841	$1,815,088	$50,578,929	$144,934,400	6.72%	8.07%	2.99%	11.06%	110,560	239,440	350,000
1997	$10,123,776	$48,763,841	$9,734,400	$39,029,441	1.04	$40,590,618	$11,549,488	$52,140,106	$150,731,776	6.72%	14.79%	5.97%	20.76%	207,575	142,425	350,000
1998	$10,528,727	$40,590,618	$10,123,776	$30,466,842	1.04	$31,685,516	$21,673,264	$53,358,780	$156,761,047	6.72%	21.50%	8.96%	30.46%	304,590	45,410	350,000
1999	$0	$31,685,516	$10,528,727	$21,156,789	1.04	$22,003,061	$32,201,991	$54,205,052	$163,031,489	0.00%	21.50%	8.96%	30.46%	304,590	45,410	350,000
2000	$0	$22,003,061	$0	$22,003,061	1.04	$22,883,183	$32,201,991	$55,085,174	$169,552,748	0.00%	21.50%	8.96%	30.46%	304,590	45,410	350,000
2001	$2,631,864	$22,883,183	$0	$22,883,183	1.04	$23,798,510	$32,201,991	$56,000,501	$176,334,858	1.49%	23.00%	8.96%	31.95%	319,516	30,484	350,000
2002	$5,474,276	$23,798,510	$2,631,864	$21,166,647	1.04	$22,013,313	$34,833,855	$56,847,167	$183,388,253	2.99%	25.98%	8.96%	34.94%	349,366	634	350,000
2003	$8,539,871	$22,013,313	$5,474,276	$16,539,037	1.04	$17,200,598	$40,308,131	$57,508,729	$190,723,783	4.48%	30.46%	8.96%	39.41%	350,000	0	350,000
2004	$9,007,156	$17,200,598	$8,539,871	$8,660,727	1.04	$9,007,156	$48,848,002	$57,855,158	$198,352,734	4.54%	35.00%	7.46%	42.46%	350,000	0	350,000
2005	$3,078,908	$9,007,156	$9,007,156	$0	1.04	$0	$57,855,158	$57,855,158	$206,286,844	1.49%	36.49%	5.97%	42.46%	364,925	0	364,925
2006	$3,202,064	$0	$3,078,908	$0	1.04	$0	$57,855,158	$57,855,158	$214,538,317	1.49%	37.99%	4.48%	42.46%	379,851	0	379,851
2007	$0	$0	$3,202,064	$0	1.04	$0	$57,855,158	$57,855,158	$223,119,850	0.00%	37.99%	4.48%	42.46%	379,851	0	379,851
2008	$0	$0	$0	$0	1.04	$0	$57,855,158	$57,855,158	$232,044,644	0.00%	37.99%	4.48%	42.46%	379,851	0	379,851
2009	$0	$0	$0	$0	1.04	$0	$57,855,158	$57,855,158	$241,326,430	0.00%	37.99%	4.48%	42.46%	379,851	0	379,851
2010	$7,491,925	$0	$0	$0	1.04	$0	$57,855,158	$57,855,158	$250,979,487	2.99%	40.97%	1.49%	42.46%	409,701	0	409,701
2011	$3,895,801	$0	$7,491,925	$0	1.04	$0	$57,855,158	$57,855,158	$261,018,666	1.49%	42.46%	0.00%	42.46%	424,627	0	424,627
2012	$0	$0	$3,895,801	$0	1.04	$0	$57,855,158	$57,855,158	$271,459,413	0.00%	42.46%	0.00%	42.46%	424,627	0	424,627
2013	$0	$0	$0	$0	1.04	$0	$57,855,158	$57,855,158	$282,317,790	0.00%	42.46%	0.00%	42.46%	424,627	0	424,627
2014	$0	$0	$0	$0	1.04	$0	$57,855,158	$57,855,158	$293,610,501	0.00%	42.46%	0.00%	42.46%	424,627	0	424,627
2015	$0	$0	$0	$0	1.04	$0	$57,855,158	$57,855,158	$305,354,921	0.00%	42.46%	0.00%	42.46%	424,627	0	424,627
2016	$0	$0	$0	$0	1.04	$0	$57,855,158	$57,855,158	$317,569,118	0.00%	42.46%	0.00%	42.46%	424,627	0	424,627
2017	$0	$0	$0	$0	1.04	$0	$57,855,158	$57,855,158	$330,271,883	0.00%	42.46%	0.00%	42.46%	424,627	0	424,627
2018	$0	$0	$0	$0	1.04	$0	$57,855,158	$57,855,158	$343,482,758	0.00%	42.46%	0.00%	42.46%	424,627	0	424,627
2019	$0	$0	$0	$0	1.04	$0	$57,855,158	$57,855,158	$357,222,068	0.00%	42.46%	0.00%	42.46%	424,627	0	424,627
2020	$0	$0	$0	$0	1.04	$0	$57,855,158	$57,855,158	$371,510,951	0.00%	42.46%	0.00%	42.46%	424,627	0	424,627
2021	$0	$0	$0	$0	1.04	$0	$57,855,158	$57,855,158	$386,371,389	0.00%	42.46%	0.00%	42.46%	424,627	0	424,627
2022	$0	$0	$0	$0	1.04		$57,855,158	$57,855,158	$401,826,245	0.00%	42.46%	0.00%	42.46%	424,627	0	424,627

EXHIBIT B

PROGRAM DELIVERY CAPABILITY

INTRODUCTION:

The In-Lieu Service Area authorized in the EIR consists of 23,000 acres of actively farmed land. Semitropic's commitment to the Banking Partners is that at full development there will be 23,000 acres of In-Lieu Service Area. In the event cropping patterns or irrigation practices change the assumed average annual quantity of water each acre of land requires for irrigation, Semitropic shall not be obligated to increase its commitment to develop 23,000 acres of in-lieu land at full program development.

I. Maximum Annual Estimated Program Delivery Capability:

1.	In-Lieu Service Area: 23,000 acres x 3.5 AF/acre	=	80,500 AF/Yr
2.	Reduce existing delivery system constraints to lands already served by Semitropic's distribution system:		10,000 AF/Yr
	Total		90,500 AF/Yr

II. Metropolitan's share of Maximum Estimated Program Delivery Capability:

1.	By Establishing an In-Lieu Service Area 23,000 acres x 0.35 = 8,050 acres 8,050 acres x 3.5 AF/acre	=	28,175 AF/Yr
2.	By Increasing System Capacity 10,000 AFY x 0.35	=	3,500 AF/Yr
	Total Metropolitan Share of Maximum Estimated Program Delivery Capability		31,675 AF/Yr

Semitropic shall not be obligated to change its commitment to have developed 8,050 acres of in-lieu land by the time Metropolitan has paid Metropolitan's share of Total Project Capital Cost.

EXHIBIT C

Expected Monthly Distribution of Metropolitan's Share of Maximum Estimated Program Delivery Capability:

	Historical Deliveries on 66,800 Acres+ Average of '84, '89 and '93		
	Acre-Feet	Percent	Estimated Monthly Distribution of MWD's share of "Program Delivery Capability " Acre-Feet Per Month
JANUARY	* 2,444	1.0	317
FEBRUARY	* 22,185	9.8	3,104
MARCH	21,185	9.6	3,041
APRIL	17,984	7.9	2,502
MAY	24,373	10.6	3,358
JUNE	36,138	15.9	5,036
JULY	41,123	18.1	5,733
AUGUST	34,084	15.1	4,783
SEPTEMBER	12,310	5.4	1,710
OCTOBER	6,373	2.8	887
NOVEMBER	4,015	1.9	602
DECEMBER	4,206	1.9	602
TOTAL	226,420 AF	100.0	31,675 AF

* Average of 1984 and 1989 only

EXHIBIT C

SEMITROPIC WATER STORAGE DISTRICT

CALCULATION OF POWER PAYMENTS UNDER SECTION 6.3.3
AGREEMENT FOR A METROPOLITAN-SEMITROPIC WATER BANKING AND EXCHANGE PROGRAM

BASIC FORMULA

(ENERGY CONSUMED to WITHDRAW WATER from STORAGE) x (TOTAL SEMITROPIC ENERGY COSTS) = (WITHDRAWAL PAYMENTS)
(TOTAL ENERGY CONSUMED BY SEMITROPIC)

Summary of components

ENERGY CONSUMED to WITHDRAW WATER from STORAGE (Water Banking activity to return stored water)

1. Energy used to extract ground water for Banking Partners, including:
   a) Actual electric meter readings from Semitropic operated wells
   b) Actual PG&E meter readings from bills submitted for payment under pumping agreements for operation of Semitropic landowner wells
   c) Energy use under pumping agreements with Semitropic landowners for operation of wells where the actual KWH is unavailable (as in engine driven wells) use the formula:
   KWH = 1.707 x (PUMPING LIFT in feet) x (ACRE-FEET EXTRACTED)
   Where 1.707 is the conversion factor assuming 60% wire to water efficiency
   Where the PUMPING LIFT is determined from the previous year's "Lines of Equal Pumping Lifts" by Bookman-Edmonston Engineering, Inc.
   Where the ACRE-FEET EXTRACTED is from actual Semitropic water meter readings
   d) Estimated use for released Contract Water (on-farm ground water pumping) use the same formula as above

2. Energy used to reverse the flow of Semitropic canals
   a) From the actual electric meter readings at reverse flow pumping structures
   The use shall be proportional to the water pumped for WITHDRAWAL for Banking Partners to the total water pumped by Semitropic

3. Energy used at the Semitropic's Pump-Back Pumping Plant to return water to the California Aqueduct
   a) From the actual electric meter readings at the Pump-Back Pumping Plant
   The use shall be proportional to the water pumped for WITHDRAWAL for Banking Partners to the total water pumped by Semitropic

4. Estimated energy use for other facilities as may be required by Semitropic

EXHITBIT D

)TAL ENERGY COSTS (Costs to secure energy required for all Semitropic activities)

5. Costs to feed energy into the Semitropic Grid
   a) PG&E billing at Semitropic Substation (single point of service with Semitropic power grid)
   b) All costs for other electrical feeds into Semitropic Grid (i.e. external cogeneration facilities)
   c) All costs for power generated by Semitropic's Energy Project including:
      (currently 4 MW of natural gas engine generation and 850 KW of hydroelectric generation)
      Fuel
      Operation & Maintenance
      Replacement Reserve deposits
      Debt Service

6. Costs for energy not fed into Semitropic Grid
   a) All PG&E billings for Semitropic facilities not on Semitropic Grid
   b) Engine/generator rental and diesel to operate temporary Semitropic facilities
   c) All payments to Semitropic landowners under ground water pumping agreements for operation of Semitropic landowner wells
   d) All payments to Contract Water Users for release of Contract Water (on-farm ground water pumping) for energy use identified in 1.d) above
   e) Costs of other facilities as may be required by Semitropic

TOTAL ENERGY CONSUMED (Energy required for all Semitropic activities)

Energy fed into the Semitropic Grid
   a) PG&E meter readings at Semitropic Substation (single point of service with Semitropic power grid)
   b) Any other electrical service metered into Semitropic Grid (i.e. external cogeneration facilities)
   c) Energy metered at each Semitropic operated natural gas engine-generator
   d) Energy metered at each Semitropic operated hydroelectric generator

8. Energy not fed into the Semitropic Grid
   a) All PG&E meter readings for Semitropic facilities not on Semitropic Grid
   b) Actual PG&E meter readings from bills submitted for payment under pumping agreements for operation of Semitropic landowner wells
   c) Energy use under pumping agreements with Semitropic landowners for operation of wells where the actual KWH is unavailable
      (as in engine driven wells) use the formula:
      KWH = 1.707 x (PUMPING LIFT in feet) x (ACRE-FEET EXTRACTED)
      Where 1.707 is the conversion factor assuming 60% wire to water efficiency
      Where the PUMPING LIFT is determined from the previous year's "Lines of Equal Pumping Lifts" by Bookman-Edmonston Engineering, Inc.
      Where the ACRE-FEET EXTRACTED is from actual Semitropic water meter readings
   d) Estimated use for released Contract Water (on-farm ground water pumping) use the same formula as above

   e) Estimated energy use for other facilities as may be required by Semitropic

DEPRECIATION ASSUMPTIONS TO BE USED FOR SECTION 12.2 OF THIS AGREEMENT

I. Depreciation is to be calculated on a straight line basis.

II. The average useful lives of facilities are as follows:

Facility	Average Useful Life (years)
Canals	50
Structures	50
Pipelines and Appurtenances	50
Pumps and Motors	25
Wells	25

EXHIBIT E

LETTER 15

RECORDED BY
GALE E. ENGLAND
KERN COUNTY RECORDER

96 DEC 20 PM 1:32

Recording Requested By
And When Recorded Return to:

179717

Semitropic Water Storage District
P.O. Box Z
Wasco, CA 93280

MEMORANDUM OF AGREEMENT
FOR A METROPOLITAN-SEMITROPIC
WATER BANKING AND EXCHANGE PROGRAM

THIS MEMORANDUM OF AGREEMENT (this "**Memorandum of Agreement**"), dated as of December 12, 1994, is entered into by and between THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA ("**Metropolitan**"), and the SEMITROPIC WATER STORAGE DISTRICT and SEMITROPIC IMPROVEMENT DISTRICT, BUTTONWILLOW IMPROVEMENT DISTRICT and POND-POSO IMPROVEMENT DISTRICT of the SEMITROPIC WATER STORAGE DISTRICT (collectively called "**Semitropic**"), with respect to that certain Agreement for a Metropolitan-Semitropic Water Banking and Exchange Program, dated of even date herewith, by and among Metropolitan and Semitropic (which Agreement, as of any particular time, as amended through that time, may be referred to herein as the "**Agreement**"). Metropolitan and Semitropic may be referred to individually as "**Party**" or, collectively, as "**Parties.**"

RECITALS

A. Metropolitan obtains water from the State Water Project ("**SWP**") through its contract with the California Department of Water Resources ("**DWR**"). From time-to-time, Metropolitan will have water available that it desires to deliver to Semitropic for storage and eventual return or other disposition pursuant to the Agreement.

B. Semitropic obtains water from the SWP through its contracts with the Kern County Water Agency ("**Agency**") under the Agency's master contract with DWR. A total of approximately 136,370 acres of land within Semitropic is irrigated. Semitropic has entered into contracts with individual landowners covering 42,328 acres of land which is designated as the Surface Water Service Area ("**SWSA**"). Additional lands outside the SWSA, in the amount of approximately 24,500 acres, have also been connected to Semitropic's distribution system so such lands may receive surface water when available. These additional lands are designated as the Temporary Water Service Area ("**TWSA**"), and may sometimes be referred to as the "**Non-Contract Service Area.**" Total landowner demand within the SWSA and TWSA for surface water supplies is greater than water available under Semitropic's entitlement for Agency SWP water and other surface water supplies. The construction of additional distribution facilities by Semitropic, as contemplated by the Agreement, will allow Semitropic to absorb additional imported water delivered to Semitropic by Metropolitan for storage pursuant to the Agreement.

C. Semitropic has constructed a seventy-eight inch (78") pumpback pipeline that is capable of conveying water withdrawn from the groundwater basin underlying the area within Semitropic's boundaries (the "**Semitropic Basin**") directly to the California Aqueduct. Semitropic's boundaries, various wellsites owned and controlled by Semitropic, said pumpback pipeline and certain other facilities of Semitropic which are to be used in connection with the Program (as hereinafter defined) are shown on Exhibit 1 to this Memorandum of Agreement (which Exhibit is incorporated herein by this reference). In addition Semitropic will construct other facilities in the area showing on Exhibit 1 as provided in the Agreement. Semitropic's pumpback operations to return stored water to Metropolitan at the California Aqueduct, as provided for in the Agreement, will take place primarily during the "off-peak" irrigation season, when groundwater pumping and conveyance capacity are available.

D. Metropolitan and Semitropic find that it will be mutually advantageous to enter into a groundwater banking and exchange program whereby Semitropic will hold in trust for Metropolitan the water deposited by Metropolitan hereunder (or its equivalent), together with (i) an easement and right to withdraw from lands owned or controlled by Semitropic an amount of water equal to Metropolitan's Stored Water on deposit with Semitropic, and (ii) an easement and right to transport such water from the Semitropic Basin to the California Aqueduct for delivery there to Metropolitan, all in accordance with the terms of the Agreement. The Agreement will provide additional groundwater storage for Metropolitan, resulting in better utilization of its SWP supplies, and will provide improved reliability of supplies and overall higher groundwater levels for Semitropic.

E. The Agreement is consistent with the goal of making optimum use of water and facilities and is consistent with conservation objectives of Metropolitan, Semitropic, Agency and DWR.

F. Consistent with the California Environmental Quality Act ("**CEQA**"), Semitropic, acting as lead agency, and Metropolitan, acting as a responsible agency, have jointly completed an environmental impact report concerning the proposed water banking and exchange program (the "**EIR**"). Semitropic's Board of Directors, on July 13, 1994, certified the EIR as being in compliance with CEQA, and Metropolitan's Board of Directors on August 19, 1994, reviewed and considered the EIR. Semitropic will also be responsible for implementing and monitoring the mitigation measures defined in "Findings and Mitigation Monitoring Plan" dated July 1994, adopted as part of the Final EIR.

G. Semitropic has also entered into a Memorandum of Understanding ("**MOU**") with neighboring districts, dated September 14, 1994, to implement in part said monitoring and mitigation measures, which the Agreement is subject to. The MOU is on file with both Metropolitan and Semitropic.

H. The Semitropic Water Banking and Exchange Program authorized in the above-referenced EIR (the "**Program**") has a defined total storage capacity of 1,000,000 acre-feet. The estimated absorptive capacity, based on the approximately 23,000 acres of In-Lieu Service Area (as defined in Article 1 of the Agreement) and the current cropping patterns and irrigation efficiencies, is 80,500 acre-feet per year. An estimated additional 10,000 acre-feet per year of absorptive capacity is anticipated as a result of Semitropic improving the delivery capability of the distribution system

to the existing SWSA and TWSA, as contemplated by the Program. The estimated withdrawal capacity is 90,000 acre-feet per year, at a maximum flow rate of 300 CFS, through the pumpback facility. In addition, Stored Water (as defined in said Article 1) may be returned from any Semitropic SWP Entitlement Water (as defined in said Article 1) allocation in excess of 25,000 acre-feet, as described in Exhibit B to the Agreement. Facilities necessary to accomplish the foregoing will increase the absorptive and withdrawal capabilities of Semitropic over and above the pre-Program conditions. Metropolitan's participation may not fully utilize these capacities. Therefore, Semitropic has developed and will be offering other potential Banking Partners (as defined in said Article 1) the opportunity to participate in the Program on substantially the same terms and conditions as Metropolitan. Metropolitan has reviewed the terms and conditions of that certain document entitled "Semitropic Groundwater Banking Program Payment and Banking Capacity Rights Options" dated August 1, 1994, setting forth the terms on which third parties may participate in the Program as Banking Partners (the "**Program Options**"). A copy of that document is on file with both Semitropic and Metropolitan. Metropolitan has agreed that anyone who is a party to an agreement with Semitropic which includes one or more of options 1 through 4 of the Program Options and which does not violate any of the requirements of the Agreement will be a Banking Partner.

I. As a part of the Agreement, Semitropic, as trustee, will hold in trust for Metropolitan, in accordance with the terms of the Agreement, the water deposited by Metropolitan (or its equivalent), together with the right to withdraw it and to deliver it to the California Aqueduct. The parties create this trust relationship for the purpose of protecting Metropolitan's ability to recover Stored Water, and Semitropic's fiduciary duty is limited to Semitropic's responsibilities as set forth in the Agreement. In addition, Semitropic, in a non-fiduciary capacity, will provide such water resource management services as are necessary to implement and operate the Program. Semitropic's non-fiduciary obligations include taking such actions, including the construction of facilities, securing agreements and entering into operational arrangements, as are necessary to receive from Metropolitan water delivered by Metropolitan for storage hereunder and to return equivalent water to Metropolitan in accordance with the terms of the Agreement. The Program, as implemented with respect to Metropolitan by the Agreement, when combined with other necessary actions undertaken by Metropolitan, will thus allow the delivery of Stored Water to Metropolitan during Metropolitan's peak demand periods. When such services are provided by Semitropic, Metropolitan will make payments to Semitropic, as provided for in the Agreement, to compensate Semitropic for its services and expenses. Although Metropolitan does not guarantee its level of participation in the Program, it is anticipated that Metropolitan will acquire at least 35 percent of the Program's capabilities, rights and capacities described in Recital H and elsewhere in the Agreement.

Metropolitan will acquire a proportionate share of total Program capabilities, capacities and rights for the term of this Agreement as Metropolitan's Permanent Storage Allocation (as defined in Section 1.7 of the Agreement) "vests," as provided in said Section 1.7. After Metropolitan's Permanent Storage Allocation is Fully Vested, as provided in said Section 1.7, Metropolitan may increase its vested Permanent Storage Allocation as provided for in Sections 6.5 and 6.6 of the Agreement.

For the first ten years of the Agreement, Semitropic will allocate interim Program capabilities, capacities and rights to Metropolitan sufficient to make available to Metropolitan at least: (i) 35 percent of Semitropic's then existing capability to store water using then existing facilities, (ii) 35 percent of Semitropic's then existing ability to return water through State Water Project entitlement exchange available, and (iii) a minimum capacity of 31,500 acre-feet per year to return withdrawn water directly to the California Aqueduct from the Semitropic's facilities.

J. The trust relationship between Metropolitan, as settlor and beneficiary, and Semitropic, as trustee, created by the Agreement and described in these Recitals, is entered into by the Parties solely for the purpose of protecting Metropolitan's interest in water delivered by Metropolitan to Semitropic hereunder for storage, and the right of Metropolitan, also held in trust by Semitropic for Metropolitan, to recovery from the Semitropic Basin of water in a quantity sufficient to return to Metropolitan, a quantity equal to Metropolitan's Storage Account Balance (as defined in Article 1 of the Agreement), such right to be exercised by Semitropic, as trustee, through the lands, facilities, rights and interests of Semitropic, or by its successor in interest in and to the trust property, all in accordance with the terms of the Agreement. Semitropic acknowledges and agrees that all water delivered to it by Metropolitan under the Agreement will be received, held, exchanged, accounted for, and returned or otherwise disposed of by Semitropic in its capacity as trustee for Metropolitan with respect to such water and the easements and rights relating thereto provided for herein and in the Agreement. Metropolitan has authorized Semitropic, as trustee, to commingle, exchange or otherwise dispose of the water delivered by Metropolitan under the Agreement. In exchange for those rights and for water delivered under the Agreement, Semitropic has granted, and does hereby grant, to Metropolitan the right to an equal quantity of water from the lands, facilities, rights and interests of Semitropic (subject, however, to the loss provisions of Article 4 of the Agreement), together with such easements and other rights as are necessary to transport the recovered water to the California Aqueduct for delivery to Metropolitan therein, all upon, and subject to the provisions of, the Agreement (all which rights and easements may be referred to herein and in the Agreement, collectively, as the "**Trust Property**"). Metropolitan has granted, and does hereby grant, to Semitropic said Trust Property, in trust, for the use and benefit of Metropolitan. The trust relationship created by the Agreement is not otherwise intended to apply to or effect the obligations of Semitropic or Metropolitan under the Agreement, or the remedies in the event of default; it being expressly understood and agreed that Semitropic's obligations under the Agreement to, among other things, construct facilities and enter into agreements with others in furtherance of the Program shall not be fiduciary in nature. Notwithstanding creation of a trust under the Agreement, Semitropic may benefit from the Agreement.

K. Metropolitan has previously delivered 45,377.2 acre-feet of water to Semitropic pursuant to the February 1, 1993, "Temporary Agreement for a Metropolitan-Semitropic Water Banking and Exchange Program." Metropolitan and Semitropic desire that such water hereafter be held and disposed of by Semitropic for the benefit of Metropolitan under the Agreement as provided therein.

NOW, THEREFORE, in consideration of the foregoing recitals (which are, by this reference incorporated herein and made a part hereof for all purposes) and for other valuable consideration, the receipt and adequacy of which are hereby acknowledged, Metropolitan and Semitropic do further agree as follows:

1. The Agreement is incorporated herein by this reference, as if set out in full herein.

2. In the event of any conflict between the provisions of this Memorandum of Agreement and the Agreement, the provisions of the Agreement shall control.

3. Neither the Agreement nor this Memorandum of Agreement shall be interpreted to modify the terms or conditions of either the water supply contracts between the DWR and the Agency or Metropolitan or the water supply agreements between the Agency and Semitropic.

4. Unless the Agreement is earlier terminated pursuant to Section 10 thereof or pursuant to Sections 11.1.3, 11.2, 11.3, 12.2 or 12.3 thereof, the Agreement and this Memorandum of Agreement shall terminate on November 4, 2035, the date of termination of the Agency's Long-Term Water Supply Contract; *provided, however,* that, if Metropolitan has timely requested return of Stored Water pursuant to Article 5 of the Agreement at such a time and in such a manner that Metropolitan's Stored Water could have been returned prior to November 4, 2035 but, because of conditions beyond the control of Metropolitan, all of Metropolitan's Stored Water has not been returned by that date, the provisions of Articles 1, 5, 6, 7, 9, 11, 12 and 13 of the Agreement shall continue in full force and effect for such additional period of time as is necessary for Metropolitan to receive its Stored Water as requested; and *provided, further,* that if a claim arising under or with respect to the terms of the Agreement has not been resolved when the Agreement terminates, or if such a claim is brought after the Agreement has terminated but within the period of time for bringing such a claim under California law (such a claim being referred to herein as a "**Late Arising Claim**"), the provisions of Articles 1,7, 9 and 13 of the Agreement shall continue in full force and effect for such additional period of time as is necessary to resolve such claim and to satisfy the rights and obligations of the Parties hereto with respect to it pursuant to such Articles. The Agreement may be renewed by mutual agreement of the parties, which renewal shall unless otherwise agreed effect a continuation of Semitropic's duties under the Agreement and an amendment of this Memorandum of Agreement, whether or not such amendment is recorded. Metropolitan may elect to terminate the Agreement at any time by giving written notice to Semitropic of Metropolitan's intent to terminate not less than one year in advance of the termination date selected by Metropolitan and specified in the notice and by conveying its beneficial interest in the amount of Metropolitan's Stored Water in Metropolitan's Storage Account Balance on that termination date to Semitropic. Upon Metropolitan's conveyance of such beneficial interest, the Agreement shall be fully terminated except as provided in Article 10 of the Agreement with respect to Late Arising Claims.

IN WITNESS WHEREOF, the Parties have caused this Memorandum of Agreement to be duly executed and delivered by their respective authorized officers as of the date first set forth above.

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

By:_____
John R. Wodraska
General Manager

APPROVED AS TO FORM:

N. Gregory Taylor
General Counsel

By:_____
Jarlath Oley
Senior Deputy General Counsel

SEMITROPIC WATER STORAGE DISTRICT

By:_____
Vido G. Fabbri, President

By:_____
Wilmar L. Boschman, Secretary

SEMITROPIC IMPROVEMENT DISTRICT OF SEMITROPIC WATER STORAGE DISTRICT

By:_____
Vido G. Fabbri, President

By:_____
Wilmar L. Boschman, Secretary

BUTTONWILLOW IMPROVEMENT DISTRICT OF SEMITROPIC WATER STORAGE DISTRICT

By:_____
Vido G. Fabbri, President

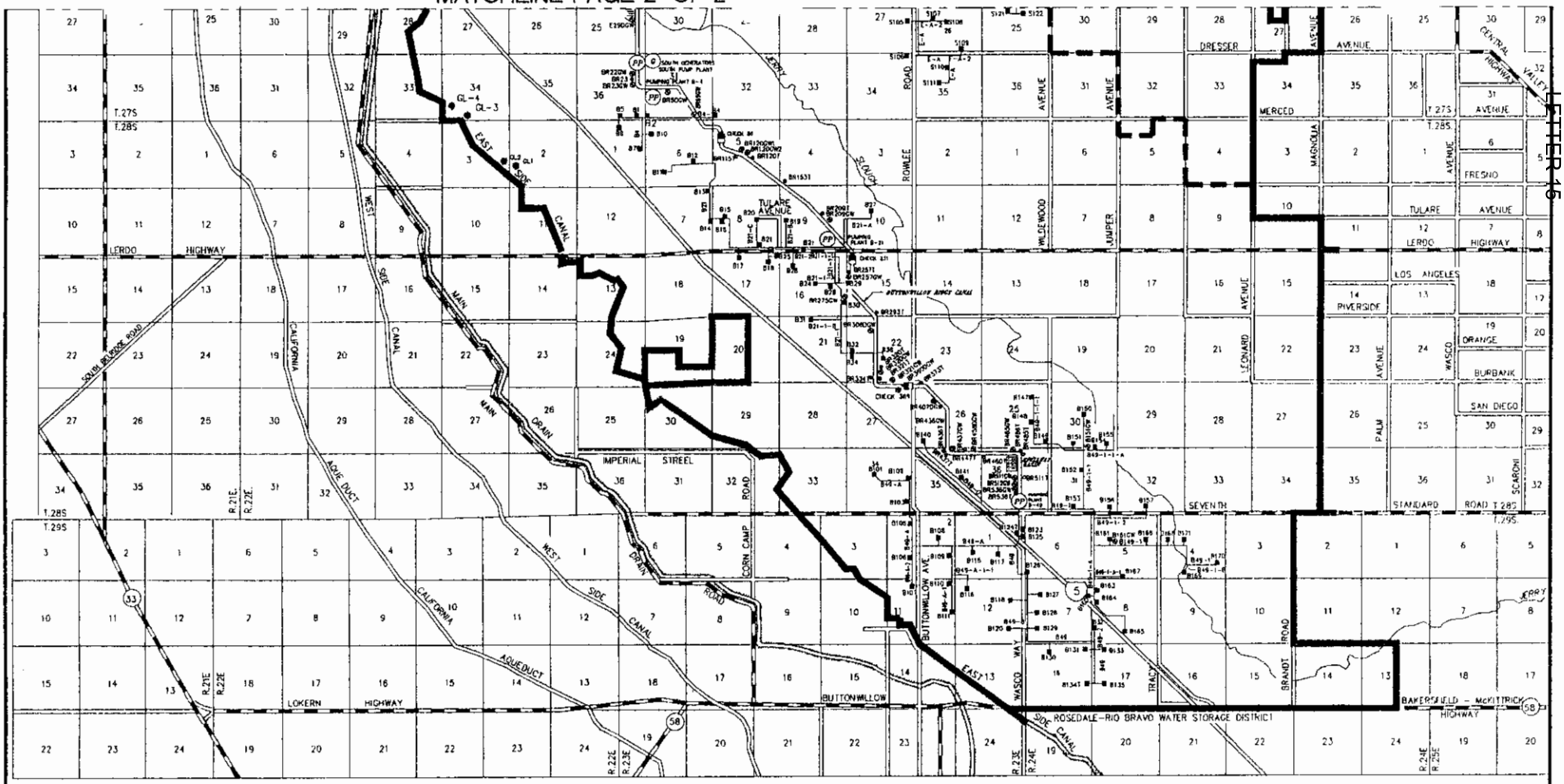
By:_____
Wilmar L. Boschman, Secretary

POND-POSO IMPROVEMENT DISTRICT OF SEMITROPIC WATER STORAGE DISTRICT

By:_____
Vido G. Fabbri, President

By:_____
Wilmar L. Boschman, Secretary

MATCHLINE PAGE 2 OF 2



LEGEND

- SEMITROPIC WATER STORAGE DISTRICT BOUNDARY.
- IMPROVEMENT DISTRICT BOUNDARY.
- CANAL SYSTEM.
- PIPELINE LATERAL DISTRIBUTION SYSTEM.
- FARM TURNOUT.
- GROUND WATER METER.
- (RP) REVERSE FLOW PUMP STATION
- (PP) PUMPING PLANT
- (D) DIVERSION STRUCTURE
- ELECTICAL SUB-STATION
- CHECK GATE
- PUMP BACK HYDRO TURBINE
- WELL LOCATION
- BOOSTER PUMP SITE.

SEMITROPIC WATER STORAGE DISTRICT

SEMITROPIC GROUNDWATER BANKING PROJECT

DECEMBER 1994

SCALE OF MILES

1 0 1 2 3

EXHIBIT 1
2 OF 2

LETTER 16

2

CADFILE:EXHBIT2.DWG 12/16/94 (DRAWN BY RALPH R SANCHEZ)

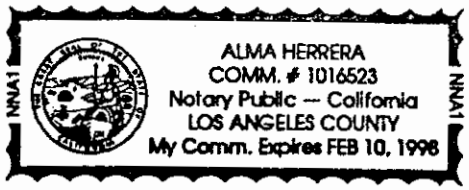
LETTER 15

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

State of California
County of Los Angeles }

On December 12, 1994 (DATE), before me, Alma Herrera (NAME, TITLE OF OFFICER-E.G., "JANE DOE, NOTARY PUBLIC") personally appeared Vido G. Fabbri (President) and Wilmar L. Boschman (Secretary) (NAME(S) OF SIGNER(S))

☐ personally known to me - **OR** - ☒ proved to me on the basis of satisfactory evidence to be the persons whose names ~~is/~~are subscribed to the within instrument and acknowledged to me that ~~he/she/~~they executed the same in ~~his/her/~~their authorized capacities, and that by ~~his/her/~~their signatures on the instrument the persons, or the entity upon behalf of which the persons acted, executed the instrument.



Witness my hand and official seal.

Alma Herrera
SIGNATURE OF NOTARY

OPTIONAL

ATTENTION NOTARY: Although the information requested below is OPTIONAL, it could prevent fraudulent attachment of this certificate to an unauthorized document.

CAPACITY CLAIMED BY SIGNER

- ☐ INDIVIDUAL
- ☐ CORPORATE OFFICER(S) _____ (TITLE(S))
- ☐ PARTNER(S)
  - ☐ LIMITED
  - ☐ GENERAL
- ☐ ATTORNEY-IN-FACT
- ☐ TRUSTEE(S)
- ☐ GUARDIAN/CONSERVATOR
- ☒ OTHER: PRESIDENT and SECRETARY

DESCRIPTION OF ATTACHED DOCUMENT

MEMORANDUM OF AGREEMENT . . .
TITLE OR TYPE OF DOCUMENT

SEVEN (7)
NUMBER OF PAGES

DECEMBER 12, 1994
DATE OF DOCUMENT

SIGNERS ARE REPRESENTING:
NAME OF PERSON(S) OR ENTITY(IES)

SEMITROPIC WATER STORAGE DISTRICT

TWO (2)
SIGNER(S) OTHER THAN NAMED ABOVE

LETTER 15

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

State of California
County of Los Angeles }

On December 12, 1994, before me, Alma Herrera personally
DATE NAME, TITLE OF OFFICER-E.G., "JANE DOE, NOTARY PUBLIC"

appeared Vido G. Fabbri (President) and Wilmar L. Boschman (Secretary)
NAME(S) OF SIGNER(S)

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ALMA HERRERA
COMM. # 1016523
Notary Public — California
LOS ANGELES COUNTY
My Comm. Expires FEB 10, 1998

Witness my hand and official seal.

Alma Herrera
SIGNATURE OF NOTARY

OPTIONAL

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SEMITROPIC IMPROVEMENT DISTRICT
OF SEMITROPIC WATER STORAGE DISTRICT

TWO (2)
SIGNER(S) OTHER THAN NAMED ABOVE

LETTER 15

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State of California
County of Los Angeles }

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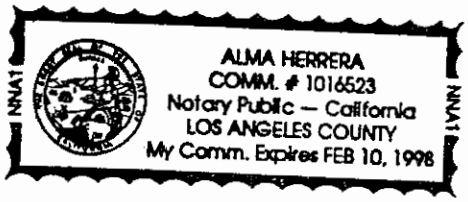

Witness my hand and official seal.

Alma Herrera
SIGNATURE OF NOTARY

OPTIONAL

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_____
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  - ☐ GENERAL
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- ☐ GUARDIAN/CONSERVATOR
- ☒ OTHER: PRESIDENT and SECRETARY

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MEMORANDUM OF AGREEMENT . . .
TITLE OR TYPE OF DOCUMENT

SEVEN (7)
NUMBER OF PAGES

DECEMBER 12 1994
DATE OF DOCUMENT

SIGNERS ARE REPRESENTING:
NAME OF PERSON(S) OR ENTITY(IES)

BUTTONWILLOW IMPROVEMENT DISTRICT
OF SEMITROPIC WATER STORAGE DISTRICT

TWO (2)
SIGNER(S) OTHER THAN NAMED ABOVE

~~LETTER 15~~

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

State of California
County of Los Angeles }

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DATE NAME, TITLE OF OFFICER-E.G., "JANE DOE, NOTARY PUBLIC"

appeared Vido G. Fabbri (President) and Wilmar L. Boschman (Secretary)
NAME(S) OF SIGNER(S)

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ALMA HERRERA
COMM. # 1016523
Notary Public — California
LOS ANGELES COUNTY
My Comm. Expires FEB 10, 1998

Witness my hand and official seal.

Alma Herrera
SIGNATURE OF NOTARY

OPTIONAL

ATTENTION NOTARY: Although the information requested below is OPTIONAL, it could prevent fraudulent attachment of this certificate to an unauthorized document.

CAPACITY CLAIMED BY SIGNER

☐ INDIVIDUAL
☐ CORPORATE OFFICER(S)

_____
TITLE(S)

☐ PARTNER(S)
  ☐ LIMITED
  ☐ GENERAL

☐ ATTORNEY-IN-FACT
☐ TRUSTEE(S)
☐ GUARDIAN/CONSERVATOR
☒ OTHER: PRESIDENT and SECRETARY

DESCRIPTION OF ATTACHED DOCUMENT

MEMORANDUM OF AGREEMENT . . .
TITLE OR TYPE OF DOCUMENT

SEVEN (7)
NUMBER OF PAGES

DECEMBER 12 1994
DATE OF DOCUMENT

SIGNERS ARE REPRESENTING:
NAME OF PERSON(S) OR ENTITY(IES)

POND-POSO IMPROVEMENT DISTRICT
OF SEMITROPIC WATER STORAGE DISTRICT

TWO (2)
SIGNER(S) OTHER THAN NAMED ABOVE

LETTER 15

CALIFORNIA ALL-PURPOSE ACKNOWLEDGMENT

State of California
County of Los Angeles }

On Dec 12, 1994 (DATE) before me, Alma Herrera (NAME, TITLE OF OFFICER-E.G., "JANE DOE, NOTARY PUBLIC") personally appeared JOHN R. WORRASTA (NAME(S) OF SIGNER(S))

☒ personally known to me - **OR** - ☐ proved to me on the basis of satisfactory evidence to be the person(s) whose name(s) is/are subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their authorized capacity(ies), and that by his/her/their signature(s) on the instrument the person(s), or the entity upon behalf of which the person(s) acted, executed the instrument.

ALMA HERRERA
COMM. # 1016523
Notary Public -- California
LOS ANGELES COUNTY
My Comm. Expires FEB 10, 1998

Witness my hand and official seal.

Alma Herrera
SIGNATURE OF NOTARY

OPTIONAL

ATTENTION NOTARY: Although the information requested below is OPTIONAL, it could prevent fraudulent attachment of this certificate to an unauthorized document.

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_____
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  - ☐ LIMITED
  - ☐ GENERAL
- ☐ ATTORNEY-IN-FACT
- ☐ TRUSTEE(S)
- ☐ GUARDIAN/CONSERVATOR
- ☐ OTHER: _____

SIGNER IS REPRESENTING:
NAME OF PERSON(S) OR ENTITY(IES)

DESCRIPTION OF ATTACHED DOCUMENT

_____
TITLE OR TYPE OF DOCUMENT

_____
NUMBER OF PAGES

_____
DATE OF DOCUMENT

_____
SIGNER(S) OTHER THAN NAMED ABOVE

EXHIBIT B

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

AGREEMENT AMONG DEPARTMENT OF WATER RESOURCES, STATE OF CALIFORNIA, KERN COUNTY WATER AGENCY AND SEMITROPIC WATER STORAGE DISTRICT FOR INTRODUCTION OF LOCAL WATER INTO THE CALIFORNIA AQUEDUCT

THIS AGREEMENT is made this 2 day of May, 1995, pursuant to the provisions of the California Water Resources Development Bond Act, and other applicable laws of the State of California, among the DEPARTMENT OF WATER RESOURCES, herein referred to as the "DEPARTMENT," the "Kern County Water Agency" herein referred to as the "AGENCY", a political subdivision of the State of California created by an Act of the California State Legislature (statute 1961 ch 1003 or as amended), and the "SEMITROPIC WATER STORAGE DISTRICT," acting on behalf of itself, Semitropic Improvement District (SID), Pond-Poso Improvement District (PPID), and Buttonwillow Improvement District (BID), herein collectively referred to as the "DISTRICT." The DISTRICT is a public agency, duly organized, existing and acting pursuant to the laws of the State of California.

RECITAL

A. In 1993, the District constructed a 300 cubic-foot-per-second turnout and turn-in/pumpback facility, also known as "Semitropic No. 2 Turnout," at Mile Post 209.80 of the California Aqueduct, constructed pursuant to provisions of an AGREEMENT FOR CONSTRUCTION, OPERATION, AND MAINTENANCE OF THE SEMITROPIC NO. 2 TURNOUT, dated October 8, 1992, between the DEPARTMENT and the

DISTRICT. This Agreement also provides for necessary right of entry for the DISTRICT to enter DEPARTMENT property.

B. The DISTRICT intends to use the facility to deliver water to the DISTRICT from the California Aqueduct and to pump Local Water into the Aqueduct under provisions of this Agreement and separate ground water banking and/or wheeling agreements currently existing or which may be agreed to in the future. These separate agreements will address appropriate legal, institutional and other pertinent aspects of making Local Water available. They will also set forth conditions under which the turn-in facility will be operated to convey Local Water to the Aqueduct, and where appropriate, how such water is to be later returned to the DISTRICT.

C. Recognizing that the DEPARTMENT has a Contract for Water Service with the AGENCY, and that the turn-in facility is located within the AGENCY'S service area, the AGENCY shall either approve and/or be party to all future agreements referenced in Recital B.

AGREEMENT

The DEPARTMENT agrees to accept Local Water from the DISTRICT into the California Aqueduct subject to the following terms and conditions:

1. DEFINITIONS

When used in this Agreement, the following definitions shall apply:

A. "LOCAL WATER" shall mean all extracted ground water from various wells throughout the DISTRICT and possibly imported surface water commingled before it reaches the turn-in facilities at the Aqueduct. Except for incidental Project

Water remaining in the DISTRICT'S distribution system at the time when the turn-in facility is activated, no Project Water shall be used for commingling purposes.

B. "PROJECT WATER" shall mean water made available for delivery to State Water Contractors by project conservation facilities and the transportation facilities included in the State Water Resources Development System as defined in Section 12931 of the Water Code.

C. "STATE WATER CONTRACTORS" shall mean any entity contracting with the State of California for a dependable supply of water made available by the State Water Resources Development System.

D. "STATE WATER PROJECT" shall mean all facilities included in the State Water Resources Development System.

2. PURPOSE

The purpose of this Agreement is to set forth provisions for the DISTRICT to introduce Local Water into the California Aqueduct using Semitropic No. 2 Turnout. All Local Water introduced into the California Aqueduct under this Agreement shall be limited to water made available under separate existing or future ground water banking and/or wheeling agreements referenced in Recital B of this Agreement.

3. AQUEDUCT INFLOW

All Local Water delivered into the California Aqueduct pursuant to this Agreement shall be scheduled and approved by the AGENCY and the DEPARTMENT. The DISTRICT shall submit a proposed schedule of Local Water showing flow rates, volumes, dates, and times to the

AGENCY for its review and approval. Upon AGENCY approval, the AGENCY shall submit the proposed schedule to the DEPARTMENT which will review the DISTRICT'S proposed schedule and send the DISTRICT a letter either approving, disapproving, or modifying the schedule. The DEPARTMENT or the AGENCY may, at any time, modify the DISTRICT'S schedule. The DEPARTMENT shall measure the amount of the DISTRICT'S Local Water placed into the California Aqueduct. The instantaneous flow rate from the DISTRICT facility discharging Local Water into the California Aqueduct under this Agreement shall not exceed the approved capacity of the turn-in facility, estimated to be approximately three hundred (300) cfs, and the quantity of Local Water introduced into the California Aqueduct shall not interfere with the operations of the State Water Project as determined by the DEPARTMENT.

4. PERMITS

The DISTRICT, at its sole expense, shall be responsible for obtaining all permits, licenses, and agreements and for performing all environmental surveys necessary for the extraction, acquisition, transportation, introduction and use of Local Water introduced into the California Aqueduct. The DISTRICT shall provide a copy of all documentation, generated in its compliance under this paragraph, to the DEPARTMENT at the State Water Project Analysis Office. The DEPARTMENT, at its option, may obtain a permit, license, or agreement or perform an environmental survey on behalf of the DISTRICT. The DISTRICT agrees to pay the DEPARTMENT any reasonable costs incurred by the DEPARTMENT in

obtaining such a permit, license, or agreement or in performing an environmental survey.

5. WATER QUALITY CRITERIA FOR LOCAL WATER

(a) Unless otherwise agreed to in writing by the DEPARTMENT, all Local Water supplies made available for inflow into the California Aqueduct shall be in conformance with the DEPARTMENT'S then current water quality criteria applicable to all other similar inflow situations at the time of the introduction of water into the California Aqueduct within the AGENCY'S service area of the California Aqueduct. The DISTRICT, at its sole expense, shall pay all costs for water quality sampling and analysis, and equipment maintenance associated with monitoring of the input of Local Water placed into the California Aqueduct. The DEPARTMENT, at its option, may perform water quality sampling and analysis, water measurement, and equipment maintenance on behalf of the DISTRICT. The DISTRICT agrees to pay to the DEPARTMENT any reasonable costs incurred by the DEPARTMENT as a result of such activities. The DEPARTMENT will provide the DISTRICT with advance notice of such testing.

(b) Before Local Water is placed into the California Aqueduct, the DISTRICT shall provide to the DEPARTMENT for its review and approval the results of all water quality tests conducted within the previous five (5) years for each well providing water to the California Aqueduct under this Agreement. Additional water quality monitoring shall be conducted by the

DISTRICT for Local Water introduced into the California Aqueduct.

6. CHARGES

(a) The DISTRICT shall pay all costs of installation, operation, and maintenance of the facilities required to deliver Local Water into the California Aqueduct under this Agreement.

(b) The DISTRICT agrees to pay to the DEPARTMENT a one-time Contract Development Charge of Two Thousand Dollars ($2,000).

(c) The DISTRICT agrees to pay all reasonable costs resulting from DISTRICT'S actions pursuant to this Agreement or that result in demonstrable increased costs to the DEPARTMENT and any State Water Contractors.

7. PAYMENTS

Upon execution of this Agreement, the DEPARTMENT will bill the DISTRICT the Contract Development Charge. Payment of all charges pursuant to this agreement are due thirty (30) days after date of invoice. Late payments shall be charged interest at one (1) percent per month.

8. LIABILITY

(a) The DISTRICT shall be responsible for any and all liability, losses, claims, demands, and damages, including but not limited to property damage, personal injury or death, which may arise out of work permitted under this Agreement or which may arise out of failure on the DISTRICT'S part to perform its obligations under this Agreement. In the event any claim of liability is made under this Agreement against the AGENCY, the State of California, or any of their departments,

officers, or employees, the DISTRICT agrees to defend, indemnify, and hold each of them harmless from such claims.

(b) Neither the State of California, the AGENCY nor any of their departments, officers, agents, or employees shall be liable for the control, carriage, handling, use, disposal, or distribution of Local Water before it is introduced into, and after it is delivered from the California Aqueduct. The DISTRICT shall be responsible for any and all liabilities, losses, claims, demands, and damages, including but not limited to property damage, personal injury or death, which may arise from the delivery of such water. In the event any claim of such liability is made against the State of California, the AGENCY or any of their departments, officers, or employees, the DISTRICT agrees to defend, indemnify, and hold each of them harmless from such claims.

9. TERM

This Agreement shall become effective on the date of execution hereof, and shall terminate on January 1, 2005 unless extended by mutual consent of all parties. However, the DEPARTMENT may suspend this Agreement upon written notice to the AGENCY and the DISTRICT if, in the judgement of the DEPARTMENT, its continuance could result in disruption or damage, including but not limited to reductions in water quality, to the State Water Project. If the DEPARTMENT should suspend this Agreement, the DISTRICT shall not be relieved of its obligation to return any water owed back to the DEPARTMENT or to pay any charges incurred up to the time of termination described in Paragraph 6 and the DEPARTMENT shall

still be obligated to return any Local Water that had been placed in the California Aqueduct that had not yet been returned.

10. NO MODIFICATION OF WATER SUPPLY CONTRACTS

This Agreement shall not be interpreted to modify the terms or conditions of either the water supply contract between the DEPARTMENT and the AGENCY dated November 15, 1963, or the three (3) water supply contracts between the AGENCY and the DISTRICT.

11. WORKERS' COMPENSATION

The DISTRICT affirms that it is aware of the provisions of Section 3700 of the California Labor Code which require every employee to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that Code, and the DISTRICT affirms that it will comply with such provisions before commencing the performance of the work under this Agreement.

12. CLAIMS DISPUTE

Any claim that a Party may have against another shall be presented in accordance with Part 3 (commencing at 900, Division 3.6 of the Government Code). The PARTIES shall then attempt to negotiate a resolution of such claim and process an amendment to this Agreement to implement the terms of any such resolution. Any unresolved disputes shall be subject to arbitration pursuant to the Code of Civil Procedure Section 1281.6.

13. NONDISCRIMINATION

During the performance of this Agreement, the DISTRICT shall not deny the contract's benefits to any person on the basis of religion, color, ethnic group identification, sex, age, physical

or mental disability, nor shall they discriminate unlawfully against any employee or applicant for employment because of race, religion, color, national origin, ancestry, physical handicap, mental disability, medical condition, marital status, age (over 40), or sex. The DISTRICT shall insure that the evaluation and treatment of employees and applicants for employment are free of such discrimination. The DISTRICT shall comply with the provisions of the Fair Employment and Housing Act (Government Code Section 12900 et seq.), the regulations promulgated thereafter (California Administrative Code, Title 2, Sections 7285.0 et seq.), the provisions of Article 9.5, Chapter 1, Part 1, Division 3, Title 2 of the Government Code (Government Code Sections 11135 - 11139.5), and the regulations or standards adopted by the DEPARTMENT to implement such article. The DISTRICT shall permit access by representatives of the Department of Fair Employment and Housing and the DEPARTMENT upon reasonable notice at any time during the normal business hours, but in no case less than 24-hours notice, to such of its books, records, accounts, other sources of information and its facilities as the Department of Fair Housing or the DEPARTMENT shall require to ascertain compliance with this clause. The DISTRICT shall give written notice of their obligations under this clause to labor organizations with which they have a collective bargaining or other agreement. The DISTRICT shall include the nondiscrimination and compliance provisions of this clause in all subcontracts to perform work under this Agreement.

14. ASSIGNMENT OF AGREEMENT

Without the written consent of the DEPARTMENT and the AGENCY this Agreement is not assignable by the DISTRICT in whole or in part.

15. PARAGRAPH HEADINGS

The paragraph headings of this Agreement are for the convenience of the parties and shall not be considered to limit, expand, or define the contents of the respective paragraphs.

16. TERMS TO BE REASONABLE

Where the terms of this Agreement provide for actions to be based upon the opinion, judgment, approval, review, or determination of any party, such terms are to be construed as providing that such opinion, judgment, approval, review, or determination be reasonable.

17. SIGNATURE CLAUSE

The signatories represent that they have been appropriately authorized to enter into this Agreement on behalf of the party

for whom they sign. A certified copy of the resolution authorizing the AGENCY and the DISTRICT to enter into this Agreement shall be delivered to the DEPARTMENT before Local Water may be introduced into the California Aqueduct.

IN WITNESS WHEREOF, the Parties hereto have entered into this Agreement.

Approved as to Legal Form and Sufficiency

Susan M. Weber
Chief Counsel
Department of Water Resources

4/20/95
DATE

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

Director

5-2-95
DATE

SEMITROPIC WATER STORAGE DISTRICT (Acting on behalf of itself, SID, PPID and BID)

Name Vido G. Fabbri

President, Board of Directors
Title

March 28, 1995
DATE

KERN COUNTY WATER AGENCY

Name

General Manager
Title

March 23, 1995
DATE

State of California
The Resources Agency
DEPARTMENT OF WATER RESOURCES

AMENDMENT NO. 1 TO THE AGREEMENT AMONG DEPARTMENT OF WATER RESOURCES, STATE OF CALIFORNIA, KERN COUNTY WATER AGENCY AND SEMITROPIC WATER STORAGE DISTRICT FOR INTRODUCTION OF LOCAL WATER INTO THE CALIFORNIA AQUEDUCT

That certain agreement dated May 2, 1995, by and between the parties hereto is hereby amended as follows:

Paragraph 9 is amended to read as follows:

9. TERM

This Agreement shall become effective on the date of execution hereof, and shall terminate on November 4, 2035 unless extended by mutual consent of all parties. However, the DEPARTMENT may suspend this Agreement upon written notice to the AGENCY and the DISTRICT if, in the judgement of the DEPARTMENT, its continuance could result in disruption or damage, including but not limited to reductions in water quality, to the State Water Project. If

the DEPARTMENT should suspend this Agreement, the DISTRICT shall not be relieved of its obligation to return any water owed back to the DEPARTMENT or to pay any charges incurred up to the time of termination described in Paragraph 6 and the DEPARTMENT shall still be obligated to return any Local Water that had been placed in the California Aqueduct that had not yet been returned.

Except as herein amended all terms and conditions of said agreement shall remain in full force and effect.

IN WITNESS WHEREOF, the Parties hereto have executed this amendment this 21 day of August, 1995.

Approved as to Legal Form
and Sufficiency

for David B. Anderson
Chief Counsel
Department of Water Resources

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

Director

SEMITROPIC WATER STORAGE DISTRICT
(Acting on behalf of itself,
SID, PPID and BID)

Name

Title

KERN COUNTY WATER AGENCY

Name

General Manager
Title General Manager

SEMITROPIC IMPROVEMENT DISTRICT
OF THE
SEMITROPIC WATER STORAGE DISTRICT

SID RESOLUTION NO. 94-7

IN THE MATTER OF

CERTIFICATION OF FINAL ENVIRONMENTAL IMPACT REPORT
SEMITROPIC GROUND WATER BANKING PROJECT
AND APPROVAL OF PROJECT

SECTION A.

WHEREAS, this Board of Directors declares and determines as follows:

1. On July 1, 1993, a Notice of Preparation was issued on preparing an Environmental Impact Report on the Semitropic Ground Water Banking Project ("Project") and a noticed public scoping meeting was held on July 15, 1993.

2. On March 29, 1994, a Draft Environmental Impact Report ("DEIR") was released on the Project followed by a public review period of 45 days, that is through May 13, 1994, pursuant to the California Environmental Quality Act ("CEQA") Section 15106.

3. Published Notice of Preparation of the "DEIR" was provided pursuant to CEQA Section 15087(a).

4. A public hearing was held to receive comments on the DEIR on April 19, 1994, pursuant to CEQA Section 15202(c) and (d).

5. The District's staff and consultants, together with staff and consultants of Metropolitan Water District of Southern California have reviewed and evaluated all comments received on the DEIR and have prepared "Public Participation and Response to Comments", which in turn has been provided to those who commented on the DEIR and reviewed by this Board, which document together with the DEIR shall constitute the Final Environmental Impact Report ("FEIR").

6. There has further been prepared and reviewed by this Board "Findings and Mitigation Monitoring Plan", dated July, 1994.

7. The DEIR, Public Participation and Response to Comments, Findings and Mitigation Monitoring Plan, have all been submitted to this Board, the decision making body of the lead agency for the Project, and this Board has reviewed and

considered the information contained therein, and finds that certification of the FEIR is in the public interest.

8. A "Memorandum of Understanding Regarding Operation and Monitoring of the Semitropic Water Storage District Ground Water Banking Project ("MOU") has been negotiated with neighboring districts.

NOW, THEREFORE, BE IT RESOLVED by this Board of Directors as follows:

1. The foregoing findings are true and correct.

2. That this Board certifies that:

   (a) The Final Environmental Impact Report, that consisting of the DEIR plus Public Participation and Response to Comments, has been prepared in compliance with the California Environmental Quality Act; and

   (b) The FEIR was presented to this Board as the decision making body of Semitropic Water Storage District and this Board has reviewed and considered the information contained therein prior to approving this Project.

3. As is set forth in detail in the "Findings and Mitigation and Monitoring Plan", which is incorporated by this reference, the Project as described more fully in the FEIR, will not have a significant effect on the environment, or in specific instances referenced therein, significant or potentially significant impacts on the environment have been eliminated or substantially lessened where feasible, and any remaining unknown significant effects on the environment are unavoidable due to overriding concerns.

4. Subject to the foregoing and subject to entering into acceptable agreements approved by this Board with prospective banking partners, the Project is approved.

5. The District's staff and consultants are authorized and directed to do all things necessary to carry out this certification and approval including, but not limited to, filing a Notice of Determination and filing the FEIR, all as required by Sections 15094 and 15095 of the State CEQA guidelines.

6. The MOU, as revised (dated July 12, 1994), is approved in place of the draft referenced in the Public Participation and Response to Comments.

All the foregoing, being on the motion of Director Wegis and seconded by Director Crawford was authorized by the following vote:

AYES: Directors Crawford, Fabbri, Frey, Franceschi, Portwood, Page and Wegis

NOES: None

ABSENT: None

ABSTAIN: None

I HEREBY CERTIFY that I am the Secretary of SEMITROPIC WATER STORAGE DISTRICT and that the foregoing resolution was adopted by the Board of Directors of said District at a meeting held on the 13th day of July, 1994, at which meeting a quorum was present at all times and acting.

IN WITNESS WHEREOF, I have set my hand and the seal of said District this 13th day of July, 1994.

Secretary of the Board of Directors

[DISTRICT SEAL]

RESPEIR

LETTER 16

January 14, 2008

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
901 "P" Street
Sacramento, CA 95814

Re: Comments on Draft Environmental Impact Report for Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement (Monterey Plus)

Dear Ms. Brown:

On behalf of the State Water Contractors (SWC), I am writing to provide comments on the Department of Water Resources' (Department) Draft Environmental Impact Report (DEIR) for the proposed Monterey Plus Project. The SWC is a non-profit association of 27 public agencies from Northern, Central, and Southern California that purchase water under contract from the California State Water Project ("SWP").[1] The SWP is the state's largest water delivery system, and collectively, members of the SWC deliver SWP water to more than 25 million residents throughout the state and more than 750,000 acres of highly productive agricultural land.

16-1

The Monterey Amendments updated the 1960s-era SWP delivery contracts to the realities of conditions at the time of its implementation in 1996, facilitating innovative water management tools that continue to help meet California's growing water needs while protecting the environment. Our member agencies fully support continuation of the Monterey Amendments and the Monterey Plus Project.

[1] The members of the SWC are: Alameda County Flood Control and Water Conservation District Zone 7, Alameda County Water District, Antelope Valley-East Kern Water Agency, Casitas Municipal Water District, Castaic Lake Water Agency, Central Coast Water Authority, City of Yuba City, Coachella Valley Water District, County of Kings, Crestline-Lake Arrowhead Water Agency, Desert Water Agency, Dudley Ridge Water District, Empire-West Side Irrigation District, Kern County Water Agency, Littlerock Creek Irrigation District, Metropolitan Water District of Southern California, Mojave Water Agency, Napa County Flood Control and Water Conservation District, Oak Flat Water District, Palmdale Water District, San Bernardino Valley Municipal Water District, San Gabriel Valley Municipal Water District, San Gorgonio Pass Water Agency, San Luis Obispo County Flood Control and Water Conservation District, Santa Clara Valley Water District, Solano County Water Agency, Tulare Lake Basin Water Storage District.

STATE WATER CONTRACTORS
SWC
Served by the State Water Project
FOUNDED IN 1982

DIRECTORS

Dan Masnada
President
Castaic Lake Water Agency

Thomas Hurlbutt
Vice President
Tulare Lake Basin Water Storage District

Steven Robbins
Secretary-Treasurer
Coachella Valley Water District

Stephen Arakawa
Metropolitan Water District of Southern California

Thomas Clark
Kern County Water Agency

Russell Fuller
Antelope Valley-East Kern Water Agency

Joan Maher
Santa Clara Valley Water District

David Okita
Solano County Water Agency

Ray Stokes
Central Coast Water Authority

General Manager
Terry Erlewine

The DEIR's analysis of the environmental effects of the Monterey Plus project is exhaustive. Indeed, the DEIR was prepared through a meticulous and transparent EIR advisory committee process in which all potential environmental effects and their analyses were thoroughly discussed and debated among Department staff, technical consultants, and committee members representing SWC, Planning and Conservation League, Citizens Planning Association of Santa Barbara, and Plumas County Flood Control and Water Conservation District. At least 27 meetings of the EIR committee and eight other meetings addressing various technical issues were convened in the course of preparing the DEIR.

Despite an exhaustive analysis of the environmental effects that could be traced to the Monterey Plus project, the DEIR found that there have been no significant environmental impacts resulting from the Monterey Amendment from 1996 through today. Moving into the future, environmental impacts from the Monterey Amendment in almost all resource categories are at less-than-significant levels. And for those few areas where the DEIR identifies potentially significant future impacts, SWC questions whether there is truly an evidentiary basis for those conclusions, as detailed in our technical comments below.

SWC reviewed the DEIR and found it provides a more than adequate description of the Monterey Plus project and its environmental effects. The following comments were identified, and we feel, for the most part, that they will help clarify the document. In a few cases, we disagree with the DEIR's conclusions of significance and explain our reasoning. Our comments are organized under the headings "Major Comments," "Additional Comments," and "Corrections and Clarifications."

16-1 (con't.)

Major Comments

1. **The Monterey Amendment was a package deal** – The DEIR notes on page 4-2 that the Monterey Amendment resulted from a package deal of negotiated concessions in order to settle significant disputes among the contractors. This is a critically important point relative to the EIR's discussion of project objectives and alternatives. The Monterey Amendment was in large part an updating of the 1960s SWP contract to 1994 conditions. This amendment included trade-offs between agricultural and urban contractors, where each side gave up and gained things that were to their benefit. For example, the urban contractors' agreement to relinquish their priority to SWP Table A supplies in times of shortage was specifically tied to the promise of additional supplies through the permanent Table A transfers, equal priority to available Article 21 water, and improved contractor opportunities for greater beneficial use from existing SWP facilities. Similarly, the agricultural contractors' agreement to permanently transfer and retire Table A amounts was directly tied to elimination of the agricultural-first shortage provision and transfer of the Kern Fan Element (KFE) property for local development of the Kern Water Bank. The resulting package was a careful balance of gains and losses for both groups of contractors. The balance of trade-offs inherent in the package would be lost with significant changes to or exclusion of a subset of Monterey Amendment provisions. Thus, it is essential that the Monterey Plus EIR recognize that the basic purpose of the Monterey Amendment project can

16-2

only be met if all of the carefully balanced provisions of the underlying Monterey Agreement can be achieved. 16-2 (con't.)

2. **Shift from firm yield operations occurred long before the Monterey Amendments** – The manner in which the Department determines the amount of water supply available for delivery to contractors each year is described on pages 6-4 – 6-5 of the DEIR. It should be noted that the current annual supply determination process is based on variable yield operations, which replaced the prior concept of SWP firm yield operation more than a decade prior to the Monterey Amendment. SWP firm yield operation, with its goal of achieving a dependable annual supply, was a concept from the 1960s. Variable yield operations replaced the concept of "firm" supplies in the 1980s, with a goal to increase long-term average annual yield. The EIR should explicitly recognize that the Monterey Amendment did not change the SWP operating goals or criteria; it merely recognized contractually a change in operational goal that had already occurred years before. 16-3

3. **Interruptible water supplies are not new supplies** – The EIR should clarify that interruptible Article 21 water is not water newly made available under the Monterey Amendment. It was available to the SWP and its contractors prior to Monterey, and Department criteria used to determine when and how much is available has not changed. If the Department had additional SWP storage available (e.g., in a Department-developed and -operated KWB or a Los Banos Grande Reservoir), this water, typically available in wet months and wet years, is the same water the Department would have pumped for SWP purposes. In absence of such Department storage, and consistent with the variable yield operations discussed in Major Comment 2 above, this same water is made available to contractors for storage in contractor-developed groundwater or other storage programs for use in improving their dry-year supply reliability. 16-4

4. **Table A retirements were linked to Kern Fan Element property transfer** – In the DEIR on page 4-7 (par. 1, sent. 2), it is stated that the Department conveyed the KFE property to Kern County Water Agency (KCWA), without any explanation of why. It should be clarified that under the Monterey Amendment, the 45,000 AF Table A retirement was in exchange for transfer of the KFE property. The Table A retirement resulted in a permanent reduction in total SWP demand, which means that the SWP water associated with that Table A amount is available for delivery to other contractors in shortage years (improving delivery reliability to the benefit of all contractors) or, in wetter years, is not exported from the Delta and so adds to Delta outflow. The KFE property, the purchase price for which was paid by the SWP contractors, was transferred for the benefit of those two contractors that agreed to permanently retire Table A amounts. This was not a give-away, but an exchange to compensate those two contractors for the 30 years of investment they had in the Table A amounts they retired. This link between the Table A retirement and KFE is not clear in the Monterey Amendment, but was clear in the negotiations that led to it and is clearly articulated in the Monterey Agreement principles. This link is further evidenced by the specific participants in the groundwater bank that was subsequently developed by the Kern Water Bank Authority (i.e., the Kern Water Bank) and those participant's shares in that water bank. The participants in the Kern Water Bank are Dudley Ridge WD and those specific 16-5

KCWA member districts that retired Table A amounts, and their share in the Kern Water Bank is proportionate to the specific Table A amounts that each retired (as shown in Appendix E, Table 3).

16-5 (con't.)

5. **Role of Castaic Lake and Lake Perris** – The DEIR on pages 2-4, 2-5, and 6-58 notes that Castaic Lake and Lake Perris serve as regulatory and emergency water supply facilities. The EIR should clarify that these reservoirs are SWP transportation facilities (i.e., part of the SWP conveyance system) and their functions, to provide storage for making peak summer deliveries and emergency storage, are different from the functions of SWP conservation reservoirs (i.e., Lake Oroville and San Luis Reservoir). The function of conservation reservoirs, which are paid for by all contractors, is to develop overall SWP supply for the benefit of all contractors. The functions of the transportation reservoirs are solely for the benefit of the downstream contractors that pay for them.

16-6

6. **Worst-case flexible storage use scenario is highly unlikely** – The DEIR on pages 5-9, 6-62, and within the individual resource sections notes that the analysis of the potential future environmental effects at Castaic Lake and Lake Perris represents a worst-case scenario. The worst-case scenario assumes that the contractors that receive water from the terminal reservoirs would borrow the maximum amounts of water permitted under Article 54 and that the borrowed water would not be replaced for a period of five years. The EIR should clarify that this is a highly unlikely scenario, as leaving the reservoirs drawn down for such an extended period of time would leave these contractors without essential supply reserves and vulnerable to shortages in any number of events, such as: dry year conditions, conveyance outages, system maintenance, and earthquake or other emergency conditions. It is much more likely that the contractors would replace the borrowed water as soon as practicable, probably within a year or two as they have since 1996 when the Monterey Amendment was implemented. Furthermore, the contractors have never withdrawn more than half the full amount available to them. (See Table 6-27). The most likely scenario for future operation of Castaic Lake and Lake Perris is a continuation of operations since 1996. Thus, it is unlikely that the potentially significant impacts identified in the DEIR for future operations at these reservoirs would occur. While it is appropriate to analyze the worst-case scenario, to put the potential for these impacts to occur into context, the minimal likelihood of its occurrence should be emphasized, along with discussion of the impacts that are more likely to occur in the absence of unusual circumstances (i.e., impacts similar to those that occurred from 1996 to 2003).

16-7

7. **Analysis limitations and qualifications would be helpful in interpreting results** – A number of different analyses were conducted for the DEIR to assess impacts resulting from: different sets of Monterey Amendment provisions, differing points in time, and differing areas of potential impact. (p. 5-5 and Table 5-2) Each of these analyses could be explained more clearly, including any limitations of the analyses themselves, and limitations or qualifications needed to appropriately interpret analysis results. For example, the following discussion of two analyses describes limitations and qualifications that are helpful in understanding how to interpret the results of these studies.

16-8

a. **Historical operations analysis (Study No. 2)** –This analysis is an attempt to analyze the impacts of *all* of the provisions of the Monterey Amendment on SWP operations, including in particular on Delta exports. However, one provision of Monterey – Table A transfers – was not included, due to the difficulty in doing so. Since the agricultural contractors that transferred Table A amounts usually took delivery of all available water associated with that Table A amount, while many of the urban contractors receiving the Table A amount had not yet developed a demand for it all within their service areas, these transfers resulted in reduced SWP deliveries during this 1996 through 2004 period. This reduction in deliveries during this period due to Table A transfers would likely offset some or all of the small increase in diversions that resulted from all of the other provisions of Monterey. Therefore, the analysis results that show a total of 44,000 AF of additional Banks pumping due to the Monterey Amendment during this period are overstated. The discussions of this analysis and its results (pp. 5-9, 6-54, 7.1-37, 7.1-38, and 7.3-43 – 44) should include this qualifying information, as is done on page 6-60. 16-9

b. **Water supply management provisions analysis (Study No. 3)** – This analysis of the impacts of the water management provisions from 1996-2004 is used to estimate the future impact of these provisions on Delta exports. In this analysis, the effects of the water supply management provisions are isolated from the remaining Monterey Amendment provisions in order to estimate the impact of just these provisions on SWP operations, including in particular on Delta exports. The analysis uses actual historical operations and deliveries from 1996 through 2004, and may be adequate for that time period. The limitation comes in how the results of this analysis are extrapolated to estimate future effects. Because historical deliveries are used to predict future impacts, those deliveries do not reflect the increase in base SWP urban contractor deliveries that will occur in the future to meet service area demands, unrelated to the Monterey Amendment. This is conceptually depicted in the attached Figure 1 for the baseline scenario. However, given the virtual certainty of this future increase in non-Monterey demand, future operations would differ from those used for this analysis. With increased base deliveries, SWP Contractors will be using more of their supply to meet service area demand, and less will be available to manage under the water supply management provisions of the Monterey Amendment. This concept is shown in the attached Figure 2, by observing the lines drawn between the "2003 with Monterey" bar and the bar for 2020 showing both total SWP deliveries and Table A deliveries. The difference between these lines is Article 21 water deliveries, which will decrease as Table A deliveries increase. While Article 21 water is not the only water that will be managed under these provisions, it is indicative of the relative amount of excess water available to be managed. 16-10

   In other words, the results of the water supply management provisions analysis might provide a reasonable estimate of the current impact of these provisions, but the effect of these provisions on exports will lessen over time and may essentially be interim impacts. Any additional Delta exports related to these provisions that do occur would likely be smaller in magnitude and occur less frequently than indicated in this analysis. The discussions of this analysis and its results (pp. 5-9, 6-63, 7.1-40, and 7.3-55) should include this qualifying information, as is done to some degree on pages 6-64 - 65.

8. **Need to identify Delta impacts of all of Monterey Amendment provisions as a whole** – The discussions of potential changes in Delta exports must analyze the Monterey Amendment as a whole. The historical operations analysis (Study No. 2) includes all of Monterey except the Table A transfers, and may be as close as you can get to analyzing the effects of the whole amendment (with the qualifying information discussed above in Major Comment 7.a). However, the discussion of *future* changes in Delta exports looks only at changes due to the water supply management provisions in isolation, ignoring the offsetting effects of the remainder of the Monterey Amendment provisions. (pp. 7.1-38 – 41 and 7.3-54 – 69) The remaining Monterey provisions (Table A transfers and retirements and altered allocation procedures) are analyzed separately using CALSIM II and show a reduction in Delta exports due to those provisions. While the results of these analyses cannot readily be combined on a year-by-year basis, the offsetting effects of these two sets of provisions should be discussed. And where appropriate, such as when discussing average annual effects, the results of these two analyses should be combined so that the *net* effect of *all* of the Monterey Amendment is identified.

   This is shown conceptually in Figures 3 and 4, under 2003 and 2020 demand conditions, respectively. Both figures show SWP deliveries, starting with deliveries under the baseline scenario, and then showing the results of Monterey Amendment implementation, including reductions in deliveries resulting from the Table A retirements and transfers and increases in deliveries resulting from the water supply management provisions. The Table A retirements and the Table A transferred to urban contractors that have not yet developed a demand for it result in reduced deliveries of Table A water. This water remains part of SWP supply and becomes available to other contractors. Some of this water may increase Table A deliveries to other contractors in shortage years, may increase the availability of Article 21 water, or may remain unused. The change in deliveries resulting from these provisions is shown in the middle bar. This is what is analyzed by CALSIM II. Increases in deliveries may result from the water supply management provisions, such as out-of-service area storage and the turnback pool, and can include both Table A and Article 21 water. This is what is analyzed in the water supply management provision analysis (Study No. 3). The net impact shown in the bar on the far right of the figures includes the net result of the Monterey-related delivery reduction and increases, which is the way this should be analyzed.

   By tying impacts only to the Monterey-related delivery increases identified in the water management provision analysis and ignoring Monterey-related delivery reductions, the DEIR overstates impacts to Delta exports.

16-11

9. **Delta export and Delta fishery impacts are overstated** – As just discussed in Major Comment 8, the DEIR overstates impacts to Delta exports. Since the Delta fishery impacts analyzed are based on these Delta export increases, the Delta fishery impacts are also overstated.

   In analyzing the future impacts of the Monterey Amendment on Delta fisheries (pp. 7.3-54 – 7.3-69), the specific event-by-event analysis of Delta exports based on the water supply management provision analysis (Study No. 3) cannot readily be combined with CALSIM II

16-12

analysis results. However, the offsetting effects of the CALSIM II-analyzed provisions on Delta exports should be discussed, as well as the qualifying information discussed above in Major Comment 7.b, to properly qualify the results of the Delta export and fishery impact analyses presented as being overstated.

In the summary discussion of Delta fishery impacts (p. 7.3-69), the 50,000 AF estimated average annual increase in Banks pumping from the water supply management provision analysis should be combined with the average annual reduction in Delta exports from the CALSIM II analyses of 23,000 AF under 2020 conditions, resulting in a net increase in pumping of 27,000 AF under 2020 conditions. With the qualifying information discussed in Major Comment 7.b regarding the decrease over time of the magnitude of the estimated increases in Delta exports resulting from the water supply management provisions, the actual net increase under 2020 conditions would likely be considerably lower than this 27,000 AF.

16-12 (con't.)

10. **Proposed fisheries impact mitigation is unclear** – The DEIR on p. 7-3-72 proposes the use of EWA operational assets as mitigation for potential fishery impacts resulting from increased export pumping, but at the same time notes that fish protection will be provided as required by the court (*NRDC v. Kempthorne*, E.D.Cal. 2007) and the forthcoming Biological Opinions. Since all mitigation for fishery impacts necessary for project operations, which includes all post-Monterey operations, is currently provided through the court order and similarly will be provided through the forthcoming Biological Opinions, reference to the EWA as providing mitigation for fishery impacts of the Project is unnecessary and confusing.

    Suggested rewording of Mitigation Measure 7.3-5: "The Department shall continue to operate the SWP in accordance with applicable federal and state endangered species act requirements, including those imposed by the courts and those set forth in incidental take statements, in order to mitigate for any increased entrainment of special-status species caused by pumped flows at the Banks Pumping Plant."

16-13

11. **Growth estimates are overstated** – Estimates of potential population that could be supported by transferred Table A amounts, presented in Chapter 8 of the DEIR are unjustifiably high. The analysis derives per capita water use rates from the Bulletin 160-05 future water demand scenarios in a manner that is inconsistent with the assumptions for those scenarios. The "current trends" and the "less resource intensive" scenarios are both defined on page 8-8 as including the same population projection (i.e., "recent trends continue for population growth and development patterns"). The "less resource intensive" scenario has a lower per capita rate because it assumes densification of development and increased lower-water using industries. Under this scenario the "saved" water is assumed to be dedicated for environmental purposes, not to support increased population. Because the potential additional population for the "current trends" and "less resources intensive" scenarios should be identical, the presentation of different population estimates for a "less resources intensive" scenario should be deleted. (p. 8-10 Table 8-3) Also, in calculating potential additional population, water use rates for the South Coast hydrologic region are applied incorrectly to four contractors. Palmdale WD is in the South Lahonton hydrologic region, and Coachella Valley WD, Desert WA, and Mojave WA are in the Colorado hydrologic region. Water use

16-14

rates in these regions are considerably higher than South Coast use rates. For both of these reasons, potential additional population estimates shown are incorrect and overstated.

In addition, it is noted that the projected populations in Table 8-2 (p. 8-9) for the "more resource intensive" scenario appear to be incorrect. The population projections for all three scenarios are shown as being the same, which is inconsistent with the scenario definitions (p. 8-8). To be consistent with these definitions, projected population should be the same for the "current trend" and "less resource intensive" scenarios, but should be higher for the "more resource intensive" scenario. According to Bulletin 160-05, the population projections for the "more resource intensive scenario" are assumed to be 116 percent of "current trends" population projections for the San Francisco Bay hydrologic region (i.e., 9,114,000), and 125 percent of "current trends" for the South Coast hydrologic region (i.e., 29,784,000). (Bulletin 160-05, Vol. 4, "Quantified Scenarios of 2030 California Water Demand," Table 7)

16-14 (con't.)

12. **No Project Alternative 1 and Court-ordered No Project Alternatives 3 and 4 are theoretical scenarios that cannot be implemented** – The purpose of describing and analyzing a no project alternative is to allow decision makers to compare the environmental impacts of approving the proposed project with the impacts of not approving the proposed project. (Guidelines, § 15126.6, subd. (e)(1).) The analysis should identify the practical results of the project's non-approval, and not create and analyze a set of artificial assumptions. (*Id.*, subd. (e)(3)(c).) No Project Alternative 2 satisfies this requirement, as it discusses what would reasonably be expected to occur from the present day forward if the Monterey Amendments are rescinded. No Project Alternative 1 and the Court-Ordered No Project Alternatives 3 and 4, however, are theoretical scenarios of what might have been expected to occur since 1995 in the absence of the Monterey Amendment. As these are purely theoretical scenarios that are impossible to implement, the EIR should explain that they are presented for informational purposes only and do not represent possible "no project" futures.

16-15

13. **Alternative 5 cannot be a theoretical scenario** – It is unclear whether this alternative is meant to eliminate water management provisions from now into future or, similar to No Project Alternative 1 and Court-ordered Alternatives 3 and 4, it is a theoretical, historical perspective on impacts if Monterey water management provisions had not been implemented in 1996. To qualify as an actual project alternative, it cannot be presented in an historical perspective. Thus, its impacts should be identical to the Proposed Project for the historic, 1996-2003 period. As a result, Alternative 5 cannot eliminate all impacts of the proposed project – impacts occurring from 1996 to 2003 would be identical to the proposed project, and future impacts to delta fisheries would still occur due to water management practices such as deliveries to existing out-of-service area storage programs, although impacts would be less than the proposed project. Therefore, the EIR discussion and entries of "No Impact" for Alternative 5 on Table 11-23 of the DEIR should be changed as follows:

Impact to Delta fisheries:	1996-2003: Same as proposed project. Future: Similar to but less than proposed project.
Impacts on environmental resources at Lake Perris and Castaic Lake:	1996-2003: Same as proposed project. Future: No Impact.
Impacts on environmental resources in San Joaquin Valley portion of Kern County:	1996-2003: Same as proposed project. Future: Similar to but less than proposed project.

16-15 (con't.)

In addition, the EIR should clarify that Alternative 5 does not meet important project objectives and is likely to be institutionally infeasible.

Additional Comments

1. **SWP contract water delivery obligation** (p. 2-9, par. 6) – Considering all of the water delivery provisions of the SWP contract in combination, it is clear that it was the original intent of the state, as well as the Department's on-going contractual obligation, to make available to the SWP contractors all water available to the SWP, within the operational and regulatory constraints that apply to the SWP and within the limits of specific SWP contract provisions. This point should be included here since it is that obligation which provides the basis for assuming under the Court-ordered no project scenarios that the Department would continue to deliver to contractors all of the SWP water that is available. 16-16

2. **Facilitation of Monterey-related actions** – Throughout the DEIR, language is sometimes used in describing Monterey Amendment provisions which states that a particular provision "enabled" or "allowed" certain actions to take place (e.g., water supply management provision-related actions). This implies that these actions could not have occurred without the Monterey Amendment in place, which is in most cases untrue. As is discussed or implied in Sections 2.5 and 6.2.4, the pre-Monterey SWP contract did not preclude these actions from occurring, and many had in fact been approved by the Department (e.g., permanent Table A transfers, storage outside the service area, carryover storage, and conveyance of non-project water). However, these actions were approved by the Department on a case-by-case basis and such approvals were sometimes uncertain. The Monterey Amendment was an agreement among the Department and the contractors on what actions they could all support, which increased certainty regarding their approval. Thus, it is more accurate to portray the Monterey Amendment as "facilitating" actions, rather than "enabling" or "allowing" them. This point should be clarified in the EIR. 16-17

3. **Article 21 water** (p. 4-5, par. 3, sent. 6) – In this Section 4.4.1, which is intended to describe the changes under the Monterey Amendment in the allocation of Table A and Article 21 water, it states here that "for signers of the Monterey Amendment, Article 21 water is allocated when…" and then goes on to describe the operational conditions under which the Department makes Article 21 "interruptible water" available. This statement is incorrect and 16-18

misleading. Under the Monterey Amendment, the conditions under which Article 21 "unscheduled water" is made available did not change. The Amendment merely renamed this water as "interruptible water," and changed how this water is allocated among contractors. This water is only allocated when contractor demands for it exceed its availability, not every time it is made available, as implied. Further, by describing in the manner done here the specific conditions under which the Department makes this water available, it implies that the Monterey Amendment changed the conditions of it availability in some way, and that this availability is somehow different for contractors that signed the Monterey Amendment than for those that did not. These implications are untrue.

Suggested rewording: "For signers of the Monterey Amendment, Article 21 water is allocated among contractors when requests for this water exceed the supply of Article 21 water available, in proportion to each requesting SWP contractors' annual Table A amount.~~the SWP's share of San Luis Reservoir is full, or projected to be full in the near term; other SWP reservoirs are full or at their storage targets, or the conveyance capacity to fill these reservoirs is maximized; the Delta is in "excess" condition (see Chapter 6); Table A deliveries are being fully met; and the Banks Pumping Plant has spare capacity.~~"

16-18 (con't.)

4. **Table A allocations** (p. 4-6, par. 2, sent. 1) – This sentence implies that contractors' "actual Table A demands" were a consideration in Department water allocations prior to Monterey but are no longer. This in not correct. As indicated on page 2-16, Table A allocations in several shortage years prior to Monterey were based on contractor "requests," not "demands" as indicated here (where requests are potential need for the calendar year and are typically more conservative and larger than "actual Table A demands"). Even if what was meant here is requests instead of demands, the statement is misleading since requests are still used in Table A allocations under the Monterey Amendment, as a limit to allocated supplies. This should be clarified.

   Suggested rewording: "The result of these contractual changes is that the Department now allocates Table A and interruptible water among contractors in proportion to annual Table A amounts, up to a contractor's request for this water, without consideration of whether the water would be used for M&I or agricultural purposes~~ and without consideration of contractor's actual Table A demand~~.

16-19

5. **Table A transfers** (p. 4-6, par. 3, sent. 1-3) – Prior to the Monterey Amendment, permanent Table A transfers could, and were, approved by the Department, as described on page 2-13. This approval was pursuant to Article 41 of the original SWP contracts, which provides the Department with authority to approve the assignment or transfer of any part of the SWP contracts. The Monterey Amendment added Article 53, which provides the consent of both the agricultural contractors and the Department for the permanent transfer of up to 130,000 AF of agricultural Table A amount to urban contractors. It should be clarified here that while Article 53 provides the consents for the 130,000 AF of Table A transfers, the transfers themselves are made pursuant to Article 41.

16-20

Suggested rewording: "Article 53 provides that the agricultural contractors… will make available 130,000 acre-feet of Table A amounts and related transportation capacity, for permanent transfer to M&I contractors or non-contractors pursuant to Article 41 of the SWP contracts on a willing buyer and willing seller basis." 16-20 (con't.)

6. **Kern Fan Element** – The discussion on page 4-6 (last par.) of why the Department did not develop an SWP groundwater bank on the KFE property should more clearly articulate the several reasons that led to the Department discontinuing its planning activities in 1993. These reasons included uncertainties related to water supply availability due to proposed Delta water quality standards and proposed fisheries protections, water quality issues related to pump-in into the California Aqueduct, cost-benefit concerns, and an inability to reach agreement with the local interests. Further, all of these reasons for discontinuing KFE planning activities should be described consistently elsewhere in the EIR (e.g., DEIR p. 7.10-2).

   Also, the terms "Kern Fan Element," "Kern Fan Element property," and "Kern Water Bank" are sometimes used interchangeably in the DEIR. The distinction between these terms can, for the most part, be implied from the discussion on page 4-6 in the last paragraph (i.e., the "Kern Fan Element" is one element of the larger Department-planned Kern Water Bank, the "Kern Fan Element property" is the property purchased and then transferred by the Department without a developed water bank on the property, and the "Kern Water Bank" is both the larger Department-planned water bank and the water bank actually developed by the Kern Water Bank Authority on the transferred KFE property). In a number of places throughout the DEIR, the "transfer of the Kern Fan Element" or activities "in the Kern Fan Element" are discussed, when what is meant is "transfer of the Kern Fan Element property" or activities "on the Kern Fan Element property." This should be clarified and these terms used appropriately. 16-21

7. **Analysis description consistency and accuracy** – The various analyses conducted for the DEIR, identified in Table 5-2 (p. 5-6), should be more clearly described. Where descriptions are included in multiple sections, these descriptions should be consistent. For example, historical operations analysis (Study No. 2) and water supply management provision analysis (Study No. 3) are described in differing, and in at least one instance, incorrect ways in Chapters 5 (p. 5-9), 6 (pp. 6-54 and 6-63), 7.1 (pp. 7.1-37 and 7.1-40), and 7.3 (pp. 7.3-44 and 7.3-55). These descriptions should be corrected and made consistent.

   An example of an incorrect characterization of the water supply management provisions analysis is on page 5-9 (par. 2, sent. 1 and 3). The statement here that "the analysis accounted for the increasing water demands of SWP contractors" is untrue. The analysis is based on actual operations, deliveries, and contractor demands from 1996 through 2004, and includes no adjustments for future contractor demand increases, either related or unrelated to Monterey, or for any other future conditions. Further, the statement here that "the analysis accounts for… the probable increase in available groundwater storage south of the Delta" is also untrue. The analysis includes no assumption about the amount of groundwater storage, let alone an increase in such storage. The analysis merely looks at those SWP deliveries that 16-22

were made from 1996 through 2004 to existing out-of-service area storage programs approved since 1995 and assumes those deliveries would not have been made.

Similarly, the description of this same analysis on page 7.3-55 (par. 2 and par. 3, first sent.) is, at best, misleading. It refers to a "future analysis," whereas the analysis is based entirely on historical 1996 through 2004 data. This historical analysis is used as the basis for estimating the future effects of the water supply management provisions on SWP operations, through qualitative extrapolation of its results. Further, there seems to be significant confusion regarding the differences between Studies No. 2 and 3, primarily related to the difference between studies in the assumption regarding out-of-service area storage. As is discussed in Appendix K, for the purpose of estimating future effects of the water management provisions in Study No. 3, it was assumed that none of the SWP water delivered to out-of-service area storage for the storing contractors would have been delivered without this Monterey Amendment provision. In Study No. 2, it was assumed that that portion of the water delivered to out-of-service area storage that could have been delivered to other existing storage programs available to the storing contractors (e.g., to in-service area storage), would have been delivered even without this Monterey Amendment provision. At some point, however, those other existing storage programs would fill, and additional deliveries would be made to the added out-of-service area storage available through this provision. In other words, total available storage would have increased, along with the potential for increased deliveries to storage. Therefore, for the purpose of estimating the future effects of this provision, the deliveries to this additional out-of-service area storage were assumed to be additional deliveries that would not otherwise have been made.

16-22 (con't.)

8. **Flexible storage use** (p. 5-9, par. 3, sent. 2) – The statement that flexible storage withdrawals are "subject to Department approval" is misleadingly broad. The Department's approval authority for flexible storage use is limited under Article 54 primarily to approval of delivery schedules for flexible storage withdrawals and replacement. Further, this authority is limited to the timing, not the amount, of a scheduled withdrawal.

   Suggested rewording: "The proposed project allows those contractors that were participating in the repayment of these reservoirs to withdraw up to about 50 percent of the total storage capacity of ~~volume of water in~~ the reservoir, subject to Department delivery schedule approval and contractual requirements to replace the water within five years."

16-23

9. **Terminal Reservoir operations** – The DEIR at page 6-62, as well as several other places within Chapter 7, states that "the terminal reservoirs fulfill their function best if they are kept full or nearly full." This is misleading and would be true only if their sole function was to provide emergency storage. However, as discussed above in Major Comment 5, terminal reservoirs also provide regulatory storage to make peak summer deliveries. As is clear from Figures 7.1-4 and 7.1-5, the terminal reservoirs Castaic Lake and Lake Perris are drawn down every year in the summer and early fall and are refilled in the winter and spring. On occasion, these reservoirs have been drawn down substantially, generally for maintenance purposes. The descriptions of typical operations at Castaic Lake and Lake Perris included

16-24

here and elsewhere in the EIR should more accurately reflect their actual operations (e.g., see discussion at page 7.1-47, par. and page 7.1-49, first full par.). 16-24 (con't.)

10. **Flexible Storage Operations** – The DEIR at pages 6-58, 7.1-47, and 7.1-49 states that "for a variety of reasons" the Department has reduced its drawdown of Castaic Lake and Lake Perris compared to pre-Monterey Amendment conditions. It should be noted that the predominant reason is the Department's agreement to limit its annual regulatory drawdown to 30,000 acre-feet in each reservoir in order to accommodate flexible storage. This limitation is noted in the Monterey Amendment White Paper, which states in the discussion of Article 54 (flexible storage) under the heading "Reservoir operations criteria": "The Department intends to modify its operation of these reservoirs [Castaic and Perris] such that the annual cycling of the storage not available to the contractors for flexible storage is limited to about 30,000 acre-feet in each reservoir." The 1995 DEIR for Implementation of the Monterey Agreement, prepared with the Department's participation, analyzed three flexible storage operating scenarios, all with annual cycling limited to 30,000 acre-feet: "Under all operating scenarios, the annual storage cycling at Castaic Lake would be reduced to about 30,000 AF in order to keep enough water in storage to meet both emergency storage requirements and Contractor withdrawals." (1995 DEIR at p. 4-8.) 16-25

    Also, on page 6-58, the DEIR states that the Department historically has often refilled the terminal reservoirs before the contractors wished to replace the water they had borrowed. It is noted that this practice is not in keeping with the SWC's understanding of how this flexible storage provision should be administered.

11. **Groundwater levels in Kern County** (p. ES-54, Table S-1) – The groundwater banking programs in Kern County related to the Monterey Amendment, including the Kern Water Bank program and out-of-service area storage programs, are all programs in which water is stored first before being withdrawn. Similar to a financial bank account, more water cannot be withdrawn than is then in the storage account. Therefore, groundwater levels in Kern County could never be lower than they otherwise would have been without these storage programs, as the statement on page ES-54 implies could occur. This should be clarified. 16-26

    Suggested rewording: On page ES-54: "Groundwater basin storage projects would raise groundwater levels <u>any time banked water remains in storage.</u>~~most of the time with a reduction in levels during extended droughts.~~"

12. **Significance determinations** – Where an impact is discussed as in fact providing a benefit, there is inconsistency in whether the impact is then identified as being "less than significant," which implies an adverse impact, or a "beneficial effect." Specifically, the proposed project's facilitation of groundwater banking in Kern County is deemed to have a beneficial effect on groundwater resources (p. 7.2-10) and the Plumas County watershed improvement projects are deemed to have beneficial effect on terrestrial biological resources (p. 7.4-37). Conversely, with respect to flexible storage, the DEIR acknowledges that the proposed project increased water surface elevations between 1996 and 2003 at both Castaic Lake and Lake Perris, but does not conclude that the effects on visual, air quality (related to erosion), 16-27

geology (soils), and recreational resources were therefore "beneficial" for the 1996 to 2003 period. To avoid an appearance of bias, consistency should be applied in making significance determinations where impacts are discussed as providing a benefit. 16-27 (con't.)

13. **Impacts and mitigation associated with flexible storage use** – As previously discussed (Major Comment 6), the most likely scenario for future operation of Castaic Lake and Lake Perris is a continuation of operations since 1996 and as a consequence, it is unlikely that the potentially significant impacts identified in the DEIR for future operations at these reservoirs would occur. But even assuming the highly unlikely worst-case scenario of a five-year extended drawdown of the terminal reservoirs, the SWC do not believe there is sufficient evidence to support the DEIR's findings of significance for impacts to terrestrial biological resources from reduced foraging, to visual resources, or to air quality or soils from increased erosion. 16-28

    a. **Terrestrial biology** – The DEIR concludes that an extended drawdown of Lake Perris could reduce overall fish populations, which in turn could reduce food resources for raptors, bats, and waterfowl, resulting in a potentially significant and unavoidable impact. (DEIR pages 7.4-33 – 34.) A review of the DEIR by a consulting biologist commissioned by the Metropolitan Water District of Southern California questioned the DEIR's finding of significance for this impact area at Lake Perris (see attached letter, Wagner, 2008). This review noted that because Lake Perris is restocked, fish populations would not drop below levels needed to support the few foraging species that occasionally forage within the lake water; that roosting and forage perch sites would not be adversely affected but in fact would benefit from drawdown due to the increased separation from sport fishing and boating activities; that open water for foraging by bats would still be available at Lake Perris and the nearby San Jacinto Wildlife Area; and that no significant adverse impacts to nesting waterfowl would occur as the adjacent Wildlife Area provides extensive foraging and nesting habitat for waterfowl and shore birds. Further, even if lake drawdown impacted fisheries such that food sources were greatly impacted, continuation and potential enhancement of the existing fish stocking program would mitigate that impact. 16-29

    In addition, the SWC question the mitigation measures proposed for impacts to riparian resources at Lake Perris and the conclusion that potential impacts to riparian resources remain significant and unavoidable. (DEIR p. 7.4-35.) Specifically, mitigation measure 7.4-6 a) calls for a surface and groundwater hydrology study to determine what water source is maintaining the riparian habitat. This is unnecessary, as the source of water supporting riparian habitat at the shoreline is clearly the lake itself. The annual monitoring for changes in hydrologic activities in mitigation measure 7.4-6 b) is similarly unnecessary. Mitigation measure 7.4-6 b) calls for installation of an irrigation system if a prolonged drawdown of longer than one year occurs, but does not define the magnitude of a drawdown that would trigger this measure (e.g., a drawdown that would either reduce water surface area by X% or more, or that would result in the shoreline receding from the riparian zone by more than about X feet). Finally, the SWC question the conclusion that with installation of an irrigation system as called for in mitigation

measure 7.4-6 b), potential riparian impacts would remain significant. The irrigation system installed at Lake Perris, which has been in operation for about two years during the current drawdown there, is demonstrating that potential impacts to riparian habitat due to reservoir lowering can be mitigated to less-than-significant levels. 16-29 (con't.)

b. **Visual resources** – The DEIR concludes that an extended drawdown of Lake Perris and Castaic Lake represents a significant and unavoidable impact due to a diminished natural lake appearance. (DEIR page 7.5-15.) The SWC disagree with this conclusion for both reservoirs, as under the baseline condition the reservoirs are cycled annually, thus exposing a visually prominent band of soil and rock each and every year. In fact, the drawdown of Castaic Lake during 2006 used in the DEIR to substantiate the significance of visual effects was part of normal operations unrelated to the Monterey Amendments. At Lake Perris, substantial vegetation regrowth and colonization had occurred on the newly exposed lakebed, beginning with the first growing season after the drawdown (see attached letter). Thus, even during the highly unlikely occurrence of an extended drawdown, natural succession would establish new vegetation within one growing season. Thus, the conclusion of significant and unavoidable visual impacts at Castaic Lake and Lake Perris do not appear to be supported. 16-30

c. **Air quality** – The DEIR describes that the exposure of soil to wind due to an extended drawdown at Castaic Lake or Lake Perris would result in differing impacts, due to differing soil types at each reservoir, with limited impact at Castaic Lake but potentially significant impacts to air quality at Lake Perris. (DEIR pages 7.7-14 – 15.) While the DEIR discussion describes a potential for this impact only at Lake Perris and not at Castaic Lake, the significance determination does not specify that it only applies to Lake Perris. It should be clarified that the DEIR's determination of potentially significant and unavoidable impacts to air quality only applies to Lake Perris. Regarding the significance determination at Lake Perris, the biologist's review mentioned above described a recent site visit to Lake Perris (see attached letter) in which minimal erosion of exposed lakebed associated with wind and wave action was observed. Further, substantial regrowth and successful colonization of native plants has occurred since Lake Perris was drawn down for safety concerns. Thus, the conclusion of a significant and unavoidable air quality impact due to wind erosion at Lake Perris does not appear to be supported. 16-31

d. **Geology (soils)** – The DEIR describes that increased erosion due to an extended drawdown at Castaic Lake or Lake Perris would also result in a limited impact at Castaic Lake but potentially significant impacts at Lake Perris. (DEIR page 7.8-11.) As with air quality impacts, the DEIR discussion describes a potential for this impact only at Lake Perris and not at Castaic Lake, while the significance determination does not specify that it only applies to Lake Perris. It should be clarified that the DEIR's determination of potentially significant and unavoidable impacts to soils only applies to Lake Perris. Regarding the significance determination at Lake Perris, in a recent visit to Lake Perris as discussed above, no erosion of the exposed lakebed was observed due to wind or wave action. The only observed areas of significant erosion occurred from stormwater 16-32

discharge from drainage channels, which could be minimized and mitigated by placement of rip-rap or other means of controlling drainage flows where identified as a potential problem. Therefore, any potentially significant erosion impact due to an extended drawdown could be mitigated to a less-than-significant level. 16-32 (con't.)

e. **Recreation** – The SWC question the purpose and triggering mechanism for mitigation measure 7.9-1 a) for impacts to recreation. (DEIR p. 7.9-17.) If the purpose of notification is to inform the public of the recreational resources that would still be available and unimpaired by the drawdown, so as to minimize recreational impacts, that purpose should be clarified. As currently worded, this mitigation measure would likely discourage recreation visits, and should be revised. The mitigation should be consistent with the Department's current notifications regarding recreation opportunities that are still available during the current drawdown at Lake Perris. It should also be recognized that a requirement for public notification of the duration of a drawdown may be impractical since the duration would depend on the availability of replacement supplies, which would not always be known ahead of time. The duration and magnitude of a drawdown event that would trigger this mitigation measure should also be specified. Further, the water quality monitoring called for in mitigation measure 7.9-1 c) would only apply at Lake Perris, as the swimming area at Castaic Lake is in the lagoon immediately downstream of the dam and is therefore not impacted by drawdowns at Castaic Lake. This water quality monitoring is already provided at Lake Perris. 16-33

Corrections and Clarifications

1. Page ES-2, third bullet from bottom – At the end of the first bullet describing the proposed project, add: "During surplus water conditions, agricultural contractors would no longer receive first priority to use of surplus water." 16-34

2. Page ES-8, first full par. – In the fourth line of the second paragraph, insert "publishing of the biennial" prior to "State Water Project Reliability Report". In the discussion of the "paper water" issue here, the State Water Project Delivery Reliability Report is mentioned as leading to better information dissemination regarding SWP supply reliability. It should be clarified that this report is not only made available to local planners, it is required to be distributed to all city, county, metropolitan, and regional planning departments within the SWP service area. Further, it is available to the public from the Department's website. 16-35

3. Page ES-11, Impact 7.1-8 – Clarify that any project would also include project-specific mitigation actions as required. 16-36

4. Page ES-39, Impact 7.9-1 – Mitigation Measure "c" should be changed to reference the California Department of Public Health (no longer DHS). 16-37

5. Page 2-11, second par. – Add the following at the end of this paragraph: "…and current storage conditions". Also, the reference to Department water demand estimates should specifically reference the series of bulletins done in the 1960s on this subject. 16-38

6. Page 2-15, first par., last sent. – The phrase "due to high storage in SWP reservoirs" does not make sense without further explanation. Either explain or delete that phrase. Also, the discussion of Water Purchases describes drought water bank supply sources. Suggest correcting the groundwater pumping description to the following, "…additional pumping of groundwater in exchange for a like amount of existing surface supplies". 16-39

7. Page 2-19, first par., third to last line – Replace "water source" with "water export location." The source of SWP supplies is upstream of the Delta. 16-40

8. Page 3-4, first bullet – Change to read: "provide for permanent sales of agricultural Table A amounts to M&I contractors and permanent retirement of agricultural Table A amounts." 16-41

9. Page 3-4, last bullet – Change to read: "provide Department approval and rules for storing water outside a contractor's service area." 16-42

10. Page 4-9, second par., line 4 – The reference to "Appendix E" should be to "Appendix D." 16-43

11. Page 4-11, third full par., line 5 – The reference to "Table 6-3" should be to "Table 6-4." 16-44

12. Page 5-1, par. 4, line 5 – Change to read: "… or revert to the possible no project alternative…" (see Major Comment 12). 16-45

13. Page 5-2, partial par. at top of page, third line from bottom – Change to read "Quantification Settlement Agreement." 16-46

14. Page 5-6, Table 5-2 – Make the following changes to Table 5-2: 16-47

Study	Method	Purpose
Study No. 1 – Historical Allocation Analysis (Appendix I)	Analysis of historical Table A allocations ~~operations~~ data from 1996~~5~~-2005	Estimate allocation of Table A water among ~~to~~ SWP contractors if Monterey Amendment had not been implemented 1996-2005.
Study No. 2 – Historical Operations Analysis (Appendix K)	Analysis of historical operations data from 1996-2004	Estimate effects of most Monterey Amendment provisions on SWP deliveries and Delta pumping 1996-2004~~5~~.
Study No. 3 – Historical Operations Analysis (Appendix K)	Analysis of historical operations data from 1996-2004	Estimate effects of water supply management practices on SWP deliveries and Delta pumping 1996-2004 for extrapolation to ~~under~~ 2020 conditions.

15. Page 6-2, second par. – Change sentence to read as follows: "This diversion rate is normally restricted to 6,680 cfs as a three-day average inflow to Clifton Court Forebay, although at times of high San Joaquin River flows, the diversion rate can be increased by an amount equal to one-third of the flow in that river as measured at Vernalis." 16-48

16. Page 6-9, sec. 6.2.4.3 – The first sentence should be revised to delete the last words "credits of water" and replace with "credits for future water deliveries". 16-49

17. Page 6-12, second par. – Change sentence to read as follows: "Under supply limited conditions, the intake to Clifton Court Forebay is operated at its maximum permitted capacity subject to the limitations of water quality…". 16-50

18. Page 6-12, sec. 6.3.2, end of second par. – Add: ", although no findings of jeopardy were made for any of those events." 16-51

19. Page 6-13, third par. – In listing the EWA agencies administering the program, it should be clarified that the three fishery agencies (referred to here as the "Management Agencies") are the ones who make the allocation decisions, pursuant to the EWA Operating Principles Agreement. 16-52

20. Page 6-13, fourth par., second sentence – Add the words "for diversions into Clifton Court Forebay" after the words "summer limit". 16-53

21. Page 6-16, Table 6-3 – The summary description of Article 1(k) should be changed to read: "Definition change for "Minimum Project Yield." Note b should be changed to read: Will analyze potential effects of invoking Article 18(b) in Court-Ordered No Project Alternatives 3 and 4." 16-54

22. Page 6-17, last par., end of second line – After the words "pursuant to" add "the consents set forth in". The transfers are not made under the Monterey Agreement, they are made under Article 41. The Monterey Agreement merely provides the sellers' consents needed to enable the transfers to proceed. 16-55

23. Page 6-19, Table 6-4 – Correct the agency name for Tulare to: "Tulare Lake Basin Water Storage District." 16-56

24. Page 6-22, par. 2, line 3 – Change to read: "… transfers of Table A amount from agricultural to M&I contractors…". 16-57

25. Page 6-52, par. 3, line 5 – Change "wet years" to "critically dry years." 16-58

26. Page 6-57, last line – Correct typo in number "9996,096". 16-59

27. Page 6-60, par.4, last sent. – At the end of the sentence, add "within their service areas." 16-60

28. Page 6-62, partial par., lines 5-6 – Change to read: "… if Table A allocations are less than 100 percent or less Article 21 water was available than the demand for it…". 16-61

29. Page 6-64, last sentence of second to last par. – SWC agrees with this statement and it should result in a clear statement that the Monterey Amendment had no impact on Delta fisheries during this time frame. 16-62

30. Page 6-65, first full par., line 5 – Following the words "information to the public," replace "on SWP operations" with "regarding current and projected SWP delivery reliability." 16-63

31. Page 7-2, second bullet – SWC suggests adding the word "adverse" to the definition of "Less Than Significant Impact" as follows: "A project impact is considered less-than-significant when it does not reach the standard of significance and would therefore cause no substantial adverse change in the environment." 16-64

32. Page 7.1-7, last par. – Background information regarding variability of Delta inflow refers to specific amounts that are described as water "reaching the Delta," which implies historical inflow. However, the amounts specified appear to be unimpaired inflow. Use of unimpaired inflow data may be appropriate here, but should be correctly described (e.g., Delta inflow absent any upstream reservoirs or depletions by upstream water users) and distinguished from actual historical inflow. Identifying specific amounts of both unimpaired and historical inflow for the several years referenced might also provide useful background information here. 16-65

33. Page 7.1-9, first paragraph. – With regard to "net diversion of water," it is noted that from a fisheries standpoint, it is the gross diversions that are important. 16-66

34. Page 7.1-9, par. 6 and page 7.3-74, par. 5 – The discussions here of factors that limit Delta exports refer to limits due to "environmental standards." It should be clarified that in addition to environmental standards, regulatory restrictions such as the U.S. Army Corps of Engineers permit (described on page 6-2, par. 2) also limit Delta exports. 16-67

35. Page 7-1-9, last par. and next page – It is unclear whether these percentages of Delta inflow are percentages of natural inflow diverted or whether they also include releases from storage. Also, using Delta inflow masks that the rising percentage could be related to increased upstream diversions rather than project operations. 16-68

36. Page 7.1-15, par. 4 – Clarify that Santa Clara Valley WD is both a SWP and a CVP contractor. It is Santa Clara Valley WD's CVP deliveries that are of concern with regard to the San Luis Reservoir low point, not its SWP deliveries as is implied here. 16-69

37. Page 7.1-17, fourth full par. – The Trinity River diversion does not flow into Shasta Lake. 16-70

38. Page 7.1-17, last sentence of last par. – Clarify that any impacts of these improvements are not related to the Monterey Amendment project. 16-71

39. Page 7.1-18, end of third par. – The statement about increased Delta outflow would only be true if the Delta was out of balance. Further, the purpose of the fish action was not to increase Delta outflow, but to reduce take at the pumps. 16-72

40. Page 7.1-23, last par., second sentence – Revise as follows: "... electrical conductivity, Delta outflow as measured by the location of X2, the 2000 mg/l isohaline, and other flow parameters in the Delta…". 16-73

41. Page 7.1-42, impact 7.1-3, second par. – The reference to 0.15 percent is confusing. The number is correct as related to river flows. However, when discussing an impact on Delta inflow, the percentage should be based on inflow from all Delta tributaries, including the SJR and the eastside streams. 16-74

42. Page 7.1-42, impact 7.1-3, third par. – Revise to read: "An important parameter with respect to Delta outflow is the average position of X2, the 2,000 mg/l. isohaline. … . As shown in Table 7.1-14, … on the average Delta outflow as measured by the average location of X2…". 16-75

43. Page 7.1-44, last par., lines 2 and 5 – The references to "Table 7.1-15" should be to "Table 7.1-17." 16-76

44. Page 7.1-44, last par., fourth line – Change term "water quality" to "Delta outflow". 16-77

45. Page 7.1-44, last par., fourth line – Revise to read: "An important parameter with respect to Delta outflow is the average position of X2, the 2,000 mg/l. isohaline. … . As shown in Table 7.1-17, … on the average Delta outflow as measured by the average location of X2…". 16-78

46. Page 7.1-51, last par., third line – Change "delaying" to "delay". 16-79

47. Page 7.1-66, Endnote 50 – The water amounts in this endnote are incorrect. Change the first sentence to read: "Between 1996 and 2004, a relatively wet period, a total of about 371,400 AF of SWP water was delivered for recharge in the Kern Water Bank (about 353,000 AF by Kern Water Bank Authority member entities, and 18,400 AF by KCWA)," and change the last sentence to read: "Thus, the delivery of 371,400 AF of SWP water for groundwater storage in the Kern Water Bank would not have had any effect on Delta outflow." 16-80

48. Page 7.2-10, last par., fifth line – Change "capacity" to "capability". 16-81

49. Page 7.3-12, "Fall-run" par., first line – Add the word "all" before " Central Valley ". 16-82

50. Page 7.3-17, "San Luis Reservoir Fish" par. – It should be noted that the striped bass population is non-reproducing. 16-83

51. Page 7.3-18, third line – It should be noted that the largemouth bass are non-native and a significant predators on listed and special status fish species. 16-84

52. Page 7.3-24, Other Recreationally Important Fish par. – The last sentence should be supplemented by a statement that there is no established relationship between young-of-year populations of striped bass and adult population levels. 16-85

53. Page 7.3-25 – Strike repetitive material at bottom of page that carries over to next page. 16-86

54. Page 7.3-27 – Strike duplicative discussion of splittail. 16-87

55. Page 7.3-37, Table 7.3-19 – The flows shown in the top half of the table under the heading "2020 Monthly Flow Change due to Change in Deliveries, AF" are too high by a factor of 1000. 16-88

56. Page 7.3-40, third par. – The statement about decreases in flow on the Sacramento River should be limited by adding the phrase "downstream of the Feather River" after the word "flow" in the second line. 16-89

57. Page 7.3-40, par. 5, sent. 2 – the maximum monthly delivery increase indicated here should be 1,170 AF (see comment above on Table 7.3-19). 16-90

58. Page 7.3-53, par. 4 – Clarify that the EWA Management Agencies do not just "recommend" pumping changes. They make decisions regarding use of EWA assets that are carried out by the Project Agencies. 16-91

59. Page 7.3-67, sixth line – It is unclear what the word "aided" means. 16-92

60. Page 7.4-21 – Strike the third paragraph. It is both duplicative and inconsistent with the second paragraph, which correctly explains that "no clear trend" in cropping patterns can be discerned that can be attributed to the Project. 16-93

61. Page 7.8-10, "1996-2003" par. – The second sentence presents average surface water elevations for Lake Perris, therefore, " delete "Castaic Lake." In the third sentence, 1996-2003 surface water elevations for Castaic Lake were about 23 feet higher than between 1974 and 1995 (not 20 feet), as cited from page 7.1-47 of the DEIR. 16-94

62. Page 7.15-10, third par. – Table 6-28 should be referenced instead of Table 6-27. 16-95

63. Page 7.16-6, "1996-20003 [*sic*]" par. – Revise the first sentence to correct referenced net load increase as follows: "The post-processed power results were only run for the 2020 Level-of-Development. The 2020 conditions show a total long-term net load increase of only 2.02 percent (see Future Impacts section)." 16-96

64. Page 7.16-7, "Future Impacts" – To better understand the energy impacts identified, it would be helpful to discuss the reasons for an increase. For example, we assume the energy increase identified is related to changes in the location of water deliveries along the California Aqueduct, primarily due to the transferred Table A amounts. Due to those 16-97

transfers, some water that would otherwise be conveyed to the San Joaquin Valley would instead be conveyed to North Bay and South Bay contractors, which likely results in an energy decrease, while other transferred water would instead be conveyed further downstream to Southern California, with a resulting energy increase. 16-97 (con't.)

65. Page 8-6, par. 1, sent. 2 – This sentence is a fragment and does not make sense. In comparing this paragraph in the DEIR to the last administrative draft provided to the advisory committee, it appears that three lines of text were inadvertently deleted. That deleted language should be added back and this sentence replaced with the following: "There is no precise way to determine whether an increase in water supply, an expansion of water delivery systems, or a transfer of water between areas directly or indirectly induces growth. Furthermore, population growth is influenced by a host of complex factors. At the statewide and regional levels, growth is principally the result of the natural increase in the population – the excess of births over deaths." 16-98

66. Page 8-6, par. 3, line 2 – Change to read: "… population growth potentially attributable to…". 16-99

67. Chapter 12. The discussions in this chapter are fairly clear, but the DEIR mixes up terms. While not critical to the overall document, nonetheless one of the terms is incorrect. The standard terms used by the Intergovernmental Panel on Climate Change and the predominant research literature are "global warming" and "climate change". The use of the term "global climate change" is incorrect, since climate change is a regional phenomenon driven by global warming. This distinction is important because climate change impacts on water supplies differ throughout the West, and are projected to be different in the Pacific Northwest than in Northern California, Southern California and the Colorado River Basin. 16-100

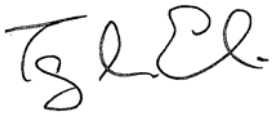
68. Page 12-13, Table 12-2 – The year identified in the title for Table 12-2 should be changed from "2020" to "2050." As is indicated in the note to this table, the supply reductions shown in the table are based on studies representing projected changes centered around 2050. 16-101

69. Pages 7.3-77, 7.3-80, 7.5-15, 7.7-14, 7.8-10, 7.9-13, 7.9-14, 7.15-10 – Section 6.4.3 should be referenced instead of 6.4.3.1, which does not exist in the DEIR. 16-102

In conclusion, the SWC believes that the DEIR does a good job of describing project impacts and demonstrates that the Monterey Plus project delivers innovative 21st Century water management tools that will help California meet its growing water needs with minimal adverse environmental effects. It is critical that the Monterey Plus project move forward in order to preserve the new direction of water management contained in the Monterey Amendment. 16-103

If you have any questions about these comments, please contact me at (916) 447-7357.

Sincerely,



Terry L. Erlewine
General Manager

Attachments

cc: SWC Member Agencies

FIGURE 1

CONCEPTUAL DEPICTION OF SWP DELIVERIES

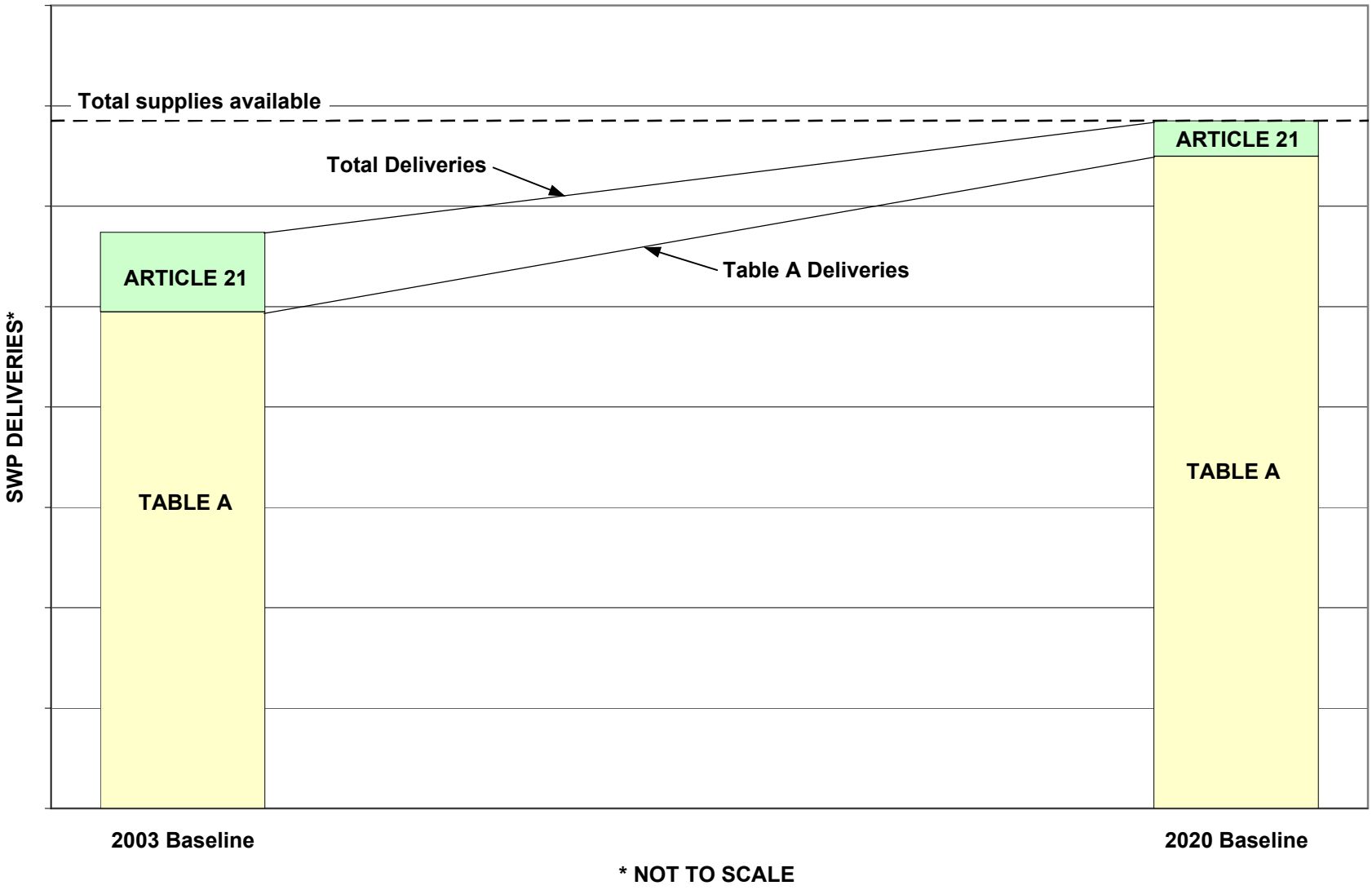


FIGURE 2

CONCEPTUAL DEPICTION OF SWP DELIVERIES

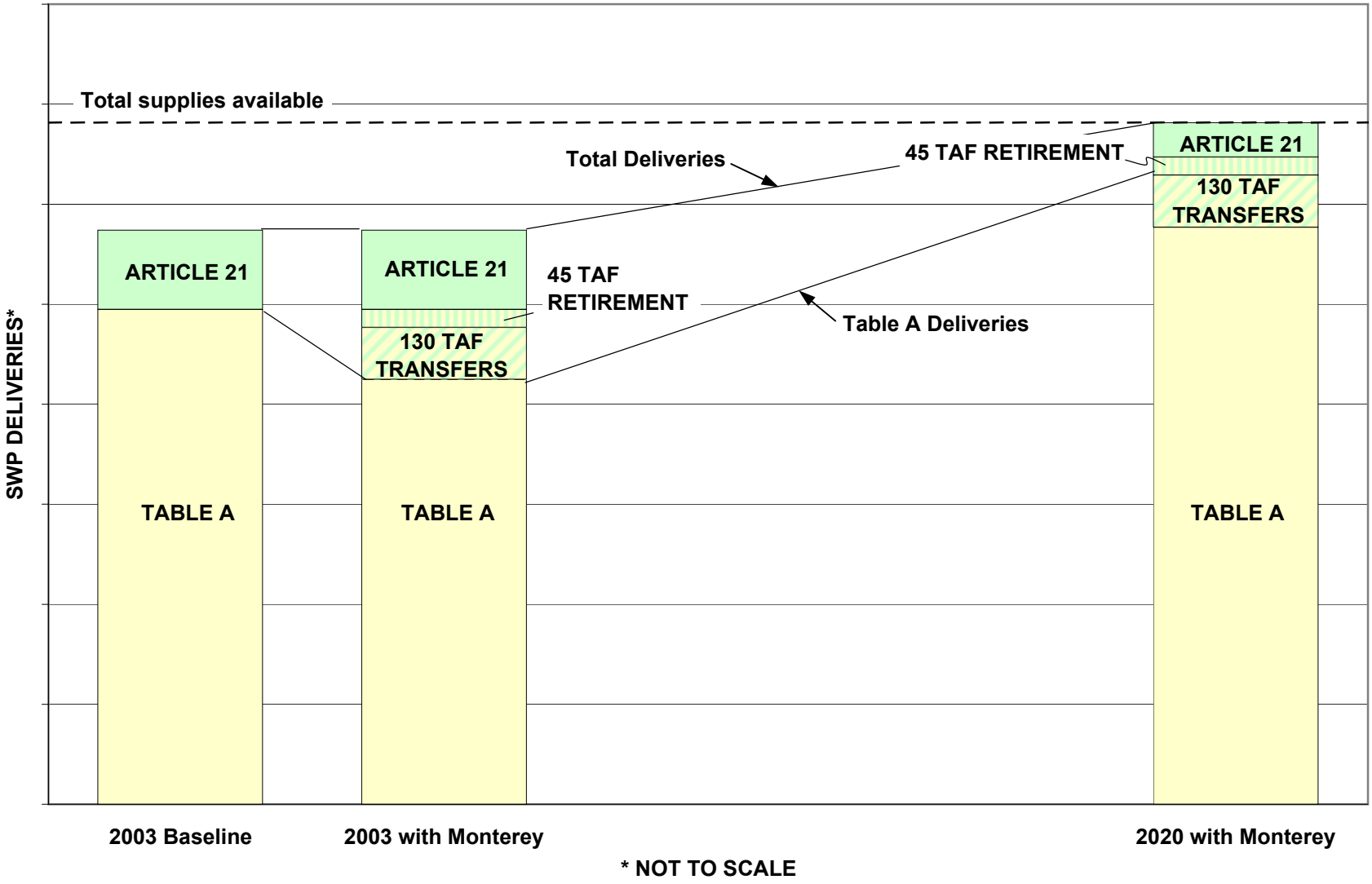


FIGURE 3

2003 DEMAND CONDITIONS

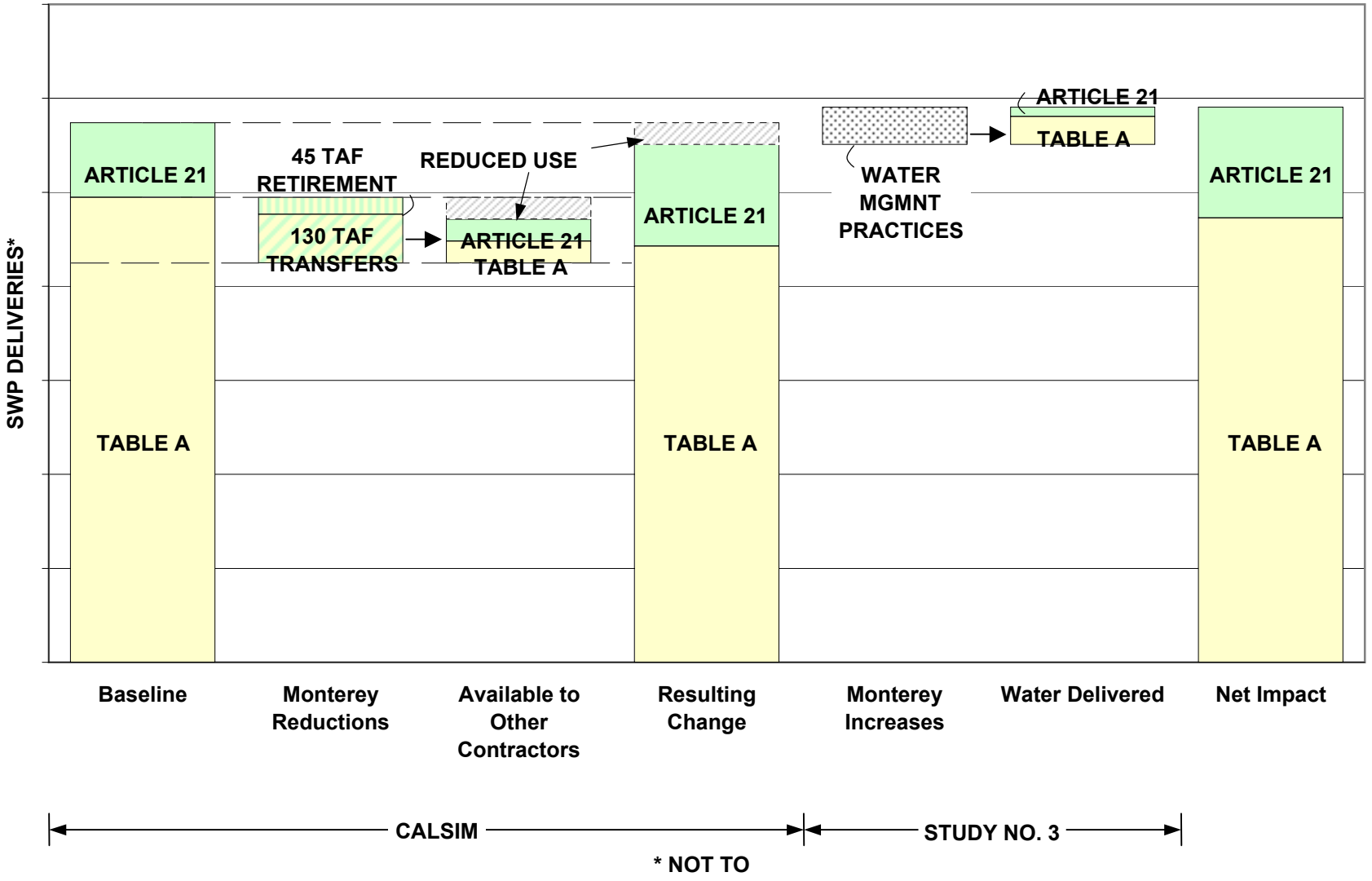
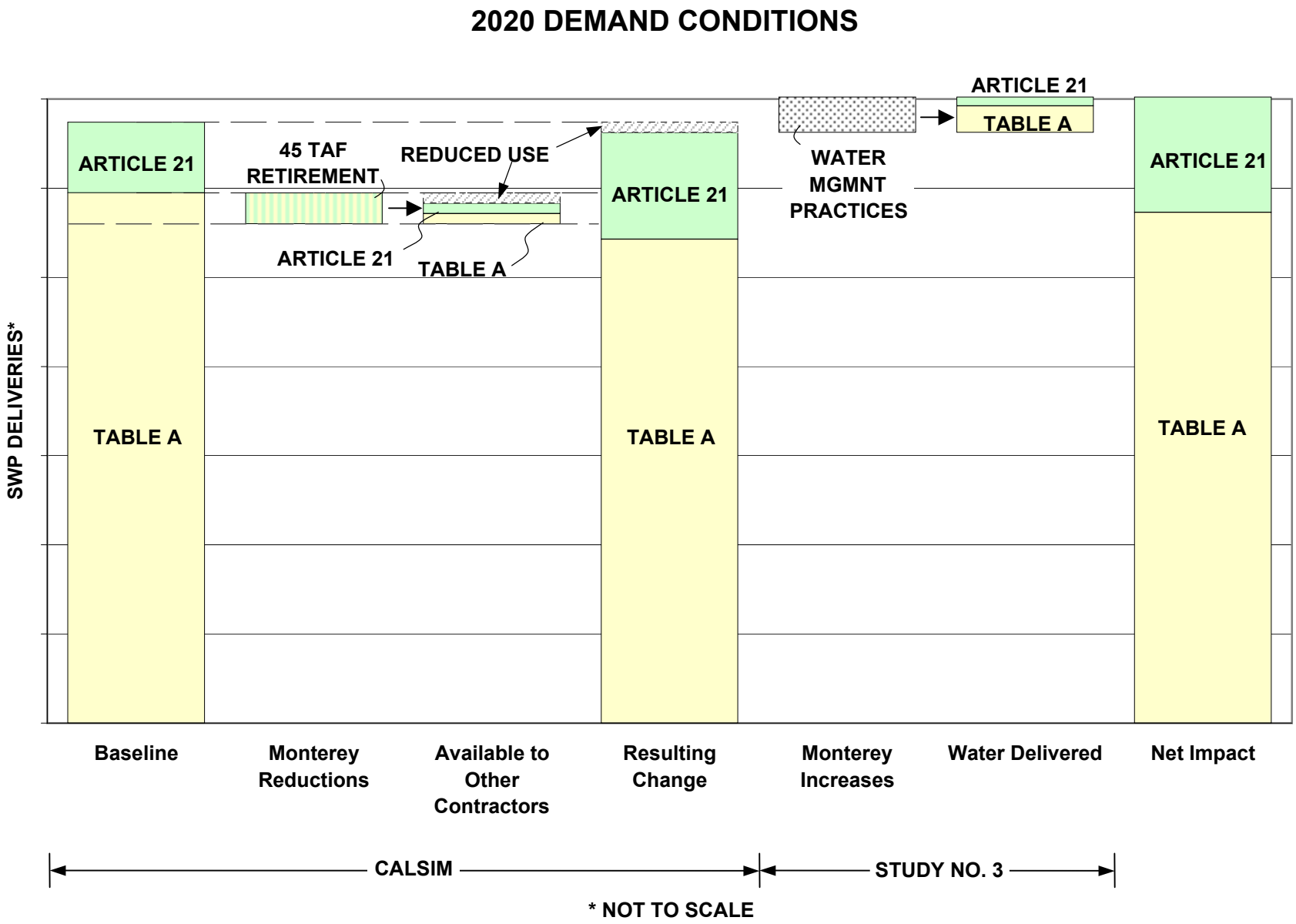


FIGURE 4


2020 DEMAND CONDITIONS
SWP DELIVERIES*
ARTICLE 21
TABLE A
45 TAF RETIREMENT
REDUCED USE
ARTICLE 21
TABLE A
ARTICLE 21
TABLE A
WATER MGMNT PRACTICES
ARTICLE 21
TABLE A
ARTICLE 21
TABLE A
Baseline
Monterey Reductions
Available to Other Contractors
Resulting Change
Monterey Increases
Water Delivered
Net Impact
CALSIM
STUDY NO. 3
* NOT TO SCALE

LETTER 16

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wllmwagner@msn.com

11 January 2008

TO: Marty Meisler
Metropolitan Water District of Southern California
Environmental Planning Team

SUBJECT: Review and comments to Monterey DEIR – Section 7.4 Terrestrial Biological Resources

The following comments are provided for the Monterey DEIR – Terrestrial Biological Resources (Section 7.4).

Section Comments

Page 7.4-17 (Section 7.4.2.5). Middle of paragraph prior to Table 7.4-3. The sentence beginning with ….. As of May 2006, the USFWS no longer ……. This statement reflects changes to some special-status species Federal/State designations since 2003. Therefore, I would think a new column should be added to Table 7.4-3 to reflect the current (2007) status designations. [I have included a revised table at the end of my comments with the new special-status species designations] This would also apply to Table 7.4-2. Note that two species, the California thrasher and Yuma myotis bat, are no longer included on either State or Federal Special-Status species lists. 16-104

The Sources presented in the notes at the bottom of Table 7.4-2 should either be dropped or updated to reflect the revised or updated special-status species lists for 2003 and 2007. Further, in the Table 7.4-3 (Special-Status Updates Table), there are no Sources listed in the Notes at the bottom of the table.

Page 7.4-22 (Section 7.4-1 under Future Impacts). The second to last sentence states …… Additionally, the Tulare Lake Basin WD (where a Swainson's hawk nest has been recorded) is subject to periodic flooding which makes it unsuitable for anything but annual crops. Is this "subject to periodic flooding" the result of natural season rainfall flooding and drainage patterns (e.g. flat terrain or basin/playa conditions) or as a result of human-related flooding, such as agricultural irrigation or Tulare Lake Basin WD flooding projects (i.e., recharge/percolation ponds, etc.)? I would think this would make a difference as to project related impacts as it relates to changes to suitable habitat for the species. 16-105

Page 7.4-32 (Section 7.4-4 under Future Impacts – last paragraph). The sentence reads …….. As discussed in Section 7.3, a reduction in lake levels could reduce overall fish 16-106

populations, a food source for the bald eagle, generally reported for southern California reservoirs as 2-10 eagles between November and March each year (Stephenson and Calcarone 1999). The citation is correct, however, the sentence could lead one to believe that 2-10 eagles can generally be found at Castaic Lake between November and March. This is unlikely the case. The CNDDB does not reveal any observations for bald eagle at Castaic Lake. However, based on my observations at other large reservoirs in southern California, I would suspect that an occasional transient or wintering bald eagle could be found at Castaic Lake during the winter period. Castaic Lake, being a recreational lake with speed boats, likely reduces the number of bald eagles that would utilize the lake over an extended period of time.

The 1999 USDA Forest Service report cited in the Monterey DEIR is a very general report drawing on past data. The report states that 20-30 bald eagles typically congregate at Big Bear Lake each winter. This is extremely misleading as recent bald eagle counts reveal that typically less than 10 bald eagles are observed annually at Big Bear Lake. The Big Bear Lake - Bald Eagle Web site indicates "The number of bald eagles using the Big Bear Basin have fluctuated over the past 20 years, from lows of 2-5 to highs of 25-30." A phone call to the information receptionist at the USFS Big Bear Ranger Station revealed the high number of the bald eagles for the past three years as follows: 2004-05 = 6 eagles, 2005-06 = 7 eagles, 2006-07 = 8 eagles. Most of the counts reveal 2-5 eagles observed. I should also note that Big Bear Lake & the adjacent Baldwin Lake area historically always have the highest number of bald eagles wintering throughout southern California.

Therefore, I don't believe that the USDA Forest Service report provides a reasonable representation of the numbers of eagles that annually winter at Castaic Lake. Unless another report or better documentation is available for the number of bald eagles wintering at Castaic Lake, the citation and number of bald eagles stated (2-10 eagles) should not be included in the Monterey DEIR.

16-106 (con't.)

Page 7.4-33 (last paragraph just before Mitigation Measures), I would drop the Yuma myotis (*Myotis yumanensis*) as this species is no longer included on any resource agency special-status species lists. I would also combine the first and second sentence to read…….Lake Perris provides a water supply and foraging habitat for special-status species (Table 7.4-2) including the osprey (*Pandion haliaetus*), greater western mastiff bat and double-crested cormorant (*Phalacrocorax auritus*). The wintering bald eagle is also occasionally observed foraging at reservoir. Note I have dropped the "Lake Perris supports a variety of special-status species" at the start of this paragraph because the lake surface area does not support a variety of special-status species, but the riparian habitat along the northeast and east shoreline does, and this is addressed in the next section (7.4-6). So the words a variety of special-status species is more applicable there.

16-107

Just as an added note, The Audubon's sponsored San Jacinto Lake Christmas Bird Count revealed a bald eagle observed at Lake Perris in 2004 and none observed in 2005 or 2006. However, this years Christmas Bird count conducted December 18, 2007, revealed one adult bald eagle at Lake Perris. If this information is included in the DEIR, the citation would be: Metcalf, Tony, Co-compiler San Jacinto Lake Christmas Bird Count. University of California – Riverside, Department of Biology, personnel communication, December 2007.

16-108

Page 7.4-33-34 (Section 7.4.5 under Future Impacts – last paragraph). The last sentence that states ……..Regardless, a reduction in food resources could result in reduced nesting success for raptors, bats, and waterfowl, which would result in a ***potentially significant and unavoidable impact.*** I would disagree with the conclusions drawn here. The reduced water level would reduce the water surface area available for foraging by some species, but the reduced water would not significantly adversely affect the overall productively of the lake. Foraging habitat would remain available for the few individual raptors (i.e., osprey and wintering bald eagle) that occasionally forage for prey within the lake water, and neither of these species nests at or near Lake Perris. Additionally, because the lake is stocked for recreational fisheries use, it is unlikely that fish populations would drop below a level that could adversely affect the special-status species that forage at Lake Perris.

Roosting and forage perch sites for raptors would not be adversely affected by future drawdown. If fact the separation of the riparian corridor, lining the north and east sides, from the drawdown water edge, may reduce human-related disturbances (i.e., fishing/boating activities) and potentially increase utilization (i.e. forage, nesting, roost and perch sites) of this area for all raptor species, particularly red-tailed hawks and white-tailed kites. 16-109

There is also no evidence to support reduced nesting success by bats, particularly when you still have an open water source for foraging. Further, many of the same individual bats and bat species that commonly forage at Lake Perris also forage at the adjacent San Jacinto Wildlife Area ponds.

The only potential for reduction in nesting success would be to waterfowl as nesting substrate (i.e., emergent and shoreline riparian vegetation) would be reduced during the drawdown period. However, no regional waterfowl populations would be adversely impacted, particularly as the lake is located adjacent to the San Jacinto Wildlife Area which provides extensive forage and nesting habitat for waterfowl and shorebirds. Therefore, the proposed project would have a less-than-significant impact on terrestrial biological resources at Lake Perris.

Page 7.4-34 (Section 7.4-6 - 1996-2003). I would drop California thrasher (*Toxoxtoma redivivum*) from the first sentence as this species is no longer included on any resource agency special-status species lists. In the second sentence beginning with …….Additionally, in 2007 the California gnatcatcher…… I would either remove this species from the document (because of the time period observed, 2007) or change the sentence to read …….Additionally, in 2007 the coastal California gnatcatcher (*Polioptila californica californica*), a federally-listed threatened species, typically associated with upland scrub habitat, was observed foraging in the riparian corridor. Here again the DEIR references an item (i.e., a species **observed in 2007**), yet Table 7.4-2 (Special-Status Species) and other changes are not addressed in the current DEIR that update changes from 2003 to 2007. The coastal California gnatcatcher site occurrence and special-status designation is not included in the table. 16-110

Page 7.4-35 (Section 7.4.6 under Future Impacts – Mitigation Measures).

The implementation of the proposed mitigation measures presented seems appropriate but I am somewhat skeptical as to its potential for success. Therefore, I would agree that this remains a ***potentially significant and unavoidable impact.*** 16-111

Baseline studies and monitoring is essential but is not necessarily mitigation. The actual mitigation is implementation of an irrigation system. However, if the riparian vegetation fails to sustain, what mitigation measures are proposed to offset any potential significant and unavoidable impact? Perhaps an additional paragraph or Measure (c) should be included that addresses mitigation in case the irrigation and/or underground water system fails to rejuvenate or sustain the shoreline riparian vegetation.

Some suggested potential mitigation measures could include:

- Restoration/planting of seedlings once the water level has been brought up to the level that previously supported the riparian community prior to drawdown. Current baseline aerial photo documentation of the riparian corridor community would be helpful. The aerial would also provide baseline acreage of the riparian area potentially affected by future projects.

- Alternately, offsite mitigation opportunities could be pursued if on-site measures fail to produce sustainable riparian vegetation.

16-111 (con't.)

One additional comment pertains to **Section 7.8.4 (page 7.8-11)** of the Monterey DEIR as it relates to erosion at Lake Perris and biological resources. A site visit to Lake Perris conducted on January 9, 2008, following a major seasonal rain event, revealed the following erosion conditions and vegetation communities observed between the previous high water line and the current drawdown water level:

- Minimal erosion associated with wind and wave action between the high water line and the current drawdown water level was observed around the entire lake.
- A few areas along the west side of the reservoir exhibited fairly major incised drainage channel erosion extending to the reservoir waters edge. Almost all of the eroded locations were the result of designed drainage channels and/or runoff from recreational asphalt parking lots and picnic areas. The west side shoreline is intentionally void of vegetation for recreational activities (i.e., swim beaches). Some of the eroded areas extending from designed drainage runoff channels could be repaired or erosion minimized by placement of rip-rap or other alternative devices installed to minimize rainwater runoff energy flow to the reservoir.
- Substantial vegetative regrowth or successional colonization of vegetation has occurred between the willow dominated riparian zone (previous highwater shoreline) and the current drawdown water level along the north and east side of the reservoir. The terrain within this area is very gentle, almost broad floodplain like in nature. Vegetation between the current drawdown water level to highwater zone is dominated by native seedlings including mulefat (*Baccharis salicifolia*), willows (*Salix* spp.), cattails (*Typha* spp.), and herbaceous growth including Douglas' mugwort (*Artemisia douglasiana*), telegraph weed (Heterotheca grandiflora), *Chenopodium* spp., alkali heliotrope (*Heliotropium curassavicum*), and western ragweed (*Ambrosia psilostachya*). Germination and subsequent emergent vegetation within this area likely occurred during the first spring/summer growing season (January through September) following the initial drawdown. The extent of regrowth or colonization currently observed (or regrowth

16-112

following future drawdowns) is also dependent on seasonal weather conditions (i.e., seasonal rainfall and temperatures).

- The prevailing winds in this area of southern California is typically from the west or southwest direction therefore most wave action would occur along the north and east side. As noted above, this area of the reservoir exhibits a gentle to almost flat shoreline with emerging vegetative growth, thus erosion is minimal throughout this area of the lake.

16-112 (con't.)

As noted between 2003 and today's current drawdown water level conditions, little wind and wave action erosion is noted at Lake Perris. This is probably due to the gentle sloping terrain, emergent vegetative growth between the previous high water level and the current drawdown level, and the prevailing wind direction. Therefore, I would conclude that the proposed project would have a less-than-significant impact to erosion during future drawdown periods.

William D. Wagner

William D. Wagner
Biological Resources Consultant

Letter 16

Updated Special-Status Species Designations for 2007 (shown in red). Note the California thrasher and Yuma myotis bat no longer have any special-status designation. If adopted, Table 7.4-2 would also need to be revised to reflect the changes at the Kern Fan Element, Lake Perris, San Luis Reservoir, Sacramento River and Delta, and Plumas County. Additionally, some species count numbers would need to be revised in the text (primarily in Section 7.4.2.2 Physical Setting in 1995).

16-112

16-113

TABLE 7.4-3
SPECIAL-STATUS UPDATES FOR PLANT AND WILDLIFE SPECIES KNOWN TO OCCUR IN THE PROJECT AREA

Common Name	Scientific Name	2003 Status (Federal/State/CNPS)	2007 Status (Federal/State/CNPS)
Hoover's woolly-star (eriastrum)	*Eriastrum hooveri*	D/-/CNPS 4	No change
Recurved larkspur	*Delphinium recurvatum*	SC/-/CNPS 1B	-/-/CNPS 1B
Slough thistle	*Cirsium crassicaule*	SC/-/CNPS 1B	-/-/CNPS 1B
Western spadefoot	*Scaphiopus hammondii*	SC/CSC	-/CSC
Western pond turtle	*Clemmys marmorata*	SC/CSC	-/CSC
Bald eagle	*Haliaeetus leucocephalus*	T, PD/E, FP	D/E,FP
Burrowing owl	*Athene cunicularia*	SC, BCC/CSC	BCC/CSC
California thrasher	*Toxostoma redivivum*	SC/-	-/-
Lawrence's goldfinch	*Carduelis lawrencei*	SC, BCC/-	BCC/-
Least Bell's vireo	*Vireo bellii pusillus*	E, BCC/E	No change
Loggerhead shrike	*Lanius ludovicianus*	SC, BCC/CSC	BCC/CSC
Swainson's hawk	*Buteo swainsoni*	SC, BCC/T	BCC/T
White-tailed (black-shouldered) kite	*Elanus leucurus*	SC, MNBMC/FP	-/FP
American badger	*Taxidea taxus*	-/SA	-/CSC
Buena Vista Lake shrew	*Sorex ornatus relictus*	E/CSC	No change
Greater western mastiff bat	*Eumops perotis californicus*	SC/CSC	-/CSC
San Joaquin antelope squirrel	*Ammospermophilus nelsoni*	SC/T	-/T
Yuma myotis	*Myotis yumanensis*	SC/-	-/-

Federal:
E — Listed as endangered under the Federal Endangered Species Act.
T — Listed as threatened under the Federal Endangered Species Act.
C1 — Category 1 Candidate for which the USFWS has on file sufficient information on biological vulnerability and threat(s) to support proposals to list them as endangered or threatened species. Proposed rules not yet issued because this action is precluded at present by other listing activity.
C2 — Category 2 Candidate for which information now in the possession of the USFWS indicated that proposing to list and endangered or threatened is possibly appropriate, but for which persuasive data on biological vulnerability and threat are not currently available to support proposed rules.
SC — Federal Species of Concern. The USFWS decided to no longer maintain C2 and C3 lists, and species formerly categorized as such were informally termed "Species of Concern." The Sacramento Fish & Wildlife Office maintains a list of *Species of Concern* . These species receive no legal protection and the use of the term does not mean that they will eventually be proposed for listing.
D — Delisted – Delisted species are monitored for five years after being delisted.
BCC — US Fish and Wildlife Service, Bird of Conservation Concern.
MNBMC — US Fish and Wildlife Service, Migratory Nongame Bird of Management Concern.
\- — No listing.

State:
E — Listed as endangered under the California Endangered Species Act.
T — Listed as threatened under the California Endangered Species Act.
CSC — California Special Concern Species – categorized as such because of declining population levels, limited ranges, and/or continuing threats have made them vulnerable to extinction.
FP — Fully Protected – Fully protected species may not be taken or possessed without a permit from the Fish and Game Commission.
* — Taxa listed with an asterisk (*) fall into one or more of the following categories – (1) Taxa that are biologically rare, very restricted in distribution , or declining throughout their range; (2) population(s) in California that are peripheral to the major portion of a taxon's range, but which are threatened with extirpation within California; and (3) taxa closely associated with a habitat that is declining in California (e.g. wetlands, riparian, old growth forest).
SA — Taxa found on the July 2003 Special Animals List, which have no legal or protection status.
\- — No listing.

Other:
CNPS 1B – Plants that are rare, threatened or endangered in the state of California.
CNPS 4 – Plants of Limited Distribution – A Watch List.

LETTER 17

South Delta Water Agency

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January 14, 2008

Via e-mail delores@water.ca.gov

Ms. Delores Brown, Chief
California Department of Water Resources
Office of Environmental Compliance
901 P Street
Sacramento, CA 95814

Re: Comments to the Draft Environmental Impact Report for the Monterey Agreement, Including the Kern Water Bank Transfer: also known as "Monterey Plus"

Dear Ms. Brown:

The following are the comments of the South Delta Water Agency ("SDWA"), joined in by the Central Delta Water Agency ("CDWA"), to the above referenced DEIR for Monterey Plus.

The DEIR is insufficient for several reasons, including most importantly, its analysis of the effects of deleting portions of Article 18 of the original State Water Contracts, its analysis of the current requirements of the State Water Project ("SWP") to maintain water quality objectives and its analysis of the potential impacts on fishery resources. 17-1

1. The DEIR does not adequately address the deletion of Article 18(b). Article 18(b) provides in the event that the State is unable to construct sufficient conservation facilities (which provide additional yield to the project), it may decrease the annual entitlements to all contractors by amending Table A (which sets forth the maximum delivery amount to each contractor). The basis for this provision is that the SWP was developed in stages, with the contractors (generally)

receiving incrementally larger deliveries as time went on until full deliveries were possible. 18(b) was a mechanism to allow a decrease in the "full" delivery allotments if all of the facilities anticipated for the SWP were for any reason not completed.

DWR's Bulletin 76 sets forth the anticipated portions and supplies of the SWP, including those amounts needed for full development. As can be seen from the graph on page 11 of Bulletin 76 (attached hereto), as of today, approximately 5 million acre feet of supply (mainly from North Coast rivers) has not been developed as part of the SWP. Pursuant to later decisions, including the designation of "Wild Rivers" to some of the potential supply sources, these rivers will not ever be used as sources of for SWP supply. Hence we see that the project is currently 5 million acre feet "short" as of the year 2000. This is the very circumstance anticipated and provided for in Article 18(b).

Rather than include this tremendous decrease in available water supply in the DEIR analysis, the document states:

> The effect of an implementation of Article 18(b) would have been to reduce the number of years when agricultural contractors would have to take shortages in years when Article 18(a) was applied to SWP deliveries. It would not, however, have altered the amount of water that the Department delivered to the contractors in the many years when more than the minimum SWP yield was available in the SWP system. Instead, such water would have been delivered to the contractors under Article 21. (DEIR at Page 2-16)
>
> [O]nce the agriculture first shortage provision was eliminated, [article 18(b)] would no longer be needed to protect agricultural water users from excessive shortages. With the elimination of the agricultural first shortage provisions, it no longer mattered whether a shortage was a temporary one or a permanent one, since the allocation of the available supply would be the same in either situation.
> (DEIR at Page 4-5)

17-1 (con't.)

It is difficult to understand the meaning of these statements. If Article 18(b) were invoked, each contractor would have a smaller Table A amount. This means that the SWP would deliver less to each contractor *every year* because they would only be entitled to that lesser amount. In that event, each contractor would adjust its needs so that its Table A amounts were sufficient for its uses. To the contrary though, the DEIR assumes that each contractor will still seek its full/original Table A amounts even after Table A amounts have been decreased, and the SWP will continue to deliver (up to) the original Table A amounts.

The manner in which the DEIR treats this issue makes Article 18(b) meaningless and results in no real analysis of the implementation of it. It would appear that the DEIR was written in an attempt to avoid the issues found to be inadequate by the court. 17-1 (con't.)

2. The DEIR does not adequately analyze changes to Article 21. The Monterey Agreement alters Article 21 to remove language that insures "surplus" water is not used or relied upon as a permanent supply. The original language precluded delivery of Article 21 water if "such delivery would tend to encourage the development of an economy within the area served by such a contractor which would be dependent on the sustained delivery of water in excess of the contractor's maximum annual entitlement." As related above, the DEIR treats the SWP deliveries the same, before and after Monterey. In that case, although the Table A amounts may be less, the DEIR delivers additional surplus to the contractors so that they receive the same amount as they would have if Article 18(b) were not invoked. This clearly violates the intent of the provisions, and results in the DEIR not disclosing an accurate or true set of circumstances should Article 18(b) and 21 have been implemented as anticipated. Under the DEIR, contractors continue to be dependent on total SWP capacity even after allocations are decreased. This turns either turns the contractors into water sellers or specifically makes areas dependent on "surplus" supplies. 17-2

3. The DEIR fails to analyze the ability of the SWP to divert water from the Delta. The SWP can only divert water from the Delta which is surplus to the needs of the Delta and the areas of origin. As stated in Bulletin 76 at page 12: *In 1959 the State Legislature directed that water shall not be diverted from the Delta for use elsewhere unless adequate supplies for the Delta are first provided*." The Bulletin goes on to state at page 11:

> The coordinated use of surplus water in and tributary to the Delta and of regulated or imported supplements to this supply, as required, is referred to as the ***Delta Pooling Concept***. Under this concept of operation the State will ensure a continued supply of water adequate in quantity and quality to meet the needs of export water users. Advantage will be taken of surplus water available in the Delta, and as the demand for water increases and the available surplus supply is reduced by further upstream uses, the State will assume the responsibility of guaranteeing a firm supply of water, which will be accomplished by construction of additional storage facilities and import works. ***At the same time, the water needs of the Delta will be fully met***." (Emphasis added)

17-3

The DEIR makes no analysis of how the SWP will or can be able to divert millions of acre feet of water from the Delta when its anticipated supplies are now approximately 5 million acre feet short. Currently, insufficient water is available for in-Delta needs, including

agricultural, fishery and other public trust uses. In that event, there are times when there is no "surplus" in the Delta to provide a make up for never developed SWP supplies. The DEIR must identify those times of shortage and then determine the amounts of water available for export. Additional legal support is found in Water Code Sections 12200 et.seq. which precludes diversions for export of water needed to provide salinity control and in-Delta uses. The DEIR analysis does not address this "supply" limitation. 17-3 (con't.)

4. The DEIR does not adequately analyze the effects of area of origin needs. Although it is not clear whether the Monterey Agreement deletes Article 18(c), it is clear that the analysis fails to examine decreasing export supplies due to area of origin needs. As areas of origin (including the Delta) grow, or uses therein increase, those areas are able to "take over" amounts developed under the SWP (and the CVP). This anticipated decrease in the amount of water available for export is never analyzed in the DEIR. Since the SWP was unable to develop approximately 5 million acre feet of supply, there is no additional water available to make up for area of origin or in-Delta (including fishery) increases, and thus exports must slowly decrease. 17-4

It appears that the Monterey Agreement has for its purpose the increase of exports over time in order to fulfill original Table A amounts when possible. Such a project goal must be clearly identified in and EIR and not lost in the analysis. This is especially true when that increase is based on an insufficient water supply.

5. The DEIR fails to adequately analyze the operational limitations on the SWP. The DEIR list the operational constraints in Table 5-3. Under "Regulations" it mentions on the Vernalis salinity objective of D-1641. That Decision also includes three other salinity objectives, or more correctly, three other locations for the same standard to be measured for compliance. Those three other locations are permit conditions of both DWR and USBR, and are required to be met by those agencies. In order to meet those objectives, DWR and USBR have to undertake some additional measures, above those historically taken. [Though the standard is required to be maintained in all channels, the measurements last summer showed a violation at the Old River at Tracy Bridge location for most of the summer.] Those measure may include releases from San Luis Reservoir and/or changes in flow patterns in the southern Delta. Those actions could result in lesser export rates; not analyzed in the DEIR. 17-5

Further, D-1641, as clarified by the Cease and Desist order issued against the projects precludes JPOD pumping during times when the standards are being violated. In summer and fall, this affects EWA pumping. According to the SWRCB's Executive Director, last summer the SWP/CVP JPOD of 500 cfs from July 1 - September 1 was an illegal diversion. The DEIR cannot incorporate illegal diversions as either available supply, or mitigation measures.

In addition, additional export pumping causes lowered water levels in the southern Delta to the detriment of local diverters. The DEIR makes no analysis of how a continuation of

existing exports, or the anticipated increased exports will affect water levels, and potentially be precluded unless mitigated. [The DEIR incorrectly identifies the temporary tidal barriers as used to protect water quality and to protect salmonids. The temporary barriers protect water levels, and do not generally improve quality. It is the Head of Old River barrier that is meant to protect salmonids, not the tidal barriers.]

17-5 (con't.)

6. The DEIR does not adequately analyze the transfers of the Kern Water Bank property. Initially, there is a question about the legality of such a transfer. Water Code Section 11464 appears to preclude the sale or transfer of any facility of the SWP owned by the Department (of Water Resources). This legal question is a threshold to any analysis of the effects.

17-6

Secondly, the DEIR does not adequately analyze how the SWP would operate and add to the SWP supplies after Article 18(b) is implemented. It is likely that when "surplus" water is available in the Delta, the Bank would be operated to slightly increase the amount of water available to southern Californian M&I users (and others). Further, the initial documents regarding the Bank indicated that its operation might have adverse effects on the Delta. These potential effects have apparently escaped analysis through assumptions in the DEIR.

17-7

7. The DEIR does not adequately analyze alternatives. Initially, the alternatives selected do not include any reduction in supplies to the contractors. As stated above, the DEIR simply assumes that the SWP will deliver the same (or increased amounts) of water under both the project and no-project scenarios, ignoring the provisions of Article 18 and 21. In light of these Articles, the DEIR must include some sort of decreased exports alternative, similar to that required by the court in the CalFed ROD cases.

17-8

Secondly, the DEIR seems to confuse the baseline conditions with those of the no-project condition, rather than comparing a set of alternatives against both the baseline and the no-project conditions. In this case (as stated above), the DEIR ends up comparing a number of scenarios which all assume virtually the same amount of exports and deliveries. This gives no real comparison for the public or the decision makers to review.

17-9

8. The DEIR inadequately examines the project's effects on the Pelagic organisms decline ("POD"). It is clear that SWP and CVP operations have been a major, if not primary cause of the POD (see Smelt Work Plan, March 2007). Entrainment of numerous species, including those pelagic, endangered and threatened species has resulted in record lows, with some species apparently approaching extinction. All of this occurred during times when significant changes in times and amounts of exports occurred under CalFed and other agreements. For example, exports in certain winter months sometimes tripled over recent and historic rates as presented by The Bay Institute at the SWRCB POD workshop in 2007.

17-10

We see that efforts such as EWA, "no-net loss" (under D-1641 export "limitations") and altered export operations have caused the drastic and catastrophic decline of the species. At the same time, the DWR was operating its Delta export facilities without any "take" permit or other authorization under CESA (see *Watershed Enforcers* (CalSPA) v. *DWR*) and the CVP was operating under (later) voided Biological Opinions (see *NRDC v. USBR*). This leads to two separate requirements of the DEIR. The first is that the no-project scenario (at the very least) must assume that SWP exports must be very limited unless and until DWR applies for and receives a take permit under CESA. Until this, or some legally equivalent action occurs, there is not authorization to take smelt (and other species) and therefore export pumping cannot occur when take is likely or in fact occurs.

The second requirement is that the DEIR cannot assume EWA or any actions are sufficient to mitigate the adverse impacts to the fisheries since EWA (and numerous other actions listed in the DEIR) were ongoing during the time the species crashed. [This was the gist of the courts ruling in the *NRDC* case.] The net result is that the DEIR fails to examine a scenario where exports are radically decreased due to existing environmental regulations and endangered species laws.

17-10 (con't.)

In addition, the other potential factors relating to the POD are related to the export facilities. Things such as changes in habitat and food can and are directly related to the export facilities changes to interior Delta flows. Similarly, effects of contaminants and toxics are also affected by those same changes in Delta flows. Contra Costa Water District has found a correlation between fall salinity levels and subsequent year smelt populations. That salinity is a function of exports affecting sea water intrusion (or X2 location) and/or San Joaquin River salinities (a direct result of CVP and SWP deliveries to the San Joaquin valley). Hence export constraints other than entrainment may be necessary to protect the species and those operational changes are ignored by the DEIR.

With regard to entrainment, the DEIR incorrectly lists only numbers of fish found to have been entrained. The normal practice of DFG and FWS is to multiply that amount to estimate actual numbers of fish affected due to the inefficiency of the screens and the large numbers not "caught" by them. In addition, the smaller forms of the fish (larvae and juveniles) are not screened, but significant numbers are killed.

In addition to these comments, SDWA and CDWA incorporate by reference the comments submitted by the California Water Impact Network and CalSPA.

17-11

As set forth above, the DEIR seemingly avoids the "new" environmental analysis required by the litigation which overturned the first. Implementing Article 18(d) would result in a drastic change in exports levels resulting in much lower export deliveries. This alternative is apparently not even contemplated in the review, yet would certainly show a significant

17-12

difference between the project and no-project alternatives. Under such a scenario, not only would exports to many agricultural uses be greatly diminished, but M&I users like MWDSC would receive larger allotments during those times when ag allotments would be first cut back. Finally, the failure to analyze the eventual impacts of area of origin demands, Delta needs and fishery requirements results in a DEIR which ignores specific laws, regulations, and the underlying promises supporting the authorization of the SWP.

17-12 (con't.)

Please feel free to contact me if you have any questions.

Very truly yours

JOHN HERRICK

LETTER 18

TULARE LAKE BASIN WATER STORAGE DISTRICT

ESTABLISHED SEPTEMBER 1926

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PHONE (559) 992-4127 • FAX (559) 992-3891

January 7, 2008

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
901 P Street
Sacramento, CA 95814

Dear Ms. Brown:

The Tulare Lake Basin Water Storage District is one of the 29 public agencies that contract with the Department of Water Resources (DWR) for water supplies from the State Water Project (SWP) and whose customers pay for and benefit from the water supplies provided by the SWP.

DWR has prepared the Draft Environmental Impact Report on the Monterey Amendment to the State Water Project Contracts, including the Kern Water Bank Transfer, and Associated Actions as Part of a Settlement Agreement (Monterey Plus DEIR). The Monterey Plus DEIR re-evaluates the environmental effects of the Monterey Amendment, which has been in operation for over a decade.

The Monterey Amendment amended the 1960s-era SWP contracts between DWR and each of the 29 public agencies. The Monterey Amendment, implemented in 1996, updated a number of state water supply contract provisions to reflect the change in real-world conditions that had occurred and incorporated opportunities for modern, more progressive water management. The Monterey Amendment accomplished a number of significant things, including: 18-1

- **Settled dispute over allocations** – The amended water allocation provisions eliminated the agriculture-first shortage requirement for contract water supplies (i.e., Table A water) as well as the agricultural priority to surplus water, and instead require that all water be allocated in proportion to contractors' contract amounts. In exchange, the agricultural contractors agreed to permanently retire a portion of their contract amounts and permanently transfer an additional portion to urban contractors.

- **Increased rate stability and funding for local investment in water management programs** – The amended financial provisions use contractor money originally committed for additional SWP facilities to instead help contractors stabilize their water rates and increase their funding for local development of water conservation, water recycling, conjunctive use, and other water management programs.

The Monterey Plus DEIR includes an exhaustive analysis of the environmental effects of the Monterey Amendment and Settlement Agreement. Our District feels that the Monterey Plus DEIR, which was drafted with the advisory collaboration of DWR, the State Water Contractors, Planning and Conservation League, Citizens Planning Association of Santa Barbara, and Plumas County Flood Control and Water Conservation District, adequately describes the environmental effects of the Amendment. The analysis in the DEIR shows that: 18-1 (con't.)

- There have been no significant environmental impacts resulting from the Monterey Amendment from 1996 through the present.

- Environmental impacts from the Monterey Amendment in almost all resource categories are at less-than-significant levels. Those few areas where potentially significant impacts were identified are for a provision analyzed under a worst-case scenario that is unlikely to ever occur, or for certain future projects that would all be subject to additional, project-level CEQA review.

The District supported implementation of the Monterey Amendment in 1996 and supports its continued implementation. We commend DWR for having prepared this thorough and significant document.

Yours truly,

Brent L. Graham
General Manager

Copy to:
TLBWSD Board of Directors
Bcc:
State Water Contractors

lc

LETTER 19

Butte
Environmental
Council

CELEBRATING
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January 14, 2008

Ms. Delores Brown, Chief Office of Environmental Compliance
California Department of Water Resources
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delores@water.ca.gov

Re: Draft Environmental Impact Report Monterey Plus

Dear Ms. Brown:

The Butte Environmental Council is submitting the following comments and questions regarding the Draft Environmental Impact Report Monterey Plus (DEIR).

Page 2-16
Will you please elaborate on the implications and impacts that would follow implementing article 18(b), which would reduce Table A allocations and use article 21 water? 19-1

Chapter 4 - Project Description
The DEIR fails to state that a goal of the proposed Project is to increase export water through the Delta. This is misleading and does not provide the public with the opportunity to address this component nor does it identify, analyze or propose mitigation for impacts. 19-2

It is not acceptable to alter the definition of Section 18(a) on page 4-3 to read that, "…shortage provisions apply to conditions due to any cause whatsoever instead of only temporary causes." The alarming increase in DWR's discretion would place far too much authority into the agencies hands, therefore, the language should not be changed.

Chapter 7.2 Groundwater Hydrology and Quality
This chapter does not include any description of groundwater, groundwater management plans, or groundwater plans for conjunctive use in the Sacramento Valley. DWR needs to incorporate into a revised DEIR the analysis and planning efforts it has either directly created, indirectly funded/supported, or formed independently in the Sacramento Valley and recirculate the revised DEIR for public review and comment. This would at a minimum include: 19-3

· Sacramento Valley Integrated Regional Water Management Plan - http://www.norcalwater.org/int_program/irwmp.shtml
· Butte County Integrated Management Plan - http://www.buttecounty.net/waterandresource/int_water_res_plan.htm
· Sacramento Valley Water Management Agreement - http://www.norcalwater.org/pdf/sac_valley_water_mgmt_agrmt.pdf
· Sacramento Valley Regional Water Management Agreement - http://www.usbr.gov/mp/watershare/mgmt_plan/Regional_Plan.pdf

Will the SWP Agreements add to the impacts of the SVIRWMP, BCIMP, SVWMA, and the SVRWMA? These four documents have not been analyzed under CEQA or NEPA to date. In addition, theSVIRWMP, the BCIMP, and the SVRWMA are not even identified in Table 10.1.1. This must be corrected in the table and each plan must be presented in a thorough fashion in a revised DEIR. It must be clarified whether or not the Monterey Agreement will add to the impacts of the planning and implementation of these local and regional planning documents.

Regarding northern Sacramento Valley groundwater, there are significant impacts already occurring in the geographic area and yet there is little knowledge about the water budget for the region, natural recharge, interdependence between surface and groundwater, and hydrologic connectivity between down gradient and up gradient users. Despite these major factual gaps, the SVIRWMP emphatically states, "…groundwater levels associated with the Sacramento Valley have remained steady, declining moderately during extended droughts and generally recovering to their pre-drought levels during subsequent wetter periods." In reality, for example, the Butte Basin Groundwater Status report 2006 notes that groundwater levels in many of Butte County's groundwater dependant sub-areas have steadily declined since the late 1990's in spite of several years of "normal" precipitation. Water policy analysts must expand their frame of reference to include data pertaining to natural precipitation regimes that include periods of drought that persist 100-400 years.
http://www.yosemite.org/naturenotes/paleodrought2.htm
http://ceres.ca.gov/snep/pubs/web/v1/ch01/v1_ch01_02.html

19-3 (con't.)

In addition, the draft SVIRWMP concludes that, "…groundwater in both the Sacramento Valley and Redding Groundwater Basins is typically replenished through the deep percolation of precipitation and applied irrigation water." There have been no detailed examinations of recharge mechanisms in these basins. Theories regarding the Tuscan aquifer unit range from suggesting a narrow band of recharge along the base of the Sierra foothills (where the Tuscan interfaces the surface and includes creek interactions) to hard rock fissures connecting the aquifer to Plumas County hydrology. DWR staff (Dudley and McManus) have suggested for years that the confined nature of the Lower Tuscan eliminates irrigation percolation as a mechanism of recharge.

It is abundantly clear that not only is the DEIR insufficient at identifying, disclosing, and mitigating impacts, so is the SVIRWMP.

Chapter 8 Growth Inducing Impacts

This "administrative action" is the mechanism that will allow for an additional 400,000 - 561,000 residents and all of the associated direct and indirect impacts. While the DEIR lists categories of possible impacts, here again, there is no detailed disclosure of the impacts, analysis, or proposed mitigation. This task is left to others. This is not acceptable and must be presented in a revised DEIR. A revised DEIR must also disclose the status of the General Plans in any county that could be impacted by the SWP Amendments. Many, such as Butte County's are illegal (Attorney General Lockyer, August 2000), so to assume that local planning will successfully analyze the potential secondary impacts is a fairy tale. We encourage DWR to apply greater analysis to this significant omission in the DEIR.

19-4

Economic impacts to areas of origin, both positive and negative are ignored in the DEIR. This must be rectified.

19-5

Chapter 10 Cumulative Environmental Impacts

This chapter is supposed to analyze cumulative impacts. The document mentions the SVWMA because it is a related project, but does not really analyze how the SWP Amendments will intersect with and/or increase the impacts from it. As mentioned above, the SVIRWMP, BCIMP, and the SVRWMA are not even acknowledged as related projects. They, too, must be added to a revised DEIR with it clearly elucidated how the SWP Amendments intersect with and/or increase the impacts from them. The three planning documents all include

19-6

conjunctive management of the groundwater resources in northern California. The answers to the following questions must be incorporated in a revised DEIR, or if DWR declines to produce one, we request that you answer in the FEIR the following:

- How will the SWP benefit from integrating the groundwater of the Sacramento Valley into the state water supply?
- How will the "integration" occur, where will it occur, who will it benefit, and what funds will facilitate all of these activities?
- How will DWR analyze the impacts, at the local, regional, and statewide levels and propose mitigation?
- How will it be presented to the public?

19-6 (con't.)

Conclusions

DWR must form a new decision based on this new DEIR, and should not ignore alternative approaches merely because they do not mirror the shape and form of the original agreement that was reached in 1994. DWR must consider what has been mentioned above and the following:

- Circumstances have changed dramatically since 1994. Endangered species concerns have and will continue to dramatically alter the way the SWP is managed. DWR also acknowledges in the DEIR that climate change may reduce reliability of the SWP by 25% in dry years. These facts should cause DWR to pause before it considers adopting contract changes that will encourage even greater reliance on the Delta
- Rather than adopt the amendments as proposed, which will increase demands on the fragile Delta, DWR should fully analyze an alternative that maintains the urban drought safeguards, provides a reassessment of the capacity of the SWP, utilizes the Kern Water Bank for drought mitigation and environmental restoration, and establishes other incentives to reduce demands on the Delta.
- If DWR nevertheless decides to move forward with the SWP Amendments, the DEIR should condition implementation of the Amendments on a package of mitigation measures designed to redress the impacts anticipated to result from the Amendments.

19-7

We look forward to your responses to our comments and questions.

Regards,

B. Vlamis

Barbara Vlamis, Executive Director

4 Assessment of Water Management Strategies

A wide range of water management strategies has been considered for the Sacramento Valley IRWMP. These strategies, which are based on the 20 water management strategies identified by the Department, are presented in response to the objectives identified in Chapter 2 of this IRWMP. In turn, the strategies outlined below also account for "resource management strategies" used in the California Water Plan. As defined in the California Water Plan, a strategy is "a project, program, or policy that helps California's local agencies and governments manage their water and related resources."

Water leaders in the region have formulated the region's objectives and priorities through extensive discussions, negotiations, and agreements over more than a decade. Local governments and water purveyors have and continue to work closely with state and federal agencies, local water interests, and others to formulate projects and identify necessary future efforts to meet these objectives. The result of this work has been the development of projects recommended for implementation that are listed and summarized in Appendix A. These projects represent the current collection that is considered technically, economically, and environmentally feasible while ensuring each project is consistent with and supports the IRWMP objectives and priorities identified and agreed on for the region. As the participants in the IRWMP process continue to work together and gain additional participants, the package of projects and proposed actions will continue to grow in response to local and regional needs in accordance with the IRWMP objectives.

4.1 Water Management Strategies

The following summarizes the valley's current and future state with respect to 20 different water strategies, including those strategies that are currently considered to not be directly applicable to the region. The California Water Plan Update 2005 also identifies 25 resource management strategies, many of which are directly applicable. It is the intent and desire of the participants in this IRWMP that the ongoing planning process identified in this IRWMP continue to drive and develop regionwide policy. These policies, recommendations, and priorities are intended to inform the Department, and other water resource agencies such as Reclamation, of regional needs to support these agencies' planning (including Bulletin 160 updates), prioritization, and funding recommendations and support.

Some water management strategies, such as "groundwater management" and "conjunctive use" have been combined into one discussion because of their similarity with respect to this IRWMP. Others, such as "water supply reliability" are included in this IRWMP as an objective rather than a "strategy" because many of the strategies discussed below support improving water supply reliability. Lastly, some strategies, such as "water conservation" are incorporated into strategies relevant to existing efforts in the region. In this case, the term

"system improvement" is used to reinforce potential water district/company facility or operational improvements that could be implemented to improve overall water management flexibility.

In support of these strategies, a number of water management planning efforts are currently proposed or underway across the region that are designed to advance and enhance the management of the region's surface water and groundwater resources. These plans, investigations, or projects generally span numerous water management strategies and, in many cases, represent an initial stage of exploration and coordination. Appendix A lists such efforts proposed to date. Table 4-1 (at the end of this section) identifies which IRWMP objectives are met and which water management strategies are addressed for each effort/project.

4.1.1 Groundwater Management and Conjunctive Management Strategies

A central part of the IRWMP is to preserve the region's groundwater resources for the long-term viability of the region's economic prosperity and environmental well-being. Local public agencies have adopted groundwater management plans under the AB3030 process (Water Code Section 10750 et seq.) and other specific authorities. Additionally, counties across the region have adopted groundwater ordinances designed to protect the health and welfare of the citizens within these areas. As a result of legislation in 2002 (SB1938), these local public agencies are now undertaking more comprehensive efforts to manage groundwater, including the development of BMOs and more extensive monitoring. Many of the region's local entities have plans in place that are consistent with SB1938, and others are working toward compliance.

For the past 5 years, these various agencies, water districts, and local interests have been developing integrated regional water monitoring and management to evaluate and better understand the groundwater resources in the region and to promote active groundwater management. This integrated management, by coordinating the local public agencies' efforts to protect and manage the groundwater resources in the region, will provide stability that will be critical to meet the water supply needs for farms, cities, fish, and waterfowl.

Conjunctive water management and monitoring is an increasingly key water management strategy to assist in improving water supply reliability across the region. As discussed in Section 6, Land and Water Use/Development Trends, groundwater use is anticipated to continue to increase across the valley associated with urban development and conversion to orchard crops. Each of the following program areas is critical to better understanding the groundwater resources in the Sacramento Valley. Together, these various actions will help foster improved knowledge and significantly enhance the ability of all of the water managers to cooperatively manage the shared resources in a manner that is economically and environmentally sustainable. Most importantly, this approach is intended to avoid conflicts among Sacramento Valley groundwater pumpers and to ensure local guidance in (1) the further development of local groundwater management as well as (2) the appropriate local mechanisms to avoid adverse impacts to groundwater resources. Additionally, coordination

of local activities to address regional and statewide issues will remain vital. All actions and investigations will continue to need to be coordinated with local, state, and federal agencies to share information and ensure compliance with all applicable ordinances, BMOs, and laws.

4.1.1.1 Groundwater Monitoring

This IRWMP intends to build on the existing monitoring network in the valley to gain a better understanding of the groundwater resources. Groundwater monitoring is an integral part of this program for the region to ensure the proper management and protection of the resource. A list of proposed or ongoing groundwater management and monitoring programs is provided in Appendices A and B to this IRWMP. These programs and projects include groundwater monitoring well pilot programs and the installation of recommended monitoring wells.

Balanced development and operation of a conjunctive water management project requires well-designed and well-managed monitoring and data management. Objectives of monitoring and assessment include the following:

- Promote development and operation of facilities to avoid impacts.
- Enable adjustments in operation to avoid or mitigate impacts (adaptive management).
- Assess and evaluate performance of the conjunctive water management project.
- Encourage cooperation among valley entities by providing a common data pool for analysis and decisionmaking.
- Monitor and assess data collection, storage, and analysis capabilities. Data will originate both from monitoring facilities developed as part of the Sacramento Valley IRWMP implementation and from coordinating with ongoing Department and county efforts across the region.

The groundwater management and monitoring program under the Sacramento Valley IRWMP is a continued ambitious effort to improve local and regional water supply reliability in accordance with the objectives identified in Section 2, Sacramento Valley IRWMP Objectives. The proposed IRWMP Performance and Monitoring Plan is included as Appendix B.

4.1.1.2 Groundwater Recharge

The Sacramento Valley IRWMP recognizes that groundwater recharge is an important issue that merits additional investigation across the valley. Phase 1 recharge activities involve identifying natural recharge areas, identifying the most promising new recharge areas, and developing specific programs to protect existing recharge areas. Phase 2 of the recharge program will focus on measures to protect and enhance recharge capacity of the basin, including construction of recharge facilities. Among the investigations being proposed is the

joint Tehama and Butte County monitoring and recharge effort that will include assessment of potential recharge areas and characteristics, including with respect to the Lower Tuscan Formation. Groundwater recharge activities are being conducted in conjunction with activities being undertaken across the region and are discussed further in Section 6, Land and Water Use/Development Trends.

4.1.1.3 Groundwater Modeling

Hydrologic experts have developed numerous models in the Sacramento Valley. These models can assist in a better understanding of existing groundwater resource conditions and how these resources would be expected to respond to a variety of situations. The Department, working with the local interests, is undertaking a review of these models and others in the Sacramento Valley to determine how these models can best be used in the future to help decisionmakers make informed decisions to ensure the wise use and sustainability of this resource. This review summary will help inform future efforts toward the development and appropriate use of models throughout the region.

4.1.1.4 Groundwater Production

Thousands of production wells use groundwater throughout the Northern Sacramento Valley, including more than 335 wells in the Lower Tuscan.

As demands for Northern California water increase, additional production wells will be used to meet Northern California water demands and to help strategically protect the water rights and supplies in the region for all uses. With limited data in certain parts of the region, the groundwater use will be an important tool to better understand the aquifer characteristics. Numerous wells are currently or in the future will be used to ensure water supply reliability in Northern California and to explore the conjunctive management as part of broader water management objectives within the Sacramento Valley. This includes strategically placed production and monitoring wells to conduct aquifer performance tests.

4.1.1.5 Regional Coordination

To help advance these coordinated efforts for groundwater, a Coordinating Group has been meeting to better understand and manage the groundwater resources for the benefit of Northern California. The Coordinating Group is a forum convened by local governments, local water purveyors, groundwater users, conservation organizations, state and federal agencies, and other interested parties that overlie the groundwater resources in the Northern Sacramento Valley to coordinate their respective efforts to better understand and manage this important resource for the benefit of Northern California. Specific objectives of the Coordinating Group include the following:

- Inventory and maintain a working knowledge base on groundwater resources and identify critical information gaps.

- Formulate and conduct data gathering and investigations to build a credible body of knowledge about the groundwater resources.
- Prepare and distribute factual information to ensure that the public has an opportunity to become better informed about this important groundwater resource.
- Identify policy issues that need to be considered by or recommended to the respective entities in the region.

Additionally, the Coordinating Group will help facilitate and clarify the respective roles of the Department, special districts, and counties. This discussion may form the basis for an MOU or similar arrangement that will articulate the respective roles necessary for a cogent and coordinated integrated plan for groundwater management in Northern California.

4.1.2 System Improvement/Water Conservation Strategies

For this IRWMP, the system improvement strategy refers to potential projects or operational changes that will improve water management at the district or farm level, and actions that can be taken related to urban use. System improvement projects include canal lining, installation of facilities to reduce operational spills, or changes in management that can result in decreased river diversions or additional reuse of water.

The system improvement/water conservation strategies are designed to provide multiple benefits and serve multiple objectives. They provide for agricultural water recycling, water conservation, drainwater management, system automation, and associated water quality improvements. These types of projects help meet local and regional water supply needs, improve water quality, and enhance water system flexibility. Common elements among these strategies follow:

- They are locally formulated.
- They provide local/districtwide water supply reliability.
- They improve water system operation at the district level.
- They generally provide water quality benefits.
- They enhance district water system flexibility and system operations.

Numerous water use efficiency projects have been implemented recently, with additional projects seeking funding either underway or awaiting final approvals to proceed. A list of proposed projects formulated under system improvement strategies is provided in Appendix A.

In October 2002, NCWA, working with various agencies throughout Northern California, developed a regional agricultural water use efficiency program to encourage water use efficiency in the region and to help implement cost-effective local and regional programs to use water more efficiently. The regional program was based on meeting Quantifiable Objectives and/or Targeted Benefits established by CALFED and the Department. The

IRWMP provides an opportunity to further this regional water use efficiency program by a more detailed review of the potential opportunities and limitations for water use efficiency in the Sacramento Valley and then providing a framework for additional system improvements or other water use efficiency measures.

4.1.2.1 Urban Water Management

The Urban Water Management Planning Act of 1983 requires that every urban water supplier (public or private) who provides water for municipal purposes either directly or indirectly to more than 3,000 customers or supplies more than 3,000 ac-ft of water annually must prepare and submit to the Department an urban water management plan. The plan is to be updated at least every 5 years. Urban water management plans include the area served, quantity and sources of water, groundwater management plans, and future supply and demand projections. The Department reviews all submitted urban water management plans. All cities across the region have prepared these plans, and many urban purveyors have also completed and are implementing water master plans that guide their provision of water services.

4.1.2.2 Agricultural Drainwater Recycling and Management

Drainwater management, in the form of controlling releases of drainwater from fields, reusing drainwater for onfield irrigation, and monitoring inflows to and outflows from drains, is a common practice in much of the Sacramento Valley. On a subbasin or larger scale, the management actions of the farmers within the individual districts can result in major cumulative influences on regional hydrology. These influences could include changes in river diversions (reduced or increased diversions as drainwater supplies change relative to irrigation demand); changes in flow rates in many natural sloughs, streams, and drains; the creation of habitat along the watercourses; and water quality and temperature effects at points of discharge to receiving waters. In addition to these influences on regional hydrology and habitat, drainwater management provides critical, regional-scale benefits by increasing the overall subbasin efficiency through repeated use of field tailwater runoff.

All of these impacts and benefits result from the largely independent actions of many irrigators who respond daily to changes in their local water supply and demand conditions. With some level of regional coordination, drainwater management could be expanded in conjunction with actions to address the water quality of return flows and other regulatory issues. The most logical and effective geographic unit for regional drainwater management appears to be the hydrologic subbasin. The following are the key objectives and related benefits of a regional drainwater management program:

- Improved measurement of drainage flows.
- Improved water quality sampling and real-time monitoring.
- Coordinated management of drainwater flow rates.
- Increased water management flexibility and potential for benefits.

4.1.3 Flood Management, Stormwater Capture, and Management Strategies

Major flood and/or stormwater management activities are currently underway to improve flood protection in many critical areas across the region. Given recent disasters in other portions of the country, significant flood-related damage over the last decade throughout the region, and concerns related to climate change and the potential for greater flood risk, flood management is a priority issue for much of California. Managing flooding is vital for protecting private property and public facilities, and is often an element of surface water storage projects. An array of flood management actions/projects are being planned under the flood management strategies for the region. These include activities authorized by the Sacramento River Flood Control Project and the Sacramento River Bank Protection Project; various efforts conducted by YCWA and Sutter County on the Yuba and Feather Rivers; the YCFCWCD; the Colusa Basin Drainage District (CBDD); and the numerous local projects undertaken by reclamation districts and other local entities such as Hamilton City. A large component of the Yuba County IRWMP now underway is the evaluation of flood management strategies for the Yuba and Feather Rivers. A list of flood management efforts for the region is provided in Appendix A.

4.1.4 Water Quality Protection and Improvement/Non-point Source Control

Significant efforts are underway in the region to identify and address water quality issues. Agricultural water conservation, tailwater recovery, and reuse projects reduce return flows to streams and rivers and improve surface water quality. Additionally, groundwater monitoring and assessment strategies planned for the region include ensuring groundwater levels and quality are protected while agricultural tailwater recovery and water recycling, and water conservation strategies are implemented. The California Rice Commission and the Coalition are implementing a watershed approach to improve water quality in the region and to help implement the Water Board's Irrigated Lands Program. The coalitions continue to implement a monitoring and reporting program to improve water quality and address non-point source pollution control from irrigated lands and managed wetlands. The coalitions and the subwatersheds will also implement management practices to improve water quality in areas where water quality standards are exceeded. A summary of the Coalition's monitoring plan is included in the Performance and Monitoring Plan included as Appendix B to this IRWMP and can be viewed on the Internet (www.svwqc.org). The coalitions will also coordinate with municipal entities in the region regarding their stormwater and effluent programs.

4.1.5 Conservation Strategies for the Sacramento Valley

Conservation and enhancement of aquatic and terrestrial species and their habitats is a continued priority for the region. The overall proposed conservation strategy for the Sacramento Valley is presented in Section 5, Conservation Strategies, of this IRWMP. The following summarizes key subcomponents of the proposed strategy in the context of the three water management strategies related to species/habitat conservation. Ecosystem enhancement strategies are embedded in most strategies developed for the region as fully described in

Section 5, Conservation Strategies. These strategies include further advancing fisheries improvement programs and waterfowl and wildlife improvement programs, and developing ricelands habitat.

4.1.5.1 Environmental and Habitat Protection and Improvement

Environmental enhancement and habitat protection are fully integrated with most of the other water management strategies and projects for the region. As described in Section 5, Conservation Strategies, it is proposed that existing efforts and partnerships be continued and enhanced toward supporting additional ecosystem improvement and enhancement. Projects included as part of this IRWMP range from those that are anticipated to assist in improving water quality through re-managed flows to those that will help improve water quality through reduced river diversions. Those projects that are proposed to reduce diversions will also aid in meeting temperatures objectives for fish, as well as provide additional flexibility in meeting water quality objectives.

Installation of state-of-the-art fish screens at diversion points is a continuing priority along the Sacramento River and its tributaries to protect the fishery resources of the region while allowing water diversions for agricultural and urban uses. Numerous fish screens have been installed in the region, and additional fish screens are being planned and designed. A list of ongoing or recently completed major fish screen projects is provided in Appendix A to this IRWMP.

4.1.5.2 Wetlands Enhancement and Creation

The management and creation of wetlands is integrated with other water management strategies and is a component of various projects in the region. For example, levee setback projects and retention basins under flood control strategies are designed to create wetlands and habitat along the floodways. Providing conveyance capacity for wildlife refuges in the region ensures reliable water supplies for enhancement, creation, and preservation of the wetlands in the region. Section 5, Conservation Strategies, provides more detailed information about future wetlands enhancement actions.

4.1.6 Surface Storage

New surface water storage in the Sacramento Valley has been one of the most exhaustively considered regional water supply and management alternatives, primarily because of the significant potential benefits that new storage could offer. The CALFED Integrated Storage Investigation Program evaluated a wide range of surface water and groundwater storage locations throughout Central and Northern California, including in-Delta, south-of-Delta, and north-of-Delta locations. The two Integrated Storage Investigation projects that are most relevant to integrated planning in the Sacramento Valley are the Shasta Dam enlargement and the potential Sites Reservoir project.

When these two projects are considered as part of an integrated Sacramento River Basin water supply and management program, the following key questions need to be answered:

- Which projects are most likely to move forward, and what are the critical factors in determining their implementation?
- What is the framework, in terms of participating parties and institutional agreements, under which the projects will be financed, built, and operated?
- What will be the direct and secondary benefits and impacts on Sacramento River Basin water users?
- What are the costs of these benefits, and how do the unit benefit costs compare with other actions or alternatives?
- How do these projects tie in with or influence the effectiveness of other regional options under consideration?

These two surface storage projects represent major undertakings that will require additional detailed evaluation efforts, including regional water system (CVP and SWP) operations studies, site investigations, cost/benefit studies, environmental studies, and determination of an institutional framework to allow for implementation of these important and necessary projects.

In addition to the Integrated Storage Investigation projects, a local surface water storage project is being developed in Yuba County. The Garden Bar Water and Power Project is located on the Bear River immediately upstream of Camp Far West Reservoir about 8.5 miles east of Wheatland in Yuba County. The Garden Bar Reservoir will have a usable storage capacity of approximately 250,000 ac-ft and a surface area of 2,000 acres at elevation 612 feet above mean sea level (msl). The Garden Bar Project will increase existing water supply deliveries by approximately 50,000 ac-ft. The project will also satisfy the peak power demands of area and reserve capacity requirements with an installed power generation capacity of 210 megawatts. In addition, the project could also provide instream flow benefits below Camp Far West Reservoir, residual flood control benefits resulting from increased storage capacity, and potential groundwater recharge.

4.1.7 Water Recycling

As agricultural, urban, and environmental water demands increase and constraints on developing new water sources tighten, water recycling is increasingly becoming a viable source of new water for the region. Water reclamation and beneficial reuse is a relatively mature practice in Southern California and much of the arid west. Recycled water as a water management strategy offers a new, relatively “drought-proof” source of supply that improves both the total water supply and the overall reliability of the supply.

The benefits of water recycling have been evaluated extensively by the Department's Recycled Water Task Force. The task force report, *Water Recycling 2030: Recommendations of California's Recycled Water Task Force* (2003b) identified the potential for 1.5 million ac-ft per year (af/yr) of recycled water statewide. Limited recycling of domestic wastewater is currently practiced in the Sacramento Valley, but the potential exists for the development of up to 80,000 af/yr of recycled water from domestic wastewater effluent by the year 2020.

Water recycling strategies are generally implemented at the local level but can have regional and statewide benefit by reducing surface water diversions and making that water available for other urban, agricultural, and environmental uses. These actions in turn can have a direct benefit to overall Bay-Delta water quality. Water recycling allows a local agency to avoid or reduce the costs of developing, treating, storing, and distributing additional potable supplies. Recycling can also reduce pollutant loads in receiving waters, aid in meeting TMDL requirements, and reduce treatment costs and concerns for downstream water purveyors.

4.1.8 Land Use Planning

Land use planning is an important tool to influence land development to promote economic health while ensuring adequate and reliable water supplies. Section 6, Land and Water Use/Development Trends, summarizes current and future land and water use projections and primary planning issues at the county level. This section was developed in close coordination with each of the eight counties within the region and summarizes current and future land and water use trends, where known. Key issues and knowledge of a given county's resources varies greatly depending on evaluations done to date and funding available to conduct such investigations. More detailed information about these strategies and specific projects developed to address land use issues can also be found in the subregional county IRWMPs either currently being developed or recently completed.

4.1.9 Recreation and Public Access Strategies

Most major recreation facilities in the region are operated and managed by state and federal agencies, and are not under the jurisdiction of the participants in this planning process. Local agencies in the region, however, are working to improve recreational facilities and to provide better public access where possible. An example of this is YCWA's New Bullards Bar facility. Significant improvements to this facility were recently made by YCWA, with the potential for additional recreation and public access improvements addressed in the Yuba County IRWMP. Potential management changes that potentially impact recreational opportunities along the Sacramento River, its tributaries, or water storage facilities that provide substantial recreational opportunities (e.g., Shasta Reservoir) will need to be tracked and evaluated.

4.1.10 Watershed Planning

Numerous local watershed efforts have and continue to be implemented in concert with various state and federal agencies. Local planning efforts have tended to be associated with key Sacramento River tributaries, including efforts along Mill, Clear, Stony, Deer, Cottonwood, Butte, Battle, and other creeks throughout the region. These grassroots efforts will continue depending on leadership, availability of funding, and continued membership commitment. Additionally, entities such as the CBDD have developed integrated watershed management plans to evaluate a range of management actions and structural/nonstructural measures to improve watershed health, assist in flood control, and enhance the environment.

4.1.11 Water and Wastewater Treatment

Cities, towns, and small to large municipalities continue to make improvements to existing wastewater and water treatment plants in response to continued urban growth and/or aging infrastructure. Depending on the size and funding capability of a given municipality, facility improvements and/or expansions can be difficult to fund. Project proponents will continue to seek assistance from sources including the State Revolving Fund to obtain grants or loans in maintaining and improving facilities. Continued maintenance of existing facilities in response to growth will continue to be an important factor in ensuring regional water quality in the Sacramento River and its tributaries.

4.1.12 Water Transfers

Improved management of water supplies for use within the Sacramento Valley is necessary to ensure that water can be put to reasonable and beneficial use to the maximum degree practicable within the area of origin, while at the same time protecting water rights, the environment, and the citizens that reside within the watersheds of origin. Water transfers can provide improved reliability, local and regional operational flexibility, and environmental benefits depending on the timing and quantity of the transfer. Most water transfers in the Sacramento Valley are intra-basin water transfers or neighbor-to-neighbor transfers. These transfers help the region meet its needs, particularly during drought periods. For example, the transfer of water is common in dry years among many of the Sacramento River Settlement Contractors through the Sacramento River Water Contractors' Association Project Water Pool, which was formed and has been active since 1974.

Additionally, increased environmental awareness and the enactment of various statutes such as the Central Valley Project Improvement Act (CVPIA) have increased the transfer of water for environmental purposes. An important part of the conservation strategy identified in Chapter 5 is an environmental water program that includes water acquisitions to help meet environmental needs within the region.

Water transfers to assist in meeting the water needs in other parts of the state have occurred, and will continue in response to need and ensuring regional needs are met. Water right holders within the region may pursue changes in its water rights as part of a strategic decision

to protect water rights, help provide flood protection to citizens and property within the region, and help contain costs for local landowners and businesses.

4.1.13 Inapplicable Water Management Strategies

Because of its setting, some forms of water management that are appropriate in other areas of California are not applicable in the Sacramento Valley at this time. Current water rights and availability in the Sacramento Valley do not necessitate the need for imported water other than through relatively local water transfers within the region. Desalination is also not a relevant water management strategy given the valley's location and relative costs.

4.2 Integration of Water Management Strategies

The Sacramento Valley IRWMP presents a mix of water management strategies to address regional and statewide water issues. This approach emphasizes integration among projects presented under the IRWMP, integration in attainment of statewide and regional benefits, and integration of water management and land use planning. As presented above, a wide range of water management strategies and projects, from water supply reliability and quality improvements to ecosystem restoration and fishery protection, have been developed and evaluated for the Sacramento Valley IRWMP. These projects and strategies are designed to meet the objectives of improving regional economic health, water supply reliability and quality, ecosystem enhancement, and flood management across the region as identified in Section 2, Sacramento Valley IRWMP Objectives, of this IRWMP. In meeting these objectives, proposed projects and actions include continued investigations, coordination, and monitoring, all of which will be integrated to the extent appropriate for each project.

Integration within and across water management strategies will continue to be key to meeting the IRWMP objectives, as well as ensuring local support and project performance as the following examples illustrate:

- Integrated management of the region's surface water and groundwater resources could significantly improve water supply reliability for the region and California. Conjunctive management strategies that enhance water supply, together with use of surface water, recharge of groundwater basins, and monitoring and assessment of the resources, will assist in improving the region's water supply reliability while protecting the region's groundwater resources.

- Integration of groundwater monitoring and assessment strategies with conjunctive management strategies is key to ensuring stakeholder support and wise management of the resource.

- Integration of local water supply reliability strategies with water quality and water use efficiency strategies can improve water supply reliability while improving water quality. However, care must to be taken to ensure that those that rely on drainwater from upstream sources are not adversely affected.

- Conjunctive water management and system improvement projects can be implemented to integrate water supply reliability with water quality and ecosystem restoration improvement strategies by providing additional water supplies for local use while also providing water for instream flows, ecosystem enhancements, and refuge water supplies.

- Integration of flood management and environmental and habitat improvement strategies such as the levee setback and flood retention basins can integrate flood management with the development of wetlands and wildlife habitat areas in the region.

4.3 Meeting Statewide Priorities

Strategies developed for the Sacramento Valley IRWMP are designed to meet local and regional needs while also assisting in meeting statewide priorities stated in this IRWMP. As stated previously, the objectives identified in Section 2, Sacramento Valley IRWMP Objectives, of this IRWMP include seeking opportunities to meet statewide needs and priorities assuming local and regional needs can be met. Among the programs and associated projects included in this IRWMP that help meet statewide needs is the implementation of the SVWMA. Implementation of these projects will help improve water supply reliability, increase in-river flows, and improve CVP and SWP flexibility to support making more water available to the Delta in late spring through early fall. Additionally, the SVWMA calls for the development of a Long-Term Workplan to evaluate regionally beneficial projects that could potentially result in water being made available to the Delta, including use by export interests, assuming local and regional needs can be met first. Appendix A identifies how each of the proposed programs/projects meets regional and statewide objectives while addressing the water management strategies.

An important initial planning process originally conducted to identify projects that could improve water management across the valley culminated with the completion of the *Sacramento Valley Water Management Agreement Short-Term Workplan*, released in October 2001. This process included local and regional interests as well as federal and state agencies and statewide water interests. The workplan identified numerous projects, programs, and necessary investigations or planning processes across the valley, many of which had been discussed or formulated through other ongoing local efforts throughout the region. These following types of projects, in turn, became the basis of this IRWMP:

- Water management (facilities or programs to use and monitor surface water and groundwater)

- System improvement (canal lining, tailwater recovery, or improved operations)

- Surface water/groundwater planning (monitoring, areawide inventory, or assessment)

- Institutional (regulatory hurdles including transfer of water within the region)

Regional long-term priorities include actions that might take more than 5 years to implement. These programs are more regional in nature and include the following:

- Advancing the regionalization vision described earlier
- Expanding short-term programs throughout the region
- Securing new surface storage (including Sites Reservoir and the enlargement of Shasta Dam)
- Conducting regional monitoring and measurement

In general, implementing regional options will need to meet the needs of regional water users, while providing environmental benefits such as improved temperature and flow conditions for aquatic species, protection of riparian or wetlands habitats, or improving surface water quality. Assuming these needs can be met, projects and programs that simultaneously make water available to meet statewide needs must be encouraged given local and regional support. Implementation on a regional or subbasin level will entail continued coordination with all relevant stakeholders, including the formation of regional coalitions, either through existing forums or through project-specific agreements.

TABLE 4-1
Sacramento Valley IRWMP Objectives and Strategies/Projects

Project Title	Project Sponsor	Counties	Objectives					Related Water Management Strategies
			Improve the Economic Health of the Region	Improve Regional Water Supply for Local Water Users, the Region, and California	Improve Flood Protection and Floodplain Management	Improve and Enhance Water Quality	Enhance the Ecosystem	
Integrated Regional Planning								
Redding Basin Water Resources Management Plan	Shasta County Water Agency	Shasta	X	X		X	X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, System Improvement/Water Conservation, Water Transfers, Water Quality Protection and Improvement/NPS Control, Land Use Planning
Butte County IRWP, Model Calibration and Water Use Forecast	Butte County	Butte	X	X		X	X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment
YCWA IRWMP	YCWA	Yuba	X	X	X	X	X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, System Improvement/Water Conservation, Flood Management, Water Quality Protection and Improvement/NPS Control, Land Use Planning
YCFCWCD IRWMP	YCFCWCD	Yolo	X	X	X	X	X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, System Improvement/Water Conservation, Flood Management, Water Quality Protection and Improvement/NPS Control, Land Use Planning
Groundwater Management								
Groundwater Modeling Program	Butte County	Butte	X	X				Groundwater Management and Conjunctive Use, Groundwater Management and Assessment
Colusa County Groundwater Management Plan	Colusa County and water purveyors	Colusa	X	X				Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Water Quality Protection and Improvement/NPS Control
Project Planning								
Tehama-Colusa Canal Authority Canal Extension	TCCA	Tehama, Colusa, and Yolo	X	X		X	X	Groundwater Management and Conjunctive Use, System Improvement/Water Conservation, Water Transfers, Water Quality Protection and Improvement/NPS Control
Sacramento Valley Water Management Agreement Long-Term Workplan	NCWA/SVWMA Signatories	All	X	X	X	X	X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, System Improvement/Water Conservation, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control, Surface Storage
Stony Creek Conveyance Options/Constant-head Orifice Operations	TCCA	Tehama and Glenn	X	X			X	System Improvement/Water Conservation
Butte County Integrated Water Resources Program	Butte County	Butte	X	X	X	X	X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, System Improvement/Water Conservation, Water Transfers, Water Quality Protection and Improvement/NPS Control, Land Use Planning
Ricelands Habitat/Winter Flooding Program	Multi-district/landowner	Multi-county	X	X			X	Ecosystem Enhancement
Stony Creek/OUWUA Investigation	OUWUA	Glenn	X	X				Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, System Improvement/Water Conservation, Ecosystem Enhancement, Surface Storage
Groundwater Monitoring and Assessment Projects								
Lower Tuscan Monitoring, Recharge, and Data Management Element	Butte County	Butte and Tehama	X	X				Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Water Quality Protection and Improvement/NPS Control
ACID Water Management Program, Phases 1c and 1d	ACID	Shasta	X	X				Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Water Quality Protection and Improvement/NPS Control
Glenn County Groundwater Monitoring Program	Glenn County	Glenn	X	X				Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Water Quality Protection and Improvement/NPS Control

TABLE 4-1
Sacramento Valley IRWMP Objectives and Strategies/Projects

			Objectives					
Project Title	**Project Sponsor**	**Counties**	**Improve the Economic Health of the Region**	**Improve Regional Water Supply for Local Water Users, the Region, and California**	**Improve Flood Protection and Floodplain Management**	**Improve and Enhance Water Quality**	**Enhance the Ecosystem**	**Related Water Management Strategies**
Butte County Groundwater Monitoring Program	Butte County	Butte	X	X				Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Water Quality Protection and Improvement/NPS Control
Implementation of the Groundwater Subcommittee Groundwater Monitoring Well Pilot Program	Various districts	All	X	X				Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Water Quality Protection and Improvement/NPS Control
Colusa Groundwater Monitoring Program	Colusa County	Colusa	X	X				Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Water Quality Protection and Improvement/NPS Control
Installation of Groundwater Monitoring Wells Recommended by SVWMP Groundwater Subcommittee (Phase I)	Department and local entities	All	X	X				Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Water Quality Protection and Improvement/NPS Control
Joint Sutter Basin Groundwater Management Program	Sutter Mutual Water Company and RD 1500	Sutter	X	X				Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Water Quality Protection and Improvement/NPS Control
Basin Management Objective Information Center	Butte County	Butte	X	X				Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Water Quality Protection and Improvement/NPS Control
Cooperative Program for Groundwater Studies between the County of Glenn and the Colusa Basin Drainage District	Glenn County	Glenn and Colusa	X	X				Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Water Quality Protection and Improvement/NPS Control
Stony Creek Fan Partnership Conjunctive Management Program	Orland Artois, Orland Unit, and GCID	Glenn	X	X				Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Water Quality Protection and Improvement/NPS Control
Tehama County Groundwater Monitoring	Tehama County	Tehama	X	X				Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Water Quality Protection and Improvement/NPS Control
Groundwater Production Projects								
Lower Tuscan Water Supply Reliability Project	Butte County	Butte	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
Princeton-Codora-Glenn Irrigation District Water Management Project	Princeton-Codora-Glenn Irrigation District	Glenn	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
Provident Irrigation District Water Management Program	Provident Irrigation District	Glenn	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
GCID Water Management Program	GCID	Glenn	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
ACID Water Management Program Phase 2	ACID	Shasta	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
Collins/Bullards Bar Groundwater Substitution	Browns Valley Irrigation District	Yuba	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
Browns Valley Irrigation District Water Management Project	Browns Valley Irrigation District	Yuba	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control

TABLE 4-1
Sacramento Valley IRWMP Objectives and Strategies/Projects

			Objectives					
Project Title	**Project Sponsor**	**Counties**	**Improve the Economic Health of the Region**	**Improve Regional Water Supply for Local Water Users, the Region, and California**	**Improve Flood Protection and Floodplain Management**	**Improve and Enhance Water Quality**	**Enhance the Ecosystem**	**Related Water Management Strategies**
Maxwell Irrigation District Water Management Project	Maxwell Irrigation District	Colusa	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
RD 108 Water Management Project	RD 108	Colusa, Yolo	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
South Sutter Water District Conjunctive Water Management Program	South Sutter Water District	Sutter	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
Natomas Water Management Project, Phase 1	Natomas Central Mutual Water Company	Sutter, Sacramento	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
River Garden Farms Water Management Project	River Garden Farms	Yolo	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
Garden Highway Mutual Water Company Water Management Program	Garden Highway Mutual Water Company	Sutter	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
RD 1004 Water Management Project	RD 1004	Colusa	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
Meridian Farms Water Management Project	Meridian Farms	Sutter	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
Pelger Mutual Water Company Water Management Project	Pelger Mutual Water Company	Sutter	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
Pleasant Grove-Verona Mutual Water Company Water Management Project	Pleasant Grove-Verona Mutual Water Company	Sutter	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
Feather Water District Water Management Project	Feather Water District	Sutter	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
Plumas Mutual Water Company Water Management Project	Plumas Mutual Water Company	Sutter	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
Sutter Extension Water District Water Management Project	Sutter Extension Water District	Sutter	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
Water Management Project	Lewis Ranch	Colusa	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
Groundwater Recharge Projects								
Butte Water District Conjunctive Water Management Program	Butte Water District	Butte	X	X			X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
Yuba County Second Point of Diversion	YCWA	Yuba	X	X		X	X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
Wheatland Canal In-lieu Recharge Project	YCWA	Yuba	X	X		X	X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control

TABLE 4-1
Sacramento Valley IRWMP Objectives and Strategies/Projects

Project Title	Project Sponsor	Counties	Objectives					Related Water Management Strategies
			Improve the Economic Health of the Region	Improve Regional Water Supply for Local Water Users, the Region, and California	Improve Flood Protection and Floodplain Management	Improve and Enhance Water Quality	Enhance the Ecosystem	
Sacramento Valley Water Quality Coalition (Water Quality Projects)								
Butte-Sutter-Yuba		Six locations				X	X	Ecosystem Enhancement, Water Quality Protection and Improvement/ NPS Control
Colusa Basin		Six locations				X	X	Ecosystem Enhancement, Water Quality Protection and Improvement/ NPS Control
El Dorado		Two locations				X	X	Ecosystem Enhancement, Water Quality Protection and Improvement/ NPS Control
Lake-Napa		Three locations				X	X	Ecosystem Enhancement, Water Quality Protection and Improvement/ NPS Control
Pit River		Three locations				X	X	Ecosystem Enhancement, Water Quality Protection and Improvement/ NPS Control
Placer-Nevada-South Sutter/ North Sacramento		One location				X	X	Ecosystem Enhancement, Water Quality Protection and Improvement/ NPS Control
Sacramento-Amador		Two locations				X	X	Ecosystem Enhancement, Water Quality Protection and Improvement/ NPS Control
Shasta-Tehama		Two locations				X	X	Ecosystem Enhancement, Water Quality Protection and Improvement/ NPS Control
Solano-Yolo		Four locations				X	X	Ecosystem Enhancement, Water Quality Protection and Improvement/ NPS Control
Upper Feather River		Three locations				X	X	Ecosystem Enhancement, Water Quality Protection and Improvement/ NPS Control
Agricultural Tailwater Recovery								
Maxwell Irrigation District Integrated System Improvement Project	Maxwell Irrigation District	Colusa		X		X		System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
Butte Water District Main Canal Automation Project	Butte Water District	Butte	X	X		X	X	System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
Colusa Basin Drain Study	NCWA	Colusa County and Lower Sacramento River	X	X				Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Water Quality Protection and Improvement/NPS Control
Wastewater Treatment and Reuse								
Various projects listed in Table A-4	Multiple agencies	Sutter and Yuba	X	X		X	X	Ecosystem Enhancement, Water Quality Protection and Improvement/ NPS Control
Agricultural Water Conservation								
Browns Valley Irrigation District Dry Creek Pump Station	Browns Valley Irrigation District	Yuba	X	X		X	X	System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
Paradise Ridge Water Supply Reliability Project	Butte County	Butte	X	X		X	X	System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
RD 1004 Canal Lining Project	RD 1004	Colusa	X	X		X	X	System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
Lewis Ranch Canal Replacement Project	Lewis Ranch	Colusa	X	X		X	X	System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
Sutter Mutual Water Company Irrigation Recycling Project	Sutter Mutual Water Company and RD 1500	Sutter	X	X		X	X	System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
Sutter Mutual Water Company Canal Lining	Sutter Mutual Water Company	Sutter	X	X		X	X	System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
ACID Churn Creek Bottom Improvements, Phase 1b	ACID	Shasta	X	X		X	X	System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement

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Project Title	Project Sponsor	Counties	Objectives					Related Water Management Strategies
			Improve the Economic Health of the Region	Improve Regional Water Supply for Local Water Users, the Region, and California	Improve Flood Protection and Floodplain Management	Improve and Enhance Water Quality	Enhance the Ecosystem	
Deer Creek Irrigation District Long-term System Improvements Feasibility Investigation	Deer Creek Irrigation District	Tehama	X	X			X	System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
Deer Creek Irrigation District Near-term System Improvements Project	Deer Creek Irrigation District	Tehama	X	X			X	System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
Heritage Center Water-Wise Irrigation Demonstration Site Project	Placer County Water Agency	Placer	X	X			X	System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
South Feather Water and Power Canal Seepage Reduction Program	South Feather Water and Power	Butte	X	X		X		System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control
Automation and Measurement Projects								
ACID Main Canal Modernization Project	ACID	Shasta	X	X		X	X	System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
GCID Flow Measurement Devices in Main Canal, Lateral System, and Drain Outflow Points/Automation Program	GCID	Glenn and Colusa	X	X		X	X	System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
Sacramento River Basinwide Water Management Plan Cooperative Water Measurement Study	Sacramento River Settlement Contractors/ Reclamation	Regional	X	X				System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control
Sacramento River Basinwide Water Management Plan Subbasin-level Water Management Study	Sacramento River Settlement Contractors	Regional	X	X			X	System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
Proposal for Utilizing GIS-Based Pesticide Permitting Application to Facilitate Advancing Water Management	Glenn County	Glenn	X	X		X		System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control
Regional Water Measurement Program for the Feather River Service Area	BWGWD		X	X		X	X	System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
Replacement and Automation of Elevation Control Structure 875	Western Canal Water District	Butte	X	X		X		System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control
Yuba City Water Meter Retrofit Project	Yuba City	Sutter	X					System Improvement/Water Conservation
Tehama-Colusa Canal Automation Upgrade	TCCA	Tehama	X	X		X	X	System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
Yolo/Colusa Flow Lab.	YCFCWCD	Yolo	X	X		X		System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control
Maxwell Irrigation District Integrated System Improvement Project	Maxwell Irrigation District	Colusa		X		X		System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
Main Canal Automation	Butte and Sutter Extension Water Districts	Feather	X	X		X	X	System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
Water Recycling								
Regional Reclaimed Water Facilities Feasibility Study	Yuba City/Marysville/Linda County Water District	Yuba	X	X		X	X	Water Recycling, Water or Wastewater Treatment, Ecosystem Enhancement
Reclaimed Water Facility Upgrade, Marysville	City of Marysville	Sutter	X	X		X	X	Water Recycling, Water or Wastewater Treatment, Ecosystem Enhancement

TABLE 4-1
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Project Title	Project Sponsor	Counties	Objectives					Related Water Management Strategies
			Improve the Economic Health of the Region	Improve Regional Water Supply for Local Water Users, the Region, and California	Improve Flood Protection and Floodplain Management	Improve and Enhance Water Quality	Enhance the Ecosystem	
Reclaimed Water Facility Upgrade, Linda County Water District	Linda County Water District	Yuba	X	X		X	X	Water Recycling, Water or Wastewater Treatment, Ecosystem Enhancement
Reclaimed Water Facility Upgrade, Yuba City	Yuba City	Yuba	X	X		X	X	Water Recycling, Water or Wastewater Treatment, Ecosystem Enhancement
Reclaimed Water Distribution System, Marysville	City of Marysville	Sutter	X	X		X	X	Water Recycling, Water or Wastewater Treatment, Ecosystem Enhancement
Reclaimed Water Distribution System, Linda County Water District	Linda County Water District	Yuba	X	X		X	X	Water Recycling, Water or Wastewater Treatment, Ecosystem Enhancement
Reclaimed Water Distribution System, Yuba City	Yuba City	Yuba	X	X		X	X	Water Recycling, Water or Wastewater Treatment, Ecosystem Enhancement
Yuba City Water Conservation Program	Yuba City	Sutter	X	X		X		System Improvement/Water Conservation, Water Quality Protection and Improvement/NPS Control, Ecosystem Enhancement
Agricultural Reclaimed Water Distribution System, Yuba City	Yuba City	Sutter	X	X		X	X	Water Recycling, Water or Wastewater Treatment, Ecosystem Enhancement
Joint Reclaimed Water Conveyance Project, Yuba City and Linda County Water District	Yuba City/Linda County Water District	Sutter	X	X		X	X	Water Recycling, Water or Wastewater Treatment, Ecosystem Enhancement
Ecosystem Restoration (Fish Screen and Fish Passage Projects)								
Red Bluff Diversion Dam	TCCA	Tehama					X	Ecosystem Enhancement
Meridian Farms Fish Screen	Meridian Farms Water Company	Sutter					X	Ecosystem Enhancement
Natomas Fish Screen	Natomas Central Mutual Water Company	Sutter/Sacramento					X	Ecosystem Enhancement
Pleasant Grove-Verona Fish Screen	Pleasant Grove-Verona Mutual Water Company	Sutter					X	Ecosystem Enhancement
Fish Screen	RD 2035	Yolo					X	Ecosystem Enhancement
Fish Screen	Bella Vista Water District	Shasta					X	Ecosystem Enhancement
Fish Screen	Small Diversion Fish Screen Program	Multiple					X	Ecosystem Enhancement
Yuba South Canal Fish Screen	YCWA	Yuba					X	Ecosystem Enhancement
Feather Water District Fish Screen	Feather Water District	Sutter					X	Ecosystem Enhancement
Yuba City Water Supply Phase 1 Fish Screen Project	Yuba City	Sutter					X	Ecosystem Enhancement
Fish Screen	South Sutter Water District	Sutter					X	Ecosystem Enhancement
Fish Screen	White Mallard	Colusa					X	Ecosystem Enhancement
Wildlife Habitat Improvement								
Implementation of the Lower Yuba Accord	YCWA	Yuba						
Yuba River Habitat and Restoration Conservation Project	Yuba County Resource Conservation District	Yuba						
Flood Management Projects								
Bear-Feather Levee Setback	Three Rivers Levee Improvement Authority	Yuba	X	X	X			Flood Management
Yuba-Bear Levee Improvement	Three Rivers Levee Improvement Authority	Yuba	X	X	X			Flood Management

TABLE 4-1
Sacramento Valley IRWMP Objectives and Strategies/Projects

Project Title	Project Sponsor	Counties	Objectives					Related Water Management Strategies
			Improve the Economic Health of the Region	Improve Regional Water Supply for Local Water Users, the Region, and California	Improve Flood Protection and Floodplain Management	Improve and Enhance Water Quality	Enhance the Ecosystem	
Forecast-Coordinated Operations	YCWA	Yuba	X	X	X			Flood Management, Surface Storage
Colgate Powerhouse Tailwater Depression	YCWA	Yuba	X	X	X			Flood Management, Surface Storage
Yuba City Flood Control Projects	Yuba City	Sutter	X	X	X			Flood Management
New Bullards Bar Reservoir Outlet Capacity Increase	YCWA	Yuba	X	X	X			Flood Management, Surface Storage
Wheatland Flood Protection Improvement	City of Wheatland	Yuba	X	X	X			Flood Management
Stormwater Management Projects								
Yuba City Stormwater Quality Improvement Project	Yuba City	Sutter				X	X	Flood Management, Ecosystem Enhancement, Water Quality Improvement
Design of Recharge/Detention Basins	Colusa Basin Drainage District	Glenn	X	X	X		X	Flood Management, Ecosystem Enhancement
Surface Water Supply Reliability Projects								
Shasta Reservoir Enlargement Study		Shasta	X	X	X			Water Supply Reliability, Flood Protection
Sites Reservoir Study		Colusa	X	X	X			Water Supply Reliability, Flood Protection
Magalia Dam	Paradise Irrigation District	Butte	X	X	X			Water Supply Reliability, Flood Protection
Garden Bar Water and Power Project	South Sutter Water District	Nevada, Placer, Yuba, and Sutter	X	X	X			Water Supply Reliability, Flood Protection
Surface Water Delivery Systems								
Wheatland Canal In-lieu Recharge Project	YCWA	Yuba	X	X		X	X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control
Yuba County Second Point of Diversion	YCWA	Yuba	X	X		X	X	Groundwater Management and Conjunctive Use, Groundwater Management and Assessment, Groundwater Recharge, Ecosystem Enhancement, Water Quality Protection and Improvement/NPS Control

Notes:
OUWUA = Orland Unit Water User's Association
NPS = non-point source

6.2 Tehama County

The following summarizes the local setting, current and future land and water use, and primary recommendations in the Tehama County area. Tehama County officials were interviewed and consulted as a part of the development of this IRWMP and identified the following key and/or highest priority water- and land use related issues (Ohlin, 2006):

- Potential groundwater impacts from urban development and protection of county groundwater resources.
- Lack of baseline groundwater information and the need for more monitoring (especially in the Redding Basin area of Tehama County).
- Potential development of the Lower Tuscan and Tehama Formations, and funding needed for further study and peer review of existing hydrogeologic data.
- Continued protection of water quality.
- Groundwater quality protection in the City of Corning.

6.2.1 Local Setting

Tehama County is located in the northern portion of the Sacramento Valley approximately midway between Sacramento and the Oregon border. The Sacramento River bisects the county. The western boundary is the Cascades Mountains, and the eastern boundary is the Sierra Nevada Mountain Range. The county consists of approximately 3,000 square miles and three incorporated cities: Red Bluff, Corning, and Tehama. The climate is typical of that found in the Central Valley, with summers being very warm and dry with mild, wet winters. The economy is based primarily on agriculture, including ranching, farming, and some timber production.

Tehama County is made up almost entirely of watersheds that feed the Sacramento River, and lies within the Sacramento Valley Hydrologic Region. Hydrologic regions are defined as “major drainage basins” by the California Water Plan. However, the western edge of the county contributes a small amount of drainage to the North Coast Region.

Agriculture and irrigated lands are the dominant land use in Tehama County along the Sacramento River. The RBDD, constructed in 1964, is on the Sacramento River just downstream from the City of Red Bluff. From this diversion, the TCCA conveys CVP water to 17 districts, which serve approximately 300,000 acres of farmland in Tehama, Glenn, Colusa, and Yolo Counties (TCCA, 2003). In Tehama County, approximately 6,000 acres are irrigated with CVP water from the Tehama-Colusa and Corning Canals.

Significant groundwater resources lie beneath Tehama County. Ninety-eight percent of public drinking water comes from groundwater sources. The northernmost portion of Tehama County overlies the southernmost part of the Redding Groundwater Basin. The southern

boundary of the Redding Basin is the Red Bluff arch in Tehama County. The Red Bluff arch is an east-northeastern trending combination of folds and a fault, which forms the northernmost barrier to groundwater flow in the Sacramento Valley Groundwater Basin. Because of this, the groundwater issues in the Redding Basin are different from the issues in the Sacramento Valley Groundwater Basin. Most of the remainder of the county overlies the Sacramento Valley Groundwater Basin, which extends several counties to the south along the Sacramento River.

Numerous water agencies and districts oversee the provision and development of water supplies in Tehama County. These include the following agricultural water purveyors, urban water purveyors, agencies with flood management responsibilities, and agencies with land use management responsibilities:

- **Agricultural Water Purveyors**
  - Proberta Water District
  - El Camino Irrigation District
  - Thomas Creek Water District
  - Corning Water District
  - Stanford Vina Ranch Irrigation Company
  - Deer Creek Irrigation District
  - Los Molinos Mutual Water Company
  - Anderson-Cottonwood Irrigation District
  - Thomas Creek Water Users Association
- **Urban Water Purveyors**
  - City of Red Bluff
  - City of Tehama
  - Gerber-Las Flores Community Services District
  - City of Corning
  - Rio Alto Water District
  - Mineral County Water District
  - Golden Meadows Estates Community Services District
  - Los Molinos Community Services District
- **Flood Management Agencies**
  - Tehama County Flood Control and Water Conservation District (FCWCD)
  - Tehama County Building and Safety Department
  - U.S. Army Corps of Engineers
  - California Department of Water Resources

- **Land Use and Resource Agencies**
  - Tehama County
  - Tehama County Resource Conservation District
  - Vina Resource Conservation District

6.2.2 Land Use Patterns

The majority of land use in the county is nonirrigated agriculture (ranch and grazing land), or other (timber or barren lands). Urban development is relatively limited, existing primarily in the Red Bluff and Corning areas and other small communities close to the Sacramento River corridor. Figure 6.2-1 demonstrates the relative gross values for the leading agricultural commodities in Tehama County.

Along the Sacramento River, agriculture and irrigated lands are the dominant land uses. Recent agricultural trends in Tehama County indicate an acreage increase in production of tree crops (almonds and walnuts) and a decrease in livestock. Between 2001 and 2004, cattle within the county have decreased from 79,000 to 66,000 (United States Department of Agriculture National Agricultural Statistics Service, 2006). Between 1998 and 2003, almond acreage increased by approximately 1,500 acres for a total of 7,426 acres, and an additional 2,300 acres of walnuts were planted in 2005, for a total of 15,587 acres. The trend towards increased acreage in tree crops results in additional groundwater demand.

Future urban growth is anticipated to be centered along the Interstate 5 corridor, which runs north-south through the center of the county. Tehama County urban land use grew by 1,733 acres between 1990 and 2002, from 9,811 to 11,544 acres. Large-scale housing developments (3,700 units, 3,950 units, and 1,200 units) are currently proposed in north-central Tehama County (northern end of the Sacramento Valley Groundwater Basin and in the Tehama County portion of the Redding Groundwater Basin). Urban growth is also expected surrounding existing urban centers of Red Bluff and Corning, including the South Avenue and Corning Road interchanges with Interstate 5.

6.2.3 Water Use and Water Supply Patterns

In the early 1900s, Tehama County relied on surface water for most of its water demand. The CVP and completion of Shasta Dam and the Corning Canal allowed for surface water to be delivered to the west side of the Sacramento River in the county.

By the 1970s, two-thirds of irrigation water used in the county was derived from surface water supplies. Figure 6.2-2 shows the change in surface water and groundwater use over the years. However, since that time, CVP water has become more expensive, and demand has exceeded supply in some years. Other factors such as increased environmental water demands, water supply reliability, and changing land use patterns have also contributed to an increased reliance on groundwater. Many agricultural users are investing in micro-emitters or

similar high-efficiency watering systems that require a higher standard of water purity and more on-demand availability than surface water can supply. Small orifices become plugged with tiny debris that is inherently found in diverted river water, and the water needs to be delivered in an on-demand basis rather than by a weekly schedule.

By the 1990s, Tehama County was relying on groundwater for more than two-thirds of its irrigated land (Tehama County FCWCD, 1996). It is important to note, however, that local stream diversions are the second largest water source in the county, and the largest surface water supply (28 percent). Local stream diversions total 106,300 ac-ft in a normal year, and CVP surface water only accounts for 21,300 ac-ft (see Table 5-2 in the *Tehama County FCWCD Water Inventory and Analysis* [Department, 2003d]).

Nearly all of the municipal and industrial (M&I) suppliers depend solely on groundwater to deliver municipal water to their customers. There are approximately 10,000 groundwater wells in Tehama County, and groundwater pumping and recharge are very high-priority issues for the county (CDM et al., 2005). Concerns about potential development in recharge areas have been raised in recent years, and the further study of recharge areas is needed. A Proposition 50 grant funding proposal has been submitted for the Lower Tuscan Recharge Investigation Program. Preliminary mapping of recharge areas can be found in the *Northern Sacramento Valley (Four County) Drinking Water Quality Strategy Document* (Four-County Document; CDM, 2005).

Tehama County has an AB3030 groundwater management plan and is SB1938 compliant. The Tehama County Board of Supervisors passed a groundwater aquifer protection ordinance in 1994 (Ordinance 1617). The Tehama County FCWCD is working with the Department and local purveyors to implement an effective groundwater management plan. Figure 6.2-3 shows the distribution of groundwater wells in Tehama County.

The majority of Tehama County's groundwater resources come from the Sacramento Valley Region (Tehama County FCWCD, 2003); however, large-scale developments in the Bowman area will induce land use and water use changes in this formerly rural setting. Tehama County FCWCD is taking a proactive approach to monitoring groundwater impacts from large-scale development by requiring developers to install additional onsite monitoring wells.

The *Tehama County FCWCD Water Inventory and Analysis* indicates that overall total groundwater in storage in the county was in a declining trend from 1998 to 2002 during years of normal to above normal precipitation. The Department is presently analyzing the total water in storage for spring 2006.

6.2.4 Existing and Ongoing Planning

In the past decade, the Tehama County water purveyors have taken several steps toward preparing for future land use changes and their associated water demands. Table 6.2-1 summarizes recent planning documents. The Tehama County FCWCD has completed a

comprehensive study that examined water inventories and issues in the county. Included in the 2003 *Tehama County FCWCD Water Inventory and Analysis* are water management recommendations and water supply and demand scenarios for 75 and 100 percent dry-year cutbacks in CVP water in the county.

TABLE 6.2-1
Existing and Relevant Tehama County Water Resource Planning Documents

Planning Document	Description	Date Published
Tehama County FCWCD Water Inventory and Analysis	Contains detailed water use analysis, groundwater analysis, and water management issue descriptions for Tehama County.	September 2003
Tehama County Small Water Systems Drought Vulnerability Study	Small water systems (small water users/groups not associated with larger municipal systems) inventory and drought analysis. GIS-based study provides tool for future management.	2005
Tehama, Butte, Glenn, and Colusa Four-Counties MOU	Agreement among common governing entities to participate in groundwater planning efforts.	March 2006
Tehama County Groundwater Management Plan	AB3030 Groundwater Management Plan.	1998
Sacramento River Basinwide Water Management Plan	Contains current and future water requirements for all Sacramento River diverters (includes portions of Tehama County).	October 2004
Northern Sacramento Valley (Four County) Drinking Water Quality Strategy Document	The Four-County effort is intended to develop and promote regional collaboration among Butte, Colusa, Glenn, and Tehama Counties to effectively coordinate drinking water resources and contribute to local, regional, and statewide water quality goals.	June 2005
Tehama County General Plan	General Plan.	Updating 2006
City of Corning Water Production Master Plan	Water plan to the year 2025.	
Ordinance 1617 “Aquifer Protection”	Prohibits the mining of groundwater, and requires a permit to move groundwater from one parcel to a noncontiguous parcel of ownership.	1994
Developing Groundwater Trigger Levels	Developing groundwater trigger levels to provide public awareness of groundwater levels in each of the 10 groundwater subbasins.	In progress
City of Red Bluff General Plan	Surface and groundwater resources section (2000-2020).	October 2000

Tehama County FCWCD is taking a proactive approach to groundwater monitoring in Tehama County. To date, the district has installed three 1,000-foot-deep multi-completion groundwater monitoring wells in three known areas of groundwater depression. The Service has donated several existing agricultural wells to be retrofitted into monitoring wells. The district has secured funding to instrument several existing Department multiple-completion

monitoring wells with pressure transducers and dataloggers to provide real-time water level data. Grant funds will be used to install additional monitoring wells in areas slated for large-scale residential developments. Hourly groundwater level data, including hydrographs, are available at the district's Web site (http://www.tehamacountywater.ca.gov). Furthermore, the Tehama County FCWCD is requiring these large-scale developers to include groundwater monitoring infrastructure in their construction plans. This includes installation of pressure transducers and dataloggers in the monitoring wells and collecting both baseline groundwater level data before construction begins and real-time groundwater level data after construction is completed to allow for evaluation of drawdown impacts due to groundwater production. Groundwater modeling is also required to help fulfill SB221 and SB210 and to track predicted effects compared to real-time demand of the project.

In 2005, the county completed a small water systems drought vulnerability study to determine which parts of the county are more susceptible to water shortage impacts. The study indicated that only six small water systems in the county are likely to be at risk in the event of drought. The Geographic Information System (GIS)-based study is now being used as a tool to help the county as it moves forward with water resources management planning.

In early 2006, the Counties of Tehama, Butte, Glenn, and Colusa signed an MOU that is commonly referred to as the "Four-County Agreement." This MOU is a voluntary agreement among these counties that share common groundwater resources to coordinate and cooperate with each other relating to water issues. The Four-County Document (2005) is an excellent example of water planning integration in the region. The Four-County Agreement highlights the primary water sources that link the four counties, including the Sacramento River that flows through each county, shallow alluvial aquifers, and the deeper Lower Tuscan Aquifer that underlies a portion of each county. Operational links include such common factors as groundwater quality and level monitoring programs, water resource studies, data and information management, county ordinance oversight, public education, and stakeholder interaction.

6.2.5 Plan Areas

The *Tehama County FCWCD Water Inventory and Analysis* divided the county into 14 discrete inventory units for analysis (see Figure 6.2-4).

The Mountain Region West and Mountain Region East areas account for approximately two-thirds of the county acreage. The middle third of the county represents lands overlying groundwater basins and is divided into regions along groundwater basin boundaries. Many of the inventory units have been further divided into inventory subunits that are based primarily on political boundaries, of which many represent irrigation or water districts. A complete description of each inventory area and subarea can be found in the *Tehama County FCWCD Water Inventory and Analysis.*

6.2.5.1 Land Use Conditions

Existing Land Use Condition (2006)

Existing land use for each subunit was mapped and inventoried for the *Tehama County FCWCD Water Inventory and Analysis.* Detailed land use information for each subregion has been categorized and documented. Tehama County land use was mapped for the IRWMP using FMMP data. Land use categories were combined to reflect regional water use and urbanization patterns in the county. Tehama County land use is summarized in Table 6.2-2.

TABLE 6.2-2
Existing Tehama County Land Use

Land Use Category	Acreage	% Change in 10 years[a]
Important Farmland[b]	245,445	3
Grazing Lands	705,674	-1
Urban	11,544	13
Other	870,610	0
Water	6,221	0

[a]Percent change over period 1992 to 2002
[b]Sum of Unique, Prime, Statewide, and Locally Important Farmland
Source: California Department of Conservation, 2002a

Future Land Use Condition

Future land use will occur in accordance with county and local plans. Interviews with local officials indicate that the majority of urban development will most likely occur in the far northern and southern portions of Tehama County along the Interstate 5 corridor. The areas that will see significant development will be the Bowman area in the far north near the community of Cottonwood, both east and west of Interstate 5, and the Corning area in the southern part of the county. The northern part of the county could see 9,000 additional homes or more in the next 10 years (Impact Sciences, Inc., 2006). The City of Corning expects to add approximately 1,700 new homes (about 60 percent population growth) by the year 2025 (Kimbrough, 2006). Corning City officials state that groundwater quality protection is the highest water management priority for the city. The City of Corning has an adequate supply according to the Corning Water Production Master Plan (Kimbrough, 2006). Corning does not allow new septic systems or private groundwater wells within the city, to protect groundwater quality.

6.2.5.2 Water Use Conditions

Existing Water Use Condition (2006)

In Tehama County, 98 percent of public drinking water comes from groundwater sources. (CDM, 2005). The *Tehama County FCWCD Water Inventory and Analysis* evaluated a dry-year scenario to see the affect on water supply sources and demands. Relative to an average

water year, water demand in a dry year from all sectors increases by 63,800 ac-ft (17 percent). Agricultural water demand and M&I demands typically increase during a dry year because of higher demand for irrigation of crops and landscape during summer months. Environmental water demand doubles in the areas near Mill and Deer Creeks, mainly because these areas participate in dry-year programs to benefit the environment. Conveyance losses decrease during a dry year because of the smaller surface water supply and less potential for percolation, evaporation, and spillage.

The composition of water supplies also changes during a dry year. Local surface water supplies decrease by 26 percent, and CVP supplies decrease by 47 percent, relative to an average year, because of lower precipitation and snowmelt in local rivers and creeks and related CVP contract curtailment provisions. Accordingly, groundwater use increases by approximately 32 percent to compensate for increased water needs and smaller surface water supplies. Supply shortages total approximately 31,000 ac-ft under the dry-year scenario.

Increased groundwater use mitigates a portion of the shortage; however, the county does not have adequate groundwater infrastructure to cover all water shortages. In general, areas with greater reliance on surface water supplies and relatively higher conveyance losses experience the larger shortages. Without the infrastructure, the cutbacks in CVP supply during a dry year create water shortages, generally in areas west of the Sacramento River. Drought along the east side of the river results in less stream diversion. Dry-year scenario supply and demands are summarized in Tables 6.2-3.

TABLE 6.2-3
Summary of Water Supply Versus Demand in Dry-year Scenario

Inventory Unit	Surface Water Supply (ac-ft)	Total Groundwater Supply (ac-ft)	Total Water Demand (ac-ft)	Total Water Shortage (ac-ft)
Red Bluff East	5,000	91,200	98,500	2,300
Red Bluff West	100	3,900	4,100	100
Corning East	10,000	131,500	150,100	8,600
Corning West	1,300	1,100	4,300	1,900
Bend	2,200	400	2,600	0
Antelope	10,500	24,600	34,900	0
Dye Creek	25,000	9,500	44,400	9,900
Los Molinos	13,400	14,500	32,200	4,300
Vina	15,500	16,800	34,600	3,400
Bowman	13,600	3,900	17,900	400
Rosewood	1,300	1,400	2,600	0
South Battle Creek	6,300	2,400	8,700	0
West Mountain	0	300	300	0
East Mountain	6,900	200	7,100	0
Total County	**111,100**	**301,700**	**442,300**	**30,900**

Source: *Tehama County FCWCD Water Inventory and Analysis*

Future Water Use Conditions

Tehama County agencies and purveyors have been managing water and supplying high-quality water from surface water and groundwater sources for more than a century. Except in times of extreme drought, water supplies have been adequate to meet demand for the entire county. Current trends indicate that most future urban development will depend on a groundwater source to meet water demands. Agricultural demands that have historically used surface water might also trend toward groundwater in the future, depending on cropping trends and water efficiency system improvements.

6.2.6 Local Water Management Issues and Strategies

6.2.6.1 Conjunctive Management and Groundwater Storage

Groundwater management is a top priority for Tehama County. Significant groundwater resources lie beneath Tehama County. The Tuscan, Tehama, and Modesto Formations are high-profile geologic layers that lie beneath Tehama and surrounding counties. Tehama County has an AB3030 groundwater management plan and is SB1938 compliant. The Tehama County groundwater management ordinance was passed in 1994. The Tehama County FCWCD is working with the Department and local purveyors to implement an effective groundwater management plan. Tehama County FCWCD is taking a proactive approach to monitoring groundwater impacts from large-scale development by requiring developers to install additional onsite monitoring wells.

Conjunctive management is the coordinated operation of surface water storage and use, groundwater storage and use, and conveyance facilities to meet water management objectives. Conjunctive management strategies are used to improve water supply reliability, reduce groundwater overdraft, protect water quality, and improve environmental conditions. The county would like to obtain funding to explore possible recharge opportunities along the western slopes of the county in areas where significant outcrops can be found, and is participating in the Lower Tuscan Recharge Investigation in the eastern part of the county.

6.2.6.2 Floodplain Management

Floodplain management in the county falls within the jurisdiction of the Tehama County Building and Safety Department. In January 1997, major storms throughout the state caused record flows in many Central Valley rivers, resulting in flooding and property damage. In Tehama County, the Sacramento River at Tehama Bridge reached 8 feet over flood stage. Over 1,000 feet of broken levee at Deer Creek resulted in $2 million in damages and an additional $1 million to repair private levees. Several areas are subject to flooding almost annually. The county is actively engaged with the U.S. Army Corps of Engineers regarding flooding and levee problems in the county. Tehama County FCWCD is responsible for maintaining the Deer Creek and Elder Creek levees. The Tehama County Flood Mitigation Plan is presently underway and is expected to be completed soon. System Reoperation – the Red Bluff Diversion Dam Problem.

The TCCA operates and maintains two canal systems owned by Reclamation: the Corning Canal and the Tehama-Colusa Canal. The Corning Canal is 15 miles long and serves three water districts in the county, and the Tehama-Colusa Canal is 110 miles long and serves 14 water districts, 6 of which are in Tehama County. The system was designed to divert water from the Sacramento River into the settling basin by virtue of a dam across the Sacramento River located in Red Bluff. Environmental concerns and regulatory requirements have altered the operational practices of the dam. Current regulations generally prevent the dam gates from being lowered until May 15. To overcome this limitation, current practice is to dam up Stony Creek in Orland and backflow water through canal gates that were actually intended to let water out of the canal into Stony Creek. Between the pumps on the Sacramento River at Red Bluff, and the reverse flow diversion at Stony Creek, the demands of irrigators have been met, but generally without any reserve. Diversions from Stony Creek are currently permitted between April 1 and May 15 and again between September 15 and October 29. The Stony Diversion depends on U.S. Army Corps of Engineers' operation of Black Butte Reservoir, which is primarily for flood control purposes and not irrigation. These two needs are not always compatible, and present operations do not provide TCCA with sufficient water diversion reliability or flexibility.

Since construction of RBDD, concern has been expressed regarding the dam's effect on both upstream and downstream fish migration. Over the years, the dam gates have been raised more frequently in an attempt to enhance fish passage, which has reduced the ability to divert irrigation water to the current 4-month (gates-in) operations from May 15 to September 14. During the remainder of the year, the dam gates are open. Studies show the current design of the fish ladders and the operations of the dam gates do not adequately allow passage of threatened and endangered fish species. At this time, National Marine Fisheries Service is finalizing the first stage of a listing of the green sturgeon as a threatened species. This listing will further emphasize the urgent need for an alternative method of diversion at Red Bluff because the green sturgeon is incapable of passing the RBDD.

Further complicating the reoperation of the RBDD is the impoundment of Lake Red Bluff that occurs when the dam gates are down. The potential loss of what is called Lake Red Bluff is a significant local concern. A draft EIS/EIR was prepared in 2002 to assess all options for reoperating the RBDD. To date, no additional operational changes have been made, and the RBDD continues to operate as described above.

Additionally, the TCCA is investigating the potential to extend the existing Tehama-Colusa Canal to provide high-quality water to urban uses in the Yolo and/or North Bay and Solano areas. This project could include a conjunctive water management/recharge component. The potential for this project, which would require extensive design, environmental, and right-of-way effort prior to construction, is being reviewed as to the potential benefits in relation to anticipated costs.

6.2.6.3 Water Conservation

The Tehama County Resource Conservation District operates a mobile irrigation lab that provides agricultural growers with important system information for management decisions. The mobile irrigation lab can identify problems with distribution uniformity and suggest solutions. An evaluation process is conducted with test protocols and evaluation software from the Irrigation Training and Research Center at Cal Poly. Through this service, growers learn to operate their systems more effectively and save water in the process. Mobile lab evaluations are performed at no cost to growers.

6.2.6.4 Ecosystem Restoration

The California Water Plan describes ecosystem (aquatic) restoration as "changing the flows in streams and rivers, restoring fish and wildlife habitat, controlling waste discharge into streams, rivers, lakes, and reservoirs, or removing barriers in streams or rivers so salmon and steelhead can spawn" (Department Bulletin 160-05). Ecosystem restoration improves the condition of the modified natural landscapes and biotic communities to provide for the sustainability and for the use and enjoyment of those ecosystems by current and future generations.

Tehama County is actively involved in many major ecosystem restoration programs, including the following:

- Battle Creek Salmon and Steelhead Restoration Program
- Cottonwood Creek Watershed Group Monitoring and Management Programs
- Deer Creek Spring-run Chinook Salmon Protection Program
- Deer Creek Water Exchange Pilot Program
- Numerous riparian rehabilitation projects along the Sacramento River

6.2.6.5 Recharge Area Protection

Butte County has proposed the Lower Tuscan Aquifer Monitoring, Recharge, and Data Management Program to be implemented in Butte and Tehama Counties. The following are goals of the project:

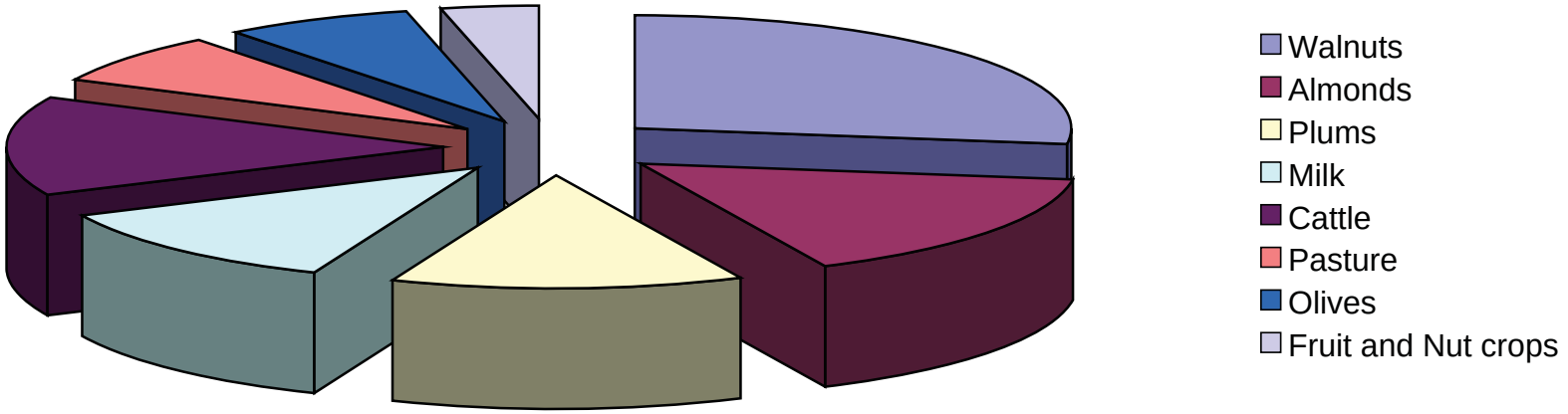
- Identify the geological makeup of the Lower Tuscan Aquifer
- Quantify the potential yield of the Lower Tuscan Aquifer
- Determine the aquifer system's ability to meet the water needs of the local agricultural economy
- Examine the potential for conjunctive water management programs
- Educate the public to reduce potential local and regional conflict
- Foster regional coordination of water management

Element facilities will consist of several stream gauging stations and monitoring wells. The wells will be integrated into the Department-Butte County cooperative monitoring well network. In addition to installation of equipment and infrastructure, the Lower Tuscan Recharge Investigation project will entail the development of a comprehensive GIS database of water and resource management information for the four counties (Butte, Tehama, Colusa, and Glenn) that overlie the Lower Tuscan Aquifer. Further detail on the SVWMA and the project are provided in Section 1, Introduction, and Section 4, Assessment of Water Management Strategies, of this IRWMP.

6.2.7 Next Steps/Recommendations

Next steps/recommendations are as follows:

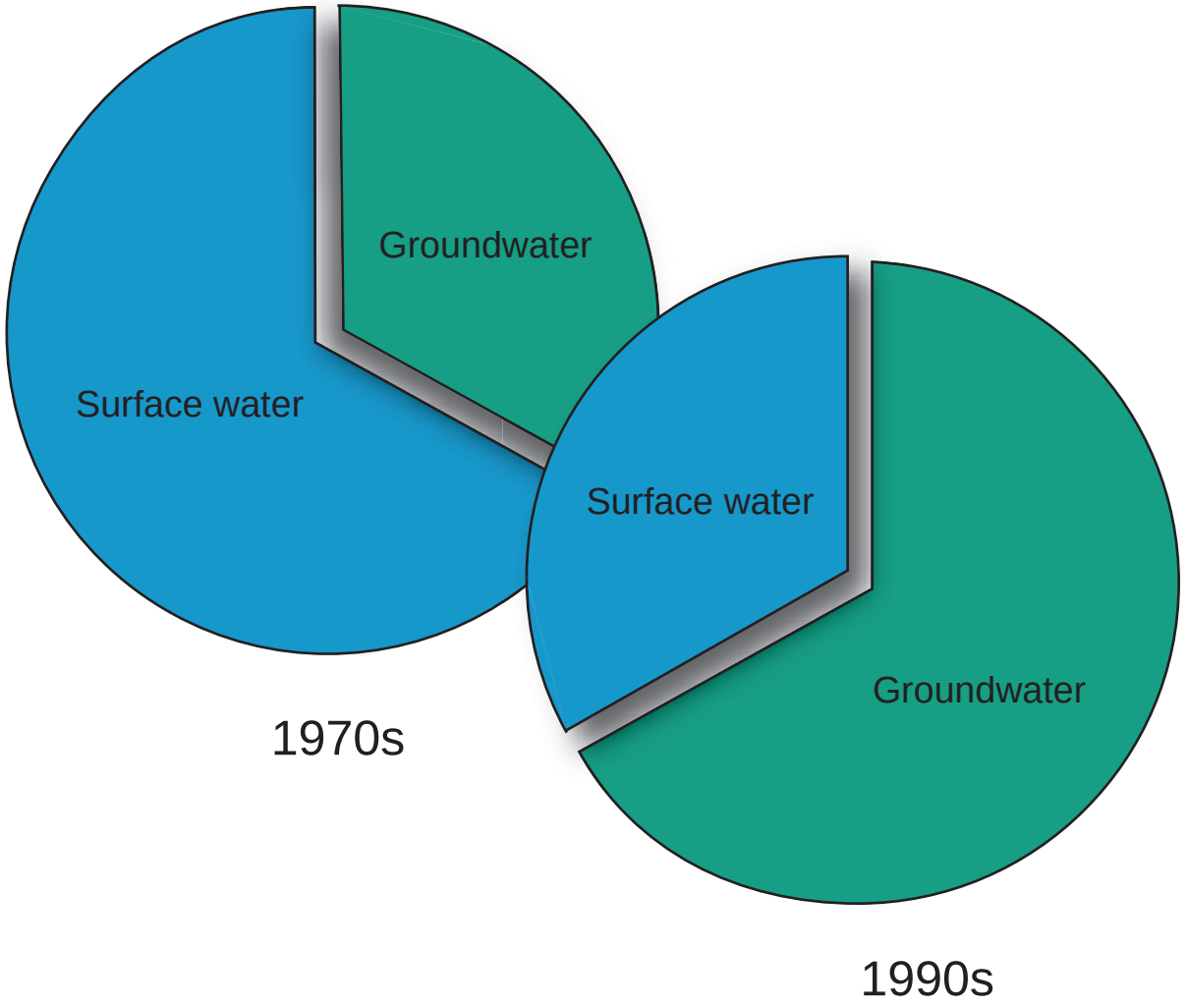
1. Implement the Lower Tuscan Recharge Investigation program.
2. Create a BMO database similar to Butte County.
3. Explore funding opportunities to develop a subsistence network.
4. Explore research opportunities and funding to expand knowledge base for the Tehama Formation.
5. Continue the cooperative effort with Glenn, Colusa, and Butte Counties to ensure reliable, high-quality drinking water, and work with the Coalition to promote management of agricultural runoff and discharge.
6. Continue to encourage agricultural uses and development through land use planning and policies.
7. Support existing efforts to evaluate flood potential and pursue funding to protect both urban and agricultural areas.
8. [Tehama County FCWCD] pursue a more coordinated effort with Tehama County Planning Department with respect to development and water supply.
9. Continue to support proposed projects within Tehama County as detailed in Appendix B to this IRWMP.



Source: United States Department of Agriculture National Agricultural Statistics Service, 2006a

FIGURE 6.2-1
TEHAMA COUNTY LEADING AGRICULTURAL COMMODITIES
SACRAMENTO VALLEY IRWMP

WB082006010RDD_04 (8/30/06)



Source: Tehama County FCWCD Inventory and Analysis

FIGURE 6.2-2
CHANGE IN SURFACE WATER GROUNDWATER USE
SACRAMENTO VALLEY IRWMP

Source: Departmemnt of Water Resources

FIGURE 6.2-3
DISTRIBUTION OF GROUNDWATER WELLS IN TEHAMA COUNTY
SACRAMENTO VALLEY IRWMP

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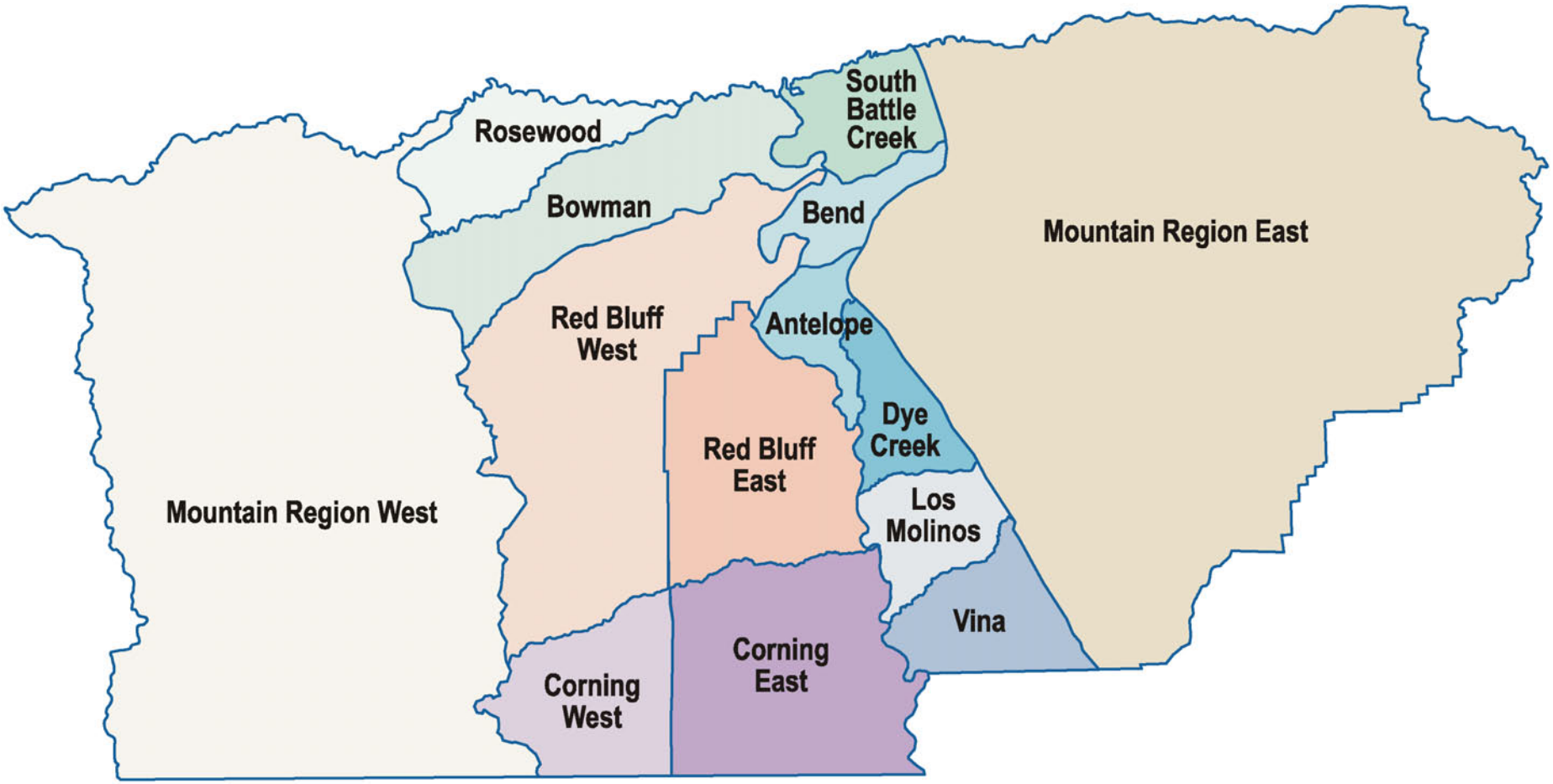

FIGURE 6.2-4
TEHAMA COUNTY INVENTORY UNITS
SACRAMENTO VALLEY IRWMP

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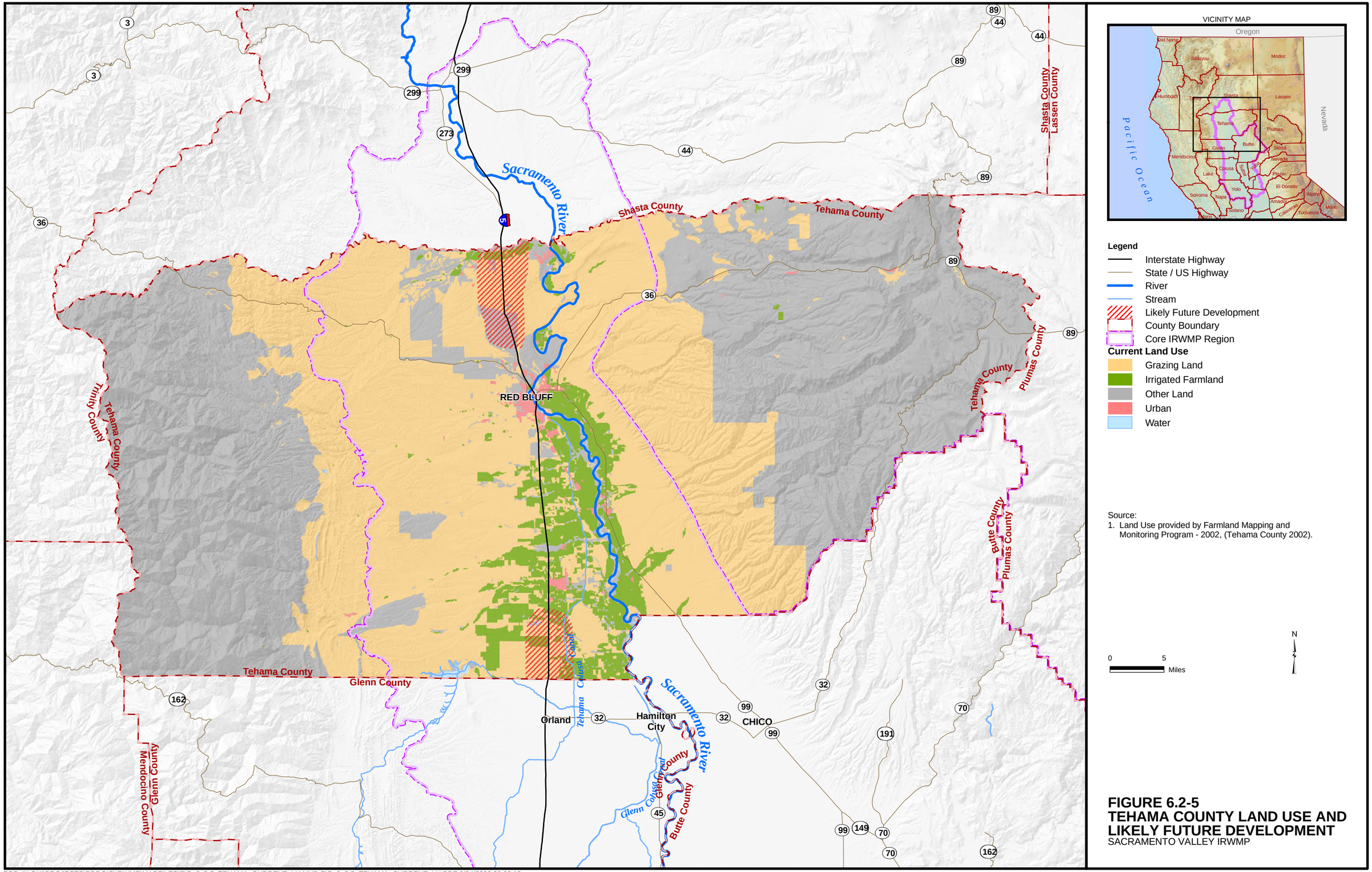

FIGURE 6.2-5
TEHAMA COUNTY LAND USE AND LIKELY FUTURE DEVELOPMENT
SACRAMENTO VALLEY IRWMP

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6.3 Glenn County

The following summarizes the local setting, current and future land and water use, and primary recommendations in the Glenn County area. Glenn County officials were interviewed and consulted as a part of the development of this IRWMP and identified the following key and/or highest priority water- and land use related issues (Messina et al., 2006):

1. Increasing shift in agricultural water supply source from surface supply to groundwater
2. Development, use, reuse, and recharge of the Lower Tuscan Formation
3. Groundwater recharge
4. Increased residential development in Orland Unit Water User's Association (OUWUA) district area
5. Agricultural land conversion to smaller, rural residential parcels (1 to 10 acres)
6. Transfers in/out of the basin

6.3.1 Local Setting

Glenn County is located in the west-central portion of the Sacramento River Hydrologic Region. Primarily an agricultural area, Glenn County totals approximately 850,000 acres with 30 percent in agriculture and only 1 percent in urban uses (Wood Rodgers and Associates, 2003). A small portion of western Glenn County lies within the North Coast hydrologic region. In 2000, the population of Glenn County was approximately 26,500, with 50 percent in urban (small community) and 50 percent in rural/farm housing. By the year 2030, Glenn County is expected to see approximately 27 percent growth to about 34,300 (California Department of Finance, 2004).

The majority of irrigated agricultural land is in the eastern third of the county. Major crops include rice, deciduous orchard, and field crops. The largest urban areas are the cities of Willows and Orland, both of which are located along Interstate 5. Surface water provides the majority of supply, with groundwater being the primary source for users outside water districts as well as orchards. Conversely, 98 percent of Glenn County residents get their drinking water from a groundwater source, and the remaining 2 percent from a surface water source.

Numerous water agencies and districts oversee the provision and development of water supplies in Glenn County. These include the following agricultural water purveyors, urban water purveyors, agencies with flood management responsibilities, and agencies with land use management responsibilities:

- Agricultural Water Purveyors
  - Stony Creek Water District

  - 4-E Water District
  - Provident Irrigation District
  - Princeton-Codora-Glenn Irrigation District
  - Orland Unit Water User's Association
  - Orland-Artois Water District
  - Kanawah Water District
  - Glide Water District
  - Glenn-Colusa Irrigation District
  - Hunter Creek Water District

- Urban Water Purveyors

  - California Water Service Company (CWSC)
  - City of Orland
  - Black Butte Water Company
  - Elk Creek Community Services District
  - Butte City Community Services District
  - Artois Community Services District

- Flood Management Agencies

  - U.S. Army Corps of Engineers
  - Glenn County
  - California Department of Water Resources
  - Colusa Basin Drainage District

- Land Use and Resource Agencies

  - Glenn County
  - Glenn County Resource Conservation District
  - Public Trust Agencies

6.3.2 Land Use Patterns

Urban and built-up land in Glenn County makes up only a small portion of overall land use. In 2002, urban and built-up lands accounted for less than 1 percent of total lands within the county (California Department of Conservation, 2002b; see Figure 6.3-1). Glenn County is presently experiencing a relative increase in housing development compared to historical trends.

County planners expect more new development and a number of new subdivisions in the future, including 1,500 residences in and around the City of Orland over the next 5 to 10 years, 60 residences in Hamilton City in the next 2 years, 1,100 residences and 40 acres of commercial development over 10 years in a new urban area between Orland and Artois, and 600 units adjacent to the City of Artois over 7 years (Four-County Document). The Glenn

County Planning Department has recently initiated an analysis of the number of parcels that might be available to develop under the current zoning structure (Walker, 2006). Future zoning regulations are always subject to change, but this analysis indicates that approximately 3,600 potential additional parcels could be created in the future within the present zoning restrictions. New Glenn County development will use groundwater as the primary drinking water source. The Glenn County General Plan is presently being updated and is expected to be completed in 2007.

Agricultural cropping trends are monitored by the county, and agriculture is by far the largest industry in the county. The 2005 gross production of agricultural commodities was valued at $393.6 million. This represents an increase of 12 percent from the 2004 gross production value of $347.9 million. For the first time since the 1930s, rice is currently not the number one leading commodity in Glenn County. Almonds have taken the lead with a production value of $134.5 million. This is a 42 percent jump from 2004 because of a significant increase in value per ton and a slight increase in production. Walnuts and prunes also showed an increase, but olives and pistachios have declined (Black, 2006). Figure 6.3-2 shows the 10 leading agricultural commodities for the county in 2005.

Water from the Sacramento River is diverted into two major canals; the Glenn-Colusa Canal and the Tehama-Colusa Canal. Stony Creek is also an important source of surface water, supporting two reservoirs: Stony Gorge and Black Butte. The eastern portion of the county overlies the Sacramento Valley Groundwater Basin. Groundwater is the primary source of domestic water for the county and is also used for irrigation in some areas (QUAD Consultants, 1993)

Given virtually all land suitable for irrigated agriculture in Glenn County has already been developed, changes in agricultural water use are generally attributed to changes in crop mix and/or need for improved supply reliability. Agricultural water supply source (groundwater versus surface water) is one of the most significant considerations for water management in Glenn County (Messina, 2006). The current source of water for agricultural use is approximately 70 percent surface water and 30 percent groundwater. This ratio is anticipated to continue to move toward a greater proportionate use of groundwater, with county officials projecting an increase in groundwater use by agricultural users in the next 25 years. This increase is primarily because of the anticipated increase in orchards in the county and their typical associated reliance on groundwater, and anticipated in-/out-of-basin transfers by substitution.

Areas historically dependent on groundwater only experienced groundwater level declines during extended (multi-year) drought-year conditions, such as 1961 to 1963, 1976 to 1977, and 1987 to 1994. Following these extended drought periods, however, regional groundwater levels generally recovered. In fact, during and following the most recent drought period, GCID implemented conjunctive water management projects to meet local needs in 1992 and 1994 (up to 74,000 ac-ft of groundwater pumping in 1992, alone). Groundwater levels in

these pumping areas typically returned to pre-pumping conditions subsequent to winter recharge that replenished the groundwater basin.

Regional groundwater levels in the Stony Creek Project Area are currently relatively stable, and, from a regional perspective, the basin is presumed to be full (e.g., natural recharge is in balance or in excess of the basin's ability to accept it). Regardless of regional trends, however, some local areas where groundwater is relied on as a primary supply recover more slowly as a result of extended dry periods and increased pumping.

6.3.3 Water Use and Water Supply Patterns

Orland along the foothills, west of the Orland Artois Water District (OAWD) service area boundary (Department, 2003c). This area has seen large increases in almond acreages in recent years, resulting in a gradual increase in demand for groundwater.

The greatest amount of natural recharge occurs in the Stony Creek area of Glenn County. The area has been a focal point of recent groundwater investigations and studied for possible groundwater recharge programs. Water balances completed for the *Stony Creek Fan Conjunctive Water Management Program Feasibility Investigation* estimate the project area contributes a net recharge to the area of approximately 1.1 ac-ft per acre per year. The Stony Creek partners, being primary surface water users, are largely responsible for this positive net recharge.

Water sources were mapped for the *Glenn County Groundwater Management Plan*. Figure 6.3-3, from the Glenn County Groundwater Management Ordinance, represents 2001 surface water, groundwater, and mixed sources in the county (http://www.glenncountywater.org/BMO.HTM).

6.3.4 Existing and Ongoing Planning

In the past decade, the Glenn County water resource planners have taken several steps toward preparing for future land use changes and their associated water demands. The Glenn County Water Resources Coordinator of the Department of Agriculture acts in a support role for the Board of Supervisors to identify exceedances in BMO water levels, quality, or land subsidence. A Water Advisory Committee and Technical Advisory Committee meet to help guide the decisionmaking process for the county. Members of the Water Advisory Committee and Technical Advisory Committee are appointed by and serve the Glenn County Board of Supervisors. The Glenn County Department of Agriculture is involved in the management of numerous water-related policies and programs, including Ordinance 1115, groundwater level monitoring, AB303-funded projects, and underground storage tank regulation. The Glenn County Department of Agriculture provides implementation support for Ordinance 1115, which adopted the *Glenn County Groundwater Management Plan. The goal of the Glenn County Groundwater Management Plan* is "to ensure the continued availability of groundwater and that extraction of groundwater does not exceed safe yield

based on the established BMOs" (Messina, 2005). The Glenn County Department of Agriculture administers the Water Advisory Committee, which developed the Glenn County Groundwater Management Plan and oversees implementation.

The Four-County Document details the results of an effort by Butte, Tehama, Glenn, and Colusa Counties to collaborate on a regional scale in areas where they currently share common operational practices and physical linkage. County water resource managers are currently facilitating activities in areas such as water resource studies, groundwater management, data and information management, county regulation and ordinance oversight, public education, and stakeholder interaction.

Table 6.3-1 summarizes existing planning documents for Glenn County.

TABLE 6.3-1
Existing and Relevant Glenn County Water Resource Planning Documents

Planning Document	Description	Date Published
Ordinance 1115 BMO Groundwater Management Plan	A six-element BMO program with 17 subareas to monitor groundwater levels, subsidence, and solve disputes with groundwater management.	February 2000
Northern Sacramento Valley (Four County) Drinking Water Quality Strategy Document	A Butte, Tehama, Glenn, and Colusa County Document that provides an integrated approach to water quality management in the four-county region.	June 2005
Glenn County General Plan	General Plan (update in progress).	June 15, 1993
Impact of Urbanization in the Vicinity of Orland, California (LEGACI Grant)	A brief report concerning the Orland Unit and conversion in the area.	August 2005
Stony Creek Groundwater Recharge Study	A study along the Lower Stony Creek corridor to determine stream interaction and the effects it might have on recharge in aquifers underlying the county.	2003 and 2005
Lower Stony Creek Fish Monitoring Study	A Reclamation study to aid future water management and determine if entrainment occurs at the North Canal and CHO for the Tehama-Colusa Canal.	2004
Stony Creek Fan Conjunctive Water Management Program Feasibility Investigation	Includes description, supply, demand, and projections for the Stony Creek Fan Partners of GCID, OAWD, and OUWUA.	January 2006
Estimating the Potential for in Lieu Conjunctive Use Water Management in the Central Valley of California	A conjunctive use water management study by the Natural Heritage Institute involving Glenn County.	February 2002

6.3.5 Plan Area

The January *2006 Stony Creek Conjunctive Water Management Feasibility Investigation* includes a plan (project) area that encompasses most of the Glenn County portion of this IRWMP (see Figure 1-1; Grant David Associates, 2006). The range of the project Area is defined by the boundaries of the three partners – GCID, OAWD, and OUWUA – and extends from southern Tehama County, across Glenn County, to central Colusa County. The plan includes existing conditions and projections to the year 2025 for each of the partners. Table 6.3-2 summarizes the land and water use information and projections in the document for each area.

6.3.6 Local Water Management Issues and Strategies

6.3.6.1 Groundwater Management

Groundwater management in Glenn County is conducted in accordance with the BMOs in the Glenn County Groundwater Management Plan. The county is highly engaged in protecting and monitoring groundwater resources. County officials are coordinating with surrounding counties in an effort to monitor any potential development of the Lower Tuscan Formation, and to ensure protection of recharge areas and groundwater quality.

6.3.6.2 Conjunctive Management and Groundwater Storage

The Stony Creek project area is defined by the boundaries of the three partners – GCID, OAWD, and OUWUA – and extends from southern Tehama County, across Glenn County, to central Colusa County. The Stony Creek Fan Conjunctive Water Management Program was initiated to evaluate the potential for conjunctive water management in the Stony Creek Fan area of Glenn County. To date, the project sponsors have developed a Phase I agreement to support this effort; an FI work plan was developed and is currently being implemented; development of an Integrated Groundwater and Surface Water Model was started; groundwater monitoring wells for a recharge test were installed; and a recharge test program was conducted. These activities are funded by a mixture of local funding and in-kind services, Conjunctive Water Management Branch service contracts (technical, modeling, and drilling), and by Department contracts with OAWD and GCID.

GCID is continuing to develop a conjunctive water management and monitoring program to supplement current surface supplies and reduce Sacramento River diversions. Water produced as part of this project is proposed to be dedicated to meeting water quality standards in the Bay-Delta and improve local, regional, and statewide water supply reliability depending on year type in accordance with SVWMA. Further detail on the SVWMA and the project is provided in Section 1, Introduction, and Section 4, Assessment of Water Management Strategies, of this IRWMP.

TABLE 6.3-2
Summary of Plan Areas

Plan Area	Land Use	Water Use
GCID	Largest irrigation district in Sacramento Valley Approximately 55,000 acres of irrigated land Rice is dominant crop (85%) By 2025, net irrigated area expected to be about 57,500 acres	Surface water delivered to 141,000 acres of land (and 20,000 acres of wildlife habitat) Primarily Sacramento River diversion, also 17,000 ac-ft of groundwater use 2025 change in groundwater pumping to meet SVWMP commitment
Orland-Artois Water District	29,988 assessed acres (approximately 24,000 irrigated) 2025 net irrigated acreage will be approximately 25,300 acres; major cropping difference expected to be expansion in permanent crops (almonds)	Closed pipeline system with virtually no spill 53,000 af/yr CVP surface supply OAWD is generally water-short, each year OAWD seeks to augment its CVP contract supplies with short-term water transfers OAWD's CVP contract would yield an average of 27,000 ac-ft annually, satisfying less than one-third of the long-term average applied water demand Additional demand met by groundwater pumping from 35,000 to 95,000 ac-ft annually
Orland Unit Water User's Association	1,099 shareholders within the OUWUA Average size farm is small; less than 25% of farms are greater than 20 acres 21,000 total acres (15,000 to 17,000 irrigated) Pasture is dominant (60 to 70%)	Primarily surface water from East Park and Stony Gorge (see Table 4 in Stony Creek Conjunctive Water Management Feasibility Investigation for details) Average annual diversion of 95,372 af/yr Surface water typically sufficient to meet demand; small amount of groundwater use (approximately 3,000 ac-ft)
Groundwater-only Areas	Approximately 75,000 acres of groundwater-only use area (49,000 acres irrigated average) 2025 projections indicate about 55,000 acres or irrigated land in this area Cropping shift to permanent crops expected	Only water supply is private pumping of groundwater

Note:

The Stony Creek Conjunctive Water Management Feasibility Investigation contains significantly more detailed descriptions of the supply, demand, cropping trends, and operational considerations for each of these planning areas as well as the assumptions used to make the 2025 projections.

6.3.6.3 Impact of Urbanization in the Vicinity of Orland

The primary source of water for the City of Orland is groundwater. As land is annexed into the city, it is removed from the OUWUA. Over time, land within the city increases, and the OUWUA service area declines. At the same time, the application of surface water for

irrigation will decline, and the extraction of groundwater grows to serve municipal needs (Wood Rodgers Consultants, 2005). Compounding the problem is the fact that over 80 percent of the parcels in the OUWAU are 20 acres or less. Smaller parcels such as this that fall outside the area of annexation are susceptible to development as "ranchettes" that will no longer be eligible for water from the OUWAU.

The *LEGACI Grant Report* found that the long-term impacts to groundwater levels from development in the vicinity of Orland are not significant. The full development of the city would, however, significantly interrupt OUWUA's water distribution system and the operations and maintenance. The OUWAU has done preliminary planning to install a new regional pipeline in lieu of canals passing through the north part of the city and terminating at the Tehama-Colusa Canal. This type of system modification would be beneficial for servicing the eastern portion of the district service area and minimizing the liability risk of having an open channel in an urbanized area.

6.3.6.4 Flood Management in the Colusa Basin Drainage District

State Legislature formed the CBDD in 1987, to address flooding, drainage, and subsidence problems in the Colusa Basin. The Colusa Basin extends into Colusa, Glenn, and Yolo Counties and is primarily used for agricultural production. CBDD commissioned the *Integrated Watershed Management Plan* to reduce flood damage in the City of Willows and surrounding agricultural lands and improve the environment in Willow and Wilson Creek Subbasins in Glenn County (CH2M HILL, 2004). The first flood control detention basin project, located on South Fork Willow Creek, is presently in the design phase.

6.3.7 Next Steps/Recommendations

Next steps/recommendations are as follows:

1. Continue the cooperative effort with Tehama, Colusa, and Butte Counties to ensure reliable, high-quality drinking water, and actively participate in ongoing efforts that support prudent management of the underlying aquifer systems. Continue to work with the Coalition to promote management of agricultural runoff and discharge.
2. Continue to support proposed projects in Glenn County as detailed in Appendix B to this IRWMP.
3. Continue formulating the Water Needs Analysis that will be completed by December 2006. Depending on the findings, further recommendations will be made in the future.
4. Support growth within the county, keeping in mind that agricultural water needs to be available to maintain the county's economic base.

LETTER 19

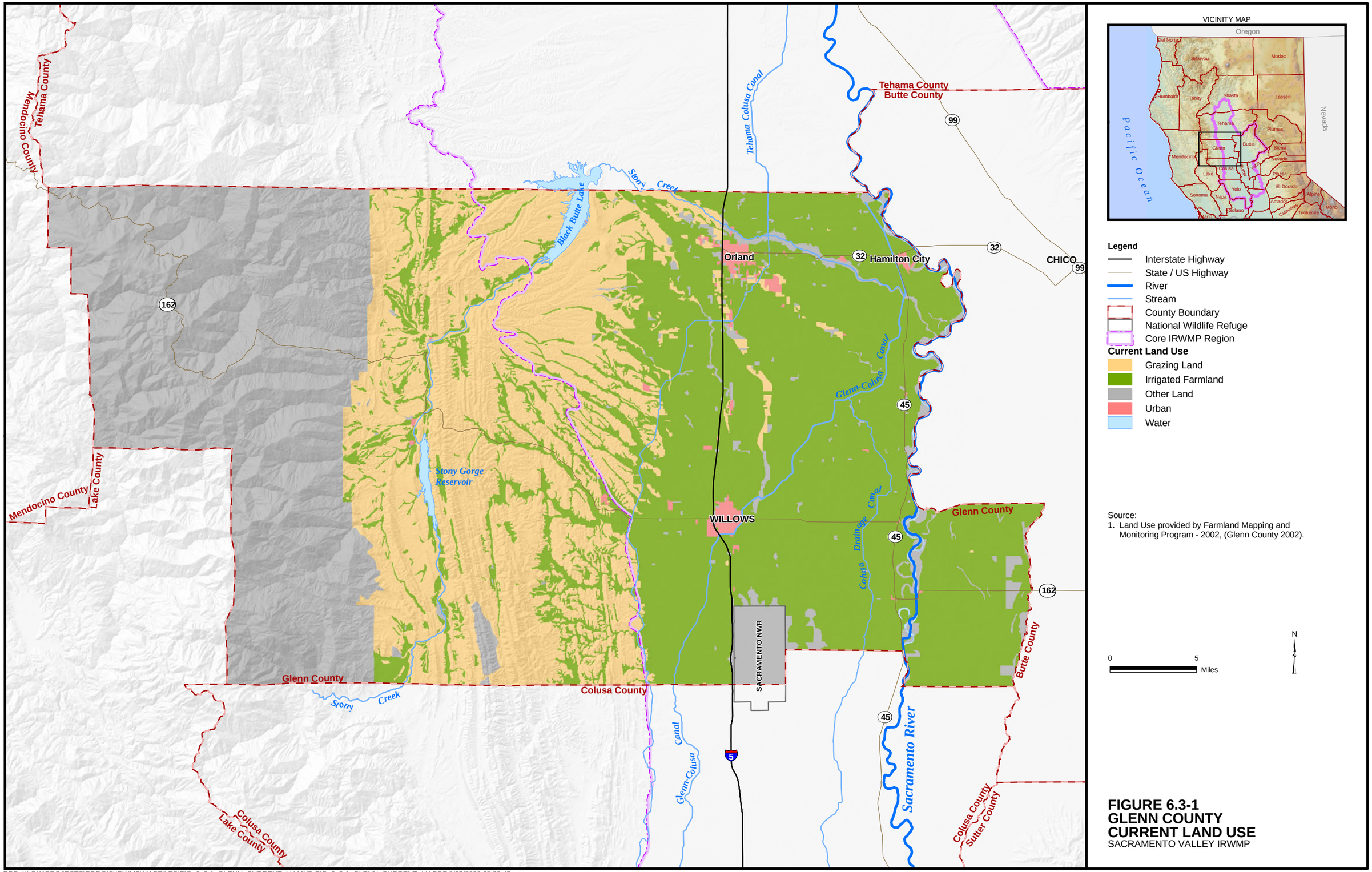

FIGURE 6.3-1
GLENN COUNTY
CURRENT LAND USE
SACRAMENTO VALLEY IRWMP

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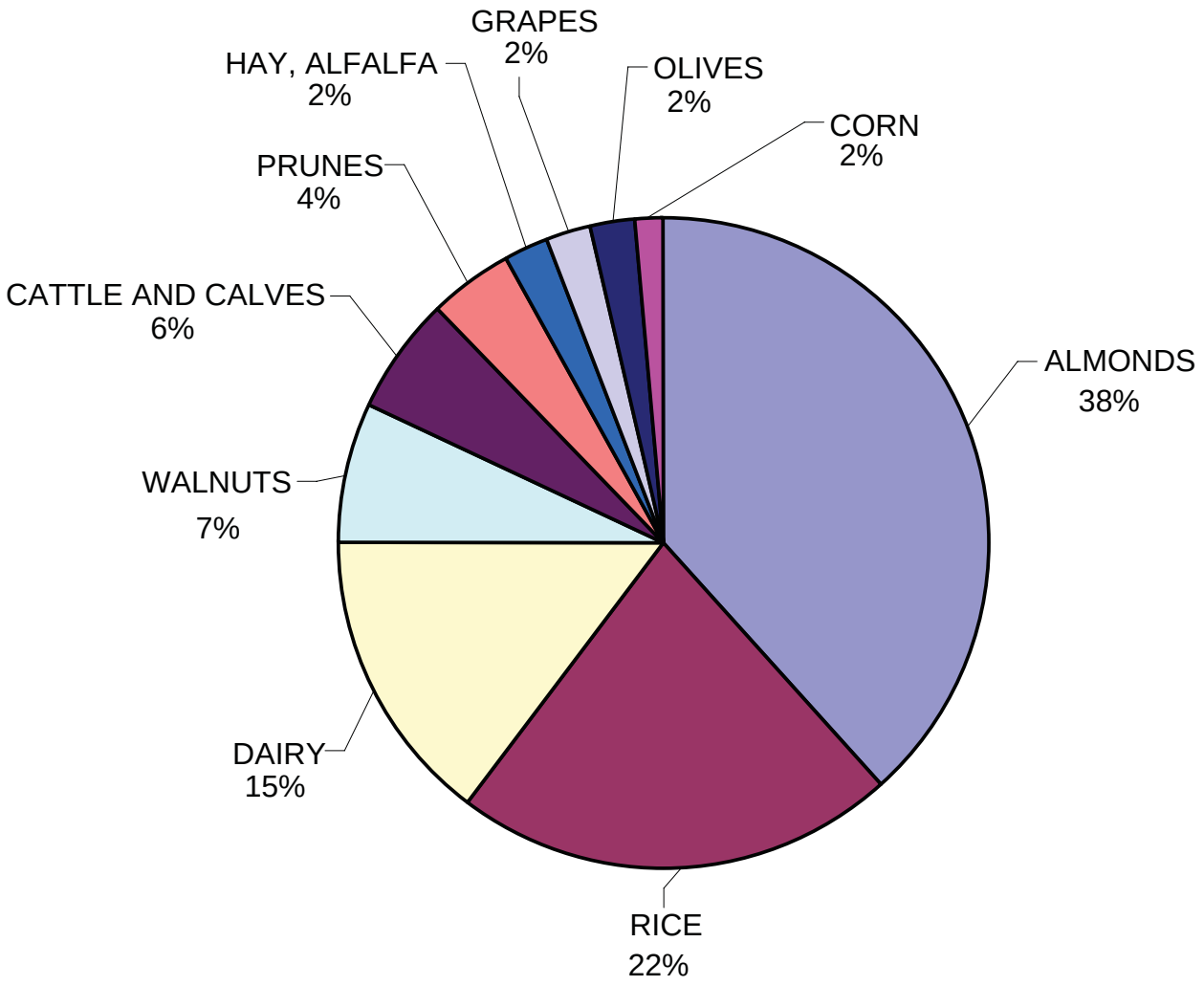

Source: Glenn County 2005 Crop Report

FIGURE 6.3-2
GLENN COUNTY'S 10 LEADING COMMODITIES IN 2005
SACRAMENTO VALLEY IRWMP

WB082006010RDD_09 (8/30/06)

LEGEND

- EXISTING DWR SPRING 2001 GROUNDWATER LEVEL MONITORING WELL
- PROPOSED GROUNDWATER MONITORING WELL
- PROPOSED SUBSIDENCE MONITORING WELL (EXTENSOMETER)
- PROPOSED DWR GROUNDWATER MONITORING WELL
- PROPOSED DWR SUBSIDENCE MONITORING WELL
- EXISTING BUTTE COUNTY SUBSIDENCE MONITORING WELL

0 1 2 3 4
MILES

BMO AREA LEGEND

1. WEST CORNING BASIN PRIVATE PUMPERS
2. STONEY CREEK WATER DISTRICT
3. WEST COLUSA BASIN PRIVATE PUMPERS
4. ORLAND UNIT WATER USERS ASSOCIATION
5. ORLAND-ARTOIS WATER DISTRICT
6. GLIDE WATER DISTRICT
7. KANAWHA WATER DISTRICT
8. EAST CORNING BASIN PRIIVATE PUMPERS
9. BOS DISTRICT FIVE PUMPERS
10. BOS DISTRICT THREE PUMPERS
11. GLENN COLUSA IRRIGATION DISTRICT
12. PROVIDENT IRRIGATION DISTRICT
13. WILLOW CREEK MUTUAL WATER COMPANY
14. PRINCETON-CODORA-GLENN IRR. DISTRICT
15. RECLAMATION DISTRICT 2106
16. RECLAMATION DISTRICT 1004
17. WESTERN CANAL WATER DISTRICT

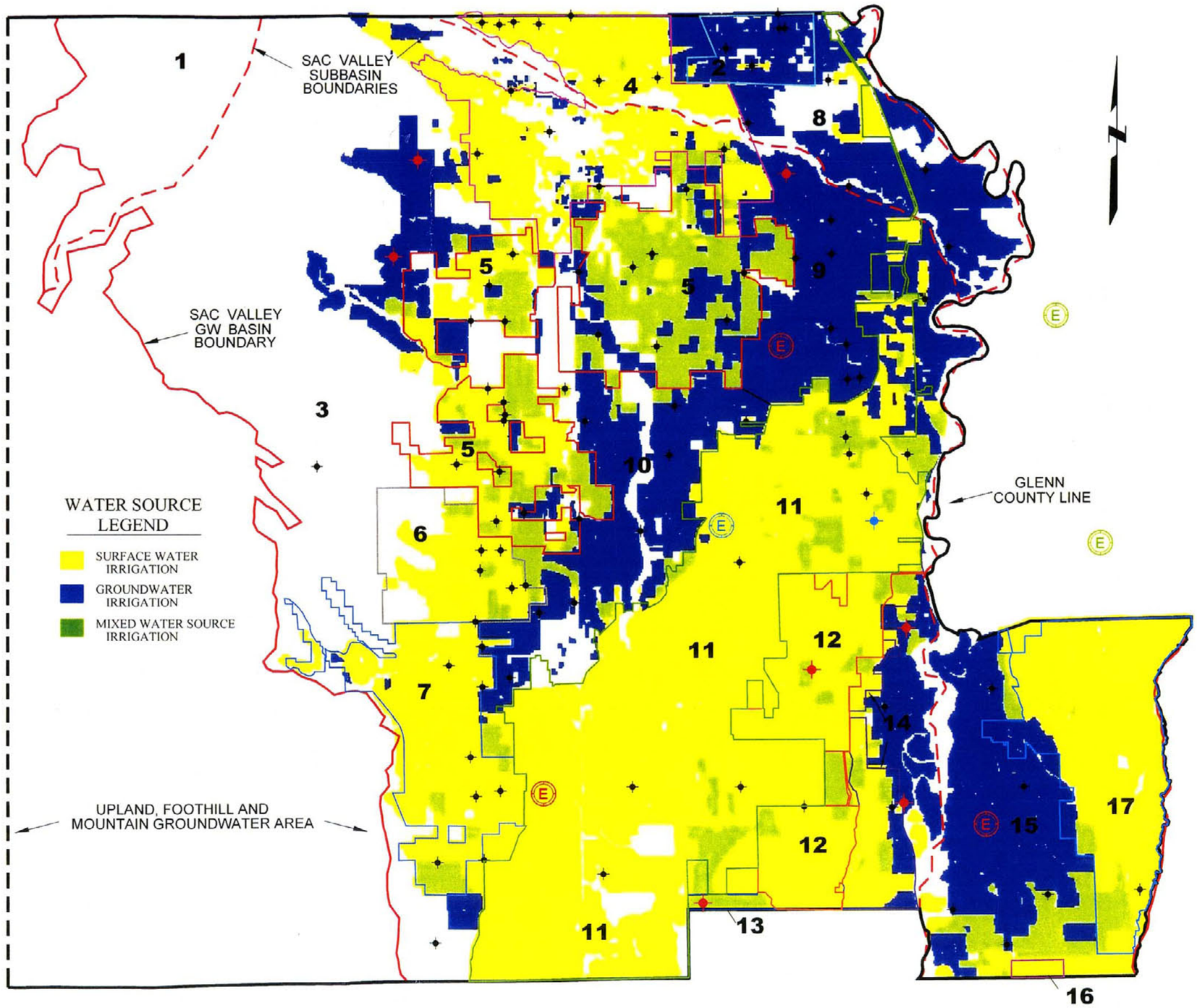

FIGURE 6.3-3
EXISTING AND PROPOSED MONITORING WELLS
SACRAMENTO VALLEY IRWMP

WB082006010RDD_44 (8/30/06)

6.4 Colusa County

The following summarizes the local setting, current and future land and water use, and primary recommendations in the Colusa County area. Colusa County officials were interviewed and consulted as a part of the development of this IRWMP and identified the following key and/or highest priority water- and land use related issues (Hackney, 2006):

- Agriculture-urban interface conflicts
- Urban water quality
- Loss of agricultural quality of life
- Flood management
- Water transfers

6.4.1 Local Setting

Colusa County is located in the western portion of the Sacramento Valley approximately 60 miles northwest of Sacramento. The county's 1,156 square miles encompass a variety of topography ranging from the Coastal Mountain Range and foothills to the west and relatively flat agricultural land in the east. Elevation ranges from 40 to 7,040 feet above sea level. Although sparsely populated, the county contains two incorporated cities: Colusa (5,000) and Williams (3,000). The population of Colusa County was 21,000 in 2005 (California Department of Finance) with approximately 7,000 homes (California Department of Finance, 2004). Fifty-five percent of the population lives in small urban communities, and forty-five percent lives in rural homes. The population of Colusa County is projected to be 29,300 by the year 2030 (U.S. Census Bureau, 2000).

The climate in Colusa County is typical of the Sacramento Valley with hot, dry summers and cool, wet winters, with most of the annual precipitation falling between November and March. The City of Colusa has an annual rainfall of approximately 16 inches per year and an average summer (July) daytime high temperature of 96 degrees Fahrenheit.

Agriculture is the major industry in the county. Within the boundaries of Colusa County are some of the richest rice-producing lands in the country and quality waterfowl habitat associated with the Pacific Flyway. Colusa was identified as having the highest percentage increase in agricultural growth, nearly 115 percent, in California during the period 1985 to 1995 (University of California Cooperative Extension, 1999). The total onfarm agricultural value in the county in 1997 was $333 million. The major crops produced include rice, processed tomatoes, almonds, wheat, vegetable seeds, walnuts, and prunes. Rice remains the number one crop, with acreage remaining fairly stable. There is currently a transition from row crops to perennial crops (almonds, grapes, and walnuts) and from low-value agronomic crops to higher value vegetables or other row crops. Environmental issues (air quality, water quality, and soil degradation), commodity marketing, and economic sustainability are the major challenges facing local producers.

Colusa County is home to many large canals and infrastructure necessary to meet the agricultural demand for the 358,000 acres of cropland in the county. Most of the irrigation water used in the county originates from the GCID Canal, which takes its principal supply from the Sacramento River at Hamilton City and a limited supply from Stony Creek in Glenn County. Some runoff from the foothills and water from the Sacramento River is channeled into the GCID Canal, Tehama-Colusa Canal, and the Colusa Drainage Trough. These canals serve as irrigation sources and flood control channels.

Water agencies and private parties have been effective over the years in obtaining and developing water supplies to meet the needs of Colusa County. In the past, most efforts were conducted by individual agencies. There are over 25 agencies with land and water management responsibilities. These include the following agricultural water purveyors, urban water purveyors, agencies with flood management responsibilities, and agencies with land use management responsibilities:

- **Agricultural Water Purveyors**
  - Glenn-Colusa Irrigation District
  - Willow Creek Mutual Water Company
  - Sartain Mutual Water Company
  - Colusa Irrigation Company
  - Maxwell Irrigation District
  - Colusa Drain Users Association
  - Cortina Water District
  - Glenn Valley Water District
  - Reclamation District 2047
  - Westside Water District
  - Reclamation District 479
  - Myers Marsh Mutual Water Company
  - 4-M Water District
  - Roberts Ditch Irrigation Co. Inc.
  - Reclamation District 108
  - Reclamation District 1004
  - Davis Water District
  - Holthouse Water District
  - Provident Irrigation District
  - Colusa County Water District
  - LaGrande Water District

- **Urban Water Purveyors**
  - City of Williams
  - City of Colusa
  - Arbuckle Public Utility District
- **Flood Management Agencies**
  - Colusa Basin Drainage District
  - County of Colusa
- **Land Use and Resource Agencies**
  - County of Colusa
  - Colusa County Resource Conservation District

6.4.2 Land Use Patterns

Land use in Colusa County is dominated by agriculture (see Figure 6.4-1). Uses consist primarily of irrigated and nonirrigated farmland; small, urban community developments; and significant wildlife refuge and recreational areas. County land use has been recently mapped for as a part of the Four-County Document and by the FMMP (California Department of Conservation, 2002a).

Table 6.4-1 shows the trends in agricultural land use changes for the period of 1986 to 1998. The only significant changes include a 33 percent increase in nonirrigated farmland and an 11 percent increase in urban development.

TABLE 6.4-1
Colusa County Land Use Changes

Land Use Category	Acreage by Category							Percentage Change
	1986	1988	1990	1992	1994	1996	1998	
Irrigated Farmland	334,354	335,587	330,383	330,046	327,879	329,348	329,049	-2
Nonirrigated Farmland	8,608	9,266	10,917	10,579	10,924	10,754	11,496	33
Grazing Land	237,818	238,350	238,255	237,129	238,981	237,759	234,874	-1
Agricultural Lands Total	**582,766**	**585,191**	**581,545**	**579,746**	**579,778**	**579,857**	**577,417**	**<1**
Urban	3,851	3,864	3,914	4,158	4,159	4,176	4,293	11
Other	82,055	79,615	83,213	84,771	84,740	84,630	87,002	6
Water Areas	1,931	1,935	1,935	1,935	1,935	1,951	1,904	<1
Total Inventoried	**668,617**							

Source: FMMP (California Department of Conservation, 2000)

Like most areas in California, Colusa County is experiencing an increase in housing development. From January 2000 to December 2003, Colusa County issued 97 building permits for residences. In 2004, a subdivision of 74 residences was permitted. Colusa County planners expect additional subdivision growth of more than 4,000 residences in the future (Hackney, 2006).

About 45 percent of the county consists of forested rangeland. The Colusa and Delevan NWRs cover about 10,300 acres of low-lying Colusa Basin and provide a haven for waterfowl in the Sacramento Valley Flyway. The Colusa County portion of the Mendocino National Forest covers over 70,000 acres, or about 10 percent of the county's total land area (Sedway Cook & Associates, 1989). Table 6.4-2 lists the existing land use categories and areas as inventoried for the Colusa County General Plan.

TABLE 6.4-2
Existing Colusa County Land Use

Land Use Category	Total Acres
Communities	2,500
Rural Subdivisions	1,200
Orchards and Vineyards	38,200
Cropland	358,000
Undeveloped Bottomland	9,300
Undeveloped Rangeland	244,800
National Wildlife Refuge	12,000
National Forest	72,000
Total Area	**738,000**

Source: Colusa County General Plan

6.4.3 Water Use and Water Supply Patterns

Surface water is the primary source of supply for agricultural uses in the county. The county uses a total of 968,000 ac-ft of water per year for irrigation purposes, of which 815,000 ac-ft are provided by irrigation canals (Sedway Cook & Associates, 1989). The majority of supply is provided by GCID, Colusa County Water District, RD 108, and TCCA and associated water districts, each of which holds a long-term contract with Reclamation. Groundwater is a source of supply for agricultural water users outside these districts. Reuse of water both within districts and use of drainwater from upstream water districts is also an important source of supply for many areas in the county.

Local governments play a vital role in water and resource management through their land use authority. Groundwater is the primary source for drinking water in Colusa County

(U.S. Environmental Protection Agency, 2005). Drinking water purveyors that deliver water to over 500 connections include the City of Williams and Arbuckle Public Utility District. An additional 61 small water systems deliver water to smaller groups of users in Colusa County. The Colusa County Department of Planning and Building, the Colusa County Resource Conservation District, and the Colusa County Department of Environmental Health are the primary agencies that have responsibilities for drinking water quality or are involved in activities related to drinking water quality (Glenn County Department of Agriculture, 2005).

M&I water use totaled just 3,400 ac-ft in 1980. The Conservation Section of the Colusa County General Plan (1989) contains M&I water use projections to the year 2010. However, the 2010 population estimate for those projections was 17,000. The county plans to update the general plan and complete a comprehensive water inventory in the near future.

The majority of existing wells in the county pump groundwater from the Tehama or Upper Tuscan Formation, with the potential for using the Lower Tuscan Formation currently under study. Colusa County is currently initiating a groundwater management and water resources planning investigation.

6.4.4 Existing and Ongoing Planning

Because of staff and fiscal limitations, limited planning has occurred to date with respect to current water resources and future water needs in Colusa County. As discussed above, the county recently began working on a groundwater management plan that will include a detailed water supply inventory and analysis. Table 6.4-3 summarizes the primary investigations and/or processes conducted to date.

TABLE 6.4-3
Existing and Relevant Colusa County Water Resource Planning Documents

Planning Document	Description	Date Published
Northern Sacramento Valley (Four County) Drinking Water Quality Strategy Document	A Butte, Tehama, Glenn, and Colusa County document that provides an integrated approach to water quality management in the four-county region.	June 2005
Sacramento River Basinwide Water Management Plan	Contains current and future water supply and use projections for many Colusa County water districts	2004
Colusa County General Plan	General Plan providing basis for decisions regarding growth and land development.	Approved January 1989 Housing Element updated 2004

County water resource managers in Butte, Colusa, Glenn, and Tehama Counties (Four-County Document) are currently facilitating activities in areas such as water resource studies,

groundwater management, data and information management, county regulation and ordinance oversight, public education, and stakeholder interaction. The Four-County Team is continuing to evaluate drinking water resources and management through continued coordination.

6.4.5 Plan Areas

Planning subareas have not yet been identified by the county. It is anticipated that the upcoming groundwater management plan will likely identify such areas. Existing land use was mapped for the IRWMP using Department and FMMP land use data. Interviews with local planning officials were conducted to determine areas within the county where future development is likely. Lack of sufficient GIS data and water supply inventories for Colusa County made projections for the year 2030 water demand impossible at this time given the scope and size of the Sacramento Valley IRWMP Region. Current land use and likely areas of future development according to interviews with county staff are shown on Figure 6.4-2.

6.4.6 Local Water Management Issues and Strategies

The following summarizes key water management issues in Colusa County in terms of the Department's water resource management strategies as applicable.

Conjunctive Management and Groundwater Storage

Groundwater management is a high-priority issue for the county, as evidenced by the initiation of a groundwater management plan and comprehensive water supply inventory. The county's current groundwater ordinance was passed in 1998. Some water districts and companies in the county have proposed conjunctive management projects identified in Appendix B to this IRWMP to decrease Sacramento River diversions as part of the SVWMA. These projects include a monitoring component that should be coordinated with ongoing monitoring efforts throughout the county.

Agricultural Water Use Efficiency

Efficient use of water remains a priority for water districts and companies throughout the county. Several districts have and continue to identify projects to improve system operations and facility improvements. Currently proposed projects are identified in Appendix B to this IRWMP. Two of the larger districts in the county (GCID and RD 108) are completing a Regional Water Management Plan in cooperation with Reclamation to assist in improved water management.

Water Quality/Drinking Water

Colusa County has partnered with Glenn, Tehama, and Butte Counties for the Four-County Document. The Colusa County Planning Department is committed to protecting water quality

throughout the county. Although water quality is generally considered good, local officials expressed concern over the number of natural gas wells that are being drilled in the county and their possible impacts on groundwater quality. With respect to agricultural discharge and associated water quality effects, many of the growers in the county are participating in the Coalition. Additional information on the Coalition and the current monitoring program is found in Section 8, Performance and Monitoring, of this IRWMP.

Local planning officials indicate that the communities of Arbuckle and Maxwell are in need of system upgrades and waste facility expansion. The City of Williams is also undergoing relatively significant housing development and is anticipated to require upgrades in the near future to accommodate continued urban growth.

Surface Storage

Investigation of the proposed Sites off-stream storage project continues. Located approximately 10 miles west of Maxwell in the Antelope Valley, the proposed reservoir would have a capacity of approximately 1.9 million ac-ft and would greatly increase water supply management throughout the region and state. A number of local districts and federal and state agencies signed an MOU in 2000 to mutually explore the potential for the project and work toward its timely implementation.

Floodplain Management

State Legislature formed the CBDD in 1987, to address flooding, drainage, and subsidence problems in the Colusa Basin. The Colusa Basin extends into Colusa, Glenn, and Yolo Counties and is primarily used for agricultural production. CBDD developed a programmatic EIR/EIS to evaluate the broad impacts of alternatives that reduce potential flood damages and improve the environment within the Colusa Basin. CBDD has since commissioned several site- and project-specific studies, in various phases of completion, to further address flooding and environmental issues. CBDD efforts to restore the environment primarily relate to soil erosion, sedimentation, habitat, and water supply. Increased sediment production rates associated with the basin's annual flooding can affect regional water quality. Sediment is deposited into the Sacramento River, which degrades the water quality for downstream water users. CBDD commissioned the *Integrated Watershed Management Plan* to reduce flood damage in the City of Willows and surrounding agricultural lands and improve the environment in Willow and Wilson Creek Subbasins in Glenn County. CBDD identified several water quality-related methods to enhance the environment including (1) improve water quality through improved erosion control measures and practices, and (2) improve water quality through filtering and trapping nutrients/sediments in spreading basins (CH2M HILL, 2004).

6.4.7 Next Steps/Recommendations

Next steps/recommendations are as follows:

1. Complete the groundwater management plan
   - Develop planning subareas or regions according to water sources, land use, hydrology, and political and physical boundaries to be used as the basis for water resource planning
   - Establish BMOs or similar approach to assist in evaluating groundwater levels and avoiding potential impacts
   - Establish a monitoring network and process with stakeholders to initiate groundwater protection actions as determined necessary
2. Require large-scale developers to install monitoring equipment to collect both baseline groundwater level data before construction begins and real-time groundwater level data after construction is completed to allow for evaluation of drawdown impacts due to groundwater production
3. Implement the Lewis Ranch and RD108 water management projects
4. Continue the cooperative effort with Glenn, Tehama, and Butte Counties to ensure reliable, high-quality drinking water, and work with the Coalition to promote management of agricultural runoff and discharge
5. Continue to support the investigation and eventual implementation of the Sites off-stream water storage project
6. Continue to encourage agricultural uses and development through land use planning and policies
7. Encourage managed urban growth adjacent to existing urban centers
8. Support existing efforts to evaluate and manage flood potential and pursue funding to protect both urban and agricultural areas

LETTER 19

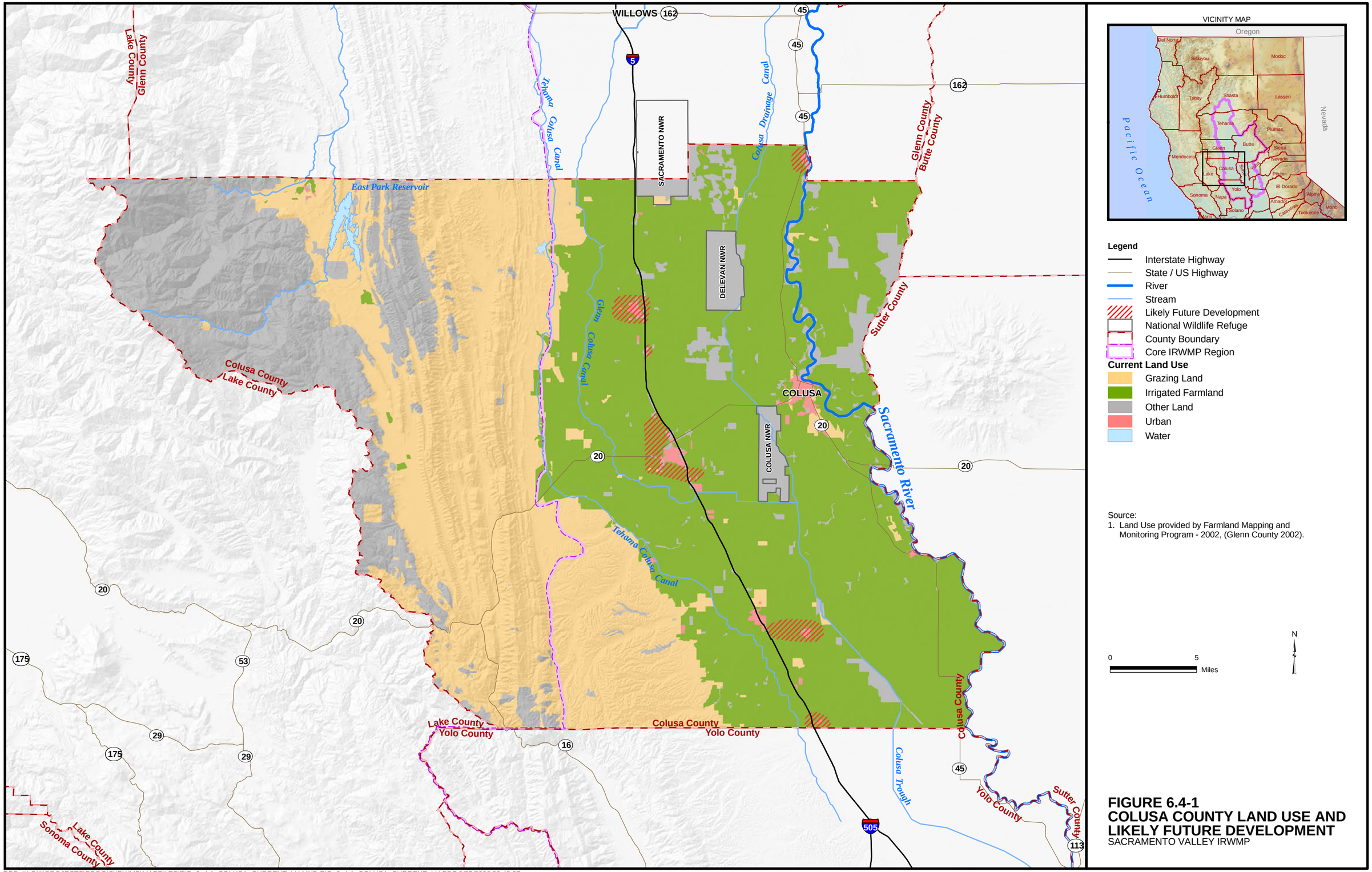

FIGURE 6.4-1
COLUSA COUNTY LAND USE AND LIKELY FUTURE DEVELOPMENT
SACRAMENTO VALLEY IRWMP

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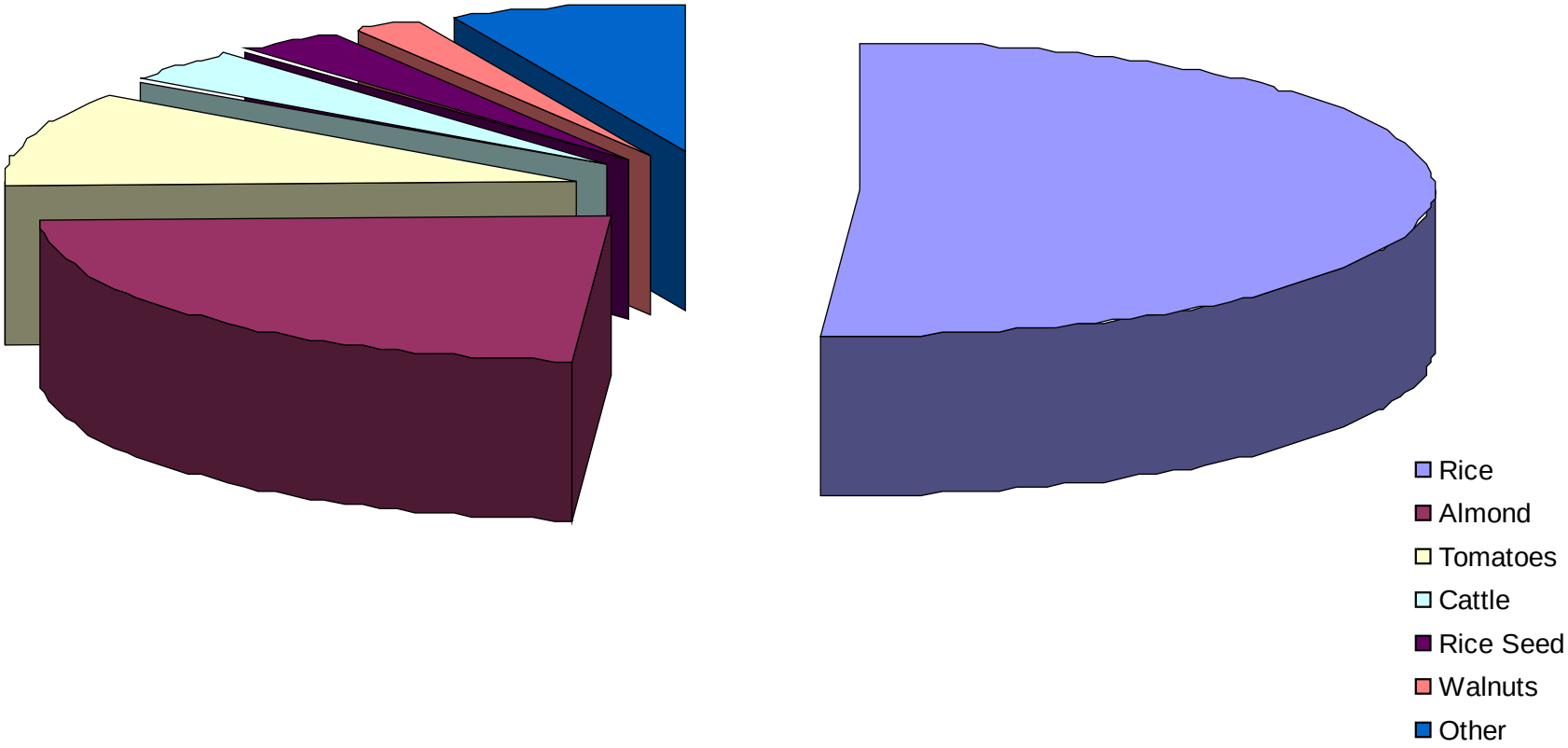

Source: California Agricultural Statistics Service (2002-03). Chart indicates leading commodities in gross value

FIGURE 6.4-2
COLUSA COUNTY
AGRICULTURAL PRODUCTION
SACRAMENTO VALLEY IRWMP

WB082006010RDD_45 (8/30/06)

6.5 Butte County

6.5.1 Introduction and Summary

The following summarizes the local setting, current and future land and water use, and primary recommendations in the Butte County area. Butte County officials were interviewed and consulted as part of the development of this IRWMP and identified the following key and/or highest priority water- and land use related issues:

- Development of agricultural lands in the rural areas of the county, and the need for water and sewer services to these areas
- Potential groundwater impacts from urban development and protection of county groundwater resources
- Potential development of the Lower Tuscan Formation and protection of recharge areas
- Groundwater quality protection in the City of Chico
- Continued protection of water quality
- Continued monitoring of the groundwater BMOs

6.5.1.1 Local Setting

Butte County is located on the eastern side of the Sacramento Valley and western Sierra Nevada. The Sacramento River flows along a portion of the western boundary of the county. The Feather River is the largest river within the county. Lake Oroville is located behind Oroville Dam on the Feather River in the foothills above the Town of Oroville (Figure 6.5-1). Oroville Dam is owned by the Department, which operates it, along with Thermalito Forebay and Afterbay, as part of the SWP.

The valley floor portion of Butte County consists of irrigated agriculture with primary crops being rice and orchards. The City of Chico is the largest urban area in this otherwise agricultural county. Other smaller urban areas include Biggs and Gridley on the valley floor, and Oroville and Paradise in the foothills. The current population of Butte County is estimated at 217,200. The population is expected to grow primarily in these urban areas between now and 2030 to about 320,000. Additional growth is also occurring in unincorporated parts of the county, which are more rural agricultural areas. Providing services such as water and sewer is one of the challenges facing the county for these lands resulting from the conversion of agricultural lands to urban uses.

The water needs of Butte County are met with a combination of surface water and ground-water from the alluvial groundwater subbasins of the Sacramento Valley Groundwater Basin. The Lower Tuscan Formation is the primary groundwater-producing aquifer in the county.

The larger public water supply wells extract water from the Lower Tuscan Formation and many smaller private domestic and agricultural wells rely on the overlying alluvial deposits.

Most of the recharge areas of the Tuscan Formation are located along the base of the Sierra Nevada foothills in Butte County. Groundwater quality is generally good, but there are some areas of concern. The City of Chico has some groundwater quality issues including high nitrates (from septic systems), tetrachloroethylene/trichloroethylene plume (from dry-cleaner releases), and petroleum plume. Portions of the south part of Butte County have elevated arsenic levels.

Some local water purveyors contract for SWP water through their settlement agreements with the Department. Much of the surface water use in the county is for agriculture. Groundwater is also used to supplement surface water supplies for agricultural uses in the areas not supplied with district water. Currently, most of the urban and domestic water needs are met with groundwater, although some surface water supplies are in the foothill areas. Paradise Irrigation District, Thermalito Irrigation District, South Feather Water and Power, Del Oro Water Company, and California Water Service in Oroville all use surface water supplies to help meet their needs.

6.5.1.2 Local Water Resources Management

In July 1999, the Butte County Board of Supervisors approved the formation of the DW&RC. The mission of the DW&RC is "…to manage and conserve water and other resources for the citizens of Butte County," thereby defining Butte County as its "Planning Region" for the evaluation of water resources management issues. Since its inception, the DW&RC has focused on coordinating local water resource management. To gather the information necessary to set a course for protection and management of resources, the DW&RC initiated an Integrated Water Resources Program. Part of this program is the *Integrated Water Resources Plan* (Butte County IWRP), which presents policy recommendations developed through close collaboration with a diverse stakeholder group. The IWRP is intended to provide direction for resource management and protection into the future.

In June 2004, Butte County adopted the IWRP that was prepared for the DW&RC to develop water resources policy recommendations for consideration by the Butte County Board of Supervisors (CDM, 2004). This plan is part of Butte County's proactive Integrated Water Resources Program. Some of the results of the Butte County IWRP are summarized in this analysis. Additional details and supporting information are available from the Butte County IWRP and the supporting documents.

In addition to the DW&RC, over 15 agencies have water resources management responsibilities and land use planning responsibilities in Butte County. They are listed below

and shown on Figure 6.5-2. The following agencies, along with other stakeholders and interested parties, participated in the preparation of the Butte County IWRP:

- **Water and Irrigation Districts**
  - Biggs-West Gridley Water District
  - Butte Water District
  - California Water Service Company (Oroville Area)
  - Del Oro Water Company
  - Durham Mutual Water District
  - Oroville-Wyandotte Irrigation District
  - Lake Madrone Water District
  - Magalia County Water District
  - Paradise Irrigation District
  - Ramirez Water District
  - Durham Irrigation District
  - Richvale Irrigation District
  - Thermalito Irrigation District
  - Western Canal Water District
- **Flood Management Agencies (not shown on Figure 6.5-2)**
  - Maintenance Area No. 5
  - Maintenance Area No. 7
  - Maintenance Area No. 13
- **Land Use Planning Agencies**
  - Butte County
  - City of Chico
  - Biggs
  - Gridley
  - Paradise

6.5.1.3 Existing and Future Land and Water Use Conditions

The IWRP relied upon the *Butte County Water Inventory and Analysis* (Water Inventory) (CDM, 2001) to estimate water supply and water demands analysis for agricultural, urban, and environmental demands in average and dry water years. As part of the Water Inventory, the county developed agricultural and urban water demand forecasts and an initial environmental demand assessment. Different methodologies were used for each sector to address specialized needs to account for various water factors that affect each sector. The findings show that future agricultural water demand will decline slightly, urban demand will

increase, and additional monitoring and research is needed to project future environmental demand.

This section presents the results and conclusions of land and water use analysis completed in the Water Inventory and summarized in the Butte County IWRP.

Recent preliminary updates on development and regional growth projections for the 2006 to 2030 period prepared by the Butte County Association of Governments describe the overall growth within Butte County. The population of the City of Chico is expected to increase by about 48,000 to about 127,000 by 2030. This represents an annual growth rate of about 2.5 percent. The Cities of Biggs, Gridley, and Oroville are expected to have an annual growth rate of around 5 percent each, representing an increase in population of about 2,200, 7,200, and 15,000 respectively. These growth rates do not include annexations. The unincorporated parts of the county area are expected to grow at about 1 percent per year, adding about 24,300 people by 2030.

Agricultural Demand

Existing Agricultural Demand

The Butte County IWRP identified about 230,500 acres of irrigated cropland in a fully cropped normal year, with rice accounting for about 110,000 acres or 48 percent of the irrigated acreage. Other major crops in the county include orchards, grains, and pasture. The 2005 Butte County Agricultural Crop Report shows that harvested rice acreage has reduced to 96,400 acres. In addition, the Crop Report also showed almonds as the highest valued crop in the county due to increased yield and unit value.

For water planning purposes, the Water Inventory characterized the agricultural demands in the county in average and dry years. The report estimates the water demand using the Department's 1997 land use data, Agricultural Commissioner Reports, and discussions with landowners and water purveyors regarding irrigated crop acreage and irrigation requirements.

The total agricultural water demand in the county is estimated at about 1 million ac-ft in a normal year and about 1.1 million ac-ft in a drought year (about 70 and 73 percent of the county demand, respectively).

The Butte County IWRP states that the county has an adequate supply of surface water and groundwater to meet current agricultural demands.

Future Agricultural Demand

Future agricultural water demands will vary from current demands because of changes in economic, land use, and hydrologic conditions. In the Butte County IWRP, future agricultural water demands were evaluated using potential reasonable scenarios for future

agricultural water use. The scenarios are summarized in Table 6.5-1 and described as follows:

- **Agricultural Land Conversion** – This scenario reflects the recent trends that show agricultural land conversion for urban and environmental uses.
- **Increased Crop Prices** – This scenario reflects the changing market demands, competition from other production regions, and government programs.

TABLE 6.5-1
Summary of Agricultural Demand Forecast Scenarios

Scenario	Implementation Method	Analytical Representation
Land Conversion	Decrease total land in production	Decrease irrigated land – 3% in Vina and West Butte Decrease irrigated land – 1% in East Butte
Crop Idling	Decrease surface water used for crop production	Decrease surface water delivery – 10%
Crop Prices	Increase relative crop prices	Increase rice and orchards price – 10%
Water Conservation	Increase crops irrigation efficiency	Set target irrigation efficiencies for each crop
Combination Scenario – Average and Dry Years	Combines land conversion, crop idling, and conservation scenarios	Decrease irrigated land – 3% in Vina and West Butte Decrease irrigated land – 1% in East Butte Decrease surface water delivery – 10% Set target irrigation efficiencies for each crop

- **Increased Crop Idling** – This scenario reflects the opportunity to idle land to develop a water source to meet new and increased water demand for environmental resource protection and water supply reliability.
- **Conservation** – This scenario reflects water conservation as an important component of managing water demands and supplies in the future. Increased irrigation efficiency would provide additional water supplies from savings associated with onfarm irrigation systems and management.
- **Combination Scenario** – This scenario forecasts likely changes in agricultural water demand, taking into account a combination of the most probable land and water use changes.

The agricultural demand forecast analysis indicates that most of the reasonably foreseeable changes would not result in significant long-term changes in agricultural water demand in Butte County. In the combination scenario, individual regions would see a reduction in agricultural water demand ranging from a minimum of 0.6 percent to a maximum of 8.75 percent. The total water demand in the county decreases by 60,500 ac-ft (6.0 percent) in an average year and 71,300 ac-ft (6.3 percent) in a dry year under the combination scenario.

Urban Water Demand

The urban water demand in Butte County was evaluated for the six study areas listed in Table 6.5-2 for the years 2000, 2010, 2020, and 2030. Urban water use includes household uses, commercial and industrial uses, and landscape irrigation.

TABLE 6.5-2
Forecast Model Study Area

Study Area	Water Purveyor(s)
Biggs	City of Biggs
Chico	California Water Service Company, Chico
Gridley	City of Gridley
Oroville	California Water Service Company, Oroville Oroville-Wyandotte Irrigation District Thermalito Irrigation District
Paradise	Paradise Irrigation District
Unincorporated Areas	Several small water purveyors (not listed) Private wells

Existing Urban Demand

The 2000 annual urban and domestic water demand totaled about 67,400 ac-ft for the county. Chico and the unincorporated areas of the county have the largest demands. The existing urban demands are summarized in Table 6.5-3.

TABLE 6.5-3
Annual Urban Water Demands

City	2000 Urban Demand (ac-ft)	Percent Increase in Urban Demand[a]	2030 Estimated Urban Demand (ac-ft)
Biggs	600	44	800
Chico	25,800	96	46,000
Gridley	1,600	33	2,000
Oroville	5,500	77	9,000
Paradise	7,600	11	8,300
Unincorporated Areas	26,300	Slight decline	25,000
Total	**67,400**		**91,100**

[a]Percent increase in single housing family units from 2000 to 2030.

Future Urban Demand

Future urban water demands vary from current demands because of changes in development, population, economic, and hydrologic conditions. The complete analysis is available in the *Butte County Urban Water Demand Forecast Report*. The urban water demand forecast analysis used IWR-MAIN Water Demand Management Suite© to perform the urban water demand forecast with the adjusted rate of water use forecasting method.

As shown in Table 6.5-3, the urban demand of the entire county is estimated to increase by about 50 percent between 2000 and 2030. The county's urban growth is primarily due to increases in residential and commercial uses in Chico. The unincorporated areas would decline somewhat because of the urban annexation of existing housing developments that are currently in unincorporated areas.

Environmental Demand

During the preparation of the Butte County IWRP, the DW&RC performed preliminary environmental demand calculations as a frame of reference for water resource planning, recognizing that additional data were needed to provide a more detailed estimate of actual environmental water demand.

The Water Inventory calculated environmental water demand for managed wetlands and rice decomposition in Butte County. Total environmental water demand is approximately 139,000 ac-ft in a normal year and 161,000 ac-ft in a dry year. The report also calculates conveyance losses, which can be considered an environmental water use. Conveyance losses were 230,100 ac-ft during a normal year and 185,100 ac-ft during a dry year. The Water Inventory did not calculate environmental demands associated with riparian and terrestrial vegetation or instream demand.

6.5.1.4 Existing and Ongoing Planning

Butte County has been working for many years to more effectively manage and protect its water resources. Some of the existing and ongoing planning efforts are as follows:

- Groundwater Conservation Ordinance (Chapter 33)
- Well Spacing Ordinance (Chapter 23B)
- Update of Butte County Water Inventory and Analysis
- Groundwater Management Plan (AB3030 Plan)
- Groundwater Monitoring Program
- Update of Butte Basin Groundwater Model
- Urban Stormwater Management Plan

In addition, the IWRP has initiated the following efforts:

- Drought Management Plan
- Water Resources update of the Conservation Element in the General Plan
- Preliminary design for an Environmental Monitoring Program
- Basin Management Objectives

Some of the relevant Butte County water resources planning documents are identified in Table 6.5-4.

TABLE 6.5-4
Existing and Relevant Butte County Water Resource Planning Documents

Planning Document	Description	Lead Agency and Date Published
Butte County Water Inventory and Analysis	Contains water supply and demand data.	Butte County DW&RC (2001)
Butte County Groundwater Inventory	Contains groundwater data and groundwater setting.	Butte County DW&RC (2001)
Integrated Water Resources Program	Provides outline to establishing water management policy for county.	Butte County DW&RC (2004)
Butte County Groundwater Management Plan	AB3030 Groundwater Management Plan.	Butte County DW&RC (2001)
Drought Management Plan	Contains plan to reduce short- and long-term impacts of drought to Butte County.	Butte County DW&RC (Ongoing)
Groundwater Management Ordinance 3869	Documents county's approach to managing groundwater resources.	Butte County Board of Supervisors (2004)
Groundwater Status Report	Summarizes groundwater level and land subsidence data collected through October 2004.	Butte County Water Commission by the Butte Basin Water Users Association (2005)
Northern Sacramento Valley (Four County) Drinking Water Quality Strategy Document	Contains water quality information from the Counties of Butte, Glenn, Colusa and Tehama.	Glenn County Department of Agriculture (2005)
BMOs Groundwater Management In Butte County, California	Describes BMOs within Butte County.	Butte County (2006)

6.5.1.5 Plan Areas

The Water Inventory organized the county into planning subareas to evaluate land and water use conditions based on the following considerations:

- Water use
- Topography
- Land use

- Geological setting
- Proximity to water source
- Water district boundaries

As a result of these considerations, the county was organized into the following five subareas shown on Figure 6.5-3:

- Vina Subarea (Chico)
- West Butte Subarea
- East Butte Subarea (highly agricultural)
- North Yuba Subarea
- Mountain/Foothill Subarea

Much of the analysis included in the Butte County IWRP is based on these subareas and includes evaluation of agricultural land use and water demands. Additional information regarding the land and water use analysis is available in the Water Inventory.

6.5.1.6 Local Water Management Issues and Strategies

Water Management Objectives

The Butte County IWRP identified planning objectives that describe what the county should achieve with regard to water management. These objectives serve as expressions of the variety of ideas and concerns held by the stakeholders and provide a reference for the evaluation and comparison of the water management strategies. The primary objectives identified by the stakeholders and the steering committee during the development of the Butte County IWRP follow, along with the relative rankings of each objective:

- **Local Control**
  - Barriers to local control (11)
  - Seek consistency and applicability at the regional level (2)
- **Water Supply**
  - Protect water rights (8)
  - Improve water management (13)
  - Meet future in-county water demands (23)
  - Meet county urban, agricultural, and environmental needs first (11)
  - Protect public health and safety (7)
- **Economy**
  - Maintain and enhance economic health of the county (14)
  - Minimize cost effects (5)

- Minimize third-party impacts (8)
- Protect rural way of life (6)

- **Natural Resources**
  - Protect and enhance biological resources (17)
  - Improve water quality (18)
  - Increase understanding of existing environmental conditions (9)
  - Integrate watershed management programs (8)

The Butte County IWRP weighted and ranked the planning objectives to show their relative importance.

Water Management Options

The Butte County IWRP identified 30 options that might help to meet Butte County objectives (listed above). An "option" is a project, program, or policy that could be implemented to help meet the county's future water management needs. The options were grouped into six categories based on their function. These categories are as follows:

1. Environmental
2. Water Use Efficiency
3. Ridge Supplies
4. Coordinated Management
5. Policies
6. SWP Allocation Management

Environmental

This category includes options that address environmental concerns in Butte County relating to special-status species habitat, water quality, and environmental water demand. Water resources-related actions that benefit environmental resources generally fall into three categories: (1) increasing flows to improve habitat, (2) restoring more natural flow patterns in rivers and creeks, and (3) increasing understanding of water quality and environmental resources.

Other options in this category propose to improve the understanding of the county's water quality and environmental resources. Increased monitoring would help the county understand surface water and groundwater quality and how the quality affects both environmental resources and water supplies.

Water Use Efficiency

Increasing water use efficiency can provide additional available water for future drought protection or other in-county beneficial uses. Public education programs would help people understand the effects of their actions on water quality and quantity, and understanding these

effects could lead to more efficient practices. The county or local water districts could work with the California Urban Water Conservation Council, the Agricultural Water Management Council, or CALFED to implement efficient water management practices.

Ridge Supplies

This option category proposes projects to address potential future water shortages in the Ridge communities, including the Town of Paradise and surrounding developments. The Ridge area has a growing population, and the water supply must be increased to meet future needs, particularly during dry years. The Ridge area water purveyors are investigating options to increase supplies, and the options within this plan are derived from those local investigations.

Coordinated Management (Conjunctive Use)

Coordinated management of groundwater and surface water enables better management of both resources. This category would help manage groundwater fluctuations to ensure future county water supplies. Coordinated management includes several components: (1) recharge, or placing water into the aquifer; (2) monitoring groundwater levels, groundwater quality, and subsidence; and (3) recovery of water from the aquifer.

Policies

The policy options propose to improve water management within the county, address regional water issues, and improve the county's water quality. These options do not identify on-the-ground projects, but rather identify policies that the DW&RC could adopt to help meet the planning objectives.

State Water Plan Allocation Management

This category includes one general option to develop a mechanism for managing the unused portion of its SWP allocation. The county could use the allocation as part of other options, many of which rely on a portion of the SWP allocation for implementation.

Options represent potential means of accomplishing the planning objectives. The options were screened for their general feasibility, which included an assessment of the technical, legal, political, financial, and environmental feasibility. Only the feasible options were carried forward for evaluation. Figure 6.5-4 reflects the results of the screening process. An "X" indicates that a criterion was not met and the option was screened out of the process. The options were combined into reasonable packages that have an ability to achieve multiple complementary objectives.

Water Management Packages

A total of 30 options passed the screening criteria, but no single option was capable of addressing all of the county's water management issues on its own. As a result of this, "packages" of options were developed that would meet multiple objectives. The packages were created by organizing the options according to their combined ability to address specific problems (called Problem Statements), which described potential issues the county could face in the future. The six Problem Statements are as follows:

- The Ridge area is projected to have water supply shortages during dry years.
- The county faces a potential reduction in its 27,500-ac-ft SWP allocation if it is not put to beneficial use, but using the entire allocation in the county could be problematic because it is very expensive.
- Water quality degradation could affect future supplies and biological resources.
- Outside interests might attempt to use county water resources that are not used beneficially within the county.
- The county must cope with fiscal challenges.
- The county faces historical and ongoing threats to its terrestrial and aquatic habitats.

The option packages were formed to focus on a single Problem Statement. Additional options were then added to an option package to address multiple Problem Statements, while maintaining the primary focus on the original, single Problem Statement. Two of the guidelines when grouping options into packages included the following:

- The package must pay for itself.
- The SWP allocation quantity must not be exceeded.

During the development of the option packages, it was found that several options were included in each package. These were eventually identified as base options and included as part of each package. The following four-option packages were identified through this process are described in detail in the Butte County IWRP:

- Economic Health Package
- Threat of Outside Interest Package
- Environmental Package – Focus on Butte Creek
- Environmental Package – Focus on Feather River

After reviewing the option packages, it was determined that none of them fully met the plan objectives. As a result, a "hybrid" package was developed that could achieve a more favorable overall rating than the initial packages. The hybrid package was then used to develop the policy recommendations as described in the following section.

Policy Recommendations

The policy recommendations of the Board of Supervisors, presented in the Butte County IWRP, were developed using the evaluation results of the hybrid package and other option packages. The hybrid package evaluation results were used to develop the First Tier Policies characterizing the policy directives necessary to implement the option combinations. Policies generated from the remaining options fell into the Second Tier of recommendations. The First Tier and Second Tier Policies are briefly described below. A more complete description is included in the Butte County IWRP.

First-tier Policies

The First Tier Polices identified in the Butte County IWRP are listed and summarized as follows:

- **Continue Ongoing Water Resources Efforts** – Butte County has been working for many years to more effectively manage and protect its water resources. Some of these efforts are listed in Section 1.4 of this analysis.
- **Improve Water Management of the SWP Allocation** – The county must develop a mechanism for managing the unused portion of its SWP allocation and other water that might be available.
- **Increase Agricultural and Urban Water Use Efficiency** – The county recognizes that improved water use efficiency can provide additional supply for future drought protection or other in-county beneficial uses.
- **Recommend that BMOs Support Native Vegetation** – Sustaining natural vegetation above recharge zones is important for managing groundwater levels, because natural vegetation enhances riparian areas and wetlands that recharge the aquifer.
- **Protect Recharge Areas through Zoning –** Land use practices on recharge areas can affect the quality and quantity of recharge into the aquifer. Protecting habitat areas and limiting activities that could degrade water quality would reduce the potential for these effects.
- **Inform and Educate the Public about Water** – Fostering public knowledge and understanding regarding water resources can help to create a culture of resource stewardship. The county will increase public education to inform residents about local water resources and issues.
- **Increase Support for Butte County Resource Conservation District (RCD)** – The Butte County RCD can play an important role in managing water resources by fulfilling its mission to "…conserve the resources of Butte County for the benefit of its citizens, its environment, and its economy." The county will maintain administrative support for the RCD and help to coordinate activities with local watershed groups through the RCD.

- **Support Solutions to Potential Future Water Shortages in the Ridge Community** – The county will provide institutional support to help the Ridge community implement a solution to potential future water shortages.

- **Implement a Coordinated Management Program** – A coordinated management program could improve the flexibility and reliability of county water resources. A coordinated management program would include a recharge component to place water into the aquifer, a recovery component to extract water from the aquifer, a monitoring program to assess the aquifer behavior, and an institutional framework within which the program would function. The county will study the feasibility of a coordinated groundwater-surface water management program and will seek to implement programs that are feasible and environmentally beneficial.

- **Take Steps to Understand and Improve Butte County Water Quality** – Understanding threats to water quality and improving water quality in Butte County are important aspects of resource stewardship. Known constituents affecting the county's water quality include nitrates, organic chemicals, sediment, and heavy metals. The county will support investigations to improve understanding of Butte County's surface water and groundwater quality.

- **Serve as an Advocate to Improve Understanding of and Conditions for Special-status Species in Creeks and Rivers** – Many creeks and rivers in Butte County provide valuable habitat for special-status species (i.e., state- and federal-listed species). The presence of these species, their requirements, and the threats to their health are not fully understood. A need exists for a better understanding of these species' location-specific requirements and for identification and implementation of actions to improve conditions for these species. The county will use Service and DFG documents to identify the type and location of special-status species and the habitat needs of these species. The county will initiate actions and participate in ongoing efforts to protect special-status species in creeks and rivers.

- **Coordinate Regional Watershed Management** – The county recognizes the efforts and progress made by the Butte County RCD and local watershed groups to meet distinct organizational and resource challenges. These local efforts could, in some cases, be enhanced through coordination and exchange of information and through sharing of staff and funding resources. Likewise, at the regional level, coordination of watershed management planning among Butte, Plumas, Yuba, and Lassen Counties could achieve mutual benefits. The county will support watershed planning and management through the RCD.

- **Implement an Environmental Monitoring Program** – Although the county has developed demand projections for municipal and agricultural water use, the county's environmental water needs are less well quantified. Better quantifying current and projected environmental water needs will allow the county to plan for its future water

needs and to protect the potential for beneficial, in-county use of its water resources. The county will implement an environmental monitoring program to increase knowledge regarding environmental resources and water demands.

- **Enhance a Multi-county Cooperative Outreach Effort** – Because management of the county's water resources affects – and is affected by – resource management in adjacent counties, opportunities might exist for the county to improve local, statewide, and federal understanding of regional water management issues and needs through a multi-county, coordinated outreach effort. The county will initiate a multi-county effort to cooperate with neighboring entities that share water resources.

Second-tier Policies

The Second Tier Polices identified in the Butte County IWRP are listed and summarized as follows:

- **Investigate the Potential for Water Storage in Former Mines** – Mining activities leave a pit that might have potential for use as a water storage reservoir. The county will investigate the potential for future water storage projects in former mines.
- **Expand Groundwater Level and Extraction Monitoring** – Increased monitoring of the groundwater aquifer will help the county protect the resource for the future. Butte County DW&RC and the Department, Northern District, have focused on characterizing the groundwater aquifer under Butte County, but additional information is needed in areas where significant volumes of groundwater are extracted each year. Increased ground-water level and extraction monitoring in these areas would provide information that could help the county and Department better understand the aquifer. The county would increase monitoring efforts to further this goal.
- **Commit to a Periodic and Coordinated Update of Water Management Plans, Ordinances, Resolutions, and Policies** – Water use and available supplies change regularly, especially with increasing development or changes in land use. Water management tools lose effectiveness if they are not updated as these changes take place. The county will commit to regularly updating water management plans, ordinances, resolutions, and policies, including management objectives.
- **Support Restoration of a More Natural Flow Regime on the Sacramento River** – The flow patterns and geomorphology of the Sacramento River vary from historical patterns of high flows during rainfall and snowmelt. Fish and riparian vegetation use flows to cue various behaviors, such as spawning and migration. Channel geomorphology also plays an important role in the river's suitability for riparian species. Butte County will provide institutional and political support to restore a more natural flow regime and geomorphology on the Sacramento River.

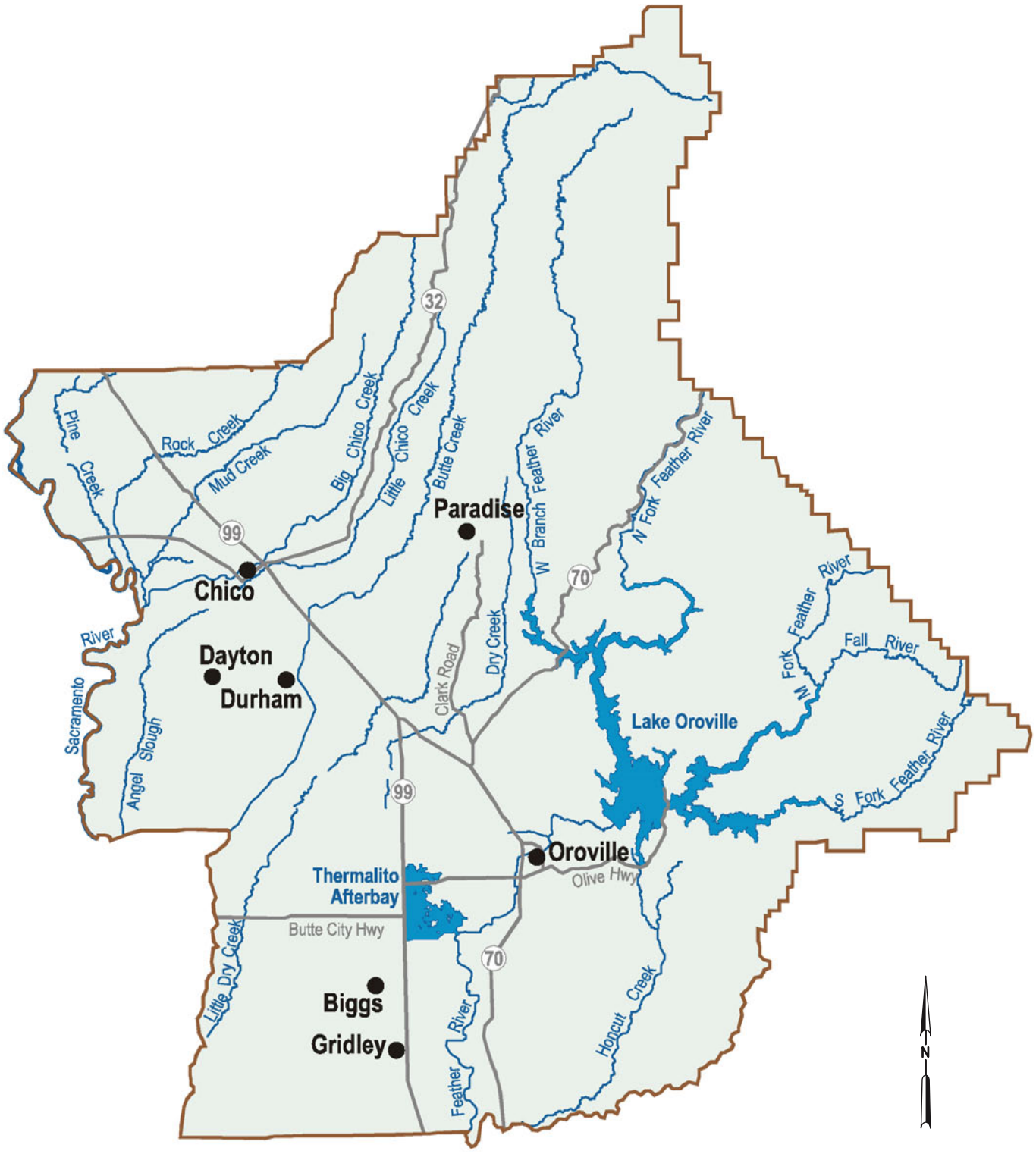

FIGURE 6.5-1
BUTTE COUNTY
HYDROLOGY MAP
SACRAMENTO VALLEY IRWMP

WB082006010RDD_46 (8/30/06)

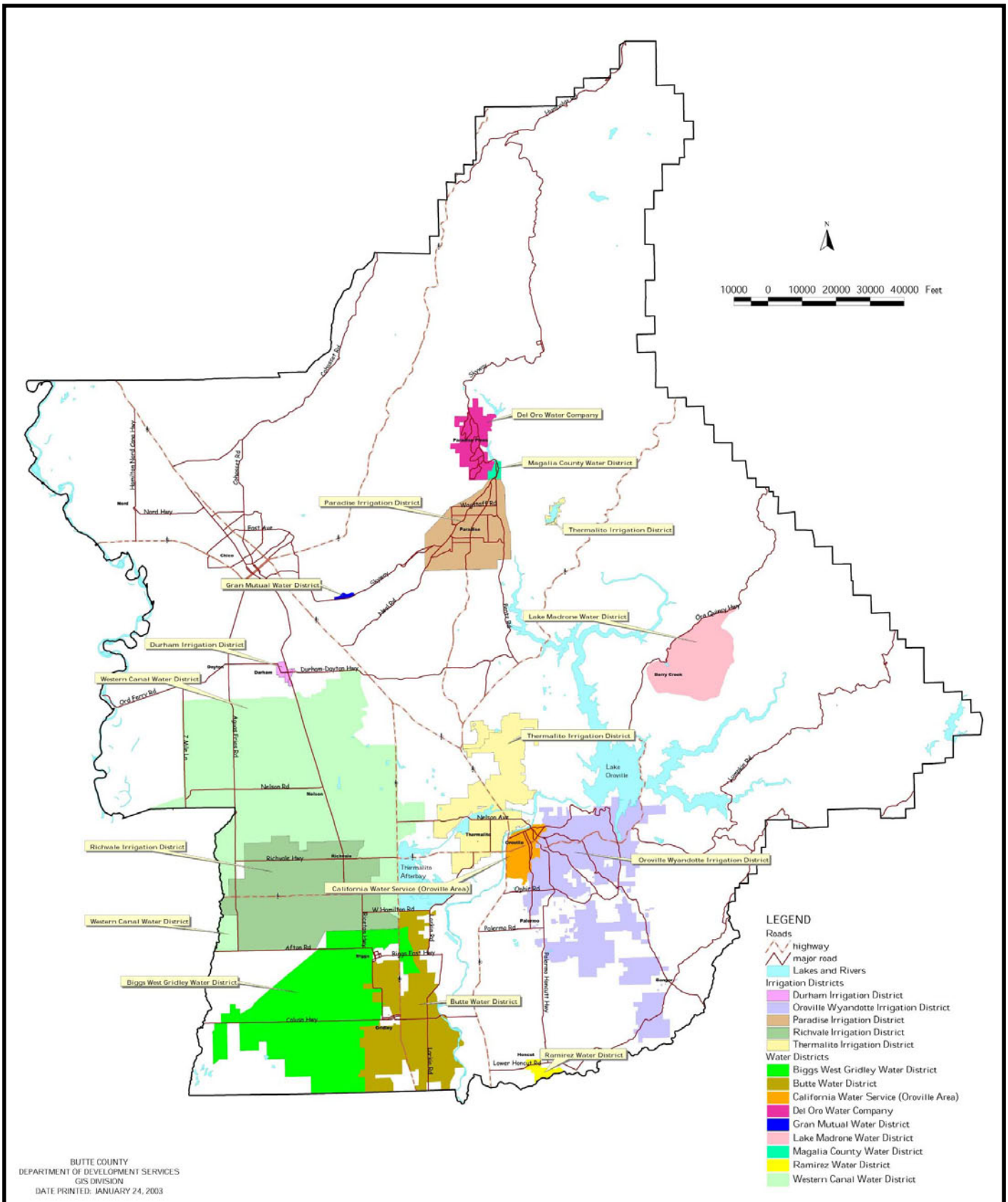

FIGURE 6.5-2
WATER DISTRICTS AND IRRIGATION DISTRICTS OF BUTTE COUNTY
SACRAMENTO VALLEY IRWMP

FIGURE 6.5-3
SUBAREAS FOR BUTTE COUNTY USED IN WATER PLANNING
SACRAMENTO VALLEY IRWMP

WB082006010RDD_48 (8/30/06)

	Option Number/Name	Screening Criteria: Technical	Legal	Political	Financial	Environmental	Benfits	Notes
Environmental	1. Increase fish flows in Upper Butte Creek							
	2. Increase fish flows in Lower Butte Creek							
	3. Restore a more natural flow regime on the Feather River							
	4. Develop a coordinated water quality database							
	5. Develop a coordinated and expanded water quality monitoring program							
	6. Implement an environmental monitoring program							
	7. Provide guidance in development of basin management objectives that support vegetation							
	• Increase flow on Big Chico Creek	X						*Big Chico Creek does not have upstream storage facilities or diversions that could be reoperated to increase flows*
Wtr Use Efficiency	8. Expand urban water efficiency measures							
	9. Expand agricultural water efficiency measures							
	10. Inform and educate the public about water							
	• Meter water use in Chico						X	*Redundant to expand urban water use efficiency measures option*
Ridge Supplies	11. Divert water from Miocene and Hendricks Canals to supply the Ridge							
	12. Build the Lime Saddle Pipeline to deliver water to the Ridge							
	13. Strengthen Magalia Dam to increase storage capacity							
	14. Raise Paradise dam to increase storage capacity							
Coordinated Management	15. Implement a coordinated management program							
	16. Identify and deepen shallow groundwater wells							
	17. Build a canal to deliver surface water to Cherokee and Esquon							
	18. Build the Oro-Chico conduit for in-lieu and direct recharge in Cherokee and Esquon							
	19. Construct groundwater recharge basins							
	20. Investigate a storage reservoir in Table Mountain's former basalt mine							
	21. Enhance natural recharge from local waterways through environmental restoration activities							
	22. Expand groundwater level and extraction monitoring							
	• Divert water from Miocene Canal to Dry Creek for groundwater recharge						X	*Redundant to Option 21 (enhance natural recharge)*
	• Construct tanks to store extracted groundwater				X		X	*Above-ground storage is expensive and not necessary; the groundwater aquifer can function as a storage facility*
	• Retire land in recharge areas			X				*County residents would likely not accept retiring land over recharge areas*
	• Adjudicate groundwater basin			X			X	*Adjudicating the groundwater basin would be unpopular and would not benefit County residents*
Policies	23. Create a groundwater replenishment district							
	24. Protect recharge area water quality through zoning							
	25. Commit to a periodic and coordinated update of water management plans, ordinances, resolutions and policies							
	26. Initiate a multi-county cooperative outreach effort							
	27. Increase support for the Butte County Resource Conservation District							
	28. Coordinate regional watershed management							
	29. Support restoration of a more natural flow regime on the Sacramento River							
	• Establish a no-growth policy for cities			X				*Cities would not be likely to accept no-growth policies*
	30. Improve management of unused SWP allocation							

X *Option is unacceptable in this category*

Source: Butte County Integrated Water Resources Plan, Table 4-1 (June 2004)

FIGURE 6.5-4
OPTION SCREENING
SACRAMENTO VALLEY IRWMP

LETTER 19

The Sacramento Valley

Water Management Agreement

September 2001

The Sacramento Valley Water Management Agreement is a grassroots, collaborative effort to increase water supplies for farms, cities, and the environment

Sacramento Valley Water Resources

Sacramento Valley at a Glance

- The Sacramento River supplies 80 percent of the water flowing into the Delta.
- The Sacramento River and its tributaries are major habitat and spawning grounds for threatened and endangered fish species.
- The Sacramento Valley has more than 20 percent of California's total irrigated acreage.
- Sacramento Valley water shortages are predicted to continue for both average and drought years.
- The Sacramento Valley is a major resting point for millions of migratory waterfowl on the Pacific Coast Flyway.
- The Sacramento Valley is home to 2 million people.

LETTER 19

The Sacramento Valley Water Management Agreement

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Pg.11 Appendix A - The Sacramento Valley Water Management Agreement

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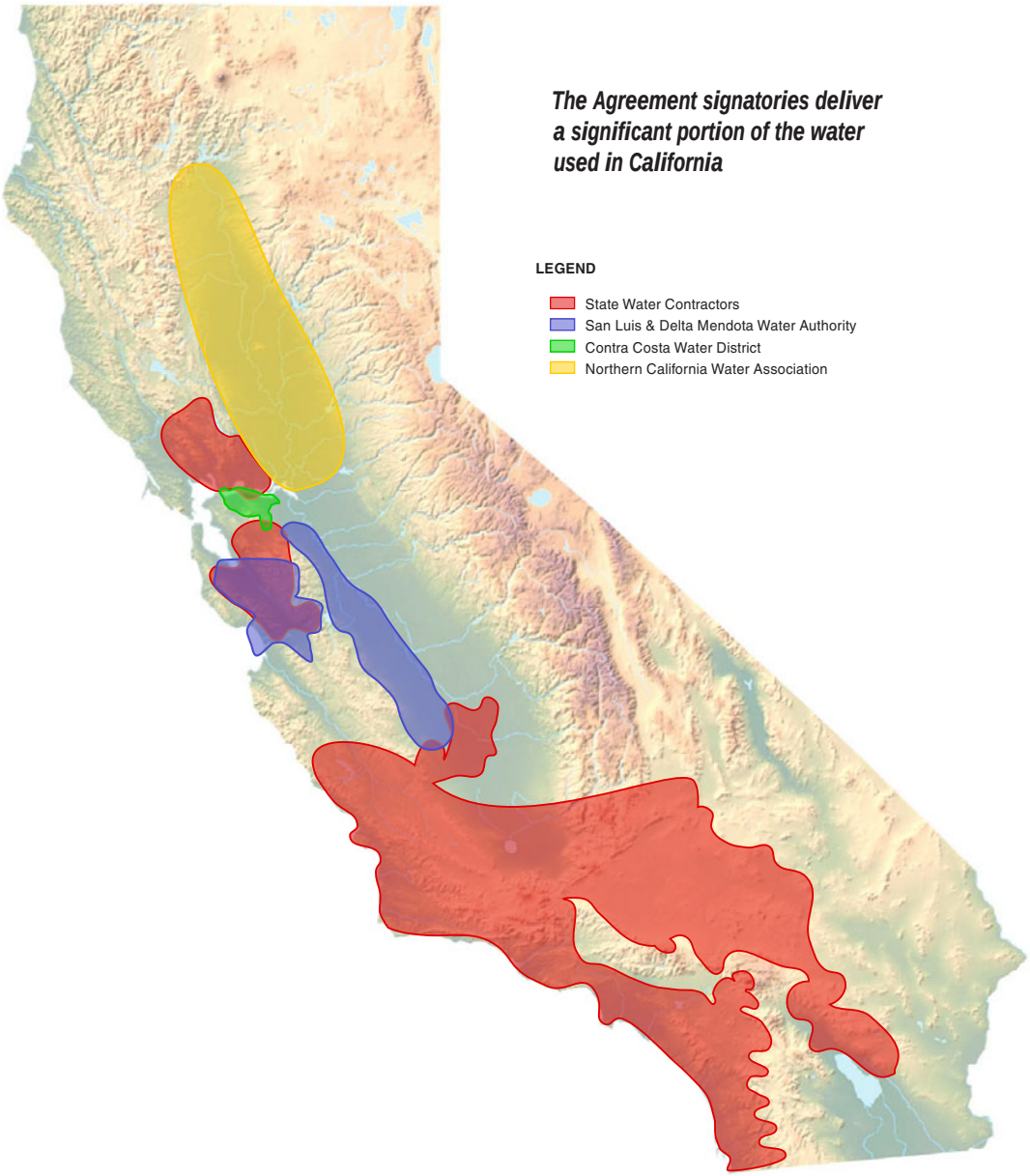
Pg.19 Appendix C - State Water Resources Control Board Decision

The Sacramento Valley Water Management Agreement

In April 2001, more than 100 organizations reached an unprecedented agreement to manage water in a way that meets water supply, water quality, and environmental needs in the Sacramento Valley and throughout California.



Agreement Benefits

Increased supplies for all uses

Through integrated water management strategies, upstream and export water users will be able to optimize existing water supplies, enhance water quality, and develop additional supplies. This will enable them to meet existing and future water needs and enhance their water management flexibility.

Sustainable solution

The Sacramento Valley Water Management Agreement (Agreement) calls for solutions to complex problems, rather than stopgap measures. Solutions will be implemented in two tiers, based on how quickly the project can be implemented and begin providing benefits.

Timely resolution

The Agreement provides firm milestones to complete a joint workplan for short-term projects within the first 180 days. These projects will provide benefits for the 2002 and 2003 water years; a long-term workplan will be completed within 1 year.

Environmental restoration

The programs and projects provided for in the Agreement will avoid unmitigated impacts to Delta water quality and the environment and will be developed and implemented to provide environmental benefits, including benefits to fish and wildlife, in the Sacramento River watershed.

Water quality standards will be met

The California Department of Water Resources and the U.S. Bureau of Reclamation will continue to voluntarily meet the requirements in the State Water Resources Control Board 1995 Water Quality Control Plan to protect the Bay-Delta until a long-term solution is negotiated as a part of the Agreement.

Consistent with other water management activities

The projects implemented under this Agreement are consistent with the August 2000 CALFED Bay-Delta Program Record of Decision and with the CALFED Integrated Storage Investigation.

LETTER 19

A 40-Year Struggle for Bay-Delta Water Quality

1959
Delta Protection Act passed.

1971
State Water Resources Control Board (SWRCB) issues Delta Water Right Decision 1379.

1973
California Department of Fish and Game (DFG) conclude Peripheral Canal best Delta water facility.

1974
Department of Water Resources (DWR), DFG, U.S. Bureau of Reclamation (USBR) and U.S. Fish and Wildlife Service (USFWS) sign statement of intent that agencies will provide protection of Delta fish and

1977
California experiences driest year on record.

1978
SWRCB issues Water Right Decision 1485 (D-1485) requiring Central Valley Project (CVP) and State Water Project (SWP) operations to meet Delta water quality standards.

1979
USBR announces CVP will voluntarily comply with D-1485 until mandatory compliance is resolved.

1982
Voters defeat Proposition 9 – the Peripheral Canal Measure.

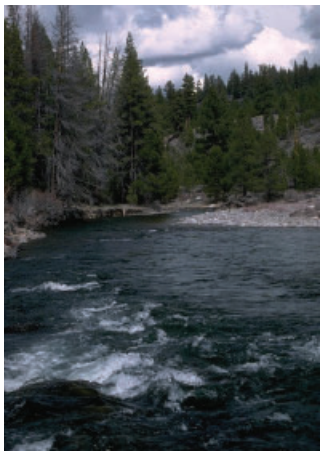
1986
Racanelli Appellate Court Decision requires SWRCB to revise water rights and water quality process.

Historic USBR-DWR Coordinated Operation Agreement authorized by Congress.

California's Sacramento Valley is rich in agricultural and environmental resources and serves as a major resting point for millions of migratory waterfowl on the Pacific Coast Flyway. The Sacramento River is the lifeblood of this Valley. The Sacramento River and its tributaries are major habitat and spawning grounds for threatened and endangered fish species and supply more than 80 percent of the inflows to the Sacramento-San Joaquin Delta. The Delta is the largest estuary on the west coast and serves as the hub for California's water system.

Competing agricultural, environmental, and urban uses create serious water management challenges within the Sacramento Valley. Current forecasts predict continuing statewide water shortages in both average and drought years. Water managers are striving to ensure that the water supply is of both adequate quantity and quality for the many uses.

For nearly 40 years, the State of California has struggled to develop the appropriate water quality standards for the Bay-Delta and to determine which water sources are required to meet those standards. This struggle has involved years of contention and litigation and has been elevated to the United States Supreme Court.



A major breakthrough occurred in late 1994 with the so-called Bay-Delta Accord (Accord). The Accord set water quality standards and required the State Water Resources Control Board (Board) to determine which water users would be responsible to meet these standards. In 1995 the Board adopted the Water Quality Control Plan (Plan) as a tool to implement the Accord. The California Department of Water Resources (Department) and the U.S. Bureau of Reclamation (Bureau) have been voluntarily meeting the Plan's water quality standards on an interim basis. Meanwhile, the Board held water rights proceedings to determine final responsibility for meeting the standards.

1987
SWRCB begins proceedings to revise D-1485 upon U.S. Environmental Protection Agency (USEPA) declaration that it is inadequate to protect Bay-Delta water quality.

1988
Senate Bill 34 passes, providing $120 million over 10 years for Delta levee maintenance.

1991
SWRCB releases new salinity control plan for Bay-Delta.

USEPA calls for more stringent standards.

1992
President George Bush signs CVP Improvement Act, requiring among other things, 800,000 a.f. of water annually for the environment.

1993
Delta smelt declared federal threatened species. SWRCB resumes work on permanent Delta Water Quality Standards.

USEPA proceeds with setting federal Bay-Delta standards.

1994
Bay-Delta Accord signed. CALFED formed.

Sacramento River winter-run chinook salmon listed as federal endangered species.

1995
SWRCB adopts new water quality standards and begins water rights proceedings.

1997
Steelhead listed as federal threatened species.

1998
CALFED released programmatic draft EIS/EIR offering three alternatives for Delta restoration.

1999
Splittail minnow and spring-run chinook salmon listed as federal threatened species.

2000
CALFED Record of Decision.

San Joaquin River Agreement.

2001
Sacramento Valley Water Managment Agreement.

Bay-Delta Water at a Glance

- More than 22 million people depend on the Delta for drinking water.
- More than 750 species of plants and animals call the Bay-Delta home, making it the richest ecosystem on the west coast.
- Seven million acres of the nation's most productive agricultural lands depend on Bay-Delta water to irrigate crops and water livestock.
- The Delta is a critical source of freshwater to blend with high salinity waters in other areas of the state to provide safe water for agricultural, environmental, and urban uses.

Phases 1 through 7 of the water rights proceedings involved the San Joaquin Valley and other Delta issues. After completion of these phases, the contentious Sacramento Valley issues (Phase 8) loomed over the State's water users.

In Phase 8, the Department and the Bureau claim that certain water rights holders in the Valley must cease diversions or release water from storage to help meet Delta water quality standards. Sacramento Valley water users believe their use has not contributed to water quality problems in the Delta; and as senior water right holders and water users within the watershed and counties of origin, they contend they are not responsible for meeting these standards. The Phase 8 process would ultimately determine which entities and individuals (if any) would be responsible for meeting water quality standards.

Agreement Partners

California Department of Water Resources
U.S. Bureau of Reclamation
State Water Contractors

San Luis & Delta-Mendota Water Authority
Contra Costa Water District
Northern California Water Association

San Luis & Delta-Mendota Water Authority includes the following:

Banta-Carbona Irrigation District
Broadview Water District
Central California Irrigation District
Centinella Water District
City of Tracy
Columbia Canal Company
Del Puerto Water District
Eagle Field Water District
Firebaugh Canal Water District
Fresno Slough Water District
Grassland Water District
James Irrigation District
Laguna Water District
Mercey Springs Water District
Oro Loma Water District
Pacheco Water District
Pajaro Valley Water Management Agency
Panoche Water District
Patterson Irrigation District
Plain View Water District
Pleasant Valley Water District
Reclamation District 1606
San Benito County Water District
San Luis Canal Company
San Luis Water District
Santa Clara Valley Water District
Tranquility Irrigation District
Tummer Island Water District
West Side Irrigation District
West Stanislas Irrigation District
Westlands Water District
Widren Water District

Northern California Water Association includes the following:

Brophy Water District
Browns Valley Irrigation District
Cordua Irrigation District
Feather Water District
Garden Highway Mutual Water Company
Glenn-Colusa Irrigation District
Joint Water Districts Board
- Biggs-West Gridley Water District
- Butte Water District
- Richvale Irrigation District
- Sutter Extension Water District

Maxwell Irrigation District
Natomas Mutual Water Company
Pelger Mutual Water Company
Plumas Mutual Water Company
Princeton-Codora-Glenn Irrigation District
Provident Irrigation District
Ramirez Water District
Reclamation District 108
Reclamation District 1004
South Sutter Water District
South Yuba Water District
Sutter Bypass-Butte Slough Water UA
Sutter Mutual Water Company
Tehama-Colusa Canal Authority
- Colusa County Water District
- Corning Water District
- Cortina Water District
- Davis Water District
- Dunnigan Water District
- 4-M Water District
- Glenn Valley Water District
- Glide Water District
- Holthouse Water District
- Kanawha Water District
- Kirkwood Water District
- LaGrande Water District
- Myers-Marsh Mutual Water Co.
- Orland-Artois Water District
- Proberta Water District
- Thomes Creek Water District
- Westside Water District

Thermalito Irrigation District
Tudor Mutual Water Company
Western Canal Water District
Yuba County Water Agency

State Water Contractors includes the following:

Alameda County Flood Control and Water Conservation District Zone 7
Alameda County Water District
Antelope Valley-East Kern Water Agency
Casitas Municipal Water District
Castaic Lake Water Agency
Central Coast Water Authority
City of Yuba City
Coachella Valley Water District
County of Kings
Crestline-Lake Arrowhead Water Agency
Desert Water Agency
Dudley Ridge Water District
Empire-West Side Irrigation District
Kern County Water Agency
Littlerock Creek Irrigation District
Metropolitan Water District of Southern California
Mojave Water Agency
Napa County Flood Control and Water Conservation District
Oak Flat Water District
Palmdale Water District
San Bernardino Valley Municipal Water District
San Gabriel Valley Municipal Water District
San Gorgonio Pass Water Agency
San Luis Obispo County Flood Control and Water Conservation District
Santa Clara Valley Water District
Solano County Water Agency
Tulare Lake Basin Water Storage District

DEPARTMENT OF WATER RESOURCES
DATED: 3/23/01
By Thomas M. Hannigan
Director

Approved as to legal form and sufficiency
Asst. Chief Counsel, DWR
DATED: 3/16/01

UNITED STATES BUREAU OF RECLAMATION
MID-PACIFIC REGION
By Lester A. Snow
Regional Director

STATE WATER CONTRACTORS
DATED: 4/3/01
By John C. Coburn
General Manager

SAN LUIS & DELTA-MENDOTA WATER AUTHORITY
DATED: 3/30/01
By David G. Nelson
Executive Director

CONTRA COSTA WATER DISTRICT
DATED: 4/3/01
By Walter J. Bishop
General Manager

NORTHERN CALIFORNIA WATER ASSOCIATION
DATED: 4/2/01
By David J. Guy
Executive Director

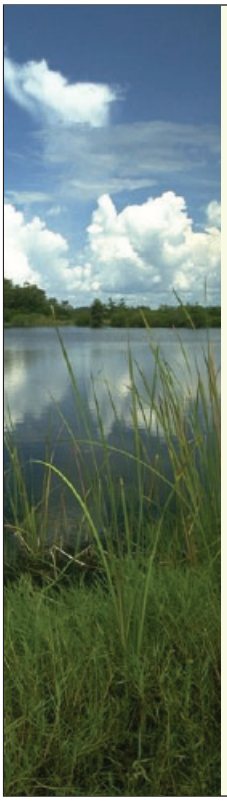
Unprecedented Cooperation

The Sacramento Valley Water Management Agreement is a grassroots, collaborative effort to increase water supplies to farms, cities, and the environment.

Proceeding with Phase 8 could involve litigation and judicial review for nearly 10 years. This extended process could result in adverse impacts to the environment and undermine progress on other statewide water management initiatives. To avoid the consequences of delay, the Sacramento Valley water users, the Department, the Bureau, and export water users developed the Sacramento Valley Water Management Agreement (Agreement). This Agreement establishes a framework to meet water supply, water quality, and environmental needs in the areas of origin and throughout California in an unprecedented cooperative spirit. The Board on April 26, 2001, issued an order to postpone and possibly dismiss Phase 8 of its Bay-Delta water rights proceedings and allow implementation of the Agreement, thus providing an amicable way to resolve these contentious issues.

Regional Strategy Based on Collaboration

The cornerstone of the Agreement is that it was achieved and will be implemented through a collaborative process including Sacramento Valley water users, the Department, the Bureau, and export water users. This will include active participation by water district managers, technical consultants, and local political leaders. The Agreement provides the foundation for a regional strategy to ensure that local water needs are fully met while helping improve water supplies throughout the state.



Agreement Principles

- The state and federal export projects will continue to meet water quality standards in the Delta until a long-term solution is negotiated as a part of the Agreement.
- The parties fully commit to an integrated water management and water supply development program for the Sacramento Valley that will meet 100% of the water needs in the Sacramento Valley, improve the water supplies and quality for other areas of the state, and provide water for environmental purposes.
- The parties will work together to secure public funding for water management and supply projects in the Sacramento Valley that will help assure environmental restoration, optimize the use of existing water supplies and enable local interests to develop additional water supplies in areas of origin.
- By the end of 2001, the parties will prepare a joint workplan for short-term Sacramento Valley water management projects to implement the Agreement. Workplans on longer-term projects will follow in 2002.
- The parties will evaluate the projects and workplans against the Agreement's goals and principles on an ongoing basis to ensure that water needs are being met.

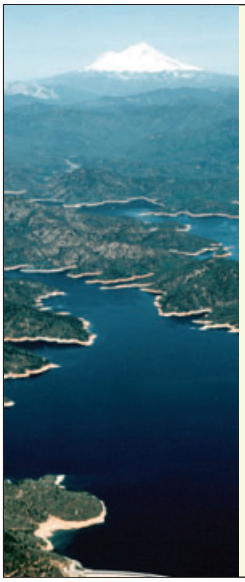
Next Steps: Workplans for Implementation

To implement the Agreement, the parties are preparing joint workplans. The workplans will describe certain Sacramento Valley projects and provide an estimate of the quantity of water or other water management benefits that can be realized by implementing these projects. The short-term workplan will provide benefits for 2002 and 2003 and will be completed by the end of 2001. The long-term workplan will be completed by May 2002.

The workplans will identify a palette of voluntary water management measures that will lead to an integrated water management program. The program will include the coordinated use of storage facilities, management and recovery of tailwater through major drains, water conservation, conjunctive management of surface water and groundwater, and transfers and exchanges among Sacramento Valley water users and other water users in the state. Furthermore, the Agreement contains a commitment to implement Sites Reservoir as an integral component of the water management and water supply development program for the Sacramento Valley.

The workplans are being developed through the process illustrated in Figure 1. It is a locally driven process, with

Figure 1 **Project Development Process**



Management Tools

Implementation of voluntary water management measures are key to accomplishing the goals of this Agreement. These include:

- Coordinated use of storage facilities
- Conjunctive management of surface water and groundwater
- Management and recovery of tailwater through major drains
- Water conservation
- Transfers and exchanges among Sacramento Valley water users and other water users in the state
- Increased surface storage

extensive involvement by all stakeholders. More than 50 stakeholders completed detailed questionnaires to propose projects for the short-term workplan. The proposed projects will be screened on the basis of a broad range of potential benefits and broad geographic coverage in the Valley.

Those projects will then be reviewed and evaluated on the basis of more detailed project summaries. From that review, projects will be selected for inclusion in the short-term workplan and implementation plans will be developed.

The next steps will be:

- Conduct environmental review and obtain necessary permits
- Secure appropriate funding
- Provide for public participation

Environmental review is a part of all projects, even those that will generate positive net effects on the environment. Environmental documentation will be prepared for all projects, and cumulative impacts will be addressed.

Funding will be pursued from a number of sources. As most of the projects will provide multiple benefits to various participants, cost-sharing arrangements will be negotiated to reflect those benefits. Many of the projects will also provide public benefits, primarily environmental, and efforts will be made to obtain state and federal funds to support those benefits. Potential funding sources include Proposition 13, Proposition 204, and state and federal funding through the CALFED program.

Public support will be crucial to successful development of the projects. Public meetings will be held to provide opportunities for full input into the planning process.

Appendix A

AGREEMENT REGARDING RESOLUTION OF PHASE 8 ISSUES, DEVELOPMENT AND MANAGEMENT OF WATER SUPPLIES, AND A BINDING COMMITMENT TO PROCEED PURSUANT TO SPECIFIED TERMS

This Agreement is in furtherance of a resolution of Phase 8 of the State Water Resources Control Board's (hereinafter "SWRCB") current Bay-Delta Water Rights Hearings. The Parties will work together to settle issues related to obligations or potential obligations to meet existing Bay-Delta water quality and flow objectives by developing a cooperative water management partnership among (a) those south of the Sacramento-San Joaquin Delta who possess water rights or are State Water Project ("SWP") or Central Valley Project ("CVP") water users; (b) the Contra Costa Water District and those who derive SWP water from the North Bay Aqueduct (hereinafter (a) and (b) for the purposes of this Agreement referred to collectively as "Export Water Users"); (c) those who possess water rights or are water users within the watershed of the Sacramento River and its tributaries (hereinafter "Upstream Water Users"); (d) the California Department of Water Resources (hereinafter "DWR"); and (e) the United States Bureau of Reclamation on behalf of the CVP (hereinafter "Reclamation"), all of which are hereafter referred to as the Parties.

Now therefore, it is mutually agreed as follows:

1. Goals and Principles

The Parties hereto agree to the following statement of goals and principles that shall guide the implementation of all aspects of this Agreement, including development of a cooperative water management partnership. This Agreement, during its term, is intended to:

(a) Provide the mechanism for satisfying the flow-related objectives of the SWRCB's 1995 Bay-Delta Water Quality Control Plan (hereinafter the "1995 WQCP");
(b) Be implemented in lieu of proceeding with Phase 8 of the SWRCB's Bay-Delta process;
(c) Facilitate the development of integrated water management strategies that will enhance the Upstream and Export Water Users' abilities to optimize use of their existing supplies, enable them to develop additional supplies to meet their existing and future water needs, and enhance their water management flexibility;
(d) Facilitate the development of protections to ensure that water stored and released by the SWP and the CVP is available for meeting downstream flow-related objectives and for SWP and CVP purposes, including exports from the Delta;
(e) Be implemented in a manner compatible with CALFED's goals;
(f) Facilitate the development of new near- and long-term water supplies through agreements among the Parties, and through the Governor's drought contingency plan, in ways that do not detract from the ability to meet the existing and future needs of Upstream Water Users;
(g) Avoid unmitigated impacts to Delta water quality or the environment;
(h) Provide net water quality benefits for Upstream Water Users, Export Water Users, and the Delta;
(i) Be implemented in a manner that provides that the comprehensive program will, among other factors, be cost effective, financially feasible, and affordable; and
(j) Result in state-wide water resource and environmental benefits and, therefore, receive funding from state and federal sources where appropriate.

2. Initial Elements of the Cooperative Management Partnership.

It is intended that the Goals and Principles adopted with this Agreement be implemented through the development of specific programs and projects. The development of these programs and projects will be an ongoing process and may, over time, involve numerous entities not signatories to this Agreement. These may include agencies of the state or federal government including, but not limited to, the United States Fish & Wildlife Service ("USFWS"), the National Marine Fisheries Service ("NMFS"), and the California Department of Fish and Game ("CDFG"), and may also include in-Delta water users. Moreover, over time, the Parties may decide to employ a facilitator or mediator to assist them in moving forward with project development and implementation. In this light, the following specific matters are intended only as the initial scope of work under this Agreement, with future work to be developed and implemented as appropriate. Future work plans, if appropriate, can become amendments to this Agreement or can be the subject of subsequent related agreements.

(a) *Quantifying Water Demands and Supplies*. The Parties recognize a need to develop reliable estimates of the quantities of water that are currently being used, present unmet demands and projected future demands within the watershed of the Sacramento River and its tributaries. The Parties also need to develop estimates of the quantities of new water supplies that could be made available to Upstream areas, Export areas, and to meet the 1995 WQCP standards based on the measures included in the programs and projects described below. The Parties agree to establish a technical committee to begin immediately to develop, collect and analyze this information.
(b) *Unmet and Future Demands in the Upstream Areas.* The Parties recognize that Upstream Water User demands may vary and that the following approximates the categories of upstream demands that will be provided for:
(i) Urban needs and uses within the watershed of the Sacramento River and its tributaries.

(ii) Needs and uses within the Tehama-Colusa and Corning Canal service areas.

(iii) Needs and uses within the Sacramento River Water Rights Settlement Contractors' collective service area.

(iv) Needs and uses within areas that obtain supply from the drains and bypasses within the Sacramento Valley.

(v) Needs and uses within the areas tributary to the Sacramento, American, and Feather Rivers.

(c) *Export Water Supplies.* The Parties recognize that Export Water Users have experienced water supply reductions as a result of regulatory and other actions. The programs and projects provided for in this Agreement will improve the water supplies on both a short- and long-term basis, and improve the water quality.

(d) *Environmental Benefits.* The Parties recognize that programs and projects provided for in this Agreement will be developed and implemented not only to meet the needs of Upstream and Export Water Users and the flow-related objectives of the 1995 WQCP, but also to provide environmental benefits, including benefits to fish and wildlife, in the watershed of the Sacramento River.

(e) *Role of Sites Reservoir.* The Parties recognize that new off-stream surface storage is an essential part of the long-term water management program, and agree that Sites Reservoir is a potentially significant off-stream surface-water storage project that could help meet the goals and objectives of this Agreement, including providing capacity to increase the reliability of water supplies for Upstream and Export Water Users, flexibility during critical fish migration periods on the Sacramento River, and storage benefits for other CALFED programs. Work being undertaken pursuant to CALFED's Sites MOU will be integrated into this Agreement and the Parties will work with CALFED to accelerate feasibility studies and completion of appropriate environmental and permitting processes for the reservoir.

(f) *Enlarged Shasta*. The Parties agree that other significant surface water storage opportunities may exist, including the enlargement of Shasta Reservoir. The Parties shall take all appropriate efforts to advance these other opportunities and shall integrate the benefits associated with these projects into the programs provided for in this Agreement.

(g) *Role of the Basin-Wide Management Plan.* Reclamation and certain Upstream Water Users are currently developing a Basin-Wide Management Plan for the purpose of improving water management within portions of the Sacramento Valley. The Basin-Wide Management Plan that Reclamation and certain Upstream Water Users are developing shall serve as a model for implementation of this Agreement and could be expanded to incorporate other areas of the watershed of the Sacramento River and its tributaries, as appropriate.

(h) *Management Tools for this Agreement.* A key to accomplishing the goals of this Agreement will be the identification and implementation of a "palette" of voluntary water management measures (including cost and yield data) that could be implemented to develop increased water supply, reliability, and operational flexibility. Some of the measures that may be included in the palette are:

(i) Basin-Wide Water Management Plan identified above;

(ii) Conjunctive uses of surface water and groundwater;

(iii) Coordinated use of storage facilities;

(iv) Management and recovery of tailwater through major drains;

(v) Transfers and exchanges among Upstream Water Users and with the CVP and SWP water contractors, either for water from specific reservoirs, or by substituting groundwater for surface water;

(vi) Substitution of water from potential north of Delta reservoirs, such as Sites Reservoir, for groundwater, or river diversions, or maintaining water quality in the Delta; and

(vii) Water conservation.

3. Resolution of Phase 8 Issues

(a) The Parties agree that while this Agreement remains in effect, DWR and Reclamation shall assume responsibility for meeting the Sacramento River and its tributaries' portions of flow-related objectives established in the 1995 WQCP. Upstream Water Users shall have no obligation to release stored water, extract groundwater or forego diversions in order to help implement the flow-related objectives included in the 1995 WQCP.

(b) In conjunction with the SWRCB, the Parties shall jointly develop a program to prevent unauthorized diversions, provided that the program is consistent with this Agreement.

(c) The Export Water Users, DWR, and Reclamation agree that while this Agreement is in effect they shall take no action before the SWRCB or elsewhere, nor shall they support any such action to insert Term 91, or its regulatory equivalent, into existing water rights permits or licenses, or modify riparian or pre-1914 water rights through the application of the regulatory equivalent of Term 91. The Parties recognize that the SWRCB will continue to implement Term 91 according to its existing terms.

(d) Notwithstanding the foregoing, nothing herein shall be interpreted as waiving the Parties' legal positions or rights in the event that the SWRCB proceeds with the Phase 8 hearings or otherwise attempts to determine the legal obligations of water users to meet adopted water quality or flow standards in the Bay-Delta or in streams tributary to the Bay-Delta. In addition, the Parties acknowledge and agree that nothing herein shall limit their ability to initiate a new or additional water right or water supply, transfer an existing water right, or change or modify an existing water right or a contract relating to a water supply; nor shall a Party be precluded from arguing that Term 91 should be applied or not applied by the SWRCB in any of these proceedings or that a new water right, transfer, or change or modification of an existing water right will or will not cause injury to a lawful water user.

(e) This Agreement shall become effective on the day the SWRCB enters an order that:

(i) Provides for a Stay of Phase 8 of the current Bay-Delta water rights proceeding pending development and approval of the Workplans described in Paragraphs 5(a) and 5(b) of this agreement;

(ii) Provides that, should either of the Workplans not be completed or approved, and this Agreement is therefore terminated, the Parties shall immediately notify the SWRCB and the SWRCB will lift the stay and proceed with Phase 8;

(iii) Under the circumstances provided for in sub-paragraph 3(e)(ii), extends the expiration of the SWP's and CVP's obligations under Conditions 1 and 2 of the Order in Revised Decision 1641 to the earlier of the completion of a resumed Phase 8 or one year from the date of a notice to the SWRCB of termination of this Agreement; and

(iv) Provides that, should the Workplans described in Paragraphs 5(a) and (b) both be completed and approved, Notice of the approval provided to the SWRCB (a) automatically dismisses the Phase 8 proceedings and (b) further extends the expiration of the SWP's and CVP's obligations under Conditions 1 and 2 of the Order in Revised Decision 1641 to one year after the Notice of the termination of this Agreement to the SWRCB or such sooner time as a water rights proceeding allocating the responsibilities to meet Bay-Delta standards is completed; and

(v) Provides that the dates set forth in sub-paragraphs 3(e)(iii) and (iv) above may be extended for up to one year if after notice and hearing the SWRCB determines that the additional time is necessary for it to fully consider and decide the matter.

4. Resolution of Related Issues

The Parties acknowledge that there are a number of administrative, regulatory, legislative and judicial actions currently ongoing or reasonably to be anticipated that could have major effects on the Parties' ability to implement the terms of this Agreement.

In this regard, the Parties acknowledge and agree that developments in any of these or other matters may have a material effect on any Party's ability to implement this Agreement and meet the Milestones set forth in Paragraph 5 below. The Parties agree that they will work together to attempt to deal with the factual/legal situation that then exists in order to allow the Parties to proceed with the programs identified in this Agreement. Nonetheless, failure to meet Milestones, for whatever reason, shall remain a cause for the termination of this Agreement.

5. Milestones

(a) *Short-Term Projects.* Within one hundred eighty days of the Effective Date of this Agreement, the Parties shall, working together, prepare a joint work plan listing short-term projects that can be used to implement this Agreement. Such projects are defined as those which can provide benefits for the 2002 and 2003 water years.

(b) *Medium and Long-Term Projects.* Within one year of the Effective Date of this Agreement, the Parties shall, working together, prepare a joint work plan listing medium- and long-term projects that can be used to implement this Agreement. Medium-term projects are defined as those which will be operational by December 31, 2005. Long-term projects are defined as those which are operational by December 31, 2010.

(c) *Workplan Standards.* For each project identified in the respective Workplan, the appropriate Workplan shall:

(i) Briefly describe the project, including expected 10 net benefits and their proposed allocations;

(ii) Provide a preliminary estimate of the quantity of water or the nature of other water management benefits that can be realized by implementing the project;

(iii) Provide a preliminary estimate of the cost of the project;

(iv) Identify any major environmental issues associated with the project; and

(v) Describe how the project could best be implemented (including a plan for financing for the project).

Each Workplan shall also provide a timetable for implementation of identified projects, which shall then constitute additional Milestones for this Agreement.

(d) *Funding.* The Parties shall immediately jointly seek funding for the development of the two Workplans identified above from general state and/or federal sources. In addition, the Parties shall also seek funding, pursuant to Proposition 204 and other possible funding sources, to cover the cost of implementing programs identified within the respective Workplans. Milestones identified within this Agreement may need to be adjusted in order to provide ample time for the Parties to secure adequate state and federal funding to allow work to proceed. Such adjustments must be accomplished pursuant to mutual agreement of all Parties. The Parties shall not seek to acquire funds that are obligated to other programs within CALFED, and shall not seek funding that may otherwise conflict with funding commitments under the Central Valley Project Improvement Act Restoration Fund.

(e) *Workplan Updates.* The Parties shall review and update the medium/long-term Workplan annually to incorporate information learned as a result of the cooperative process contemplated by this Agreement or as a result of other efforts.The Parties may also revise the list of projects contained in the medium/long-term Workplan, the estimates of the water supply or other benefits associated with such projects, the cost estimates for such projects, the environmental issues associated with such projects, and the implementation plan for each project. The Parties may review and update the medium/long-term Workplan as necessary in the event that circumstances identified in Paragraph 4 above occur.

(f) *Sites Reservoir Milestones.* Because of the potential significance of Sites Reservoir or other north of Delta offstream storage to achieving the

goals of this Agreement, the following additional specific Milestones shall be adhered to:

(i) finalize a Purpose and Needs Statement for the project satisfactory to the Parties no later than March 9, 2001;
(ii) initiate initial scoping sessions associated with appropriate environmental review by April 9, 2001;
(iii) initiate negotiations on all relevant Planning Agreements called for within the Sites MOU, including addressing issues dealt with in Paragraphs 7.4, 7.5 and 7.6 of the Sites MOU, by January 31, 2001;
(iv) complete all environmental and planning documentation for the project not later than August 2004;
(v) make a final decision with respect to the implementation and construction of the project, including obtaining all relevant permits/ biological opinions, including compliance with Clean Water Act section 404(b)(1) or 404(r) by August 2005; and
(vi) assuming a decision to proceed, initiate project construction not later than August 2006.

6. Term and Termination

(a) *Term.* Except as may be otherwise expressly provided, the term of this Agreement shall be until December 31, 2010.

(b) *Annual Reviews.* The Parties shall agree upon the Workplan identified in Paragraph 5(a) of this Agreement within 60 days of its completion. A failure to do so shall cause the immediate termination of this Agreement. The Parties shall agree upon the Workplans identified in Paragraph 5(b) of this Agreement within 60 days of their completion. A failure to do so shall cause the immediate termination of this Agreement. Assuming approvals of the Workplans identified in Paragraphs 5(a) and 5(b), the Parties shall thereafter, on an annual basis as scheduled by the Parties, jointly review the status of development and implementation of all Workplans, as well as the meeting of Milestones provided for herein and in the Workplans. Each annual review shall include a detailed examination of the status of Workplan and Milestone implementation including, without limitation, project feasibility and design, environmental review, permitting and funding. Except as provided for above, this Agreement may only be terminated following an annual review performed in accordance with this Paragraph 6.

(c) *Termination for Failure to Meet Milestones.* Any Party may terminate this Agreement if, following an annual review and after the mediation provided for in Paragraph 7 of this Agreement, it determines:

(i) that either reasonable progress in achieving the Milestones established under this Agreement or in the Workplans cannot be made through the exercise of reasonable diligence by the Parties; or the Milestones established under this Agreement or in the Workplans have not been substantially achieved; and
(ii) that the Milestones established under this Agreement or in the Workplans cannot be revised to result in the reasonable achievement of the Milestones of this Agreement.

(d) *Termination on Modification in 1995 WQCP.* In the event the flow-related objectives contained in the 1995 WQCP are increased or decreased, the Parties shall meet and, if necessary, employ the process outlined in Paragraph 7 of this Agreement, in an attempt to address the changed circumstances associated with modified flow-related objectives. A failure to reach agreement shall cause the termination of this Agreement.

(e) *Petition on Termination.* In the event the Workplans are not completed or approved or this Agreement is terminated, the Parties shall immediately petition the SWRCB to conduct a water rights hearing to consider the issues described in the SWRCB's Revised Notice of Phase 8 Hearing dated May 6, 1998.

7. Resolution of Disputes

Resolution of disputes, and issues which a Party believes may subject this Agreement to termination shall first be submitted to a mediator, mutually selected by the Parties, with experience in water-related disputes. The Parties will use their best efforts to resolve the issues within 30 days. The costs of any such mediation will be borne equally among the Parties.

8. Effect of this Agreement on Other Matters

Nothing in this Agreement, and nothing incorporated by reference into the terms of this Agreement, is intended or shall be construed as a precedent or other basis for any argument that the Parties to this Agreement have waived or compromised their rights which may be available under State or Federal law except as to the matters addressed in this Agreement, nor shall it be construed as an admission or determination of any Party's responsibility for meeting the requirements of the 1995 WQCP.

9. Contingent Upon Appropriations

The expenditure or advance of any money or the performance of any obligation of the United States under this Agreement shall be contingent upon appropriation or allotment of funds. No liability shall accrue to the United States in case funds are not appropriated or allotted.

10. Technical and Management Committees

The Parties shall form two committees. The first shall be a technical committee which shall have the initial responsibility to develop the Workplans and related Milestones. The second shall be a management committee which shall provide policy direction to the technical committee and review and approve Workplans and Milestones. The committees shall together, in a manner that they determine, be responsible for the implementation of the Workplans. Each Party to this Agreement shall appoint one or more representatives to each of these committees.

11. Public Participation

The Parties shall hold periodic public meetings to provide an opportunity for nonparticipating individuals and entities to have input into the planning process.

12. Other Agreements

The Parties recognize that as program development progresses there will be a need to either amend this Agreement or to enter into additional agreements. In this regard, the Parties acknowledge that this Agreement will complement other relevant local partnerships and/or CALFED agreements and shall, as a consequence, be flexible enough to accommodate those other partnerships and agreements.

13. Environmental Compliance

In carrying out actions which may ultimately result from this Agreement, its amendments or subsequent agreements, the Parties hereto are committed to completing all required environmental review including all procedures and documents required by the National Environmental Policy Act and the California Environmental Quality Act, and to complying with all applicable statutes, including the federal and state Endangered Species Act. The costs of funding this environmental work and compliance shall be among the funding issues dealt with herein. Nothing contained herein is intended to affect DWR's and USBR's compliance with regulatory constraints that are imposed under the Federal Endangered Species Act, the Central Valley Project Improvement Act, the Federal Clean Water Act, or any other applicable state or federal law or regulation, including those incorporated into Tier 1 in the CALFED Record of Decision dated August 28, 2000.

14. Counterparts

This Agreement may be executed simultaneously or in one or more counterparts, each of which shall be an original but all of which together shall constitute one and the same document.

15. Notices

All notices shall be sent to the following: DWR: Thomas R. Hannigan Director Department of Water Resources P.O. Box 942836 Sacramento, CA 94236-0001 Reclamation; Lester Snow Regional Director United States Department of the Interior Bureau of Reclamation, MP-100 2800 Cottage Way Sacramento, CA 95825; Export Water Users: John Coburn, General Manager, State Water Contractors, 455 Capitol Mall, Sacramento, CA 95814; Daniel Nelson, General Manager, San Luis & Delta-Mendota Water Authority, 842 – 6th Street, Suite 7, P.O. Box 2135, Los Banos, CA 93635, Walter J. Bishop, General Manager, Contra Costa Water District, 1331 Concord Avenue, P.O. Box H2O, Concord, CA 94524; Upstream Water Users: David J. Guy Executive Director Northern California Water Association, 455 Capitol Mall, Suite 335, Sacramento, CA 95814.

16. Cooperation

The Parties shall cooperate in carrying out the Mutual Goals and Principles contained herein and the provisions and intent of this Agreement.

17. Effective Date

This Agreement shall become effective upon its full execution by all of the Parties hereto and the satisfaction of the conditions set forth in Paragraph 3(e) of this Agreement.

DEPARTMENT OF WATER RESOURCES

DATED: 3/23/01

By _____
Thomas M. Hannigan
Director

STATE WATER CONTRACTORS

DATED: 4/3/01

By _____
John C. Coburn
General Manager

CONTRA COSTA WATER DISTRICT

DATED: 4/3/01

By _____
Walter J. Bishop
General Manager

UNITED STATES BUREAU OF RECLAMATION
MID-PACIFIC REGION

DATED: 5/16/01

By _____
Lester A. Snow
Regional Director

SAN LUIS & DELTA-MENDOTA
WATER AUTHORITY

DATED: 3/30/01

By _____
Daniel G. Nelson
Executive Director

NORTHERN CALIFORNIA WATER
ASSOCIATION

DATED: 4/6/01

By _____
David J. Guy
Executive Director

Appendix B

United States Department of the Interior

BUREAU OF RECLAMATION
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, California 95825-1898

IN REPLY REFER TO:
MP-[illegible]
[illegible]
WTR-1.00

APR 25 [illegible]

Mr. Harry M. Schueller
Chief, Division of Water Rights
State Water Resources Control Board
P.O. Box 2000
Sacramento, CA 95812-2000

Dear Mr. Schueller:

In a separate letter dated April 20, 2001, the United States Bureau of Reclamation (USBR) and the California Department of Water Resources (DWR) submitted comments to the Draft Order for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, dated April 11, 2001, by the State Water Resources Control Board (SWRCB). On March 26, 2001, and March 29, 2001, respectively, the USBR and the DWR executed the "Agreement Regarding Reoperation of Folsom Lake, Development and Management of Water Supplies, and a Binding Commitment to Proceed Pursuant to Specified Terms." The Agreement was later executed by the remaining settlement parties.

The USBR and DWR hereby agree to an extension of Conditions 1 and 2 of the Water Right Decision 1641, provided that the SWRCB adopts a final order in accordance with the Draft Order of April 11, 2001, including the proposed modifications to the Draft Order contained in the April 20, 2001 comments of USBR and DWR. A copy of the April 20, 2001, comments is attached hereto and incorporated herein by reference.

Concur:

for Kirk C. Rodgers
Acting Regional Director
Mid-Pacific Region
U.S. Bureau of Reclamation

Thomas M. Hannigan
Director
California Department of Water Resources

Attachment

LETTER 19

Appendix C

STATE OF CALIFORNIA
STATE WATER RESOURCES CONTROL BOARD

ORDER WR 2001 - 05

In the Matter of
Implementation of Water Quality Objectives
for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary,
Amending License 1986 (Application 23) and Permits 11315, 11316, 11885, 11886, 11887, 11967, 11968, 11969, 11970, 11971, 11972, 11973, 12364, 12721, 12722, 12723, 12725, 12726, 12727, 12860, 15735, 16597, 16600, and 20245 (Applications 13370, 13371, 234, 1465, 5638, 5628, 15374, 15375, 15376, 16767, 16768, 17374, 17376, 5626, 9363, 9364, 9366, 9367, 9368, 15764, 22316, 14858A, 19304, and 14858B, respectively) of the United States Bureau of Reclamation and Permits 16478, 16479, 16481, 16482, and 16483 (Applications 5630, 14443, 14445A, 17512, and 17514A, respectively) of the Department of Water Resources.

Sources: Sacramento and San Joaquin Rivers and their tributaries, and the Sacramento-San Joaquin Delta Estuary

ORDER STAYING AND DISMISSING PHASE 8 OF THE BAY-DELTA WATER RIGHTS HEARING AND AMENDING REVISED DECISION 1641

By The Board:

1.0 Introduction

By this order, the State Water Resources Control Board (SWRCB) takes actions to facilitate negotiations that may lead to a settlement of the potential responsibilities of numerous water users to implement the objectives in the *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*, adopted May 22, 1995 (1995 BayDelta Plan).[1]

In the absence of this order, the SWRCB would promptly convene the remainder of Phase 8 of the Bay-Delta Water Rights Hearing to consider the water users' potential responsibilities that have not yet been determined.

This order stays the resumption of Phase 8 for eighteen months from the date of this order. This order automatically dismisses Phase 8 at the end of eighteen months, unless the SWRCB receives notice from the Department of Water Resources (DWR) or the United States Bureau of Reclamation (USBR), within eighteen months, requesting resumption of Phase 8. This order extends the responsibilities of the DWR and the USBR under Conditions 1 and 2 to meet the water quality objectives in the 1995 Bay-Delta Plan. Unless the SWRCB issues a further order after notice and an opportunity for a hearing, the extension of their responsibilities will expire no later than one year after the DWR or the USBR requests a hearing. Upon request of the DWR or USBR, the SWRCB will resume Phase 8, or, after dismissal, will commence a new hearing. The SWRCB will expedite any hearing conducted pursuant to this order, to issue a decision within two years after receiving a request from the DWR or the USBR.

The SWRCB will, at least every six months, commencing not later than October 1, 2001, conduct a public informational workshop. The purpose of these workshops will be to provide the public and the SWRCB with information regarding the then-current status of negotiations and plans to implement the flow-dependent objectives, including information about the opportunities for non-parties to the negotiations to provide input.

2.0 Background

2.1 Procedural History

This order is part of a series of actions by the SWRCB to protect the beneficial uses of water in the Bay-Delta Estuary against the adverse effects of water diversions. In the BayDelta proceedings, the SWRCB adopts water quality objectives that, when implemented, will protect the beneficial uses. The SWRCB implements the objectives through water right orders and by requesting or directing that other agencies take appropriate actions including water quality control measures to be implemented by the Regional Water Quality Control Boards.

The 1995 Bay-Delta Plan contains the current water quality objectives. D-1641 and Order WR 2000-10 contain the current water right requirements to implement the BayDelta flowdependent objectives. D-1641 includes both long-term and temporary implementation requirements. Order WR 2000-10 requires partial implementation that will remain in effect up to thirtyfive years. In D-1641 and in Order WR 2000-10, the SWRCB assigned responsibilities, for specified periods, to water users (including the USBR and the DWR in D-1641, and the DWR in Order

WR 2000-10) in the watersheds of the San Joaquin River upstream of Vernalis, the Mokelumne River, Putah Creek, Cache Creek, within the boundaries of the North Delta Water Agency, and within the Bear River watershed. These responsibilities need not be revisited in the near future. These responsibilities require that the water users in these watersheds will contribute specified amounts of water, and that the DWR and/or the USBR will ensure that the objectives are met in the Delta.

To meet the potential responsibilities that are not yet assigned, but may be assigned to water users in areas not yet addressed, D-1641, in Conditions 1 and 2 on page 146 thereof, requires that the DWR and the USBR temporarily implement the objectives. Conditions 1 and 2 also require that the DWR and USBR meet certain objectives that the SWRCB does not contemplate assigning to other parties, such as export limits and gate closure requirements. D1641 provides that Conditions 1 and 2 will remain in effect only until the SWRCB makes further decisions establishing the responsibilities of water right holders in the areas where the potential responsibilities have not yet been determined. D-1641 sets these conditions to expire no later than November 30, 2001.

The SWRCB considered and heard comments on earlier drafts of this order at a Board meeting on March 7, 2001 and at a Board meeting on April 4, 2001.

2.2 Physical Setting

The Bay-Delta Estuary includes the Sacramento-San Joaquin Delta, Suisun Marsh, and the embayments upstream of the Golden Gate. The Delta and Suisun Marsh are located at the confluence of the Sacramento and San Joaquin rivers, which converge to flow westward through San Francisco Bay. The watershed of the Bay-Delta Estuary produces water that is used in much of the state for municipal, industrial, agricultural, and environmental purposes. The watershed is a source of drinking water for two-thirds of the state's population. The State Water Project, operated by the DWR, and the Central Valley Project, operated by the USBR, store water upstream of the Delta, release the stored water into the Delta, and export both the stored water and uncontrolled flows[2] from the Delta. The two projects export water from the Delta to areas south and west of the Delta through a system of water conveyance facilities.

Fish, wildlife, and other public trust resources also use the waterways of the Bay-Delta Estuary and its tributaries. Some of the fish that reside in the estuary or migrate through it are protected under the state or federal Endangered Species Act. Additionally, migratory birds and other animals use the marshlands of the estuary for food and habitat.

3.0 Discussion

It is the policy of the SWRCB in the Bay-Delta proceedings to encourage the parties to resolve among themselves the responsibilities for meeting the objectives in the 1995 Bay-Delta Plan, and to bring their joint proposals for establishing responsibilities to the SWRCB for approval.

The DWR, the USBR, some of their water supply contractors, and the members of the Northern California Water Association approached the SWRCB at a workshop on January 11, 2001, with a draft of an agreement among these parties. The parties proposed that the SWRCB adopt an order staying Phase 8 of the Bay-Delta Water Rights Hearing and automatically dismissing Phase 8 after the parties to the agreement complete and approve work plans for developing water supply projects. The parties presented an executed agreement to the SWRCB on April 4, 2001. The agreement includes a commitment by the DWR and the USBR to meet the objectives implemented under Conditions 1 and 2 in D-1641 so long as the agreement remains in effect, and for a period thereafter. This order is not based on the commitment in the agreement.

At the April 4, 2001, meeting, the SWRCB informed the parties to the agreement that, to be able to dismiss Phase 8 as requested, the SWRCB would need an independent commitment from the DWR and the USBR to meet the flow-dependent objectives for an interim period, and that the commitment could not be dependent on the agreement or on progress in implementing water supply projects pursuant to the agreement. The SWRCB further informed the parties that if it received the two projects' independent commitment to meet the objectives for an indefinite interim period and accept an indefinite extension of Conditions 1 and 2, it would (1) stay Phase 8 of the Bay-Delta Water Rights Hearing for up to eighteen months, (2) automatically dismiss Phase 8 after eighteen months had passed, (3) upon request of the DWR or the USBR at any time during the stay or after dismissal of Phase 8, convene a hearing to consider allocating responsibilities to meet the flow-dependent objectives to other parties, (4) set Conditions 1 and 2 to expire no later than two years after the request for hearing unless the SWRCB issues a further order after notice and opportunity for hearing, and (5) expedite the hearing to issue a decision within two years after the request for hearing.

The SWRCB has received the necessary commitment from the DWR and the USBR, by letter dated April 25, 2001. This order is based on that commitment. During the interim period, the SWRCB assumes that the DWR, the USBR, and other parties will conduct further negotiations. The SWRCB will take no part in the negotiations, and takes no position with respect to the direction of such negotiations.

After the DWR or the USBR requests a hearing to determine the responsibilities of the parties to meet the flow-dependent objectives, a hearing is likely to require two years or more. Therefore, an extension of Conditions 1 and 2 after the request for a hearing will help ensure that any necessary additional environmental documentation can be prepared and will ensure that the implementation of the objectives does not lapse. During any further hearing, the objectives in the 1995 Bay-Delta Plan must be met. A lapse in implementation could have serious consequences for the beneficial uses the objectives are intended to protect.[3] In the absence of a hearing, the SWRCB could not place responsibility for meeting

the objectives on a party or parties other than the DWR and the USBR.[4] Accordingly, the most reasonable approach is to retain the existing responsibilities to meet the objectives until the SWRCB is able to complete a hearing and make a decision after the hearing.[5]

A stay is appropriate for eighteen months, with the DWR and the USBR meeting the objectives. A dismissal after the stay is appropriate only if the objectives will be met for a reasonable, albeit interim, period. The DWR and the USBR will meet the objectives for an adequate period. Therefore, this order stays and dismisses Phase 8, effective eighteen months after the date of this order, unless either the DWR or the USBR requests, within eighteen months, that the SWRCB resume Phase 8. The stay and subsequent dismissal apply to proceedings to determine the responsibilities of the water right holders and water users within the watersheds of the Sacramento, Calaveras and Cosumnes Rivers to meet the flow-dependent objectives in the 1995 Bay-Delta Plan.

The administrative record of this order includes the entire evidentiary hearing record of the BayDelta Water Rights Hearing, from July 1, 1998, through April 12, 2000, and the notices and correspondence sent or received by the SWRCB regarding Phase 8 through the date of this order.

4.0 Environmental Considerations

Under the California Environmental Quality Act (CEQA) (Pub. Resources Code §§ 21000, et seq.), the SWRCB is the lead agency for preparation of environmental documentation for this order. The SWRCB has prepared and certified a final *Environmental Impact Report for the Implementation of the 1995 Bay-Delta Water Quality Control Plan* (BayDelta EIR). The BayDelta EIR fully analyzes the effects of several alternatives for assigning responsibility to water right holders in the watershed of the Bay-Delta Estuary, including Flow Alternative 2, under which the DWR and the USBR are jointly responsible for meeting all of the flowdependent objectives in the 1995 Bay-Delta Plan. D-1641 adopts Flow Alternative 2 as an interim measure, by including Conditions 1 and 2 in the water rights of the DWR and the USBR. This order amends Conditions 1 and 2 of D-1641 by extending the periods for which the requirements set forth in those conditions are effective.

CEQA contemplates that agencies may make serial decisions relying on a single EIR. (Cal. Code Regs., tit. 14, §§ 15165, 15168.) This order is one in a series of orders relying on the Bay-Delta EIR.

Except as applied to the Joint Point of Diversion and the San Joaquin River Agreement, the findings set forth in D-1641 in sections 14.3.1, 14.3.4, 14.3.5, 14.3.6, 14.3.7, 14.3.8, and 14.4 are applicable to the inclusion of Conditions 1 and 2 in the permits of the DWR and the USBR for an extended period. Those findings are incorporated herein by reference to the extent that they are applicable to this order. The SWRCB will file a Notice of Determination under CEQA after it adopts this order, and the Notice of Determination will state that this order relies on the BayDelta EIR.

ORDER

A. IT IS HEREBY ORDERED that Phase 8 of the Bay-Delta Water Rights Hearing is stayed for a period of eighteen months from the date of this order. Phase 8 will be automatically dismissed at the end of eighteen months from the date of this order unless the DWR or the USBR notifies the SWRCB in writing, before the end of the eighteen month period, that it is requesting the SWRCB to resume Phase 8.[6] The purpose of the stay and dismissal is to allow water right holders whose rights might be amended after Phase 8 to negotiate toward a mutual settlement of their responsibilities to meet the flow-dependent objectives in the 1995 Bay-Delta Plan. If the DWR or the USBR requests in writing a hearing to allocate responsibilities to meet the flow-dependent objectives to other parties, the SWRCB expeditiously will convene a water right hearing, will determine whether the water right holders in the watersheds of the Sacramento, Cosumnes, and Calaveras Rivers have responsibility to meet the flow-dependent objectives in the 1995 Bay-Delta Plan, and will determine the amount of such responsibility in a decision or order.

B. IT IS HEREBY ORDERED that License 1986 (Application 23) and Permits 11315, 11316, 11885, 11886, 11887, 11967, 11968, 11969, 11970, 11971, 11972, 11973, 12364, 12721, 12722, 12723, 12725, 12726, 12727, 12860, 15735, 16597, 16600, and 20245 (Applications 13370, 13371, 234, 1465, 5638, 5628, 15374, 15375, 15376, 16767, 16768, 17374, 17376, 5626, 9363, 9364, 9366, 9367, 9368, 15764, 22316, 14858A, 19304, and 14858B, respectively) of the United States Bureau of Reclamation and Permits 16478, 16479, 16481, 16482, and 16483 (Applications 5630, 14443, 14445A, 17512, and 17514A, respectively) of the Department of Water Resources shall be amended by revising Conditions 1 and 2 in SWRCB Decision 1641 as follows.

1. Licensee/Permittee shall ensure that the water quality objectives for municipal and industrial beneficial uses and agricultural beneficial uses for the western Delta, interior Delta, and export area as set forth in Tables 1 and 2, attached, are met on an interim basis until the Board adopts a further decision assigning responsibility for meeting these objectives. Unless it is renewed pursuant to a further order after notice and an opportunity for hearing, this condition shall expire no later than one year after the DWR or the USBR requests in writing that the SWRCB convene a water right proceeding to determine whether to replace this condition with another condition that meets the objectives in Tables 1 and 2. Any extension hearing shall be for the limited purpose of determining whether additional time is necessary, and shall not include consideration of changes in allocation of responsibility. The SWRCB shall expedite any proceeding it conducts to assign long term responsibility to meet the objectives in Tables 1 and 2, in an effort to keep the proceeding under two years. This condition does not mandate that the Licensee/Permittee use water under this license/permit if it uses other sources of water or other means to meet this condition.

2. Licensee/Permittee shall ensure that the water quality objectives for Delta outflow and for Sacramento River flow at Rio Vista for fish and wildlife beneficial uses as set forth in Table 3, attached, are met on an interim basis until the Board adopts a further decision in the BayDelta Water Rights Hearing assigning responsibility for meeting these objectives. Any extension hearing shall be for the limited purpose of determining whether additional time is necessary, and shall not include consideration of changes in allocation of responsibility. Unless it is renewed pursuant to a further order after notice and an opportunity for hearing, this condition shall expire no later than one year after the DWR or the USBR requests in writing that the SWRCB convene a water right proceeding to determine whether to replace this condition with another condition that meets the objectives in Table 3. The SWRCB shall expedite any proceeding it conducts to assign long term responsibility to meet the objectives in Table 3, in an effort to keep the proceeding under two years. This condition does not mandate that the Licensee/Permittee use water under this license/permit if it uses other sources of water or other means to meet this condition.

CERTIFICATION

The undersigned, Clerk to the Board, does hereby certify that the foregoing is a full, true, and correct copy of an order duly and regularly adopted at a meeting of the State Water Resources Control Board held on April 26, 2001.

AYES: Art G. Baggett
Pete S. Silva
Richard Katz

NOS: None

ABSTAIN: None

ORIGINAL SIGNED BY Maureen Marché
Clerk to the Board

Footnotes:

[1] From July 1, 1998 through December 21, 1999, the SWRCB conducted Phases 1 through 7 of the BayDelta Water Rights Hearing. On December 29, 1999, the SWRCB adopted Decision 1641, determining some of the responsibilities for meeting the objectives in the 1995 Bay-Delta Plan and resolving other related issues. On April 11 and 12, 2000, the SWRCB conducted a session of Phase 8 of the Bay-Delta Water Rights Hearing to consider a petition for change filed by South Sutter Water District in connection with a settlement agreement to resolve the responsibilities of water right holders on the Bear River. The SWRCB approved the petition on July 20, 2000, in Order WR 2000-10.

[2] Uncontrolled flows include both natural flow and abandoned flow.

[3] Conditions 1 and 2 require full implementation of the objectives for municipal, industrial, and agricultural beneficial uses, and require full implementation of the flow-dependent objectives for fish and wildlife beneficial uses for an interim period. The objectives protect the public interest.

[4] The hearing record for D-1641 supports continuing the implementation by the DWR and the USBR of the objectives in the 1995 BayDelta Plan as provided by this order. See, for example, the Bay-Delta EIR, which analyzes the effects of imposing Conditions 1 and 2 on the DWR and the USBR.

[5] This conclusion addresses the need to extend the responsibilities of the DWR and the USBR for an adequate interim period. This conclusion does not predetermine the allocation of responsibility after completion of any further proceedings before the SWRCB, should further proceedings become necessary. The DWR and the USBR historically have been responsible for meeting Bay-Delta objectives. SWRCB Decision 1641 continues the responsibility of the DWR and the USBR to meet the municipal, industrial, and agricultural objectives, and the flowdependent fish and wildlife objectives on an interim basis. To stay or dismiss of Phase 8, it is necessary to continue the interim requirements imposed on the DWR and the USBR. If it did not extend the responsibility of the DWR and the USBR for at least two years beyond the date when the DWR or the USBR requests resumption or initiation of a hearing, the SWRCB would have to conduct a hearing to determine whether to require a party or parties to meet the objectives pending completion of the hearing. Considering their historical involvement, the public interest in continuously implementing the objectives, their role as public entities managing vast quantities of the state's water supply, and the lack of any other means for setting interim requirements, it is reasonable to continue the responsibility of the DWR and the USBR until the SWRCB establishes other responsibilities to meet the objectives.

[6] The stay and dismissal do not apply to the following proceedings related to the Bay-Delta Proceedings:

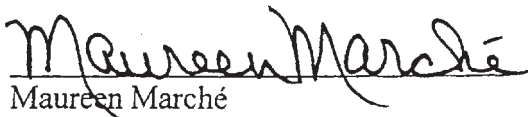
(a) Any proceedings necessary to respond to a writ of mandate or other court order, decision or opinion issued in connection with litigation to which the SWRCB is a party.

(b) An order necessary to implement new water quality objectives or amendments to the 1995 Bay-Delta Plan.

(c) A proceeding on an issue that is sufficiently unrelated [e.g. carriage water] to the subject of long term responsibility to meet the

flow-dependent objectives in the 1995 Bay-Delta Plan that the proceeding will not adversely affect any negotiations among the parties seeking to settle their responsibilities to meet the BayDelta objectives. The SWRCB shall hold a workshop to obtain input from the parties before initiating any such proceedings.

(d) A proceeding relating to the implementation of the narrative salmon doubling objective set forth in Table 3 of the objectives in the 1995 Bay-Delta Plan. The existing D-1641 terms and conditions for fish and wildlife protection provide reasonable protection for a range of aquatic species in the Bay-Delta Estuary and help implement all of the objectives, including the narrative salmon doubling objective. Compliance with the existing flow objectives and other objectives in the 1995 Bay-Delta Plan may be sufficient to implement the salmon objective. Moreover, statutorily mandated non-flow fish restoration programs currently being implemented in other forums (e.g., CVPIA implementation and CALFED) will help implement the salmon objective. As other programs are implemented and monitored, the SWRCB will review the progress toward meeting the objective and may take additional action if needed.



Maureen Marché
Administrative Assistant to the Board.

Sacramento Valley Water Management Agreement Signatories

California Department of Water Resources

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P.O. Box 942836
Sacramento, CA 94236-0001

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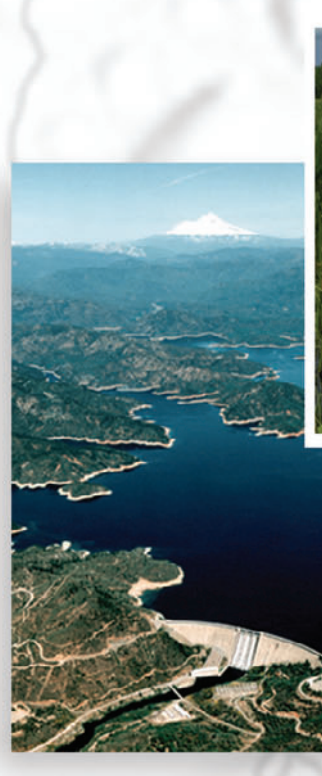
LETTER 19



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LETTER 20

california water impact network

Carolee K. Krieger
president

Lisa Coffman
executive director

Dorothy Green
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Joan Hartmann
treasurer

Lloyd G. Carter
director

Malinda Chouinard
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director

Jim Edmondson
director

Michael Jackson
director

Huey Johnson
director

Tom Stokely
director

December 4, 2007

Delores Brown, Chief
Office of Environmental Compliance
Department of Water Resources

RE: Monterey Plus Amendments to the SWP Contracts Draft EIR

Dear Ms. Brown,

Thank you for this opportunity to express concerns regarding the proposed amendments to the SWP contracts.

The amendments changed the contracts in several fundamental ways, all of them bad for the environment, and bad for the state's ability to manage our water resources in the public interest. If (when) this new Draft EIR is formally approved by DWR, it would: 20-1

- Eliminate the requirement that agriculture take the first hit during times of drought before urban areas leaving urban areas vulnerable. 20-2
- Hand over the state-owned Kern Water Bank, the largest groundwater storage facility in California, to a coalition of interests dominated by private corporations, despite state laws that prohibit just such a transfer. This would effectively privatize a major storage facility and make the State Water Project less reliable. 20-3
- Eliminate the original contract requirement that DWR must determine the realistic yield of the SWP and limit contract deliveries to that amount. Instead, the proposed contract amendment would allow DWR to continue promising to deliver water that does not exist, "paper water," which has been used to fuel unwise development all over California. 20-4
- Allow DWR to continue over-pumping from the Delta in the winter and spring months, which has already, under the provisional use of the Monterey Amendments, contributed to the near extinction of the Delta smelt and other Bay-Delta fish populations. 20-5
- New transfer rules allow contractors to sell water outside their service areas; this begins the privatization of the State Water Project. The sum total of the amendments means a loss of accountability to the state. 20-6
- Changing the so called "surplus Article 21 water" to "interruptible water" is allowing water marketing where contractors and developers are counting on this non- 20-7

permanent water for building homes and business; not a sustainable practice. The amendments remove the clause that specifically states that permanent economics like new houses are not supposed to be founded on Article 21 surplus water. 20-7 (con't.)

C-WIN is preparing extensive comments on this Draft EIR to be submitted to DWR in mid-December, pointing out its many problems. However, given past experience, we have every reason to believe that our concerns will be largely ignored and that DWR will adopt a final EIR that is very close to the original. 20-8

At this time, I would incorporate the "Declaration of John Leahigh In Support of the California Department of Water Resources' Proposed Interim Remedy" August 21, 2007. Mr. Leahigh concludes that to meet the requirements of the State Water Resources Control Board Decision 1641 (D-1641), The SWP and the CVP would have to reduce pumping exports considerably (see attachment #1). Mr. Leahigh assumed that both the SWP and the CVP are equally responsible for meeting the objectives of D-1641. If this is taken literally, the SWP would have to reduce exports by 220-440 taf a year in dry years and by 825 tafy to 1.16 mafy in average years. This is very significant since the average actual deliveries of the SWP from 1990- 2004 was just 2.0 mafy. 20-9

I would also like to include in the record here my letter to DWR Director Lester Snow of May 31, 2007 (attachment #2.) This letter goes into great detail about the above stated concerns. Related to this letter is a press release that C-WIN put out in conjunction with this letter to Director Snow (attachment #3.) 20-10

C-WIN hereby incorporates all other comments opposing this Draft EIR in its present form.

Thank you so much for the opportunity to comment,

Respectfully submitted,

Carolee Krieger

Carolee Krieger, President

Attachments:

1. "Declaration of John Leahigh In Support of the California Department Of Water Resources Proposed Interim Remedy", August 21, 2007

2. C-WIN letter from Carolee Krieger to DWR Director Lester Snow, May 31, 2007

3. C-WIN Press Release for the Lester Snow letter

attachment #1

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Attorneys for Defendant-Intervenor

IN THE UNITED STATES DISTRICT COURT

FOR THE EASTERN DISTRICT OF CALIFORNIA

NATURAL RESOURCES DEFENSE COUNCIL, et al.,

Plaintiffs,

v.

DIRK KEMPTHORNE, in his official capacity as Secretary of the Interior, et al.,

Defendants,

SAN LUIS & DELTA-MENDOTA WATER AUTHORITY and WESTLANDS WATER DISTRICT; CALIFORNIA FARM BUREAU FEDERATION; GLENN-COLUSA IRRIGATION DISTRICT, et al.; CALIFORNIA DEPARTMENT OF WATER RESOURCES, and STATE WATER CONTRACTORS,

Defendant-Intervenors.

05 CV 01207 OWW (LJO)

DECLARATION OF JOHN LEAHIGH IN SUPPORT OF THE CALIFORNIA DEPARTMENT OF WATER RESOURCES' PROPOSED INTERIM REMEDY

Hearing: August 21, 2007
Time: 9:00 a.m.
Courtroom: 3
Judge: Hon. Oliver W. Wanger

I, John Leahigh, declare as follows:

1. I am employed by the Department of Water Resources (DWR) as Chief of the Project Operations Planning Branch (POPB) within the Division of Operations and Maintenance. I have been in my current position since March 2005.

2. I am responsible for short-term planning of water operations for the State Water Project (SWP). These planning responsibilities include the estimation of delivery capabilities of the SWP and forecasted water export operations from the Sacramento/San Joaquin Delta (Delta) through the Harvey O. Banks Delta Pumping Plant (Banks), Skinner Fish Protection Facility (Skinner), and Clifton Court Forebay (CCF).

3. Prior to taking the position of Chief of the POPB, I worked within the branch in various engineering classifications from November 1996 through February 2005. I have worked for DWR since May 1992. I received a Bachelor's degree in Civil Engineering from the University of New Mexico in 1989 and a Master's degree in Civil Engineering with emphasis on Water Resources Engineering from California State University at Sacramento in 1999. I am a registered Civil Engineer in the State of California.

4. One of my responsibilities as Chief of the POPB is to supervise the work of engineering staff that develop and monitor studies, projections and delivery capabilities of the SWP. I coordinate with a team of engineers to plan and schedule water export operations based on water availability, water permit/quality restrictions, environmental needs, and projected hydrology.

5. I have personal knowledge of the facts stated herein, and, if called to do so, could and would testify competently thereto.

6. I am familiar with and contributed to the development of the proposed remedy actions, set forth in the Delta Smelt Action Matrix for Water Year 2008 (Action Matrix)[1/], proposed by the United States Fish and Wildlife Service (USFWS), as supported by DWR. The Action Matrix has been developed to minimize and prevent adverse impacts to delta smelt and its habitat from SWP and CVP operations during the interim period pending completion of the consultation on the delta smelt with USFWS. I am informed and believe that the USFWS will complete the consultation and issue its biological opinion before August 2008.

///

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1. A copy of the Action Matrix is attached as Exhibit A to the Declaration of Jerry Johns in Support of the California Department of Water Resources' Proposed Interim Remedy, filed concurrently herewith.

7. I have worked with POPB staff to develop an estimate of the water costs associated with implementation of the Action Matrix through July 2008.

8. For the purposes of the following analysis, "water costs" are defined as the estimated export reductions and the estimated reductions in deliveries of water to CVP/SWP contractors for 2008 as a result of implementing the actions described in the Action Matrix.

9. The term baseline" is defined as the expected delivery of water without implementing the Actions proposed in the USFWS remedy matrix. Baseline water deliveries often vary depending on hydrology and the costs estimates are based on two different hydrology assumptions, as described in detail below.

10. Water supply forecasting requires a projection of initial reservoir storages and forecasted runoff as a foundation to delivery estimates. Reliable projections are available for the initial reservoir storages going into 2008, but the forecasted runoff is largely dependent on the amount of precipitation that will be experienced next year, which is unknown and could vary greatly. Water supply costs were analyzed for 2008 with two different assumptions on the amount of precipitation that may be experienced in 2008: dry and average.

11. A year with low precipitation or a "dry year" for the purposes of my analysis assumes the amount of precipitation in 2008 will be equal to the amount of precipitation that was exceeded 90% of the time over the past 85 years.

12. A year with average precipitation or an "average year" for the purposes of my analysis assumes the amount of precipitation in 2008 will be equal to the amount of precipitation that was exceeded 50% of the time over the past 85 years.

13. Although many different assumptions could be made for the amount of precipitation that could occur in any year, assumptions of precipitation at a 90% and 50% chance of exceedence are the most widely used water supply forecasting assumptions. These two hydrologic assumptions generally give a good analytical range for project operations.

EXISTING RESTRICTIONS ON WATER DELIVERIES

14. DWR provides water to twenty-nine (29) contractors throughout California under water right permits issued by the State Water Resources Control Board (SWRCB). These permits

include restrictions on water exports. The DWR permit most recently issued by the SWRCB resulted in a SWRCB decision, known as Water Rights Decision 1641 (D-1641). Details of the decision can be found at 14. DWR provides water to twenty-nine (29) contractors throughout California under water right permits issued by the State Water Resources Control Board (SWRCB). These permits include restrictions on water exports. The DWR permit most recently issued by the SWRCB resulted in a SWRCB decision, known as Water Rights Decision 1641 (D-1641). Details of the decision can be found at http://www.waterrights.ca.gov/baydelta/d1641.htm.

15. The water costs associated with the Action Matrix are measured against allowable deliveries under baseline operations, considering all flow and water quality objectives required by D-1641. Through D-1641, the SWRCB assigns responsibility for meeting water quality objectives adopted in the Water Quality Control Plan ("WQCP") for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. These WQCP objectives protect fish and wildlife, and the agricultural, municipal and industrial uses of water.

16. The WQCP was updated in 2006. The new plan did not result in any changes in the requirements of D-1641. The new WQCP can be found at http://www.waterrights.ca.gov/baydelta/docs/rev2006wqcp.pdf.

17. A team of engineers and I took into account the restrictions imposed by meeting the objectives of the WQCP when developing the estimates for water costs associated with the implementation of the Action Matrix.

ASSUMPTIONS FOR THE IMPLEMENTATION OF ACTIONS

18. I assumed in the analysis that Action 1 would be triggered and implemented as of December 25, 2007 and continue through January 3, 2008. December 25 is described as the first possible day to trigger this 10-day Action in the Action Matrix.

19. I assumed in the analysis that delta smelt spawning will occur on February 20, 2008. February 20 is the date on which DWR biologists have estimated that spawning has begun historically. This assumption establishes the durations of Actions 2 and 3, which could vary significantly. The end of Action 2 and the trigger for the start of Action 3 is the onset spawning

as described in the Action Matrix.

20. In the Action Matrix, Actions 3 and 4 assume a range of flow objectives. A range of Old and Middle River upstream flows between 0 and 4000 cubic feet per second (cfs) is explicitly described and assumed for analyzing Action 3.

21. Action 4 does not have targeted flow but allows a range similar to Action 3 (from zero to approximately 4000 cfs).

22. Because the Action Matrix describes Actions 3 and 4 flow objectives as a range I assumed a range for water costs as well. The high end of this range assumes that the Old and Middle River objective is 0 cfs for both Actions 3 and 4. For determining the lower costs in the range I assumed that Action 3 is implemented at the 4000 cfs flow objective and Action 4 is not triggered, resulting is no water costs.

23. This range of cost was necessary as part of the analysis because of the uncertainty related to the real-time distribution of delta smelt and the susceptibility of this distribution to the exports as noted in footnotes of the Action Matrix.

ESTIMATED EXPORT REDUCTIONS ASSOCIATED WITH THE USFWS'S REMEDY PROPOSAL

24. Implementation of flow objectives in the Action Matrix will require reductions in export operations by the SWP and CVP. My team of engineers and I estimated ranges of export reductions associated with each Action in the Action Matrix. The ranges are based on 2008 being dry or having average precipitation as defined earlier. In addition, Actions 3 and 4 have sub-ranges due to their adaptive nature.

#1. reductions: 100 taf (dry yr.) 160 taf (average yr.)

25. Action 1 - Winter Pulse Flow to Benefit Adult Spawning: CVP and SWP target upstream Old and Middle River flow not to exceed 2,000 cfs for a 10-day period during late December or early January. This action is estimated to reduce combined project exports by 100 thousand acre-feet (taf) in a dry year and 160 taf in an average year.

#2. 150 taf (dry yr.) 500 taf (average yr.)

26. Action 2 - Adult Salvage Minimized: CVP and SWP target upstream Old and Middle River flow not to exceed 4,500 cfs from early January to late February. This action is estimated to reduce combined project exports by 150 taf in a dry year and 500 taf in an average year.

27. Action 3 – Larval and Juvenile Protection: CVP and SWP target upstream Old and Middle River flow between 4,000 cfs to 0 cfs from late February through the end of May. This action is estimated to reduce combined project exports by 60 taf to 500 taf in a dry year and 640 taf to 1.3 million-acre feet (maf) in an average year.

28. Action 4 – Juvenile Protection: If triggered, the CVP and SWP may target upstream Old and Middle River flow of up to 0 cfs in June. This action is estimated to reduce combined project exports up to 130 taf in a dry year and up to 350 taf in an average year.

29. Action 5 - Barrier Operations: There were no additional export reductions associated with this action.

COMBINED SWP/CVP ESTIMATED DELIVERY REDUCTIONS

30. I assumed in my analysis that both the SWP and CVP are equally responsible for meeting the objectives in the Action Matrix. The estimated delivery reductions provided below represent combined CVP/SWP delivery reductions.

31. Export reductions do not result in a one-for-one impact on deliveries because of a multitude of complicating factors including system constraints, runoff patterns, annual delivery patterns, and operational flexibility.

32. The export reductions for each action were entered into an operational spreadsheet model developed by DWR staff that estimates the delivery capabilities of the SWP and CVP. We modeled the remedy period with the implementation of the Action Matrix and without implementation of the Action Matrix. A comparison of model output indicates what annual delivery reduction could occur in 2008 if all proposed actions are implemented.

33. The resulting delivery reductions are expressed as a range for each hydrologic assumption for the same reason that the export reductions were expressed as a range. Actions 3 and 4 of the Action Matrix have an adaptive management process that will vary the flow objective.

34. The conclusion of the analysis is that the sum of all these export reductions in a dry year is expected to decrease combined 2008 deliveries of the SWP and CVP by 6% (183 taf) to 25% (814 taf) from a baseline delivery of 3.2 maf.

35. In an average year, the delivery reductions are expected to be between 14% (820 taf) to 37% (2.17 maf) from a baseline delivery of 5.9 maf.

SWP SHARE OF ESTIMATED DELIVERY REDUCTIONS

36. The analysis showed that the SWP 2008 annual deliveries would be reduced 8% (91 taf) to 27% (305 taf) from a baseline delivery of 1.15 maf in a dry year.

37. In an average year, SWP 2008 annual deliveries would be reduced 8% (252 taf) to 31% (940 taf) from a baseline delivery of 3 maf.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed this 9th day of July, 2007 at Sacramento, California

JOHN LEAHIGH, Declarant.

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LETTER 20

Attachment #2

california water impact network

Carolee K. Krieger
president

Dorothy Green
secretary

Joan Hartmann
treasurer

Lloyd G. Carter
director

Malinda Chouinard
director

Yvon Chouinard
director

Jim Edmondson
director

Michael Jackson
director

Huey Johnson
director

Linda Mitrovich
director

Tom Stokely
director

May 31, 2007

Lester Snow, Director
Department of Water Resources
P.O. Box 942836, Rm. 1115-1
Sacramento, CA 94236

Dear Mr. Snow,

I am writing to recommend a reduction in State Water Project (SWP) Table A Allocations from 4.1 million acre feet a year (MAFY) to a level that ensures the average annual delivery does not exceed 1.17 MAFY. This letter will explain why this is necessary and how we arrived at this figure.

On March 22, 2007, Alameda Superior Court Judge Frank Roesch ordered the State Department of Water Resources (DWR) to shut down its Harvey O. Banks Pumping Plant, the major facility that pumps water to Southern California, in 60 days unless DWR obtains a long-required permit to kill endangered fish. *Watershed Enforcers v. Dept. of Water Resources*, Case No. RG06292124. On April 18, 2007, Judge Roesch affirmed his earlier order and started the 60 day clock. Regardless of the outcome of DWR's pending appeal from this decision, the case provides DWR a unique opportunity to capitalize on the current political will to tackle the growing crisis in the San Francisco-San Joaquin Delta.

The California Water Impact Network (C-WIN) is a statewide organization dedicated to promoting equitable and environmentally sensitive uses of California's water. We would like to suggest a solution to the crisis in the Delta that may help satisfy Judge Roesch, thereby avoiding a complete shutdown of the Banks pumps, while also addressing other long-neglected issues.

The ultimate question raised by the *Watershed Enforcers* is: What is the sustainable safe yield of the SWP? In light of recent fish population surveys, it is clear that current pumping far exceeds the safe yield, and that pumping will need to be permanently reduced.

At the same time, it is widely known that the SWP is not able to deliver the full Table A allocations that were proposed in 1960 when the project was first approved. DWR's 2005 Reliability Report, used by planners to justify development activities throughout Southern California, indicates that 77% of the current Table A allocation will be available for use. Yet, this 77% figure is deeply flawed, particularly in light of recent information concerning the health of the Delta. The problem with proceeding under an unrealistic assumption of future delivery capabilities is that planners are relying on the promise of "reliable" water supplies that cannot be delivered without bending (or breaking) environmental requirements.

We propose that the Table A allocations be <u>permanently</u> reduced from the current 4.1 MAFY to reflect the biologically safe yield of the Delta. This will permanently eliminate all "paper water" from the system, enabling planners to make rational decisions about future development activities in Southern California. If DWR fails to do this, it will be setting the stage for yet another round of pumping wars as municipal users begin to demand the promised "paper water" that cannot be delivered.

The rest of this letter will discuss the problems in the Delta, the problems with the reliability of the SWP as it is currently being managed, and why the reduction of the Table A allocations is a good solution.

Problems in the Delta

It is now widely recognized that several species of fish in the Bay Delta, including the Delta smelt, splittail, winter run salmon, and several others, are on the verge of extinction. It is also virtually undeniable that one of the causes of fish decline is excessive export pumping from the Delta.

Several judicial rulings have found current and proposed approaches to managing the impacts of export pumping to be inadequate. For example, an October 2005 ruling by the Third District Court of Appeal overturned the CALFED Record of Decision. *In Re Bay-Delta Programmatic Environmental Impact Report Coordinated Proceedings*, (2005) 133 Cal. App. 4th 154. That decision requires analysis of an alternative that would reduce the export of water south of the San Francisco/San Joaquin Delta. If implemented, this alternative would curtail deliveries from the SWP. Similarly, a February 9, 2006 Third District Court of Appeal ruling, *State Water Resources Control Board* (SWRCB) Cases (2006) 136 Cal. App. 4th 674, in which Golden Gate Audubon prevailed, requires that existing salinity standards in the Bay Delta be upheld.[1] The courts are giving a clear message to DWR; the Delta crisis requires less pumping at Banks.

On April 26, 2007, a group of environmental organizations, led by the California Sportfishing Protection Alliance (CSPA), submitted a letter to Department of Fish and Game Director Ryan Broddrick, urging Fish and Game to deny DWR's pending request for a consistency determination under the California Endangered Species Act. (Attachment #1.) This letter very clearly delineates the fish crash in the Delta and why it is happening.

Despite crashing fish populations and continued rebukes from the courts, DWR and the Bureau of Reclamation propose to pump up to 27% more water out of the Bay-Delta as part of the South Delta Improvement Project (SDIP). This proposal is soundly critiqued by the CSPA in their comments submitted to DWR February 7, 2006. (Attachment #2.) In addition, the National Marine Fisheries Service has suspended formal consultation on the SDIP until more studies have been completed. (Attachment #3.) DWR should abandon this untenable plan in favor of a sustainable way forward, by setting a cap on Table A allocations that corresponds with a safe level of pumping at Banks.

SWP Water Reliability

Determining what is a safe level of pumping must coincide with an acknowledgement that the SWP has been unable to deliver more than half of the 4.1 MAFY promised in the SWP contracts.

The 2005 SWP Delivery Reliability Report is full of "paper water." "Paper water" is water that exists as "little more than a wish and a prayer." *Planning and Conservation*

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[1] A subsequent order by the SWRCB requires DWR and the CVP to shut down their pumps if the salinity standards are not met. SWRCB Order WR 2006-0006. This means that more water must be left in the San Joaquin River and the Bay-Delta and, consequently, that there will be less water to pump to southern California.

League v. DWR, (2000) 83 Cal. App. 4th 892, 915. While the SWP contracts promise allocations of up to 4.1 MAFY, in reality the average actual annual delivery between 1990 and 2004 was a mere 2.0 MAFY. However, rather than relying upon the average historical annual delivery of slightly less than half the promised allocation, the 2005 Reliability Report projects that, on average, 77% of the SWP Table A Allocation will be available. This projection, relied upon by planners throughout the state, is deeply flawed.

We have attached the December 19, 2005 comments on the deficiencies of the 2005 SWP Reliability Report submitted by Physicist and Systems Analyst Arve Sjovold. (Attachment #4.) Also attached are the December 22, 2005 comments on the deficiencies of the 2005 SWP Reliability Report submitted by PCL Water Program Manager Mindy McIntyre. (Attachment #5.)

One of the central flaws with the Reliability Report is its reliance on **CALSIM II,** a computer model that has been widely criticized by peer review studies. See "A Strategic Review of CALSIM II and its Use for Water Planning, Management, and Operations in Central California," by J. R. Lund, et al, December 4, 2003 (Attachment #6). Among other things, CALSIM II presumes groundwater is an unlimited resource. This leads to a false impression of what water is actually available.[2] More recently, "An Environmental Review of CalSim II" by Jeffrey T. Payne and David R. Purkey, November 2005, concludes "...we are left with the profound impression that [CalSim II] is not a tool that can -- under its current formulation -- fully address the legally required water management objectives. CalSim II holds that the environment is a constraint on system operations, not one of the objectives for which the system should be managed." (Attachment #9.)[3]

In addition, the Reliability Report fails to take into consideration the potential **impacts of global climate change.** The growing consensus of experts studying this issue is that global climate change will result in less snow, earlier melting of the snowpack, and more rain, all of which will lead to higher spring flows, rather than the snowpack acting as a reservoir as it has in the past. Rising ocean levels, which may lead to greater influx of salt water into brackish ecosystems, is another problem exacerbated by global climate change. This is elaborated in "Emissions Pathways, Climate Change, and Impacts on California." (Attachment #14.) [4]

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[2] See "Additional Comments on CalSim II Pertinent to the Temporary Restraining Order" by Arve Sjovold regarding the Injunction granted by the Court in the InterTie case. (Attachment #7.) In addition, we submit "Musings on a Model: CalSim II in California's Water Community," March 2005. (Attachment #8.)

[3] Also attached is a critique of CalSim II by Jan de Leeuw, Distinguished Professor and Chair CLA Department of Statistics, dated October 23, 2005 (Attachment #10), as well as three comment letters concerning CALSIM II modeling by Arve Sjovold: "Response to Director Johns' letter of September 22, 2005 on CALSIM II" (Attachment #11); "Some Insights on Water Deliveries to Settlement Contractors", October 24, 2004 (Attachment #12); "On the Adequacy of CALSIM II for Environmental Impact Analysis and SWP Reliability Analysis," August 12, 2004 (Attachment #13.) All of these documents clearly lay out the problems with reliance on CALSIM II as the predictor of reliability for the SWP.

[4] **DWR** recently issued a report titled **"Progress on Incorporating Climate Change Into Management of California's Water Resources"** (July 2006). In this report, DWR attempts to incorporate climate change into CALSIM. Arve Sjovold reviewed that report and concluded, "that it too was seriously flawed for the purposes intended. It does a decent job on reviewing the extant literature on climate change but its quantitative analyses have very little to do with the issues that attend climate change. For example, when they attempt to calculate the effect on stream runoff in the northern Sierra, they take gross estimates from the climate change models, use a more detailed runoff model (which may or may not be a good model) to

Article 18 (a) & (b) of the SWP Contracts

Article 18(a) of the SWP Water Contracts requires that agriculture take the first cutbacks in SWP deliveries during drought years.[5] **Article 18(b)** of the SWP Water Contracts states that DWR will only promise what it can actually deliver on a long-range basis, thus requiring the elimination of "paper water." The Monterey Amendments to the SWP Contracts attempted to eliminate both Article 18 (a) & (b) from the SWP Contracts without analysis of the consequences of doing so. The original Monterey Amendments were set aside in part for this very reason.

Permanently revising the Table A allocations to reflect the real environmental needs of the Delta will assist planners throughout the state by providing them a truly realistic picture of water supplies. Doing so will also go a long way toward resolving long-standing objections to the Monterey Amendments.

Solution to the Delta Problems

It is clear that the Courts and the scientific community both agree that too much water is being pumped from the Delta. We understand that the Metropolitan Water District (MWD), the largest SWP contractor with rights to half of the Table A allocations, recognizes that the Delta is in crisis and that new dams are not the answer. The SWP is the largest single user of energy in the state, reflecting the enormous amounts of energy required to pump SWP water up over the Tehachapi Mountains for Southern California. As global warming is caused in large part by CO_2 emissions, conservation of local water sources is the best way to cut back on these emissions and provide a cheaper and more reliable water supply. MWD recognizes this.

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develop a scale factor to ramp up peak runoff forecasts, but use this scale factor as a multiplier on a base year that is one of the driest in history. In effect, they show that the increase in runoff is not very large and they use their estimates of this increase to drive their quantitative studies of Delta behavior. I found practically nothing of value in their quantitative studies that really goes to the heart of the climate change problem." (Attachment #15.) Also significant here is the report by Michael Dettinger of the U.S. Geological Survey entitled "Climate Change and the Water supplies in the West." Mr. Dettinger is an expert on snowpack storage and his report shows that snowpack in the Sierra is in steep decline. (Attachment #16.) Also relevant here is the report from NASA showing the temperature rise in California in the last half of the 20th Century. (Attachment #17.)

[5] Article 18(a) is a very important safeguard for municipal water supplies. The California Water Code specifically states that urban users have a priority over agricultural users. Water Code Sections 106 and 106.5 provides:

> 106. It is hereby declared to be the established policy of this State that the use of water for domestic purposes is the highest use of water and that the next highest use is for irrigation.
>
> 106.5. It is hereby declared to be the established policy of this State that the right of a municipality to acquire and hold rights to the use of water should be protected to the fullest extent necessary for existing and future uses, but that no municipality shall acquire or hold any right to waste water, or to use water for other than municipal purposes, or to prevent the appropriation and application of water in excess of its reasonable and existing needs to useful purposes by others subject to the rights of the municipality to apply such water to municipal uses as and when necessity therefore exists.

How should DWR come up with an appropriate Table A cap? First, it must be acknowledged that it is not enough to maintain Table A Allocations at or near 2.0 MAFY, the average pumped from 1990 through 2004. Pumping at those rates has had devastating effects on the Delta. This must stop if the Delta is to be restored. The courts are mandating that alternative pumping scenarios that require far less exports from the Delta be thoroughly considered. These scenarios must be evaluated using robust, scientifically justifiable modeling. The SWP contracts were always meant to be a reflection of the "true safe yield" or the "firm yield" of the project. It is time to cut back the Table A Allocations to reflect this.

One way to significantly lower the total Table A allocations, and thereby reduce the requirements for exports from the Delta, would be to pursue retirement of the drainage impaired lands in the Western San Joaquin Valley served by the SWP. Table 1 below portrays a preliminary estimate of potential water savings in Tulare and Kern County within the SWP service area.

Table 1[6]

	Total Irrigated croplands in 2002(acres)[7]	**Drainage Impaired acreage in 2000 (acres)**[8]	**% of County Requiring Drainage Service**	**Estimated Contract Amounts (AF)**[9]	**Estimated Water Savings (AF)**
Tulare County	652,385	291,000	44.60%	1,304,770	581,927
Kern County	811,672	313,000	38.56%	1,623,344	625,961
Total	1,464,057	604,000	N/A	2,928,114	1,207,888

The Pelagic Fish Action Plan, a March, 2007 document by DWR and the California Department of Fish and Game, recommends reductions in pumping from the Delta of 1.66 MAFY.[10] **Both the SWP and the federal CVP are affected by these recommendations. Reducing the SWP 1990 -2004 average actual deliveries of 2.0 MAFY by 0.83 MAFY (half of the recommended cuts 1.66 MAFY cut), would give us a new average safe yield amount of 1.17 MAFY.**

It is widely known that there is no extra or "surplus" water any longer in California. In conjunction with the Table A reductions outlined above, it is essential to eliminate the concept of "surplus" water from the State Water Project contracts. Article 21 water, the so

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6 This table is drawn from a January 1, 2005 letter sent by the Trinity County Board of Supervisors to the DWR regarding the Draft Environmental Impact Statement/Report for the SDIP.

7 The acres of irrigated croplands is taken from the USDA farm census statistics report in 2002.

8 The acreage of drainage impaired acres is derived from a report by DWR produced as part of the 2000 San Joaquin Valley Drainage Monitoring Program. The acreages identified are for lands with high groundwater within 20 feet of the surface.

9 The contract amounts are figured by estimating 2 acre-feet per acre irrigated, most likely an underestimate.

10 1.66 mafy is the sum of the estimated "costs" of those water operations actions recommended in the Pelagic Fish Action Plan at pages 5-6 and 43-48 (Attachment #18.)

called "surplus" water feature of the SWP contracts must be removed from the contracts. This Article 21 water has been used to "game the system" for too long and must be eliminated from the contracts.

Using DWR and Fish and Game's own data, we recommend that the Table A Allocations for the SWP be permanently reduced to a level that ensures average annual deliveries do not exceed 1.17 MAFY.

Sincerely,

Carolee K. Krieger

Carolee K. Krieger, President
808 Romero Canyon Road
Santa Barbara, CA 93108
PH: (805)969-0824

Cc: Bill Jennings, Executive Director, California Sportfishing Protection Alliance
Ryan Broddrick, Director Department of Fish and Game
Tim Brick, President Metropolitan Water District Board of Directors
Jeff Kightlinger, Manager Metropolitan Water District
Pam Doduc, Chair, State Water Resources Control Board
Darrell Steinberg, Chair, Senate Natural Resources & Water Committee

Attachments:

1. CSPA group letter to Ryan Broddrick, Director Department of Fish and Game April 26, 2007 (15 pgs.)

2. "CSPA Comments on the South Delta Improvement Program, Draft EIS/EIR" by Bill Jennings, chairman and Executive Director, CSPA, 2/7/06 (50 pgs.)

3. Letter from NOAA National Marine Fisheries Service 1/11/07 re: SDIP (2 pgs.)

4. "Comments on the Draft SWP Reliability Report 2005" by Arve Sjovold, 12/19/05 (6 pgs.)

5. "Comments on Public Review Draft of the SWP Delivery Reliability Report 2005" by Mindy McIntyre, PCL Water Program Manager, 12/22/05 (20 pgs)

6. "A Strategic Review of CALSIM II and its Use for Water Planning, Management, and Operation in Central California" by A. Close, W.M. Haneman, J.W. Labadie, D.P. Loucks (Chair), J. R. Lund, D.C. McKinney, and J.R. Stedinger, December 4, 2003 (129 pgs)

7. "Additional Comments on CALSIM II by Arve Sjovold, Feb. 7, 2006 (1 pg)

8. San Francisco Estuary & Watershed Science, March 2005 "Musings on a Model: CALSIM II in California's Water Community." (13 pgs)

9. "An Environmental Review of CalSim II" by Jeffrey T. Payne and David R. Purkey, 11/05 (65 pgs)

10. "Response to Gerald Johns' Memo" by Jan de Leeuw, 10/23/05 (3 pgs)

11. "Response to Gerald Johns' Letter on CalSim II", by Arve Sjovold, 10/2/05 (3 pgs)

12. "Some Insights on Water Deliveries to Settlement Contractors" by Arve Sjovold, 10/24/04 (1 pg)

13. "On the Adequacy of CalSim II for Environmental Impact Analysis and SWP Reliability Analysis" by Arve Sjovold, 8/12/04 (7 pgs)

14. "Emissions Pathways, Climate Change, and Impacts on California", August 24, 2004 (6 pgs)

15. "Comments on DWR's Technical Memorandum", "Progress on Incorporating Climate Change into Management of California's Water Resources", July 2006 by Arve Sjovol 9/2/06 (5 pgs)

16. "Climate Change and Water Supplies in the West", Michael Dettinger of the USGS, (24 pgs.)

17. NASA Images April 17, 2007 (3 pgs.)

18. "Pelagic Fish Action Plan", March 2007, California Department of Water Resources and California Department of Fish and Game (9 pgs)

LETTER 20

attachment #3

california water impact network

PRESS RELEASE

For Immediate Release

Press Contacts: Carolee Krieger, President, California Water Impact Network: (805) 969-0824

Lloyd Carter, Director, California Water Impact Network: (559) 304-5412

Carolee K. Krieger *president*

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Joan Hartmann *treasurer*

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Jim Edmondson *director*

Michael Jackson *director*

Huey Johnson *director*

Linda Mitrovich *director*

Tom Stokely *director*

C-WIN Demands Reduced Delta Pumping as answer to Delta Eco-Crash

California's Department of Water Resources (DWR) is mismanaging our precious Bay Delta and misrepresenting the amount of water that can be safely sucked from the Delta for delivery to farmers and developers. The California Water Impact Network (C-WIN), an organization dedicated to promoting sensible and sustainable water use throughout California, has asked DWR to dramatically and **permanently lower the total amount of water it pledges to deliver under the State Water Project (SWP) delivery contracts from the current level of 4.1 million acre feet per year to a level that ensures average deliveries will not exceed 1.2 million acre feet per year.** This reduction will help save the Delta and will give farmers and urban planners across the State a realistic picture of how much water will be available for use.

Currently, the SWP contracts pledge to deliver 4.1 million acre feet per year to water users south of the Delta, the same volume of water promised when the SWP was first approved in 1960. But, a lot has changed since 1960. "We now have a better appreciation of the importance of the health of the Delta and other aquatic ecosystems, an appreciation that is reflected in both state and federal environmental laws." says C-WIN's president, Carolee Krieger. As a result, Krieger notes, **"between 1990 and 2004, the SWP was, on average, able to deliver only 2.0 million acre feet of water per year, slightly less than half the promised allocation."**

To deliver water to central and southern California, DWR must pump it out of the Delta into storage and transport facilities. But, pumping kills fish and disturbs Delta ecosystems. Even though deliveries have been far lower than the proposed 4.1 million acre feet for many years, the Delta is still dying. Recent fish surveys have revealed that the Delta smelt, considered an indicator of the health of the Delta, has plummeted to record low numbers and is on the verge of extinction.

Many SWP Water Contractors are selling their water rights to urban areas in Southern California. What usually changes hands in such transfers is the full amount of water promised to the seller. But, because DWR has historically been unable to deliver a substantial portion of the promised amount, this leaves the purchaser, often a municipal water district, holding a large amount of what is known as "paper water." Paper water only exists on paper -- in the contracts -- and cannot be delivered. "The really dangerous thing about paper water is that it is being used to justify new construction throughout Southern California, even though it may never materialize," says C-WIN's Secretary, Dorothy Green, a well-known Southern California Water Activist.

According to language in each SWP Water Contract, DWR is required to reduce the amount of water it promises to deliver to reflect what it actually can deliver on a long-range basis. Doing so would get rid of the paper water. But, DWR has failed to obey the requirements of its own contracts.

C-WIN is asking DWR to permanently reduce the amount it promises in its contracts to reflect the real, biologically safe, capacity of the SWP to deliver the water. "If it fails to do so, new homeowners in Southern California may have nothing more than paper and hot air flowing from their taps," according to Carolee Krieger. "It is absolutely critical for the people of California to understand what it happening with paper water," says Dorothy Green. "Water policy in California is so complicated that the public is often left out of the decision making process," Green says, "but the use of paper water to fuel development in Southern California threatens to further erode our quality of life. It must be stopped."

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LETTER 20

SDIP
CalSPA
(Mike J.)

California Sportfishing Protection Alliance
"An Advocate for Fisheries, Habitat and Water Quality"
3536 Rainier Avenue, Stockton, CA 95204
Tel: 209-464-5090, Fax: 209-464-5174, E: deltakeep@aol.com

7 February 2005

attachment #1

Mr. Paul A. Marshall
Department of Water Resources
South Delta Branch, Draft EIS/EIR Comments
1416 9th Street, 2nd Floor
Sacramento, CA 95814

Via email to: marshall@water.ca.gov and sdip_comments@water.ca.gov

RE: CSPA Comments on the South Delta Improvements Program, Draft Environmental Impact Statement/Environmental Impact Report

Dear Mr. Marshall:

The California Sportfishing Protection Alliance, San Joaquin Audubon and Watershed Enforcers (hereinafter, CSPA) submit the following comments on the Draft Environmental Impact Statement/Environmental Impact Report (DEIS/R) of November 2005, by the California Department of Water Resources (DWR) and the US Bureau of Reclamation (BOR) concerning the South Delta Improvements Program (SDIP). We incorporate by reference the comments submitted by the Planning and Conservation League, Northern California Counsel of the Federation of Fly Fishers, Friends of Trinity River, California Trout and Richard Izmarian. We also incorporate the attached comments concerning the inadequacies of the DEIS/R's assessment of water quality impacts by Drs. G. Fred Lee and Ann Jones-Lee (Attachment 1).

great!

The environmental assessments for virtually every previous significant project in the Delta have promised benign or beneficial effects. All exacerbated existing conditions. It is frankly astonishing that, in the midst of attempts to understand the causes of the collapse of the Delta's pelagic fisheries, DWR has proposed significantly increased export pumping accompanied by a major modification of the hydrologic regime in the south Delta on the basis of a seriously flawed, inadequate and legally deficient document. That DWR and BOR are aggressively pushing this project at a time when numerous species in the Delta are in precipitous decline, with several hovering on the brink of extinction, speaks volumes about the values and intentions of its proponents.

The Administrative Record for the SDIP must comply with the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) and carry out the statutory duty to provide decision-makers and the general public with a clear understanding of the consequences of the project.

An EIR is "an environmental 'alarm bell' whose purpose it is to alert the public and its responsible officials to environmental changes *before* they have reached ecological points of no return." *Village Laguna of Laguna Beach, Inc. v. Board of Supervisors* (1982) 134 Cal. App. 3d 1022, 1027 (emphasis added). Beginning with its artificial segmentation of the proposed project through to its failure to evaluate a reasonable range or project alternatives, the DEIS/R fails to provide an accurate depiction of the many significant environmental impacts that will result from approval of the SDIP. The massive length of the DEIS/R does not reflect a depth of environmental analysis, but instead impedes a comprehensive understanding of the project's impacts. This letter details some, but not all, of the inadequacies in the DEIS/R, which include:

- The document is based upon the "Biological Opinion (BO) on the Long-Term Central Valley Project (CVP) and State Water Project (SWP) Operations Criteria and Plan (OCAP)", which has been found faulty by an independent technical review team convened by the CALFED Bay-Delta Program whose findings were made public January 3, 2006. (Attachment 2) A report by the Department of Commerce's Inspector General also found the BO process violated government procedures (Attachment 3).

- The document does not consider an alternative that **reduces** exports from the Delta, per the Third District Court of Appeals Decision (RCRC et al v State of California, Attachment 4), which sets aside the CALFED PEIR because the PEIR improperly fails to discuss an alternative that requires reduced exports of water from the Delta.[1]

- Similar to the CALFED PEIR and the Third District Court of Appeals Decision (RCRC et al v State of California), the document does not adequately disclose the environmental impacts of diverting water from various potential sources to meet the CALFED Program's goals. In particular, the analysis of impacts to upstream reservoirs, upstream river fisheries and upstream recreation are not only inadequate, but grossly misleading.

- The larger CALFED program, which includes SDIP, CVP long-term contract renewal, the so-called "Napa Proposal" and other elements to integrate CVP and SWP operations requires an EIS/EIR which amends the 1986 Coordinated Operating Agreement between DWR and BOR to include the regulatory baseline as it exists today prior making long term, potentially irretrievable, commitments of natural resources by building the barrier program in the Delta.

- The SDIP DEIS/EIR is premature in assuming that ever-larger deliveries of water to the San Luis Unit of the CVP can be justified, as the ROD for the San Luis Unit Drainage Re-Evaluation has not been completed. The National Economic

[1] Although the Supreme Court recently granted review of this case, the reasoning and conclusions of the Court are based on well-established CEQA law.

Analysis for that project identified that land retirement would be the most cost effective alternative, which could actually allow for **reduced** Delta exports.

Based on myriad inadequacies, prudence and a decent respect for the Delta Estuary we recommend that DWR and BOR withdraw the proposed DEIS/R for this project. We also request that the comment period be extended another 30 days in order to allow adequate time to review this complex and lengthy document.

I. The DEIS/R Improperly Defines the Proposed Project.

In order for an EIR to adequately evaluate the environmental ramifications of a project, it must first provide a comprehensive description of the project itself. "An accurate, stable and finite project description is the *sine qua non* of an informative and legally sufficient EIR." *San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus* (1994) 27 Cal. App. 4th 713, 730 (quoting *County of Inyo v. City of Los Angeles* (1977) 71 Cal. App. 3d 185, 193). As a result, courts have found that even if an EIR is adequate in all other respects, the use of a "truncated project concept" violates CEQA and mandates the conclusion that the lead agency did not proceed in the manner required by law. *San Joaquin Raptor*, 27 Cal. App. 4th at 729-30. In particular, an inadequate project description hinders the evaluation of project alternatives in violation of CEQA.

The proposed South Delta Improvement Program, which has been promoted as a comprehensive solution to problems in the South Delta, and described as such in the CalFed Delta Improvements Plan, is arbitrarily divided into two stages:

- Stage I is presented as the selection of the physical/structural component of the program, the preferred alternative being the construction of four permanent physical barriers, and operation within the existing export constraints of the two water projects (CVP and SWP).

- Stage 2 is presented as the selection of a preferred operational component for the program. This selection process will follow the selection of the alternative in Stage 1, and will be subject to a Draft Supplemental EIS/EIR and a full public review. It is at this stage that the relaxation of the existing COE export constraints will be addressed.

The proposed staging approach (see ES-9) does not allow for a complete discussion of key elements such as alternatives to the proposed operation project. Specifically, each of the alternatives evaluated assumes that Stage 2 will include the full diversion of 8500 acre feet. The operation studies included in the Draft EIR/EIS, in a perhaps revealing way, do not include an alternative that conforms to the staged decision process. Operation studies described in this document include:

No Project	6680	No barriers, dredging, or ag. diversions
Missing Alt.	**6680**	**Full Barriers, dredging and ag. diversion**
2A	8500	Full Barriers, dredging, and ag. diversions
2B	8500	Full Barriers, dredging, and ag. diversions
2C	8500	Full Barriers, dredging, and ag. diversions

3B	8500	No Grantline Canal Barrier, dredging, and ag. div.
4B	8500	No Agricultural Barriers, dredging, and ag. div.

It is clear that an alternative (the "Missing Alt." shown above in bold, underlined) which includes the barriers, dredging, and agricultural diversion extensions (physical/structural component), but which is limited to the 6680cfs pumping limitation (no operational component), is missing from the mix. Therefore it will be impossible to separate the effects of Stage 1 from Stage 2 in the analysis.

The DEIS/R further undermines the effectiveness of the project description through its reliance on the artful use of semantics begins to describe the water transfers. For example, the DEIS/R separates the CVP/SWP contract water deliveries, from the EWA water, the refuge water supplies, and the water transfers for other parties. Thus, the document states that the effects are limited to a 1% to 3% increase in CVP/SWP contract deliveries and for the environmental water (Page ES-5). Yet another 2% increase is then subsequently assigned to water transfers. The Estuary is affected by the whole of the exports, and this "piece-mealing" of the analysis is inappropriate. The analysis should be based on the effects of the 3% to 5% combined increase in exports.

The narrow definition of the operational component of SDIP to increasing exports in four versions of 8,500 cfs does not allow a thorough discussion of alternative methods of increasing water supply reliability for CVP and SWP export contractors. Despite the DEIS/R's claim that the alternatives were developed through a "stakeholder process" the range of alternatives is far too narrow and was focused only on increasing exports to 8500 cfs at the SWP pumps in the Delta. This narrow focus was inherent in naming the stakeholder group "the 8500 Stakeholder Process" at DEIS/R Vol. 1a, 2-9.

In the face of the State Appeals Court ruling on the CalFed EIS/R and ROD we are astounded to find that the document does not consider reductions in exports from the Delta as a means of solving the south Delta problems. The State Appeals Court was quite clear on this issue, and this point alone requires the preparation of a new draft, which includes and analyzes the relevant environmental improvement from choosing such an alternative.

Yes

II. The Long Term CVP/SWP SDIP/OCAP BO is Inadequate

The SDIP project is based on Endangered Species Act compliance through the CVP/SWP OCAP. A revised BO should be prepared with adequate analyses to determine jeopardy to listed species, including winter and spring run Chinook, steelhead, and Delta smelt. An independent CBDA sponsored review by a team of 6 scientists recently concluded that the SDIP-OCAP BO for salmon had the following deficiencies:

1. **Global climate change was not considered.** The BO assumes that the climate and hydrologic regime during the last century will persist into the future. The Panel does not believe that global climate change (e.g.,

temperature warming), and the consequent temperature and hydrological changes, received adequate treatment in the BO. This deficiency resulted in an important uncertainty being ignored that could affect the characterization of the risk to the ESUs.

2. **Variability in ocean productivity, and its affect on fish production, was not incorporated into the analyses.** The current status of the listed populations is, in part, an outcome of recent favorable ocean conditions. What will the status of listed populations be under less favorable conditions that may occur in the near future? By not including variability of ocean conditions in its analysis, the BO does not adequately address whether or not the listed populations are sufficiently large to survive a period of poor ocean conditions.

3. **Unknowns or uncertainty were either not adequately incorporated into the analyses, or their incorporation was not clearly explained.** In some cases, uncertainties were simply ignored or their consideration was deferred to other future analyses or other in-progress biological opinions. For example, Table 9 in the BO (page 193) summarizes the effects of the proposed project on the listed ESUs, but Table 9 fails to list eleven additional effects mentioned in the text of the BO. Ignoring or deferring the consideration of these effects in analyses does not give the listed species the required benefit of the doubt.

4. **Some models and analyses appeared to be flawed.** The application of monthly temperature models to anadromous fish studies is a point of concern. Of particular concern is the adoption, with little discussion, by NMFS of these monthly results both for assessing potential impacts and for setting thermal criteria. In addition, the data used to develop relationships between water temperature and salmon gamete, egg, and alevin mortality was not the best available.

5. **Greater consideration should be given to genetic and spatial diversity in the ESUs.** Too little consideration was given to the genetic and spatial diversity aspects of the ESUs. The Central Valley Technical Recovery Team noted that the "dependent" populations of spring Chinook and steelhead occupy marginally suitable habitats that either depend on migrants from the nearby streams or operate as a meta-population in which each stream is not individually viable, but the group persists. These dependent populations are a valuable resource because they exist in marginal environments, may contain valuable genetic attributes (e.g., higher temperature tolerance), and may serve as links with other populations in ways that increase the viability and resiliency of the ESUs over long time scales. The BO did not adequately treat the genetic and spatial diversity aspects in their analysis.

The DEIS/R may not rely on an inadequate environmental document to address and mitigate the environmental impacts of the SDIP. *Santa Clara River v. Castaic Lake* (2002) 95 Cal. App. 4th 1373. Clearly, the BO for the SDIP is inadequate and must be revised and completed prior to release of a new DEIS/R. In order to fully disclose impacts and mitigation measures, the revised BO must be completed prior to release of the new DEIS/R.

III. The DEIS/R Fails To Consider A Reasonable Range Of Alternatives

"An EIR for any project subject to CEQA must consider a reasonable range of alternatives to the project, or to the location of the project, which (1) offers substantial environmental advantages over the project's proposal . . .; and (2) may be feasibly accomplished in a successful manner considering the economic, environmental, social and technological factors involved." *Citizens of Goleta Valley v. Board of Supervisors* (1990) 52 Cal.3d 553, 566. "The discussion of alternatives shall focus on alternatives to the project or its location which are capable of avoiding or substantially lessening any significant effects of the project, even if these alternatives would impede to some degree the attainment of the project objectives, or would be more costly." CEQA Guidelines § 15126.6(b).

The DEIS/R must consider feasible alternatives that would obviate the necessity for increased export capacity. These include: 1) evaluation of the cost effective retirement of marginal farmland (including, but not limited to the selenium-laced soils of Westlands), 2) comprehensive agricultural and urban water conservation (including recycling, reclamation and the capture and treatment of surface/stormwater runoff), and 3) implementation of an aggressive desalination program in Southern California. It is likely that these alternatives would be environmentally superior and considerably more cost effective than the billions of dollars required for the SDIP. The cost of desalination is approaching the $750 to $1,000 range. Point and non-point control programs, like TMDLs, are problematic and prohibitively expensive. Conservation is clearly more cost effective than heavily subsidized export water. The DEIS/R should also examine alternatives that would reduce or eliminate the need for dredging (i.e., setback levees). Should the aforementioned alternatives be rejected, the DEIS/R must contain a discussion of why they were considered infeasible.

In October, the California Third District Court of Appeals set aside the CALFED ROD because, among other things, the PEIS for CALFED did not consider an alternative that **reduces** exports from the Delta. In January, the California Supreme Court agreed to review the case. It is therefore shocking to see that similar to the flawed CALFED PEIS, the SDIP DEIS/R does not contain an alternative that reduces Delta exports. This is particularly arbitrary since the first phase of the 8500 cfs project is supposedly only for fish and wildlife purposes and less pumping would seem to be a feasible alternative to meet the purpose and need or objective of the physical barriers project. This is a serious deficiency in the SDIP DEIS/R and must be remedied by development of an alternative that does not require an increase in use of the SWP's pumping capacity at Clifton Court. The "less export" alternative should be evaluated in light of alternative water supplies for

Delta exporters available and identified in numerous public reports, including DWR Bulletin 160-05.

The DEIS/R's justification for increased exports south of the Bay-Delta Estuary is predicated upon Bulletin 160-98. However, the recently released California Water Plan Update 2005 demonstrates that, under current trends, south of Delta water demands actually decrease in 2030, even accounting for the increased population. The Water Plan Update provides a reasonable scenario under it's Less Resources Intensive assumptions that water use statewide could decrease by up to 500 million acre feet, even without additional water conservation efforts taken by California water agencies. Additionally, a recent report by the Pacific Institute titled *California Water 2030: an Efficient Future* demonstrates that California water use in 2030 could be 20% below 2000 levels, even with a growing population and a healthy economy. Basing water demand upon outdated and discredited information while ignoring more recent relevant information is misleading and unacceptable. The DEIS/R must be withdrawn and reanalyzed using a reduced export alternative.

CSPA supports Trinity County's suggestion for development of a "Land Retirement Alternative" which returns water to the environment and other water users as follows:

A revised SDIP DEIS/R should expand on Appendix A of the Trinity River Fishery Restoration Supplemental EIR (shown below revised as Table 1). Table 1 portrays a rough estimate of the potential water savings associated with the retirement of lands within the San Luis Unit, Delta-Mendota Canal Unit and the San Joaquin River Exchange Contractors of the Central Valley Project that are expected to require drainage service. The purpose of the Trinity County analysis was to estimate an amount of CVP water that could be obtained from the retirement of drainage-impacted lands in the 3 units of the CVP. The water savings would then be dedicated to increase cold-water storage, drought protection, and recreational use in upstream reservoirs. Use of this water should be dedicated to environmental restoration, water quality, or other water users as needed. The total land with drainage problems is 376,751 acres in the water districts identified below in Table 1, but other problem areas also exist outside of the SLU and DMC areas, as identified in Table 2 below.

The analysis below shows that land retirement could save 793,056 AF in total CVP contracted water, which would have been an actual reduction in demand of 568,373 AF in 2002, the same year as the unprecedented Klamath Fish Kill on the Trinity River, one of the CVP source rivers. Every increasing diversion from the Delta export projects effect water conditions on all Central Valley Rivers and are causing a decline in species numbers and habitat quality. Permanent land retirement and dedication of water to other CVP project purposes would result in significant benefits from reduced pollution from drainage water, reduced CVP project power usage, increased ability to meet various water quality standards, increased water storage, increased M&I water supplies, and more water for environmental needs such as fishery flows and wildlife refuges. Land retirement could also be the basis for an alternative that reduces exports from the Delta, per the Third District Court of Appeals decision on the CALFED PEIR.

Table 1 from the Draft Trinity River Fishery Restoration Supplemental Environmental Impact Report (Trinity County 2004, as amended 1/24/05 and 2/16/05)

CVP

	Acres	Acres Requiring Drainage Service	% of District Requiring Drainage Service	Max CVP Contract Amount (AF)	Max CVP Contract Water Savings (AF)	2002 CVP Contract Deliveries (AF)	2002 CVP Water Savings (AF)
Broadview Water District	9,515	9,515	100.00%	27,000	27,000	18,588	18,588
Panoche Water District	39,292	27,000	68.72%	94,000	64,593	66,743	45,863
Westlands Water District	***604,000***	***298,000***	***49.34%***	***1,154,198***	***569,455***	***776,631***	***383,172***
Eagle Field	1,438	1,435	99.82%	4,550	4,542	2,869	2,864
Mercy Springs	3,589	2,417	67.35%	2,842	1,914	4,679	3,151
Oro Loma	1,095	,1095	100%	4,600	4,600	3,173	3,173
Widren	881	881	100%	2,990	2,990	2,094	2,094
Firebaugh	23,457	23,457	100%	85,000	85,000	85,000	85,000
Cent. Cal ID	149,825	4,951	3.30%	532,400	17,569	532,400	17,569
Charleston Drainage District (portion of San Luis WD with drainage problems)	4,314	3,000	69.54%	8,130	5,654	Not avail	Not avail
Pacheco Water District	5,175	5,000	96.62%	10,080	9,739	7,137	6,898
Total	842,581	376,751	NA	1,925,790	793,056	1,499,314	568,370

Table 1 above was derived by obtaining acreage information for each district through Chris Eacock at the Bureau of Reclamation (USBR) in Fresno. The number of acres requiring drainage by 2050 was taken from estimates in the San Luis Drainage Feature Evaluation, Plan Formulation Report, USBR, December, 2002 (pages 2-5 and 2-6). The maximum water savings associated with the retirement of these lands was calculated by multiplying the maximum contract amounts for each district by the percent of that district requiring drainage. Contract amounts were taken from a list of CVP contracts provided by Reclamation. Each district's total contract amount was calculated by adding all of its water contracts if more than one contract exists.

According to information we have received from the Environmental Working Group, water and crop subsidies to Westlands in 2002 amounted to over $100 million. If approximately half of Westlands, as well as those impacted lands in other drainage-problem districts such as Broadview, Widren, Mercy Springs, Panoche, Pacheco and others were retired, it would free up hundreds of thousands of acre-feet of water, as well as significantly reduce water and crop subsidies by tens of millions of dollars a year. Full analysis of such an alternative would provide meaningful disclosure to decision makers and the public about the true costs of delivering water to these problem lands.

Table 2

	Total Irrigated croplands in 2002(acres)	Drainage Impaired acreage in 2000 (acres)	% of County Requiring Drainage Service	Estimated Contract Amounts (AF)	Estimated Water Savings (AF)
Tulare County	652,385	291,000	44.60%	1,304,770	581,927
Kern County	811,672	313,000	38.56%	1,623,344	625,961
Total	1,464,057	604,000	N/A	2,928,114	1,207,888

Table 2 above portrays a very preliminary estimate of water savings in Tulare and Kern County within the SWP service area. The acres of irrigated croplands in these Counties was taken from the USDA farm census statistics report in 2002. The acreage of drainage impaired acres is derived from a report by CA Dept of Water Resources, the 2000 San Joaquin Valley Drainage Monitoring Program. The acreages identified are for lands with high groundwater within 20 feet of the surface. The contract amounts were figured by estimating 2 acre-feet per acre irrigated, most likely an underestimated amount. Further investigation is needed to verify and refine these numbers, but clearly there is adequate justification to remove these lands from irrigation due to continuing drainage problems and salinization of land, in violation of Water Code Section 100- Wasteful and Unreasonable Use of Water.

Finally, the DEIS/R not only fails to suggest reasonable alternatives to the barriers project that would better solve the objectives of a real South Delta Improvement program-land retirement and less export, it also fails to evaluate the impacts of increasing the capacity to deliver export water to drainage impacted land.

IV. The Selection of Alternatives Biases the Analysis, Predetermines Results and Fails to Achieve Identified Purposes of the Project.

The DEIS/R unreasonably narrows the project purposes to eliminate reasonable alternatives. The identified purposes of the project are defined as:

1. Reduce the movement of San Joaquin River watershed Central Valley fall/late fall-run juvenile Chinook salmon into the south Delta via Old River.

2. Maintain adequate water levels and, through improved circulation, water quality available for agricultural diversions in the south Delta, downstream of the head of Old River; and

3. Increase water delivery reliability for SWP and CVP water contractors south of the Delta and provide opportunities to convey water for fish and wildlife purposes by increasing the maximum permitted level of diversion through the existing gates at CCF to 8,500 cfs.

However, other than the no-project alternative, the only alternatives considered are construction of permanent barriers and increasing exports. This disingenuously predetermines the outcome and inappropriately excludes feasible less environmentally damaging alternatives. Arbitrarily excluding less environmentally damaging alternatives fails to meet the required scope of CEQA and NEPA.

In any case, project implementation will not meet the purposes of the project.

1. Construction of a Head-of-Old-River barrier may enable out-migrating salmonids to continue down the San Joaquin River rather than being drawn down Old River. However, DWR's particle tracking model and Vogel's radio-telemetry studies establish that San Joaquin out-migrants will subsequently be drawn down Turner and Columbia Cuts to the state and federal project pumps. Out-migrant salmonids still will not reach Chipps' Island.[2] Reducing the movement of salmonids into the south Delta via Old River accomplishes no environmental purpose if they escape Old River only to be drawn to the pumps via Turner and Columbia Cuts.

2. Likewise, project implementation will not improve water levels and water quality in the south Delta. As we discuss below, the DEIS/R acknowledges that water levels will decrease in the south Delta and any perceived improvement in water quality is speculative and lost in the noise of the modeling.

[2] http://calwater.ca.gov/Programs/Conveyance/FTDDCCTDF/Sept15_2005/TDF_Presentation_Vogel_9-15-05.pdf ; http://science.calwater.ca.gov/pdf/2002_Salmonid_Workshop_Summary.pdf (page 37) ; Vogel D. 2001. Juvenile Chinook salmon radio-telemetry study in the northern Sacramento-San Joaquin Delta, January – February 2000. Final project report submitted to U.S. Fish and Wildlife Service, Stockton, Calif. Red Bluff (CA): Natural Resources Sciences, Inc. 32 p; and Vogel D. 2002. Juvenile Chinook salmon radio-telemetry study in the southern Sacramento-San Joaquin Delta, December 2000 – January 2001. Final report submitted to the U.S. Fish and Wildlife Service, Stockton, Calif. Red Bluff (CA): Natural Resources Sciences, Inc. 27 p.

3. The only project purpose that is potentially realized by project implementation is increased water exports. However, increasing exports is not likely to improve water supply reliability as DWR's Draft 2005 Reliability Report predicts that as water deliveries increase, reliability actually decreases. While the Reliability Report contains serious flaws that must be corrected, DWR has elected to use the report analysis as the method for determining project water supply reliability. The Reliability Report shows that the SWP is estimated to be capable of delivering 1.2 maf about 90% of the time under DWR's 2025 modeling while deliveries of around 3 maf are only reliable in less than 70% of years. The DEIS/R must analyze how increasing exports under the proposed alternatives affects the reliability curve of the SWP.

V. The DEIS/R Fails To Provide An Adequate Discussion of the Project Setting and Therefore Fails to Properly Analyze SDIP impacts to Fisheries

"Accurate and complete information pertaining to the setting of the project and surrounding uses" is critical to an evaluation of a project's impact on the environment. *San Joaquin Raptor/Wildlife Center v. Stanislaus County* (1994)27 Cal. App. 4th 713, 729; *See also Friends of the Eel River v. Sonoma County Water Agency* (2003) 108 Cal. App. 4th 859, 875 ("incomplete description of the Project's environmental setting fails to set the stage for a discussion of" significant effects). As detailed below, the DEIS/R does not provide a complete analysis of the current state of the Delta and therefore cannot adequately address the impacts of the SDIP on the environment.

Abundance indices calculated by the Interagency Ecological Program (IEP) suggest recent marked declines in numerous pelagic fishes and zooplankton in the upper San Francisco Estuary (the Delta and Suisun Bay). These low levels were unexpected given the relatively moderate hydrology over the past three years. IEP proposes to augment existing monitoring, perform new data analyses, and conduct special studies to investigate whether there is a new threat to pelagic fish and their prey, and if so, what has caused it.

The IEP conceptual model includes at least three general factors that may be acting individually or in concert to lower pelagic productivity: 1) toxins; 2) invasive species; and 3) water project operations. The overall approach adopted in 2005 is a screening-level study to better define the degree to which each of these factors may be responsible individually, in sequence, or in concert for the apparent step-changes. The workplan is based on a "triage" model to identify the most likely causes, and to assign priorities to projects on the basis of where funds and resources can be best used. Results also may shed additional light on causes of long-term declines in several of the affected species. Several of the lines of inquiry will be managed on an adaptive basis in that information will be examined as it is made available and depending on the results, increasingly focused studies will be conducted in 2006 and later years. SDIP needs to wait for the results of those studies before effective mitigations can be designed and implemented.

As noted, the abundance indices calculated by the IEP Fall Mid-water Trawl survey (MWT) show marked declines in numerous pelagic fishes in the upper San Francisco Estuary (the Delta and Suisun Bay). The abundance indices for 2002-2004 include record lows for delta smelt and age-0 striped bass and near record lows for longfin smelt and threadfin shad (Bryant and Souza 2004; Hieb et al. 2005). Data from another IEP monitoring survey, the Summer Tow Net Survey (TNS), support the MWT findings: TNS abundance indices for striped bass and delta smelt were among the lowest indices in the 45-yr record. In contrast, the San Francisco Bay Study did not show significant declines in its catches of marine/lower estuary species (Hieb et al. 2004; Hieb et al. 2005). Based on these findings, the problem appears to be limited to fish dependent on the upper estuary.

In addition to the declines in fish species, IEP monitoring also found declining abundance trends for zooplankton with a substantial drop in calanoid copepod abundance in 2004. Calanoid copepods such as *Eurytemora affinis* and *Pseudodiaptomus forbesi* are the primary food for larval pelagic fishes in the upper estuary (IEP 1987; Meng and Orsi 1991; Nobriga 2002) as well as older life stages of planktivorous species such as delta smelt (Lott 1998). Conversely, the invasive cyclopoid copepod *Limnoithona tetraspina*, which may be a poor food source for fish and an intraguild predator of calanoid copepods, is increasing in abundance and continues to be the most abundant copepod in the estuary (Mecum 2005).

While several of these declining species - including longfin smelt, juvenile striped bass and calanoid copepods have shown evidence of a long-term decline - there appears to have been a precipitous "step-change" to very low abundance during 2002-2004. This observation is supported by initial statistical analyses of the MWT data (Manley in prep.). Moreover, the record or near-record low abundance levels are remarkable in that the hydrological regime in the San Francisco Estuary was moderate during this period. Many estuarine organisms including longfin smelt and striped bass typically produce poor year classes in dry years (Jassby et al. 1995); delta smelt abundance is generally lowest in very wet or very dry years (Moyle et al. 1992). Thus, the moderate hydrology during the past three years should have supported at least modest production.

The fact that multiple pelagic species at more than one trophic level seem to show the 2002-2004 step decline is of particular concern. Regardless of whether the observations over the past three years are remarkable, the fact that the efforts of the California Bay-Delta Authority (CDBA) have apparently not arrested long-term declines in some pelagic species indicates that additional efforts are needed to identify what limits pelagic fisheries production in the upper estuary. Over the past decade, CBDA activities have resulted in a major shift in the timing of water exports, the development of an Environmental Water Account, and construction of habitat restoration projects. Additional information about the factors affecting pelagic organisms is needed before alternatives are designed for the SDIP, and provide guidance for future activities in the upper estuary including step 2 of SDIP.

Kimmerer (2002a) showed that water project operations have resulted in lower winter/spring inflow and higher summer inflow to the Delta. As noted previously, the CBDA actions have restored some spring inflow, but have also increased summer inflows to meet increasing summer export demands. This shift was implemented based on the assumption that it would be more protective to sensitive early life stages of key estuarine fishes and invertebrates. However, it is possible that high export during summer-winter months has unanticipated food web effects by exporting biomass that would otherwise support the estuarine food web. Other possible mechanisms include increased entrainment of fishes during the summer-winter months, or a reduction in habitat quality downstream (e.g. less area of the appropriate salinity). Total annual exports have continued to increase under the CBDA. It is also possible that the total volume diverted on an annual basis influences estuarine productivity (Livingston et al. 1997, Jassby et al 2002). The FEIR/S must disclose such information, analyze potential impacts from increased usage of pumping capacity in light of the uncertainties inherent in installation of permanent barriers and making operational changes to include further use of 8500 cfs export capacity.

We also suggest that you further evaluate impacts of SDIP in light of knowledge that in the past few years, more water has been exported during the summer (July-September) and the winter (December-March) than before, in part to compensate for conservation-driven export reductions in spring (April and May). There have been other changes in water project operation changes, which may also have had unexpected biological side-effects (e.g. export of more primary production). The purpose of ongoing scientific investigation is to closely examine recent changes in water project operations to identify effects potentially strong enough to account for the apparent step change in pelagic fish species abundances since 2001.

water project operations changes

Other historical changes in water project operations should also be disclosed and analyzed to support the decision-makers understanding of historical population dynamics for fish species in the Bay/Delta and to advance knowledge of the role of water project operations in the long-term decline of certain pelagic fish species. "Dramatic increases in winter CVP and SWP salvage occurred contemporaneously with recent declines in several pelagic fish species. These unexpected increases in salvage density coincide with the step decline pelagic fishes in 2002. The *Winter Adult Entrainment Hypothesis* presently being studied by the CALFED program posits that these events are causally linked. Evidence for this hypothesis includes:

1. There appears to have been a step increase in salvage density of adult delta smelt, threadfin shad and longfin smelt between 2001 and 2002. This increase is consistent with recent-year changes in winter water export operations. See Herbold et al

2. There appears to have been a step decrease in the Fall Mid-water Trawl indices of adult delta smelt, threadfin shad, and longfin smelt between 2001 and 2002. See Study Component 2i report by Manly and Chotkowski for details.

3. Winter exports from the CVP and SWP have increased since the late 1990s. See Study Component 2h report by Simi and Ruhl for details.

Increased winter entrainment of delta smelt, long-fin smelt and threadfin shad represents a loss of the pre-spawning adults and all potential progeny. This means on a per capita basis loss of each adult fish may be equivalent to the loss of hundreds or even thousands of juveniles later in the year. Because an entrainment impact specifically affecting adult fishes has the potential to be strong, we regard finding an explanation for this coincidence a high priority.

The main sorts of explanations for why winter salvage densities may have increased since 2002 include: (1) the source of exported water has been changed to an area where more of these fishes occur during the winter; (2) the affected fishes have moved to areas from which exports are drawn; and/or 3) winter exports have increased past some sort of hydrodynamic threshold below which fish were better able to avoid entrainment. We expect well-documented answers in the FEIS/R to questions like: How have recent (1995 – 2004) water project operations policy changes changed delta hydrology? "Hydrology" is meant here to include the volume, timing, and pattern of input flows into the delta, delta outflow, exports, and operation of various water project gates and barriers. We also ask: which, if any, of the changes might plausibly have contributed to, or caused, a step change decrease in pelagic fishes abundance since 2001? We also want to know how the barriers will effect the questions above.

We suggest that you redo the DEIR/S to adopt the following assumptions for your new analysis since the on-going IEP study is using them:

1. Stressor effects on pelagic populations are highest during the summer period.
2. Ideal" hydrology in 2005 will not result in substantial increases in the abundance of pelagic fish and calanoid copepods.
3. Stressor effects have increased during the summer period relative to historical data.

We further suggest that you redo the inadequate analysis in the DEIS/R of the potential for the SDIP to aggravate the unfolding pelagic fish crash. A thorough analysis of the direct and indirect effects of building the barriers on reverse flows, water levels, entrainment of salmon and smelt, predation, residence time of water in the South Delta, and hydrodynamic changes in the South Delta caused by the new permanent barriers should be prepared. The analysis that presently exists in the DEIS/R is not adequate to justify selection of any of the alternatives presented and will result in misleading the decision-makers about the environmental impacts of the project and what course to take in their respective decision documents.

VI. The DEIS/R Fails to Adequately Analyze Project Impacts.

An EIR must provide information about the magnitude and type of environmental impacts; it may not, as this draft does, simply speculate that there may be impacts and hope for the best. *See Stanislaus Natural Heritage Project v. County of Stanislaus* (1996) 48 Cal. App. 4th 182, 196-97. An EIR must also provide "information about how adverse the adverse impact will be." *Santiago County Water District v. County of Orange* (1981) 118 Cal. App. 3d 818, 831. This information must contain facts and analysis, not the agency's bare conclusions . . . .") *See Citizens of Goleta Valley*, 52 Cal. 3d at 568.

As detailed below, the DEIS/R fails to provide an adequate analysis of a range of project impacts. This failure renders the DEIS/R inadequate and requires that the DEIS/R be revised and recirculated prior to project approval.

1. Water Quality Impacts from SDIP were inadequately disclosed and considered in the DEIS/R.

The analysis of water quality impacts in the DEIS/R is woefully inadequate. The SDIP must be consistent with and comply with requirements of the federal Water Pollution Control Act and California's Porter-Cologne Water Quality Control Act. Delta water quality must not be sacrificed at the altar of increased exports. The historical export of South Delta water has fundamentally altered the movement of pollutants throughout the Delta. Rapid population growth in the South Delta is increasing the mass loading of numerous pollutants (i.e., wastewater, stormwater, illegal dumping). Implementation of the SDIP will further alter the distribution and concentration of these constituents. The majority of water quality monitoring has primarily focused on salinity, with little emphasis on other water quality parameters. Sufficient baseline field data does not yet exist to adequately calibrate/verify models and evaluate project effects on the rainbow of water quality constituents (i.e., virtually the entire suite of organic and inorganic pollutants) that will likely be affected by the project. A rigorous water quality analysis should precede project evaluation, alternative formulation, and implementation.

As previously noted, attached and included as a part of these comments is the assessment titled *Comments on the Draft Environmental Impact Statement Environmental Impact Report, South Delta Improvement Program* by Dr. G. Fred Lee and Dr. Anne Jones-Lee on the fundamental inadequacy of the DEIS/R's analysis of the project's potential adverse impacts to water quality. (Attachment 1)

The DEIS/R failed to address our scoping comments for this project with respect to water quality issues. It does, however, acknowledge that the project will require a Clean Water Act § 401 Certification. Regardless or whether our concerns are adequately addressed in this environmental review, DWR and BOR cannot avoid addressing these issues in what is likely to be a highly contested certification process.

The Delta is identified on the California Clean Water Act 303(d) List as impaired because of diazinon, chlorpyrifos, DDT, Group A Pesticides, electrical conductivity, mercury, organic enrichment/low dissolved oxygen and unknown toxicity. Old and Middle Rivers

are listed as impaired because of low dissolved oxygen. The DEIS/R acknowledges that changes in hydrology can affect fate and transport of pollutants. It also acknowledges that synthetic and natural contaminants have bioaccumulated in Delta fish and other aquatic organisms and that synthetic organic chemicals and heavy metals are found in Delta fish in quantities exceeding acceptable standards for food consumption. Inexplicably, the DEIS/R fails to address the project's effects on the full suite of pollutants presently identified as impairing Delta waters, with the exception of salt. The DEIS/R cannot simply evaluate project impacts in terms of a "conservative" constituent like salt or impacts to dissolved oxygen in the Stockton deep-water channel. It must analyze and quantify the Project's effects on toxicity and impairing constituents in the south Delta and propose mitigation, so that the public and decision makers may reach their own conclusions about the adverse impacts of the project. *Save Our Peninsula v. County of Monterey* (2001) 87 Cal. App. 4th 99, 130. *See Citizens to Preserve the Ojai v. County of Ventura* (1986) 176 Cal. App. 3d 421, 432-33 (finding "an absolute failure to comply [with CEQA]" where information relevant to project's impacts was omitted).

Toxicity to lower tropic populations in Paradise Cut, attributable to organophosphorus insecticides, extends for weeks at a time. Delta waters frequently contain a cocktail of as many as 15 pesticides. Many of these interact additively or synergistically and/or bind to sediment. The tissue of fish collected from the South Delta contains high concentrations of bioaccumulative toxins (i.e., legacy pesticides, mercury and PCBs). Changes in south Delta hydrology will inevitability affect the fate and transport of these toxic constituents. The DEIS/R must be revised to include a characterization and assessment of the sources, mass loading and fate and transport of all pollutants likely to be present in south Delta channels and an evaluation of water quality impacts from the project and alternatives.

There are indications that selenium loads in the San Joaquin River have historically been diverted down Old River. Benthic organisms bio-accumulate selenium. The EIR/EIS should evaluate the effects of redirected selenium loads into the eutrophic areas of the Central Delta.

Dioxin concentrations significantly above levels protective of public health have been documented throughout San Francisco Bay and the Stockton Deep-Water Channel. Discussion with staff from the California Department of Public Health and the Central Valley Regional Water Quality Control Board, as well as private consultants, lead CSPA to believe that elevated concentrations of dioxins are likely present in the South Delta. The SDIP should evaluate the project's effects on likely dioxin concentrations in the South Delta.

Elevated levels of pathogens have been identified in the South Delta. Changes in flow will likely have an effect on concentration and spatial distribution of bacteria, viruses and parasites. Consequently, the DEIS/R must identify and evaluate the project's effects on pathogens.

The project's permanent barriers and inevitable changes in hydrology and export rates will likely have a significant effect on existing efforts to achieve water quality standards.

The DEIS/R must discuss the project's compatibility with TMDLs, Toxic Hot Spot Cleanup Plans, NPDES permitting for increased contaminate loading and Basin Water Quality Control Plans. It must also discuss how altered flow and increased exports will effect implementation of control measures.

Increased exports will likely alter streamflow regimes on major tributaries to the Delta (including the Trinity and Klamath Rivers). The DEIS/R must more completely evaluate and discuss the project's effects on the physical and chemical parameters necessary to support renewable fisheries within upstream tributaries and reservoirs.

Increased exports during certain periods of the year will likely lead to reductions in streamflow during other times of the year (as the VAMP did on the San Joaquin River). This will almost certainly lead to a reduction in assimilative capacity (i.e., reduction in available dilution) on a number of Bay/Delta tributary rivers during certain time-periods. Reduction in streamflow and the resulting loss of assimilative capacity could necessitate more stringent NPDES permit limits. More restrictive permit limits will require dischargers to expend enormous sums of money to comply with new limits. The DEIS/R must evaluate the impacts to dischargers who will face more stringent permit limits caused by reductions in available dilution. Class water present -

A significant SDIP component involves increased dredging of south Delta channels. Recently, the Central Valley Regional Water Quality Control Board strengthened requirements for dredging and dredge spoil placement. A comprehensive assessment of contaminate remobilization from dredging activities and potential effects of land disposal on terrestrial organisms is required. The discussion must include an evaluation of the adequacy of available sediment analyses (i.e., number of core samples, locations, constituents analyzed, concentrations, detection limits, etc.) and identify and evaluate disposal sites.

Lastly, we note that State Water Resource Control Board Revised Water Rights Decision 1641 changes the salinity standard for south Delta channels from 0.7 mmhos/cm (April through August) to 1.0 mmhos/cm upon implementation of the permanent barriers. This degradation of water quality represents a significant adverse environmental impact. The DEIS/R is deficient for not discussing and mitigating this degradation of water quality on south Delta agriculture.

2. The Analysis of Upstream Fisheries Impacts Caused by SDIP Is Inadequate.

The SDIP DEIS/EIR contains unsubstantiated findings about the lack of impacts to Central Valley fisheries. Spring chinook, fall Chinook and steelhead spawn, migrate and hold during periods when temperatures can be an issue in the summer and early fall. The same is true for pelagic species in the Delta. The DEIS/R fails to recognize the importance of steelhead and Chinook in sport, tribal and commercial harvest, and it fails to identify that lower upstream carryover storage will have a negative impact on the survival of Central Valley fisheries below major dams. The DEIS/R completely ignores

the issue of cold water reserves that are required in upstream reservoirs to ensure that adequate stream temperatures can be achieved in the dry periods and parts of each year (summer) in which cold water is most necessary for species survival.

Presumably, increased export rates could lead to drawdown of upstream reservoirs. Should the SDIP lead to reductions in upstream reservoir storage and water elevation, the effects on fisheries and recreation in the affected impoundments requires a much more complete analysis than has been done in the DEIS/R. It should also discuss potential effects to non-state water project facilities and water rights holders (i.e., those having to meet shortfalls induced by the SDIP).

The DEIS/R should be revised to include a full analysis of impacts to Central Valley River temperatures from the SDIP-OCAP project and of each alternative's likely consistency with State and federal water quality standards and objectives. The DEIS/R revision should evaluate project compliance with all Delta water quality standards, including the .7 EC standard at interior Delta locations as required by D-1641.

The BOR has previously recognized the need to lower Delta export as a result of a decision limiting diversions from the Trinity to the Sacramento/Delta system. The 2000 Trinity River Record of Decision (ROD) called for increased fishery flows into the Trinity River from Trinity and Lewiston Dams, corresponding to roughly a 1/1 reduction in water exports to the Sacramento River. It is now apparent that the BOR, through the SDIP, has no intention whatsoever of honoring its requirement to reduce water exports to the CVP commensurate with the increase in Trinity River fishery flows. Instead, BOR intends to continue historic deliveries of CVP water from the Delta, as indicated by the numerous CVP long-term contracts such as the San Luis Unit that promise larger future deliveries.

Therefore, approval of the SDIP and implementation of the Joint Point of Diversion whereby the CVP can send its "surplus" water south of the Delta using SWP pumping capacity will surely result in depleted cold water reserves in all upstream Reservoirs at the beginning of the next multi-year drought. The DEIS/R should identify the source of water for increased SDIP exports and disclose and evaluate environmental impacts in the source areas. Whose water are they exporting in this project anyway? ★★★★★

3. The DEIS/R Fails to Acknowledge, Address and Mitigate Project Impacts to the Tracy Fish Facility.

The DEIS/R ignores the effects of barrier operation in conjunction with accelerated export pumping on Central Valley Project export facilities. While DWR's pumping facility draws water from Clifton Court Forebay, the BOR relies upon the Old River tidal pool for its water supply. Implementation of the temporary barriers and increased export pumping have caused water stage height in Old River to decline causing head loss at the BOR pumps, especially during low tides. The Tracy Fish Facility is no longer able to operate within design criteria in accordance with the Biological Opinion and export pumping costs have increased. Moving the Grantline Canal barrier further downstream

will further constrict BOR's tidal pool. The proposed project will exacerbate these problems by causing further and longer reductions in stage height, reduced fish salvage effectiveness, greater turbulence and increased electricity costs.

The south Delta has lost 4-5 feet in stage height since the 1950's. BOR staff has suggested that as much as an additional 4 feet head loss could occur in the coming years from implementation of the Intertie (1.5 foot loss), Banks 8,500 cfs (1 foot loss) and Banks 10,200 (1.5 foot loss).

Temporary barriers and increased pumping have reduced primary and secondary channel and holding tank velocities and secondary bypass ratios are now below one. Turbulence has increased. The primary channel was designed to operate at a 16-21 foot depth but now operates at 13-19 foot depth. The secondary channel was designed to operate at a 5-10 foot depth but presently operates at a 0.5-8 foot depth. The holding tank was designed to operate at a minimum depth of 5 feet but now operates at a minimum depth of 0.5 feet. Fish salvage effectiveness has been reduced from design criteria (80-90% in the 1960's) to 50-60% (early 1990's) to less than 20% today. Improving TFCF Hydraulics, Lloyd Hess, Attachment 2.

BOR project pumps are 3 feet lower than DWR's export pumps. Operation of permanent barriers will:

a. Reduce the volume of water available to BOR at low tides.
b. Will cause longer low tides.
c. Increase debris buildup on trash racks.
d. Increase power costs from having to raise water from a lower elevation.
e. Further decrease the efficiency of salvage operations.
f. Increase sedimentation in Old River adjacent to BOR's facility.

The DEIS/R must be withdrawn and revised to analyze and discuss the project's adverse impacts to the BOR facility.

4. The DEIS/R Fails to Adequately Analyze and Mitigate Impacts from New and/or Modified Irrigation Diversions.

Since the project will lower water levels in the south Delta during periods of high export pumping, the project proposes to extend 24 agricultural intakes and install more powerful pumps to facilitate irrigation. These new pumps will replace less powerful pumps or, in many cases, existing siphons and are more likely to entrain fish. However, these new pump intakes will not be screened in violation of California Department of Fish and Game and NOAA Fisheries fish screen policies. This despite clear evidence from DWR's Particle Tracking Model that these diversions are a cause for fish loss in the south Delta. The DEIS/R is deficient for not analyzing and mitigating increased entrainment.

5. The DEIS/R's Analysis and Explanation of the Project's Effects on South Delta Water Circulation and Water Quality is Deficient.

One of the three identified project purposes is to "[m]aintain adequate water levels and, through increased circulation, water quality available for agricultural diversions in the south Delta, downstream of the head of Old River." The DEIS/R describes the modified circulation pattern as:

a. During high tides the three gates will be lowered to allow water to flow upstream. The gates will be raised prior to the following ebb tides to ensure adequate water level remains behind the gates.

b. The height of the Grantline Canal barrier will be lower than the Old River and Middle River barriers and this will ensure that water will flow from Old and Middle River into Grantline Canal to exit over the Grantline barrier.

The Summary of Environmental Effect (Chapter 4, page 4.4) states that construction and operation of permanent gates would not result in any significant reductions in south Delta channel tidal level. This begs the question of what is significant. For example, Figure 4.1 (Minimum and Maximum Tidal Level for Grant Line Canal at Tracy Boulevard Bridge for Each Alternative) reveals that installation of permanent barriers would reduce the tidal level about 0.5 feet (maximum tide) and up to 1.0 feet (minimum tide). Examination of DSM-2 validation (Appendix D-24 – D-26) reveals that model simulations of tidal elevations in south Delta waterways are 0.5 foot to 1.0 foot higher than measured tidal elevations. Clearly, replacement of the temporary barriers with permanent barriers results in lower water elevation in the south Delta.

The DEIS/R doesn't include DSM-2 validation for salinity (EC) for interior south Delta stations. However, DWR's web sit does contain comparisons between current calibration and observed EC levels for interior south Delta stations. http://modeling.water.ca.gov/delta/studies/validation2000/map.html. Both 14-Day Moving Averages and 24.75 Hour Running Averages show substantial differences between simulated and observed EC levels. For example, simulated EC at Old River at Tracy Boulevard is often more than 1,000 μS/cm lower than field observation. Any representation regarding improved EC in the south Delta resulting from implementation of permanent barriers must be taken with a grain of salt. The DEIS/R must be revised to adequately discuss the potential errors in modeling and the relative probabilities of increased circulation, water levels and water quality.

The modeling fails to account for resistance in the upper reaches of Old and Middle Rivers, especially during the two low tide cycles each month. As tidal flow pushes upstream, it encounters greater resistance until the net flow disappears and a null zone develops. Resistance can also be increased as channel geometry changes (i.e., increases in sedimentation or formation of sandbars). DWR modeling relies upon old data and, consequently, it is unlikely that the simulations accurately reflect current conditions. It also incorporates an assumed average salinity concentration for local agricultural

discharges despite the fact that central Delta farmers discharge lower levels of salt than south Delta farmers. This has the effect of understating the salinity in return flows and the resulting salinity concentrations in south Delta channels. Further DSM-2 treats waterways as boxes and a comparison of actual channel dimensions with modeled dimensions reveals substantial differences, often as much as 20-25% (personal conversation, Jeff Stuart, NOAA Fisheries). These effects are likely to be exacerbated as agricultural diversions remove water from the channels. It is possible that, under these conditions, there would be no net flow down Grantline Canal. Indeed, considering that the modeling of agricultural diversion is based upon 30-day averages (and farmers don't irrigated on 30-day averages), it is likely that actual agricultural diversions would lead to channel depletion causing reverse flows down Old and Middle Rivers for significant periods. The DEIS/R must be revised to provide a candid in-depth discussion of how circulation will be assured under the project.

There have been several suggestions that the use of low lift pumps would help ameliorate problems cause by lack of circulation. We note that Volume 1, Page 2-23, Gate Design and Construction Detail states that "[p]er a developing agreement with south Delta water users, three agricultural gates may include structural and wiring features that would allow the easy addition of low head pumps and piping, should this contingency prove necessary and appropriate in the future." However, this would raise problems of its own and is clearly outside the scope of the described project. As such, implementation of these structural and wiring features would represent an illegal commitment of resources in violation of CEQA.

Another problem largely ignored in the DEIS/R is that reductions in San Joaquin River flow through the HOR barrier will make it more problematic for farmers along Tom Paine Slough, Paradise Cut and below the HOR barrier to irrigate. Even a brief loss of suction to a siphon would represent significant trouble and cost to a farmer. The description of potential impacts to Tom Paine Slough, Paradise Cut and upper Old River is seriously deficient and must be revised.

Nor does the DEIS/R adequately discuss the quality of agricultural discharges and return flows and discharges of stormwater and wastewater from municipalities. Considering the rapid growth and increased pollutant loading from Tracy, Mountain House and adjacent communities, it is likely that water quality problems will be exacerbated during periods of low flow or stagnation. The DEIS/R must analyze the effects of these pollutant inputs on water quality.

6. The DEIS/R Ignores Impacts to Aquatic Life from Construction and Operation of Permanent Barriers.

Although DFG trawls are no longer conducted in south Delta channels, these waterways once provided good habitat for Delta smelt. Oddly, there is no analysis of the impacts to aquatic life, including Delta smelt, in south Delta channels although the construction and operation of the permanent barriers and other structural components are likely to have

adverse impacts. The DEIS/R must be revised to include a rigorous discussion of potential impacts to all life stages of all aquatic life in these waterways.

7. The DEIS/R Fails to Analyze the Impacts of Increased Winter Pumping on Delta Smelt.

As previously noted, the decline of pelagic species in the Delta has occurred during periods of increased export pumping and operation of the EWC. In fact, IEP studies have suggested that increased winter pumping is a contributing factor to recent declines of Delta smelt. Since the DEIR/S relies upon EWC, it must analyze and mitigate for adverse impacts to Delta smelt and other species caused by increase EWC winter pumping.

8. The DEIS/R Fails to Analyze Redirected Impacts from SDIP.

The scoping document for the SDIP identified the primary issues as: 1) current and proposed diversion rates impede the ability to divert irrigation water, 2) salinity standards, and 3) decline in Delta smelt and San Joaquin River salmon populations. The project's elements are defined as: 1) increased maximum export capacity at Clifton Court Forebay, 2) dredging in Old River to facilitate increased exports, 3) improved agricultural water delivery by construction of permanent operable barriers and local channel dredging, and 4) construction of a fish control structure at the head of Old River to reduce salmon losses at CVP and SWP export facilities.

However, increased export rates, the potential for increases in total export quantity and the inevitable altered hydrographs on numerous tributaries are likely to affect the entire Central Valley circulatory system. Many of the Delta's present problems derive from a failure to consider the redirected or system-wide impacts caused by previous projects. The DEIS/R must reevaluate the project's potential present and future redirected adverse impacts on: 1) the suite of water quality problems and pollutants in the Delta, downstream waters (Suisun and San Francisco Bays) and upstream tributaries (including the Trinity-Klamath system), 2) aquatic life populations in those waterbodies and 3) existing programs to meet water quality standards (i.e., TMDLs, Toxic Hot Spot cleanup programs, NPDES permits, etc.).

VII. The DEIS/R Fails to Adequately Analyze Cumulative Impacts Caused by the SDIP and Other On-going State and Federal Programs.

NEPA does not allow projects to be analyzed in artificial isolation. Instead, it requires discussion, in an EA or EIS, of the cumulative impacts of the proposed project in combination with "past, present, and reasonably foreseeable future actions." 40 C.F.R. § 1508.7; *see Native Ecosystems Council v. Dombeck*, 304 F.3d 886, 895-96 (9th Cir. 2002). That discussion cannot be "perfunctory," *Kern v. United States BLM*, 284 F.3d 1062, 1075 (9th Cir. 2002), but instead must provide "some quantified or detailed information; ... general statements about 'possible' effects and 'some risk' do not constitute a 'hard look' absent a justification regarding why more definitive information

could not be provided." *Id.* (quoting *Neighbors of Cuddy Mt. v. United States Forest Serv.*, 137 F.3d 1372, 1379-80 (9th Cir. 1998)). See also *Muckleshoot Indian Tribe v. United States Forest Serv.*, 177 F.3d 800, 811-12 (9th Cir. 1999); *City of Carmel-by-the-Sea v. United States DOT*, 123 F.3d 1142, 1161 (9th Cir.1997); *LaFlamme v. FERC*, 852 F.2d 389, 401-02 (9th Cir. 1988). CEQA similarly requires lead agencies to consider cumulative impacts, or the incremental effects of the proposed project viewed together with the effects of past, current, and probable future projects. Pub. Resources Code § 21083(b); CEQA Guidelines § 15130(a)-(b).

A cumulative impacts analysis must address "reasonably foreseeable" projects that may have a "synergistic environmental effect" combined with the project under review. *Tenakee Springs*, 915 F.2d at 1312-13. A project is "reasonably foreseeable" when formally proposed by government agencies. *Kern*, 284 F.3d at 1075-78; *Muckleshoot Indian Tribe*, 177 F.3d at 811-12. The state and federal government are required to evaluate their SDIP project in context of the numerous other projects presently contemplated during the thirty-year CalFed program.

Such analysis was particularly necessary here, for the SDIP is a component of a larger set of interrelated actions in the CALFED program, many of which involve sustaining damaging level of exports or increasing extraction of water from the Bay-Delta. In their CALFED programmatic FEIS/EIR, the Bureau and DWR described the SDIP project as part of a broader effort to increase water supply, and the CALFED agencies "recognized that many of their proposed actions were interrelated." BOR EA/IS for the Interte, at 3-86. Likewise, in the OCAP ESA consultation process, the Bureau, FWS, and NMFS defined the SDIP, along with several other changes to CVP and SWP operations, as part of the same overall OCAP project. Cumulative impacts discussions cannot merely provide "general statements about possible effects." *Kern*, 284 F.3d at 1075; *see Neighbors of Cuddy Mt.*, 137 F.3d at 1379-80. Yet the SDIP DEIS/R cumulative impacts discussion contains only generalities and unsupported conclusions in violation of both CEQA and NEPA.

Even if it had prepared the cumulative impacts analysis NEPA requires, the Bureau and DWR could not have explained their deviation from the earlier CALFED EIS/EIR's conclusions, for those conclusions were right. As the CALFED EIS/EIR explained, the SDIP and related projects also designed to sustain or increase exports have significant potential impacts:

1. Export pumping causes "negative" flows, in which water flows toward the south Delta pumps rather than San Francisco Bay, for many months each year. Those "[r]everse flows...have contributed to the reduction of Bay-Delta productivity and of some Bay-Delta invertebrate and fish populations." *Id.* at 6.1-8, 6.1-42 (listing affected species, many of which are threatened or endangered);

2. Export pumping pulls saline water into the Delta. "Sea-water intrusion into the Delta can be intensified by diversion of fresh water and the corresponding decrease of freshwater outflow from the Delta" *Id.* at 5.2-5;

3. Export pumping causes "salinity [that] adversely affects most beneficial uses. Bromides associated with sea water lead to the formation of DBPs in treated water." *Id.* at 5.3-11. Salinity intrusion also forces open water species that prefer non-saline habitat to move from Suisun Bay, which provides open-water habitat, into the Delta, which does not. *Id.*; *see id.* at 6.1-35 (explaining benefits of minimizing saline intrusion);

4. Export pumping kills thousands of fish. Those fish die through "direct loss at pumps, reduced survival when young fish are drawn out of river channels into the Delta, and reduced spawning success of adults when migratory cues are altered." Therefore, "most species are potentially affected" by pumping increases, "including chinook salmon, delta smelt, steelhead, and striped bass"—all of which are protected under federal law;

5. Export pumping for irrigating the west side of the San Joaquin Valley, where SDIP water will be transported, drains pollutants into the San Joaquin River and the Bay-Delta. *Id.* at 5.3-7. The CALFED Program EIS/R recognized that "Inadequate natural drainage, salt accumulation, and high selenium concentrations in agricultural return flow have been long-standing problems in this area and have intensified with the importation of irrigation water from the Delta." *Id.* at 6.1-11; and,

6. Export pumping threatens compliance with federal and state law, both of which require attaining water quality objectives and recovering endangered species populations. CALFED specifically acknowledged that "[t]here is concern whether a through-Delta conveyance approach," in which water is sucked through the Bay-Delta by the South Delta pumps, "can meet future water quality objectives and not adversely affect the recovery of threatened and endangered fish species." *Id.* at ES-17.

The CALFED EIR analysis confirms a common-sense notion: increasing the already-massive amount of water pumped out of a fragile aquatic ecosystem, at a time when other export-increasing projects are proposed, fish populations in that ecosystem are threatened or collapsing, and water quality already fails to meet federal and state standards, is likely to cause adverse environmental impacts. The SDIP DEIS/R's contrary conclusion is arbitrary and unreasonable given the historical facts in the Bay/Delta.

Further, the DEIS/R fails to identify and analyze a number of other existing and proposed projects that will have synergistic environmental impacts. Consequently, the DEIS/R is deficient, and should be withdrawn and revised to address and analyze these projects.

1. **South Delta Temporary Barriers Project.** The DEIS/R begins with the clear assumption, that project effects from the Temporary Barriers project are part of the "baseline." As such they are not to be considered impacts of this project. However, a careful review of the environmental documentation for the Temporary Barriers project clearly identifies areas of concern that were to be studied. Examples include the effects of inundation of listed plants (such as the Mason's lileaopsis), by the operation of the barriers, and the accumulation of avian and fish predators at the barrier sites. These impacts have occurred and are the responsibility of the Temporary Barrier's Project to mitigate. Since the SDIP will replace the Temporary Barrier's Project, it becomes the responsibility of the SDIP to mitigate for these impacts.

2. **City of Stockton Drinking Water Intake.** The City of Stockton is planning to construct an intake on the San Joaquin River near Potato Slough. The environmental documents for the project acknowledge entrainment and reduction of Delta outflow issues.

3. **Delta Improvement Project (DIP).** This CalFed program includes the SDIP, the Delta Cross-channel re-operation, the Through Delta Facility, the Frank's Tract modification, the Contra Costa Water District facilities, and the increases in export capability.

4. **CVP-SWP Intertie.** A connection between the CVP's Delta Mendota Canal and the SWP's California Aqueduct, which will permit 300 cfs to be pumped from the CVP to the SWP, and will allow up to 900 cfs to flow from the SWP to the CVP.

5. **Joint Point of Diversion and Coordinated Operating Agreement.** This item is currently before the SWRCB who is currently conducting a Cease and Desist Order hearing on the subject of violations of internal Delta water quality standards by the CVP and SWP.

6. **Port of Stockton Water Quality Improvement Project.** This project proposes to inject oxygen into the zone of low DO in an effort to improve the water quality. Injection of pure oxygen into the water column is likely to create super saturated conditions detrimental to fish.

7. **San Joaquin River Recirculation** – This proposed recirculation program would move Delta water south, via the Delta-Mendota Canal, to the Newman Wasteway for release into the San Joaquin River.

NEPA also does not allow project to be analyzed in artificial isolation. Instead, it requires discussion of the cumulative impacts of the proposed project in combination with "**past**, present and reasonably foreseeable future actions." The past direct and indirect impacts to the aquatic habitat, ecology and fishery populations from state and

federal project operations (including temporary barriers) have resulted in long-term cumulative adverse effects on present and future generations of aquatic life in the Delta. The DEIS/R is deficient for not candidly discussing project impacts on population trends for striped bass, sturgeon, American shad, Delta and long-fin smelt and other Delta species, including their food webs. Such an evaluation would encompass entrainment of all species of fish and lower tropic populations and provide an assessment of what cumulative impacts have occurred over the life of the projects and what can reasonably be expected to occur if the proposed project goes forward.

VIII. The DEIS/R Improperly Relies on DSM-2 and CALSIM II, Flawed Analytical Tools that Fail to Adequately disclose the SDIP's Environmental Impacts.

The DEIS/R's analyses of water availability, environmental impacts, export and project effectiveness are predicated almost entirely on modeling output. While DSM-2 and CalSim-II may be useful tools, a complete dependence upon modeling is inappropriate as the models are incapable of providing the certainty that is required of an environmental document. Yet, throughout the DEIR/S, modeled predictions are presented as fact. There are no error bars that would indicate the range of uncertainty or accuracy (although the DEIS/R briefly admits that modeled surface elevations in the south Delta tend to be half a foot higher than actual levels). It is simply inappropriate to base major planning decisions on modeling output without discussing model resolution and probabilistic error rates.

DSM-2 has never been peer reviewed and been heavily criticized. It's 2001 calibration and verification report has never been finalized and remains in an incomplete draft form. For example, DSM-2's salinity transport module is one-dimensional and has been calibrated exclusively using surface salinity. It ignores stratification and assumes that surface salinity over a channel cross-section is constant. Only a three-dimensional model can account for higher concentrations of salinity at depth, as has been documented by subsurface monitoring. Examination of the most recent verification of DSM-2 water quality modeling reveals substantial differences between actual and predicted values. For example, as previously discussed, salinity at Old River at Tracy Road 14 Day Moving Averages and 24.75 Hour Running Average Plots: 1 April 1900 through 30 September 1994 and 1 October 1994 through 30 September 1999 show substantial discrepancies; often more than 1,000 µS/cm. http://modeling.water.ca.gov/delta/studies/validation2000/qual-ec/rold059Avg.html. It is clear that any claimed improvement from the project implementation is lost within the "noise" of the model. Consequently, proponent claims that the project will improve electric conductivity by a precise amount are without creditable foundation.

CALSIM II modeling is similarly flawed. CalSim II is not an accurate model design to evaluate environmental impacts of the SDIP-OCAP and it has not been sufficiently calibrated for this use. DWR and BOR have been told this by other scientists repeatedly. CalSim-II is being used in every significant water planning process now underway in California. When the outcome of a planning process like this one hinges on modeling

results, even partially, the assumptions and assertions that lead to these results should be accurate and transparent. Indeed, the failure to utilize an accurate model to assess the environmental impacts renders the DEIS/R's analysis inadequate. *See Berkeley Keep Jets Over the Bay v. Board of Port Commissioners,* 91 Cal. App. 4th 1344 (2001) (finding that agency improperly relied on outdated air quality model to assess the impact of toxic air contaminants.)

Given the paucity of available empirical water quality data, evaluations of project impacts on water quality and flow are dependent upon flow and water quality modeling efforts. However, hydrodynamic modeling by any known technique is not an exact science. Models are easily manipulated and should not be employed as substitute for hard data or common sense. Subtle changes in coefficients or assumptions can dramatically alter output. Input variables are critical. Proper calibration and verification is crucial. Even then, models are only an idealization of actual field conditions and must be used with caution to ensure that underlying assumptions hold for the site-specific situation being modeled. For example, the DEIS/R's assumption that future water flow patterns will be similar to those that have occurred in the past is clearly inconsistent with the body of literature on the effects of global warming on California water flows. The use of average values in modeling ensures results that are generally unprotective of specific water quality criteria. Virtually all models, even those subject to peer-review, have significant rates-of-error, often greater than plus or minus 50%.

The DEIS/R fails to identify and discuss:

1. Model input variables; i.e., channel geometry, surface and bottom temperature and density, constituent concentration, velocity, friction factors, stratification, etc.
2. Calibration and verification of models; i.e., adequacy of baseline data for various constituents and how closely output conforms to actual field measurement.
3. Assumptions used in modeling flow and water quality. For example, CalSim II studies for the SDIP have assumed that Stanislaus River operations are in accordance with the USBR's New Melones' Interim Operation Plan. However, since the Interim Operation Plan cannot be met during drought cycles, the model cannot accommodate the lack of New Melones' storage and reduced instream flow during consecutive drought years.
4. Foreseeable future changes: i.e., loss of storage capacity due to sedimentation and the continuing 80 year decline in snowmelt as a percentage of yearly runoff.

The independent peer-review report titled *A Strategic Review of CALSIM II and its Use for Water Planning, Management, and Operations in Central California* that was submitted to the California Bay Delta Authority Science Program in December 2003 documented numerous problems with the model. (Attachment 6) The report stated that "[I]n our opinion CalSim II has not yet been calibrated or validated for making absolute predictions values. Report at 6.1, absolute Values or Comparative Results. It further stated that the panel is skeptical of the suggestion that, while the model might not

generate a highly reliable absolute prediction because of errors in model specification and /or estimation, it might produce a reasonably reliable estimate of the relative change in outcome.

Among the many weaknesses noted by the peer-review panel are:

1. The model is too complex and did not handle particular components of the system with sufficient detail.
2. The model provides limited and inadequate coverage of non CVP or SWP water and of the California water system south of the Delta.
3. The model assumes that facilities, land-use, water supply contracts and regulatory requirements are constant over this period, representing a fixed level of development rather than one that varies in response to hydrologic conditions or changes over time.
4. Groundwater has only limited representation in CalSim II.
5. Groundwater resources are assumed infinite, i.e., there is no upper limit to groundwater pumping.
6. The linear programming model considers only the current month, and hence CalSim II operating rules are required to determine annual water allocations, to establish reservoir carryover storage targets, and to trigger transfers from north of Delta to south of Delta storage.
7. Better quality control is needed both for the model and its current version and input data. Procedures for model calibration and verification are also needed. Currently many users are not sure of the accuracy of the results. A sensitivity and uncertainty prediction capability and analysis is needed.
8. Need improved ways of altering the model's geographic scope and resolution and its temporal resolution to better meet the needs of various analyses and studies.
9. Need to improve the model's comparative as well as absolute (or predictive) capabilities.
10. CalSim II needs better capabilities for analyzing economic, water quality, and groundwater issues.
11. Need improved documentation explaining how the model works, its assumptions, its limitation, and its applicability to various planning and management issues.
12. DWR and USBR have not provided a centralized source of support for CalSim II. More training for CalSim II is needed. There is a need for more people who can run CalSim II. There is a need for a well-publicized user group. A more extensive users' guide is needed.
13. Improved capabilities are needed for real-time operations especially during droughts, gaming involving stakeholders during a simulations run, handling of evapotranspiration and agriculture demand changes over time, water transfers, Delta storage, carryover contract rights, refuge water demands and more up to date representation of Feather River, Stanislaus River, Upper American River, San Joaquin River and Yuba River operations.
14. Need an improved graphical user interface to facilitate input of model data, setting of model constraints and weights, operating the model, and displaying and post analysis of model results.
15. Need to be able to change the model time period durations for improved accuracy of model results.

Many of the above-enumerated weaknesses of CalSim II were also identified in the

survey report from the University of California at Davis. Ferreira, et al. 2003. Additional flaws in the statistical basis for CalSim II was revealed in a recent study titled *Analysis of CALSIM's Statistical Basis* by Arve Sjovold, 28 December 2005.

Additionally, an expert panel sponsored by the CalFed Science Program and the California Water and Environmental Modeling Forum recently reviewed the CalSim II model representation of the San Joaquin River. http://science.calwater.ca.gov/workshop/calsim_05.shtml. The January 2006 report titled *Review Panel Report San Joaquin River Valley CalSim II Model Review* found that the model:

1. Used incomplete data sets.
2. Underestimated salinity.
3. Underestimated releases of water from New Melones Reservoir that leads to overestimates of water availability to entities dependent on New Melones storage.
4. Documentation and testing was not sufficient to provide users or model results with a complete reasonable basis for understanding the accuracy and limitations of results.
5. Did not include groundwater.
6. Took loss and return flow rates from older model without re-examination and scrutiny.
7. Failed to update Westside water demands.
8. Failed to include error rates.

Since the San Joaquin River module sets boundary conditions for the Delta, errors are likely to be carried over to the rest of CalSim II's output.

Another recent critique of CalSim II titled *An Environmental Review of CalSim-II, Defining "Full Environmental Compliance" and "Environmentally Preferred" Formulations of the CalSim-II Model* by Jeffrey T. Payne and Dr. David R. Purkey of the National Heritage Institute, November 2005 (Attachment 7) was prepared in order to examine the transparency of CalSim-II and to measure the current version of the model against two important standards. This report is purposely focused on two specific questions.

1. Does the representation of environmental regulations and objectives in CalSim-II represent full compliance with current legal requirements?
2. Can CalSim-II be used to plan for water management alternatives associated with improve environmental outcomes and habitat restoration?

The NHI report does not deal with any of the other CalSim-II issues identified in the CalSim-II Peer Review. All of the issues identified in the review cause flaws in the results displayed in the SDIP EIR/S. The Natural Heritage Institute (NHI) was hired to carry out the technical analysis needed to determine whether CalSim II can answer the above questions. The first question was posed in order to assure that the current

formulation of CalSim-II is consistent with all current environmental regulations on California's water resources.

CalSim-II attempts to characterize all components of the regulatory structure. This report reviewed a significant but limited subset of these regulations. Those reviewed were selected based on the experience of a panel of environmental experts. This selection does not imply that characterizations of other regulations in CalSim-II meet the full compliance standard. In fact, it would be very valuable for the SDIP proponents to complete a similar analysis on the model characterization of all existing environmental regulations. With regards to the Full Compliance standard, NHI identified three areas where the assumptions and assertions in the current version of CalSim-II were at odds with the expert panel's interpretations of existing environmental regulations:

- **CalSim-II uses information not available to real time operators of the California water system.** This allows CalSim-II to relax environmental standards earlier than is the case in actual operations. As a result, the model under-allocates water needed to satisfy existing environmental regulations; in turn, the model makes that water available for export to south of Delta contractors or other uses.
- **CalSim-II is not faithful to Federal law that allocates water to meet ecosystem restoration objectives.** The 1992 Central Valley Project Improvement Act calls for 800 TAF of water to be allocated for environmental regulation and the logic of CalSim-II does not fully honor this requirement.
- **CalSim-II currently includes no requirement to maintain a minimum flow in the San Joaquin River below Friant Dam,** contrary to a court ruling requiring such flows. This allows for allocation of water to urban and agricultural uses in the Friant Service area rather than allocating that water to maintain water in the San Joaquin River.

For each of these deficiencies, this report proposes a series of actions that can be taken in order to improve the performance of the model. These should be considered the minimum steps required to meet the Full Compliance standard for the regulations reviewed as part of this effort.

The second question is motivated by the SDIP proponent's historic failure to protect and restore the Sacramento-San Joaquin watershed as legally required. Long-term monitoring of the system suggests that threatened and endangered fish populations are in serious jeopardy. A prudent approach to water management planning would use modeling tools that evaluate the impact of various environmental regulations on water deliveries. CalSim-II has not been crafted to include this flexibility.

As examples of the kinds of new regulations that may need to be considered before CalSim-II can be adequately used in SDIP, the expert panel identified the following regulatory changes that the model needs:

- CalSim-II should have the flexibility to shift salinity compliance points to allow more targeted tributary restoration action. For example, changing the location of the Vernalis salinity standard may reduce the burden on the Stanislaus River.
- CalSim-II should have the capacity to shift required salinity profiles in the Delta (X2) to benefit Delta-dependent species.
- CalSim-II should allow for the prioritization of tributary environmental objectives, such as targeted operation of the Nimbus/Folsom system for the American River.
- CalSim-II should allow for the modification of Delta export restrictions to target improvements in the Delta ecosystem.
- CalSim-II should not count, towards the satisfaction of environmental regulations, water that otherwise would have been released as part of unavoidable reservoir spills.
- CalSim-II should allow for the definition of flow requirements that result in periods of spring high-flow and summer low-flow conditions in Central Valley rivers.

These changes are consistent with the need to comply with existing environmental laws (CEQA, NEPA, ESA) through the evaluation of alternatives, including identifying those that are the most environmentally beneficial. Given the historic difficulty associated with returning the San Francisco Bay/Delta to a viable ecosystem, these changes would allow policy makers to engage in more thoughtful alternatives analysis.

Having completed this environmental review of the CalSim-II model the authors of the attached review say, "we are left with the profound impression that it is not a tool that can – under its current formulation – fully address the legally required water management objectives. CalSim-II is, after all, a tool that has been designed to determine how best to operate the state's hydraulic infrastructure in ways that maximize the satisfaction of contractual demands. This reality is a result of both the history of water model development in California and a general analytical approach that has held sway for decades in the field of water resources planning and analysis. This approach holds that the environment is a constraint on system operations, not one of the objectives for which the system should be managed. In order to create a tool that can investigate water management innovations designed to comply with the law and restore the environment, it is not simply a matter of adjusting a few input parameters. Instead, a reformulation of the model along the lines described in this document is needed."

This philosophy of including the environment as an objective in water resources management is gaining credence around the world. Unfortunately, in California we cannot get to this point if we limit ourselves to the current version of CalSim-II. In any event, CalSim II is an inadequate tool for SDIP alternatives analysis as it cannot be adjusted to solve for improved environmental conditions; it can only tell us how to maximize exports. In other words, CalSim II cannot measure environmental impact above baseline standards; it can only measure the impact of improving the environment on water export amounts. Project proponents have also improperly employed CalSim II results to represent precise predictions regarding potential impacts although it has not yet

been calibrated or validated for making absolute predictions values. That is not acceptable NEPA/CEQA environmental analysis.

Finally, we note that the U.S. District Court for the Northern District of California recently issued a Temporary Restraining Order in an action brought by the Planning and Conservation League against the BOR enjoining construction of the Intertie because, in part, the BOR failed to disclose the short-comings of the data or models. Here, the DEIS/R for the SDIP also fails to disclose error-bars and numerous other limitations in the modeling. The DEIS/R also inappropriately uses the model for predictive rather than comparative purposes, especially in addressing whether the project would meet specific water quality standards, maintain specific tidal levels, etc.

IX. The DEIS/R's Mitigation for Project Impact is Inadequate and Fails to Comport with Legal Requirements.

As the California Supreme Court has repeatedly emphasized, "the chief goal of CEQA is mitigation or avoidance of environmental harm." Laurel Heights I, 47 Cal.3d at 403; see Goleta II, 52 Cal.3d at 564. CEQA requires public agencies such as the County to implement this goal through a three-step process. First, the County must accurately identify, analyze, and disclose the adverse impacts of a Project. Stanislaus Natural Heritage Project v. County of Stanislaus (1996) 48 Cal.App.4th 182, 196-97. Second, the County must "identify mitigation measures for each significant environmental effect." Guidelines § 15126.4(a)(1)(A). Finally, the County must actually adopt such mitigation measures, unless it is infeasible to do so. § 21002.1(b) ("Each public agency shall mitigate or avoid the significant effects on the environment of projects that it carries out or approves whenever it is feasible to do so."); Citizens for Quality Growth v. City of Mt. Shasta (1988) 198 Cal.App.3d 433, 440-41.

"Mitigation" as defined in CEQA includes:

1. Avoiding the impact altogether by not taking a certain action or parts of an action.
2. Minimizing impacts by limiting the degree or magnitude of the action and its implementation.
3. Rectifying the impact by repairing, rehabilitating, or restoring the impacted environment.
4. Reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action.
5. Compensating for the impact by replacing or providing substitute resources or environments

CEQA Guidelines section 15370. This definition of the term "mitigation" adopts the definition contained in the federal NEPA regulations. The federal definition is used so that this term will have identical meanings under NEPA and CEQA for projects that are subject to both acts.

The DEIS/EIR proposes a novel set of "Mitigation Measures" for the impacts associated with the proposed actions. As discussed below, these actions will not reduce or avoid significant project impacts, but instead seem to totally rely upon the Environmental Water Account (EWA) and fail to meet the requirements of either NEPA or CEQA, as they are contingent on other actions outside the scope of, and beyond the control of, this project.

This deficiency is clearly evident in the text taken from page 6.1-2 of the DEIS/EIR:

1. *Avoidance Measure.* All pumping at SWP Banks that is in excess of the existing permitted capacity from November 1 through June 30 will be tracked by EWA and SWP/CVP operations staff. When EWA actions reduce exports for fish protection during this period, any pumping at SWP Banks that is above the existing permitted capacity will be reduced without cost to the EWA account, limited only by the amount of pumping reduction funded by the EWA (i.e., maximum of 100% match with EWA action).

This suggests that the proponents agree not to use the excess "Banks" pumping plant capacity to pump above the existing permitted capacity, only if, and limited by the size of, the EWA actions at that time. However, it would appear to reserve the right to exceed the permitted capacity, if any remained, after the EWA action was taken into account.

In other words, the project proposes to exceed the "existing permitted export capacity" when it suits them. Clearly this is not mitigation for project impacts, but would in fact exceed the limits of the EWA, the very measure the project relies upon to reduce project impacts.

2. *Crediting Measure.* From November 1 through March 31, pumping reduction credits will be given to the EWA (ranging from 10% to up to 30%) for all non-EWA pumping that is above the existing permitted capacity. Under this mitigation component, for each 100 taf of non-EWA pumping above the existing permitted capacity, a pumping reduction credit, ranging from 10 taf to 30 taf, could be used by EWA to reduce pumping during periods of high fish density.

This measure appears to offer a 1:10 (or a 3:10) exchange for non-EWA pumping above the existing permitted capacity, between November 1 and March 31. Again, the project proposes to permit "non-EWA pumping above the existing permitted capacity" as it suits them.

The limitation of actions to mitigate for losses that may occur during the May 16 to May 31 pumping, which is subject to actions by the EWA, is not mitigation. There is no certainty to the proposed mitigation and it is subject to an action that is unrelated to this project. As such, it has not met the test of mitigation, since it is not available without other independent actions. Further, the decision maker cannot with any certainty

determine the level of mitigation being proposed, since the nature of the external actions cannot be determined.

EWA may not even be real it has no secure funding to carry it out.

Given the definition from CEQA, it is difficult to see how the various proposed mitigation measures in the DEIS/R are valid. For example, "Mitigation Measure Fish–MM–1 " is premised on another action by an unrelated event i.e., the actions of the EWA. Nowhere in the definition is the mitigation, of acknowledged impacts, made subject to contingencies based on an unrelated event. The DEIS/R also fails to make provision for mitigation in the event EWA actions are not taken to reduce entrainment. As a result, MM-1 relies entirely on an existing program, the EWA, to mitigate new impacts associated with the SDP. The EWA has already proven unsuccessful at protecting aquatic species in the Delta. This existing program cannot satisfy the requirement that impacts associated with the SDIP be mitigated, especially since EWA winter pumping has been targeted by the IEP POD studies as a potential cause of the loss of Delta smelt in the winter. Finally, studies (or initiatives) are not mitigation.

Mitigation Measure Fish-MM-3: Minimize Entrainment Losses of Delta Smelt Associated with Increased SWP Pumping (Volume 1 – Page 6.1-96) states that "[t]he SWP has proposed increased funding through an amended Four-Pumps Agreement to support SDIP mitigation measures, including an expanded EWA. In the absence of the EWA, that increased funding would continue to be available to DFG to mitigate impacts of the SDIP through purchases of water to reduce pumping during critical periods for fish or other mitigation strategies developed through the adaptive management process." The funds in the Four-Pumps Agreement are mitigation for on-going losses of fish the result of the existing operations of the SWP. Why would those funds be used to then permit additional damage? Those funds are (or should be) fully encumbered for existing loss mitigation. It is the worst form of chicanery to propose the use of these funds to permit the projects to increase their impacts on the populations of fish we are trying to preserve.

why should DFG have to "purchase" water?

Impact Fish-68: Operations-Related Increases in Entrainment Losses of Splittail (Volume 1 – Page 6.1-99) acknowledges spawning on the San Joaquin River, and an increase of up to 40% in entrainment (10 to 20% in other years), but concludes that no mitigation for these increases is warranted due to the Sacramento River production, and the fact that they occur in the drier years. The loss is acknowledged, the impacts can be avoided or minimized, and the mitigation is feasible but proponents simply decided that they just don't want to do it. This is unacceptable and in violation of CEQA and NEPA.

The bottom line is that the DEIS/R relies upon the EWA for mitigation despite the complete lack of credible studies documenting the success of the EWA in reducing adverse impacts from water exports. Indeed, the decline in Delta fish species has occurred and accelerated concurrent with increased exports and operation of the temporary barriers. As an added insult, the DEIS/R states that mitigation measures would be carried out "if necessary." The DEIS/R must clearly define precise mitigation measures that will be established and the specific assurances that will ensure that the mitigation measures will be successfully implemented.

Thank you for considering these comments. Please place us on all lists to receive the FEIS/R, notice of hearing dates and the Notice of Determination. We reiterate our request that the comment period be extended another 30 days in order to allow sufficient time to review and analyze the 2,788 pages of this document.

Sincerely,

Bill Jennings
Chairman & Executive Director
California Sportfishing Protection Alliance

CSPA SDIP Comments Attachment 1

Comments on

Draft Environmental Impact Statement Environmental Impact Report South Delta Improvement Program

Prepared by

Bureau of Reclamation for the U .S. Department of the Interior and the Department of Water Resources for the State of California Resources Agency'

Submitted by

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February 5, 2006

The Department of Water Resources (DWR)/US Bureau of Reclamation (USBR) (DWR/USBR, 2005) draft EIS/EIR states,

> *"The general purposes of the SDIP were identified by the Agencies, as follows:*
>
> *(c) increase water deliveries and delivery reliability for State Water Project (SWP) and Central Valley Project (CVP) water contractors south of the Delta and provide opportunities to convey water for fish and wildlife refuge purposes by increasing the maximum permitted level of diversion through the existing intake gates at Clifton Court Forebay from 6,680 to 8,500 cubic feet per second.*

Basically, in this draft EIS/EIR DWR/USBR have attempted to justify increasing the amount of South Delta water exported by the Central Valley Project (CVP) and State Water Project (SWP).

The Draft EIS/EIR further states,

> *"The impact assessment focuses on benefits and impacts to hydrology, water quality, fish resources, recreation, vegetation and wildlife, ..."*

We are familiar with current water quality issues in the South Delta and the generally inadequate understanding of how the current South Delta water exports through the CVP and SWP impact Delta water quality. **We find that the draft EIS/EIR for the proposed expanded export of South Delta water is significantly deficient in providing an adequate, reliable discussion of the potential water quality impacts of the proposed project.**

At the time of the notice of preparation of this EIR/EIR we were highly involved in a study of the low dissolved oxygen (DO) problem in the San Joaquin River (SJR) Deep Water Ship Channel (DWSC). We were the coordinating principal investigators for a $2-million CALFED-supported study of the characteristics of the low DO problem, factors

influencing the DO in the DWSC, the sources of the oxygen demand, and potential approaches for controlling the concentrations of DO in the DWSC to eliminate violations of the DO water quality objective (WQO). It was through those studies that we found that the CVP and SWP exports of South Delta water were a major factor contributing to the low-DO problem in the SJR DWSC.

We developed a SJR DWSC low-DO "Issues report" for the SJR DWSC TMDL Steering Committee that identified and described many of the issues that needed to be addressed as part of studying the nature of the DWSC low DO problem (Lee and Jones-Lee, 2000). We also developed a Synthesis Report summarizing and integrating the results of the approximately $4-million of studies conducted by about a dozen investigators on the DWSC low-DO problem (Lee and Jones-Lee, 2003a). That synthesis report also presented our findings on the impact of SJR flow in the DWSC on DO depletion below the WQO. Of particular importance were the results of the DWR D-1641 SJR cruises, in which DO was measured at about biweekly intervals from late summer to early winter at the Rough and Ready Island DO monitoring station, and the USGS monitoring of SJR DWSC flow. Lee and Jones-Lee (2003a) reported that when the SJR DWSC flows were on the order of a few hundred cfs, severe low-DO problems occurred in the DWSC. However, when the SJR DWSC flows were above about 1,500 cfs there were no DO WQO violations in the DWSC.

Since completion of the synthesis report we have continued to examine the relationship between SJR DWSC flow and DO WQO violations, and have issued a series of reports of our findings (Lee 2003a, b, 2005a,b; Lee and Jones-Lee 2003a,b,c; 2004a; 2005a,b,c). Those follow-up studies have confirmed that low SJR DWSC flow is a major factor contributing to violations of the DO WQO in the DWSC. It has also been noted that the export of South Delta water through the USBR CVP and DWR SWP is the primary cause of low SJR flow in the DWSC. Basically those projects at times, draw most of the SJR Vernalis water into the South Delta through the Head of Old River to the CVP and SWP export pumps. Figure 1 presents a map of the Delta area of concern in the Delta Improvement Package.

When the SDIP request for comments on the CEQA scope was issued, it was with this background that Lee (2002) submitted comments on the water quality issues that needed to be addressed in the EIS/EIR. Lee (2002) stated,

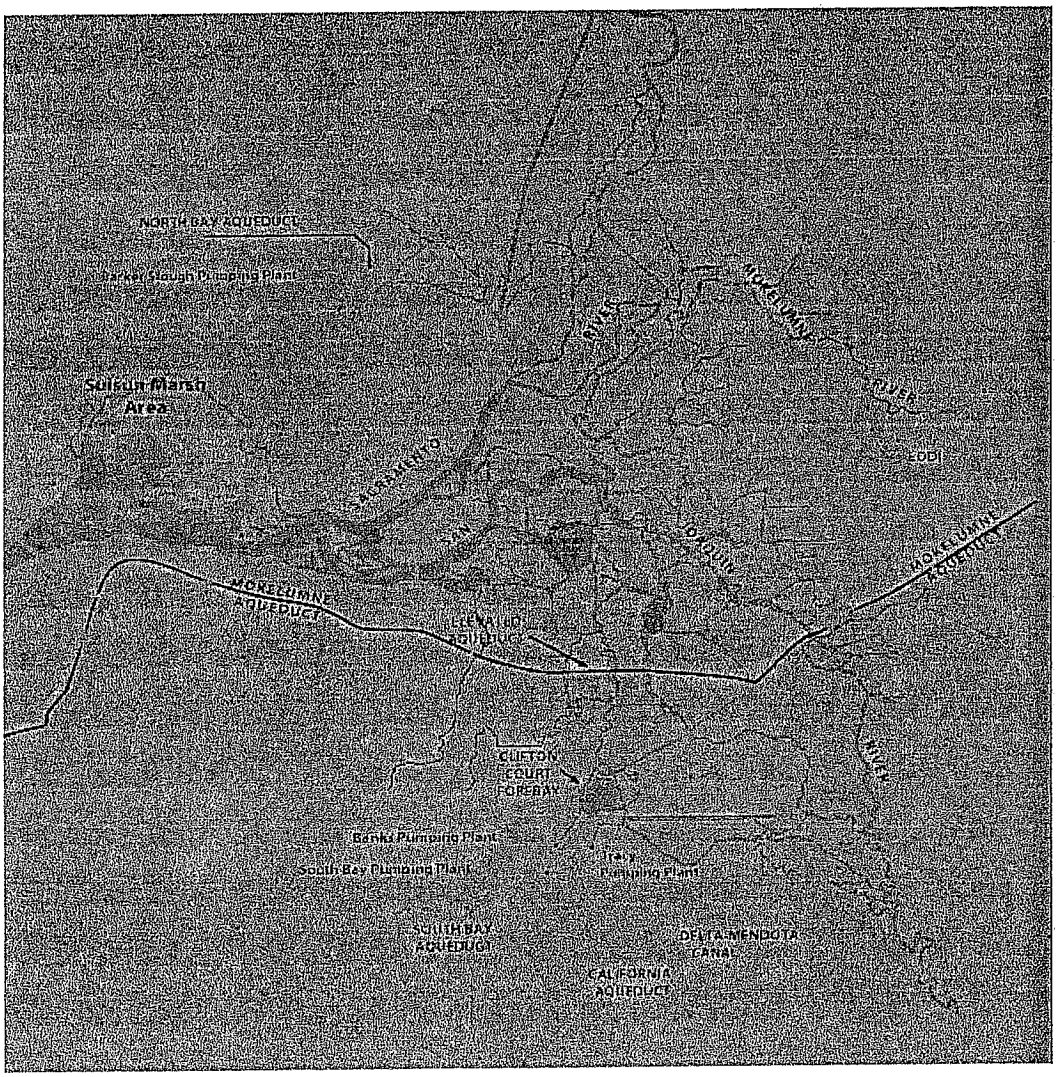
> *"A credible, certifiable EIR/EIS for the SDIP should include a detailed evaluation of the full range of water quality problems caused by the South Delta diversions and how they will be corrected as part of implementing the SDIP."*

Lee (2002) also stated,

> *"As discussed in these reports, the South Delta currently has significant water quality problems of low DO, currently-used pesticide caused aquatic life toxicity, legacy organochlorine pesticide excessive bioaccumulation in edible fish which are a threat to cause cancer in people who use the fish as food, excessive*

nutrients and elevated salts and TOC. Dr. Anne Jones-Lee and I have just completed a review for the Central Valley Regional Water Quality Control Board

Figure 1



on the organochlorine pesticide and PCB excessive bioaccumulation problems in Central Valley fish, which shows that Old River and Paradise Cut fish have excessive concentrations of legacy pesticides that are a threat to the health of those who use these fish as food."

There is no doubt that the existence and operation of the permanent operable barriers will have water quality impacts, many of which are not currently recognized.

A number of key factors will ultimately govern how the operable barriers are operated. Salinity is only one of those factors. Others include:

- potential impacts on the low-DO problems,
- excessive bioaccumulation of mercury, organochlorine "legacy" pesticides, and PCBs that accumulate in fish and other organism to threaten the health of those who eat those organisms,
- aquatic life toxicity, and
- other pollutants in several of the South Delta channels.

Lee and Jones-Lee (2004b) have provided a comprehensive review of Delta water quality issues that need attention as part of evaluating the potential impacts of the SDIP.

A review of the "Water Quality" section of the draft EIS/EIR shows that the draft EIS/EIR does not conform to CEQA requirements of providing full disclosure of potential environmental impacts of the proposed SDIP. Instead, consideration of water quality impacts has been essentially limited to potential impacts on salinity in South Delta Channels. The current modeling of salt, a conservative parameter, does not address the behavior and impacts of non-conservative pollutants such as pesticides that cause aquatic life toxicity. While there is mention of low-DO situations in some South Delta channels, the discussions are superficial and inadequate to inform the readers of the draft EIS/EIR about the potential impacts of the proposed increased export of water on the low-DO situation in South Delta channels.

The draft EIS/EIR also fails to address the large number of other water quality issues in the South Delta that have been impacted by the current water exports by the CVP and SWP and that will be exacerbated by the increased water exports that will occur if the proposed SDIP is approved. Further, there is no discussion of the impacts of the proposed operation of the operable barriers that are part of the proposed SDIP. As indicated above, the Lee and Jones-Lee (2004b) review of Delta water quality issues provides a discussion of the lack of understanding of impacts of the CVP and SWP on the large number of water quality issues that exist in the Delta overall and especially the South Delta. Many of the Delta channels have been listed as US EPA Clean Water Act (CWA) Section 303(d) impaired due to excessive concentrations of variety of pollutants compared to WQOs.

DWR and the USBR have not complied with SWRCB (2000) Water Rights D-1641 requirements to reliably delineate the potential impacts of exporting South Delta water on Delta water quality. Lee and Jones-Lee (2004b) observed that those agencies have

apparently convinced the IEP managers that the proposed exports will not cause any water quality impacts and that there is no need to conduct a comprehensive water quality monitoring/evaluation in the Delta to assess the impacts of the exports. The fallacy of that approach was clearly brought to light in the findings of an independent expert panel review of the current pelagic organism decline (POD) (POD Review, 2005). The POD has resulted in a crash program to attempt to quickly gather information to define and understand the potential combined impacts of CVP and SWP exports on POD. Lee and Jones-Lee (2005a) discussed the problems with that approach, which stem from the subtle nature of potential impacts of exports on water quality.

During the past six months we have been developing a San Joaquin River Water Quality Issues Report (Lee and Jones-Lee, 2006) as a follow-up to our Delta Water Quality Issues report (Lee and Jones-Lee, 2004a). Table 1, taken from Lee and Jones-Lee (2006), lists the current TMDLs for the SJR. The Lee and Jones-Lee (2002, 2006) SJR water quality issues reviews also list a number of potential water quality issues that could readily lead to CWA section 303(d) listings for the SJR that would require TMDLs to be developed to control the loads/conditions that are causing WQO violations.

WQO violations that occur in the SJR at Vernalis can also contribute to WQO violations in the South Delta as a result of the CVP and SWP export projects' drawing most of the SJR Vernalis water into the South Delta either through the Head of Old River or through Turner Cut. As discussed by Lee and Jones-Lee (2006), this results in the carrying of SJR water quality problems into the South Delta and to some extent into the Middle Delta. The proposed SDIP will amplify the water quality impacts of the SJR watershed as well as contribute locally derived pollutants. A credible EIS/EIR for the SDIP must include an evaluation of the potential impacts of the proposed increase in exports and an assessment of the impacts of the operation of the operable barriers on Delta water quality. This will require a large-scale, focused, comprehensive, multi-year monitoring and evaluation program, with particular attention to Delta aquatic life resources, to gather the background information needed to begin to reliably assess the potential impacts of the proposed SDIP on Delta water quality. The current POD studies are not focusing on many of the issues that will need to be addressed in order to develop a credible EIS/EIR for the SDIP.

Because of this major deficiency, the current draft EIS/EIR is inadequate and rejected as failing to comply with CEQA requirements. DWR and USBR should be required to fund a multi-year monitoring/evaluation program delineated by an independent panel of experts that would be responsible for organizing the studies, overseeing the implementation of the studies, reviewing results as they are developed, and reviewing the appropriateness of the draft reports and conclusions. This study program review should be conducted in a manner that provides the public with adequate opportunity to be informed of the progress and findings of the review and to provide and have considered comments on the approach and findings. It will take several years of study and assessment to obtain an adequate information base upon which to develop an EIR/EIR that could reliably assess the water quality impacts of the then proposed SDIP involving

increased CVP and SWP exports of South Delta water, and the potential consequences of various methods of operable barrier operation approaches.

Table 1. San Joaquin River Watershed TMDLs
Updated from Lee and Jones-Lee (2002)

Current (Active)
Selenium
Salinity at Vernalis, Total Dissolved Solids (TDS), Electrical Conductivity (EC)
Boron
Organophosphorus (OP) Pesticides (Diazinon, Chlorpyrifos)
Oxygen-Demanding Substances (BOD/Algae, Ammonia, Organic N)
Pending (to be Developed)
Organochlorine "Legacy" Pesticides (DDT, Chlordane, Dieldrin, Toxaphene, etc.)
PCBs
Dioxins/Furans
Mercury
Sulfate (Bioaccumulation of Mercury)
Pathogen-Indicator Organisms, *E. coli,* Fecal Coliforms
Toxicity of Unknown Cause
Salinity Upstream of Vernalis
Potential Future (to be Evaluated)
Nutrients, Excessive Fertilization (Nitrogen and Phosphorus Compounds)
High pH, Low DO caused by Excessive Fertilization (Photosynthesis/Respiration)
Alternative Pesticides to OP Pesticides including the Pyrethroid-Based Pesticides that are Causing Water Column and Sediment Toxicity
PBDEs.
Total Organic Carbon, and other chemicals such as Bromide that develop into Disinfection Byproducts (Trihalomethanes) in Treated Domestic Water Supplies
Excessive Sediment, Erosion, Turbidity
Herbicides (Toxicity to Algae)
Aquatic Sediment Toxicity, (Pesticides, Nutrients/Algae/Sediment Ammonia, Heavy Metals, PAHs and other Chemicals)
Unrecognized Pollutants
Pharmaceuticals and other Unregulated Chemicals Discharged by Confined Animal Facilities (dairies, feedlots, etc.) and domestic wastewaters

A key part of the monitoring/evaluation program should be an assessment of the mitigation that DWR/USBR would need to implement to eliminate, to the maximum extent practicable, the adverse water quality and aquatic life impacts of the current export of South Delta water for the projects.

One of the conditions that also need to be evaluated in this program is the beneficial impacts of reduced South Delta exports by CVP and SWP from the current conditions.

Incorporation of this approach is justified since the current water export rates were not based on a reliable assessment that they could be practiced without adverse impacts on Delta aquatic ecosystems.

The draft EIS/EIR Chapter 5 Section 3 presents DWR/USBR's assessment of SDIP impacts on "Water Quality". The introduction to that discussion states,

> *"5.3 Water Quality*
>
> *Introduction*
>
> *The maintenance of beneficial uses of Delta waters depends on several key water quality variables (e.g., salinity, water temperature, dissolved oxygen, and dissolved organic carbon) in Delta waters. This chapter describes these key water quality variables, the objectives associated with maintaining beneficial uses of Delta waters, existing Delta water quality conditions, and impacts of the SDIP project on selected water quality variables in Delta channels and exports."*

That chapter then reviews the perceived impacts of the SDIP increased exports and barrier operations on "Water Quality." It is stated in Chapter 5,

> *"Summary of Significant Impacts*
>
> *There are no significant impacts on water quality as a result of implementation of the project alternatives. Operation of the tidal gates provides substantial improvements in salinity in the south Delta channels. There are occasional slight increases in salinity occur in the CCWD intakes and at SWP Banks, but these are less than 5% of the baseline values. The water quality benefits are less under Alternative 4B, which includes constructing only the head of Old River gate."*

In the subsequent section it is stated,

> *"Affected Environment*
>
> *Delta waters serve several beneficial uses, each of which has water quality requirements and concerns associated with it. The Delta is a major habitat area for important species of fish and aquatic organisms, as well as a source of water for municipal, agricultural, recreational, and industrial uses. Dominant water quality variables that influence habitat and food-web relationships in the Delta are temperature, salinity, suspended sediments (SS) and associated light levels for photosynthesis, DO, pH, nutrients (nitrogen and phosphorus), DOC, and chlorophyll. Other key constituents that are monitored in water for municipal are bromide (Br–) concentrations (measured in raw water) and concentrations of THMs or other chemical by-products formed during the disinfection of water (measured in treated water).*

What about arsenic, selenium, mercury, pesticides, etc !!

That presentation of so-called water quality impacts illustrates one the fundamental flaws of DWR/USBR's approach to water quality evaluation. The focus of the DWR and

USBR discussion is on selected aspects of municipal and agriculture uses of Delta waters. Those who understand water quality know that water quality impacts of a proposed project must be evaluated from all perspectives, as they relate to the impairment of the beneficial uses of a waterbody. DWR/USBR considers water quality as being limited to the quality of the water that is exported. These agencies largely ignore the vast arena of conventional water quality issues associated with the impacts of pollutants on the beneficial uses of a waterbody.

The federal congress defined water quality in the Clean Water Act in terms of all designated beneficial uses of a waterbody. By definition in the CWA, the exceedance of a water quality standard/objective is an impairment of beneficial uses of a waterbody that must be corrected. As discussed by Lee and Jones-Lee (2004b) there are highly significant water quality problems in the Delta that are caused by known chemicals that that occur at concentrations above the applicable WQO for the Delta channels. Most importantly with respect to Delta water quality, water manipulation/diversions/exports do impact how pollutants in the Delta impact aquatic life-related beneficial uses of Delta waters. Changing the flow of water in the Delta will impact the location and magnitude of pollutant impacts on aquatic life and other beneficial uses of Delta waters.

An example of this can be seen with the potential impacts in the SJR sulfate that is brought into the South Delta by the CVP and SWP. The concentration of sulfate affects the methylation of mercury. The CVRWQCB (2005) has indicated that the manipulation of flows in the South Delta as part of DWR-proposed operation of the operable barriers could affect the distribution of sulfate in the South Delta channels which, in turn, could affect the bioaccumulation of mercury in edible fish. There is need to evaluate how the operation of the South Delta operable barriers that are scheduled to be installed and operational by 2009 could affect the bioaccumulation of mercury in South Delta fish.

In testimony before the SWRCB hearing on the DWR and USBR draft Cease and Desist Order to prevent violations of the South Delta Salinity standard established as part of D-1641, Lee (2005c) indicated that DWR, as part of developing the operation of the South Delta operable barriers, will need to expand its scope of evaluation of barrier operation to include not only EC but also the impact of sulfate on mercury bioaccumulation. In addition, that evaluation should include the impact of barrier operations on the impacts of the other pollutants on the CVRWQCB 303(d) list for South Delta channels and other constituents that, while not on the 303(d) list, are impacting South Delta water quality. Lee (2005c) also suggested that DWR needs to more reliably evaluate the potential benefits of installing low-head, reverse-flow pumping across the permanent operable barriers to bring more Sacramento River water into the South Delta. Adoption of this approach could be highly cost-effective in improving South Delta water quality as well as the quality of the CVP-exported water. It could also help solve the low-DO problem in the DWSC.

Overall, the draft EIS/EIR cannot be certified as a credible discussion of SDIP water quality impacts. It does not provide a reliable evaluation of how the increased exports

and operation of the barriers will impact the aquatic life related beneficial uses of the Delta.

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Background of Drs. G. Fred Lee and Anne Jones-Lee
Pertinent to Assessment of San Joaquin River and Delta Water Quality

Dr. G. Fred Lee is President of G. Fred Lee & Associates, a specialty environmental quality consulting firm located in El Macero, CA, near Sacramento. He and Dr. Anne Jones-Lee, the principals of the firm, work on issues, projects, and problems of water supply water quality, water and wastewater treatment, water pollution control in both fresh and marine surface waters, and solid and hazardous waste impact evaluation and management, with particular emphasis on groundwater quality protection. Their client base includes governmental agencies, industry, public interest groups, and individuals.

Dr. Lee earned a BA degree from San Jose State College in environmental health sciences in 1955, a Master of Science in Public Health degree focusing on water quality issues from the University of North Carolina in 1957, and a PhD degree in environmental engineering/environmental science from Harvard University in 1960. For a period of 30 years beginning in 1960, he held university graduate-level professorial teaching and research positions at several major US universities, including the University of Wisconsin, Madison, the University of Texas system, and Colorado State University. In the 1980's he was Distinguished Professor of Civil and Environmental Engineering at the New Jersey Institute of Technology and Director of the Site Assessment and Remediation division of a multi-university hazardous waste research center there; for a several-year period, he also served as Director of the Water Quality Program for the State of New Jersey Sea Grant Program. During his university teaching and research career he conducted in excess of five million dollars of research and published over 500 papers and reports on those efforts.

Dr. Anne Jones-Lee earned a BS degree in biology from Southern Methodist University and a PhD degree in Environmental Sciences in 1978 from the University of Texas at Dallas focusing on water quality evaluation and management. She held university professorial positions for 11 years in environmental engineering and environmental sciences. Most recently she held the position of Associate Professor of Civil and Environmental Engineering with tenure at the New Jersey Institute of Technology. She and Dr. Lee have worked together as a team since the mid-1970s.

In 1989, Dr. Lee retired from university teaching and research; with Dr. Jones-Lee he expanded his part-time consulting activities into a full-time activity, and moved their base of operation to the Central Valley of California. They have continued to be active in publishing the results of their studies; in the past 15 years they have developed another 600 papers and reports covering work they have done in their various areas of activity, one of which is San Joaquin River and Delta water quality.

Dr. Lee's areas of expertise include the fate, effects and impacts of chemical constituents and pathogens on various aspects of water quality/beneficial uses of waterbodies. He has frequently served as an adviser to local, state, national and international governmental agencies and other entities on a variety of aspects of water quality, including the development and implementation of water quality criteria and standards. He served as an

invited peer reviewer for the National Academies of Science and Engineering "Blue Book" of water quality criteria in 1972, a member of the American Fisheries Society Water Quality Committee that reviewed the US EPA's "Red Book" water quality criteria of 1976, and a US EPA invited peer reviewer in the early 1980s for the approach that the Agency then proposed, and ultimately adopted, for developing water quality criteria for protection of aquatic life. That criteria development approach is still in use today. Further, Dr Lee was involved as a US EPA invited peer reviewer for several criteria documents. His work on water quality issues is somewhat unusual, in that, in addition to having a strong background in the chemical and biological sciences pertinent to water quality evaluation, he has an engineering background that provides a foundation for developing and evaluating control programs for chemical constituents in point and nonpoint source discharges.

Dr. Lee's involvement in Delta water quality issues began in the late 1980's when, while still in New Jersey, he became involved in three different consulting projects in California; one was concerned with Delta water quality issues, another with Lake Tahoe water quality, and the third with groundwater quality protection in the San Gabriel Basin on behalf of the Metropolitan Water District of Southern California. As a consultant to Delta Wetlands on water quality issues associated with the development of in-Delta storage reservoirs he became familiar with Delta water quality issues. Since then, Dr. Lee's work on Delta water quality issues has included participating in various CALFED (now California Bay-Delta Authority – CBDA) committees, subcommittees, working groups, etc., concerned with water quality issues in the Delta and its tributaries.

Beginning in the mid-1990s Dr. Lee became involved in the details of water quality issues in both the Sacramento and San Joaquin River watersheds. One aspect of his involvement was as a volunteer technical advisor to the DeltaKeeper (William Jennings) to help the DeltaKeeper establish and maintain a technically sound grounding as it addresses issues pertinent to the protection and enhancement of water quality in the Delta and its tributaries. Dr. Lee's work with the DeltaKeeper has included such matters as managing aquatic life toxicity in the Central Valley and Delta caused by runoff/discharges of pesticides from agricultural and urban areas; reviewing and managing excessive bioaccumulation of organochlorine legacy pesticides and PCBs in Central Valley waterbodies and the Delta; reviewing potential environmental impacts of aquatic pesticides used for aquatic weed control in the Central Valley and Delta; assessing the impacts of flow management in and from the South Delta on water quality; and providing guidance on environmental aspects of dredging and dredged sediment management in the Delta.

Another key aspect of Dr. Lee's involvement continues to be the low-DO problem in the San Joaquin River Deep Water Ship Channel. In 1999, Dr. Lee began to work closely with the SJR DO TMDL Steering Committee, as well as the Central Valley Regional Water Quality Control Board (CVRWQCB) staff, in helping to improve the level and quality of science and engineering incorporated in the San Joaquin River low-DO TMDL program. Dr. Lee was awarded a contract with the CVRWQCB to develop an "Issues" report to identify and discuss the issues that need to be addressed as part of formulating a

TMDL to control the low-DO problem in the San Joaquin River DWSC (Lee and Jones-Lee, 2000).

Dr. Lee worked closely with the CVRWQCB lead staff (Dr. Chris Foe) in developing a coherent two-million-dollar proposal, which was funded by CALFED. Dr. Lee served as the coordinating PI for the 12 projects that were conducted under this proposal. From the work, Lee and Jones-Lee (2003) developed the "synthesis report" that presents a summary/synthesis of approximately four years and four million dollars of studies on the SJR DWSC low-DO problem. Since completion of that synthesis report in March 2003, Drs. Lee and Jones-Lee have continued to be active in Delta water quality issues and develop a supplement to synthesis report (Lee and Jones-Lee, 2004a). They have also developed a comprehensive report on Delta water quality issues (Lee and Jones-Lee, 2004b). Lee and Jones-Lee (2006) are developing a comprehensive report on San Joaquin River water quality issues. These and other reports on these issues are available from their website, www.gfredlee.com, in the San Joaquin River Watershed section at http://www.gfredlee.com/psjriv2.htm.

Further information on Drs. Lee and Jones-Lee's expertise and experience pertinent to assessment of Delta water quality issues is available on their website, www.gfredlee.com, or upon request.

References Cited in Qualifications

Lee, G. F. and Jones-Lee, A., "Issues in Developing the San Joaquin River Deep Water Ship Channel DO TMDL," Report to Central Valley Regional Water Quality Board, Sacramento, CA, Report of G. Fred Lee & Associates, El Macero, CA, August (2000). http://www.gfredlee.com/sjrpt081600.pdf

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LETTER 20

Re: SDIP

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Region
501 West Ocean Boulevard, Suite 4200
Long Beach, California 90802-4213

January 11, 2007

In response refer to:
2006/03464

attachment #2

Alan R. Candlish
Regional Planning Officer
Bureau of Reclamation
Mid-Pacific Regional Office
2800 Cottage Way
Sacramento, California 95825-1898

Dear Mr. Candlish:

NOAA's National Marine Fisheries Service's (NMFS) intends to suspend formal consultation for the South Delta Improvements Program (SDIP). During the course of the project effects analysis, several areas of significant concern arose. These concerns were:

1. The interrelated aspects of the SDIP barrier construction actions with the long term operations of the Central Valley Project (CVP) and State Water Project (SWP) under the operations and criteria plan (OCAP). Analysis of the SDIP as a separate project without consideration of how it will be used under OCAP would be seen as piecemealing under the Endangered Species Act. The stated objectives and purposes of the SDIP confirm the interdependence and interrelatedness of the two projects.

   - Increase water supply to the SWP and the CVP water contractors south of the Delta by increasing diversions at the existing Clifton Court Forebay radial gates and maximizing the frequency of 8,500 cubic feet per second (cfs) pumping at the Harvey O. Banks Pumping Plant (Banks).

   - Ensure water of adequate quantity and quality for agricultural diverters within the south Delta.

   - Reduce entrainment of Central Valley fall/late fall-run Chinook salmon (*Oncorhynchus tshawytscha*) from the San Joaquin River.

2. The CalSim-II (SWP and CVP Operating Model) modeling analysis done for the SDIP is no longer in harmony with the current modeling being done for the reinitiated OCAP consultation. NMFS staff is aware of the changes being considered for the baseline programming assumptions in the reinitiated OCAP consultation, and has previously indicated that both SDIP and OCAP computer

simulations must be based on the same common modeling assumptions to be valid and comparable.

3. The modeling conducted for the SDIP actions neglected to assess the use of the permanent barriers with the current level of water diversion (6,680 cfs). This modeling run is important to know since the future increase in the SWP diversion rate to 8,500 cfs is not a guaranteed action. The "baseline" modeling done with the permanent barriers under the 2004 OCAP modeling runs assumed that the diversion rate was 8,500 cfs. The "interim" period of barrier operations between completion of construction and the increase to water diversions of 8,500 cfs has not been presented to NMFS staff in the Action Specific Implementation Plan.

4. The true baseline conditions in the South Delta occur during the period between November 30 and April 7 of each year when the barriers are absent from the channels of the South Delta. The alterations in hydrology of the barrier installations from the true baseline have not been presented in a coherent fashion within the modeling run outputs.

NMFS recommends that the SDIP Stage 1 (and stage 2) actions be incorporated into the overarching OCAP action. This will avoid inconsistencies with the modeling assumptions between the two actions. In addition, by combining the two actions into one, all of the interacting effects of the two proposed actions are addressed at the same time in one consultation rather than breaking the effects into two consultations. This avoids the appearance of piecemealing the projects. Although other activities linked to OCAP have been proposed (*e.g.*, Yuba Accord water transfers, Red Bluff Diversion Dam Fish Passage Improvement Program, *etc.*), their potential effects to water operations are less clear. These activities will be evaluated for inclusion in the OCAP consultation on a case-by-case basis.

Please contact Mr. Jeffrey Stuart at 916-930-3607, or via e-mail at J.Stuart@noaa.gov if you have any questions concerning this response or require any additional information.

Sincerely,

for Rodney R. McInnis
Regional Administrator

cc: Copy to file – ARN 151422SWA1999SA5950
NMFS-PRD, Long Beach, CA
Katherine F. Kelly, Chief, Bay-Delta Office, California Department of Water Resources, 1416 9th Street, Sacramento, CA 95814

LETTER 20

attachment #3

Natural Resources Defense Council
Environmental Defense
The Bay Institute
Planning and Conservation League
California Sportfishing Protection Alliance

April 26, 2007

Ryan Broddrick, Director
Department of Fish and Game
1416 Ninth Street, 12th Floor
Sacramento, CA 95814

Re: Department of Water Resources' Request for a CESA Consistency Determination

Dear Director Broddrick:

We are writing on behalf of numerous environmental and fishing organizations representing hundreds of thousands of Californians to urge you to deny the Department of Water Resources' ("DWRs'") pending request for a consistency determination under the California Endangered Species Act ("CESA") for its continuing, status quo operation of the State Water Project ("SWP"). DWR asks you to determine that listed salmonids and imperiled delta smelt will be adequately protected under the federal biological opinions for the joint operations of the Central Valley Project ("CVP") and SWP (the "Operating Criteria and Plan" or "OCAP"). However, those biological opinions – one of which addresses impacts to delta smelt (the "smelt BO") and one of which addresses impacts to listed salmon and steelhead (the "salmon BO") – have been explicitly disavowed by the agencies party to those biological opinions, including DWR, as well as numerous independent scientific reviewers. Further, DWR asks you to allow it to continue operating under those biological opinions, even though the biological opinions have failed to stem the tide of crashing Delta fisheries over the last several years that they have been in effect. Finally, DWR asks you to allow it to continue operating under those biological opinions, even though more recent scientific evidence and the requirements of CESA militate against it.

Instead of adopting DWR's unlawful and ineffective approach to addressing its ongoing CESA violations, we urge you to require DWR to take steps to protect listed species and to mitigate the adverse effects of the SWP, as required by CESA. At the bare minimum, such steps include fully implementing all of the actions that DWR and the Department of Fish and Game ("DFG") have already acknowledged are necessary to "address the pelagic organism decline (POD) and stabilize the ecosystem in the Sacramento-San

Joaquin Delta." Resources Agency, Pelagic Fish Action Plan (March 2007) at 4 ("Action Plan"). If DFG cannot require those minimal actions through a consistency determination, DFG should immediately request DWR to submit an application for an incidental take permit. As the Action Plan recognizes, the existing federal biological opinions on which DWR seeks to rely are undergoing re-consultation which "will help formulate a more accurate and comprehensive approach to improving Delta ecosystem health for pelagic fish." *Id.* Until that re-consultation is complete and the new biological opinions are shown to be consistent with CESA, DFG should require DWR, at a minimum, to fully implement and fully fund all of the actions in the Action Plan.

Among other things, the Action Plan indicates that DFG seeks to secure a specific commitment of water from DWR. Action Plan, p. 37. Unfortunately, DWR has not, to date, committed sufficient amounts of water necessary to protect delta smelt and salmon. DFG's authority under CESA provides the mechanism by which DFG must require the necessary commitments of water and specific operational changes from DWR. As indicated below, we believe that additional actions are required; however, anything less than the Action Plan clearly fails to comply with CESA.

I. THE FEDERAL BIOLOGICAL OPINIONS FAIL TO MEET THE REQUIREMENTS OF CESA

Section 2080.1 of the Fish and Game Code identifies the limited circumstances under which DFG may issue a consistency determination. It may do so only if the federal "incidental take statement or incidental take permit is consistent with this chapter", which includes all the requirements of CESA. Fish and Game Code § 2080.1(c). CESA includes two requirements that are of particular relevance here. First, DFG may only authorize take of endangered, threatened and candidate species if *all* of the following conditions are met: (1) the impacts of the authorized take "shall be minimized and fully mitigated" to an extent "roughly proportional" to the impact of the authorized taking on the species; (2) the proposed mitigation measures "shall be capable of successful implementation"; and (3) the applicant "shall ensure adequate funding to implement" the mitigation measures "and for monitoring compliance with, and effectiveness of, those measures." *Id.*, § 2081(b). Second, no permit may be issued if issuance of the permit would jeopardize the continued existence of the species "based on the best scientific and other information that is reasonably available" and considering any adverse impacts of the taking in light of "known population trends, known threats to the species, and reasonably foreseeable impacts on the species from other related projects and activities." *Id.*, § 2081(c). DWR has not and cannot demonstrate that its continued operation under the federal OCAP biological opinions would meet these requirements here.

A. The Federal BOs Do Not Satisfy CESA's Mitigation Requirements

The federal Endangered Species Act does not require, as CESA does, that the impacts of taking a covered species be "minimized or fully mitigated" to an extent "roughly proportional" to the impact of the authorized activity. Thus, the federal BOs on which DWR seeks to rely do not require "minimization" or "full mitigation" of the take authorized therein. For this reason alone, the federal BOs do not suffice to meet all the requirements of CESA.

In addition, to the extent that the federal BOs rely on purported mitigation measures to conclude that the OCAP will not cause jeopardy to listed species or adverse modification of critical habitat, those measures are uncertain and unproven, and do not meet CESA's requirements of being "capable of successful implementation," of being "adequately funded," or of being adequately monitored. *See* Fish and Game Code, § 2081(b). For example, as explained in the attached briefs filed in the pending action challenging the adequacy of the smelt BO, the lynchpin of the smelt BO is a fluid and unenforceable "adaptive management" scheme using the Delta Smelt Risk Assessment Matrix ("DSRAM"). *See, e.g., NRDC v. Norton,* Plaintiffs' Memorandum of Points and Authorities in Support of Motion for Summary Judgment (June 9, 2006) at 9-16 (appended as Exhibit 1). However, the DSRAM as described in the BO requires nothing more than discretionary meetings and paperwork, and explicitly does not require implementation of *any* decision, even if unanimously recommended by every expert fisheries biologist from the numerous agencies represented on the Delta Smelt Working Group ("DSWG"). Instead, the smelt BO gives DWR and the U.S. Bureau of Reclamation, via the "Water Operations Management Team," an explicit veto over any mitigation measure or action recommended by the DSWG. *Id.*; *see also NRDC v. Norton,* Plaintiffs' Reply in Support of Motion for Summary Judgment (Jan. 22, 2007) at 14-19 (appended as Exhibit 2). In short, there is absolutely no assurance that any mitigation measure can or would be successfully implemented under the DSRAM process which lies at the heart of the federal smelt BO.

The smelt BO further relies on several mitigation measures that are most certainly not "adequately funded" or being implemented as anticipated in the document. These include the Environmental Water Account, CVPIA b(2), and the Vernalis Adaptive Management Plan ("VAMP"), none of which are supplying sufficient amounts of "environmental water" to cover necessary mitigation actions or to protect listed fish in the Delta or fish habitat. FWS recognized the uncertainty of these measures in the smelt BO itself, stating that "[a]lthough VAMP and the Environmental Water Account have helped to ameliorate [threats resulting from operation of the State and Federal water projects], it is unclear how effective these will continue to be over time based on available funding and future demands for water." *NRDC v. Norton,* Pls.' Mem. of P&A, at 14.

Since the smelt BO was finalized, it has become quite clear that these measures are not providing the amount of water necessary to support essential protective actions. For example, over the last several months, the DSWG has evaluated a range of protective actions that could be taken to lessen the impacts of water project operations. One action that was evaluated was to address fall (September-December) Delta salinity levels by making releases from upstream reservoirs to increase Delta outflows. The discussions and analyses of this proposed action are reported in DSWG notes for July 10 (with an appendix with the analyses dated June 17), August 21, August 30, and Sept 26 (appended hereto as Exhibits 3 - 6). The DSWG determined that the fall action had a high likelihood of being successfully implemented and that the scientific basis for the action was supported by statistically significant correlations.

Unfortunately, the fall action was not taken because it was determined that "the amounts of water needed to demonstrably improve fall habitat quantity/quality [were] unavailable". Based on analyses provided by DWR, the amount of water necessary for maintaining net Delta outflows at 7000 cfs for the September-December period would range from only 170-433 TAF. Delta Smelt Working Group notes (Aug. 21, 2006). As a result of not taking this action, Delta outflows steadily declined, falling below 6000 cfs in October, and salinity levels shifted upstream of 80 km, the critical threshold identified by the DSWG for delta smelt habitat quality and subsequent abundance. It is too soon to know the actual quantitative impact this has had on populations, but it is safe to assert that higher salinity levels did not improve conditions for smelt.[1]

Perceived unavailability of water assets was also the reason behind the DSWG rejecting a protective action this winter intended to set net flows in Old and Middle Rivers to zero cfs to better protect pre-spawning adults. Low San Joaquin River inflows and negative flows on Old and Middle Rivers, concurrent with high export rates, are likely creating hydrodynamic conditions that draw greater numbers of fish to the pumps and correspond to significantly higher salvage rates. Protection of these biologically valuable spawning adult fish is essential for recovery and sustainability of this at-risk species. Despite the expected benefit of taking this action, it was rejected because "DWR staff have derived estimates of the water costs of the potential actions in the Resources Agency POD Action Matrix and found that the proposed winter action could consume all available

[1] While the specific impact of the failure to take this fall action may still be unclear, there is no doubt that the delta smelt continues to face perilous conditions following implementation of the smelt BO. At the April 12, 2007 Fish and Game Commission hearing, DFG acknowledged that the delta smelt currently faces imminent risk of extinction and merits endangered status. Given that this decline in the smelt's condition occurred and has continued under the current smelt BO, its measures are clearly insufficient to protect and recover this species. *See* The Bay Institute *et al.*, Petition to the State of California Fish and Game Commission and supporting information for listing the Delta Smelt (Hypomesus transpacificus) as an endangered species under the California Endangered Species Act (Feb. 7, 2007) (appended as Exhibit 15).

environmental water, leaving no assets for spring actions for larvae or juveniles." Delta Smelt Working Group notes (Dec. 11, 2006) (appended as Exhibit 7).

There is no doubt that in past years the water promised through the CALFED ROD through both the Environmental Water Account and the CVPIA (b)(2) account has been significantly less than what was promised in the CALFED ROD, and assumed in the federal BOs. *Finding the Water: New Water Supply Opportunities to Revive the San Francisco Bay-Delta*, Environmental Defense, 2005 (appended as Exhibit 8). This shortfall has been as much as 500,000 acre-feet per year. Nevertheless, the federal BOs do not provide adequate mechanisms "for monitoring compliance with, and effectiveness of" these and other mitigation measures. Fish and Game Code § 2081(b). For example, the BOs do not require the agencies to ensure that the assumed levels of "environmental water" will be provided, nor do those BOs impose any contingency measures in the event that sufficient "environmental water" is not provided. Such mechanisms must be part of any adequate CESA compliance.

The salmon BO suffers many of the same problems as the smelt BO, relying on uncertain mitigation measures that are not adequately funded nor effectively monitored. *See, e.g., PCFFA v. Gutierrez*, First Amended Complaint w/Attachments (Sept. 11, 2006) (appended as Exhibit 9). The salmon BO provides for an "adaptive management" process under which the Bureau, NMFS and the FWS would discuss potential changes in water storage and release to benefit the five listed salmonids, but does not provide any assurance of any particular level of protection for the listed species as a result of this promise of future "adaptive management," nor does it identify reasonably certain, enforceable measures that would be implemented if changes in operations were necessary to protect the species.

The salmon BO also permits substantial backsliding from protections that previously existed for listed salmonids. For example, the salmon BO moves the temperature compliance point upstream from Bend Bridge to Ball's Ferry, and eliminates the Shasta carryover requirement necessary to maintain adequate cold water reserves for salmonids. DFG biologists have previously expressed their concern about this backsliding, stating that "DFG salmon biologist[s] do not support the proposal to move the temperature compliance point up-stream. It has been calculated that up to sixty river miles of habitat will be impacted by this proposed change in the temperature compliance point." Email from James Starr, DFG (April 23, 2004) (attached as Exhibit 10). Before abruptly changing their minds in the final salmon BO, biologists at NMFS concurred, stating that: "NOAA Fisheries is concerned that shifting the temperature compliance point upstream could result in a large loss of winter-run Chinook spawning habitat. Winter-run Chinook spawning habitat in the Sacramento River is currently restricted to a short distance of mainstem habitat below Shasta Dam. Moving the temperature compliance point further upstream would seriously reduce the already restricted spawning area afforded to winter-run Chinook salmon in the Sacramento River." Letter from Rodney McInnis, Regional

Administrator, NMFS, to Mr. Thomas Stokely, Trinity County (Jul. 23, 2004) at 2 (attached as Exhibit 11). DWR, DFG and the State Water Resources Control Board have similarly acknowledged that the salmon BO will have greater, unmitigated impacts on listed salmonids than the biological opinions it replaces, stating in a May 17, 2005 letter to Senator Machado that "the State anticipates increased impacts to winter-run and spring-run Chinook will occur as a result of the changes in water project operation and less stringent temperature compliance requirements." *PCFFA v. Gutierrez*, First Amended Complaint at 27.

In addition, the salmon BO allows for a known salmon migration obstacle – the Red Bluff Diversion Dam – to continue operating in the "gates-in" position for four months out of the year.[2] The agencies have recognized for years now that this operation of Red Bluff Diversion Dam is deadly to a large percentage of listed salmonids, stating in a 2002 Draft Environmental Impact Statement/Environmental Impact Report that 72 percent of adult spring-run Chinook salmon and over 35 percent of juvenile winter-run Chinook and steelhead are adversely affected by the operation of the Dam. Red Bluff Diversion Dam DEIS/EIR (Sept. 5, 2002) at ix (available at http://www.usbr.gov/mp/nepa/nepa_projdetails.cfm?Project_ID=237). Gates-in operation also "results in complete blockage of migrating adult green sturgeon" and adversely affects "approximately 99 percent of annual juvenile green sturgeon passing RBDD." Red Bluff Diversion Dam DEIS/EIR, p. B-15. DFG, along with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service, and the California Advisory Committee on Salmon and Steelhead Trout, have all previously endorsed year-round gates-out operation of Red Bluff Diversion Dam as the only alternative acceptable for protecting listed salmonids. *See, e.g.*, Red Bluff Diversion Dam DEIS/EIR, pp. 1-13 to 1-14, Appendix G, Appendix I. DFG has further explained that "The RBDD fish passage problem is considered one of the highest priority projects to attain the objectives for salmon and steelhead restoration." *Id.*, App. I. Moreover, several agencies note that a large amount of taxpayer funds has been expended for habitat restoration *upstream* of the Dam, but a large percentage of listed fish cannot reach that restored habitat due to the current operations of RBDD. *Id.*, App. I, Draft Report, p. 16.

In sum, neither the smelt BO nor the salmon BO was designed nor functions to meet the requirements of CESA.

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[2] On April 24, 2007, the Bureau of Reclamation announced that it would close Red Bluff Diversion Dam for *more* than four months this year to meet "earlier-than-usual agricultural water demands resulting from a dry, warm spring." USBR, press release, "Closure of Red Bluff Diversion Dam Gates Scheduled Early to Meet Water Demands", April 24, 2007 (available at http://www.usbr.gov/newsroom/newsrelease/detail.cfm?RecordID=16641).

B. The "No Jeopardy" Conclusions of the Federal BOs Are Not Based on the Best Scientific Information, as CESA Requires

As explained above, CESA prohibits DFG from issuing a consistency determination if the permit would jeopardize the continued existence of the species "based on the best scientific and other information that is reasonably available" and considering any adverse impacts of the taking in light of "known population trends, known threats to the species, and reasonably foreseeable impacts on the species from other related projects and activities." Fish and Game Code § 2081(c). The federal agencies party to the federal BOs and several independent scientific panels have already explained that the federal BOs are *not* based on the best scientific information available, nor do they adequately consider impacts of the taking in light of known population trends, known threats to the species, or reasonably foreseeable impacts from other related projects and activities. Thus, DWR's requested consistency determination also fails to satisfy this requirement of CESA.

1. Several Federal Agencies And DWR Have Acknowledged the Smelt BO is Woefully Out-of-Date

The U.S. Fish and Wildlife Service and Bureau of Reclamation explain in the attached brief that it is precisely the failure of the smelt BO to reflect recent scientific information and known threats that prompted the agencies to reinitiate ESA section 7 consultation. *See NRDC v. Kempthorne*, Federal Defendants' Response to Plaintiffs' Motion for Summary Judgment and Cross-Motion to Dismiss, or in the Alternative, Motion for Voluntary Remand (July 14, 2006) (appended as Exhibit 12). DWR has explicitly joined in their findings, thereby acknowledging that the smelt BO fails to meet the requirements of CESA. *NRDC v. Kempthorne*, California Department of Water Resources' Joinder in the Federal Defendants' Motion to Dismiss or, In the Alternative, Motion for Voluntary Remand and Joinder in Federal Defendants' Supplemental Motion for Stay (Nov. 1, 2006) at 2 (appended as Exhibit 13.)

Among other things, these agencies recognize that the smelt BO is not based on "known population trends" or consideration of the substantial population declines experienced by the smelt in recent years. *NRDC v. Kempthorne*, Federal Defendants' Response to Plaintiffs' Motion for Summary Judgment and Cross-Motion to Dismiss, or in the Alternative, Motion for Voluntary Remand, at 4. They also recognize that the smelt BO is not based on the best scientific information or the known threats to the species revealed in the 2005 IEP POD synthesis and more recent POD studies. *Id.* at 4-5. Nor does the smelt BO include consideration of the impacts of climate change on the Delta and its ecosystem, including DWR's own July, 2006 climate change report that, according to the federal agencies, "requires further consideration." *Id.* at 6. Even the project description of the smelt BO is admittedly out-of-date, failing to reflect current information on American River Flow Standards, Water Transfers, the Delta Mendota-California

Aqueduct Intertie, Sac River Reliability Study, M & I Shortages, Article 21, EWA as modeled, and more. *Id.* at 5-6.

Collectively, these shortcomings in the smelt BO have led the agencies, including DWR, to conclude that the 2005 smelt BO will likely be affected in "at least three ways" in the current re-consultation:

> First, the environmental baseline and jeopardy analysis will be revisited, because whether or not the OCAP implementation will appreciably reduce the likelihood of survival and recovery of the delta smelt must be evaluated against what may likely be a new baseline, potentially with a lower species population than was previously understood to exist. Second, the critical habitat analysis will be revisited, because data on salinity concentrations, declining population recruitment activity from downstream areas, and invasion of the exotic clam species, *potamocorbula amurensis*, require further analysis of whether the implementation of the OCAP adversely modifies critical habitat, in terms of both survival and recovery of the species. Third, and finally, the existing incidental take statement may need to be revised to take into account recent delta smelt population changes.

Id. at 6. In other words, the smelt BO will likely undergo significant changes once it does incorporate the best and most recent available science, rendering DFG's and DWR's reliance on the document for CESA compliance at this time both unwise and unlawful.

2. Several Independent Studies Have Thoroughly Discredited the Salmon BO

On October 22, 2004, NMFS released its biological opinion on the impacts of the 2004 OCAP on federally listed salmon and steelhead. The salmon BO documents the severe decline of these species due to the joint operations of the CVP and SWP, and the substantial adverse impacts that the 2004 OCAP would have on those species. Nevertheless, the final BO, in contrast to the "jeopardy" conclusion of at least one draft BO, found that the 2004 OCAP would not jeopardize the continued existence of any listed salmonid or adversely modify critical habitat. In April and May, 2006, the Bureau of Reclamation requested reinitiation of consultation on the OCAP, recognizing that "new information has been developed since issuance of the 2004 OCAP Biological Opinion in October, 2004, and that this information will be considered in the consultation." Letter from Ronald Milligan, USBR, to Rodney McInnis, NMFS (May 19, 2006). Thus, like the smelt BO, the federal agencies have acknowledged that the salmon BO does not reflect the best scientific information currently available, as required by CESA.

Moreover, the salmon BO has undergone several independent reviews, all of which have

echoed this finding. Because of the abrupt and apparently unjustified alteration of the finding of the final salmon BO to "no jeopardy" and "no adverse modification" from the contrary conclusions in the draft BO, U.S. Senator Barbara Boxer (D-CA) called for an investigation to determine whether improper political pressure had been placed upon NMFS to change the draft Biological Opinion's jeopardy conclusions. U.S. Rep. George Miller (D-Martinez) and 18 other members of Congress also asked the Inspectors General of the Interior and Commerce departments to investigate whether federal political appointees played a role in encouraging NMFS to ignore the scientific basis for the initial jeopardy conclusions and to override those conclusions.[3] State Senator Michael Machado, chair of the Natural Resources and Water Subcommittee on Delta Resources, made a similar request.

In response to these Congressional concerns, on July 8, 2005, the Department of Commerce's Inspector General issued a report on the NMFS consultation on the 2004 OCAP ("IG Report"). Appended as Attachment 1 to Exhibit 9. The IG Report criticized NMFS for "bypass[ing] key internal controls over the integrity of the biological opinion," and stated that the flawed process leading up to the issuance of the salmon BO "raises questions about the integrity of that OCAP opinion." *Id.* at 16. The IG Report noted that neither NMFS's regional ESA Section 7 coordinator nor its Office of Regional Counsel reviewed the salmon BO, contrary to NMFS's own internal procedures. *Id.* at 10-13. The IG Report stated that, in any case, the regional ESA Section 7 Coordinator "would not have signed off on the opinion because of her belief that there is a basic disconnect between the scientific analysis and the [no jeopardy] conclusion." *Id.* at 11.

Following one of the recommendations in the IG Report, NMFS asked a panel of independent fisheries biologists from the California Bay-Delta Authority ("CALFED") Science Program to review the salmon BO and determine whether NMFS had used the best available science in developing it. On January 3, 2006, the CALFED panel issued a report unanimously concluding that NMFS had *not* used the best available science. Appended as Attachment 2 to Exhibit 9. The CALFED report identified no fewer than fifteen technical deficiencies in the salmon BO, including "[l]ack of a comprehensive population approach to jeopardy assessment," "[t]oo little attention devoted to the effects of future global climate change," and "[u]nclear connection between the analyses and the findings in the [Biological Opinion]."

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[3] A recently released Inspector General report on the improper interference of Deputy Assistant for Fish and Wildlife and Parks, Julie MacDonald, with the scientific findings of Fish and Wildlife staff confirms that this type of political interference occurred on numerous occasions in the Bush Administration. *See*, U.S. Dept. of Interior, Office of Inspector General, Report of Investigation, Julie MacDonald (Mar. 23, 2007) (appended as Exhibit 14). The report confirms "that MacDonald has been heavily involved with editing, commenting on, and reshaping the Endangered Species Program's scientific reports from the field [despite the fact that] she has no formal educational background in natural sciences, such as biology." *Id.* at 2.

NMFS also requested that scientists from the Center for Independent Experts ("CIE") in Miami, Florida review the salmon BO to determine whether NMFS had used the best available science. On January 12, 2006, one of the two CIE reviewers concluded that the salmon BO was *not* based on the best available science. Appended as Attachment 3 to Exhibit 9. That reviewer criticized numerous elements of the biological opinion, including its failure to examine the relative significance of various threats to salmon species, its failure to take into account substantial uncertainty brought about by less than optimal modeling and data, and its failure to support statements in the salmon BO with actual data. The reviewer also noted that "one of the main assumptions [in the Biological Opinion], that past weather observations are indicative of the future, is neither clearly stated nor reasonable." *Id.* at 2. The second CIE reviewer, while characterizing the salmon BO as "a good faith effort," also pointed out numerous shortcomings in NMFS's analysis. Appended as Attachment 4 to Exhibit 9.

On March 29, 2006, the Department of Commerce Inspector General issued a memorandum demanding that NMFS's parent agency, the National Oceanic and Atmospheric Administration ("NOAA"), submit "a written response regarding NOAA's plan to address the deficiencies and related recommendations made in the scientific reviews," and stating that "it is clear that additional steps should be taken in light of the results of these independent analyses that the scientific integrity of the biological opinion was impaired." Appended as Attachment 5 to Exhibit 9.

In light of these findings, neither DWR nor DFG has any grounds to assert that the salmon BO is based on the best scientific information, as required by CESA.

II. THE PELAGIC FISH ACTION PLAN DEFINES THE MINIMUM STEPS THAT DFG SHOULD REQUIRE OF DWR

In response to a directive from the legislature in June 2006, the Resources Agency embarked on developing a plan to address the dramatic decline in pelagic organisms and the need to stabilize the ecosystem in the Sacramento-San Joaquin Delta. Based on significant scientific study and analysis conducted on behalf of the Interagency Ecological Program as well as numerous independent experts, the Pelagic Fish Action Plan was released in March of 2007 to provide recommended actions for improving conditions for pelagic fish species and for helping to stabilize the Delta ecosystem.

The Action Plan outlines three recommendations to modify water project operations to benefit pelagic species. These actions focus on reducing adult delta smelt and larvae entrainment at the SWP and CVP intakes, providing better spawning distribution, and increasing the availability of delta smelt habitat. While these are all key actions for protecting critical life stages of the smelt and for possibly minimizing harm to species, the actions may be insufficient to reverse the decline of the species.

Improved scientific understanding of delta smelt has indicated that increasing the magnitude (i.e., duration of action, greater reduction in exports, etc.) of the actions in the Action Plan would better recreate the spawning and rearing environment to the one in which the delta smelt evolved and would further reduce entrainment of adults and larvae at the pumps.[4] Of particular concern is the emerging science indicating that the current management of the pumps is taking a significant number of larval and juvenile smelt hatched before the Vernalis Adaptive Management Program (VAMP) period. Herbold, B. C. S. Armor, R. Baxter, M. W. Chotkowski, M. Gringas, A. B. Mueller-Solger, M. L. Nobriga, and T. R. Sommer. 2006. POD conceptual synthesis. CALFED Science Conference, October 23-25, 2006, Sacramento, CA. (Abstract available at: http://sciconf.abag.ca.gov/conferences/abstract_view_01a.php). It is therefore recommended that the VAMP export curtailment be extended beyond the required 31-day period until monitoring and salvage indicate that the majority of the delta smelt population is located downstream of the confluence of the Sacramento and San Joaquin Rivers.

At an absolute *minimum* there must be a commitment that all of the operational actions outlined in the Action Plan will be *fully* implemented to prevent further harm to pelagic species. In order to fully implement the Action Plan, it is critical that a firm commitment be made from DWR to dedicate a significant amount water on an annual basis that well exceed the currently undersized and unreliable EWA.[5] Anything less will result in the fisheries agencies being constrained to take actions based on what water is made available to them, which in the past has been led to an inability to fully protect the species.[6] The Action Plan itself refers to the limited ability of the EWA to adequately allow proposed actions to be taken and that if jeopardy is to be avoided additional water need to be provided by the SWP and/or CVP.[7] Only 210-250 TAF is available in Tier 2 of the EWA for WY 2007, which clearly will not be sufficient to allow full implementation of the Action Plan.

Given that the population of the Delta smelt is so low, it is also imperative that in addition to the current monitoring underway, new real-time monitoring be in place to detect presence of larval and small juvenile Delta smelt at and near the pumping facilities. Emerging science is now indicating that this segment of the population is heavily impacted by entrainment at the pumps, but the exact impact is not yet known.

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[4] Letter from Peter Moyle, Ph.D. and Christina Swanson, Ph.D. to USFWS, DFG, NMFS, USBR, and DWR regarding Recommendations for Actions to Protect Delta Smelt, March 13, 2007.

[5] As outlined in the Action Plan, in some years it may require up to 1-1.5 million acre-feet to fully implement the operational actions specified in the plan. The EWA is currently sized at 210-250 TAF/yr.

[6] Finding the Water: New Water Supply Opportunities to Revive the San Francisco Bay-Delta, Environmental Defense, 2005.

[7] Action Plan, page 37.

Since many of the actions in the Action Plan are triggered by presence of smelt, there is a need for the more comprehensive monitoring data to be used to make this assessment.

DFG should require DWR to implement the actions set forth in the Action Plan, plus any necessary additional actions, through the issuance of an incidental take permit ("ITP"), rather than the questionable route of a consistency determination for the existing federal biological opinions. Some existing environmental documents may assist DFG in securing necessary and timely compliance with CEQA. The Action Plan itself indicates that all three of the actions affecting the SWP pumps can be implemented immediately and without further environmental review. *See* Action Plan, pp. 43, 45, 47, 48. An immediate ITP could serve as a bridge to a new or reissued ITP at the end of 2007.

III. PHYSICAL HABITAT RESTORATION MEASURES ARE ALSO REQUIRED BY CESA

The stated intent of the OCAP BOs is to provide ESA compliance for the vast majority of the operations of the CVP and SWP under the ESA. The operations of the Delta pumps, as discussed above, are among the most significant aspects of the CVP and SWP, from the perspective of endangered species protection. However, CESA requires the consideration of additional actions, particularly physical habitat restoration measures designed to fulfill the CESA requirement for full mitigation.

A. The Operation of Red Bluff Diversion Dam has Significant Impacts on State-Listed Species

As explained above, the current four-month gates-in operation of Red Bluff Diversion Dam has significant, unmitigated adverse impacts on listed salmonids. Not only does Dam operation impede salmonid migration and spawning success, it creates enormous predation problems and blocks passage to spawning and rearing habitat that fish agencies have expended tens of millions of dollars restoring.[8] The Bureau of Reclamation recently recirculated the DEIS/EIR for public comment, presumably in recognition of the fact that current Dam operations need to be modified. However, the Bureau identified two-month gates-in operation as its preferred alternative, a proposal that would continue to have unacceptably high adverse effects on listed salmonids.[9] DFG should require that any

[8] With regard to predation, the Red Bluff Diversion Dam DEIS/EIR acknowledges that lack of flow below the Dam during gates-in operation allows predators such as Sacramento pikeminnow and striped bass to congregate below the Dam and consume vast amounts of juvenile salmonids. DEIS/EIR, p. 3-15. It also recognizes that predation by avian species may be greater near the Dam than on undammed reaches of the Sacramento River, presumably because of the slackwater conditions and congregating fish caused by lack of flow. *Id.* The U.S. Fish and Wildlife Service has concluded that predation alone causes the death of up to 42% of migrating steelhead and more than 50% of Chinook salmon below the Dam. DEIS/EIR, p. B.-7.

[9] The Red Bluff Diversion Dam DEIS/EIR acknowledges that the following percentages of listed fish and other salmonids would continue to be impacted by gates-in Dam operations during the months of July, August, and early September:

CESA-compliant plan include year-round gates-out operation of Red Bluff Diversion Dam.

B. Delta Habitat Restoration Measures are Required by CESA

The Delta is one of the most highly modified aquatic ecosystems in the nation. Those changes have had significant adverse impacts on both listed salmon species and smelt. The provisions of CESA suggest that DFG should require DWR to implement, in an expedient manner, an ambitious set of habitat restoration measures in the Delta, designed to minimize and mitigate the impacts of the projects on state-listed species.

The operations of the SWP and CVP have a significant impact on the suitability of habitat in the Delta. The POD investigations have revealed, for example, that the lack of suitable habitat has resulted in the concentration of smelt near the Delta pumps. The lack of adequate food supplies, in part a likely indirect impact of the projects, also threatens the smelt. The operations of the cross channel gates divert salmon smolts into the Central Delta, which provides poorer habitat and likely increases mortality rates.

A wide range of Delta restoration actions have been investigated through the CALFED Program and other efforts. Recently, the PPIC report discussed the potential fisheries benefits of Delta restoration actions[10]. In addition, the Action Plan includes a significant discussion of potential food web and habitat restoration measures[11]. For example, the construction of fish passage facilities at the Fremont Weir and the provision of adequate flows into the Yolo Bypass could allow downstream migrating salmon to avoid the Delta cross-channel, thus reducing the impacts of the pumps. In addition, the restoration of habitat in the Yolo Bypass, Cache Slough, Sherman Island, Decker Island, Dutch Slough and the Suisun Marsh could provide rearing benefits for salmon and food chain benefits for Delta smelt. Cache Slough and the Suisun Marsh are known spawning area for Delta smelt.

Winter-run Chinook adults:	3% of the total run
Winter-run Chinook juveniles:	39% of the total run
Steelhead adults:	16% of the total run
Steelhead juveniles:	26% of the total run
Fall-run Chinook adults:	25% of the total run
Fall-run Chinook juveniles:	3% of the total run
Late fall-run Chinook juveniles:	27% of the total run
Spring-run Chinook adults:	11% of the total run
Green Sturgeon juveniles:	61% of the total run

DEIS/EIR, pp. B-6 to B-16. The extent of these impacts is simply unacceptable for fish facing extinction.

[10] PPIC, page 77

[11] Action Plan, page 59.

The Action Plan addresses the potential benefits of these actions, however, it contains little, if any, commitment to implement any of these projects. In addition, in some areas, such as the discussion of Suisun Marsh, we believe that more extensive habitat restoration measures should be considered. The provisions of CESA require a stronger commitment to implementation than is contained in the Action Plan.

IV. THE BAY-DELTA CONSERVATION PLAN DOES NOT MEET CESA REQUIREMENTS

The goal of the Bay-Delta Conservation Plan (BDCP) is to develop a plan that allows water operations to proceed in a way that is compatible with the recovery of key species that live in or migrate through the Bay-Delta by implementing a robust set of conservation actions. While the BDCP is intended to comply with all aspects of the State and Federal Endangered Species Act's through the development of conservation measures and a comprehensive strategy, the development of the plan is nowhere near being ready so as to have any relevance to the immediate need for CESA compliance. At best, the plan will be completed at the end of 2008 and will still require the development and certification of an EIR/S which will involve additional time to complete. We believe that it is likely that it will require significantly more time than assumed in this timeline for the BDCP to produce a plan

It is also important to note that while the goal of the BDCP is to meet the recovery standard of the Natural Communities Conservation Planning Act, this effort has not yet committed to meet the recovery requirement of this act. In addition, the voluntary nature of the process allows for any applicant to withdraw from the process at any time and request a much less rigorous standard for compliance. It is quite possible that at the end of the day the final plan might not include much more, in terms of protective measures, than what is currently in place. Therefore, there is no basis for using the BDCP, which is far from completion and has an uncertain conclusion, as justification for granting a Consistency Determination.

We look forward to discussing these issues with you further. Please feel free to contact any of the organizations identified below for more information.

Sincerely,

Barry Nelson
Senior Policy Analyst
Natural Resources Defense Council

Ann Hayden
Senior Water Resource Analyst
Environmental Defense

Gary Bobker
Program Director
The Bay Institute

Jonas Minton
Water Policy Advisor
Planning and Conservation League

Bill Jennings
Executive Director
California Sportfishing Protection Alliance

Cc: Senate President pro tem Don Perata
Senator Mike Machado
Senator Joe Simitian
Senator Daryl Steinberg
Assemblywoman Lois Wolk
Assemblywoman Loni Hancock
Assemblyman Jared Huffman
Susan Kennedy, Chief of Staff
Mike Chrisman, Resources Secretary
Lester Snow, Department of Water Resources

LETTER 20

California Department of Water Resources
SWP Reliability Report-Attn: Johnnie Young-Craig
P.O. box 042836
Sacramento, CA 94236-0001

December 19, 2005

attachment #4

Subject: The State Water Project Reliability Report 20005—Draft

Dear Sirs:

The report informs us that it is an update to the 2002 edition of the report of the same name. The foreword states that DWR will update this information every 2 years. However, the Department of Water Resources is derelict in not acknowledging that this report is a requirement of the amendments to the SWP contracts that was agreed to in the settlement negotiations pursuant to the Monterey litigation.

Purpose

The report is not simply information to help the contractors understand to what degree they can rely on SWP deliveries, but in fact is an essential requirement stemming from the need to eliminate "paper water" from the contracts. The Appellate Court was clear on the problems in planning that proceeded from the previous interpretations allowed by DWR that in effect created the notion of "paper water." In the settlement negotiations it was made clear that a well documented and unambiguous report of delivery reliability was essential to the elimination of "paper water." Accordingly, this report must be reviewed with that primary objective in mind.

Does the report fulfill that purpose? Its self-defined scope certainly allows for that possibility, but without serious calibrations of the main analytic tool, CALSIM II, used to perform the analysis, it is doubtful that it can. This deficiency has been pointed out many times over the past several years and DWR has still failed to come to grips with it. Their limited study, whose results are summarized in the draft, do little to meet the requirements of a legitimate calibration. Calibration, properly done, allows the program developers to assure that all elements of the computer program work properly. In the case of CALSIM II the calibration will show from where in the operational regimen of the SWP the increased amounts of water it predicts will materialize. Even the Scientific Peer Review Committee stated as much; they noted without a proper calibration there is no assurance that the results that are calculated from an optimization routine are a real solution. They must be shown to conform to realistic operations that are known to be feasible. No where in the report is this demonstrated or even hinted at.

Previously Noted Deficiencies

The lack of calibration and other deficiencies have been made known the DWR in formal comments on the 2002 draft. On reading this draft there seems to be no acknowledgement that any of these deficiencies have been addressed. The list of these previous deficiencies is highlighted below.

1.) The frequency diagrams are without statistical merit and therefore cannot be used to provide estimates of "reliability."

2.) The draft continually refers to CALSIM II as a "simulation." Until CALSIM II has been calibrated to show that it conforms to a real and feasible operational regimen, its results cannot be interpreted as though it is a simulation. Even then, its computerized configuration is not even close to what is ordinarily referred to as "simulation." CALSIM II is an optimization model in which the objective function is to maximize exports of water from the Delta given certain constraints. In typical optimization models not all solutions are feasible. Only calibration can establish that possibility. This model does not meet that criterion.

3.) The model makes certain assumptions about the individual contractors' demand for SWP deliveries. Those demand functions have not been vetted against the realistic capabilities of each contractor to take SWP water. In one case the assumption is factually wrong- San Luis Obispo County physically cannot take its full Table A amount of 25,00 acre feet because it is limited by physical capacity of the SWP pipeline to only 4800 acre-feet. Nonetheless, the model assumes that SLO County will take 25,000 acre-feet when it is available at the Delta. Also there are some contractors that are unable to take their full Table A amount simply because they don't have the proper amount of equalizing storage to take the water when the SWP says it is available. The demand functions have not taken these and many other considerations into account. Because the model is an optimization against these demand functions the results cannot be taken at face value until the demand functions have been made realistic in terms of the requirements of the individual contractors.

4.) The report uses a definition of reliability that follows from their construct -ion of the frequency charts they use to summarize the results. When they state for example that the project can deliver 73% reliability, that is an incorrect interpretation of the data in the chart. In fact, the point at which 73% of the Table A water is delivered is actually the 50% point in the frequency chart. The correct statement would be: The project can deliver 73% of the water 50% of the time. However, this is not quite true either because the frequency charts are not statistically valid and insufficient to support an estimate of delivery reliability.

Additional Deficiencies

There are also some additional deficiencies that have since been revealed through careful studies of the CALSIM II model. These have to do with the assumptions on constraints and some fundamental errors in the statistical basis of the model's inputs.

The model exercises for this report assume that SWRCB rules that operate to constrain export pumping will continue unchanged into the future. If the model results showed that future export pumping would continue at about the same level, that may perhaps be a defensible assumption. However, we have the case where the model results show that on average future export pumping will be 50% greater than the recent historical average under most all anticipated hydrologic conditions. Given that result it would seem prudent to examine to what degree SWRCB rules might be modified in anticipation of the environmental damage to be expected with such an increase in export pumping. The model does not do that. In fact, before these results can be used by anyone, the model's calculations should be explored to discover where and to what degree existing historic pumping regimens are expected to change. After all, the existing rules were developed in response to concerns with the operational problems that were demonstrated along the way during historic pumping. The rules certainly cannot be interpreted as definitive statements on what is acceptable for the Delta environment irrespective of the levels of export in the future.

The model also uses a sub-model to calculate the movement of the X 2 salinity threshold in the Delta as a function of hydrologic conditions. Unbelievably the sub-model calculational routine does not include the level of pumping. It is difficult to believe that the movement of the salinity threshold is independent of export pumping. Furthermore, given that CALSIM II predicts a 50% increase in exports over historic levels it would seem prudent to examine whether this simple routine is really applicable at that higher level. The research that went into the development of this calculational routine should be peer reviewed. The same may be said with the entire modeling of cross Delta transport calculations.

Perhaps the greatest problem with CALSIM II is its total disregard for proper statistical analysis in the development of the model. It is easy to verify that the input hydrology to the model represents a complex statistical distribution. In fact, it is what is referred to by statisticians as "bi-modal" meaning there are two main modes. One significant consequence of this feature is that the grand average of the total 73 year record is a very unlikely occurrence. All references in the report to average deliveries over 73 years are totally misleading.

The two modes clearly depict a collection of dry years and another of wet years. There are slightly more cases of dry years than wet ones although for practical purposes they are roughly equal. It is also the case that except for droughts there is virtually no serial correlation year-to-year. This means that a wet year may be followed with equal likelihood by either a dry or wet year. The fundamental problem that SWP operators must continually face is under what conditions is it prudent to pump given uncertainty in what kind of year the project will face. It is a classic operations research problem and involves tradeoffs between the objective of pumping water and the risk that too much will be taken. This operational problem is faced at the beginning of every water year beginning in the fall. A careful study of historic input flows from the Sacramento River in the fall and winter shows that it may be difficult to establish until late in January if the water year will likely be wet so as to allow higher levels of pumping. But a careful examination of SWP pumping capacity shows that the pumps must run at nearly maximum capacity for most of the year if export flows near 4 MAF are to be realized. Clearly, if the 73 average predicted by this model is near 4 MAF then we must assume that heavy pumping is

allowed during the fall and winter months before it is known that the year will indeed be wet. How is this reconciled with prudence and so call risk avoidance?

Because the model incorrectly deals with the statistical nature of the input hydrology it also includes some totally improper inputs. The model relies on a "water year index" which is a convolution of the spring and fall/winter runoffs across years. The affect is to produce an index which is uni-modal in contrast to the bi-modal hydrologic input. Because there is no significant year-to-year correlation in runoff, this convolution is without scientific merit and totally distorts the basic operational decision problem so that it no longer represents any reality. Furthermore, this water year index is further convoluted to a "water year type" designator that is used to establish Delta export/inflow ratios that ostensibly are used to protect the Delta environment.

The "water year type" is the index that is used in the CALSIM II model to establish what the required outflow in the Delta must be to satisfy the SWRCB rules. It is used in the model by a "lookup table" that predetermines the water year before it is fully developed. It does this by combining the previous spring's runoff with the current fall and/or winter runoff to decide whether the coming water year is going to be wet or dry. Needless to say, the statistical nature of the runoff record defies predicting what the upcoming water year will be. But by this simple mechanism the model is given fore knowledge of conditions before they are experienced. This departs radically from any notion of simulation. The convolution giving rise to this "water year type" has no demonstrable logical analysis for its existence. Clearly, the CALSIM II model cannot be taken as a valid model until some of these logical flaws are explained or corrected. By extension, the Reliability Report is without any scientific merit and is virtually useless for the purposes stated.

Additional Inconsistencies

There are additional problems that deserve explanation beyond what is stated in the Reliability Report. When one compares the set of tables documenting the past 10 years of deliveries to the various contractors and compares them to the same years reported in the 2002/2003 version there are some significant changes. Out of the ten years only one of the years appears to be the same in the two volumes. Most of the changes in deliveries seem to occur in the values reported for Kern Co. and Castaic Lake Water Agency. The latest report should explain these differences.

Sincerely,

Arve R. Sjovold

Plaintiff CPA Representative
In the Monterey Settlement
Negotiations

Plaintiff CPA Representative
To Monterey ++ EIR Comm.

ADDITIONAL DATA ON OROVILLE STORAGE 1996-2004

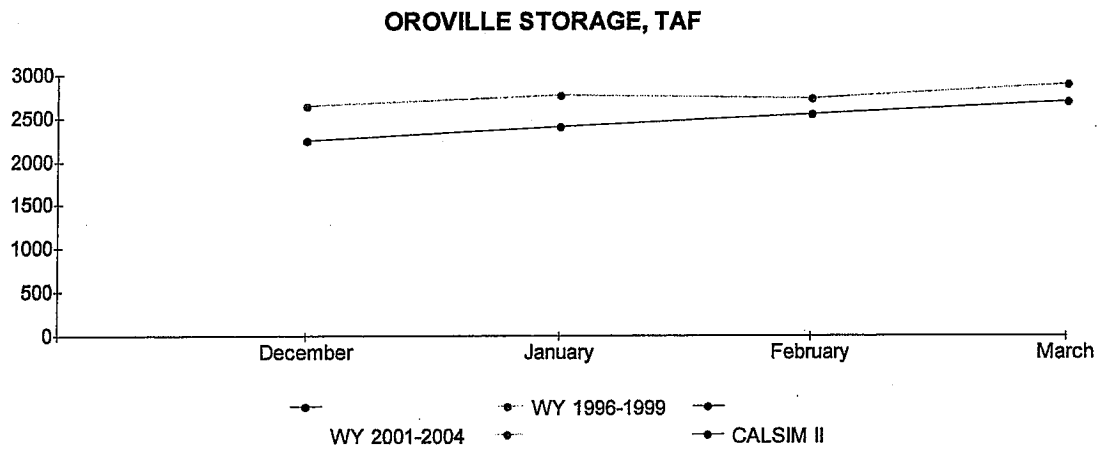
By: Arve R. Sjovold
October 8, 2006

As part of my investigation on SWP pumping from the Delta and releases from Oroville, I also tabulated the corresponding data for Oroville storage. I divided the period into before water-year 2000 and after. This provides two sets to distinguish the changes in operations as a result of the new pumping regimen documented previously. I left out the year 2000 data as I considered it a transition year between the two regimens.

The results are presented in the table below and a corresponding chart. I plot the averages storage levels for the two periods, 1996-1999 and 2001-2004, for the months of December, January, February, and March. Each value represents the average of the four period designated in the column head. A third entry is the estimates provide by the CALSIM II model as reported in a recent draft report from DWR.

I don't know what level is called for by their operational guidelines or any fishery constraints that may apply in these months. However, it is clear that to support the new regimen, it appears that Oroville storage levels will be systematically lower with the new regimen than before. It is also noteworthy that the new regimen levels are systematically lower than the CALSIM II prediction. This may be important to the FERC licensing process now going on.

Month	WY 1996-1999	WY 2001-2004	CALSIM II
December	2636	1798	2250
January	2758	2067	2400
February	2728	2271	2550
March	2886	2541	2700


OROVILLE STORAGE, TAF
3000
2500
2000
1500
1000
500
0
December
January
February
March
WY 2001-2004
WY 1996-1999
CALSIM II

LETTER 20

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Kevin Johnson
Senior Vice President
Gary Patton
Vice President
J William Yeates
Secretary-Treasurer

PLANNING AND CONSERVATION LEAGUE

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December 22, 2005

Kathy Kelly
California Department of Water Resources
Bay Delta Office Chief
1416, 9th Street, Room 215-37
Sacramento, CA 95814

attachment #5

California Department of Water Resources
SWP Delivery Reliability Report – Attn: Johnnie Young-Craig
P.O. Box 942836
Sacramento, CA 94236-0001

via facsimile to: (916) 653-6077
via email to: Comments-on-2005DRR@water.ca.gov

Re: Comments on Public Review Draft of the State Water Project Delivery Reliability Report 2005

Ms. Kelly:

The Planning and Conservation League (PCL), a strong advocate for accurate and realistic water supply planning, submits the following comments on DWR's Public Review Draft of the State Water Project Delivery Reliability Report (Draft Reliability Report). As one of the signatories to the court-approved settlement agreement requiring DWR to prepare these biennial reliability reports, PCL seeks to ensure that the final report lives up to the rigorous reporting requirements specified in that agreement. Serious deficiencies are present in the Draft Report that, if left uncorrected, would dangerously overestimate DWR's future ability to deliver water and compound the risk that local planning decisions will be predicated on "paper" rather than deliverable water.

The Reliability Report Should Accurately Disclose its Foundation in the Settlement Agreement and the State Water Project Contracts

The present Draft fails to inform local decision-makers and the public of the context and history behind DWR's reporting requirement. DWR's legal duty to prepare biennial reliability reports arises from the court-approved settlement agreement executed by PCL, DWR, state water contractors and other entities in the wake of the Third District Court of Appeal's ruling in the "Monterey Amendments" case, *Planning & Conservation League v. Department of Water Resources* (2000) 83 Cal. App. 4th 892.

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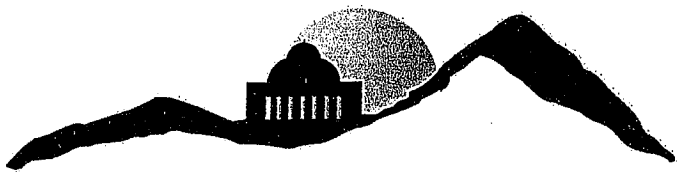

PLANNING AND CONSERVATION LEAGUE

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In *Planning & Conservation League*, the decision invalidating the Monterey Amendments EIR, the court bluntly addressed the "huge gap" between the 4.23 million acre-feet of SWP entitlements referenced in Table A of the SWP contracts and the half or less of that amount the state can reliably deliver. Recognizing the practical consequences of paper water for local development decisions, that court vindicated "the commonsense notion that land use decisions are predicated at some level on assumptions about available water supply. The Court also recognized that reliance on "paper water in local development decisions can produce excessive groundwater pumping and a host of other detrimental environmental consequences. " (83 Cal. App. 4th at p. 915.)

In the settlement decision following that ruling, DWR expressly agreed to add a rigorous new set of reporting requirements. In a new provision (Article 58) of the SWP contract, DWR committed to the following:

> 1.Commencing in 2003, and every two years thereafter, the Department Water of Resources (DWR) shall prepare and deliver to all State Water Project (SWP) contractors, all city and county planning departments, and all regional and metropolitan planning departments within the project service area a report which accurately sets forth, under a range of hydrologic conditions, the then existing overall delivery capability of the project facilities and the allocation of that capacity to each contractor. The range of hydrologic conditions shall include the historic extended dry cycle and long-term average. The biennial report shall also disclose, for each of the ten years immediately preceding the report, the total amount of project water delivered and the amount of project water delivered to each contractor. The information presented in each report shall be presented in a manner readily understandable by the public. (Settlement Agreement Attachment B)

The Settlement Agreement further states:

> 3. DWR shall provide assistance to enable all Municipal and Industrial Contractors to provide complete and accurate information to relevant land-use planning agencies to assure that local land-use decisions reflect accurate information on the availability of water from state, local, and other sources. (Settlement Agreement Attachment B)

The Draft Reliability Report does not fulfill these requirements. As detailed in the remaining sections of these comments, the Draft omits important information and misinterprets data, which would mislead both the public and local water agencies. Accordingly, it lacks the accuracy that the settlement agreement requires. In order to help DWR meet the commitments made under the settlement agreement, we submit the following comments for inclusion in the final 2005 Reliability Report.

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Excerpts of the Reliability Report should not have been privately shared with the State Water Contractors, but denied to PCL and the public

We are aware that DWR provided an earlier draft chapter of the Draft Reliability Report to State Water Project contractors in May 2005 ("Excerpts from Working Draft 2005 SWP Delivery Reliability Report") and further recommended that local agencies incorporate information provided in that draft chapter in their Urban Water Management Plans (UWMPs). Castaic Lake Water Agency has acknowledged relying on that document in reviewing other projects, and other contractors may have done so as well. However, DWR did not provide that draft chapter to PCL or the public, even though PCL staff requested the opportunity to review the draft. After followup requests, we were informed that the draft chapter would be posted to a web page for contractor announcements. There was no public announcement informing interested parties of the availability of the draft chapter.

DWR's decision to circulate part of the report to the contractors, while denying that same document to PCL and members of the public, represents an unfortunate throwback to the defective process singled out for criticism in *Planning and Conservation League*, where the court took notice of the interested parties and members of the public who were "not invited to the table." (83 Cal. App. 4th at 905.)

The draft and final Reliability Reports should be available to the public prior to deadlines for local agency Urban Water Management Plans

The most important purpose of the Reliability Report is to provide local water agencies and the public with accurate and realistic information on the reliability of SWP deliveries. Those local agencies should be able to use that information in planning documents and to inform land use decisions. Unfortunately, the timing of this report significantly compromises its utility. DWR did not release its draft to the public until just weeks prior to the state mandated deadline for local water agencies to complete and submit their 2005 Urban Water Management Plans.

DWR's decision to provide a single draft chapter prior to release of the full draft significantly compromises the information now included in many UWMPs. Without the complete report and the benefit of public review, decision-makers, planners and the public were denied the opportunity to evaluate and confirm the credibility of the information included in the draft chapter and now included in the UWMPs. Releasing the draft chapter and significantly delaying the release of this report is functionally equivalent to eliminating public oversight and transparency.

Water supply information from one chapter of a draft report also does not provide an adequate level of certainty or rigorous review required to determine the reliability of future water supplies for millions of Californians. To avoid damaging that review, water agencies and the public were supposed to have the complete final report, not just a preliminary part of it.

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DWR must ensure that in the future, the public will have ample opportunity to review and comment on Draft Reliability Reports, and that those public comments will be appropriately responded to and incorporated into vetted and substantiated final future reports well before Urban Water Management Plans are due to the State.

The Reliability Report should include DWR's analysis of SWP reliability under anticipated effects of climate change.

The 2005 Draft Reliability Report recognizes that a primary factor in determining reliability of SWP supplies is the availability of water in source areas. Yet the Draft Report fails to discuss and incorporate known and recognized information regarding the substantial adverse impacts climate change will have upon California's water supply. This omission is particularly troubling because DWR previously committed to including such information.

In 2002 DWR's first Reliability Report recognized that climate change could significantly alter availability of water in source areas. The 2002 report stated that information on climate change impacts to California was being developed in the California Water Plan Update process, and that such information would be incorporated into the 2005 reliability report. The California Water Plan Update 2005 is now nearly complete, and it contains information on climate change. The April 7, 2005 draft of the Water Plan Update states:

> California's relies on snowpack as its largest means of annual water storage. Runoff from the Sierra Nevada mountains during April through July of each year averages 14 million acre-feet and comes primarily from snowmelt. Computer modeling of global climate change scenarios predict significant future reductions in the Sierra snowpack. A reduced snowpack will reduce the total water storage for the state. Figure 4-7 (Model simulation of potential changes in snowpack during the 21st Century) shows a 52 percent reduction in the annual April through July runoff for a 2.1 degree C (3.8 F) of warming, well within the 1.4 to 5.8 degree C (2.5–10.4 F) range predicted by global climate models for this century.
>
> Changes in the timing of snowfall and snowmelt, as a result of climate change, may make it more difficult to refill reservoir flood control space during late spring and early summer, potentially reducing the amount of surface water available during the dry season. Changes in reservoir levels also affect lake recreation, hydroelectric power production, and fish habitat by altering water temperatures and quality. Reductions in snowpack may require changes in the operation of California's water systems and infrastructure, and increase the value of additional flood control space in reservoirs.
> (Public Review Draft California Water Plan Update, April 7, 2005, Vol. 4, page 4-27)

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Despite the commitments made in the 2002 Reliability Report, this information is not included in the recent draft of the 2005 Delivery Reliability Report.

In addition, the Draft Reliability Report misleads readers by suggesting that information on climate change impacts in California is not available. Since the release of the Draft Reliability Report 2002, a large amount of analysis on potential climate change impacts on water management in California has been published. Yet, the Draft Report 2005 states:

> The studies do not incorporate any modifications to account for changes related to climate change or assess the risk of future seismic or flooding events significantly disrupting SWP deliveries. As tools are developed to address these risks and the resulting studies become available, the information will be incorporated into the assessment of SWP delivery reliability. The results of the CalSim-II studies conducted for this update to *The State Water Project Delivery Reliability Report 2002* (DWR 2003b) represent the best available assessment of the delivery capability of the SWP. (Draft Reliability Report page 17)

However, estimates of the deliveries from the SWP under climate change conditions have been modeled and analyzed. The California Energy Commission recently completed such an analysis in their report, "Predictions of Climate Change Impacts on California Water Resources Using CalSim-II: A Technical Note" (CEC report).

In contrast to the statement included in the Draft Reliability Report, the CEC report provides assessments of SWP delivery capability under several probable climate change scenarios. This work was prepared in response to Executive Order S-3-05 issued by Governor Schwarzenegger, which called for a report on the impacts to California of global warming, including impacts to water supply, public health, agriculture, the coastline, and forestry.

It includes analysis carried out using CalSim-II, some of it performed by DWR staff.
It is disappointing that it took the initiative of the Energy Commission to generate climate change scenarios that PCL has been requesting of DWR for over two years. Moreover, DWR cannot credibly represent that such studies are impossible even after they become publicly available. To claim otherwise would fatally compromise the commitment to accuracy that is the hallmark of DWR's reporting requirement.

The figures below from the CEC Report show that under climate change hydrologies, SWP deliveries at 75% reliability could be as much as 1.9 million acre feet less than the base condition.

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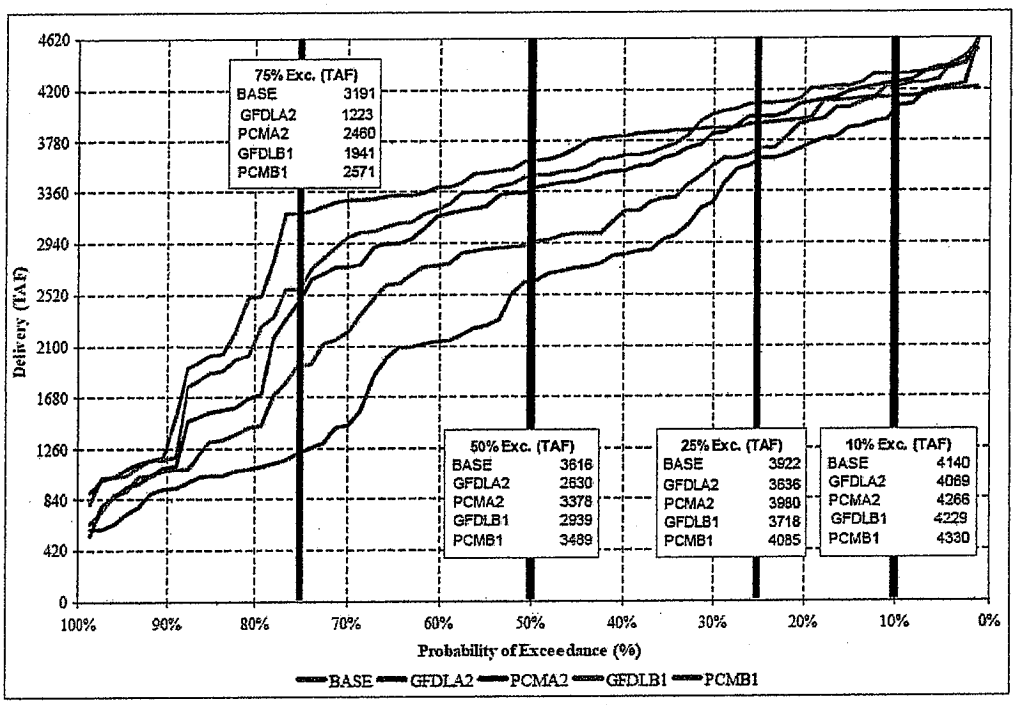

Figure 7. Exceedance probability plot of SWP Annual Deliveries under climate change scenarios PCM B1-A2 and GFDL B1-A2 for 2070-2099

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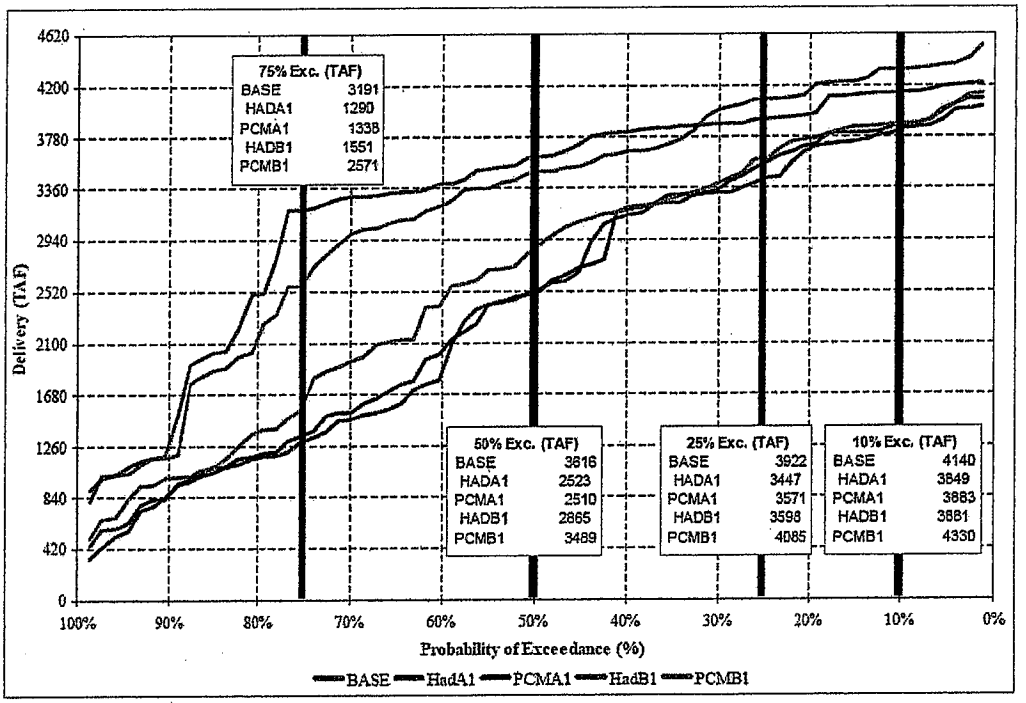

Figure 8. Exceedance probability plot of SWP Annual Deliveries under climate change scenarios PCM B1-A1 and HadCM3 B1-A1 for 2070-2099

(California Energy Commission, draft Predictions of Climate Change Impacts on California Water Resources Using CalSim-II: A Technical Note, December 2005 page 14 & 15 http://www.energy.ca.gov/2005publications/CEC-500-2005-200/CEC-500-2005-200-SD.PDF)

The CEC report concluded that modeling, "results show great negative impacts on California hydrology and water resources associated with most of climate change scenarios analyzed (only one scenario PCM run under B1 emission scenarios show just mild negative impacts)." (page 4)

This information demonstrates the range of outcomes that water managers must be prepared to address. This important assessment of the delivery capability of the SWP should be included in the Draft Reliability Report.

We also understand that DWR may have done its own analysis of the impacts of climate change on SWP deliveries. On the official State of California Climate Change Portal (http://www.climatechange.ca.gov/climate_action_team/reports/index.html) there is a reference to a study done by DWR. However unlike all of the other references, no results are included. The Reliability Report should include the results of DWR's own analysis.

Omission of this information prevents planners and decision makers from preparing for the inevitable implications for their water supplies. If the CEC already is predicting that water

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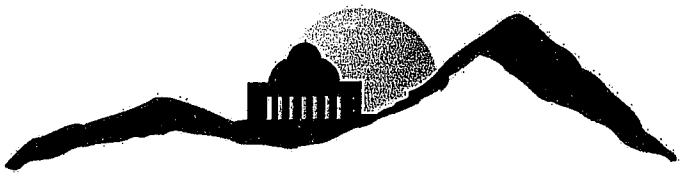

availability, and thus SWP deliveries, will be substantially reduced in the near future, water planners must adjust to that reality. DWR must address this problem, and will do California an enormous disservice if it continues to pretend that this problem does not exist.

Information in the Reliability Report will be used by local planners to make infrastructure investments and development decisions. The decisions made today about where to place infrastructure and where to approve development are long term commitments that will have impacts for hundreds of years into the future.

For instance, local decision-makers may chose not to place purple pipe in new development on the basis of assumed high level of delivery reliability from the SWP. Instead, decision-makers could choose to invest in new infrastructure to provide traditional supplies, including SWP supplies to new development. Once development is approved, the local area has foregone the opportunity to increase water supply reliability through use of recycled water. Should SWP supplies become significantly lower than predicted in the Reliability Report due to foreseeable impacts of climate change, significant local and statewide investments in infrastructure and housing would be stranded.

If local decisions are predicated on information from DWR that does not fully acknowledge potential constraints on DWR deliveries, they run the risk of producing excessive groundwater pumping and a host of other detrimental environmental consequences " (See *Planning and Conservation League*, 83 Cal. App. 4th at p. 915.)]

The long term nature and the resulting implications for the future of local areas as well as California as a whole, demand that the Reliability Report provide accurate, realistic information that fully discloses foreseeable uncertainty and risks.

The Report's unreliability also creates financial risks for the state. In many cases bonds will be committed to infrastructure built on expectations generated or encouraged by the Reliability Report. As with any financial investment, the risks associated with these investments must be fully disclosed to those who buy the bonds, those who approved the bonds, and those who invest in that infrastructure or in the developments supported by that infrastructure. As the state has learned in the past with levee liability, there is a potential risk that the State may be held accountable for decisions and investments made by others on the basis of false interpretation of the State's ability to protect and guarantee those investments.

The Reliability Report should include risk analysis and impacts from catastrophic failure in the Bay Delta Estuary from earthquake or flood

The Draft Reliability Report correctly identifies the availability and means of conveyance as a primary factor in determining reliability of SWP supplies. However, like climate change impacts, the Draft Report fails to include analysis or discussion of serious and eminent risks to the Bay Delta

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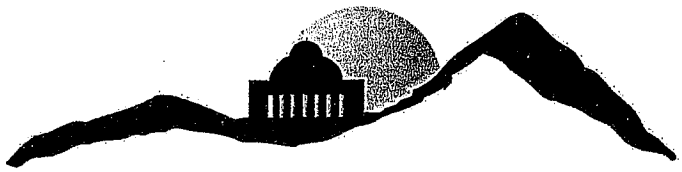

Estuary, an essential component of the SWP conveyance system. Significant risks to the ability of the SWP to export water from the Bay Delta Estuary are posed by the vulnerability of levees to flood, sea level rise and earthquake, as well as environmental degradation and continued declines of important fish species.

Dr. Jeffery Mount from the University of California, Davis, recently completed a risk analysis estimating that there is a 64 percent probability that the Bay Delta Estuary will experience abrupt changes resulting from flooding or seismic activity within the next fifty years. These changes would permanently alter the hydrology, water quality and ecosystem of the Estuary. Furthermore, Dr. Mount found that there is no institutional capacity to address these permanent changes. (Subsidence, Seismicity and Sea Level Rise: Hell AND High Water in the Delta; presented by Dr. Jeffery Mount to the California Bay-Delta Authority October 14, 2004. http://calwater.ca.gov/CBDA/AgendaItems_10-13-14-04/Presentation/Item_13_6_Subsidence_Seismicity_Sea_Level_Rise.pdf)

In recent testimony to a joint committee of the California Legislature, Lester Snow, Director of DWR, outlined the serious risks to SWP water supply availability associated with Bay Delta levee failure. In his presentation, "How a Delta Earthquake Could Devastate California's Economy," Director Snow stated that extended impacts to water availability would include:

- Using most optimistic projection, levee repairs will require at least 15 months. More realistically, the repairs will take much longer.
- Southern California water agencies are drawing from reserves. Some will last up to 36 months; others will go dry sooner.
- Extreme water conservation measures enacted
- Ground water basins drawn dangerously down – may lead to contamination
- Water conservation and transfer programs enacted

(Slide 16 of Lester Snow's presentation to the joint legislative committee, November 1, 2005 http://www.publicaffairs.water.ca.gov/newsreleases/2005/11-01-05DeltaEarthquake.pdf)

Director Snow further indicated that recovery of the conveyance through the Delta could be abandoned. (Slide 19 of Lester Snow's presentation). Director Snow told the Legislature that "… we also need to recognize the Statewide impacts …if Delta water supplies are reduced or eliminated as a result of a catastrophic failure of our levee system." (Quote taken from DWR Press Release, November 1, 2005, http://www.publicaffairs.water.ca.gov/newsreleases/2005/11-01-05flood.cfm)

Accordingly, the Reliability Report should incorporate Director Snow's recommendation to recognize the risk to SWP reliability from flood, sea level rise and earthquake.

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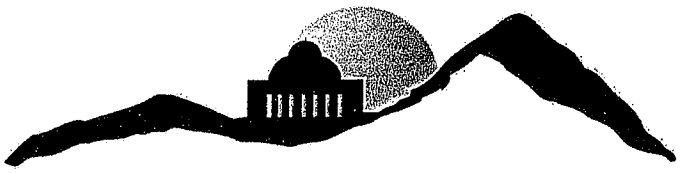

In addition to vulnerable levees, ecosystem degradation poses a significant risk to the ability to convey SWP water reliably through the Bay Delta Estuary. Recently, data from the Department of Fish & Game's Fall Mid Water Trawl signaled that there is a serious ecosystem collapse in the Estuary, with four important pelagic fish populations at historic lows, including the California and Federally Endangered Species Act listed Delta Smelt.

In response, many agencies, including DWR are participating in an emergency science review called the 'Pelagic Organism Decline' (POD) investigation. The most recent report from the POD investigations indicates that increased exports, which increase fish entrainment and decrease available habitat, may be a primary contributor to the fisheries declines ("Interagency Ecological Program Synthesis of 2005 Work to Evaluate the Pelagic Organism Decline (POD) in the Upper San Francisco Estuary," November 2005 http://science.calwater.ca.gov/pdf/workshops/IEP_POD_2005WorkSynthesis-draft_111405.pdf).

The final Reliability Report should acknowledge the current pelagic organism decline and disclose the possibility that decreases in exports may be necessary in order to reverse those declines. Lastly, while the pelagic species decline currently is the most salient of the Bay-Delta Estuary's environmental problems, it is not the only problem that might compel delivery reductions. Bay-Delta water currently does not meet federal or state water quality standards, and many other species are listed as threatened or endangered. The final Reliability Report should acknowledge that fixing these other environmental problems also may require export reductions.

The Reliability Report should evaluate variable levels of demand, utilizing demand modeled in the Draft California Water Plan Update 2005

The Draft Reliability Report identifies the level and pattern of water demand in the delivery service area as the third primary component in determining SWP reliability. However, the Draft Reliability Report does not examine a significantly varied range of possible demand scenarios for the future. That omission is important, for such analysis would likely show that reliability is inversely proportional to California's overall level of demand.

Recent work completed by DWR for the California Water Plan provides a range of demand scenarios that should be included in the Reliability Report. The California Water Plan Update 2005 identifies three plausible demand scenarios: current trends continued; less resource intensive; and more resource intensive. Two of these three scenarios demonstrate that it is plausible that in 2030 California water demands will *decrease*, even with an expected 12 million more residents. The greatest decreases in water demands in every scenario occur in the SWP service area of Tulare Lake.

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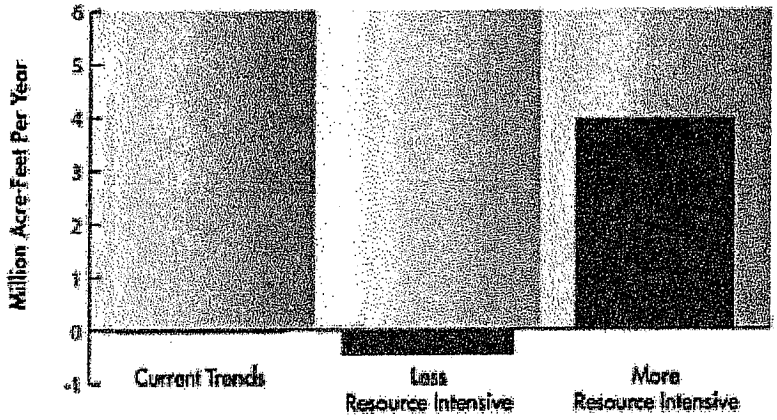
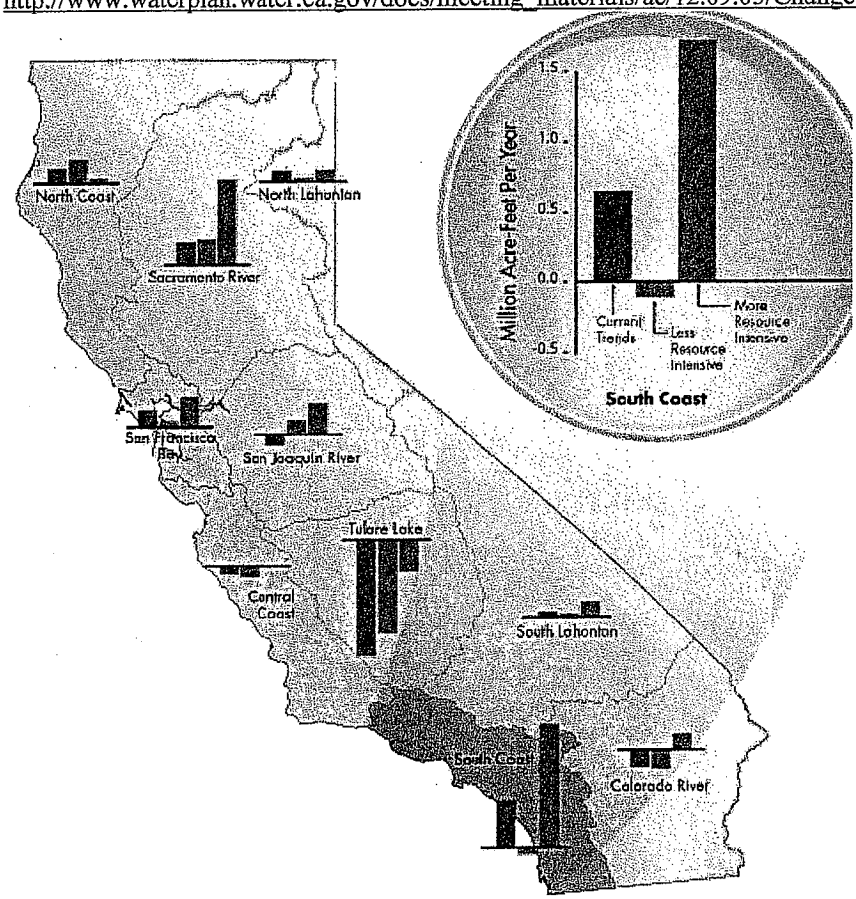
Figure 4-2 Net changes statewide in average-year water demand for baseline scenarios, 2000–2030



An additional 1 maf to 2 maf per year (not shown in the figure) is needed for all scenarios to eliminate groundwater overdraft statewide.

Water demands may change between 2000 and 2030 for average water conditions. Statewide water demand changes are shown for three baseline scenarios.

http://www.waterplan.water.ca.gov/docs/meeting_materials/ac/12.09.05/Changes_to_PRD_Slides_(12-08-2005).pdf



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http://www.waterplan.water.ca.gov/docs/meeting_materials/ac/12.09.05/Changes_to_PRD_Slides_(12-08-2005).pdf

Recently, the California Court of Appeals determined that state and Federal water agencies erred when they failed to adequately assess a range of reasonable scenarios in the CALFED ROD EIR in part because the environmental document did not include an analysis of reduced pumping from the Bay Delta Estuary (*In Re Bay Delta Programmatic Environmental Impact Report Coordinated Cases* (2005) 133 Cal.App.4th 154). Consistent with this finding, and DWR's recent good work on the State Water Plan Update, the Reliability Report should evaluate reliability under the three demand scenarios presented in the California Water Plan Update.

The Reliability Report should be consistent with operations described in environmental reviews

The Draft Reliability Report assumes that SWP deliveries into the future will be much higher than historic averages. In the past, SWP deliveries have averaged about 2 maf per year, while the Draft Reliability Report proposes that future deliveries will average from 2.8 to 3.1 maf annually. The Draft Reliability Report also assumes that an additional maximum of 1.11 maf of water could be delivered under Article 21.

Because CalSim-II is an optimization model that does not necessarily reflect options available to water operators, it may predict these levels of exports. However, federal and state water quality and endangered species laws and regulations probably would prohibit such high export levels for water quality problems and if species impacts were chronic even at historic levels. In light of the recent pelagic organism declines in the Bay Delta Estuary, it is prudent to ensure the Draft Reliability delivery predictions would not violate conditions of the Federal Clean Water Act, the Federal or California Endangered Species Acts, or any other environmental permit condition, regulation, standard, or law.

In order to ensure that stated water deliveries would be legally feasible, the Reliability Report must explicitly state whether listed export levels are consistent with those modeled in environmental reviews, including the recently issued biological opinions. For instance, the Reliability Report should state whether the Biological Opinions for OCAP in 2004 accounted for impacts to listed species under a modeling scenario that contemplated deliveries of 1.11 million acre feet of Article 21 water.

The Reliability Report should not recommend that water agencies integrate Article 21 as firm annual supplies in planning documents

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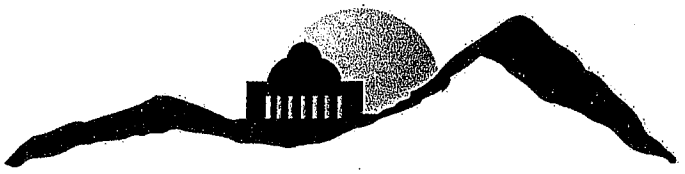

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Article 21 water is by definition interruptible water; indeed, the word "interruptible" replaces the formerly used "surplus" in the Monterey Amendments. It should not be used as the basis for uninterruptible demands. Yet in chapter 6 of the Draft Reliability Report, local agencies are encouraged to include Article 21 water in a table of average annual values.

As DWR is aware, water supplies accounted for in the Urban Water Management Plans become the basis for approval of water supply assessments for new development in California. It is not only imprudent, but would provide institutional cover for unreliable planning, to recommend that local decision-makers approve housing that will be dependent on water that is 'interruptible.'

Article 21 water should be removed from the recommended table of average annual deliveries.

Use of CalSim-II as the sole tool to determine reliability is inappropriate given the following significant and yet to be resolved deficiencies

The lack of calibration and other deficiencies of CalSim-II have been made known the DWR in formal comments on the 2002 Draft by several parties, specifically Arve Sjovold and Dennis O'Conner. In addition, a 2003 expert peer review report documented numerous problems in CalSim II, and concluded that its predictions should be treated as "hypotheses." A. Close et al., A Strategic Review of CalSim II and its User for Water Planning, Management and Operations in California 13 (2003). This Draft has not adequately addressed those deficiencies. Some of these previously-highlighted deficiencies are listed below.

- CalSim-II has not been calibrated or validated
- It is unclear whether CalSim-II incorporates limitations to groundwater use in the Sacramento Valley
- The CalSim-II model should not be used to make absolute predictions, such as those incorporated into the Reliability Report
- CalSim-II does not recognize or report uncertainty

Additionally, CalSim-II may produce results not consistent with reality, replacing the problem of paper water with an even greater problem of 'cyber water.' For example, in 2001, California experienced water supply associated with approximately the 75% exceedence level, and the State Water Project was able to deliver 1,607,570 ac-ft. However, the CalSim-II simulations predicted a 75% exceedence level of supply of roughly 2,500,000 ac-ft (as read from Figure 5.1). In other words, CalSim-II overpredicted deliveries by more than 50%. These discrepancies demonstrate the need to use multiple tools to determine reliability, as well as the need to articulate limitations of this particular model. Similarly, they demonstrate that local agencies will take enormous risks if they approve projects in reliance on CalSim II's predictions that future deliveries will be substantially higher than historic deliveries.

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The Draft Reliability Report attempts to respond to the recent to the recommendations and conclusions from the recent CBDA Peer Review, *A Strategic Review of CalSim II and its Uses for Water Planning, Management, and Operations in Central California* (Close and others 2003).

The Draft Reliability Report states:

> In *Peer Review Response,* DWR and USBR (2004) conclude the concern about overestimations of south-of-Delta deliveries is unwarranted because the 73-year study referenced by the panel is not designed to mimic historical conditions; rather it is intended to determine the reliability of the SWP when the demand equals the maximum Delta Table A amount (4.133 MAF) every year. The results of the referenced study are documented in *The SWP Delivery Reliability Report 2002*
> (DWR 2003b) as study 3 (2021B).
>
> A more appropriate method for assessing the ability of CalSim II to accurately model SWP operations is to compare the historical SWP deliveries with the simulated deliveries of the Historical Operations Study. DWR committed to conducting this study in *The SWP Delivery Reliability Report 2002* (DWR 2003b). The study is documented in the November 2003 Technical Memorandum Report *CalSim-II Simulation of Historical SWP/CVP Operations* (DWR 2003a). The Historical Operations Study is designed to assess CalSim II's ability to mimic historical operations of the SWP. In this study, historical input is used where reliable data are available. In situations where reliable historical record is not readily available, reasonable assumptions and estimates are made. (pages 10 & 11)

Before stating that this approach is the most appropriate response to the Peer Review concerns, DWR should reconvene the panel in order to review whether DWR's response satisfies the concerns raised in the original peer review. To verify that this response appropriately satisfies the concerns raised by that panel.

Additional specific comments on uses of CalSim-II in the Draft Reliability Report 2005 are attached in Appendix A.

Conclusion

PCL hopes that these comments assist DWR in arriving at a final version of the Reliability Report that corrects the serious deficiencies identified in the draft, and provides the

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additional analysis recommended here. Without these additional efforts, the report would not fulfill DWR's responsibilities under the settlement agreement and the Article 58 of the SWP contracts, and would fail to provide local decision-makers with a credible basis to ensure that development decisions are grounded in an accurate assessment of deliverable SWP supply.

Sincerely,

Mindy McIntyre
Water Program Manager
Planning and Conservation League

Cc:
Lester Snow, Director , Department of Water Resources
Antonio Rossmann, Rossmann & Moore, LLP
Roger Moore, Rossmann & Moore, LLP
Dave Owen, Rossmann & Moore, LLP
Senator Kuehl,
Senator Machado
Senator Kehoe
Senator Ducheny
Senator Perata
Assemblywoman Wolk
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Carol Baker, Speaker, Assemblyman Nunez's office
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LETTER 20

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APPENDIX A: **Specific comments on uses of CalSim-II in this Draft Reliability Report are highlighted below.**

Page 7: "Whatever assumptions are made, every responsible water delivery reliability analysis should expressly state the assumptions, methods and data used to produce its results. It should also be understood that those numbers depend on, and are no better then, the assumptions upon which they must necessarily rest."

This statement is entirely true. Yet this particular "water delivery reliability analysis" does not measure up to its own standard, because it does not adequately disclose the weaknesses of the key assumptions it makes and the key model upon which it relies. The reliability report should acknowledge that the simulated levels of SWP deliveries reported on the Draft Reliability Report are defined entirely by the explicit and implicit assumptions used in CalSim-II—they are CalSim-II's reliability results and not the results for the physical system itself—and should address the potential weaknesses in the "assumptions, methods and data" used to make those predictions.

Additionally, a statement such as this is so important that it should be made prominently, perhaps in a highlighted text box, rather than at the end of a paragraph in the body of the report.

Page 7: "For example, the demand 30 years ago for the SWP was not as high as it is currently or expected to be in the future. Because the need for SWP water then was relatively low, less water was exported through the SWP during normal and wet times then could have been if the demand had been higher. Simply put, less water was delivered because less water was needed."

The implicit assumption in this statement that there was no logic for contractors to take the water they were entitled to under Table A because 1) they had no need for it at that time, and 2) they had no place to store it for later use. If the assumption is that now and into the future the contractors will want to take delivery of their full Table A amounts—in other words, that circumstances have changed—then one or both of two conditions must be true 1) they need it and/or 2) they can store it. The reliability report should substantiate its reasons for assuming such a change in conditions.

On page 15, the Draft Reliability Report states that studies 4 and 5 were developed in discussions with SWP contractors and stakeholders involved with the development of the analysis associated with the environmental documentation for the Monterey Agreement. What analysis of current or future demand patterns and our available storage capacities is used to justify the assumption of a demand for the full Table A allotments? What are the assumptions about population growth, water use rates, availability of non-SWP supplies and available local storage capacity that lead to the conclusion that contractors will consistently ask for full Table A allotments?

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Page 7: "Conversely, the current or projected delivery capability of the a water project would be less if (1) demand for water from a water project was at its maximum level for many years, (2) no new facilities were built, and (3) the supply of the main sources of water was recently reduced because another entity with a prior water right increased its use of that source."

This statement is unclear and counterintuitive. The Draft Reliability Report often argues that higher levels of demand will increase the delivery capability not decrease it. DWR should clarify the point it is trying to make here or eliminate this statement altogether.

Page 8: "In the 2002 Reliability Report, the Department committed to conducting a comprehensive sensitivity analysis for assumptions contained in the CalSim-II model studies. This analysis is complete."

While this analysis is reported on in the Draft Reliability Report, DWR has made no attempt to use the results of that analysis to comment on the results of the CalSim-II modeling conducted for the reliability investigation. This seems to defeat the purpose of conducting and reporting on the sensitivity analysis. An attempt to consider the implications of the sensitivity analysis is included later in these comments.

Page 11: "The simulated deliveries in Figure 3-1 were adjusted for any differences between the historical and simulated carry-over storage in the SWP system reservoirs, Lake Oroville and SWP's portion of San Luis Reservoir."
Page 74 "(in Appendix E dealing with the Historical SWP/CVP Operations Simulation Technical Memorandum: Simulations of historically wet years, when the system was not supply constrained, may therefore be a poor indicator of the model's ability to accurately simulate future levels of development. Particular interest is therefore place on model results during the six-year drought of 1987-1992."

The Draft Reliability Report appears to offers up the Technical Memorandum Report entitled *CalSim-II Simulation of Historical SWP/CVP Operations* in order to support the legitimacy of the using CalSim-II to conduct the reliability analysis. If this is the goal then these two statements are problematic.

While the Draft Reliability Report gives no clear indication about what the adjustments referred to on page 11 entail, the fact that adjustments had to be made to generate the claimed correspondence shown in Figure 3-1 cannot stand without further explanation. The goal of the *CalSim-II Simulation of Historical SWP/CVP Operations* Technical Memorandum should have been to see if CalSim-II could be used to faithfully reproduce all aspects of system operations, not simply the SWP exports during the 1987-1992 drought. If the storage levels in SWP reservoirs were not faithfully reproduced and had to be adjusted in some unexplained way to generate the results in Figure 3-1, then the Technical Memorandum should not be used to build the creditability of the CalSim-II.

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In the same way, the comment in Appendix E that only the results for drought periods are critical for reliability analysis is not valid. The Technical Memorandum is being offered as support for the use of CalSim-II, not as a part of the reliability analysis itself. The claim that is being made is that the model faithfully replicated history and therefore has creditability in terms of simulating future conditions. The apparent recognition that the model did not do particularly well in normal and wet periods calls into question the validity of this claim.

In addition, even if CalSim II did accurately simulate deliveries in one past drought, that does not mean it can accurately simulate deliveries in a future drought, for constraints on the system are likely to be different. Water quality standards and endangered species protections have changed substantially since the 1987-02 drought, largely because the standards in place during that drought proved insufficiently protective. If the same drought conditions were to recur in the future, those heightened protections would likely prevent the SWP from exercising the same delivery capacity. CalSim II's predictions that those past diversions would be repeated therefore may prove the model's inadequacy rather than its credibility.

In keeping with the first comment, the inconclusive and somewhat opaque presentation of the *CalSim-II Simulation of Historical SWP/CVP Operations* Technical Memorandum results suggest that this report is about the reliability of SWP deliveries in the CalSim-II model and that the CalSim-II model is not a fully faithful representation of the how the system has been or presumably will be operated. Once again, it is fair to point out that if one wants to imagine future conditions then one must use some sort of model but the reader should not be left with the assumption that CalSim-II is a fully faithful representation of the system.

As an aside, Table 4 of the *CalSim-II Simulation of Historical SWP/CVP Operations* Technical Memorandum offers the most real, albeit limited, assessment of the reliability of the actual system if one is to assume that at some point in the future SWP contractors will consistently request their full Table A allotments. In 2001, contractors requested 4,124,126 ac-ft of SWP water and were allotted 1,607,570 ac-ft of supply. In 2003, contractors requested 4,126,929 ac-ft of SWP water and were allotted 3,714,233 ac-ft supply. These are two points on the exceedence curve of the real system reliability, certainly not enough to develop a robust reliability assessment. It is interesting to point out, however, that these delivery levels fall at roughly the 85% and 8% exceedence levels on the results for Study 4 that are meant to approximate current levels of development and demand (Figure 5.1). In terms of the hydrologic conditions 2001 and 2003 fall at approximately the 77% and 42% exceedence levels in terms of the Sacramento Valley water year index values for the period from 1922 to 1994 period simulated in CalSim-II. While far from a perfect metric for evaluating the performance of CalSim-II, this points out how the operations of the real system under roughly current conditions when nearly the full Table A amount was requested by the contractors compare with the simulated results.

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In terms of system reliability during dry periods, the most interesting conclusion to draw from this comparison is that actual operations in 2001, which benefited from a water supply associated with approximately the 75% exceedence level, provided a level of service of only 1,607,570 ac-ft while the CalSim-II simulations yielded a 75% exceedence level of supply of roughly 2,500,000 ac-ft (as read from Figure 5.1).

Page 16: "The Article 21 demand in the updated studies (4 and 5) is higher than the earlier studies for the December through March period."

It does not appear that DWR makes any attempt to explain why these higher levels were assumed. They are used in CalSim-II to prompt an export of water to SWP contractors when conditions warrant. While the Draft Reliability Report fairly comments on page 17 that "Incorporating supplies received under Article 21 into the assessment of water supply reliability is a local decision based on specific local circumstances, facts and level of water supply reliability required", including these numbers that are driven by a somewhat unjustified level of assumed Article 21 demand is not the clearest manner in which to present reliability analysis.

Page 25: "By referencing the curve for Study 5 in Figure 5-2, the following can be deduced":

- *In 75 percent of the years, the annuall delivery of the SWP is estimated to be at of above 2.7 maf per year (65 % of 4.13 maf).*

There is nothing special about the 75, 50 and 25% thresholds used in providing a narrative description of Figure 5.2 In fact it is equally valid to open and close the list of bullets with statements like:

- The maximum amount of water that can be delivered in response to full Table A demands with 100 percent reliability, in the CalSim-II model, is 187,000 ac-ft.
- Under the least supply constricted conditions the SWP will be able to deliver, in the CalSim-II model, the full Table A allotments.

Without even worrying about whether or not the assumptions used in the CalSim-II model are valid or not, these two statements are as valid as the three offered by DWR and they create a much different impression of SWP reliability.

Even if 100% reliability is not a valid standard, water utility plans for a system that will fail 25% of the time, as is the corollary of the 75% exceedence, are no more valid. Municipal utilities are often looking for, 90-95% reliability. According to these standards, Figure 5-2 suggests that the reliability of the system is between 1.4 maf and 0.8 maf. These numbers, which are no more or less valid than those reported by DWR, are perhaps more useful for water managers in assessing the reliability of a water supply.

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Page 26: "In the case of 1977, it is reasonable to assume that up to 500 taf of 1976 allocated Table A water could be carried over to 1977."
This sort of conditional post-processing of model output, which could have ripple effect across the rest of the simulation with potential changes in model results, is not valid and this whole section should be removed. To its credit DWR does not try and use any of this after the fact hand waving in the Table and Figures published in the Draft Reliability Report. Nonetheless, by including this narrative DWR is attempting to argue both that the model can be trusted and that the model cannot be trusted. This is not legitimate model interpretation.

Page 49: "The estimate could be viewed as too low because the Department of Water Resources (DWR) is planning to have facilities in place by 2025 that will increase the reliability of the SWP. The estimate could be viewed as too high because there is the potential for exports to be required to be reduced to protect endangered fish species."

It is inappropriate to speculate on what deliveries could be with new facilities when the information is to be used under the provisions of Senate Bill 221 to verify that water supplies are available for new developments.

Page 78: "Table E-1 Summary of the Expected Elasticity Index (EI) and Sensitivity Index (SI) for Selected Variables."

These very interesting results are included in the Draft Reliability Report and are then ignored completely interpreting the results of the reliability analysis. Let us for example attempt to recast the statement offered above:

- The maximum amount of water that can be delivered in response to full Table A demands with 100 percent reliability, according to the CalSim-II model, is 187,000 ac-ft.

If the sensitivity analysis is valid, it is legitimate to make the following statements.

- If the assumed levels of Banks Pumping vary by ±10% relative to the base level assumed in the CalSim-II simulation, then the maximum amount of water that be delivered in response to full Table A demands with 100 percent reliability, in the CalSim-II model, will very between 184,195 and 189,805 ac-ft.
- If the assumed levels of Oroville inflows vary by ±10% relative to the base level assumed in the CalSim-II simulation, then the maximum amount of water that can be delivered in response to full Table A demands with 100 percent reliability, according to the CalSim-II model, will very between 182,138 and 191,862 ac-ft.

DWR should either make these sorts of statements or they should not attempt to use the results of the sensitivity analysis to assert the legitimacy of the use of CalSim-II for SWP reliability analysis.

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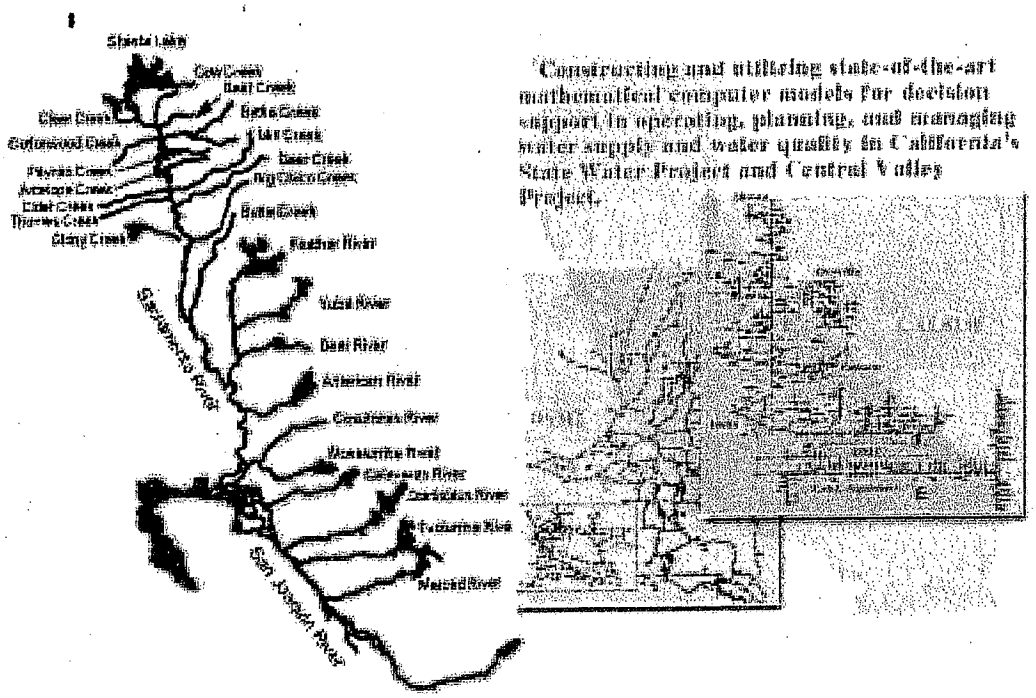
LETTER 20

1st 2005 - touch attachment #6 Norm "this approach"

A Strategic Review of CALSIM II and its Use for Water Planning, Management, and Operations in Central California



Submitted to the

California Bay Delta Authority Science Program
Association of Bay Governments
Oakland, California

by

A. Close, W.M. Haneman, J.W. Labadie, D.P. Loucks (Chair), J.R. Lund, D.C. McKinney, and J.R. Stedinger

December 4, 2003

Executive Summary

1. Summary

The central all-encompassing question put to the panel is whether the CALFED program has adopted an appropriate approach to modeling the CVP-SWP-Central Valley system. Is the general CALSIM modeling approach appropriate for predicting the performance of the general facilities and for use in allocation planning, assessing water supply reliabilities and for carrying out operational studies? We believe the use of an optimization engine for simulating the hydrology and for making allocation decisions is an appropriate approach and is in fact the approach many serious efforts of this kind are using. It is a substantial improvement of the previous modeling approaches and provides a basis for consensus among federal and state interests. The modeling approach addresses many of the complexities of the CVP-SWP system and its water management decisions.

There exists a common tension between those who wish for greater detail and those who want less detail from the model. This argues for a more comprehensive, modular and flexible approach than is now available. In this report we suggest some ways this might be accomplished in the future. We also propose some management procedures that could be considered to improve model and model application quality control and documentation. The openness and availability of the model is admirable and very important given the numerous stakeholders who have interests in the management and allocation of water in the state. To increase the public's confidence in the many components and features of CALSIM II, we suggest that these components of CALSIM be subjected to careful technical peer review by appropriate experts and stakeholders.

2. Background

The California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (USBR) have developed a computer model called CALSIM II that simulates much of the water resources infrastructure in the Central Valley of California and the Delta region. This infrastructure is referred to as the CVP-SWP system. In particular CALSIM II provides quantitative hydrologic-based information to those responsible for planning, managing and operating the State Water Project (SWP) and the federal Central Valley Project (CVP). As the official model of those projects, CALSIM II is the default system model for any inter-regional or statewide analysis of water in the Central Valley of California.

CALSIM II has a central role in the analysis of many CVP-SWP and related issues, some of which require capabilities beyond those included in the model. California needs a large-scale relatively versatile inter-regional operations planning model and CALSIM II currently serves that purpose reasonably well. As the primary State and Federal-sponsored model available for water operations and planning, CALSIM II is critical to the study of many technical and policy issues related to water supply reliability, environmental management and performance, water demands, economics, hydrology and climate, and regulatory compliance.

CALSIM II is a particular application of the California Water Resources Simulation Model called CALSIM. It uses a mixed integer linear programming model solver to route water through a network over time. Currently it uses monthly time steps. Policies and priorities are implemented through the use of user-defined weights applied to the flows in the system (represented by arcs of the network). Simulation cycles at different temporal scales allow for successive implementation of constraints. The model can simulate the operation of relatively complex environmental water accounts and state and federal environmental regulations. In our judgment CALSIM II represents a very impressive modeling effort on the part of all those involved with its development and application.

The CALFED Science Program commissioned this external review panel (Appendix D) to 1) provide an independent analysis and evaluation of the strengths and weaknesses of CALSIM and CALSIM II, and 2) to offer suggestions on the appropriate uses of these modeling tools, on ways their use might complement or be complemented by other models, and on further development, quality assurance, and use in major water systems operations and planning in California.

The panel received background documents (Appendix B), including a survey by the University of California at Davis of stakeholder responses to questions about CALSIM II. We subsequently met for one and a half days in Sacramento for discussions and presentations (Appendix A) by CALFED, DWR and USBR staff. The discussions concluded with a summary presentation by the panel outlining our tentative conclusions.

The information we received and the shortness of our meetings with modeling staff precluded a thorough technical analysis of CALSIM II. We believe such a technical review should be carried out. Only then will users of CALSIM II have some assurance as to the appropriateness of its assumptions and to the quality (accuracy) of its results. By necessity our review is more strategic. It offers some suggestions for establishing a more complete technical peer review, for managing the CALSIM II applications and for ensuring greater quality control over the model and its input data, and for increasing the quality of the model, the precision of its results, and their documentation.

In this review we were asked to address the following questions:

1. Is CALSIM a reasonable modeling approach for current and proposed applications and problems?
2. Do other modeling approaches show similar or greater promise and flexibility for such problems? If so, how?
3. What are the major comparative strengths and weaknesses of the current CALSIM approach and alternative approaches?
4. What are major scientific, technical, and institutional limitations, uncertainties, and impediments for current and proposed applications of CALSIM?
5. What model, software, and data developments, special studies or tests would be beneficial to improve CALSIM for current and proposed uses?
6. How might CALSIM development and applications be managed and overseen to improve the quality assurance of model results for current and proposed applications?

7. What are your suggestions for long-term use, development, or replacement of the current suite of models and data available for the current and proposed uses of CALSIM?

The following sections of this summary present our responses to these questions. The main parts of this report and its appendices provide additional detail.

3. CALSIM Modeling Approach

CALSIM II is a simulation model developed as a joint venture between the California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (USBR) to (i) provide a significant modernization and upgrading of the DWRSIM and PROSIM models developed and used by these organizations, (ii) develop a comprehensive modeling system that simultaneously addresses the current and future needs of both the SWP and CVP systems; and (iii) develop a generalized modeling system that could be applied in any river basin system, in contrast with the previous models that were less generalized and more specifically designed for the existing SWP and CVP systems. In this respect, CALSIM II represents a state-of-the-art modeling system that is similar in general concept, while differing in specific details, to other data-driven river basin modeling systems such as ARSP, MODSIM, OASIS, REALM, RiverWare and WEAP.

CALSIM uses linear programming to solve sets of equations that simulate water movement through the CVP-SWP system in accordance with various objectives and constraints. This is a modeling approach which has been used successful in California (Johnson et al., 1991). In a complex system such as that being modeled, it is essential to have some mathematical representation of system flows that reflects all of the interconnections and constraints. Use of an optimization algorithm allows good decisions to be identified from among all possible and feasible decisions. To the extent this simulates what actually occurs, it is a good modeling approach. To the extent it optimizes when in reality no such optimization is implemented, it has the potential to produce inaccurate and overly optimistic outputs.

Most successful applications of optimization that attempt to simulate the behavior of a system have calibrated their objective functions (i.e., set the weights that prioritize flows over time and space) so that the model results correspond to what actually happens or would happen under a particular hydrologic and demand scenario. In these cases the model's decisions correspond to those the operators would make, as often prescribed by rules that have been worked out in a legal/political process. It does not appear that such a calibration of the objective function weights in CALSIM has yet been completed.

4. Other Modeling Approaches

There are two aspects of modeling, the model structure and algorithms used, and the model software. The use of linear optimization algorithms to solve simultaneous equations for simulating hydrology is a common way of avoiding a typically long list of procedural rules for simulating regional water systems. Such sets of procedures can be difficult to generate for

complex systems, and very different and new rule sets may be needed if structural or significant policy changes are to be investigated. In addition the performance of the system when simulated will be less than that which can be achieved in practice if a good set of rules is not provided. Optimization models are generally easier to reformulate when system changes are to be investigated. However unless the optimization is calibrated in such a way as to actually resemble what takes place in practice it can produce an optimistic description of system performance. This is particularly true if the optimization model is allowed to have perfect foresight of future events that in practice would not be available to system operators.

Large simulation models using optimization and procedural rules both need to have internal checks to ensure to the extent possible that errors in mass balances, for example, do not occur due to errors made when the model is being defined or created. Such internal checking is not apparent to us in our admittedly brief review of CALSIM II. Nor were calibration procedures well defined.

One obvious limitation of using linear optimization procedures is its inability to model accurately and efficiently some of the non-linear hydrologic and decision processes that occur in systems as complex as the CVP-SWP. One approach to addressing this issue of model accuracy, and possibly for decreasing the computational time as well, is to link linear optimization models to non-linear simulation models in a way that permits the simulation to represent the hydrology in any spatial and temporal detail desired. The optimization is used to determine what the decisions should be at every site where a water allocation, reservoir release, or other management decisions must be made. The time steps for simulation could be daily, or weekly or longer, depending on the needs of the user, but would likely be of shorter durations than the optimization time steps. After a predetermined number of simulation time steps, the optimization model would be run. The initial state of the optimization should be set at the beginning of each optimization time step. The optimization component should include multiple future time periods, with imperfect hydrologic and demand forecasts, but once solved only the current period's solutions are implemented – i.e., these decision variable values are sent to the simulation component. The decisions indicated for future periods are ignored. When appropriate, the initial state of the multi-period optimization model is updated and the model is again solved. And so on. Such a modeling approach may prove to be both more realistic, more accurate, and require less time, once developed. We believe such an approach might be worth considering for future development.

CALSIM II currently consists of a combination of software modules developed in several languages, including FORTRAN, Java and C. Several of the modules require proprietary software packages in order to run CALSIM II (Lahey FORTRAN and XA Solver). DWR and USBR staff have said that these components are being replaced by public domain software that can be obtained free of charge. We agree with this decision. Very good public domain software packages of optimization, visualization, file management, and data base support are currently available, and new ones will continually be produced. Periodic updates should be anticipated as part of the business of maintaining the modeling system.

Significant thought should be given to the sustainability of the CALSIM II software. How will future programmers be able to maintain this software? How will future software developments

be incorporated into the system? Will the solver currently being developed by LBNL be adequate in terms of accuracy and computation speed? Will other solvers need to be tested? Can the system accommodate these future developments without major modifications? What reasonable modifications could be made now in anticipate of future developments?

5. Comparative Strengths and Weaknesses

Many of the stakeholder perceived strengths and weaknesses of CALSIM and CALSIM II are very well identified in the survey report from the University of California at Davis (Ferreira, et al. 2003). Our background materials and briefings covered various strengths and weaknesses, but without first hand experience, all we can do here is to summarize those that we have heard expressed by others.

Here we provide a brief summary list.

5.1 Some Prominent Strengths

The strengths of CALSIM II are many. Most are expressed in comparison to previous DWRSIM and PROSIM models DWR and USBR were using. Some of these strengths include:

- Consensus model. CALSIM II is the official joint modeling environment of the State DWR and USBR. This includes a common schematic, hydrologic representation of the system, common set of facility capacities, and common representation of system operating policies. This helps all parties improve representations, rather than compete over representations.

- Common effort. The joint development of CALSIM II by USBR and DWR has provided more focused and effective use of resources and expertise than previous development of agency-specific models. CALSIM II development has also involved other agencies and consulting expertise more than pervious models of this system.

- Data-driven model. CALSIM II is a rather data-driven simulation model with an optimization engine. This modeling approach provides:
  a. greater flexibility than its predecessors and traditional water resources simulation approaches.
  b. a promising framework for improving transparency, data, and model documentation, compared to other approaches.

- Public domain. The model and data are substantially in the public domain, facilitating transparency and adaptability for California's decentralized water system.

- Steady improvements. Data improvements have been steadily pursued following the adoption of CALSIM II, although deficiencies remain.

- Improved Delta water quality representation. Although problems appear to remain, the model developers have made substantial gains in representing Delta water quality operating criteria and performance.

- Better groundwater representation. Efforts to better include groundwater and non-CVP-SWP project operations merit continuation and expansion.

- Benchmark Studies. The development of documented benchmark studies have resulted in significant model improvements and aided in the development of comparative model applications. Such exercises should be continued and improved.

- Long-term vision. The vision of a more transparent and publicly available model that can be employed by those outside the major agencies is excellent. This is a major change in direction, and achieving this vision will require adjustments over time. Often, these adjustments will be externally driven. Externally-driven improvements are a price of success and evidence of success for an open, public, modeling policy.

- Important CALSIM II features:
  a. CALSIM II is able to simulate the operation of the complete CVP-SWP system in all areas that contribute flow to the Delta in monthly time-steps.
  b. CALSIM II is being applied to examine a diverse range of options including flood control, water conservation and supply, power generation, recreation, water transfers, groundwater banking, recycling, desalination, conjunctive use, the purchase of options and streamflow and water quality protection.
  c. CALSIM II has successfully been applied by both DWR and USBR to examine both structural and non-structural changes to the CVP-SWP system as well as to ascertain the risks involved with different potential operating scenarios and to quantify the impacts of proposed actions.
  d. CALSIM II can dynamically model operation of environmental water accounts.
  e. Demands may vary according to various levels of development (e.g. 2001, 2020) and to hydrologic conditions.
  f. The regulatory environment under which the projects must operate can be simulated.
  g. CALSIM II can link to external modules as needed, e.g., to estimate the salinity at water quality stations within the Delta.

5.2 Some prominent weaknesses

As its strengths are many, so are its weaknesses. It seems worth saying, however, that no model can perfectly (meaning efficiently and effectively) serve all interests in a system as complex as the CVP-SWP. Tradeoffs need to be made. This can result in what some would call weaknesses. Such weaknesses are often accepted to gain strengths in another ways.

We heard that the CALSIM II model was too complex. We also heard that it did not handle particular components of the system with sufficient detail. And such is the dilemma of any

complex model, such as CALSIM II. The model is clearly too complex, and not complex enough. The root of this difficulty is that when such a model is constructed, it is not clear what level of detail is needed, so the model must be made sufficiently complex to ensure it is complex enough. And the complexity needed to address some issues will remain in the model when it is used to address other less complex issues, or the same issues at less complex locations. One approach to addressing this issue is to develop different linkable modules of CALSIM II having different complexities. In this way the level of detail can be varied to be consistent the application or study at hand, and level of sophistication and resources available to the user.

Other weaknesses model users would like addressed include:

- The model provides limited and inadequate coverage of non CVP or SWP water and of the California water system south of the Delta.
- The model assumes that facilities, land-use, water supply contracts and regulatory requirements are constant over this period, representing a fixed level of development rather than one that varies in response to hydrologic conditions or changes over time.
- Groundwater has only limited representation in CALSIM II.
- Groundwater resources are assumed infinite, i.e., there is no upper limit to groundwater pumping.
- The linear programming model considers only the current month, and hence CALSIM II operating rules are required to determine annual water allocations, to establish reservoir carryover storage targets, and to trigger transfers from north of Delta to south of Delta storage.
- Better quality control is needed both for the model and its current version and the input data. Procedures for model calibration and verification are also needed. Currently many users are not sure of the accuracy of the results. A sensitivity and uncertainty prediction capability and analysis is needed.
- Need improved ways of altering the model's geographic scope and resolution and its temporal resolution to better meet the needs of various analyses and studies.
- Need to improve the model's comparative as well as absolute (or predictive) capabilities.
- CALSIM II needs better capabilities for analyzing economic, water quality, and groundwater issues.
- Need improved documentation explaining how the model works, its assumptions, its limitations, and its applicability to various planning and management issues.
- DWR and USBR have not provided a centralized source of support for CALSIM II. More training for CALSIM II is needed. There is a need for more people who can run CALSIM II. There is a need for a well-publicized user group. A more extensive users' guide is needed.
- Improved capabilities are needed for real-time operations especially during droughts, gaming involving stakeholders during a simulation run, handling of evapotranspiration and agriculture demand changes over time, water transfers, Delta storage, carryover contract rights, refuge water demands and more up to date representation of Feather River, Stanislaus River, Upper American River, San Joaquin River and Yuba River operations.

- Need an improved graphical user interface to facilitate input of model data, setting of model constraints and weights, operating the model, and displaying and post analysis of model results.
- Need to be able to change the model time period durations for improved accuracy of model results.

6. Limitations, Uncertainties, and Impediments

6.1 Absolute Values or Comparative Results

Modelers sometimes make a distinction between the use of a model for *absolute* versus *comparative* analyses. In an absolute analysis one runs the model once to predict an outcome. In a comparative analysis, one runs the model twice, once as a baseline and the other with some specific change, in order to assess change in outcome due to the given change in model input configuration. The suggestion is that, while the model might not generate a highly reliable absolute prediction because of errors in model specification and/or estimation, nevertheless it might produce a reasonably reliable estimate of the relative change in outcome. The panel is somewhat skeptical of this notion because it relies on the assumption that the model errors which render an absolute forecast unreliable are sufficiently independent of, or orthogonal to, the change being modeled that they do not similarly affect the forecast of change in outcome; they mostly cancel out. This feature of the model is something that would need to be documented rather than merely assumed.

In our opinion CALSIM II has not yet been calibrated or validated for making absolute predictions values. Yet it is apparent that there has been a distinct need by model users for absolute predictions. In the absence of alternatives, users are adopting CALSIM II results as the best absolute prediction available and they are likely to continue to do so. We recommend that model developers recognize the requirement for CALSIM II to provide absolute predictions. To satisfy this new purpose, additional calibration of the model will be required to ensure that the output it produces is fit for this purpose. Regardless of how possible it is to match the model closely with observed behavior, statistics on the accuracy of the calibration run should be supplied to users to enable them to gauge the likely errors involved with using the model output.

6.2 Sensitivity and Uncertainty Analyses

Sensitivity analyses would be useful to identify which parameters and input data have major impacts on decisions and system performance criteria of concern. Uncertainty analyses would help users of the model understand better the risks of various decisions and the confidence they can have in various predictions.

6.3 Graphical User Interface

Having a graphical user interface would substantially aid those who use the model in managing both input and output data, and in controlling or managing model operations. This model will not likely become as available to and as well understood by the public, to the extent desired by the model developers, until an effective menu-driven GUI has been created that can help create and draw from a database of system parameters and characteristics, and simulation results.

6.4 Documentation and Training

When if ever is adequate documentation and training available? Rarely, but we believe there is a serious need to improve the documentation as well as the training available for all those interested in using CALSIM II.

7. Options for Improving CALSIM

7.1 CALSIM Model Software

We encourage the developers of CALSIM to convert their present software to that which is publicly available and to develop a useful graphic based user interface that can facilitate the input, editing, and display of all the data that are input to and output from CALSIM II. There are many options, some of which we have discussed with the model developers.

The CALSIM package should be made more modular and capable of linking to other more complex models of components of the CVP-SWP system. If the changes in code and modeling approach result in a quicker running model, it might be possible to link, when desired, modules that facilitate position analyses and other types of uncertainty analyses. A modular system would allow alternative representations of different components of the system. Thus different levels of spatial detail, or representations of the fundamental processes, would be allowed within the overall system representation and record of California hydrology. This will allow the use of more general and streamlined models for use of preliminary investigation and general planning, as well as a more detailed representation of the system for final analyses and more detailed studies. This would be very useful.

7.2 Sensitivity and uncertainty analyses

Both sensitivity analyses need to be performed, and procedures need to be developed to enable the estimation of measures of uncertainty associated with model output. Perhaps workshops focused on just these needs should be scheduled to better determine how best to meet these needs. There are numerous procedures available that could be applied. Appendix H contains some approaches for performing sensitivity and uncertainty analyses.

7.3 Model calibration

There is a need to develop the model so that it is able to provide absolute estimates of key model outputs rather than limiting the use of the model to comparative studies. One way to do this is to subject the model to a comprehensive calibration process where it is fine-tuned until it is able to reproduce the historical behavior of the system with sufficient accuracy to provide absolute results. The calibration of the model should aim to test all the key outputs of model including water quality in the San Joaquin River and in the Delta. It is necessary to test the monthly values of outputs for those outputs for which the monthly pattern is important.

7.4 Other extensions and improvements

- The opportunity of improving the collection of data on the use of water (preferably broken down by irrigation district and water source) should be investigated. The use of groundwater should be included in this investigation.
- It would be useful to expand the geographic extent of the model so that it includes all the components of the linked water supply system, including both the San Joaquin and Tulare Lake Basins of the Central Valley. The model should also account in some manner for imported supplies of water to users in southern California from the Colorado River.
- The linkage between surface water and groundwater would appear to be of critical importance and output that would enable the impact of surface water use on groundwater extractions would appear to be useful.
- Examination of the report *'CALSIM II Simulation of Historical SWP/CVP Operations'*, DWR (2003) indicates that the current formulation of CALSIM II:
  - Overestimates water deliveries to SWP and CVP contractors,
  - Determines carryover storage target values that differ from those the operators have determined in the past, and
  - Operates the San Luis Reservoir at lower levels and fills it later in the season than operators have in the past.

8. Managing CALSIM Development and Applications

The predicted impacts and other information derived from CALSIM II applied to the CVP and SWP can influence major investment decisions. It is thus self evident that those who use the model results need to have some confidence as to their precision. Is the science behind the information derived from CALSIM II been reviewed and judged correct? Is the model software free from errors? Are the assumptions made when performing the modeling the correct ones? Are the model results accurately and fully reported? In other words, just how much credence should decision makers place in the model output? Users of the model results should be assured that they are credible and unbiased. One way to help ensure this is to have the models, their associated software, and their applications under the control of some interagency organization that can oversee and provide quality control over model development, application and documentation. They can also plan and implement needed peer reviews.

One possible means of facilitating the peer review processes and for maintaining control on the particular versions of CALSIM II and accompanying models used for CVP-SWP planning and management decisions is to create an interagency modeling consortium (IMC) consisting of DWR, USBR, and other stakeholder organization (including university) personnel if they are interested and want to participate. This center would be responsible for maintaining a toolbox of 'acceptable' models for use by the agencies and contractors. The models placed in the toolbox should be peer reviewed with respect to their applicability and suitability for use in particular applications. Those that are not peer reviewed should be considered for peer review. New models proposed for use in California should be peer reviewed with respect to their suitability, and for their strengths and limitations, before being placed in the toolbox. The review should be of the theory underlying the model, the model's software, the documentation of the model as well as of its software, the model's functions and capabilities including those pertaining to model data input and output, the input data themselves, model calibration and verification, capabilities for sensitivity and uncertainty analyses, user control of all model operations including pre and post analyses (GUIs), spatial and temporal resolutions, and its limiting assumptions.

9. Future Use, Development, or Replacement of CALSIM

9.1 A coupled optimization simulation approach

Given a system as complex as the SWP/CVP system, it seems to us it might make sense to consider the development of a more detailed simulation 'engine' and couple it to an optimization or management 'engine'. The simulation component can more accurately model hydrologic processes. For example it can include the deterministic non-linear routing of flows and their quality constituents through the system on a smaller time step (e.g., daily) and hence much more realistically or accurately, than can linear optimization using longer time steps, even with all the known tricks for linearizing separable (single variable) non-linear functions and 'if-then-else' statements. The simulation engine itself may require a simultaneous equation solver, especially for the Delta. But the simulation engine needs to know what to do, i.e., what decisions to make. Periodic use of the optimization, say once a week or even less frequently if conditions are relatively constant, for determining the decisions to be simulated, e.g., the water allocation and reservoir release decisions, eliminates much of the maze of rules that otherwise would be required and which developers of CALSIM II are avoiding through the use of optimization. Each time the optimization or management 'engine' is run it is first updated with the current state of the system as determined from the more precise simulation 'engine'. The optimization component would include multiple time periods only to the extent that the current period's solution is not affected by the time horizon in the optimization. The other time period solutions are ignored. This coupled optimization-simulation approach has the potential to be both more accurate as well as quicker to execute. In our opinion it is worth considering for future development.

9.2 Models as hypotheses

CALSIM II is really about the future, not the past. Benchmarking studies can help establish the credibility of the model and provide estimates of its accuracy by comparing its performance to actual historical operations. A concern is how well the model reproduces historical operations, not whether it is valid or invalid on some absolute scale of perfection. But the real issue is how well CALSIM can predict what might happen in the future with sets of hydrological and meteorological conditions that have not yet been experienced, and may be significantly different from the past if climate variability and climate change are considered. In these cases the ability of the model to forecast what will happen depends both upon its ability to describe what would happen should a particular system operating policy, priorities and water demands be adopted. In this sense CALSIM II modeling studies should be thought of as the exploration of a hypothesis that particular policies and priorities have been adopted. Our ability to predict the future has generally been poor, but it is the obligation of agencies such as DWR and USBR to attempt to ensure that should water demands, water supplies, and water policies evolve as one would expect, society is prepared for the consequences. And that would seem to be what CALSIM II is about.

9.3 Future Model Development and Use

From the list of perceived weaknesses above, there are clearly many opportunities for further refinement of CALSIM II. Rather than attempt to meet all needs using only one model, namely CALSIM II, it seems preferable to improve its adaptability to various levels of detail through its ability to link to other models when additional detail in a particular region or for a particular feature is desired. For example, the monthly time step used by CALSIM II is sufficient for many studies. Yet some seasonal (multi-month) decision making is needed in CALSIM II to reflect decisions made by the SWP and CVP as to what Table A and other allocations to honor in full. On the other hand, it is clear that many water quality and ecosystem management decisions would profit from more detailed weekly or daily time steps. However, such shorted time-step models will need the guidance of a longer time-step model. As discussed earlier, models with shorter time scales can require increased spatial resolution, both of which lead to increased model complexity and a strong argument for model modularity.

Additional potential applications of CALSIM II include operational planning using gaming, or the involvement of potential decision makers during the simulation runs via a well developed graphical user interface, and to improve the capability of modeling water quality, energy production, conjunctive groundwater and surface water interactions and use, to mention a few.

There will always be a need to perform alternative 'what if' policy analyses where a relatively fast model that also provides some capability for uncertainty analyses is required. Perhaps CALSIM II will never be able to serve this need, and if so another more simplified modeling approach could be developed to fill that need. This simpler screening tool would be calibrated to produce results comparable to those of CALSIM II or observed data. Is this possible? We can not be certain but feel the idea should be seriously considered.

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Caveat

Just as all models are approximations of reality, so may all advice be an approximation of what it should be. We hope what we have written in this report is correct and useful, but encourage CALSIM model managers and California's water community to take our assessments and suggestions for what they are, arrived at based on our own experiences and some limited exposure to those who know much more about CALSIM and CALSIM II than we do.

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Appendix A: CALSIM II Science Review Schedule

Appendix B: Briefing Material for CALSIM II Peer Review

Appendix C: CALSIM II Review Process and Timeline

Appendix D: Peer Review Panel

Appendix E: Managing Model Development, Application, Documentation and Communication.

Appendix F: Analysis of the November 2003 CALSIM II Validation Report

Appendix G: Some Principles for Strategic Water Analysis

Appendix H: Model Sensitivity and Uncertainty Analysis

Appendix I: Model Calibration Examples

1. CALSIM Compared to Other Modeling Approaches

Management of complex systems such as coordination of the California State Water Project (SWP) and the Federal Central Valley Project (CVP) requires effective decision support tools for simulating and analyzing system components in a fully integrated manner. The classic definition of a decision support system (DSS) provided by Sprague and Carlson (1982) is *"an interactive computer-based support system that helps decision makers utilize data and models to solve unstructured problems."*

A DSS integrates the following interactive subsystems: (i) dialog generation and management subsystem (DGMS) for managing the interface between the user and the system; (ii) data base management subsystem (DBMS); and (iii) model base management subsystem (MBMS).

CALSIM II is a DSS developed as a joint venture between the California Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (Bureau) to (i) provide a significant modernization and upgrading of the previous models DWRSIM and PROSIM employed by these organizations, (ii) develop a comprehensive modeling system that simultaneously addresses the current and future needs of both the SWP and CVP; and (iii) develop a generalized modeling system that could be applied in any river basin system, in contrast with the previous models that were less generalized and more specifically designed for the SWP and CVP. In this respect, CALSIM II represents a state-of-the-art modeling system that is similar in general concept, while differing in specific details, to other river basin modeling systems such as AQUATOOL (Valencia Polytechnic University, Spain), ARSP (Acres Reservoir Simulation Program) (Boss International, 2003), IRAS (Interactive River-Aquifer Simulation) (Loucks, et al. 1996), MIKE BASIN (Danish Hydrologic Institute, 2002), MODSIM (Labadie and Larson, 2000), OASIS (Randall, et al., 1997), RAISON (Young, et al. 2000), ResSim (U.S. Army Corps of Engineers, Hydrologic Engineering Center), Ribasim (River BAsin SIMulation Model) (Delft Hydraulics, Netherlands), REALM (REsource ALlocation Model) (James, 2003), RiverWare (Zagona, et al. 1998), WaterWare (Jamieson and Fedra, 1996), and WEAP (Water Evaluation and Planning System, 2003) (Hansen, 1994). All of these can be categorized as decision support systems since all three subsystems of a DSS are embodied within them.

A distinguishing feature of several of these modeling systems is the use of optimization on a period by period basis (not fully dynamic) to "simulate" the allocation of water under various prioritization schemes, such as water rights, without the presumption of perfect foreknowledge of future hydrology and other uncertain information. This is a valid approach since use of optimization overcomes the disadvantage of employing numerous, unwieldy prescriptive rules governing water allocation. Systems employing optimization in this manner include: ARSP, MODSIM, OASIS, REALM, RiverWare, and WEAP and are therefore more akin to CALSIM II. ARSP, MODSIM, REALM and Ribasim are further distinguished by use of specialized minimum cost network flow optimization algorithms, although of these only MODSIM includes iterative structures using an imbedded scripting language for including non-network "side constraints" in the optimization. The other modeling systems are essentially limited to a

pure network structure that does not allow inclusion of all the complex, non-network type constraints necessary to model the complex CVP-SWP system.

It may be useful to compare this use of optimization with some other uses that have appeared in the modeling literature. One use of optimization is purely for computational convenience; in this case optimization is employed as a numerical method for obtaining the solution of a series of simultaneous (often linear) equations. This approach, which was used in the first generation of computational economic models about forty years ago, exploited the fact that some existing computational algorithms for solving optimization problems were faster than those for solving large systems of simultaneous equations. A second use of optimization applies when the solution of the system of equations characterizing a water balance has multiple possible solutions; this is essentially the case described above, where optimization is being used primarily to identify a unique solution for a system of equations. Both of these uses of optimization are primarily descriptive rather than prescriptive (also referred to as positive vs. normative) in intent: the goal is to model how a system, characterized by a set of equations, operates. To the extent that the real–world managers of the system do optimize some objective function, the aim is to mimic their behavior by setting up and solving a similar optimization. But, the goal is to model what they actually do, not to advise them what they ought to do. The third use of optimization adopts an explicitly prescriptive goal and sets out to ascertain what managers ought to do if they wished to optimize some objective function (e.g. maximize economic efficiency). While this is certainly a legitimate analytical exercise, it should be kept conceptually distinct from the use of optimization in a purely descriptive context.

1.1 Advantages of Optimization-Driven Simulation

For large, complex, integrated systems, simulation models that optimize operation and allocation of water within each time-step by operational priorities have become the major simulation approach. Models of similar approach include ACRES (Acres Engineering), AQUATOOL (Spain), MODSIM (Colorado State U.), OASIS (Hydrologics, Inc.), WASP (Australia), and WEAP (Tellus Institute). Priority-based simulation models with optimization engines have become widespread in part because:

- The models are simpler to develop, comprehend, and modify.
- Their software is easier to upgrade, since the data set describing the system and its operating policies is substantially separate from the software code.
- Data are easier to update and modify, since changes require little or no software changes.
- Priority-based operations are a common basis for water rights and operating policies.
- Priority-based operations are relatively easy to explain.

The major exception to this technological trend in simulation modeling is to use more traditional procedural operating rules in simulation models with a graphical user interface for primarily flood control operations (HEC-RESSIM) or for exploratory study of large systems or detailed management of relatively small systems (Stella-type models).

Similar to several of these systems, CALSIM II allows specification of objectives and constraints in strategic planning and operations without the need for reprogramming of

complex models. The CALSIM II authors developed the English-like WRESL (Water Resources Engineering Simulation Language) as an intuitive means of defining the objective function and constraints for a mixed-integer linear programming model, similar to the OCL (Operational Control Language) used in OASIS and the Policy Editor employed in RiverWare. In MODSIM, the optimization model is formulated directly through the graphical user interface with no need for a modeling language, but with supplemental features of the optimization defined through the PERL scripting language. WRESL allows planners and operators to specify targets, objectives, guidelines, constraints, and their associated priorities, in ways familiar to them. WRESL provides simple text file output that is converted to FORTRAN 90 code by a parser-interpreter program, whereas PERL is fully embedded in the network optimization code. Both modeling systems are data centered, meaning that model operation is controlled solely by user specification of input data rather than hidden rules or hard-wired data structures.

CALSIM II, OASIS, RiverWare and MODSIM are similar in that all use a high level language with syntax and logical operators; are written to simple text files which are subsequently parsed and interpreted; use rule-based or IF-THEN-ELSE conditional structures; are designed to be easy for planners and operators to use without the need for reprogramming; allow adaptive and conditional rules which are dependent on current system state variable information; include constructs for assigning targets, guidelines and constraints, along with their associated priorities; and include a goal seeking capability. CALSIM employs a mixed integer linear programming solver for repeated period by period solution that is less efficient computationally than the network solver employed in MODSIM, ARSP, REALM and Ribasim.

Unfortunately, unlike these aforementioned modeling systems, CALSIM lacks a comprehensive graphical user interface for constructing and editing the river basin system topology. CALSIM II would be greatly enhanced if, similar to RiverWare, IRAS, and MODSIM, objects representing features of the basin such as reservoirs, canals, and river reaches, could be created on the palette of a graphical user interface by simply clicking and dragging various icons for the objects to the display. The objects are instances of various classes that share certain common characteristics, and each object contains its own physical process methods and associated data. We believe that complaints concerning the complexity of using CALSIM II would be greatly reduced with development of such an object-oriented graphical user interface.

2. Comparative Strengths and Weaknesses

2.1 Some Prominent Strengths

CALSIM II has important strengths as a general inter-regional operations planning model, particularly compared with available alternatives and its predecessors. The primary strengths include:

- Coordination of Federal and State Interests A unique aspect of CALSIM II is the high degree of cooperation between Federal (i.e., U.S. Bureau of Reclamation) and State (i.e.,

California Department of Water Resources) interests in its development. This kind of cooperation is rare, and in fact this may be the only such example of such coordination for a system of this scale and complexity. Although it is clear that DWR staff have taken the greatest degree of responsibility in the planning, development, coding, testing and application of CALSIM II, it is also clear that USBR staff have also played an important role. CALSIM II can provide a showcase for other states as to what can be accomplished with Federal and State cooperation for river basin management.

- Consensus model. CALSIM II is the official joint modeling environment of the State and USBR. This includes a common schematic, hydrologic representation of the system, common set of facility capacities, and common representation of system operating policies. This saves a lot of unproductive bickering and helps all parties improve representations, rather than compete over representations.

- Common effort. The joint development of CALSIM II by USBR and DWR has provided more focused and effective use of resources and expertise than previous development of agency-specific models. CALSIM II development has also involved other agencies and consulting expertise more than pervious models of this system.

- Data-driven model. CALSIM II is a rather data-driven simulation model with an optimization engine. This modeling approach provides:

    a. much greater flexibility than its predecessors and traditional water resources simulation approaches.
    b. a promising framework for improving transparency, data, and model documentation, compared to other approaches.

- Public domain. The model and data are substantially in the public domain, facilitating transparency and adaptability for California's decentralized water system. Ongoing software development efforts will improve CALSIM in this regard.

- Steady improvements. Data improvements have been steadily pursued following the adoption of CALSIM II, although deficiencies remain widespread.

- Improved Delta water quality representation. Although problems appear to remain, the model developers have made substantial gains in representing Delta water quality operating criteria and performance.

- Better groundwater representation. Efforts to better include groundwater and non-CVP-SWP project operations are good efforts in the right direction, and merit continuation and expansion.

- Benchmark Studies. The development of documented benchmark studies seems to have resulted in significant model improvements and aided in the development of comparative model applications. Such exercises should be continued and improved.

- Long-term vision. The vision of a more transparent and publicly available model that can be employed by those outside the major agencies is excellent. This is a major change in direction, and achieving this vision will require adjustments over time. Often, these adjustments will be externally driven. Externally-driven improvements are a price of success and evidence of success for modeling policy that is open and public.

Few, if any, modeling organizations in the country have consistently done as good a job on model development and application for such a large, complex, and controversial system as the modeling group which developed CALSIM II. They are to be commended for their work to take California water modeling beyond past "closed shop" practices in favor of the development and dissemination of modeling capabilities that are more relevant to California's current water management problems. Most areas and suggestions for improvement noted below are meant to aid the model developers in moving further and faster in the direction they are already heading.

2.2 Some Prominent Weaknesses

The strengths and weaknesses of CALSIM II are not only technical (software, data, and methods), but also are institutional regarding how this model has been developed and employed. The administrative setting and objectives of model development and application are important, and difficult to manage. Alas, the management/policy problems of a system change frequently, while data and modeling capability change more slowly, and effective administrative structures change very slowly, if at all.

- Inadequate data development and management are principal shortcomings of CALSIM II. There has not been a sufficiently systematic, transparent, and accessible approach to the development and use of hydrologic, water demand, capacity, and operational data for CALSIM II. This problem extends beyond inadequate documentation and has led to controversy, confusion, and inefficiency in application of CALSIM II.
    a. Inadequate data management steepens the unavoidably difficult learning curve inherent for a complex system. Data have mostly been considered a "back room" activity of a few experienced experts. Retirement, promotion, or departure of these experts has left many gaps in knowledge and created difficulties for re-developing data for newer policy and planning problems.
    b. The administration of data development is fragmented, disintegrated, and lacks a coherent technical or administrative framework. Data required by CALSIM II are developed by several administrative units, without systematic technical vision or quality control for modeling purposes. Within DWR, different groups develop hydrologic and water demand data under different Deputy Directors, without effective coordination. This division must be overcome for a coherent data and analytical framework to be developed and implemented.
    c. In many cases it appears that water use and other hydrologic data inputs to CALSIM II are based on data collection and analyses that took place during the 1960s when DWRSIM and PROSIM were being constructed. It is important to ensure that data used for CALSIM II are up-to-date and consistent with the best current information

- The expertise and insights of many in local agencies, system operators, and consulting firms have not been prominent in the development of CALSIM II. For such a system with many hundreds of local experts, this is somewhat unavoidable, especially early in model development. Periodic re-examinations of how each area in CALSIM II is represented, in consultation with local agency and consulting experts, might overcome these technical shortcomings, and create and maintain a broader technical, user, and credibility base for CALSIM II. Active involvement of local agencies in CALSIM II development and applications would be much easier with better data management, and would be rewarded with a broader base of CALSIM II expertise and enhanced model credibility.

- Compared to the current CALSIM II, any central operations planning model for California water management should be:
  a. Expanded in geographic scope to include major non-CVP-SWP areas, especially the Tulare Basin, the Colorado River, and southern California. Operations and demands in these regions seem increasingly important for CVP and SWP operations, and are important for the integrated operations of California's major local and regional water management agencies.
  b. Expanded in management scope to include local management options such as water conservation, reuse, water transfers, groundwater and conjunctive use management, etc. These additional water management options are important for local, regional, and statewide water policy, planning, and management efforts and can have significant effects on CVP and SWP water demands.
  c. Made regionally modular, so smaller regional models can be run independently and tested locally, with boundary conditions consistent with the larger model.
  d. Made modular in terms of hydrologic, water management, and water demand processes, allowing better development, comparison, and updating of hydrologic and water demand process models. Agricultural, urban, environmental, and other water demands should be represented more directly, and explicitly. Groundwater should be represented and operated more explicitly. Land use based local hydrology and water demand approaches might be implemented in such standardized modules.
  e. Subject to a systematic model and data testing regime and continuous quality improvement program. As the problems of California water change, different and greater demands will be placed on analytical capability, requiring an essentially continuous testing, re-testing, and improvement of data and models. This might parallel a continuous review of local representations and data involving local agency and consulting experts.
  f. Financed on a broader base, by more than the CVP and SWP projects. Increasing use of CALSIM II is being made by local, regional, State, and Federal agencies interested in developing bilateral or multi-lateral water transfers or projects, which incidentally involve the CVP and SWP. To develop inter-regional modeling capability needed to integrate these activities at local, regional, and inter-regional scales, more sustained funding and involvement from local and regional agencies is needed. In effect, local and regional agencies have been "free riders" on CALSIM

II's analytical capabilities, and it is not necessarily a good bargain for them. Everyone should benefit from broader technical and financial participation.

g. Capable of analyzing a wide range of scenarios. More capability is needed to examine various long-term scenarios with respect to hydrologic, water demand, and operational uncertainties in the future. There also needs to be a better capacity to accommodate other approaches to representing hydrologic uncertainty and variability besides simply simulating 70-plus years of record.

- Input data and its development. Important aspects of CALSIM II rest upon the representations of other models of Delta hydrodynamics and water quality, water demands, and groundwater. The credibility of CALSIM II also rests on testing these models that send important data/representations to CALSIM II, and documenting them adequately. These models include:
  a. CU Model and SIMETAW: The consumptive use model and the newer SIMETAW model, used to develop hydrologic inputs and estimate return flows, also require testing and more explicit documentation. The underlying data for these models also need more systematic, standardized, and transparent treatment.
  b. DSM2: Representation of the Sacramento-San Joaquin Delta will always be important and prone to controversy, given the prominent importance of Delta flows and water quality for the operation and planning of California's water system. The difficulties of representing the Delta in operations and planning models are compounded by the tidal nature of the Delta, which usually implies a need for shorter time-steps. Representation of Delta water quality constraints currently falls heavily on an ANN method within CALSIM II. This ANN is calibrated (trained) based on a hydrodynamics model, DSM2. Thus, controversies regarding Delta representation in CALSIM II are likely to lead to questions of the adequacy of DSM2. The transparency and testing procedures valuable for establishing the credibility and limitations of a Central Valley operations model would also seem to apply to DSM2, or any other Delta hydrodynamics-water quality model. Tests of methods used to represent small-time step phenomena with larger time-steps (e.g., "partial month standards") should be tested in a forum that would give the approach credibility and where its limits could be developed, discussed, and documented.
  c. CVPM/CALAG/LCPSIM/IWR-MAIN: Representations of water demands in CALSIM II rely heavily on other models, particularly CVPM and eventually CALAG for agricultural water demands and LCPSIM and eventually IWR-MAIN for urban water demands. Thus, these models also will attract attention, and will probably require the same types of testing, transparency, and documentation suggested for DSM2 and CALSIM II. Many water contractors of the CVP and SWP also have internal water sources (groundwater, water conservation, and water reuse) and side contracts with other agencies to supply water that can increase or decrease (at different times) their water demands from the CVP and SWP contracts and from the demands estimated from CALAG and IWR-MAIN types of models.
  d. IGSM /CVGSM: Water users in California rely on groundwater as a water source and as the major source of over-year drought storage. Groundwater is also being increasingly used and looked-towards as a source of storage as part of conjunctive use schemes, and water transfer and market schemes. Thus, representation of

groundwater in the system is important, and probably should be expanded considerably. The representation of groundwater quantities, storage, and recharge and pumping capability will also attract attention from interested and critical parties. Thus, the IGSM/CVGSM modeling efforts of DWR and USBR should include the same types of transparency, documentation, and testing suggested for CALSIM II.

e. Agricultural demands: Agricultural demands in the model are estimated by an external modeling system (CU model). Staff noted that the estimation methods being used are include out of date information on agricultural cropping patterns and irrigation technology, both of which result in inaccurate estimates of agricultural water demands. This estimation process needs to be revised and updated to include current information on an ongoing basis. The methodology needs to be improved to include economic factors in the estimation of cropping decisions and water demands. In many case, the preferred spatial scale for the economic modeling of agricultural water demand is going to be the individual irrigation district rather than very broad areas containing multiple quite heterogeneous districts.

- CALSIM II is currently awkward to apply for broader State and CVP-SWP policy questions. Practically, the time needed to complete analyses is too long and CALSIM II does not explicitly represent many of the management options which policy makers are interested in investigating, evaluating, and orchestrating.

- More CALSIM II modelers are needed. Many water managers and policy makers across California look to CALSIM II for many purposes, and there is near-universal consensus that the application of CALSIM II is currently limited by a dearth of knowledgeable modelers. Current training by DWR and USBR on CALSIM software is useful, but clearly insufficient. To be a functioning and credible CALSIM II modeler one must understand both CALSIM software and the operational complexities of the system (which probably no one can know in its entirety). Improved model and data documentation is also essential here.

- Stakeholders and policy makers are poorly guided in how to interpret CALSIM II results. Not only must CALSIM II become more responsive to current planning and policy concerns and management options, but current policy makers must receive some education in the benefits and limits of such modeling for their purposes. This is a very difficult problem that will often involve the role assigned to modeling and model results within larger politically-driven policy making processes.

- Non-interpretation of model results is not helpful. Several recent DWR reports based on CALSIM II results have been considerable improvements over past practices in terms of presenting model results, discussion of the model, and examination of model performance in a historical context. However, often the studies have not contained the kind of written discussion and interpretation of results that would demonstrate that the authors have thought about the results and drawn conclusions in a realistic and self-critical manner. This detracts from the perceived credibility of the work and makes the study less informative for readers (most of who surely do not have the modeling background of the authors).

- Some needs exist to improve CALSIM software. These are well-known to the model developers and include:
  a. Elimination of the need for the FORTRAN compiler,
  b. A public-domain mixed integer-linear programming (MIP) solver,
  c. A graphical user interface, including ties to databases and GIS display if possible,
  d. Post-processing tools for users to help new users and broader application and scrutiny of CALSIM II results,
  d. Version control software and system (also a problem for model administration),
  e. Better data and database management software and protocols (this has great data management and administration implications),
  f. An ability to more systematically set objective function weights,
  g. More automated input and output data checking is needed to improve productivity in model application and quality control of modeling output. This would also facilitate use of CALSIM II by a broader range of modelers,
  h. Ability to access and employ sensitivity analysis information coming from the MIP solver to identify possible multiple optima and identify binding constraints and slacks,
  i. A debug version of the code where water can be added or subtracted at any location and time (at a great penalty) to quickly identify locations and times of model infeasibilities. (Prof. J. Lund has had great success with this approach to correcting infeasibilities in the CALVIN model of California for a network flow algorithm.),
  j. Time-step issues should be explored and evaluated comparatively. There are major drawbacks to shortening time-steps system-wide (run-time, data development, interpretability of results, etc.), but short time-step components within the model or other approaches might adequately represent short-period aspects of the system for many purposes.

There will be some who argue that CALSIM II is and should remain a model of only the CVP and SWP system. While this would be simpler administratively and financially, it seems technically and politically untenable. California's water system is being asked to operate in an increasingly integrated manner across local and regional scales, with multiple local water demands, supplies, and aquifers being coordinated with the operations of major aqueduct and storage infrastructure. Any model of the CVP and SWP systems must be responsive to this operational integration, either implicitly through better parameterization of local supplies and demands, or explicitly by widening the geographic and functional scope of the model.

3. Limitations, Uncertainties, and Impediments

3.1 Removal of Unnecessary Ties to DWRSIM and PROSIM

Much of the spatial detail employed in CALSIM II is a carryover from the previous DWRSIM model. This is particularly evident in the coarse delineation of watersheds and sub-areas, which may no longer be relevant for future applications of CALSIM II. It is recommended that all unnecessary ties to the previous DWRSIM and PROSIM models be removed in further development of CALSIM II.

3.2 Relative vs. Absolute Predictions

As noted in the Executive Summary, we are skeptical of the usefulness of the distinction between comparative and absolute predictions. To declare that CALSIM II is intended for comparative predictions and should not be used for absolute predictions is not a helpful or desirable strategy. Rather than embracing this limited view of what CALSIM II can be expected to accomplish, we recommend that model developers recognize the requirement for CALSIM II to provide absolute values. To satisfy this purpose, additional calibration of the model will be required to ensure that it provides a reasonably reliable depiction of how the California water system operates. In addition, data on model accuracy and the outcome of the calibration runs should be made available so that users can gauge the likely errors involved in using the model for their own particular purposes. Some methods for doing this and performing sensitivity and uncertainty analyses are contained in Appendix H.

Model uses should realize that model calibration and validation exercises can illustrate only how well the model can reproduce historical decisions and system behavior. Our ability to predict future policy decisions and the emergency responses to water shortages is clearly limited, thus decreasing the absolute precision of any model's predicted values of various system performance measures. Thus it is useful to distinguish between the ability of the model to reproduce correctly the physical operations of the water systems in California (which should be good), its ability to reproduce and anticipate decisions by the agricultural sector that determine the quantities of water the consume, and its ability to mimic historical and current water operation decisions by the CVP, SWP and other water management agencies.

In general, it appears that the developers of CALSIM II do not have a clear idea of how to define the scope of CALSIM II use and many of the applications are evolving in a reactionary manner. Model developers should identify clearly the desired uses for CALSIM II and then determine acceptable approaches for satisfying those desires. Developers should seek to improve data accuracy and overcome unrealistic assumptions to improve confidence in model results.

3.3 Hydropower

CALSIM II is currently greatly lacking in hydropower computations, which is an important of the federal CVP system. This should include risk-based power capacity evaluation, and possible incorporate the ISM (indexed sequential hydrologic modeling) method that the Bureau has used for many years in hydropower capacity analysis. Also, hydropower should not simply be an after-the-fact calculation, but explicitly included in the system objectives.

3.4 Daily operations

A great challenge awaits the developers as they attempt to adapt CALSIM II to daily operations. These challenges are primarily related to the impacts of routing on distribution of flows and scheduling of reservoir releases. Under the current period-by-period optimization structure over daily time increments, without appropriate consideration of routing there is the

danger that the model will allow diversion of upstream flows to lower priority users, resulting in injury to higher priority downstream users in the following days where travel times exceed 1 day. The proper inclusion of routing in the daily operations requires some kind of look-ahead capability in CALSIM II, which is currently lacking. In addition, scheduling of reservoir releases on a daily basis creates difficult timing issues in order to minimize unnecessary downstream spills or shortages caused by routing and attenuation of upstream reservoir releases. Another complexity in moving into daily operations is that reservoir discharges now become head-dependent, whereas this can usually be ignored on a monthly time scale. This means that the maximum reservoir release in any day will be dependent on the head, and should be based on the average head over the day, which introduces the potential for time consuming iterative processes to deal with nonlinear relationships in discharge-head curves for any reservoir.

3.5 Groundwater model

Groundwater has only limited representation in CALSIM II. This resource is modeled as a series of inter-connected lumped-parameter basins. Groundwater pumping, recharge from irrigation, stream-aquifer interaction and inter-basin flow are calculated dynamically by the model.

The purpose of the multi-cell groundwater model is to better represent groundwater levels in the vicinity of the streams to better estimate stream gains and losses to aquifers.

In the Sacramento Valley floor, groundwater is explicitly modeled in CALSIM II using a multiple-cell approach based on DSA boundaries. For the Sacramento Valley, there are a total of 14 groundwater cells.

Currently no multi-cell model has been developed for the San Joaquin Valley. Instead stream-aquifer interaction is estimated from historical stream gage data. These flows are fixed and are not dynamically varied according to stream flows or groundwater elevation.

The approach to modeling groundwater in CALSIM II, a lumped-parameter "tank" model seems to be a reasonable approach. However, few details of this implementation were provided to the review panel, that it is not possible to assess its accuracy or reliability. Details of the calibration and verification activities performed to date should be carried out and reported for the groundwater tank model. The effect of using large size tanks should be assessed and the level of uncertainty in computed results reported. In addition, the effect of these uncertainties on CALSIM II calculations should also be assessed. The San Joaquin valley aquifers are not well represented in the tank model, but it is in the CVGSWM. The San Joaquin valley groundwater should also be modeled in CALSIM II.

Groundwater availability from aquifers is poorly represented in the model. This results from the fact that aquifers in the northern part of the state (Sacramento Valley) have not been investigated regarding storage and recharge characteristics. Thus, in the model, upper bounds on potential pumping from aquifers are undefined. This does not represent reality, since, if CALSIM II is used for statewide planning, it would allow pumping of vast quantities of water for export to southern parts of the state, something which agency staff claim is unrealistic.

Realistic upper bounds to pumping from any of the aquifers represented in the model need to be developed and implemented.

In addition, historical groundwater pumping is used to estimate local groundwater sources in the model. However, the information on the historical pumping is very limited, causing these pumping rates to be very uncertain. Better pumping information is needed and an analysis of the effect of this uncertainty on model results needs to be conducted.

In general, the level of representation of groundwater in CALSIM II is not reasonable from the point of view of the reviewers. This is due to several factors, perhaps the most important being the lack of information presented to the reviewers for their assessment. Another factor is the lack of data collected and analyzed by the State of California to properly account for groundwater resources in the Central Valley. These data are critical to an understanding of the availability of water in the state and the operation of the major water systems that supply water to agriculture and small municipalities in the Central Valley. Assumptions of unlimited groundwater resources in the Sacramento Valley are unfounded and unbelievable. Efforts should be taken to make reasonable estimates of these resources.

There are other approaches that provide reasonably accurate estimates of river-aquifer interactions and groundwater basin response, while not sacrificing computer time. The response function approach is a good example, whereby the CVGSM model is used to develop kernel functions describing this response. A similar approach is described in Fredericks, et al. (1998). These kernels may require readjustment as head conditions change in the basin, but they provide a more accurate prediction tool and are easily incorporated in the MIP model since they apply a linear superposition assumption and retain the linearity of the constraints in the model. A dynamically linked CALSIM-CVGSM configuration is not necessary for reasonably accurate solutions. If computer run time for CALSIM II is considered excessive now, it could only considerably worsen if this type of linkage is incorporated.

Soil moisture is not dealt with in a realistic manner and needs to be improved in applications where the model output might be sensitive to these assumptions.

3.6 Dynamic Variation of Priority Weights

A severe restriction in CALSIM II is the inability to dynamically vary the weights used to prioritize flow allocation in the system. It should not only be possible to dynamically vary these weights, but this variation should be conditional on the current system state, however that state (or states) is defined. In addition to dynamic variation of weights, more explanation is needed of the reservoir operating rules and how these rules are incorporated into CALSIM II. The description of operating rules used in the system is not very clear. For example, what kinds of hedging or shortage rules are used to mitigate the effects of drought?

3.7 Expanding Scope of CALSIM II

CALSIM II is a considerable advance on earlier models in that it fully incorporates both the State Water Project run by the Department of Water Resources and the Central Valley Project

operated by the Bureau of Reclamation. However to be able to examine the full range of Californian water issues, it would be desirable that all components of the linked system should be incorporated in the model including the Friant system, the larger Tulare Basin, and southern California and its links to the Colorado River. Also because of the very important linkage between surface water and groundwater use, improvements should be made in this area particularly with regard to how that linkage affects demand for surface water and how access to groundwater reduces the economic impact of surface water restrictions.

When expanding the geographical scope of the model to include non CVP-SWP areas, as well as Southern California, a hierarchical, decomposition approach would allow development of separate models for these areas that can then be linked together through iterative processes. Otherwise, the CALSIM II model can become extremely unwieldy. Again, integration can still be achieved through appropriate iterative interaction between the regional models. In the same vein, it is also unnecessary to explicitly integrate water quality and detailed water demand/consumptive use models into the model structure. Iterative schemes involving successive estimation of water quality and other parameters can produce comparable accuracy at reduced computer run times, while reducing the complexity of the model.

The replacement of DSM2 with a neural network is consistent with reinforcement or machine learning methods which are increasingly being used to replace complex, computationally time consuming models employed in decision support systems. The complex models are only used to provide the data sets used for training the neural network. Current research at Colorado State University and elsewhere is using neural networks for groundwater surface water interaction and return flow computation to replace computationally expensive groundwater models.

3.8 Key Model Outputs

In the past, the primary purpose behind the development of CALSIM II and its predecessors has been the examination of the reliability of water supplied to the State Water and the Central Valley Projects. However it is clear that there is now a demand for a model that will provide a wider range of outputs including:

- Water supply reliability for all water users
- Demand for water by existing users
- Outflows to Delta
- Use of groundwater and the rate of depletion of aquifers
- Water quality in the Delta and in the San Joaquin River
- Indicators of ecological health in particular with regard to key fish species
- The value of hydroelectric generation.

Although the modules in the CALSIM II package currently address many of these areas, the recognition that all these outputs are important may necessitate some further model development and a greater degree of testing and calibration of these parameters.

3.9 Modeling Allocation, Accounting and Operating Rules

CALSIM II uses a system of weights and constraints to define the water allocation process and the operating rules for storage reservoirs. Unfortunately these do not accurately reflect how operators of the state and federal water projects behave in managing their complex systems. Ideally, CALSIM should both reflect how the operators behave and be accepted by them as a useful tool when considering their management alternatives. The failure to achieve this limits the usefulness of CALSIM to investigate the specific operating or accounting rules that are of interest to those operators. For example, CALSIM II was not used to test changes to the accounting and allocation rules that have recently been proposed by the Department of Water Resources and the US Bureau of Reclamation because the rules that were changed do not exist in CALSIM II.

4. Options for Improving CALSIM

4.1 Optimization Model and Run Times

Many of the complaints regarding using of CALSIM II relate to long run times, which is not conducive to sensitivity or uncertainty analyses. Since CALSIM II employs a mixed integer linear programming (MIP) solver, the usual sensitivity information available in linear programming solvers, such as dual variables and right-hand-side ranging, are not available. The problem is that small changes in right-hand-side constants or objective coefficients (i.e., weights on water allocation priorities) can produce large abrupt changes in model solutions. In this case, dual variables do not provide useful information for MIP problems. Sensitivity analysis can only be conducted through trial and error processes involving incremental adjustment of important weights, coefficients, and uncertain data inputs with subsequent repetitive execution of the model. In light of this, it is crucial that the MIP solver employed in CALSIM II is upgraded. Significant advances have been made in MIP solvers, as described by Bixby, et al. (2000), which are not reflected in the current XA solver utilized in CALSIM II. There have been many recent improvements to the branch and bound method which should be incorporated, and the LP solver itself can be improved with better sparse matrix analysis. As planned by the CALSIM II developers, removal of the need for use of the FORTRAN 90 compiler will also improve run times when changes in optimization model structure are required.

4.2 Confidence in the model

The usefulness of a computer model in water resource management is only as good as the confidence that the stakeholders have in the accuracy and reliability of the model and the trust that they have in the modelers. There are several factors that affect that confidence and a number of ways that confidence can be improved.

- **Documentation**

Producing documentation of models requires considerable resources to do properly and ongoing resources to maintain especially when model development is continuing. Typically documentation of any water resource model is poorly done. However, where there are external model users, as is the case with CALSIM II, it is important. The survey conducted by Ferreira et al (2003) indicated that many users of the model thought that documentation of CALSIM II was poor.

- **Seminars**

In the Murray-Darling Basin, seminars with key users and interest groups in which the operation of the model is described and discussed have proved to be useful in increasing confidence in models. The practicality of this approach will depend on the number and location of the prospective participants and the resources available to support the process.

- **Data**

A model can only be as good as the data that is used to develop and calibrate it. The agreement over an acceptable set of hydrologic data that occurred during the development of CALSIM II is a considerable advance. However, there appears to be a need to improve the collection and use of data on water diversions and return flows. Because of the close links between the surface water use and groundwater use there also is a need to have better information on the use of groundwater.

The models used to calculate the Local Water Supplies in the Depletion Study Areas depend on estimates of surface water use, crop evapotranspiration rates and water use efficiencies developed using data from the 1970's. Confidence would be improved if more recent data were available to check these estimates.

- **Calibration**

A very good way to improve confidence in a model is to calibrate it against historical data to ensure that the model output is able to reproduce the observed data. Calibration is the process of using the model to reproduce the historical behavior of the system and then fine-tuning the model so that the match between modeled and observed values improves. The calibration of the model assists in detecting errors in the model and the input data. It also enables a comparison to be made between the way that the operators actually manage the system and the way that the model assumes that the system is managed.

A further consequence of the calibration process is that the statistics of the match between modeled and observed values can be used as a reasonable estimate of the absolute accuracy of the model output.

It is legitimate in a calibration/validation run to incorporate changes to infrastructure, institutional or operational rules as they occurred especially if these changes are specified as

input parameters to the model. This was done to a limited extent in the CALSIM II validation run with three regulatory periods modeled related to decisions made by the State Water Resources Control Board. It is also legitimate to incorporate growth in demand especially if that growth is described in a manner that is consistent with the way that demand is specified in the production run. Demand north of the Delta was specified in the validation run by inputting the historical crop areas.

A Calibration/Validation report should be very useful in demonstrating the accuracy of the model. However there are a number of elements in the CALSIM II validation run and the validation report which reduce that confidence including:

- State Water Project (SWP) demands south of the Delta were set at historical deliveries in years with no restriction and at the contractor's request level in restricted years. Neither of these pieces of information is available to a production run which calculates demand based on crop areas. Therefore the validation run does not provide reliable information on how well the model can represent these demands.
- The validation run omitted Article 21 deliveries. Although this omission will not affect the delivery of 'Table A' volumes south of the Delta, it will affect flow in the Delta and Delta water quality. Also, in the example model run presented in the paper by Draper A.J. et al (2003) which was supplied as part of the review, changes to Article 21 deliveries constituted the largest impact resulting from a change to the allowable pumping capacity at Banks between March and December. This suggests that the modeling of these demands is important.
- The DWR (2003) report produces estimates of SWP and Central Valley Project (CVP) deliveries south of the Delta but then adjusts them for changes in storage before presenting comparisons of those results with observed deliveries. This process merely checks that the model is preserving a water balance and does not present a legitimate validation of model deliveries.
- The report provides statistics on long term average deliveries and flows but no statistics on the fit for individual years. Additional analysis of the output would assist stakeholders to assess whether the estimate of water supply reliability and in particular the modeled volumes of water available in the most restricted years are accurate.
- In some instances, such as the examination of water quality in the Delta, the ability to accurately model monthly flows and deliveries will be important. The validation report contains no information that would enable the ability to model monthly flows to be assessed.
- A key model output is the water quality in the Delta. It would assist the validation of the model if a comparison of parameters such as the location of the X2 boundary was provided.

The users of CALSIM should recognize that models are a summary of what one believes to be true and important about a system. Validation is then an exercise to test how good that summary and understanding really is.

Appendix I contains brief descriptions of calibration modeling in the Murray-Darling Basin in Australia and in the State of Texas.

4.3 Assessment of the reliability of "delivered" water

An important recent application of CALSIM II which has drawn widespread attention is the "State Water Project Delivery Reliability Report. While this is an important step forward in the use of CALSIM for policy purposes, it highlights a number of issues, both conceptual and empirical, that need to be resolved in order to provide a more adequate assessment of the reliability of water supply in California.

First, it illustrates the need for sound calibration of CALSIM. The question being asked is not a comparative one – What are the consequences of changing some aspect of the system from X to Y? – but rather an absolute one – How does the system function at present? How often can users expect a shortage in deliveries of Z%?

Second, it highlights the fact any water system model such as CALSIM requires a blend of hydrology and behavioral analysis. To conduct a water balance, the model needs to know what deliveries are required by the customers of the given project, and what are the diversions by other user groups who extract water from the same surface or groundwater sources. These are fundamentally questions of economic and institutional behavior, not matters of hydrology. Therefore they cannot be dealt with by hydrologists alone. Like its predecessors, CALSIM tends to treat these as black boxes. The diversions by water users outside the CVP-SWP are taken as exogenously given, based on an assumed "level of development" and simplistic assumptions about the patterns of water use associated with that level of development. The deliveries required by the water users who are served by CVP-SWP are generally taken as given. For reasons explained below, both of these treatments are simplistic and unsatisfactory.

In CALSIM modeling exercises the level of development plays two different roles depending upon the context. In a simulation context, the level of development is used to represent hydrologic variability and uncertainty; in a calibration/validation context, it is used to reflect the actual historical demand for water withdrawals. These are very different purposes and it is important to keep them distinct. In most applications of CALSIM prior to the recent reliability study, the main focus was simulation and the representation of hydrologic variability. The chief purpose served by using 73 years of adjusted streamflow records was to represent the variability and uncertainty in the streamflow that one can expect to observe in any single year. Therefore, the calendar date of the record has no substantive significance, the (adjusted) streamflows for 1952 or 1982 are not being used to represented what happened historically in 1952 or 1982, but rather as an indication of the variation in streamflow that could be expected to occur next year, or any other year. In this context of simulating hydrologic variability, it makes good sense to apply the *same* level of development (i.e. the same pattern of water use) to every year in the sequence, rather than a series of different levels of development that vary with calendar time, because the streamflows represent alternative hydrologies that can occur in any given year.[1] The situation is different when one is conducting a calibration or validation

[1] This could be modified to allow for the fact that local weather conditions have a significant impact on irrigation (and urban) demands – e.g., farmers plant fewer acres of crops in a drought year. In that case, one could have different levels of water demand and extraction in different year *types;* but, these would all be keyed to the same overall level of economic development (e.g. the California economy in the 1990s). CALSIM II does not presently

exercise. In that case, one wants to represent the historical demands in 1952 or 1982 in order to compare what the model predicts with what actually happened. Therefore, in a calibration or validation exercise one wants the level of development to change each year in order to reflect the demand that occurred historically.

Both simulation and calibration/validation raise some other important technical issues. In the context of simulation, there are several different ways to generate a hydrologic sequence that is calibrated to a fixed level of development. One can use all 73 years for which data are available. One could use a subset of those years chosen either according to some deterministic rule or randomly. The subset could be oriented, for example, towards the extremes of the 73 sequence of annual records. However, the drawback of any approach based on sampling from the observed historical record is that it *understates* the full variability in streamflow that could be experienced in the future. The 73 years of record are drawings from a probability distribution the extremes of which extend beyond the minimum and maximum flows observed in the historical record. Relying on this record, therefore, understates the true minimum and maximum flows that might be encountered. In a reliability assessment exercise, one might want to take some steps to minimize the potential understatement of streamflow uncertainty. This could be accomplished by fitting a (parametric) probability model to the historical streamflow record and then sampling from the tails of the fitted distribution (Stedinger, 1981). The use of statistical models of streamflow variability could be considered in future applications of CALSIM to assess delivery reliability.

The assessment of delivery reliability requires that particular attention be given to the definition and measurement of the water users' demands. In this context, the user's demands play two roles: they affect the definition of "deliveries" and they influence the assessment of "reliability". With respect to deliveries, CALSIM II considers water to be delivered whenever it has the water irrespective of the ability of a contractor to use the water or to store it; The reality is that, if the contractor does not have a demand for the full quantity of water and is not able to store the excess, that amount will not be delivered. Therefore, the calculation of deliveries would be flawed. Furthermore, reliability cannot be assessed without reference to demand. Stating that a water supply system can deliver 100 acre feet in a wet year but only 70 acre feet in a dry year is useful only if one knows what the demands will be in wet and dry years. The implications are quite different if the user needs 105 acre feet per year than if he or she needs 65 acre feet per year. Thus, the users' demands should serve as the norm against which reliability is assessed. Instead, the recent reliability report uses the so-called 'Table A' water amounts as the norm for assessing deliveries to SWP contractors. This does not seem to be a satisfactory approach because there is no presumption that the Table A amounts, negotiated in 1960, measure the actual demands of SWP contractors in any particular year. The actual demands of the individual contractors will be influenced by how much storage they have, what access they have to other surface water or groundwater, and the demands of the farmers they serve to plant crops and apply water. Without accounting for these factors, it is difficult to generate a meaningful assessment of supply reliability.

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consider the impact of annual weather conditions on demands. In order to model water demands accurately in a year, the climate conditions would be linked to the flow conditions to provide an input set for a particular year.

The assessment of reliability should ideally go beyond a comparison with quantities demanded to incorporate the notion of a loss function. If a user has a demand for 100 acre feet and can only receive 90 acre feet in one scenario and 80 acre feet in another, while the shortfall is twice as large in the second scenario the actual *consequences* of the shortfall to the user, in terms of lost profit or higher cost, might be more than twice as large. To assess the economic value of reliability, or the economic cost of a lack of reliability, one needs to be able translate shortages into monetary losses. To accomplish this, the warning time provided and the delivery shortfalls from CALSIM would need to be processed through an economic model of the value of water to different SWP contractors.

Because water users face difference demands and have access to different sources of supply, when assessing reliability it is unhelpful to aggregate all contractors and simply present the results in terms of total annual project deliveries, as was done in the report. Precisely because of the potential non-linearity of the loss function, a given aggregate shortfall can have different consequences when distributed differently among the individual contractors. A similar observation applies to the temporal distribution of delivery shortfalls across the year. It is unhelpful to aggregate supply system deliveries into an annual total, as done in the report. For a user to be able to obtain 100% of his or her demands in the period from March to May but only 60% in the next three-month period from June to August has different consequences than being able to obtain 80% in each of the six months. Furthermore, for both agricultural users and many urban users, major decisions affecting water use have to be made in the spring. They are based on the expectation around March about the amount of water that will subsequently be available for delivery during the summer months. What matters to these users when assessing supply reliability is the amount of water they can expect around March to be delivered over the summer, rather than the ultimate total delivery.

For both reliability assessment and also model calibration/validation, it is important to avoid excessive aggregation when describing shortfalls between demand and supply, or deviations between model predictions and actual outcomes. In regression analysis, it is the convention to measure the goodness of fit of a regression equation not by the average deviation but rather by the sum of the squared deviations. In ordinary least squares regression, by definition the average deviation is always zero (that is to say, the average of the predicted values of the dependent variable always equals the average of the actual values) regardless of how well or badly the regression equation fits the data. The average deviation thus provides *no* information regarding the goodness of fit; by contrast, the sum of squared deviations or the sum of the absolute values of the deviations are sensitive measures of goodness of fit. Although the calibration of CALSIM is not an exercise in least squares regression, the same general principle applies. To judge whether the model is doing a good job, the goodness of fit should be measured by reference to the disaggregate results and not simply by the overall average deviation.

Additional comments on the 2003 CALSIM II Validation Report are contained in Appendix F.

5. Managing CALSIM Development and Applications

The costs of not continuously and substantially improving our analytical capabilities are political (in terms of continued controversy and diminished agency credibility), economic (as inferior system performance for agricultural and urban water users), environmental (in terms of inferior environmental system performance), and financial (lawyers and policy consultants are more expensive than engineers and scientists).

CALSIM II is a substantial improvement over its predecessor models, DWRSIM and PROSIM, with a great deal more flexibility, transparency, and potential than these earlier models. The modeling team for CALSIM has identified an exciting and relevant vision of how modeling should be done for this complex and difficult system in the coming years. However, implementation of this vision in a coherent technical manner that leads to both technical and stakeholder credibility will be a difficult process, requiring financial and institutional support if this kind of capability is to be developed and sustained.

To accomplish these objectives CALSIM II developers need to be in an institutional position where they can see the model more as "outsiders" view it. This would allow them to be more responsive in supporting the credibility of their work and the relevancy of their tools and results to the broad range of current water management problems. As such CALSIM II should no longer be solely responsible to CVP-SWP managers, but should be responsible to a broader range of technical managers from additional interests, reflecting its current and prospective uses.

It would be imprudent to manage a state's finances, a business, or a retirement plan without quantification – quantification in such matters is necessarily imperfect, but necessary nonetheless. While shortcomings have been identified in CALSIM II, it would be similarly irresponsible to manage California's water budget without carefully-interpreted quantification. Progressive and continuous improvement in our quantitative understanding of California's water system provides a common basis for improving its performance for all interests.

One possible means of maintaining control of the quality of particular versions of CALSIM II and accompanying models used for SWP-CVP planning and management decisions is to create an interagency modeling consortium (IMC) consisting of DWR, USBR, and persons from other stakeholder organizations if they are interested and want to participate. This consortium would be responsible for maintaining a toolbox of 'acceptable' models for 'official' use by the agencies and contractors.

IMC responsibilities and authority could include:

- Prioritize, coordinate, and provide consistency, technical guidance and oversight for all modeling applications,
- Approve model selection and insure that each requested application is carried out using the most appropriate model(s) and input data,
- Provide or otherwise insure documentation of the modeling process itself as well as the modeling results,

- Insure that the results are expressed and made available in a way such that others can understand and benefit from that modeling application, as applicable.
- Implement peer reviews of models and their applications as deemed appropriate.

To help meet their responsibilities the IMC will need to establish, publish and implement some procedures for insuring the quality of the entire model development and application process. They will need to identify among all the models that might be used, which are the most appropriate to address each of these separate groups of model applications. They must identify various models, i.e., establish a model toolbox, from which clients can choose the one that best meets their needs (or perhaps argue that another model should be added to the toolbox). The IMC will also need to maintain model documentation and provide for peer reviews of any model, its documentation, and/or its use in a project.

Further suggestions and discussion on the creation and operation of a possible IMC for model development and application, as well as for managing peer reviews of both the models and their applications, are contained in Appendix E.

6. Recommendations for Future Use, Development, and Application of CALSIM II

The most concise recommendation we might make would be to fix the shortcomings beginning with what are considered the most serious, and proceeding to those that are less serious, taking into account the time and other resources needed to address each weakness. However, we believe it is more useful to suggest ideas on how to systematically address both present shortcomings and those likely to emerge as stakeholders' quantitative understanding of California's water system and its problems continue to evolve.

6.1 Model development and support consortium

As discussed in the previous section and in Appendix E, it might be useful to explore creation of a broader interagency modeling consortium for developing operations planning models for California. The joint DWR-USBR development strategy used for CALSIM II has shown some notable successes, and should be expanded to include additional parties and sources of expertise. Such a consortium might include staffs from several agencies (DWR and USBR, as well as potential members from MWD, KCWA, CCWD, and other agencies), NGOs, some consultants, and universities. Such a model development forum would:

a. Bring a wider range of expertise to bear on model development problems.
b. Facilitate having more agencies involved in supporting model development with expertise and financial resources.
c. Better enable model developers to see the model as "outsiders" see it.
d. Potentially improve contracting for model development and testing.

e. Take model development and testing outside of the explicit agency framework; a broader consortium should be more conducive to self-critical and transparent technical practices.
f. Provide a common training ground for agency, NGO, and consulting staffs to become effective modelers, broadening the talent base for technical work in California.
g. Reduce impediments to model development and testing arising from current State budgetary and personnel hiring problems.

Many of the questions, concerns, and problems mentioned in the user community interviews could be addressed well in such a distributed model development, testing, and support framework. It would still be necessary for each stakeholder group and agency to maintain its own modeling staff, but these would be partially shared in an interagency modeling consortium.

The governance and finance of such a consortium would be difficult and would probably require a steering committee or governing board, but any resulting model(s) would have broader credibility and a broader and deeper technical base.

In the immediate term, a users' group should be formed and the formal listing of model development activities should be posted on the web, including short descriptions of each development activity and contact information.

6.2 Quality Control Program

The DWR and USBR modeling team (or a broader model development consortium) need an explicit quality control program. Such a program should include a variety of activities:

a. periodic external reviews on the broad modeling program
b. specialized external reviews of model products and applications
c. a standing (or sitting) external technical advisory body
d. software engineering and maintenance
e. a regime of model testing
f. model and data documentation
g. data development and management
h. user group activities
i. local agency and interest involvement
j. model, data, and documentation accessibility (including web site use).
k.

Such a quality control program would benefit from deep consultation with stakeholders and the broad community of water technical people, perhaps via the California Water and Environment Modeling Forum (www.cwemf.org).

6.3 A Training Program

DWR, USBR, and assorted agencies and consultants should establish a more formal common regimen to train new CALSIM II users in both CALSIM software and the complexities of actual system operation. All these groups currently rely on a relatively small pool of perhaps a

dozen knowledgeable CALSIM II users and all proclaim a need for many more capable users. A training regimen consisting of current CALSIM II training classes, supplemented by additional training in software application and system operation and apprenticeships or rotations through operations and model development shops would be useful to all concerned. The entire water community would benefit from having such expertise being widespread. Having widespread CALSIM II modeling expertise also makes explaining CALSIM II and its results easier. This might be an appropriate activity for a model development consortium.

6.4 Extend Improvements in Modeling Practice to Supporting Models

CALSIM II is at the center of a web of additional models used by DWR, USBR, and other agencies to prepare inputs for CALSIM II and post-process outputs from CALSIM II.

Delta controversies and difficulties of representation seem endemic to problems of modeling Central Valley operations. The technical basis for representations of Delta operations and water quality performance requires a similar level of transparency and testing to avoid this becoming a "weak link" in the Valley-wide operations planning model. Since so much is based on the DSM2 Delta model, documentation of fairly strenuous tests of the DSM2 model are highly desirable. This would provide a firm foundation for the use of ANN or other approaches for summarizing DSM2 behavior in an operations model. Similar documentation, testing, and development are desirable for the other models mentioned above which provide data for CALSIM II (CVGSM/IGSM, CVPM/CALAG, IWR-MAIN, LCPSIM, CU model, and SIMETAW).

6.5 Hydrologic Data and Data Development

An effort should be made to step back and perhaps re-define a more systematic and solid basis for developing hydrology for water management models of California's inter-tied water system. Currently, several efforts exist to develop surface or groundwater hydrologies for parts of the Central Valley (sponsored by DWR-USBR, USACE-Sacramento District, USEPA, USGS, CALFED, local agencies, etc.). An effort should be made to broaden the range of hydrologic expertise involved in hydrology data development for management modeling of California's inter-tied water system, and establish a consistent and high, but reasonable, standard of documentation and testing for developed data and any underlying hydrologic models. Establishing such a standard of documentation and testing would make existing hydrologic studies more accessible and useful for future studies and encourage the comparison and further development of existing representations of the system's hydrology.

6.7 Performance-Based Optimization

Performance-based optimization should be added to CALSIM's capabilities; it would not be difficult in terms of software or data, and would add much greater ability to explore and seek improvements in management within a complex system. The multi-period optimization approach being developed (CAM) is an operations-oriented first step in this direction, but could be expanded without great difficulty.

For large-scale water resource systems of great complexity and many options for system management, it is often difficult to find "optimal" operations with simulation modeling. There are simply many myriads of decision options and combinations of options, which theoretically each require a simulation model run – which would be prohibitive in terms of analysis cost and time. In such situations, performance-based optimization models, such as those seeking maximum economic performance, can offer useful insights as to where to look for improving system operations and management. Metropolitan Water District of Southern California (MWD) and San Diego County Water Authority (SDCWA) employ performance-based optimization modeling of parts of California's water system to gain strategic insights for planning and management. An economic-engineering optimization model has been developed for California and, despite significant limitations, shows several insights for California (CALVIN), suitable for identifying promising operational and management strategies worthy of more detailed analysis (Jenkins et al. 2001; Draper et al. 2003; Jenkins et al. 2004). The CALSIM II modeling approach could easily be adapted to provide greater functionality to this type of performance optimization. Having performance-based optimization capability together with a compatible simulation model for more detailed analysis and trade-off evaluation could greatly improve the capability of California's water community to explore and develop promising and creative options for improving operations, facilities, and overall system management.

6.8 Modular and Layered Versions of CALSIM II

Speedier versions of CALSIM II are needed for operations planning and integrated water planning studies. Such versions would be regional modules of CALSIM II (for regional studies) or explicitly aggregated system-wide models from the most detailed CALSIM II schematic for system-wide or statewide studies. Both approaches would simplify the model for particular purposes, yet be tied to a common detailed schematic and detailed hydrologic, operations, and water demand data sets.

Geographically modular or aggregated system-wide versions would allow additional local and regional water management options to be represented for particular operations and policy planning purposes and allow users to more quickly explore and develop operating policies. The final runs from such integrated or exploratory studies could then be evaluated using a more detailed and complete version of CALSIM II.

Modular regional models might represent regions with relatively few inter-ties, such as: Sacramento Valley, Delta and eastside streams, San Joaquin Valley, San Francisco Bay Area, Tulare Basin, and Southern California (DWR's South Coast and Colorado River hydrologic regions). (We have had good success with the CALVIN model of California with 5 modular regional models, which combine to form a system-wide model. These geographic sub-models greatly improved quality control in model development, work flow and data checking, and identification of problems in the model.)

6.9 Model Calibration and Testing

Many approaches exist for model calibration and testing (Modeling Forum 2000). Calibrating a planning model oriented to operations in an uncertain and distant future is always challenging. For a model that serves many uses (including policy-urgent uses unforeseen by developers), use-specific testing will often be impossible within a responsive time frame and budget. Such unavoidable situations call for more thorough, general, and well-documented model calibration and testing than would otherwise be needed.

For the model to have technical credibility, stakeholder credibility, and to serve the kind of training and reference function needed for the water management community, a systematic and coherent means of setting parameter values in the model and documenting these values is needed. Similarly, a systematic self-critical means of testing is needed for a model to establish and retain credibility, and have defined limitations, for a range of applications.

A potentially excellent resource for model testing is comparisons of seasonal operations planning CALSIM II model runs with recent years' seasonal operations, as done by actual operators. Similarly, system operators could scrutinize historical simulations, such as those in the recent November report, for systematic differences from operating practice. Such comparison with operator policies and philosophy could also be performed with SWP or CVP delivery reliability estimates. Such comparative analyses would both help define the likely (and unavoidable) differences between actual and modeled operations and water deliveries and identify potential opportunities to narrow such differences.

Credibility arises, in part, from demonstration that problems and limitations are systematically identified and addressed or considered in model development and in making and interpreting model runs. This can be accomplished by use of documentation, metadata, written guidance, and protocols and logs for identifying model problems and recording model improvements.

Given present and anticipated uses of CALSIM II, the model should be calibrated, tested, and documented for "absolute" or non-comparative uses. This is what many applications require today and will be increasingly desired and required in the future. Maintaining the traditional "comparative-only" use of CALSIM II is undesirable if the model is to be useful for the CVP and SWP systems, the operations of water contractors, or for statewide planning purposes.

6.10 Documentation of Model Improvements

Along with better documentation of model versions, logs of data and model improvements and "bug fixes" should be maintained. Explicit protocols and records for identifying and correcting modeling errors and problems would enhance the credibility of the modeling effort with technical people and policy makers. Such protocols also provide an internal aid to staff and staff development in modeling. I understand that this kind of record-keeping is done, but the precise form of, nature, and extent of this record-keeping is unclear. It would be useful and reassuring to stakeholders and policy makers to know that this kind of record-keeping of the software and data was being done.

6.11 Better Model Integration in Decision-Processes and Stakeholder Education

Greater aid should be given to interested parties and decision-makers who must work with the unavoidable limitations of any model. If possible, a document should be prepared for stakeholders and interested parties outlining the model, summarizing the model's primary limitations, and providing guidelines for interpreting model results. Those developing policy-making forums and processes should thoughtfully incorporate computer models in these processes in ways that do not assume model omniscience, or otherwise place too great or exclusive a reliance on model results.

Models and model results will never be perfect. If models are to be important for planning and policy-making, they be must be presented and used in ways that enlighten policy-makers more than they add confusion and controversy to already difficult situations, if possible.

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Appendix A: CALSIM II Science Review

Dates: Nov 13-14th
Location: Bay-Delta Room, CBDA Offices
650 Capitol Mall, 5th Floor
Sacramento, CA

Day 1: The Management Context, Model and Application Details

9:00 Welcome – Kim Taylor
- Overview of the CALFED Bay Delta Program -
- Introduction of the Panel

9:15 Water issues in California – Francis Chung
- General Hydrology
- SWP/CVP
- Operational challenges
- Sacramento-San Joaquin Delta – Ron Ott (5 min.)

9:35 Panel Q&A

9:45 Planning Models – Andy Draper
- CALSIM software
- CALSIM II application overview
- Interaction with other models

10:10 Panel Q&A

10:20 Break

10:30 Summary of CALSIM Applications
- DPLA/CalFed/US Bureau of Reclamation: Integrated Storage Investigations – Steve Roberts
- Bay Delta Office (DWR): SWP Delivery Reliability Report - Kathy Kelly
- USBR: Multi-layered modeling to simulate CVPIA (b)(2) water and Environmental Water Account Operations – Nancy Parker
- Operations Control Office (DWR): Oroville Relicensing, SWP Allocation decision procedure – Curtis Creel
- Department of Planning and Local Assistance (DWR): California Water Plan Update – Kamyar Guivetchi/Ken Kirby

12:15 Panel Q&A

12:30 Lunch

1:15 Summary of User and Stakeholder Interviews
- 1:15 Interview Summary and Findings – UC Davis
- 1:35 Panel Q&A
- 1:50 Public Comment

2:15 CalSim II Details
- Development philosophy – Francis Chung
- Operation priorities, constraints, common assumptions – Erik Reyes
- Hydrology development – Andy Draper
- Delta water quality constraints – Ryan Wilbur

3:15 CalSim Evaluation
- Historical Operations Study / Sensitivity Analysis – Sushil Arora

3:30 Panel Q&A

3:45 Break

4:00 Future Directions
- Data Structure / Version Control / Multi-Period Prescriptive Optimization – Ryan Wilbur
- Daily Time Step - Dan Easton
- CalSim II – CVGSM Integration – Tariq Kadir
- Water Quality / Upstream Models – Nancy Parker

5:00 Panel organizational meeting (additional information needs, questions of specific staff, discussion plan)

Day 2—Panel Deliberations and Preliminary Report

8:30 Panel Q&A with specific DWR and USBR staff on request

9:30 Panel *in camera* discussions

11:00 Panel presentation of draft main findings—Pete Loucks

12:00 Wrap up and next steps - Kim Taylor

Appendix B: Briefing Material for CALSIM II Peer Review

California Water
Averting a California Water Crisis (3 pages)
California Water Today, Bulletin 160-0, Chapter 2 (20 pages)
Water Supplies, California Water Plan Update, Bulletin 160-98, Chapter 3 (11pages)
Urban, Agricultural and Environmental Water Use, California Water Plan Update, Bulletin 160-98, Chapter 4 (17 pages)
California's Major Water Projects (map) (1 page)

CVP and SWP
State Water Project Operations (6 pages)
Central Valley Project Operations (16 pages)

CalSim and CalSim II Overview
CalSim: A Generalized Model for Reservoir System Analysis (19 pages)

CalSim Software Details
CalSim water resources simulation model: Users guide (18 pages)
CalSim water resources simulation model: Wresl language reference (11 pages)

CalSim II Details
Network Representation (1 page)
Sacramento-San Joaquin Delta Operations (9 pages)
Coordinated Operating Agreement (3 pages)
Reservoir Rule Curves (2 pages)
CalSim ANN Implementation (8 pages)
CVPIA (b)(2) Management and Operations (6 pages).ii
EWA Management and Operations (8 pages)
Multi-Cell Groundwater Model (2 pages)
SWP and CVP Delivery Allocation Logic (3 pages)

Hydrology Development
Surface Water Hydrology Development for CalSim II (8 pages)

Supporting Computer Models
Model Interaction (1 page)
CALAG (2 pages)
CU Model (2 pages)
DSM2 (2 pages)
IGSM2 – CVGSM (4 pages)
LCPSIM (5 pages)

CalSim II Evaluation
Planned Sensitivity Analysis (7 pages)
CalSim II Simulation of Historical SWP-CVP Operations - Extracts (61 pages)

CalSim II Applications
CalSim II Project Applications Summary (not completed)
SWP Delivery Reliability Report – Extracts (25 pages)
North of Delta Offstream Storage Investigations (3 pages)
In-Delta Storage Investigations (3 pages)
California Water Plan Update 2003 (3 pages)
CalSim II and SWP Operations Control Office (1 page).iii

Future Model Development

(a) CalSim Software
CalSimMulti-period Prescriptive Optimization (not completed)
CalSim Daily Time Step Model (not completed)
CalSim Water Quality Module (not completed)
Data Structure / Version Control (not completed)
CalSim Graphical User Interface (not completed)

(b) CalSim II Applications
CalSim II – CVGSM Integration (not completed)
CalSim II Geographical Expansion (not completed)
Global Climate Change (not completed)
Refined Spatial Resolution (not completed)
Expansion of Land Use Based Demands (not completed)
CalSim II – CALVIN Integration (not completed)
Revision of Urban Water Demands (not completed)

(c) Supporting Models
Replacement of Consumptive Use Model (not completed)

Appendix C: CALSIM II Review Process and Timeline

Establishing the Peer Review Panel

Dr. Pete Loucks (Cornell University and South Florida Water Management District) has accepted the CALFED Science Program's invitation to chair the panel. Other members are being currently being contacted by the Science Program staff

Organization of Briefing Material

Science Program and key agency staff, in consultation with the review panel chair, are identifying and organizing briefing material for panel members. Target date for completion is Sept 1, 2003. (This was extended to December 8, 2003)

Public Meeting of Review Panel

Target: 2-day session in November, 2003 in Sacramento area

Review workshop structure will include:

- Presentation overviews of California hydrology, water management, current issues, and the development of CALSIM II
- Presentations on the range of different current and potential applications of CALSIM for planning, operations, and supply reliability projects
- A summary of an independent interview project by Dr. Jay Lund of users and stakeholders explaining the major questions people are trying to answer with CALSIM II and other models
- Public comment to the panel
- Detail discussion of the model, including assumptions used in different applications, verification studies, and sensitivity analyses
- Opportunity for panel members to ask follow up questions of CALSIM developers and users
- An in camera session for panelists to discuss and begin compiling review comments
- A public presentation of the panel's draft findings

Panel Chair Provides Final Report to CALFED Lead Scientist

The panelists will be asked to finalize their review comments within 3 weeks of the public meeting and to transmit those directly to the Lead Scientist. The Science Program will transmit the completed review to CBDA and the CALFED community.

Appendix D: Panelists CALSIM II Review, Nov. 13-14, 2003

Name	Affiliation	Position	Address/Phone/E-mail
Andy Close	Murray Darling Basin Commission	Lead Modeler and System Manager	GPO Box 409 Canberra ACT 2601, AUSTRALIA (02)62790102 andy.close@mdbc.gov.au
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Pete Loucks	Cornell University	Professor	"Civil and Environmental Engineering, 311 Hollister Hall, Ithaca, NY 14853 " (607) 255-4896 DPL3@cornell.edu
Jay Lund	UC Davis	Professor	Civil and Environmental Engineering 3109 Engineering III, Davis, CA 95616" (530)752-5671 jrlund@ucdavis.edu
Daene McKinney	University of Texas at Austin	Professor	Civil and Environmental Engineering Campus Mail Code: C1786, Austin, TX 78712 (512)471-8772 daene_mckinney@mail.utexas.edu
Jery Stedinger	Cornell University	Professor	Civil and Environmental Engineering, Hollister Hall, Ithaca, NY 14853 (607) 255 2351 JRS5@Cornell.edu

Appendix E: Managing Model Development, Application, Documentation and Communication.

One possible means of maintaining control of the quality of particular versions of CALSIM II and accompanying models used for SWP-CVP planning and management decisions is to create an interagency modeling consortium (IMC) consisting of DWR, USBR, and persons from other stakeholder organizations, including NGOs and universities, if they are interested and want to participate. This consortium would be responsible for maintaining a toolbox of 'acceptable' models for 'official' use by the agencies and contractors.

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- Insure that the results are expressed and made available in a way such that others can understand and benefit from that modeling application, as applicable.
- Implement peer reviews of models and their applications as deemed appropriate.

To help meet their responsibilities the IMC will need to establish, publish and implement some procedures for insuring the quality of the entire model development and application process. They will need to identify among all the models that might be used, which are the most appropriate to address each of these separate groups of model applications. They must identify various models, i.e., establish a model toolbox, from which clients can choose the one that best meets their needs (or perhaps argue that another model should be added to the toolbox). The IMC will also need to maintain model documentation and provide for peer reviews of any model, its documentation, and/or its use in a project.

CMM Level 3 Performance Expectations

Firms that develop professional software are typically required to meet certain software standards. One such standard is defined in a book from Carnegie Mellon University. These so called Capability Maturity Model (CMM 1994) standards have various levels. For example, the South Florida Water Management District, that develops hydrologic models used as inputs to major investment decisions, strives to meet Level 3 standards. To meet such standards in software development and peer review, one needs to show that

- Modeling related problems are anticipated and prevented

- Model development and application groups work together as an integrated product team.
- Model use training is planned and provided as is needed.
- New modeling methodologies are identified and evaluated for possible implementation on a qualitative basis.
- Data are collected and used in all defined processes.
- Data are systematically shared across various projects.
- Both the models and their applications are evaluated and judged satisfactory by independent reviewers.

It seems to this panel that CALFED could without too much difficulty meet such standards if it chose to. Clearly planning for, conducting, and documenting these activities will require additional time and money. The expectation is that in the long run, such documentation and review will save time and money by redirecting misguided initiatives, identifying alternative approaches, or providing valuable technical support for a potentially controversial decision.

Model Toolbox

The IMC in collaboration with all agencies involved in water resources planning could be responsible for creating and maintaining a collection of models that agencies can use to meet their needs. As shown in Figure 1, this collection of models might be called the model toolbox. The criteria to be used as a basis for deciding whether a proposed model should or should not be included in the toolbox will depend in part on an assessment of the attributes of that model compared to alternative models and the suitability of the model to meet the needs of the project. Associated with the model toolbox is a library of completed model application documents and data bases for use by anyone who could benefit from them.

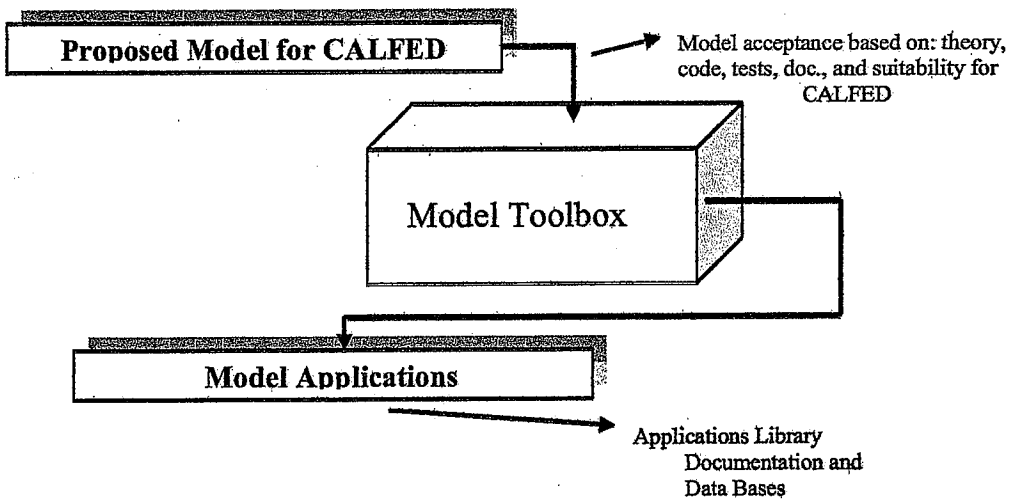


Figure 1. Model Toolbox consisting of approved models for use and Applications Library consisting of documentation and model data bases.

Everyone would agree that all modeling applications should be performed with the 'best' models available. But 'best' does not mean that all models used should be the most detailed, complex, realistic and thus usually the most expensive models available. The decision regarding the 'best' or most appropriate model should be based on the particular issues or questions being addressed, on the quantity and quality of the available input data, and on the time, personnel, and money available to perform the modeling application. The central question to be answered before initiating any modeling application is just what model output information (and precision) is needed to meet the needs of the decision making process. Expressed in other words, just how sensitive will the decision be to the type, amount and precision of the model output?

IMC in consultation with the other agencies could provide guidance on the adequacy of a particular version of CALSIM II or other associated model requested by each client with respect to the theory upon which it is based, its data requirements, its spatial and temporal resolutions, its documentation and status with respect to peer reviews, its capabilities, and its limitations. Similar considerations must be given to the proposed input data. To provide these services to each client requesting services from the IMC would require IMC to be staffed with personnel acquainted with the models in the toolbox, as well as be able to perform or review the simulations requested by various agencies.

There will likely be requests to use models not yet included in the model toolbox. IMC together with others from the DWR and/or USBR will need to judge the merits of such requests and if deemed beneficial, consider including such models in the toolbox. Undoubtedly the extent and quality of the documentation, testing, and peer review of various models in the toolbox will vary. However, a model's inclusion in the toolbox should signify that the model has been judged to be the best available for meeting the goals for which it was designed and is applicable to conditions in California.

Information Flows and Documentation

The IMC will probably be devoting a substantial amount of time giving guidance to clients and, when applicable, to the public. They will need to be working with the clients who are requesting model applications, and in situations where they are not doing this work, they will need to be reviewing and approving the work of the agencies or contractors who are performing the modeling services. IMC would provide technical assistance as well as oversight and coordination among all CALSIM II modeling activities.

Requests for modeling are easy to make, and time and money are required to carry them out. Requests sent to this proposed IMC should reflect some thought by those requesting such model runs as to just why the model application is desired, and just how the results are to be used. We would propose that requests include such items as:

- Reason for modeling,

- Type of modeling (e.g., event based or continuous),
- Particular model preference if any, and why, and possible alternatives,
- Model output information (data) needed and why and when it is needed,
    - What questions are the model results going to answer?
    - What issues are being studied?
    - What decisions are to be made, or at least to be informed, based on these model results?
    - When are the model results needed?
    - What formats are desired for presenting the model results?
- Location or site being modeled and the spatial and temporal scales desired,
- Particular input data assumptions, boundary conditions and other regional assumptions required,
- Source of input data, and format required or desired for the output data,
- Model calibration and verification needs and preferred procedures if any,
- Money and time available for modeling,
- Extent (duration) of the simulations to be performed,
- Desired performance measures, other than variables being simulated, if any,
- Alternative scenarios to be modeled (i.e., number of simulation runs needed),
- Other analyses or model applications that may or will need the output from this model application,
- Sensitivity and uncertainty analyses needed, and for which decision variables and why,
- Client contact person,
- Requirements for intermediate reviews of results or needs for periodic review of modeling application process logs and documents, and
- Other particular requirements or needs.

The use of a model nearly always takes place within a broader context. The model itself can also be part of a larger whole, such as a network of models in which some are using the outputs of other models. These conditions may impose constraints on the simulation modeling project. All these considerations need to be specified in the modeling application request.

Along with the proposal, there should also be a simple order-of-magnitude estimate of the expected values of all relevant decision variables based on simple mass-balance analytical solution methods that can be used without requiring a computer. These estimated values should be used to validate (check the reasonableness of) selected portions of the model runs. If there are any serious discrepancies, it may signify a major problem in the model output.

Is all this paperwork useful? It is to the extent it leads to a more effective and efficient use of personnel, money and time. Preparing a formal modeling application request requires some serious thought as to just why this is necessary and just what information is needed to further the project or analysis. It involves defining the objectives that are to be accomplished. Writing this down in some detail helps reduce the differences in perception that can exist between those who need information and those who are going to provide that information (IMC or a contractor). The problem as stated is often not the problem as understood, by either

the client or the model user. In addition, problem perceptions and modeling objectives can change over the duration of a project. One should ask and answer the question of whether or not modeling in general is the right way to obtain the needed information. What are the alternatives to modeling?

The objective of any modeling project should be clearly understood with respect to the domain and the problem area, the reason for using a particular model, the questions to be answered by the model, the model assumptions and limitations, and the scenarios to be modeled. Throughout the project these objective components should be checked to see if any have changed and if they are being met.

If IMC is to serve as a central point to coordinate CALSIM II-related modeling activities, and to provide modeling services, it needs to have the authority to do so. This authority extends to giving advice on issues related to model and input data selection, and for reviewing, approving and prioritizing requests for services. Should contractors be involved in particular model applications, IMC must be authorized to specify the technical terms to be met and oversee the work done by the contractor. Finally IMC will need the financial and human resources needed to do this in a timely manner.

Modeling Application Documentation

One common problem of model studies once they are underway occurs when one wishes to go back over a series of simulation results to see what was changed or why a particular simulation was made or what was learned. It is also commonly difficult if not impossible for third parties to continue from the point at which any previous modeling project was terminated, especially if some time has passed. These problems are caused by a lack of information on how the study was carried out. What was the pattern of thought that took place? Which actions and activities were carried out? Who carried out what work and why? What choices were made? How reliable are the end results? These questions should be answerable if a model journal is kept. Just like computer programming documentation, modeling project documentation is often neglected under the pressure of time and perhaps because writing it is not as interesting as running the models themselves.

The paper trail of what has happened, what assumptions have been made, how calibration and verification were carried out, what results were obtained, why changes, if any, were made, what sensitivity analysis procedures were used and their results, and so on, could be contained in a modeling application documentation (MAD). Once the model application is completed, a copy of the MAD should be given to the requesting agency, as applicable and a copy should remain in IMC. These reports, or at least a summary of them, should be available for downloading from the web. Should further model applications be requested and approved, the requester as well as the IMC can refer to this previously prepared documentation to better understand what was done previously that pertains to the current request.

Model Calibration

Once a model is tested satisfactorily, it can be calibrated. Calibration of models such as CALSIM II are difficult because there are no historical observations of future scenarios to compare with model results. Historical runs, such as have been made, can provide some basis for calibration. In general the smaller the deviation between the calculated model results and the field observations, the better the model. This is true to a certain extent, as the deviations in a perfect model are only due to measurement errors. In practice, however, a good fit is by no means a guarantee of a good model.

The deviations between the model results and the field observations can be due to a number of factors. These factors include possible software errors, inappropriate modeling assumptions such as the (conscious) simplification of complex structures, neglecting certain processes, errors in the mathematical description or in the numerical method applied, inappropriate parameter values, errors in input data and boundary conditions, and measurement errors in the field observations.

To determine whether or not a calibrated model is a 'good' predictor, it should be validated or verified. Calibrated models should be able to reproduce field observations not used in calibration. Validation can be carried out for calibrated models if an independent data set has been kept aside for this purpose. If all available data are used in the calibration process in order to arrive at the best possible results, validation will not be possible. A decision to leave out validation may be a justifiable one especially when data are limited.

Philosophically it is impossible to know if a simulation model of a complex system is 'correct'. There is no way to prove it. Experimenting with a model, such as by carrying out multiple validation tests, can increase confidence in that model. After a sufficient number of successful tests, one might be willing to state that the model is 'good enough', based on the modeling project requirements. The model can then be regarded as having been validated, at least for the ranges of input data and field observations used in the validation.

If model predictions are to be made for situations or conditions for which the model has been validated, there may be some confidence in the reliability of those predictions. Yet one cannot be certain. Much less confidence can be placed on model predictions for conditions outside the range for which the model was validated.

While a model should not be used for extrapolations as commonly applied in predictions and in scenario analyses, this is often exactly the reason for the modeling project. What is likely to happen given events we have not yet experienced? A model's answer to this question should also include the uncertainties attached to these predictions. Depending on the type of model selected and used, one might end up predicting an incorrect future with great accuracy, or predicting the correct future with great uncertainty'. We don't yet know how to predict the correct future with great accuracy – so we do 'what ifs'. One can then argue about what scenarios – the ifs – are the most reasonable or probable, or about the impacts from improbable scenarios that you want to avoid should such scenarios occur.

Use the model

Once the model has been judged 'good enough,' the model may be used to obtain the information desired. Close communication between the client and the modeler during the modeling application process is essential to avoid any unnecessary misunderstandings about what information is wanted and the assumptions on which that information is to be based.

Before the end of this model-use step one should determine whether all the necessary simulations have been performed and whether they have been performed well. Questions to ask include

- did the model fulfill its purpose?
- are the results valid?
- are the quality requirements met?
- was the discretization of space and time chosen well?
- was the choice of the model restrictions correct?
- was the correct model and/or model program chosen?
- was the numerical approach appropriate?
- was the implementation performed correctly?
- what are the sensitive parameters (and other factors)?
- was an uncertainty analysis performed?

If any of the answers to these questions is no, then the situation should be corrected. If it cannot, the reason(s) for why it cannot be corrected should be documented in the model application document (MAD).

Interpret model results

Interpreting the information resulting from models is a crucial step in the modeling application process, especially in situations in which the client may only be interested in those results and not the way they were obtained. The model results can be compared to those of other similar studies. Are the results consistent? IMC must make that judgment. Any unanticipated results should be discussed and explained. The results should be judged with respect to the modeling project objectives.

The results of any modeling project typically include large files of time-series data. Only the most dedicated of clients will want to read those files. Thus these data must be presented in a more concise form. Statistical summaries should explicitly include any restrictions and uncertainties in the results. They should identify any gaps in the domain knowledge, thus generating new research questions or identifying the need for more field observations and measurements.

Report model results

Once the modeling application is completed, the organization doing the modeling will be responsible for preparing a report. The contents of this report should conform to the agreement

made between modeling organization and the client prior to the initiation of the modeling application (see above). Although the results of a model are very rarely used as the sole basis for policy decisions, those requesting model applications may have a responsibility to translate their model results into policy recommendations. Policymakers, managers, and indeed the participating stakeholders typically want simple and clear unambiguous answers to complex questions. Much of the scientifically justified discussion, say regarding the uncertainties associated with some of the data, included in the main body of a report are not included in the executive summary of that report. This executive summary is often the only part read by those responsible for making decisions. Therefore, the conclusions of the model study must not only be scientifically correct, but also concisely formulated, without jargon, and fully understandable by managers and policymakers. When preparing or reviewing contractor model results reports, the IMC should consider this need.

These model application and model results reports should include sufficient detail to allow others to reproduce the model study (including its results) and/or to proceed from the point where this study ended. The report therefore requires a clear indication of the validity, usability and any restrictions of the model results.

Data Management

CALSIM II and its associated or linked models will require data. They will also produce data. Many of these data will have spatial and temporal dimensions. This information must be documented (meta data), preserved, and made accessible to IMC customers, coordination agencies and others. IMC should participate in data management strategic development, storage, documentation and dissemination. It should work with data base managers of various agencies to help them satisfy the IMC's data management requirements.

The availability of quality assured data is a critical dependency that must be met to facilitate timely completion of model development, implementation and application. To mitigate the impact of the availability of data on the timeline for the major model completion deadlines, the following issues should be addressed. :

- Updating land use / land cover data at regular and timely intervals.
- Developing and maintaining a common modeling database. This data base should include infrastructure design and operating policy data as well as water quality, ecological, land use, economic and of course hydrological data. Many of these data sets will have spatial as well as temporal dimensions. Each data set should have an associated metadata file.
- Pre-processed and post-processed datasets from previous model runs should be archived along with its metadata file in a central location for ease of access and availability.
- Measures to insure the consistency and quality of the input data.
- Measures to insure adequate communication among model developers, users and stakeholders. This includes measures to assist in developing documentation appropriate for each type of stakeholder.

Support of IMC activities

Common failures of IMC type organizations are typically due to:

- Insufficient staff to enable cross-training. This may lead to the dependency on one person or a very small group of employees for each sub module or the overall effort.
- Inadequate funding to institute good project management discipline.
- Inadequate funding to contract for technical writers and software engineers.
- Inadequate funding to contract for peer reviews.

Risk assessments

A risk assessment of CALSIM II and its associated models and data should be completed. The timely availability of quality assured data for example, is a risk. Project risk management includes the processes concerned with identifying, analyzing, and responding to uncertainties. Risk management attempts to minimize the results of adverse events. As a guide, the template, such as shown at the end of this Appendix, may be used to facilitate the assessment of risks.

Problem Management

Given the high visibility and criticality of the CALSIM II modeling effort an issue or problem management process should be developed within IMC. Issue/problem management includes the process for identifying, communicating, and resolving issues and problems.

The purpose of this procedure is to ensure that:

- Issues are identified, reported, managed, and resolved in a timely and effective manner. Responsibility is assigned to an owner for reporting, managing and resolving each issue
- All affected stakeholders are aware of the status of the issues
- Escalation of unresolved issues take place according to a defined procedure

In order to ensure that project issues and problems are appropriately managed various issue/problem management steps should be identified and followed to track the actions taken to resolve the issue or problem throughout the life of a modeling project.

B. Managing Peer Reviews

One means of quality control involves peer reviews of the models, their associated software, and their applications. One possible means of facilitating the peer review processes and for maintaining control on the particular versions of CALSIM II and accompanying models used for SWP-CVP planning and management decisions is another reason to create an interagency modeling consortium (IMC) consisting of DWR, USBR, and other stakeholder organization personnel if they are interested and want to participate. As suggested above, this consortium could be responsible for maintaining a toolbox of 'acceptable' peer-reviewed models for use by the agencies and contractors. The peer reviews should be of the theory underlying each

model, the model's software, the documentation of that software, the model's functions and capabilities including those pertaining to model data input and output, model calibration and verification, sensitivity analyses, uncertainty analyses, user control (GUIs), spatial and temporal resolutions, limiting assumptions, and on the model (as opposed to code) documentation.

Just having evidence of published articles about a particular model in peer reviewed journals is not a substitute for a peer review of the model software and its applicability or suitability for certain types of analyses for SWP-CVP. Peer reviews of all models, their software, and their use should be accomplished by experts both within and outside of the originating agencies. 'Inside' agency (or internal) reviews may uncover some needed changes and identify other issues or problems that external reviewers could be asked to specifically examine and address. Internal reviews can make the external review process more effective, less costly and less time consuming.

Peer reviews are considered a key process area for Level 3 and higher of the Capability Maturity Model guidelines for improving the software process (Carnegie Mellon University, 1994). The purpose of peer review evaluations is to find defects in the model formulation and software and in its use, i.e., model application. Peer reviewers can also identify possible ways of correcting those defects, if any. If there are no defects, or after all known defects have been corrected, both the developers and users of any model and its software can have a stronger basis for believing that their product and its output are reliable.

Peer reviews serve the same function as accountants. Once a firm's financial records have been peer reviewed by accountants (assuming they are qualified, objective and honest) the board of directors as well as the stockholders will have more assurance of the liabilities and net worth of their firm, and just how well it is being managed. In this case it is the assurance of the quality of the models, their software, and on their use in project evaluations, that actual and potential users of the model results depend upon.

The types of problems and issues for which a model, its software, and its documentation are designed to address are called the model's 'application niche'. Peer review of model development should include the evaluation of the intended application niche along with consideration of other aspects of model performance. Users of any model should be aware of the types of analyses for which the model is best suited and those for which the model is not well suited. This, along with the results of a peer review of any model application, should help the potential model user, or the user of the model results, better understand the limitations of the scientific basis of the model and just how much confidence can be placed on the model output.

Peer review triggers

Clearly judgment will have to be exercised as to just when and in what detail a peer review needs to be implemented. However the triggers on when a decision about a peer review needs to be made can be defined.

As shown in Figure 2, decisions regarding peer review are needed when models are proposed for the tool box and when model applications are completed. Should IMC decide a peer review is warranted when either of those events takes place, they will have to decide on the type of review and its level of detail. They will also need to identify the individuals to be asked to carry out that peer review.

Peer reviews are going to take time and cost money. They will also require IMC time to prepare the documentation needed for the peer reviewers and to read and act on reports prepared by the peer reviewers. This will apply if the peer review is internal or external.

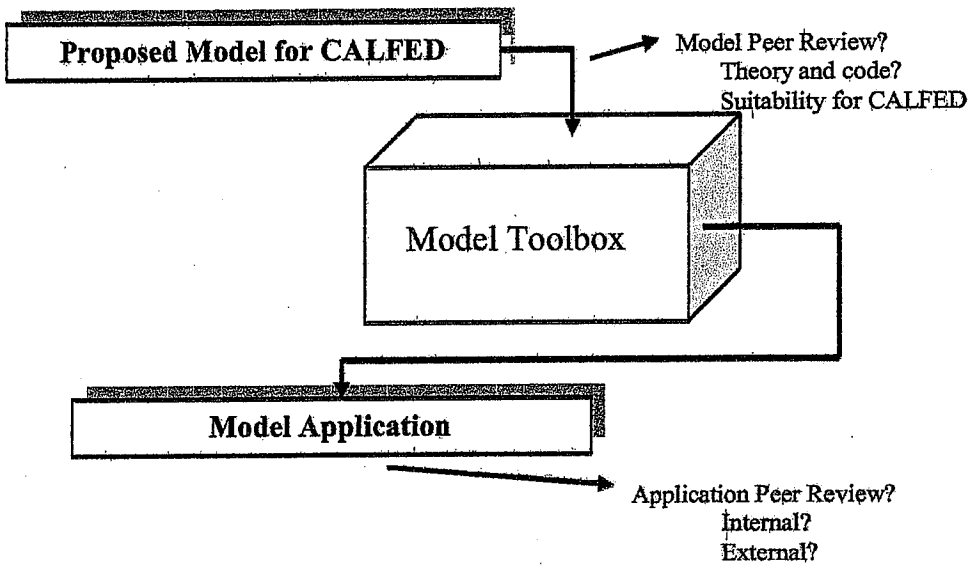


Figure 2. Schematic showing events where a peer review decision can be made.

The particular models and their associated software and documentation to be peer reviewed should be identified by the individuals or departments or agencies. This can include model process descriptions, software source code, documents, test results, and other supporting materials, as needed, for an adequate peer review of the entire model and its software. These products to be reviewed should be identified in writing and a written history of the review of different versions of each item should be maintained.

Events that take place in the progression of model development and use and subsequent modifications that warrant a peer review should be identified and specified in a written document. (This fits in to the model development and use documentation that should be maintained for Level 3 or higher CMM) When these events take place a peer review process should be considered, and if warranted, implemented. Depending on the event, the review can be solely internal, or it can involve an independent external review team as well.

Model application reviews should include an evaluation of the intended model application niche, and its applicability to current needs. Peer review may be appropriate for existing models when new information becomes available that could negate some or all of the conclusions of previous reviews or suggest a change in the currently specified application niche. Peer review of a model's applicability to a particular study should be planned well in advance of when model results are needed. The results of application reviews can influence the decisions made based on the model outputs. Once a peer review has been conducted for a particular model and its input data, peer reviews of subsequent applications of a model with similar inputs might be unnecessary. However, any time the model results may be controversial, or end up in litigation, another peer review may be justified.

Peer Review Process

The extent and process of performing and responding to peer reviews can vary in any organization. The ones discussed in this section attempt to follow the processes recommended by the Capability Maturity Model Level 3 guidelines.

Project peer review process should be specified in writing. A first step in this process should be to identify the particular modeling products and processes that will undergo peer review. This includes the models (i.e. the processes being modeled and the assumptions built into the models for describing these processes), their supporting software, the documentation of the model and its software, as well as all the written guidelines on how the models are to be used.

A second step is to perform an internal peer review prior to a model's use for project evaluation. It should be peer reviewed for accuracy, its suitability for use, and for identifying any possible errors in its logic, its coding, or in its documentation. Following an internal review, an external peer review can be performed.

Following the successful conclusion of internal and external peer reviews of a model and its documentation, the model can be applied to evaluate alternative projects. After the model has been applied to a particular project, the modeling process and its results should be peer reviewed to insure that the model has been applied properly, that the input data were appropriate, and that the conclusions drawn were valid.

Peer review teams should be selected, along with a peer review team leader. The particular personnel on the team will depend on the particular model and its software and documentation being reviewed. CALFED should have a list of qualified peer reviewers representing all applicable disciplines, both internal and external, that it can call upon to perform these reviews. The peer reviews are to be of the models and their use, not of the people who developed or used them. The reviews are to be used to evaluate the quality of modeling products and processes, not of the personnel involved.

Establishing and carrying out ongoing peer review processes costs money. Adequate funding must be made available to

1. identify and recruit a peer review team and team leader
2. prepare and distribute the peer review materials to the peer review team
3. support the time required for the team to review the materials prior to a team meeting
4. support the team meeting and to participate in it as appropriate (e.g., answering questions, conducting model experiments and sensitivity analyses, etc.)
5. reproduce and distribute the team report and to take actions as needed
6. monitor the modifications or changes being made to the model, its software, and its documentation, or redoing the model application, as needed.
7. prepare and distribute to model developers and potential users a report on the results of the peer review and the actions taken.

The particular peer review process may depend on just what is being peer reviewed and the resources and time available to perform the review. In general, however, the steps of a peer review could include the following:

1. DWR or CALFED should identify and establish a pool of possible reviewers representing various disciplines, with sufficient redundancy to allow for scheduling conflicts when ever some subset of those reviewers are needed. This includes both internal as well as external reviewers. What ever administrative work is need to establish this pool should be completed prior to when these reviewers will be needed.

2. At particular milestones in any new model development or in model application an internal peer review process could be initiated, to examine the modeling assumptions, the software that implements those assumptions in the case of model development or the data being used for model inputs in the case of model applications, and the documentation being prepared to describe the processes, to document the software code, and to document the tests that were run to test the code, or to document the results of the model application. If deemed appropriate, an external peer review could also be performed. If an external review is to take place, the particular reviewers need to be selected, notified, sent supporting documents, and be scheduled for one or more meetings, as needed. They should be issued contracts specifying the requirements (the checklist of items to be reviewed) and products expected.

3. Recommendations made by the peer review team need to be addressed and the actions taken along with the rationale for those actions should be documented.

4. The peer review team should review the actions taken and the results obtained from these actions. If not judged acceptable new recommendations should be made and submitted. A final report should be prepared by the peer review team when all recommendations have been successfully implemented or addressed, or if no further actions based on review team's recommendations will be taken by the model developers or users.

The time and effort required for various levels of review should also be assessed and provided to the review team so that they can carry out the level of review requested of them. Otherwise the reviews may be superficial and while appearing to be peer reviewed, a model and its

associated products may in fact be inadequately reviewed. Peer review teams have the responsibility to specify in writing the scope and limitations of their reviews.

As was the case for this peer review panel, the materials to be sent to the review team to allow them to prepare for their meeting should include the statement of review objectives and the level of detail desired, the applicable requirements and standards upon which to judge the adequacy of the products being reviewed, and of course the material that is to be reviewed. There should be a list of questions for the reviewers to address. Each review team member should be assigned and given responsibility for answering specific questions and for completing specific aspects of the overall review. All team members should be given specific review standards or requirements, including the expected completion dates. Checklists should be provided the review team that are applicable to the specific type of product being reviewed and the level of detail to be examined. These checklists will contain the criteria for judging the product, such as compliance with any standards and procedures, completeness, correctness, rules of construction, and maintainability.

Peer Review Issues and Questions

Each model development or application review will dictate its own special set of questions to be addressed. Some of these questions could relate to:

- Model Purpose and Objective
  - Use of model related to decisions being considered.
  - Model application niche, and why.
  - Model strengths and weaknesses –is it the best model?
- Model Processes and Limitations
  - Model processes, spatial and temporal scales, grid resolution.
  - Model variables and level of aggregation.
- Model Theoretical Basis
  - Model algorithms, numerical or analytical methods,
  - Model process formulation
  - Modeling approach in comparison with other models
  - Any shortcomings in relation to application niche
- Model Parameter Estimation
  - Methods used
  - Data available for parameter estimation
  - Parameter estimate reliabilities
  - Boundary conditions and appropriateness.
- Model Input Data Quantity/Quality
  - Data used in design of model
  - Data adequacy (quantity, quality, resolution) for model purpose and application
  - Data necessary for application of model
  - Key data gaps in model application
  - Additional data needs and why
- Model Key Assumptions
  - Basis for major assumptions

- Sensitivity of model outputs to key assumptions
- Sensitivity of potential decisions to key assumptions
- Ease in modifying key assumptions

- Model Performance Measures
  - Criteria for assessing model performance
  - Correspondence of model output with measured observed data
  - Any model bias throughout range of model predictions
  - Variability and uncertainty analyses and representations in model results
  - What determines model's variability and uncertainty.
  - Model performance relative to others in application niche
- Model Documentation and User's Guide
  - Clarity of documentation, comprehensiveness of user's guide
  - Model applicability and limitations
  - Input data requirements for calibration, verification, model runs
  - Post modeling analyses, display and interpretation of results
  - Model code documentation
  - Model application documentation examples for prospective users.
- Review Retrospective
  - How well model and its application meet objectives and needs of project
  - Possible changes in the model to improve model performance
  - Robustness of model solutions to small changes in uncertain parameters, etc.
  - Ease of including uncertainty analyses associated with uncertain input data.
  - Key research needs for model improvement.

Peer Review Completion Reports

Procedures need to be established to track and confirm actions based on suggested changes or modifications in the material being reviewed. Once these actions are taken and completed, and documented, the peer review process for that particular product is completed. Peer review completion reports should contain data on what was reviewed and the results of the review. These data should include a description of the products that were reviewed, the level of detail of the review, any review limitations or qualifications, the number and backgrounds of the reviewers, the time spent preparing for and during review team meetings, the defects found and recommendations made, and the actions taken to address these recommendations.

Overall Peer Review Evaluations

The IMC or initiating agency should document the planning for and scheduling of peer reviews. The products to be reviewed and the level of detail to be examined also need to be specified. The procedures to be followed for selecting peer review team members, and the team leader, should also be determined and documented. Procedures for training potential reviewers, if such training is needed, should be identified and implemented, as required.

Periodically the IMC or applicable agency should assess just how well the plan described in the preceding paragraph is being carried out, and just how beneficial these peer reviews are to the overall modeling effort. Measures should be identified and used to determine the status of the

peer review activities. These measures could include the number of completed peer reviews performed compared to the number expected to be performed, the overall effort expended on peer reviews compared to that expected, and the number and extent of peer review recommendations requiring actions.

At a minimum these periodic reviews should verify that

1. The planned peer reviews and/or audits are conducted.
2. The peer review leaders are adequately trained for their roles.
3. The reviewers are properly trained or experienced in their roles.
4. The processes for preparing for and conducting peer reviews, and for following up on reviewer's recommendations are adequate and are being followed.
5. The reporting of peer review results is complete, accurate, timely and is being made available to model users.

Risk Management Template

Risk Definition Name	Enter a short name that uniquely defines the risk
Risk #	Enter a unique number assigned to the risk. Range starts with 1 and continues.
Date Risk Identified	Enter the date the risk was identified
Risk Identification Source	Enter the source of the risk identification. In example, meeting name, group, or person.
Risk Owner	Enter the name of the person who will be responsible for ensuring the risk is approved, managed, periodically assessed, communicated, and tracked through closed or transfer.
Risk Detailed Description	Enter a detailed description of the risk so that a reader clearly understands the risk.
Probable Impact of Risk on Project (H, M, L)	Enter the impact on the project. o High = the risk will most likely occur and the impact could prevent the project from achieving its purpose. o Medium = there is a 50/50 change the risk would occur and the impact is serious but the project could still achieve its purpose if appropriately managed. o Low = there is a low probability that the risk would occur and minimal impact to the project's purpose.
Probable Impact of Risk on Project Costs	Enter the impact on the project in dollars. Determine what the potential cost to the project would be if the risk occurs.
Probable Impact of Risk on Project Schedule	Enter the schedule impact on the project. Determine how the schedule would be potentially impacted if the risk occurs.
Probable Impact of Risk on Project Results	Enter the impact on the project. Determine how the overall project purpose and results will be potentially impacted if the risk occurs.
Detailed Plan to Mitigate or Transfer Risk	Enter the detailed plan to mitigate the risk or a statement that the risk will be accepted. Mitigation could include ways to minimize, avoid, or transfer the risk to another party or group. Risk transfer would include evidence of agreement by the accepting party.
Detailed Project Action Items Required to Mitigate or Transfer Risk	Enter the detailed action items required to mitigate the risk. These items will be summarized and assigned within the project Action Log, along with an action item owner, and target completion date.
Detailed Project Plan Tasks Required to Mitigate Risk	Enter the detailed project plan task required to mitigate the risk. These items will be summarized and contained within the MS Project Schedule along with the effort, duration, schedule, and assigned resources.
Comments	Enter any permanent comments that cannot be included in the above items.
Referenced Documents	Enter any documents that a reader should consider in understanding, analyzing, mitigating, or accepting this risk.
Date Risk Closed	Enter the date this risk was closed. This would include when all action items or project tasks were completed, or the risk was transferred to another party or group.

Appendix F: Analysis of the November 2003 CALSIM II Validation Report

The following comments come from an analysis of the model results presented in the validation report *'CALSIM II Simulation of Historical SWP/CVP Operations'*, DWR (2003). The observations relate to the formulation of the model at November 2003. Changes might be made to that formulation which could resolve these issues.

Overestimation of Project Deliveries

The validation run suggests that the modeled demands included in CALSIM II overestimate the actual demands. CVP demands south of the Delta are assumed to be always equal to the contract entitlement whereas the observed deliveries in unrestricted years are consistently less than this amount. The modeled North of Delta deliveries are also consistently higher than observed. The modeled and observed CVP deliveries from the validation report are listed in Table 1.

Table 1. Comparison of modelled and observed CVP deliveries (1975-1998)

Project	Simulated Delivery (Taf/yr)	Historical Delivery (taf/yr)	Difference (taf/yr)	% Difference
CVP North of Delta	1960	1750	210	12
CVP South of Delta	2650	2490	160	6.4

Because the SWP south of delta demands were set to historical deliveries in many years, comparison with the historical deliveries in the validation report is of limited validity. However the fact that the historical SWP deliveries over the last ten years have averaged only 2385 taf/year while the modeled 'year 2001 development' SWP Delta deliveries reported in the 2002 State Water Project Delivery Reliability Report average 3090 taf/year, suggests that modeled SWP deliveries may also be too high.

Allocations to Project Contractors

Seasonal allocations to SWP and CVP contractors are made on the basis of water in storage, forecast inflows, projected carryover storage requirements and in-Basin and Delta regulatory requirements. The allocation processes used by the operators and those used by CALSIM II, are not identical. An examination of the way that CALSIM II has restricted project deliveries during the dry period of 1987-1992 (Figures 10, 16, 17 and 24 of the validation report) suggests that CALSIM II has allocated less water in the early years of the dry sequence than occurred in practice and consequently had more water available in 1991 and 1992 when the most severe restrictions were experienced. The carryover storage rules adopted can have a significant impact on the expected frequency and severity of water supply restrictions. The

model rules need to be examined to ensure that the accurately reflect the way the system will be managed in the future.

San Luis Reservoir Operation

The rules used by the system operators for transferring water from headwater storages to the San Luis Reservoir can have a significant impact on:

- the pattern of flow in the Delta,
- the operation of accounting rules between the SWP and the CVP and
- opportunities for SWP wheeling of CVP water and possibly the availability of Article 21 water to SWP contractors.

A comparison of the modeled and observed storage behavior of the SWP component of San Luis (Figure 15) reveals that the model consistently underestimates the volume in storage. A comparison of the CVP component of the storage (Figure 23) indicates that the actual storage is filled earlier in the season and that the actual storage is also slightly higher than the modeled.

Users of CALSIM II output need to be confident that the rules adopted by the model for determining these transfers reflect the way this component of the system will be operated in the future.

Appendix G: Some Principles for Strategic Water Analysis for the California Water Plan Bulletin 160-03 (from the stakeholder review Draft, Sept. 30, 2003)

Strategy:

1) A frequently amended strategic document will lay out DWR's strategic analysis framework and identify the technical objectives, roles, and responsibilities of major DWR data collection efforts and analytical tools and their interactions and their responsible managers.

Transparency:

2) All data and models should be in the public domain and available on the web.
3) All data and models should have significant documentation.
4) Known limitations should be documented.

Longer-term viability:

5) Modularity: Major analytical tools will be designed and implemented to fit modularly and explicitly within the larger strategic analysis framework.
6) Adaptive data management framework: Major data efforts will fall within a larger data management framework, including protocols for data documentation and updating, and documentation of limitations.
7) A frequently-updated document will outline short-term and long-term efforts, budgets, and responsibilities for continuous improvement of analytical tools and data, with policy for continued user, local agency, and stakeholder involvement.

Coverage:

8) Spatial coverage for the basic data and analytical framework will be statewide.
9) Local and regional water management and resources will be explicitly represented.

Accountability and Quality Control:

10) In developing analytical tools, systematic efforts should be made to involve local agencies and stakeholders.
11) Major analytical products will undergo external review by a) external unaffiliated experts and b) local agencies whose systems are included in the model. User groups will exist for all major analytical products.
12) DWR's strategic analysis framework will undergo periodic internal and external review.

Appendix H: Model Sensitivity and Uncertainty Analysis

(This is a draft of a book chapter by DPL/JRS that may be useful for CALSIM II developers)

1. **Introduction**
2. **Issues, concerns, and terminology**
3. **Variability and uncertainty in model output**
   - 3.1 **Natural variability**
   - 3.2 **Knowledge uncertainty**
   - 3.3 **Decision uncertainty**
4. **Sensitivity and uncertainty analyses**
   - 4.1 **Sensitivity Analyses**
   - 4.2 **Uncertainty Analyses**
5. **Performance indicator uncertainties**
   - 5.1 **Performance measure target uncertainty**
   - 5.2 **Distinguishing differences between performance indicator distributions**
6. **Communicating model output uncertainty**
7. **Conclusions**
8. **References**

The usefulness of any model is in part dependent on the accuracy and reliability of its output data. Yet, because all models are imperfect abstractions of reality, and because precise input data are rarely if ever available, all output values are subject to imprecision. The input data and modeling uncertainties are not independent of each other. They can interact in various ways. The end result is imprecision and uncertainty associated with model output. This chapter focuses on ways of identifying, quantifying, and communicating the uncertainties in model outputs.

1. Introduction

Models are the primary way we have to estimate the multiple affects of alternative water resource system design and operating policies. Models predict the values of various system performance indicators. Model outputs are based on model structure, hydrologic and other time-series inputs and a host of parameters whose values describe the system being simulated. Even if these assumptions and input data reflect, or are at least representative of, conditions believed to be true, we know they will be wrong. Our models are always simplifications of the

real systems we are studying. Furthermore, we simply cannot forecast the future with precision. So we know the model outputs of future conditions are uncertain estimates, at best.

Some prediction uncertainties can be reduced by additional research and data collection and analysis. Before undertaking expensive studies to gather and analyze additional data it is reasonable to ask what improvement in estimates of system performance or what reduction in the uncertainty associated with those estimates would result if all data and model uncertainties could be reduced. Such information helps determine how much one would be willing to 'pay' to reduce prediction uncertainty. If prediction uncertainty on average is costing a lot, it may pay to invest in additional data collection, more studies, or in better models all aimed at reducing that prediction uncertainty. If that uncertainty has no, or only a very modest, impact on the likely decision that is to be made, one should find other issues to worry about.

If it appears that reducing prediction uncertainty is worthwhile, then one should consider how best to do it. If doing this involves obtaining additional information, then it is clear that the value of this additional information, however measured, should exceed the cost of obtaining it. The value of such information will be the increase in system performance, or the reduction in its variance, that one can expect from obtaining such information. If additional information is to be obtained, it should be that information which reduces the uncertainties considered important, not the unimportant ones.

This chapter reviews some methods for identifying and communicating model prediction uncertainty. The discussion begins with a review of the causes of risk and uncertainty in model output. It then examines ways of measuring or quantifying uncertainty and model output sensitivity to model input imprecision, concentrating on methods that seem most relevant or practical for large-scale regional simulation modeling. It builds on some of the statistical methods reviewed in Chapter III and the modeling of risk and uncertainty in Chapter VI.

2. Issues, concerns, and terminology

Outcomes or events that cannot be predicted with certainty are often called risky or uncertain. Some individuals draw a special and interesting distinction between risk and uncertainty. In particular, the term risk is often reserved to describe situations for which probabilities are available to describe the likelihood of various events or outcomes. If probabilities of various events or outcomes cannot be quantified, or if the events themselves are unpredictable, some would say the problem is then one of uncertainty, and not of risk. In this chapter what is not certain is considered uncertain, and uncertainty is often described by a probability distribution. When the ranges of possible events are known and their probabilities are measurable, risk is called objective risk. If the probabilities are based solely on human judgment, the risk is called subjective risk.

Such distinctions between objective and subjective risk, and between risk and uncertainty, rarely serve any useful purpose to those developing and using models. Likewise the distinctions are often unimportant to those who should be aware of the risks or uncertainties associated with system performance indicator values.

Uncertainty in information is inherent in future-oriented planning efforts. Uncertainty stems from inadequate information and incorrect assumptions, as well as from the variability of natural processes. Water managers often need to identify both the uncertainty as well as the sensitivity of, or changes in, system performance indicator values due to the any changes in possible input data and parameter values from what were predicted. They need to reduce this level of uncertainty to the extent practicable. Finally, they need to communicate the residual uncertainties clearly so that decisions can be made with this knowledge and understanding.

Sensitivity analysis can be distinguished from uncertainty analysis. Sensitivity analysis procedures explore and quantify the impact of possible errors in input data on predicted model outputs and system performance indices. Simple sensitivity analysis procedures can be used to illustrate either graphically or numerically the consequences of alternative assumptions about the future. Uncertainty analyses employing probabilistic descriptions of model inputs can be used to derive probability distributions of model outputs and system performance indices. Figure 1 illustrates the impact of both input data sensitivity and input data uncertainty on model output uncertainty.

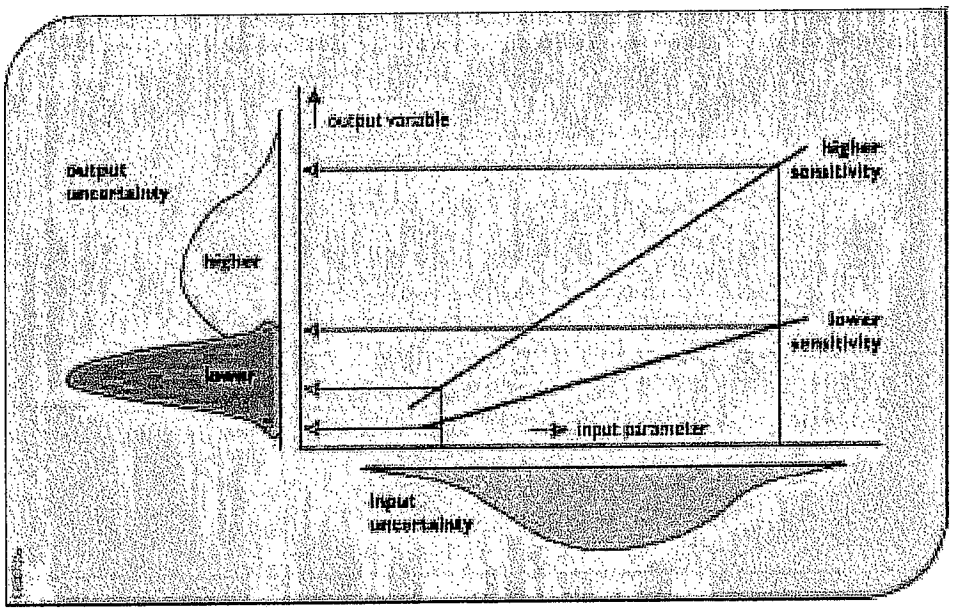


Figure 1. Schematic diagram showing relationship among model input parameter uncertainty and sensitivity to model output variable uncertainty (Lal, 1995).

It is worthwhile to explore the transformation of uncertainties in model inputs and parameters into uncertainty in model outputs when conditions differ from those reflected by the model inputs. Historical records of system characteristics are typically used as a basis for model inputs. Yet conditions in the future may change. There may be changes in the frequency and

amounts of precipitation, changes in land cover and topography, and changes in the design and operation of control structures, all resulting in changes of water stages and flows, and their qualities, and consequently changes in the impacted ecosystems.

If asked how the system would operate with inputs similar to those in the historical database, the model should be able to interpolate within the available knowledge base to provide a fairly precise estimate. Still that estimate will not be perfect. This is because our ability to reproduce current and recent operations is not perfect, though it should be fairly good. If asked to predict system performance for situations very different from those in the historical knowledge base, or when the historical data are not considered representative of what might happen in the future, say due to climate change, such predictions become much less precise. There are two reasons why. First, our description of the characteristics of those different situations or conditions may be imprecise. Second, our knowledge base may not be sufficient for calibrating model parameters in ways that would enable us to reliably predict how the system will operate under conditions unlike those that have been experienced historically. The more conditions of interest are unlike those in the historical knowledge base, the less confidence we have that the model is providing a reliable description of systems operation. Figure 2 illustrates this issue.

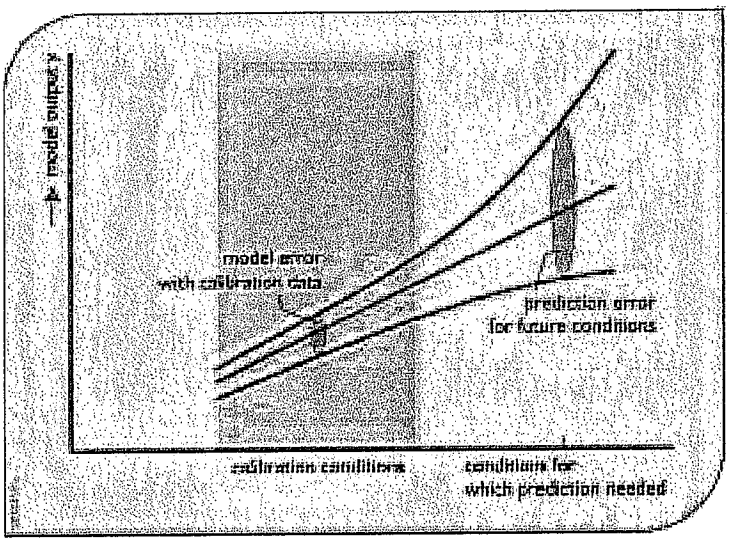


Figure 2. The precision of model predictions is affected by the difference between the conditions or scenarios of interest and the conditions or scenarios for which the model was calibrated.

Clearly a sensitivity analysis needs to consider how well a model can replicate current operations, and how similar the target conditions or scenarios are to those described in the

historical record. The greater the required extrapolation from what has been observed, the greater will be the importance of parameter and model uncertainties.

The relative and absolute importance of different parameters will depend on the system performance indicators of interest. Seepage rates may have a very large local effect, but a small global effect. Changes in system-wide evapotranspiration rates will likely impact system-wide flows. The precision of model projections and the relative importance of errors in different parameters will depend upon the:

(1) precision with which the model can reproduce observed conditions,
(2) difference between the conditions predicted and the historical experience included in the knowledge base, and the
(3) system performance characteristics of interest.

Errors and approximations in input data measurement, parameter values, model structure and model solution algorithms, are all sources of uncertainty. While there are reasonable ways of quantifying and reducing these errors and the resulting range of uncertainty of various system performance indicator values they are impossible to eliminate. Decisions will still have to be made in the face of a risky and uncertain future. Decisions can be modified as new data and knowledge are obtained in a process of adaptive management.

There is also uncertainty with respect to human behavior and reaction related to particular outcomes and their likelihoods, i.e., to their risks and uncertainties. As important as risks and uncertainties associated with human reactions are to particular outcomes, they are not usually part of the models themselves. Social uncertainty may often be the most significant component of the total uncertainty associated with just how a water resource system will perform. For this reason we should seek designs and operating policies that are flexible and adaptable.

When uncertainties associated with system operation under a new operating regime are large, one should anticipate the need to make changes and improvements as experience is gained and new information accumulates. When predictions are highly unreliable, responsible managers should favor actions that are robust (e.g., good under a wide range of situations), gain information through research and experimentation, monitor results to provide feedback for the next decision, update assessments and modify policies in the light of new information, and avoid irreversible actions and commitments.

3. Variability and uncertainty in model output

Differences between model output and observed values can result from either natural variability, say caused by unpredictable rainfall, evapotranspiration, water consumption, and the like, and/or by both known and unknown errors in the input data, the model parameters, or the model itself. The later is sometimes called knowledge uncertainty but it isn't always due to a lack of knowledge. Models are always simplifications of reality and hence 'imprecision' can result. Sometimes imprecision occurs because of a lack of knowledge, such as just how a

particular species will react to various environmental and other habitat conditions. Other times known errors are introduced simply for practical reasons.

Imperfect representation of processes in a model constitutes model structural uncertainty. Imperfect knowledge of the values of parameters associated with these processes constitutes model parameter uncertainty. Natural variability includes both temporal variability and spatial variability, to which model input values may be subject.

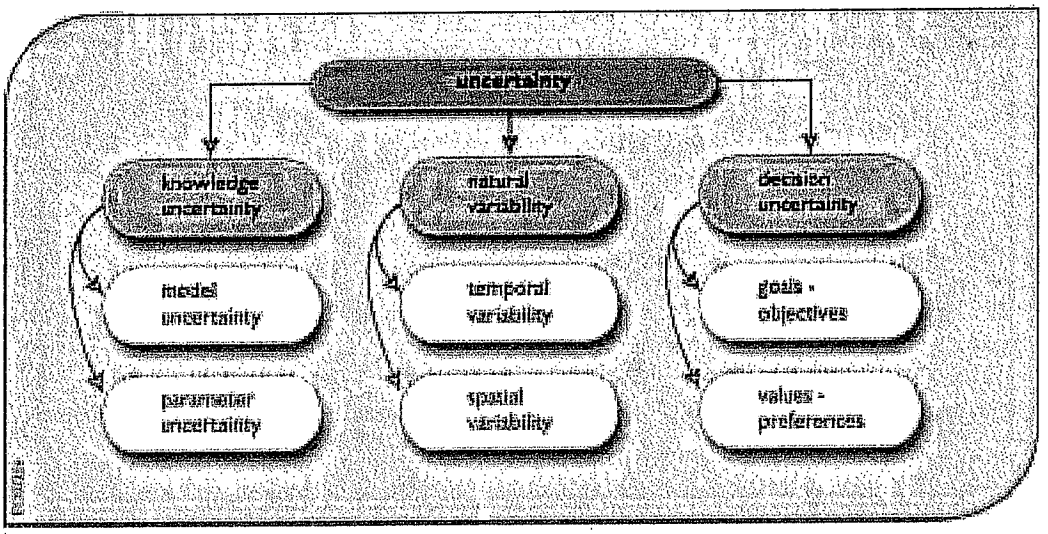


Figure 3. One way of classifying types of uncertainty.

Figure 3 illustrates these different types of uncertainty. For example, the rainfall measured at a weather station within a particular model grid cell may be used as an input value for that cell, but the rainfall may actually vary at different points within that cell and its mean value will vary across the landscape. Knowledge uncertainty can be reduced through further measurement and/or research. Natural variability is a property of the natural system, and is usually not reducible at the scale being used. Decision uncertainty is simply an acknowledgement that we cannot predict ahead of time just what decisions individuals and organizations will make, or even just what particular set of goals or objectives will be considered and the relative importance of each.

Rather than contrasting 'knowledge' uncertainty vs. natural variability vs. decision uncertainty, one can classify uncertainty in another way based on specific sources of uncertainty, such as those listed below, and address ways of identifying and dealing with each source of uncertainty.

Informational Uncertainties:

- imprecision in specifying the boundary and initial conditions that impact the output variable values
- imprecision in measuring observed output variable values

Model Uncertainties:

- uncertain model structure and parameter values
- variability of observed input and output values over a region smaller than the spatial scale of the model
- variability of observed model input and output values within a time smaller than the temporal scale of the model. (e.g., rainfall and depths and flows within a day)
- errors in linking models of different spatial and temporal scales

Numerical Errors:

- errors in the model solution algorithm

3.1 Natural variability

The main source of hydrologic model output value variability is the natural variability in hydrological and meteorological input series. Periods of normal precipitation and temperature can be interrupted by periods of extended drought and intense meteorological events such as hurricanes and tornadoes. There is no reason to think such events will not continue to occur and become even more frequent and extreme. Research has demonstrated that climate has been variable in the past and concerns about anthropogenic activities that may increase that variability increase each year. Sensitivity analysis can help assess the affect of errors in predictions if those predictions are based only on past records of historical time-series data describing precipitation, temperature and other exogenous forces across and on the border of the regions being studied.

Time series input data are often actual, or at least based on, historical data. The time-series values typically describe historical conditions including droughts and wet periods. What is distinctive about natural uncertainty, as opposed to errors and uncertainty due to modeling limitations, is that natural variability in meteorological forces cannot be reduced by improving the model's structure, increasing the resolution of the simulation, or by better calibration of model parameters.

Errors result if meteorological values are not measured or recorded accurately, or if mistakes are made in the generation of computer data files. Furthermore, there is no assurance the statistical properties of historical data will accurately represent the statistical properties of future data. Actual future precipitation and temperature scenarios will be different from those in the past, and this difference in many cases may have a larger affect than the uncertainty due to incorrect parameter values. However, the affects of uncertainties in the parameter values

used in stochastic generation models are often much more significant than the affects of using different stochastic generation models (Stedinger and Taylor, 1982).

While variability of model output is a direct result of variability of model input (e.g., hydrologic and meteorological data), the extent of the variability, and the lower and upper limits of that variability, may also be affected by errors in the inputs, the values of parameters, initial boundary conditions, model structure, processes and solution algorithms.

Figure 4 illustrates the distinction between the variability of a system performance indicator due to input data variability, and the extended range of variability due to the total uncertainty associated with any combination of the causes listed in the previous section. This extended range is what is of interest to water resource planners and managers.

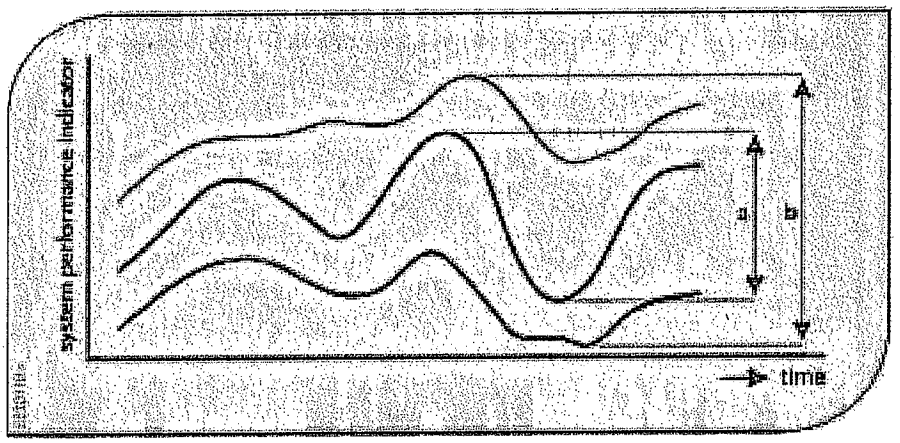


Figure 4. Time-series of model output or system performance showing variability over time. Range "a" results from the natural variability of input data over time. The extended range "b" results from the variability of natural input data as well as from imprecision in input data measurement, parameter value estimation, model structure and errors in model solution algorithms. The extent of this range will depend on the confidence level associated with that range.

What can occur in practice is a time-series of system performance indicator values that can range anywhere within or even outside the extended range, assuming the confidence level of that extended range is less than 100%. The confidence one can have that some future value of a time series will be within a given range is dependent on two factors. The first is the number of measurements used to compute the confidence limits. The second is on the assumption that those measurements are representative of - come from the same statistical or stochastic process yielding - future measurements. Figure 5 illustrates this point. Note that the time series may even contain values outside the range "b" defined in Figure 4 if the confidence level of that range is less than 100%. Confidence intervals associated with less than 100% certainty will not include every possible value that might occur.

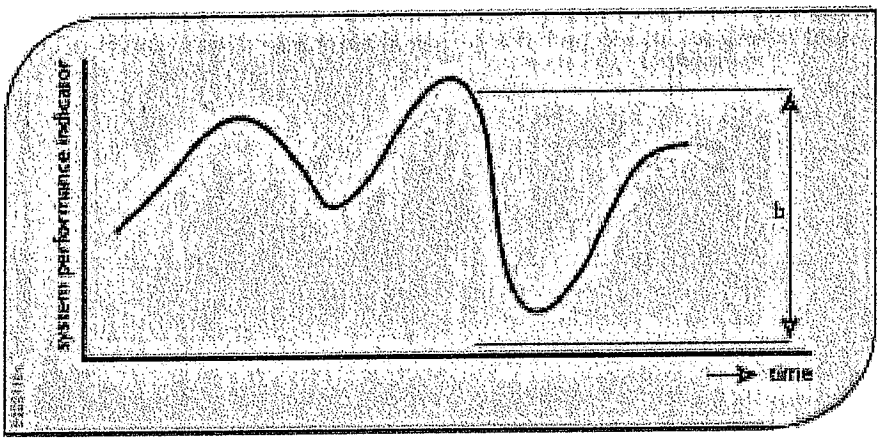


Figure 5. Typical time series of model output or system performance indicator values that are the result of input data variability and possible imprecision in input data measurement, parameter value estimation, model structure and errors in model solution algorithms.

3.2 Knowledge uncertainty

Referring to Figure 3, knowledge uncertainty includes model structure and parameter value uncertainties. First we consider parameter value uncertainty including boundary condition uncertainty, and then model and solution algorithm uncertainty.

3.2.1 Parameter value uncertainty

A possible source of uncertainty in model output results from uncertain estimates of various model parameter values. If the model calibration procedure were repeated using different data sets, different parameter values would result. Those values would yield different simulated system behavior, and thus different predictions. We can call this parameter uncertainty in the predictions because it is caused by imprecise parameter values. If such parameter value imprecision were eliminated, then the prediction would always be the same and so the parameter value uncertainty in the predictions would be zero. But this does not mean that predictions would be perfectly accurate.

In addition to parameter value imprecision, uncertainty in model output can result from imprecise specification of boundary conditions. These boundary conditions can be either fixed or variable. However, because they are not being computed based on the state of the system, their values can be uncertain. These uncertainties can affect the model output, especially in the vicinity of the boundary, in each time step of the simulation.

3.2.2 Model structural and computational errors

Uncertainty in model output can also result from errors in the model structure compared to the real system, and approximations made by numerical methods employed in the simulation. No matter how good our parameter value estimates, our models are not perfect and there is a residual model error. Increasing model complexity to more closely represent the complexity of the real system may not only add to the cost of data collection, but also introduce even more parameters, and thus even more potential sources of error in model output. It is not an easy task to judge the appropriate level of model complexity, and to estimate the resulting levels of uncertainty associated with various assumptions regarding model structure and solution methods. Kuczera (1988) provides an example of a conceptual hydrologic modeling exercise with daily time steps where model uncertainty dominated parameter value uncertainty.

3.3 Decision uncertainty

Uncertainty in model predictions can result from unanticipated changes in what is being modeled. These can include changes in nature, human goals, interests, activities, demands, and impacts. An example of this is the deviation from standard or published operating policies by operators of infrastructure such as canal gates, pumps, and reservoirs in the field, as compared to what is specified in documents and incorporated into the water systems models. Comparing field data with model data for model calibration may yield incorrect calibrations if operating policies actually implemented in the field differ significantly from those built into the models. What do operators do in times of stress? And can anyone identify a place where deviations from published policies do not occur?

What humans will want to achieve in the future may not be the same as what they want today. Predictions of what people will want in the future are clearly sources of uncertainty. A perfect example of this is in the very flat Greater Everglades region of south Florida in the US. Fifty years ago folks wanted the swampy region protected from floods and drained for agricultural and urban development. Today many want just the opposite at least where there are no human settlements. They want to return to a more natural hydrologic system with more wetlands and unobstructed flows, but now for ecological restoration objectives that were not a major concern or much appreciated some half a century ago. Once the mosquitoes return and if the sea level continues to rise, future populations who live there may want more flood control and drainage again. Who knows? Complex changing social and economic processes influence human activities and their demands for water resources and environmental amenities over time. Some of these processes reflect changes in local concerns, interests and activities, but population migration and many economic activities and social attitudes can also reflect changing national and international trends.

Sensitivity scenarios that include human activities can help define the affects of those activities within an area. It is important that careful attention go into the development of these alternative scenarios so that they realistically capture the forces or stresses that the system may face. The history of systems studies are full of examples where the issues studied were rapidly

overwhelmed by much larger social forces resulting from, for example, the relocation of major economic activities, an oil embargo, changes in national demand for natural resources, economic recession, sea-level rise, an act of terrorism, or even war. One thing is sure; the future will be different than the past, and no one is certain just how.

3.3.1 Surprises

Water resource managers may also want to consider how vulnerable a system is to undesirable environmental surprises. What havoc might an introduced species like the zebra mussel invading the Great Lakes of North America have in a particular watershed? Might some introduced disease suddenly threaten key plant or animal species? Might management plans have to be restructured to address the survival of some species such as salmon in the Rhine River in Europe or in the Columbia River in North America? Such uncertainties are hard to anticipate when by their nature they are truly surprises. But surprises should be expected. Hence system flexibility and adaptability should be sought to deal with changing management demands, objectives, and constraints.

4. Sensitivity and uncertainty analyses

An uncertainty analysis is not the same as a sensitivity analysis. An uncertainty analysis attempts to describe the entire set of possible outcomes, together with their associated probabilities of occurrence. A sensitivity analysis attempts to determine the relative change in model output values given modest changes in model input values. A sensitivity analysis thus measures the change in the model output in a localized region of the space of inputs. However, one can often use the same set of model runs for both uncertainty analyses and sensitivity analyses. It is possible to carry out a sensitivity analysis of the model around a current solution and then use it as part of a first order uncertainty analysis.

This discussion begins by focusing on some methods of uncertainty analysis. Then various ways of performing and displaying sensitivity analyses are reviewed.

4.1 Uncertainty Analyses

Recall that uncertainty involves the notion of randomness. If a value of a performance indicator or performance measure, or in fact any variable, like the phosphorus concentration or the depth of water at a particular location varies and this variation over space and time cannot be predicted with certainty, it is called a random variable. One cannot say with certainty what the value of a random variable will be but only the likelihood or probability that it will be within some specified range of values. The probabilities of observing particular ranges of values of a random variable are described or defined by a probability distribution. There are many types of distributions and each can be expressed in several ways as presented in Chapter III.

Suppose the random variable is X. If the observed values of this random variable can be only discrete values, the probability distribution of X can be expressed as a histogram, as shown in Figure 6a. The sum of the probabilities for all possible outcomes must equal 1. If the random variable is a continuous variable that can assume any real value over a range of values, the probability distribution of X can be expressed as a continuous distribution as shown in Figure 6b. The shaded area under the density function for the continuous distribution is 1. The area between two values of the continuous random variable, such as between u and v in Figure 6c, represents the probability that the observed value x of the random variable value X will be within that range of values.

The probability distribution, $P_X(x)$ shown in Figure 6 (a) is called a probability mass function. The probability distributions shown in Figure 6 (b and c) are called a probability density functions (pdf) and are denoted by $f_X(x)$. The subscript X of P_X and f_X represents the random variable, and the variable x is some value of that random variable X.

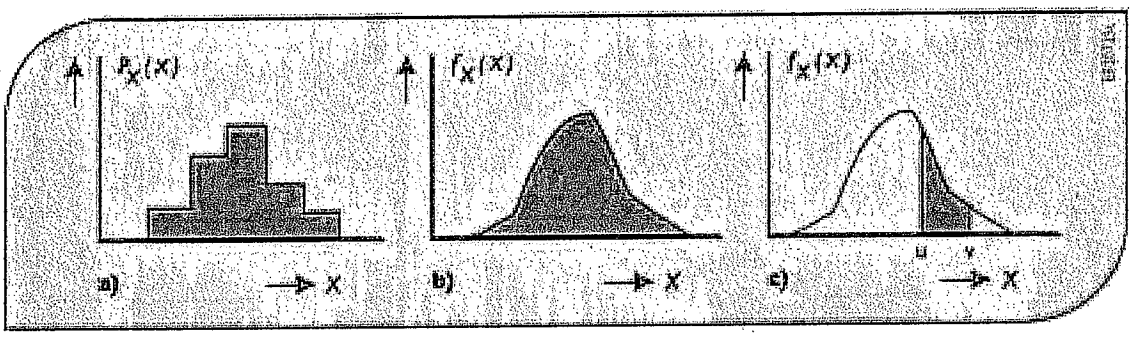


Figure 6. Probability distributions for a discrete or continuous random variable X. The area under the distributions (shaded areas in a and b) is 1, and the shaded area in c is the probability that the observed value x of the random variable X will be between u and v.

Uncertainty analyses involve identifying characteristics of various probability distributions of model input and output variables, and subsequently functions of those random output variables that are performance indicators or measures. Often targets associated with these indicators or measures are themselves uncertain.

A complete uncertainty analysis would involve a comprehensive identification of all sources of uncertainty that contribute to the joint probability distributions of each input or output variable. Assume such analyses were performed for two alternative project plans, A and B, and that the resulting probability density distributions for a specified performance measure were as shown in Figure 7. Figure 7 also identifies the costs of these two projects. The introduction of two performance criteria, cost and probability of exceeding a performance measure target (e.g., a pollutant concentration standard) introduces a conflict where a tradeoff must be made.

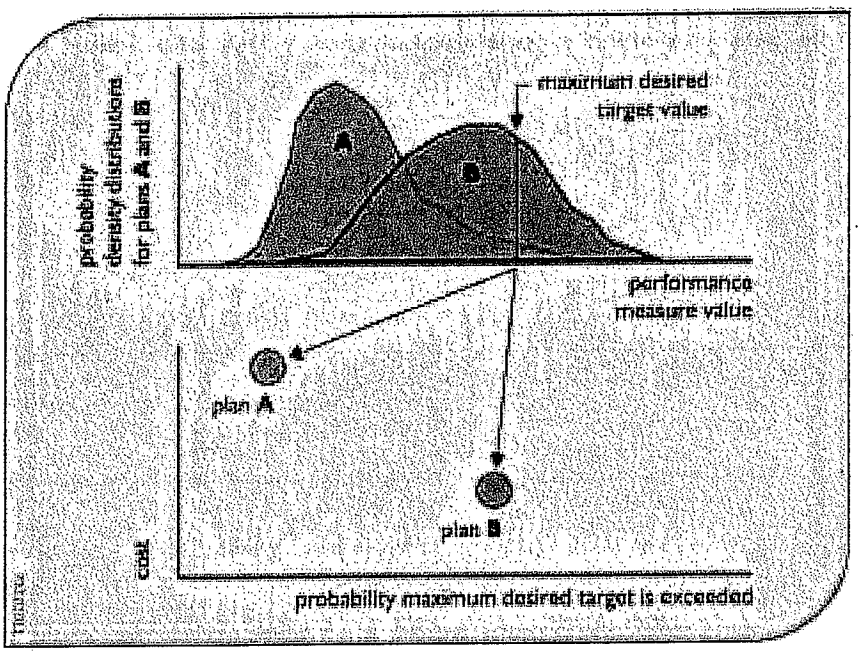


Figure 7. Tradeoffs involving cost and the probability that a maximum desired target value will be exceeded. In this illustration we want the lowest cost (*B* is best) and the lowest probability of exceedance (*A* is best).

4.1.1 Model and model parameter uncertainties

Consider a situation as shown in Figure 8, in which for a specific set of model inputs, the model outputs differ from the observed values, and for those model inputs, the observed values are always the same. Here nothing randomly occurs. The model parameter values or model structure needs to be changed. This is typically done in a model calibration process.

Given specific inputs, the outputs of deterministic models are always going to be the same each time those inputs are simulated. If for specified inputs to any simulation model the predicted output does not agree with the observed value, as shown in Figure 8, this could result from imprecision in the measurement of observed data. It could also result from imprecision in the model parameter values, the model structure, or the algorithm used to solve the model.

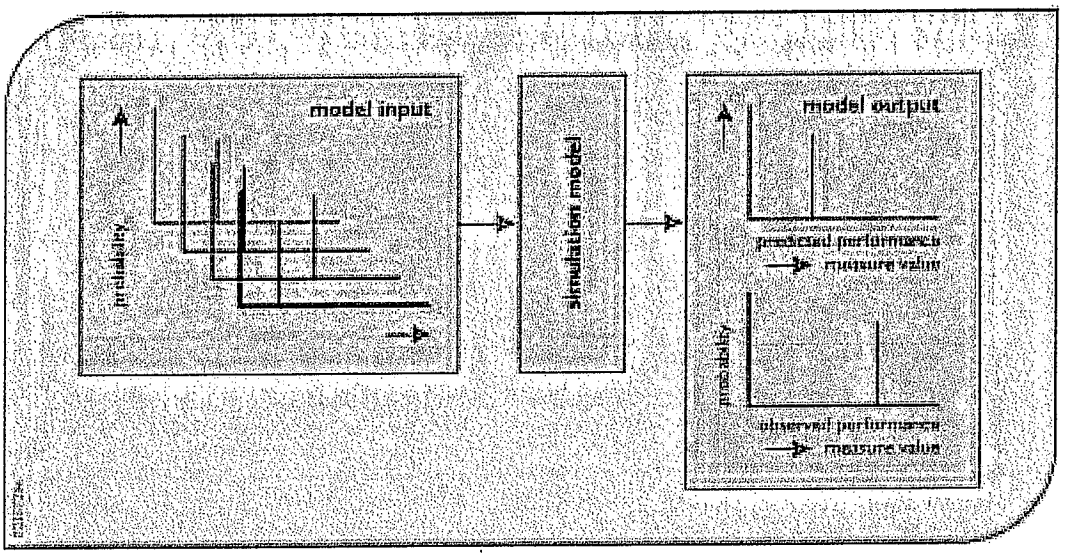


Figure 8. A deterministic system and a simulation model of that system needing calibration or modification in its structure. There is no randomness, only parameter value or model structure errors to be identified and corrected.

Next consider the same deterministic simulation model but now assume at least some of the inputs are random, i.e., not predictable, as may be case when random outputs of one model are used as inputs into another model. Random inputs will yield random outputs. The model input and output values can be described by probability distributions. If the uncertainty in the output is due only to the uncertainty in the input, the situation is similar to that shown in Figure 8. If the distribution of performance measure output values does not fit or is not identical to the distribution of observed performance measure values, then calibration of model parameter values or modification of model structure may be needed.

If a model calibration or 'identification' exercise finds the 'best' values of the parameters to be outside reasonable ranges of values based on scientific knowledge, then the model structure or algorithm might be in error. Assuming the algorithms used to solve the models are correct and observed measurements of system performance vary for the same model inputs, as shown in Figure 9, it can be assumed that the model structure does not capture all the processes that are taking place that impact the value of the performance measures. This is often the case when relatively simple and low-resolution models are used to estimate the hydrological and ecological impacts of water and land management policies. However, even large and complex models can fail to include or adequately describe important phenomena.

In the presence of informational uncertainties there may be considerable uncertainty about the values of the "best" parameters during calibration. This problem becomes even more pronounced with increases in model complexity.

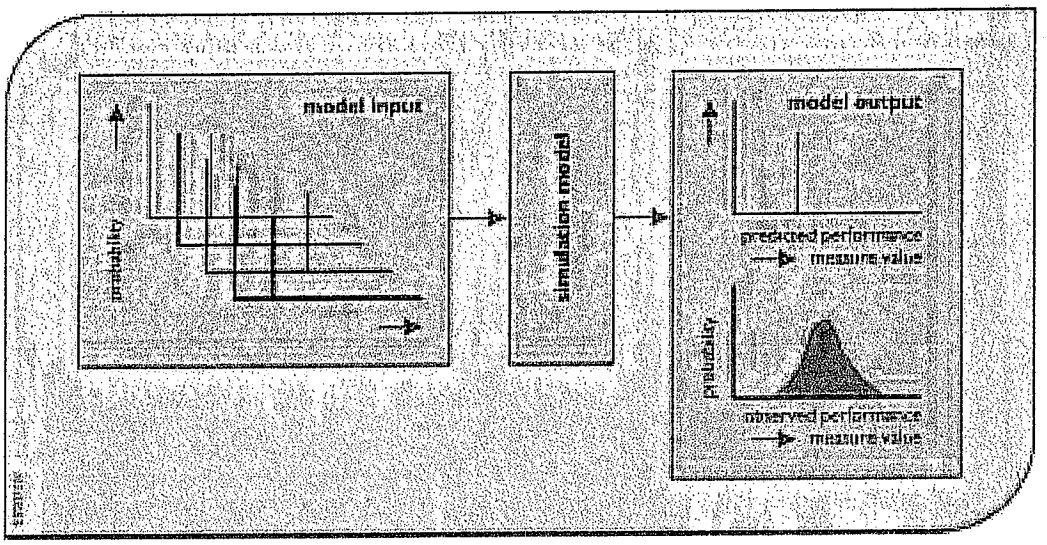


Figure A deterministic simulation model of a 'random or stochastic' system. To produce the variability in the model output that is observed in the real system, even given the same input values, the model's parameter values may need to vary over distributions of values and/or the model structure may need modification along with additional model inputs.

An example: Consider the prediction of a pollutant concentration at some site downstream of a pollutant discharge site. Given a streamflow Q (in units of 1000 m^3/day), the distance between the discharge site and the monitoring site, X (m), the pollutant decay rate constant k (day^{-1}), and the pollutant discharge W (Kg/day), we can use the following simplified model to predict the concentration of the pollutant C (g/m^3 = mg/l) at the downstream monitoring site:

$$C = (W/Q)\exp\{-k(X/U)\}$$

In the above equation assume the velocity U (m/day) is a known function of the streamflow Q.

In this case the observed value of the pollutant concentration C may differ from the computed value of C even for the same inputs of W, Q, k, X, and U. Furthermore, this difference varies in different time periods. This apparent variability, as illustrated in Figure 9, can be simulated using the same model but by assuming a distribution of values for the decay rate constant k. Alternatively the model structure can be modified to include the impact of streamflow temperature T on the prediction of C.

$$C = (W/Q)\exp\{-k\theta^{T-2}(X/U)\}$$

Now there are two model parameters, the decay rate constant k and the dimensionless temperature correction factor θ and an additional model input, the streamflow temperature, T. It could be that the variation in streamflow temperature was the sole cause of the first

equation's 'uncertainty' and that the assumed parameter distribution of k was simply the result of the distribution of streamflow temperatures on the term $k\theta^{T-20}$.

If the output were still random given constant values of all the inputs, then another source of uncertainty exists. This uncertainty might be due to additional random loadings of the pollutant, possibly from non-point sources. Once again the model could be modified to include these additional loadings if they are knowable. Assuming these additional loadings are not known, a new random parameter could be added to the input variable W or to the right hand side of the equations above that would attempt to capture the impact on C of these additional loadings. A potential problem, however, might be the likely correlation between those additional loadings and the streamflow Q.

While adding model detail removed some 'uncertainty' in the above example, increasing model complexity will not always eliminate or reduce uncertainty in model output. Adding complexity is generally not a good idea when the increased complexity is based on processes whose parameters are difficult to measure, the right equations are not known at the scale of application, or the amount of data for calibration is small compared to the number of parameters.

Even if more detailed models requiring more input data and more parameter values were to be developed, the likelihood of capturing all the processes occurring in a complex system is small. Hence those involved will have to make decisions taking this uncertainty into account. Imprecision will always exist due to less than a complete understanding of the system and the hydrologic processes being modeled. A number of studies have addressed model simplification, but only in some simple cases have statisticians been able to identify just how one might minimize modeling related errors in model output values.

The problem of determining the "optimal" level of modeling detail is particularly important when simulating the hydrologic events at many sites over large areas. Perhaps the best approach for these simulations is to establish confidence levels for alternative sets of models and then statistically compare simulation results. But even this is not a trivial or costless task. Increases in the temporal or spatial resolution typically require considerable data collection and/or processing, model recalibrations, and possibly the solution of stability problems resulting from the numerical methods used in the models. Obtaining and implementing alternative hydrologic simulation models will typically involve considerable investments of money and time for data preparation and model calibration.

What is needed is a way to predict the variability evident in the system shown in Figure 9. Instead of a fixed output vector for each fixed input vector, a distribution of outputs are needed for each performance measure based on fixed inputs (Figure 9) or a distribution of inputs (Figure 10.). Furthermore the model output distribution for each performance measure should 'match' as well as possible the observed distribution of that performance measure.

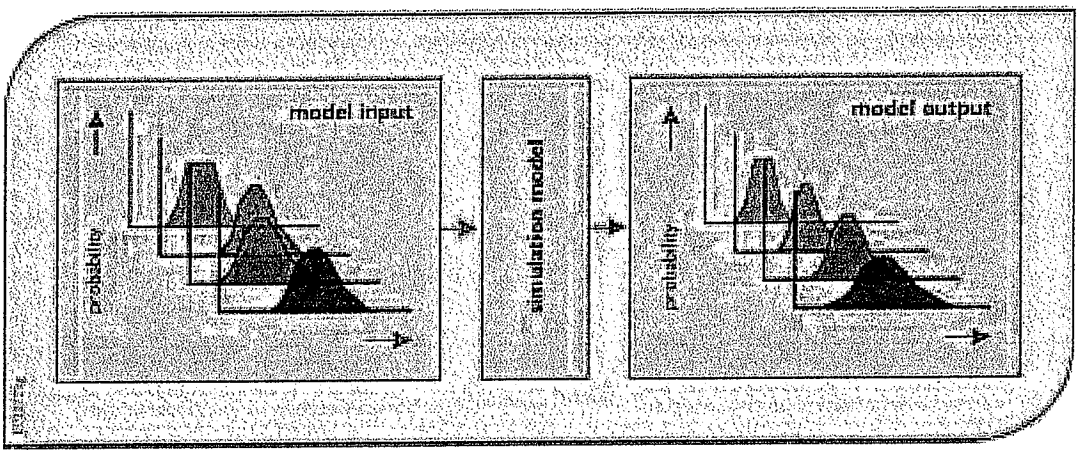


Figure 10. Simulating variable inputs to obtain probability distributions of predicted performance indices that match the probability distributions of observed performance values.

4.1.2 What uncertainty analysis can provide

An uncertainty analysis takes a set of randomly chosen input values (that can include parameter values), passes them through a model (or transfer function) to obtain the distributions (or statistical measures of the distributions) of the resulting outputs. As illustrated in Figure 11, the output distributions can be used to

- Describe the range of potential outputs of the system at some probability level.
- Estimate the probability that the output will exceed a specific threshold or performance measure target value.

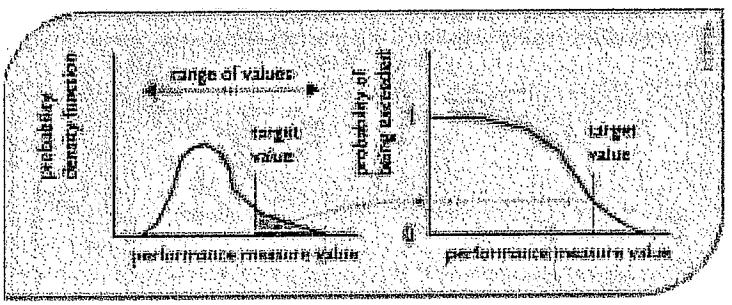


Figure 11. The distribution of performance measures defines range of potential values and the likelihood that a specified target value will be exceeded. The shaded area under the density function on the left represents the probability that the target value will be exceeded. This probability is shown in the probability of exceedance plot on the right.

Common uses for uncertainty analyses are to make general inferences, such as the following:

- Estimating the mean and standard deviation of the outputs.
- Estimating the probability the performance measure will exceed a specific threshold.
- Putting a reliability level on a function of the outputs, e.g., the range of function values that is likely to occur with some probability.
- Describing the likelihood of different potential outputs of the system.

Implicit in any uncertainty analysis are the assumptions that statistical distributions for the input values are correct and that the model is a sufficiently realistic description of the processes taking place in the system. Neither of these assumptions is likely to be entirely correct.

4.2 Sensitivity analyses

"Sensitivity analysis" is aimed at describing how much model output values are affected by changes in model input values. It is the investigation of the importance of imprecision or uncertainty in model inputs in a decision making or modeling process. The exact character of sensitivity analysis depends upon the particular context and the questions of concern. Sensitivity studies can provide a general assessment of model precision when used to assess system performance for alternative scenarios, as well as detailed information addressing the relative significance of errors in various parameters. As a result, sensitivity results should be of interest to the general public, federal and state management agencies, local watershed planners and managers, model users, and model developers.

Clearly, upper level management and the public may be interested in more general statements of model precision, and should be provided such information along with model predictions. On the other hand, detailed studies addressing the significance and interactions among individual parameters would likely be meaningful to model developers and some model users. They can use such data to interpret model results and to identify where efforts to improve models and their input values should be directed.

Initial sensitivity analysis studies could focus on two products:

(1) detailed results to guide research and assist model development efforts, and
(2) calculation of general descriptions of uncertainty associated with model predictions so that policy decisions can reflect both the modeling efforts best prediction of system performance and the precision of such predictions.

In the first case, knowing the relative uncertainty in model projections due to possible errors in different sets of parameters and input data should assist in efforts to improve the precision of model projections. This knowledge should also contribute to a better understanding of the relationships between model assumptions, parameters, data and model predictions.

For the second case, knowing the relative precision associated with model predictions should have a significant effect on policy development. For example, the analysis may show that, given data inadequacies, there are very large error bands associated with some model variables. When such large uncertainties exist, predictions should be used with appropriate skepticism.

Incremental strategies should be explored along with monitoring so that greater experience can accumulate to resolve some of those uncertainties.

Sensitivity analysis features are available in many linear and nonlinear programming (optimization) packages. They identify the changes in the values of the objective function and unknown decision variables given a change in the model input values, and a change in levels set for various constraints (Chapter V). Thus sensitivity analysis addresses the change in "optimal" system performance associated with changes in various parameter values, and also how "optimal" decisions would change with changes in resource constraint levels, or target output requirements. This kind of sensitivity analysis provides estimates of how much another unit of resource would be worth, or what "cost" a proposed change in a constraint places on the optimal solution. This information is of value to those making design decisions.

Various techniques have been developed to determine how sensitive model outputs are to changes in model inputs. Most approaches examine the affects of changes in a single parameter value or input variable assuming no changes in all the other inputs. Sensitivity analyses can be extended to examine the combined effects of multiple sources of error, as well.

Changes in particular model input values can affect model output values in different ways. It is generally true that only a relatively few input variables dominate or substantially influence the values of a particular output variable or performance indicator at a particular location and time. If the range of uncertainty of only some of the output data is of interest, then undoubtedly only those input data that significantly impact on the values of those output data need be included in the sensitivity analysis.

If input data estimates are based on repeated measurements, a frequency distribution can be estimated that characterizes natural variability. The shorter the record of measurements, the greater will be the uncertainty regarding the long-term statistical characteristics of that variability. If obtaining a sufficient number of replicate measurements is not possible, subjective estimates of input data ranges and probability distributions are often made. Using a mixture of subjective estimates and actual measurements does not affect the application of various sensitivity analysis methods that can use these sets or distributions of input values, but it may affect the conclusions that can be drawn from the results of these analyses.

It would be nice to have available accurate and easy-to-use analytical methods for relating errors in input data to errors in model outputs, and to errors in system performance indicator values that are derived from model output. Such analytical methods do not exist for complex simulation models. However methods based on simplifying assumptions and approximations can be used to yield useful sensitivity information. Some of these are reviewed in the remainder of this chapter.

4.2.1 Sensitivity coefficients

One measure of sensitivity is the sensitivity coefficient. This is the derivative of a model output variable with respect to an input variable or parameter. A number of sensitivity

analysis methods use these coefficients. First-order and approximate first-order sensitivity analyses are two such methods that will be discussed later. The difficulty of

1. obtaining the derivatives for many models,
2. needing to assume mathematical (usually linear) relationships when obtaining estimates of derivatives by making small changes of input data values near their nominal or most likely values, and
3. having large variances associated with most hydrologic process models have motivated the replacement of analytical methods by numerical and statistical approaches to sensitivity analysis.

Implicit in any sensitivity analysis are the assumptions that statistical distributions for the input values are correct and that the model is a sufficiently realistic description of the processes taking place in the system. Neither of these assumptions is likely to be entirely correct.

The importance of the assumption that the statistical distributions for the input values are correct is easy to check by using different distributions for the input parameters. If the outputs vary significantly, then the output is sensitive to the specification of the input distributions and hence they should be defined with care. A relatively simple deterministic sensitivity analysis can be of value here (Benaman, 2002). A sensitivity coefficient can be used to measure the magnitude of change in an output variable Q per unit change in the magnitude of an input parameter value P from its base value P_o. Let SI_{PQ} be the sensitivity index for an output variable Q with respect to a change ΔP in the value of the input variable P from its base value P_o. Noting that the value of the output $Q(P)$ is a function of P, the sensitivity index could be defined as

$$SI_{PQ} = [\, Q(P_o + \Delta P) - Q(P_o - \Delta P) \,] / 2\,\Delta P \qquad (1)$$

Other sensitivity indices could be defined (McCuen 1973). Letting the index i represent a decrease and j represent an increase in the parameter value from its base value P_o, the sensitivity index SI_{PQ} for parameter P and output variable Q is could be defined as

$$SI_{PQ} = \{\, |\, (Q_o - Q_i) / (P_o - P_i)\, | + |\, (Q_o - Q_j) / (P_o - P_j)\, |\, \} / 2 \qquad (2)$$

or

$$SI_{PQ} = \max \{\, |\, (Q_o - Q_i) / (P_o - P_i)\, |,\ |\, (Q_o - Q_j) / (P_o - P_j)\, |\, \} \qquad (3)$$

A dimensionless expression of sensitivity is the elasticity index, EI_{PQ}, that measures the relative change in output Q for a relative change in input P could be defined as

$$EI_{PQ} = [P_o / Q(P_o)]\, SI_{PQ} \qquad (4)$$

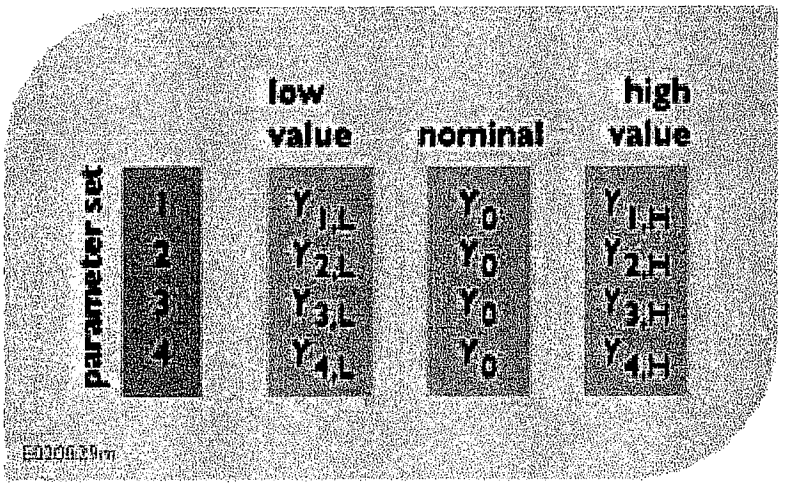
4.2.2 A simple deterministic sensitivity analysis procedure

This deterministic sensitivity analysis approach is very similar those most often employed in the engineering economics literature. It is based on the idea of varying one uncertain parameter value, or set of parameter values, at a time. The ideas are applied to a water quality example to illustrate their use.

The output variable of interest can be any performance measure or indicator. Thus one does not know if more or less of a given variable is better or worse. Perhaps too much and/or too little is undesirable. The key idea is that, whether employing physical measures or economic metrics of performance, various parameters (or sets of associated parameters) are assigned high and low values. Such ranges may reflect either the differences between the minimum and maximum values for each parameter, the 5 and 95 percentiles of a parameters distribution, or points corresponding to some other criteria. The system model is then run with the various alternatives, one at a time, to evaluate the impact of those errors in various sets of parameter values on the output variable.

Table 1 illustrates the character of the results that one would obtain. Here Y_0 is the nominal value of the model output when all parameters assume the estimated best values, and $Y_{i,L}$ and $Y_{i,H}$ are the values obtained by increasing or decreasing the values of the ith set of parameters.

Table 1. Sensitivity of model output Y to possible errors in four parameter sets containing a single parameter or a group of parameters that vary together.



A simple water quality example is employed to illustrate this deterministic approach to sensitivity analysis. The analysis techniques illustrated here are just as applicable to complex models. The primary difference is that more work would be required to evaluate the various alternatives with a more complex model, and the model responses might be more complicated.

The simple water quality model is provided by Vollenweider's empirical relationship for the average phosphorus concentration in lakes (Vollenweider, 1976). He found that the phosphorus concentration, P (mg/m^3), is a function of the annual phosphorus loading rate, L (mg/m^2•a), the annual hydraulic loading, q (m/a or more exactly m^3/m^2•a), and the mean water depth, z (m).

$$P = (L/q) / [\, 1 + (z/q)^{0.5} \,] \qquad (5)$$

L/q and P have the same units; the denominator is an empirical factor that compensates for nutrient recycling and elimination within the aquatic lake environment.

Data for Lake Ontario in North America would suggest that reasonable values of the parameters are $L = 680$ mg/m^3; $q = 10.6$ m/a; and $z = 84$ m, yielding $P = 16.8$ mg/m^3. Values of phosphorus concentrations less than 10 mg/m^3 are considered oligotrophic, whereas values greater than 20 mg/m^3 generally correspond to eutrophic conditions. Reasonable ranges reflecting possible errors in the three parameters yield the values in Table 2.

Table 2. Sensitivity of estimates of phosphorus concentration (mg/m^3) to model parameter values. The two right most values in each row correspond to the Low and High values of the parameter, respectively

	parameter value		phosphorus concentration	
	low	high	P_{low}	P_{high}
L — P loading (mg/m^2•a)	500	900	12.4	22.3
q — hydraulic loading (m/a)	8	13.5	20.0	14.4
z — mean depth (m)	81	87	17.0	16.6

One may want to display these results so they can be readily visualized and understood. A tornado diagram (Eschenbach, 1992) would show the lower and upper values of P obtained from variation of each parameter, with the parameter with the widest limits displayed on top, and the parameter having smallest limits on the bottom. Tornado diagrams (Figure 12) are easy to construct and can include a large number of parameters without becoming crowded.

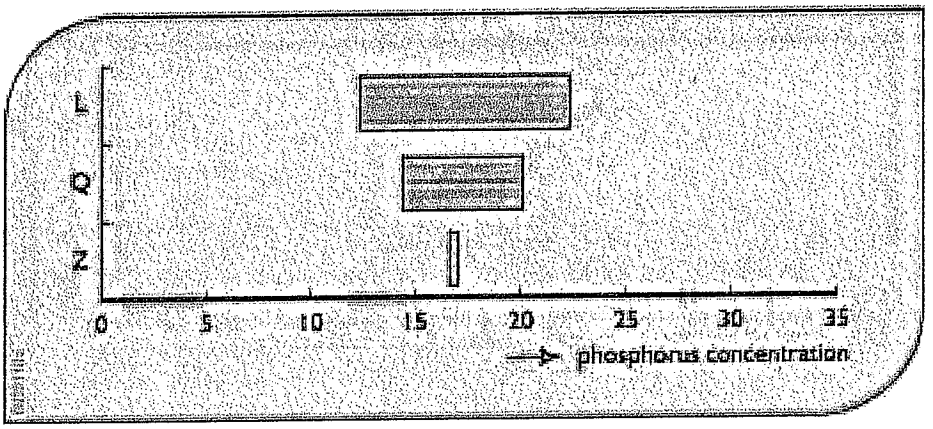


Figure 12. A Tornado diagram showing the range of the output variable representing phosphorus concentrations for high and low values of each of the parameter sets. Parameters are sorted so that the largest range is on top, and the smallest on the bottom.

An alternative to tornado diagrams is a Pareto chart showing the width of the uncertainty range associated with each variable, ordered from largest to smallest. A Pareto chart is illustrated in Figure 13.

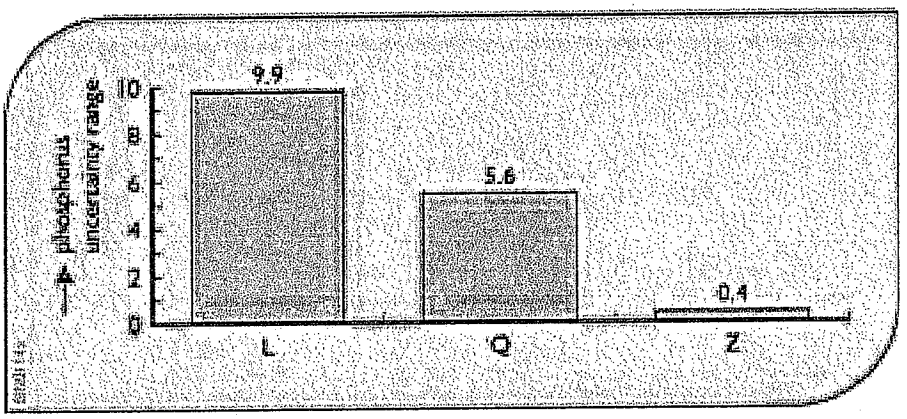


Figure 13. A Pareto Chart showing the range of the output variable representing phosphorus concentrations resulting from high and low values of each parameter set considered.

Another visual presentation is a spider plot showing the impact of uncertainty in each parameter on the variable in question, all on the same graph (Eschenback, 1992; DeGarmo, 1993, p. 401). A spider plot, Figure 14, shows the particular functional response of the output to each parameter on a common scale, so one needs a common metric to represent changes in all of the parameters. Here we use percentage change from the nominal or best values.

Spider plots are a little harder to construct than tornado diagrams, and can generally include only 4 - 5 variables without becoming crowded. However, they provide a more complete view of the relationships between each parameter and the performance measure. In particular, a spider plot reveals nonlinear relationships and the relative sensitivity of the performance measure to (percentage) changes in each variable.

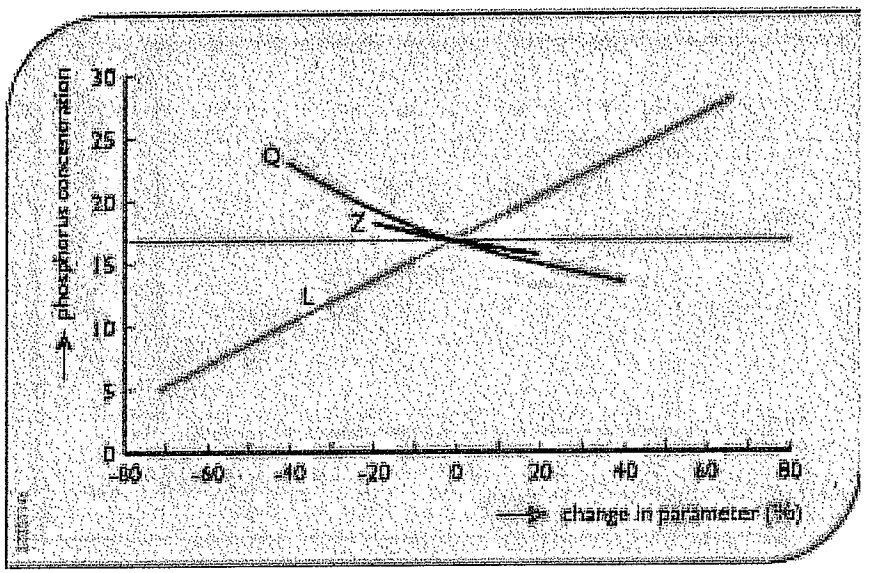


Figure 14. Spider Plot illustrates the relationships between model output describing phosphorus concentrations and variations in each of the parameter sets, expressed as a percentage deviation from their nominal values.

In the spider plot, the linear relationship between P and L and the gentle nonlinear relationship between P and q is illustrated. The range for z has been kept small given the limited uncertainty associated with that parameter.

4.2.3 Multiple errors and interactions

An important issue that should not be ignored is the impact of simultaneous errors in more than one parameter. Probabilistic methods directly address the occurrence of simultaneous errors, but the correct joint distribution needs to be employed. With simple sensitivity analysis procedures, errors in parameters are generally investigated one at a time, or in groups. The idea of considering pairs or sets of parameters is discussed here.

Groups of factors. It is often the case that reasonable error scenarios would have several parameters changing together. For this reason, the alternatives have been called parameter sets. For example, possible errors in water depth would be accompanied with corresponding variations in aquatic vegetation and chemical parameters. Likewise, alternatives related to changes in model structure might be accompanied with variations in several parameters. In other cases, there may be no causal relationship among possible errors (such as model structure

versus inflows at the boundary of the modeled region), but they might still interact to effect the precision of model predictions.

Combinations. If one or more non-grouped parameters interact in significant ways, then combinations of one or more errors should be investigated. However, one immediately runs into a combinatorial problem. If each of m parameters can have 3 values (high, nominal, and low) there are 3^m combinations, as opposed to 2m + 1 if each parameter is varied separately. [For m = 5, the differences are $3^5 = 243$ versus 2(5)+1 = 11.] These numbers can be reduced by considering instead only combinations of extremes so that only $2^m + 1$ cases need be considered [$2^5 + 1 = 33$], which is a more manageable number. However, all of the parameters would be at one extreme or the other, and such situations would be very unusual.

Two factors at a time. A compromise is to consider all pairs of two parameters at a time. There are m(m-1)/2 possible pairs of m parameters. Each parameter has a high and low value. Since there are 4 combinations of high and low values for each pair, there are a total of 2m(m-1) combinations. [For m = 5 there are 40 combinations of two parameters each having two values.]

The presentation of these results could be simplified by displaying for each case only the maximum error, which would result in m(m-1)/2 cases that might be displayed in a Pareto diagram. This would allow identification of those combinations of two parameters that might yield the largest errors and thus are of most concern.

For the water quality example, if one plots the absolute value of the error for all four combinations of high (+) and low (-) values for each pair of parameters, they obtain Figure 15.

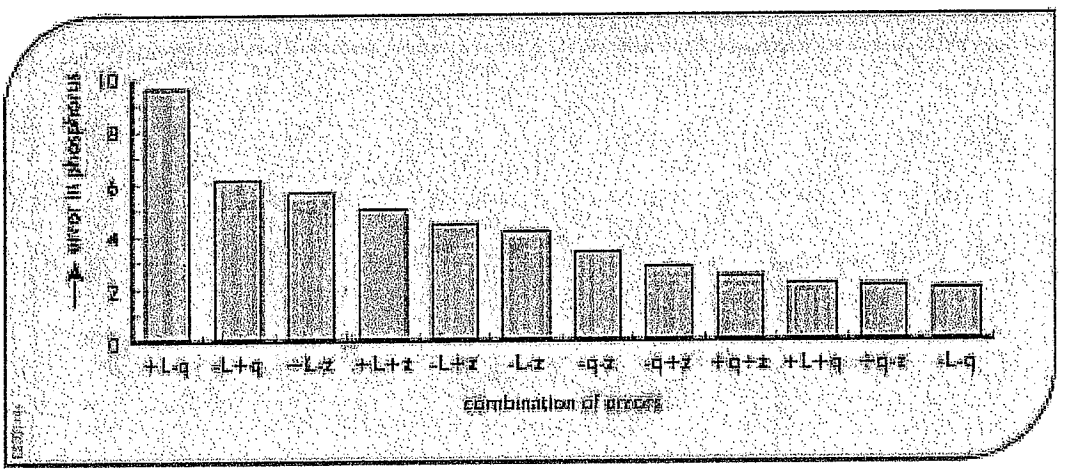


Figure 15. Pareto diagram showing errors in phosphorus concentrations for all combinations of pairs of input parameters errors. A + indicates a high value, and a - indicates a low value for indicated parameter. *L* is the phosphorus loading rate, *q* is the hydraulic loading, and *z* is the mean lake depth.

Considering only the worst error for each pair of variables yields Figure 16.

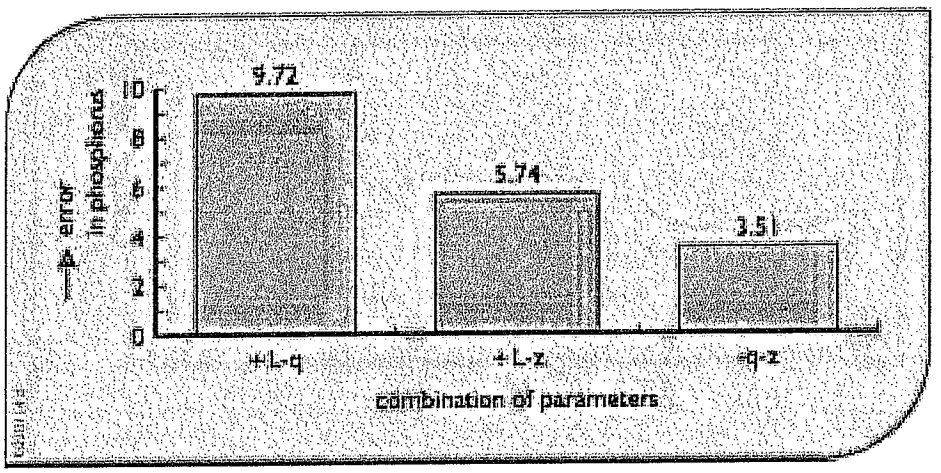


Figure 16. Pareto diagram showing worst error combinations for each pair of input parameters. A '+' indicates a high value, and a '–' indicates a low value for indicated parameter.

Here we see, as is no surprise, that the worst error results from the most unfavorable combination of L and q values. If both parameters have their most unfavorable values, the predicted phosphorus concentration would be 27 mg/m^3.

Looking for non-linearities. One might also display in a Pareto diagram the maximum error for each pair as a percentage of the sum of the absolute values of the maximum error from each parameter separately. The ratio of the joint error to the individual errors would illustrate potentially important nonlinear interactions. If the model of the system and the physical measure or economic metric were strictly linear, then the individual ratios should add to one.

4.2.4 First-order sensitivity analysis

The above deterministic analysis has trouble representing reasonable combinations of errors in several parameter sets. If the errors are independent, it is highly unlikely that any two sets would actually be at their extreme ranges at the same time. By defining probability distributions of the values of the various parameter sets, and specifying their joint distributions, a probabilistic error analysis can be conducted. In particular, for a given performance indicator, one can use multivariate linear analyses to evaluate the approximate impact on the performance indices of uncertainty in various parameters. As shown below, the impact depends upon the square of the sensitivity coefficients (partial derivatives) and the variances and covariances of the parameter sets.

For a performance indicator $I = F(Y)$, which is a function $F(\bullet)$ of model outputs Y, that are in turn a function $g(P)$ of input parameters P, one can use a multivariate Taylor series approximation of F to obtain the expected value and variance of the indicator:

$$E[I] = F(\text{ based on mean values of input parameters}) + (1/2)\ \{\Sigma_i\Sigma_j\ [\partial F^2/\partial P_i \partial P_j]\ \text{Cov}\ [P_i, P_j]\ \} \quad (6)$$

and

$$\text{Var}[I] = \Sigma_i\Sigma_j\ (\partial F/\partial P_i)(\partial F/\partial P_j)\ \text{Cov}\ [P_i, P_j] \quad (7)$$

where $(\partial F/\partial P_i)$ are the partial derivative of the function F with respect to P_i evaluated at the mean value of the input parameters P_i, and $\partial F^2/\partial P_i \partial P_j$ are the second partial derivatives. The covariance of two random input parameters P_i and P_j is the expected value of the product of differences between the values and their means.

$$\text{Cov}[P_i, P_j] = E[(P_i - E[P_i])(P_j - E[P_j])] \quad (8)$$

If all the parameters are independent of each other, and the second-order terms in the expression for the mean $E[I]$ are neglected, one obtains

$$E[I] = F(\text{ based on mean values of input parameters}) \quad (9)$$

and

$$\text{Var}\ [I] = \Sigma_i\ [\partial F/\partial P_i]^2\ \text{Var}\ [P_i] \quad (10)$$

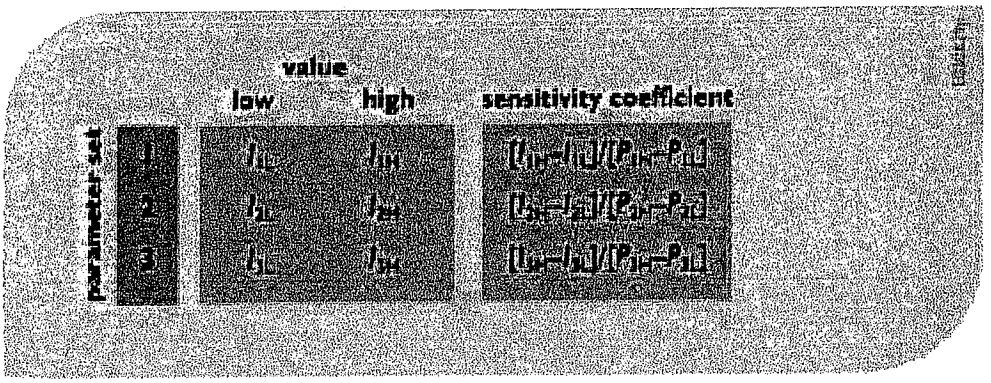
(Benjamin and Cornell, 1970). Equation 6 for $E[I]$ shows that in the presence of substantial uncertainty, the mean of the output from nonlinear systems is not simply the system output corresponding to the mean of the parameters (Gaven and Burges, 1981, p. 1523). This is true for any nonlinear function.

Of interest in the analysis of uncertainty is the approximation for the variance $\text{Var}[I]$ of indicator I. In Equation 10 the contribution of P_i to the variance of I equals $\text{Var}[P_i]$ times $[\partial F/\partial P_i]^2$, which are the squares of the sensitivity coefficients for indicator I with respect to each input parameter value P_i.

4.2.4.1 An example of first-order sensitivity analysis

It may appear that first-order analysis is difficult because the partial derivatives of the performance indicator I are needed with respect to the various parameters. However, reasonable approximations of these sensitivity coefficients can be obtained from the simple sensitivity analysis described in Table 3, as shown below. In that table, three different parameter sets, P_i, are defined in which one parameter of the set is at its high value, P_{iH}, and one is at its low value, P_{iL}, to produce corresponding values (called high, I_{iH}, and low, I_{iL}) of a system performance indicator I.

Table 3. Approximate parameter sensitivity coefficients.



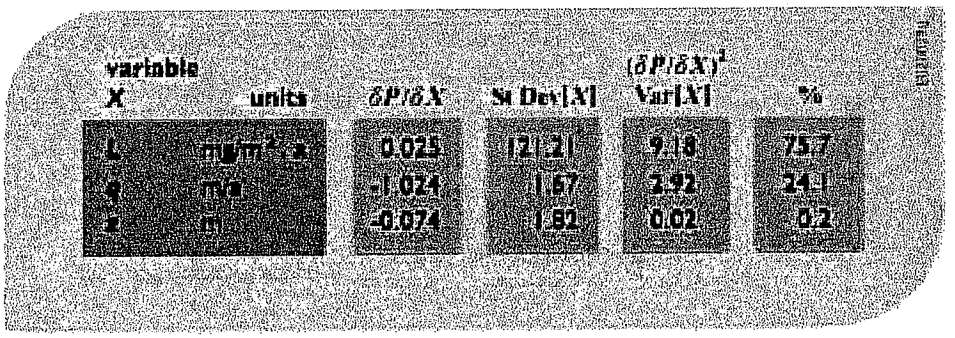
It is then necessary to estimate some representation of the variances of the various parameters with some consistent procedure. For a normal distribution, the distance between the 5 and 95 percentiles is 1.645 standard deviations on each side of the mean, or 2(1.645) = 3.3 standard deviations. Thus, if the high/low range is thought of as approximately a 5-95 percentile range for a normally distributed variate, a reasonable approximation of the variance might be

$$\mathrm{Var}[P_i] = \{ [P_{iH} - P_{iL}]/3.3 \}^2. \qquad (11)$$

This is all that is needed. Use of these average sensitivity coefficients is very reasonable for modeling the behavior of the system performance indicator I over the indicated ranges.

As an illustration of the method of first-order uncertainty analysis, consider the lake quality problem described above. The "system performance indicator" in this case is the model output, the phosphorus concentration P, and the input parameters, now denoted as $X = L$, q, and z. The standard deviation of each parameter is assumed to be the specified range divided by 3.3. Average sensitivity coefficients $\partial P/\partial X$ were calculated. The results are reported in the table below.

Table 4. Calculation of approximate parameter sensitivity coefficients.



Assuming the parameter errors are independent:

$$\text{Var}[P] = 9.18 + 2.92 + 0.02 = 12.12 \qquad (12)$$

The square root of 12.12 is the standard deviation and equals 3.48. This agrees well with a Monte Carlo analysis reported below.

Note that 100*(9.18/12.12), or about 76% of the total parameter error variance in the phosphorus concentration P is associated in the phosphorus loading rate L and the remaining 24% is associated with the hydrologic loading q. Eliminating the uncertainty in z would have a negligible impact on the overall model error. Likewise, reducing the error in q would at best have a modest impact on the total error.

Due to these uncertainties, the estimated phosphorus concentration has a standard deviation of 3.48. Assuming the errors are normally distributed, and recalling that ± 1.645 standard deviations around the mean define a 5-95 percentile interval, the 5-95 percentile interval would be about

$$16.8 \pm 1.645\ (3.48)\ \text{mg/m}^3 = 16.8 \pm 5.7\ \text{mg/m}^3 = 11.1 \text{ to } 22.5\ \text{mg/m}^3. \qquad (13)$$

These error bars indicate there is substantial uncertainty associated with the phosphorus concentration P, primarily due to uncertainty in the loading rate L.

The upper bound of 22.6 mg/m^3 is considerably less than the 27 mg/m^3 that would be obtained if both L and q had their most unfavorable values. In a probabilistic analysis with independent errors, such a combination is highly unlikely.

4.2.4.2 Warning on accuracy.

First-order uncertainty analysis is indeed an approximate method based upon a linearization of the response function represented by the full simulation model. It may provide inaccurate estimates of the variance of the response variable for nonlinear systems with large uncertainty in the parameters. In such cases Monte Carlo simulation (discussed below and in Chapter VII) or the use of higher-order approximation may be required. Beck (1987, p. 1426) cites studies that found that Monte Carlo and first-order variances were not appreciably different, and a few studies that found specific differences. Differences are likely to arise when the distributions used for the parameters are bimodal (or otherwise unusual), or some rejection algorithm is used in the Monte Carlo analysis to exclude some parameter combinations. Such errors can result in a distortion in the ranking of predominant sources of uncertainty. However, in most cases very similar results were obtained.

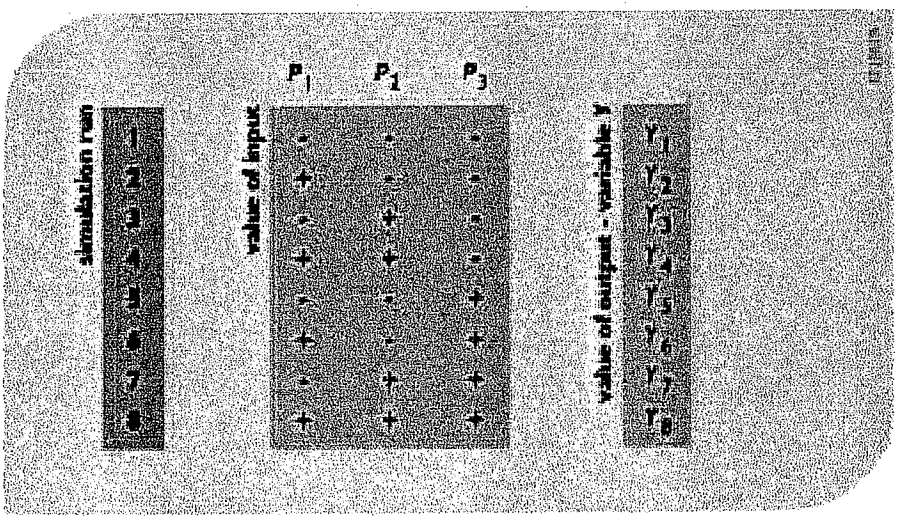
4.2.5 Fractional factorial design method

An extension of first-order sensitivity analysis would be a more complete exploration of the response surface using a careful statistical design. First consider a complete factorial design. Input data are divided into discrete "levels'. The simplest case is two levels. These two levels can be defined as a nominal value, and a high (low) value. Simulation runs are made for all combinations of parameter levels. For n different inputs, this would require 2^n simulation runs. Hence for a three-input variable or parameter problem, 8 runs would be required. If 4 discrete levels of each input variable or parameter were allowed to provide a more reasonable description of a continuous variable, the three-input data problem would require 4^3 or 64 simulation runs. Clearly this is not a useful tool for large regional water resources simulation models.

A fractional factorial design involves simulating only a fraction of what is required from a full factorial design method. The loss of information prevents a complete analysis of the impacts of each input variable or parameter on the output.

To illustrate the fractional factorial design method, consider the two-level with three-input variable or parameter problem. Table 5 below shows the 8 simulations required for a full factorial design method. The '+' and the '–' show the upper and lower levels of each input variable or parameter P_i where $i = 1, 2, 3$. If all 8 simulations were performed, seven possible effects could be estimated. These are the individual effects of the three inputs P_1, P_2, and P_3, the three two-input variable or parameter interactions, $(P_1)(P_2)$, $(P_1)(P_3)$, and $(P_2)(P_3)$, and the one three-input variable or parameter interaction $(P_1)(P_2)(P_3)$.

Table 5. A three-input factorial design.



Consider an output variable Y, where Y_j is the value of Y in the jth simulation run. Then an estimate of the effect, denoted $\delta(Y|P_i)$, that input variable or parameter P_i has on the output variable Y, is the average of the four separate effects of varying P_i:

For i = 1:

$$\delta(Y \mid P_1) = 0.25 \left[(Y_2-Y_1)+(Y_4-Y_3)+(Y_6-Y_5)+(Y_8-Y_7) \right] \quad (14)$$

Each difference in parentheses is the difference between a run in which P_1 is at its upper level and a run in which P_1 is at its lower level, but the other two parameter values, P_2 and P_3, are unchanged. If the effect is equal to 0, then, in this case, P_1 has no impact on the output variable Y.

Similarly the effects of P_2 and P_3, on variable Y can be estimated as:

$$\delta(Y \mid P_2) = 0.25 \left\{ (Y_3-Y_1)+(Y_4-Y_2)+(Y_7-Y_5)+(Y_8-Y_6) \right\} \quad (15)$$

and

$$\delta(Y \mid P_3) = 0.25 \left\{ (Y_5-Y_1)+(Y_6-Y_2)+(Y_7-Y_3)+(Y_8-Y_4) \right\} \quad (16)$$

Consider next the interaction effects between P_1 and P_2. This is estimated as the average of the difference between the average P_1 effect at the upper level of P_2, and the average P_1 effect at the lower level of P_2. This is the same as the difference between the average P_2 effect at the upper level of P_1 and the average P_2 effect at the lower level of P_1:

$$\delta(Y \mid P_1, P_2) = (1/2) \left\{ \left[(Y_8-Y_7) + (Y_4-Y_3) \right]/2 - \left[(Y_2-Y_1) + (Y_6-Y_5) \right]/2 \right\}$$

$$= (1/4) \left\{ \left[(Y_8-Y_6)+(Y_4-Y_2) \right] - \left[(Y_3-Y_1) + (Y_7-Y_5) \right] \right\} \quad (17)$$

Similar equations can be derived for looking at the interaction effects between P_1 and P_3, and between P_2 and P_3 and the interaction effects among all three inputs P_1, P_2, and P_3.

Now assume only half of the simulation runs were performed, perhaps runs 2, 3, 5 and 8 in this example. If only outputs Y_2, Y_3, Y_5, and Y_8 are available, for our example:

$$\delta(Y \mid P_3) = \sqcup(Y \mid P_1, P_2) = 0.5 \left\{ (Y_8 - Y_3) - (Y_2 - Y_5) \right\} \quad (18)$$

The separate effects of P_3 and of P_1P_2 are not available from the output. This is the loss in information resulting from fractional instead of complete factorial design.

4.2.6 Monte Carlo sampling methods

The Monte Carlo method of performing sensitivity analyses, illustrated in Figure 16, first selects a random set of input data values drawn from their individual probability distributions. These values are then used in the simulation model to obtain some model output variable values. This process is repeated many times, each time making sure the model calibration is

valid for the input data values chosen. The end result is a probability distribution of model output variables and system performance indices that results from variations and possible errors in all of the input values.

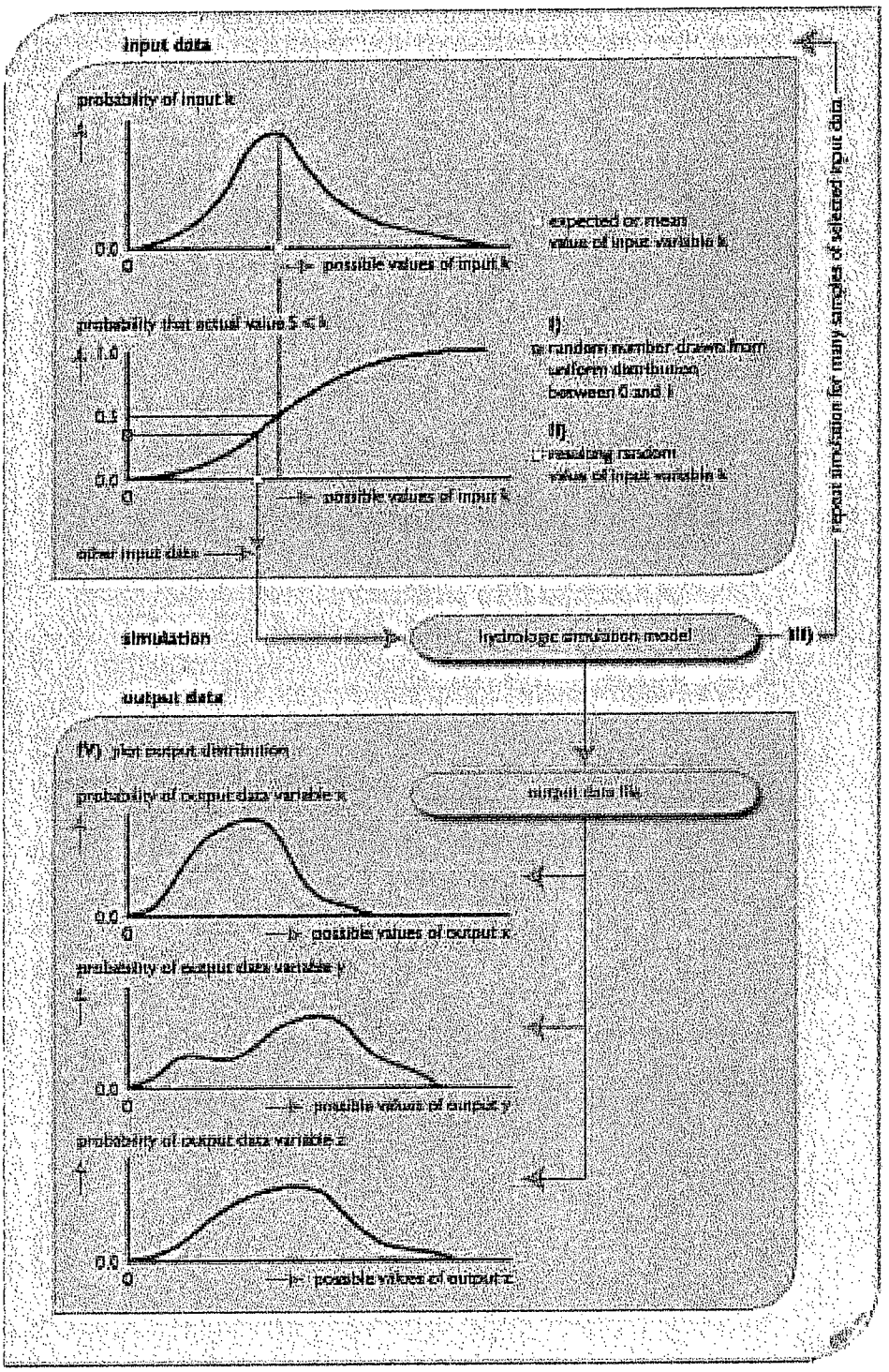


Figure 16. Monte Carlo sampling and simulation procedure for finding distributions of output variable values based on distributions, for specified reliability levels, of input data values. This technique can be applied to one or more uncertain input variables at a time. The output distributions will reflect the combined effects of this input uncertainty over the specified ranges.

Using a simple Monte Carlo analysis, values of all of the parameter sets are selected randomly from distributions describing the individual and joint uncertainty in each, and then the modeled system is simulated to obtain estimates of the selected performance indices. This must be done many times (often well over 100) to obtain a statistical description of system performance variability. The number of replications needed is generally not dependent on the number of parameters whose errors are to be analyzed. One can include in the simulation the uncertainty in parameters as well as natural variability. This method can evaluate the impact of single or multiple uncertain parameters.

A significant problem that arises in such simulations is that some combinations of parameter values result in unreasonable models. For example, model performance with calibration data sets might be inconsistent with available data sets. The calibration process places interesting constraints on different sets of parameter values. Thus, such Monte Carlo experiments often contain checks that exclude combinations of parameter values that are unreasonable. In these cases the generated results are conditioned on this validity check.

Whenever sampling methods are used, one must consider possible correlations among input data values. Sampling methods can handle spatial and temporal correlations that may exist among input data values, but the existence of correlation requires defining appropriate conditional distributions.

One major limitation of applying Monte Carlo methods to estimate ranges of risk and uncertainty for model output variable values, and system performance indicator values based on these output variable values, is the computing time required. To reduce the computing times needed to perform sensitivity analyses using sampling methods, some tricks and as well as stratified sampling methods are available. The discussion below illustrates the idea of a simple modification (or trick) using a "standardized" Monte Carlo analysis. The more general Latin Hypercube Sampling procedure is also discussed.

4.2.6.1 Simple Monte Carlo sampling

To illustrate the use of Monte Carlo sampling methods consider again Vollenweider's empirical relationship, Equation 5, for the average phosphorus concentration in lakes (Vollenweider, 1976). Two hundred values of each parameter were generated independently from normal distributions with the means and variances as shown in Table 6.

The table contains the specified means and variances for the generated values of L, q and z, and also the actual values of the means and variances of the 200 generated values of L, q, z and also of the 200 corresponding generated output phosphorus concentrations, P. Figure 17 displays the distribution of the generated values of P.

Table 6. Monte Carlo analysis of lake phosphorus levels.

parameter	L	q	z	P
		specified means and standard deviations		
mean standard deviation	680.00 121.21	10.60 1.67	84.00 1.82	— —
		generated means and standard deviations		
mean standard deviation	674.18 130.25	10.41 1.73	84.06 1.82	17.07 3.61

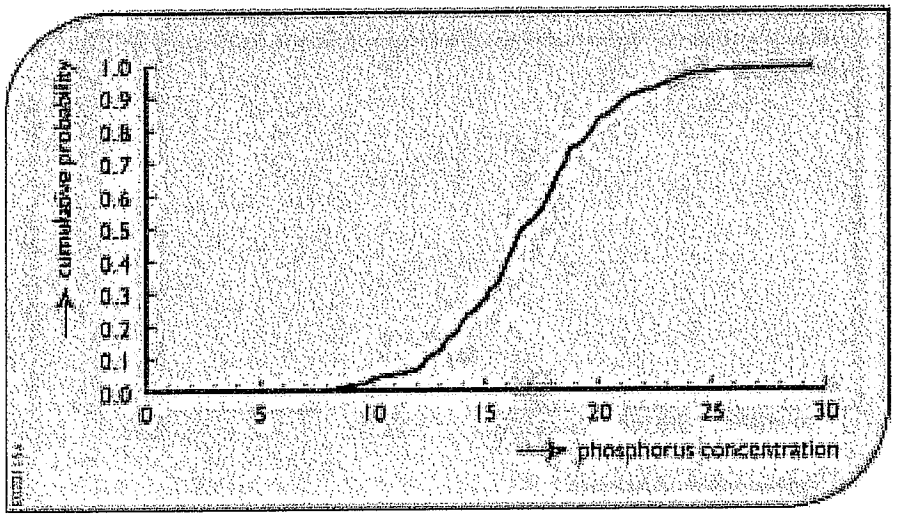


Figure 17. Distribution of lake phosphorus concentrations from Monte Carlo analysis

One can see that given the estimated levels of uncertainty, phosphorus levels could reasonably range from below 10 to above 25. The probability of generating a value greater than 20 mg/m^3 was 12.5%. The 5% to 95 percentile range was 11.1 to 23.4 mg/m^3. In the figure, the cumulative probability curve is rough because only 200 values of the phosphorus concentration were generated, but these are clearly enough to give a good impression of the overall impact of the errors.

4.2.6.2 Sampling uncertainty.

In this example, the mean of the 200 generated values of the phosphorus concentration, P, was 17.07. However a different set of random values would have generated a different set of P values as well. Thus it is appropriate to estimate the standard error, SE, of this average. The standard error equals the standard deviation σ of the P values divided by the square root of the sample size n:

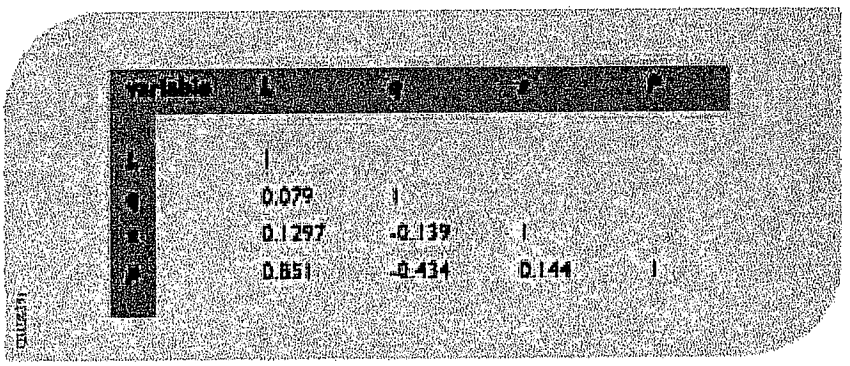
$$SE = \sigma/(n)^{0.5} = 3.61/(200)^{0.5} = 0.25. \qquad (19)$$

From the central limit theorem of mathematical statistics, the average of a large number of independent values should have very nearly a normal distribution. Thus, 95% of the time, the true mean of P should be in the interval $17.1 \pm 1.96\ (0.25)$, or 16.6 to 17.6 mg/m^3. This level of uncertainty reflects the observed variability of P and the fact that only 200 values were generated.

4.2.6.3 Making sense of the results.

A significant challenge with complex models is to determine from the Monte Carlo simulation which parameter errors are important. Calculating the correlation between each generated input parameter value and the output variable value is one way of doing this. As Table 7 below shows, based upon the magnitudes of the correlation coefficients, errors in L were most important, and those in q second in importance.

Table 7. Correlation analysis of Monte Carlo results.



One can also use regression to develop a linear model defining variations in the output based on errors in the various parameters. The results are shown in the Table 8. The fit is very good, and $R^2 = 98\%$. If the model for P had been linear, a R^2 value of 100% should have resulted. All of the coefficients are significantly different from zero.

Note that the correlation between P and z was positive in Table 7, but the regression coefficient for z is negative. This occurred because there is a modest negative correlation between the generated z and q values. Use of partial correlation coefficients can also correct for such spurious correlations among input parameters.

Table 8. Results of Regression Analysis on Monte Carlo Results

	coefficient	standardized error	ratio
intercept	18.605	1.790	10.39
L	0.075	0.000	85.36
Q	-1.068	0.022	-48.54
Z	-0.085	0.021	- 4.08

Finally we display a plot, Figure 18, based on this regression model illustrating the reduction in the variance of P that is due to dropping each variable individually. Clearly L has the biggest impact on the uncertainty in P, and z the least.

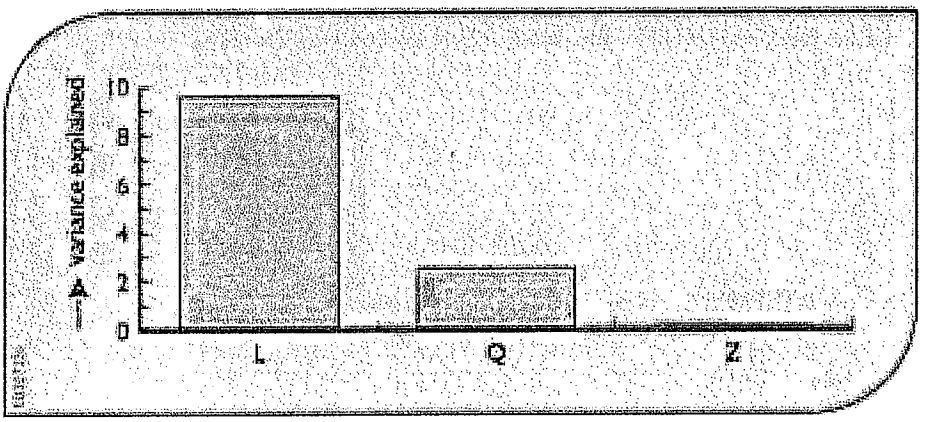


Figure 18. Reduction in the variance of P that is due to dropping from the regression model each variable individually. Clearly L has the biggest impact on the uncertainty in P, and z the least.

4.2.6.4 Standardized Monte Carlo analysis

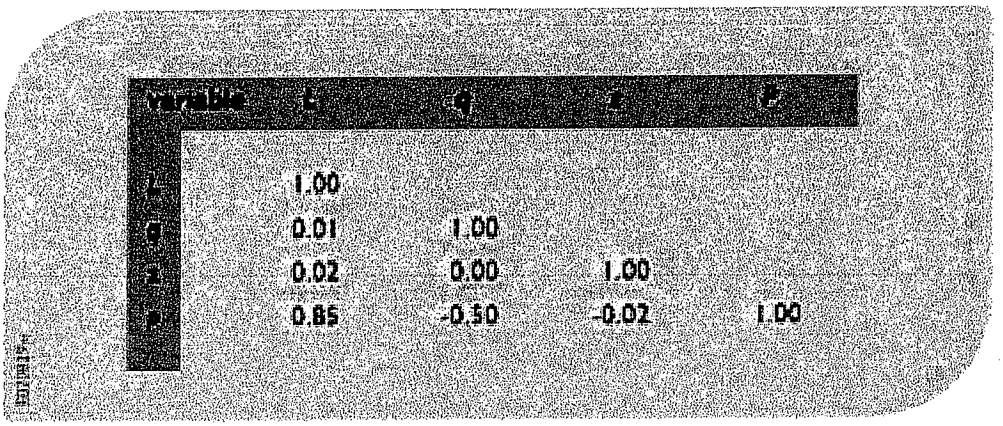
Using a "standardized" Monte Carlo analysis, one could adjust the generated values of L, q and z above so that the generated samples actually have the desired mean and variance. While making that correction, one can also shuffle their values so that the correlations among the generated values for the different parameters are near zero, as is desired. This was done for the 200 generated values to obtain the statistics shown in Table 9.

Table 9. Standardized Monte Carlo analysis of lake phosphorus levels

parameter	L	q	z	P
	specified means and standard deviations			
Mean	680.00	10.60	84.00	—
Standard deviations	121.21	1.67	1.82	—
	generated means and standard deviations			
Mean	680.00	10.60	84.00	17.03
Standard deviations	121.21	1.67	1.82	3.44

Repeating the correlation analysis from before (shown in Table 10) now yields much clearer results that are in agreement with the regression analysis. The correlation between P and both q and z are now negative as they should be. Because the generated values of the three parameters have been adjusted to be uncorrelated, the signal from one is not confused with the signal from another.

Table 10. Correlation analysis of standardized Monte Carlo results



Variable	L	Q	I	P
L	1.00			
Q	0.01	1.00		
I	0.02	0.00	1.00	
P	0.85	-0.50	-0.02	1.00

The mean phosphorus concentration changed very little. It is now 17.0 instead of 17.1 mg/m^3.

Using control variates with a linear predictive model in conjunction with the standardized Monte Carlo variates, the standard deviation of the errors associated with the 200 observations is only 0.45. Thus the standard error for this estimate of the mean of P is $0.45/(200)^{0.5}$ or just 0.03. Thus this is a highly accurate result. The regressions were also repeated and yielded very similar results. The only real difference was that the parameter estimates had small standard errors and were more significant because of the elimination of correlation between the generated parameters.

4.2.6.5 Generalized likelihood estimation

Beven (1993) and Binley and Beven (1991) suggest a Generalized Likelihood Uncertainty Estimation (GLUE) technique for assessment of parameter error uncertainty using Monte Carlo simulation. It is described as a "formal methodology for some of the subjective elements of model calibration" (Beven, 1989, p. 47). The basic idea is to begin by assigning reasonable ranges for the various parameters and then to draw parameter sets from those ranges using a uniform or some similar (and flat) distribution. These generated parameter sets are then used on a calibration data set so that unreasonable combinations can be rejected, while reasonable values are assigned a posterior probability based upon a likelihood measure which may reflect several dimensions and characteristics of model performance.

Let $L(P_i) > 0$ be the value of the likelihood measure assigned to the ith parameter set's calibration sequence. Then the model predictions generated with parameter set/combination P_i are assigned posterior probability, $p(P_i)$.

$$p(P_i) = L(P_i)/\Sigma_j L(P_j) \qquad (20)$$

These probabilities reflect the form of Bayes theorem, which is well supported by probability theory (Devore, 1991). This procedure should capture reasonably well the dependence or correlation among parameters, because *reasonable* sequences will all be assigned larger probabilities, whereas sequences that are unable to reproduce the system response over the calibration period will be rejected or assigned small probabilities.

However, in a rigorous probabilistic framework, the L would be the likelihood function for the calibration series for particular error distributions. (This could be checked with available goodness-of-fit procedures; for example, Kuczera, 1988.) When relatively ad hoc measures are adopted for the likelihood measure with little statistical validity, the $p(P_i)$ probabilities are best described as pseudo probabilities or "likelihood" weights.

Another concern with this method is the potential efficiency. If the parameter ranges are too wide, a large number of unreasonable or very unlikely parameter combinations will be generated. These will either be rejected or else will have small probabilities and thus little effect on the analysis. In this case the associated processing would be a waste of effort. A compromise is to use some data to calibrate the model and to generate a prior or initial distribution for the parameters that is at least centered in the best range (Beven 1993, p. 48). Then use of a different calibration period to generate the $p(P_i)$ allows an updating of those initial probabilities to reflect the information provided by the additional calibration period with the adopted likelihood measures.

After the accepted sequences are used to generate sets of predictions, the likelihood weights would be used in the calculation of means, variances and quantiles, rather than the customary procedure of giving all the generated realizations equal weight. The resulting conditional distribution of system output reflects the initial probability distributions assigned to parameters, the rejection criteria, and the likelihood measure adopted to assign "likelihood" weights.

4.2.7 Latin hypercube sampling

For the simple Monte Carlo simulations described above, with independent errors, a probability distribution is assumed for each input parameter or variable. In each simulation run, values of all input data are obtained from sampling those individual and independent distributions. The value generated for an input parameter or variable is usually independent of what that value was in any previous run, or what other input parameter or variable values are in the same run. This simple sampling approach can result in a clustering of parameter values and hence both redundancy of information from repeated sampling in the same regions of a distribution and lack of information from no sampling in other regions of the distributions.

A stratified sampling approach ensures more even coverage of the range of input parameter or variable values with the same number of simulation runs. This can be accomplished by dividing the input parameter or variable space into sections and sampling from each section with the appropriate probability.

One such approach, Latin hypercube sampling (LHS), divides each input distribution into sections of equal probability for the specified the probability distribution, and draws one observation randomly from each range. Hence the ranges of input values within each section actually occur with equal frequency in the experiment. These values from each interval for each distribution are randomly assigned to those from other intervals to construct sets of input values for the simulation analysis. Figure 19 shows the steps in constructing a LHS for six simulations involving three inputs P_j (P_1, P_2, and P_3) and six intervals of their respective normal, uniform and triangular probability distributions.

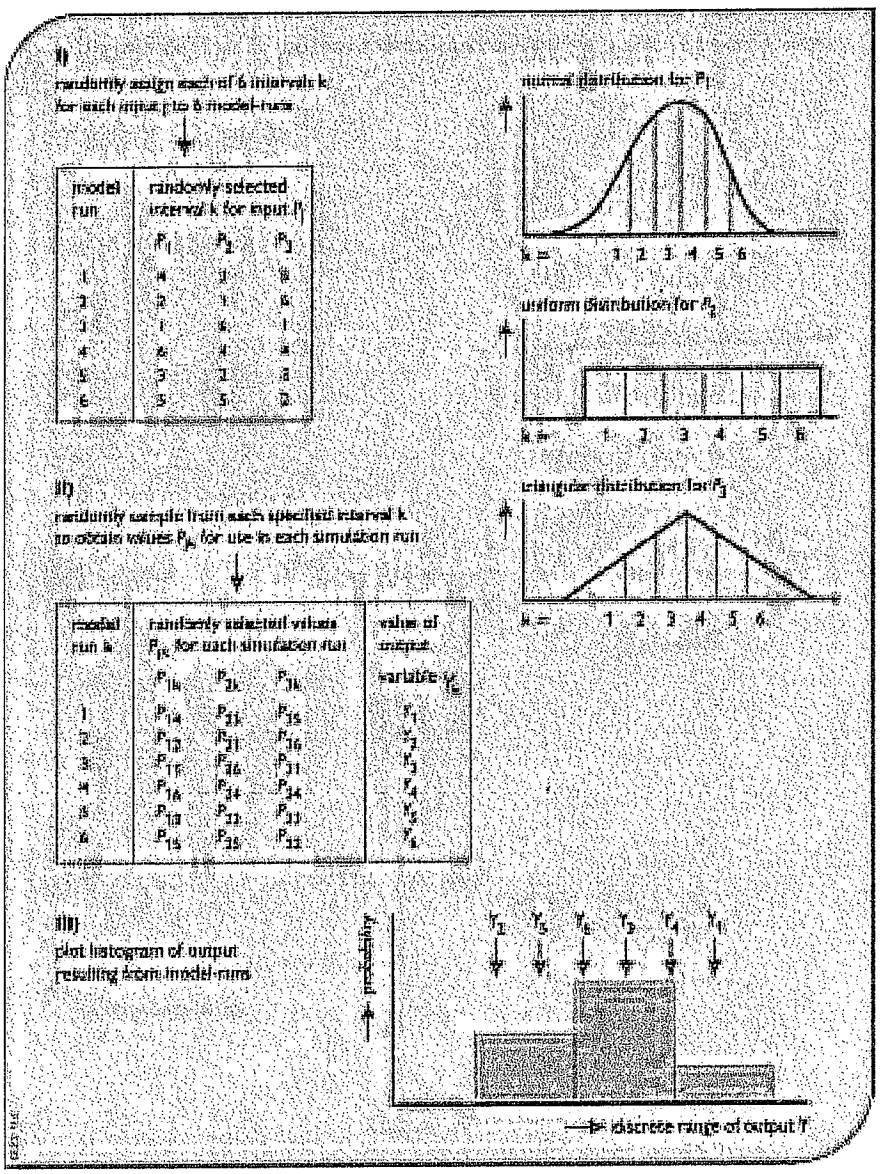


Figure 19. Schematic representation of a Latin hypercube sampling procedure for six simulation runs.

5. Performance indicator uncertainties

5.1 Performance measure target uncertainty

Another possible source of uncertainty is the selection of performance measure target values. For example, consider a target value for a pollutant concentration based on the effect of exceeding it in an ecosystem. Which target value is best or correct? When this is not clear, there are various ways of expressing the uncertainty associated with any target value. One such method is the use of fuzzy sets (Chapter VI). Use of 'grey' numbers or intervals instead of 'white' or fixed target values is another. When some uncertainty or disagreement exists over the selection of the best target value for a particular performance measure it seems to us the most direct and transparent way to do this is to subjectively assume a distribution over a range of possible target values. Then this subjective probability distribution can be factored into the tradeoff analysis, as outlined in Figure 20.

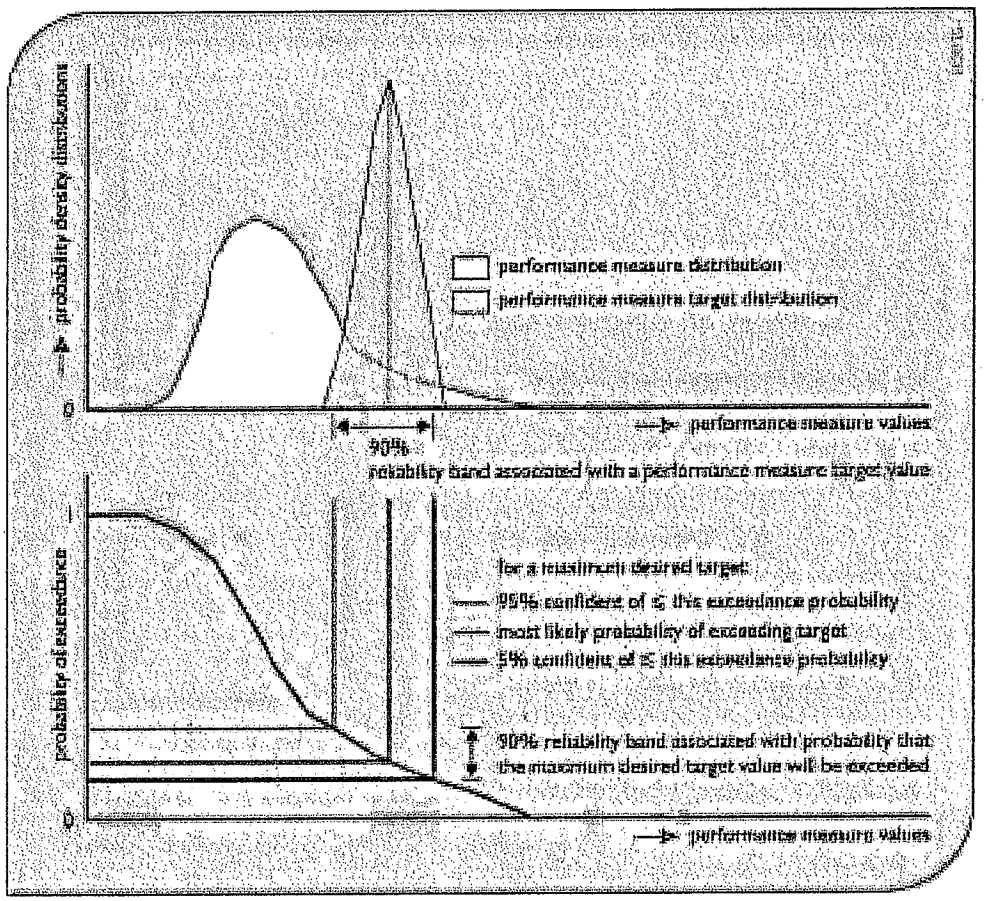


Figure 20. Combining the probability distribution of performance measure values with the probability distribution of performance measure target values to estimate the confidence one has in the probability of exceeding a maximum desired target value.

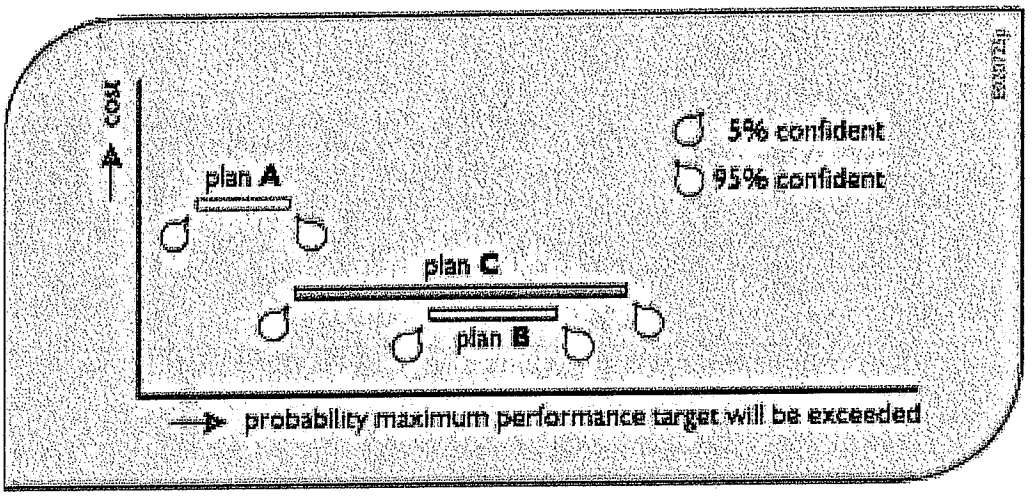


Figure 23. Tradeoffs among cost, reliabilities, and the confidence level of those reliabilities. The relative ranking of plans with respect to the probability of exceeding the desired (maximum limit) target may depend on the confidence given to that probability.

In Figure 23, in terms of cost the plans are ranked, from best to worst, B, C, and A. In terms of reliability at the 90 percent confidence level, they are ranked A, B, and C but at the 50 percent confidence level the ranking is A, C and B.

If the plan evaluation process has difficulty handling all this it may indicate the need to focus the uncertainty analysis effort on just what is deemed important, achievable, and beneficial. Then when the number of alternatives has been narrowed down to only a few that appear to be the better ones, a more complete uncertainty analysis can be performed. There is no need nor benefit in performing sensitivity and uncertainty analyses on all possible management alternatives. Rather one can focus on those alternatives that look the most promising, and then carry out additional uncertainty and sensitivity analyses only when important uncertain performance indicator values demands more scrutiny. Otherwise the work is not likely to affect the decision anyway.

5.2 Distinguishing differences between performance indicator distributions

Simulations of alternative water management infrastructure designs and operating policies require a comparison of the simulation outputs – the performance measures or indicators – associated with each alternative. A reasonable question to ask is are the observed differences statistically significant. Can one really tell if one alternative is better than another or are the observed differences explainable by random variations attributable to variations in the inputs and how the system responds?

This is a common statistical issue that is addressed by standard hypothesis tests (Devore, 1991; Benjamin and Cornell, 1970). Selection of an appropriate test requires that one first resolve what type of change one expects in the variables. To illustrate, consider the comparison of two

One of the challenges associated with defining and including in an analysis the uncertainty associated with a target or threshold value for a performance measure is that of communicating just what the result of such an analysis means. Referring to Figure 20, suppose the target value represents some maximum limit of a pollutant, say phosphorus, concentration in the flow during a given period of time at a given site or region, and it is not certain just what that maximum limit should be. Subjectively defining the distribution of that maximum limit, and considering that uncertainty along with the uncertainty (probability of exceedance function) of pollutant concentrations – the performance measure – one can attach a confidence to any probability of exceeding the maximum desired concentration value.

The 95% probability of exceedance shown on Figure 20, say $P_{0.95}$, should be interpreted as "we can be 95% confident that the probability of the maximum desired pollutant concentration being exceeded will be no greater than $P_{0.95}$." We can be only 5% confident that the probability of exceeding the desired maximum concentration will be no greater than the lower $P_{0.05}$ value. Depending on whether the middle line through the subjective distribution of target values in Figure 20 represents the most likely or median target value, the associated probability of exceedance is either the most likely, as indicated in Figure 20, or that for which we are only 50% confident.

Figure 21 attempts to show how to interpret the reliabilities when the uncertain performance targets are

- minimum acceptable levels that are to be maximized,
- maximum acceptable levels that are to be minimized or
- optimum levels.

An example of a minimum acceptable target level might be the population of wading birds in an area. An example of a maximum acceptable target level might be, again, the phosphorus concentration of the flow in a specific wetland or lake. An example of an optimum target level might be the depth of water most suitable for selected species of aquatic vegetation during a particular period of the year.

For performance measure targets that are not expressed as minimum or maximum limits but that are the 'best' values, referring to Figure 21, one can state that one is 90% confident that the probability of achieving the desired target is no more than B. The 90% confidence level probability of not achieving the desired target is at least A+C. The probability of the performance measure being too low is at least A and the probability of the performance measure being too high is at least C, again at the 90% confidence levels. As the confidence level decreases the bandwidth decreases, and the probability of not meeting the target increases.

Now, clearly there is uncertainty associated with each of these uncertainty estimations, and this raises the question of how valuable is the quantification of the uncertainty of each additional component of the plan in an evaluation process. Will plan evaluators and decision makers

benefit from this additional information, and just how much additional uncertainty information is useful?

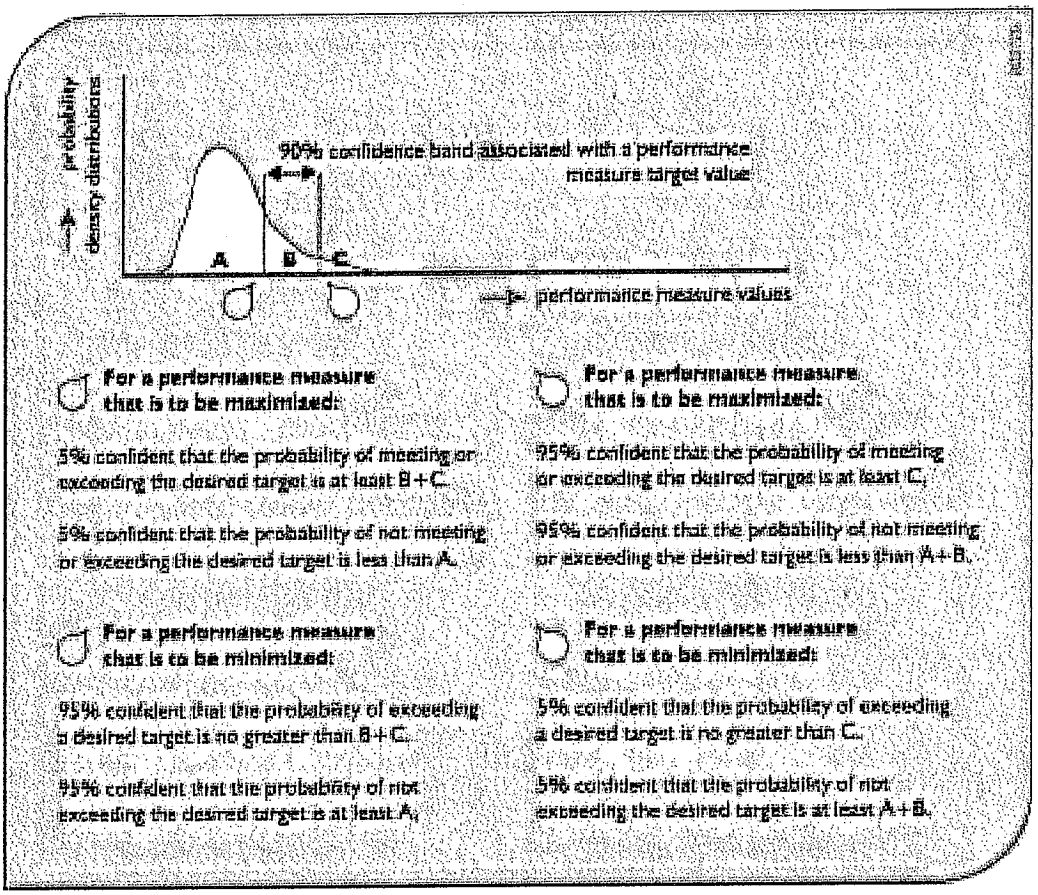


Figure 21. Interpreting the results of combining performance measure probabilities with performance measure target probabilities depends on the type of performance measure. The letters A, B, and C represent proportions of the probability density function of performance measure values. (Hence probabilities A + B + C = 1.)

Now consider again the tradeoffs that need to be made as illustrated in Figure 7. Instead of considering a single target value as shown on Figure 7, assume there is a 90% confidence range associated with that single performance measure target value. Also assume that the target is a maximum desired upper limit (e.g., of some pollutant concentration).

positive (say Y_1 tends to be larger then Y_2), or negative (Y_1 tends to be smaller), or are positive and negative differences are equally likely (there is no difference between Y_1 and Y_2).

Both parametric and non-parametric families of statistical tests are available for paired data. The common parametric test for paired data (a one-sample t test) assumes that the mean of the differences

$$X(i) = Y_1(i) - Y_2(i) \tag{21}$$

are normally distributed. Then the hypothesis of no difference is rejected if the t statistic is sufficiently large, given the sample size n.

Alternatively, one can employ a nonparametric test and avoid the assumption that the differences $X(i)$ are normally distributed. In such a case, one can use the Wilcoxon Signed Rank test. This nonparametric test ranks the absolute values $|X(i)|$ of the differences. If the sum S of the ranks of the positive differences deviates sufficiently from its expected value, $n(n+1)/4$ (were there no difference between the two distributions), one can conclude that there is a statistically significant difference between the $Y_1(i)$ and $Y_2(i)$ series. Standard statistical texts have tables of the distribution of the sum S as a function of the sample size n, and provide a good analytical approximation for $n > 20$ (for example, Devore, 1991). Both the parametric t test and the nonparametric Wilcoxon Signed Rank test require that the differences between the simulated values for each year be computed.

6. Communicating model output uncertainty

Spending money on reducing uncertainty would seem preferable to spending it on ways of calculating and describing it better. Yet attention to uncertainty communication is critically important if uncertainty analyses and characterizations are to be of value in a decision making process. In spite considerable efforts by those involved in risk assessment and management, we know very little about how to ensure effective risk communication to gain the confidence of stakeholders, incorporate their views and knowledge, and influence favorably the acceptability of risk assessments and risk-management decisions.

The best way to communicate concepts of uncertainty may well depend on what the audiences already know about risk and the various types of probability distributions (e.g., density, cumulative, exceedance) based on objective and subjective data, and the distinction between mean or average values and the most likely values. Undoubtedly graphical representations of these ways of describing uncertainty considerably facilitate communication.

The National Research Council (NRC 1994) addressed the extensive uncertainty and variability associated with estimating risk and concluded that risk characterizations should not be reduced to a single number or even to a range of numbers intended to portray uncertainty. Instead, the report recommended managers and the interested public should be given risk characterizations that are both qualitative and quantitative and both verbal and mathematical.

different operating policies. Let Y_1 denote the set of output performance variable values with the first policy, and Y_2 the set of output performance variable values of the second policy. In many cases, one would expect one policy to be better than the other. One measure might be the difference in the mean of the variables; for example is $E[Y_1] < E[Y_2]$?. Alternatively one could check the difference in the median (50 percentile) of the two distributions.

In addition, one could look for a change in the variability or variance, or a shift in both the mean and the variance. Changes described by a difference in the mean or median often make the most sense and many statistical tests are available that are sensitive to such changes. For such investigations parametric and non-parametric tests for paired and unpaired data can be employed.

Consider the differences between "paired" and "unpaired" data. Suppose that the meteorological data for 1941-1990 is used to drive a simulation model generating data as described in Table 11:

Table 11. Possible flow data from a 50-year simulation

1941	Y_1 (1)	Y_2 (1)
1942	Y_1 (2)	Y_2 (2)
1943	Y_1 (3)	Y_2 (3)
1944	Y_1 (4)	Y_2 (4)
1989	Y_1 (49)	Y_2 (49)
1990	Y_1 (50)	Y_2 (50)

Here there is one sample, $Y_1(1)$ through $Y_1(50)$, for policy 1, and another sample, $Y_2(1)$ through $Y_2(50)$, for policy 2. However, the two sets of observations are not independent. For example, if 1943 was a very dry year, then we would expect both $Y_1(3)$ for policy 1 in that year and $Y_2(3)$ for policy 2 to be unusually small. With such paired data, one can use a paired hypothesis test to check for differences. Paired tests are usually easier than the corresponding unpaired tests that are appropriate in other cases. (For example, if one were checking for a difference in average rainfall depth between 1941-1960, and 1961-1990, they would have two sets of independent measurements for the two periods. With such data, one should use a two-sample unpaired test.)

Paired tests are generally based on the differences between the two sets of output, $Y_1(i) - Y_2(i)$. These are viewed as a single independent sample. The question is then are the differences

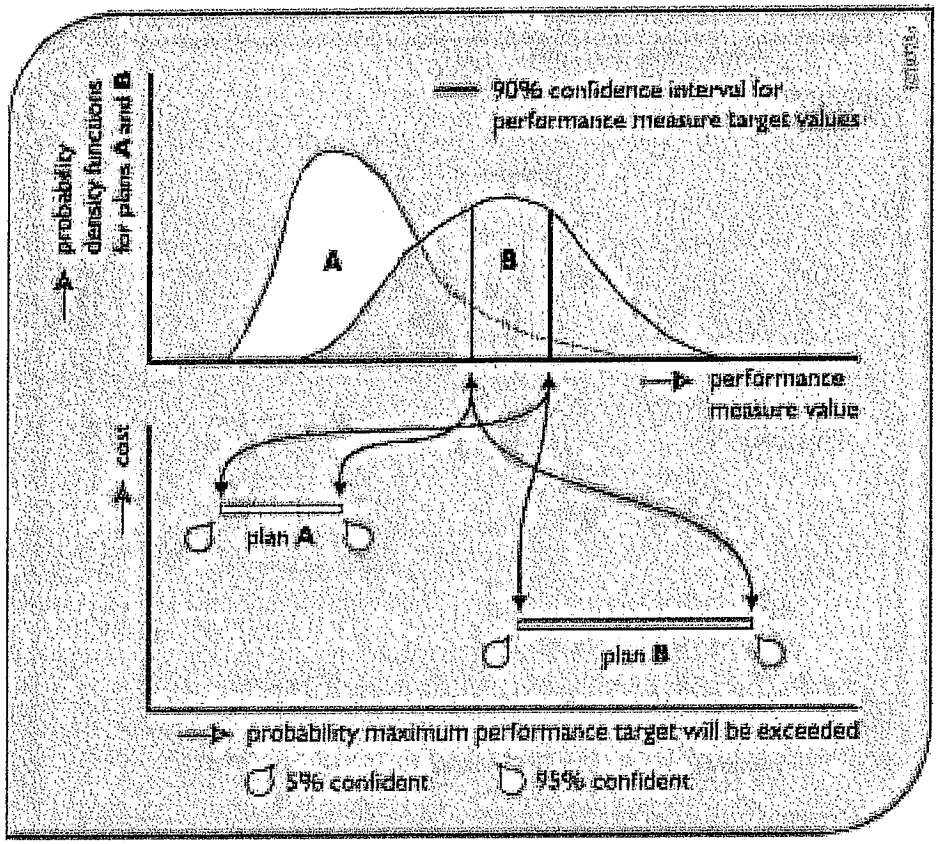


Figure 22. Two plans showing ranges of probabilities, depending on one's confidence, that an uncertain desired maximum (upper limit) performance target value will be exceeded. The 95% confidence levels are associated with the higher probabilities of exceeding the desired maximum target. The 5% confident levels are associated with the more desirable lower probabilities of exceeding the desired maximum target. Plan A with reduced probabilities of exceeding the upper limit costs more than Plan B.

In the case shown in Figure 22, the tradeoff is clearly between cost and reliability. In this example, no matter what confidence one chooses, Plan A is preferred to Plan B with respect to reliability, but Plan B is preferred to Plan A with respect to cost. The tradeoff is only between these two performance indicators or measures.

Consider however a third plan, as shown in Figure 23. This situation adds to the complexity of making appropriate tradeoffs. Now there are three criteria: cost, probability of exceedance (reliability) and the confidence in those reliabilities or probabilities. Add to this the fact that there will be multiple performance measure targets, each expressed in terms of their maximum probabilities of exceedance and the confidence in those probabilities.

In some cases communicating qualitative information about uncertainty to stakeholders and the public in general may be more effective than quantitative information. There are, of course, situations in which quantitative uncertainty analyses are likely to provide information that is useful in a decision-making process. How else can tradeoffs such as illustrated in Figures 10 and 27 be identified? Quantitative uncertainty analysis often can be used as the basis of qualitative information about uncertainty, even if the quantitative information is not what is communicated to the public.

One should acknowledge to the public the widespread confusion regarding the differences between variability and uncertainty. Variability does not change through further measurement or study, although better sampling can improve our knowledge about variability. Uncertainty reflects gaps in information about scientifically observable phenomena.

While it is important to communicate uncertainties and confidence in predictions, it is equally important to clarify who or what is at risk, possible consequences, and the severity and irreversibility of an adverse effect should a target value, for example, not be met. This qualitative information is often critical to informed decision-making. Risk and uncertainty communication is always complicated by the reliability and amounts of available relevant information as well as how that information is presented. Effective communication between people receiving information about who or what is at risk, or what might happen and just how severe and irreversible an adverse effect might be should a target value not be met, is just as important as the level of uncertainty and the confidence associated with such predictions. A two-way dialog between those receiving such information and those giving it can help identify just what seems best for a particular audience.

Risk and uncertainty communication is a two-way street, It involves learning and teaching. Communicators dealing with uncertainty should learn about the concerns and values of their audience, their relevant knowledge, and their experience with uncertainty issues. Stakeholders' knowledge of the sources and reasons for uncertainty needs to be incorporated into assessment and management and communication decisions. By listening, communicators can craft risk messages that better reflect the perspectives, technical knowledge, and concerns of the audience.

Effective communication should begin before important decisions have been made. It can be facilitated in communities by citizen advisory panels. Citizen advisory panels can give planners and decision makers a better understanding of the questions and concerns of the community and an opportunity to test its effectiveness in communicating concepts and specific issues regarding uncertainty.

One approach to make uncertainty more meaningful is to make risk comparisons. For example, a ten parts per billion target for a particular pollutant concentration is equivalent to 10 seconds in over 31 years. If this is an average daily concentration target that is to be satisfied "99 percent," of the time, this is equivalent to an expected violation of less than one day every three months.

Many perceive the reduction of risk by an order of magnitude as though it were a linear reduction. A better way to illustrate orders of magnitude of risk reduction is shown in Figure 24, in which a bar graph depicts better than words that a reduction in risk from one in a 1,000 (10^{-3}) to one in 10,000 (10^{-4}) is a reduction of 90% and that a further reduction to one in 100,000 (10^{-5}) is a reduction 10-fold less than the first reduction of 90%. The percent of the risk that is reduced by whatever measures is a much easier concept to communicate than reductions expressed in terms of estimated absolute risk levels, such as 10^{-5}.

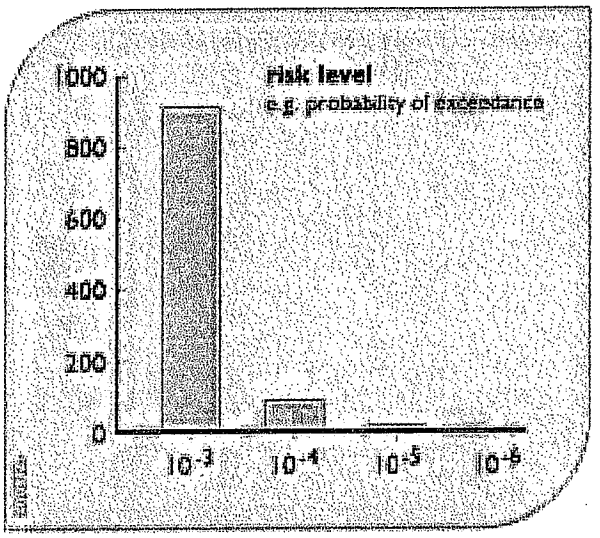


Figure 24. Reducing risk by orders of magnitude is not equivalent to linear reductions.

Risk comparisons can be helpful, but they should be used cautiously and tested if possible. There are dangers in comparing risks of diverse character, especially when the intent of the comparison is seen as minimizing a risk (NRC 1989). One difficulty in using risk comparisons is that it is not always easy to find risks that are sufficiently similar to make a comparison meaningful. How is someone able to compare two alternatives having two different costs and two different risk levels, for example, as is shown in Figure 7? One way is to perform an indifference analysis (Chapter X), but that can lead to different results depending who performs it. Another way is to develop utility functions using weights, where, for example reduced phosphorus load by half is equivalent to a 25 percent shorter hydroperiod in that area, but again each person's utility or tradeoff may differ.

At a minimum, graphical displays of uncertainty can be helpful. Consider the common system performance indicators that include:

- Time-series plots for continuous time-dependent indicators (Figure 25 upper left)
- Probability exceedance distributions for continuous indicators (Figure 25 upper right),
- Histograms for discrete event indicators (Figure 25 lower left), and
- Overlays on maps for space-dependent discrete events (Figure 25 lower right).

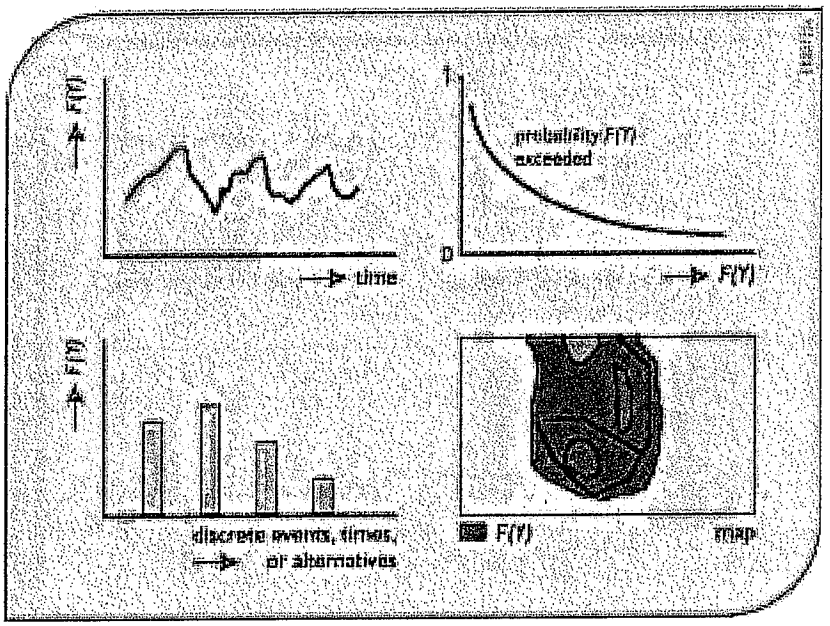


Figure 25. Different types of displays used to show model output Y or system performance indicator values $F(Y)$.

The first three graphs in Figure 25 could show, in addition to the single curve or bar that represents the most likely output, a range of outcomes associated with a given confidence interval. For overlays of information on maps, different colors could represent the spatial extents of events associated with different ranges of risk or uncertainty. Figure 26, corresponding to Figure 25, illustrates these approaches for displaying these ranges.

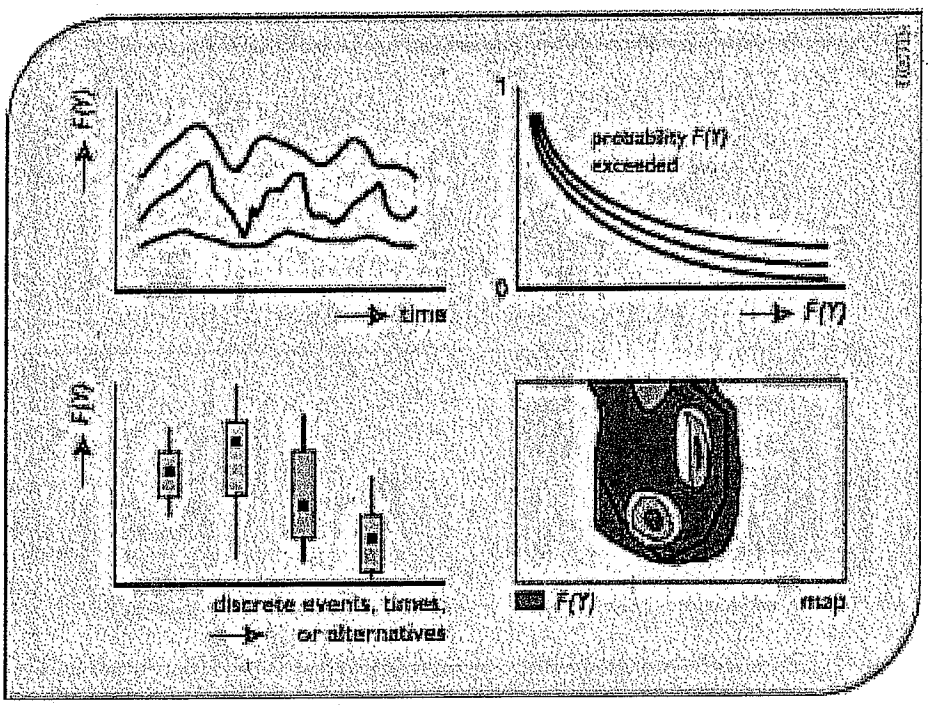


Figure 26. Plots of ranges of possible model output Y or system indicator values $F(Y)$ for different types of displays.

7. Conclusions

This chapter provides an overview of uncertainty and sensitivity analyses in the context of hydrologic or water resources systems simulation modeling. A broad range of tools are available to explore, display, and quantify the sensitivity and uncertainty in predictions of key output variables and system performance indices with respect to imprecise and random model inputs and to assumptions concerning model structure. They range from relatively simple deterministic sensitivity analysis methods to more involved first-order analyses and Monte Carlo sampling methods.

Because of the complexity of many watersheds or river basins, Monte Carlo methods for uncertainty analyses may be a very major and unattractive undertaking. Therefore it is often prudent begin with the relatively simple deterministic procedures. This coupled with a probabilistically based first-order uncertainty analysis method can help quantify the uncertainty in key output variables and system performance indices, and the relative contributions of uncertainty in different input variables to the uncertainty in different output variables and system performance indices. These relative contributions may differ depending upon which output variables and indices are of interest.

A sensitivity analysis can provide a systematic assessment of the impact of parameter value imprecision on output variable values and performance indices, and of the relative contribution of errors in different parameter values to that output uncertainty. Once the key variables are identified, it should be possible to determine the extent to which parameter value uncertainty can be reduced through field investigations, development of better models, and other efforts.

Model calibration procedures can be applied to individual catchments and subsystems, as well as to composite systems. Automated calibration procedures have several advantages including the explicit use of an appropriate statistical objective function, identification of those parameters that best reproduce the calibration data set with the given objective function, and the estimations of the statistical precision of the estimated parameters.

All of these tasks together can represent a formidable effort. However, knowledge of the uncertainty associated with model predictions can be as important to management decision and policy formulation as are the predictions themselves.

No matter how much attention is given to quantifying and reducing uncertainties in model outputs, uncertainties will remain. Professionals who analyze risk, managers and decision makers who must manage risk, and the public who must live with risk and uncertainty, have different information needs and attitudes regarding risk and uncertainty. It is clear that information needs differ among those who model or use models, those who make substantial investment or social decisions, and those who are likely to be impacted by those decisions. Meeting those needs should result in more informed decision making. But it comes at a cost that should be considered along with the benefits of having this sensitivity and uncertainty information.

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Appendix I: Model Calibration Examples

- *Calibration of models in the Murray-Darling Basin*

In the Murray-Darling Basin, in order to preserve water quality, water reliability and the environment, a decision was made in 1995 to restrict water use to the 1993/94 level of development. Computer models of the major tributary streams are now used at the end of each year to determine the annual use target for the previous season based on that level of development. Rules are in place to ensure that long term usage is maintained at the agreed level. Because the models now define the overall water rights of each valley, there are legal requirements to calibrate models and each model is independently audited and certified as being unbiased before being approved as fit for purpose. The key model output of interest is water use but emphasis is also placed on the modeling of downstream flow which impacts the rights of downstream regions. Each model must be calibrated over at least ten years and this often means that changes in infrastructure, operating rules and growth in demand have to be incorporated into the calibration run. Calibration reports contain plots of modeled and observed water use, storage behavior and flow and statistics such as mean error, correlation coefficients and standard errors. The aim of calibration is to ensure that the model is unbiased and to give confidence to stakeholders.

An issue that is sometimes raised with model development is the role of calibration, where the model is fine-tuned to match the observed data, and validation where the model is tested against data that was not used in the calibration process to get an independent assessment of the model's accuracy. For the Murray River, because of the variability of our climate, we like to calibrate our model against a long period of data including the most recent years when the current operating rules were being used and the historical data is generally the most reliable. Validation is considered to be less important and is typically carried out using the two or three years of data available following the completion of model calibration.

- *Use of models for Allocating Water in Texas*

Recent legislation in Texas revised the State Water Planning process and mandated the development of water allocation models for every river basin in the state (http://www.tnrcc.state.tx.us/permitting/waterperm/wrpa/permits.html). Similar to the Murray – Darling situation, these models are used to provide estimates of reliability for all permitted water diversions in the state as well as analysis of the effects of all permit applications. Naturalized, or predevelopment, time series of flows were constructed for the basins, and then the effects of developments were added in to achieve models of the current situation. The process of developing the basin models was an iterative, peer reviewed calibration process subject to stakeholder comment at several critical junctures. The naturalized flows and subsequent development of the basins now form an accepted and legal basis for future water allocations. Currently, similar activities are ongoing to provide calibrated and verified models of the state's groundwater aquifers and usage.

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LETTER 20

attachment #7

ADDITIONAL COMMENTS ON CALSIM II
PERTINENT TO THE TEMPORARY RESTRAINING ORDER

February 7, 2006
By: Arve R. Sjovold

On reading the Court's decision on our temporary restraining order, I tossed over in my mind the defendant's assertion about using CALSIM II for its relative accuracy. As I discussed with Dave Owens, the relative accuracy claim only has credence if they have established an accurate baseline upon which to impose the relative findings. This is of course totally lacking in their studies because the present operations cannot explain why the Delta ecosystem is crashing at existing pumping levels. Until this is done the BOR or DWR cannot make any valid claim that additional pumping will not harm the environment significantly.

More importantly, CALSIM II, as it is presently structured, is not capable of assessing relative harm to the environment. That is because the environmental constraints that affect the projects are hardwired into the software and are left unchanged while they study scenarios with more pumping. It is unrealistic to assume that constraints (most of which have little to do with species and more to do with water quality) developed in adversarial proceedings before the SWRCB when the projects were pumping less water are sufficient to protect the environment at any higher pumping levels. CALSIM II merely assumes that the SWRCB standards are some kind of absolute standards that will protect the environment forever after, independent of pumping levels. In fact, any proposal to increase pumping over historic levels when the standards were adopted should return to the SWRCB for review and adjustment.

It is also noteworthy that CALSIM II's treatment of the environment involves perfect foresight due to the way it is implemented. This foresight is evident in the way CALSIM II uses its indices to set environmental flows in the Delta. Once the model has established (with near perfect foresight) what the coming water year will look like, it is free to then seek to maximize the extraction of water from the Delta without regard for environmental damage. In other words, CALSIM II is far from conservative or objective when it comes to simulating hydrology and operations. What is needed is to remove the present scheme of indices as they are presently used in CALSIM II and to try and configure the model to allow environmental variables to be dependent on simulated operations. The present model construction is ill-suited for environmental impact analysis.

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Musings on a Model: CalSim II in California's Water Community

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ABSTRACT

Computer model results are becoming more prominent in water policy deliberations in California. CalSim II is the most prominent water management model in California, and has become central to a variety of water management and policy issues and controversies. This paper reports on the results of an extensive set of loosely-structured interviews with members of California's technical and policy-oriented water management community regarding the use and development of CalSim II in California. The interviewers reflect on the thoughts of interviewees and how such interview activities can further policy-effective modeling and technical activities for water management. CalSim II is a complex model of a complex part of California's changing multi-purpose water system. As such, analytical controversies and misunderstandings are inevitable. Ideally, a model and its associated data would perform an additional service as a forum to resolve technical controversies and continually improve quantitative understanding of the system. While CalSim II is generally seen as a significant improvement over previous models, a wide variety of ideas are suggested for improvements.

KEYWORDS

CalSim II, water resources planning, water management, regional water planning, model development, Sacramento-San Joaquin Bay-Delta

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INTRODUCTION

Computer models have become increasingly important in the management and planning of California's water resources. The California Department of Water Resources (DWR) and U.S. Bureau of Reclamation (USBR) jointly developed CalSim II to model the State Water Project and Central Valley Project (SWP and CVP, respectively), which form much of the state's surface water storage and inter-regional water delivery infrastructure (DWR 2004).

CalSim II is a simulation model of the CVP and SWP storage and distribution systems that utilizes a linear programming solver in each time-step to route water through a network given user-defined constraints and priority weights. Developers of CalSim (the generalized water resources management model software underlying CalSim II) also developed the Water Resources Simulation Language (WRESL), which acts as an interface between the user and the solver, time-series database, and relational database. CalSim II simulation of the operations of the CVP and SWP systems includes physical, institutional, and regulatory constraints and an objective function composed of priority-weighted operational penalties. California's current regulatory environment is very complex; and that complexity is represented in the model by four regulatory layers: State Water Resources Control Board's Decision (SWRCB) 1485 (D-1485) and SWRCB Decision 1641 (D-1641); Central Valley Improvement Act (CVPIA), Section 3406 (b)(2); and the California Bay-Delta Authority's Environmental Water Account (EWA). While (b)(2) requires that the conditions under D-1485 be known, EWA requires that condition under D-1485, D-1641, and (b)(2) be known. Because the regulatory environments are interdependent, CalSim II simulates each regulatory condition sequentially for one entire year, before moving on to the following year. This sequential simulation of environmental conditions is commonly known as regulatory layers of CalSim II.

While USBR and DWR developed CalSim II for project-related purposes, CalSim II's actual uses have been wide-ranging. As the single official model for California's two largest water projects, CalSim II and its results affect statewide and Central Valley water operations and planning, and are often at the center of technical and policy controversies. Resolution of controversies often requires an initial airing of concerns from all parties, as it is usually difficult to address informally stated technical problems. This is especially true when many parties are involved, representing a wide range of interests and expressing a variety of concerns. As computer model results have played increasingly important roles in policy and planning decisions, technical concerns (and their policy manifestations) have impeded the development and use of serious modeling tools for water management in California. The original and central purpose of this research was to gather the uses, thoughts, and concerns of a broad cross-section of the California water community regarding CalSim II with the intent to facilitate discussion and assessment, and perhaps address these issues more productively. This project also provided background information for a peer review panel convened in November 2003. http://science.calwater.ca.gov/pdf/CALSIM_Review.pdf (Loucks et al. 2003).

Feedback was collected during interviews of 89 individuals who are involved in the management, planning, decision-making, analysis, and/or modeling of California water resources. Information gathered during the interview process includes existing and potential uses of and questions for CalSim II, reasons for selecting this model, views on its strengths and weaknesses, views on alternatives to CalSim II, and features that people would like to see in alternative operations and planning models or in an improved CalSim model. The report to the CALFED Science Program and its peer review panel presents the detailed methodology and summary of these interviews (Ferreira et al. 2004). The collected uses, thoughts, and insights regarding CalSim II should be useful for:

- Purposes of external review,
- Identification and prioritization of further model development activities,
- Education and outreach activities that would make the model (and modeling in general) better understood and more useful, and
- Better practical understanding (and perhaps ultimately better scientific understanding) of modeling and its complex role in water management in California.

Technical discussions usually benefit from open airing of technical concerns. We hope this paper and its underlying report provide such benefits.

For the California water community, this paper provides a concise overview and insights regarding the roles, problems, and concerns for water operations planning modeling. For researchers and technical managers, this study presents and illustrates a qualitative field method for gaining a better understanding of complex and controversial technical topics and highlight some challenges for the development and use of CalSim II and other models of the California water system.

METHODOLOGY

Surveys and interviews are commonly undertaken for research purposes. However, unlike most interview research, the intent of this particular project was not quantitative or scientific hypothesis-testing, but qualitative and applied, to extract from a broad selection of California's water management community their impressions, concerns, and uses for the CalSim II model. As such, a loosely structured interview process with emphasis on clear and verified interviewee statements of their ideas was developed (Bailey 1978). No attempt was made to assess the frequency of ideas contributed by interviewees. The frequency of responses or thoughts was not relevant for most intended purposes of this research. These interviewee-validated statements of uses, impressions, and concerns are available in the appendix of a report (Ferreira et al., 2004), with a systematic consolidation of these comments being presented in the report itself for easier reading and use by model developers, reviewers, users, and policy-makers.

Since most members of the interview team are also active in computer modeling of California water management (albeit not using CalSim), special potential problems and opportunities arose. As such, the process had some elements of a classical participant-observer study (Gans 1967; Whyte 1955), especially as reported in the latter part of this paper. The potential problems of having interviewers interpret interviewee responses based on the interviewers' experiences were mitigated by having multiple interviewers (for all but one interview), with all interviewers reviewing draft summaries of each interview for verisimilitude with interviewee statements. These draft summaries of each interview were then returned to interviewees with ample opportunity for correction or expansion. The interviewers' prior acquaintance with modeling water problems in California provided advantages for understanding many of the points made by interviewees, facilitating consolidation of comments in the report, and hopefully communicating these thoughts for later use.

Interview procedure

The research team developed and followed standardized procedures to arrange and conduct the interviews. Ninety-five individuals from California's water community, including staff from both DWR and USBR (the agencies that created, own, and manage CalSim II) and individuals affiliated with consulting firms, water districts, environmental groups, and universities, were contacted, of whom 89 agreed to participate in the interviews. Potential interviewees were selected from the members of the California statewide long-term planning (California Bulletin 160-03) advisory committee, from discussions with individuals known to be active in development and use of CalSim II, and from suggestions provided during the course of the interviews. A summary of interviewee affiliations is presented in Table 1. After being contacted, interviewees received a document describing the purpose of the CalSim II interviews, the questions they would be asked during the interview, procedures for interview write-up and review, and policies for attribution.

Table 1. Affiliation of interviewees

Affiliation	Number of Interviewees
DWR	23
USBR	13
Public Water Purveyors	18
Other Government Agencies	5
Non-Profit	5
Universities	1
Consultants	24

The research team conducted interviews either individually or in groups, with group sizes ranging from two to five. In total the team conducted 65 interviews (16

groups and 49 individual) between April 30 and August 28, 2003. Each interview followed a common questionnaire (available in Appendix A of Ferreira et al. 2004), focusing on how the individual and his/her organization currently use CalSim II, would like to use the model, or plan to use the model in the future, as well as more open-ended questions to solicit the individual's full range of thoughts and suggestions regarding CalSim II. The responses were extensive, varied, and at times contradictory. Typical interviews lasted one hour, but some lasted as little as half an hour or as long as two and a half hours.

In all but one case at least two interviewers were present for each interview. Each member of the interview team took hand-written notes during the interviews, none of which were tape-recorded. After the interview was completed, the team wrote a summary and sent it to the interviewee or "lead interviewee" for group interviews. The interviewee then had two weeks to revise and/or extend the summary of his or her interview. Each interviewee had the option of having some, all, or none of the interview summary included in the remarks "Not For Attribution." All of the summaries of the interviews with DWR and USBR personnel were designated "Not For Attribution." Interviewees also had the option of submitting separate written statements, documents, or materials for inclusion or citation in an appendix of the report.

After finalizing the summaries, the research team aggregated the comments into a single database, combining both comments "For Attribution" and "Not For Attribution," and then categorized the comments by topic and content. The *Current and Prospective Uses of CalSim II* section presents the range of analysis to which users apply CalSim II. The section entitled *Interviewee Thoughts and Suggestions* describes remarks regarding the perceived strengths and weaknesses of CalSim II. The results presented below are based on what was heard during the interviews and, to the extent possible, do not contain the opinions of the research team. In the subsequent section entitled *Discussion of Results* the interview team presents its own thoughts on CalSim II and its future management and development.

CURRENT AND PROSPECTIVE USES OF CALSIM II

Current uses of CalSim II include policy planning studies, system operations, facility planning, regulatory compliance, model development, water management, impact estimation, and policy evaluation. Interviewees often use CalSim II with other models, as its output serves as input to numerous economic, hydrodynamic, water quality, operations, and other water planning models at both state and local levels. Table 2 presents a sample of interviewees' current and prospective uses of CalSim II; a full listing and discussion appears in Ferreira et al. (2004).

Table 2. Summarized examples of current and prospective uses of CalSim II

Use	Current	Prospective
Planning Studies		
California Water Plan Update	x	x
SWP Reliability Study	x	x
Integrated Water Resources Planning (local)	x	x
Proposed Facilities		
Storage and Conveyance Projects	x	x
Dam Removal		x
Operations		
Water Temperature Management	x	x
Seasonal Planning (local)	x	x
Real-time	x	
Position Analysis	x	x
Regulatory Analysis and Compliance		
FERC Re-licensing	x	x
Local Flow Standards	x	
EIR/EIS	x	x
ESA Consultations	x	x
Evaluation of Management Options		
Water Transfers	x	x
Conjunctive Use	x	x
Groundwater Banking	x	x
Other		
Gaming Exercises	x	x
Hydropower Generation	x	x

INTERVIEWEE THOUGHTS AND SUGGESTIONS

Most interviewee comments relate to CalSim II's strengths and weaknesses, suggestions regarding CalSim II technical support and development, and broad conclusions about the model's effectiveness in meeting the diverse goals of the many users of CalSim II results. Interviewee thoughts and suggestions were classified according to five major categories and 36 subcategories (Table 3). Some of the most prominent themes that emerged from the hundreds of individual comments are summarized below according to five major categories presented in Table 3. The comments in the *Mission* section highlight the purposes and uses of the model. *Administration* refers to how DWR and USBR manage, direct, and supervise CalSim II and related activities. *Implementation* refers to how the CalSim software is applied to the SWP/CVP system. *Inputs* refer to the data required by CalSim II for each model run. Finally, *Software* refers to the general water resources simulation software package, CalSim, and is not specific to its application to the SWP/CVP system. Many other comments, not mentioned below due to limitations on space, appear in the larger report (Ferreira et al. 2004).

Table 3. Categorization of Thoughts and Suggestions

Major Category	Sub-Category
I. Mission	A. General Comments
	B. Uses of the Model
	C. Model Scope
	D. Consensus Model
	E. Comparative vs. Absolute Applications
	F. Geographic Scope and Scale
	G. Other
II. Administration	A. Support
	B. Documentation
	C. Management of Model Development
	D. Credibility
	E. Revisions and Updates
	F. Calibration
	G. Benchmark Study
III. Implementation	A. Mathematical Formulation
	B. Operations Representation
	C. Model Complexity
	D. Time Step
	E. Model Flexibility
	F. Representation of Management Options
	G. Stability/Sensitivity of Model Results
	H. Geographic Representation
	I. Run Time
	J. Other
IV. Inputs	A. General Comments
	B. Demands
	C. Hydrology
V. Software	A. Solver
	B. GUI (Graphical User Interface)
	C. Output/Post-processor
	D. Database/Data Management Software
	E. DSS (Data Storage System)
	F. WRESL (Water Resources Simulation Language)
	G. Transparency
	H. Simulation vs. Optimization
	I. Other

Mission

Prior to CalSim II, DWR and USBR had independent models of the Central Valley projects (DWRSIM and PROSIM, respectively). The two models had different sets of hydrologic data and treated project operations differently. There is wide agreement that cooperation between DWR and USBR has improved greatly as a result of their joint modeling effort to develop and maintain CalSim II. In addition, the use of a single, standard modeling tool and data set has greatly improved the general modeling environment in the California water community. Work now focuses more on substantive issues, rather than on differences between competing models.

While there is consensus that CalSim II represents a step forward, there is also consensus that it needs further improvement in a variety of areas. Many interviewees assert that CalSim II developers did not think through the questions that CalSim II would be asked prior to building the model, and so it is poorly suited to address many of the questions for which interviewees need answers. However, many see CalSim II as the only tool available for such questions, especially for modeling the CVP and SWP systems. The limited (or seemingly limited) modeling options for California water mangers leads to the perception that CalSim II is often misused, misapplied, or over-stretched. Some feel

that DWR and USBR have already invested too much time and money in CalSim II to be able to objectively ask if the model can answer the questions asked of it, and if not, then what can and/or should be done.

A primary area of concern among interviewees is CalSim II's ability to perform comparative and/or absolute analyses. Comparative modeling examines differences between multiple model runs to evaluate the effects that varying a condition, facility, or operating policy will have on the system, while absolute (or predictive) modeling directly estimates what is likely to happen to the system given a single set of inputs. There is general agreement among interviewees that CalSim II is an appropriate tool for comparative studies, but there is no such consensus regarding absolute studies. Many interviewees feel that using CalSim II in absolute mode is risky and/or inappropriate, but they have no other option because there are no other agency-supported alternatives. To that end, many interviewees want DWR and USBR to either improve CalSim II's predictive capabilities or create a predictive companion model. If users are to apply CalSim II in an absolute mode, many believe that detailed documentation of known limitations and weaknesses, a better understanding of the uncertainty associated with results, and additional effort towards the calibration and testing of the model are imperative.

The huge range of expectations that the California water community has for CalSim II exacerbates this problem of perception. Model developers promised that CalSim II would be easy to use and accessible; in reality, it is a complex model of a complex system that requires significant expertise to run and understand. As a result, only a few individuals concentrated in DWR, USBR, and several consulting firms understand the details and capabilities of CalSim II. Thus, much of the rest of the water community feels left in the dark regarding what CalSim II can do, how to use it, and where to find further guidance. This widespread confusion and uncertainty has eroded CalSim II's credibility outside the small circle of knowledgeable users, as it is difficult to trust a tool that one is unfamiliar with and does not understand. Many indicate that reducing these uncertainties would improve the model's credibility.

Administration

Interviewees commonly mentioned a need for more people who can run CalSim II. The current need for model runs outstrips the number of people who can produce them. This situation is likely to worsen as the demand for CalSim II runs continues to grow. CalSim II's complexity is daunting to new and potential users, and so very few individuals can conduct an entire model study and produce good quality CalSim II runs. This shortage of expertise means that DWR and USBR may be unable to produce CalSim II runs quickly, reducing the usefulness of the model, as it is effectively inaccessible due to the lack of qualified modelers. In addition, the narrow circle of knowledgeable CalSim II users contributes to the perception that CalSim II is a "closed shop" available only to a few insiders. Finally, a small group of users limits the power of CalSim II as an analytical tool, as some see CalSim II's potential power and utility expanded by having a broad spectrum of groups representing different perspectives on water management debates. There is also concern that CalSim II analyses are considered "good" or "acceptable" only with the approval of a select group of individuals who are very familiar with California's water system. A larger pool of users is likely to broaden this circle and dilute the influence of individuals. In the absence of expanding this group, or until the number of experienced users has increased sufficiently, there may be value in creating a standing review group or some other method to certify studies. In general, interviewees agree that DWR and USBR should actively seek to expand the group of expert users, especially to include non-agency and non-consulting users.

To further this goal, many interviewees recommend that DWR and USBR create a centralized source of support for CalSim II users. They would like a help desk or website to provide information on assumptions made in the model and guidance regarding model code, logic, and structure. Tutorials for running CalSim II and interpreting its results, software utilities with which to download data and perform statistical analyses of results, answers to common questions, and results from a sample CalSim II run would also further this cause. In addition, the agencies should expand the existing CalSim II training course to address both the logistics of running CalSim II and the subtleties

required to understand the meaning of its output and its appropriate application. A well-publicized user group also could provide many of these services, distributing information to model users from many interest groups efficiently, and thereby expanding the skill base and reducing the perception of CalSim II as a "closed shop." Similarly, many interviewees feel that some CalSim II managers are defensive in the face of criticism and that including more stakeholders in the development process or providing a forum for input from model users will enhance CalSim II's acceptance and credibility.

All users agree that CalSim II needs better documentation of the model, data, inputs, and results. CalSim II is data-driven, and so it requires numerous input files, many of which lack documentation. Documentation of assumptions is spotty and very technical when it exists, making it difficult for anyone other than model developers to understand how CalSim II arrives at its results. Poor documentation of the conceptual model means that it takes a long time for users to answer seemingly trivial questions and it is difficult for new users to learn how to use the model at all. Overall, the lack of clear and comprehensible documentation increases the likelihood of misunderstandings regarding how the model functions and it contributes to the common impression of CalSim II as a "black box" whose inner workings are beyond the comprehension of most users. This also makes CalSim II runs difficult to duplicate, eroding the model's credibility.

CalSim II is still relatively new and so many users are unsure of and thus uncomfortable with its limitations. They want more information on the model's limitations, including a clear description of what the model does and does not do well. In addition, information on the uncertainty associated with CalSim II results in the form of error bounds, ranges for individual values, or statistical parameters (e.g., mean, variance, etc.) would inform users about the limitations of specific outputs, which is particularly important when users run CalSim II in absolute mode.

There is considerable debate about the current and desirable state of CalSim II's calibration and verification. Some efforts have been made to calibrate the model, but many interviewees express concern that this effort is insufficient if the model is to be run in absolute mode. In addition, DWR and USBR have released a benchmark study to provide a baseline case from which users create alternative scenarios and to which they compare results of alternative runs. This benchmark study has changed with ongoing modifications to CalSim II. Many model users and potential users look forward to a complete, unchanging benchmark study to provide a stable point of reference for other analyses.

Implementation

CalSim II is at once both too simple and too complex. Its representation of the SWP and CVP includes many simplifications that raise concerns regarding the accuracy of results. At the same time, CalSim II is so complex that it is difficult to understand and requires several hours to run. Interviewees express numerous concerns about specific details of CalSim II's implementation, only a few concerns which seemed more prominent and informative are addressed here.

CalSim II's complexity reflects the complexity of the California water system. However, this makes the model cumbersome and difficult to learn. The difficulty in learning and running the model has been a source of frustration to many users and potential users, and there is a common consensus among respondents that CalSim II should be more user-friendly so that stakeholders can run the model without hiring consultants. Just as CalSim II is complex and difficult to understand, so are its results. Many interviewees indicate that interpreting CalSim II results requires not only experience with the model, but also knowledge of the CVP/SWP system and of linear programming. Model users require significant time to determine if results are reasonable and very little guidance on this topic is available from model developers. Also, some claim that there are no specific criteria to define a "good" model run or post-processing tools to help visualize, interpret, correct errors, and obtain answers to common questions. There is additional concern that CalSim II's formulation should be more robust so that runs are not user-dependent. Starting from the same point, different model users likely will produce different CalSim II outputs because during a CalSim II run, the model user generally views intermediate results and adjusts model parameters until he/she

reaches an acceptable result. This adds to inconsistencies across CalSim II runs, making results more difficult to interpret. Finally, CalSim II's complexity and its many layers have resulted in a model that requires several hours to run, frustrating planners who need to explore many refinements to alternatives.

Many interviewees are concerned that CalSim II's monthly time step cannot capture hydrologic variability adequately and thus does not compute water exports and export capacity accurately, both of which are significant factors in system operations. The model's inability to capture within-month variations sometimes results in overestimates of the volume of water the projects can export from the Sacramento-San Joaquin Bay-Delta and makes it seem easier to meet environmental standards than it is in real operations. Many of the system's operations function on a shorter time scale and so CalSim II cannot represent them well given its current formulation. On the other hand, it is unclear if reducing the time step would be either more accurate or more useful, given the additional data and assumptions that would be needed to characterize the system. Some fear that moving to a daily time step might worsen some problems due to questions regarding the precise timing of short events.

Interviewees cannot always determine the parameters to which CalSim II is highly sensitive or its overall stability and sensitivity. They feel that the linear programming formulation allows multiple solutions, which can differ considerably. Small changes in CalSim II input can result in large changes in model results, causing difficulties in impact analyses and the defensibility of model results. In addition, some users note that the multiple layers of regulations and operational agreements included in CalSim II may obscure the effects of the change to the system being modeled.

Inputs

Many interviewees indicate that CalSim II represents demands simplistically using out-of-date values and calculations. Specifically, they believe that demands should be based on land use and should be sensitive to economic factors such as the unit price of water. Without a better basis for the demands in CalSim II, many question the model's validity and capabilities.

Some interviewees also want to see further improvement in CalSim II's representation of hydrologic processes. They feel that it is weak enough to undermine the entire model, as errors in this input propagate through each layer of the model. Many claim that CalSim II's hydrology uses data and methods that are decades out of date and rely on too coarse a geographic scale. In addition, some feel that development of a hydrology should be based on land use patterns and include thorough documentation. Despite these significant concerns, interviewees agreed that CalSim II's joint hydrology (agreed upon by both DWR and USBR) is an improvement over those used by each agency for its previous model.

Software

Model users express general frustration with CalSim II's commercial linear programming (LP) solver. They contend that it provides little information on the location of infeasibilities, so that even a knowledgeable individual may need many days to debug a run. In addition, the solver sometimes produces non-unique solutions and running identical scenarios on different computers seems to generate different results. Several model users state that the solver does not provide any of the sensitivity analysis that LP solutions usually offer and gives no indication of which parameters are constrained, so that users have to search for this information on their own. However, many interviewees feel that the use of an optimization engine for CalSim II is a step forward from previous models and that it is appropriate given the regulatory structures that it tries to model. Others are unsure of how the optimization engine works within CalSim II, while some feel that an optimization approach does not make sense given the many constraints of the SWP and CVP systems.

Individual users are developing their own post-processing techniques, creating the potential for inconsistencies between analyses. They would like visual tools with which to present and compare multiple CalSim II runs. Interviewees expressed interest in tools, both computational and especially visual, that would make it easier to compare results across runs.

Users would like a more intuitive, geographically referenced interface to facilitate the understanding of both

inputs and outputs. It would be helpful if the interface could show the current CalSim II schematic, allowing a user to click on a node and see relevant information including input data, metadata, water balances, and information on the location of relevant equations.

Interviewees applaud CalSim II's inherent transparency as a data-driven model. However, some find the vast number of input files required by CalSim II daunting, thus reducing the effective transparency. In addition, CalSim II includes no automated quality control mechanisms for its many input files, resulting in a time-consuming, generally manual process for setting up a CalSim II run that leaves substantial room for error. Interviewees largely agree that CalSim II would be easier to use if it had a simpler and more coherent data management system. Particularly desirable functions include the archiving of calculation files and the ability to conduct multiple traces of dependencies.

DISCUSSION OF RESULTS

The section above is a brief distillation of the remarks heard during the interview process, absent, to the extent possible, of the research team's opinions. They include many of the most common and interesting points raised throughout the interviews. During the analysis of the many interviews, the research team developed its own thoughts regarding CalSim II and its future development and management. While these clearly are informed by the interviews, this section represents the opinions of the research team. Some of these conclusions are similar to those in the report of a subsequent external peer review panel (Loucks et al. 2003). Our conclusions below are organized around three areas.

Broader involvement in development and use

CalSim II is a significant improvement over previous models of the CVP and SWP systems. A publicly available model, CalSim II uses a modeling approach that affords a flexible, expandable, data-driven, and more transparent modeling framework than alternative and previous models. These modeling features are a remarkable achievement for the developers of CalSim II. DWR's and USBR's agreement to use a single model and underlying data sets has facilitated this significant accomplishment. This consensus has allowed the two agencies to devote resources to develop a single tool rather than critiquing each other's model, as seemed common in the days of PROSIM and DWRSIM.

Despite the advancements of the CalSim II modeling efforts, the consensus between DWR and USBR needs to extend beyond the two agencies. Although both agencies have made attempts to include outsiders in the model development process, CalSim II might have been a much better model had a broader range of stakeholders been more integrally involved during its development. The knowledge and expertise that stakeholders could have brought to the fore would have allowed model developers to better represent the operations and water demands of many local water agencies, particularly how local operations interact with and affect the CVP and SWP systems. This would allow model developers to implement more realistic water demands, in terms of both land use and alternative management options available at the local and regional levels. More importantly, the inclusion of stakeholders in the early stages of model development would have provided developers with crucial insight regarding current and prospective modeling needs of the water community and helped broaden the model user community.

The disconnect between CalSim II developers and the broader California water community is one of the greatest obstacles to CalSim II's acceptance. In part, this obstacle stems from the limited institutional charge of model developers to model only the CVP and SWP systems, and not California water management more generally. Broader and more serious effort on the part of CalSim II developers is needed to raise CalSim II's credibility among stakeholders. To gain credibility among stakeholders it is imperative that model developers see CalSim II as "outsiders" see it. That is, DWR and USBR should more fully commit to communication with the wider California water community through a well publicized, open, and available channel. This communication channel should be a way for outsiders to provide feedback to DWR and USBR regarding their modeling needs and for model developers to provide information and assistance to

model users. For CalSim II to be effective for policy and planning purposes it must be seen as more widely accepted by stakeholders, something that seems unlikely to happen unless (i) stakeholders are involved in ongoing model development, (ii) CalSim II is seen as a useful model to stakeholders, and (iii) more people around the state are comfortable using the model and interpreting its results.

Continuous improvement for contemporary problems

A significant consequence of not including more stakeholders in the early phases of CalSim II development is that the current versions of CalSim II are ill-suited for many of the current analysis needs of the broader water community, particularly absolute applications. Current California water management differs considerably from a decade or two ago, when models that were designed for comparative applications were adequate for most analysis needs. Compliance with legislative provisions regarding both the environment and water availability for new land development requires much more accurate and non-comparative quantitative results than before. While CalSim II developers like to promote it as a model best used for comparative analysis, there is a clear need for a model for absolute purposes. Many local agencies and other stakeholders (including DWR) are employing CalSim II to develop non-comparative, absolute estimates of short- and long-term water deliveries. Therefore, given the issues facing California's water resources and the analysis needs of the water community, it seems unrealistic to expect that modelers only will use CalSim II for comparative analysis. Under the mantra of "the best available tool" (in this case the only available tool), CalSim II is being used, and will continue to be used, for many other types of analyses for which it may be ill-suited, including in absolute mode. Considering the setting in which CalSim II exists, its developers should work toward a model appropriate for absolute applications.

For use in absolute applications, CalSim II needs adequate calibration and testing against recent historical data. (Some very preliminary exploratory work has begun in this direction (DWR 2003).) As with any other type of study, calibration and testing results must be accompanied by a self-critical analysis indicating where the model performs well and where it does not, as well as how this will affect studies that use CalSim II results, both in comparative and in absolute mode, and why. This type of self-critical information is essential. Only when model limitations are understood better will CalSim II gain broader and deeper credibility and acceptance within the water community, and needed improvements can be better pursued.

In addition to the need for a model that can be used in absolute mode, there is also widespread demand for a model that encompasses more than just the SWP and the CVP elements of California's inter-tied water system. The desired model or modeling framework would include not only more of California geographically, but also represent a wider range of water management opportunities and options. For CalSim II to be a truly statewide model it needs to cover the Bay Area, Tulare Basin (including the Friant-Kern and Madera canals, eastside San Joaquin reservoirs, and Millerton), Yuba River Basin (for potential water transfer opportunities), Colorado River, Colorado River and Los Angeles aqueducts, and local Southern California projects.

Coupled with a need for greater geographic coverage, CalSim II should include management options available in California at the regional and local levels. Inter- and intra-agency water transfers are now commonplace, as are other management options such as groundwater banking, conjunctive use, desalination, and water conservation. Consequently, to effectively simulate the array of water operations available within the State, CalSim II needs to include a wider range of management options, facilities, and regions. It is vital that those involved in the management of California's water be able to analyze how local, regional, and state facilities and options best go together. California does not currently have a model or modeling framework capable of such integrated analysis, to parallel the kinds of integrated management thinking being pursued at local, regional, and statewide levels.

Accessibility

Along with serving the needs of the water community, acceptance of CalSim II will increase if more people are able to use and understand the model. Consequently, DWR and USBR need to widen the pool

of model users (a problem DWR and USBR managers often note). Unfortunately, the current narrow circle of knowledgeable CalSim II users contributes to the perception that CalSim II is a "closed shop," available only to a few insiders. This perception also raises concerns about conflicts of interest, as skills on which many diverse stakeholders rely are concentrated in the hands of a few consulting firms, DWR, and USBR.

To widen the group of CalSim II users, DWR and USBR should provide a much greater level of user support than presently available. More frequent training workshops, a comprehensive manual/user's guide, a help desk, and online tutorials could supply much needed assistance to current and prospective CalSim II users. Better pre- and post-processing tools should be available to make the input process more automated and less prone to user error and to facilitate comparison, retrieval, viewing, and result interpretation.

Such attempts, however, should not replace thorough model and data documentation and version control, something that CalSim II currently lacks. CalSim II is unavoidably a very complex model and thus requires comprehensive documentation to enable users to understand the model framework and, more importantly, the sources and methodology used in the derivation of input data, including their limitations. It is difficult to attain credibility when the model and data are seen as impenetrable, particularly when model results run counter to many people's understanding of the system. Counterintuitive results are not necessarily infrequent or bad outcomes for a complex model of a complex system serving diverse stakeholders.

Model documentation should include information regarding appropriate uses of the model, data and model limitations, and error bounds on output values specific to the various purposes for which the model can be used. An often-mentioned frustration of many would-be model users is the lack of guidance on (i) how to appropriately interpret model results for various applications and (ii) what constitutes an acceptable model run.

As with any model, it is much easier to perform a good run if the user thoroughly understands what is being modeled. Understanding California's water system allows the model user to determine whether or not a particular run is "good" and to interpret its results. However, this should not be an excuse not to provide guidance on determining what constitutes a good model run and what must be done to attain a good run. If there are people who can evaluate a set of model results and determine if they are appropriate (and if not, how to modify model inputs to achieve adequate results) then that knowledge should be made available in the public domain, perhaps in the form of a post-processor. Such a post-processor should include guidelines for the appropriate interpretations of model results for various types of applications, including the use of monthly model results to assess impacts that depend on operations and processes that occur at a sub-monthly time-scale. Such a post-processor might not be a final certification of a model run, but would provide an initial screening.

A major problem facing CalSim II developers is that the system they try to model is extremely complex, particularly in light of numerous environmental requirements that must be modeled sequentially. While some people criticize CalSim II for doing too much and therefore being too complex, others believe that CalSim II is not comprehensive enough. Consequently, CalSim II is simultaneously seen as both too complex and too simple. This apparent dichotomy can only be resolved if CalSim II is made truly modular. Modularity would allow model users to turn features, regions, or layers of disaggregation on or off depending on their modeling needs. Modularity could also reduce model run time for many purposes and allow model users to apply CalSim II more efficiently in the early stages of screening alternatives.

THEORETICAL CONTEXT

The theme of opening CalSim II to a broader set of users is consistent with a growing body of literature on the value of combining policy and technical processes, rather than letting one lead the other (Sabatier 1999). While much of this literature focuses on how decision makers plan large infrastructure projects or manipulate natural resource systems, their lessons apply to the development and use of CalSim II, a complex model with significant policy implications.

The importance of including affected parties is now broadly accepted in project planning (WCD 2000; Delli Priscoli 2004). Beginning with research in ecosystem dynamics in the 1970s (Holling 1978), the concept of adaptive management and the integral use of computer models in environmental management and policy-making has grown to influence a variety of disciplines. Traditional methods of centralized planning for projects that affect a broad array of stakeholders based on technical expertise have largely given way to more holistic approaches that solicit input from a wider variety of sources and perspectives (NRC 2004). Within water resources management, this approach has been applied to projects as varied as restoration of the Everglades in Florida and the planning and construction of high dams in developing countries (NRC 2003; WCD 2000). The vast majority of the stakeholders interviewed about CalSim II expressed some interest in a more inclusive process for the ongoing development and improvement of the model. This broader literature supports many interviewees' assertion that CalSim II would benefit from their input, as the inclusion of multiple stakeholders in this process is likely to improve both the performance and acceptance of a complex project such as CalSim II (Lee 1993).

DISCONTENT AND MODEL DEVELOPMENT

Based on the concerns voiced by the interviewees during the interview process and on the impressions of the research team there exists significant concern regarding the abilities and applicability of CalSim II to California's large inter-tied water system. A simple reading of the summaries from the interviews could leave one with the impression that discontent with CalSim II in the water community is a serious impediment to the model's success. However, discontent with an analytical tool is not necessarily unhealthy or avoidable. Voiced concerns are a sign that the model is being used, produces useful insights, and encourages more systematic discussions of system details. Concerns also often provide a positive basis for model improvement.

Investments, both in terms of money and time, in analytical tools for decision-making usually arise from discontent with unaided decision-making. Technical development often follows six stages:

1. Informal statements of concerns;
2. Formal statement of concerns;
3. Assessment of concerns;
4. Plans to address concerns;
5. Actions to address concerns;
6. More (and hopefully different) concerns (repeat step 1).

The development process is by no means linear (BDMF, 2000). Stages can overlap and there is still the likelihood that new concerns will arise even after the effort is made to address the original concerns. Thus the development process is circular, reflecting evolution of the model, greater understanding of the system, and changing thoughts regarding management and policy problems.

If the technical end product was useless, its audience would ignore it entirely and the cycle would end without having successfully addressed the concerns. Many concerns will appear internally within the technical development team working on the products; such comments usually require less communication effort since they are already internal to the development team. New concerns also arise as the field problems to which the model is applied change. Such concerns are a sign of success, as the model is considered worthy of being stretched or adapted to address new problems. Finally, some concerns indicate great success from a model when they arise because model users demand further refinements as they ask more probing questions of the system.

In the case of CalSim II both the user community and the development team have raised concerns. Some of these concerns are quite positive in that the model is being asked to address new and expanded problems in more precise ways, going beyond the model's original narrow SWP/CVP scope. Ultimately, the broader the range of individuals involved with the on-going development of the model, the better the product likely will be. The fact that so many individuals have concerns regarding the uses and applicability of CalSim II is a sign that the model is being used and is worthy of on-going applications, discussions, and development.

ACKNOWLEDGEMENTS

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LETTER 20

An Environmental Review of CalSim-II:

Defining "Full Environmental Compliance" and "Environmentally Preferred" Formulations of the CalSim-II Model

attachment #9

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one of the main problems w/ CalSim II, as I understand it, is that the model treats groundwater as an infinite supply

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Preface

The "Environmental Review of CalSim-II" was undertaken at the request and under the sponsorship of Water For California, a non-profit organization dedicated to sound stewardship of the State's waters. The original work statement given to the Natural Heritage Institute requested that they examine the CalSim-II code to establish the requirements to meet two specific standards: one, to determine what changes in the data inputs and the code would be necessary to capture "full compliance" with the legal mandates under which the State Water Project (SWP) and the Central Valley Project (CVP) operate; and the second, to establish in a similar fashion the changes in data and code which would be required to perform an "an environmentally preferred" analysis.

This report is prompted by the use of CalSim-II by agencies as the preferred tool for environmental impact analysis, even though the model is constructed as an optimization model for maximizing exports given certain hydrology and constraints. This report raises a number of important questions and issues with regard to the way CalSim-II is being used.

The "full compliance" option was deemed necessary because present operations of the projects are not fully implementing measures sufficient to meet legal and regulatory requirements promulgated to protect and restore important fisheries and habitats. These deficiencies include directives of the State Water Resources Control Board, the CVPIA's Anadromous Fishery Restoration Programs (AFRP), and more. Each affects operational requirements on dam and pumping operations to protect fisheries and Delta water quality standards. It is important for the investigation to determine just how the code treats these legal directives on the operations of projects and to determine how the CalSim-II model could be used to investigate the impact on project operations if these directives were followed.

The "restoration planning" option was held to be necessary because it was plainly apparent that existing operations, even with expected stricter adherence to the spirit of the environmental limitations, were not effective in redressing the damage that has been incurred to the environment over the lives of these projects. Simply put, the projects, including the present format of CALFED, do not appear adequate to restore health to the Delta and the fisheries as was intended by these programs and as directed by the Endangered Species Act. Again the investigation was required to determine what additional requirements and changes might be added to CalSim-II to move us in the direction of environmental restoration.

We anticipate that implementation of the proposed changes to CalSim-II will elevate environmental objectives to the same level afforded consumptive water uses in water resource decision-making.

This report is prompted by the use of CalSim-II by agencies as the preferred tool for environmental impact analysis, even though the model is constructed as an optimization model for maximizing exports given certain hydrology and constraints. It raises a number of important questions and issues with regard to the way CalSim-II is being used. We anticipate that implementation of the proposed changes to CalSim-II will elevate environmental objectives to the same level afforded consumptive water uses in water resource decision-making.

Water for California
November, 2005

Executive Summary

CalSim-II is being used in almost every significant water planning process underway in California. When the outcome of a planning process hinges on modeling results, even partially, the assumptions and assertions that lead to these results should be accurate and transparent. Unfortunately, the 2003 peer review of CalSim-II raised a number of concerns about the applicability of the model to these important planning processes. The report published here, *An Environmental Review of CalSim-II*, was prepared in order to improve the transparency of CalSim-II and to measure the current version of the model against two important standards. This report is purposely focused on and limited to two specific questions.

1. **Does the representation of environmental regulations and objectives in CalSim-II represent full compliance with current legal requirements?**
2. **Can CalSim-II be used to plan for water management alternatives associated with improve environmental outcomes and habitat restoration?**

This report does not deal with any of the other CalSim-II issues identified in the CalSim-II Peer Review. The Natural Heritage Institute (NHI) was engage to carry our technical analysis needed to answer these questions.

Full Compliance

The first question is posed in order to assure that the current formulation of CalSim-II is consistent with all current environmental regulations on California's water resources. CalSim-II attempts to characterize all components of the regulatory structure. This report reviewed a significant but limited subset of these regulations. Those reviewed were selected based on the experience of a panel of environmental experts. This selection does not imply that characterizations of other regulation in CalSim-II meet the full compliance standard. In fact, it would be very valuable to complete a similar analysis on the model characterization of all environmental regulations.

Results With regards to the Full Compliance standard, NHI identified three areas where the assumptions and assertions in the current version of CalSim-II were at odds with the expert panel's interpretations of existing environmental regulations:

- **CalSim-II uses information not available to real time operators of the California water system.** This allows CalSim-II to relax environmental standards earlier than is the case in actual operations. As a result, the model under-allocates water needed to satisfy existing environmental regulations; in turn, the model makes that water available for export to south of Delta contractors or other uses.
- **CalSim-II is not faithful to Federal law that allocates water to meet ecosystem restoration objectives.** The 1992 Central Valley Project Improvement Act calls for 800 TAF of water to be allocated for environmental regulation and the logic of CalSim-II does not fully honor this requirement.
- **CalSim-II currently includes no requirement to maintain a minimum flow in the San Joaquin River below Friant Dam**, contrary to a court ruling requiring such flows. This allows for allocation of water to urban and agricultural uses in the Friant Service area rather than allocating that water to maintain water in the San Joaquin River.

For each of these deficiencies, this report proposes a series of actions that can be taken in order to improve the performance of the model. These should be considered the minimum steps required to meet the Full Compliance standard for the regulations reviewed as part of this effort.

Restoration Planning

The second question is motivated by the failure to protect and restore the Sacramento-San Joaquin watershed as legally required. Long-term monitoring of the system suggests that threatened and endangered fish populations are in serious jeopardy. A prudent approach to water management planning would use modeling tools that evaluate the impact of various environmental regulations on water deliveries. CalSim-II has not been crafted to include this flexibility.

Results As examples of the kinds of new regulations that may need to be considered in CalSim-II, the expert panel identified the following regulatory changes that the model should be able to accommodate:

- CalSim-II should have the flexibility to shift salinity compliance points to allow more targeted tributary restoration action. For example, changing the location of the Vernalis salinity standard may reduce the burden on the Stanislaus River.
- CalSim-II should have the capacity to shift required salinity profiles in the Delta (X2) to benefit Delta-dependent species.
- CalSim-II should allow for the prioritization of tributary environmental objectives, such as targeted operation of the Nimbus/Folsom system for the American River.
- CalSim-II should allow for the modification of Delta export restrictions to target improvements in the Delta ecosystem.
- CalSim-II should not count, towards the satisfaction of environmental regulations, water that otherwise would have been releases as part of unavoidable reservoir spills.
- CalSim-II should allow for the definition of flow requirements that result in periods of spring high-flow and summer low-flow conditions in Central Valley rivers.

These changes are consistent with the need to comply with existing environmental laws (CEQA, NEPA, ESA) through the evaluation of alternatives, including those that are the most environmental beneficial. Given the historic difficulty associated with return the Central Valley water system to a viable ecosystem, these changes would allow policy makers to engage in more thoughtful restoration planning. This report includes a workplan to implement these changes. The responses to the proposed actions should be considered markers of the long-term utility of CalSim-II for restoration planning.

Conclusion

Having completed this environmental review of the CalSim-II model, we are left with the profound impression that it is not a tool that can – under its current formulation – fully address the legally required water management objectives. CalSim-II is, after all, a tool that has been designed to determine how best to operate the state's hydraulic infrastructure in ways that maximize the satisfaction of contractual demands. This reality is a result of both the history of water model development in California and a general analytical approach that has held sway for decades in the field of water resources planning and analysis. This approach holds that the environment is a constraint on system operations, not one of the objectives for which the system should be managed. In order to create a tool that can investigate water management innovations designed to comply with the law and restore the environment, it is not simply a matter of adjusting a few input parameters. Instead, a reformulation of the model along the lines described in this document is needed.

CalSim-II holds that the environment is a constraint on system operations, not one of the objectives for which the system should be managed. In order to create a tool that can investigate water management innovations designed to comply with the law and restore the environment, it is not simply a matter of adjusting a few input parameters.

This philosophy of including the environment as an objective in water resources management is gaining credence around the world. Unfortunately, in California we cannot get to this point if we limit ourselves to the current version of CalSim-II. On the positive side, it is clear that no one views the current version of CalSim-II as the final and definitive water planning tool. An effort is underway to develop CalSim-III, which will respond to many of the critiques that have been offered about the model in recent months and years.

The conclusions of this report are offered to constructively contribute to this evolution. We feel that they will elevate, when implemented, aquatic ecosystem restoration to a place alongside of the other water management objectives in the system as is consistent with the imperatives of law and policy. A failure to respond to these critiques would demonstrate, on the other hand, that the water management community has little interest in viewing ecosystem restoration as more that a nettlesome constraint that has to be dealt with, preferably in the most minimal fashion. This would represent a division more profound than some varying professional opinions about the best way to model a complex water resource system.

Approximating Natural Systems in Models

When modeling a natural system, especially a complex one like the Delta and the water systems that support life in it, it is important to consider the context for the modeling effort. This section of the report briefly describes some of the systems and processes impacted by water management decisions. The overall goal of this section is to highlight the need for modelers to understand the natural systems they attempt to represent and for stakeholders to understand the rationale behind assumptions used to represent environmental regulations within water management model logic.

The plants, fish, birds, and other animals that are native to California streams, rivers and wetlands evolved to flourish under the particular climatic and hydrologic patterns of their native watersheds. Prior to development, streams routinely flooded outside of their embankments during strong winter storms and heavy periods of spring snowmelt runoff. By late summer streams ran low and in drought years many sections of smaller rivers and streams dried up completely. In the fall, the first rains would refresh streams and rivers and attract anadromous fish like the fall run Chinook salmon to migrate back up into the watershed to spawning grounds in mid-elevation reaches. Dried-up floodplains and wetlands would begin to fill again in time for the migrating waterfowls to find refreshed habitat.

The riparian forest along California's streams also adapted to these conditions and contributed to the character of the ecosystems in California's rivers and streams. Being inundated throughout much of the winter and spring does not harm the willow, alder, cottonwood and other riparian plants, and the shallow waters around their trunks are important habitat for juvenile fish escaping the faster moving waters in the main currents. In addition, the riparian forest provided much of the food for the aquatic life around them as terrestrial bugs dropped into the waters below.

The seasonal pulses of flow down California's rivers and streams into the Delta interacted with the daily and seasonal tidal fluctuations in the San Francisco Bay to create a shifting pattern of freshwater, brackish water and salt water that was shaped by the complex and shifting flow patterns in the Delta itself to form a mosaic of aquatic habitats. This mosaic supported a complex assemblage of Delta resident plants and animals.

Californians value their native aquatic ecosystems. A system of environmental laws and regulations, including minimum flow requirements and restrictions on water diversions, has been developed in reaction to serious damage to ecosystems including declines and even loss of species and degradation and loss of habitat.

It goes without saying that conditions changed with the onset of water development in California. The building of levees isolated rivers from their floodplains and fragmented the mosaic of ecosystems in the Delta. The construction and operation of dams and diversion works for water extraction changed the natural flow regimes in ways which reduced the amount of flooding and increased the level of flows in managed rivers and streams during the low

flow period. In the Delta, the combined influence of channelization and changes in the flow regime vastly reduced the amount of certain habitat types used by Delta resident species. These changes were counter to the evolutionary tendencies of native plants and animals throughout the system and were often favorable to invasive species.

This synopsis of pre-development California aquatic ecology and the changes that accompanied water development is not intended to serve as a utopian alternative to the highly developed water system that has been constructed in California over the past century. Indeed, the vast majority of Californians, to one degree or another, rely upon the hydraulic manipulations that water development has accomplished. By the same token, Californians value their native aquatic ecosystems. A system of environmental laws and regulations, including minimum flow requirements and restrictions on water diversions, has been developed in reaction to serious damage to ecosystems including declines and even loss of species and the degradation and loss of habitat. This is the environmental regulatory structure that the developers of CalSim-II have attempted to capture in a simulation model of the California water system.

So just what is CalSim-II and how did it come to play such a central role in California water planning? In order to answer these questions a little bit of historical context is required. For several decades, the managers of the Central Valley Project and the State Water Project have used computer models to simulate the operations of their particular projects. The original models, which went by the names of ProSim for the CVP facilities north of the Delta, SanJaSim for the CVP facilities in the San Joaquin Valley, and DWRSim for the SWP facilities, where used to simulate the extent to which facilities could be operated to meet contractual water demands given a set of assumptions regarding legal requirement and the operating environment. They assumed that historic hydrologic conditions were a decent representation of the likely future. The models were not integrated and therefore it was difficult to evaluate the constraints and opportunities imposed by simultaneous operations of the projects. In addition, the models themselves were developed over many years in a somewhat ad hoc manner with new model logic being added over time as new operating and regulatory approaches were articulated. The end result was a set of codes that were complex, relatively unstable, and nearly impossible to navigate and support as many of the original developers had retired or moved on.

By the 1990s this was clearly an untenable situation on several counts. First, the Delta was in crisis. Ecosystem functions were negatively impacted, and salmon and other species were listed under the ESA. Delta water diversions and extraction over a period of decades was understood to be at least a part of the reason for the problems. The Coordinated Operating Agreement between the CVP and the SWP, and the CALFED Bay-Delta Program, called for closer coordination of CVP and SWP operations to respond to the problem and to legal mandates to restore the populations of listed species. Second, the stakeholder community was demanding a more flexible and transparent set of analytical tools at the very time when the pool of competent ProSim, SanJaSim, and DWRSim analysts was dwindling. Finally, advances in the field of water resources analysis and planning were providing more flexible approaches to water resource simulation modeling based on the application of user-defined priorities and preferences rather than the rigid, If-Then rules used in developing the original models. The time was

right to construct a new simulation model of the California water system, and the managers of both the CVP and the SWP committed resources in an effort to accomplish this task.

At this point, a few observations are warranted. While CalSim-II represents an improvement over the original simulation models in terms of its integration of the State's hydraulic infrastructure, it is clearly derivative from those earlier models. Much of the data and logic used in the original models was introduced to CalSim-II. As a result, CalSim-II still seeks to simulate the extent to which facilities could be operated to meet contractual water demands given a set of assumptions regarding the operating and regulatory environment, and assuming that the range of historic hydrologic conditions is representative of future conditions. As in the early codes, the logic of CalSim-II is designed to maximize the degree to which infrastructure can be operated to satisfy contractual demands. In addition, while CalSim-II is more flexible and stable than the earlier codes, it is not transparent to those outside of the relatively small CalSim-II modeling community.

As a result of this situation, significant questions regarding the model's suitability for multi-objective water resource planning have been raised at the very same time that CalSim-II analyses are being used to inform numerous planning and decision-making processes. There exists a nagging suspicion that the model is not amenable to a full consideration of environmental restoration objectives, and there is a real frustration that it is nearly impossible to address this doubt by examining the logic and assumptions contained in CalSim-II.

This report seeks to evaluate the degree to which CalSim-II captures the critical characteristics of the existing regulatory structure and explore how the model could be used to evaluate the implications of environmental management strategies that more closely mimic the natural hydrologic conditions under which native aquatic plants and animals in California evolved.

This report reviews a subset of CalSim-II logic dealing with environmental regulation and seeks to evaluate the degree to which this subset of the model captures the critical characteristics of the existing regulatory structure. A similar analysis should be completed on the entire model by the official CalSim-II development team. This report also explores how the model could be used to evaluate the implications of environmental management strategies that more closely mimic the natural hydrologic conditions under which native aquatic plants and animals in California evolved. The first goal is to assure that CalSim-II correctly models existing environmental regulations. A second goal is to create a model that can be used to explore objectives that go beyond maximizing deliveries to meet contractual demands and which instead seek to balance the restoration of California's aquatic environment with the demands for urban and agricultural water use.

Background on CalSim II

CalSim-II was developed collaboratively by the California Department of Water Resources and the United States Bureau of Reclamation. It is the primary water supply planning tool employed by the managers that extract water from the Central Valley water system. CalSim-II is being used to support numerous studies (e.g. the Integrated Storage Investigation) and environmental processes (e.g. the Monterey EIR), requiring that the model's logic, structure and limitations and their influence on the conclusions drawn from model output be both understood and accepted as valid by stakeholders involved in these efforts.

Developing a model that can be accepted as credible, relevant, and useful by those with an interest in the model results is a central challenge in the use of all water resource planning models. For the CalSim-II model, this challenge is magnified by the overall complexity of the Central Valley water system, and the scale at which operations need to be represented. An important response to this challenge occurred in 2003 when a panel of nationally recognized experts conducted a peer review of the CalSim-II model and published a strategic review of how the model could appropriately support water planning, management, and operations in California[1]. The peer review, which was managed by the CALFED Bay-Delta Program and published by the Association of Bay Area Governments, produced many important critiques of the overall CalSim-II approach. These included, among others:

The peer review did not specifically address the manner in which CalSim-II represents the environmental regulations and objectives established for the Central Valley water system.

- Its extreme reliance on the output of other models as CalSim-II model input without adequate consideration of the assumptions implicit in these other models;
- Its rudimentary representation of important groundwater resources in the system; and,
- Its failure to undergo a classic calibration and validation analysis prior to its deployment in numerous water resources decision-making processes.

The peer review did not specifically address, however, the manner in which CalSim-II represents the environmental regulations and objectives established for the Central Valley water system.

This report describes an effort specifically designed to consider the issue of environmental performance and compliance with environmental requirements. In implementing this review, which involved detailed examination of CalSim-II code and model output, two questions were posed:

[1] Close, A., W.M. Hanemann, J.W. Labadie. D.P. Loucks (chair), J.R. Lund, D.C. McKinney, and J.R. Stedinger. 2003. **A Strategic Review of CALSIM II and its Use for Water Planning, Management, and Operations in Central California.** Association of Bay Area Governments. Oakland, California.

1. Does the representation of environmental regulations and objectives in CalSim-II represent full compliance with current legal requirements?
2. Can CalSim-II be used to plan for water management alternatives associated with improve environmental outcomes and habitat restoration?

In formulating a response to these questions, the effort specifically sought to define a series of actions that could be taken to make CalSim-II responsive to these "full environmental compliance" and "environmentally preferred" standards. For this assessment, compliance was defined as representing all current and pertinent environmental laws and regulations in a manner consistent with how they are actually implemented. Environmentally preferred includes environmental restoration measures that might emerge from on-going regulatory processes, different interpretations of existing regulations, or measures that go beyond current regulatory requirements but are appropriate for long-term planning studies. In particular, we are interested in how CalSim-II could be used to evaluate management strategies that contribute to the restoration of aquatic ecosystems and not the perpetuation of the declining situation under the status quo.

This environmental review was funded by Water for California and managed by the Natural Heritage Institute. Owing to its in-house technical capacity using CalSim-II, NHI was responsible for identifying and describing environmentally pertinent details of the CalSim-II model, including details of both the CalSim-II model logic and results from the Common Assumptions Baseline model runs. Through a series of meetings and one-on-one interactions, NHI collaborated with analysts from Wolf and Associates, the Bay Institute, and Environmental Defense to evaluate and measure these details against the full environmental compliance and environmentally preferred standards. NHI then used the results of this collaboration to formulate two distinct work plans that would (i) assure full environmental compliance and (ii) reflect desired and/or anticipated regulatory changes with regard to environmental services in the Central Valley system. The motivation for this effort is that the implementation of these work plans will increase the level of acceptance afforded the CalSim-II model by the environmental stakeholder community. Absent this acceptance, the usefulness of CalSim-II in multi-stakeholder planning and environmental review processes may be unnecessarily compromised.

Scope of the Review Process

In defining the scope of the CalSim-II environmental review, several general observations about the model proved instructive:

- The CalSim-II model treats environmental considerations as constraints on system operations rather than as objectives to be included in the water allocation optimization routine.
- While some environmental constraints are defined for a particular river/reservoir system, others, in particular the accounting logic associated with implementation of section 3406(b)(2) of the Central Valley Project Improvement Act, have system-wide implications.
- There are numerous local and system-wide sets of environmental constraints in CalSim-II, including regulations for 12 Central Valley rivers and creeks, in the Sacramento-San Joaquin Delta and associated with (b)(2) accounting.

The first observation is important because while treating environmental objectives as "constraints" assures that they will be satisfied, it also requires that certain *a priori* assumptions be made in defining the constraints. Some of these assumptions currently apply perfect foresight through the use of water year indices. This foresight influences the manner in which risk tolerance is captured in the CalSim-II water allocation logic that does not correspond with actual operational decisions made in pursuit of environmental objectives.

The second observation has implications because the approach taken in integrating different local regulations into a governing system-wide constraint set can be as important as the definition of the local constraints themselves. For example, the model logic that applies local environmental operations against (b)(2) obligations can be as important as the logic governing the definition of a minimum flow for a particular river reach.

The third observation this report reviewed a significant but limited subset of these regulations. Those reviewed were selected based on the experience of a panel of environmental experts. This selection does not imply that characterizations of other regulation in CalSim-II meet the full compliance standard.

The flow of this document turns first towards the role that water year indices play in the characterization of environmental constraints and objectives, with specific reference to the definition of risk tolerance in CalSim-II. The report then examines a set of specific environmental regulations in greater detail, examining the model logic that governs the establishment of environmental constraints on the CalSim-II water allocation logic. The report closes with detailed workplans designed to move CalSim-II towards full environmental compliance and environmentally preferred standards that were applied during this model review. While much technical detail has been included in the discussion of water year indices and specific environmental regulations, an honest attempt was made to limit the technical detail to those items that have a direct bearing on the proposed work plans. We ask for our reader's patience in working through the technical details and promise that the effort will be rewarded through a fuller capacity to evaluate the proposed workplans found in the final section of the report.

Water Year Indices and the Role of Foresight in CalSim-II Risk Tolerance

CalSim-II considers environmental objectives to be constraints on the water allocation optimization routine. While the current treatment of environmental regulations assures that environmental "constraints" are satisfied before any water is allocated to other purposes, *the model decides whether or not environmental flows are to be met in full **in advance** of all other allocations*. This reduces the many environmental unknowns and creates more manageable resource allocation problems but it also serves to optimize water exports rather than environmental outcomes.

This approach is inconsistent with the manner in which water resource allocations actually evolve between the months of February and May, when inflows are highly uncertain. Further, the formulation of environmental objectives as constraints removes the possibility that the environmental objectives for the system will benefit from the same level of optimization as other beneficial uses and hides the need to consider the real environmental impacts of water management activity, namely the condition of the ecosystem.

The formulation of environmental objectives as constraints removes the possibility that the environmental objectives for the system will benefit from the same level of optimization as other beneficial uses and hides the need to consider the real environmental impacts of water management activity, namely the condition of the ecosystem.

This approach to modeling environmental compliance is problematic in terms of responding to the two questions posed in this model review. These criteria focus on the actions necessary to restore California's aquatic ecosystems in order to comply with environmental law rather than simply meeting delivery targets. It also calls into question the use of CalSim-II as a tool for environmental impact assessment, since it is changes in the environment associated with specific projects and not the satisfaction of arbitrary constraints which is the critical focus of environmental review.

Discerning the contours of this problem involves understanding the source and environmental application of all the water year indices used in CalSim-II. Before examining specific indices, it is worth pointing out that water year indices are read into CalSim-II from look-up tables, and they are invariant for a 12-month period subsequent to the month in which they are updated. The index values themselves are pre-calculated from the historic 1921-1994 data used as input to the model. In other words, water year types are defined with *perfect foresight*. Text Box 1 presents a summary of indices that govern environmental standards in CalSim-II.

The following text describes these indices in greater detail and highlights the ways in which they are used to establish environmental constraints. This text is followed by a description of how these indices influence environmental constraints in the CalSim-II water allocation routine and, thereby, how this impacts the final service throughout the system vis-à-vis the risk tolerance logic applied to non-environmental deliveries. Prior to continuing, however, it is important to point out that this document's focus indices use, rather than on the scientific justification of the indices themselves, is not to be interpreted

as an acceptance of the actual indices. The use of data from the previous year has an inappropriate impact on the values of the individual indices.

D1485 Indices

Five water year indices defined by D1485 standards are used to determine Delta Outflow requirements, as they would have been executed under Decision 1485. In addition, they are used for accounting purposes in assigning 'costs' to the (b)(2) account. Each of the indices is updated during the February time step and remains invariant for the subsequent 12 months.

Text Box 1: Water Year Indices Used to Define Environmental Constraints

- D1485
  - D1485 Index
  - D1485 Subnormal Snowmelt Index
  - D1485 2-year Index
  - D1485 Fish and Wildlife Standards Index
  - D1485 Project Deficiency Index
- DWR Indices
  - 40-30-30 Sacramento Basin Index
  - 60-20-20 San Joaquin Basin Index
  - Feather River Basin Index
- CVP Indices
  - Shasta Index
  - American River D893 Index
- Miscellaneous
  - Trinity River Index
  - 8-River Index

D1485 WATER YEAR TYPE INDEX:

The D1485 index[2] has 5 levels: 1 = Wet, 2 = Above Normal, 3 = Below Normal, 4 = Dry, 5 = Critically Dry. The index is used in the calculation of the 1485 Fish and Wildlife Index.

D1485 SNOWMELT INDEX:

The D1485 Snowmelt index[3] has 2 levels: 1 = Above Normal, 2 = Sub-Normal. The index is used in defining Minimum Required Delta Outflow (MRDO) requirements under the D1485 regulatory simulation.

D1485 2-YEAR INDEX

The D1485 2-year index[4] has 2 levels: 0 = normal D1485 conditions, 1 = post-Critical Water Year conditions. Analysis of the input data reveals that the post-Critical Water Year conditions do not always follow years with a D1485 index value of 5, or Critically Dry. The index is used in the calculation of the D1485 Fish and Wildlife Index.

D1485 FISH & WILDLIFE STANDARDS INDEX

The D1485 Fish & Wildlife Standards Index is based on the current values of the D1485 Index and the D1485 2-year Index. Essentially, when the D1485 2-year Index is 1, post-Critical Water Year conditions, the value of the D1485 Index is increased by one increment corresponding to the next drier condition. The D1485 Fish and Wildlife Index

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[3] ...\D1485\Run\Lookup\wytypeSnow.table
[4] ...\D1485\Run\Lookup\wytype2yr.table

is then used to define the Rio Vista minimum flow requirement[5]. Additionally, this index is used to define Minimum Required Delta Outflow (MRDO) requirements under the D1485 regulatory simulation.

D1485 PROJECT DEFICIENCY INDEX

The D1485 Project Deficiency Index[6] has 2 levels: 0 = no deficiencies, 1 = deficiencies. This index is used in defining Minimum Required Delta Outflow (MRDO) requirements under D1485 flow requirements.

DWR Indices

Two DWR indices, which are defined in February and remain invariant for the subsequent 12 months, are used for setting minimum flow standards for certain rivers as well as Delta outflow standards.

40-30-30 SACRAMENTO BASIN INDEX

The 40-30-30 Sacramento Basin Index[7] has 5 levels: 1 = Wet, 2 = Above Normal, 3 = Below Normal, 4 = Dry, 5 = Critically Dry. The index is used in i.) defining the volume of water in the (b)(2) account, ii.) determining reservations of (b)(2) water to assure that (b)(2) is not entirely depleted in the fall, iii.) changing the salinity standards in the Delta, iv.) changing the Minimum Required Delta Outflow[8], and v.) defining the Rio Vista minimum flow requirement[9].

60-20-20 SAN JOAQUIN BASIN INDEX

The 60-20-20 San Joaquin Basin Index[10] has 5 levels: 1 = Wet, 2 = Above Normal, 3 = Below Normal, 4 = Dry, 5 = Critically Dry. The index is used to define minimum flow requirements in certain river reaches. Flow requirements affected by the index include the minimum flows on the Calaveras and Mokelumne River, the San Joaquin ERPP (Ecosystem Restoration Program Plan) flows (May 1-10), as well as the VAMP (April 15 – May 15) and Vernalis (October) requirements, which can be relaxed when conditions are dry.

CVP Indices

The Shasta and American River CVP indices included in CalSim-II are used to determine minimum flow requirements in the Sacramento basin. Values of the CVP indices are updated in March and remain invariant over the subsequent 12 months.

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[9] ...\common\Delta\Riovista\riovista.wresl
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SHASTA INDEX (CVP)

The Shasta Index[11] has 4 levels, where a value of 4 is considered Critically Dry. The Shasta index is used to determine minimum flows in Clear Creek and at Red Bluff. When the index equals 4, reductions are made to Refuge Contracts North of the Delta[12].

AMERICAN RIVER D893 INDEX

The American River D893 Index[13] has 2 levels and is used to determine the H Street minimum flow requirements, specified in Decision 893. Requirements at H Street vary by month and are specified in a lookup table[14].

Miscellaneous Indices

Several stand-alone indices that are applied at various places in the system are also used to set environmental constraints.

THE TRINITY RIVER INDEX

The Trinity River Index[15] has 5 levels: 1 = Wet, 2 = Above Normal, 3 = Below Normal, 4 = Dry, 5 = Critically Dry. The Trinity Index is set in April and held constant throughout the year. The Trinity River Index is used to determine minimum flow requirements in the Trinity River. Requirements for the Trinity River vary by both month and are specified in a lookup table[16].

EIGHT RIVER INDEX

The Eight River Index[17] is a table of pre-calculated, invariant numbers derived from analysis of historic data. The Eight River Index is used to define Minimum Required Delta Outflow requirements in January.

The most fundamental observation that can be made based on the information presented in the preceding section is that some environmental standards are set based on perfect foresight about the values assigned to water year indices. This assumption can influence the operational logic of the model. Understanding how this operational logic ignores the risk of operating for dynamic environmental objectives is critical to the application of the full environmental compliance and environmentally preferred standards to the performance of CalSim-II.

The Influence of Water Year Indices on the Definition of Risk Tolerance

The most fundamental observation that can be made based on the information presented in the preceding section is that some environmental standards are set based on perfect

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[15] ...\Run\Lookup\wytypes.table
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[17] ...\Run\Lookup\eightriver.table

foresight about the values assigned to water year indices. This assumption can influence the operational logic of the model. Understanding how this operational logic ignores the risk of operating for dynamic environmental objectives is critical to the application of the full environmental compliance and environmentally preferred standards to the performance of CalSim-II. The easiest way to explain how risk management for the environment could be improved is to illustrate how CalSim-II approaches risk management in promising water deliveries.

CalSim-II relies upon a series of curves to manage uncertainty in promising water to users throughout California: generally these curves define risk tolerance. Specifically, these curves illustrate the ability to promise water deliveries given a specific water year outlook (not to be confused with the water year indices). While the treatment of risk tolerance varies somewhat between the CVP and SWP systems, the procedure used in the CVP portion of the model is illustrative. CVP water allocations (i.e. monthly varying delivery promises) are set by the Water Supply Index-Demand Index (WSI-DI) curve, Figure 1. Here the promised CVP delivery (embedded in the Demand Index) is determined by the specific water year outlook (determined by the Water Supply Index). Unlike the water year indices, the water supply index (WSI) is calculated every month as the sum of storages *plus* an imperfect forecast of inflows.

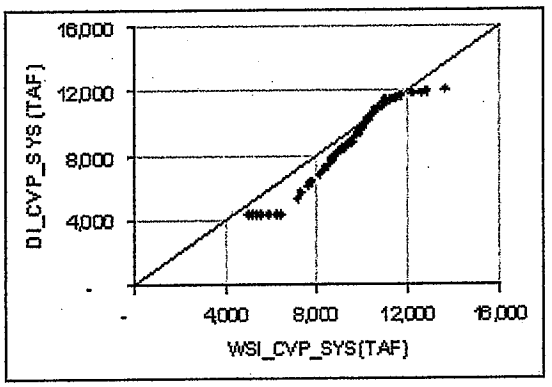

Figure 1 – WSI-DI Curve for CVP water allocations

Three interesting observations emerge from Figure 1. First, at very high levels of water supply the corresponding demand flattens out. This is associated with the fact that the system demand is not unlimited and that above a certain water supply threshold, all water demand can be satisfied. Second, at very low water supply values, the demand index is also flat. This corresponds to the hard water demand that will exist even in the driest conditions. Finally, intermediate to these two tails, an increase in water supply translates into an increase in the water demand that can be satisfied. At high water supply levels all of the available supply is allocated to meet demand. As the water supply decreases, however, the WSI-DI curve falls below the 1:1 line suggesting that a smaller percentage of the available supply is made available to meet demand. This is the first part of the CalSim-II's risk tolerance definition: when conditions are dry, caution is taken in promising water to meet demand.

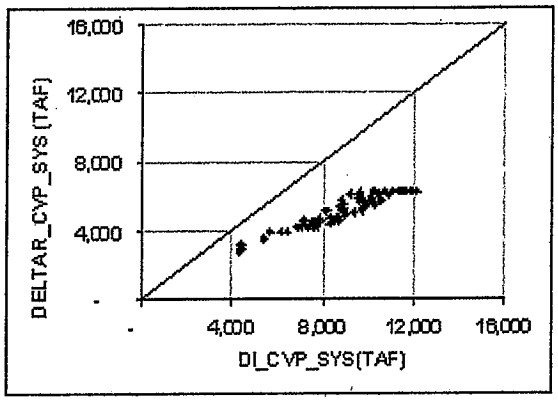

Figure 2 – Del-Car Curve for CVP water allocations

The Demand Index, however, is the sum of both delivery and carry-over storage demands. A second step in determining the CVP water allocations in CalSim-II involves partitioning of the available water between CVP contractors and storage in CVP reservoirs. The Delivery-Carry Over (DelCar) Curve, Figure 2, accomplishes this. Note that the curve has a high-end tail similar to the WSI-DI curve, which occurs during full contract deliveries to CVP contractors. As the Demand Index decreases in value, a smaller percentage of the available supply is committed to carry over storage relative to the amount that is delivered to meet current water demand. This is the second component of the risk tolerance included in CalSim-II: as conditions get dry, a larger percentage of available supply is used to meet current demands in the hope that future inflows will restore reservoir storage levels. Notice that at a DI value of roughly 4000 TAF, the nearly all of the water available to meet demand, is being delivered to satisfy current needs.

At this point the reader is probably wondering how the shape of these two curves are established. In other words, how is the acceptable level of risk tolerance defined? The answer is that some trial and error takes place to train the WSI-DI and DelCar curves. Before describing this process, however, a short digression is made to respond to the other question likely on the mind of the reader, namely how are forecasts of reservoir inflows used to define WSI?

CalSim-II makes a series of annual water allocation decisions starting in February of each water year. At that moment, based on an analysis of historic conditions that has been conducted outside of CalSim-II, knowledge of the snow pack above the major reservoirs in a given water year is added to the level of precipitation that, over the ensuing 5 months, has been exceeded 99% of the time in the historic record. A simple regression model developed by the Department of Water Resources is then used to translate the existing snow pack and anticipated rainfall into a predicted level of reservoir inflow that is added to the water already in reservoir storage to yield the Water Supply Index shown on the x-axis of Figure 1. Unless there is an unusually large snow pack in place in February, by anticipating such a low level of precipitation, CalSim-II likely forces the value of WSI to fall relatively low on the x-axis of Figure 1. This translates to a relatively modest commitment to satisfy demand that may results in delivery cuts being set by the allocation logic relative to full contract amounts.

The forecasted reservoir inflow is updated during the March, April and May time-steps using the process described above and historic information on the available snow pack and future precipitation at the levels exceeded 90, 75 and 50% of the time, respectively. These updated reservoir inflow forecasts are combined with the simulated level of reservoir storage to define a new value of WSI that is translated to a commitment to deliver water to satisfy current needs. If this leads to a higher level of delivery, then the cut logic invoked during an earlier time step is relaxed. By June, the value of WSI is considered fixed for the current water year.

One final comment is warranted. If the situation worsens as the process is implemented, for example if warm late winter temperatures deplete the snow-pack, forcing releases from reservoirs to comply with flood control obligations, and the actual precipitation is less than that which was forecast, the allocation logic will not reduce the quantity of deliveries defined during a previous time step, and end-of-year carry-over storage will be reduced as a consequence.

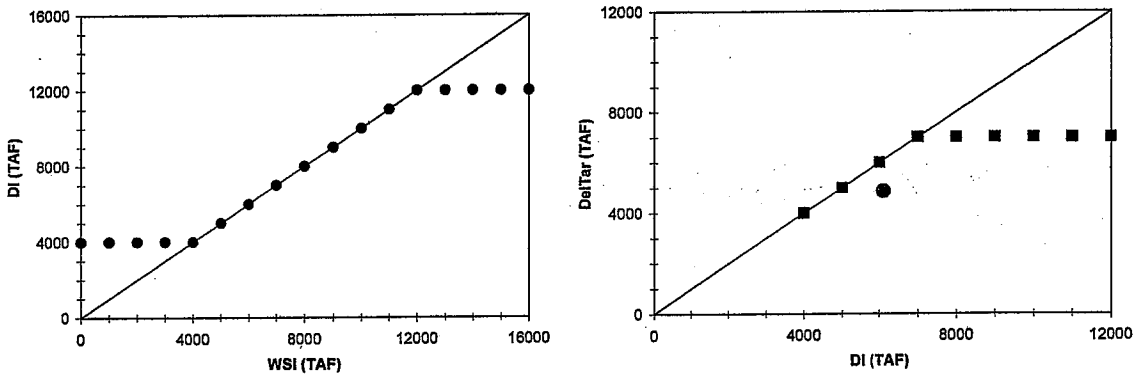

Figure 3 – Stylized Representation of Maximum Risk Tolerance

As alluded to above, the WSI values arrived at by implementing this iterative process drive the use of the WSI-DI and DelCar Curves shown in Figures 1 and 2. This brings us back to the question of how the shape of the curves is established. The most aggressive possible operational strategy for providing water to users would be to use all of the available supply to meet current needs. This posture is stylized in Figure 3. As in Figures 1 and 2, the tails at the upper and lower values of WSI and DI have been preserved. At intermediate values, however, all available water is used to satisfy the current need for water deliveries as both the WSI-DI and DelCar Curves follow the 1:1 line. This posture, however, presumes that the system is completely unconstrained in its ability to deliver all available water to demands throughout the Central Valley. Four primary constraints act to prevent this aggressive delivery policy.

1. There is uncertainly associated with the forecast value of WSI;
2. The actual physical capacity of installed infrastructure can limit water deliveries;
3. Carry-over storage is critical to meeting water management objectives in future years; and most importantly from the perspective of this review
4. Constraints related to environmental regulations may limit the delivery of water.

These factors could, therefore, conspire to create a situation whereby the actual deliveries to demands throughout the system would be somewhat less than promised (e.g. the circle on the right-hand graph in Figure 3). This failure to deliver promised water is in essence a "broken promise" to contractors, and was deemed unacceptable to the CalSim-II development team. To avoid this situation, the WSI-DI and DelCar Curves were developed to add prudence to the interpretation of how much water is available, and what fraction thereof is deliverable. Obviously, this is a departure from the most aggressive posture (Figure 3) toward the aversion to promise deliveries that ultimately cannot be made as expressed in Figure 1 and Figure 2.

The most fundamental observation from the review of CalSim-II is that the environmental constraints used to train the WSI-DI and DelCar Curves were based on a number of *a priori* assumptions, including perfect foresight associated with the use of water year indices. Our thoughts on the implications of the assumptions are found in the section discussing proposed work plans to meet the Full Compliance and Environmentally Preferred standards. The overall implications of perfect foresight should also be kept in mind as the reader reviews the details of specific environmental standards found in the following section.

Detailed Analysis of Specific Environmental Regulations

As mentioned earlier, CalSim-II includes representations of numerous environmental standards, more in fact than could be examined given the time and resources available to this review process. Starting from the input matrix that is typically used to describe a CalSim-II model formulation, the following table identifies the portions of CalSim-II Common Assumptions Baseline code that we evaluated as part of this study.

Regulatory Standards
Trinity River
Upper Sacramento River
Feather River
American River
Stanislaus River
Sacramento-San Joaquin Delta
Operations Criteria
Subsystem
• Stanislaus River
System Wide
• CVP Water Allocation
• CVPIA 3406(b)(2)

Before launching into the specific details of particular environmental regulations, it is probably worthwhile to present the logic of model cycles and model steps used in CalSim-II. CalSim-II is, in fact, run iteratively (recall the discussion of cycles) with different assumptions being applied to the model during each iteration. The pattern of iteration is shown in Figure 4.

Beginning in October, the first month of a water year, CalSim-II executes a series of model cycles that iteratively add objectives to the system. The first cycle involves meeting delivery requirements on the east side of the San Joaquin Valley. During the second cycle, base operations are checked against certain water quality standards for the San Joaquin River, and additional releases are made if required and possible. In the third cycle, it attempts to satisfy pulse flow requirements for the San Joaquin River and its tributaries. The fourth cycle checks that the San Joaquin River water quality standards are still being met after the addition of the pulse flows, and it makes adjustments if needed and feasible. The fifth and final cycle for the San Joaquin River applies specific objectives such as the Vernalis Adaptive Management Plan and the Stanislaus River dissolved oxygen standards.

At the end of the fifth cycle, the CalSim-II representation of San Joaquin River inflows to the Delta is established for the month. The next two cycles add in all of the model logic related to the water management in the Sacramento River, the Delta and the Export zone. Once releases under all seven cycles are calculated, CalSim-II moves on to the next month of the water year. The set of seven calculation cycles continues until calculations for the final month of the water year, September, are completed.

At this point, it is important to introduce and define a new term: "steps." Steps represent the final, monthly set of releases for a 12 month water year. CalSim-II utilizes several

steps before finalizing monthly releases made throughout each water year. Each step in CalSim-II corresponds with a particular water resource policy benchmark. CalSim-II is required to calculate releases under multiple policy regimes because policies (such as the (b)(2)) manage and account for water deliveries relative to releases that *might* have been made under prior regulatory environments.

The first CalSim-II step, referred to as D-1485, calculates releases that would have been made under the regulatory environment pre-dating the enactment of the Water Quality Control Plan. Older regulatory environments can present opportunities to deliver water that are greater than they would be under present conditions. These 'false' opportunities are not reported as the actual availability of water, but are instead used to measure changes in delivery as a result of changes in regulatory policy.

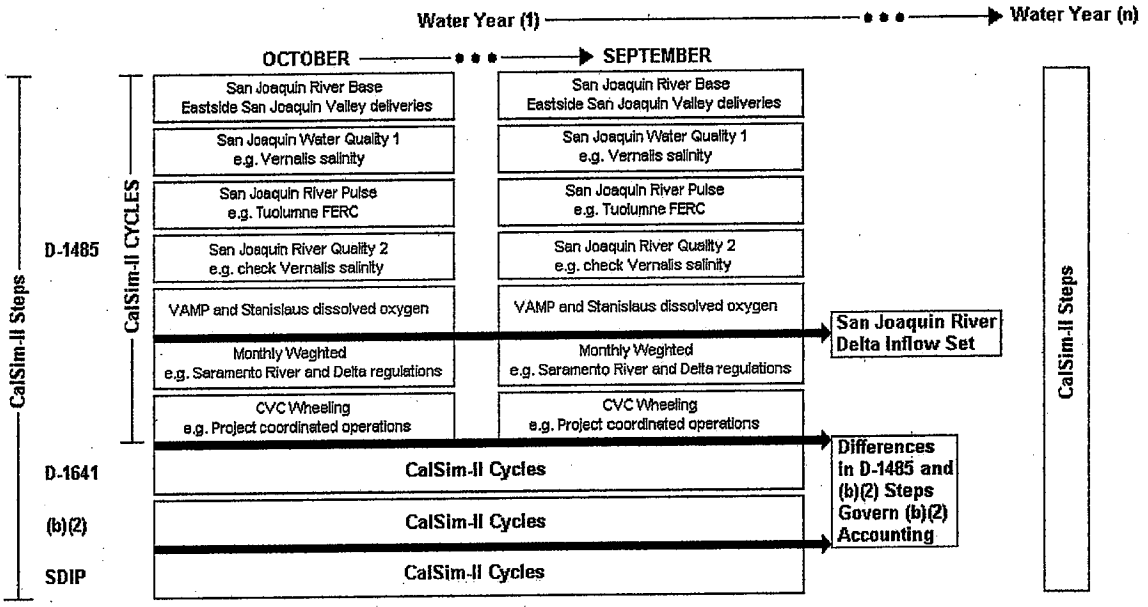

Figure 4 – CalSim-II model cycles and steps

The second CalSim-II model step assumes that the Water Quality Control Plan is in place, which increasingly constrains the ability to deliver water. Any reduction is accounted for as the cost of implementing the Water Quality Control Plan. The next model step assumes that the (b)(2) provisions of the CVPIA require between 600 and 800 TAF of CVP water to be rededicated to environmental objectives. During this step, in completing the seven cycles for the 12 months of a water year, CalSim-II invokes a series of actions that can provide the extra water relative to that which was used for environmental purposes in the D-1485 step. This implies that additional environmental water uses associated with implementation of the Water Quality Control Plan are counted against the (b)(2) obligation. Once all of the environmental considerations are addressed, CalSim-II completes a final step to resolve management considerations related to the adoption of the South Delta Improvement Plan. Only after all cycles and steps are completed for a given 12 month water year does CalSim-II move on to calculations for the following water year, beginning with October.

The implications of this pattern of iteration employed by CalSim-II should be kept in mind as the reader reviews details of specific environmental regulations presented below.

CVPIA 3406(b)(2) Accounting

Section 3406(b)(2) of the Central Valley Project Improvement Act states that the Central Valley Project will:

> "dedicate and manage annually 800,000 acre-feet of Central Valley Project yield for the primary purpose of implementing the fish, wildlife, and habitat restoration purposes and measures authorized by this title; to assist the State of California in its efforts to protect the waters of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; and to help to meet such obligations as may be legally imposed upon the Central Valley Project under State or Federal law following the date of enactment of this title, including but not limited to additional obligations under the Federal Endangered Species Act."

This prescription has, since the passage of CVPIA, been the focus of protracted legal and administrative wrangling. The key questions relate to whether or not the 800 TAF dedication to restoration efforts applies in all years and what actions taken in the operation of the CVP system can be considered as acceptable contributions to the (b)(2) account. In May 2003 the Department of the Interior issued what are considered to be the current rules for interpreting Congressional intent. These are summarized below.

A. Accounting Period
The accounting period for determining the use of the annual (b)(2) allocation will be October 1 through September 30.

B. Accounting Methodology
The appropriate accounting methodology for the dedication and management of (b)(2) water is based upon how and where the water is used. Interior's new methodology for accounting for (b)(2) will involve only two measurement methods, or metrics, to account for how the water is managed under (b)(2). The two metrics used will be upstream releases and Delta exports.

1. Upstream Actions – October 1 through September 30

   a. Accounting Methodology

   Upstream fishery actions from October 1 through September 30 will be accounted as the increase in releases from upstream reservoirs with the fishery actions, compared to releases from the reservoirs[18] that would have resulted from baseline CVP operations[19] during the same period without the fishery actions. The calculation of the increase in release with the fishery measures will be based on daily changes in releases resulting from the (b)(2) measures prescribed by the Fish & Wildlife Service (Service), accumulated over the period.

   b. Upstream Releases may Flow through Delta

   If specified by Interior, based on a written assessment of biological benefits to the fishery from the Service, steps will be pursued under California law to allow upstream releases to flow through the Delta. Upstream releases specified to flow through the Delta would be accounted for solely under this provision, and not as Delta actions.

2. Delta Actions that affect Exports – October 1 through September 30

[18] Releases from Trinity Reservoir for Trinity River flows pursuant to 3406(b)(23) of the CVPIA are excluded from the accounting under this provision. Releases to the river from Whiskeytown Dam, Keswick Dam, Nimbus Dam and Goodwin Dam comprise the basis for this metric.

[19] Interior is currently using the pre-1992 base CVP operations with D-1485 water quality obligations as the baseline CVP operation. The pre-1992 baseline includes the 1992 Winter Run Chinook Salmon Biological Opinion and other licenses and permits as construed at that time.

a. Accounting Methodology

Delta actions that affect exports will be accounted throughout the water year as the reduction in exports from the Delta resulting from the prescribed fishery actions. Any export reductions prescribed by the Service below the baseline operation will be accounted as (b)(2) actions. The calculation of decrease in Delta exports with the fishery measures will be based on daily changes in Delta exports with the fishery measures will be based on daily changes in Delta exports resulting from the (b)(2) measures prescribed by the Service, accumulated over the period.

b. Limitation on Delta Actions – February 1 through August 31

During the period February 1 through August 31 (the "low point" for CVP storage in San Luis Reservoir), (b)(2) prescriptions for export reductions will be limited to a maximum of 640,000 acre-feet (80 percent of 800,000 acre-feet of (b)(2) water). This maximum amount will be reduced up-to 80 percent when the overall water available to (b)(2) is reduced in Dry and Critical water years.

The Department of the Interior decision continues to state, "... for the purposes of classifying the water year type and developing operation plans, the 90-percent exceedence hydrology will be used."

Translating these legislative and administrative guidelines into CalSim-II model logic is a complicated endeavor. Two observations regarding the manner in which this was accomplished are particularly relevant to this environmental review. First, in spite of the suggestion that some notion of uncertainty be applied to the determination of water year type, CalSim-II employs perfect foresight in determining the amount of water that must be dedicated to (b)(2) actions. Based on the 40-30-30 Sacramento River Index which is read into CalSim-II during the February time step, CalSim-II sets the size of the (b)(2) account for the entire water year at the levels shown in Table 1.

CalSim-II employs perfect foresight in determining the amount of water that must be dedicated to (b)(2) actions.

Table 1 – Annual (b)(2) requirements based on Sacramento River water year type

Sacramento River Water Year Type	(b)(2) Requirement (TAF)
Wet	800
Above Normal	800
Normal	800
Below Normal	700
Critically Dry	600

The second pertinent observation is that CalSim-II employs the simulated operation of the system following the D-1485 step (see Figure 4, above) as a baseline against which additional ecosystem restoration actions called for under (b)(2) are measured. This implies that all CVP actions related to implementation of the D-1641 Water Quality Control Plan are considered to be acceptable charges against the (b)(2) account. This belies the fact that water quality actions can have little direct ecosystem benefit. These

observations will be taken up again the discussion of the full environmental compliance and environmentally preferred work plans. For the moment, the remainder of this sections deals with actions taken during the CalSim-II (b)(2) step in order to satisfy (b)(2) obligations.

This implies that all CVP actions related to implementation of the D-1641 Water Quality Control Plan are considered to be acceptable charges against the (b)(2) account. This belies the fact that water quality actions can have little direct ecosystem benefit.

As stated in the Department of the Interior guideline, either increases in releases from CVP regulating reservoirs (Whiskeytown, Keswick, Nimbus, and Goodwin), or decreases in CVP Delta exports relative to a pre-1992 baseline, can be considered to constitute contributions against the (b)(2) obligations. These are described in the standing interpretations, and in CalSim-II, as the Release Metric and the Export Metric. In operation, both are calculated daily. In CalSim-II, the release metric is calculated as the **increase** in total end-of-month releases from CVP reservoirs finalized in the (b)(2) step, relative to the simulated end-of-month releases from CVP reservoirs in the D-1485 step. In the event that the (b)(2) step reduces outflows from CVP reservoirs (relative to D-1485), the (b)(2) account is not credited.

Similarly, the Release Metric is defined as the reduction in end-of-month CVP Delta exports for the (b)(2) step, relative to the D-1485 step. Increased exports (relative to D-1485) are not credited to the (b)(2) account, and the total possible charge to the Release Metric is limited to a fraction of the (b)(2) account. Generally, one of three actions results in a charge to the Release Metric. 1) Changes to the Delta salinity standards between the (b)(2) and D-1485 steps could result in a reduction to exports, 2) exports could be curtailed in the months in April and May as part of the Vernalis Adaptive Management Plan (VAMP), or 3) exports could be curtailed in June in order to bring the (b)(2) account into compliance with the target ecosystem budget.

Table 2 - April and May VAMP export cuts for (b)(2)

Flow at Vernalis (cfs)	CVP Delta Export Restrictions		
	April 1 – 14	April 15 – May 15	May 16 – 31
< 5700	17.5% Inflow	750 CFS	3000 CFS
5700 – 8600	17.5% Inflow	Alternate 750 CFS and 1500 CFS	3000 CFS
> 8600	17.5% Inflow	25% Flow at Vernalis	3000 CFS

VAMP export restrictions from April 1 to May 31 are always activated for (b)(2) accounting purposes (Table 2). The (b)(2) export restrictions apply to CVP Delta exports from Tracy and Banks. During the first non-pulse period, April 1-14, total Delta exports from Tracy and Banks are limited to 35% of Delta inflow[20], with the CVP and the SWP

[20] The sum of Sacramento River flows at Hood, Yolo Bypass return flows, San Joaquin River flows at Vernalis, Mokelumne River, Calaveras River, and Marsh Creek inflows to the Delta.

each being apportioned 50% of the water. During the April 15 – May 15 pulse period, CVP Delta exports are restricted to 750 cfs if the VAMP requirement is less than 5700 cfs. If the VAMP requirement is greater than 5700 cfs then CVP delta exports are restricted to either 750 or 1500 cfs, depending upon the previous year's VAMP restriction. This export restriction alternates between years. Maximum CVP exports are increased to 25% of flows at Vernalis if they are greater than 8600 cfs. In the second non-pulse period, May 16-30, CVP Delta exports are restricted to 3000 cfs. If extending the pulse period restrictions through the end of May is more than what is needed to satisfy (b)(2) requirements then the pumping restrictions for May 16-31 will be adjusted to a level that brings the CVP into compliance with its (b)(2) obligations.

CVP delta exports in June are always restricted to a maximum of 3000 cfs. If there are remaining (b)(2) costs that are not met by projected WQCP actions then CVP pumping at Tracy and Banks will be curtailed. June CVP delta pumping can be reduced from the 3000 cfs standard, but cannot be reduced below the level of export pumping simulated during May. In addition, pulse period pumping restrictions can be applied for the first 7 days in June and increased to 3000 cfs for the remaining 23 days of the month. If extending the pulse period restriction through the first week of June exceeds the amount needed to satisfy (b)(2) requirements then June pumping restrictions will be adjusted to a level that brings the CVP into compliance with its (b)(2) obligations.

Keep in mind as you read the following sections and work plans that modeling (b)(2) correctly requires both correct representation and correct comparison. Representation is more or less an issue of capturing the regulated policy, e.g. there are 800 TAF for disbursement. Comparison is an issue of appropriately capturing the accounting baseline, and charging specific accounts at the appropriate point within the myriad of cycles and steps being performed to calculate operations.

A comment: CalSim-II contains an impressive bulk of code devoted specifically to the accounting of (b)(2) water. Literally, over half of the current model could be eliminated if the (b)(2) account were not being tracked. This demonstrates the power and flexibility of CalSim-II's environment for adopting incremental accounting regulations such as (b)(2). Conversely, this makes an enormous statement about the magnitude of effort required to track "packets" of water running through the Central Valley, as if water releases were so many parcels being ferried through a factory on conveyor belts. While tracking incremental quantities may be appropriate for contracted deliveries, it is an ill-conceived starting point for protecting environmental services because they depend more upon the 'state' of the system than upon raw quantities. There is a need to move away from incremental policies such as the (b)(2) toward dynamic water management decision making that is driven by targeted responses to current environmental conditions. This suggestion also speaks directly to a primary issue that stakeholders have with models: transparency. Quite simply, less complex accounting procedures require less code. Less code makes water resource

There is a need to move away from incremental policies such as the (b)(2) toward dynamic water management decision making that is driven by targeted responses to current environmental conditions.

models simpler to explain, to track and to understand: thereby making the dialogue over alternatives more accessible to stakeholders. While the authors harbor no great illusions about California's water resource system and regulatory environment getting simplified, we suggest it as a practical rule of thumb for future policy directions.

Trinity Operations

CalSim-II models releases of water from storage in the Trinity System along two arcs, marked in Figure 5 as C100 (Trinity River) and D100 (Clear Creek Tunnel). The logic dividing flows between the Trinity River releases and diversion towards the Sacramento River are relatively straightforward.

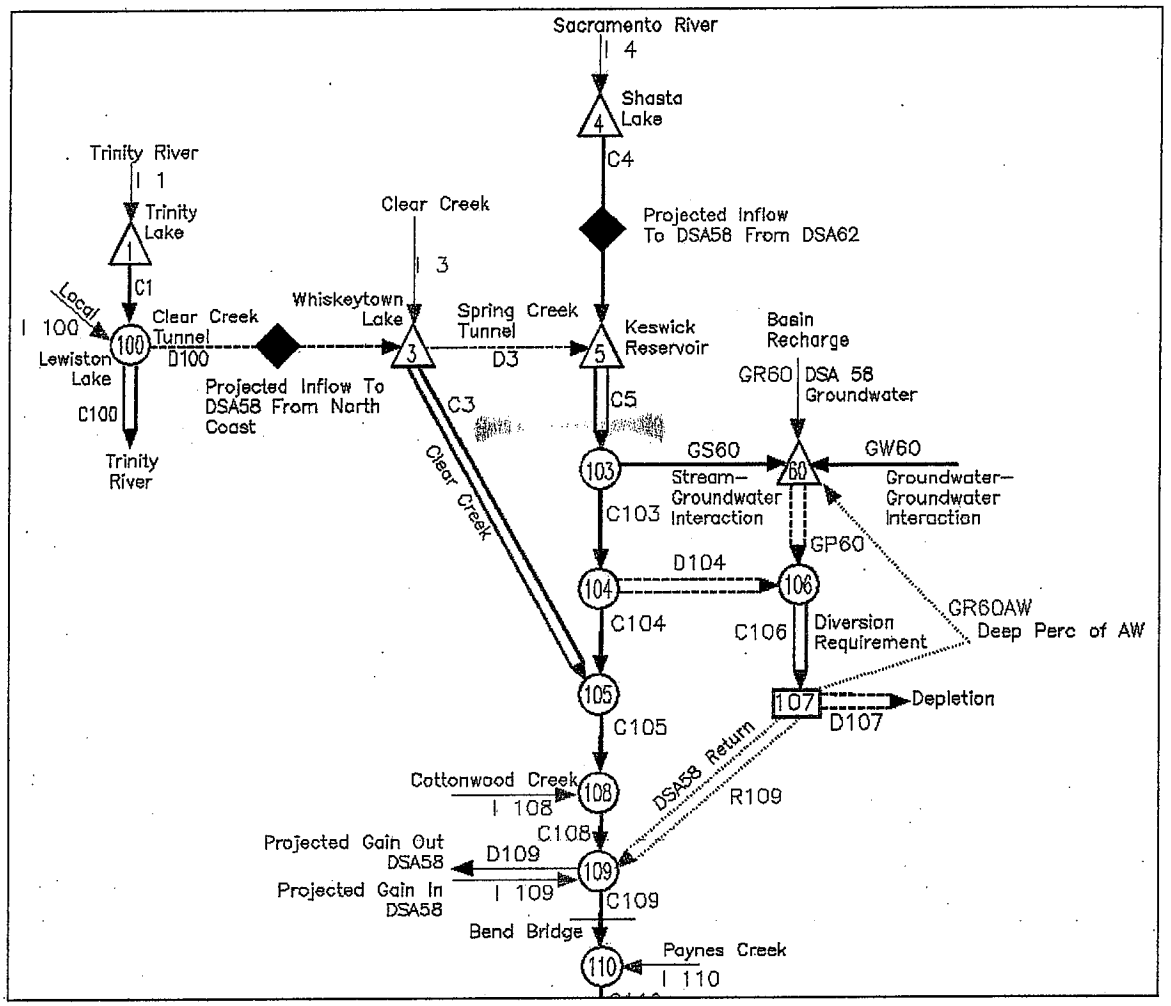

Figure 5 - Trinity Storage and Releases, represented on the CalSim-II schematic as reservoir 1 and arcs C100 (Trinity River) and D100 (Clear Creek Tunnel)

The Trinity River water year index determines the release schedule for the Trinity River[21]. The release schedule is referenced from a lookup table (Table 3), and is the same for each CalSim-II step.[22] Notice that there are significant differences between required releases to the Lower Trinity depending on the water year index, particularly during the late spring and early summer months. This is the kind of difference that has implications for the manner in which risk tolerance is established in CalSim-II, as discussed in the previous section.

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[21] ...\common\NorthOfDelta\Trinity\Trinitymin.wresl

[22] ...\Run\Lookup\Trinitymin.table

Table 3 – Trinity River minimum flow requirements (cfs), set by the Trinity water year index

Month	Trinity River Water Year Index				
	Wet (1)	Above Normal (2)	Below Normal (3)	Dry (4)	Critical (5)
October	373	373	373	373	373
November	300	300	300	300	300
December	300	300	300	300	300
January	300	300	300	300	300
February	300	300	300	300	300
March	300	300	300	300	300
April	427	460	493	540	600
May	4570	4709	4189	2924	1498
June	4626	2526	2120	783	783
July	1102	1102	1102	450	450
August	450	450	450	450	450
September	450	450	450	450	450

Trinity river transfers to the Sacramento River basin are made through the 3300 cfs Spring Creek tunnel into Whiskeytown Reservoir. The transfer goal is set relative to the storage levels in Lake Shasta and in reservoirs on the Trinity River. In both cases, Storage Level 1 corresponds to the lowest storage zone, in which case a reservoir is extremely drawn down. At the highest reservoir storage levels, Level 5 for the Trinity reservoirs and Level 6 at Lake Shasta, reservoirs are so full that they are spilling water. Table 2 shows the assigned relationship between the Trinity to Sacramento transfer targets and the storage levels in the two reservoirs.[23] These transfer values can be exceeded when, for instance, Trinity is spilling and the "excess flows" in the Trinity River are used to augment CVP storages or to meet Delta outflow objectives. This is important because when the Trinity River transfers are increased between the D1485 step and the (b)(2) step, the transfer of this "excess flow" is accounted for as a charge against the (b)(2) obligations. As a result the model may be able to avoid clearly beneficial environmental actions called for under (b)(2) during the spring months.

This is important because when the Trinity River transfers are increased between the D1485 step and the (b)(2) step, the transfer of this "excess flow" is accounted for as a charge against the (b)(2) obligations. As a result the model may be able to avoid clearly beneficial environmental actions called for under (b)(2) during the spring months.

[23] ...\Run\Lookup\trinity_import.table

Table 4 – Trinity River Diversions through Clear Creek Tunnel (cfs)

Trinity Level	Shasta Level	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	1	0	0	0	0	0	0	0	0	250	250	250	250
1	2	0	0	0	0	0	0	0	0	250	250	250	250
1	3	0	0	0	0	0	0	0	0	250	250	250	250
1	4	0	0	0	0	0	0	0	0	250	250	250	250
1	5	0	0	0	0	0	0	0	0	250	250	250	250
1	6	0	0	0	0	0	0	0	0	0	0	0	0
2	1	250	100	100	100	100	100	100	100	250	1500	1500	1000
2	2	250	100	100	100	100	100	100	100	250	1500	1500	1000
2	3	250	100	100	100	100	100	100	100	250	1250	1250	1000
2	4	250	100	100	100	100	100	100	100	250	1000	1000	750
2	5	250	0	0	0	0	0	0	0	250	750	750	500
2	6	0	0	0	0	0	0	0	0	0	0	0	0
3	1	1250	750	250	250	250	250	250	250	1250	2500	2500	1750
3	2	1250	750	250	250	250	250	250	250	1250	2500	2500	1750
3	3	1000	500	250	250	250	250	250	250	1000	2250	2250	1500
3	4	750	500	250	250	250	250	250	250	750	1750	1750	1500
3	5	750	250	100	100	100	100	100	100	750	1500	1500	1000
3	6	0	0	0	0	0	0	0	0	0	0	0	0
4	1	1750	1000	250	250	250	250	250	250	1750	3250	3250	3250
4	2	1750	1000	250	250	250	250	250	250	1750	3250	3250	3250
4	3	1500	750	250	250	250	250	250	250	1500	2500	2500	2500
4	4	1250	500	250	250	250	250	250	250	1250	2000	2000	2000
4	5	750	500	100	100	100	100	100	100	750	1500	1500	1500
4	6	0	0	0	0	0	0	0	0	0	0	0	0
5	1	3250	3000	1000	250	250	250	250	250	3000	3250	3250	3250
5	2	3250	3000	1000	250	250	250	250	250	3000	3250	3250	3250
5	3	2750	2500	750	250	250	250	250	250	2500	3000	3000	3000
5	4	2500	1750	500	250	250	250	250	250	1750	2750	2750	2750
5	5	1500	1500	500	100	100	100	100	100	1500	1500	1500	1500
5	6	0	0	0	0	0	0	0	0	0	0	0	0

Shasta/Keswick Downstream Releases

CalSim-II models releases of water from storage in the Shasta/Keswick along two arcs, marked in the Figure 6 as C4 (Shasta releases) and C5 (Keswick releases). Model logic associated with these arcs account for minimum flow requirements in the Sacramento River.

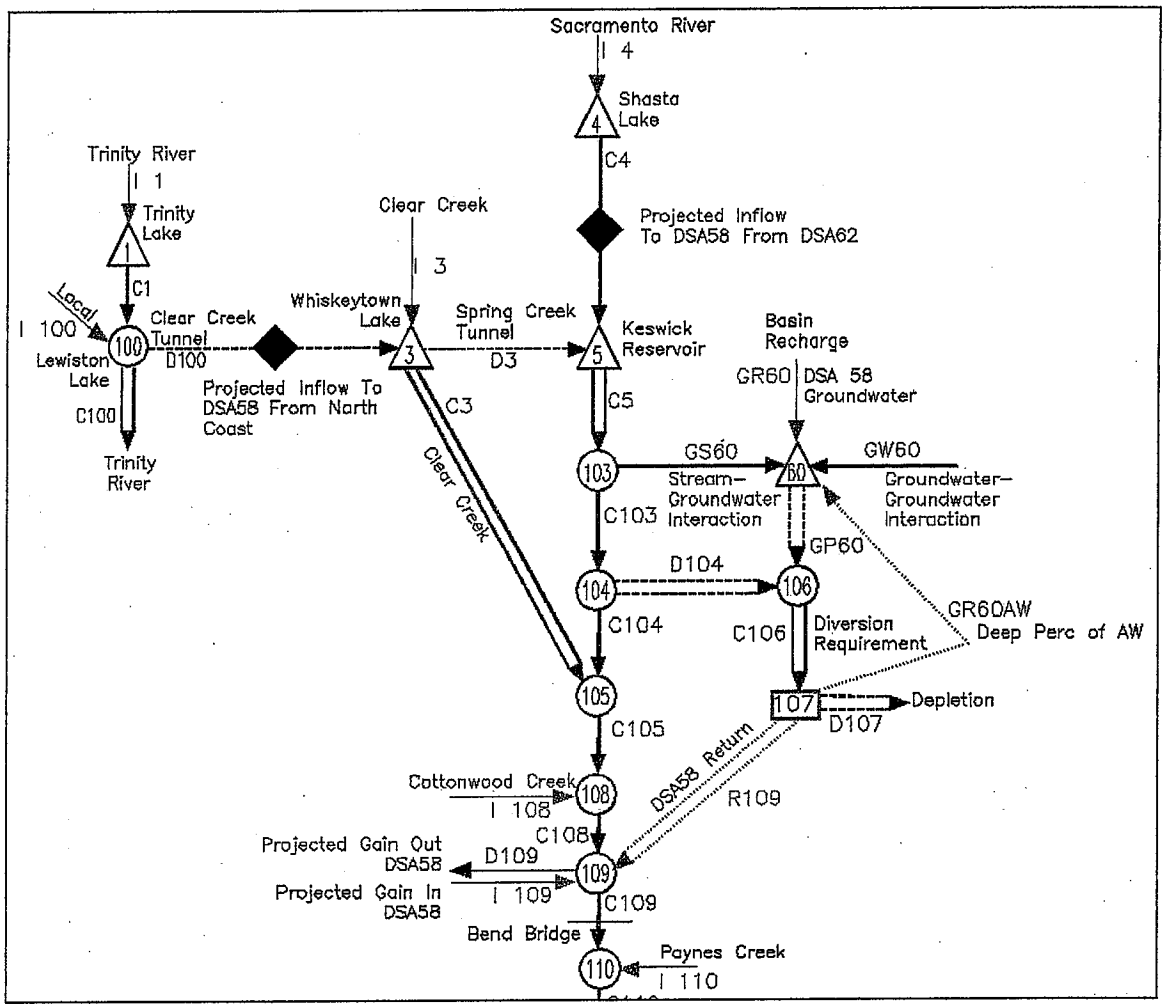

Figure 6 - Shasta/Keswick Storage and Releases, represented on the CalSim-II schematic through reservoirs 4 and 5 and arcs C4 and C5

The minimum flow requirement has three parts: (1) the Keswick Temperature Requirement, (2) the Stability Flow Requirement, and (3) the AFRP requirement. The Keswick Temperature Requirement is based upon the storage in Lake Shasta at the end of September. These values are taken from a look-up table[24] and applied continuously throughout the year (Table 5). Temperature requirements are applied in all CalSim-II model steps (D1485 through SDIP).

[24] ... \Run\Lookup\keswick_tempcntrl.table

The Stability Flow requirement exists to maintain the stability of the downstream levee systems against sloughing that could occur as a result of rapid, dramatic declines in river levels. If outflows from Shasta fall below a threshold, the current month's reservoir release must be maintained at a certain fraction of the previous month's reservoir release to sustain the structural integrity of the earthen riverbanks. The thresholds and fractions associated with this regulation are given in Table 6[25], and the Stability Requirement is only invoked when the previous month's flows are below the stability threshold. Stability requirements are applied only in the (b)(2) step and can result in charges to the (b)(2) account.

Table 5 – Temperature Releases from Shasta Dam (in cfs) corresponding storages

Storage in Shasta (TAF)	Oct	Nov through Mar	Apr	May	Jun	Jul	Aug	Sep
0	3,250		3,250	3,250	3,250	3,250	3,250	3,250
2,000	3,250		3,250	3,250	3,250	3,250	3,250	3,250
2,500	3,250		4,000	5,500	5,500	6,000	6,000	4,500
3,250	4,000	3,250	4,250	6,350	7,000	8,500	8,000	5,500
3,750	4,500		4,500	7,000	8,000	9,500	9,000	6,000
4,500	5,000		5,000	8,000	9,000	11,000	10,000	6,500
>4,500	5,000		5,000	8,000	9,000	11,000	10,000	6,500

Table 6 – Stability of Flow requirements for Shasta Dam, coded to represent FWS management of b2 under the May 2003 Department of Interior (b)(2) Decision

	Previous month's release from Shasta-Keswick (cfs)	Required Fraction of previous month's flow to maintain in current month
November	<6,000	65%
December	<4,500	90%
January	<4,500	80%
February	<4,500	80%
March	<4,500	80%

The Anadromous Fish Restoration Plan (AFRP) flow requirements for the Sacramento River below Shasta and Keswick are based on the previous month's Shasta storage or, between March and September, upon storage plus a forecast of inflows[26] (Table 7). These forecasts are based on 99%, 90%, 75%, and 50% exceedence probabilities for February, March, April, and May through September, respectively. AFRP requirements are applied in the (b)(2) step and can result in charges to the (b)(2) account.

Between the temperature, stability, and AFRP requirements the maximum requirement is not always applied. In conditions when large (b)(2) allocations have been made by the end of January, the AFRP requirement will be relaxed, and the next highest of the temperature and stability flow requirements will be applied[27]. Table 8 explains this

[25] ...\(b)(2)\Run\Lookup\SacStability.table
[26] ...\(b)(2)\Run\Lookup\sacramento_runoff_forecast.table
[27] ...\(b)(2)\Run\(b)(2)Actions\(b)(2)Action1.wresl

decision logic. The bottom two rows in Table 8 refer to "Expected AFRP Costs in January." This value is calculated as the sum of previous costs plus full AFRP flow requirements in January from Whiskeytown, Shasta/Keswick and Folsom/Nimbus. As indicated in the table, requirements that result in (b)(2) costs in excess of 200 TAF by the end of January will be relaxed. This relaxation is performed to conserve (b)(2) water through the spring.

Table 7 – AFRP flow requirements are specified (in cfs) by the storage in Shasta (TAF). Values marked "" were not tabulated, and are determined through linear interpolation**

Shasta Storage (TAF)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	3250	3250	3250	3250	3250	3250	3250	3250	3250	3250	3250	4500
1500	**	**	**	3500	**	**	**	3250	3250	3250	3250	**
1750	**	**	**	**	3500	**	**	3250	3250	3250	3250	**
2000	**	**	**	3750	**	3500	3500	3250	3250	3250	3250	6000
2200	3500	3500	3500	**	3750	**	**	3250	3250	3250	3250	6000
2300	3750	3750	3750	**	**	**	**	3250	3250	3250	3250	6000
2400	4000	4000	4000	**	**	3750	3750	3250	3250	3250	3250	6000
2500	4250	4250	4250	**	**	**	**	3250	3250	3250	3250	6000
2600	4500	4500	4500	4000	**	**	**	3250	3250	3250	3250	6000
2700	4750	4750	4750	4250	4000	**	**	3250	3250	3250	3250	6000
2800	5000	5000	5000	4500	4250	**	**	3250	3250	3250	3250	6000
2900	5250	5250	5250	4750	4500	**	**	3250	3250	3250	3250	6000
3000	5500	5500	5500	5000	4750	4000	**	3250	3250	3250	3250	6000
3050	5500	5500	5500	**	**	4250	**	3250	3250	3250	3250	6000
3100	5500	5500	5500	5250	5000	4500	**	3250	3250	3250	3250	6000
3150	5500	5500	5500	**	**	4750	**	3250	3250	3250	3250	6000
3200	5500	5500	5500	5500	5250	5000	4000	3250	3250	3250	3250	6000
3300	5500	5500	5500	5500	5500	5250	4250	3250	3250	3250	3250	6000
3400	5500	5500	5500	5500	5500	5500	4500	3250	3250	3250	3250	6000
3500	5500	5500	5500	5500	5500	5500	4750	3250	3250	3250	3250	6000
3600	5500	5500	5500	5500	5500	5500	5000	3250	3250	3250	3250	6000
3700	5500	5500	5500	5500	5500	5500	5250	3250	3250	3250	3250	6000
3800	5500	5500	5500	5500	5500	5500	5500	3250	3250	3250	3250	6000
4552	5500	5500	5500	5500	5500	5500	5500	3250	3250	3250	3250	6000

Table 8 – Minimum flow selection matrix, assuming that the Stability Requirement is evoked

Month	(b)(2) Account Condition	Shasta Minimum Flow Requirement
Dec	(b)(2) costs through Nov. >50 TAF	Max between (Temp, Stability), but not above the AFRP requirement
Dec	(b)(2) costs through Nov. <50 TAF	Max (Temp, Stability, AFRP)
Jan	(b)(2) costs through Dec. >150 TAF	Max between (Temp, Stability), but not above the AFRP requirement
Jan	(b)(2) costs through Dec. <150 TAF	Max (Temp, Stability, AFRP)
Jan	(b)(2) costs through Dec. + Expected AFRP Cost in Jan >200 TAF	Max between (Temp, Stability), but not above the AFRP requirement
Jan	(b)(2) costs through Dec. + Expected AFRP Cost in Jan <200 TAF	Max (Temp, Stability, AFRP)

Shasta's storage is treated as part of the larger, integrated Central Valley Project. As such, releases can be made from Shasta in order to fulfill obligations (e.g. delta outflow, instream requirements, export, wheeling, or COA) that are shared among CVP reservoirs. Generally, CalSim-II attempts to keep Shasta, Folsom, and Trinity reservoirs in the same storage zones, thereby balancing the obligations for water with both the capacity of the three dams, and probably the likelihood of being refilled. This balancing, however, is relevant to the 1993 Winter Run Biological Opinion that includes a provision for minimum carryover storage in Lake Shasta of 1.9 MAF at the minimum end-of-September. In CalSim-II, this storage goal is not made explicitly and the fulfillment of the requirement must be judged through an analysis of the output generated at the end of a particular simulation. For the common assumptions baseline, the time-series of simulated September End-of-Month storage is shown in Figure 7.

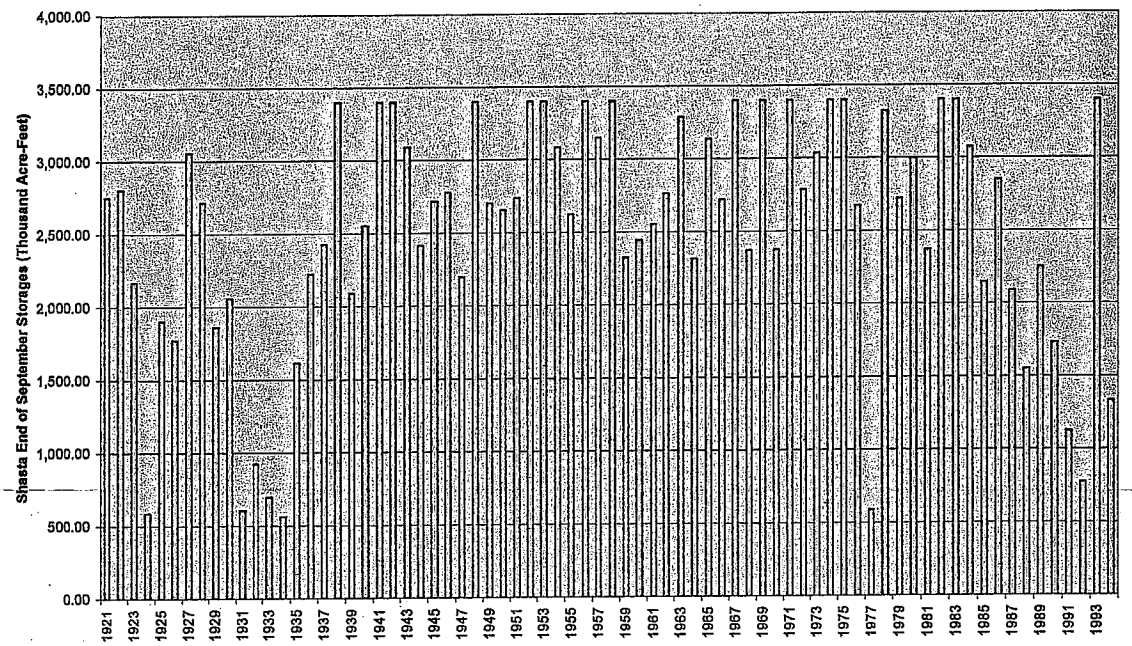

Figure 7 – End of September storages resulting from Baseline (CA_2020D09D_FutureSDIP_2_1) CalSim-II operations

Oroville/Thermalito Downstream Releases

CalSim-II models the combined releases from Oroville and Thermalito along one arc, marked in the Figure 8 as C203. There are three minimum flow requirements imposed on Feather River releases, all of which are expressed in one sub-arc, C203_MIF[28].

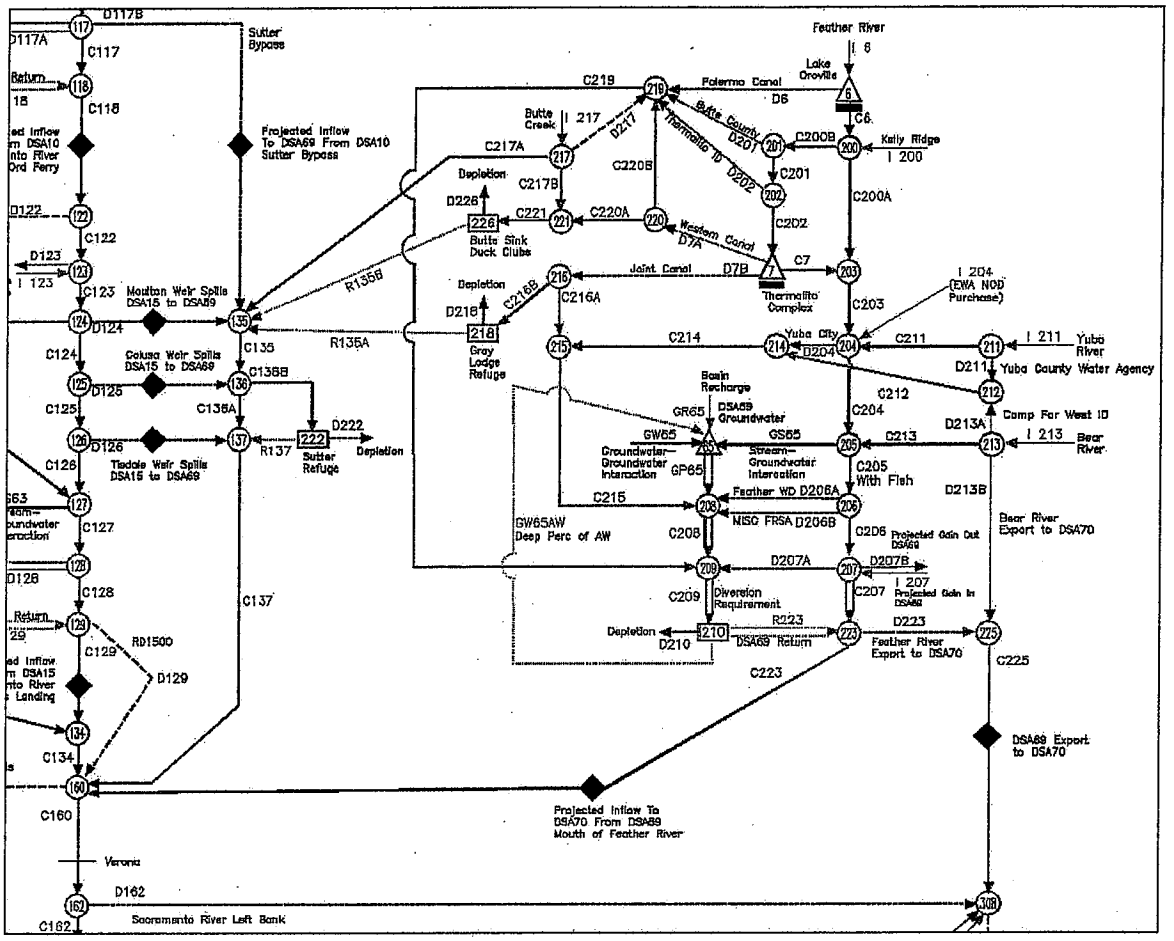

Figure 8 - Oroville/Thermalito Storage and Releases, represented on the CalSim-II schematic through reservoirs 6 and 7 and arc C6, C7 and (as a combined flow) C203

If flows on the Feather River exceed an average of 4,000 cfs in October, or 2,500 cfs in November, then the following months (through March) must maintain at least the previous months flow, minus 500 cfs. The only exception to this requirement is in the event of an October or November flood (expressed as Lake Oroville storage in zone 6), in which case no flow requirements are triggered for the following months. CalSim-II attempts to avoid this minimum flow requirement by placing a heavy penalty on flows above 4,000 cfs in October and 2,500 cfs in November.

There is also a minimum instream flow requirement set for the reach of the Feather River between Thermalito and Verona that varies between 750-1,850 cfs depending on the month and the water year.

[28] ...\common\NorthOfDelta\Feather\feather_special.wresl

Finally, between April and September, Lake Oroville is called upon to provide 2,800 cfs in addition to diversions along the Feather River, shown in the CalSim-II schematic as D7A, D7B, D206A, and D206B. Yuba River inflows count toward this requirement. Additionally, the instream flow requirement here is constrained such that the sum of the diversions and instream flow requirement will not exceed the monthly inflow to Oroville Dam. The implication is that maintaining reservoir levels is a higher priority than the satisfaction of downstream environmental flows.

Folsom/Nimbus Downstream Releases

CalSim-II models releases from Folsom and Nimbus along two arcs, marked in Figure 9 as C8 and C9. The Nimbus release arc is divided into three sub-arcs, to assist in accounting for release requirements.

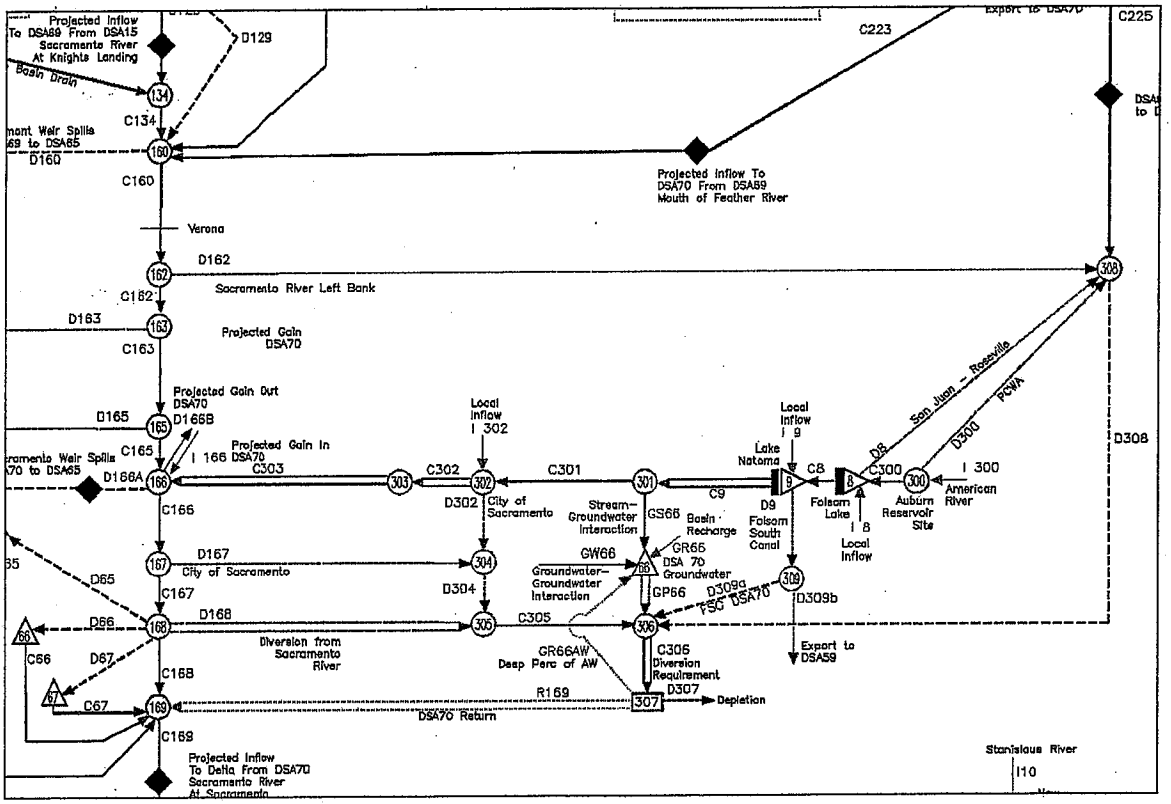

Figure 9 - Folsom/Nimbus Storage and Releases, represented on the CalSim-II schematic through reservoirs 8 and 9 and arc C8 and C9

The historic flow requirement at Folsom is based upon "modified D-1400" requirements, as they were modeled within the PROSIM environment[29]. This flow requirement calls for distinct downstream release actions depending on whether the Folsom storage is above or below 200 TAF. If storage is above 200 TAF, CalSim-II bases minimum flow requirements on either storage in Folsom (October – February) or storage plus a forecast of inflows until the end of the water yeas in September (March – September)[30]. Forecasts are based on 99%, 90%, 75% and 50% exceedence probabilities for February, March, April and May through September, respectively. Minimum flows resulting from the application of this logic are given in Table 9.

[29] ...\common\NorthOfDelta\American\NimbusHistMinQ.wresl
[30] ...\D1485\Run\Lookup\american_runoff_forecast.table

Table 9 - Historic flow requirements through Nimbus Dam, given storages (Oct. – Apr.) or storages plus forecasted inflows (Mar. – Sep.). Values marked "" were not tabulated, and are determined through linear interpolation.**

Folsom Storage (TAF)	Flow Requirement from Nimbus (cfs)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
80	**	**	**	**	**	188	188	188	188	188	188	281
100	500	500	500	500	500	250	250	250	250	250	250	375
200	600	500	500	500	500	**	**	**	**	**	500	375
300	**	500	500	500	500	500	500	500	500	500	500	**
400	750	500	500	500	500	500	500	500	500	500	500	**
500	**	**	**	**	**	500	500	500	500	500	500	**
550	**	**	**	**	**	**	**	500	500	500	500	**
575	**	1375	**	**	**	**	**	**	**	500	500	**
600	1250	**	**	**	**	**	**	**	**	500	500	**
635	**	**	1000	1000	**	**	**	**	**	**	**	**
650	**	**	**	**	**	**	**	**	**	**	**	500
685	**	**	**	**	1000	**	**	**	**	**	**	**
700	**	3000	**	**	**	**	**	**	**	**	**	**
760	**	3000	3000	3000	**	**	**	**	**	**	**	**
770	**	**	**	**	**	**	**	**	**	**	**	1000
772	**	3000	3000	3000	3000	**	**	**	**	**	**	**
800	2650	3000	3000	3000	3000	**	**	**	**	**	**	**
840	**	3000	3000	3000	3000	**	**	**	**		2000	**
960	**	3000	3000	3000	3000	**	**	**	**	2000	**	**
975	3000	3000	3000	3000	3000	**	**	**	**	**	**	**
1000	3000	3000	3000	3000	3000	750	750	**	**	**	2500	2500
1080	3000	3000	3000	3000	3000	**	**	**	2000	**	**	2500
1150	3000	3000	3000	3000	3000	**	**	**	**	2500	**	2500
1200	3000	3000	3000	3000	3000	**	**	2000	**	**	**	2500
1300	3000	3000	3000	3000	3000	**	**	**	2500	**	3000	2500
1450	3000	3000	3000	3000	3000	**	**	2500	**	**	3000	2500
1500	3000	3000	3000	3000	3000	**	1750	**	**	**	3000	2500
1600	3000	3000	3000	3000	3000	**	**	**	**	3000	3000	2500
1750	3000	3000	3000	3000	3000	1500	**	**	**	3000	3000	2500
1900	3000	3000	3000	3000	3000	**	**	**	3000	3000	3000	2500
2250	3000	3000	3000	3000	3000	**	3000	**	3000	3000	3000	2500
2300	3000	3000	3000	3000	3000	**	3000	3000	3000	3000	3000	2500
2500	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	2500
>2500	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	2500

Alternatively, when Folsom storages are below 200 TAF, CalSim-II defaults to the pre-CVPIA "18 MAR 1953 D-893 American River at H Street" baseflow requirement. This requirement varies by month, and is defined based on the value of the American River D893 Index. The resulting H-Street requirement is given in Table 10.

Table 10 - H-Street flow requirements for American River under the D1485 Step

Month	"H" Street Flow Requirement (cfs)	
	D-893 Water Year Type 1	*D-893 Water Year Type 2*
Oct	500	375
Nov	500	375
Dec	500	500
Jan	250	250
Feb	250	250
Mar	250	250
Apr	250	188
May	250	188
Jun	250	188
Jul	250	188
Aug	250	188
Sep	375	281

In addition to these historic flow schedules, Stability and AFRP flow requirements are set during the (b)(2) step of CalSim-II's runs. The Stability Flow requirement exists to maintain stable levee systems in the case of low-flow months. If outflows from Folsom fall below a threshold, defined in Table 11[31], then the current month's outflow must maintain a certain fraction of the previous month's outflow to sustain the structural integrity of the earthen riverbanks. Invocation of the stability requirements result in charges against the (b)(2) account.

Table 11 - Stability Flow requirements for Folsom Dam, coded to represent FWS management of b2 under the May 2003 Department of Interior (b)(2) Decision

	Previous month's release from Folsom-Nimbus (cfs)	Required Fraction to maintain in current month
November	<3,000	80%
December	<3,000	90%
January	<3,000	75%
February	<3,000	75%
March	<3,000	75%

The AFRP flow requirements, shown above in Table 12[32], are chosen based on storages in Folsom reservoir (October – April) or Folsom storage plus an inflow forecast (March – September). Forecasts for the American River change between February and May based on 99%, 90%, 75%, 50% exceedence probabilities for February, March, April and May through September, respectively.[33]

[31] ...\(b)(2)\Run\Lookup\AmerStability.table
[32] ...\(b)(2)\Run\Lookup\AFRP_AMER.table
[33] ...\(b)(2)\Run\Lookup\american_runoff_forecast.table

Table 12 – AFRP Flow Requirements for the American River as a function of Folsom storage or, between March and September, storage plus inflow forecasts through September. Values marked "" were not tabulated, and are determined through linear interpolation.**

Folsom Storages (TAF)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
105	**	**	**	250	250	250	250	250	250	250	250	375
125	500	500	500	**	**	**	**	**	**	**	**	**
200	**	**	**	750	750	**	**	**	**	**	**	**
250	1000	1000	1000	**	**	**	**	**	**	**	**	**
300	1500	1500	1500	**	**	**	**	**	**	**	**	500
350	1750	1750		1500	1500	**	**	**	**	**	**	1000
400	**	**	1750	**	**	**	**	**	**	**	**	1250
450	**	**	**	1750	1750	**	**	**	**	**	**	**
500	**	**	**	**	**	**	**	**	**	**	500	**
575	**	2000	2000	2000	2000	**	**	**	**	**	**	**
600	**	2000	2000	2000	2000	**	**	500	500	500	1000	1750
650	1750	2000	2000	2000	2000	**	**	**	**	**	**	1750
700	2000	2000	2000	2000	2000	500	500	**	**	**	**	1750
725	2000	2000	2000	2000	2000	**	**	**	**	750	**	1750
750	2000	2000	2000	2000	2000	**	**	750	750	**	**	1750
775	2000	2000	2000	2000	2000	**	**	**	1000	1250	**	1750
800	2000	2000	2000	2000	2000	**	**	1250	1250	1500	**	1750
900	2000	2000	2000	2000	2000	750	750	1750	1500	**	1750	1750
950	2000	2000	2000	2000	2000	**	**	**	1750	**	1750	1750
967	2000	2000	2000	2000	2000	**	1000	**	1750	**	1750	1750
1000	2000	2000	2000	2000	2000	**	1250	**	1750	1750	1750	1750
1075	2000	2000	2000	2000	2000	**	1500	**	1750	1750	1750	1750
1150	2000	2000	2000	2000	2000	**	1750	**	1750	1750	1750	1750
1250	2000	2000	2000	2000	2000	1000	**	2000	1750	1750	1750	1750
1400	2000	2000	2000	2000	2000	**	**	**	2750	1750	1750	1750
1450	2000	2000	2000	2000	2000	**	**	3000	**	1750	1750	1750
1500	2000	2000	2000	2000	2000	**	**	3000	3000	1750	1750	1750
1750	2000	2000	2000	2000	2000	1500	**	3000	3000	1750	1750	1750
1800	2000	2000	2000	2000	2000	**	1750	3000	3000	1750	1750	1750
2050	2000	2000	2000	2000	2000	**	2750	3000	3000	1750	1750	1750
2100	2000	2000	2000	2000	2000	**	3000	3000	3000	1750	1750	1750
2500	2000	2000	2000	2000	2000	3000	3000	3000	3000	1750	1750	1750
>2500	2000	2000	2000	2000	2000	3000	3000	3000	3000	1750	1750	1750

Between the Historic, Stability, and AFRP requirements, the maximum requirement is not always applied. This results from the desire to conserve (b)(2) water for spring releases. In conditions when large (b)(2) allocations have been (or might be) made by the end of January, the AFRP requirement will be relaxed, and the next highest flow

requirement (between Historic and Stability) will be applied.[34] Table 13 explains this decision process.

Table 13 - Minimum Flow selection matrix, given that the stability requirement is invoked

Month	(b)(2) Account Condition	Folsom Minimum Flow Requirement
Dec	(b)(2) costs through Nov. >50 TAF	Max between (H St., Stability), but not above the AFRP requirement
Dec	(b)(2) costs through Nov. <50 TAF	Max (H St., Stability, AFRP)
Jan	(b)(2) costs through Dec. >150 TAF	Max between (H St., Stability), but not above the AFRP requirement
Jan	(b)(2) costs through Dec. <150 TAF	Max (H St., Stability, AFRP)
Jan	(b)(2) costs through Dec. + Expected AFRP Cost in Jan >200 TAF	Max between (H St., Stability), but not above the AFRP requirement
Jan	(b)(2) costs through Dec. + Expected AFRP Cost in Jan <200 TAF	Max (H St., Stability, AFRP)

The bottom two rows in Table 13 refer to "Expected AFRP Costs in January." This value is calculated as the sum of previous costs plus full AFRP flow requirements in January from Whiskeytown, Shasta/Keswick and Folsom/Nimbus. As indicated in the table, requirements that result in (b)(2) costs in excess of 200 TAF by the end of January will be relaxed. This relaxation is performed to conserve (b)(2) water through the spring.

[34] ...\(b)(2)\Run\(b)(2)Actions\(b)(2)Action1.wresl

New Melones/Goodwin Downstream Releases

CalSim-II models regulatory requirements for the Stanislaus River along three arcs, marked in Figure 10 as C10 (outflow from New Melones Reservoir), C16 (releases from Goodwin Dam), and C527 (a regulatory point upstream of Ripon). All releases from New Melones made for water quality and environmental purposes are routed through Goodwin Dam, and are unavailable for irrigation withdrawals.

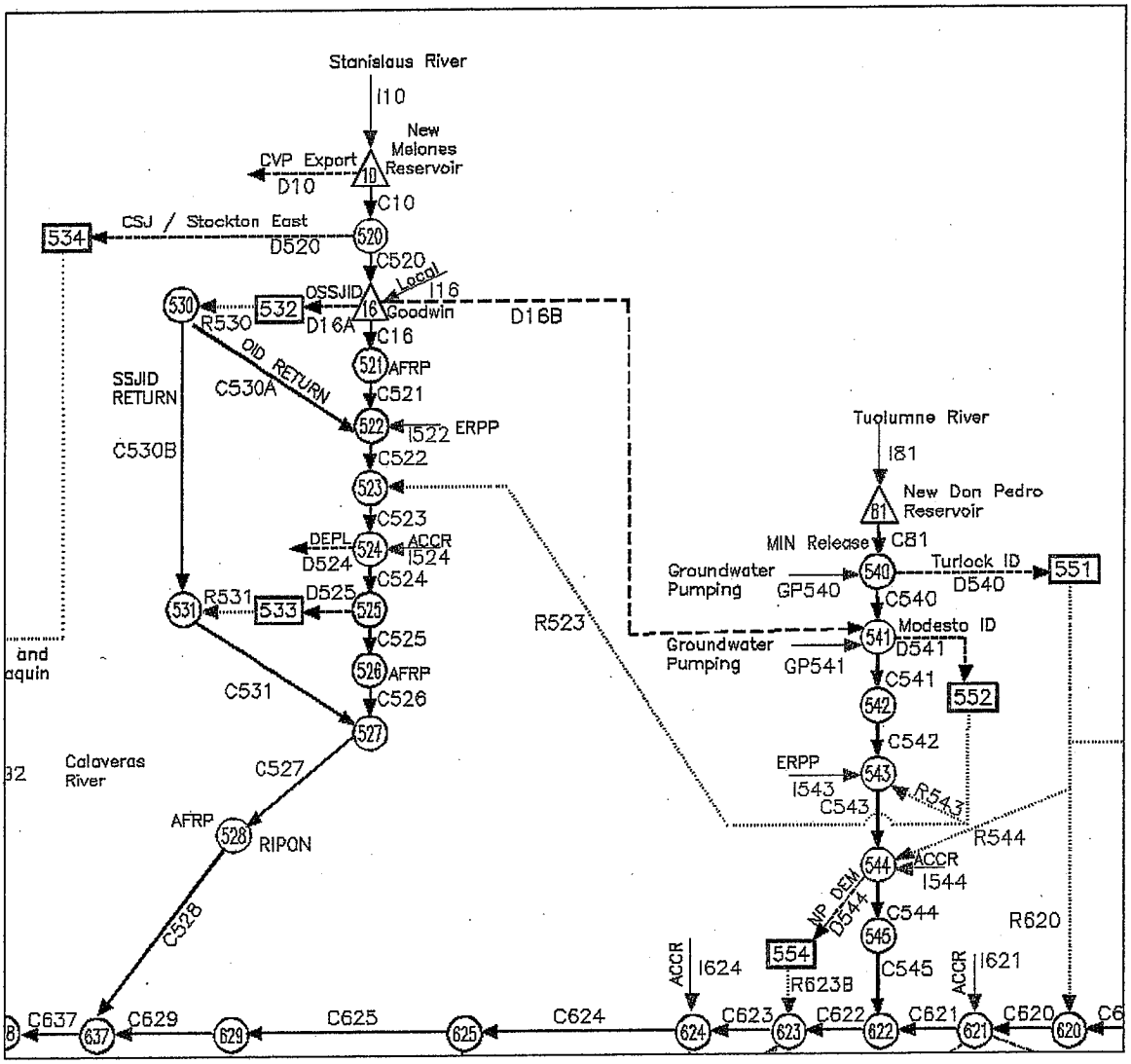

Figure 10 - CalSim-II schematic for the Stanislaus and Tuolumne Rivers

There are four general requirements governing minimum flows in the Stanislaus River below Goodwin Dam: dissolved oxygen standards, salinity standards, minimum flows and pulse flows for fish and wildlife in the Stanislaus River, and the Vernalis Adaptive Management Plan (VAMP) pulses.

Dissolved oxygen requirements for the Stanislaus River are defined below both New Melones and Goodwin[35]. As CalSim-II in its present form is incapable of simulating changes in dissolved oxygen concentrations, a surrogate flow prescription is given to represent the D.O. requirements. The flow prescription, shown in Table 14, is applied as part of all CalSim-II cycles.

Table 14 – Flow based dissolved oxygen criteria for the Stanislaus River[36]

Month	Requirement (TAF)
June	13.2
July	16.2
August	16.4
December	14.3

The Vernalis salinity requirements for the Stanislaus River are set below Goodwin.[37] If releases from Goodwin are sufficient to meet the standard, storage at New Melones will not be utilized for this purpose; otherwise the requirement will be meet through releases from New Melones. The requirement is based on limiting electrical conductivity (EC) values to not more than 700 and 1000 micromhos/cm for irrigation (April – August) and non-irrigation (September – March) seasons, respectively. CalSim-II approximates the required Stanislaus release by assuming a known salt concentration from several sources of flow in the Lower San Joaquin River system, specifically accretions and returns in the Stanislaus River, main-stem flows of the San Joaquin River before confluence with the Stanislaus River, and the west-side San Joaquin River return flows below the Stanislaus/San Joaquin confluence but upstream of Vernalis. Releases from Goodwin are made such that the aggregate concentration at Vernalis meets water quality standards.

All available water in the Stanislaus may be allocated to satisfy consumptive demands when in fact some portion should have been reserved to meet ecosystem objectives.

Pulse flow requirements for the Stanislaus River are defined as outflow from Goodwin and a point upstream from Ripon (node 525 in Figure 10)[38]. The flow requirement is determined through a three-step calculation. First the six-month New Melones forecast (NMF) is defined as the storage in February plus the sum of inflows through September based on a perfect forecast. Second, following the D1485 CalSim-II cycle, the NMF is used to determine an annual fishery allocation.[39] This allocation is given in Table 15. Finally, the fishery allocation is apportioned between pulse flow and minimum flow schedules, shown in Table 16 and Table 17.

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[35] ...\Run\SanJoaquin\Stanislaus\DO.wresl
[36] ...\Run\Lookup\DO.table
[37] ...\common\SanJoaquin\WaterQuality\vernalis_wqmin.wresl
[38] ...\SanJoaquin\Stanislaus\stan_FW_pulse.wresl
[39] ...\Run\Lookup\stan_yr.table

Table 15 – Allocation to fisheries, based on New Melones Forecasts[39]

New Melones Forecast: NMF (TAF)	Fishery Allocation (TAF)
0	98
1,400	98
2,000	125
2,500	345
>3,000	467

Table 16 – Pulse flow requirement for the Stanislaus River, April 15 – May 15 [40]

Fishery Allocation (TAF)	Pulse Requirement (cfs)
0	0
98.9	500
>245.7	1,500

Table 17 – Minimum flow schedule for the Stanislaus River, in relation to Fishery Allocations [41]

	New Melones Forecast (x1,000 acre-feet)							
	0	98.9	155	200.6	256.2	311.5	410.2	466.4
January	-	125	150	250	275	300	350	400
February	-	125	150	250	275	300	350	400
March	-	125	150	250	275	300	350	400
April	-	250	300	300	300	900	1,500	1,500
May	-	250	300	300	1,500	900	1,500	1,500
June	-	-	125	200	200	250	800	825
July	-	-	125	200	200	250	300	625
August	-	-	125	200	200	250	300	525
September	-	-	125	200	200	250	300	400
October	-	110	110	200	250	250	350	350
November	-	200	225	250	275	300	350	400
December	-	200	225	250	275	300	350	400

The 1995 WQCP Vernalis minimum flow requirement is defined as soft constraints on releases from New Melones.[42] Releases from New Melones for Vernalis minimum flows are released through Goodwin, and cannot be diverted for other purposes. The standard is determined by (a) the San Joaquin water year type, (b) the day weighted average X2 requirement at Roe Island, Chipps Island and the Sacramento – San Joaquin River confluence (Table 18), (c) a restriction on flows at Goodwin and Ripon (1500 cfs) and (d) a cap set on the sum of New Melones releases between February and June. The New Melones outflow restriction is based on the New Melones forecast as shown in Table 19. Releases from New Melones are designed to make up any deficit in the Vernalis minimum flow requirement, up to release restrictions at New Melones, Goodwin, and Ripon.

[40] ...\Run\Lookup\stan_pulse.table
[41] ...\Run\Lookup\stan_monfish.table
[42] ...\SanJoaquin\Vernalis\vernalis_min.wresl

Table 18 – Vernalis Requirement, by Water Year and X2 Position

San Joaquin Water Year Type	IF X2 is East of Chipps Island, Vernalis Requirement (cfs)	IF X2 is West of Chipps Island, Vernalis Requirement (cfs)
1	2130	3420
2	2130	3420
3	1420	2280
4	1420	2280
5	710	1140

Table 19 – Annual Release Restriction at New Melones[43]

New Melones Forecast (TAF)	Release Restriction at New Melones (TAF)
0	0
1,400	0
2,000	0
NMF ≥ 2,500	1,000

VAMP are target flows in the San Joaquin River at Vernalis during April and May, the obligation for which is shared by water users on all of the eastside San Joaquin River tributaries and the beneficiaries of the exchange pool at Mendota. In the event that other CalSim-II operations leave a deficit in the VAMP account, a portion of the deficit must be offset by release to the lower Stanislaus below Goodwin Dam. Table 20 identifies the VAMP obligation of the Stanislaus River water users and other VAMP regulated rivers, as a function of the VAMP deficit.

Table 20 – New Melones release requirements (TAF), relative to VAMP deficits

VAMP Deficit (TAF)	Merced ID: Merced River	OID: Stanislaus River	Exchange: Mendota Pool	MID/TID: Tuolumne River
0	0	0	0	0
25	25	0	0	0
35	25	10	0	0
40	25	10	5	0
50	25	10	5	10
61.5	36.5	10	5	10
66.1	36.5	14.6	5	10
68.4	36.5	14.6	7.3	10
73	36.5	14.6	7.3	14.6
81.5	45	14.6	7.3	14.6
84.9	45	18	7.3	14.6
86.6	45	18	9	14.6
90	45	18	9	18
100	55	18	9	18
104	55	22	9	18
106	55	22	11	18
Deficit ≥ 110	55	22	11	22

[43] ...\Run\Lookup\stan_yr.table

CalSim-II sequences the access to storage in New Melones Reservoir to meet these various water quality and environmental flow requirements. The general sequence of access is as follows:

1) In the first CalSim-II model cycle, irrigators access storage and inflows to New Melones and Goodwin, up to their current monthly demand.
2) Throughout the remaining model cycles, inflows to and storage in New Melones and Goodwin are made available for water quality and environmental flow requirements in the Lower Stanislaus River and in the Delta.

This sequencing suggests that water delivery objectives are paramount relative to environmental flow requirements. The implication is that all available water may be allocated to satisfy consumptive demands when in fact some portion of available storage should have been reserved to meet ecosystem objectives.

Delta Outflow Requirements

CalSim-II represents the basic outflow requirements from the Sacramento-San Joaquin Delta through a demand arc marked as D407 in

Figure 11. Generally, the D407 flow requirement is a composite of the X2 requirement and other Delta outflow standards. This standard is set by evaluating (1) the Minimum Required Delta Outflow (MRDO) in concert with either (2a) the ANN Delta Outflow Requirement or (2b) the G-Model. In the CalSim-II model evaluated for this review, the final Delta outflow requirement is the maximum between MRDO and the ANN.

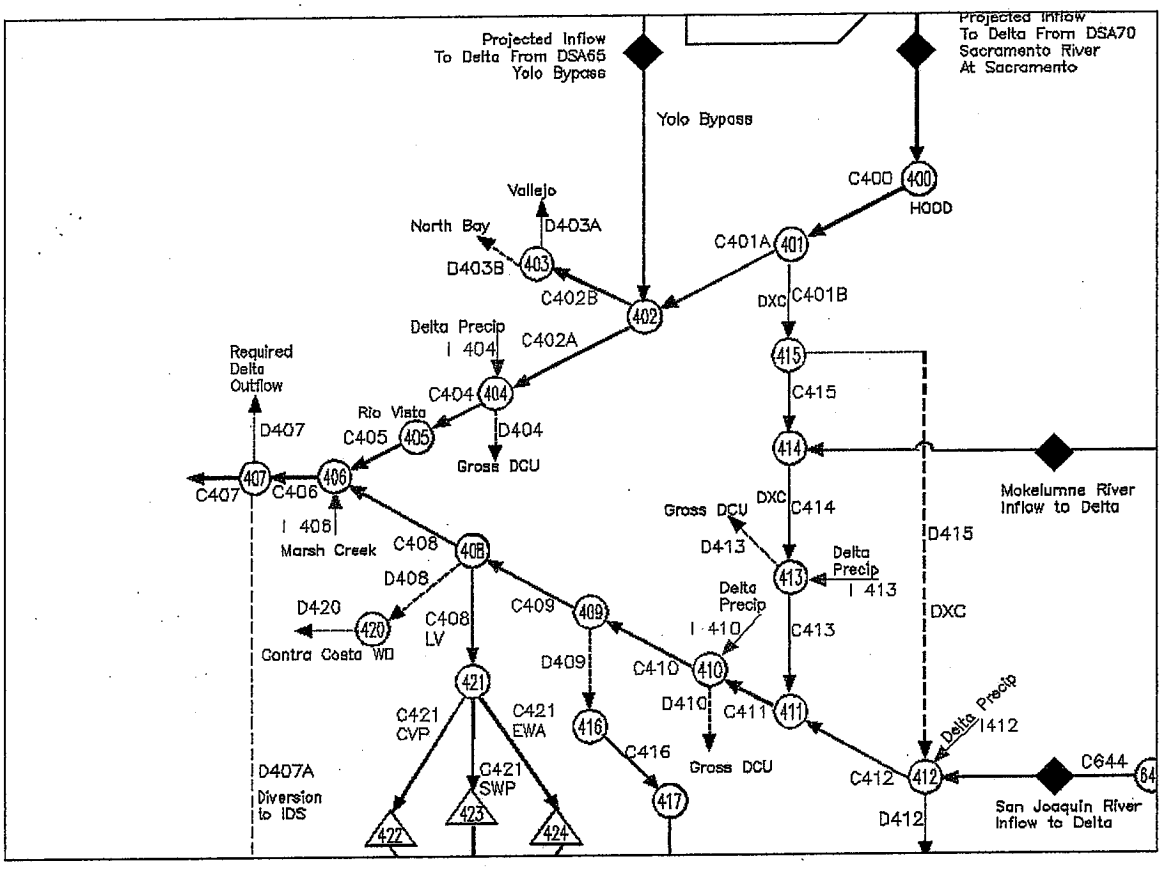

Figure 11 - CalSim-II Representation of the Sacramento-San Joaquin Delta

The Minimum Required Delta Outflow is calculated by evaluating eight separate flow requirements:

i.	Striped Bass Survival/Spawning	(D1485 Flow Requirement, for (b)(2) accounting)
ii.	Suisun Marsh Flow Requirement	(D1485 Flow Requirement, for (b)(2) accounting)
iii.	60-day Suisun Marsh Flow Requirement	(D1485 Flow Requirement, for (b)(2) accounting)
iv.	Flood Envelope Flow Requirement	(D1485 Flow Requirement, for (b)(2) accounting)
v.	X2 at Roe Island/Port Chicago	(D1641, (b)(2), and SDIP Flow Requirement)
vi.	X2 at Chipps Island	(D1641, (b)(2), and SDIP Flow Requirement)
vii.	X2 at the Sacramento-San Joaquin confluence	(D1641, (b)(2), and SDIP Flow Requirement)
viii.	Absolute Minimum Delta Outflow	(D1641, (b)(2), and SDIP Flow Requirement)

These requirements specify (a) the quantity of Delta outflow required to satisfy the requirement, (b) the day the requirement begins, and (c) the day the requirement ends. A composite of these standards is sent by CalSim-II to an external FORTRAN routine that determines the minimum required Delta outflow quantity by arraying the flow requirements across the days in a month, finding the maximum value for each day and averaging these daily maximums to get a monthly value. This procedure is required because CalSim-II runs on a monthly time step. While this is common for water resource planning models, it complicates the simulation of environmental regulation in the Delta which has been designed to manage day to day conditions in the system.

These standards are more related to protecting consumptive uses than creating optimal environmental conditions.

The first four flow requirements are considered by MRDO during the D1485 model cycle (requirements i-iv), but not during subsequent cycles. Increases in reservoir releases or decreases in South of Delta exports that result from changes to these policies during later model cycles are charged to the (b) (2) account.

EWC

Table 21 – Striped Bass survival and spawning Delta outflow schedules

	Delta outflow schedule (cfs) by water year designation						
	W[44] (1)	AN[44] (2)	D[44] (3)	C[44] (4)	Dry-Dry[44]	Wet-Dry[44]	Low Snow[45]
October	4000	4000	4000	4000	3000	2500	2500
November	4500	4500	4500	4500	3500	2500	2500
December	4500	4500	4500	4500	3500	2500	2500
January	2500	2500	2500	2500	2500	2500	2500
February	2500	2500	2500	2500	2500	2500	2500
March	2500	2500	2500	2500	2500	2500	2500
April	6700	6700	6700	6700	6700	6700	6700
May	14000	14000	11400	4300	3300	4300	6500
June	14000	10700	9500	3600	3100	3600	5400
July	10000	7700	6500	3200	2900	3200	3600
August	2500	2500	2500	2500	2500	2500	2500
September	2500	2500	2500	2500	2500	2500	2500

The Striped Bass survival and spawning requirement defines Delta outflows from May 6th – April 14th (excluding April 15th – May 5th). The level of flow required is set by three indices: the D1485 Fish and Wildlife Standards Index[46], the D1485 Subnormal Snowmelt Index[47], and the D1485 Project Deficiency Index[48]. Under normal circumstances, the flow requirement corresponds to the D1485 water year index, shown in the first four columns of Table 21. For sequential dry water years, the requirement

[44] ...\D1485\Run\Lookup\NdoBass.table
[45] ...\D1485\Run\Lookup\NdoBassSnow.table
[46] ...\D1485\Run\Wytypes\wytypes.wresl [NOTE: defined in wresl code as the product of 2 other wytypes]
[47] ...\D1485\Run\Lookup\wytypeSnow.table
[48] ...\D1485\Run\Lookup\wytypeDefic.table

goes to the Dry-Dry schedule. In a dry year following a wet year, the Wet-Dry schedule is invoked. If the water year type is either dry or critical *and* there is a low snowpack forecast (as determined by the D1485 Subnormal Snowmelt Index) the Low Snow schedule in the final column governs the standard.

When the D1485 Project Deficiency Index is triggered (an index value of 1), then the April 1st and 14th schedule can be reduced to 2,500 cfs. Likewise, in a critical D1485 water year the same reduction is allowed.

The Suisun Marsh flow requirement is set based on two water year indices: the D1485 Fish and Wildlife Standards Index[49], the D1485 Subnormal Snowmelt Index[50]. This requirement specifies a default 2,500 cfs Delta outflow flow throughout the year. Criteria for deviating from the default flow requirement are specified in Table 20.

Table 20: Conditional Wet Water Year Suisun Marsh spring flows

D1485 F&W Index	D1485 Subnormal Snowmelt Index	Flow Requirement	Period of Flow Requirement
Wet	Low Snow	10,000 cfs	February - April
Wet	Not Low Snow	10,000 cfs	February - May

The 60-day Suisun Marsh Flow Requirement operates between January and April. This requirement is 2,500 cfs by default. In non-wet (i.e. index $\neq 1$) and non-dry (i.e. index $\neq 4$) water years, the flows are required to be 12,000 cfs for two months between January and April. The months do not have to be sequential, and CalSim-II accounts for the months during this period when the requirement is met.

The three-reservoir Flood Envelope requirement is set by North of Delta storage conditions. In the case that two of the North of Delta projects (Shasta, Folsom, and/or Oroville) have storage in zone 5 (high/spill storage reservoir zone), Delta outflow is required to be 6,600 cfs. Otherwise, the flow requirement defaults to 2,500 cfs.

The Post-D1641 X2 Outflow Requirements (requirements v-viii) are calculated by tracking the 2ppt (X2) bottom isohaline line between the months of February and June. CalSim-II calculates a net monthly flow requirement for three locations (Roe Island/Port Chicago at river mile 39, the Sacramento-San Joaquin Confluence at river mile 50, and Chipps Island at river mile 74).

The first step in setting the X2 requirements is determining where the X2 isohaline line is situated at the beginning of a month or period (BOP). This is determined using the Kimmerer-Monismith equation[51], which references the previous month's North of Delta outflow (NDO) which enters the Delta and the X2 location at the beginning of the previous month (Equation 1). [52]

---

[49] ...\D1485\Run\Wytypes\wytypes.wresl [NOTE: defined in wresl code as the product of 2 other wytypes]

[50] ...\D1485\Run\Lookup\wytypeSnow.table

[51] It is important to note that this regression equations were develop using data from historic Delta export conditions and that future changes that include dramatic changes in Delta exports may compromise the use of these relationships.

[52] ...\Run\Delta\MRDO\X2\X2req.wresl

Equation 1	$X2_{BOP} = \mathbf{122.2} + \mathbf{0.3278} * X2\text{-}Location_{\text{beginning of previous month in kilometers}} - \mathbf{17.65} * log_{10}(NDO_{\text{previous month in cubic feet per second}})$

If the calculated BOP X2 location is greater than 66.3 km (river mile 41) then the calculation of the Roe Island requirement is invoked. If the BOP X2 position is at, or below the 66.3 km point, then the Roe Island requirement is bypassed. If the Roe Island X2 requirement is triggered, the number of days that the Roe Island X2 constraint is expected to be a controlling Delta outflow requirement is referenced from a lookup table.[53] This number varies by month and by water year. The Delta outflow required to satisfy Roe Island is capped at 29,200 cfs, and is calculated Equation 2.[54]

Equation 2	$Q_{\text{Roe Island Requirement}} = 10 \wedge [(\mathbf{122.2} + \mathbf{0.3278} * X2\text{-}Location_{\text{beginning of previous month}} - \mathbf{64}) / \mathbf{17.65}]$

If Roe Island is triggered, a further calculation (Equation 3)[55] determines where X2 will be situated at the end of the month as a result of meeting the Roe Island outflow requirement.

Equation 3	$X2\text{-}Location_{\text{Post Roe Island}} = \mathbf{122.2} + \mathbf{0.3278} * X2\text{-}Location_{\text{beginning of month}} - \mathbf{17.65} * Log_{10}(Q_{\text{Roe Island Requirement}})$

In the case that Roe Island standard is invoked, the number of days in which the Chipps Island requirement controls the Delta outflow requirement (same lookup table as the Roe Island standard) [56] is reduced by the number of Roe Island days. The Chipps Island flow requirement is capped at 11,400 cfs, and is calculated using Equation 4[57].

Equation 4	$Q_{\text{Chipps Island Requirement}} = 10 \wedge [(\mathbf{122.2} + \mathbf{0.3278} * X2\text{-}Location_{\text{Post Roe Island}} - \mathbf{74}) / \mathbf{17.65}]$

Equation 5 [58] then determines where X2 will be situated as a result of meeting the Chipps Island outflow requirement.

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[53] ...\D1641\Run\Lookup\x2days.table
[54] ...\Run\Delta\MRDO\X2\X2req.wresl
[55] ...\Run\Delta\MRDO\X2\X2req.wresl
[56] ...\D1641\Run\Lookup\x2days.table
[57] ...\Run\Delta\MRDO\X2\X2req.wresl
[58] ...\Run\Delta\MRDO\X2\X2req.wresl

Equation 5	$X2\text{-}Location_{\,Post\ Chipps\ Island} = 122.2 + 0.3278 * X2\text{-}Location_{\,beginning\ of\ month} - 17.65 * Log_{10}(Q_{\,Chipps\ Island\ Requirement})$

The Sacramento-San Joaquin Confluence flow requirement is reduced by the number of days in which either the Roe or Chipps Island requirements are being met (the greater between the two). In the case that Roe Island is not triggered, then the number of days in which the Confluence requirement would be a controlling outflow requirement (same lookup table as the Roe and Chipps Island standards) [59] is reduced by the number of Chipps Island days. The Confluence flow requirement is capped at 7,100 cfs, and is calculated using Equation 6[60].

Equation 6	$Q_{\,Chipps\ Island\ Requirement} = 10\ \wedge\ [(122.2 + 0.3278 * X2\text{-}Location_{\,Post\ Roe\ Island} - 74) / 17.65]$

To generate the final X2 requirement, the Roe Island requirement is assumed to begin on day 1 and end after the pre-determined period of time. Any remaining Chipps Island requirements begin on the day after the Roe Island requirement is met. Lastly, any Sacramento-San Joaquin Confluence flow requirements begin on the day after the Chipps Island requirements are met. The Confluence requirement then continues through to the end of the month.

Observation of the results of CalSim-II evaluated during this review reveal that during May and June of the 1924, 1931, 1939, 1976, 1977, 1990, 1991 and 1994 water years, zero X2 days were required, apparently because the projected 40-30-30 Sacramento River Index fell below 8.1 MAF in the month of May. During these situations, a 4,000 cfs minimum flow standard is maintained.

The ANN Delta Outflow Requirement is computed in an external FORTRAN routine (an Artificial Neural Network). Current physically based models, such as the DSM-II, report salinity levels as a function of Delta inflows and exports, and not visa-versa. CalSim-II's ANN was designed to reverse this functional relationship in a procedure that would otherwise be a lengthy iterative process. The ANN bases its decisions on the current month's flow (the only variable), on antecedent flow conditions, and on the current level of salinity at each station. Standards that emerge from the ANN are designed to protect water quality at various points throughout the Delta. These standards are more related to protecting consumptive uses than creating optimal environmental conditions

CalSim-II takes a composite of all of the preceding flow standards in order to arrive at the minimum Delta outflow assigned to arc D407 shown in the schematic found in Figure 11.

[59] ...\D1641\Run\Lookup\x2days.table
[60] ...\Run\Delta\MRDO\X2\X2req.wresl

Full Environmental Compliance CalSim-II Formulation Work Plan

Based on the insights gleaned from this environmental review, it is possible to begin sketching out a work plan for developing a legal compliance formulation of the CalSim-II model. Before launching in to this exercise, however, it is worth forwarding a few general impressions that can place the recommended work plan items in a proper context.

1. Any water resources model, including CalSim-II, can be improved through continued refinement of its underlying assumptions. The following work plan is offered in the spirit of constructively contributing to continued improvements to the CalSim-II model.
2. Based on the sub-set of CalSim-II logic reviewed for this report we are confident in the validity of our conclusions that we used them to motivate the following proposed work plan.
3. Like most water resource planning models, CalSim-II is path dependent. Much of the model logic governing the simulated system operation is governed by the state of the system at a particular moment in time, and this state will evolve differently under alternative assumptions about the environmental regulations governing system operations. This means that examining model code is not a sufficient method for understanding the implications of different model formulations. In the end, changes in the code must be implemented and the implications of these changes must be measured by examining model output. For these reasons recommend that the CalSim-II development team implement this workplan and evaluate the magnitude of potential changes in model output.

With these impressions on the table, our conclusion after having completed the environmental review are that the work plan for creating a full environmental compliance formulation should focus on:

- Removing all vestiges of perfect foresight from the definition of environmental regulations governing system operations;
- Revising the (b)(2) accounting logic to align it with what we consider to be the current interpretation of the CVPIA; and
- Introducing a minimum flow standard from the San Joaquin River.

Removing Perfect Foresight from the Definition of Environmental Regulations

In developing the work plan for this CalSim-II model improvement, we adopt the assumption implicit in the definition of environmental regulations as constraints on system operations, namely that they are of a higher priority than any other water management objectives in the system. As such, at any particular moment in a CalSim-II simulation, the model should anticipate that environmental regulations should be met to the fullest possible extent, unless and until conditions dictate that environmental regulations can be relaxed. This is not the approach taken in the current CalSim-II formulation, which relies on water year indices defined during the February or March time step, to determine if environmental regulations can be relaxed.

For example, consider the definition of the obligation associated with the (b)(2) account as described in Table 1. In February, with the benefit of perfect foresight, a determination is made regarding whether the annual (b)(2) obligation is 800 TAF, 700 TAF, or 600 TAF. In order to meet the full environmental compliance standard and honor the top priority assumption implicit in the definition of environmental constraints, the strictest possible regulations must be anticipated until enough information is available to decide otherwise. In much the same way that CalSim-II uses forecasts to introduce uncertainty into its promised water deliveries, uncertainty needs to influence the establishment of environmental regulations.

As discussed above, in calculating the value of WSI during the February time step, CalSim-II uses the level of precipitation that has been exceeded 99% of the time during the remaining months of the water year in order to forecast what reservoir inflow will be available for allocation during the coming months. This threshold drops to 90% during the March time step, 75% during the April time step, and 50% during the May time step. This is a prudent risk management strategy, as it assumes the worst when much is still unknown about what the future holds. A corollary to this prudent posture is to also assume that environmental constraints will be at their most stringent when much is still unknown about what the future holds. Perfect foresight is not consistent with this risk management posture.

To satisfy a full environmental compliance standard, all of the indices used in CalSim-II need to be calculated dynamically based on prudent forecasts about what the future may hold. In February the question should be what are the environmental constraints that will be in place going forward assuming that future inflows associated with the level of precipitation exceeded 1% of the time during the remainder of the water year is used to forecast the relevant indices. The answer to this question will surely be the most stringent set of environmental constraints. As time passes and the future becomes more certain then the level risk tolerance related to calculating water year indices can be increased. During the March time step the question would be what are the environmental constraints that will be in place going forward assuming that future inflows are associated with the level of precipitation exceeded 10 % of the time during the remainder of the water year are used to update the relevant indices. In April the threshold would drop to 25% and then to 50% in May. By applying this corollary to the risk tolerance already applied to project water supply availability, the top priority environmental constraints would not be weakened until there was justification for doing so.

Under this formulation, the calculation of the water supply index and use of the WSI-DI and DelCar Curves to translate WSI into a promised level of deliveries to meet current water demands does not change. During years when perfect foresight allowed for an early weakening of environmental constraints under the old formulation, however, under the new formulation the promised deliveries will be subject to more stringent environmental constraints during some portion of the February to June period. This may mean that CalSim-II could fail to meet the water delivery promises generated by the current set of risk management curves (the red dot in Figure 3). In keeping with the risk tolerance philosophy implicit in these curves, they should be retrained as part of the full

environmental compliance formulation in the event that significant delivery shortfalls materialize so that less water is promised to other water uses in the system.

Activity 1: Internalize the calculation of water year indices used to set environmental regulations.

This activity involves moving the values of water year indices used to set environmental regulations from external look-up tables where they are stated with perfect foresight into the actual WRESL code where they will be updated continuously based on forecasted inflows.

Activity 2: Define risk tolerance posture with respect to anticipated environmental regulations.

We propose that the 1% exceedence probability of forecasted inflows be used for the months of October-February. This will assure that the strictest possible environmental regulations will be anticipated during that period when large amounts of uncertainly exist about the future. As a corollary to the risk tolerance implicit in the forecasts used to support water allocation, assume that the 10% exceedence inflow will be used in March, 25% in April, and 50% in May. By June that water year index can be set definitively for the remainder ~~of the water year.~~

Activity 3: Construct the forecasted inflow data tables that will drive the continuous calculation of water year indices.

The forecasted inflows used to support water allocation are read in to CalSim-II from an external file. A similar set of anticipated inflow tables would need to be developed to capture the risk tolerance posture adopted for anticipating environmental regulations.

Activity 4: Implement WRESL code required to adjust environmental regulations based on the continuous evolution of water year indices.

In the current version of CalSim-II, the environmental regulations create a pre-determined constraint on simulated system operations. The new formulation would require WRESL code to look-up the regulations associated with an evolving series of water year indices.

Activity 5: Update the WSI-DI and DelCar curves to reflect the change in underlying constraint set.

As the underlying constraint set used to develop the WSI-DI and DelCar curves, which was based on the application of perfect foresight in setting environmental constraints, will be modified by implementing the preceding activities, it may be necessary to update these risk tolerance defining curves as higher environmental flows will likely be required during the late winter and early spring months.

REVISING THE (B)(2) ACCOUNTING LOGIC

While the method used in applying environmental actions against the (b)(2) account has been the subject of legal and administrative wrangling since the passage of CVPIA in 1992, we believe that the logic employed in CalSim-II to capture the currently accepted accounting methodology is not entirely consistent with the current legal interpretation of

the Act. We recognize that this conclusion derives from our interpretation of current law, so it is probably worthwhile to articulate our position on this point.

First, we believe that the intent of (b)(2) was to rededicate a portion of the CVP yield back to fish and wildlife enhancement objectives, primarily the restoration of anadromous fish. While courts have found that Delta water quality actions, which benefit Delta resident fish and consumptive water users relying on water drawn from the Delta, could be considered as acceptable charges against the (b)(2) account, they stipulated *"as long as the allocation gives effect to the hierarchy of purposes established in section 3406(b)(2)"*. Here we believe the intent was clear as Section 3406(b)(2) of the Central Valley Project Improvement Act states that the CVP will:

> "dedicate and manage annually 800,000 acre-feet of Central Valley Project yield for the **primary purpose** of implementing the fish, wildlife, and habitat restoration purposes and measures authorized by this title; to assist the State of California in its efforts to protect the waters of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; and to help to meet such obligations as may be legally imposed upon the Central Valley Project under State or Federal law following the date of enactment of this title, including but not limited to additional obligations under the Federal Endangered Species Act."

We also believe that fish, wildlife, and habitat restoration purposes and measures specifically include the anadromous fish doubling goal included in the Act.

The current CalSim-II formulation turns this notion of primacy upside down by fully changing water quality actions to (b)(2), as well as other non-fish motivated actions, while using fish and wildlife actions to make up any remaining obligations to the (b)(2) account. This stems from the fact that the D-1641 step is run before the (b)(2) step and that all changes in the release and export metrics associated with the difference between the D-1485 and D-1641 steps are charged to (b)(2) with perfect foresight for the water year. In addition, in reviewing various environmental regulations we discovered several other actions of questionable fish and wildlife value that are charged to (b)(2). All this occurs before any fish and wildlife (b)(2) action occurs.

We propose an alternative course of action that envisions the implementation of a new step in the CalSim-II formulation. In keeping with its implicit focus on anadromous fish recovery, this new step is provisionally referred to as the salmon step. The sequence of (b)(2) actions currently used in CalSim-II, as shown in Table 21, is a good starting point for developing the elements of the salmon step. We feel that the highest priority should be assigned to AFRP releases (currently priority 3) as these are designed specifically to meet the anadromous fish-doubling target that was also part of the CVPIA. If this were the case, the type of limitations on AFRP releases that are contained in Table 8 and Table 13 would be unnecessary as these are intended to minimize AFRP flows when significant credits to the (b)(2) account can be derived from the D-1641 step.

A second level of priority would be assigned to the VAMP export priorities (current priority 2), as well as the pre- and post-VAMP restrictions (currently priorities 7 and 4 respectively). As all of these actions would occur after the October to March period

during which AFRP flows would be implemented, it should be possible to consider the three components of the VAMP export limitations as a single action.

The final actions in the new salmon step would include the export ramping and the 3000 cfs export limit actions anticipated for the month of June. As these occur after the VAMP export restrictions, a decision will be made in June as to whether they are necessary.

Action Description	Priority of Action	Reserve* for Action (taf)	Balance† Req'd to Trigger Action (taf)	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
WQCP Support (D-1641)	1														
AFRP Releases	3		1												
Export Reductions (150 taf)	6	150	1+2+3+4+5+6												
VAMP Export Restrictions	2	115													
Post VAMP Export Restrictions	4	45	1+4												
Export Ramping	5	60	1+5												
3000 cfs Export Limit	2														
Pre VAMP Export Restrictions	7	40	1+2+4+4+7												
Export Reductions (35 taf)	8	35													

* Average reserve amount. Actual reserves may depend on water year type and/or other hydrologic conditions. Reserves for multi-month actions represent the amount required to complete the entire actions.

† (b)(2) balance after accounting for past costs and current month WQCP(D-1641) support. Values refer to the sum of the reserve amounts associated with the action priorities.

A couple of clarifying points are useful at this point in the discussion. Based on the removal of perfect foresight from the establishment of environmental regulations described above, the exact (b)(2) obligation will not be known as the AFRP actions are implemented between October and March. If this creates a situation whereby AFRP actions result in greater charges against (b)(2) than are finally called for based on the evolution of water year indices, the excess will be changed against the (b)(2) account during the following water year.

Second, several local environmental regulations that are of questionable fishery value, namely the stability criteria on the Sacramento and American Rivers and the diversion of water that would otherwise spill in the Trinity system, are currently charged against (b)(2). In implementing the new salmon step, these charges would not be allowed.

Finally, as the proposed salmon actions are implemented sequentially, there is no need to define and manage reserves and triggers as is the case in the current (b)(2) step. The proposed anadromous fish related actions would simply be implemented in sequence until the (b)(2) obligations is satisfied.

Following the completion of the new salmon CalSim-II step, the current D-1641 step would be implemented. This step contains regulatory drivers related to Delta water quality to protect Delta resident fish and water users who draw water from the Delta. It

seems to us that these two drivers are so tightly bound in the D-1641 step that it is unreasonable to separate actions driven by fishery objectives from those driven by consumptive water needs. Therefore we acknowledge that should any remaining (b)(2) obligations remain after the new salmon step, all D-1641 actions can be used to satisfy this obligation, even if they are designed primarily to protect the interest of consumptive water users. As in the case of the new salmon step, D-1641 actions will be implemented sequentially, although in this step, D-1641 actions will continue even after (b)(2) obligations are retired.

If additional (b)(2) obligations remain at the end of the D-1641 step, then a revised (b)(2) step will be implemented. This step will sequentially implement the December-January export reductions, the February-March export reductions, and the May export limit actions described in Table 21, as needed until the (b)(2) obligation for the year is retired. If (b)(2) obligations remain following this step, they will be forgiven.

While there will be surely be discussion of the legal underpinning of this alternative formulation of the (b)(2) accounting logic, we do not feel that the assignment of first priority to Delta water quality objectives relative to (b)(2) obligations complies with the intend of CVPIA or court findings. The following steps are needed to implement this aspect of the compliance work plan.

Activity 1: Create and implement the new salmon CalSim-II step.
This step will involve adding a new step that sequentially implements the AFRP, VAMP export reductions, and June actions up to the limit of the (b)(2) account that will evolve over the course of the water year according to the forecast based water year indices. Stability releases and Trinity transfers to avoid spills will not be charges against (b)(2) in this step.

Activity 2: Implement conditional logic to govern the implementation of the final revised (b)(2) CalSim-II step.
Under the proposed CalSim-II formulation the (b)(2) obligation may or may not be retired following the D-1641 step. CalSim-II logic must be developed to control the flow of the model depending on the status of the (b)(2) account at the end of the D-1641 step. This conditional flow is depicted in Figure 12.

INCLUDING MINIMUM INSTREAM FLOWS FOR THE SAN JOAQUIN RIVER BELOW FRIANT

The final proposed environmental compliance element is the inclusion of a minimum instream flow requirement for the San Joaquin River below Friant Dam. This is motivated by the recent ruling that called upon the Bureau of Reclamation to release sufficient water to restore the anadromous fishery in the reach between Friant and the Merced River confluence. While the ruling provided no specific guidelines as to release schedule required to satisfy this obligation, it is clear that a release regime will be a part of the environmental regulatory structure in the future and needs to be implemented in CalSim-II. The following work plan steps are needed to accomplish this goal.

Activity 1: Define a release schedule
As part of the failed settlement negotiations, several proposed release regimes for the lower San Joaquin River were developed. This task would involve deciding on two flow regimes from the proposed alternatives that will bracket the potential flow regime.

Activity 2: Implement the Friant Release Logic
Add WRESL code to CalSim-II that can read the release requirements from a look-up table.

Activity 3: Perform Sensitivity Analysis on the two Release Regimes
Run the model with both release regimes and assess the sensitivity of model results to the difference. If the model is highly sensitive, two baselines may be needed. If the model is insensitive, institute a compromise between the two as part of the CalSim-II baseline.

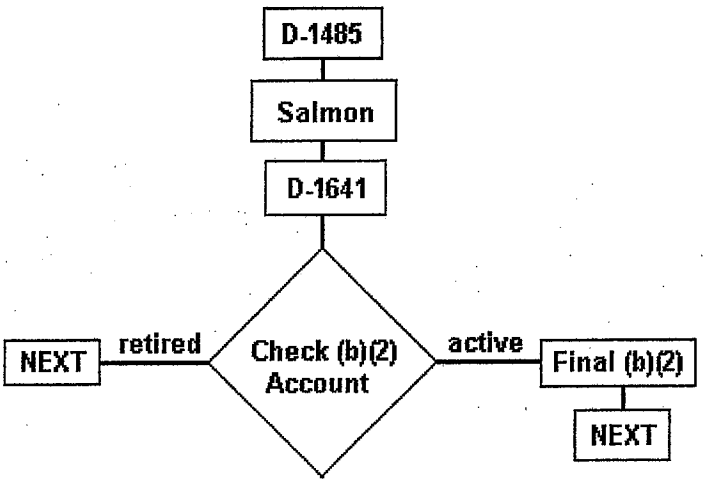

Figure 12: Proposed CalSim-II Flow Chart

Environmentally Preferred CalSim-II Formulation Work Plan

As could reasonably be expected, the definition of an environmentally preferred CalSim-II formulation is a more ambitious activity than the comparison of the current model formulation against a standard of regulatory compliance. It implies that the management of California water systems will be adjusted until the point that ecosystems protected under current law are restored rather than a legalistic determination of whether or not the model accurately represents current regulations that may not be meeting restoration objectives. While the preceding discussion focusing on the full environmental compliance workplan was quite focused and detailed, the following discussion of an environmentally preferred formulation will be broader. In addition, our suggestions regarding required modifications to the CalSim-II code associated with the environmentally preferred formulation will be more strategic and less prescriptive.

With this qualification on the table, our conclusions after having completed the environmental review are that the work plan for creating a full environmental compliance formulation should focus on:

- Adapting several existing regulations to conform more with future conditions that are either anticipated or desired and would avoid the legal impacts associated with a failure to achieve real aquatic ecosystem restoration.
- Introducing operational flexibility to the CalSim-II code so that alternative sets of environmental flow regimes, beyond the establishment of minimum instream flows, can be simulated and evaluated.

In each case, several existing regulations or alternative flow regimes are presented. For each, a possible approach for CalSim-II modifications associated with the specific regulation or regime are summarized without defining a specific set of activities required to implement these modifications. These activities can be developed once an agreement has been reached to implement a specific element of the environmentally preferred formulation.

Adapting the Representation of Existing Regulations

The following changes to specific regulations are proposed for the environmentally preferred CalSim-II formulation. As with the full compliance workplan, these items are not meant to be exhaustive as a comprehensive inventory of all existing regulations was not performed. They are representative, however, of the kind of incremental improvements in the environmental regulatory structure that may be of interest.

Changes to the Vernalis Salinity Standard

Action: CalSim-II should be reformulated to evaluate an EC standard on the San Joaquin River at a point upstream of the Stanislaus River confluence. The contribution of a San Joaquin River fishery release schedule from Friant Dam should be considered as a source of water to help meet this standard. Doing so will dramatically reduce the amount of water that needs to be released from New

Melones Dam to dilute the salt load at Vernalis, shifting responsibility for San Joaquin salinity control to all water users on the San Joaquin River.
Possible Approach: This can be accomplished by reconfiguring reservoir release arcs upstream of the Stanislaus to include sub-arcs for meeting the salinity standard. CalSim-II is incapable of directly evaluating salinity as a function of flow, so this suggestion requires that new empirical relationships between flow and salinity be developed with higher spatial and temporal resolution than the flow salinity relationship now used to control the Vernalis salinity standard.

Shift the position of X2

Action: The X2 compliance point should be moved to the western Delta when this would most benefit conditions for Delta-dependent species. Closing the Delta Cross Channel Gates as recommended in the AFRP to assist salmon smolt outmigration will affect the location of X2 and move it further to the west than would otherwise be the case. Limiting Delta export pumping when smolts are in the Delta will also result in X2 being further to the west. The combined effect of changes and Delta operations and the maintenance of X2 in the western Delta needs to be evaluated in CalSim-II.
Possible Approach: Evaluate the latest scientific understanding concerning the estuarine water quality needs of key species during their various life stages in order to refine where the X2 standard should be set. Update the Kimmerer-Monismith equation and the supporting data tables to accommodate this refined understanding, including some consideration of the operation of the cross channel gates and restrictions on Delta exports. Introduce these changes into CalSim-II.

Changes to Folsom/Nimbus Operations

Action: A portion of Folsom reservoir storage space should be held in reserve to assure adequate water supply for maintaining targeted instream flows and water temperatures for salmonid fishes at levels identified by AFRP and/or Sacramento Water Forum.
Possible Approach: This can be accomplished through either the development of a dummy reservoir, or the adjustment of the "dead storage" level to absorb target storage reservations. Dead storages have very high weights, which means that the model resists releasing from the dead storage pool until the most severe conditions are encountered.

Action: Increases in Sacramento Water Forum demand above current levels should have lower priority than instream flow, temperature and reservoir reserves for environmental use.
Possible Approach: Incremental increases to Sacramento River withdrawals beyond the 2000 Level of Development could be performed in cycles subsequent to those considering environmental flow objectives, and be given a weight corresponding to junior water rights holders or interruptible deliveries.

Action: Reduce reliance on the American River for maintaining Delta water quality standards and cap Folsom/Nimbus releases for the purpose of meeting

Delta outflow requirements at 4000 cfs. This would result in greater sharing of the responsibility for meeting Delta water quality standards between all Sacramento Valley tributaries. It may also be possible to share this responsibility with San Joaquin Valley tributaries in light of the fact that upper San Joaquin River releases will most likely occur in the future.

Possible Approach: This suggestion requires the inclusion of non-CVP reservoirs (particularly Oroville) in the call for both X2 and the Water Quality standards within the ANN. The cap on reservoir releases is, however, relatively straightforward to achieve in CalSim, as it would require logic similar to the manner in which orchards downstream of New Melones are protected from high flows. Spreading responsibility for Delta water quality standards to the San Joaquin River tributaries would require the introduction of feedback between North of Delta operations and the simulated San Joaquin River Delta inflow contribution.

Modify Delta Export Restrictions

Action: The benefits of enhanced Delta outflow, as well as more balanced Delta inflows associated with changes to Folsom/Nimbus operations, should be complemented by increased constraints on exports. During the February 1-June 15 period, exports should be capped at 35% of total inflow and/or <200% of Vernalis flow (2:1 export:Vernalis ratio).

Possible Approach: The current configuration of CalSim-II could be changed to accommodate this policy suggestion without major revision.

Action: VAMP (enhanced San Joaquin tributary flows + curtailed exports) should be expanded from 31 days to 61 days (April 1- May 31). The upper San Joaquin River releases should be included as a potential contribution to satisfying VAMP.

Possible Approach: The current configuration of CalSim-II could be changed to accommodate this policy suggestion without major revision.

Action: From October 1-Feb 29, a total of 60 days of DCC gate closures should be allowed.

Possible Approach: The current configuration of CalSim could be changed to accommodate this policy suggestion without major revision.

Refinement of the (b)(2) Accounting Rules

Action: Offset and Reset accounting rules should be used. If (b)(2) water is released from a reservoir and the reservoir subsequently fills and spills, the amount of water released from the reservoir earlier in the water year should not be charged to the (b)(2) account. If (b)(2) water is used to curtail CVP exports and the CVP responds by concurrently reducing reservoir releases that had been supporting some (or all) of the higher export rate, (b)(2) should only be charged for the difference.

Possible Approach: When (b)(2) was originally implemented, the Offset/Reset accounting rules were coded into CalSim-II. Although CalSim-II has undoubtedly changed in configuration since Offset/Reset was abandoned, most of

the former code should be usable in re-establishing the old accounting system in the current model.

Action: The "zero credit" treatment of the (b)(2) metric should be eliminated. When the (b)(2) step produces release and export metrics are less than the D-1485 "baseline" the (b)(2) account should be credited by the amount of the difference.
Possible Approach: The current configuration of CalSim-II could be changed to accommodate this policy suggestion without major revision.

ALLOWING FOR EVALUATION OF ALTERNATIVE FLOW REGIMES

As stated at the very beginning of this report, the natural flow regime that characterizes the rivers of the Central Valley has been significantly modified by the water development that has taken place over the course of the past 100 years. While fully recreating this natural hydrology is not possible given the extent to which California relies on the installed hydraulic infrastructure, it is important to explore the degree to which system operations could be modified to mimic the natural hydrology within the context of the multiple objectives to which these operations respond. Under an environmentally preferred formulation, CalSim-II would be able to contribute to this sort of evaluation. CalSim-II already is able to handle environmental constraints related to minimum flow and acceptable rates of change in stream flow. Under an environmentally preferred formulation, this functionality should be used to investigate alternative regulatory regimes, such as full implementation of the AFRP recommendations. In addition, however, CalSim-II functionality should be added to accommodate the following potential changes in the flow regime that are of interest to the environmental community.

1. Period High Flow Events

Action:

All streams should have regularly occurring high flows that help restore the riparian forest, move and sort gravel, clean out silt from deep holes in the river bed, topple trees to create large woody debris in the stream and help maintain the naturally occurring conditions that depend on periodic high water. These high flow events need to recede at a rate consistent with the needs of newly germinating plants in the riparian forest. Appropriate high flow levels and the rate at which they recede will need to be determined for each stream. Current ecological understanding suggests that such events should occur once every five to ten years.

All the streams do not need to flood in the same year, though when storm induced floods do occur, the ramping down of the high water should be done at the rate needed for new riparian seedlings to become established. When natural flooding and receding doesn't occur, it should be scheduled and the flows accounted for in the long-term operation of upstream dams. Done in a coordinated manner, these flood flow releases can arrive in the Delta to meet the needs of the export pumps. For example, while some rivers are "flooding" in one winter, other rivers could be experience "man made" drought conditions. The flows into the delta are stable but the streams are benefiting from periodic, scheduled "floods".

2. Summer Low Flows

Action:

It is not natural to have high summer flows on the Sacramento, Feather, Yuba, American and other rivers in California's Central Valley. Presently these streams run high in the summer to meet water export demands in the Delta. The preferred condition should be a changed in how water is stored and delivered to the south via the Delta so that stream flows can drop in the summer and rise in the winter.

Until the infrastructure of Delta island reservoirs, groundwater conjunctive use reservoirs or local southern California water supplies are built, the best that can be done is an adaptive management plan of rotating low flows for these different streams. Both the volume and duration of low flows need to be evaluated for invasive weed reduction and restoration benefits.

The ability to investigate these components of the flow regime will require the development of new WRESL code. The actual design of software upgrades will be developed should the proposed functionality be included in a future environmentally preferred formulation of the CalSim-II model.

Conclusions

Having completed this environmental review of the CalSim-II model, we are left with the profound impression that it is not a tool that can – under its current formulation – fully address the legally required water management objectives. CalSim-II is, after all, a tool that has been designed to determine how best to operate the state's hydraulic infrastructure in ways that maximize the satisfaction of contractual demands. This reality is a result of both the history of water model development in California and a general analytical approach that has held sway for decades in the field of water resources planning and analysis. This approach holds that the environment is a constraint on system operations, not one of the objectives for which the system should be managed. In order to create a tool that can investigate water management innovations designed to comply with the law and restore the environment, it is not simply a matter of adjusting a few input parameters. Instead, a reformulation of the model along the lines described in this document is needed.

CalSim-II holds that the environment is a constraint on system operations, not one of the objectives for which the system should be managed. In order to create a tool that can investigate water management innovations designed to comply with the law and restore the environment, it is not simply a matter of adjusting a few input parameters.

This philosophy of including the environment as an objective in water resources management is gaining credence around the world. Unfortunately, in California we cannot get to this point if we limit ourselves to the current version of CalSim-II. On the positive side, it is clear that no one views the current version of CalSim-II as the final and definitive water planning tool. An effort is underway to develop CalSim-III, which will respond to many of the critiques that have been offered about the model in recent months and years.

The conclusions of this report are offered to constructively contribute to this evolution. We feel that they will elevate, when implemented, aquatic ecosystem restoration to a place alongside of the other water management objectives in the system as is consistent with the imperatives of law and policy. A failure to respond to these critiques would demonstrate, on the other hand, that the water management community has little interest in viewing ecosystem restoration as more that a nettlesome constraint that has to be dealt with, preferably in the most minimal fashion. This would represent a division more profound than some varying professional opinions about the best way to model a complex water resource system.

attachment #10

Gerald Johns' Memo

Jan de Leeuw

October 23, 2005

These are brief comments on a Gerald Johns' memo to the Monterey Plus EIR Committee dd 90/22/05 re CALSIM II.

The argumentation in the memo is somewhat defensive and not always convincing. It is certainly true that the use of a model "to simulate actions in the system is valid and recognized practice". In fact, there is no alternative, because there is no physical copy of the system which can be used for experimentation. This does not imply, however, that the use of CALSIM II is "an acceptable and valuable analysis method". Such a conclusion certainly does not follow from the fact the models in general are useful, and asserting from the start that CALSIM II is valuable obviously begs the question if it is indeed valuable. The argument that DWR and other agencies have "consistently used CALSIM II" is not convincing either, unless it can be shown that this use has indeed led to better or more reliable predictions of supply than any of the available alternatives.

The memo does little more than summarizing the support materials that are available, without emphasizing that some of this material is quite critical of CALSIM II. The fact that CALSIM II is a cooperation between federal and state agencies may be important to federal and state bureaucrats, but it cannot be used as an argument in favor of the model. Similarly, the argument that using an optimization engine is what many other modeling

systems do is not a cogent argument, because it relies solely on authority and not on superior performance compared to other approaches. Intuitively, optimization engines do not seem to be very natural tools to model complex systems, because they assume all operators in the system are optimizers in possesion of perfect information. Also, by its very nature, if you maximize deliveries to purveyors, then of course you overestimate actual deliveries.

The memo adds the by now standard DWR disclaimer that "Traditional model calibration and verification process is difficult to apply to a planning model, such as CALSIM II, that simulates operations and water supplies at a fixed level of development". To me this has always seemed in appropriate testimonium paupertatis on the one hand, and a unconvincing attempt to have your cake and eat it too. Either CALSIM II is a model that describes the operations of SWP/CVP and is used to make predictions about future water supply to the purveyors, or it isn't. If it is, then it surely must be able to withstand traditional calibration and verification processes, because these are the only ways to assess its quality. If it is not such a model, then it clearly should not be used as such.

As I have said elsewhere, the main problems with CALSIM II is that it is only tested on a very limited set of realistic scenarios to assess its sensitivity, that it does not take the essentially stochastic nature of model inputs into account, that it optimizes deliveries instead of modeling actual deliveries, and that it has weak links between optimizations for successive time points. The actual implementation of CALSIM II has many additional problems. The documentation is virtually non-existent, the course of the program is not available, and the actual manipulations by DWR and its consultants to produce results from the program are shrouded with a mysterious layer of unassailable expertise.

In fact, at a recent CALSIM meeting in Sacramento, someone from the audience asked the chair of the peer review committee if anyone on the committee had ever tried to actually run the CALSIM II program. Somewhat surprisingly, the answer was no. For actual

not good

CALSIM II results the peer review relied on runs provided by DWR and its consultants. It is clear that such a strategy implies that what we studying is not just the actual computer program, but it is whatever goes on when the experts are producing their results, including possible non-documented tweaks and iterative attempts to "improve" the results of the runs. The CALSIM II provides much opportunity for such tweaking, for instance by relaxing "hard" to "soft" constraints.

I want to make this point perfectly clear, admittedly exaggerating (although I don't know by how much). There is no guarantee that the results in the SWP Delivery Reliability Report actually come from CALSIM II runs. The whole process of arriving at these results is not sufficiently transparent for others to be able to reproduce the results, and whenever that is the case a true peer review and true scientific scrutiny are not possible.

LETTER 20

attachment #11

Mr. Gerald Johns
Deputy Director, DWR

October 2, 2005

Subject: Response to Director Johns' Letter of September 22, 2005 on CALSIM II

Dear Mr. Johns:

The letter was directed to the EIR committee but in fact it deals with comments generated by the plaintiff group of the committee. The comments we have generated over the past several months go to the technical validity of the model, CALSIM II, and because of its shortcomings its use as the tool in the Monterey Plus EIR. In your letter you make several assertions that are intended to respond to our comments but none really deal with the technical shortcomings of the model. As we have attempted to point out, the model contains fundamental errors in its construction that probably cannot be readily fixed. To continue to use this model in the EIR process will jeopardize the entire validity of the EIR. Accordingly, it is important that the Department undertake actions to address the vulnerability of the EIR.

You state that the model is an important tool to "study many technical and policy issues related to water supply reliability, environmental management and performance, water demands, economics, hydrology and climate, and regulatory compliance." In truth the model is not really specified to do these things and its construction is ill-suited to do them. Water supply reliability requires a model that has verified absolute accuracy, which can only be accomplished by calibration of this model to the historical record, which the Department has steadfastly refused to do.

Environmental management and performance would require that the model output provides measures that can be reasonably used to perform these tasks. In fact, the model treats the environmental issues as constraints buried in the hard code of the model and some of these constraints are of lower priority than water deliveries in the model. Furthermore, the constraints are based primarily on studies of the response of the environment in the Sacramento basin to conditions and project operations prior to the Monterey Amendments. Because this uncalibrated model now predicts that average future deliveries can be increased by 50% over pre-Monterey operations, a review of those old constraints is absolutely required. The current conditions of ecological collapse in the Delta demand it. But this model is exceedingly cumbersome to use for this purpose. What new constraints should be offered? Shouldn't we be going back to the State Water Resources Control Board for review? These are questions that need to be answered before an EIR is ever published.

Water demands are not treated by this model save for the users in the Sacramento Valley, most of who are not SWP beneficiaries. In fact, the model assumes that all SWP contractors except MWD and KCWA will request full Table A amounts from now on. Furthermore, as we have pointed out in our previous comments, at least one of those demands is totally unrealistic and that is the case of San Luis Obispo County for which the model assumes 25,000 acre-feet as its annual request when in fact it has SWP pipeline capacity for only 4800 acre-feet. Other demands can also be argued to be without any merit. One must conclude that the model is not being used to "study …water demands"

when in fact demands are taken as fixed inputs to the model without any critical evaluation of the capabilities of the contractors to take such amounts.

Similar arguments can be raised as to how much the model is used to study "regional hydrology." As with demands, the most important hydrologic input is the historical record of major stream runoff into the Central Valley. If this hydrologic record had been studied, one would have immediately found that its statistical makeup is very complex and that the simple tacit assumptions built in to the model regarding that makeup are just plain wrong. The statistical flaws impact both the interpretation given to the model's output and to the fundamental specification of indices used in the model. These flaws are of such degree that both the model and the indices need to be re-specified. The model as it stands is basically useless as a tool for EIR or reliability studies.

In general, the model is ill-specified for the uses to which it is being put in the Monterey Plus EIR. A correctly specified model would begin with environmental variables as dependent variables rather than constraints. In other words, we need a model in which one can input hydrology and demands and retrieve as output changes in the environment. CALSIM II does the exact opposite. In fact, it is very reasonable to question a model that is designed to maximize exports as in any way suitable to study environmental impacts.

Your assertion that CALSIM II is an accepted tool for use in environmental impact analysis and planning is not warranted. The Peer Review Committee strongly recommended that CALSIM II be calibrated properly if it is to be used for objective measures of system performance. Both reliability assessment and environmental impact analysis both depend on objective measures.

And again, I must take issue with your general assertions of "good faith" efforts on the part of DWR staff. The Department has been asked on several occasions beginning with the settlement negotiations on through the EIR preparation to perform calibration of the model. The Department has stonewalled on this request for close to 5 years now.

As to your comments on how the Department has made its choice to use this model after receiving comments from many forums, again there has been a total reluctance to join the technical issues of the model's flaws. We made very specific comments on the draft Reliability report questioning the statistical use of the output data. There was no response from anyone in DWR to support its particular use of statistics. In general, the Department has never attempted to join the issue of the statistical flaws in the model, continuing to dismiss criticisms to that effect with broad statements such as you make here. We must consider these broad statements to be totally inadequate as a response.

You refer to the Peer Review Committee's report to substantiate your general claims for this model. However, you should realize that the Peer Review Panel made its comments about optimization models and their suitability as a general approach. Their more specific claims about the use of CALSIM II were not supportive. And we must remind the Department that the Peer Review Panel was asked to review a model without any specific application in mind nor without any model specification. In fact, we have not seen a model specification against which we can validate the model's performance. A model specification is an essential step in any model development. We are sure that if the original model specification had called for the ability to perform environmental impact

analyses and delivery reliability assessments it would have been structured in a completely different fashion. It certainly would have called for model calibration and that requirement would have led to a model whose structure would readily allow calibration. We have been continually told that this model can't be calibrated, which we consider nonsense.

With regard to the Department's report where they outline their continuing effort to establish trust in and credibility for the model, we regard that as nothing but "spin" given the Department's stonewalling on critical technical issues that have more to do with developing "trust and credibility".

Finally, if your letter was intended to be a response to technical comments, we regard it as totally unresponsive.

Sincerely,

Arve R. Sjovold
Plaintiff Citizens Planning
Association Representative
To The EIR Committee

LETTER 20

attachment #12

SOME INSIGHTS ON WATER DELIVERIES TO SETTLEMENT CONTRACTORS

By: Arve R. Sjovold
October 24, 2004

In the course of reviewing the use of specific indices in the CALSIM II model it was brought to my attention that the Feather River Settlement Contractors agreed in the contracts to receive 50% cutbacks in years designated "drought years." The 50% cutback is against their total demand according to the research conducted by Jeffrey Payne. What is interesting about this particular requirement is what it does to the rights of the Settlement Contractors when viewed from the perspective of the Monterey Amendments and the Environmental Water Account (EVA).

The feature of the Monterey Amendments that is of interest is the removal from the master contracts of provision 18 (a), the provision that called for agricultural cutbacks first in time of drought. The primary beneficiary of this removal has been Kern County Water Agency (KCWA), which now takes all the water it can get to store in the Kern Water Bank to be sold back to the EWA. Clearly, if the Settlement Contractors did not take cuts in drought years, as KCWA no longer has to do, there would be less water going south, especially to KCWA. In fact, the settlement contractors could then be the benefactors for the EWA and could also be the beneficiaries of the payouts from the EWA. Given the construct of the EWA, this only seems fair since it is water from the watershed of origin that is at issue and should by senior right belong to the Settlement Contractors.

There is also a factor of fairness involved here. When the SWP and Oroville Dam were authorized is when these settlement contracts were executed. At that time, the SWP contracts included the 18 (a) provision, so one could fairly state that SWP ag contractors and settlement contractors were being treated equally. Now that Monterey has attempted to do away the ag first provision in the SWP contracts, it only seems fair at a minimum that the same provision be deleted from the settlement contracts.

ON THE ADEQUACY OF CALSIM II FOR ENVIRONMENTAL IMPACT ANALYSIS AND SWP RELIABILITY ANALYSIS

By: Arve R. Sjovold

August 12, 2004

Introduction:

The matter of application of CALSIM II to a variety of analyses has been questioned by many in water resources analyses, most notably by the scientific peer review team recently convened by the California Bay Delta Authority Science Program, Association of Bay Governments whose comments have been documented in a report dated December 4, 2003. In that report the peer review panel made many comments on the adequacy of CALSIM II which have yet to be acted upon. Several of the comments are directly related to the adequacy of CALSIM II to address the applications of environmental impact analyses and delivery reliability analyses of the SWP. The peer review was broad in reach and was not directed toward any specific application. However, its comments regarding the applications cited above are very pertinent now that the Department of Water Resources (DWR) is moving ahead to use this model for purposes of assessing the environmental impacts of the Monterey Amendments to the SWP contracts and because the Castaic Lake Water Agency (CLWA) is also using the same model outputs for justifying its Urban Water Management Plan and a controversial action to claim as lawful a 41,000 acre-foot transfer of SWP entitlement from the Kern County Water Agency.

Because DWR has not acted on any of the peer review recommendations regarding deficiencies in CALSIM II, it is important that a clear statement be made regarding CALSIM II's adequacy to pursue both the environmental impact analysis of the Monterey Amendments and the CLWA proposed action. Because both environmental impact analysis and delivery reliability analyses require some measure of accuracy in their assessments it is vitally important to assess the accuracy of the CALSIM II calculated estimates. We and the peer review panel agree that calibration of the model is paramount if we are to make any confident statements of accuracy for this model. To date DWR has refused to do a timely calibration of the model even though they have been asked on many occasions over the past several years to do so. It is disingenuous on their part now to move ahead with production runs from this model arguing that they have insufficient time to do a proper calibration. Nevertheless, there are some definitive statements that can be made at this time based on the information made available by DWR in various documents.

Accuracy

Both the preliminary outputs for the environmental impact analysis and the documented outputs from the reliability assessment performed by DWR show levels of export from the Delta that average 50% higher than any estimates of actual average

exports evident to date. These predicted levels of export are not qualified by any statements of how accurate they may be based on comparisons to the historical record. In responses to comments received on their final report on delivery reliability they did include some comparisons to predicted and actual deliveries during the most recent drought (1987-1992). That report also reported actual delivery history through 2003. Although the comparison during the drought seems quite good, that same comparison shows that the SWP could not come close to requested deliveries (Demands) over that period. Additional information supplied by DWR in the appendices of that report also shows that even after the drought, actual deliveries showed large shortfalls below requests. Table 1 shows the data extracted from the DWR reports. (These data are for Table A requests and Table A deliveries.)

Table 1

COMPARISONS OF ACTUAL DELIVERIES AND REQUESTED DEMANDS (maf/yr) 1987 to 2002

Year	Requested Demands	Actual Deliveries
1987	2.7	2.14
1988	2.6	2.32
1989	3.0	2.71
1990	3.1	2.45
1991	3.5	0.55
1992	3.6	1.38
1993	2.75	2.10
1994	2.7	1.75
1995	3.15	1.87
1996	2.7	2.21
1997	3.0	2.29
1998	3.2	1.62
1999	3.2	2.52
2000	3.6	2.71
2001	4.05	1.39
2002	3.9	2.52

It is apparent that throughout this period the SWP had difficulty meeting requests. It is significant to note that the last several years bracket the year 2001, which is one of the parametric levels of development for which CALSIM II calculates expected deliveries. It is also noteworthy that the average delivery for the last 6 years in this series is virtually the same as the first 6 years, the acknowledged period of the drought. The series shows a trend whereby the requests slowly increase over time but in the last 6 years of the series the contractor requests are virtually at the same level as that parametrized for the CALSIM II 2001 run. Accordingly, it is difficult to see how DWR can state that the primary reason that past deliveries are not as high as the model now predicts for the 2001

run is "..that the contractors did not ask for enough in the past." These data clearly show that the SWP has difficulty averaging more than 2.0 maf independent of request levels. It also demonstrates why it is important to calibrate this model so that we can deduce why it fails to accurately reproduce the historical record by any ordinary accounting. We may conclude that the CALSIM II model, absent calibration, is inadequate for any application relying on the accuracy of its calculations. One may state that, based on the data record of requests and deliveries, that the CALSIM II model overestimates deliveries by at least 50% on average. We can further state that the SWP based on the history of actual deliveries can not be relied upon for more than 2.0 maf of total delivery, approximately 48% of Table A entitlements. The record also clearly shows that in the depths of a prolonged 6 year drought that the average reliable delivery is not more than 38%(See my analysis of the statistical analysis of the CALSIM II calculations; "ANALYSIS OF SWP RELIABILITY OF DELIVERY", November 11, 2003.) We may further state that without a peer reviewed calibration and appropriate documentation, that CALSIM II cannot be relied upon for the accuracy of its calculations. These are all important conclusions regarding the adequacy of CALSIM II to support environmental impact analysis or for estimating SWP delivery reliability.

We also note that the charts presenting the results of the CALSIM II runs in support of the Monterey EIR seem to predict even higher deliveries overall than was shown in the DWR reliability report for ostensibly the same conditions and constraints. The reliability report presents 73 year average deliveries of approximately 3.1 to 3.2 maf for the 2020 scenario while the more recent runs are reporting 3.4 maf for the same scenario. A difference of this amount needs to be explained as to where the additional water is coming from.

Another factor affecting the accuracy and utility of CALSIM II calculations is the reconciliation of its optimal outputs with feasible SWP operational scenarios. It is a characteristic of an optimization methodology as used in CALSIM II to substitute the optimization algorithm for the detailed simulation of all the decision operations that properly depict the real system. In the particular optimization used in CALSIM II the set of solution weights is the surrogate for all the decision criteria that would ordinarily be simulated. In order to render the results of the optimization calculations useful, the set of solution weights must be reduced to a realistic, feasible set of decision criteria that can be implemented. Otherwise, there is no assurance that the optimization results are realizable.

Environmental Impact analysis

DWR has recently presented draft presentations of CALSIM II outputs in support of environmental impact analysis for the Monterey Amendments EIR. These calculations are performed on the same basis as those used in the SWP reliability of delivery analysis in that the model is not calibrated and the methodology is the same. However, the impact analysis proceeds on assumptions that may or may not be applied to previous calculations for reliability delivery. Most important, beyond the fundamental deficiency of an uncalibrated model, are the assumptions made on the priority of exports.

One of the fundamental scenarios in effect mandated by the Court of Appeals is to study the "no project alternative." This is the scenario where it is envisioned that DWR invokes Article 18(b) to address the chronic deficiency to deliver full entitlement

amounts as articulated in the SWP contracts. If Article 18(b) is invoked it requires that DWR reduce uniformly the stated Table A entitlements of all the contractors down to a level that reasonably conforms to the ability of the project to deliver those entitlements reliably. The data in Table 1 above suggest that this new level of aggregate entitlement should be about 2.0 maf or less compared to the original 4.23 maf of the original contracts. This represents a uniform lowering of contractor entitlements to approximately 47%. If DWR were to take this action, it would raise the question of how water exports would be managed when there is more water coming into the Delta than would seem necessary to meet entitlements, the so-called "surplus" water.

The calculations performed by DWR with CALSIM II assume that all the water that arrives in the Delta is available solely to the projects after meeting regulatory requirements in the Delta and after providing for Delta uses. The regulatory requirements that are assumed are those prevailing today. Therefore, the calculations simply treat the surplus water created by invoking Article 18(b) as water to be freely exported as before. In consequence, the amounts shown in the preliminary runs show nearly similar totals to those without invoking Article 18(b). The only significant difference between runs with and without Article 18(b) invoked is the label put on the water exported; the amounts are the same.

There are several things wrong with this assumption regarding surplus water. If indeed there is water that is surplus to regulatory constraints it does not necessarily mean that it is in the same entitlement category as entitlement water (i.e. Table A water). This is especially true when one considers that present operations have not redressed nor restored the Delta environment. If water is surplus beyond entitlement water its use to redress environmental damage in the Delta must be given priority over exports as surplus. At the very least, CALFED should not be required to pay for water to put in the environmental water account to offset costs to would-be entitlement exports when the SWP is mandated to stop pumping for protection of endangered species. In fact, export of so-called surplus water should be accorded lower priority than any watershed of origin claims. In other words, surplus water should be dedicated to protection of the environment in the watershed of origin before consideration is given to export to what are recognized as junior water rights holders. We cannot accept that export water has superior claim to water originating in the Sacramento and Trinity watersheds in analyzing environmental impacts of this project. The environmental impact analysis must consider the use of surplus water in fashioning an environmentally superior alternative to the assumed no-project alternative used in developing CALSIM II estimates. Furthermore, we must acknowledge that regulatory constraints established on the basis of existing operations, especially when considering the adversarial nature of the process of water rights hearings, cannot be considered as fixed limits on future operations that on their face propose to export at least 50% more water than the conditions that led to those constraints. Calculations that purport to show that 50% more water can be exported than present operations must be subjected to careful scrutiny as to the likelihood of even more damage to the environment than has already been sustained. We cannot simply assume that the existing constraints are satisfactory to de-limit environmental impacts in the face of increased exports. The calculations must reflect real considerations of more stringent constraints with increasing exports if they are to be used for environmental impact assessments.

In previous meetings of the EIR sub-committee on modeling, flow charts of the simulation network that is modeled were presented. At those meetings objections were raised concerning the lack of any fidelity in network representation for south-of-Delta operations. This especially concerns operations of the San Joaquin and Stanislaus rivers as well as the operations of the Kern Water Bank. We have since learned that detailed networks for the San Joaquin and Stanislaus systems have indeed been developed for other analyses. We see no reason why this detail should not be included in the CALSIM II model used for the Monterey Amendments EIR. We also note that even in this additional detail, no distinction is made between exports of entitlement and surplus water as far as priority of uses in the model calculations. We request that in all CALSIM II simulated systems in either the Sacramento or San Joaquin valleys, the simulations carefully reflect that surplus water flows, where ever they may occur, should be represented as lower priority than water shed of origin uses, whether in-stream or diversions for beneficial use.

We have also learned that SWP and CVP contractor demand functions are used on their face to establish the amounts of exports that guide the optimization of the CALSIM II model, while the settlement contractors in the area-of-origin are modeled by simulation of actual applied water requirements based on land use. Since the water rights of export are necessarily junior to those of the settlement contractors we see no reason why export contractor demand, at a minimum, should not be modeled to the same degree as the settlement contractors. In fact, the modeling of settlement contractor demands based on land uses in the Sacramento and Feather River areas show that these diversions are approximately 1maf less than the maximum under the settlement contracts. This means that export amounts calculated by CALSIM II include in effect a "borrowing" of water that by right belongs to settlement contractors. Is it proper to include such water as entitlement water to exporters when it may in fact be taken by senior rights holders at some unspecified time?

We also note the export demand functions are assumed at Table A levels for all but the two largest contractors, MWD and KCWA, even though most of the contractors do not have sufficient storage to balance wet year deliveries with dry year deliveries. (See my analysis of the reliability report previously cited.) We also note that the SWP contractor demand functions for each contractor must be developed consistent with the ability of the contractor to accept SWP water when it is available. In many cases, without equalizing storage, a contractor cannot even accept his full annual entitlement because of capacity constraints. Our calculations on this limitation could limit the effective delivery of entitlement water to about 60% of the full Table A annual entitlement in some cases. The degree to which a specified contractor can avail himself of SWP deliveries depends critically on how he structures his priority of use of his different sources of supply. To maximize SWP entitlement deliveries, a contractor may often have to forego the use of a cheaper, local source and instead pay a little more to secure a higher reliability of delivery of SWP water. To our knowledge none of these considerations have been factored in to the assumptions of contractor demand and the preliminary calculations produced by CALSIM II cannot be taken as realistic.

Reliability of Delivery Analysis

For reliability of SWP deliveries it should be clear that only deliveries against Table A amounts can be accounted. Since the majority of SWP deliveries are designated as M&I, those uses, which entail fixed structures dependent on firm water supplies, cannot be tied to speculative deliveries associated with so-called "surplus" water. The calculations supplied by CALSIM II to date do not distinguish the importance of the delivery categories to the reckoning of reliability of supply. Even those contractors that have some level of equalizing storage by which they can store surplus wet year deliveries to be used in times of drought should have to demonstrate and implement a plan to use the deliveries in that way before any surplus deliveries can be accounted as firm supply, and the amounts of surplus delivery to be expected must meet all the requirements for environmental protection in the watersheds of origin as cited above.

We must also state that DWR's continued use of frequency charts to present the results of its calculations on reliability of delivery is unwarranted. There is no statistical basis presented by DWR to show why drought deliveries should be lumped with normal and wet year deliveries in a single frequency diagram. (Again see my analysis of delivery reliability cited above.) This flagrant misuse of statistics is now being seized upon by local planning authorities who adopt SWP reliabilities that cannot in fact be sustained. The consequence is that in all probability local land use plans are being based on erroneously high deliveries that are the epitome of "paper water." Irrespective of the accuracy and deficiencies of CALSIM II, DWR must provide more robust statistical analyses of CALSIM II outputs if they are to be useful to anyone.

The assessment of SWP delivery reliability must depend on calculations that meet stringent requirements of accuracy and proper statistical practice. Neither requirement is presently met by the CALSIM II model.

Conclusions

Because of the necessity of having accurate estimates of SWP deliveries under the scenarios cast for the EIR impact analyses, it is absolutely required that this model be calibrated and peer reviewed for that calibration. Based on the record to date of SWP operations there is no reason to believe that the CALSIM II calculations have any utility for EIR impact analyses.

The scenarios that have been cast must be reformulated to consider uses of so-called "surplus" water for environmental restorations and enhancement in the water sheds of origin. It cannot be taken as given that water identified by the SWP contracts as surplus to whatever level of Table A entitlements is free to be exported solely to the contractors.

The calculations of CALSIM II must be reported in more detail to deduce environmental impacts. At a minimum, estimates for delivery to each contractor must be reported by month and arrayed against each contractor's monthly requests. DWR must ascertain the validity of each contractor's water supply plan insofar as the use of SWP water is involved. Of particular concern is the availability of equalizing storage in each contractor's service area. This is to assure that no contractor is taking water for beneficial use that can be claimed by a superior right holder in the watersheds of origin.

DWR must provide for a more thorough and robust statistical analysis of CALSIM II's calculated outputs. The present portrayals are simply improper and not

deserving of the effort that has gone in to generating the outputs. The present outputs cannot be used to make any useful estimates of reliability of delivery.

DWR must show that the optimization results represent a feasible solution of realistic decision criteria by which the project can be operated.

attachment #14

Emissions pathways, climate change, and impacts on California

Katharine Hayhoe[a,b], Daniel Cayan[c], Christopher B. Field[d], Peter C. Frumhoff[e], Edwin P. Maurer[f], Norman L. Miller[g], Susanne C. Moser[h], Stephen H. Schneider[i], Kimberly Nicholas Cahill[d], Elsa E. Cleland[d], Larry Dale[g], Ray Drapek[j], R. Michael Hanemann[k], Laurence S. Kalkstein[l], James Lenihan[j], Claire K. Lunch[d], Ronald P. Neilson[j], Scott C. Sheridan[m], and Julia H. Verville[e]

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Contributed by Christopher B. Field, June 23, 2004

The magnitude of future climate change depends substantially on the greenhouse gas emission pathways we choose. Here we explore the implications of the highest and lowest Intergovernmental Panel on Climate Change emissions pathways for climate change and associated impacts in California. Based on climate projections from two state-of-the-art climate models with low and medium sensitivity (Parallel Climate Model and Hadley Centre Climate Model, version 3, respectively), we find that annual temperature increases nearly double from the lower B1 to the higher A1fi emissions scenario before 2100. Three of four simulations also show greater increases in summer temperatures as compared with winter. Extreme heat and the associated impacts on a range of temperature-sensitive sectors are substantially greater under the higher emissions scenario, with some interscenario differences apparent before midcentury. By the end of the century under the B1 scenario, heatwaves and extreme heat in Los Angeles quadruple in frequency while heat-related mortality increases two to three times; alpine/subalpine forests are reduced by 50–75%; and Sierra snowpack is reduced 30–70%. Under A1fi, heatwaves in Los Angeles are six to eight times more frequent, with heat-related excess mortality increasing five to seven times; alpine/subalpine forests are reduced by 75–90%; and snowpack declines 73–90%, with cascading impacts on runoff and streamflow that, combined with projected modest declines in winter precipitation, could fundamentally disrupt California's water rights system. Although interscenario differences in climate impacts and costs of adaptation emerge mainly in the second half of the century, they are strongly dependent on emissions from preceding decades.

California, with its diverse range of climate zones, limited water supply, and economic dependence on climate-sensitive industries such as agriculture, provides a challenging test case to evaluate impacts of regional-scale climate change under alternative emissions pathways. As characterized by the Intergovernmental Panel on Climate Change, demographic, socioeconomic, and technological assumptions underlying long-term emissions scenarios vary widely (1). Previous studies have not systematically examined the difference between projected regional-scale changes in climate and associated impacts across scenarios. Nevertheless, such information is essential to evaluate the potential for and costs of adaptation associated with alternative emissions futures and to inform mitigation policies (2).

Here, we examine a range of potential climate futures that represent uncertainties in both the physical sensitivity of current climate models and divergent greenhouse gas emissions pathways. Two global climate models, the low-sensitivity National Center for Atmospheric Research/Department of Energy Parallel Climate Model (PCM) (3) and the medium-sensitivity U.K. Met Office Hadley Centre Climate Model, version 3 (HadCM3), model (4, 5) are used to calculate climate change resulting from the SRES (Special Report on Emission Scenarios) B1 (lower) and A1fi (higher) emissions scenarios (1). These scenarios bracket a large part of the range of Intergovernmental Panel on Climate Change nonintervention emissions futures with atmospheric concentrations of CO_2 reaching ≈550 ppm (B1) and ≈970 ppm (A1fi) by 2100 (see *Emissions Scenarios* in *Supporting Text*, which is published as supporting information on the PNAS web site). Although the SRES scenarios do not explicitly assume any specific climate mitigation policies, they do serve as useful proxies for assessing the outcome of emissions pathways that could result from different emissions reduction policies. The scenarios at the lower end of the SRES family are comparable to emissions pathways that could be achieved by relatively aggressive emissions reduction policies, whereas those at the higher end are comparable to emissions pathways that would be more likely to occur in the absence of such policies.

Climate Projections

Downscaling Methods. For hydrological and agricultural analyses, HadCM3 and PCM output was statistically downscaled to a 1/8° grid (≈150 km²) (6) and to individual weather stations (7) for analyses of temperature and precipitation extremes and health impacts. Downscaling to the 1/8° grid used an empirical statistical technique that maps the probability density functions for modelled monthly precipitation and temperature for the climatological period (1961–1990) onto those of gridded historical observed data, so the mean and variability of observations are reproduced by the climate model data. The bias correction and spatial disaggregation technique is one originally developed for adjusting General Circulation Model output for long-range streamflow forecasting (6), later adapted for use in studies examining the hydrologic impacts of climate change (8), and compares favorably to different statistical and dynamic downscaling techniques (9) in the context of hydrologic impact studies.

Station-level downscaling for analyses of temperature and precipitation extremes and health impacts used a deterministic method in which grid-cell values of temperatures and precipi-

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Abbreviations: DJF, December, January, February; HadCM3, Hadley Centre Climate Model, version 3; JJA, June, July, August; PCM, Parallel Climate Model; SRES, Special Report on Emission Scenarios; SWE, snow water equivalent.

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Table 1. Summary of midcentury (2020–2049) and end-of-century (2070–2099) climate and impact projections for the HadCM3 and PCM B1 and A1fi scenarios

			2020–2049				2070–2099			
			PCM		HadCM3		PCM		HadCM3	
	Units	1961–1990	B1	A1fi	B1	A1fi	B1	A1fi	B1	A1fi
Change in statewide avg temperatures										
Annual	°C	15.0	1.35	1.5	1.6	2.0	2.3	3.8	3.3	5.8
Summer (JJA)	°C	22.8	1.2	1.4	2.2	3.1	2.15	4.1	4.6	8.3
Winter (DJF)	°C	7.6	1.3	1.2	1.4	1.45	2.15	3.0	2.3	4.0
Change in statewide avg precipitation										
Annual	mm	544	−37	−51	+6	−70	+38	−91	−117	−157
Summer (JJA)	mm	20	−3	+2	−1	−7	+4	−46	−5	−1
Winter (DJF)	mm	269	−45	−55	+4	−44	+13	−13	−79	−92
Sea level rise	cm	—	8.7	9.5	11.6	12.7	19.2	28.8	26.8	40.9
Heatwave days										
Los Angeles	Days	12	28	35	24	36	44	76	47	95
Sacramento	Days	58	91	101	93	104	109	134	115	138
Fresno	Days	92	113	120	111	116	126	147	126	149
El Centro	Days	162	185	185	176	180	191	213	197	218
Length of heatwave season*	Days	115	135	142	132	141	149	178	162	204
Excess mortality for Los Angeles†										
Without acclimatization	avg no. of deaths/yr	—	—	—	—	—	394	948	667	1,429
With acclimatization	avg no. of deaths/yr	165	—	—	—	—	319	790	551	1,182
Change in April 1 snowpack SWE										
1,000–2,000 m elevation	%	3.6 km³	−60	−56	−58	−66	−65	−95	−87	−97
2,000–3,000 m elevation	%	6.5 km³	−34	−34	−24	−36	−22	−73	−75	−93
3,000–4,000 m elevation	%	2.3 km³	−11	−15	4	−16	15	−33	−48	−68
All elevations	%	12.4 km³	−38	−37	−26	−40	−29	−73	−72	−89
Change in annual reservoir inflow‡										
Total	%	21.7 km³	−18	−22	5	−10	12	−29	−24	−30
Northern Sierra	%	15.2 km³	−19	−22	3	−9	9	−29	−20	−24
Southern Sierra	%	6.5 km³	−16	−23	10	−14	17	−30	−33	−43
Change in April–June reservoir inflow‡										
Total	%	9.1 km³	−20	−24	−11	−19	−1	−46	−41	−54
Northern Sierra	%	5.5 km³	−21	−24	−16	−19	−6	−45	−34	−47
Southern Sierra	%	3.6 km³	−18	−24	−2	−19	5	−47	−52	−65
Change water year flow centroid‡										
Total	Days	03/26	0	2	−15	−7	−7	−14	−23	−32
Northern Sierra	Days	03/13	0	3	−16	−5	−3	−11	−18	−24
Southern Sierra	Days	05/01	−10	−7	−19	−12	−22	−34	−34	−43

avg, average; JJA, June, July, August; DJF, December, January, February; SWE, snow water equivalent.
*The number of days between the beginning of the year's first and end of the year's last heatwave.
†Reference period is 1990–1999, and projections are for the period 2090–2099.
‡Results are for inflows to seven major dams and reservoirs in the Sacramento/San Joaquin water system, including three in the Northern Sierra (Shasta, Oroville, and Folsom) and four in the Southern Sierra (New Melones, New Don Pedro, Lake McClure, and Pine Flat).

tation from the reference period were rescaled by simple monthly regression relations to ensure that the overall probability distributions of the simulated daily values closely approximated the observed probability distributions at selected long-term weather stations (7). The same regression relations were then applied to future simulations, such that rescaled values share the weather statistics observed at the selected stations. At the daily scales addressed by this method, the need to extrapolate beyond the range of the historically observed parts of the probability distributions was rare even in the future simulations (typically <1% of the future days) because most of the climate changes involve more frequent warm days than actual truly warmer-than-ever-observed days (7).

Except where otherwise noted, we present projected climate anomalies and impacts averaged over 2020–2049 (with a midpoint of 2035) and 2070–2099 (here designated as end-of-century, with a midpoint of 2085), relative to a 1961–1990 reference period.

Temperature. All simulations show increases in annual average temperature before midcentury that are slightly greater under the higher A1fi emissions scenario (see Fig. 4, which is published as supporting information on the PNAS web site). By end-of-century, projected temperature increases under A1fi are nearly twice those under B1, with the more sensitive HadCM3 model producing larger absolute changes (Table 1). Downscaled seasonal mean temperature projections (10) show consistent spatial patterns across California, with lesser warming along the southwest coast and increasing warming to the north and northeast (Fig. 1). Statewide, the range in projected average temperature increases is higher than previously reported (11–14), particularly for summer temperature increases that are equal to or greater than increases in winter temperatures.

2.

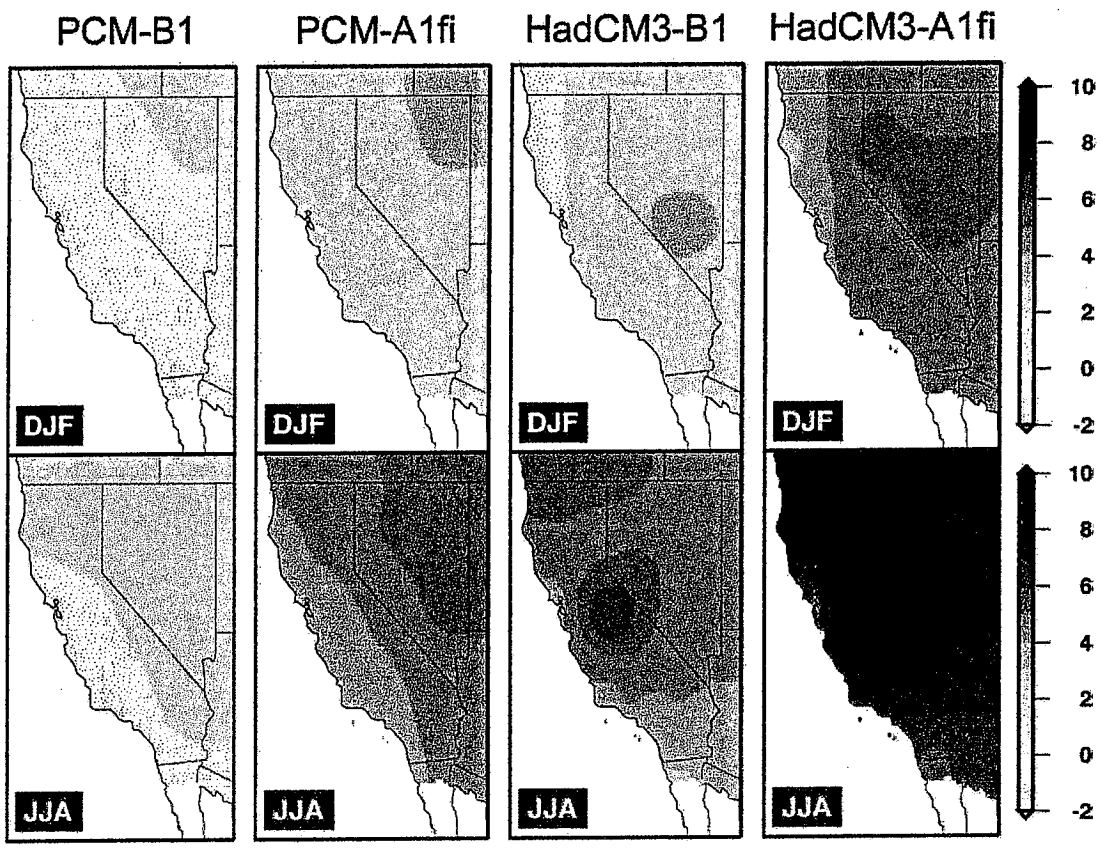

Fig. 1. Downscaled winter (DJF) and summer (JJA) temperature change (°C) for 2070–2099, relative to 1961–1990 for a 1/8° grid. Statewide, SRES B1 to A1fi winter temperature projections for the end of the century are 2.2–3°C and 2.3–4°C for PCM and HadCM3, respectively, compared with previous projections of 1.2–2.5°C and 3–3.5°C for PCM and HadCM2, respectively. End-of-century B1 to A1fi summer temperature projections are 2.2–4°C and 4.6–8.3°C for PCM and HadCM3, respectively, compared with previous projections of 1.3–3°C and 3–4°C for PCM and HadCM2, respectively (11–14).

Precipitation. Precipitation shows a tendency toward slight decreases in the second half of the century with no obvious interscenario differences in magnitude or frequency (see Figs. 5–10, which are published as supporting information on the PNAS web site). Three of four simulations project winter decreases of −15% to −30%, with reductions concentrated in the Central Valley and along the north Pacific Coast. Only PCM B1 projects slight increases (≈7%) by the end of the century (Table 1). These results differ from previous projections showing precipitation increases of 75–200% by 2100 (11–13), but they are consistent with recent PCM-based midrange projections (14, 15). The larger-scale pattern of rainfall over North America is more uniform across scenarios, showing an area of decreased (or lesser increase in) precipitation over California that contrasts with increases further up the coast (see Fig. 11, which is published as supporting information on the PNAS web site). Because interdecadal variability often dominates precipitation over California, projected changes in climate and impacts associated with the direct effects of temperature should be considered more robust than those determined by interactions between temperature and precipitation or precipitation alone.

Extreme Heat and Heat-Related Mortality

Temperature extremes increase in both frequency and magnitude under all simulations, with the most dramatic increases occurring under the A1fi scenario. Changes in local temperature extremes were evaluated based on exceedance probability analyses, by using the distribution of daily maximum temperatures downscaled to representative locations (16). Exceedance probabilities define a given temperature for which the probability exists that X% of days throughout the year will fall below that temperature (i.e., if the 35°C exceedance probability averages 95% for the period 2070–2099, this means that an average of 95% or ≈347 days per year are likely to lie below 35°C). For the four locations examined for extreme heat occurrence (Los Angeles, Sacramento, Fresno, and Shasta Dam), mean and maximum temperatures occurring 50% and 5% of the year increase by 1.5–5°C under B1 and 3.5–9°C under A1fi by the end of the century. Extreme temperatures experienced an average of 5% of the year during the historical period are also projected to increase in frequency, accounting for 12–19% (B1) and 20–30% (A1fi) of days annually by 2070–2099 (see Fig. 12, which is published as supporting information on the PNAS web site).

The annual number of days classified as heatwave conditions (3 or more consecutive days with temperature above 32°C) increases under all simulations, with more heatwave days under A1fi before midcentury (see Fig. 13, which is published as supporting information on the PNAS web site). Among the four locations analyzed, increases and interscenario differences are proportionally greatest for Los Angeles, a location that currently experiences relatively few heatwaves. By the end of the century, the number of heatwave days in Los Angeles increases four times under B1, and six to eight times under A1fi. Statewide, the length of the heatwave season increases by 5–7 weeks under B1 and by 9–13 weeks under A1fi by the end of this century, with interscenario differences emerging by midcentury (Table 1; see also Fig. 14, which is published information on the PNAS web site).

The connection between extreme heat and summer excess mortality is well established (17). Heat-related mortality estimates for the Los Angeles metropolitan area were determined

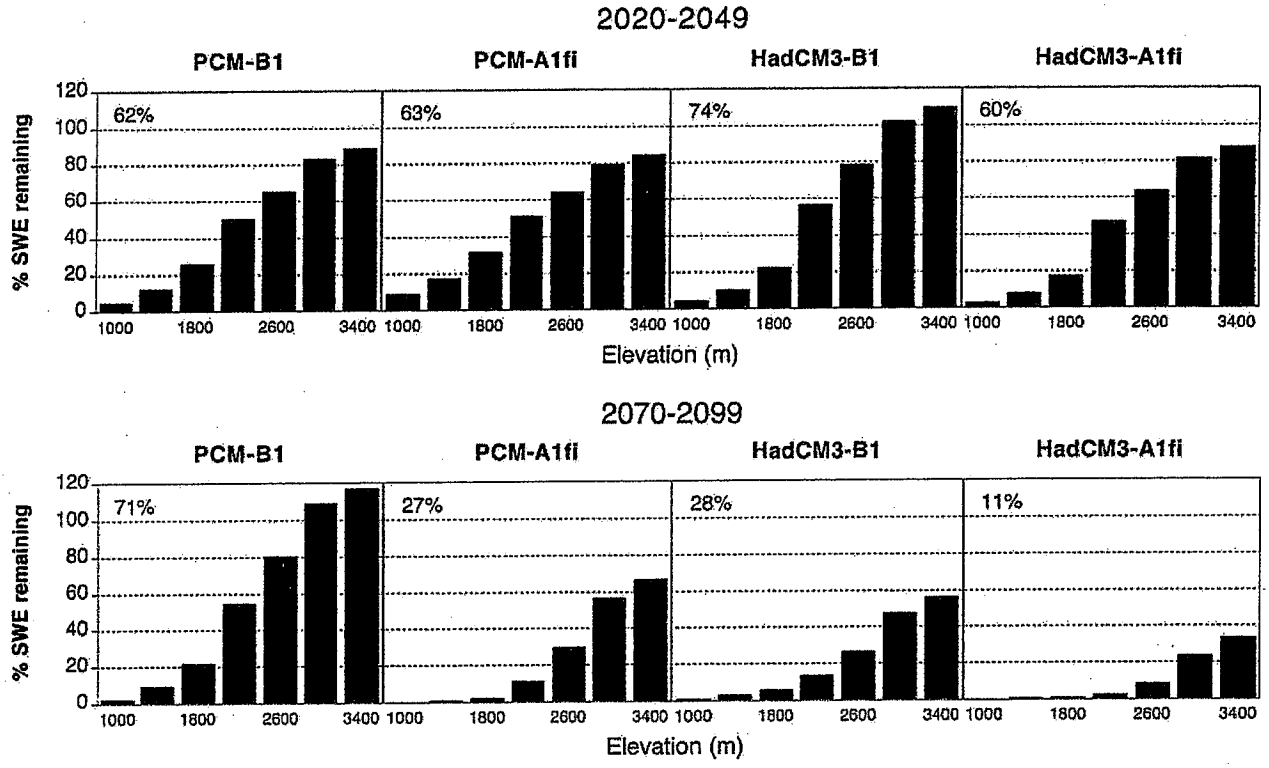

Fig. 2. Average snowpack SWE for 2020–2049 and 2070–2099 expressed as a percent of the average for the reference period 1961–1990 for the Sierra Nevada region draining into the Sacramento–San Joaquin river system. Total SWE losses by the end of the century range from 29–72% for the B1 scenario to 73–89% for the A1fi scenario. Losses are greatest at elevations below 3,000 m, ranging from 37–79% for B1 to 81–94% for A1fi by the end of the century. Increases in high elevation SWE for midcentury HadCM3 B1 and end-of-century PCM B1 runs result from increased winter precipitation in these simulations.

by threshold meteorological conditions beyond which mortality tends to increase. An algorithm was developed to determine the primary environmental factors (including maximum apparent temperature, number of consecutive days above the threshold apparent temperature, and time of year) that explain variability in excess mortality for all days with apparent maximum temperatures at or above the derived daily threshold apparent temperature (18) value of 34°C (see *Heat-Related Mortality* in *Supporting Text*). Estimates do not account for changes in population or demographic structure.

From a baseline of ≈165 excess deaths during the 1990s, heat-related mortality in Los Angeles is projected to increase by about two to three times under B1 and five to seven times under A1fi by the 2090s if acclimatization is taken into account (see *Heat-Related Mortality* in *Supporting Text*). Without acclimatization, these estimates are about 20–25% higher (Table 1). Actual impacts may be greater or lesser depending in part on demographic changes and societal decisions affecting preparedness, health care, and urban design. Individuals likely to be most affected include elderly, children, the economically disadvantaged, and those who are already ill (19, 20).

Impacts on Snowpack, Runoff, and Water Supply

Rising temperatures, exacerbated in some simulations by decreasing winter precipitation, produce substantial reductions in snowpack in the Sierra Nevada Mountains, with cascading impacts on California winter recreation, streamflow, and water storage and supply. Snowpack SWE was estimated by using daily, bias-corrected and spatially downscaled temperature and precipitation to drive the Variable Infiltration Capacity distributed land surface hydrology model. The Variable Infiltration Capacity model, using the resolution and parameterization also implemented in this study, has been shown to reproduce observed streamflows when driven by observed meteorology (10) and has been applied to simulate climate change (8) in this region. April 1 SWE decreases substantially in all simulations before midcentury (see Fig. 15, which is published as supporting information on the PNAS web site). Reductions are most pronounced at elevations below 3,000 m, where 80% of snowpack storage currently occurs (Table 1 and Fig. 2). Interscenario differences emerge before midcentury for HadCM3 and by the end of the century for both models. These changes will delay the onset of and shorten the ski season in California (see *Impact of Decreasing Snowpack on California's Ski Industry* in *Supporting Text*).

Water stored in snowpack is a major natural reservoir for California. Differences in SWE between the B1 and A1fi scenarios represent ≈1.7 km^3 of water storage by midcentury and 2.1 km^3 by the end of the century for HadCM3. For PCM, overall SWE losses are smaller, but the difference between the A1fi and B1 scenarios is larger by the end of the century, representing >4 km^3 of storage. Reductions for all simulations except PCM under the lower B1 emission scenario are greater than previous projections of diminishing snowpack for the end of the century (8, 21). By 2020–2049 the SWE loss is comparable to that previously projected for 2060 (22).

Warmer temperatures and more precipitation falling as rain instead of snow also causes snowmelt runoff to shift earlier under all simulations (Table 1), which is consistent with earlier studies (23). The magnitude of the shift is greater in the higher-elevation Southern basins and under the higher A1fi scenario. Stream inflows to major reservoirs decline because of diminished snowpack and increased evaporation before midcentury, except where winter precipitation increases (Table 1). The greater reductions in inflows seen under A1fi are driven by both higher temperatures and lower average precipitation as compared with B1.

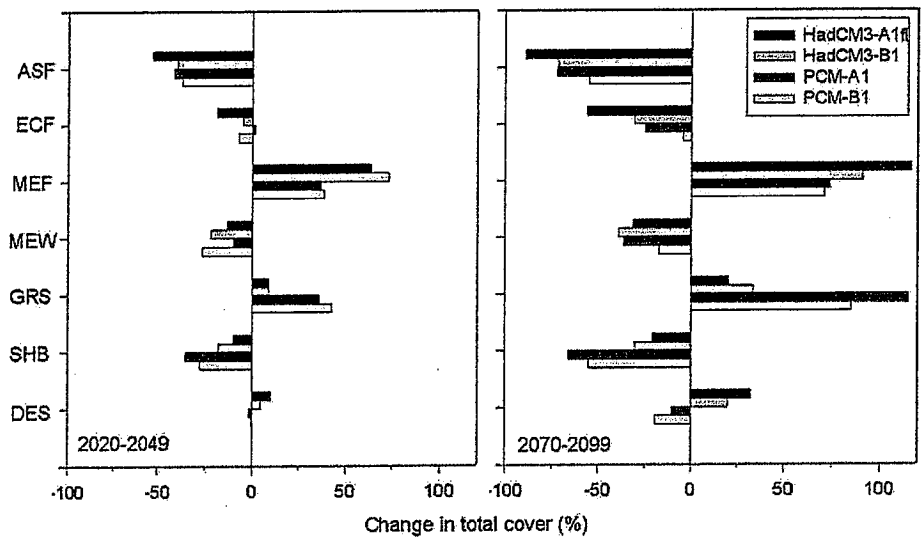

Fig. 3. Statewide change in cover of major vegetation types for 2020–2049 and 2070–2099, relative to simulated distributions for the 1961–1990 reference period. ASF, alpine/subalpine forest; ECF, evergreen conifer forest; MEF, mixed evergreen forest; MEW, mixed evergreen woodland; GRS, grassland; SHB, shrubland; DES, desert. Increasing temperatures drive the reduction in alpine/subalpine forest cover and cause mixed conifer forest to displace evergreen conifer forest in the Sierra Nevada Mountains and the North Coast. Mixed conifer forest in the South Coast expands because of increased humidity and reduced fire frequency. Because of drier conditions and increased fire frequency in inland locations, grassland displaces shrubland and woodland, particularly in the PCM simulations, whereas warmer and drier conditions under HadCM3 cause an expansion of desert cover in the southern Central Valley.

Earlier runoff may also increase the risk of winter flooding (7). Currently, state operators maintain ≈12 km^3 of total vacant space in the major reservoirs to provide winter and early spring flood protection,[n] a volume approximately equal to that stored in the natural snowpack reservoir by April 1st. Capturing earlier runoff to compensate for future reductions in snowpack would take up most of the flood protection space, forcing a choice between winter flood prevention and maintaining water storage for the summer and fall dry period use. Flood risk and freshwater supply are also affected by higher sea levels, which are projected to rise 10–40 cm under B1 and 20–65 cm under A1fi by 2100 (Table 1; see also Fig. 16, which is published as supporting information on the PNAS web site).

Declining Sierra Nevada snowpack, earlier runoff, and reduced spring and summer streamflows will likely affect surface water supplies and shift reliance to groundwater resources, already overdrafted in many agricultural areas in California (24). This could impact 85% of California's population who are agricultural and urban users in the Central Valley, San Francisco Bay Area, and the South Coast, about half of whose water is supplied by rivers of the Central Valley. Under A1fi (both models) and B1 (HadCM3), the projected length, frequency, and severity of extreme droughts in the Sacramento River system during 2070–2099 substantially exceeds what has been experienced in the 20th century. The proportion of years projected to be dry or critical increases from 32% in the historical period to 50–64% by the end of the century under all but the wetter PCM B1 scenario (see Table 2, which is published as supporting information on the PNAS web site). Changes in water availability and timing could disrupt the existing pattern of seniority in month-dependent water rights by reducing the value of rights to mid- and late-season natural streamflow and boosting the value of rights to stored water. The overall magnitude of impacts on water users depends on complex interactions between temperature-driven snowpack decreases and runoff timing, precipitation, future population increases, and human decisions regarding water storage and allocation (see *Impacts on Water Supply* in *Supporting Text*).

Impacts on Agriculture and Vegetation Distribution

In addition to reductions in water supply, climate change could impact California agriculture by increasing demand for irrigation to meet higher evaporative demand, increasing the incidence of pests (25), and through direct temperature effects on production quality and quantity. Dairy products (milk and cream, valued at $3.8 billion annually) and grapes ($3.2 billion annually) are the two highest-value agricultural commodities of California's $30 billion agriculture sector (26). Threshold temperature impacts on dairy production and wine grape quality were calculated by using downscaled temperature projections for key counties, relative to average observed monthly temperatures.[o]

For dairy production, losses were estimated for temperatures above a 32°C threshold (27), as well as for additional losses between 25°C (28) and 32°C. For the top 10 dairy counties in the state (which account for 90% of California's milk production), rising temperatures were found to reduce production by as much as 7–10% (B1) and 11–22% (A1fi) by the end of the century (see Table 3, which is published as supporting information on the PNAS web site). Potential adaptations may become less practical with increasing temperature and humidity (29).

For wine grapes, excessively high temperatures during ripening can adversely affect quality, a major determinant of market value. Assuming ripening occurs at between 1,150 and 1,300 biologically active growing degree days (30), ripening month was determined by summing modeled growing degree days above 10°C from April to October, for both baseline and projected scenarios. Monthly average temperature at the time of ripening was used to estimate potential temperature impacts on quality. For all simulations, average ripening occurs 1–2 months earlier and at higher temperatures, leading to degraded quality and marginal/impaired conditions for all but the cool coastal region

[n]See the U.S. Army Corps of Engineers Flood Control Requirements for California Reservoirs, Sacramento District Water Control Data System, Sacramento, CA (www.spk-wc.usace.army.mil).

[o]See Western U.S. Climate Historical Summaries (Western Regional Climate Center) at www.wrcc.dri.edu/climsum.html.

under all scenarios by the end of the century (see Table 3, which is published as supporting information on the PNAS web site). As with other perennial crops, adaptation options to shift varieties or locations of production would require significant time and capital investment.

The distribution of California's diverse vegetation types also changes substantially over the century relative to historical simulations (Fig. 3; see also Fig. 17, which is published as supporting information on the PNAS web site). Projections of changes in vegetation distribution are those given by MC1, a dynamic general vegetation model that simulates climate-driven changes in life-form mixtures and vegetation types; ecosystem fluxes of carbon, nitrogen, and water; and fire disturbance over time (31). Vegetation shifts driven primarily by temperature, such as reductions in the extent of alpine/subalpine forest and the displacement of evergreen conifer forest by mixed evergreen forest, are consistent across models and more pronounced under A1fi by the end of the century. Changes driven by precipitation and changes in fire frequency are model-dependent and do not exhibit consistent interscenario differences. Most changes are apparent before mid-century, with the exception of changes in desert cover. The shift from evergreen conifer to mixed evergreen forest and expansion of grassland are consistent with previous impact analyses (13), whereas the extreme reduction in alpine/subalpine forest and expansion of desert had not been reported in previous impacts assessments (12, 13).

Conclusions

Consistent and large increases in temperature and extreme heat drive significant impacts on temperature-sensitive sectors in California under both lower and higher emissions scenarios, with the most severe impacts occurring under the higher A1fi scenario. Adaptation options are limited for impacts not easily controlled by human intervention, such as the overall decline in snowpack and loss of alpine and subalpine forests. Although interscenario differences in climate impacts and costs of adaptation emerge mainly in the second half of the century, they are largely entrained by emissions from preceding decades (32). SRES scenarios do not explicitly assume climate-specific policy intervention, and thus this study does not directly address the contrast in impacts due to climate change mitigation policies. However, these findings support the conclusion that climate change and many of its impacts scale with the quantity and timing of greenhouse gas emissions (33). As such, they represent a solid starting point for assessing the outcome of changes in greenhouse gas emission trajectories driven by climate-specific policies (32, 34), and the extent to which lower emissions can reduce the likelihood and thus risks of "dangerous anthropogenic interference with the climate system" (35).

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LETTER 20

attachment #15

COMMENTS ON DWR'S TECHNICAL MEMORANDUM

"Progress on Incorporating Climate Change into Management of California's Water Resources", July 2006

By Arve R. Sjovold
September 2, 2006

In DWR'S year 2002 report on the "The State Water Project Delivery Reliability Report" it was explicitly acknowledged that climate change would affect the timing and amounts of snowfall and possibly precipitation and that sea level rise was likely. At that time the timing of these impacts was speculative. That report promised that more definitive studies of the impact on climate change would be provided, possibly as soon as the update of the California Water Plan Update 2003. Thus, it was with some anticipation that I looked forward to a comprehensive study of the affects of climate change on the SWP. The subject report fails to provide that comprehensive study. Although DWR did engage in some rather elaborate computerized calculations, the subject of those calculations studiously avoided the impacts, now more widely recognized, but clearly acknowledged in the 2002 Reliability Report. Any keenly interested observer of the debate on climate change would have expected a cogent and objective analysis of the effects of sea level rise and changed Sierra run-off patterns as first order effects.

The report devotes considerable of its quantitative analyses to the calculations of the effects of a very modest sea level rise of 15 inches on the ability of the Delta to deliver water to the pumps without severe violations of salinity thresholds. It does so based on assumptions that upstream reservoir operations are not changed and that sea level rise does not change the hydraulic network in the Delta. Another assumption for this analysis is that the salinity gradient in the western Delta does not change with this sea level rise. No supporting evidence or analysis is given as to why these assumptions are reasonable. In other words, a primary assumption is that the current system of Delta levies remains in tact with a 15 inch sea level rise. I won't argue that that level of sea level rise may indeed leave the levies operationally in tact, but it misses the first order question of what level of sea level rise will compromise the system of levies. There are good maps (produced by DWR, if I am not mistaken) of what the Delta may look like with 1, 2, 4, and 10-foot sea level rises. From these maps it is clear that somewhere between 2 and 4 feet of rise there is little assurance that the Delta can perform as a delivery network of fresh water to the South Delta pumps. Since the subject report acknowledges that 2.9 feet of sea level rise is likely under one of the scenarios studied by the International Panel on Climate Change (IPCC) by the end of the century, clearly the most important question to be addressed by DWR is to calculate at what level the Delta's levies cannot be relied upon. **The subject report does not do this and does not offer a qualitative discussion.**

The other major assumption underlying their quantitative calculations is that reservoir operations (that is, Oroville and Shasta) are not changed by climate change impacts. That this is an untenable assumption is apparent from the report's side study that shows under 3 different scenarios that peak discharge from the Feather River may be

1

substantially altered. In fact, the most severe scenario carefully quantifies that peak discharge for a "15 year event" may be 2 ½ times the current estimate of a 15-year peak discharge. Clearly, any inquiring mind would wonder how reservoir operations might be affected by such a finding. Curiously, the report does not inquire further. But that may be the most intriguing finding of the report. If as a matter of hydrology peak discharges at any return level are 2 ½ times higher, such a finding would call into question the ability of the dams to function as designed. First, 2 1/2 times peak discharge would probably tax the design limits of dam spillways. Second, flood pools in reservoirs would have to be enlarged compromising water conservation objectives. Third, passage of discharges 2 1/2 times as large would undoubtedly cause havoc below the dams. None of this is addressed in the report even though that is where it should logically lead.

In conclusion, the report shows no scientific curiosity concerning the very likely first order impacts of climate change. The detailed quantitative analyses that are performed are totally irrelevant to what are the major questions that are posed by climate change. The report should candidly state that the most reasonable forecasts of what climate change might produce would seriously compromise the project, to the extent that the SWP may be obsolete in its current configuration within the current century. This is certainly a different tone than that conveyed by this report.

Specific Criticisms

1) The report still relies on CALSIM II as a reliable model to study the impacts of climate change. First, as we have so many times stated in the past CALSIM II is a fatally flawed model. It has not been calibrated and is not a true simulation model, as it is commonly referred to. Second, the indices that are use to drive the model in certain of its calculations are without scientific or practical merit. They provide the so-called simulation with perfect information of stream flows in advance of simulated operational decisions and the indices are highly distorted representations of the true stochastic nature of the operational problem, simulating operations in the face of uncertain future stream flows. It is particularly noteworthy that the CALSIM II run labeled "Base" in the report does not resemble the CALSIM II 2021-runs performed for the Reliability Report for ostensibly the very same assumptions. In fact, the variance between these two case studies, the "2021" study in the reliability report and the "Base" in the climate change study, is roughly the same as the differences reported between the "Base" case in the climate change study and the alternative scenarios. (See Table 1 below.) In stark terms, we are using a measuring instrument that is too imprecise to reliably distinguish differences among the scenarios. Scientifically, the model is inappropriate just on that finding and DWR staff should be required to establish why there are such differences between these two reports.

2) Throughout a significant portion of the report detailing previous hydrologic history of the Central Valley, there are many regression analyses results that are portrayed to establish certain trends that may have some significance. The report does not state why they may be relevant. I find it difficult to see any

such relevance except if it is to acknowledge that some climate change may have already occurred. Even then, I fail to see the relevance absent any analysis that shows why it should be. Beyond that observation of relevance, there is the more important issue of deciding when a calculated trend is significant. It appears from the data presented in the report that many of the trends are statistically insignificant at normally accepted thresholds. Why such trends are reported as maybe "real" is puzzling.

3) The preoccupation with the affects of climate change on stream flow temperatures is probably misplaced. Given that current project operations are decimating species in the Delta, the concern seems an attempt to show that the species are doomed anyway and we shouldn't worry about what the projects are doing now. That is a very shortsighted view and seems to be extremely self-serving with respect to current operations. My view would show more emphasis on characterizing future overall stream flow amounts and timing rather than on speculations on stream-flow temperatures as if the basic stream flows are relatively unperturbed.

4) The report does provide a fairly decent summary of the extant scientific theories supporting global warming and the effects on climate. The report depends most strongly on the work reported by the IPCC and the scenarios they cast. However, other more recent work out of the Goddard Space Science Institute (GSSI) strongly suggests that ice sheet breakup of the Greenland and/or Antarctic ice sheets may accelerate sea level rise significantly, an event that is not a major factor in the IPCC scenarios. If the GSSI theory is more correct the integrity of the Delta in the nearer future may be in doubt. Neither the IPCC nor the GSSI can offer precise timelines as to when significant sea level rise may occur. Nonetheless, it is vitally important that DWR include a candid appraisal of the likelihood of sea level impacts on the Delta beyond the mere 15-inch rise assumed in their studies. Calculations can easily show that the generally accepted existing level of climate forcing, .85 watts/m^2, is sufficient to melt sufficient ice to raise sea level by 0.4 feet per year. What is not certain is how future climate forcing will divide between melting ice and warming the biosphere. It is very clear right now that the rate of sea level rise cannot be estimated precisely but the potential for rapid sea level rise is the most important feature of global warming. The report should candidly state so.

5) The report summarizes the past history that has been developed for global warming over the past 650,000 years which shows that within our recorded history the Earth is near a peak warm temperature for this interval. If the report had included the corresponding data on the coincidence of greenhouse gas concentrations and sea levels with temperature (See attachment) it would be quite clear that greenhouse gases are the most significant driver of temperature change and consequent sea level rise. The DWR report does include a table of the existing concentrations of CO_2 and methane,

corroborated in the attachment, which are higher than ever measured by the ice cores within the past 650,000 years. This remarkable finding should require the widest possible range of possible changes rather than the restricted ranges chosen by the report. In short, the authors of the report did not delve deeply enough into the current research being performed on climate change and the report cannot claim to have met its objective of "incorporating climate change into the SWP."

6) The analysis to incorporate climate change into CALSIM II involves an intricate attempt to translate IPCC climate change scenarios into specific quantitative changes in major Northern California river run-off as the basis of the computer calculations that form the major effort of the report. It is noted in the analysis that the climate change scenarios are based on global models that incorporate only six grid points to characterize expected rainfall for all of California. The analysis then proceeds to use the information developed for these six grid points to generate estimated changes for 10 of the major rivers. Another model, the Variable Infiltration Capacity (VIC) model, is used to calculate these estimated changes of rainfall into run-off. An important assumption in this exercise is the use of the VIC model to develop perturbation ratios due to climate change that can then be used to modify the characteristic run-off measurements for these rivers. The clear flaw in this methodology is the measured run-off used to characterize the rivers. The analysts chose the year 1976, a readily acknowledged drought year to characterize the average or "normal" run-off. Since 1976 was well below average for any river system in California, this choice necessarily biases the estimated changes low. 1976 run-off was probably less than half the average. Therefore, on translating changed rainfall into estimated run-off for the major rivers feeding the CVP and SWP, the use of 1976 as a basis to scale from as described in the report necessarily underestimates the run-offs under climate change by a significant amount. Accordingly, the entire exercise with the Delta model, DSM, is not even a reasonable estimate. Since this computer exercise seems to comprise the most substantive portion of the report, it calls into question any and all of its findings. DWR should be required to justify the choice of 1976 (although on its face it seems that this can't be done). A standard analysis of this type would have done so as a matter of course.

Table 1
Comparison of "Base" and 2021 CALSIM II Runs

(Million acre-feet per year)

Water Year	Climate Change Report SWP Exports	2002 Reliability Report SWP Exports Fixed Demand	Variance
76	2.97	2.78	.19
77	1.00	0.83	.17
78	3.61	3.91	.30
79	3.70	3.49	.21
80	4.10	3.46	.64
81	3.33	3.40	.07
82	4.71	4.13	.58
83	3.68	4.13	.45
84	3.42	4.10	.68
85	3.52	3.32	.20
86	4.20	3.01	1.19
87	2.57	2.84	.27
88	1.54	0.99	.55
89	2.72	2.90	.18
90	1.60	1.15	.45
91	1.10	1.00	.10
Average Variance			**0.39**

LETTER 20

attachment #16

Climate Change and Water Supplies in the West

Michael Dettinger, USGS

USGS

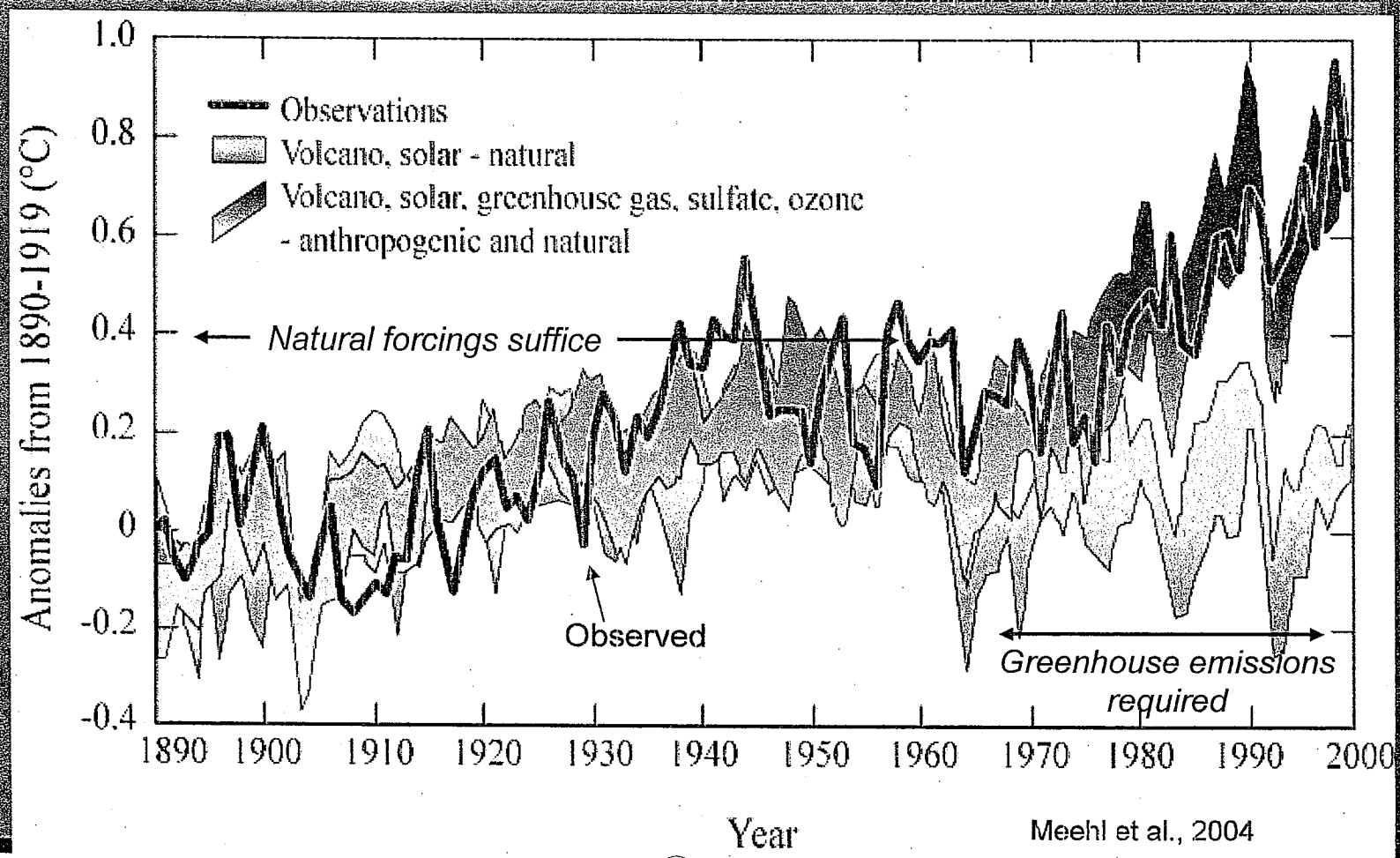
Scripps Institution of Oceanography

CEC's California Climate Change Center

NOAA OGP's California Applications Program

During the past 30 years--and in the near-term future--natural climate variability has been *augmented* by warming trends associated with increases in the global greenhouse effect.

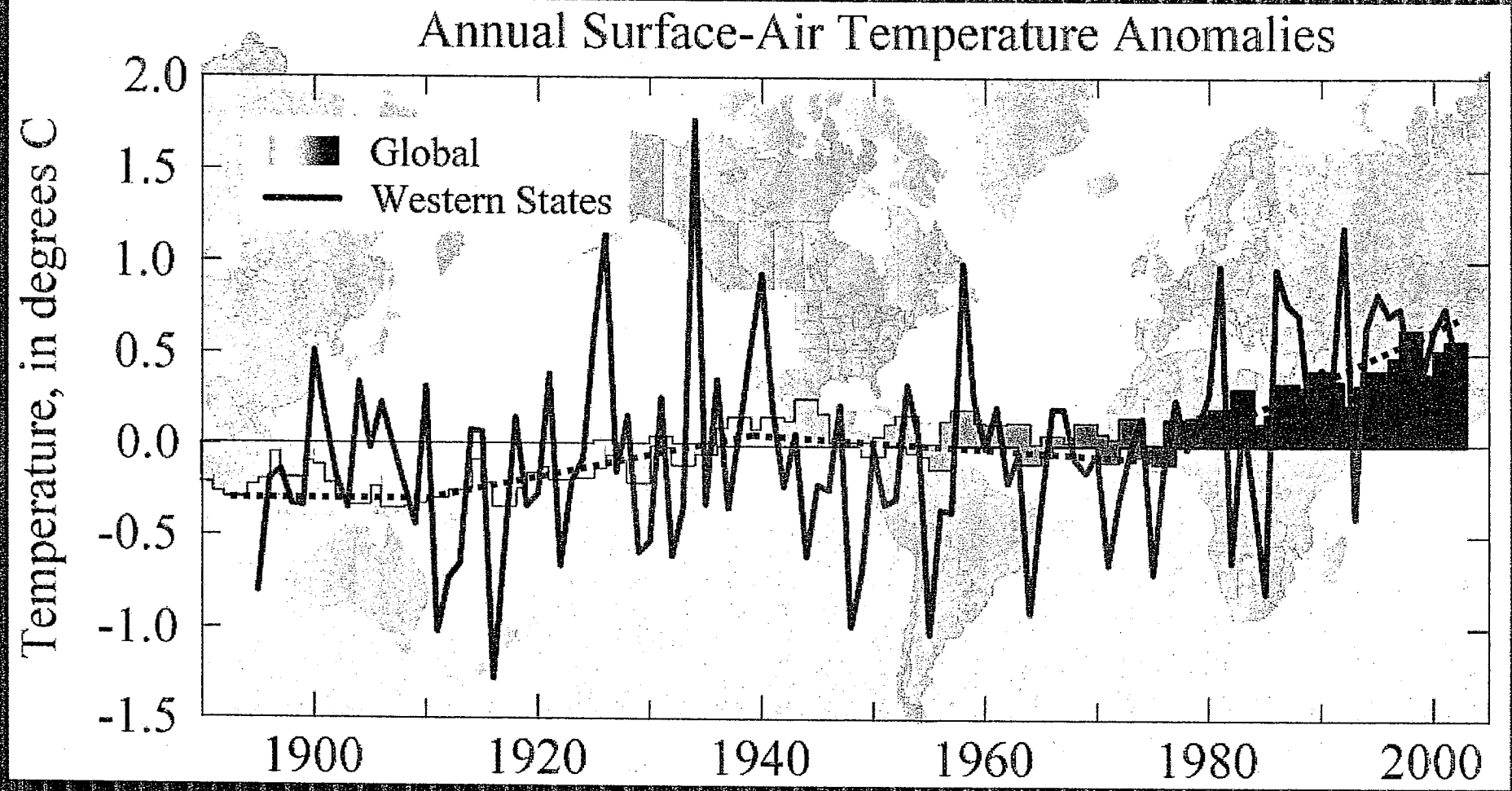
Climate-model simulations of global-average temperature



Meehl et al., 2004

LETTER 20

...and observed temperatures in the Western States have followed pretty faithfully.



USGS

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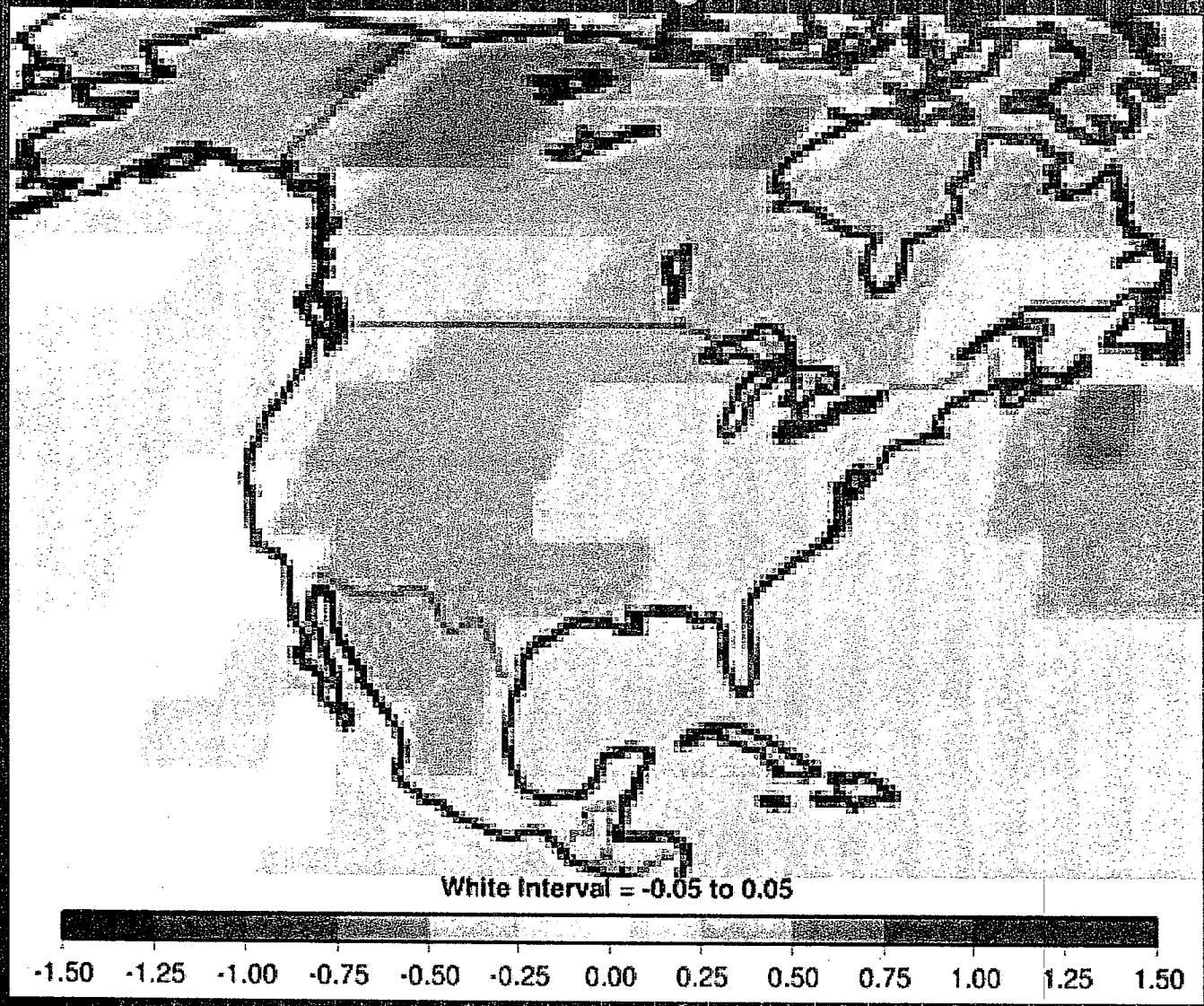
Observed Warming, 1979-2005



IPCC 4th Assessmt, WG1 Ch. 4, 2007

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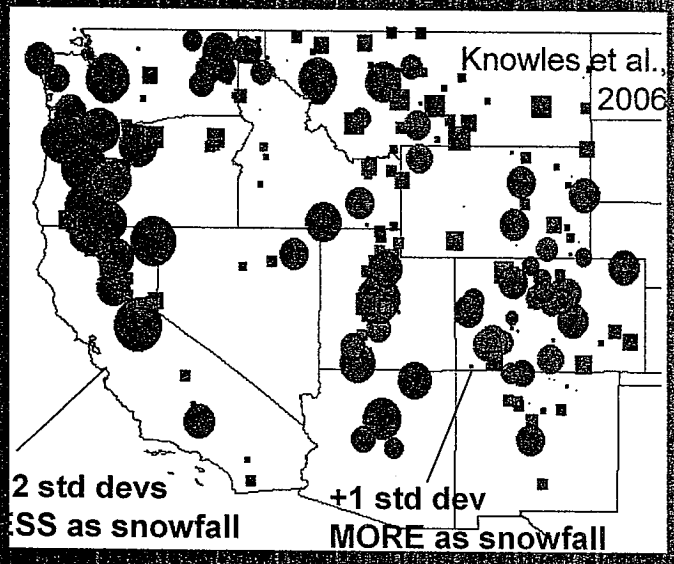
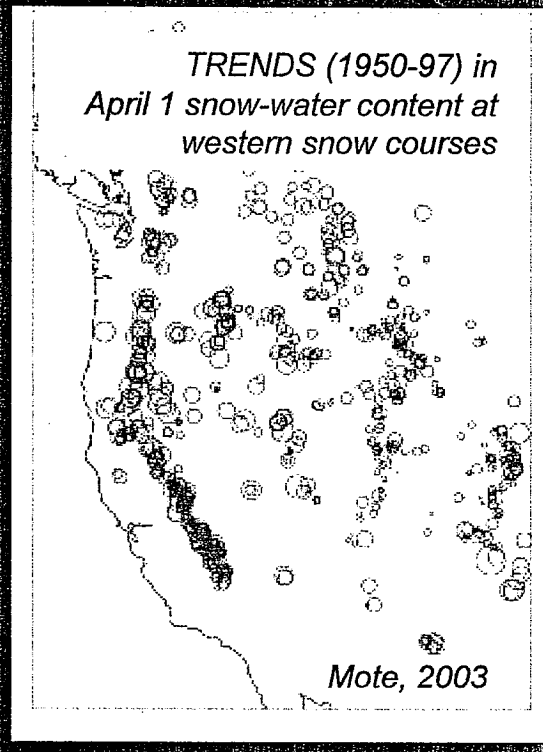
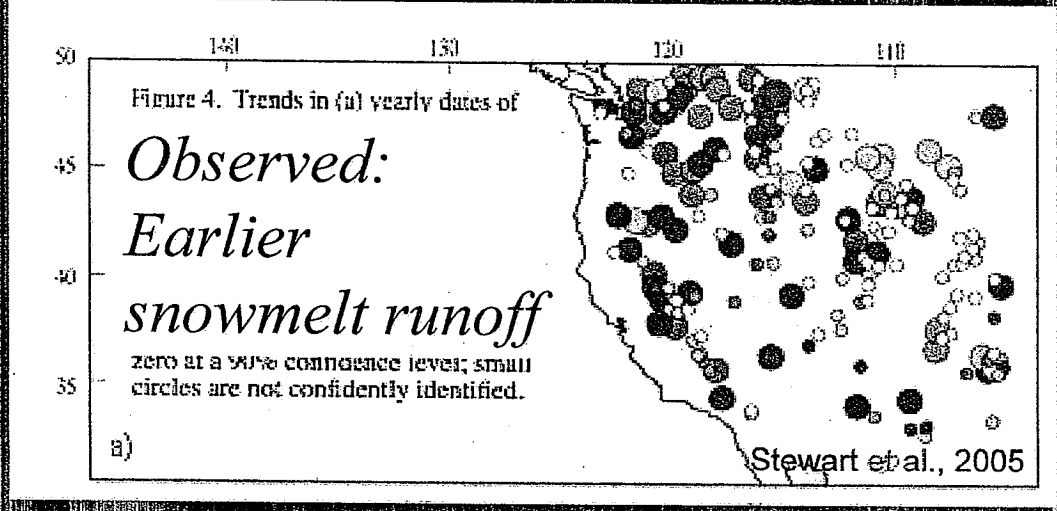
Warming already has driven observable hydroclimatic change

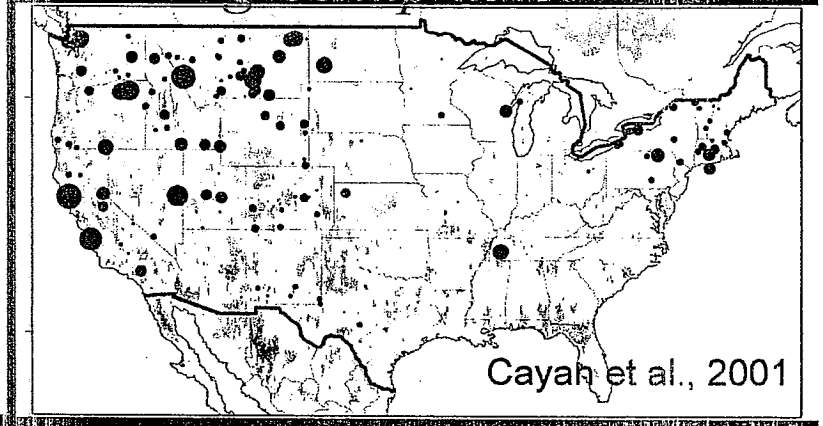


Observed: Less spring snowpack



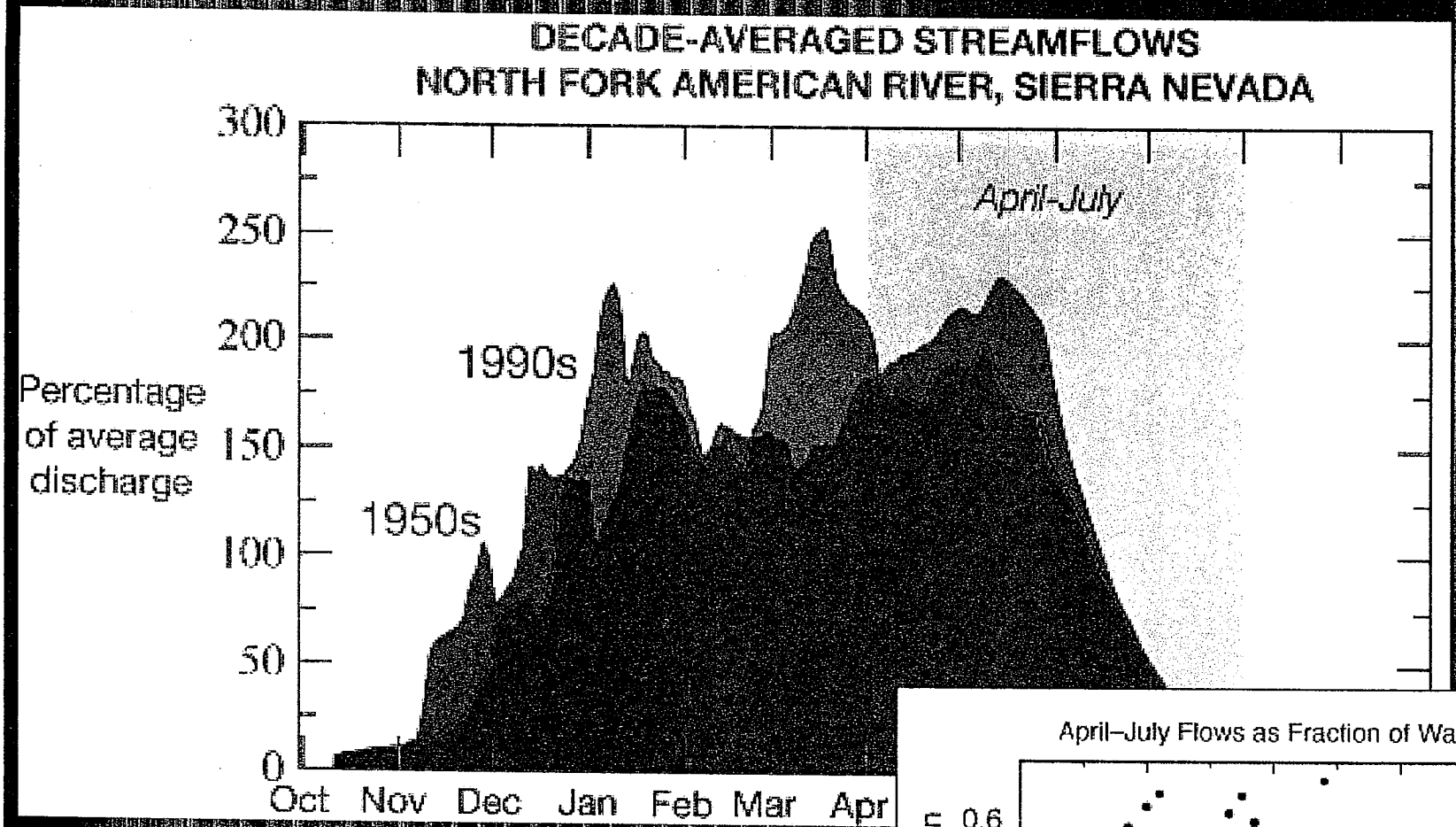


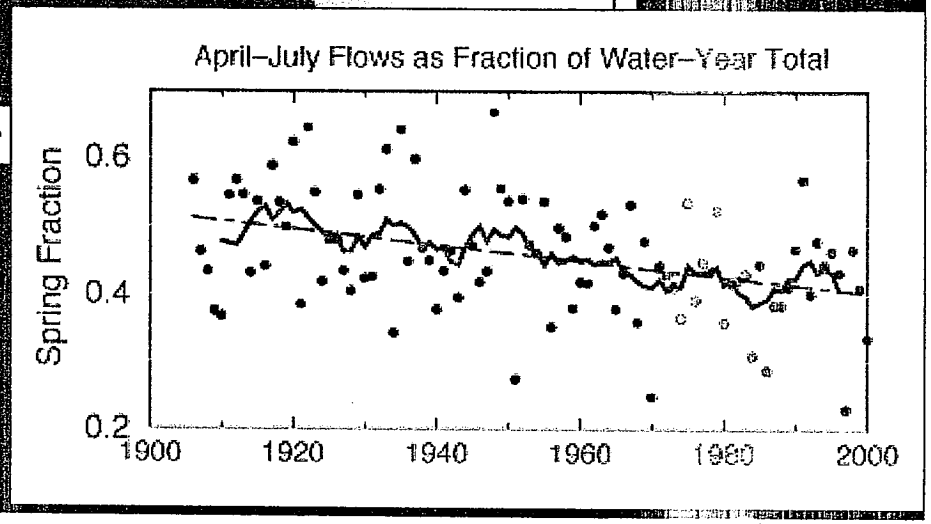
Observed: Earlier greenup dates



LETTER 20

As a result of these trends, the warm-season fraction of annual streamflow has declined.



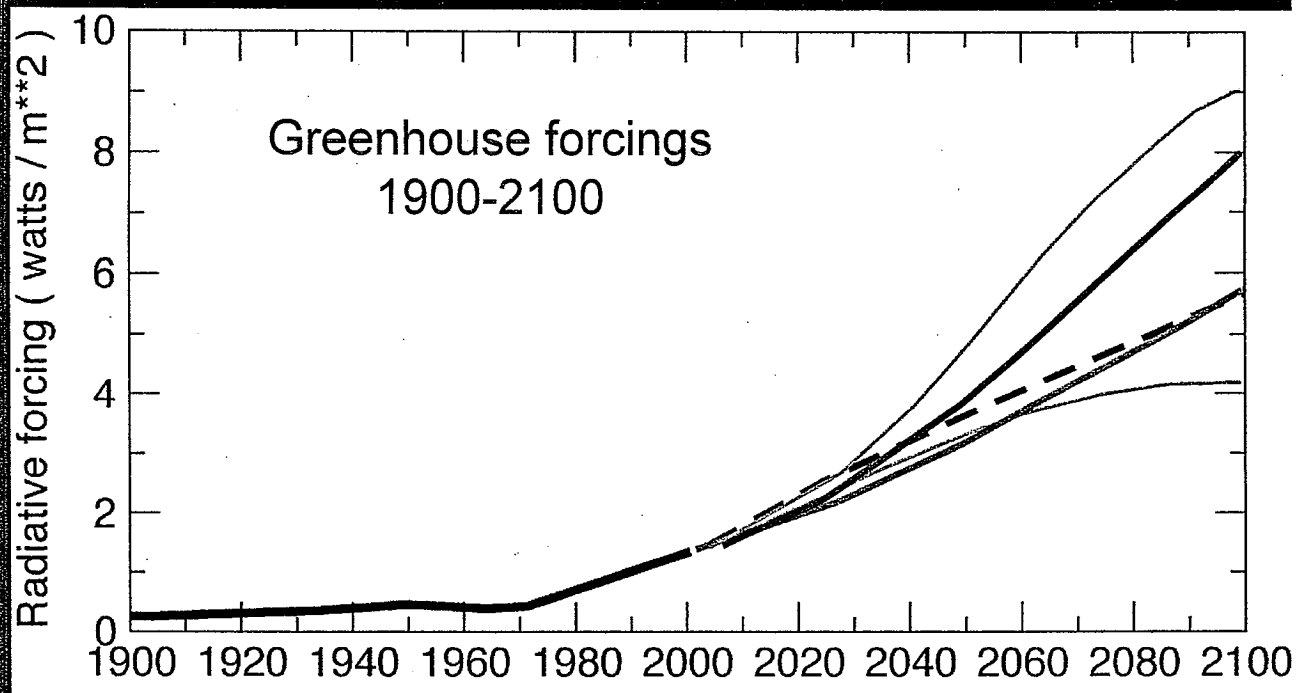


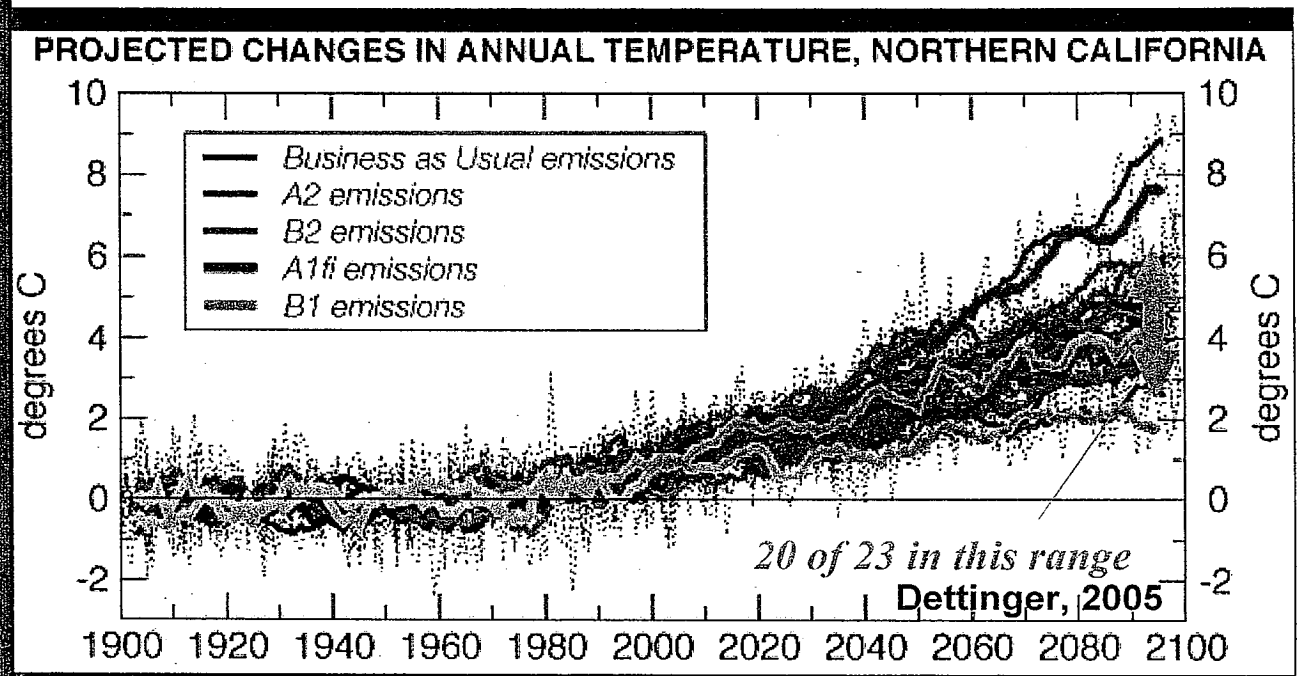
Roos, 1989, 1991; Dettinger and Cayan, 1995; Stewart et al 2005

USGS

LETTER 20

Under projected greenhouse forcings, all climate models yield warmer futures for California and the West.



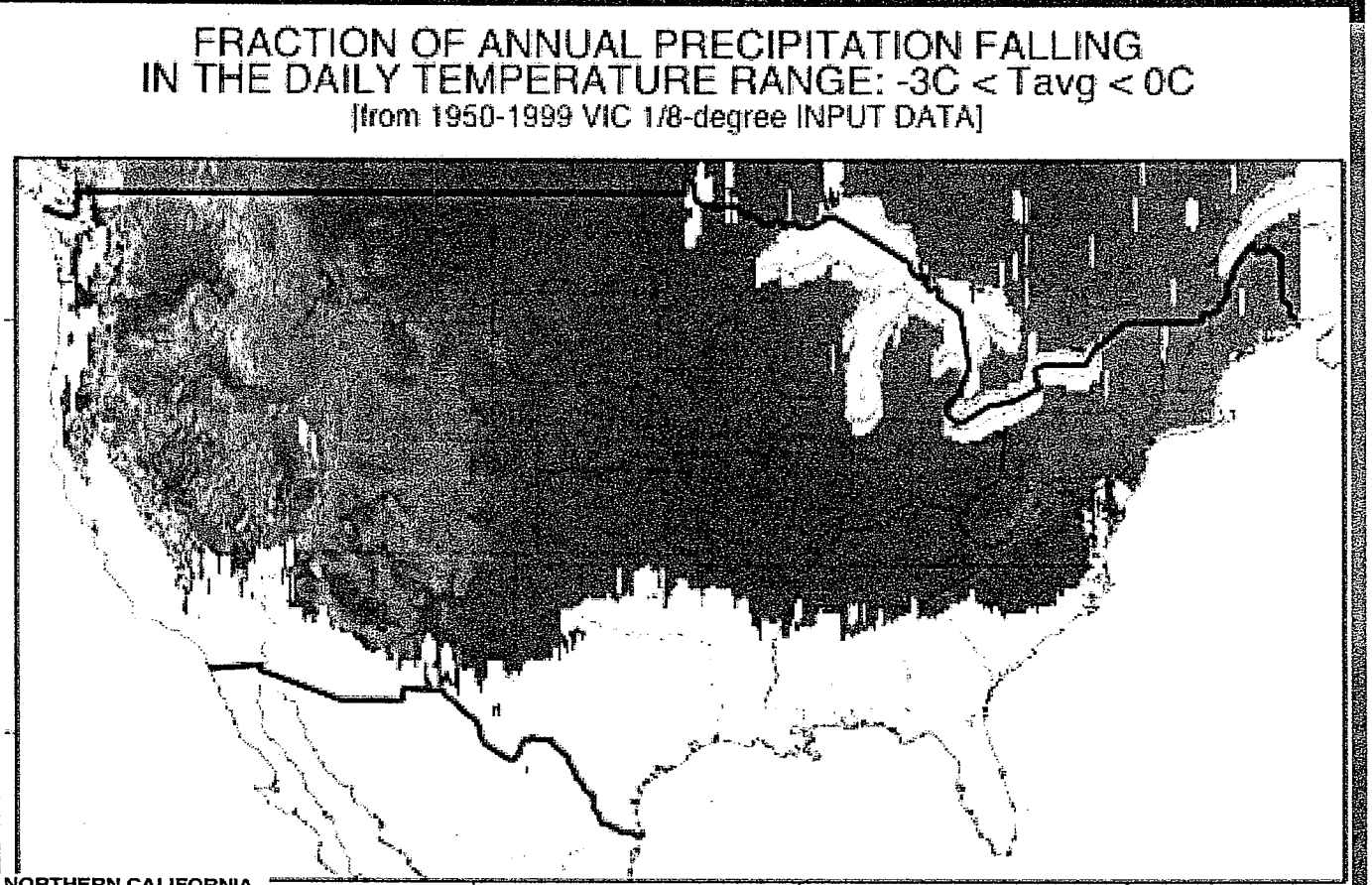


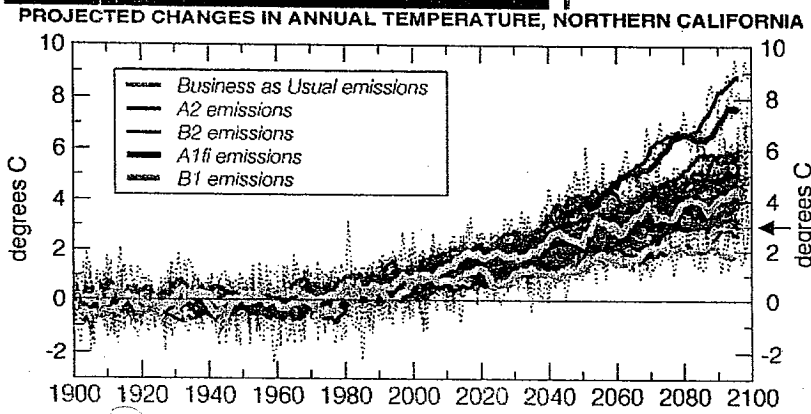
USGS

LETTER 20

To put these levels of of warming into perspective:

What fraction of precipitation historically fell on days with average temperatures just below freezing?





"Rain vs Snow"

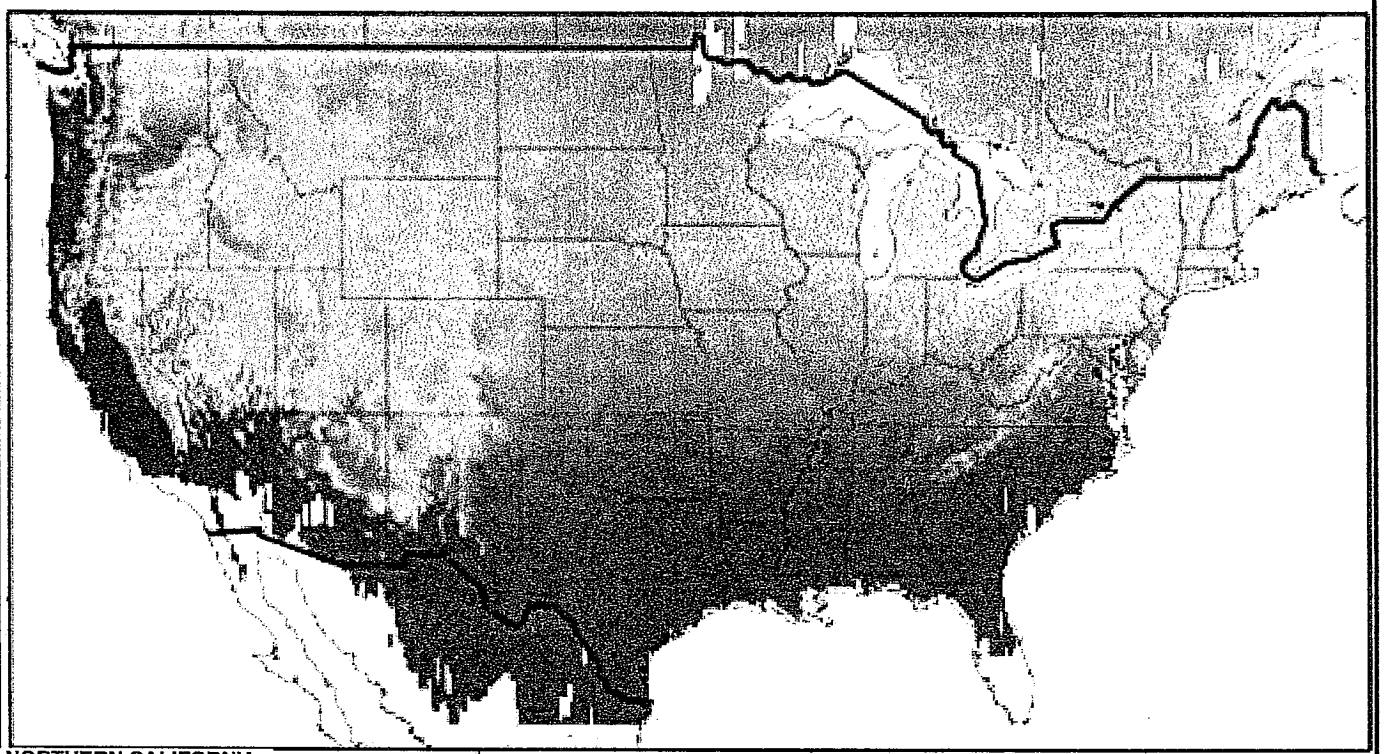
Computed from UW's VIC model daily INPUTS (Bates et al. 2006)

LETTER 20

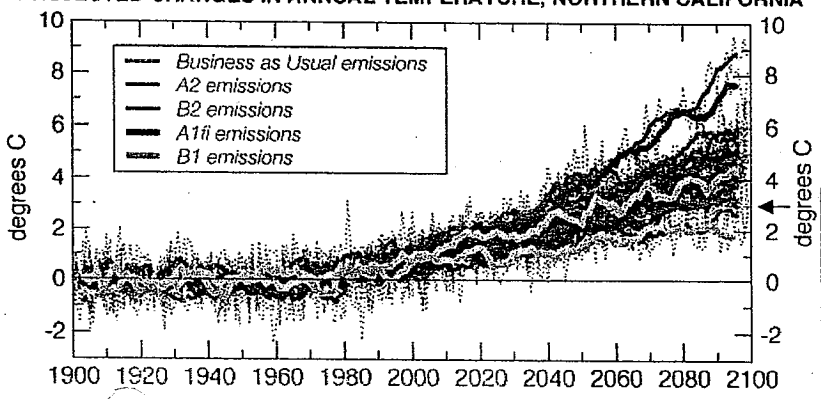
To put these levels of of warming into perspective:

How many days/year historically were just below freezing?

NUMBER OF DAYS/YEAR WITH MEAN TEMPERATURES
IN THE RANGE: -3C < Tavg < 0C
[from 1950-1999 VIC 1/8-degree INPUT DATA]



PROJECTED CHANGES IN ANNUAL TEMPERATURE, NORTHERN CALIFORNIA

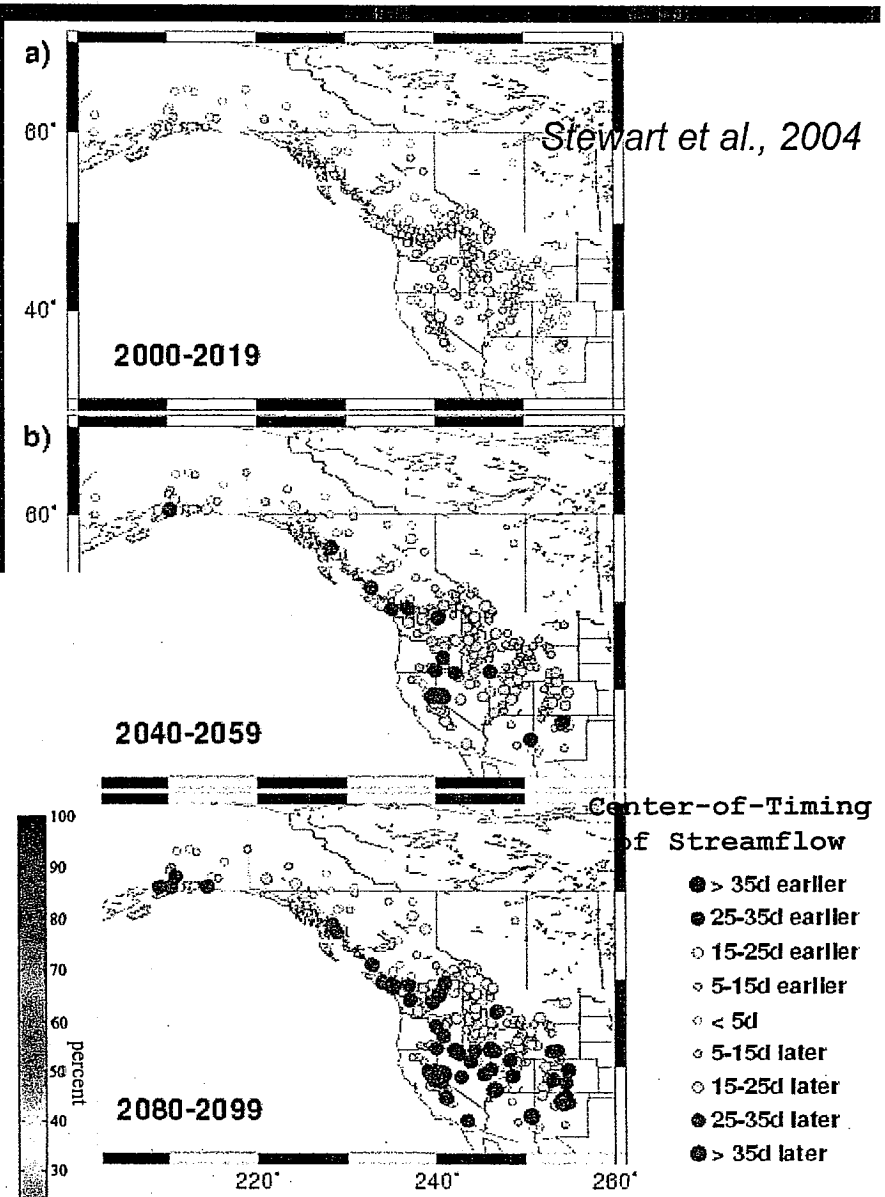


"Duration of Snowpack"

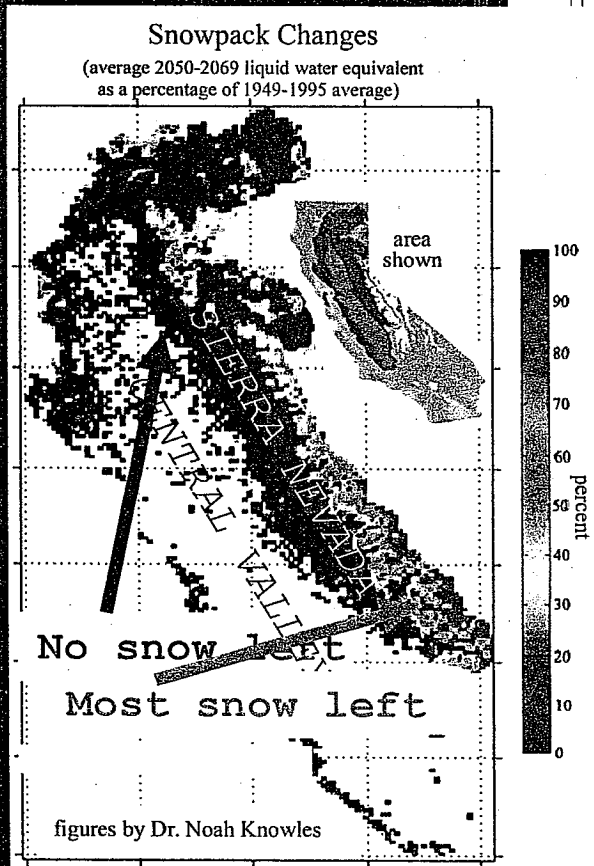
Computed from UW's VIC model daily INPUTS (Bates et al, 2006)

LETTER 20

Under even the coolest of these scenarios, historical streamflow-timing trends in snowfed streams are projected to continue in 21st Century.



Stewart et al., 2004

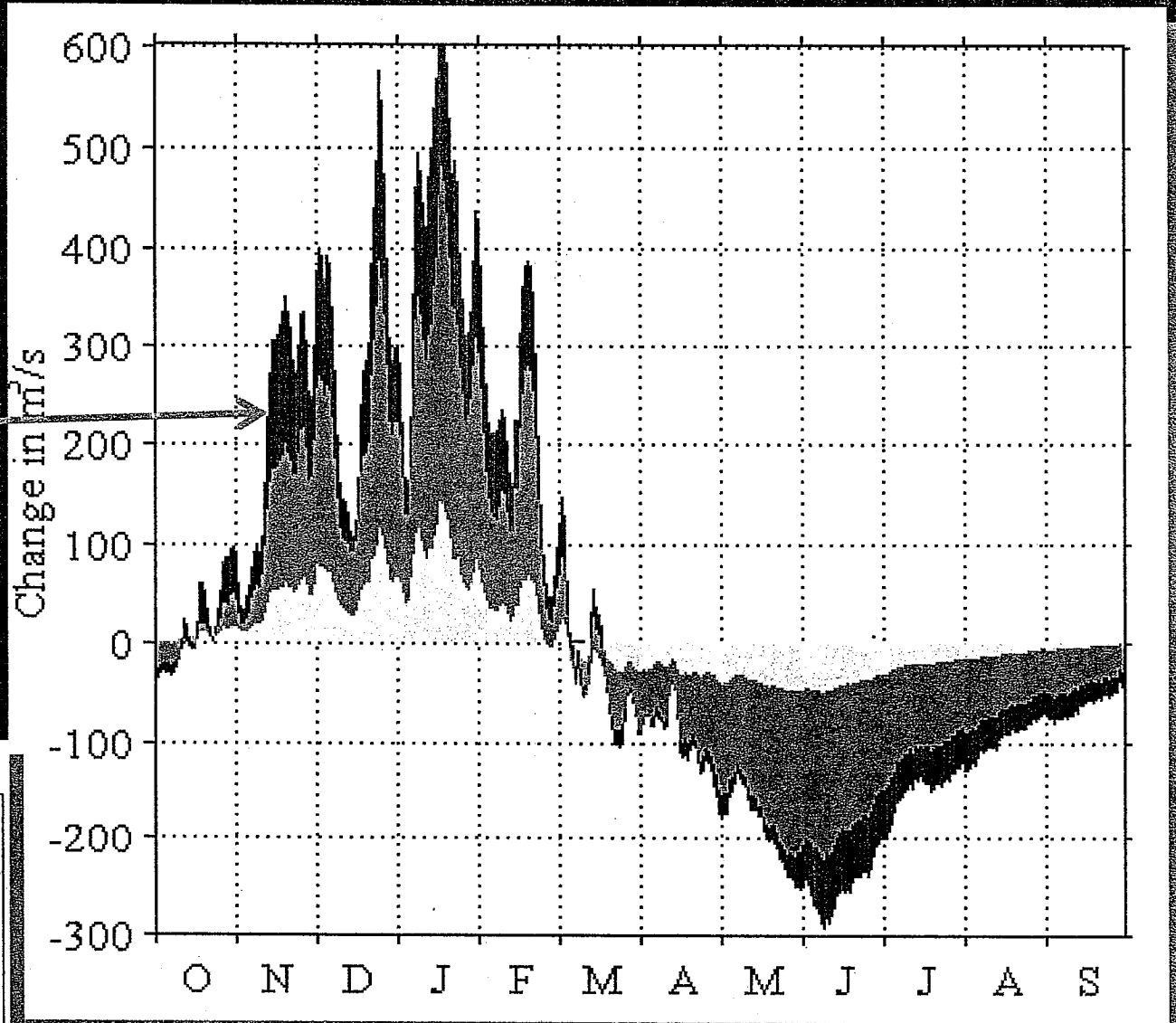


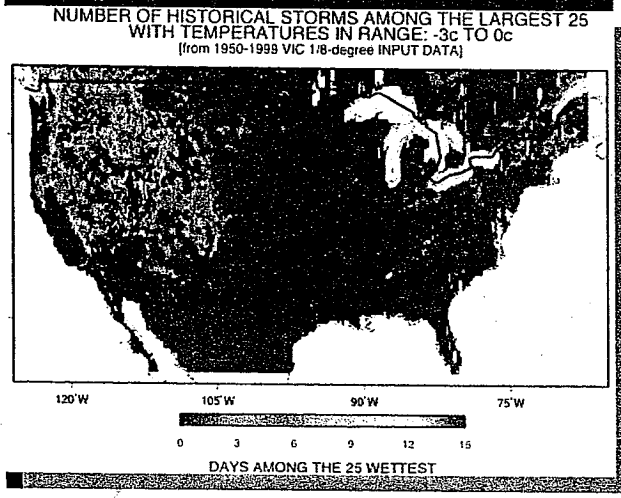
USGS

LETTER 20

Changes in Sierra Nevada Outflow, 2060 – 2000

Besides changing flow seasonality, these changes may bring more severe winter floods in at least some settings…

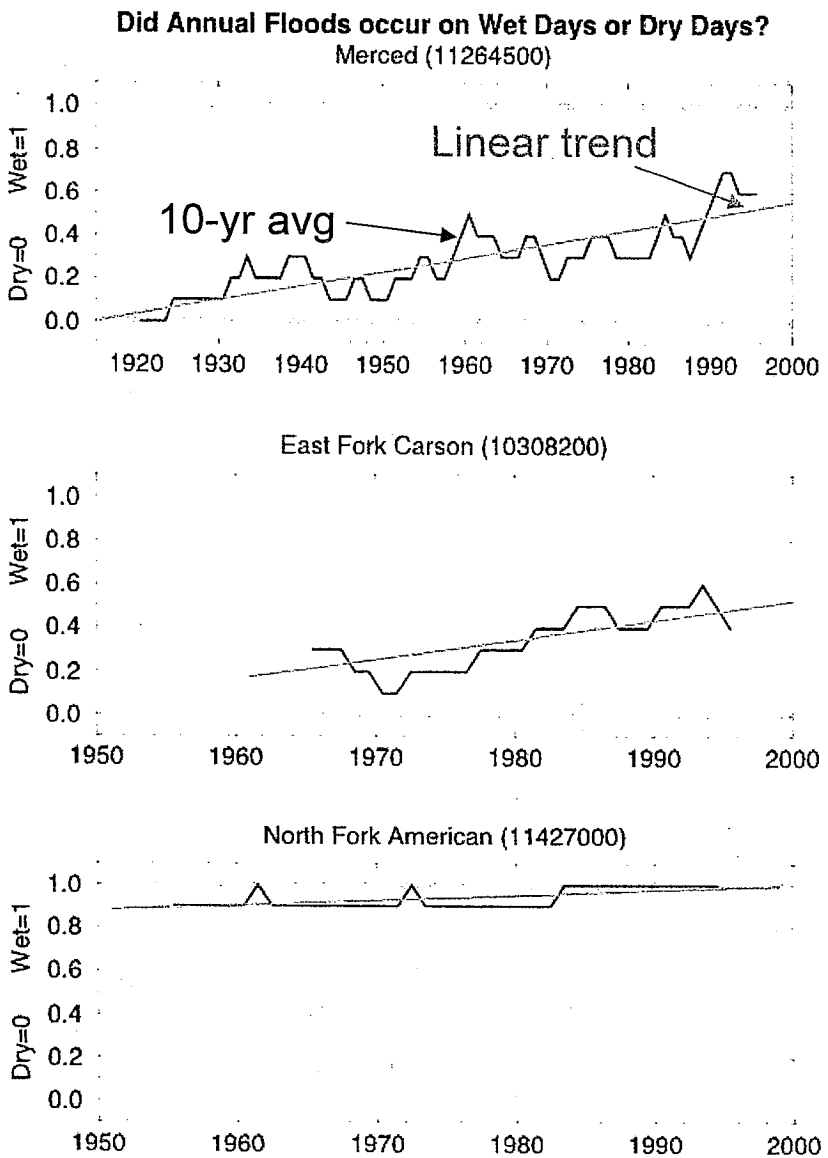


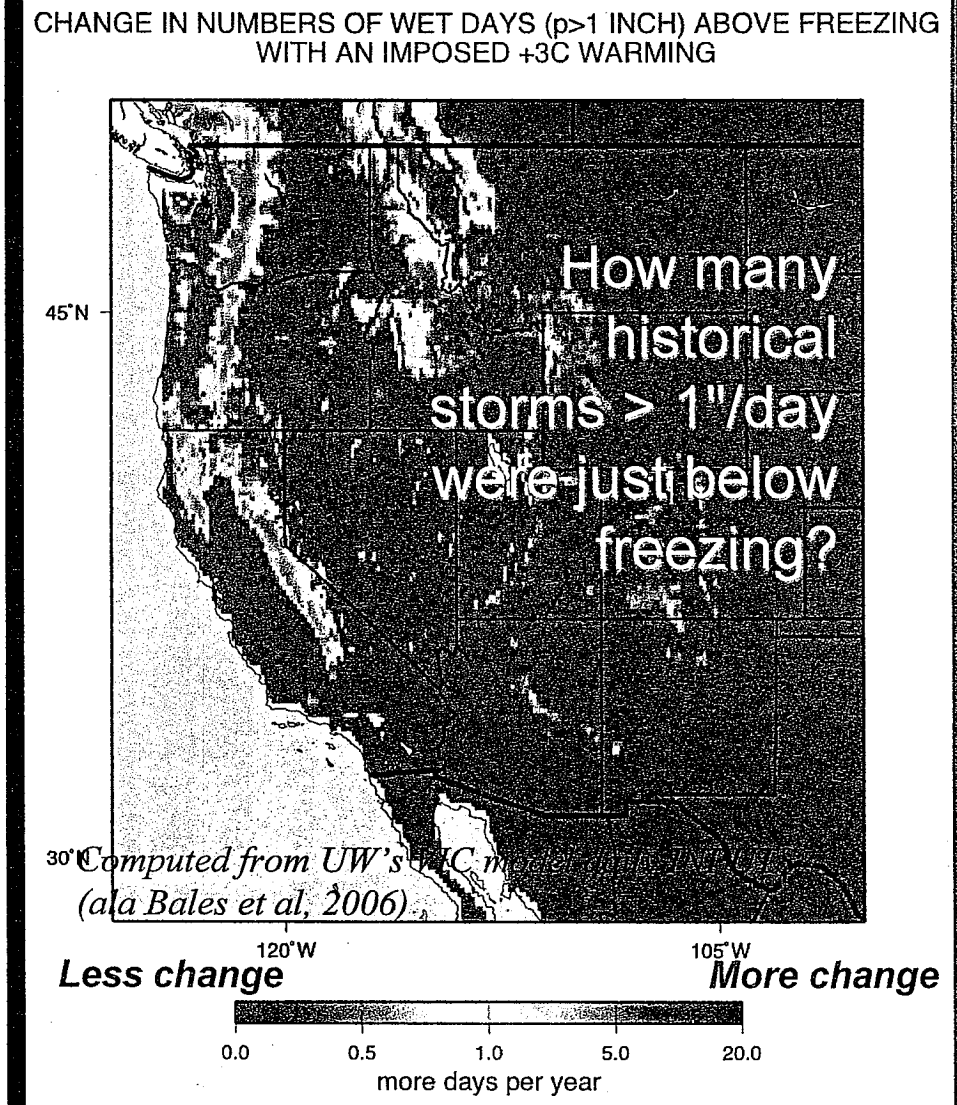


Knowles and Cayan, 2004; http://www.fs.fed.us/psw/cirmount/meetings/agu/pdf2006/dettinger_etal_poster_AGU2006.pdf

LETTER 20

If the warming continues, where should we expect the largest changes in warm-storm flooding to be manifested?



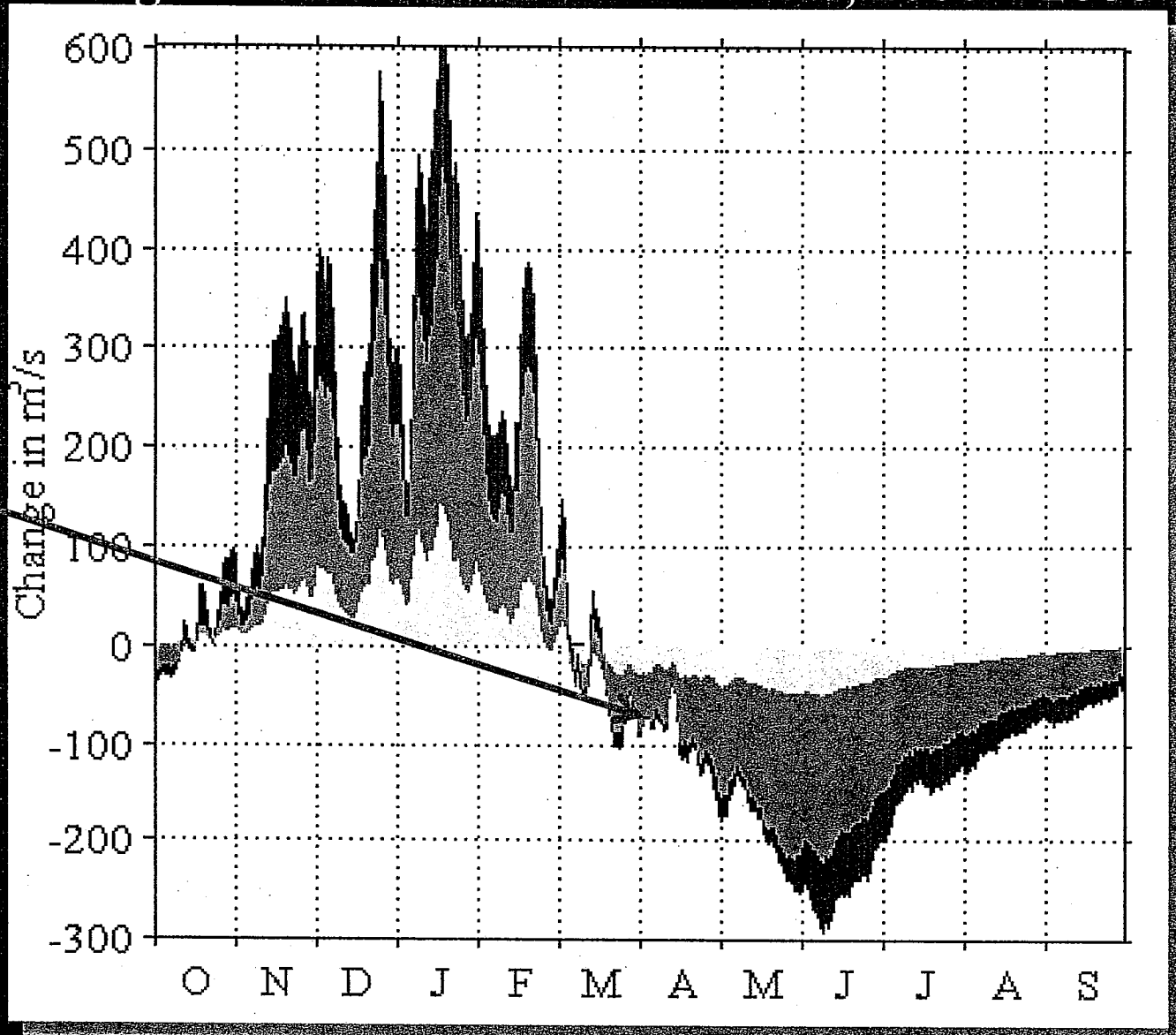


"Warm-storm flooding"

LETTER 20

Changes in Sierra Nevada Outflow, 2060 – 2000

...and, with earlier runoff/ET and warmer summer temperatures,



Knowles and Cayan, 2004

Dettinger et al., 2004

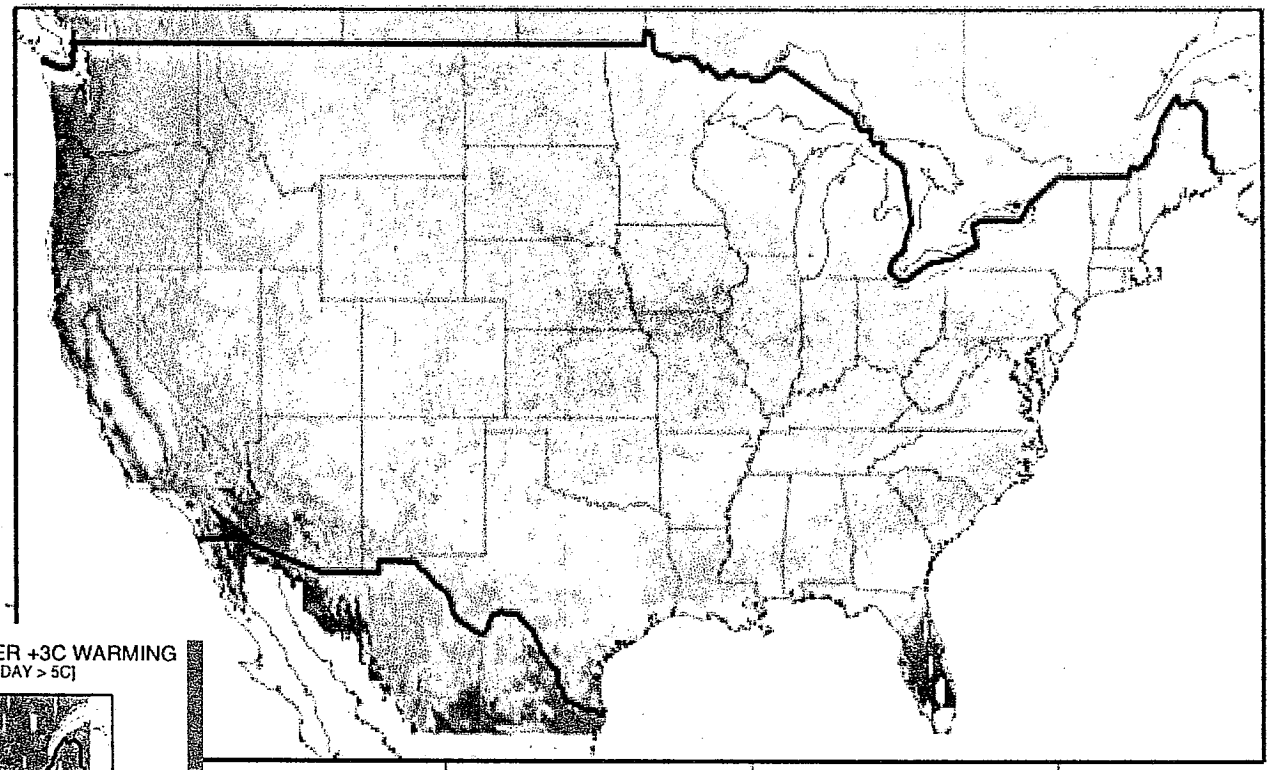
USGS

LETTER 20

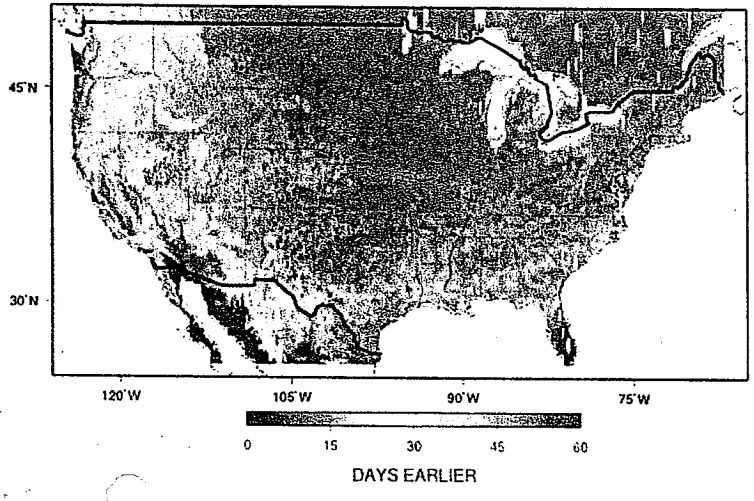
How much would a +3°C warming matter to GROWING SEASONS?

How many days historically were just below the onset temperatures for growing seasons ?

CHANGE IN GROWING-SEASON LENGTH UNDER +3C WARMING
[GROWING SEASON = LONGEST INTERVAL FROM FIRST TO LAST 3-DAY > 5C]



MEAN CHANGE IN BEGIN DATE OF GROWING SEASON UNDER +3C WARMING
[GROWING SEASON = LONGEST INTERVAL FROM FIRST TO LAST 3-DAY > 5C]



Growing Season Length

Computed from UW's VIC model daily INPUTS (ala Bates et al, 2006)

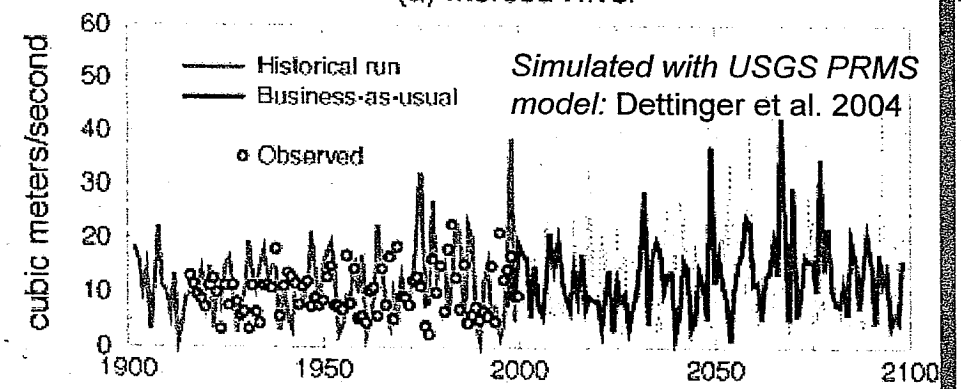
LETTER 20

Overall, though, these seasonal-scale changes pretty much balance each other, so that runoff+recharge may not change much.

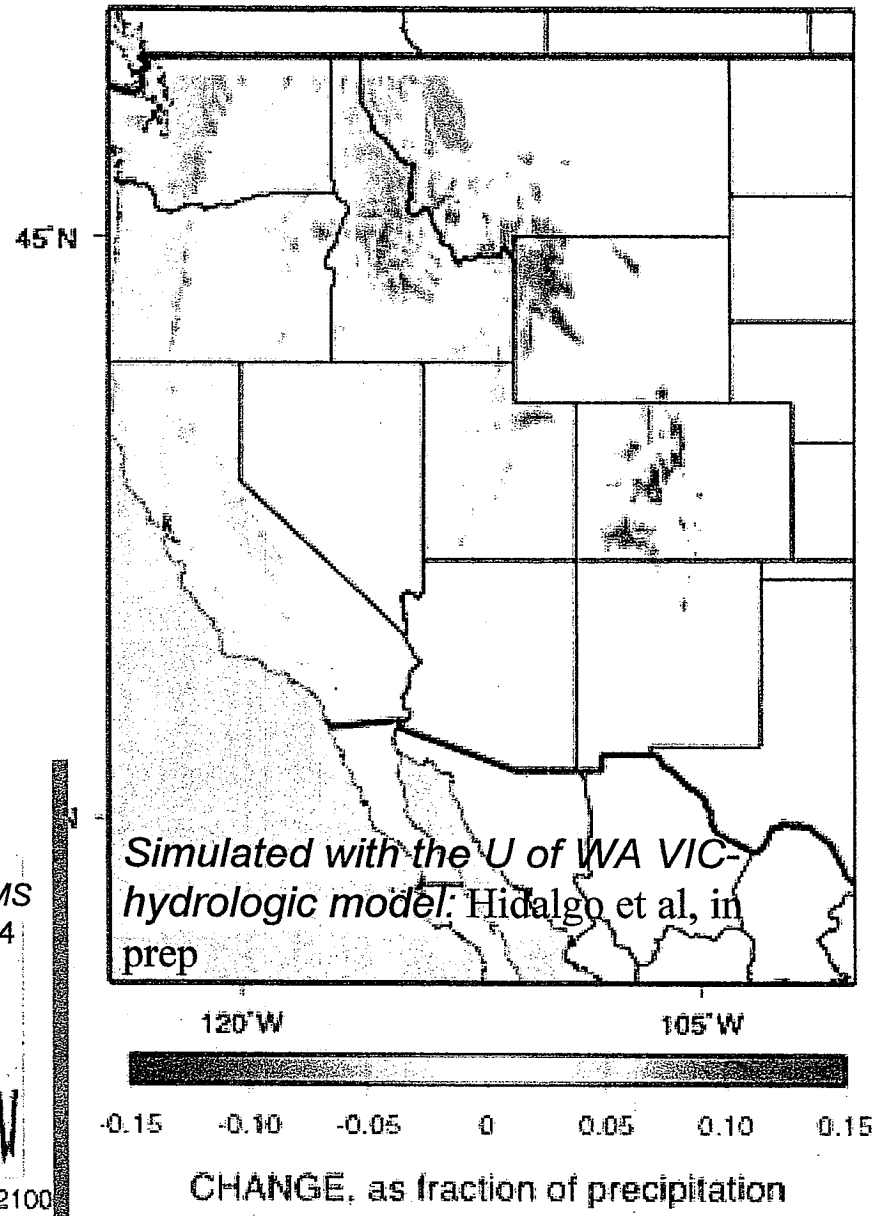
SIMULATED CHANGES IN RUNOFF+RECHARGE under a uniform +3°C warming

WATER–YEAR MEAN STREAMFLOWS

(a) Merced River



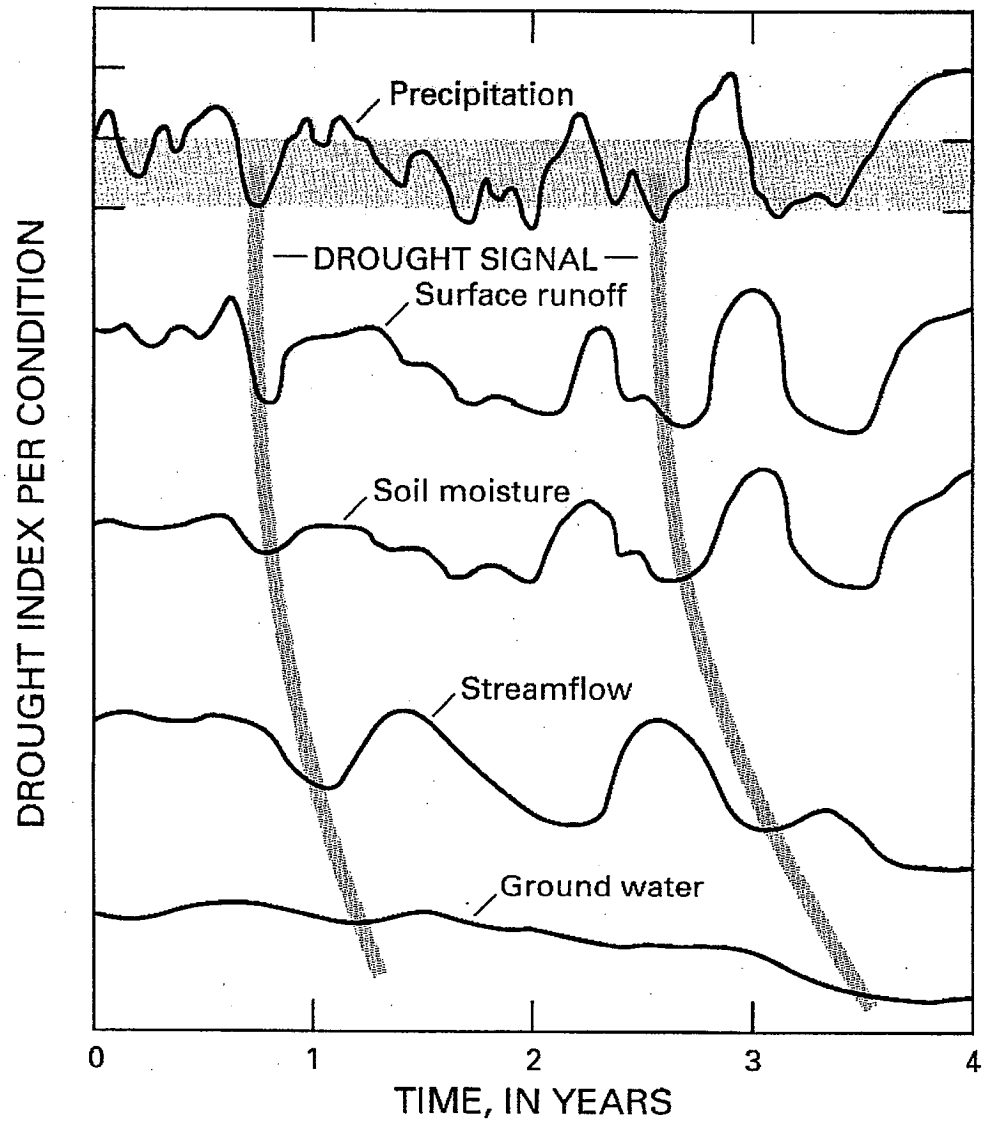
CHANGE IN PARTITIONING OF PRECIPITATION INTO OUTFLOW under +3C WARMING



LETTER 20

Aquifers respond preferentially to lowest frequency climatic variations

This means that aquifers may express climate TRENDS disproportionately.



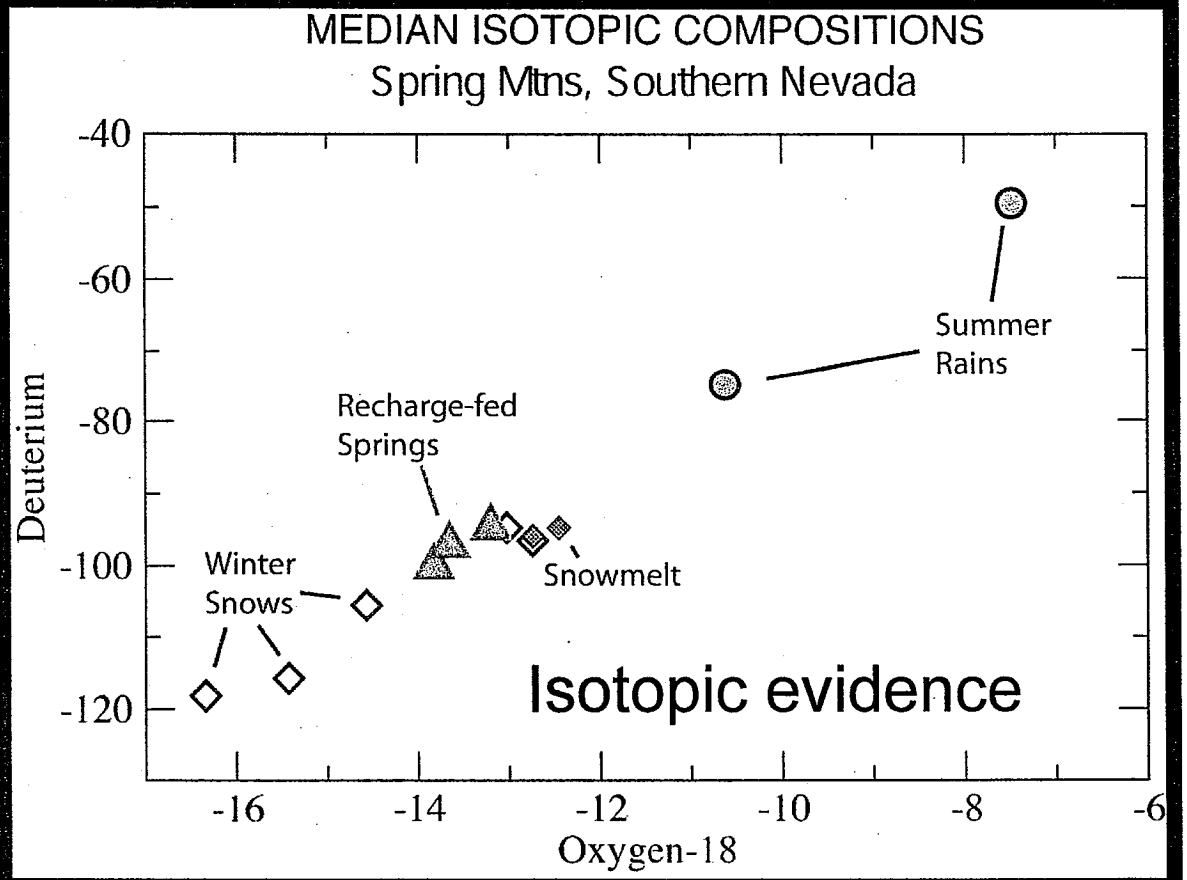
Changnon, 1987

LETTER 20

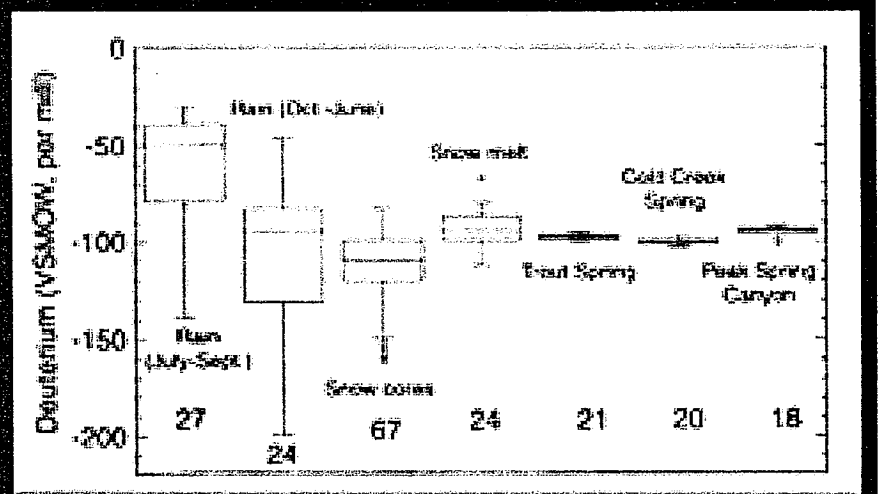
USGS

In arid-semiarid zones, recharge comes preferentially from snowmelt.

An example from the Great Basin



Winograd et al., 1998



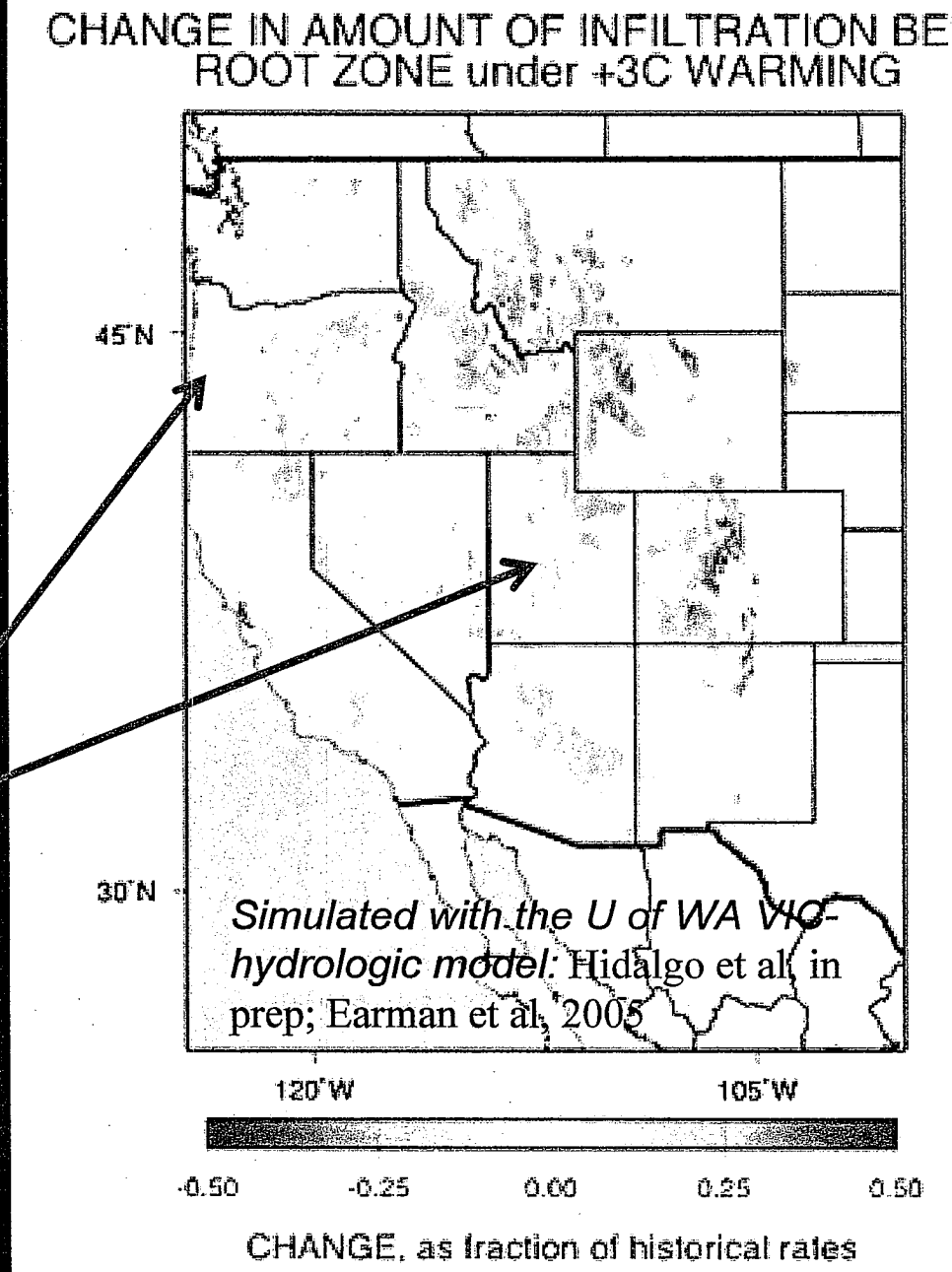
LETTER 20

USGS

Thus, as snowpacks decline and rainfall takes over, RECHARGE may tend to decline in much of the West.

SIMULATED CHANGES IN RECHARGE under a uniform +3°C warming

Widespread 15 to 25% changes projected, mostly as declines in recharge



USGS

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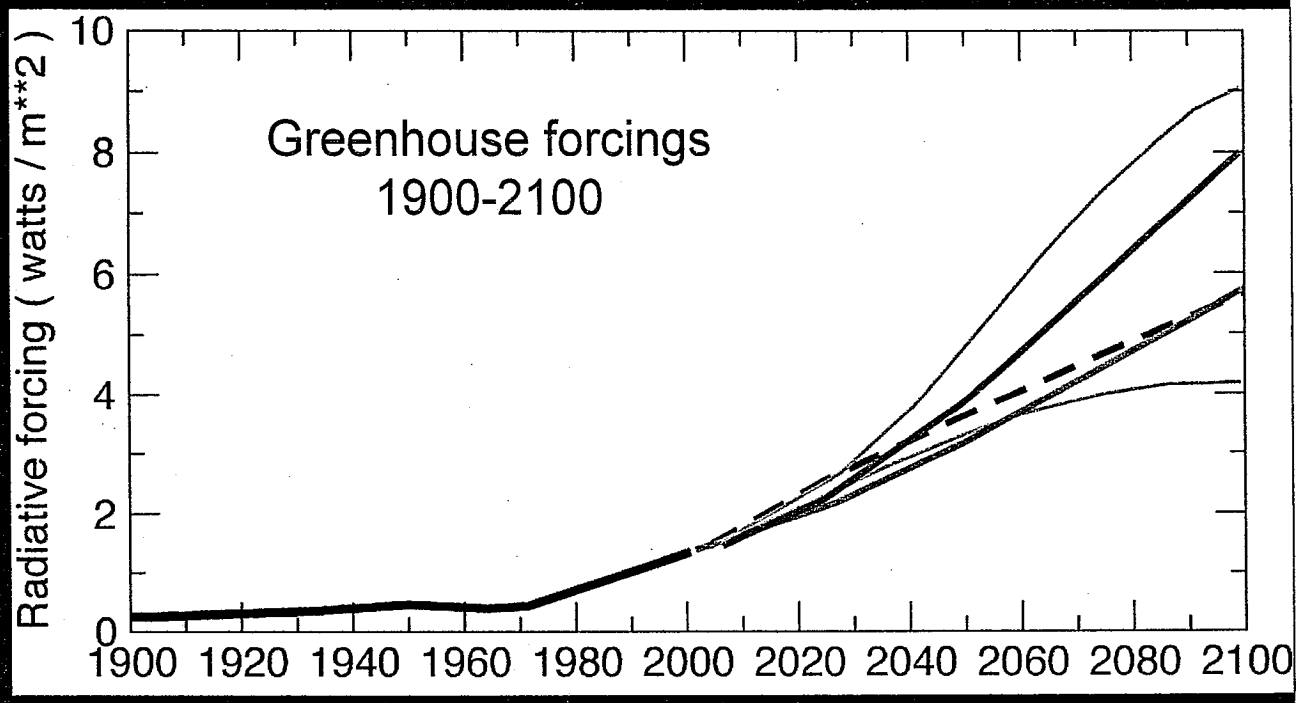
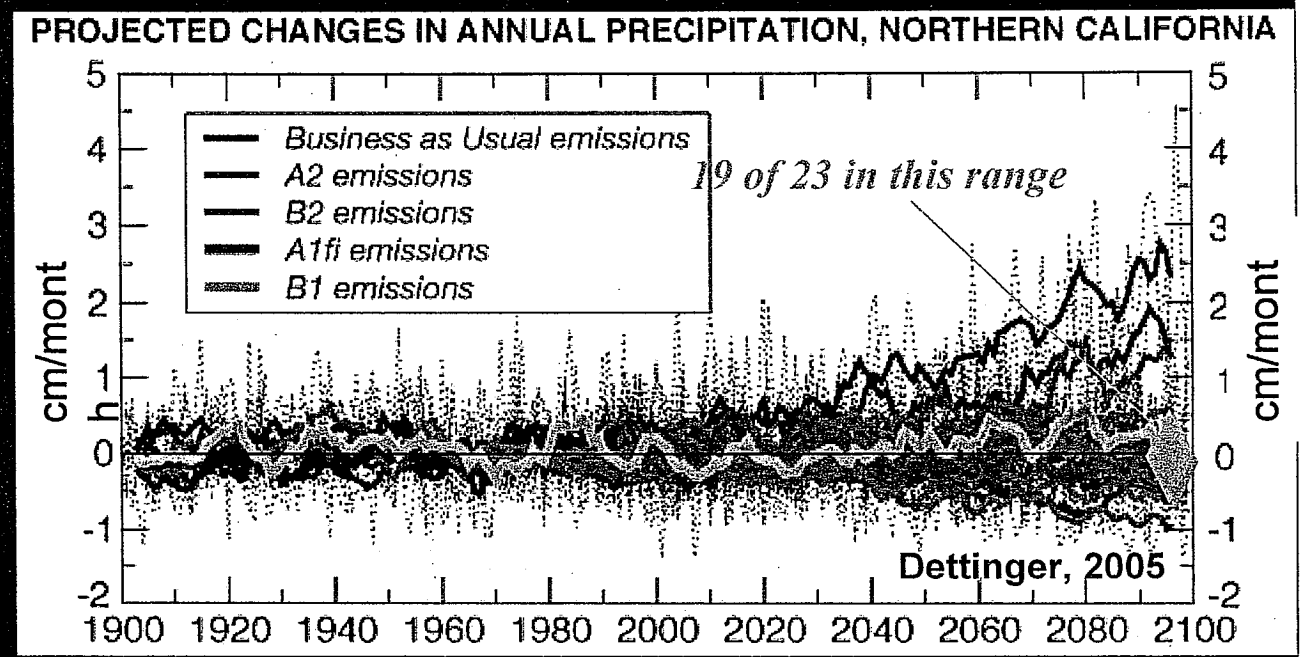
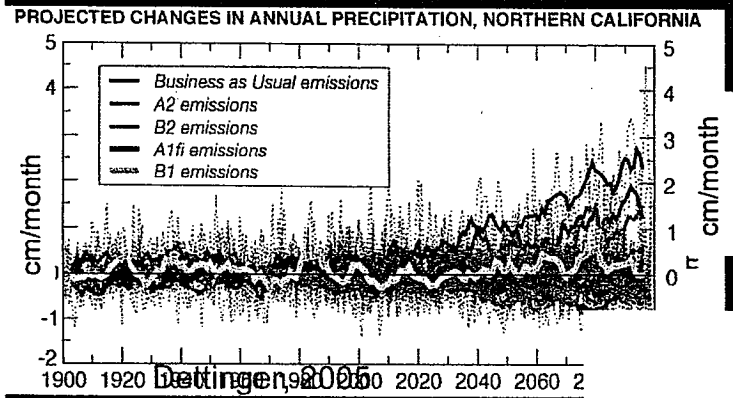
Under projected greenhouse forcings, most climate models yield a fairly narrow range of precipitation changes in California and most of the West.





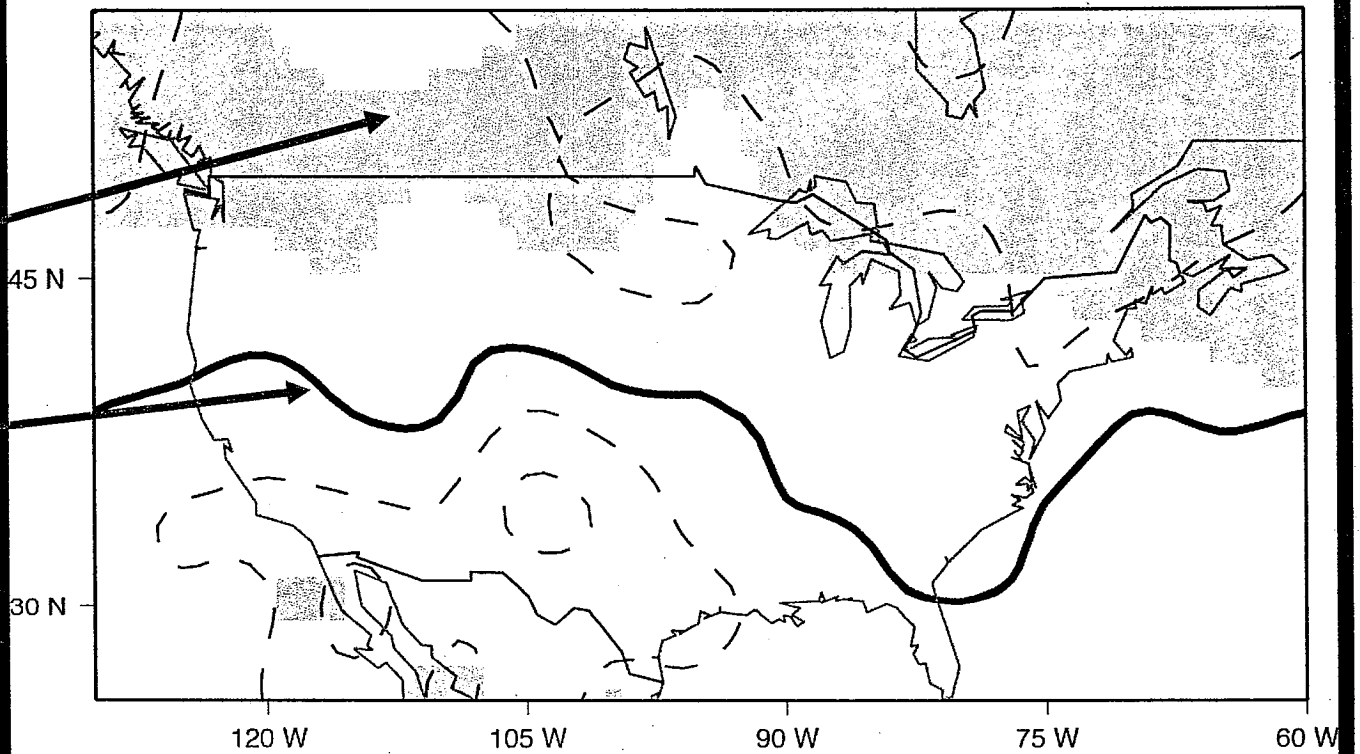
LETTER 20



Across most of the central/north West, current climate models project small changes in precipitation. SW gets drier.

PRECIPITATION TRENDS FROM 13 MODELS

[IPCC 4TH ASSESSMENT (2007) A2 EMISSION SCENARIOS, 2001-2099]

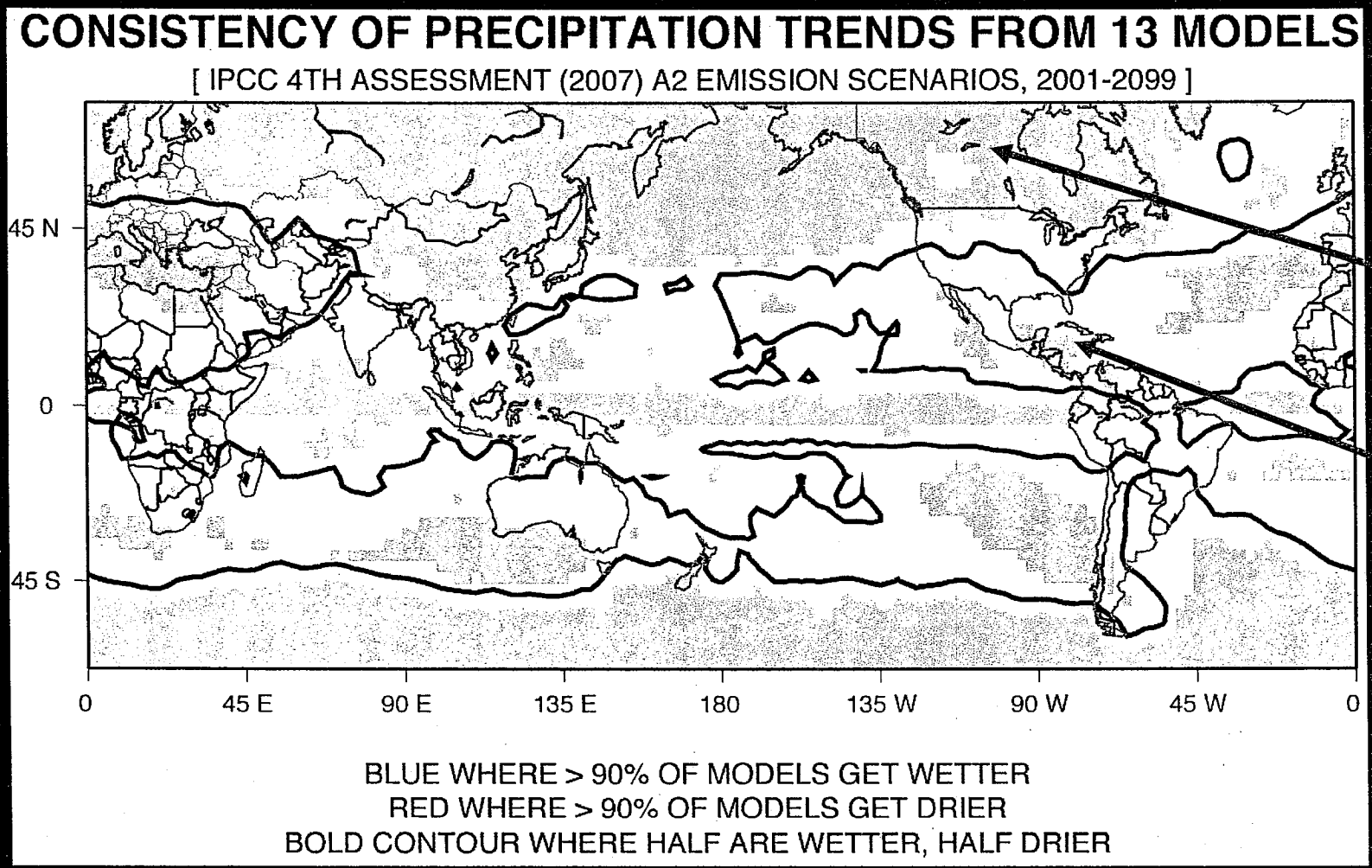


BLUE WHERE > 90% OF MODELS GET WETTER
RED WHERE > 90% OF MODELS GET DRIER

HEAVY CONTOUR WHERE HALF ARE WETTER, HALF DRIER
DASHED CONTOUR INTERVAL = 10% MEDIAN CHANGES

LETTER 20

This is not an accident, but rather is part of a global pattern of projections of precipitation change.



Poles and tropical oceans get wetter.

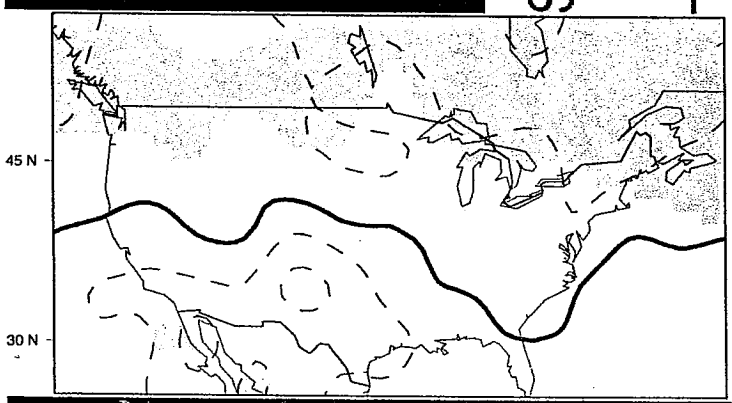
Subtropics get drier.

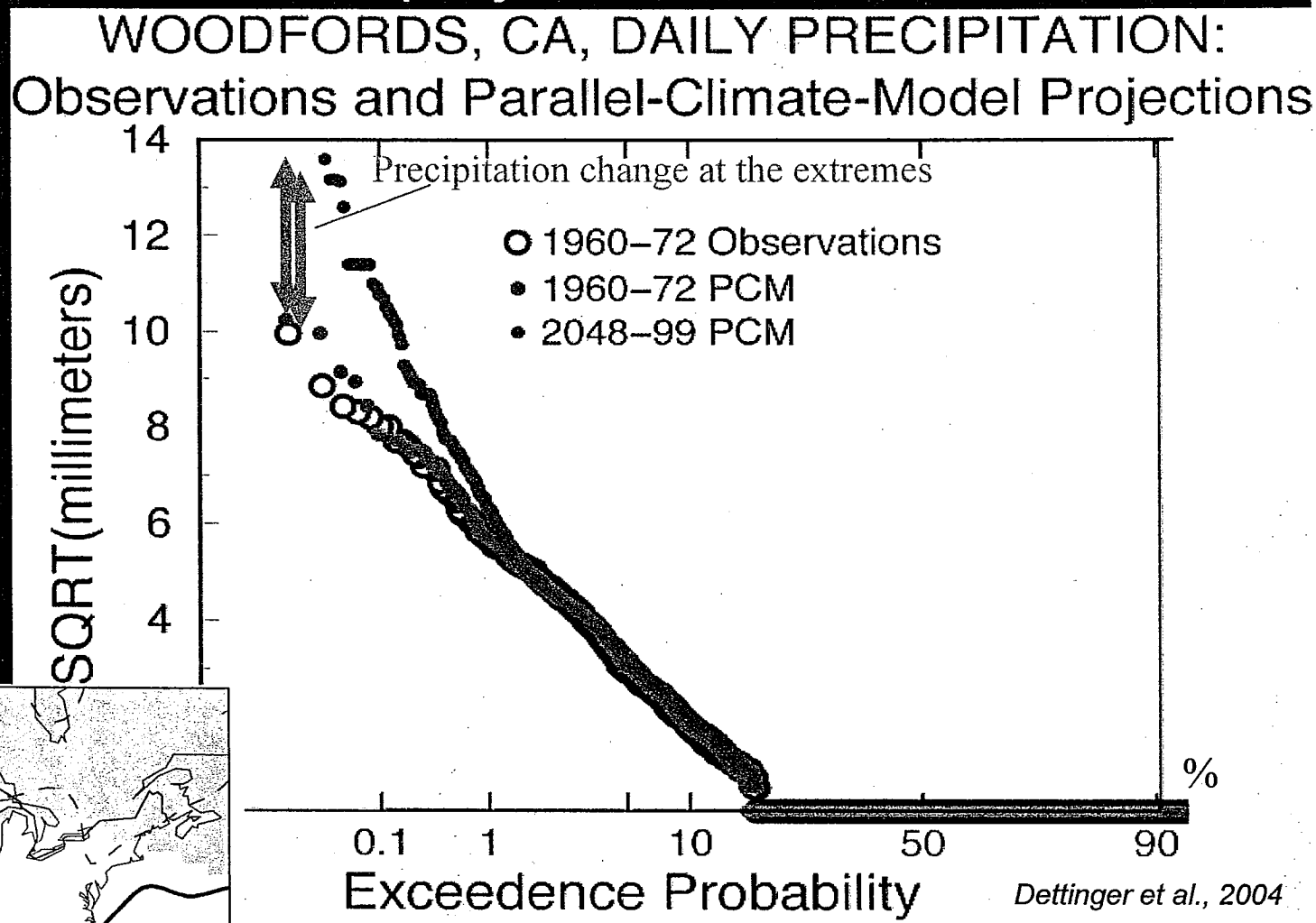
Most of conterminous US (& NV) somewhere in between.

LETTER 20

However, with high-lats getting wetter and desert belts getting drier, the VARIABILITY of precipitation in middle latitudes is projected to INCREASE

Results from the US Parallel-Climate Model, 2001, which yields small changes in AVERAGE precipitation





LETTER 20

TO SUMMARIZE…

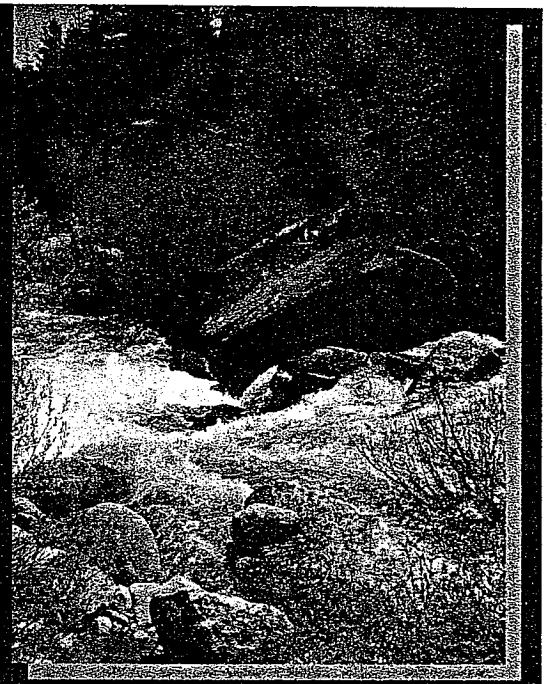
Warming by +2 to +6°C,
likely more so at higher altitudes

Uncertain precipitation changes,
maybe more--maybe less, mostly small

Significant changes in

- rain-vs-snow storms
- snowpack amounts
- snowmelt timing
- flood risk
- streamflow timing
- low flows
- growing seasons
- recharge?

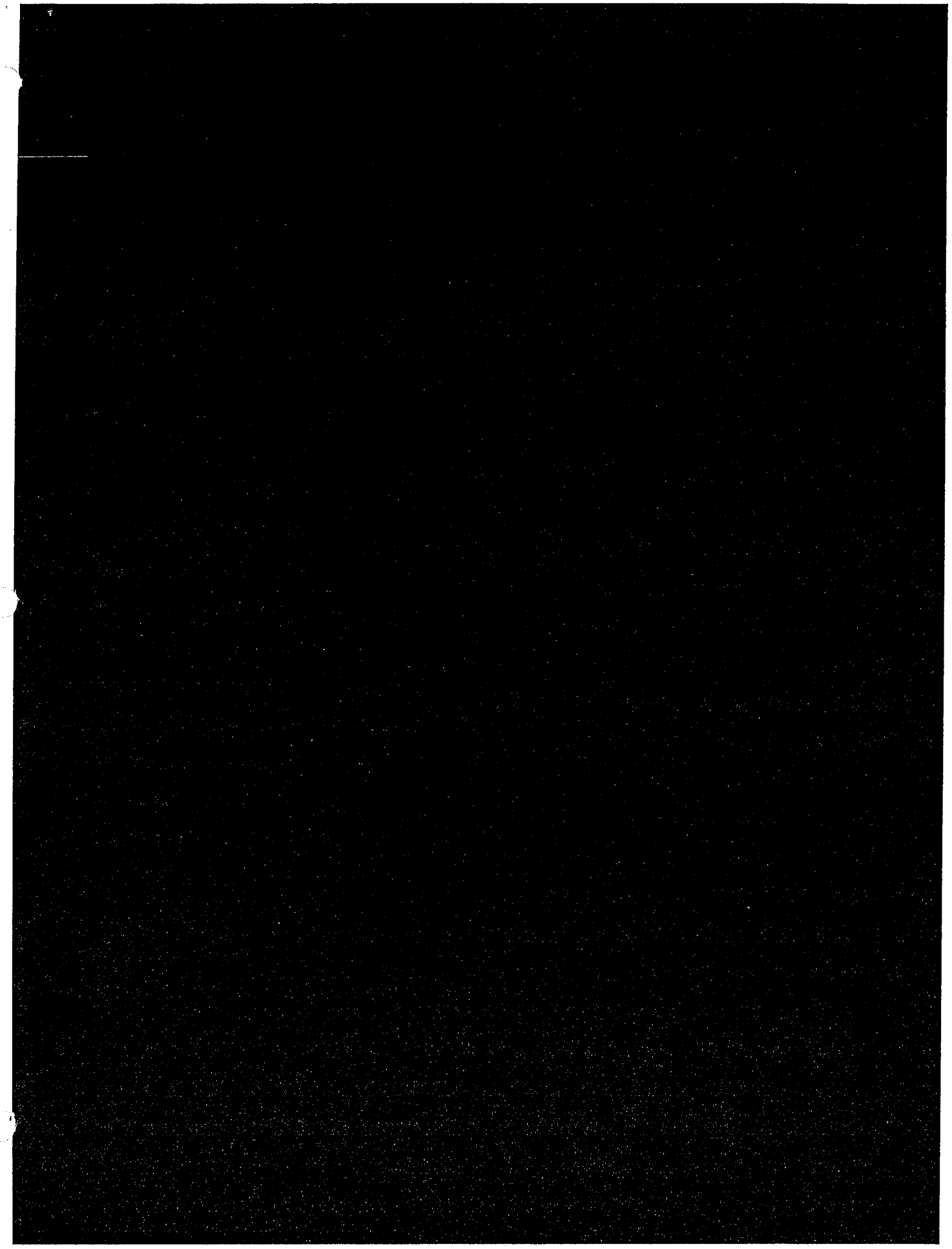
just in response to temperatures



"The most appropriate response to uncertainty is not denial; it is insurance."
--Prof. Michael Hanneman, UCB

LETTER 20

LETTER 20



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LETTER 20

LETTER 20

Carolee Krieger

From: "Michael Dettinger" <dettinge@cox.net>
To: <caroleekrieger@cox.net>
Sent: Thursday, March 22, 2007 4:29 PM
Attach: Dettinger_bren07_shared.ppt
Subject: slides from sustainability talk

Michael Dettinger.....voice: 858 822-1507
US Geological Survey.....fax:□□□858 822-2028
Scripps Inst of Oceanography.....http://tenaya.ucsd.edu/~dettinge
La Jolla, CA 92093-0224 USA.....mdettinger@ucsd.edu□□

All things are connected, like the blood that runs in your family...
The water's murmur is the voice of my father's father.
--Chief Seattle, 1854
----------Sent from USGS----------

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US Geological Survey.....fax:□□□858 822-2028
Scripps Inst of Oceanography.....http://tenaya.ucsd.edu/~dettinge
La Jolla, CA 92093-0224 USA.....mdettinger@ucsd.edu□□

"Anything else you're interested in is not going to happen if you□
can't breathe the air and drink the water. Don't sit this one out.□
Do something. You are by accident of fate alive at an absolutely□
critical moment in the history of our planet."--Carl Sagan
----------Sent from home----------

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----------Sent from home----------

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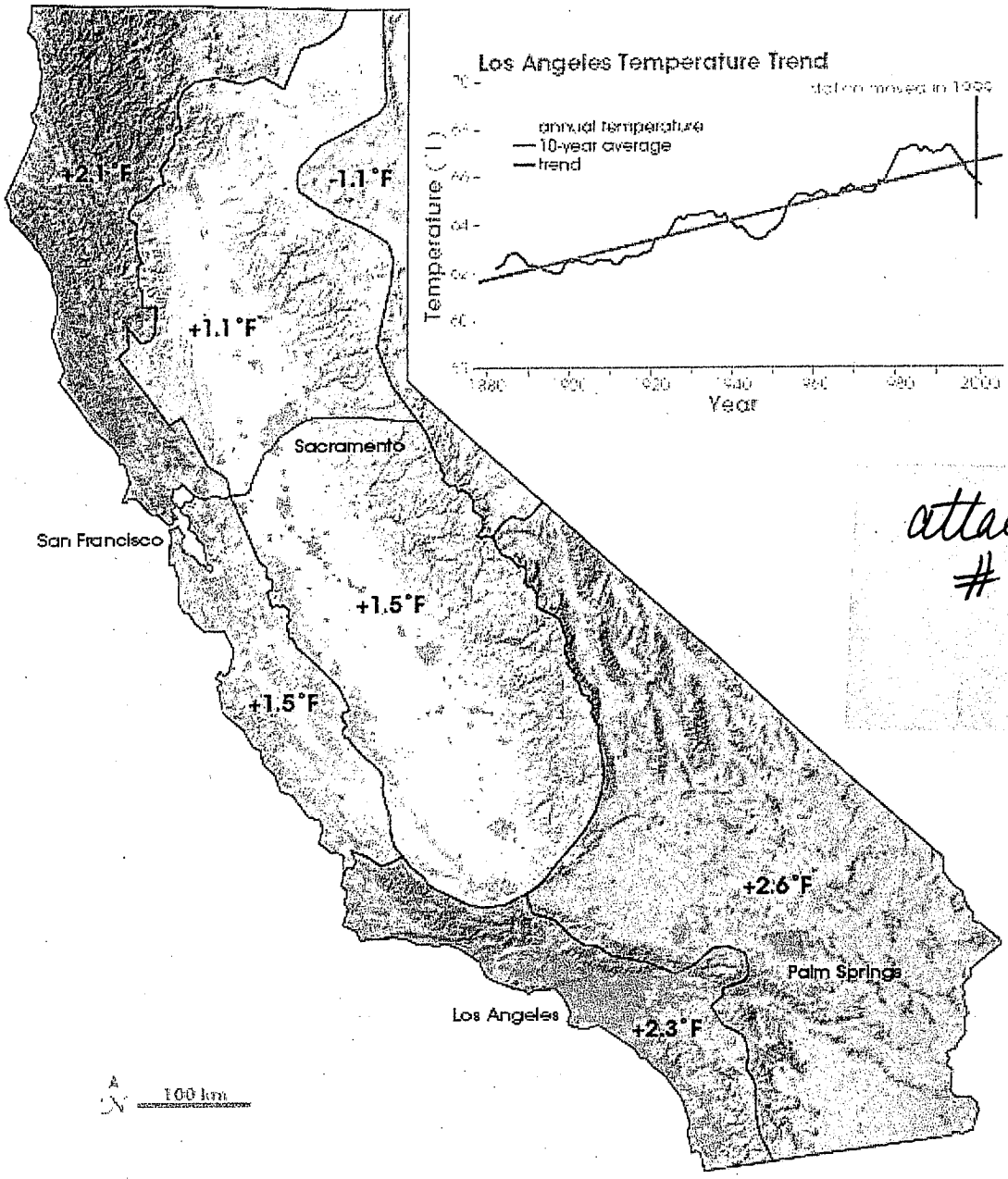


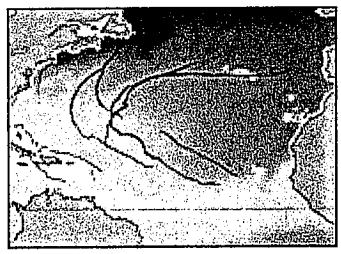
attachment #17

High-resolution Images

- Map (1.6 MB JPEG)
- Graph (110 kB PDF)

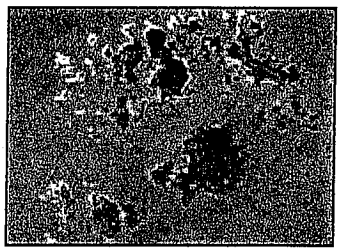
Average temperatures in California rose nearly two degrees Fahrenheit during the second half of the 20th century, with urban areas blazing the way to warmer conditions. When scientists at NASA and California State University, Los Angeles, analyzed observations from 331 weather stations between 1950 and 2000, they found that average temperatures rose in 6 out of 7 of the state's major climatic sub-regions. The scientists concluded that small increases measured in many rural areas may reflect the contribution of

Latest Images
View Images Index

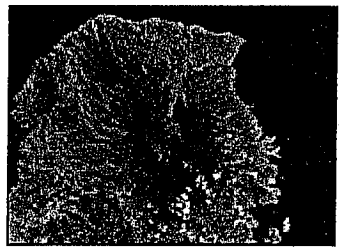


Dust Dampens Hurricane Formation

global warming due to rising greenhouse gas concentrations. Larger changes in and around urban areas are mostly due to growing population and the conversion of natural areas to urban ones.



Isles of Scilly, UK



Sumbawa, Indonesia

California's seven climate sub-regions are separated by black lines on the map. Regions where the average surface air temperature climbed less than 2 degrees are colored yellow, while areas where temperatures climbed more than 2 degrees are orange. The only region where temperatures dropped is colored light blue. Urban areas are colored gray. The greatest warming occurred in southern California's urbanized areas, including Los Angeles and rapidly growing Palm Springs. Urban areas raise average temperatures mostly by preventing an area from cooling off at night. According to one of the study's authors, NASA climatologist Bill Patzert, "California nights are heating up, giving us a jump start on hotter days."

For some California cities, temperature records go back to the late 19th century. The graph shows a record of temperatures in Los Angeles from 1878 through 2005. Gray bars show annual average temperatures, the black line shows the rolling 10-year average, and the blue line shows the warming trend. Average temperatures climbed from around 62 degrees to 66 degrees.

The drop in temperatures observed at the end of the 20th century resulted from the relocation of the official "downtown" Los Angeles station away from the more built-up part of the city to a more natural setting on the campus of the University of Southern California. The old site has so far remained operational, which gives scientists a chance to account for the impact of the move on long-term trends.

Further reading:

- Golden State Heating Up, New NASA/University Study Finds
- Urban Heat Island: Atlanta Georgia
- Beating the Heat in the World's Big Cities
- Urban Rain

NASA image adapted by Robert Simmon, based on data from Richard Medina, University of Utah (map), and Bill Patzert, NASA Jet Propulsion Laboratory (graph.)

LETTER 20

Carolee Krieger

From: "Lloyd Carter" <lcarter0i@comcast.net>
To: "Linda Mitrovich" <lkm@solutionstrategies.com>; "Carolee Krieger" <caroleekrieger@cox.net>; "Dorothy Green" <dorgreen@adelphia.net>; "Joan Hartmann" <jrhartmann@impulse.net>; "Michael Jackson" <mjatty@sbcglobal.net>; <Tstokely@trinityalps.net>
Sent: Tuesday, April 17, 2007 4:56 PM
Subject: Emailing: EO Newsroom New Images - California Temperatures on the Rise

NEW IMAGES

California Temperatures on the Rise

PELAGIC FISH ACTION PLAN

March, 2007

pg. 351

attachment #18

RESOURCES AGENCY

CALIFORIA DEPARTMENT OF WATER RESOURCES

CALIFORNIA DEPARTMENT OF FISH AND GAME

580
553
104
485
1662

1.662 MAF

Status: *New.* The Planning Agreement for the BDCP dated October 6, 2006 has been signed by members of the Steering Committee and can be found at http://resources.ca.gov

Costs: For calendar years 2006 and 2007, Reclamation and DWR are contributing approximately $3 million annually for DFG, USFWS, and NMFS staff and administrative costs related to the development of the BDCP.

Water Project Operations

Jan 1 – Feb 15

- **Minimize Net Upstream Flows in Old and Middle Rivers from January to February 15th to 3,500 cfs, or 3,500-5,000 cfs (winter/early spring)** - *Limit the upstream (i.e. reverse or southward) net flow in Old River and Middle River to 3,500 cfs or 3,500-5,000 cfs from January through February 15, depending on water temperature and Sacramento River flow. Increased (more positive) ORMR flows may reduce adult delta smelt entrainment losses at the SWP and CVP intakes, and may also provide a better spawning distribution and reduce subsequent larval entrainment.*

  Status: *New.* The Delta Smelt Working Group (DSWG) reviewed this action and recommended its implementation to the Water Operations Management Team (WOMT). The WOMT approved this action in December 2006.

  Costs: Water costs may be highly variable depending on hydrologic conditions and export demand. Costs were estimated at the level needed to keep flows greater than 3500 cfs in Old and Middle Rivers. If the action were triggered in late December and continued through mid-February, the estimated maximum total water cost would be 580 TAF depending on the amount of export reduction needed to keep flows within the set parameters.

580,6

Mar 1 – ~~15~~ – April 15

- **Maintain Net Downstream Flow in Old River and Middle River Flows prior to the Vernalis Adaptive Management Program (VAMP) Period (early/late spring)** - *At least two weeks prior to VAMP, maintain net flows in Old and Middle Rivers at zero or positive (downstream or northward) to reduce entrainment losses of larval delta smelt. If March 1 14-day running average X2 position is east (upstream) of 65 kilometers (km), then trigger action when ripe or spent females are found in the Spring Kodiak Trawl (SKT) or within 10 days of Delta water temperatures reaching 12° C.*

  Status: *New.* The DSWG is reviewing this action. Recommendations on implementation will be forwarded to the WOMT for consideration and approval. The decision whether to implement an action would be made on a real-time basis dependent on the specific criteria and conditions for the potential action.

  Costs: Water costs may be highly variable depending on hydrologic conditions and export demand. Estimated water costs for an action during the first two weeks in April range from 35 TAF to 37 TAF. If the action were to extend back to March 1 and continued until mid-April, the estimated maximum total cost would be about 553 TAF

553,0

late May

- **No South Delta Barriers during VAMP and until June 1 (late spring)** - *Postpone installation of south Delta barriers until June 1 to reduce the proportion of water drawn towards the pumps from the central and south Delta in order to reduce entrainment losses of larval delta smelt.*

Status: *New.* The DSWG is reviewing this action, and recommended it for implementation to the WOMT. The WOMT is considering this action.

Costs: If this action delays ramping up of exports in late May, there may be costs associated with the action. The maximum estimated cost for two weeks in May would be about 104 TAF, and assumes the VAMP combined export level of 1,500 cfs would continue through May 31.

- **Maintain X2 West of Collinsville during May-December (summer/fall)** - *Increase Delta outflow to maintain an average X2 position west (seaward) of Broad Slough (80 km) near Collinsville from May through December to increase the amount of delta smelt habitat and shift it downstream. Winter entrainment may be reduced and food availability may be improved.*

Status: *New.* The DSWG is reviewing this action. Recommendations on implementation will be forwarded to the WOMT for consideration and approval.

Costs: This action is estimated to cost up to 425 TAF with most of the water costs occurring September-November. In below normal water years, the water costs would exceed 1 million acre-feet and such flows cannot be provided by storage releases without dramatic effects on storage levels and temperature conditions for fish upstream in the fall. Therefore, it is impractical to proceed with such flows in below normal and drier years.

Food Web Actions

- **Provide Flows through Yolo Bypass into Cache Slough (summer)** -*Yolo Bypass has high primary productivity in summer, but net flows move upstream from Cache Slough. Increase summer flow connectivity from the bypass to downstream areas to provide for net downstream transport of productivity. Explore ways to add Yolo Bypass flows into Cache Slough during summer.*

Status: *New.* Implementation in the coming year is unlikely due to the need to develop specific plans, and permit and construct any physical modifications.

Costs: Costs are unknown at this time and would depend on the structural modifications needed.

- **Manage Flooding in North Delta for Seasonal Floodplain Habitat** – *Modify operations or land management to allow increased area and time of floodplain inundation in the Yolo Bypass and Cosumnes River floodplain. These actions would increase productivity of phytoplankton and zooplankton in order to support adults and egg production in fall, egg production in winter, and young delta smelt in spring and summer.*

Status: *Evaluating.* This action would likely require additional years to implement actions on the ground.

Costs: Overall costs are unknown. Planning and environmental review, including conceptual models, are estimated at $500,000.

- **Sherman Island Floodplain Phytoplankton Pilot Project** – *Pilot project to construct mile-long floodways on Sherman Island to emulate floodplains and increase primary production. Water will enter through screened inlets and be pumped out into Sherman Lake by fish-friendly pumps.*

Cons: Implementation of this action would place heavy demands on EWA water, and may exceed available assets if San Joaquin River inflows are in the typical range and export pumping rates are high.

This action has a high degree of scientific uncertainty because the relationship between net flow in Old and Middle Rivers and adult delta smelt salvage may not be linear. Average flow for the two months may not be the best predictor of salvage; antecedent conditions and events over shorter time periods in January and February may determine the outcome. The range of salvage is fairly wide at two-month average flows close to the selected target and at more negative flows. The migration behavior of delta smelt is not currently known (timing, destination).

If entraining fewer adult delta smelt results in more spawning in the southern Delta, entrainment of newly hatched delta smelt larvae may increase. No data are presently available to assess this potential outcome because these larval smelt are too small to be detected in current fish facility sampling. Avoiding upstream flow on Old and Middle Rivers once spawning has begun should increase the survival of larvae produced in the southern Delta. (See early/late spring action below)

Time to Implementation: This action has been approved for implementation by the WOMT. In general, this action would be initiated from January through mid-February unless the target flow conditions in Old and Middle Rivers are already satisfied. However, the action could be triggered and initiated as early as late-December 2006, and could end in mid-February 2007, depending upon river flows and exports. The decision whether to implement an action would be made on a real-time basis dependent on the specific criteria and conditions for the potential action.

Costs: Water costs may be highly variable depending on hydrologic conditions and export demand, and were estimated at the level needed to keep flows greater than -3500 cfs in Old and Middle Rivers. If the action were triggered in late December and continued through mid-February, the estimated maximum total water cost would be 580 TAF (ranging from 9 to 112 TAF per week) depending on the amount of export reduction needed to keep flows within the set parameters.

Maintain Net Downstream Flow in Old and Middle Rivers prior to the Vernalis Adaptive Management Plan (VAMP) Period (early/late spring)

At least two weeks prior to VAMP, maintain net flows in Old and Middle Rivers at zero or positive (downstream or northward) to reduce entrainment losses of larval delta smelt. If the March 1 14-day running average X2 position is east (upstream) of 65 kilometers (km), then trigger action when ripe or spent females are found in the Spring Kodiak Trawl (SKT) or within 10 days of Delta water temperatures reaching 12° C.

ORMR flows in March through May are primarily a function of San Joaquin River flow into the Delta and export pumping rate. Because San Joaquin River inflow is usually less than the export flow, ORMR flows are often in the reverse or upstream direction. With increasing upstream flows, there is increasing entrainment of delta smelt at the SWP and CVP pumps. The action is to maintain downstream (positive or northward) flow in Old and Middle Rivers once delta smelt spawning begins unless the March-April X_2 position in the Bay-Delta is seaward of 65 km. The action is focused on the first two weeks of April (just prior to the VAMP period), but could be started as early as March 1. Based on the start time, the action could extend over a two to six week period.

Implementation of this action would be triggered when ripe or spent female delta smelt are found in the SKT or within ten days of water temperature in the southern or central Delta increasing to12° C, the temperature at which delta smelt spawning is expected to begin. Ten days is about the time required for the attached eggs to hatch at this temperature, producing free-floating larvae which initially have very limited swimming ability. The action would likely not be necessary if on March 1 the 14-day running average X_2 position in the Bay-Delta is west (seaward) of 65 km because with this condition delta smelt would likely be distributed to the west and spawning would occur away from the influence of SWP and CVP pumping. The action would continue for at least two weeks, or if possible, until the start of the VAMP period (mid-April to mid-May). If these criteria are met, measures will be taken to maintain a downstream flow in Old and Middle Rivers utilizing increased San Joaquin flows or decreased exports at the SWP or CVP facilities.

Rationale: Favorable X_2 location during the spawning period reduces the exposure of delta smelt to effects of reverse flow in the southern Delta channels. With a less favorable X_2 location, avoiding upstream flow in Old and Middle Rivers once smelt have begun spawning in the central or southern Delta will reduce entrainment losses of larval smelt.

Combined particle tracking and 20 millimeter (mm) survey distributions suggest population losses are directly correlated with X_2 position and could reach an estimated 20-40% when X_2 moves landward of 60 km. Maintaining X_2 in a favorable location during the spawning period of delta smelt reduces their exposure to the effects of reverse flow in the southern Delta channels. If X_2 is in a less favorable location and delta smelt spawn within the Central and southern Delta, then avoiding upstream flow in Old and Middle Rivers once they have begun spawning will reduce entrainment losses of the smelt larvae. A favorable location for X_2 during this period is defined as seaward of 65 km based on a 14-day running average.

Delta smelt hatch dates back-calculated from otoliths (ear bones) indicate most fish surviving to summer-fall were hatched during the VAMP period when San Joaquin River flow is typically augmented, export pumping is relatively low and ORMR flows are from south to north (downstream). Ripe and spent adult smelt are commonly observed in the weeks and months prior to the VAMP period, so the scarcity of early-spawned smelt in fish sampling later in the summer or fall suggests either early spawning fish and/or their offspring experience high mortality, including loss from entrainment. If, as hypothesized by Bennett (unpublished data), early-spawned fish have high natural survival rates and potentially high reproductive value to the population, then their increased vulnerability to entrainment episodes may have important negative effects on the population.

Based on otolith strontium chemistry, in the POD years a relatively higher proportion of delta smelt surviving to summer/fall originated in the north and central Delta in recent years (Hobbs/Bennett, unpublished data) while contributions from other areas (e.g. Suisun Marsh) have declined for reasons yet to be determined. If persistence of the population depends increasingly on recruitment from the central Delta, then actions to minimize impacts of water management on survival of fish spawned in this area is warranted.

Pros and Cons:

Pros: Benefits include reduced entrainment of delta smelt, increased abundance and distribution of young delta smelt, and an increased percentage of larger, early-spawned fish. Avoiding upstream

flow on Old and Middle Rivers once spawning has begun should increase the survival of larvae produced in the southern/central Delta. The immediate positive effects on survival of delta smelt larvae seem likely. Whether there is a positive effect on age and size composition or abundance at later life stages, will depend on whether summer food conditions limit smelt population levels. Recent data suggest that summer food levels are limiting delta smelt abundance in the fall. Increasing the survival of delta smelt in the spring and early summer may not translate directly into increased fall population levels of delta smelt unless early hatching fish can survive through the summer.

Cons: Depending on water year and other actions taken, there may not be enough assets to maintain a positive flow in Old and Middle Rivers during this period.

Although the immediate effect on increasing the survival of delta smelt larvae seems likely, the scientific uncertainty of this action is medium-high. No data are presently available to assess this outcome directly because these larval smelt (less than 20 mm) are not detected in current fish facility sampling. The subsequent effect of this action on abundance depends on intervening factors later in the season, such as summer food limitation, which may diminish or override the benefits of this action.

In the post-VAMP period, inflow from the San Joaquin River usually decreases and diversions from the Delta increase. Salvage may increase at this time because the area of the Delta affected by pumping (zone of entrainment) expands as the pumping rate increases. Increased numbers of smelt in the salvage after the VAMP period may also be an indication of a larger post-larval and juvenile population in the affected portion of the Delta due to the benefits from prior action.

Time to Implement: This action can be implemented immediately upon a decision by WOMT. The decision whether to implement an action would be made on a real-time basis dependent on the specific criteria and conditions for the potential action. The action could be triggered on March 1, but would more likely be the first two weeks of April as a pre-VAMP action. The action could extend over a two to six week period depending on the start date.

Costs: Water costs may be highly variable depending on hydrologic conditions and export demand. Estimated water costs for an action during the first two weeks in April range from 35 TAF to 37 TAF. If the action were to extend back to March 1 and continued until mid-April, the estimated maximum total cost would be about 553 TAF (ranging from 35 to 108 TAF per week).

No South Delta Barriers during VAMP and until June 1 (late spring)

Postpone installation of south Delta barriers until June 1 to reduce the proportion of water drawn towards the pumps from the central and south Delta in order to reduce entrainment losses of larval delta smelt.

ORMR flows in March through May are primarily a function of San Joaquin River flow into the Delta and export pumping rate. Because San Joaquin River inflow is usually less than the export flow, ORMR flows are often in the reverse or upstream direction. With increasing upstream flows, there is an increasing entrainment of delta smelt at the project pumps. Under this action, no barriers in

the southern Delta would be operated during the VAMP period (typically April 15 to May 15), and thereafter until June 1. San Joaquin River flow and export pumping would be maintained according to VAMP protocol.

As part of the VAMP experimental design, a barrier is constructed at the head of Old River, where it begins at the San Joaquin River, to keep migrating young salmon in the San Joaquin River where survival is higher than if they move into Old River and the interior Delta. Three other temporary barriers are also constructed at other locations in nearby southern Delta channels. Together, these barriers dramatically alter flow patterns in the southern Delta, blocking the flow of water from the San Joaquin River through upper Old River to the CVP and SWP diversion facilities, so that more exported water flows from north to south in Old and Middle Rivers from the central Delta. During the 31-day VAMP period, combined SWP/CVP export pumping is relatively low, typically 1,500, 2,250 or 3,000 cfs per the VAMP design. Local agricultural diversions also operate at high rates in this season. Positive ORMR flows cannot be achieved unless the export flow is provided from the San Joaquin River via the upper reaches of Old and Middle Rivers.

Rationale: Recent particle tracking models (DSM-2) suggest the south Delta barriers substantially increase central and south Delta particle entrainment risk under VAMP conditions.

Combined particle tracking models and 20 mm survey distributions suggest population losses are directly correlated with X2 position and might reach an estimated 20-40% when X2 moves landward of 60 km. Maintaining X2 in a favorable location during the spawning period of delta smelt reduces their exposure to the effects of reverse flow in the southern Delta channels. A favorable location for X2 during this period is defined as seaward of 65 km during a 14-day running average.

Delta smelt hatch dates back-calculated from otoliths indicate most fish surviving to summer-fall were hatched during the VAMP period when San Joaquin River flow is typically augmented, export pumping is relatively low, and ORMR flows are from south to north (downstream). Ripe and spent adult smelt are commonly observed in the weeks and months prior to the VAMP period, so the scarcity of early-spawned smelt in fish sampling later in the summer or fall suggests either early-spawning fish and/or their offspring experience high mortality, including loss to entrainment. If, as hypothesized by Bennett (unpublished data), early-spawned fish have high natural survival rates and potentially high reproductive value to the population, then their increased vulnerability to entrainment episodes may have important negative effects on the population.

Based on otolith strontium chemistry, in the POD years a relatively higher proportion of fish surviving to summer/fall originated in the north and central Delta in recent years (Hobbs and Bennett, unpublished data) while contributions from other areas (e.g. Suisun Marsh) have declined for reasons yet to be determined. If persistence of the population depends increasingly on recruitment from the central Delta, then actions to minimize impacts of water management on survival of fish spawned in this area is warranted.

Pros and Cons:

Pros: Benefits include reduced entrainment of larval delta smelt, increased abundance and distribution of young delta smelt, and an increased percentage of larger, early-spawned fish.

Avoiding upstream flow on Old and Middle Rivers once spawning has begun should increase the survival of larvae produced in the southern and central Delta.

The immediate positive effects on survival of delta smelt larvae, until the early summer survey, seems likely. However, a positive effect on age and size composition, or abundance at later life stages, will depend on whether summer food conditions for delta smelt limit smelt population levels. Recent data suggest that summer food levels are limiting delta smelt abundance into the fall, and the increase in delta smelt in the spring and early summer may not translate directly into increased fall population levels of delta smelt.

Cons: This action has a medium-high degree of scientific uncertainty. The barrier at the head of Old River is presently utilized to increase survival of Chinook salmon smolts migrating out of the San Joaquin Basin. The other barriers are used to help maintain water levels in the southern Delta to prevent cavitation of agricultural diversion pumps. Postponement of barrier installation would conflict with these purposes.

Time to Implement: Agreement to implement this action may take some time in order to resolve issues regarding the use of these barriers. This action would be implemented during the 31-day VAMP period starting on or about April 15. The barriers addressing local agricultural diversion would not be fully installed until June 1.

Costs: If this action delays ramping up of exports in late May, there may be some costs associated with the action. The maximum estimated cost for two weeks in May would be about 104 TAF (ranging from 26 to 52 TAF per week), and assumes the VAMP combined export level of 1,500 cfs would continue through May 31.

Maintain X_2 West of Collinsville during May-December (summer/fall)

Increase Delta outflow to maintain an average X_2 position west (seaward) of Broad Slough (80 km) near Collinsville from May through December to increase the amount of delta smelt habitat and shift it downstream. Winter entrainment may be reduced and food availability may be improved.

Through a combination of increased upstream releases and decreased project exports, the X_2 position is maintained seaward of Broad Slough during May-December. This action might be implemented if the current water year type is "above normal" or wetter, which is largely determined by precipitation and runoff in the previous winter and spring. This action would not be considered for implementation if the water year is a "below normal" or drier year because water costs would exceed 1 million acre-feet, and such flows cannot be provided by storage releases without dramatic effects on storage levels and temperature conditions for fish upstream in the fall.

Rationale: Higher Delta outflow in the summer and fall can increase the amount of habitat for delta smelt. If smelt use this habitat and their distribution is wider and shifted downstream, subsequent entrainment in the winter will be reduced.

Pros and Cons:

Pros: Benefits may include an improved Environmental Quality Index, wider geographic distribution of delta smelt, decreased larval and adult delta smelt entrainment at project pumps, and an increased percentage of early-spawned fish. Food availability may also be improved resulting in improved survival and health of the fish.

Cons: Water assets could be difficult to provide. The scientific uncertainty of this action is high. The effectiveness of this action depends on fish behavior in reaction to changed habitat conditions, and most responses pertaining to increased population numbers are expected well after the period of action implementation. Post-VAMP delta smelt salvage may increase if Delta inflow from the San Joaquin River decreases and diversions increase because the zone of entrainment expands and the post-larval and juvenile population may be larger due to the positive effects of prior actions.

Time to Implement: Once the management decision is made, and if assets are available, implementation can occur almost immediately.

Costs: This action is estimated to cost up to 425 TAF with most of the water costs occurring September-November. In below normal water years, the water costs would exceed 1 million acre-feet and such flows cannot be provided by storage releases without dramatic effects on storage levels and temperature conditions for fish upstream in the fall. Therefore, it is impractical to provide such flows in below normal and drier years.

LETTER 21

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January 14, 2008

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Via email: delores@water.ca.gov

Re: Comments on the Draft Environmental Impact Report (DEIR) for the Monterey Amendments to the State Water Project Contracts, including the Kern Water Bank Transfer and associated actions as part of a Settlement Agreement (Monterey Plus).

Dear Ms. Brown:

I write on behalf of the California Water Impact Network (C-WIN), a statewide nonprofit organization dedicated to ensuring that California's water resources are allocated in an equitable and environmentally sensitive manner. This letter is also submitted on behalf of the California Sportfishing Protection Alliance (CSPA). The proposed project represents a fundamental alteration of the State Water Project (SWP). It is with this in mind that we submit the following comments on the Draft Environmental Impact Report (DEIR). 21-1

In general, we believe the DEIR has lost sight of the environmental catastrophe that has been accelerating in tandem with the interim implementation of this project. Since 1996, the Sacramento-San Joaquin Delta has descended into an ecosystem crash. A number of critical species have exhibited record low abundance numbers. Recent increases in pumping from the Delta by the SWP and the federal Central Valley Project (CVP) has been identified as a primary cause of the Delta's decline. 21-2 Of particular note are marked increases in winter and spring exports of Article 21 and turnback pool water, brought about in part by the project currently under review. 21-3

Not only has the proposed project contributed to the decline of the Delta, it has facilitated massive urban sprawl in Southern California, where multiple developments are now moving through the planning process, all relying to varying degrees on water that the SWP cannot reliably deliver. 21-4 In this respect, the project's proposed changes to Article 18 and Article 21 are of particular concern. The elimination of Article 18(b) and the Urban Preference previously contained within Article 18(a) eliminate critical drought protections for urban areas and remove provisions that empower DWR to reduce project entitlements to reflect the safe yield of the project <u>without compensating contractors at public expense</u> for the water that they "lost." At the same time, the proposed deletion of Article 21(g)(1)'s prohibition against the use of "surplus" water to support permanent development threatens to make permanent the newest embodiment of the "paper water" problem. 21-5

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By handing the Kern Water Bank (KWB) over to a joint powers authority controlled by private interests, DWR is giving up yet another tool that could be used to hedge against statewide shortages. If approved, this transfer would fundamentally change the purpose of the bank and would eliminate public accountability over that resource. This move could not come at a worse time in California's water history. Just as we need such resources to protect established uses and the public trust, the project proposes giving away the largest groundwater bank in the world. 21-6

Circumstances have changed dramatically since the Monterey Agreement was negotiated. What may have seemed like a good bargain for the people of California in 1995 is now desperately out of sync with reality. *Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal. App. 4th 892 ("PCL v. DWR") and the subsequent Settlement Agreement compel DWR to render a new decision, unclouded by past actions. We believe that DWR has the courage and foresight to resist the inertia associated with this project, and we urge DWR to take a hard look at the costs and benefits of this project for the people of California and the State's precious public trust resources. 21-7

(We also incorporate herein the comments made on behalf of C-WIN by (a) Carolee Krieger at the public forum in Ventura, California, held on December 4, 2007, as well as the letter and exhibits she submitted at that time; and (b) Michael Jackson at the public forum in Quincy, California on November 29, 2007. We further incorporate all other comments submitted by other concerned parties.) 21-8

I. The DEIR Does Not Accurately Disclose DWR's Responsibility to Make a New Decision.

The primary purpose of this EIR is to inform DWR's decision whether to approve, modify, or discard the project or components of the project. However, section 1.2 of the DEIR uses language that obscures this clear purpose. Specifically, at page 1-1, the DEIR states that DWR will use the EIR to "decide whether to *continue* operating under the proposed project...or to decide to implement one of the alternatives to the proposed project." (Emphasis added.) This language suggests that the interim implementation of the project has undergone prior environmental review. This, as DWR is well aware, is not the case. The interim operation of the project will expire as soon as DWR files its return to the Superior Court's writ of mandate. This section should instead explicitly articulate DWR's real responsibilities vis-a-vis the project and its alternatives. Specifically, DWR must make a new decision whether to approve implement aspects of the project, including the Monterey Amendments, the Settlement Agreement, and the transfer of the Kern Fan Element; whether to approve and implement an alternative to the project and/or more substantial mitigation for the project; or whether to approve no project at all. 21-9

This semantic choice is no small matter. Throughout the document, as is demonstrated below, it appears as though DWR is not fully committed to its role as a decision-maker.

II. The DEIR Fails to Accurately Describe Fundamental Aspects of the Project and Omits Critical Information from the Project Description.

a. Subsequent drafts should more accurately explain the role of Article 18(b) in the pre-project contracts.

The DEIR suggests in several places that, under most circumstances, there would be no effective difference between implementation of Article 18(b) and operations under the Monterey Amendments. For example, at page 2-16, the DEIR suggests that even if article 18(b) were implemented, it would have no effect on water deliveries in years where the project yield exceeded the minimum safe yield:

> The effect of an implementation of Article 18(b) would have been to reduce the number of years when agricultural contractors would have to take shortages in years when Article 18(a) was applied to SWP deliveries. It would not, however, have altered the amount of water that the Department delivered to the contractors in the many years when more than the minimum SWP yield was available in the SWP system. Instead, such water would have been delivered to the contractors under Article 21.

Similarly, and for similar reasons, the DEIR suggests that article 18(b) is superfluous language at page 4-5: 21-10

> [O]nce the agriculture first shortage provision was eliminated, [article 18(b)] would no longer be needed to protect agricultural water users from excessive shortages. With the elimination of the agricultural first shortage provisions, it no longer mattered whether a shortage was a temporary one or a permanent one, since the allocation of the available supply would be the same in either situation.

Again, at page 6-51, the DEIR admits that one of the historical operations analyses used to examine the effects of the water supply management aspects of the project does not account for altered water allocation procedures. The DEIR offers several reasons for this failure. Most importantly, the DEIR asserts: "the altered allocation procedures provided for by Articles 18 and 21 result primarily in a shift in deliveries from one contractor to another and do not affect total deliveries..." (DEIR at p. 6-54.)

These assertions are misleading in many respects, most obviously because, as mentioned in nearby passages (e.g., at p. 2-17), the Monterey Amendments altered Article 21 to remove language precluding delivery of Article 21 water if "such delivery would tend to encourage the development of an economy within the area served by such a contractor which would be dependent upon the sustained delivery of water in excess of the contractor's maximum annual entitlement."

The original Article 18(b) served as a safety valve, allowing DWR to lower the project yield to reflect the extent to which water can be delivered on a sustainable basis. If

article 18(b) was invoked and the original Article 21 prohibition against the use of surplus water to support permanent economies were retained, the entire system would be able to operate sustainably and the paper water problem would be completely eliminated.

In contrast, if Article 18(b) and 21(g)(1) are eliminated, Article 21 water, which would be no more predictable than it was before the Monterey Amendments, can be used to fuel permanent economies at the discretion of local land use decision-makers. DWR acknowledges that Article 21 water is "highly unpredictable and unreliable" in its own 2005 Reliability Report.[1]

21-10 (con't.)

Article 18(b) is not just a protective device for agricultural contractors, nor does it become superfluous upon the elimination of Article 18(a). Article 18(b) paired with Article 21(g)(1) is an important safety valve that could operate to maintain the long-term sustainability of the project. It must be described as such in subsequent drafts of the EIR

b. The role of Article 18(a) in the pre-Monterey contracts should also be more accurately explained.

In addition to operating as a shortage allocation mechanism, Article 18(a) served as a constraint on transfers that might have had growth inducing impacts. In the absence of the Monterey Amendments, entitlement transferred from an agricultural contractor to an M&I contractor would have retained its agricultural priority (or lack thereof). This limited the use of such transferred water to support permanent developments, as it could not be relied upon in times of shortage. This should be clearly disclosed in subsequent drafts.

21-11

c. The EIR should explain DWR's right to so-called "surplus water."

The EIR states that it delivers surplus water when all of the following conditions exist "the SWP's share of San Luis Reservoir is full, or projected to be full in the near term; other SWP reservoirs are full or at their storage targets, or the conveyance capacity to fill these reservoirs is maximized; the Delta is in 'excess' conditions []; Table A deliveries are being fully met; and the Banks Pumping Plant has spare capacity." (DEIR at p. 2-17.)

Yet, nowhere does the DEIR explain what right the SWP has to extract so-called surplus water in the Delta. These waters, which are being extracted from an ecosystem in crisis, are subject to the public trust. The public is entitled to a description of the basis upon which DWR distributes this resource to SWP contractors. As is demonstrated below, delivery of Article 21 water has increased considerably in recent years. Yet, given the continuing decline of the Delta ecosystem, from which Article 21 water is taken, it is clear that these deliveries are not truly "surplus" to the needs of the ecosystem. DWR should explain how, if at all, their operational definition of surplus comports with the ecological reality in the Delta.

21-12

[1] Attachment 1, DWR, The State Water Project Delivery Reliability Report 2005 (2006) at p. 15.)

The scoping comments submitted by Robert C. Wilkenson previously pointed out the need for such a disclosure, emphasizing that "[i]f 'surplus' water is unavailable to DWR dues to uses by more senior appropriators and/or upstream users exercising their legal claims to water and/or due to water quality environmental, and other legal requirements, the SWP's ability to deliver water will be impacted." (DEIR, Appendix, B, Comments of Robert C. Wilkenson at p. 5.)

21-12 (con't.)

d. The DEIR fails to clearly disclose Article 53's proposed privatization of the SWP.

Section 4.4.2 at page 4-6 generally describes that the addition of Article 53 to the long-term water supply contracts will allow for the permanent transfer of 130,000 AF of Table A entitlement on a willing buyer/willing seller basis to M&I contractors or non contractors. This section, which is one paragraph in length, does not fully explain the implications of Article 53. For instance, Article 53 also allows for the permanent transfer of entitlements among contractors above and beyond 130,000 AF with little state oversight. This, in effect, allows for the wholesale privatization of the SWP.[2]

21-13

The text at page 4-6 does explain that Article 53 also provides for the permanent retirement of 45,000 AF of Table A entitlements. However, to avoid giving the false impression that this retirement will reduce overall deliveries by 45,000 AF, the section should also explain that only a portion of that amount had been historically available to the "donor" prior to its retirement.

e. The DEIR does not describe the practical effect of the water management practices described in Section 4.4.4.

Together, all of the water management practices described in section 4.4.4 ensure that Delta exports remain at their maximum during all times of the year. This should be clearly disclosed.

21-14

For example, the Turnback Pool is described generically as a mechanism that "enables contractors to be partially compensated for unused allocated Table A water purchased by other SWP contractors and increases the likelihood that any excess allocated water would be available to other contractors early enough in the year to be managed and used more efficiently." (DEIR at p. 4-8.) Although this is an accurate description of one aspect of the Turnback Pool, the Pool also serves to motivate contractors to ask for their full entitlement even if they do not need it or have nowhere to store it, because they can use any excess the next year and/or sell it on the market.

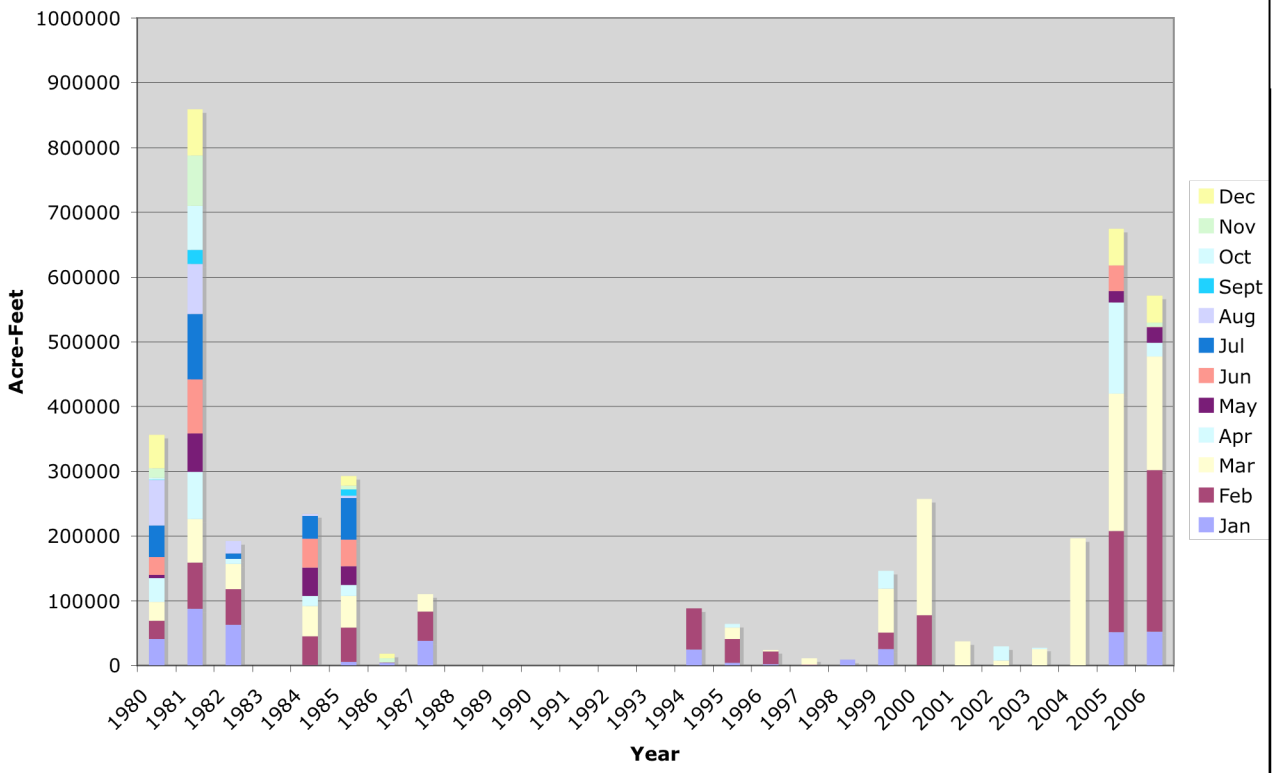
[2] DEIR Appendix C, Kern County Water Agency Contract Amendment No. 23, at p. 42-43, Art. 53(h).

In part as a result of the project-related changes to water management practices, demand for Article 21 water, particularly from urban contractors, has increased since the interim implementation of the Monterey Agreement.

Through a Public Records Act request, C-WIN obtained monthly delivery data for the two largest SWP agricultural contractors (Kern County Water Agency & Tulare Lake Basin Water Storage District) and the two largest M&I contractors (Metropolitan Water District of Southern California and Santa Clara Valley Water District) from 1980 to 2007.[3]

Utilizing this data, Figure A, charts the delivery of "surplus" water (pre 1994) and Article 21 water (post-1994). Each column represents a year of deliveries, from 1980 to 2006. Each column is, in turn, broken down to show the monthly contribution to the total. Most critically, during those years in which so-called surplus or Article 21 water is made available, the post-Monterey period shows a clear trend toward delivering that water earlier in the year.

Figure A
Delivery of Surplus & Article 21 Water Delivered to KCWA, TLBWSD, MWDSC & SCVWD



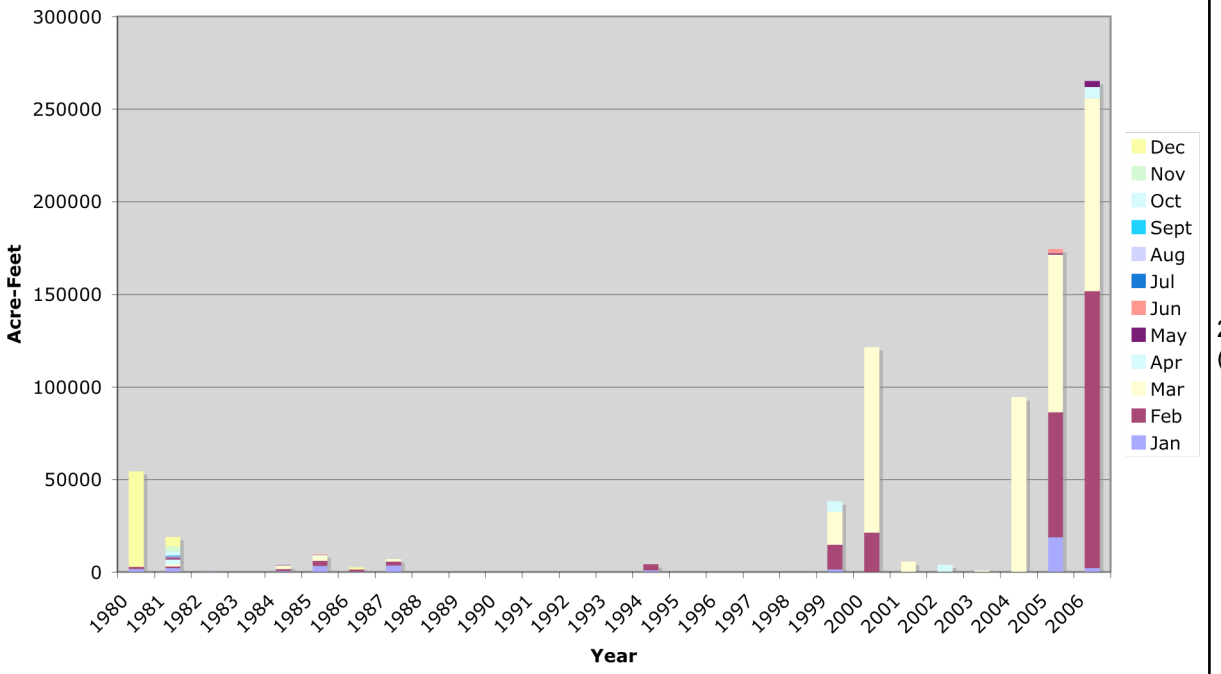
21-14 (con't.)

Figure B charts the deliveries of surplus and/or Article 21 water to the two largest M&I contractors only. This chart clearly demonstrates a huge spike in post-Monterey

[3] That raw data is attached to this letter as two electronic files, Electronic Attachment A & B. (No hard copy has been attached.)

deliveries of "surplus" water to M&I contractors, particularly in January, February, and March.

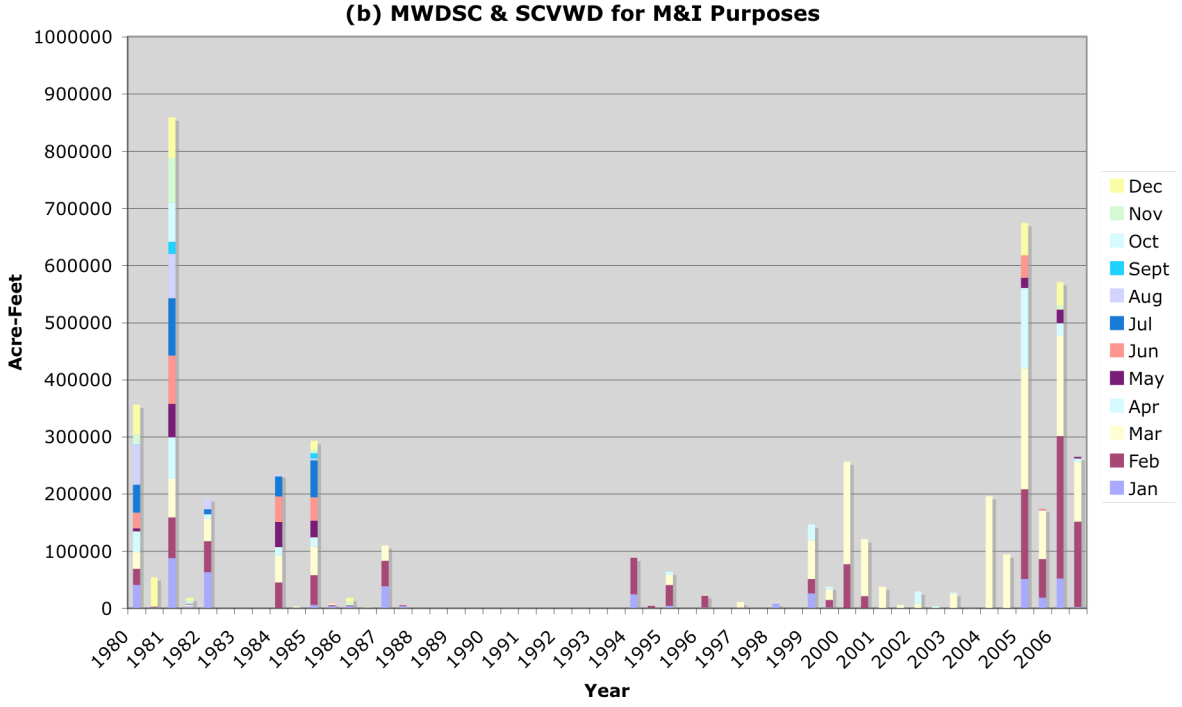
Figure B
Deliveries of Surplus & Article 21 Water to MWDSC and SCVWD for M&I Purposes



21-14 (con't.)

Figure C places the information from Figures A and B side-by-side to depict the relative contribution of the M&I deliveries to the total. Noticeably, prior to the interim implementation of the Monterey Amendments, M&I demand for surplus water constituted a negligible fraction of overall surplus water deliveries, while post-interim implementation, M&I deliveries of "surplus" water were considerable.

Figure C
Side-by-side comparison of Surplus/Article 21 Deliveries to:
(a) KCWA, TLBWSD, MWDSC & SCVWD All Contractor versus
(b) MWDSC & SCVWD for M&I Purposes



21-14 (con't.)

This analysis should be repeated by DWR for all contractors and disclosed in the DEIR. To the extent that DWR asserts this shift in timing can be attributed to other causes, DWR should explicitly demonstrate the relative contribution of those other explanations for seasonal shifts in Article 21 demand.

III. There Are Fundamental Problems with the DEIR's "Baseline."

a. The DEIR confuses the concept of a "baseline" with the concept of a "no project alternative."

21-15

According to CEQA Guideline § 15125(a), an EIR must "include a description of the physical environmental conditions in the vicinity of the project, as they exist at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced, from both a local and regional perspective." Critically, "[t]his environmental setting will normally constitute the baseline physical conditions by which a lead agency determines whether an impact is significant." (*Id.*)

The DEIR utilizes three different points in time as landmarks for its analyses: 1995, 2003, and 2020. As a threshold mater, it no longer makes sense to utilize 2020, which is a scant

12 years away, as the outside limit of DWR's analysis. Other DWR documents analyze scenarios extending to 2035.[4]

The DEIR indicates that the baseline "condition that existed in 1995 was adjusted...to include events that are expected to occur over time unrelated to the Monterey Amendment or the Settlement Agreement." (DEIR at p. 5-2.) For example, the baseline for 2020 includes "[o]ther changes and transfers unrelated to the Monterey Amendment that occurred since 2003 or are anticipated to occur by 2020 (including 100,000 AF of Table A transfers from MWDSC to Coachella Valley WD and Desert WA)." (DEIR p. 5-3.) Similarly, Appendix F to the DEIR indicates that "the 2003 and 2020 Baseline scenarios include inputs such as increased Table A amounts and water demands to capture immutable and non-discretionary changes that occurred from 1995 to 2003 and that will occur in the future." (DEIR, Appendix F, at p. 4.)

There are several fundamental problems with this approach to designing the baseline. First, the DEIR does not provide a detailed explanation of the exact "anticipated" and "future" changes that are in fact included in the baseline scenarios. The most detailed description we could locate is provided at page 5-2, which states:

> Thus, the baseline for the Monterey Plus EIR will be continued operation of the SWP in accordance with the long-term water supply agreements but adjusted to include events that are expected to occur over time that are not related to [the] Monterey Amendment and the Settlement Agreement. The events expected to occur between 1995 and 2020, unrelated to the proposed project, include increased population growth and urban development in California, increased demand for water in the SWP service area and elsewhere and certain Table A transfers.

21-15 (con't.)

(Emphasis added.)

Second, as a general matter, it is inappropriate to include anticipated future changes, such as anticipated population growth and urban development, in a baseline scenario. That is the role of the "no project" scenario under CEQA. This is made explicitly clear in CEQA Guideline § 15126.6(e), which states in pertinent part:

> (1) The specific alternative of "no project" shall also be evaluated along with its impact. The purpose of describing and analyzing a no project alternative is to allow decisionmakers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project. The no project alternative analysis is not the baseline for

[4] DWR uses this 2020 end date as an excuse for not thoroughly analyzing the impact of climate change on project operations, asserting that "the extent to which these effects will be felt between now and 2020 has not been studied and remains unknown." (DEIR at p. 12-12.) Yet, in the subsequent paragraph, DWR acknowledges that between 2035 and 2064, studies indicate that Table A supplies could decline by up to 10 percent.

> determining whether the proposed project's environmental impacts may be significant, unless it is identical to the existing environmental setting analysis which does establish that baseline (see Section 15125).
>
> (2) The "no project" analysis shall discuss the existing conditions at the time the notice of preparation is published, or if no notice of preparation is published, at the time environmental analysis is commenced, as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services....

(Emphasis added.)

21-15 (con't.)

By describing the baseline as a condition that includes certain changes that "would be reasonably expected to occur in the foreseeable future if the project were not approved," the DEIR has fundamentally corrupted the impact analyses in Chapters 6 and 7. By skewing the baseline to reflect, for example, increased demand caused by these anticipated future changes, the project's relative impact on the environment may be masked, thereby resulting in findings of no significant impact where impacts might otherwise surface. Practically, this has impact of narrowing the categories of environmental impacts that are subject to comparison during the alternative analysis.

At the very least, the methods/baseline section must be clarified to more clearly explain what future anticipated changes are included in the baseline and why those impacts have been included in the baseline, rather than only in a no project alternative. In addition, the baseline should be adjusted to more faithfully reflect the role of the "baseline" scenario under CEQA.

b. The baseline scenarios fail to account for the manner by which the Monterey Agreement changed contractor demand for water.

21-16

As described above at Part II(g), deliveries of Surplus/Article 21 water, particularly early in the year, have increased since the interim implementation of the project. This is presumably a reflection in changed patterns of demand. The baseline scenario fails to account for these changed patterns of demand.

c. The historical baseline scenarios utilized in the DEIR fail to back out certain aspects of the Monterey Agreement.

21-17

The DEIR appears to fail to back out all aspects of the project from the various baseline scenarios described in Chapter 5. For example, while historical study #1 does back out of the baseline the changed allocation scheme and the Table A retirements, it does not attempt to back out of the baseline the project's changes to contractors' ability to store water outside their service areas, changes to the Turnback Pool, or the deletion of Article 21(g)(1), which precluded use of surplus water to fuel permanent economies. Again, this skews the analysis so as to minimize the difference between the baseline and the project.

IV. The DEIR Inappropriately Relies Upon CalSim II as a Tool for Environmental Impact Analysis.

a. It is inappropriate to rely upon an optimization model as the primary tool for the measurement of environmental impacts under CEQA.

CalSim II is an optimization model that, on its own, cannot satisfy CEQA's mandate to analyze and disclose the environmental impacts of a proposed project. CalSim II does enable programmers to include certain environmental requirements as constraints (e.g., Delta water quality standards). However, even assuming all relevant constraints have been added to the code (an assumption which is refuted below), these constraints operate as a ceiling on deliveries. Although CalSim II will not model deliveries above this threshold, thereby ensuring compliance with those environmental constraints contained within the code, it is the nature of an optimization model to assume that deliveries will reach all the way to this ceiling, causing the maximum environmental impact permissible under the laws/regulations/requirements that happen to be coded into the program. Stated another way, CalSim II never allows the DEIR to truly measure environmental harm beyond simply projecting how to maximize deliveries without violating the incorporated environmental constraints. 21-18

This approach is at odds with the fundamental purpose of CEQA, which is to disclose to the public the spectrum of environmental impacts caused by the project vis-a-vis the no-project alternative and other alternatives. A report produced by the Natural Heritage Institute entitled "An Environmental Review of CalSim-II" summarizes this flaw succinctly by "call[ing] into question the use of CalSim-II as a tool for environmental impact assessment, since it is changes in the environment associated with specific projects and not the satisfaction of arbitrary constraints which is the critical focus of environmental review."[5]

b. Subsequent drafts of the EIR should provide a more balanced summary of the Strategic Review's findings.

At p. 5-10, the DEIR attempts to summarize the findings of the CALFED Science Program's peer review of CalSim II. However, the DEIR does not faithfully disclose the severity of the critique presented in the Strategic Review. For example, the bullet points included at the bottom of p. 5-10 suggest that the findings of the Strategic Review were all positive. They undoubtedly were not. The public is entitled to a more balanced summary of the Strategic Review. 21-19

[5] Attachment 6, J. Payne & D. Purkey, An Environmental Review of CalSim-II: Defining "Full Environmental Compliance" and "Environmentally Preferred" Formulations of the CalSim-II Model" (November 2005), at p. 14.

c. CalSim II does not include critical constraints regarding mandated Delta fish species protection or ecosystem restoration actions.

CalSim II contains no code to account for the myriad of flow, habitat, and water quality requirements mandated by federal and state species protection statutes. As a result, there is, again, an "aura of unreality,"[6] about all aspects of this DEIR that rely upon CalSim II. In the face of potentially the most significant set of environmental cutbacks mandated in the history of the SWP -- the interim delta smelt protection order -- this DEIR proceeds without incorporating any Endangered Species Act requirements into its modeling. Given the model's failure to reflect this significant environmental constraint on operations, CalSim II is not suited to the task at hand, namely, the disclosure of the project's impacts on the environment.

Nor does CalSim II possess any capacity to account for or measure the project's impacts upon efforts to restore the Delta watershed and its fisheries. By focusing so completely on a handful of largely outmoded environmental constraints, CalSim II fails to evaluate how the pumping changes engendered by the project will impede ongoing or future restoration programs. 21-20

Performing a more appropriate analysis is feasible. For example, in separate comments submitted to DWR on behalf of the Citizens Planning Association of Santa Barbara County, Dr. Arve Sjovold indicates that, although there are no routines in CalSim II to model reverse flows that contribute to delta smelt entrainment, there is sufficient information to allow the model to predict when such flows would occur. This information could be used to incorporate a smelt-protection constraint on Delta pumping based on anticipated reverse flows.

Alternatively, subsequent drafts of the EIR could turn away from the DEIR's heavy reliance on modeling in favor of more traditional approaches to impact analysis, such as hands on environmental monitoring, analysis by fisheries experts, etc.

d. Other problems with the use of CalSim II in this document.

- **CalSim II assumes perfect supply and perfect demand.** The notion of perfect supply is based on the erroneous assumption that groundwater can always be obtained to augment upstream SWP supply. Among other things, operating under this assumption risks causing impacts to ecosystems dependent upon the groundwater basins in the areas of origin. The notion of perfect demand is also problematic.[7] Prior to the interim implementation of the Monterey Agreement, 21-21

[6] *PCL v. DWR*, 83 Cal. App. 4th at 913.

[7] The DEIR purports to address previous criticisms regarding the overestimation of demand by revising demand estimates as described in Appendix F. (See page 5-11.) However, according to Appendix F, although the categories of demand may have

contractors did not demand their full Table A amounts every year. The project has offered contractors opportunities to take and store water when they otherwise would have had nowhere to put it. The assumption by CalSim II that demand is always constant under all modeling scenarios makes it impossible for the CalSim II runs utilized in this EIR to truly measure the impact of the demand-altering aspects of the project.

21-21 (con't.)

- **Actual operations are not faithful to legal constraints**. In reality, operations do not always comply with legal constraints, threatening the ecosystem values protected by these constraints.[8] CalSim-II has no way of accounting for this reality.

21-22

- **CalSim II has not been calibrated, nor is there any way to account for uncertainty in the model's operation.** These and other flaws in CalSim II have been pointed out to DWR on many occasions. Given CalSim II's well-documented shortcomings, DWR should consider imposing upon all CalSim II model predictions a margin of safety that would prevent harm to the environment until a more accurate model is available.

21-23

Subsequent drafts of the EIR should address and/or disclose all of the above issues. Attempts should also be made to adjust CalSim II (or another model) to account for **all** Delta environmental constraints. In addition, DWR could post-process the CalSim II results to build in a margin of safety to account for Delta health and restoration and the model's uncertainties.

V. The Project's Impacts Upon SWP Deliveries.

a. The Final EIR should include a full description and analysis of the impact of the delta smelt/OCAP decision on the delivery reliability of the SWP.

21-24

Conspicuously absent from Section 6.3 (Changes in SWP Operations Since 1995 Unrelated to the Proposed Project) is any mention of the Delta Smelt/OCAP case, arguably the most significant environmental constraint upon the SWP moving forward. Although the final interim order imposing conditions upon Delta pumping facilities did not come out until December 14, 2007, after the DEIR was issued, the federal court's summary judgment decision was issued on May 25, 2007, many months before the DEIR.[9]

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changed, overall demand of the SWP remained constant across all modeling scenarios. (*See* Appendix F, at p. 11.)

[8] *See generally*, Payne & Purkey, An Environmental Review of CalSim-II, *supra* at n. 5.

[9] Attachment 7, *NRDC v. Kempthorne*, 1:05-cv-1207 (EDCA), Doc. 560, Interim Remedial Order Following Summary Judgment and Evidentiary Hearing, dated Dec. 14,

Regardless of the timing of the decision vis-a-vis the issuance of the DEIR, it is beyond dispute that the final order is significant enough to merit discussion in the final EIR and/or a supplemental EIR. For example, a recent article in the Sacramento Bee indicated that on December 28, 2007, shortly after the issuance of the final interim order, Delta exports were cut in half to protect the smelt from entrainment.[10] Such significant cutbacks were predicted by DWR's own scientists well before the issuance of the final order by the federal court. On July 9, 2007, DWR's Chief of Project Operations Planning Branch, John Leahigh, declared that under the interim remedy actions proposed by the United States Fish and Wildlife Service, as supported by DWR, SWP 2008 deliveries would be reduced anywhere between 8% (91,000 AF) to 27% (305,000 AF) from a baseline delivery of 1.15 MAFY in a dry year; and from between 8% (252,000 AF) and 31% (305,000) from a baseline of 3 MAFY in an average year.[11] A recent Metropolitan Water District of Southern California staff report indicated similarly dramatic cutbacks would result from the delta smelt decision and that the project worsened the impact of these cutbacks upon MWDSC vis-a-vis the baseline.[12]

21-24 (con't.)

Although it is not exactly clear how the types of cutbacks imposed by way of the interim remedy will translate into permanent changes to operations under the not-yet-issued Biological Opinion (BiOp), it is safe to say that the OCAP BiOp will impose significant, substantially similar, cutbacks. Although it may not be possible to precisely model the nature of these future cutbacks, the likelihood of their imposition should be disclosed and thoroughly discussed. The types of cutbacks ordered during the interim period could be evaluated as an example of the types of cutbacks that might be ordered on a permanent basis.

Subsequent drafts of the EIR should note, in particular, the timing of cutbacks that will be needed to avoid jeopardy of and restore the delta smelt. Specifically, those cutbacks are and will probably continue to focus on winter and spring pumping, exactly the period of time during which project-induced pumping has taken place in the past.

2007; Attachment 8, *NRDC v. Kempthorne*, Doc. 323, Order Granting In Part and Denying In part Plaintiffs' Motion for Summary Judgment, dated May 25, 2007.

[10] Attachment 9, Matt Weiser, Delta Water Exports Halved, SacBee.com, December 29, 2007.

[11] Attachment 10, *NRDC v. Kempthorne*, Doc. 398, Declaration of J. Leahigh, dated July 9, 2007, at ¶¶ 6. 36-37.

[12] Attachment 11, MWDSC, Update on Monterey Amendment, PowerPoint Presentation to the Water Planning and Stewardship Committee, Agenda Item 6(e), presented Jan. 7, 2008, dated Jan. 9, 2008, at slide 5.

b. The results of the analyses contained within Chapter 6 must be reconciled with observed increases in deliveries.

The DEIR fails to clearly explain, in a manner intelligible to a member of the general public, how the results of various studies comport with observed increases in pumping. For example, how can Study No. 2, which concluded that from 1996 to 2004, the project resulted in increased deliveries of only 44,000 AF (total), be reconciled with observed increased deliveries from the project as a whole, and, specifically, increases in winter and spring deliveries of 49% and 30% respectively?[13]

21-25

Subsequent drafts of the EIR should contain a clear explanation of how these large annual and seasonal changes can be explained, if they are not caused by project operations.

c. The DEIR should clearly disclose the seasonality of the increase predicted by in Study No. 3

Study No 3 indicates that in the future, the project will increase annual deliveries of SWP water by 50,000 AF/year. (DEIR at 6-64.) Future drafts of the EIR should clearly disclose the months during which these increases are expected to occur.

VI. The Impact of the Project on the Environmental Water Account.

a. The DEIR should more clearly explain what the EWA is and how it operates, including an explanation that the EWA causes increased pumping at Banks.

Nowhere does the DEIR clearly explain how the EWA operates. A clear, complete, and accurate explanation of the EWA program should be included in any subsequent drafts. Some clear language on the issue can be found in the Environmental Defense report: "Finding the Water."[14]

21-26

In particular, subsequent drafts of the EIR should take care to faithfully disclose that the EWA causes increased Delta exports by compensating contractors for water that could otherwise be withheld under various laws. For example, at p. 6-14, the DEIR cryptically states that "[t]he result of this aspect of EWA operations is to reduce the amount of time when all SWP reservoirs south of the Delta are full or at their storage targets, all SWP demands are being met, and Banks pumping can be reduced. Banks pumping would

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[13] Attachment 12, The Bay Institute, et al., Petition to the State of California Fish and Game Commission and Supporting Information for Listing the Delta Smelt (*Hypomesus transpacificus*) as an Endangered Species under the California Endangered Species Act (Feb. 7, 2007) at p. 25.

[14] Attachment 13, Environmental Defense, "Finding the Water: New Water Supply Opportunities to Revive the San Francisco Bay Delta Ecosystem" (2005) at p. 5.

generally not be reduced until the EWA debt has been repaid and SWP storage in San Luis Reservoir is physically full." This language is too vague. 21-26 (con't.)

b. The DEIR improperly classifies the impact of increasing EWA costs as an "economic" not an "environmental" impact.

The DEIR admits that implementation of the project could increase EWA costs by about 10 percent in years when curtailments occurred, but states that "because this is an economic and not a physical environmental impact, no significance conclusions were drawn." (DEIR at p. 7.1-61.) This is pure fiction. Impacts upon EWA funding directly translate into environmental impacts. For example, because the EWA has been chronically underfunded, it has failed to function as originally envisioned and has limited the willingness of responsible agencies to fully implement recommended fish protection actions.[15] On this topic, we incorporate the attached December 10, 2007 comment letter from the Natural Resources Defense Council to the Bureau of Reclamation Re: the Draft Supplemental EIS/EIR for Extending the Environmental Water Account, as well as a number of exhibits to that letter.[16] 21-27

The past performance of the EWA and the environmental impacts that have resulted from underfunding the program must be considered in subsequent drafts of the EIR. *See Laurel Heights Improvement Association v. Regents of the University of California*, (1988) 47 Cal. 3d 376, 420 ("Because an EIR cannot be meaningfully considered in a vacuum devoid of reality, a project proponent's prior environmental record is properly a subject of close consideration in determining the sufficiency of a proponent's promises in an EIR.").

VII. The Project's Impacts Upon Groundwater Resources in the Area of Origin Are Not Disclosed.

As discussed above, CalSim II is hard-wired to assume perfect supply. In part, this results in an assumption that the SWP can access groundwater from the Sacramento River basin. However, the SWP has no right to this groundwater, which lies in an unadjudicated basin. There is no mention in the DEIR of the potential environmental problems that may result from tapping into this aquifer and/or of the fallacy of relying on this water as a source of SWP supply. Both are fundamental flaws that must be addressed. 21-28

[15] *See* Finding the Water, *supra* note 14.

[16] Attachments 14 & 14-A through 14-N.

VIII. Fisheries Impacts & Related Mitigation Measures.

a. The DEIR should disclose that project operations are believed to be a significant contributor to the Pelagic Organism Decline (POD).

The DEIR does not accurately disclose the status of scientific understanding regarding the cause of the Pelagic Organism Decline (POD). For example, at page 7.3-25, the DEIR states:

> POD investigations have proceeded under a *hypothesis* that the recent declines are a response to a new stressor (or at least a new version of an old stressor). The investigation centers around impacts of water project operations, food web changes, and contaminants.

(Emphasis added.)

The impact of the export pumps upon pelagic organisms has evolved beyond mere hypothesis. Subsequent drafts of the EIR should disclose that there is mounting scientific evidence indicating that the export pumps are a major contributing cause to the POD through direct entrainment, habitat modification, and other indirect effects.[17]

21-29

b. Subsequent drafts of the EIR should include the most up-to-date information regarding the POD.

Given the precarious state of the pelagic organisms in the Delta, it is imperative that this EIR attempt to include as much up-to-date information as possible in its analysis of project impacts upon fisheries resources. For example, table 7.3-14, at page 7.3-27, presents the annual results of the adult delta smelt recovery index from 1967 through 2005. This table should be updated to include the 2006 and 2007 results, both of which are now available.[18]

21-30

[17] Attachment 15, F. Feyrer, M. Nobriga & T. Sommer, Multidecadal trends for three declining fish species: habitat patterns and mechanisms in the San Francisco Estuary, California, USA, Can. J. Fish. Aquat. Sci. 64: 723-734 (2007); Attachment 16, N. Monsen, J. Cloern, J. Burau, Effects of Flow Diversions on Water Habitat Quality: Examples from California's Highly Manipulated Sacramento-San Joaquin Delta (July 2007); The Bay Institute, et al., 2007, *supra*, at p. 21-32.

[18] Attachment 31, California Department of Fish and Game, Fall Midwater Trawl Survey Results (2005-2007), available at "http://www.delta.dfg.ca.gov/data/mwt/."

c. Subsequent drafts of the EIR should acknowledge that observable take of delta smelt at the pumps represents a tiny fraction of actual take.

The only quantitative analyses of the project's impacts upon delta smelt contained within the DEIR proceeds by first identifying periods of time during which the project increased pumping at Banks and then examining whether delta smelt take was measured at the pumps during those periods of time. This approach is flawed on many levels.

First, observed incidental take of delta smelt at the state and federal water export facilities is a gross underestimate of the actual number of delta smelt entrained (i.e., killed) at the pumps. The daily take numbers utilized in the DEIR's analysis are calculated by periodically sampling water that is diverted away from the pump intakes by a set of louvers and/or fish screens. Fish that are above 20 mm in length are then counted as having been "taken" during the sampling period. The total "take" for a period of time is then extrapolated from that sampled take. For several reasons, this calculated "take" is not representative of the actual take of delta smelt. First, the louvers and/or fish screens are known to be highly inefficient in their ability to divert smelt away from the pumps (as compared to other, larger fish species). It is estimated that the louvers and/or fish screens miss more than half of the delta smelt that are caught up in the pumping process. Second, delta smelt larvae and juveniles are too small to be counted. Nevertheless, larval and juvenile entrainment is estimated to reach several million individuals each year. Finally, it is not known how many smelt that are drawn near to the pumping facilities are lost to predation and/or other factors and never reach the counting facility.[19]

21-30 (con't.)

d. Subsequent drafts of the EIR should explain why the document considers project-related contributions to certain salvage events to be "negligible."

In project-related smelt take events # 2 and #3, described at page 7.3-51, the DEIR concludes that the project resulted in negligible contributions to salvage. Yet, it is not clearly explained why the DEIR reaches these conclusions. For example, in event #3, the project contributed a small amount to a month-and-a-half-long continuous salvage event. Although the daily contribution of the project may be relatively small, the project's cumulative contribution to the take event is arguably considerable. The EIR should explain why it concludes otherwise.

21-31

[19] Attachment 17, M. Bowen, et al., Empirical and experimental analyses of secondary louver efficiency at the Tracy Fish Collection Facility, March 1996 to November 1997, Tracy Fish Facility Studies, Volume 11, U.S. Bureau of Reclamation, Mid-Pacific Region, Denver Technical Service Center (2004); Attachment 18, U.S. Fish & Wildlife Service, 5-Year Review, *Hypomesus transpacificus* (delta smelt), Sacramento Fish and Wildlife Office, Sacramento, CA (2004); *see also* The Bay Institute, et al., 2007, *supra*.

e. Subsequent drafts of the EIR should evaluate the indirect impacts of project operations.

As discussed above, the analysis of how the increased pumping caused by the project will impact fisheries is confined to an examination of a handful of specific "events" during which project-related pumping coincided with measured smelt and splittail salvage at the pumps. No effort was made to estimate, either qualitatively or quantitatively, the other, indirect impacts exports have on fish species, such as impacts to habitat, water quality, etc. 21-32

f. Subsequent drafts of the EIR should more closely evaluate project impacts upon salmonids passing through the Delta.

The DEIR, in section 7.3-5, which purports to discuss the effect of the project on special-status fish species in the Sacramento-San Joaquin Delta due to Delta export changes, makes no effort to either qualitatively or quantitatively estimate the impact of the project's operations on migrating salmonids. This is a particularly glaring omission, given that the section concludes at page 7.3-52, that project-related changes in Delta flow patterns could "disrupt movement of species of fish, and increase entrainment losses of adult delta smelt and salmonid smolts." 21-33

The DEIR has a responsibility to address the reality that recent salmonid returns, representing the first few post-project salmonid populations to return from the ocean, are at record low population levels.[20] A draft report recently prepared for the CALFED Independent Science Board concludes that increased transit time through the Delta is connected with increased mortality of out-migrating Chinook salmon.[21]

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[20] Attachment 19, California Department of Fish and Game (CDFG) 2007. Excel spreadsheet summary of Chinook salmon escapement for Central Valley Streams, "Grandtab", August 22, 2007 revision. Prepared by the Native Anadromous Fish and Watershed Branch, California Department of the Fish and Game; Attachment 20, John Willams Central Valley Salmon: A Perspective on Chinook and Steelhead in the Central Valley of California, San Francisco Estuary & Watershed Science, Vol. 4, Issue 3, Art. 2 (2006).

[21] Attachment 33, J. Burau, et al., Sacramento/San Joaquin River Delta Regional Salmon Outmigration Study Plan: Developing Understanding For Management And Restoration (December 10, 2007), Draft Prepared for January 8, 2007 Meeting of the CALFED Independent Science Board.

g. The DEIR's conclusion that environmental programs in place from 1996 through 2003 were sufficient to render project impacts less-than-significant is unsupportable.

Despite having concluded that project-related pumping increases from November through March "could change Delta flow patterns, disrupt movement of species of fish, and increase entrainment losses of adult delta smelt and salmonid smolts" (DEIR at 7.3-52), the DEIR concludes that various other programs and agreements are sufficient to have prevented species impacts from 1996 through 2003:

> The department believes that the environmental agreements developed with CDFG prior to and during the 1996-2003 timeframe were sufficient to protect Delta species from the impacts of pumping and satisfy any statutory requirements (see Mitigation Measures section below). In addition, the Banks pumping curtailments to address federal ESA concerns in 1996 (71,000 AF May 16-24), 1997 (10,000 AF June 7-11), 1999 (292,000 AF May 20-June 30), and 2000 (28,000 AF May 25-31) provided some added fish benefits. Beginning in 2000, the EWA Program provided real-time adaptive management response to fish distribution, abundance, and salvage in the Delta.

(DEIR at 7.3-52.)

This ignores the well-documented ecological crisis in the delta, which has worsened in recent years at least in part because of export pumping. (See, e.g., the Adult Delta Smelt Recovery Index, at Table 7.3-14.) The specific programs listed in the DEIR at page 7.3-52 - 7.3-53 are demonstrably not doing enough to sustain Delta species.

21-34

h. It is improper for the DEIR to rely so heavily on existing and planned programs designed to comply with Endangered Species Act requirements.

The DEIR justifies its finding of less-than-significant impact on special status species in the Sacramento San-Joaquin Delta in part because of the existence of several biological opinions issued under the federal Endangered Species Act to provide incidental take coverage for CVP and SWP facilities. Reliance upon these biological opinions is fundamentally misplaced for several reasons.

21-35

First, the DEIR should acknowledge that the district court in *NRDC v. Kempthorne* held that the central pillar around which the most recent delta smelt biological opinion is constructed, an adaptive management program known as the Delta Smelt Risk Assessment Matrix (DSRAM), is unlawful as currently designed.

> The existing DSRAM process provides absolutely no certainty that any needed smelt protection actions will be taken at any time by DSWG or WOMT. The DSRAM is in substance an organizational flow chart that

> prescribes that certain administrative processes (meetings) will be held whenever a trigger criteria is met or exceeded. Although mitigation measures are identified, no defined mitigation goals are required, nor is any time for implementation prescribed. Incorporating some ascertainable mitigation standards and enforceable mitigation measures is not inconsistent with avoiding unduly restrictive "hard-wiring" of the DSRAM. ***
>
> Here, the adaptive management process has no quantified objectives or required mitigation measures. Although the process must be implemented by holding meetings and making recommendations, nothing requires that any actions ever be taken. The BiOp asks the court to trust the agency to protect the species and its habitat. Notwithstanding any required deference to expertise, the ESA requires more. All parties agree that adaptive management can be beneficial and that flexibility is a necessary incident of adaptive management. The law requires that a balance be struck between the dual needs of flexibility and certainty. The DSRAM, as currently structured, does not provide the required reasonable certainty to assure appropriate and necessary mitigation measures will be implemented. The DSRAM does not provide reasonable assurance admitted adverse impacts of the 2004 OCAP will be mitigated.

21-35 (con't.)

(*NRDC v. Kempthorne*, Summary Judgment Decision at 57-58.)

More generally, even if the ESA-related programs listed in the DEIR brought the projects into full compliance with the ESA, this would not necessarily satisfy DWR's mandate under CEQA to mitigate significant environmental impacts whenever feasible.

i. The proposed mitigation measure of implementing an EWA-type program is insufficient.

The DEIR concludes at page 7.3-71 that future implementation of the project has the potential to "have an adverse impact on Delta fish species by increasing salvage at the Skinner facility as a result of higher pumping at Banks during certain periods when San Luis Reservoir would otherwise be full. This impact is potentially significant."

However, the DEIR then reasons that implementation of an EWA-type program as mitigation will render any such impacts less-than-significant:

21-36

> Implementation of the following mitigation measure in combination with the [enumerated] environmental programs already in place or forthcoming that are relevant to the SWP would reduce this impact to a less than significant level.
>
> > The Department shall implement operational assets that could be deployed through a continuation of the EWA, through an

> equivalent type for program, or through another program that would replace the EWA and provide the fish protection required by the court and the Biological pinions on delta smelt and Chinook salmon that would limit any adverse impact resulting from the proposed project on special status Delta fish species as a result of higher pumping at Banks during periods when San Luis Reservoir, absent of the proposed project, would be full.

21-36 (con't.)

(DEIR at 7.3-73 - 7.3-74)

As discussed above, the EWA is a failed program that has not lived up to its initial mandate. To merely promise to "implement" an EWA-like program is no better than the status quo. For this to be a useful mitigation measure, DWR must ensure that there are sufficient operational assets to undertake fish protection actions whenever they are recommended. This should become a condition of implementation of the project.

IX. Chapter 7.16 - Energy.

a. The DEIR's choice of a 10% significance threshold is not justified.

The SWP is the largest single user of energy in California, using 2-3 percent of all electricity consumed in the state.[22] Why, then, given the enormity of the SWP's impact on California's energy consumption, is the threshold of significance set at 10%. No rationale is provided for setting the threshold at 10%. This threshold seems arbitrarily high, given the overall load the SWP places on the power grid. For example, according to Table 7.16-2 on page 7.16-8, the net load of the project under 2020 conditions will be 102 GWh annually. Assuming, as the CEC does, that California's per capita energy consumption will remain relatively flat for the foreseeable future, at approximately 7,032 Kwh per person per year, the project will cause the use of enough additional energy each year to serve the needs of more than 14,500 individuals.[23]

21-37

b. The analysis used to evaluate the net energy load of the project is not clearly explained.

Table 7.16-2 on page 7.16-8 purports to disclose net energy load and generation for the "Monterey Plus EIR Alternatives." First, despite its title, it does not evaluate Monterey Plus EIR Alternatives at all. Rather, it appears to compare net energy loads under 2020 conditions with and without Monterey. Second, no explanation is given as to why there

21-38

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[22] Attachment 21, Ronnie Cohen, Barry Nelson, & Gary Wolff, Energy Down the Drain: The Hidden Costs of California's Water Supply (August 2004), at p. 2, available at: http://www.nrdc.org/water/conservation/edrain/contents.asp.

[23] Attachment 22, California Energy Commission, U.S. Per Capita Electricity Use By State in 2005, http://www.energy.ca.gov/electricity/us_per_capita_electricity_2005.html (last visited Jan 10, 2008).

are three different time periods analyzed (1922-93, 1929-34, and 1987-92), all of which overlap. This analysis must be more fully explained.

21-38 (con't.)

X. Chapter 11 - Growth Inducing Impacts.

a. The DEIR should not bury the results of the population growth analysis behind outdated, and misleading figures.

Section 8.2.2, at page 9-8 reveals the shocking truth that the project-related Table A transfers along with Article 21 deliveries could support between 405,103 and 561,684 new residents in the service areas that receive these project-related water deliveries. Yet, this crucially important result is preceded in the document by the recitation, without any hint of its invalidity, of the outdated population growth estimates produced in the original, 1995 Monterey EIR, which predicted that the additional water could support an additional population of 39,000. That data should be removed or clearly marked as erroneous.

21-39

b. The DEIR disregards DWR's responsibility to analyze growth-inducing environmental impacts.

The entirety of DEIR's analysis of the growth-inducing environmental impacts of the project is confined to three paragraphs on the bottom of page 8-11. (The remainder is dedicated to determining the growth that will be induced by the project and/or explaining why these growth estimates are "conservative.")

In essence, although the DEIR admits that the transfers may induce regional population growth on the order of 400,000 -500,000 new residents, the DIER capitulates that "[t]he specific environmental effects associated with increased population are too speculative to predict or evaluate since the exact location and manner of potential future development within the eight M&I contractors' services areas cannot be determined." (DEIR at p. 8-11.)

21-40

The DEIR makes no effort to quantitatively or qualitatively review or aggregate some of the known environmental impacts that have and are being caused by these transfers. This is a total derogation of DWR's responsibility to evaluate the statewide impacts of the project. Instead, the local agencies are left to perform piecemeal the analysis, exactly the problem that programmatic environmental analysis is meant to avoid.

The information needed to complete such an analysis is readily available. (In fact, DWR purports to have compiled and reviewed most of this evidence already as part of its "survey" of planning documents.)[24] The following table lists a number of projects in Los Angeles County that depend in large part on Table A transfers made possible by the Monterey Amendments (this may not be an exhaustive list).

[24] We request that DWR incorporate these surveys into future versions of the EIR.

Project	General Description
West Creek Project	2,545 units
River Valley Project	1,444 units & 1.5 million square feet of mixed non-residential space
Riverpark Project	1,183 units
Northlake Project	3,000 units
Synergy Project	946 units
Mission Village Project	5,331 units & 1.229 million square feet mixed use commercial space
Soledad Townhouse Project	437 units
Lyons Canyon Ranch Project	190 units
Gate-King Annexation, Addendum	4.45 million square feet of industrial/ commercial space
Tick Canyon	492 units
Newhall Ranch	21,000 units

21-40 (con't.)

Attached to this letter are portions of several of the EIRs for these projects (the impact summary tables from the executive summaries of these documents, along with the water supply sections).[25] The water supply impact sections discuss the extent to which each project relies upon imported, project-related Table A transfers, while the executive summary discloses the wide range of environmental impacts that are anticipated to result from implementation of the proposed projects. The complete EIRs for the projects listed above are easily located and could be utilized to construct a more complete evaluation of the statewide growth-inducing impacts of the project.

c. DWR cannot allow other agencies to determine whether transfers will be growth inducing.

By allowing other agencies to determine whether transferred Table A entitlements will be growth-inducing, DWR is relinquishing its responsibility to evaluate the growth-inducing impacts of the project. At the very least, DWR should set a standard for determining

21-41

[25] Attachments 23A through 23F: Attachment 23-A, City of Santa Clarita Department of Planning & Building Services, Riverpark Draft Environmental Impact Report (Mar. 2004), Excerpts; Attachment 23-B, City of Santa Clarita, Soledad Village Draft Environmental Impact Report (Nov. 2005), Excerpts; Attachment 23-C, City of Santa Clarita, Gate-King Industrial Park Final Environmental Impact Report (June 2003), Excerpts; Attachment 23-D, City of Santa Clarita, Gate-King Industrial Park Additional Analysis (May 2006); Attachment 23-E, City of Santa Clarita, The Keystone Project Draft Environmental Impact Report (July 2005), Excerpts; Attachment 23-F, Castaic Lake Water Agency, Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount, Draft Environmental Impact Report (June 2004), Excerpts.

whether a use is growth inducing and then independently evaluate the uses to which the Table A transfers are being put. 21-41 (con't.)

d. DWR erroneously classifies use of supply to meet "planned population growth and development objectives" as non-growth inducing.

In one specific instance, DWR has mis-characterized a transfer as non-growth inducing because the transferred water will be used to "meet planned population growth and development objectives specified in their respective General Plans." (See Table 8-1, at p. 8-5, first column, regarding a 5,756 AF transfer of SWP entitlement to the Solano County WA.) Just because a county has previously planned for population growth and development as part of its General Plan does not mean that the county would be able to serve those new residences with existing resources. Moreover, even if water could be acquired from other sources, the environmental impacts of doing so must be evaluated at some point. DWR cannot relinquish its responsibility to evaluate the growth-inducing impacts of the project on this ground. 21-42

e. The DEIR provides inappropriate explanations as to why the estimated growth-inducing impacts are "conservative, over-estimate[s]."

Section 8.3.2 at page 8-13, suggests that M&I contractors would have gotten water from elsewhere to support growth. This may be true, but acquisition of water from alternative sources would be subject to CEQA review, just as acquisition via the Monterey Agreement transfers is subject to CEQA review here. The possibility that local agencies might have acquired water through other channels does not excuse DWR in any way from performing required environmental analyses of the impacts caused by the transfers that did indeed occur and that are presently being relied upon to support growth (see above). 21-43

Nor is it valid for the DEIR to excuse itself from completing a thorough analysis of growth-inducing impacts because local governments are "responsible for considering the environmental effects of their decisions." (DEIR at p. 8-14.) This undermines the purpose of programmatic environmental review, which is to allow for the up-front assessment and mitigation of program-wide impacts, rather than permitting the piecemeal assessment and mitigation of localized portions of such impacts.

XI. <u>Reliability of Water Supplies and Growth.</u>

a. Subsequent drafts of the EIR should formally incorporate the Reliability Report, allowing for public input and judicial review of the document relied upon by the DEIR to "resolve" the paper water problem. 21-44

Section 4.5.1 sets fort the requirement that DWR prepare a report every two years describing the reliability of SWP water deliveries under a range of hydrologic conditions.

This report, the Reliability Report, is relied upon by DWR throughout the DEIR to explain why there is no longer a paper water problem. It is, therefore, in a sense, a form of mitigation. Yet, the report itself is not subject to public oversight**,** nor is it a legally enforceable constraint, as would be the case for a true mitigation measure. Accordingly, it would seem appropriate to incorporate the Reliability Report into the DEIR itself, subjecting it to the scrutiny of the CEQA process. Public (and possibly judicial) scrutiny of the Reliability Report is critical, given the extent and nature of the Report's potential shortcomings.[26]

21-44 (con't.)

b. The DEIR erroneously concludes that there is no longer a "paper water" problem.

Chapter 9 of the DEIR essentially concludes that there is no longer a "paper water" problem because local planners now recognize that it is important to incorporate limitations on the reliability of the SWP into their planning efforts. The analysis in this section is flawed for a number of reasons.

First, DEIR makes no effort to truly address the issues at hand. Historically, land use decisions in California have routinely been made in the absence of reasoned assessments of water supply availability. This problem was so widespread that it resulted in the passage of SB 610 and SB 221. The pre-Monterey contracts contained important mechanisms designed to counteract this problem (Articles 18(b) and 21(g)(1)). If the project is approved as currently described, an important tool that could be used to combat this problem will be lost.

21-45

Second, the notion that SB 610 and SB 221 somehow magically eliminate the paper water problem because they require local water agencies to evaluate water supply reliability is ludicrous. The agencies that are subject to those laws routinely look to the state for guidance in determining the reliability of their water supply. With the elimination of Article 21(g)(1), which allows surplus water to be utilized to support permanent developments, DWR has simply created a new type of "paper water" by allowing local decisionmakers the freedom to choose when and how to allow Article 21 water to support permanent developments.

XII. <u>Cumulative Impact Analysis</u>

The cumulative impacts analysis is lacking for the same reasons articulated elsewhere in this comment letter:

21-46

- At page 10.1-13, the Sacramento Valley Water Management Agreement is described but the DEIR does not disclose the connection between the

[26] *See, e.g.*, <u>Attachment 24</u>, Comments of California State Senator Michael J. Machado on the SWP Reliability Report, Oct. 30, 2002; <u>Attachment 25</u>, DWR's Responses to Machado Letter, March 11, 2003.

Agreement's plans to replace surface water supplies with groundwater pumping so that those surface water supplies can be utilized by the SWP.

- Also at page 10.1-13, the DEIR discusses the EWA, and concludes that it is likely that an EWA-like program will continue to be implemented in the future. However, the DEIR again makes no mention of the problems that have arisen as a result of underfunding the EWA.

- At page 10.1-22, the DEIR admits that the cumulative effect of the project in conjunction with other water development projects could potentially affect special status fish species. The DEIR then concludes that various environmental programs along with the implementation of a planned EWA-type program would limit the project's contribution rendering the projects' cumulative impacts less-than significant. The same arguments articulated above at Part VII(g)-(h) apply here.

21-46 (con't.)

XIII. Alternatives Analysis.

a. The DEIR misstates DWR's responsibility to analyze alternatives.

At page 11-2, the DEIR states that "...the approach taken with the Monterey Plus EIR was to first analyze the environmental effects of the proposed project and determine whether the proposed project had any significant adverse environmental impacts. If the proposed project had no significant adverse environmental effects there would be no need to analyze alternatives other than the required no project alternative." This is not what CEQA requires. Rather, every EIR must analyze a reasonable range of alternatives. As is discussed below, the DEIR fails to comply with this requirement. Remedying this failure should begin with a careful re-statement of DWR's responsibilities regarding alternative analysis.

21-47

b. The DEIR unjustifiably rejects numerous alternatives on the ground that they do satisfy most of the stated objectives of the project.

As described in Chapter 4, the stated specific objectives of the Monterey Amendments are to:

- Resolve conflicts and disputes among SWP contractors regarding water allocations and financial responsibilities for SWP operations;

- Restructure and clarify procedures for SWP water allocation and delivery during times of shortage and surplus;

- Reduce financial pressures on agricultural contractors in times of drought and supply reductions;

21-48

- Adjust the financial rate structure of the SWP to more closely match revenue needs;

- Facilitate water management practices and water transfers that improve reliability and flexibility of SWP water supplies in conjunction with local supplies;

- Resolve legal and institutional issues related to storage of SWP water in Kern County groundwater basins and in other areas.

The DEIR unjustifiably eliminates from analysis a number of alternatives on the ground that they do not meet most of the objectives of the project. Several alternatives are eliminated on this basis without any explanation as to why they do not meet the project's objectives. For example, the "No Urban Preference and Dry Year Reliability" alternative is summarily rejected because it would not meet most, if any of the objectives of the project. Yet, it appears that such an alternative would resolve many of the disputes between the parties and satisfy other objectives of the project if implemented correctly. (The other basis given for rejecting this alternative -- that it would "introduce a new level of water management by the state" -- is discussed below.)

21-48 (con't.)

Similarly, the rejection of the "Improved Reliability through Environmental Enhancement Alternative" because it would "not meet any of the objectives of the Monterey Amendment" is baseless. Such an alternative could, in fact, meet all of the objectives of the project by enhancing the ability of the SWP to deliver water reliably by restoring the ecosystem services that make water delivery possible and by lessening the need to constrain water operations to protect those ecosystem services.

c. The document treats as an underlying purpose of the project increased deliveries and exports from the Delta, thereby providing improper justification of the elimination of alternatives that would provide for reduced exports.

21-49

The analysis appears to assume that an objective of the project is to maintain or increase current exports from the Delta. The DEIR eliminates from consideration alternatives that seek to reduce exports without providing any legitimate reason why such an alternative should not be seriously considered. If maintaining or reducing exports is an objective of the project, it should be so stated; if it is not, then DWR has no basis for refusing to analyze a reduced export alternative.

d. It is not appropriate to reject alternatives simply because they exceed the current authority of DWR.

21-50

Several alternatives were rejected at the screening stage because they would have required changes to DWR's role vis-a-vis local water agencies and land user planners and/or would require actions outside the current scope of DWR's authority. For example, section 11.2.4 discusses the alternative of having DWR "reduce[] stress on fishery

resources in the Delta by directly implementing water use efficiency measures, water recycling, storm water capture and other local water system enhancements that stabilize water demand and improve SWP reliability." (DEIR at p. 11-5.) This alternative was rejected in part because "[t]he Monterey Amendment is not an appropriate tool for mandating 'local water enhancements.' There are other forums where these concerns can be discussed as part of a comprehensive process." (*Id.*) This is an arbitrary distinction. Nothing precludes DWR from evaluating an alternative of this nature. In fact, there some authority that suggests analysis of just such an alternative is required.[27]

Nor should such an alternative be rejected as infeasible. As the Appellate Court made clear in *In re Bay-Delta Programmatic Environmental Impact Report Coordinated Proceedings* (Cal. App. 3 Dist., 2005) 34 Cal.Rptr.3d 696, 774:

> The feasibility of [] a reduced exports alternative is clear, notwithstanding the projected population growth that undergirds the commitment not to reduce exports. As stated previously, it is projected that the state's population will grow from 30 to 49 million by the year 2020, and that half of this growth will be in Southern California. Such population growth requires water. However, if there is no water to support the growth, will it occur as projected? Population growth is not an immutable fact of life. Stable populations have been established in such states as New York, Pennsylvania, Connecticut, and Rhode Island. (Carle, supra, at p. 196.) Inflow of new residents to California continues to exceed outflow because conditions in the State are conducive to population growth. One aspect of these conditions is the availability of water. However, as the State reaches the limit of available water and must seek other sources such as desalination, water will become more expensive to obtain and California's appeal will lessen.

Finally, the DEIR asserts that the environmental review of this project is not the appropriate forum for mandating local water supply enhancements, efficiency measures, or other mechanisms to reduce demand. Yet, there is no guarantee that any of the alternative fora will produce results, let alone results sufficient to mitigate the impacts of this project.

21-50 (con't.)

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[27] *See, e.g.*, *In re Bay-Delta Programmatic Environmental Impact Report Coordinated* proceedings (Cal. App. 3d Dist., 2005) 34 Cal.Rptr.3d 696, 773-75; *Friends of the Eel River v. Sonoma County Water Agency* (1st Dist. 2003) 108 Cal App. 4th 859, 864-67, 872-73l (where it seemed likely that FERC would force reductions in Eel River diversion, water agency's EIR for project to increase diversions from the Russian River should have discussed alternatives that would have reduced dependence on diversions from the Eel); *Methow Valley Citizens Council v. Regional Forester* (9th Cir. 1987) 833 F2d 810, 815 (NEPA case which held that even if an alternative requires legislative action, this fact does not necessarily justify excluding that alternative from an EIS).

e. The alternatives analysis does not provide enough information to allow a meaningful comparison between the alternatives and the project.

21-51

The actual analysis of the environmental impacts of the alternatives vis-a-vis the project is confined to slightly more than a single page of text and a single summary table. Given the extraordinary importance of this project and the emphasis placed on alternatives analysis in *PCL v. DWR*, this analysis is insufficiently detailed, precluding a meaningful comparison between the project and the various alternatives.

XIV. The DEIR's Treatment of Climate Change is Insufficient.

a. The Final EIR should include a thorough analysis of the greenhouse gas emissions increases that will result from the particular type of growth supported by the project.

21-52

In light of the passage of AB 32 in September 2006, it is imperative that the final EIR more thoroughly analyze the extent to which the proposed project will result in additional greenhouse gas emissions caused by the additional urban sprawl fueled by various aspects of the project. The Attorney General has openly called for such analyses to be included in CEQA documents.[28]

The DEIR at page 12-14 reminds the reader that in Chapter 8, the DEIR concludes that "the proposed project may result in changes in growth patters at the local level, but would have no effect on statewide population growth." The DEIR then goes on to conclude that "[t]hus, within the SWP service area as a whole, the proposed project would not result in any changes in GHG emission due to growth." This logical leap is unsupportable. The Table A transfers have supported discrete development projects outside existing urban boundaries. The DEIR essentially asserts that location of growth bears no relationship to greenhouse gas (GHG) emissions. This is simply false. The nature and patterns of growth can significantly increase overall GHG emissions of a given population.[29]

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[28] Attachment 26, Letter from Attorney General Bill Lockyer to the County of San Bernardino, dated Oct. 23, 2006; Attachment 31, Office of the California Attorney General, Global Warming Mitigation Measures,

[29] Attachment 27, Reid Ewing, et al., Smart Growth America, Growing Cooler: The Evidence on Urban Development and Climate Change, available at "http://www.smartgrowthamerica.org/gcindex.html" (2007).

b. The DEIR's analysis of climate change impacts on SWP deliveries is insufficient.

The DEIR, at pages 12-12 - 12-13, provides a general discussion of how DWR has evaluated the impacts of Climate Change on SWP operations and then summarizes a CalSim II simulation designed to estimate whether there would be a relative difference in the impact of climate change with and without the project. Table 12-2, which presents the results of this analysis, indicates that there would be little or no relative difference. However, this analysis does not explore whether there would be a relative difference in impacts upon M&I contractors versus agricultural contractors. For example, if climate change does indeed reduce SWP supplies by approximately 25% in critical years, this would presumably impact urban contractors much more severely in the absence of Article 18(a) than if that "urban shortage" provision remained in the contracts. These distinct analyses must be included in the final EIR in order to disclose to the public the full impact of the project in light of anticipated climate changes. 21-53

c. The EIR should disclose that, by eliminating Article 18(b), the project is giving up a tool that would enable the SWP to better respond to climate change in the future.

By eliminating Article 18(b), the project is eliminating a key safeguard that allows DWR to respond to permanent shortages by proportionally and without compensation to the contractors adjusting entitlements to reflect reality. Instead of maintaining or exercising this provision, the project relies instead on its Reliability Report to share information with water agencies about the project's reliability. These two options are not equivalent. The differences between the capacity of Article 18(b) to adjust project operations in light of climate change versus the capacity of the Reliability Report to do the same needs to be analyzed and disclosed. 21-54

d. Climate Change should be incorporated into the analyses contained within the rest of the DEIR.

Enough is known about climate change to facilitate the incorporation of climate change impacts into the environmental and water supply analyses set forth in the DEIR. It is, in fact, far more likely than not that California's hydrology will be altered as a result of climate change.[30] To ignore this mounting evidence in favor of modeling based on the status quo endangers both the `environment and water supply reliability. 21-55

[30] Attachment 28, N. Miller, California Climate Change, Hydrologic response, and Flood Forecasting, Earth Sciences Division, Berkeley National Laboratory, Berkeley, California, USA. Presented at the International Expert Meeting on Urban Flood Management, November 20-21, 2003, April 30, 2004 (available at: www.osti.gov/bridge/servlets/purl/820274-R49cYy/native/820274.pdf); Attachment 29, Field, C.B., L.D. Mortsch, M. Brklacich, D.L. Forbes, P. Kovacs, J.A. Patz, S.W. Running and M.J. Scott, 2007: North America. Climate Change 2007: Impacts,

e. Alternatives that provide for greater water use efficiency, conservation, reuse, recycling, and reduced exports from the Delta have the potential to lessen the GHG impacts of the project.

21-56

Energy savings is one of the most significant advantages of utilizing water conservation/efficiency measures to achieve greater water supply reliability.[31] The Attorney General of California has identified the implementation of water conservation and efficiency measures as a potential form of mitigation that may be considered under CEQA to offset or reduce the global warming impacts of a project.[32] This should be incorporated into the alternative analysis in subsequent drafts.

XV. The DEIR Does Not Adequately Disclose or Analyze Kern Water Bank Issues and Impacts.

In general, although the DEIR does include some brief references to the Kern Water Bank within the body of the EIR along with a study of the "Transfer, Development, and Operation of the Kern Water Bank" in Appendix E, the disclosures and analyses contained in the DEIR and its appendices are inadequate to satisfy DWR's requirements under CEQA.

21-57

a. The DEIR does not disclose that transfer of the Kern Fan Element from DWR to the Kern Water Bank Authority via the Kern County Water Agency would alter the fundamental purpose of the water bank.

Section 4.4.3 (at pp. 4-6 - 4-7) describes the transfer of the Kern Fan Element (KFE) property simply as a transfer of the KFE property and its fixtures to another entity. This obscures the underlying nature of the shift from public to quasi-private control. When the project was controlled by DWR, the "primary purpose of the Kern Water Bank [was] to augment the dependable water supply of the State Water Project."[33] In contrast, the

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Adaptation and Vulnerability. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, M.L. Parry, O.F. Canziani, J.P. Palutikof, P.J. van der Linden and C.E. Hanson, Eds., Cambridge University Press, Cambridge, UK, 617-652.

[31] *See* Energy Down the Drain, *supra* note 22.

[32] Attachment 32, Office of the Attorney General of California, Global Warming Mitigation Measures, dated Dec. 3, 2007, available at: "http://ag.ca.gov/globalwarming/ceqa.php."

[33] Attachment 2, Memorandum of Understanding Between the Department of Water Resources of the State of California and Kern County Water Agency for Developing and Operating the Kern Water Bank, March 25, 1987, at p. 2.

March 1995 Statement of Principles for the Kern Water Bank declares that the "primary purpose" of the bank is to "augment water supplies for KWB participants." (DEIR Appendix E, at p. 14.)[34]

21-57 (con't.)

b. Neither the DEIR nor any document associated with the KWB transfer explains how the transfer complies with Water Code § 11464.

DWR's original purchase of the Kern Fan Element property was only permitted to occur if "the Department's right to use the area for project purposes will be preserved." In addition, "[c]onsistent with section 11464 of the Water Code, the Department shall not sell facilities acquired for the Kern Water Bank."

21-58

Water Code Section 11464 provides:

> No water right, reservoir, conduit, or facility for the generation, production, transmission, or distribution of electric power, acquired by the department shall ever be sold, granted, or conveyed by the department so that the department thereby is divested of the title to and ownership of it.

Given that the entire transfer arrangement seems at odds with this legal constraint, the public is entitled to an explanation of DWR's rationale for permitting it to move forward.

c. Subsequent drafts should clearly disclose that previous environmental analyses of the Kern Water Bank indicated that its operation might have a detrimental impact on the Delta.

In the first paragraph of section 4.4.3, the DEIR briefly recounts the history of the KFE property. However, it does not disclose that DWR's own environmental analyses prior to the transfer indicated that the bank might have an impact on the Delta.[35] In fact, the Kern Water Bank's own web page asserts that one of the "legal, institutional, and political impediments to implementation of a groundwater storage facility" by DWR was that "proposed revisions of Delta water quality standards and measures to protect threatened and endangered species, [might] affect the SWP's ability to pump water from the Delta for recharge at KWB."[36]

21-59

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[34] We request that DWR attach to any subsequent drafts the March 1995 Statement of Principles, the October 1995 Joint Powers Agreement, and any other relevant documents

[35] Attachment 3, DWR, First Stage Kern Fan Element Draft Supplemental Environmental Impact Report (1990), at p. 38-42.

[36] Attachment 4, Kern Water Bank Authority, "DWR & the KWB," available at "http://www.kwb.org" (last visited Jan 1, 2008).

d. Subsequent drafts should address the assertions made in Public Citizen's report "Water Heist."

There is no question that the transfer of the Kern Fan Element is a subject of considerable public controversy. An often-cited report by Public Citizen[37] asserts that the KWBA is effectively controlled by a single corporate entity and largely serves the interest of that entity. The report also asserts that the operation of the bank has been and will continue to be environmentally detrimental. DWR should endeavor to address these concerns in subsequent drafts of the EIR. 21-60

e. The analyses of the environmental impacts of the Kern Water Bank in the DEIR and its Appendices are inadequate.

The DEIR fails to analyze the potentially significant environmental consequences of the transfer and operation of the Kern Water Bank. These potential environmental consequences include the following:

- Increased Delta Exports - As described above, DWR's own pre-transfer environmental documents acknowledge that operation of the bank could increase pressure on the Delta. Other documents previously brought to DWR's attention by the Planning and Conservation League (PCL) document the potential for the bank to impact the Delta.

- Environmental Impacts Resulting from Loss of Public Control - Under the control of a private entity, there can be no assurance that the bank will be utilized to lessen pressures on the Delta during times of shortage, a purpose to which the bank's water could have been directed prior to the transfer. Rather, it can be assumed that the bank will be used as an economic resource for the benefit of its participants. Among the possible implications are increased uses of banked water to support permanent economies, such as housing and permanent crops, each of which would have resulting environmental impacts. In addition, DEIR reveals that the Kern Water Bank made numerous sales to the Environmental Water Account. (DEIR, Appendix E. at 25.) Had the bank remained under state control, it is possible that the state would not have had to purchase EWA water on those occasions from contractors. All of these possible impacts must be evaluated. 21-61

The analysis contained within Appendix E barely does not sufficiently explore these questions. Of particular concern is the fact that the "independent" report relies heavily on personal communications with KWBA and KCWA staff, none of whom have trust responsibilities over state water resources.

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[37] Attachment 5, Public Citizen, Water Heist: How Corporations Are Cashing In on California's Water (2003), available at "http://www.citizen.org/california/water/heist."

In sum, we believe that the DEIR contains a number of fundamental flaws that mask the environmental impacts of the project. Moreover, the document fails to place the project into the real-world context of a crashing Delta ecosystem and predicted climate changes. The final EIR must more faithfully disclose the downsides of this project so that the public and relevant decision-makers have an opportunity to steer the SWP in a more rational direction.

21-62

For your convenience, with a few exceptions noted on the appended list, we have provided both a hard copy and an electronic copy (on CD-ROM) of each of our attachments.

Thank you for your attention to these comments. We appreciate your hard work and look forward to receiving your responses. Should you have any questions or require clarification, please do not hesitate to contact the undersigned.

Sincerely,

Lisa Coffman, Executive Director
California Water Impact Network

Bill Jennings, Executive Director
California Sportfishing Protection Alliance

Index of Attachments -
C-WIN et al. Comment Letter Re: Monterey Plus DEIR

(Unless otherwise noted, attachments have also been provided in electronic form.)

1. DWR, The State Water Project Delivery Reliability Report 2005 (2006).

2. Memorandum of Understanding Between the Department of Water Resources of the State of California and Kern County Water Agency for Developing and Operating the Kern Water Bank, March 25, 1987.

3. DWR, First Stage Kern Fan Element Draft Supplemental Environmental Impact Report (1990).

4. Kern Water Bank Authority, "DWR & the KWB," available at "http://www.kwb.org" (last visited Jan. 1, 2008).

5. Public Citizen, Water Heist: How Corporations Are Cashing In on California's Water (2003), available at "http://www.citizen.org/california/water/heist/".

6. J. Payne & D. Purkey, An Environmental Review of CalSim-II: Defining "Full Environmental Compliance" and "Environmentally Preferred" Formulations of the CalSim-II Model" (November 2005).

7. *NRDC v. Kempthorne*, 1:05-cv-1207 (EDCA), Doc. 560, Interim Remedial Order Following Summary Judgment and Evidentiary Hearing, dated Dec. 14, 2007.

8. *NRDC v. Kempthorne*, Doc. 323, Order Granting In Part and Denying In part Plaintiffs' Motion for Summary Judgment, dated May 25, 2007.

9. Matt Weiser, Delta Water Exports Halved, SacBee.com, Dec. 29, 2007.

10. *NRDC v. Kempthorne*, Doc. 398, Declaration of J. Leahigh, dated July 9, 2007.

11. MWDSC, Update on Monterey Amendment, PowerPoint Presentation to the Water Planning and Stewardship Committee, Agenda Item 6(e), presented Jan. 7, 2008, dated Jan. 8, 2008.

12. The Bay Institute, et al., Petition to the State of California Fish and Game Commission and Supporting Information for Listing the Delta Smelt (*Hypomesus transpacificus*) as an Endangered Species under the California Endangered Species Act (Feb. 7, 2007).

13. Environmental Defense, "Finding the Water: New Water Supply Opportunities to Revive the San Francisco Bay Delta Ecosystem" (2005).

14. NRDC, December 10, 2007 Letter to the Bureau of Reclamation Re: Comments on the Draft Supplemental EIS/EIR for Extending the Environmental Water Account and OCAP Consultations.

    14-A. NRDC Letter Exhibit 2 - Teir 3 Protocol.

    14-B. NRDC Letter Exhibit 3 - DSWG Briefing Statement (May 15, 2007).

    14-C. NRDC Letter Exhibit 4 - Statement Presented by Ryan Broddrick, Director, CDFG, to House Subcommittee on Water and power (July 2, 2007).

    14-D. NRDC Letter Exhibit 5 - May, June, July 2007 delta smelt take tables.

    14-E. NRDC Letter Exhibit 6 - Data Assessment Team call notes (Feb. 1, 2005).

    14-F. NRDC Letter Exhibit 7 - CVO smelt report (Feb. 2005).

    14-G. NRDC Letter Exhibit 8 - DSWG notes (July 10, 2007).

    14-H. NRDC Letter Exhibit 9 - DSWG notes for (Dec. 11, 2006).

    14-I. NRDC Letter Exhibit 10 - DSWG notes for (Oct. 10, 2006).

    14-J. NRDC Letter Exhibit 11 - Declaration of Bruce Oppenheim in *NRDC v. Kempthorne* (June 15, 2007).

    14-K. NRDC Letter Exhibit 12 - Declaration of Ronald Milligan in NRDC v. Kempthorne (June 21 2007).

    14-L NRDC Letter Exhibit 13 - Transcript of Hearing re: Interim Remedies Day 7, *NRDC v. Kempthorne*, Testimony of Ronald Milligan at 1553-54 (Aug. 31, 2007).

    14-M. NRDC Letter Exhibit 14 - Declaration of Kirk Rodgers (Oct. 18, 2006); Declaration of Kirk Rodgers (July 9, 2007).

    14-N. NRDC Letter Exhibit 15 - Interagency Ecological Program 2006-2007 Work Plan to Evaluate the Decline of Pelagic Species in the Upper San Francisco Estuary (Jan. 12, 2007).

15. F. Feyrer, M. Nobriga & T. Sommer, Multidecadal trends for three declining fish species: habitat patterns and mechanisms in the San Francisco Estuary, California, USA, Can. J. Fish. Aquat. Sci. 64: 723-734 (2007).

16. N. Monsen, J. Cloern, J. Burau, Effects of Flow Diversions on Water Habitat Quality: Examples from California's Highly Manipulated Sacramento-San Joaquin Delta (July 2007).

17. M. Bowen, et al., Empirical and experimental analyses of secondary louver efficiency at the Tracy Fish Collection Facility, March 1996 to November 1997, Tracy Fish Facility Studies, Volume 11, U.S. Bureau of Reclamation, Mid-Pacific Region, Denver Technical Service Center (2004).

18. U.S. Fish & Wildlife Service, 5-Year Review, *Hypomesus transpacificus* (delta smelt), Sacramento Fish and Wildlife Office, Sacramento, CA (2004).

19. California Department of Fish and Game (CDFG) 2007. Excel spreadsheet summary of Chinook salmon escapement for Central Valley Streams, "Grandtab," August 22, 2007 revision. Prepared by the Native Anadromous Fish and Watershed Branch, California Department of the Fish and Game.

20. J. Willams, Central Valley Salmon: A Perspective on Chinook and Steelhead in the Central Valley of California, San Francisco Estuary & Watershed Science, Vol. 4, Issue 3, Art. 2 (2006).

21. R. Cohen, B. Nelson, & G. Wolff, Energy Down the Drain: The Hidden Costs of California's Water Supply (August 2004).

22. California Energy Commission, U.S. Per Capita Electricity Use By State in 2005, available at "http://www.energy.ca.gov/electricity/ us_per_capita_electricity_2005.html" (last visited Jan 10, 2008).

23-A. City of Santa Clarita Department of Planning & Building Services, Riverpark Draft Environmental Impact Report (Mar. 2004), Excerpts.

23-B. City of Santa Clarita, Soledad Village Draft Environmental Impact Report (Nov. 2005), Excerpts.

23-C. City of Santa Clarita, Gate-King Industrial Park Final Environmental Impact Report (June 2003), Excerpts.

23-D. City of Santa Clarita, Gate-King Industrial Park Additional Analysis (May 2006).

23-E. City of Santa Clarita, The Keystone Project Draft Environmental Impact Report (July 2005), Excerpts.

23-F. Castaic Lake Water Agency, Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount, Draft Environmental Impact Report (June 2004), Excerpts.

24. Comments of California State Senator Michael J. Machado on the SWP Reliability Report, dated Oct. 30, 2002.

25. DWR's Responses to Machado Letter, dated Mar. 11, 2003.

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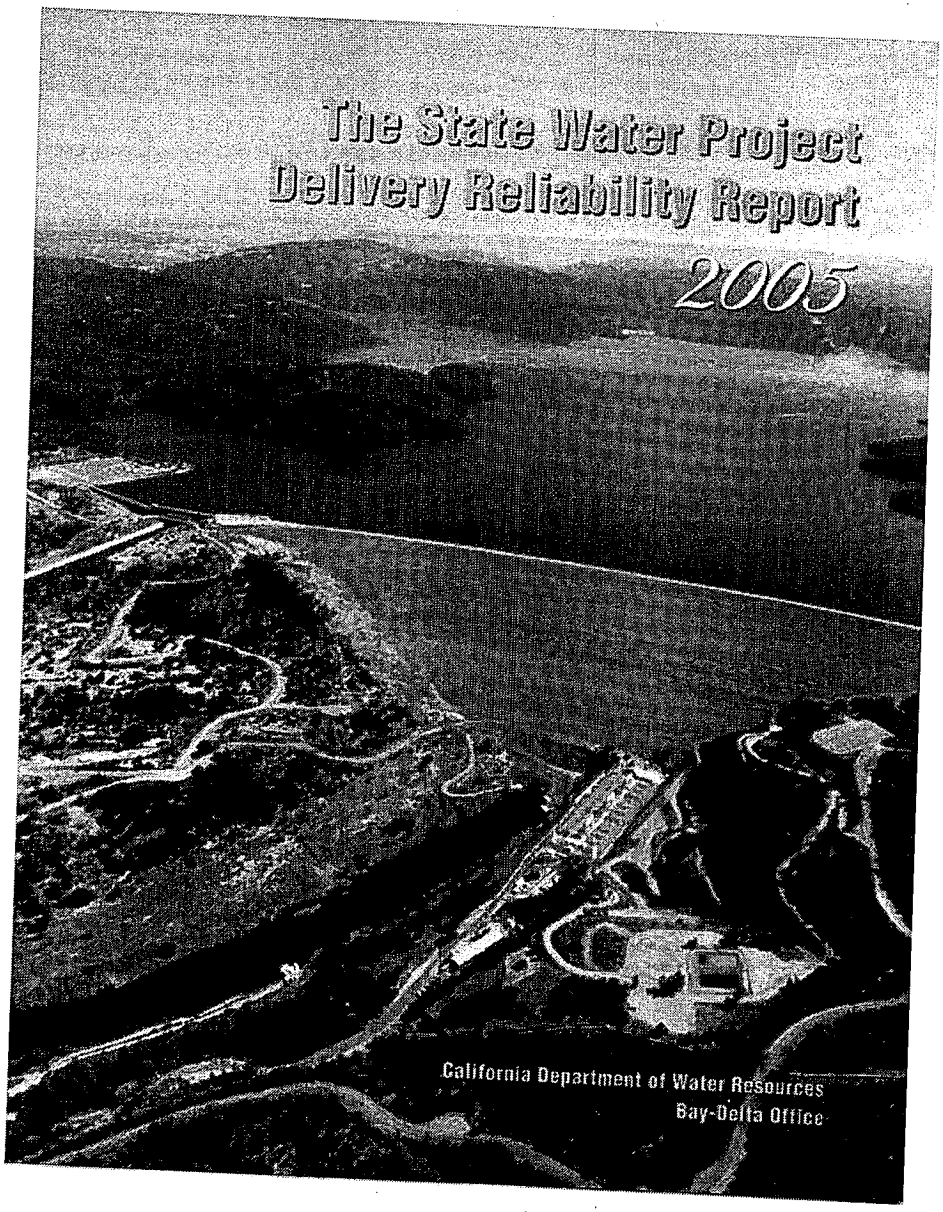
Electronic Exhibits (provided electronically only).

EA-A. Spreadsheet: SWP Deliveries, 1980-1999.
EA-B. Spreadsheet: SWP Deliveries, 2000-2007.
EA-C. Spreadsheet: SWP Initial Requests for Selected Contractors 2001.

EA-D. Spreadsheet: SWP Initial Requests for Selected Contractors 2002.
EA-E. Spreadsheet: SWP Initial Requests for Selected Contractors 2003.
EA-F. Spreadsheet: SWP Initial Requests for Selected Contractors 2004.
EA-G. Spreadsheet: SWP Initial Requests for Selected Contractors 2005.
EA-H. Spreadsheet: SWP Initial Requests for Selected Contractors 2006.
EA-I. Spreadsheet: SWP Initial Requests for Selected Contractors 2007.
EA-J. Spreadsheet: SWP Initial Requests for Selected Contractors 2008.

Attachment 1


The State Water Project
Delivery Reliability Report
2005
California Department of Water Resources
Bay-Delta Office

LETTER 21

State of California
The Resources Agency
Department of Water Resources

The State Water Project Delivery Reliability Report 2005

Final

April 2006

Arnold Schwarzenegger
Governor
State of California

Mike Chrisman
Secretary for Resources
The Resources Agency

Lester A. Snow
Director
Department of Water Resources

If you need this report in alternate format, call the Office of Workforce Equality at (916) 653-6952 or TDD (916) 653-6934.

Foreword

The Department of Water Resources (DWR) is issuing this report to update information presented in the first report of this series, *The State Water Project Delivery Reliability Report 2002*, which was finalized in 2003 after an extensive public review. A draft of the *The State Water Project Delivery Reliability Report 2005* underwent a 30-day public review during November and December 2005. The information contained in this update was recommended by DWR in May 2005 for use by SWP water supply contractors in developing their 2005 Urban Water Management Plans.

The SWP Delivery Reliability Report 2002 and *The SWP Delivery Reliability Report 2005* are based upon analyses using a computer simulation model, CalSim II. Public criticism of this analytical approach centers on two areas: the ability of CalSim II to simulate "real world" conditions and accurately estimate SWP deliveries; and the inability of the approach to account for future uncertainties such as changes in the climate pattern or levee failure in the Delta due to flooding or an earthquake. While no model is perfect, DWR is satisfied with the degree to which CalSim II simulates actual, real-world operations of the SWP. When professional judgment is used with the knowledge of the limitations of CalSim II and the assumptions used in the studies, CalSim II is a useful tool in assessing the delivery reliability of the SWP. The studies and peer review related to CalSim II are discussed in Chapter 3 and Appendix E of this update.

Although the estimates contained in *The SWP Delivery Reliability Report 2005* are the best quantifications available of the delivery ability of the SWP, these estimates are limited because of the uncertainty of future conditions. DWR will continue to use the CalSim II model and its updates as appropriate for analyses, but other information is being developed that will help us analyze, understand, and prepare for our uncertain future. Per the Governor's directive (Executive Order S-3-05), the potential impacts of climate change on the State's resources, including water supply, are being evaluated. Using CalSim II, preliminary estimates have been done of the potential impact upon the SWP 50 to 100 years in the future if no additional conveyance facilities or upstream reservoirs are built. As these estimates become more refined, they will be helpful in guiding strategies for the management and development of the State's water resources, including improvements to the SWP.

In addition, DWR is working on three projects that will improve our ability to make qualitative or quantitative statements about the reliability of conveyance across the Sacramento-San Joaquin Delta. These include: the Delta Risk Management Strategy, which will assess risks to the Delta from floods, seepage, subsidence, and earthquakes, evaluate the consequences of levee failure, and develop recommendations to manage the risk; implementation of AB 1200 (Laird, 2005) which calls for a similar evaluation of impacts on water supplies from catastrophic Delta failure; and a broader public process to develop a shared vision of a sustainable Delta that continues to support societal needs related to water supply, transportation, recreation, land use, energy, and environmental health. Although none of these efforts will be completed before release of the next Reliability Report, some preliminary results and conclusions may be completed. Subsequent Reliability Reports will fully incorporate this information.

The updated SWP delivery estimates are summarized in Chapter 5. Chapter 6 contains examples of how to incorporate this information into a local water supply assessment. These examples are based upon examples contained in the *Draft Guidelines for Documentation and Integration of SWP Supplies with UWMPs*, which will soon be released by DWR for public review. These draft guidelines are designed to assist SWP urban contractors in estimating the amount of SWP supplies available to them and in integrating the SWP supply information with information from other sources of supply to develop an overall assessment of each contractor's total water portfolio. For additional information on the *Draft Guidelines*, contact the Office of Water Use Efficiency and Transfers at (916) 651-7027. DWR's Bay-Delta Office may be contacted at (916) 653-1099 with questions about other aspects of *The SWP Delivery Reliability Report 2005*.

Lester A. Snow
Director
California Department of Water Resources

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Chapter 1. Introduction

Will there be enough water? Public officials throughout California face this question with increasing frequency as growth and competing uses strain existing resources. Water supply, however, has always been an uncertain and contentious matter in our state. For many years, the Department of Water Resources (DWR) has investigated this question. At its simplest level, the question might be, "How many wells are needed for a rural town's water supply?" or "How many people can a 100,000 acre-foot reservoir serve?" But for most areas of the state, the evaluation of water supply adequacy is not simple. The answer requires a complex analysis, taking into account multiple sources of water, a range of water demands, the timing of water uses, hydrology, available facilities, regulatory restraints, levels of demand management (water conservation) strategies, and, of course, future weather patterns.

Most water users in California live in areas that rely on multiple sources of water supply, some local and some imported. Typically, local water providers "mix and match" their supply sources to maximize water supply and quality and to minimize cost. In addition to considering available sources of supply, local water providers are planning for ways to improve the efficiency of local water uses and the operation of their water management systems. To help with this effort, DWR presents 25 different resource management strategies available to local agencies and governments and private utilities in the *California Water Plan Update 2005* (see website at http://www.waterplan.water.ca.gov).

Purpose

The State Water Project Delivery Reliability Report 2005 presents DWR's current information regarding the annual water delivery reliability of the State Water Project (SWP) for existing and future levels of development in the water source areas, assuming historical patterns of precipitation. This report first looks at the general subject of water delivery reliability and then discusses how DWR determines delivery reliability for the SWP. A discussion of the analysis tool (the CalSim II computer simulation model), the analyses, and peer review regarding the accuracy of CalSim II and its suitability for use in this report is included. Finally, estimates of SWP delivery reliability today and in the future are provided along with examples of how to incorporate this information into local water management plans.

This report responds to a requirement in the settlement agreement[1] with the Planning and Conservation League to provide an assessment of the existing delivery capability of the SWP over a range of hydrologic conditions. The range of conditions is to include the historic extended dry cycle and the long-term average. In addition, the biennial report is to include the total amount of project water delivered and the amount of project water delivered to each contractor for each of the 10 years immediately preceding the report (see Appendix D, Recent SWP Deliveries).

The State Water Project Delivery Reliability Report 2005 does not include analyses of how specific water agencies should integrate SWP water supply into their water supply equation. That topic requires extensive information about local facilities, local water resources, and local water use, which is beyond the scope of this report. Moreover, such an analysis would require decisions about water supply and use that traditionally have been made at the local level. DWR believes that local officials should continue to fill this role. The examples provided in Chapter 6 are included to help local agencies incorporate the information presented in this report into local water management assessments.

[1] *Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal. App. 4th 892

Background

The original *SWP Delivery Reliability Report* was issued as a draft in August 2002. In 2002, DWR held six public meetings throughout the state to discuss the report and receive comments upon the content. The final *SWP Delivery Reliability Report* was released in early 2003. *The State Water Project Delivery Reliability Report 2005* is an update to the report issued in 2003. DWR intends to publish biennial updates of the *SWP Delivery Reliability Report* in the future.

The SWP supplies two-thirds of the state's population with a portion of its water supply and provides water to irrigate, in part, 750,000 acres of agriculture. The SWP delivers water under long-term contracts to 29 public water agencies throughout the state. They, in turn, either deliver water to water wholesalers or retailers or deliver it directly to agricultural and urban water users.

The water delivery reliability of the SWP is of direct interest to those who use SWP supplies because it is an important element of the overall water supply in those areas. Local supply reliability is of key importance to local planners and local government officials who are responsible for planning for future growth while assuring that an adequate and affordable water supply is available for the existing population and businesses. This function is usually conducted in the course of preparing a water management plan such as the Urban Water Management Plans required by Water Code section 10610. The information in this report may be used by local agencies in preparing or amending their water management plans and identifying the new facilities or programs that may be necessary to meet future water demands.

Local agencies and governments and private utilities will also find in this report information that is useful in conducting analyses mandated by laws requiring water retailers to demonstrate whether their water supplies are sufficient for certain proposed subdivisions and development projects subject to the California Environmental Quality Act. DWR published the *Guidebook for Implementation of Senate Bill 610 and Senate Bill 221 of 2001*, which includes suggestions on how local water suppliers can integrate supplies from various sources, such as the SWP, into their analyses. DWR has also published the *Guidebook to Assist Water Suppliers in the Preparation of a 2005 Urban Water Management Plan*, which includes suggestions on how local water suppliers can integrate supplies from other sources such as the SWP in their analyses. Both documents can be found on the DWR's Office of Water Use Efficiency home page at http://www.owue.water.ca.gov.

The *Draft Guidelines for Documentation and Integration of SWP Supplies with UWMPs* will soon be released for public review. These guidelines are designed to assist SWP urban contractors in determining the amount of SWP supplies available to them. Using the information in this report (*SWP Delivery Reliability Report 2005*), these guidelines explain how to integrate the SWP supply information with supply information from other sources to develop an overall reliability assessment of each contractor's total water portfolio.

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Chapter 2. Water Delivery Reliability

What is Water Delivery Reliability?

"Water delivery reliability" means how much one can count on a certain amount of water being delivered to a specific place at a specific time.

Objectively, water delivery reliability indicates a particular amount of water that can be delivered with a certain numeric frequency. A delivery reliability analysis assesses such things as facilities, system operation, water demand, and weather projections.

Subjectively, water delivery reliability indicates an acceptable or desirable level of dependability of water deliveries to the people receiving the water. Usually, a local water agency in coordination with the public it serves determines the acceptable level of reliability and plans for new facilities, demand-management and conservation programs, or additional water supply sources to meet or maintain this level.

What Factors Determine Water Delivery Reliability?

In its simplest terms, water delivery reliability depends on three general factors:

1. Availability of water from the source (that is, the natural source or sources of the water from which the supplier draws, such as a particular watercourse or groundwater basin). Availability of water from the source depends on the amount and timing of precipitation and runoff, or "hydrology," which provides water to the stream or groundwater basin, and the anticipated patterns of use and consumption of this water within the source area, including water returned to the source after use.
2. Availability of means of conveyance (that is, the means for conveying the water from the source via pumps, diversion works, reservoirs, canals, etc. to its point of delivery). The ability to convey water from the source depends on the existence and physical capacity of the diversion, storage, and conveyance facilities and also on contractual, statutory, and regulatory limitations on the operation of the facilities.
3. The level and pattern of water demand in the delivery service area (destination). The level of water demand in the delivery service area is affected by the magnitude and types of water demands, level of water conservation strategies, local weather patterns, water costs, and other factors. Supply from a water system may be sufficiently reliable at a low level of demand but become less reliable as the demand increases. In other cases, the reliability of a water supply system to meet a higher demand may be maintained at its past level because new facilities have been added or the operation of the system has been changed.

How is Water Delivery Reliability Determined?

Water Delivery Reliability is Defined for a Specific Point in Time

For this report, water delivery reliability is analyzed for 2005 conditions and for conditions projected to exist 20 years in the future (2025). These analyses must describe current conditions adequately and make predictions about the three factors described earlier and discussed here.

The Availability of Water at the Source

This factor depends on how much rain and snow there will be in any given year and what the level of development (that is, the use of water) will be in the source areas. No model or analytical tool can predict the actual, natural water supplies for any year or years in the future. Until the impacts of climate change on precipitation and runoff patterns in California are better quantified, future weather patterns are usually assumed to be similar to those in the past,

especially where there is a significant historical rainfall record.

The State Water Project analyses contained in this report are based upon 73 years of historical records (1922-1994) for rainfall and runoff that have been adjusted to reflect the current and future levels of development in the source areas by analyzing land use patterns and projecting future land and water use. These series of data are then used to forecast the amount of water available to the SWP under current and future conditions.

The assumption that past rainfall-runoff patterns will be repeated in the future has an inherent uncertainty, especially given the evolving information on the potential effects of global climate change. The *California Water Plan Update 2005* (December 2005) states:

> California's water systems have been designed and operated based on data from a relatively short hydrologic record. Mounting scientific evidence suggests that forecasted climate changes could significantly change California's precipitation pattern and amount from that shown by the record. Less snowpack would mean less natural water storage. More variability in rainfall, wetter at times and drier at times, would place more stress on the reliability of existing flood management and water systems. California's high dependence on reservoir storage and snowpack for water supply and flood management makes us particularly vulnerable to these types of projected hydrologic changes. (See Chapter 4 in this volume and articles in Volume 4 Reference Guide under Global Climate Change for further discussion.)
> (*California Water Plan Update*, December 2005, Vol. 1, page 3-15)

Potential changes in climate patterns are becoming better defined and attempts to quantify the resulting impacts to SWP water supply are underway. Broad brush estimates are being developed of the potential impact upon the SWP in 50 to 100 years if no additional conveyance facilities or upstream reservoirs are built. As this information becomes more refined, it will be helpful in guiding the development of statewide strategies for the future management and development of water resources facilities, including the SWP.

The Ability to Convey Water from the Source to the Desired Point of Delivery

This factor describes the facilities available to capture and convey surface water or groundwater and the institutional limitations placed upon the facilities. The facilities and institutional limitations may be assumed to be those that currently exist. Alternatively, predictions may be made regarding planned new facilities. Assumptions made about the institutional limitations to operation—such as legal, contractual, or regulatory restrictions—often are based upon existing conditions. Future changes in conditions that affect the ability to convey water usually cannot be predicted with certainty, particularly the regulatory and other institutional constraints on water conveyance.

The analyses in this report include the assumptions that current regulatory and institutional limitations regarding water quality, fish protection, and flows will exist 20 years in the future (2025); no facility improvements, expansions, or additions will be made to the SWP; and conveying water through the Sacramento-San Joaquin Delta will not be significantly interrupted.

Most of the Delta's levees do not meet modern engineering standards and are highly susceptible to failure. Levees are subject to failure at any time of the year due to seepage or the piping of water through the levee, slippage or sloughing of levee material, or sudden failure due to an earthquake. DWR is working on three projects that will improve the ability to make qualitative or quantitative statements about the reliability of conveyance across the Sacramento-San Joaquin Delta. These include: the Delta Risk Management Strategy, which will assess risks to the Delta from floods, seepage, subsidence, and earthquakes, evaluate the consequences of levee failure, and develop recommendations to manage the risk; implementation of AB 1200 (Laird, 2005) which calls for a similar evaluation of impacts on water supplies from catastrophic Delta failure; and a broader public process to develop a shared vision of a sustainable Delta that continues to support societal needs related to water supply, transportation, recreation,

land use, energy, and environmental health. Information developed through these efforts will be incorporated into subsequent Reliability Reports.

The Level of Demand

This factor includes the amount and pattern of water demand on the water management system. Demand can have a significant effect upon the reliability of a water system. For example, if the demand occurs only three months in the summer, a water system with a sufficient annual supply but insufficient water storage may not be able to reliably meet the demand. If, however, the same total amount of demand is distributed over the year, the system could more easily meet the demand because the need for water storage is reduced.

Demand levels for the SWP are derived from historical data and information received from the SWP contractors. Demand on the SWP is nearing the maximum Table A amount. Each of the SWP contracts has a Table A, which lists the maximum annual delivery amount over the period of the contract. These annual amounts usually increase over time. Most contractors' Table A amounts reached a maximum in 1990. The total of all contractors' maximum Table A amounts is 4.173 million acre-feet (maf) per water year. Table A is used to define each contractor's portion of the available water supply that DWR will allocate and deliver to that contractor. The Table A amounts in any particular contract, accordingly, should not be read as a guarantee of that amount but rather as the tool in an allocation process that defines an individual contractor's "slice of the pie." The size of the "pie" itself is determined by the factors described in this report. (See Appendix C for additional explanation and listing of the maximum Table A amounts.)

There are 29 SWP contractors. Yuba City, Butte County, and the Plumas County Flood Control and Water Conservation District are north of the Delta. Their maximum Table A amounts total 0.040 maf. The maximum Table A amounts for the remaining 26 contractors, which receive their supply from the Delta, total 4.133 maf. This report focuses on SWP deliveries from the Delta because the amount of water pumped from the Delta by SWP facilities is the most significant component of the total amount of SWP deliveries. The results presented in this report regarding the percent of Table A deliveries applies to contractors north of the Delta in the same manner as those contractors receiving supply from the Delta.

Past Deliveries May Not Accurately Predict Future Deliveries

It is worthwhile to note that in some situations, actual, historical water deliveries cannot be used with a significant degree of certainty to predict future water deliveries. As discussed earlier, there are continual, significant changes over time in the determinants of water delivery for a specific water supply system: changes in water storage and delivery facilities, in water use in the source areas, in water demand in the receiving areas, and in the regulatory constraints on the operation of facilities for the delivery of water. Given the very significant changes that have occurred for the SWP over the past 40 years, past deliveries are not a good predictor of current deliveries, much less of future deliveries.

For example, the demand 30 years ago for water from the SWP was not as high as it is currently or expected to be in the future. Because the demand for SWP water then was low, less water was transported through the SWP during normal and wet times than could have been if the demand had been higher. Simply put, less water was delivered in those past years because less water was needed. Conversely, the projected deliveries of a water project would be less than the past if the water project had been operated at its maximum ability for many years, no new facilities were planned to be built, and the annual supply from one of its main sources of water was recently reduced and would remain at the reduced level.

Many Assumptions Must Be Made in the Determination and Analysis of Water Delivery Reliability

As discussed earlier, to plan for the future, many assumptions must be made about the future. One of the most significant assumptions for water planning in general is how wet, dry and variable the weather will be. For many planning purposes and until the potential effects of climate change are better defined, the assumption is that future patterns of weather will be like the past, and an effort is made to develop information on

the longest historical period for which acceptable records exist.

Using the historical record, planners analyze the worst drought in the period of record to evaluate how the water management systems will respond. Precipitation information for the Central Valley used for this report begins in 1922 and records the area's worst multi-year drought (1928-1934), although the brief drought from 1976 through 1977 was more acutely dry. Whatever assumptions are made, every responsible water delivery reliability analysis should expressly state the assumptions, methods and data used to produce its results. It should be understood that those numbers depend on, and are no better than, the assumptions upon which they must necessarily rest.

Because assumptions are the foundation upon which the estimates are made, it is helpful to know how each assumption affects study results. For example, what impact would a significant increase in water use in the source areas have upon the projected SWP water delivery reliability? Would it significantly reduce the amount of SWP supply, and if so, by how much? These types of questions can be answered by varying specific factors to see the impact upon the results. These studies are referred to as sensitivity analyses and can be helpful in assessing the importance of certain assumptions to the study results. Per a commitment in the 2002 Reliability Report, DWR has conducted a sensitivity analysis for assumptions contained in the CalSim II model studies. The results of this study are discussed in Appendix E. In the future, the results of this study will be analyzed to develop more detailed findings regarding SWP Delta deliveries. Summaries of the findings of other studies of CalSim II, as well as a peer review of the model, are contained in this report and discussed in more detail in Appendix E.

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Chapter 3. Study Approach and CalSim II Follow-up Studies

This report presents information from computer simulation studies of the operation of the SWP using the CalSim II model. CalSim II is a planning model developed by the Department of Water Resources (DWR) and the U.S. Bureau of Reclamation (USBR). It simulates the SWP and the Central Valley Project (CVP) and areas tributary to the Sacramento-San Joaquin Delta. Using historical rainfall and runoff data, which has been adjusted for changes in water and land use that have occurred or may occur in the future, the model simulates the operation of the water resources infrastructure in the Sacramento and San Joaquin river basins on a month-to-month basis. In the model, the reservoirs and pumping facilities of the SWP and CVP are operated to assure the flow and water quality requirements for these systems are met.

The month-to-month simulations are conducted over the 73-year period (1922-1994) of the adjusted historical rainfall/runoff data. This approach incorporates the over-arching assumption that the next 73 years will have the same rainfall/snowmelt amount and pattern, both within-year and from year to year, as the period 1922 through 1994. The studies do not incorporate any modifications to account for changes related to climate patterns or assess the risk of future seismic or flooding events significantly disrupting SWP deliveries. The results of the CalSim II studies conducted for this update to *The State Water Project Delivery Reliability Report 2002* (DWR 2003a) represent the best available assessment of the delivery capability of the SWP.

Since the release of the 2002 report, a peer-review and several studies have been conducted regarding CalSim II. These reports include:

- An external peer review commissioned by the California Bay-Delta Authority (CALFED);
- An analysis of an historical operations simulation;
- An analysis of the effect varying selected parameters has upon model results (sensitivity analysis study); and
- An analysis of the significance of the simulation time-step to the estimated SWP delivery amounts.

An overview of these efforts follows.

Science Program Peer Review of CalSim II

In 2003, the CALFED Science Program commissioned an external review panel to provide an independent analysis and evaluation of the strengths and weaknesses of CalSim II. The central question put to the review panel was whether the CALFED program had adopted an appropriate approach to modeling the Central Valley Project/State Water Project (CVP/SWP) system. The panel considered a variety of CalSim II issues and addressed how future model development activities could be managed to assure quality results for current and proposed applications. The panel published its results in *A Strategic Review of CALSIM II and its Uses for Water Planning, Management, and Operations in Central California* (Close and others 2003).

In general, the panel concluded that the current modeling approach was comparable to other state-of-the-art models and addressed many of the complexities of the CVP/SWP system. To balance the competing needs of those who require greater detail from the model and those who require less detail, the panel recommended steps to achieve a more comprehensive, modular, and flexible approach in modeling practices and tools. To increase user confidence in model results and to provide a basis for gauging the

model's ability to produce absolute predictive results of system behavior, the panel suggested calibration and verification of the model, as well as analyses in sensitivity and uncertainty.

In what was most relevant to the subject of this report on the SWP delivery reliability, the panel summarized its observation on the accuracy of the model to estimate the delivery capability of both the CVP and SWP systems in the *Strategic Review's* Appendix F "Analysis of the November 2003 CalSim II Validation Report." Appendix F is discussed in the next section.

In August 2004, DWR and the USBR jointly responded to the questions, comments, and recommendations of the review panel in a report, *Peer Review Response: A Report by DWR/Reclamation in Reply to the Peer Review of the CalSim II Model Sponsored by the CALFED Science Program in December 2003.* (*Peer Review Response*). In their report, the agencies outline current and planned work on model development and the priorities for improving CalSim II. The *Peer Review Response* also highlights the ongoing and planned efforts to establish trust in and credibility for the model by improving documentation, conducting sensitivity and uncertainty analyses of the model parameters and results. Other efforts include enhancing the level of detail in the geographic representation of the system, and improving hydrologic input and software development.

Many of the elements of model development outlined in the *Peer Review Response* are in progress and will be implemented in the updated version of the model, CalSim III. Some of the *Strategic Review's* pressing issues regarding the reliability of CalSim II as a planning tool are addressed below.

The Ability of CalSim II to Estimate Water Deliveries

The accuracy of CalSim II in simulating "real-world" conditions was one of the major issues raised by the peer review panel. The review panel focused on the system's delivery capability as a major concern to water users as well as water managers who rely on CalSim II when making planning decisions. In Appendix F of the *Strategic Review,* the panel expresses concern that CalSim II overestimates deliveries to south-of-Delta water users. This observation is based on comparing the average deliveries for the last 10 years (1993-2002) with the average annual deliveries in a 73-year model simulation (1922-1994) conducted at the 2001 level of development.

In *Peer Review Response,* DWR and USBR (2004) conclude the concern about overestimations of south-of-Delta deliveries is unwarranted because the 73-year study referenced by the panel is not designed to mimic historical conditions; rather it is intended to determine the reliability of the SWP when the demand equals the maximum Delta Table A amount (4.133 maf) every year. The results of the referenced study are documented in *The SWP Delivery Reliability Report 2002* (DWR 2003a) as study 3 (2021B).

A more appropriate method for assessing the ability of CalSim II to accurately model SWP operations is to compare the historical SWP deliveries with the simulated deliveries of the Historical Operations Study. DWR committed to conducting this study in *The SWP Delivery Reliability Report 2002* (DWR 2003a). The study is documented in the November 2003 Technical Memorandum Report *CALSIM-II Simulation of Historical SWP/CVP Operations* (DWR 2003b). The Historical Operations Study is designed to assess the ability of CalSim II to mimic historical operations of the SWP. In this study, historical input is used where reliable data are available. In situations where reliable historical record is not readily available, reasonable assumptions and estimates are made.

Comparing the average annual historical deliveries with the simulated deliveries in the Historical Operations Study for the dry period shows reasonable results: The average annual SWP south-of-Delta Table A delivery for the 6-year drought of 1987-1992 is 1,930 taf per year, compared to 2,030 taf per year for actual historical deliveries (Figure 3-1). Figure 3-1 compares the simulated Table A deliveries with the actual Table A deliveries for calendar years 1987 through 1992. Although the averages are close, the annual differences between the simulated and actual values can be large. This illustrates that the results of CalSim II analyses are best used for estimating SWP performance over longer periods of time and that considerable judgment must be used when analyzing a specific year. Figure 3-1 replaces the figure contained in the draft of this report which showed the calculated annual delivery amounts would be very close to the

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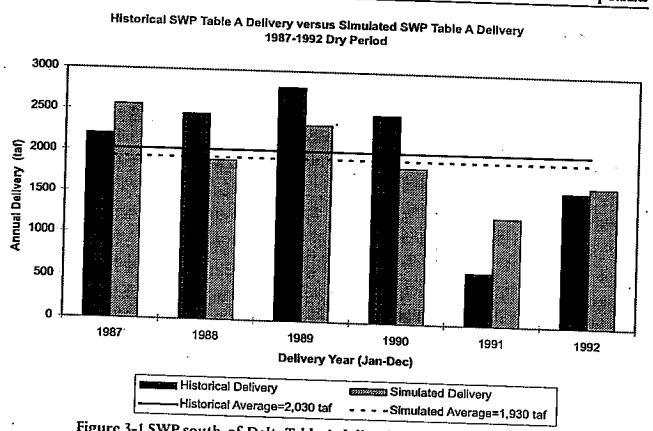

Figure 3-1 SWP south-of-Delta Table A deliveries (1987-1992 dry period)

actual annual delivery amounts, if SWP reservoir storages were adjusted to match the historical values. Additional discussion on this subject is contained in the response to the comment letter from the Planning and Conservation League (Appendix G, Comment Letters on the Draft Report and the Department's Responses).

The observed differences in the annual historical and simulated deliveries can be attributed to differences in the operational rules and parameters assumed in the simulation run. Some of the major operational parameters that could be different between the model run and the actual historical operations include the rule governing the amount of delivery versus the amount of storage to be carried-over into the following year (delivery-carryover storage rule), flood control rules, San Luis Reservoir operation rule, Delta outflow requirements, regulatory decisions, Delta export curtailments caused by pumping facilities outages or compliance with state and federal endangered species regulations, compliance with the provisions of the Coordinated Operations Agreement, implementation of a drought water bank, and water transfers.

In the wetter years (above-normal and wet year-types), when supply is plentiful and deliveries are mostly determined by demands, the simulated deliveries are very close to historical values. When long-term values are compared, the average annual delivery for the SWP during the 23-year period of 1975-1997 is 1,810 taf per year for the Historical Operations Study and 1,790 taf per year for the historical deliveries.

Additional details of this study are in Appendix E.

CalSim II Sensitivity Analysis Study

The sensitivity analysis is an important component of any water resources planning model evaluation. The sensitivity analysis procedures explore and quantify the impact of possible errors in input data on the model outputs and system performance measures. With a simple sensitivity analysis procedure, errors in model input parameters are generally investigated one at a time. With a more complex procedure, the investigation can be conducted by varying a set of parameters simultaneously. In the sensitivity analysis conducted in response to the recommendations in the *Strategic Review* (Close and others 2003), the simple procedure was adopted and errors in model input parameters were investigated one at a time. The objective of the analysis was twofold: (1) to examine the behavior of the

model in response to variations in selected input parameters; (2) to provide a basis for CalSim II modelers for prioritizing future model development activities. The *CalSim-II Model Sensitivity Analysis* is available at website http://baydeltaoffice.water.ca.gov/index.cfm.

There are many input parameters used in the CalSim II model to define the physical characteristics of the system, as well as the regulatory environment and operational characteristics. Some input parameters are in the form of time series or monthly distribution curves, and others are simply single values. Some input parameters are estimated from the historical data, and others are values developed or calibrated by users. After consultation with model developers and project operators, 21 model input parameters in four major categories with reasonable ranges of variations were selected for this sensitivity analysis study. The results of the sensitivity analysis are given in more detail in Appendix E.

Examination of the results of the sensitivity analysis provides the following information on the behavior of the SWP system's delivery capability with respect to some of the key input parameters:

- The most significant input parameters affecting SWP Table A Delta deliveries are the assumed SWP Table A demands and the monthly Delta diversion limits applied to Banks Pumping Plant. The results show the long-term average annual SWP Table A Delta deliveries between 3.0 maf to 3.5 maf increase by 0.54 acre-foot for every acre-foot increase in Table A demands. The increase is 0.33 acre-foot for every acre-foot of increase in Table A demands for the range between 3.5 maf per year and 3.9 maf per year.
- Also, the long-term average annual SWP Table A Delta deliveries decrease by 0.48 acre-foot for every 1 acre-foot per month decrease in the monthly Delta diversion limits applied to Banks Pumping Plant during the March 16 to December 14 period. This sensitivity study evaluates a 5 percent reduction in the capacity during this period.
- Inflow to Lake Oroville displays a moderate impact on the SWP Table A Delta deliveries. The long-term average annual SWP Table A Delta deliveries increase by 0.20 acre-foot for every acre-foot increase in annual Oroville inflows.
- The effect of changing SWP contractors' demands for Article 21 water on Article 21 deliveries is high, as expected. The results show that for every acre-foot of change in the peak monthly demands for Article 21 water in the range between 134 taf per month and 400 taf per month, the long-term average annual Article 21 deliveries increase by 0.27 acre-foot.

Examples of parameters not significantly influencing the estimates for SWP Delta deliveries include the projected land use in the source areas and inflow into Lake Shasta and Folsom Reservoir.

Impact of Model Simulation Time-step in Estimating Projects Average Deliveries

In general, the delivery reliability of the SWP is assessed using monthly time-step CalSim II simulations. Monthly time-step simulations implicitly assume that daily hydrologic variability combined with daily physical and regulatory operating constraints are not significant to the forecast of expected average annual deliveries. In other words, it is assumed that a study with monthly inflows, reservoir releases, exports, and associated constraints would produce the same long-term average annual deliveries as a study where inflows, releases, exports, and associated constraints vary on a daily basis.

To confirm the above assumption, results were examined from a recently completed, simplified, daily time-step CalSim II simulation conducted for the California Bay-Delta Authority's Surface Storage Investigations. The assumptions for the baseline monthly and daily time-step simulations are documented in the draft report "Interim Common Model Package, Modeling Protocol and Assumptions" (CALFED 2005). The daily variability appears to have only minor impacts on SWP Table A deliveries. The results show the long-term average annual SWP Table A delivery is increased by 0.3 percent and the average annual deliveries during two 6-year droughts (1929-1934 and 1987-1992) is increased by 0.8 percent in the daily simulation.

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Chapter 4. Computer Simulation Assumptions

The selection of the assumptions and factors that go into the estimation of future water delivery reliability is very important and must be tailored to the particular water supplier. Assumptions and factors for the State Water Project focus on Sacramento and San Joaquin river basin precipitation; water rights and uses; SWP storage and conveyance facilities, including diversion facilities in the Delta; SWP service area demand; and the statutes, regulations, and contractual provisions that govern and regulate the SWP, including coordinating operations with the federal Central Valley Project (CVP). A detailed list of the study assumptions for this report is found in Appendix A.

The results of five computer simulations are included in this report. Studies 1, 2, and 3 are from the *The State Water Project Delivery Reliability Report 2002* (DWR 2003). The results of studies 1, 2 and 3 are included in this report for comparison purposes. Studies 4 and 5 are updated studies conducted specifically for this report. A significant difference between the updated studies and the earlier studies is the assumed demands for SWP Table A and Article 21. Article 21 refers to a section of the water supply contracts that allows additional water to be delivered under certain conditions (see Chapter 5 for further discussion).The assumed demands for studies 4 and 5 were developed in discussions with SWP water contractors and stakeholders involved in the development of the analyses associated with the environmental documentation for the Monterey Agreement. The demands developed for studies 4 and 5 are within the range covered under the current SWP biological opinions.

The assumptions for the studies differ in three main categories: the assumed level of water use in the source areas (the level of development), the assumed SWP Table A and Article 21 demands, and the base model assumptions. These categories are summarized in Table 4-1.

Table 4-1 Key study assumptions

Study	Study name	Level of development (year)	SWP Table A demand (maf/year)	SWP Article 21 demand (taf/month)	Model version
SWP Delivery Reliability Report (2003)					
1	2001 Study	2001	3.0–4.1	0–84, Apr–Nov 50–134, Dec–Mar	May 2002 benchmark
2	2021A Study	2021	3.3–4.1	0–84, Apr–Nov 50–134, Dec–Mar	May 2002 benchmark
3	2021B Study	2021	4.1	0–84, Apr–Nov 50–134, Dec–Mar	May 2002 benchmark
Updated Studies					
4	2005 Study	2005	2.3–3.9	0–84, Apr–Nov 100–184, Dec–Mar	2004 OCAP
5	2025 Study	2025	3.9–4.1	0–84, Apr–Nov 100–184, Dec–Mar	2004 OCAP

maf = million acre-feet

OCAP = 2004 Long-Term Central Valley Project Operations Criteria and Plan

taf = thousand acre-feet

The water use estimates for the source areas for 2001 are assumed to be representative of 2005. The water use estimates for the source areas for 2020 are assumed to be representative of 2021 and 2025 conditions.

The SWP contractors' Table A and Article 21 demands for deliveries from the Delta assumed for the five studies are shown in Table 4-1. In four of the studies, a range in Table A demands is shown because the demand is assumed to vary each year with the weather in the delivery areas. In study 3 (2021), the SWP Table A demand is maximized each year, regardless of weather. Article 21 deliveries are available on an unscheduled and interruptible basis and are not counted as part of the Table A amount. (See Chapter 5 for more discussion of Article 21.) The Article 21 demand in the updated studies (4 and 5) is higher than the earlier studies for the December through March period.

Two versions of the model are used for these studies as shown in Table 4-1. Studies 1, 2 and 3 are based on the May 2002 benchmark study version. The updated studies (4 and 5) use the most recent version, which was developed for the 2004 Long-Term Central Valley Project Operations Criteria and Plan (OCAP). The assumption differences between the May 2002 benchmark version and the 2004 OCAP version that affect the SWP simulation significantly are listed below. A complete list of the differences in key assumptions is included in Appendix A.

1. Addition of a minimum pumping level at Banks Pumping Plant of 300 cubic feet per second.
2. Addition of flow requirements for flow at the mouth of the Feather River for SWP Settlement Contractors.
3. Delivery-carryover relationship adjusted to reduce delivery targets and increase carryover in critically dry years.
4. Addition of Lake Oroville end-of-September carryover target storage rule.
5. Study 5 assumes the implementation of Freeport Regional Water Project, including modified East Bay Municipal Utility District operations on the Mokelumne River.

All studies assume current SWP Delta diversion limits (often referred to as "Banks Pumping Plant capacity"), existing conveyance capacity of the upper Delta-Mendota Canal/California Aqueduct system, and current SWP/CVP operations agreements.

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Chapter 5. Study Results

The five CalSim II model studies in this report are described in Chapter 4. Studies 1, 2, and 3 are from the *The State Water Project Delivery Reliability Report 2002* (DWR 2003). Studies 4 and 5 are updated studies conducted specifically for this report. The results of studies 1, 2 and 3 are included in this report for comparison purposes. This chapter contains tables summarizing the estimated delivery amounts of the studies for the entire study period (1922-1994), dry years, and wet years and presents information on the estimated probability of SWP delivery amounts currently and twenty years in the future. The annual values for SWP deliveries estimated by CalSim II for the five studies are listed in tables B-3 through B-7 of Appendix B. These tables also show the annual Table A demands assumed for each study.

The results of the updated studies (4 and 5) are compared to the results of the earlier studies (1, 2 and 3) to identify and explain any significant differences in estimated delivery values. For most values, the differences are not large enough to be significant and are generally caused by differences in the assumed demands. There are, however, significant differences between the updated and earlier studies for the estimated deliveries during 1, 2 and 4-year droughts. These differences are discussed further in "Drought Years." Information from studies 4 and 5 was transmitted to SWP contractors (Notice Number 05-08) in May 2005. Studies 4 and 5 are referred to as studies 6 and 7 in the notice.

Article 21 Deliveries

The studies estimate delivery amounts for Table A and Article 21. As mentioned in Chapter 2, Table A is the contractual method for allocating available supply, and the total of all maximum Table A amounts for deliveries from the Delta is 4.133 million acre-feet (maf) per year. Article 21 refers to a provision in the contracts for delivering water that is available in addition to Table A amounts. (See Appendix C for more detail about Table A and Appendix D for historical delivery amounts.) Article 21 of SWP contracts allows contractors to receive additional water deliveries only under specific conditions. These conditions are:

1. It is available only when it does not interfere with Table A allocations and SWP operations;
2. It is available only when excess water is available in the Delta;
3. It is available only when conveyance capacity is not being used for SWP purposes or scheduled SWP deliveries; and
4. It cannot be stored within the SWP system. In other words, the contractors must be able to use the Article 21 water directly or store it in their own system.

Water supply under Article 21 becomes available only during wet months of the year, generally December through March. Because an SWP contractor must have an immediate use for Article 21 supply or a place to store it outside of the SWP, not all SWP contractors can take advantage of this additional supply.

The importance of Article 21 water to local water supply is tied to how each contractor uses its SWP supply. For those SWP contractors who are able to store their wet weather supplies, Article 21 supply can be stored by being put directly into a reservoir or by offsetting other water that would have been withdrawn from storage, such as local groundwater. In the absence of storage, Article 21 water is not likely to contribute significantly to local water supply reliability. Incorporating supplies received under Article 21 into the assessment of water supply reliability is a local decision based on specific local circumstances, facts, and level of water supply reliability required.

Table 5-1 SWP Table A demand from the Delta

Study	Average demand (taf per year)	Average demand (percent of maximum Table A)	Maximum demand (taf per year)	Maximum demand (percent of maximum Table A)	Minimum demand (taf per year)	Minimum demand (percent of maximum Table A)
SWP Delivery Reliability Report (2003):						
1. 2001 Study	3,712	90%	4,114	100%	3,007	73%
2. 2021A Study	4,026	97%	4,133	100%	3,343	81%
3. 2021B Study	4,133	100%	4,133	100%	4,133	100%
Updated Studies:						
4. 2005 Study	3,290	80%	3,862	93%	2,321	56%
5. 2025 Study	4,110	99%	4,133	100%	3,898	94%

Maximum Delta Table A is 4.133 million acre-feet per year

This report presents information on Article 21 water separately, so local agencies can determine whether it is appropriate to incorporate this supply into their analyses.

SWP Water Deliveries under Different Hydrologic Scenarios

Tables 5-1 and 5-2 summarize the assumed Table A demands for the updated (4 and 5) and the earlier (1, 2, and 3) studies and the resulting estimates for SWP deliveries. Table 5-3 presents information on the assumed Article 21 demand and the estimated Article 21 deliveries. Tables 5-4 through 5-8 summarize values for dry and wet hydrologic periods. The estimated probabilities for a given amount of annual SWP delivery are presented in Figures 5-1 and 5-2.

Assumed Table A Demands

The average, maximum, and minimum Table A demands from the Delta for the five studies are shown in Table 5-1. Study 4 has lower assumed demands than study 1. The average demand for study 4 is 80 percent of maximum Table A compared to 90 percent of maximum Table A for study 1. The primary reason for the lower demand in study 4 is that it includes a new set of annual Table A demands for the Metropolitan Water District of Southern California (MWDSC) prepared specifically for 2003 conditions by MWDSC. The average demand for study 5 is 99.4 percent of maximum Table A and is very similar to study 3. The annual assumed demand for study 5 is less than maximum Table A in only seven wet years due to the assumption that some Table A deliveries would be replaced by supplies from the Kern River.

As explained in Chapter 2 and Appendix C, the maximum Table A amounts for the 26 contractors which receive their supply from the Delta total 4.133 maf. The demands for studies 1 and 4 assume slightly earlier conditions when the maximum Table A amounts totaled slightly less than 4.133 maf (4.114 maf and 4.112 maf, respectively). To simplify the use of this report, the calculation of demand or delivery in percent of maximum Table A is based on the maximum Delta Table A total of 4.133 maf for all five studies. This simplification has no significant effect on the annual delivery percentages for studies 1 and 4. Additional information can be found in Appendix B.

Table A and Article 21 Deliveries

Table 5-2 contains the average, maximum, and minimum estimates of Table A deliveries from the Delta for the five studies. Comparing the relevant updated and earlier studies shows the averages of the estimated delivery percentages and the maximum estimated deliveries do not vary significantly. Study 4 has an average delivery of 68 percent of maximum Table A compared to 72 percent for study 1. This lower delivery under current conditions is due to the lower demand level assumed for study 4. The slightly higher average delivery of 77 percent for study 5 compared to 75 percent for study 2 is attributed to the higher demand assumed for study 5 and to differences in modeling assumptions as summarized in Chapter 4 and listed in Appendix A. The average delivery for study 5 is one percentage

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Table 5-2 SWP Table A delivery from the Delta

Study	Average delivery		Maximum delivery		Minimum delivery	
	(taf per year)	(percent of maximum Table A)	(taf per year)	(percent of maximum Table A)	(taf per year)	(percent of maximum Table A)
SWP Delivery Reliability Report (2003):						
1. 2001 Study	2,962	72%	3,845	93%	804	19%
2. 2021A Study	3,083	75%	4,128	100%	830	20%
3. 2021B Study	3,130	76%	4,133	100%	830	20%
Updated Studies:						
4. 2005 Study	2,818	68%	3,848	93%	159	4%
5. 2025 Study	3,178	77%	4,133	100%	187	5%

Maximum Delta Table A is 4.133 million acre-feet per year.

point higher than study 3 even though study 3 has a slightly higher demand. This slightly higher value for study 5 is due to differences in modeling assumptions.

Comparing the updated studies (2005 versus 2025 study levels) shows study 5 has an average delivery of 77 percent of maximum Table A compared to 68 percent for study 4, an increase of 9 percent. This average increase in delivery is due to the higher demand assumed for study 5. Although the average amount (quantity) of delivery is shown to increase over time, the ability of the SWP to meet the assumed demands decreases over time. The responses from the Department to the comments of the Coachella Valley Water District and the Planning and Conservation League in Appendix G discuss this subject in more detail.

The difference between the earlier studies and the updated studies for the estimated minimum Table A delivery is significant. The updated studies have a minimum delivery of 4 percent to 5 percent of maximum Table A compared to 19 to 20 percent for the studies in the *SWP Delivery Reliability Report 2002* (DWR 2003). The lower minimum delivery is primarily due to modification of the delivery-carryover storage rule. Compared to the rule used for the earlier studies, the modified rule reduces delivery by about 80 percent whenever carryover storage (sum of the end-of-September storages of Oroville Reservoir and the SWP share of San Luis Reservoir) is projected to be less than about 860 thousand acre-feet (taf). The modified rule was developed in coordination with the DWR's SWP Operations Control Office to meet the primary objective of reducing the number of years storage in Oroville Reservoir reaches a very low level. The minimum delivery occurs in 1977, the driest year in the 73-year simulation. A closer look at this estimation is done later in this chapter. It applies reasonable assumptions about the amount of Table A deliveries carried-over in San Luis Reservoir from the previous year by SWP contractors and the use of storage in San Luis Reservoir to illustrate how the estimate could be adjusted to 20 percent of maximum Table A while not reducing storage in Oroville Reservoir.

Average Article 21 demands and average, maximum, and minimum Article 21 deliveries for the five studies are shown in Table 5-3. All studies have the same Article 21 demand from April through November. The updated studies (4 and 5) assume a 200 taf increase in Article 21 demand for the period December through March compared to the earlier studies (50 taf per month).

The average Article 21 delivery for study 4 is 260 taf per year, an increase of 130 taf per year from the study 1 average delivery of 130 taf per year. This increase in delivery is a result of the increase in Article 21 demand of 200 taf per year in studies 4 and 5 and also due to the decrease in Table A demand in study 4 compared to study 1. Study 5 has an average Article 21 delivery of 120 taf per year, 40 taf per year more than study 2 and 50 taf per year more than study 3. These increases are the result of the higher assumed Article 21 demand.

Table 5-3 SWP Article 21 demand and delivery from the Delta (taf per year except as noted)

Study	Average Article 21 demand		Total	Annual delivery from the Delta		
	Dec-Mar	Apr-Nov		Average	Maximum	Minimum
SWP Delivery Reliability Report (2003):						
1. 2001 Study	504	607	1,111	130	510	0
2. 2021A Study	504	607	1,111	80	400	0
3. 2021B Study	504	607	1,111	70	400	0
Updated Studies:						
4. 2005 Study	704	607	1,311	260	1,110	0
5. 2025 Study	704	607	1,311	120	550	0

Delivery numbers rounded to the nearest 10,000 acre-feet.

Table 5-4 SWP average and dry year Table A delivery from the Delta

Study	SWP Table A delivery from the Delta (in percent of maximum Table A)					
	Average 1922-1994	Single dry year 1977	2-year drought 1976-1977	4-year drought 1931-1934	6-year drought 1987-1992	6-year drought 1929-1934
SWP Delivery Reliability Report (2003):						
1. 2001 Study	72%	19%	48%	37%	41%	40%
2. 2021A Study	75%	20%	44%	39%	40%	41%
3. 2021B Study	76%	20%	44%	39%	40%	41%
Updated Studies:						
4. 2005 Study	68%	4%	41%	32%	42%	37%
5. 2025 Study	77%	5%	40%	33%	42%	38%

Drought Years

Table 5-4 includes estimates of water deliveries under an assumed repetition of historical drought periods for the five studies. The years are identified as dry by the Eight River Index, a good indicator of the relative amount of water supply available to the SWP. The Eight River Index is the sum of the unimpaired runoff from the four rivers in the Sacramento Basin used to define water conditions in the basin plus the four rivers in the San Joaquin Basin, which correspondingly define water conditions in that basin. The eight rivers are the Sacramento, Feather, Yuba, American, Stanislaus, Tuolumne, Merced, and San Joaquin. Table 5-4 also includes the average deliveries for comparison purposes.

As discussed earlier in conjunction with the minimum deliveries shown in Table 5-2, the single-year drought deliveries for the updated studies are estimated at 4 percent to 5 percent of maximum Table A compared to 19 to 20 percent for the studies in the *SWP Delivery Reliability Report 2002* (DWR 2003). The 2-year drought average annual delivery decreases from 48 percent for study 1 to 41 percent for study 4. Similarly, study 5 delivery decreases to 40 percent as compared to 44 percent for studies 2 and 3. The results for a 4-year drought show a 5 percent decrease in delivery for study 4 compared to study 1 and a 6 percent decrease in delivery for study 5 compared to studies 2 and 3, for the same reason. The decreases in each of these cases are primarily due to modification of the delivery-carryover storage rule as discussed earlier.

For the updated studies, the annual delivery for the single dry year is estimated to be about the same amount whether the dry year happens now or in twenty years. This is also true for estimated annual deliveries during the multi-year drought periods. This is projected to occur even though the amount of reservoir carryover storage resulting from the increased demand is projected to be less. This result is attributable to the operation rules governing the amount of water that must be retained for carryover storage, the fact the SWP demand between 2005 and 2025

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Table 5-5 Average and dry year delivery under Article 21 (taf per year)

Year	Study 1 2001	Study 2 2021A	Study 3 2021B	Study 4 2005	Study 5 2025
1929	0	0	0	0	0
1930	90	30	30	120	140
1931	0	0	0	0	0
1932	200	40	40	240	110
1933	130	10	10	510	550
1934	0	0	0	210	240
1976	110	0	0	190	0
1977	0	0	0	0	0
1987	0	0	0	550	180
1988	0	0	0	0	0
1989	0	0	0	0	90
1990	0	0	0	0	0
1991	0	0	0	0	0
1992	0	0	0	0	100
1922-1994 average	130	80	70	260	120

Numbers rounded to the nearest 10,000 acre-feet.

increases only slightly, and because less water is made available under Article 21.

Table 5-5 summarizes the estimates of dry year deliveries under Article 21 for the five studies. The updated studies (4 and 5) have higher deliveries than the earlier studies (1, 2 and 3) because of assumed higher Article 21 demand. Also notice the reductions in delivery for studies 2 and 3 compared to study 1 in the years 1930, 1932, 1933, and 1976. These reductions are due to the increase in Table A deliveries. The average values for Article 21 deliveries for Study 5 is lower than study 4, primarily due to the assumed higher Table A demand in study 5.

Wet Years

Tables 5-6 and 5-7 summarize the model run results for historical wet years. As with drought years, the Eight River Index is used to identify the wet years. Because plenty of water is available for deliveries in wet years, variations in Table A delivery are due to variations in the demand assumed for each of the studies.

Table 5-7 contains information about Article 21 deliveries for the wet period 1978-1987. The information illustrates a significant decrease in the availability of Article 21 supply between study 5 and study 4. This is primarily due to the increase in Table A demand. Article 21 deliveries are generally higher in the updated studies (4 and 5) than the earlier studies (1, 2 and 3). This is attributed to the 200 taf per year increase in Article 21 demand assumed for studies 4 and 5. In addition, the increase in Article 21 deliveries for study 4 compared to the study 1 is partially due to the lower Table A demand assumed for study 4.

SWP Table A Delivery Probability

The probability that a given level of SWP Table A amount will be delivered from the Delta is shown for the two current condition studies (1 and 4) in Figure 5-1 and for the three future condition studies (2, 3, and 5) in Figure 5-2. The plot lines in the figures are derived from the study results listed in tables B-3 through B-7. Each line is constructed by ranking the 73 annual Table A delivery values of the relevant study from lowest to highest and calculating the percentage of values equal to or greater than the delivery value of interest. For example, for study 4 in Figure 5-1, the value of 3.3 maf is in the 30 percent position of the ranking; therefore,

Table 5-6 SWP average and wet year Table A delivery from Delta

Study	SWP Table A delivery from the Delta (in percent of maximum Table A) Average 1922-1994	Single wet year 1983	2-year wet 1982-1983	4-year wet 1980-1983	6-year wet 1978-1983	10-year wet 1978-1987
SWP Delivery Reliability Report (2003):						
1. 2001 Study	72%	73%	79%	80%	80%	80%
2. 2021A Study	75%	82%	89%	86%	87%	84%
3. 2021B Study	76%	100%	100%	91%	91%	87%
Updated Studies:						
4. 2005 Study	68%	60%	65%	69%	75%	72%
5. 2025 Study	77%	95%	97%	93%	93%	89%

Table 5-7 Average and wet year delivery under Article 21 (taf per year)

Year	Study 1 2001	Study 2 2021A	Study 3 2021B	Study 4 2005	Study 5 2025
1978	100	100	100	300	300
1979	140	90	100	160	140
1980	100	70	80	140	90
1981	120	0	0	550	70
1982	390	100	60	800	170
1983	200	200	160	400	360
1984	410	380	370	550	490
1985	0	0	0	0	0
1986	50	50	60	120	80
1987	0	0	0	550	180
1922-1994 average	130	80	70	260	120

Numbers rounded to the nearest 10,000 acre-feet.

it is equaled or exceeded by 30 percent (about 22) of the 73 delivery values. The delivery value of 0.16 maf, the minimum value for study 4, is equaled or exceeded by all of the delivery values.

The curve for study 4 is generally lower than study 1 due to assumed lower annual demands. Neither curve reaches 100 percent because the assumed annual demands are 100 percent (99.5 percent) of the maximum Delta Table A in only two years for study 1 and the assumed maximum demand for study 4 is 93 percent of the maximum Delta Table A. In study 1, the two years with demand at 100 percent are dry years so delivery of 100 percent is not possible. The divergence of the two curves for the minimum delivery amounts (100 percent probability of being equaled or exceeded) is due to modification of the delivery-carryover storage rule.

Study 5 shows higher deliveries than study 3 for delivery values exceeded by up to 70 percent of the values, and mostly lower deliveries for values exceeded by 80 to 100 percent of the values. Because the assumed demands are nearly the same for these two studies, the delivery differences between study 5 and study 3 are primarily due to modification of the delivery-carryover storage relationship. The delivery-carryover relationship assumed in study 5 allows less delivery than study 3 in dry years which results in higher carryover storage and higher deliveries in normal to above normal years. Study 5 deliveries reach 100 percent 26 percent of the time, the highest percentage for the five studies.

The amount of SWP Table A delivery per year, either in percent of maximum Delta Table A or in thousand acre-feet, associated with a

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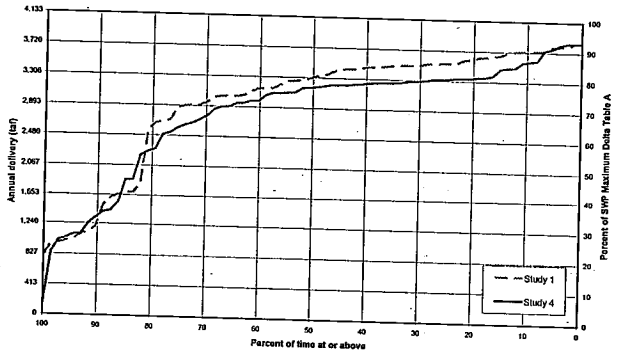

Figure 5-1 SWP Delta Table A delivery probability for year 2005

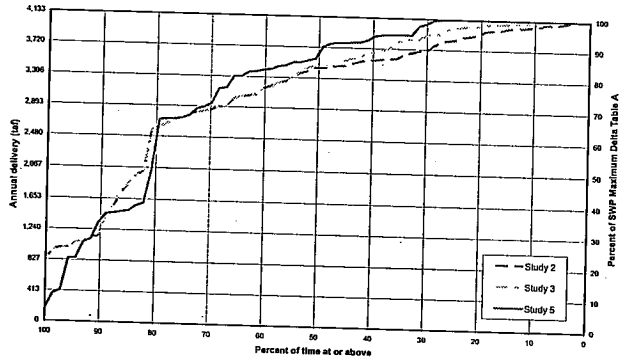

Figure 5-2 SWP Delta Table A delivery probability for year 2025

specific degree of reliability can be estimated from Figures 5-1 and 5-2 for 2005 and 2025 conditions, respectively. The study 4 curve in Figure 5-1 is recommended to be used to represent 2005 conditions, and the study 5 curve in Figure 5-2 is recommended to be used to represent 2025 conditions. By referencing the curve for study 5 in Figure 5-2, the following can be deduced:

- In 75 percent of the years, the annual water delivery of the SWP is estimated to be at or above 2.70 maf per year (65 percent of 4.13 maf).

- In 50 percent of the years, it is estimated to be at or above 3.50 maf per year (85 percent of 4.13 maf).
- In 25 percent of the years, it is at 4.13 maf per year.

Figures 5-1 and 5-2 depict the estimated reliability for the total of SWP deliveries. Under conditions when almost all contractors are requesting their maximum Table A, such as study 5, this information can be directly applied to individual long-term water supply contracts for the SWP. For example, if a water agency has a maximum SWP Table A amount of 400 taf, at least 260 taf per year (65 percent of 400 taf) is estimated to be delivered 75 percent of the time.

Potential Adjustments to 1977 CalSim II Table A Deliveries

The CalSim II model, a planning model, is best used for estimating SWP performance over long periods of time. Considerable judgment should be applied when evaluating CalSim II results for shorter periods of time. This is especially true for estimates for a single year. The updated studies (studies 4 and 5) show that the changes in the operations criteria assumed for the SWP produce a delivery estimate of about 5 percent of maximum Delta Table A for the driest year on record (1977). This estimate is lower than the amount actually delivered from the Delta in 1977 (733 taf, 18 percent of maximum Delta Table A), as well as lower than what was shown in *SWP Delivery Reliability Report 2002* (DWR 2003). The discussion below presents some adjustments contractors may consider in estimating Table A deliveries under weather conditions similar to 1977.

In order to understand what led to the lower delivery estimates for 1977, it is best to start with 1975. The year 1975 is a wet year and is immediately followed by two critically dry years (1977 being the driest year on record during the last 80 years of historical hydrology). SWP Table A deliveries estimated in study 4 for 1975, 1976, and 1977 are 3.23 maf, 3.27 maf, and 159 taf, respectively. For study 5 the respective deliveries are 4.13 maf, 3.14 maf, and 187 taf. As currently practiced and allowed under the SWP water supply contracts, many of the contractors would carry over a portion of their allocated Table A water during 1975 and 1976 to succeeding years. In the case of 1977, it is reasonable to assume that up to 500 taf of 1976 allocated Table A water could be carried over to 1977. In addition, due to the slightly conservative delivery-carryover rule curve used in these studies, the minimum SWP storage in San Luis Reservoir for 1977, which occurs during the June-August period, averages about 190 taf for both studies 4 and 5. The minimum pool for the SWP share of San Luis Reservoir is just over 40 taf. In a year as critically dry as 1977, it is also reasonable to assume an additional 150 taf would be made available for deliveries bringing the SWP storage in San Luis Reservoir to minimum pool. After August, the SWP storage in San Luis Reservoir begins to rise. It is reasonable to expect additional deliveries to be made in the September-December period.

In summary, under the hydrologic conditions similar to a critically dry year like 1977, project deliveries can be expected to range from 4 or 5 to 20 percent of Table A, depending upon such factors as the delivery-carryover risk curve applied by SWP operators and the amount of allocated Table A water carried over from the previous year by SWP contractors.

Additional Analysis of Tables B-3 through B-7 in Appendix B

The information presented earlier in this chapter is helpful in analyzing the delivery reliability of a specific water system receiving a portion of its water supply from the SWP. In addition, the series of data contained in tables B-3 through B-7 are very helpful in analyzing longer periods of time that contain not only dry periods but wetter periods, which can replenish local water supplies if there is a place to store the supply. Analysis of this information can help determine if a local agency has adequate storage for capturing these supplies or if more storage could be utilized in the local water system.

Cited Reference

[DWR] California Department of Water Resources, Bay-Delta Office. 2003. The State Water Project Delivery Reliability Report 2002. Final.

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Chapter 6. Examples of How to Apply Information

The following two examples illustrate how to use the information presented in this report to develop water supply assessments for a hypothetical SWP contractor. Hypothetical examples illustrating applications of the delivery probability curves and adjustments to the data for a SWP contractor that cannot convey its maximum Table A amount are provided in *The State Water Project Delivery Reliability Report 2002*. Questions regarding the use of the information contained in these reports may be directed to the Department of Water Resources' Bay-Delta Office at (916) 653-1099.

Example 1

This example uses data directly from Table 5-4 for studies 4 and 5, and employs an allocation methodology that provides a simple means of estimating supplies to each contractor. The data in the table is interpolated for 5-year increments and contained in Table 6-1. In all but the average values in Table 6-1, the estimated percentages of Table A deliveries for the 2005 and the 2025 levels of development differ by one percentage point only. Interpolation between these values is shown in this example for illustration purposes. When values are this close, a valid alternative approach would be to use the same percentage value throughout the entire twenty-year period.

Although the percentage values are calculated using the maximum Delta Table A value, they may be directly applied to generate estimates for SWP deliveries for the entire 20-year period. This is because the Delta Table A value for 2005 is 4.114 maf/yr, 99.5 percent of the maximum Delta Table A value of 4.133 maf/yr. For comparison purposes, the percentage values for studies 1 and 4 based upon a full Table A value of 4.113 maf/yr and 4.133 maf/yr are listed in Tables B-3 and B-6. In addition, the percentages may also be used to estimate the Table A deliveries to SWP contractors in Butte and Plumas counties and Yuba City. The deliveries to these contractors would be calculated using the same method described below.

Table 6-1 shows the average percentage of maximum Delta Table A deliveries for average, single-dry year, and 2-, 4-, and 6-year multiple dry year scenarios from 2005 to 2025 in five-year increments. The maximum Table A amounts of each contractor are listed in Appendix C. Note that Table A amounts can be amended and a contractor's Table A amount over the next 20 years may be less than its maximum over some or all of this period. In this case, the contractor should use the amended Table A amounts for the corresponding years during this period. To use dry years other than those presented in Table 6-1, or to show year-to-year supplies instead of

Table 6-1 SWP average and dry year Table A delivery from the Delta in five-year intervals for studies 4 and 5

Year	SWP Table A delivery from the Delta (in percent of maximum Table A)					
	Average 1922-1994	Single dry year 1977	2-year drought 1976-1977	4-year drought 1931-1934	6-year drought 1987-1992	6-year drought 1929-1934
2005	68%	4%	41%	32%	42%	37%
2010	70%	4%	41%	32%	42%	37%
2015	73%	4%	41%	33%	42%	37%
2020	75%	4%	41%	33%	42%	37%
2025	77%	5%	40%	33%	42%	38%

Tables for Example 1

Average Annual Values (acre-feet)

Water Supply Source	2005	2010	2015	2020	2025
State Water Project (Table A)	68,000	70,000	73,000	75,000	77,000
State Water Project (Article 21)[1]					
Groundwater					
Local Surface Water					
Transfers					
Exchanges					
Reclaimed Water					
Other (identify)					
Total					

[1] Annual Article 21 amounts vary significantly from year to year. Without the ability to store Article 21 supply, it is not likely to contribute to local supply. See discussion of Article 21 supply in Chapter 5.

Single Dry Year 1977 conditions (acre-feet)

Water Supply Source	2005	2010	2015	2020	2025
State Water Project (Table A)	4,000	4,000	4,000	4,000	5,000
State Water Project (Article 21)	0	0	0	0	0
Groundwater					
Local Surface Water					
Transfers					
Exchanges					
Reclaimed Water					
Other (identify)					
Total					

Multiple Dry Year Period 1931-1934 conditions (acre-feet per year)

Water Supply Source	2005	2010	2015	2020	2025
State Water Project (Table A)	32,000	32,000	33,000	33,000	33,000
State Water Project (Article 21)[1]					
Groundwater					
Local Surface Water					
Transfers					
Exchanges					
Reclaimed Water					
Other (identify)					
Total					

[1] Annual Article 21 amounts vary significantly from year to year. Without the ability to store Article 21 supply, it is not likely to contribute to local supply. See discussion of Article 21 supply in Chapter 5.

averages over a multiple-dry year period, see Example 2.

How to calculate supplies:

Multiply the contractor's Table A amount for a particular year by the corresponding delivery percentages for that year from Table 6-1 to get an estimated delivery amount, for the average and drought periods, for each 5 year increment from 2005 to 2025.

The example tables show the SWP Table A deliveries projected to be available to a hypothetical contractor with a maximum Table A amount of 100,000 af, on average and for the various drought periods. For this example, the supplies shown for the multiple-dry year period are average supplies over the four-year drought from 1931-1934. Data from other year types, although not required in an urban water management plan, could also be presented this way.

Example 2

This example is similar to Example 1 but allows a contractor to select alternative single year or multiple-dry year sequences other than those presented in Table 6-1. This option might be selected if analyzing different hydrologic year(s) makes more sense given a contractor's other supply sources, or given the locally acceptable risk level for water delivery shortages.

This example can also be used to identify supplies projected to be available in each year of a multiple-dry year period. While the Water Code does not specifically require this, the *Urban Water Management Plan Guidebook* suggests showing year-to-year supplies (see the *UWMP Guidebook*, Section 7, Step 3).

Where to find the data

Choose a single year or multiple-year sequence from Tables B-6 and B-7 to represent single-dry year and multiple-dry year scenarios. Table B-6 contains the percent of maximum Table A deliveries under all 73 hydrologic years in the updated model study for 2005. Table B-7 contains the percent of maximum Table A deliveries under all 73 hydrologic years in the updated model study for 2025.

How to calculate supplies

Multiply the contractor's Table A amount for a particular year by the percent of maximum Table A deliveries for the selected years, to get an estimated delivery amount for the years selected, for 2005 and 2025. Values for years between 2005 and 2025 can be linearly interpolated.

The following tables show the SWP Table A deliveries projected to be available to a hypothetical contractor with a maximum Table A amount of 100,000 af, in a single dry year and year-to-year over a multiple dry year period. For this example, the single dry year selected is for 1988 conditions, and the multiple dry year period selected is the three-year period from 1990-1992. In showing year-to-year supplies for the multiple dry year period, these year-to-year supplies should be shown for each five-year increment during the 20-year projection period.

Tables for Example 2

Single Dry Year
1988 conditions
(acre-feet)

Water Supply Source	2005	2010	2015	2020	2025
State Water Project (Table A)	21,000	18,000	15,000	13,000	10,000
State Water Project (Article 21)	0	0	0	0	0
Groundwater					
Local Surface Water					
Transfers					
Exchanges					
Reclaimed Water					
Other (identify)					
Total					

Tables for Example 2 (cont.)

Multiple Dry Year Period 1990-1992
1990 conditions
(acre-feet per year)

Water Supply Source	2005	2010	2015	2020	2025
State Water Project (Table A)	27,000	25,000	24,000	22,000	21,000
State Water Project (Article 21)	0	0	0	0	0
Groundwater					
Local Surface Water					
Transfers					
Exchanges					
Reclaimed Water					
Other (identify)					
Total					

Multiple Dry Year Period 1990-1992
1991 conditions
(acre-feet per year)

Water Supply Source	2005	2010	2015	2020	2025
State Water Project (Table A)	25,000	24,000	23,000	22,000	21,000
State Water Project (Article 21)	0	0	0	0	0
Groundwater					
Local Surface Water					
Transfers					
Exchanges					
Reclaimed Water					
Other (identify)					
Total					

Multiple Dry Year Period 1990-1992
1992 conditions
(acre-feet per year)

Water Supply Source	2005	2010	2015	2020	2025
State Water Project (Table A)	34,000	34,000	35,000	35,000	35,000
State Water Project (Article 21)	0	0	0	0	0
Groundwater					
Local Surface Water					
Transfers					
Exchanges					
Reclaimed Water					
Other (identify)					
Total					

Appendix A. 2005 Delivery Reliability Report CalSim II Modeling Assumptions

Two versions of the model are used for this report. Studies 1, 2 and 3 are based on the May 2002 benchmark study version. The updated studies (4 and 5) use the most recent version, which was developed for the 2004 Long-Term Central Valley Project Operations Criteria and Plan (OCAP). The key assumption differences between the May 2002 benchmark version and the 2004 OCAP version are listed below.

1. Temperature flow below Keswick Dam was changed from a fixed time series flow to a dynamic storage dependent flow.
2. Relaxation of criteria for flow below Nimbus Dam when Folsom Lake storage drops below 300 thousand acre-feet.
3. Navigation control point flow criteria were modified from being dependent on water year type to being dependent on CVP agricultural allocation levels. Criteria were also relaxed for very low allocation years.
4. Clear Creek Tunnel target flows were modified to match the latest Trinity EIR analysis.
5. Addition of a minimum pumping level at Banks Pumping Plant of 300 cubic feet per second.
6. Addition of a minimum pumping level at Tracy Pumping Plant of 600 cubic feet per second.
7. Addition of flow requirements for flow at the mouth of the Feather River for Settlement Contractors.
8. Delivery-carryover relationship was adjusted to reduce delivery targets and increase carryover in critically dry years.
9. Addition of Lake Oroville end-of-September carryover target storage rule.
10. Five-step study setup modified to isolate (b)(2) accounting from "with Project" conditions.
11. Modification of American River demands as described in Tables A-2 and A-3.
12. Modification of Contra Costa Water District demands to include the effect of Los Vaqueros Reservoir operations.
13. The minimum flow of the Trinity River below Lewiston Dam in study 4 ranges from 369 to 453 thousand acre-feet per year depending on water year type. All other studies used in this report assume the Trinity River minimum flow has a greater range from 369 to 815 thousand acre-feet per year. This greater range of Trinity River minimum flows represents the Trinity Environmental Impact Statement Preferred Alternative.
14. Study 5 assumes the implementation of Freeport Regional Water Project, including modified East Bay Municipal Utility District operations on the Mokelumne River.
15. Implementation of May 2003 CVPIA 3406 (b)(2) decision and other changes:
    a. Streamlining actions to simplify analysis of the results.
    b. Anadromous Fish Restoration Program table updates to better represent management of (b)(2) water under the May 2003 (b)(2) decision.
    c. Action triggering modifications to attempt to meet 200 thousand-acre feet target during October through January period.
16. Environmental Water Account (EWA) changes include:
    a. Streamlining actions and coordination with (b)(2) actions.
    b. EWA purchase amount increase to a maximum of 250 thousand acre-feet per year.
    c. Addition of storage debt carryover accounting, including debt spill at San Luis Reservoir.
    d. Addition of EWA asset takeover by SWP and CVP at San Luis Reservoir when reservoir space utilized by EWA is needed for project operations.

All studies assume current Banks Pumping Plant capacity, existing conveyance capacity of the upper Delta-Mendota Canal/California Aqueduct system, and current SWP/CVP operations agreements.

The following table is a complete list of the study assumptions.

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Table A-1 2005 Delivery Reliability Report CalSim II Modeling Assumptions

	Study 1 2001 Study, 2003 Report	Study 4 2005 Study, Updated Studies	Study 2 2021A Study, 2003 Report	Study 3 2021B Study, 2003 Report	Study 5 2025 Study, Updated Studies
Period of Simulation	73 years (1922-1994)	Same	Same	Same	Same
HYDROLOGY					
Level of Development (Land Use)	2001 Level, DWR Bulletin 160-98[1]	Same as Study 1	2020 Level, DWR Bulletin 160-98	Same as Study 2	Same as Study 2
Demands					
North of Delta (except American River)					
CVP	Land Use based, limited by Full Contract	Same	Same	Same	Same
SWP (FRSA)	Land Use based, limited by Full Contract	Same	Same	Same	Same
Non-Project	Land Use based	Same	Same	Same	Same
CVP Refuges	Firm Level 2	Same	Same	Same	Same
American River Basin					
Water rights	2001[2]	2001[3]	2020[4]	Same as Study 2	2020, as projected by Water Forum Analysis[5]
CVP	2001[2]	2001[3]	2020[4]	Same as Study 2	202 0, as projected by Water Forum Analysis[7]
San Joaquin River Basin					
Friant Unit	Regression of historical	Same	Same	Same	Same
Lower Basin	Fixed annual demands	Same	Same	Same	Same
Stanislaus River Basin	New Melones Interim Operations Plan	Same	Same	Same	Same
South of Delta					
CVP	Full Contract	Same	Same	Same	Same
CCWD	143 TAF/YR[8]	124 TAF/YR[8]	151 TAF/YR[8]	Same as Study 2	158 TAF/YR[8]

Table A-1 2005 Delivery Reliability Report CalSim II Modeling Assumptions (cont.)

	Study 1 2001 Study, 2003 Report	Study 4 2005 Study, Updated Studies	Study 2 2021A Study, 2003 Report	Study 3 2021B Study, 2003 Report	Study 5 2025 Study, Updated Studies
SWP (w/ North Bay Aqueduct)	3.0-4.1 MAF/YR	2.3-3.9 MAF/YR	3.3-4.1 MAF/YR	4.1 MAF/YR	3.9-4.1 MAF/YR
SWP Article 21 Demand	MWDSC up to 50 TAF/month, Dec-Mar, others up to 84 TAF/month	MWDSC up to 100 TAF/ month, Dec-Mar, others up to 84 TAF/month	Same as Study 1	Same as Study 1	Same as Study 4
FACILITIES					
Freeport Regional Water Project	None	Same as Study 1	Same as Study 1	Same as Study 1	Included[9]
Banks Pumping Capacity	6680 cfs	Same	Same	Same	Same
Tracy Pumping Capacity	4200 cfs + deliveries upstream of DMC constriction	Same	Same	Same	Same
REGULATORY STANDARDS					
Trinity River					
Minimum Flow below Lewiston Dam	Trinity EIS Preferred Alternative (369-815 TAF/YR)	369-453 TAF/YR	Same as Study 1	Same as Study 1	Same as Study 1
Trinity Reservoir End-of-September Minimum Storage	Trinity EIS Preferred Alternative (600 TAF as able)	Same	Same	Same	Same
Clear Creek					
Minimum Flow below Whiskeytown Dam	Downstream water rights, 1963 USBR Proposal to FWS and NPS, and FWS use of CVPIA 3406(b)(2) water	Same	Same	Same	Same
Upper Sacramento River					
Shasta Lake End-of-September Minimum Storage	SWRCB WR 1993 Winter-run Biological Opinion (1900 TAF)	Same	Same	Same	Same

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Table A-1 2005 Delivery Reliability Report CalSim II Modeling Assumptions (cont.)

	Study 1 2001 Study, 2003 Report	Study 4 2005 Study, Updated Studies	Study 2 2021A Study, 2003 Report	Study 3 2021B Study, 2003 Report	Study 5 2025 Study, Updated Studies
Minimum Flow below Keswick Dam	Flows for SWRCB WR 90-5 and 1993 Winter-run Biological Opinion temperature control, and FWS use of CVPIA 3406(b)(2) water	Same	Same	Same	Same
Feather River					
Minimum Flow below Thermalito Diversion Dam	1983 DWR, DFG Agreement (600 CFS)	Same	Same	Same	Same
Minimum Flow below Thermalito Afterbay outlet	1983 DWR, DFG Agreement (750-1700 CFS)	Same	Same	Same	Same
American River					
Minimum Flow below Nimbus Dam	SWRCB D-893 (see accompanying Operations Criteria), and FWS use of CVPIA 3406(b)(2) water	Same	Same	Same	Same
Minimum Flow at H Street Bridge	SWRCB D-893	Same	Same	Same	Same
Lower Sacramento River					
Minimum Flow near Rio Vista	SWRCB D-1641	Same	Same	Same	Same
Mokelumne River					
Minimum Flow below Camanche Dam	FERC 2916-029, 1996 (Joint Settlement Agreement) (100-325 CFS)	Same	Same	Same	Same
Minimum Flow below Woodbridge Diversion Dam	FERC 2916-029, 1996 (Joint Settlement Agreement) (25-300 CFS)	Same	Same	Same	Same
Stanislaus River					
Minimum Flow below Goodwin Dam	1987 USBR, DFG agreement, and FWS use of CVPIA 3406(b)(2) water	Same	Same	Same	Same

Table A-1 2005 Delivery Reliability Report CalSim II Modeling Assumptions (cont.)

	Study 1 2001 Study, 2003 Report	Study 4 2005 Study, Updated Studies	Study 2 2021A Study, 2003 Report	Study 3 2021B Study, 2003 Report	Study 5 2025 Study, Updated Studies
Minimum Dissolved Oxygen	SWRCB D-1422	Same	Same	Same	Same
Merced River					
Minimum Flow below Crocker-Huffmen Diversion Dam	Davis-Grunsky (180-220 CFS, Nov-Mar), and Cowell Agreement	Same	Same	Same	Same
Minimum Flow at Shaffer Bridge	FERC 2179 (25-100 CFS)	Same	Same	Same	Same
Tuolumne River					
Minimum Flow at Lagrange Bridge	FERC 2299-024, 1995 (Settlement Agreement) (94-301 TAF/YR)	Same	Same	Same	Same
San Joaquin River					
Maximum Salinity near Vernalis	SWRCB D-1641	Same	Same	Same	Same
Minimum Flow near Vernalis	SWRCB D-1641, and Vernalis Adaptive Management Program per San Joaquin River Agreement	Same	Same	Same	Same
Sacramento River-San Joaquin River Delta					
Delta Outflow Index (Flow and Salinity)	SWRCB D-1641	Same	Same	Same	Same
Delta Cross Channel Gate Operation	SWRCB D-1641	Same	Same	Same	Same
Delta Exports	SWRCB D-1641, FWS use of CVPIA 3406(b)(2) water and CALFED Fisheries Agencies use of EWA assets	Same	Same	Same	Same
OPERATIONS CRITERIA					
Subsystem					
Upper Sacramento River					
Flow Objective for Navigation (Wilkins Slough)	3,500-5,000 CFS based on Lake Shasta storage condition	3,250-5,000 CFS based on CVP Ag allocation levels	Same as Study 1	Same as Study 1	Same as Study 4

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Table A-1 2005 Delivery Reliability Report CalSim II Modeling Assumptions (cont.)

	Study 1 2001 Study, 2003 Report	Study 4 2005 Study, Updated Studies	Study 2 2021A Study, 2003 Report	Study 3 2021B Study, 2003 Report	Study 5 2025 Study, Updated Studies
American River					
Folsom Dam Flood Control	SAFCA, Interim re-operation of Folsom Dam, Variable 400/670 (without outlet modifications)	Same	Same	Same	Same
Flow below Nimbus Dam	Operations criteria corresponding to SWRCB D-893 required minimum flow	Same	Same	Same	Same
Sacramento Water Forum Miligation Water	None	Same as Study 1	Sacramento Water Forum (up to 47 TAF/YR in dry years)[a]	Same as Study 2	Same as Study 2
Feather River					
Flow at Mouth	No criteria	Maintain the DFG/DWR flow target above Verona or 2800 cfs for Apr-Sep dependent on Oroville inflow and FRSA allocation	Same as Study 1	Same as Study 1	Same as Study 4
Stanislaus River					
Flow below Goodwin Dam	1997 New Melones Interim Operations Plan	Same	Same	Same	Same
San Joaquin River					
Flow near Vernalis	San Joaquin River Agreement in support of the Vernalis Adaptive Management Program	Same	Same	Same	Same
System-wide					
CVP Water Allocation					
CVP Settlement and Exchange	100% (75% in Shasta Critical years)	Same	Same	Same	Same
CVP Refuges	100% (75% in Shasta Critical years)	Same	Same	Same	Same

Table A-1 2005 Delivery Reliability Report CalSim II Modeling Assumptions (cont.)

	Study 1 2001 Study, 2003 Report	Study 4 2005 Study, Updated Studies	Study 2 2021A Study, 2003 Report	Study 3 2021B Study, 2003 Report	Study 5 2025 Study, Updated Studies
CVP Agriculture	100% - 0% based on supply (reduced by 3406(b)(2) allocation)	Same	Same	Same	Same
CVP Municipal & Industrial	100% - 50% based on supply (reduced by 3406(b)(2) allocation)	Same	Same	Same	Same
SWP Water Allocation					
North of Delta (FRSA)	Contract specific	Same	Same	Same	Same
South of Delta	Based on supply; Monterey Agreement	Same	Same	Same	Same
CVP/SWP Coordinated Operations					
Sharing of Responsibility for In-Basin-Use	1986 Coordinated Operations Agreement	Same	Same	Same	Same
Sharing of Surplus Flows	1986 Coordinated Operations Agreement	Same	Same	Same	Same
Sharing of Restricted Export Capacity	Equal sharing of export capacity under SWRCB D-1641; use of CVPIA 3406(b)(2) only restricts CVP exports; EWA use restricts CVP and/or SWP exports as directed by CALFED Fisheries Agencies	Same	Same	Same	Same
Transfers					
Dry Year Program	None	Same	Same	Same	Same
Phase 8	None	Same	Same	Same	Same
MWDSC/CVP Settlement Contractors	None	Same	Same	Same	Same

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Table A-1 2005 Delivery Reliability Report CalSim II Modeling Assumptions (cont.)

	Study 1 2001 Study, 2003 Report	Study 4 2005 Study, Updated Studies	Study 2 2021A Study, 2003 Report	Study 3 2021B Study, 2003 Report	Study 5 2025 Study, Updated Studies
CVP/SWP Integration					
Dedicated Conveyance at Banks	None	Same	Same	Same	Same
NOD Accounting Adjustments	None	Same	Same	Same	Same
CVPIA 3406(b)(2)	May 2002 benchmark study assumptions	Dept of Interior 2003 Decision	Same as Study 1	Same as Study 1	Same as Study 4
Allocation	800 TAF/YR (600 TAF/YR in Shasta Critical years)	800 TAF/YR, 700 TAF/YR in 40-30-30 Dry Years, and 600 TAF/YR in 40-30-30 Critical years	Same as Study 1	Same as Study 1	Same as Study 4
Actions	AFRP flow objectives (Oct-Jan), CVP export reduction (Dec-Jan), 1995 WQCP (up to 450 TAF/YR), VAMP (Apr 15- May 16) CVP export restriction, Post (May 16-31) VAMP CVP export restriction, Ramping of CVP export (Jun), Pre (Apr 1-15) VAMP CVP export restriction, CVP export reduction (Feb-Mar), Additional Upstream Releases (Feb-Sep)	1995 WQCP, Fish flow objectives (Oct-Jan), VAMP (Apr 15- May 16) CVP export restriction, 3000 CFS CVP export limit in May and June (D1485 Striped Bass continuation), Post (May 16-31) VAMP CVP export restriction, Ramping of CVP export (Jun), Upstream Releases (Feb-Sep)	Same as Study 1	Same as Study 1	Same as Study 4
Accounting adjustments per May 2003 Interior Decision	None	No limit on responsibility for non-discretionary D1641 requirements no Reset with the Storage metric and no Offset with the Release and Export metrics	Same as Study 1	Same as Study 1	Same as Study 4

Table A-1 2005 Delivery Reliability Report CalSim II Modeling Assumptions (cont.)

	Study 1 2001 Study, 2003 Report	Study 4 2005 Study, Updated Studies	Study 2 2021A Study, 2003 Report	Study 3 2021B Study, 2003 Report	Study 5 2025 Study, Updated Studies
CALFED Environmental Water Account					
Actions	Total exports restricted to 4,000 cfs, 1 wk/mon, Dec-Mar (wet year: 2 wk/mon), VAMP (Apr 15- May 16) export restriction, Pre (Apr 1-15) and Post (May 16-31) VAMP export restriction, Ramping of export (Jun)	Dec-Feb reduce total exports by 50 TAF/month relative to total exports without EWA; VAMP (Apr 15- May 16) export restriction on SWP; Post (May 16-31) VAMP export restriction on SWP and potentially on CVP if B2 Post-VAMP action is not taken; Ramping of exports (Jun)	Same as Study 1	Same as Study 1	Same as Study 4
Assets	50% of use of JPOD, 50% of any CVPIA 3406(b)(2) or ERP releases pumped by SWP, flexing of Delta Export/Inflow Ratio (not explicitly modeled), dedicated 500 CFS increase of Jul-Sep Banks PP capacity, north-of-Delta (35 TAF/Yr) and south-of-Delta purchases (50-200 TAF/Yr), 100 TAF/Yr from south-of-Delta source shifting agreements, and 200 TAF/YR south-of-Delta groundwater storage capacity	Fixed Water Purchases 250 TAF/yr, 230 TAF/yr in 40-30-30 dry years, 210 TAF/yr in 40-30-30 critical years. The purchases range from 0 TAF in Wet Years to approximately 153 TAF in Critical Years NOD, and 57 TAF in Critical Years to 250 TAF in Wet Years SOD. Variable assets include the following: used of 50% JPOD export capacity, acquisition of 50% of any CVPIA 3406(b)(2) releases pumped by SWP, flexing of Delta Export/Inflow Ratio (post-processed from CalSim II results), dedicated 500 CFS pumping capacity at Banks in Jul-Sep	Same as Study 1	Same as Study 1	Same as Study 4

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Table A-2 2001 American River Demand Assumptions

Location / Purveyor	Allocation Type (maximum acre-feet)					
	CVP AG	CVP MI	CVP Settlement / Exchange	Water Rights / Non-CVP / No Cuts	CVP Refuge	Total
Auburn Dam Site (D300)						
Placer County Water Agency	0	0	0	8,500	0	8,500
Total	0	0	0	8,500	0	8,500
Folsom Reservoir (D8)						
Sacramento Suburban	0	0	0	0	0	0
City of Folsom (includes P.L. 101-514)	0	0	0	20,000	0	20,000
Folsom Prison	0	0	0	2,000	0	2,000
San Juan Water District (Placer County)	0	0	0	10,000	0	10,000
San Juan Water District (Sacramento County) (includes P.L. 101-514)	0	11,200	0	33,000	0	44,200
El Dorado Irrigation District	0	7,550	0	0	0	7,550
El Dorado Irrigation District (P.L. 101-514)	0	0	0	0	0	0
City of Roseville	0	32,000	0	0	0	32,000
Placer County Water Agency	0	0	0	0	0	0
Total	0	50,750	0	65,000	0	115,750
Folsom South Canal (D9)						
So. Cal WC/ Arden Cordova WC	0	0	0	3,500	0	3,500
California Parks and Recreation	0	100	0	0	0	100
SMUD (export)	0	0	0	15,000	0	15,000
South Sacramento County Agriculture (export, SMUD transfer)	0	0	0	0	0	0
Canal Losses	0	0	0	1,000	0	1,000
Total	0	100	0	19,500	0	19,600
Nimbus to Mouth (D302)						
City of Sacramento	0	0	0	63,335	0	63,335
Arcade Water District	0	0	0	2,000	0	2,000
Carmichael Water District	0	0	0	8,000	0	8,000
Total	0	0	0	73,335	0	73,335
Sacramento River (D162)						
Placer County Water Agency	0	0	0	0	0	0
Total	0	0	0	0	0	0
Sacramento River (D167/D168)						
City of Sacramento	0	0	0	38,665	0	38,665
Sacramento County Water Agency (SMUD transfer)	0	0	0	0	0	0
Sacramento County Water Agency (P.L. 101-514)	0	0	0	0	0	0
EBMUD (export)	0	0	0	0	0	0
Total	0	0	0	38,665	0	38,665
Total from the American River	0	50,850	0	166,335	0	217,185

Table A-1 2005 Delivery Reliability Report CalSim II Modeling Assumptions (cont.)

	Study 1 2001 Study, 2003 Report	Study 4 2005 Study, Updated Studies	Study 2 2021A Study, 2003 Report	Study 3 2021B Study, 2003 Report	Study 5 2025 Study, Updated Studies
Debt restrictions	No planned carryover of debt past Sep, no reset of unpaid debt, debt carried past Sep paid back by Feb	Delivery debt paid back in full upon assessment; Storage debt paid back over time based on asset/action priorities; SOD and NOD debt carryover is allowed; SOD debt carryover is explicitly managed or spilled; NOD debt carryover must be spilled; SOD and NOD asset carryover is allowed.	Same as Study 1	Same as Study 1	Same as Study 4

[1] 2000 Level of Development defined by linearly interpolated values from the 1995 Level of Development and 2020 Level of Development from DWR Bulletin 160-98

[2] 1998 level demands defined in Sacramento Water Forum EIR with a few updated entries.

[3] Presented in attached Table 2001 American River Demand Assumptions

[4] Sacramento Water Forum 2025 level demands defined in Sacramento Water Forum's EIR.

[5] Presented in attached Table 2020 American River Demand Assumptions

[6] Sacramento Water Forum 2025 level demands defined in Sacramento Water Forum's EIR. Fregon Alternative defined in EBMUD Supplemental Water Supply Project REIR/SEIS.

[7] Same as footnote 5 but modified with PCWA 35 TAF CVP contract supply diverted at the new American River PCWA Pump Station

[8] Data directions include operations of Los Vaqueros Reservoir and represent average annual diversion

[9] Includes modified EBMUD operations of the Mokelumne River

[10] This is implemented only in the PCWA Middle Fork Project release used in defining the CALSIM II inflows to Folsom Lake

Table A-3 2020 American River Demand Assumptions

Location / Purveyor	Allocation Type (maximum acre-feet)						Folsom Unimpaired Inflow (FUI)			Notes
	CVP AG	CVP MI	CVP Settlement / Exchange	Water Rights / Non-CVP / No Cuts	CVP Refuge	Total	FUI = Total TAF (Mar – Sep) + 60 TAF			
Auburn Dam Site (D300)										
Placer County Water Agency	0	35,000	0	35,500	0	70,500	70,500	70,500	70,500	1/2/3/12
Total	0	35,000	0	35,500	0	70,500	70,500	70,500	70,500	
Folsom Reservoir (D8)										
Sacramento Suburban	0	0	0	29,000	0	29,000	29,000	0	0	4/5/11
City of Folsom (includes P.L. 101-514)	0	7,000	0	27,000	0	34,000[1]	34,000	34,000	20,000	1/2/3
Folsom Prison	0	0	0	5,000	0	5,000	5,000	5,000	5,000	
San Juan Water District (Placer County)	0	0	0	25,000	0	25,000	25,000	25,000	10,000	1/2/3/11
San Juan Water District (Sac County) (includes P.L. 101-514)	0	24,200	0	33,000	0	57,200	57,200	57,200	44,200	1/2/3
El Dorado Irrigation District	0	7,550	0	17,000	0	24,550	24,550	24,550	22,550	1/2/3
El Dorado Irrigation District (P.L. 101-514)	0	7,500	0	0	0	7,500	7,500	7,500	0	1/2/3
City of Roseville	0	32,000	0	30,000	0	62,000	54,900	54,900	39,800	1/2/3/11/12
Placer County Water Agency	0	0	0	0	0	0	0	0	0	11
Total	0	78,250	0	166,000	0	244,250	237,150	208,150	141,550	
Folsom South Canal (D9)										
So. Cal WC/ Arden Cordova WC	0	0	0	5,000	0	5,000	5,000	5,000	5,000	
California Parks and Recreation	0	5,000	0	0	0	5,000	5,000	5,000	5,000	
SMUD (export)	0	15,000	0	15,000	0	30,000	30,000	30,000	15,000	1/2/3
South Sacramento County Agriculture (export, SMUD transfer)	0	0	0	0	0	0	0	0	0	1/2/3
Canal Losses	0	0	0	1,000	0	1,000	1,000	1,000	1,000	
Total	0	20,000	0	21,000	0	41,000	41,000	41,000	26,000	
Nimbus to Mouth (D302)										
City of Sacramento	0	0	0	96,300	0	96,300	96,300	96,300	50,000	6/7/8

Table A-3 2020 American River Demand Assumptions (cont.)

Location / Purveyor	Allocation Type (maximum acre-feet)						Folsom Unimpaired Inflow (FUI)			Notes
	CVP AG	CVP MI	CVP Settlement / Exchange	Water Rights / Non-CVP / No Cuts	CVP Refuge	Total	FUI = Total TAF (Mar – Sep) + 60 TAF			
Arcade Water District	0	0	0	11,200	0	11,200	11,200	11,200	3,500	13
Carmichael Water District	0	0	0	12,000	0	12,000	12,000	12,000	12,000	
Total	0	0	0	119,500	0	119,500	119,500	119,500	65,500	
Sacramento River (D162)										
Placer County Water Agency	0	0	0	0	0	0	0	0	0	
Total	0	0	0	0	0	0	0	0	0	
Sacramento River (D167/D168)										
City of Sacramento	0	0	0	34,300	0	34,300	34,300	34,300	80,600	8
Sacramento County Water Agency (SMUD transfer)	0	30,000	0	0	0	30,000				10
Sacramento County Water Agency (P.L. 101-514)	0	15,000	0	0	0	15,000				10
EBMUD (export)	0	133,000	0	0	0	133,000				
Total	0	178,000	0	34,300	0	212,300	34,300	34,300	80,600	
Total demands from the American River	0	133,250	0	342,000	0	475,250	468,150	439,150	303,550	

Notes

[1] Wet/average years for this diverter are defined as those years when the projected March through November unimpaired inflow to Folsom Reservoir is greater than 950,000 af.

[2] Drier years for this diverter are defined as those years when the projected March through November unimpaired inflow to Folsom Reservoir is less than 950,000 af but greater than 400,000 af.

[3] Driest years for this diverter are defined as those years when the projected March through November unimpaired inflow to Folsom Reservoir is less than 400,000 af.

[4] Wet/average years for this diverter are defined as those years when the projected March through November unimpaired inflow to Folsom Reservoir is greater than 1,600,000 af.

[5] Drier years for this diverter are defined as those years when the projected March through November unimpaired inflow to Folsom Reservoir is less than 1,600,000 af.

[6] Wet/average years as it applies to the City of Sacramento are time periods when the flows bypassing the E. A. Fairbairn Water Treatment Plant diversion exceed the "Hodge flows."

[7] Drier years are time periods when the flows bypassing the City's E.A. Fairbairn Water Treatment Plant diversion do not exceed the "Hodge flows."

[8] For modeling purposes, it is assumed that the City of Sacramento's total annual diversions from the American and Sacramento River in year 2030 would be 130,600 af.

[10] The total demand for Sacramento County Water Agency would be up to 78,000 af. The 45,000 af represents firm entitlements; the additional 33,000 af of demand is expected to be met by intermittent surplus supply. The intermittent supply is subject to Reclamation reduction (50%) in dry years.

[11] Water Rights Water provided by releases from PCWA's Middle Fork Project; inputs into upper American River model must be consistent with these assumptions.

[12] Demand requires "Replacement Water" as indicated below

[13] Arcade WD demand modeled as step function: one demand when FUI > 400, another demand when FUI < 400.

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Appendix B. Results of Report Studies

A study to estimate the supply reliability of the State Water Project is done using a computer program that simulates the operation of the SWP on a monthly basis over a 73-year historical record of rainfall and runoff (1922–1994). The simulation model integrates all the relevant water resource components and calculates key water management parameters, such as:

- the amount of water released from reservoirs in the Sacramento-San Joaquin valleys,
- the amount of water required to maintain Delta water quality standards,
- the amount of water to be pumped from the Delta by the SWP and the Central Valley Project (CVP), and
- the amount of water that can be delivered by each of these projects.

The information required to run the simulation is referred to as the "model input." The most significant categories of input are:

- the physical description of the water system facilities (maximum pumping or release capacity, maximum reservoir storages, etc.);
- institutional requirements (delivery contract requirements, Delta water quality standards, the operations agreement between the SWP and CVP, endangered species requirements, and other requirements of federal and state laws, etc);
- hydrology (river and stream flows adjusted for water use in the source areas); and
- the level of SWP water demand.

CalSim II is the current version of the computer simulation model used to estimate SWP delivery reliability. All versions of CalSim employ commercially available linear programming software as a solution device. The application of the software, graphical user interface, and input/output devices are discussed in the documentation for CalSim.

The model studies selected for this report answer two questions.

1. "What is the estimated current delivery reliability of the SWP?" and
2. "What is the estimate for SWP deliveries in the year 2025, if there were no new facilities or improvements to existing facilities, SWP water demand increased, and the institutional requirements existing today were in place?"

The key study assumptions are shown in Table B-1 and listed in more detail in Chapter 4 and Appendix A. Additional discussions of these studies are on DWR's Modeling Branch's Website for the SWP Delivery Reliability Report 2002 (DWR 2003) studies and on the US Bureau of Reclamation's Website for Operations Criteria and Plan (OCAP) studies (http://modeling.water.ca.gov/hydro/studies/SWPReliability/index.html and http://www.usbr.gov/mp/cvo/ocap_page.html, respectively).

Study Results

The annual delivery amounts calculated by the supply reliability studies are contained in Tables B-3 through B-7 at the back of this appendix. The tables show the demand level in thousand acre-feet (taf), the amount of delivery from the Delta, and percent of full Delta Table A calculated for each year of simulation for the five studies. Delta Table A refers to the total of the Table A amounts for each of the SWP contractors receiving water from the Delta. Of the 29 SWP contractors, 26 receive their deliveries from the Delta. The total maximum Table A amount for all SWP contractors is 4.173 maf/year. Of this amount, 4.133 maf/yr is the maximum Delta Table A amount.

Table B-1 Key study assumptions

Study	Study name	Level of development (year)	SWP Table A demand (maf/year)	SWP Article 21 demand (taf/month)	Model version
		SWP Delivery Reliability Report (2003)			
1	2001 Study	2001	3.0–4.1	0–84, Apr–Nov 50–134, Dec–Mar	May 2002 benchmark
2	2021A Study	2021	3.3–4.1	0–84, Apr–Nov 50–134, Dec–Mar	May 2002 benchmark
3	2021B Study	2021	4.1	0–84, Apr–Nov 50–134, Dec–Mar	May 2002 benchmark
		Updated Studies			
4	2005 Study	2005	2.3–3.9	0–84, Apr–Nov 100–184, Dec–Mar	2004 OCAP
5	2025 Study	2025	3.9–4.1	0–84, Apr–Nov 100–184, Dec–Mar	2004 OCAP

maf = million acre-feet
OCAP = 2004 Long-Term Central Valley Project Operations Criteria and Plan
taf = thousand acre-feet

Table B-2 SWP average and dry year Table A delivery from the Delta for studies 4 and 5

Year	SWP Table A delivery from the Delta (in percent of maximum Table A)					
	Average 1922-1994	Single dry year 1977	2-year drought 1976-1977	4-year drought 1931-1934	6-year drought 1987-1992	6-year drought 1929-1934
2005	68%	4%	41%	32%	42%	37%
2025	77%	5%	40%	33%	42%	38%

To simplify the use of this report, the calculation of delivery in percent of full Delta Table A is based on the maximum Delta Table A total of 4.133 maf for all five studies. The demands for studies 1 and 4 were developed assuming slightly earlier conditions when the maximum Delta Table A amounts totaled slightly less than 4.133 maf (4.114 maf and 4.112 maf, respectively). To show the effect of these minor differences in Table A totals, the annual deliveries in percent of full Delta Table A for study 1 (Table B-3) are calculated with the earlier Delta Table A total of 4.114 maf and also with the maximum Delta Table A total of 4.133 maf. Similarly, study 4 results in Table B-6 are calculated with the earlier and maximum Delta Table A totals. The tables show that most years have the same delivery percentage for both Table A totals.

These values must be interpreted within the confines of the assumptions upon which they are calculated. For example, for the year 1958 in study 5, the annual delivery is calculated to be 4,133 taf or 100 percent of maximum Delta Table A (see Table B-7). This result should be stated as follows:

If the rainfall were the same as it was in 1958 but (1) the level of water use in the source area was increased to the level it would be in 2025; (2) SWP facilities and operation requirements were the same as they are today; and (3) SWP contractor demands were at their maximum Delta Table A level, the SWP would deliver approximately 4,133 taf or 100 percent of the maximum Delta Table A.

Actually, the conditional statement associated with the result for any particular year is even more complicated than this because the result is also dependent upon the rainfall that has occurred in previous years. For example, if the previous year (1957) were wet, runoff for 1958 for the same amount of rainfall would be greater than if 1957 were dry. In addition, reservoir storage for the beginning of 1958 would vary depending upon the weather conditions in

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1957. This linkage makes each year's simulation dependent on the previous year's and, hence, links the entire historical series.

Table B-2 contains a summary of the delivery estimates for the SWP for important dry periods in history computed by the studies. Studies 4 and 5 were selected to represent the estimated 2005 and 2025 deliveries, respectively. This information can be helpful in analyzing the delivery reliability of a specific water system that receives a portion of its water supply from the SWP. The series of data contained in Tables B-3 through B-7 are also helpful in analyzing longer periods of time that contain not only dry periods but wetter periods, which can replenish water supplies.

Finally, to help analyze the chance of receiving a given level of delivery in any particular year, a probability distribution curve is useful. It simply shows the percent of the years the annual delivery estimate is at or above a given value. The probability distribution curves for the five studies are included as figures B-1 and B-2. For example, for study 5 (Figure B-2), the curve indicates that in 75 percent of the years, the annual delivery reliability is estimated to be at or above 65 percent of the maximum Delta Table A amount or 2.70 maf. Similarly, annual delivery reliability during 50 percent of the years is estimated to be at or above 85 percent of the maximum Delta Table A or 3.50 maf. The curve also shows that in 25 percent of the years, annual delivery reliability is estimated to be at 100 percent of the maximum Delta Table A.

Table B-3 SWP water delivery from the Delta for Study 1 (taf)

Year	Model variable Table A demand	Model Table A delivery	Percent of maximum Table A - 4.114 maf	Percent of future maximum Table A - 4.133 maf	Model Article 21 supply
1922	3,407	3,389	82%	82%	175
1923	3,717	3,727	91%	90%	143
1924	3,961	1,014	25%	25%	0
1925	3,940	1,502	36%	36%	0
1926	3,777	2,951	72%	71%	0
1927	3,543	3,504	85%	85%	220
1928	3,897	3,337	81%	81%	155
1929	3,952	1,037	25%	25%	0
1930	3,922	2,697	66%	65%	92
1931	3,971	1,141	28%	28%	0
1932	3,673	1,620	39%	39%	199
1933	3,939	1,663	40%	40%	134
1934	3,981	1,689	41%	41%	0
1935	3,697	3,439	84%	83%	81
1936	3,769	3,638	88%	88%	0
1937	3,451	3,297	80%	80%	87
1938	3,418	3,439	84%	83%	470
1939	3,673	3,475	84%	84%	227
1940	3,713	3,544	86%	86%	102
1941	3,013	3,036	74%	73%	100
1942	3,583	3,599	87%	87%	513
1943	3,632	3,545	86%	86%	447
1944	3,563	3,449	84%	83%	0
1945	3,613	3,479	85%	84%	136
1946	3,710	3,724	91%	90%	3
1947	3,954	2,653	64%	64%	0
1948	3,959	2,681	65%	65%	2
1949	3,864	2,568	62%	62%	2
1950	3,812	2,909	71%	70%	0
1951	3,779	3,794	92%	92%	311
1952	3,078	3,108	76%	75%	103
1953	3,790	3,801	92%	92%	272
1954	3,833	3,803	92%	92%	98
1955	3,761	1,694	41%	41%	0
1956	3,639	3,649	89%	88%	261
1957	3,759	3,331	81%	81%	96
1958	3,481	3,492	85%	84%	441
1959	4,055	3,506	85%	85%	265
1960	4,114	1,795	44%	43%	0
1961	4,114	2,873	70%	70%	0
1962	3,689	3,158	77%	76%	21
1963	3,634	3,630	88%	88%	223
1964	3,907	3,262	79%	79%	5
1965	3,586	3,256	79%	79%	96
1966	3,722	3,731	91%	90%	147
1967	3,439	3,424	83%	83%	497
1968	3,792	3,548	86%	86%	402
1969	3,157	3,151	77%	76%	100
1970	3,714	3,727	91%	90%	406
1971	3,837	3,845	93%	93%	0
1972	4,012	3,057	74%	74%	2
1973	3,611	3,592	87%	87%	261
1974	3,650	3,664	89%	88%	297
1975	3,720	3,737	91%	90%	415
1976	4,014	3,150	77%	76%	110
1977	3,948	804	20%	19%	0
1978	3,126	3,036	74%	73%	100
1979	3,527	3,509	85%	85%	140
1980	3,197	3,208	78%	78%	100
1981	3,834	3,632	88%	85%	124
1982	3,451	3,471	84%	84%	366
1983	3,007	3,036	74%	73%	200
1984	3,692	3,706	90%	90%	408
1985	3,753	3,540	86%	86%	0
1986	3,345	3,023	73%	73%	51
1987	3,905	2,894	70%	70%	0
1988	4,026	968	24%	23%	0
1989	4,097	2,903	71%	70%	0
1990	3,961	1,101	27%	27%	0
1991	3,957	983	24%	24%	0
1992	3,880	1,199	29%	29%	0
1993	3,559	3,505	85%	85%	133
1994	3,739	3,272	80%	79%	9
Average	3,712	2,962	72%	72%	134
Maximum	4,114	3,845	93%	93%	513
Minimum	3,007	804	20%	19%	0

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Table B-4 SWP Water Delivery from the Delta for Study 2 (taf)

Year	Model variable Table A demand	Model Table A delivery	Percent of maximum Table A - 4.133 maf	Model Article 21 supply
1922	4,133	4,043	98%	0
1923	4,133	3,670	89%	0
1924	3,980	972	24%	0
1925	4,133	1,445	35%	0
1926	4,133	2,856	69%	113
1927	4,133	4,032	98%	124
1928	4,133	3,255	79%	3
1929	3,971	1,070	26%	0
1930	4,133	2,734	66%	27
1931	4,133	1,086	26%	0
1932	4,116	1,855	45%	39
1933	4,133	1,966	48%	6
1934	4,133	1,564	38%	0
1935	3,907	3,562	86%	59
1936	4,133	3,655	88%	5
1937	4,133	3,189	77%	65
1938	4,133	4,128	100%	192
1939	3,948	3,443	83%	1
1940	4,133	3,856	93%	22
1941	3,481	3,472	84%	0
1942	3,881	3,894	94%	378
1943	4,120	3,591	87%	375
1944	3,711	3,443	83%	2
1945	3,948	3,574	86%	123
1946	3,969	3,772	91%	0
1947	3,973	2,602	63%	0
1948	4,133	2,587	63%	2
1949	3,996	2,656	64%	0
1950	4,133	2,895	70%	0
1951	4,094	3,994	97%	230
1952	3,510	3,538	86%	100
1953	4,063	3,989	97%	236
1954	4,133	3,830	93%	6
1955	3,995	1,735	42%	0
1956	4,133	4,127	100%	129
1957	4,029	3,069	74%	3
1958	3,942	3,910	95%	335
1959	4,133	3,477	84%	167
1960	4,133	2,021	49%	0
1961	4,133	2,815	68%	0
1962	3,933	3,153	76%	2
1963	4,133	4,046	98%	134
1964	4,030	3,050	74%	0
1965	3,966	3,234	78%	3
1966	4,046	3,844	93%	61
1967	4,033	3,979	96%	167
1968	4,128	3,583	87%	398
1969	3,583	3,556	86%	93
1970	4,004	3,929	95%	398
1971	4,133	4,082	99%	0
1972	4,133	2,727	66%	0
1973	4,119	3,699	89%	211
1974	4,090	4,107	99%	147
1975	4,113	4,088	99%	209
1976	4,032	2,789	67%	0
1977	4,133	830	20%	0
1978	3,898	3,706	90%	100
1979	4,133	3,512	85%	89
1980	3,751	3,462	84%	74
1981	4,133	3,400	82%	0
1982	4,009	4,027	97%	101
1983	3,343	3,370	82%	200
1984	4,061	4,079	99%	379
1985	3,905	3,326	80%	0
1986	3,898	3,011	73%	52
1987	3,923	2,837	69%	0
1988	4,045	992	24%	0
1989	4,133	2,895	70%	0
1990	4,133	1,151	28%	0
1991	4,133	999	24%	0
1992	4,133	1,155	28%	0
1993	4,133	4,018	97%	156
1994	4,133	3,042	74%	0
Average	4,026	3,083	75%	78
Maximum	4,133	4,128	100%	398
Minimum	3,343	830	20%	0

Table B-5 SWP Water Delivery from the Delta for Study 3 (taf)

Year	Model fixed Table A demand	Model Table A delivery	Percent of maximum Table A - 4.133 maf	Model Article 21 supply
1922	4,133	4,043	98%	0
1923	4,133	3,670	89%	0
1924	4,133	972	24%	0
1925	4,133	1,446	35%	0
1926	4,133	2,856	69%	113
1927	4,133	4,031	98%	124
1928	4,133	3,255	79%	3
1929	4,133	1,070	26%	0
1930	4,133	2,734	66%	27
1931	4,133	1,086	26%	0
1932	4,133	1,855	45%	39
1933	4,133	1,967	48%	6
1934	4,133	1,564	38%	0
1935	4,133	3,729	90%	59
1936	4,133	3,669	89%	0
1937	4,133	3,165	77%	71
1938	4,133	4,129	100%	197
1939	4,133	3,444	83%	1
1940	4,133	3,856	93%	22
1941	4,133	4,084	99%	0
1942	4,133	4,122	100%	75
1943	4,133	3,584	87%	318
1944	4,133	3,465	84%	3
1945	4,133	3,547	86%	123
1946	4,133	3,801	92%	0
1947	4,133	2,597	63%	0
1948	4,133	2,586	63%	2
1949	4,133	2,654	64%	0
1950	4,133	2,893	70%	0
1951	4,133	3,996	97%	222
1952	4,133	4,133	100%	14
1953	4,133	3,931	95%	244
1954	4,133	3,860	93%	33
1955	4,133	1,779	43%	0
1956	4,133	4,126	100%	111
1957	4,133	3,067	74%	3
1958	4,133	4,063	98%	306
1959	4,133	3,467	84%	97
1960	4,133	2,007	49%	0
1961	4,133	2,818	68%	0
1962	4,133	3,153	76%	2
1963	4,133	4,046	98%	134
1964	4,133	3,050	74%	0
1965	4,133	3,233	78%	3
1966	4,133	3,853	93%	56
1967	4,133	4,069	98%	115
1968	4,133	3,584	87%	398
1969	4,133	4,078	99%	13
1970	4,133	3,933	95%	358
1971	4,133	4,082	99%	0
1972	4,133	2,725	66%	0
1973	4,133	3,699	89%	211
1974	4,133	4,133	100%	143
1975	4,133	4,102	99%	211
1976	4,133	2,775	67%	0
1977	4,133	830	20%	0
1978	4,133	3,915	95%	100
1979	4,133	3,493	85%	98
1980	4,133	3,465	84%	75
1981	4,133	3,387	82%	0
1982	4,133	4,133	100%	63
1983	4,133	4,133	100%	160
1984	4,133	4,101	99%	369
1985	4,133	3,322	80%	0
1986	4,133	3,006	73%	62
1987	4,133	2,835	69%	0
1988	4,133	993	24%	0
1989	4,133	2,895	70%	0
1990	4,133	1,151	28%	0
1991	4,133	999	24%	0
1992	4,133	1,155	28%	0
1993	4,133	4,018	97%	156
1994	4,133	3,042	74%	0
Average	4,133	3,130	76%	68
Maximum	4,133	4,133	100%	398
Minimum	4,133	830	20%	0

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Table B-6 SWP water delivery from the Delta for Study 4 (taf)

Year	Model variable Table A demand	Model Table A delivery	Percent of maximum Table A - 4.112 maf	Percent of future maximum Table A - 4.133 maf	Model Article 21 supply
1922	3,750	3,743	91%	91%	104
1923	3,251	3,251	79%	79%	106
1924	3,489	1,244	30%	30%	0
1925	3,353	1,870	45%	45%	0
1926	3,393	2,981	72%	72%	54
1927	3,860	3,845	93%	93%	213
1928	3,458	3,384	82%	82%	134
1929	2,907	1,108	27%	27%	0
1930	3,326	2,855	69%	69%	117
1931	2,933	1,018	25%	25%	0
1932	3,139	1,406	34%	34%	242
1933	3,427	1,330	32%	32%	512
1934	3,470	1,541	37%	37%	206
1935	3,798	3,769	92%	91%	229
1936	3,596	3,573	87%	86%	0
1937	3,492	3,362	82%	81%	80
1938	3,344	3,344	81%	81%	714
1939	3,262	3,262	79%	79%	349
1940	3,239	3,219	78%	78%	154
1941	2,526	2,527	61%	61%	246
1942	3,167	3,167	77%	77%	918
1943	3,104	3,104	75%	75%	623
1944	3,090	3,091	75%	75%	0
1945	3,112	3,101	75%	75%	359
1946	3,215	3,215	78%	78%	249
1947	3,422	3,292	80%	80%	0
1948	3,395	2,942	72%	71%	0
1949	3,313	2,284	55%	55%	0
1950	3,465	3,199	78%	77%	0
1951	3,497	3,497	85%	85%	388
1952	2,585	2,588	63%	63%	275
1953	3,323	3,323	81%	80%	513
1954	3,294	3,294	80%	80%	523
1955	3,228	2,207	54%	53%	0
1956	3,581	3,586	87%	87%	324
1957	3,235	3,235	79%	78%	257
1958	2,980	2,980	72%	72%	1,106
1959	3,547	3,480	85%	84%	366
1960	3,555	1,865	45%	45%	0
1961	3,580	2,659	65%	64%	97
1962	3,690	3,262	79%	79%	0
1963	3,823	3,818	93%	92%	202
1964	3,492	3,323	81%	80%	0
1965	3,059	3,059	74%	74%	177
1966	3,282	3,282	80%	79%	518
1967	2,950	2,946	72%	71%	923
1968	3,324	3,329	81%	81%	552
1969	2,636	2,632	64%	64%	275
1970	3,257	3,257	79%	79%	552
1971	3,341	3,341	81%	81%	0
1972	3,457	3,342	81%	81%	414
1973	3,097	3,092	75%	75%	384
1974	3,184	3,184	77%	77%	854
1975	3,229	3,229	79%	78%	903
1976	3,471	3,265	79%	79%	189
1977	3,421	159	4%	4%	0
1978	3,623	3,603	88%	87%	300
1979	3,512	3,501	85%	85%	160
1980	2,715	2,709	66%	66%	138
1981	3,358	3,358	82%	81%	546
1982	2,890	2,890	70%	70%	801
1983	2,497	2,498	61%	60%	400
1984	3,227	2,766	67%	67%	552
1985	3,214	3,214	78%	78%	0
1986	2,321	2,297	56%	56%	120
1987	2,896	2,896	70%	70%	546
1988	2,967	856	21%	21%	0
1989	3,551	3,174	77%	77%	0
1990	3,628	1,099	27%	27%	0
1991	3,425	1,052	26%	25%	0
1992	3,366	1,426	35%	34%	0
1993	3,862	3,848	94%	93%	159
1994	3,689	3,306	80%	80%	0
Average	3,290	2,818	69%	68%	262
Maximum	3,862	3,848	94%	93%	1,106
Minimum	2,321	159	4%	4%	0

Table B-7 SWP water delivery from the Delta for Study 5 (taf)

Year	Model variable Table A demand	Model Table A delivery	Percent of maximum Table A -4.133 maf	Model Article 21 supply
1922	4,133	4,133	100%	21
1923	4,133	4,133	100%	0
1924	4,133	382	9%	0
1925	4,133	1,491	36%	190
1926	4,133	2,721	66%	279
1927	4,133	4,133	100%	301
1928	4,133	3,379	82%	0
1929	4,133	1,118	27%	0
1930	4,133	2,738	66%	141
1931	4,133	1,072	26%	0
1932	4,133	1,572	38%	112
1933	4,133	1,337	32%	547
1934	4,133	1,471	36%	242
1935	4,133	4,061	98%	218
1936	4,133	3,729	90%	0
1937	4,133	3,369	82%	70
1938	4,133	4,133	100%	200
1939	4,133	3,450	83%	0
1940	4,133	4,116	100%	114
1941	3,898	3,908	95%	0
1942	4,133	4,133	100%	123
1943	4,133	3,797	92%	487
1944	4,133	3,542	86%	0
1945	4,133	3,889	94%	118
1946	4,133	3,828	93%	0
1947	4,133	2,771	67%	0
1948	4,133	2,940	71%	0
1949	4,133	2,025	49%	0
1950	4,133	3,400	82%	0
1951	4,133	4,133	100%	252
1952	3,898	3,912	95%	0
1953	4,133	4,133	100%	296
1954	4,133	4,133	100%	0
1955	4,133	1,505	36%	0
1956	4,133	4,133	100%	352
1957	4,133	3,565	86%	0
1958	4,133	4,133	100%	229
1959	4,133	3,787	92%	107
1960	4,133	1,607	39%	0
1961	4,133	2,712	66%	299
1962	4,133	3,311	80%	1
1963	4,133	4,133	100%	161
1964	4,133	2,889	70%	0
1965	4,133	3,465	84%	47
1966	4,133	4,133	100%	178
1967	4,133	4,133	100%	157
1968	4,133	3,797	92%	465
1969	3,898	3,910	95%	63
1970	4,133	4,122	100%	493
1971	4,133	4,133	100%	0
1972	4,133	2,721	66%	0
1973	4,133	4,032	98%	259
1974	4,133	4,133	100%	69
1975	4,133	4,133	100%	134
1976	4,133	3,137	76%	0
1977	4,133	187	5%	0
1978	3,898	3,902	94%	300
1979	4,133	3,773	91%	144
1980	3,898	3,513	85%	86
1981	4,133	3,797	92%	71
1982	4,133	4,133	100%	171
1983	3,898	3,909	95%	357
1984	4,133	4,133	100%	490
1985	4,133	3,413	83%	0
1986	3,898	2,857	69%	83
1987	4,133	3,307	80%	183
1988	4,133	423	10%	0
1989	4,133	3,513	85%	91
1990	4,133	855	21%	0
1991	4,133	850	21%	0
1992	4,133	1,461	35%	102
1993	4,133	4,133	100%	255
1994	4,133	3,153	76%	0
Average	4,110	3,178	77%	124
Maximum	4,133	4,133	100%	547
Minimum	3,898	187	5%	0

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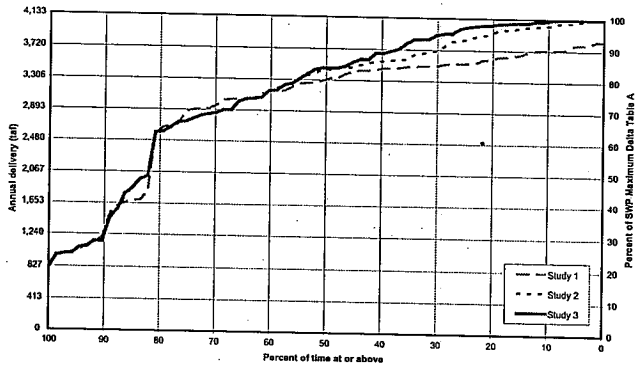

Figure B-1 SWP Delta Table A delivery probability for studies 1, 2 and 3

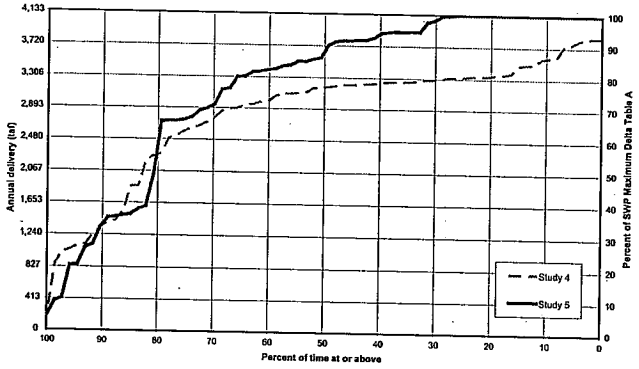

Figure B-2 SWP Delta Table A delivery probability for studies 4 and 5

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Appendix C. State Water Project Table A Amounts

What is State Water Project Table A?

The contracts between the Department of Water Resources and the 29 State Water Project water contractors define the terms and conditions governing the water delivery and cost repayment for the SWP. Table A is an exhibit to these contracts. Comprehension of Table A is important in understanding the information in this report. To understand the table, it is necessary to understand how the contracts work.

All water-supply related costs of the SWP are paid by the contractors, and Table A serves as a basis for allocating some of the costs among the contractors. In addition, Table A plays a key role in the annual allocation of available supply among contractors. When the SWP was being planned, the amount of water projected to be available for delivery to the contractors was 4.2 million acre-feet (maf) per year. This was referred to as the minimum project yield, and it was recognized that in some years the project would be unable to deliver that amount and in other years project supply could exceed that amount. The 4.2 maf number was used as the basis for apportioning available supply to each contractor and as a factor in calculating each contractor's share of the project's costs. This apportionment is accomplished by Table A in each contract. Table A lists by year and acre-feet the portion of the 4.2 maf deliverable to each contractor. Other contract provisions permit changes to an individual contractor's Table A under special circumstances. The total of the maximums in all the contracts now equals 4.173 maf.

A copy of the consolidated Table A from all the contracts follows this explanation. The amounts listed in Table A cannot be viewed as an indication of the SWP water delivery reliability, nor should these amounts be used to support an expectation that a certain amount of water will be delivered to a contractor in any particular time span. Table A is simply a tool for apportioning available supply and cost obligations under the contract. In this report, reference to "Table A amounts" means the amounts listed in Table A. Contractors also receive other classifications of water from the project, as distinguished from Table A (for example, Article 21 water, and turnback pool water). These other contract provisions are discussed in Appendix D.

Table C-1 Maximum Annual SWP Table A Amounts

SWP Contractors	Maximum Table A
Delivered from the Delta	
North Bay	
Napa County FC&WCD	29,025
Solano County WA	47,756
Subtotal	76,781
South Bay	
Alameda County FC&WCD, Zone 7	80,619
Alameda County WD	42,000
Santa Clara Valley WD	100,000
Subtotal	222,619
San Joaquin Valley	
Oak Flat WD	5,700
County of Kings	9,305
Dudley Ridge WD	57,343
Empire West Side ID	3,000
Kern County WA	998,730
Tulare Lake Basin WSD	95,922
Subtotal	1,170,000
Central Coastal	
San Luis Obispo County FC&WCD	25,000
Santa Barbara County FC&WCD	45,486
Subtotal	70,486
Southern California	
Antelope Valley-East Kern WA	141,400
Castaic Lake WA	95,200
Coachella Valley WD	121,100
Crestline-Lake Arrowhead WA	5,800
Desert WA	50,000
Littlerock Creek ID	2,300
Mojave WA	75,800
Metropolitan WDSC	1,911,500
Palmdale WD	21,300
San Bernardino Valley MWD	102,600
San Gabriel Valley MWD	28,800
San Gorgonio Pass WA	17,300
Ventura County FCD	20,000
Subtotal	2,593,100
Delta Subtotal	4,132,986
Feather River	
County of Butte	27,500
Plumas County FC&WCD	2,700
City of Yuba City	9,600
Subtotal	39,800
Grand Total	4,172,786

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Appendix D. Recent State Water Project Deliveries

SWP Contract Water Types

The State Water Project contracts define several classifications of water available for delivery to contractors under specific circumstances. All classifications are considered "project" water. Many contractors make frequent use of these additional water types to increase or decrease the amount available to them under Table A.

Table A Water

Each contract's Table A is the amount in acre-feet that is used to determine the portion of available supply to be delivered to that contractor. Table A water is water delivered according to this apportionment methodology and is given first priority for delivery.

Article 21 Water

Article 21 of the contracts permits delivery of water excess to delivery of Table A and some other water types to those contractors requesting it. It is available under specific conditions discussed in Chapter 5. Article 21 water is apportioned to those contractors requesting it in the same proportion as their Table A.

Turnback Pool Water

Contractors may choose to offer their allocated Table A water excess to their needs to other contractors through two pools in February and March. Contributing contractors receive a reduction in charges, and taking contractors pay extra.

Carryover Water

Pursuant to the long-term water supply contracts, the Department of Water Resources (DWR) has offered contractors the opportunity to carry over a portion of their allocated water approved for delivery in the current year for delivery during the next year. The carryover program was designed to encourage the most effective and beneficial use of water and to avoid obligating the contractors to use or lose the water by December 31 of each year. The water supply contracts state the criteria of carrying over Table A water from one year to the next. Normally, carryover water is water that has been exported during the year, has not been delivered to the contractor during that year, and has remained stored in the SWP share of San Luis Reservoir to be delivered during the following year. Storage for carryover water no longer becomes available to the contractors if it interferes with storage of SWP water for project needs.

Updated Historical Deliveries

The tables in this appendix list annual historical deliveries by various water classifications for each contractor for 1995 through 2004. Similar delivery tables for years 1995 through 2002 are included in the *State Water Project Delivery Reliability Report 2002*. Amounts listed for these years are slightly different due to accounting adjustments made by DWR's State Water Project Analysis Office.

Table D-1 Historical State Water Project Deliveries: 1995

	Table A	Art. 21	Turnback	Carryover	Total
County of Butte	203				203
Plumas County FC&WCD	308				308
City of Yuba City	910				910
Napa County FC&WCD	5,182				5,182
Solano County WA	21,345				21,345
Alameda County FC&WCD, Zone 7	30,091				30,091
Alameda County WD	17,793				17,793
Santa Clara Valley WD	28,756				28,756
Oak Flat WD	5,169				5,169
County of Kings	4,000				4,000
Dudley Ridge WD	57,700			2,986	60,686
Empire West Side ID	957	106		568	1,631
Kern County WA	1,089,063	59,671		2,795	1,151,529
Tulare Lake Basin WSD	71,679	4,553		25,637	101,869
Antelope Valley-East Kern WA	47,286				47,286
Castaic Lake WA (+Rch 31A, 5 & 7)	25,660			1,573	27,233
Coachella Valley WD	23,100				23,100
Crestline-Lake Arrowhead WA	409				409
Desert WA	38,100				38,100
Littlerock Creek ID	480				480
Mojave WA	3,722				3,722
Metropolitan WDSC	396,600			19,442	416,042
Palmdale WD	6,961				6,961
San Bernardino Valley MWD	696				696
San Gabriel Valley MWD	12,922				12,922
Totals	**1,889,092**	**64,330**	**0**	**53,001**	**2,006,423**
Total South of Delta	**1,887,671**	**64,330**	**0**	**53,001**	**2,005,002**

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Table D-2 Historical State Water Project Deliveries: 1996

	Table A	Art. 21	Turnback	Carryover	Total
County of Butte	257				257
Plumas County FC&WCD	360				360
City of Yuba City	820				820
Napa County FC&WCD	4,893				4,893
Solano County WA	29,144			855	29,999
Alameda County FC&WCD, Zone 7	18,903				18,903
Alameda County WD	19,662				19,662
Santa Clara Valley WD	88,829			1,021	89,850
Oak Flat WD	4,904				4,904
County of Kings	4,000				4,000
Dudley Ridge WD	52,491	4,457			56,948
Empire West Side ID	1,371			497	1,868
Kern County WA	1,117,060	15,653		52,350	1,185,063
Tulare Lake Basin WSD	118,500	8,537	71,268	38,570	236,875
San Luis Obispo County FC&WCD	100				100
Antelope Valley-East Kern WA	56,356				56,356
Castaic Lake WA (+Reh 31A, 5 & 7)	32,500				32,500
Coachella Valley WD	23,100		39,119		62,219
Crestline-Lake Arrowhead WA	485				485
Desert WA	38,100		64,522		102,622
Littlerock Creek ID	494				494
Mojave WA	7,427				7,427
Metropolitan WDSC	553,259			40,121	593,380
Palmdale WD	11,434				11,434
San Bernardino Valley MWD	6,064				6,064
San Gabriel Valley MWD	15,989				15,989
Totals	**2,206,502**	**28,647**	**174,909**	**133,414**	**2,543,472**
Total South of Delta	**2,205,065**	**28,647**	**174,909**	**133,414**	**2,542,035**

Table D-3 Historical State Water Project Deliveries: 1997

	Table A	Art. 21	Turnback	Carryover	Total
County of Butte	185				185
Plumas County FC&WCD	231				231
City of Yuba City	1,005				1,005
Napa County FC&WCD	4,341				4,341
Solano County WA	35,530				35,530
Alameda County FC&WCD, Zone 7	27,522				27,522
Alameda County WD	24,063				24,063
Santa Clara Valley WD	95,601				95,601
Oak Flat WD	5,238				5,238
Dudley Ridge WD	51,623	7,141	12,544		71,308
Kern County WA	1,092,543	10,264			1,102,807
Tulare Lake Basin WSD	21,156	1,213			22,369
San Luis Obispo County FC&WCD	1,199				1,199
Santa Barbara County FC&WCD	7,439				7,439
Antelope Valley-East Kern WA	61,752	641			62,393
Castaic Lake WA (+Reh 31A, 5 & 7)	27,712				27,712
Coachella Valley WD	23,100		35,000		58,100
Crestline-Lake Arrowhead WA	651				651
Desert WA	38,100		15,000		53,100
Littlerock Creek ID	444				444
Mojave WA	10,374				10,374
Metropolitan WDSC	738,990				738,990
Palmdale WD	11,861				11,861
San Bernardino Valley MWD	9,654				9,654
San Gabriel Valley MWD	16,002	2,173			18,175
Ventura County FCD	1,850				1,850
Totals	**2,308,166**	**21,432**	**62,544**	**0**	**2,392,142**
Total South of Delta	**2,306,745**	**21,432**	**62,544**	**0**	**2,390,721**

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Table D-4 Historical State Water Project Deliveries: 1998

	Table A	Art. 21	Turnback	Carryover	Total
County of Butte	527				527
City of Yuba City	1,054				1,054
Napa County FC&WCD	5,359				5,359
Solano County WA	21,377	9,982		407	31,766
Alameda County FC&WCD, Zone 7	17,941				17,941
Alameda County WD	19,075				19,075
Santa Clara Valley WD	62,526			884	63,410
Oak Flat WD	4,401				4,401
County of Kings	3	12			15
Dudley Ridge WD	52,919	984		1,747	55,650
Empire West Side ID				542	542
Kern County WA	856,906			1,684	858,590
Tulare Lake Basin WSD	11,367	9,310			20,677
San Luis Obispo County FC&WCD	3,592				3,592
Santa Barbara County FC&WCD	18,618				18,618
Antelope Valley-East Kern WA	52,926				52,926
Castaic Lake WA (+Rch 31A, 5 & 7)	20,093				20,093
Coachella Valley WD	23,100		55,000		78,100
Crestline-Lake Arrowhead WA	187				187
Desert WA	38,100		20,000		58,100
Littlerock Creek ID	404				404
Mojave WA	3,925				3,925
Metropolitan WDSC	359,213			33,672	392,885
Palmdale WD	8,752				8,752
San Bernardino Valley MWD	1,878				1,878
San Gabriel Valley MWD	9,310				9,310
Ventura County FCD	1,850				1,850
Totals	1,595,403	20,288	75,000	38,936	1,729,627
Total South of Delta	1,593,822	20,288	75,000	38,936	1,728,046

Table D-5 Historical State Water Project Deliveries: 1999

	Table A	Art. 21	Turnback	Carryover	Total
County of Butte	286				286
City of Yuba City	1,096				1,096
Napa County FC&WCD	4,550	754			5,304
Solano County WA	37,753				37,753
Alameda County FC&WCD, Zone 7	46,000	2,910			48,910
Alameda County WD	34,871	2,781			37,652
Santa Clara Valley WD	67,465	15,480			82,945
Oak Flat WD	4,871				4,871
County of Kings	4,000				4,000
Dudley Ridge WD	51,870	4,990	6,566		63,426
Empire West Side ID	3,000	176			3,176
Kern County WA	1,077,755	58,241	42,154		1,178,150
Tulare Lake Basin WSD	118,500	49,898	121,337		289,735
San Luis Obispo County FC&WCD	3,743				3,743
Santa Barbara County FC&WCD	20,137				20,137
Antelope Valley-East Kern WA	69,073				69,073
Castaic Lake WA (+Rch 31A, 5 & 7)	32,899				32,899
Coachella Valley WD	23,100		27,380		50,480
Crestline-Lake Arrowhead WA	1,132				1,132
Desert WA	38,100		20,000		58,100
Littlerock Creek ID	342				342
Mojave WA	5,144				5,144
Metropolitan WDSC	829,777	22,840			852,617
Palmdale WD	13,278				13,278
San Bernardino Valley MWD	12,874				12,874
San Gabriel Valley MWD	18,000				18,000
Ventura County FCD	1,850				1,850
Totals	2,521,466	158,070	217,437	0	2,896,973
Total South of Delta	2,520,084	158,070	217,437	0	2,895,591

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Table D-6 Historical State Water Project Deliveries: 2000

	Table A	Art. 21	Turnback	Carryover	Total
County of Butte	586				586
City of Yuba City	901				901
Napa County FC&WCD	3,136	297		1,525	4,958
Solano County WA	32,882	1,040		1,417	35,339
Alameda County FC&WCD, Zone 7	53,877	3,740			57,617
Alameda County WD	33,598	2,380			35,978
Santa Clara Valley WD	70,433	18,381		13,174	101,988
Oak Flat WD	4,494			14	4,508
County of Kings	3,600				3,600
Dudley Ridge WD	38,673	7,454	12,193	2,884	61,204
Empire West Side ID	1,271	528			1,799
Kern County WA	825,856	78,908	233,202	13,193	1,151,159
Tulare Lake Basin WSD	98,595	56,818	27,073	15,827	198,313
San Luis Obispo County FC&WCD	3,962				3,962
Santa Barbara County FC&WCD	22,741				22,741
Antelope Valley-East Kern WA	83,577				83,577
Castaic Lake WA (+Rch 31A, 5 & 7)	40,680				40,680
Coachella Valley WD	20,790	17,820	3,713		42,323
Crestline-Lake Arrowhead WA	1,194				1,194
Desert WA	34,290	17,820	6,124		58,234
Mojave WA	9,135				9,135
Metropolitan WDSC	1,273,729	103,124		169,529	1,546,382
Palmdale WD	8,221			839	9,060
San Bernardino Valley MWD	18,399				18,399
San Gabriel Valley MWD	14,000	475			14,475
Ventura County FCD	4,050				4,050
Totals	**,702,670**	**308,785**	**282,305**	**218,402**	**3,512,162**
Total South of Delta	**2,701,183**	**308,785**	**282,305**	**218,402**	**3,510,675**

Table D-7 Historical State Water Project Deliveries: 2001

	Table A	Art. 21	Turnback	Carryover	Total
County of Butte	513				513
City of Yuba City	1,065				1,065
Napa County FC&WCD	4,293	996	82	1,723	7,094
Solano County WA	17,756	2,304		1,021	21,081
Alameda County FC&WCD, Zone 7	22,307		308	5,990	28,605
Alameda County WD	13,695	10	107	4,192	18,004
Santa Clara Valley WD	35,689			12,233	47,922
Oak Flat WD	2,089		22	101	2,212
County of Kings	1,560				1,560
Dudley Ridge WD	18,467	933	347	6,815	26,562
Empire West Side ID		253		1,107	1,360
Kern County WA	363,204	23,233	6,502	92,052	484,991
Tulare Lake Basin WSD	40,830	8,755	769	7,889	58,243
San Luis Obispo County FC&WCD	4,184		99		4,283
Santa Barbara County FC&WCD	14,285	396	296		14,977
Antelope Valley-East Kern WA	45,071		899		45,970
Castaic Lake WA (+Rch 31A, 5 & 7)	30,471	850	618		31,939
Coachella Valley WD	9,009		91		9,100
Crestline-Lake Arrowhead WA	1,057				1,057
Desert WA	14,859		151		15,010
Mojave WA	4,433				4,433
Metropolitan WDSC	686,545	10,415	7,949	200,000	904,909
Palmdale WD	8,170			2,257	10,427
San Bernardino Valley MWD	26,488				26,488
San Gabriel Valley MWD	6,534				6,534
Ventura County FCD	1,850				1,850
Totals	**1,374,424**	**48,145**	**18,240**	**335,380**	**1,776,189**
Total South of Delta	**1,372,846**	**48,145**	**18,240**	**335,380**	**1,774,611**

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Table D-8 Historical State Water Project Deliveries: 2002

	Table A	Art. 21	Turnback	Carryover	Total
County of Butte	419				419
City of Yuba City	1,181				1,181
Napa County FC&WCD	2,022	827	283	3,743	6,875
Solano County WA	28,223	2,242			30,465
Alameda County FC&WCD, Zone 7	40,707	1,484	556	8,113	50,860
Alameda County WD	24,250	83	862	2,331	27,526
Santa Clara Valley WD	55,896	202	2,053	3,311	61,462
Oak Flat WD	3,841	50	76	134	4,101
County of Kings	2,800		54		2,854
Dudley Ridge WD	38,688	1,861	1,177	1,994	43,720
Empire West Side ID	1,278	26		101	1,405
Kern County WA	670,884	21,951	20,543	15,680	729,058
Tulare Lake Basin WSD	73,785	3,749	2,289	5,385	85,208
San Luis Obispo County FC&WCD	4,355				4,355
Santa Barbara County FC&WCD	24,166	436	324	3,455	28,381
Antelope Valley-East Kern WA	53,907		1,008	3,256	58,171
Castaic Lake WA (+Rch 31A, 5 & 7)	61,880	280		6,657	68,817
Coachella Valley WD	16,170	111	474		16,755
Crestline-Lake Arrowhead WA	2,189				2,189
Desert WA	26,670	189	781		27,640
Mojave WA	4,346				4,346
Metropolitan WDSC	1,273,205	9,624	14,335	97,940	1,395,104
Palmdale WD	8,359		437		8,796
San Bernardino Valley MWD	68,268			3,801	72,069
San Gabriel Valley MWD	18,353			4,698	23,051
Ventura County FCD	4,998				4,998
Totals	**2,510,840**	**43,115**	**45,252**	**160,599**	**2,759,806**
Total South of Delta	**2,509,240**	**43,115**	**45,252**	**160,599**	**2,758,206**

Table D-9 Historical State Water Project Deliveries: 2003

	Table A	Art. 21	Turnback	Carryover	Total
County of Butte	551				551
City of Yuba City	1,324				1,324
Napa County FC&WCD	6,026	376	180	1,055	7,637
Solano County WA	25,135	2,280		1,918	29,333
Alameda County FC&WCD, Zone 7	30,695		656	13,099	44,450
Alameda County WD	31,086		354	5,150	36,590
Santa Clara Valley WD	90,620	936	841	14,104	106,501
Oak Flat WD	4,059	19	48	140	4,266
County of Kings	3,600	58	34		3,692
Dudley Ridge WD	49,723	1,928	482	1,452	53,585
Empire West Side ID	1,074	175		187	1,436
Kern County WA	841,697	27,891	8,419	22,380	900,387
Tulare Lake Basin WSD	94,376	6,243	938	4,284	105,841
San Luis Obispo County FC&WCD	4,417	36			4,453
Santa Barbara County FC&WCD	24,312	339	43	2,274	26,968
Antelope Valley-East Kern WA	52,730		250	7,049	60,029
Castaic Lake WA (+Rch 31A, 5 & 7)	49,895	991	90	4,760	55,736
Coachella Valley WD	14,045	204	194		14,443
Crestline-Lake Arrowhead WA	1,563				1,563
Desert WA	23,168	330	321		23,819
Mojave WA	10,907			3,528	14,435
Metropolitan WDSC	1,550,356	17,622	16,920	134,845	1,719,743
Palmdale WD	9,701			1,846	11,547
San Bernardino Valley MWD	25,371	200		1,844	27,415
San Gabriel Valley MWD	13,034	200			13,234
San Gorgonio Pass WA	116				116
Ventura County FCD	5,000				5,000
Totals	**2,964,581**	**59,828**	**29,770**	**219,915**	**3,274,094**
Total South of Delta	**2,962,706**	**59,828**	**29,770**	**219,915**	**3,272,219**

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Table D-10 Historical State Water Project Deliveries: 2004

	Table A	Art. 21	Turnback	Carryover	Total
County of Butte	1,440				1,440
City of Yuba City	1,434				1,434
Napa County FC&WCD	5,030	1,450	52	1,602	8,134
Solano County WA	15,991	7,787		47	23,825
Alameda County FC&WCD, Zone 7	38,895			11,466	50,361
Alameda County WD	20,959		214	6,714	27,887
Santa Clara Valley WD	52,867	2,983	508		56,358
Oak Flat WD	4,324		29	276	4,629
County of Kings	5,850	3,157	46		9,053
Dudley Ridge WD	36,676	7,393	291	1,886	46,246
Empire West Side ID	1,310	626		1,626	3,562
Kern County WA	641,368	86,513	5,075	38,729	771,685
Tulare Lake Basin WSD	58,125	15,299	489	5,638	79,551
San Luis Obispo County FC&WCD	4,096	69			4,165
Santa Barbara County FC&WCD	29,358		122		29,480
Antelope Valley-East Kern WA	50,532			9,199	59,731
Castaic Lake WA (+Reh 31A, 5 & 7)	46,358	1,618		35,785	83,761
Coachella Valley WD	8,631		89	6,745	15,465
Crestline-Lake Arrowhead WA	2,006				2,006
Desert WA	9,966		102	11,122	21,190
Mojave WA	13,176				13,176
Metropolitan WDSC	1,195,807	91,601	10,223	215,000	1,512,631
Palmdale WD	10,549			1,613	12,162
San Bernardino Valley MWD	35,523			20,631	56,154
San Gabriel Valley MWD	15,600				15,600
San Gorgonio Pass WA	837				837
Ventura County FCD	5,250				5,250
Totals	**2,311,958**	**218,496**	**17,240**	**368,079**	**2,915,773**
Total South of Delta	**2,309,084**	**218,496**	**17,240**	**368,079**	**2,912,899**

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Appendix E. Technical Memorandum Report Summaries: Historical SWP/CVP Operations Simulation and CalSim II Model Sensitivity Analysis

Study

This appendix presents summaries of the findings of the CalSim II Simulation of Historical SWP/CVP Operations and a CalSim II Model Sensitivity Analysis Study. The entire reports are available at the websites listed at the end of this appendix.

1. CalSim II Simulation of Historical SWP/CVP Operations

Technical Memorandum Report

Objective of Study

The purpose of the Historical Operations Study is to evaluate the ability of CalSim II to represent CVP and SWP operations, in general, and the delivery capability of the projects, in particular, through the monthly simulation of recent historical conditions.

Study Description

The period of simulation for the Historical Operations Study is water years 1975 to 1998. This 24-year period includes the 1976-77 and 1987-92 droughts, as well as the driest (1977) and the wettest (1983) years on record. The version of CalSim II used for this study is the benchmark study dated 30 September 2002, but with some inputs changed to reflect the historically changing conditions rather than a fixed level of development. Model inflows correspond to the historical flow from gage records, or are estimated from a hydrologic mass balance, or stream-flow correlation. Land use-based demands are calculated for annual varying land use, as determined from DWR's land surveys and county commissioners' reports. The operational logic has been revised to reflect the changing regulatory environment. The historical regulations have been simplified into three periods:

- October 1974–September 1992: represented by State Water Resources Control Board (SWRCB) Water Right Decision 1485 (D-1485),
- October 1992–September 1994: represented by D-1485 and the 1993 National Marine Fisheries Service (NMFS) winter-run Chinook salmon biological opinion (minimum carryover storage in Lake Shasta, and temperature related minimum instream flows downstream of Keswick Reservoir),
- October 1994–September 1998: represented by SWRCB Water Right Decision 1641 (D-1641) and the 1993 winter-run biological opinion.

The Historical Operations Study is limited in geographical scope to a dynamic operation of the Sacramento Valley, the Delta, and the CVP-SWP facilities south of the Delta. Delta inflows from the San Joaquin Valley and East Side streams are constrained to their historical values. Imports from the Trinity River system are similarly constrained.

Results and Discussion

The key performance measures in evaluating CalSim II are considered to be SWP and CVP deliveries, project storage operations, and stream flows. During the study period of water years 1975-1998, SWP demands were historically much lower than the current or projected level of demands. Simulation of historically wet years, when the system was not supply constrained,

may therefore be a poor indicator of the model's ability to accurately simulate future levels of development. Particular attention is therefore placed on model results during the six-year drought of 1987-1992. Results for four key performance parameters are summarized in the table below.

The table below shows that simulated SWP Table A and CVP south-of-Delta deliveries during the drought are less than historical values. Differences are, however, within 5 percent. Comparison of Sacramento Valley inflow to the Delta (flow at Freeport) is a good measure of how well the Sacramento Valley hydrology is simulated by CalSim II. Simulated Delta inflows are 0.3 percent greater than historical. Comparison of the Net Delta Outflow Index, a measure of how well the Sacramento-San Joaquin Delta is represented by CalSim II, appears favorable. Simulated values are 3.5 percent greater than historical during the 1987-1992 period. The table also shows that simulated long-term (1975-1998) average deliveries compare quite well and are within 7 percent of historical values.

The total volume of surface water to be held in storage or routed through the model network is the same as historical. Model inflows to the Delta can deviate from historical due to three reasons: storage regulation, groundwater pumping to supplement surface water diversions, and stream-aquifer interaction.

Differences in Delta inflows are primarily caused by differences in project storage regulation (i.e. Lake Shasta, Lake Oroville and Folsom Lake). Storage operations in CalSim II are driven by two sets of rule curves. The first set of rule curves determines how much of the available project water will be held as carryover storage and how much will be delivered to meet contractors' current-year demands. The second set of rule curves determines when and how-much water will be transferred from north of Delta storage to San Luis Reservoir. These two sets of rule curves are fixed throughout the period of simulation. The rule curves have been determined in prior simulations of CalSim II. They are subjective in nature, but balance the conflicting objectives to maximize long-term average annual deliveries, to maintain water deliveries during the critically dry period 1928-34, and to keep water levels in project reservoirs above minimum levels while meeting minimum flow requirements. Secondly, differences in Delta inflows are due to differences in upstream surface water diversions and return flows. The historical consumptive water demand must be met by the model. Differences in Delta inflow, after accounting for differences in upstream storage regulation, therefore reveal how well CalSim II matches the historical mix of surface water and groundwater to meet demands. Lastly inflows to the Delta are influenced by the stream-aquifer interaction.

For a given south-of-Delta demand and a given Delta inflow, differences in model and historical project exports are indicative of how well the model represents the regulatory operating constraints to which the projects must comply, and how the model simulates storage operations in the San Luis Reservoir.

Conclusions from the study can be framed in the form of answers to some frequently asked questions about CalSim II.

Does CalSim II overestimate the projects' ability to export water from the Delta?

For the supply constrained years 1987-1992, model exports from the Delta average 4,450 taf/yr compared to a historical six-year average of 4,460 taf/yr. This suggests that CalSim II's

	Dry-period average 1987-1992				Long-term average			
Performance parameter	Simulated	Historical	Difference		Simulated	Historical	Difference	
	taf/yr			%	taf/yr			%
SWP south-of-Delta Table A deliveries	1,930	2,030	-100	-4.9	1,810	1,790	20	1.1
CVP south-of-Delta deliveries	2,230	2,320	-90	-3.9	2,650	2,490	160	6.4
Sacramento Valley inflow to the Delta	9,700	9,670	30	0.3	19,830	19,920	-90	-0.5
Net Delta Outflow Index	5,270	5,090	180	3.5	19,070	19,690	-620	-3.1

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simulation of the Delta operations is representative of actual historical conditions.

Does CalSim II overestimate the availability of surface water in the Delta by meeting Sacramento Valley in-basin use through excessive groundwater pumping?

The mix of surface water and groundwater used by the model to meet Sacramento Valley consumptive demands depends primarily on project water allocation decisions and levels of minimum groundwater pumping that are specified in the model. Over the 24-year period average annual net groundwater extraction in CalSim II as compared to estimates based on the Central Valley Groundwater Surface water Model (CVGSM) is lower by 378 taf. The average annual net stream inflow from groundwater in CalSim II is 190 taf greater than estimated by the CVGSM for the same period. The combined effect of dynamically modeling groundwater operations in CalSim II (pumping, recharge and stream-aquifer interaction) leads to 188 taf/yr less water being available to the Delta. For the 1987-1992 period the combined effect results in 46 taf/yr additional water being available to the Delta.

How well does CalSim II represent stream flows?

Differences in long-term average annual flows at key stream locations are typically 1.2 percent or less. It is noted that differences are larger for the Sacramento River at the Ord Ferry gage. At this location a proportion of the water diverted upstream returns downstream so that simulated river flows are sensitive to assumed model water use efficiencies.

How well does CalSim II simulate the Sacramento Valley system?

The net Sacramento Valley accretion is calculated as the Sacramento Valley Delta inflow less releases from Whiskeytown Reservoir, Keswick Reservoir, Lake Oroville and Folsom Lake. The historical 24-year average annual net accretion is 5,950 taf/yr compared with a model value of 5,920 taf/yr.

Do different reservoir operating rules in CalSim II translate into differences in project deliveries?

Simulated month-to-month and year-to-year model results can vary significantly from historical operations. This is primarily due to differences in storage operations. However when averaged over a longer period, model operations (stream flows and deliveries) are very close to historical.

2. CalSim II Model Sensitivity Analysis Study Technical Memorandum Report

Background

The sensitivity analysis is an important component of any water resources planning model evaluation. It enhances understanding of the model, builds greater public confidence, and expands public acceptance of the model. The sensitivity analysis explores and quantifies the effects of various inputs on the model outputs. With a simple sensitivity analysis procedure, variations of model input parameters are generally investigated one at a time. With a more complex procedure, the investigation is conducted by changing a set of input parameters simultaneously. For this study, the simple sensitivity study procedure is used.

The Sensitivity Analysis Study responds to the commitment in *The State Water Project Delivery Reliability Report 2002* to conduct such a study and to issues raised during the public review of that report. The sensitivity analysis study is also one of the recommendations by the CalSim II peer review sponsored by the CALFED Science Program in December 2003. The review panel recommended such a study would help identify key input parameters that have significant effects on the model output, and to provide a systematic way to measure the sensitivity of the model output to variations of key input parameters.

Study Objectives

There are three objectives of the CalSim II Sensitivity Analysis Study:

- to examine the behavior of the SWP-CVP system performance in response to variations in selected input parameters within CalSim-II
- to help SWP contractors and others understand the impact of key assumptions within CalSim II on the SWP delivery capability
- to aid CalSim II modelers for prioritizing future model development activities on the basis of sensitivities of input parameters

Study Description

The development of the CalSim II model is an ongoing effort. DWR and Reclamation periodically release updated versions of the model. This study uses the modified benchmark study of September 30, 2002, under the D-1641 regulatory environment as the base study.

The CalSim II model uses many input parameters to define the physical characteristics of the system, as well as the regulatory environment and operational parameters. Input parameters include time series, single dimensionless coefficients, or monthly distribution curves. Some input parameters are estimated from the historical data and others are user-input or calibrated values. After discussions with model developers and project operators, 21 model input parameters in four major categories and their reasonable ranges of variations were selected for this study. Similarly, there are many output variables in different categories, including reservoir storage, flows at key locations, Delta outflows, project exports and deliveries that characterize the overall outcome of any particular simulation run. After discussions with model users, project operators, and model developers, 22 key output variables that cover various aspects of the SWP-CVP system performance were selected.

In this study, two performance measures – Sensitivity Index (SI) and Elasticity Index (EI) – are used to quantify the model output sensitivity with respect to a certain model input parameter. The SI is a first-order derivative of a model output variable with respect to an input parameter. It can be used to measure the magnitude of change in an output variable per unit change in the magnitude of an input parameter from its base value. The EI is a dimensionless expression of sensitivity that measures the relative change in an output variable to a relative change in an input parameter. As an example, assuming SI = 0.5 and EI = 0.25 for the output variable of total Delta outflow with respect to the input parameter of Oroville inflow, means that for one thousand acre-feet (taf) increase in Oroville inflow, total Delta outflow increases by 0.5 taf; and for 1 percent increase in Oroville inflow, total Delta outflow increases by 0.25 percent, respectively.

Study Results and Discussions

The complete results of the study showing sensitivity and elasticity indices for each one of the selected output variables are listed in terms of their long-term (1922–1994) averages with respect to variations of input parameters. Table E-1 highlights the behavior of some of the key output variables that define the important aspects of SWP–CVP system performance. In Table E-1, the top row is the list of model input parameters and the left-most column is the list of model output variables. In general, each cell in the table contains two numbers except cells in Columns 8 and 9. The number inside parentheses is the SI value and the number outside parentheses is the EI value. Signs in front of SI and EI values can be either positive or negative. In general, the positive sign indicates that the output variable changes in the same direction as the input parameter. For example, as shown in the Row 1 of Column 1 in the table, when SWP Table A demand increases, SWP total delivery, which is the sum of SWP Delta delivery and FRSA delivery, increases as well (SI = +0.39). SWP Delta Delivery is defined as SWP Table A deliveries to South-of-Delta plus deliveries to North Bay (Solano and Napa Counties) contractors. FRSA delivery is defined as the sum of deliveries to the Settlement Contractors in Feather River Service Area (FRSA) and Table A deliveries to Butte and Yuba Counties. The negative sign indicates that the output variable changes in the opposite direction as the input parameter. For example, as shown in the Row 5 of Column 1 in the table, when SWP Table A demand increases, Article 21 delivery decreases (SI = -0.13). In order to highlight relative sensitivity of the various input parameters, a color coded cell background has been used. A red color cell background represents a relatively higher sensitivity or (SI >= 0.2); yellow background represents a moderate sensitivity or (0.1 <= SI <= 0.2); and white background shows a lower sensitivity or (SI <= 0.1).

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Table E-1 Summary excerpt of Elasticity Index (EI) and Sensitivity Index (SI) for selected variables from Table 2

Model Output Response	Model Input Parameters											
	SWP Table A Demand	Article 21 Demand	Banks Pumping Limit	Historical Land Use	Projected Land Use	Crop ET	Basin Efficiency	SWP Delivery-Carryover Curve	SWP San Luis Rule Curve	Shasta Inflow	Oroville Inflow	Folsom Inflow
	1	2	3	4	5	6	7	8	9	10	11	12
1 SWP Total Delivery		0.01 (0.16)		0.09 (-0.13)	-0.05 (-0.03)	0.00 (0.00)*	-0.15 (0.10)	-0.01	0.02	0.07 (0.05)	0.18 (0.19)	0.05 (0.14)
2 CVP total Delivery	-0.01 (-0.01)	0.00 (0.00)*	-0.01 (-0.13)	0.10 (-0.18)	0.14 (0.11)	0.16 (0.09)		0.00*	0.00*		0.05 (0.07)	0.03 (0.09)
3 SWP SOD Delivery		0.00 (-0.01)		0.12 (-0.13)	-0.09 (-0.04)	-0.21 (-0.08)	-0.17 (0.08)	-0.02	0.00*	0.08 (0.04)		0.05 (0.12)
4 SWP NOD Delivery	-0.01 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.17 (0.02)	0.78 (0.08)	-0.17 (0.02)	0.00	0.00*	0.00 (0.00)	0.01 (0.00)	0.00 (0.00)
5 Article 21 Delivery	-2.62 (-0.12)	0.15 (0.17)		-0.05 (0.00)*	-0.45 (-0.01)	-0.03 (0.00)*	0.30 (-0.01)	0.08	0.46	0.34 (0.01)	-0.51 (-0.02)	0.16 (0.02)
6 CVP SOD Delivery	-0.01 (-0.01)	0.00 (0.00)*	-0.02 (-0.10)	0.15 (-0.15)	-0.25 (-0.11)	-0.27 (-0.09)	-0.10 (-0.04)	0.00*	0.00*	-0.58 (-0.18)	0.08 (0.06)	0.04 (0.08)
7 CVP NOD Delivery	0.00 (0.00)	0.00 (0.00)*	0.00 (-0.02)	0.03 (-0.03)		0.46 (0.18)		0.00*	0.00*	0.10 (0.04)	0.02 (0.01)	0.01 (0.01)
8 Total Delta Outflow		0.00 (-0.16)					-0.07 (0.15)	0.00	0.00			
9 Banks Export		0.01 (0.16)		0.11 (-0.11)	-0.11 (-0.06)	-0.20 (-0.08)	-0.14 (0.08)	-0.01	0.02	0.10 (0.06)	0.21 (0.13)	0.05 (0.14)
10 Tracy Export	-0.01 (-0.01)	0.00 (0.00)*	-0.02 (-0.10)	0.16 (-0.15)	-0.25 (-0.10)	-0.28 (-0.09)	-0.10 (0.04)	0.00*	0.00*	0.39 (0.18)	0.09 (0.06)	0.04 (0.08)
11 Banks SWP Export		0.01 (0.16)		0.11 (-0.13)	-0.10 (-0.05)	-0.20 (-0.08)	-0.14 (0.07)	-0.01	0.02	0.08 (0.05)	0.22 (0.18)	0.06 (0.14)
12 Banks CVP Export	-0.53 (-0.02)	0.00 (0.00)	0.79 (0.17)	0.42 (-0.01)	-0.37 (-0.01)	-0.43 (0.00)	-0.31 (0.00)	0.00	0.02	0.86 (0.01)	0.04 (0.00)	0.02 (0.00)*

Note: (1) Values inside parentheses are SI and outside are EI. Values with asterisks indicate that EI and SI are not monotonic functions.
(2) Cell with an asterisk (*) indicates that the SI and EI of that output variable are non-monotonic functions of the corresponding input parameter. Please refer to the main report for details.

Moderate Sensitivity	0.1 <= |SI| <= 0.2
Low Sensitivity	|SI| < 0.1

An examination of Row 3 of Table E-1 highlights the behavior of SWP Delta delivery with respect to changes in some of the key input parameters. It shows that the SWP Table A demand, the Banks pumping limit, and the Oroville inflow affect SWP Delta delivery the most. Folsom inflow and historical land use display moderate effects on the SWP Delta delivery. A positive SI of 0.52 for the SWP Table A demand indicates that the SWP Delta delivery will increase by an average of 0.52 taf if the SWP Table A demand increases by 1 taf; and a positive EI of 0.55 for the SWP Table A demand indicates that the SWP Delta delivery will increase by an average of 0.55 percent if the SWP Table A demand increases by one percent. Similarly, a positive SI of 0.20 for the Oroville inflow indicates that the SWP Delta delivery will increase by an average of 0.20 taf if the Oroville inflow increases by 1 taf; and a positive EI of 0.26 for the Oroville inflow indicates that the SWP Delta delivery will increase by an average of 0.26 percent if the Oroville inflow increases by one percent.

No SI values are computed for input parameters of the SWP Delivery-Carryover Curve and the SWP San Luis Rule-curve (see Columns 8 and 9) because the equivalent changes in the commensurate units of taf are difficult to define for these two parameters. A more detailed discussion of their impact on the SWP Delta delivery is presented in the Memorandum Report.

Future Work

Further analysis of this sensitivity study will be done to develop more detailed findings regarding the impact of various parameters on SWP Delta deliveries.

This sensitivity study is mainly focused on Sacramento Valley hydrology, Sacramento-San Joaquin Delta water quality, and SWP operations. Additional sensitivity studies focused on San Joaquin Valley hydrology and CVP operations are planned for the near future by Reclamation.

Linear programming solution methodology used in the CalSim II model has the potential to produce an array of sensitivity analyses as a by-product of the linear programming analysis automatically. Discussion of these results will provide a degree of transparency to model users and an internal diagnostic tool that the current CalSim II does not provide. Studying these by-products of the linear programming solution procedure will be considered during the development of the next generation of the CalSim II model.

The CALFED report, A Strategic Review of CalSim-II and its Use for Water Planning, Management, and Operations in Central California (December 2003), recommends a model uncertainty analysis be conducted. An uncertainty analysis is not the same as a sensitivity analysis. It takes a set of randomly chosen input values (that can include parameter values), passes them through a model to obtain the probability distributions (or statistical measures of the probability distributions) of the resulting outputs, while a sensitivity analysis attempts to determine the relative change in model output values given modest changes in model input values. The uncertainty analysis would help users of the model understand better the risks of various decisions and the confidence they can have in various model predictions. DWR is currently working on a contract with University of California, Davis to develop a strategy for the evaluation of the major sources of uncertainty in CalSim II modeling studies, and to implement a recommended procedure for the quantification of uncertainties in a CalSim II study.

Websites for the Memorandum Reports:

1. [DWR] California Department of Water Resources, Bay-Delta Office. 2003. CalSim II Simulation of Historical SWP/CVP Operations. Technical Memorandum Report. Availability: http://science.calwater.ca.gov/pdf/CalSim_II_Simulation.pdf

2. [DWR] California Department of Resources, Bay-Delta Office. 2005. CalSim II Model Sensitivity Analysis Study. Technical Memorandum Report. Availability: http://baydeltaoffice.water.ca.gov/

Appendix F. Guidelines for Review of Proposed Permanent Transfers of SWP Annual Table A Amounts

This appendix contains a copy of the Notice to State Water Project Contractors Number 03-09 entitled "Guidelines for Review of Proposed Permanent Transfers of State Water Project Annual Table A Amounts". These guidelines are being included per the Settlement Agreement, dated May 5, 2003, reached in the Planning and Conservation League et al. v. Department of Water Resources, 83 Cal. App. 4th 892 (2000).

STATE OF CALIFORNIA • RESOURCES AGENCY • DEPARTMENT OF WATER RESOURCES

NOTICE TO

STATE WATER PROJECT CONTRACTORS

NUMBER: 03-09 DATE: 7/3/03

SUBJECT: Guidelines for Review of Proposed Permanent Transfers of State Water Project Annual Table A Amounts

FROM: _____
INTERIM DIRECTOR, DEPARTMENT OF WATER RESOURCES

The Department of Water Resources is issuing the following guidelines prepared in connection with the Settlement Agreement, dated May 5, 2003, reached in *Planning and Conservation League et al. v. Department of Water Resources, 83 Cal. App. 4th 892 (2000)*. These guidelines are effective upon the superior court's approval of the Settlement Agreement on May 20, 2003.

1. Purpose: The purpose of these guidelines is to describe the process for DWR's review of proposed permanent transfers of State Water Project Annual Table A Amounts and, by so doing, provide disclosure to SWP contractors and to the public of DWR's process and policy for approving permanent transfer of SWP Annual Table A Amounts. Such disclosure should assist contractors in developing their transfer proposals and obtaining DWR review expeditiously, and assist the public in participating in that review.

2. Coverage: These guidelines will apply to DWR's approval of proposed permanent transfers of water among existing SWP contractors and, if and when appropriate, to proposed permanent transfers of water from an existing SWP contractor to a new SWP contractor.

3. Interpretation: These guidelines are in furtherance of the State policy in favor of voluntary water transfers and shall be interpreted consistent with the law, including but not limited to Water Code Section 109, the Burns-Porter Act, the Central Valley Project Act, the California Environmental Quality Act, area of origin laws, the public trust doctrine, and with existing contracts and bond covenants. These guidelines are not intended to change or augment existing law.

4. Revisions: Revisions may be made to these guidelines as necessary to meet changed circumstances, changes in the law or long-term water supply contracts, or to address conditions unanticipated when the guidelines are adopted. Revisions shall be in accordance with the Settlement Agreement.

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Notice to State Water Project Contractors
Page 2 JUL 3 2003

5. Distribution: The transfer guidelines shall be published by DWR in the next available edition of Bulletin 132, and also as part of the biennial disclosure of SWP reliability as described in the Settlement Agreement.

6. Contract Amendment: Permanent transfers of SWP water are accomplished by amendment of each participating contractor's long-term water supply contract. The amendment consists of amending the Table A upwards for a buying contractor and downwards for a selling contractor. The amendment shall be in conformity with all provisions of the long-term water supply contracts, applicable laws, and bond covenants. Other issues to be addressed in the contract amendment will be subject to negotiation among DWR and the two participating contractors. The negotiations will be conducted in public, pursuant to the Settlement Agreement and Notice to State Water Project Contractors Number 03-10.

7. Financial Issues: The purchasing contractor must demonstrate to DWR's satisfaction that it has the financial ability to assume payments associated with the transferred water. If the purchasing entity was not a SWP contractor as of 2001, special financial requirements pertain as described below, as well as additional qualifications.

8. Compliance with CEQA: Consistent with CEQA, the State's policy to preserve and enhance environmental quality will guide DWR's consideration of transfer proposals (Public Resources Code Section 21000). Identification of the appropriate lead agency will be based on CEQA, the CEQA Guidelines, and applicable case law, including *PCL v. DWR*. CEQA requires the lead agency at a minimum to address the feasible alternatives to the proposed transfer and its potentially significant environmental impacts (1) in the selling contractor's service area; (2) in the buying contractor's service area; (3) on SWP facilities and operations; and (4) on the Delta and areas of origin and other regions as appropriate. Impacts that may occur outside of the transferring SWP contractors' service areas and on fish and wildlife shall be included in the environmental analysis. DWR will not approve a transfer proposal until CEQA compliance is completed. The lead agency shall consult with responsible and trustee agencies and affected cities and counties and, when DWR is not the lead agency, shall provide an administrative draft of the draft EIR or Initial Study/Negative Declaration to DWR prior to the public review period. A descriptive narrative must accompany a checklist, if a checklist is used. The lead agency shall conduct a public hearing on the EIR during the public comment period and notify DWR's State Water Project Analysis Office of the time and place of such hearing in addition to other notice required by law.

9. Place of Use: The purchasing contractor must identify the place and purpose of use of the purchased water, including the reasonable and beneficial use of the water.

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Page 3 JUL 3 2003

Typically, this information would be included in the environmental documentation. If a specific transfer proposal does not fit precisely into any of the alternatives listed below, DWR will use the principles described in these Guidelines to define the process to be followed. The information to be provided under this paragraph is in addition to the CEQA information described in Paragraph 8 of these guidelines.

a. If the place of use is within the contractor's service area, the contractor should disclose the purpose of the transferred water, such as whether the water is being acquired for a specific development project, to enhance overall water supply reliability in the contractor's service area, or some other purpose. If the transferred water is for a municipal purpose, the contractor should state whether the transfer is consistent with its own Urban Water Management Plan or that of its member unit(s) receiving the water.

b. If the place of use is outside the contractor's service area, but within the SWP authorized place of use, and service is to be provided by an existing SWP contractor, then, in addition to Paragraph 9(a) above, the contractor should provide DWR with copies of LAFCO approval and consent of the water agency with authority to serve that area, if any. In some instances, DWR's separate consent is required for annexations in addition to the approval for the transfer.

c. If the place of use is outside the SWP authorized place of use and service is to be provided by an existing SWP contractor, the contractor should provide information in Paragraph 9(a) and 9(b). Prior to approving the transfer, DWR will consider project delivery capability, demands for water supply from the SWP, and the impact, if any, of the proposed transfer on such demand. If DWR approves the transfer, DWR will petition State Water Resources Control Board for approval of expansion of authorized place of use. Water will not be delivered until the place of use has been approved by the SWRCB and will be delivered in compliance with any terms imposed by the SWRCB.

d. If the place of use is outside the SWP authorized place of use and service is not to be provided by an existing SWP contractor, DWR will consider the transfer proposal as a proposal to become a new SWP contractor. Prior to adding a new SWP contractor, DWR will consider project delivery capability, demands for water supply from the SWP, and the impact, if any, of the proposed transfer on such demand. DWR will consult with existing SWP contractors regarding their water supply needs and the proposed transfer. In addition to the information in Paragraph 9(a), 9(b), and 9(c), the new contractor should provide information similar to that provided by the original SWP contractors in the 1960's Bulletin 119 feasibility report addressing hydrology, demand for water supply, population growth, financial feasibility, etc.

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DWR will evaluate these issues independently and ordinarily will act as lead agency for CEQA purposes. In addition, issues such as area of origin claims, priorities, environmental impacts and use of water will be addressed. The selling contractor may not be released from financial obligations. The contract will be subject to a CCP 860 validation action initiated by the new contractor. If DWR approves the transfer, DWR will petition the SWRCB for approval of expansion of authorized place of use. Water will not be delivered until the place of use has been approved by the SWRCB and will be delivered in compliance with any terms imposed by the SWRCB.

10. DWR Discretion: Consistent with the long-term water supply contract provisions, CEQA, and other provisions of law, DWR has discretion to approve or deny transfers. DWR's exercise of discretion will incorporate the following principles:

    a. As required by CEQA, DWR as an agency with statewide authority will implement feasible mitigation measures for any significant environmental impacts resulting from a transfer if such impacts and their mitigation are not addressed by other public agencies and are within DWR's jurisdiction.

    b. DWR will invoke "overriding considerations" in approving a transfer only as authorized by law, including but not limited to CEQA, and, to the extent applicable, the public trust doctrine and area of origin laws.

If you have any questions or need further information, please contact Dan Flory, Chief of DWR's State Water Project Analysis Office, at (916) 653-4313 or Nancy Quan of his staff at (916) 653-0190.

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Appendix G. Comment Letters on the Draft Report and the Department's Responses

Written comments from the public on the *Draft State Water Project Delivery Reliability Report* (November 2005) were accepted through December 2005. DWR reviewed the letters and made appropriate modifications to the report. These letters and the responses to them are contained in this appendix.

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LETTER 21

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COACHELLA VALLEY WATER DISTRICT

POST OFFICE BOX 1058 • COACHELLA, CALIFORNIA 92236 • TELEPHONE (760) 398-2651 • FAX (760) 398-3711

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DAN PACKS, ASST. TO GENERAL MANAGER
REDWINE AND SHERRILL, ATTORNEYS

December 29, 2005

File: 022.57
0644.103

Katherine Kelly, Chief
Bay-Delta Office
California Department of Water Resources
1416 9th Street, Room 215-37
Sacramento, CA 95814

Dear Ms. Kelly:

Subject: Draft 2005 State Water Project Delivery Reliability Report

On December 23, the Coachella Valley Water District (CVWD) e-mailed comments on the draft report, to Johnnie Young-Craig. This is a follow-up to that e-mail submittal. In response to the Department of Water Resources (DWR) Draft 2005 State Water Project Delivery Reliability Report, CVWD submits the following comments:

1. On page 18, the report states, "To simplify the use of this report, the calculation of demand or delivery in percent of maximum Table A is based on the maximum Delta Table A total of 4.133 maf for all five studies." CVWD believes that this approach may result in misleading conclusions if State Water Project (SWP) contractors simply rely on the percentages to estimate their supply reliability.

   Most SWP contractors (with the probable exception of Metropolitan) would be expected to request their full Table A amounts, regardless of the water year type. However, when some contractors request less than their full Table A amount, more water should be available for allocation to other contractors. The use of the maximum Table A amounts to compute the delivery percentages indicates a lower reliability for current (2005) demands than for future (2025) demands. This is demonstrated in Table 5-2, where Study 4 shows an average delivery of 68 percent of the maximum Table A, while Study 5 shows an average delivery of 77 percent. If the delivery percentages were expressed as a percent of the corresponding Table A demand, the results for the current demands would be higher. Study 4 would have an average delivery of 85.7 percent of Table A demand (281/3290 = 0.857) while Study 5 would have an average delivery of 77.3 percent of Table A demand (3178/4110 = 0.773). Similar calculations for maximum and minimum deliveries would also indicate the lower reliability of future SWP deliveries. For dry and wet years, it is recommended that percentages be based on the ratio of deliveries to demands for the corresponding years.

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CVWD believes this computation would more accurately indicate the lower reliability of SWP deliveries in the future as demands increase. SWP contractors could then more directly apply the percentages to estimate their current and future Table A deliveries.

2. It is recommended that the probability charts shown on Figures 5-1 and 5-2 be revised such that the percentages are based either on the maximum demand requests, or the percentages be eliminated. While these figures correctly depict the deliveries in acre-feet, they seem to imply that the project is better able to meet demands in the future simply because demands are closer to the maximum Table A amounts.

3. In Chapter 6, examples are presented on the application of the reliability data. Information from Table 6-1 is used to estimate the potential supplies under average, single dry and multiple dry years. Due to the method whereby the percentages are computed, the average supply is shown to increase over the next twenty years. In reality, the average supply would be spread over a greater demand. Using the average values computed under Comment 1 above, the average annual values in the example would be 85,700 acre-feet in 2005, decreasing to 77,300 acre-feet in 2025. If a contractor were to request less than its full Table A amount in 2005, then the requested amount would be used instead of the Table A value.

4. It is recommended that DWR include, in an appendix, a table showing the annual demands used for each contractor under 2005 and 2025 conditions. This information could then be used to interpret the results of the studies for a particular contractor.

CVWD wishes to thank DWR for the opportunity to comment on this report and looks forward to receiving the final version.

If you have any questions, please call Zachary Ahinga, Resource Engineer, at (760) 398-2661, extension 2510.

Yours very truly,

Steve Robbins
General Manager – Chief Engineer

ZAcsa\engr\resource\05\doc\kelly-draft 2005 State Wtr Project

COACHELLA VALLEY WATER DISTRICT

LETTER 21

STATE OF CALIFORNIA – THE RESOURCES AGENCY ARNOLD SCHWARZENEGGER, Governor
DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

January 30, 2006

Mr. Steven B. Robbins
Coachella Valley Water District
Post Office Box 1058
Coachella, California 92236

Dear Mr. Robbins:

Thank you for your comments on the Draft State Water Project Delivery Reliability Report 2005 (Report 2005). Your comments have been thoroughly reviewed and the recommended changes considered for inclusion into the final report.

I appreciate your concern that, by simplifying the presentation of the information, the report may cause the State Water Project (SWP) contractors to come to an incorrect conclusion about the ability of SWP to meet their needs. You make the point that the ability of the SWP to meet demands will decrease as these demands increase. This is certainly correct. A plot of studies 4 and 5 (from the draft report) showing how well the SWP is estimated to meet demand is attached. It shows that the amount of years under which at least 90 percent of the assumed SWP demand can be met drops from 70 percent for 2005 demands to 50 percent for 2025 demands. The final Report 2005 has been modified to assure that readers will not come to an incorrect conclusion regarding the estimated ability of SWP to meet future demands.

The final report has not been modified, per your request, to present the results as a percentage of assumed demand. The results contained in Report 2005 are shown as percentages of the maximum Table A amount so the information can be easily interpreted by SWP contractors and incorporated into their analyses. Presenting the information as a percentage of the assumed demand would require additional calculations and, we believe, would increase the potential for calculation errors. For example, with the data presented as a percentage of the maximum Table A amount, a contractor may apply a percentage value to the specific maximum Table A amount for his or her district to determine how much water would be available to the district. Once this is done, the capability of the district to convey that amount could be analyzed and the amount of supply reduced accordingly. If the information were presented as a percent of the demand, the amount of water that it equates to must be determined by referencing the assumed demand for a specific year and then calculating the amount of water associated with it. This is particularly cumbersome when calculating average values for any given period.

Mr. Steven B. Robbins
January 30, 2006
Page 2

Finally, you recommend an appendix be included showing the annual demands assumed for each SWP contractor for the 2005 and the 2025 studies. The values for the total annual assumed Table A demand for studies 4 and 5 are listed in Tables B-6 and B-7. Tables containing a breakdown of these values for each contractor would be very long and provide a relatively small increase in the usefulness of the report. Individual contractors are encouraged to contact DWR staff at (916) 653-1099 to discuss the specific applicability to their district of the information in the report.

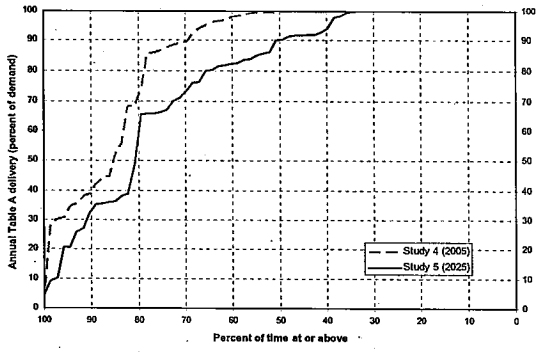
I appreciate your review of this document. The final report will be available soon and will include your letter and this response in an appendix. If you wish to discuss this report further, please contact me at (916) 653-1099 or kkelly@water.ca.gov. Francis Chung, Chief of the Modeling Support Branch of the Bay-Delta Office, should be contacted for technical questions on the CalSim II modeling studies. He can be reached at (916) 653-5924 or chung@water.ca.gov.

Sincerely,

Katherine F. Kelly, Chief
Bay-Delta Office

Attachment

SWP Delta Table A delivery probability for studies 4 and 5



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California Department of Water Resources
SWP Delivery Reliability Report -- Attn: Johnnie Young-Craig
P.O. Box 942836
Sacramento, CA 94236-0001
Date 12/20/05

Dear Sir or Madam,

These are my comments on the 2005 Delivery Reliability Report. I have been studying the WRIMS/CALSIM methodology for some time, although this is made difficult by lack of documentation, non-availability of the WRIMS source code, use of proprietary libraries, and so on. Also, the CALSIM model is inherently very complicated, so it takes a long time to find out what the actual constraints and variables are. So my comments will necessary be of a general methodological character, without using any of the specifics of CALSIM. I think these general considerations are sufficient to argue that the delivery predictions made by CALSIM for the next 20 years cannot possibly be taken seriously. There may be a paucity of data, even in the past, but it simply will not do to compensate for this by making a multitude of seemingly unreasonable assumptions. It is obvious that modeling SWP/CVS is a gargantuan task, but the importance of Table A predictions for development in Southern and Central California is now so important that we really have to do better.

Let me explain what I understand WRIMS/CALSIM modeling to do. I may be wrong, because as I said good documentation is difficult to come by. The SWP/CVS system, or a subset of it, is modeled as the CALSIM network with hundreds of nodes and (valued) arcs. Flows through the system are modeled as arcs, and there are inflow, outflow, and through-flow nodes. There are many

constraints on the flows, depending on capacity, environmental regulations, demands, and balance of inflows and outflows at through-flow nodes. Some outflows are deliveries, some inflows are runoff and rainfall. The objective function is a combination of delivery outflows. We choose flows in such a way that (a) they satisfy the constraints, and (b) over all possible flows satisfying the constraints they maximize the objective function. In actual WRESL modeling the objective function and the constraints are linear, which means that the optimization is actually a linear programming network optimization method. I don't discuss complications, such as using mixed integer programming and soft constraints, which generally make matters worse anyway.

To discuss the results of this process, and the way they are presented, define a function F_N which gives as its value y the total delivery to the 29 SWP contractors and takes as input runoff and rainfall x. The structure of the CALSIM network, including all the constraints, is considered to be fixed. Thus F_N transforms runoff and rainfall x uniquely to delivery y, for a given structure of CALSIM (and for a given objective function). In the delivery reliability studies DWR calculates $F_N(a)$ for t=1,...,73 and for N a limited number of variations of the basic network. Here 73 is the number of years for which we have data, i.e. 1922 to 1994. One N is the network in 2005, another N the network in 2025. Those two networks are supposed to differ only in demand, not in the constraints defined by the infrastructure or regulations. Thus $F_N(x_t)$ is a time series of 73 different values, and as a next step DWR calculates for each number z the percentage of the 73 numbers $F_N(x_t)$ larger than or equal to z. Let's write this as $p_N(z)$. DWR calls $p_N(z)$ the probability that the delivery of network N will be at least z aft/year.

Now let us look at the assumptions inherent in this process. In the first place it assumes that F_N represents the SWP/CVS system adequately. This means that if we assume that if N is the actually network at time t and x_t is the actual rainfall at time t, then $y_t=F_N(x_t)$ should be at least close to the

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observed deliveries at time t. This is basically all we want, but clearly a sufficient condition for this to be the case are that N represents the infrastructure and the constraints adequately and that the many people operating SWP/CVS act as if they are optimizing a particular linear function under the particular constraints used. Both these sufficient conditions are obviously false. It is known that the model does not adequately represent the environmental regulations, it is also know that the mix-and-match strategies used by suppliers to add ground water or banked water to the system are not adequately represented either. It is unknown how serious these violations are. From the system theoretic point of view it is not necessary to assume that the network is true and the operators are optimizers, the only thing we are interested in is if y_t is sufficiently close to $F_N(x_t)$ (ands, eventually, if the predicted future observed y_t will be close to the predicted $F_N(x_t)$.

Another assumption that seems inherent in the calculations is that x_t is, in some sense, a random sample of size 73 of the possible values of rainfall/runoff in California, not just for now but also for the future. Now certainly there are large autocorrelations in the hydrologic time series x_t, so we certainly do not have independent observations. In fact, it is highly debatable if the notion of randomness applies here at all, and if we do not have a unique series of 73 observations for which there is no suitable framework of replication. Of course if randomness does not apply, then the notion of probability does not apply. But if randomness applies, then it should also be possible, and in fact highly desirable, to construct confidence regions for the $p_N(z)$ curves. Recently published time series also suggest that rainfall/runoff exhibit systematic trends, possibly related to climate change. So in particular extrapolating into the future may be risky.

For now, we will just insert some additional words of caution. A system that maximizes deliveries will obviously tend to overestimate deliveries. A system with hundreds and hundreds of variables can easily be manipulated to reproduce historic results, so future predictions are much more

important than close fit. Sensitivity analysis, i.e. changing the network from N to N', is definitely important but is a huge undertaking with a network as large as CALSIM. The assumption that the constraints (except for demand) and the structure of the network will remain basically the same until 2025 seem very arbitrary. The sensitivity study looks at some variation in the pumping done at Banks, but what we want to know, of course, is the actual level of pumping in future years. There is no way to tell what the environmental regulations in 2025 will be, because those depend on politics, climate change, and possible catastrophes.

DWR argues that the CALSIM projections are the best we have. This may be true, but it may be just a reflection of historical circumstances during development of the model. It certainly does not mean that it is the best we can do. DWR also argues, in many places, that past deliveries cannot be used to reliably predict future deliveries. This is dangerous nonsense. Of course they can. Even CALSIM uses them. It is true that the structure of the network and the constraints also play an important role, but ultimately all we have is a complicated way to relate the time series of runoff/ rainfall to the time series of deliveries to the SWP contractors. With the many threats to the Delta, which the possible impact of climate change, with the rapid population growth in Southern California, with the increasing demand of Northern California, with much less water from the Colorado River going to Southern California, we may have to face the fact that "best we have" is simply not good enough any more.

In summary, I do not think the DWR Delivery Reliability estimates are, themselves, very reliable. They are build on a host of unrealistic assumptions, that are "saved" by a model with the property that it always outputs a single number. And that single number is what the clients downstream are interested in. As far as I can see, a large fraction of that number is "model" or "virtual" water. It looks good on paper, but only water agency boards and modeling divisions can live on it.

Sincerely yours,

Jan de Leeuw

Director CVSC

Distinguished Professor and Chair, UCLA Department of Statistics

LETTER 21

STATE OF CALIFORNIA -- THE RESOURCES AGENCY ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF WATER RESOURCES
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January 30, 2006

Dr. Jan de Leeuw
Cuddy Valley Statistical Consulting
11667 Steinhoff Road
Frazier Park, California 93225

Dear Dr. de Leeuw:

This letter responds to your letter dated December 20, 2005 commenting on the Draft State Water Project Delivery Reliability Report (Report 2005). Most of your comments are regarding the suitability of the CalSim II computer simulation model for estimating the delivery reliability of the State Water Project (SWP).

You state that due to the lack of documentation for the CalSim model and its tremendous complexity, you may have a limited understanding of the model. Your general understanding of the model is correct with respect to its basic structure. It should be noted that CalSim II is not an optimization model but, rather, a system simulation model. The simulation is done on a monthly time step. It is not designed to maximize deliveries but to meet the assumed annual requested contractors' demands to the extent possible while meeting all physical, operational, and institutional constraints. The CalSim II modeled operation has been critically reviewed by both the SWP and the Central Valley Project operators and they are satisfied with the degree the model results mimic the actual real-world operations. The CalSim II model has been used extensively by State Water Contractors and SWP operation staff to help them develop annual water supply guidelines.

Over the past few years, there has been significant outreach to the interested public regarding CalSim II. Explaining what the model is and how it works is a big challenge given its complexity and the varying levels of understanding desired by interested parties. As you are aware, the CalSim II model has undergone a peer review (November 2003) which was open to the public and identified the strengths and weaknesses of the model. The peer reviewers produced a report of their findings (December 2003) to which the Department of Water Resources (DWR) responded (August 2004). This response includes a description of the goals for improving different aspects of CalSim and the plan for meeting them. Improving the credibility of the model with the interested public is a top priority in the plan. We will continue to strive to increase public understanding of the model.

With respect to technical understanding of the model, documentation of the CalSim II Benchmark Studies (September 2002) and the associated assumptions is available on the Bay-Delta Office web site. This site also includes drafts of a CalSim Manual, Users Guide and WRSL Reference. In addition, an intense training session on CalSim was conducted in October 2003 for the interested public and was attended by 45 individuals. This training was designed to increase the technical understanding of the model, encourage informed discussion of the technical strengths and weaknesses of the model, and decrease the demand on DWR staff to conduct or assist with modeling studies by increasing the ability of other agencies and private consultants. This effort was very successful and DWR will conduct training sessions in the future as appropriate.

The CalSim II results in the Report 2005 are the best quantifications available of the delivery ability of the SWP but, as you point out, these estimates are limited because of the uncertainty of future conditions. DWR will continue to use the CalSim model as appropriate for analyses but other information is being developed that will help us analyze, understand, and prepare for our uncertain future. The potential impacts of climate change on the State's resources, including water supply, are being evaluated per the Governor's directive (Executive Order S-3-05). This effort includes broad brush estimates, using CalSim II, of the potential impact upon the SWP in 50 to 100 years if no additional conveyance facilities or upstream reservoirs are built. In addition, DWR is working on three projects that will improve our ability to make qualitative or quantitative statements about the reliability of conveyance across the Sacramento-San Joaquin Delta. These are: the Delta Risk Management Strategy, which will assess risks to the Delta from floods, seepage, subsidence, and earthquakes, evaluate the consequences of levee failure, and develop recommendations to manage the risk; implementation of AB 1200 (Laird, 2005) which calls for a similar evaluation of impacts on water supplies from catastrophic Delta failure; and a broader public process to develop a shared vision of a sustainable Delta that continues to support societal needs related to water supply, transportation, recreation, land use, energy, and environmental health. Although none of these efforts will be completed before release of the next Reliability Report, some preliminary results and conclusions may be done in time for inclusion. Subsequent Reliability Reports will fully incorporate this information.

In closing, the discussion of using past deliveries to predict future deliveries has been clarified in response to your comment. You comment that it is incorrect to state that past deliveries cannot be used reliably to predict future deliveries. We certainly believe, for the SWP, past deliveries cannot be reliably used to predict future deliveries because of the significant increase over time in the demand for SWP supplies.

Thank you for your comments on the draft Report 2005. The final report will be available soon and will include your letter and this response in an appendix. If you wish to discuss the report further, please contact me at (916) 653-1099 or kkelly@water.ca.gov. Francis Chung, Chief of the Modeling Support Branch of the Bay-Delta Office, should be contacted for technical questions on the CalSim II modeling studies. He may be reached at (916) 653-5924 or chung@water.ca.gov.

Sincerely,

Katherine F. Kelly, Chief
Bay-Delta Office

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December 22, 2005

Kathy Kelly
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SWP Delivery Reliability Report – Attn: Johnnie Young-Craig
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via facsimile to: (916) 653-6077
via email to: Comments-on-2005DRR@water.ca.gov

Re: Comments on Public Review Draft of the State Water Project Delivery Reliability Report 2005

Ms. Kelly:

The Planning and Conservation League (PCL), a strong advocate for accurate and realistic water supply planning, submits the following comments on DWR's Public Review Draft of the State Water Project Delivery Reliability Report (Draft Reliability Report). As one of the signatories to the court-approved settlement agreement requiring DWR to prepare these biennial reliability reports, PCL seeks to ensure that the final report lives up to the rigorous reporting requirements specified in that agreement. Serious deficiencies are present in the Draft Report that, if left uncorrected, would dangerously overestimate DWR's future ability to deliver water and compound the risk that local planning decisions will be predicated on "paper" rather than deliverable water.

The Reliability Report Should Accurately Disclose its Foundation in the Settlement Agreement and the State Water Project Contracts

The present Draft fails to inform local decision-makers and the public of the context and history behind DWR's reporting requirement. DWR's legal duty to prepare biennial reliability reports arises from the court-approved settlement agreement executed by PCL, DWR, state water contractors and other entities in the wake of the Third District Court of Appeal's ruling in the "Monterey Amendments" case, *Planning & Conservation League v. Department of Water Resources* (2000) 83 Cal. App. 4th 892.

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In *Planning & Conservation League*, the decision invalidating the Monterey Amendments EIR, the court bluntly addressed the "huge gap" between the 4.23 million acre-feet of SWP entitlements referenced in Table A of the SWP contracts and the half or less of that amount the state can reliably deliver. Recognizing the practical consequences of paper water for local development decisions, that court vindicated "the commonsense notion that land use decisions are predicated at some level on assumptions about available water supply. The Court also recognized that reliance on "paper water in local development decisions can produce excessive groundwater pumping and a host of other detrimental environmental consequences. " (83 Cal. App. 4th at p. 915.)

In the settlement decision following that ruling, DWR expressly agreed to add a rigorous new set of reporting requirements. In a new provision (Article 58) of the SWP contract, DWR committed to the following:

> 1.Commencing in 2003, and every two years thereafter, the Department Water of Resources (DWR) shall prepare and deliver to all State Water Project (SWP) contractors, all city and county planning departments, and all regional and metropolitan planning departments within the project service area a report which accurately sets forth, under a range of hydrologic conditions, the then existing overall delivery capability of the project facilities and the allocation of that capacity to each contractor. The range of hydrologic conditions shall include the historic extended dry cycle and long-term average. The biennial report shall also disclose, for each of the ten years immediately preceding the report, the total amount of project water delivered and the amount of project water delivered to each contractor. The information presented in each report shall be presented in a manner readily understandable by the public. (Settlement Agreement Attachment B)

The Settlement Agreement further states:

> 3. DWR shall provide assistance to enable all Municipal and Industrial Contractors to provide complete and accurate information to relevant land-use planning agencies to assure that local land-use decisions reflect accurate information on the availability of water from state, local, and other sources. (Settlement Agreement Attachment B)

The Draft Reliability Report does not fulfill these requirements. As detailed in the remaining sections of these comments, the Draft omits important information and misinterprets data, which would mislead both the public and local water agencies. Accordingly, it lacks the accuracy that the settlement agreement requires. In order to help DWR meet the commitments made under the settlement agreement, we submit the following comments for inclusion in the final 2005 Reliability Report.

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Excerpts of the Reliability Report should not have been privately shared with the State Water Contractors, but denied to PCL and the public

We are aware that DWR provided an earlier draft chapter of the Draft Reliability Report to State Water Project contractors in May 2005 ("Excerpts from Working Draft 2005 SWP Delivery Reliability Report") and further recommended that local agencies incorporate information provided in that draft chapter in their Urban Water Management Plans (UWMPs). Castaic Lake Water Agency has acknowledged relying on that document in reviewing other projects, and other contractors may have done so as well. However, DWR did not provide that draft chapter to PCL or the public, even though PCL staff requested the opportunity to review the draft. After followup requests, we were informed that the draft chapter would be posted to a web page for contractor announcements. There was no public announcement informing interested parties of the availability of the draft chapter.

DWR's decision to circulate part of the report to the contractors, while denying that same document to PCL and members of the public, represents an unfortunate throwback to the defective process singled out for criticism in *Planning and Conservation League*, where the court took notice of the interested parties and members of the public who were "not invited to the table." (83 Cal. App. 4th at 905.)

The draft and final Reliability Reports should be available to the public prior to deadlines for local agency Urban Water Management Plans

The most important purpose of the Reliability Report is to provide local water agencies and the public with accurate and realistic information on the reliability of SWP deliveries. Those local agencies should be able to use that information in planning documents and to inform land use decisions. Unfortunately, the timing of this report significantly compromises its utility. DWR did not release its draft to the public until just weeks prior to the state mandated deadline for local water agencies to complete and submit their 2005 Urban Water Management Plans.

DWR's decision to provide a single draft chapter prior to release of the full draft significantly compromises the information now included in many UWMPs. Without the complete report and the benefit of public review, decision-makers, planners and the public were denied the opportunity to evaluate and confirm the credibility of the information included in the draft chapter and now included in the UWMPs. Releasing the draft chapter and significantly delaying the release of this report is functionally equivalent to eliminating public oversight and transparency.

Water supply information from one chapter of a draft report also does not provide an adequate level of certainty or rigorous review required to determine the reliability of future water supplies for millions of Californians. To avoid damaging that review, water agencies and the public were supposed to have the complete final report, not just a preliminary part of it.

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DWR must ensure that in the future, the public will have ample opportunity to review and comment on Draft Reliability Reports, and that those public comments will be appropriately responded to and incorporated into vetted and substantiated final future reports well before Urban Water Management Plans are due to the State.

The Reliability Report should include DWR's analysis of SWP reliability under anticipated effects of climate change.

The 2005 Draft Reliability Report recognizes that a primary factor in determining reliability of SWP supplies is the availability of water in source areas. Yet the Draft Report fails to discuss and incorporate known and recognized information regarding the substantial adverse impacts climate change will have upon California's water supply. This omission is particularly troubling because DWR previously committed to including such information.

In 2002 DWR's first Reliability Report recognized that climate change could significantly alter availability of water in source areas. The 2002 report stated that information on climate change impacts to California was being developed in the California Water Plan Update process, and that such information would be incorporated into the 2005 reliability report. The California Water Plan Update 2005 is now nearly complete, and it contains information on climate change. The April 7, 2005 draft of the Water Plan Update states:

> California's relies on snowpack as its largest means of annual water storage. Runoff from the Sierra Nevada mountains during April through July of each year averages 14 million acre-feet and comes primarily from snowmelt. Computer modeling of global climate change scenarios predict significant future reductions in the Sierra snowpack. A reduced snowpack will reduce the total water storage for the state. Figure 4-7 (Model simulation of potential changes in snowpack during the 21st Century) shows a 52 percent reduction in the annual April through July runoff for a 2.1 degree C (3.8 F) of warming, well within the 1.4 to 5.8 degree C (2.5–10.4 F) range predicted by global climate models for this century.
>
> Changes in the timing of snowfall and snowmelt, as a result of climate change, may make it more difficult to refill reservoir flood control space during late spring and early summer, potentially reducing the amount of surface water available during the dry season. Changes in reservoir levels also affect lake recreation, hydroelectric power production, and fish habitat by altering water temperatures and quality. Reductions in snowpack may require changes in the operation of California's water systems and infrastructure, and increase the value of additional flood control space in reservoirs.
> (Public Review Draft California Water Plan Update, April 7, 2005, Vol. 4, page 4-27)

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Despite the commitments made in the 2002 Reliability Report, this information is not included in the recent draft of the 2005 Delivery Reliability Report.

In addition, the Draft Reliability Report misleads readers by suggesting that information on climate change impacts in California is not available. Since the release of the Draft Reliability Report 2002, a large amount of analysis on potential climate change impacts on water management in California has been published. Yet, the Draft Report 2005 states:

> The studies do not incorporate any modifications to account for changes related to climate change or assess the risk of future seismic or flooding events significantly disrupting SWP deliveries. As tools are developed to address these risks and the resulting studies become available, the information will be incorporated into the assessment of SWP delivery reliability. The results of the CalSim-II studies conducted for this update to *The State Water Project Delivery Reliability Report 2002* (DWR 2003b) represent the best available assessment of the delivery capability of the SWP. (Draft Reliability Report page 17)

However, estimates of the deliveries from the SWP under climate change conditions have been modeled and analyzed. The California Energy Commission recently completed such an analysis in their report, "Predictions of Climate Change Impacts on California Water Resources Using CalSim-II: A Technical Note" (CEC report).

In contrast to the statement included in the Draft Reliability Report, the CEC report provides assessments of SWP delivery capability under several probable climate change scenarios. This work was prepared in response to Executive Order S-3-05 issued by Governor Schwarzenegger, which called for a report on the impacts to California of global warming, including impacts to water supply, public health, agriculture, the coastline, and forestry.

It includes analysis carried out using CalSim-II, some of it performed by DWR staff.
It is disappointing that it took the initiative of the Energy Commission to generate climate change scenarios that PCL has been requesting of DWR for over two years. Moreover, DWR cannot credibly represent that such studies are impossible even after they become publicly available. To claim otherwise would fatally compromise the commitment to accuracy that is the hallmark of DWR's reporting requirement.

The figures below from the CEC Report show that under climate change hydrologies, SWP deliveries at 75% reliability could be as much as 1.9 million acre feet less than the base condition.

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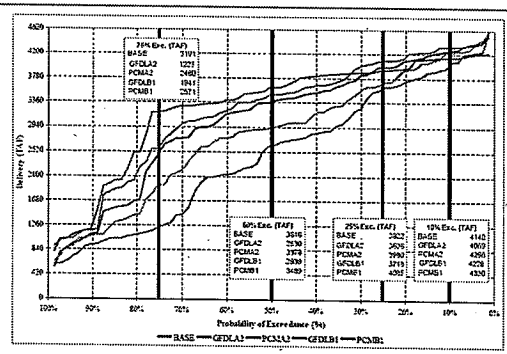

Figure 7. Exceedance probability plot of SWP Annual Deliveries under climate change scenarios PCM B1-A2 and GFDL B1-A2 for 2070-2099

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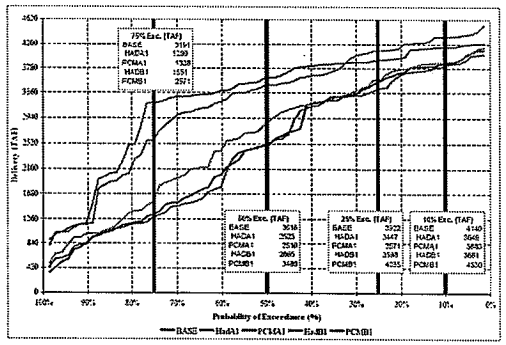

Figure 8. Exceedance probability plot of SWP Annual Deliveries under climate change scenarios PCM B1-A1 and HadCM3 B1-A1 for 2070-2099

(California Energy Commission, draft Predictions of Climate Change Impacts on California Water Resources Using CalSim-II: A Technical Note, December 2005 page 14 & 15 http://www.energy.ca.gov/2005publications/CEC-500-2005-200/CEC-500-2005-200-SD.PDF)

The CEC report concluded that modeling, "results show great negative impacts on California hydrology and water resources associated with most of climate change scenarios analyzed (only one scenario PCM run under B1 emission scenarios show just mild negative impacts)." (page 4)

This information demonstrates the range of outcomes that water managers must be prepared to address. This important assessment of the delivery capability of the SWP should be included in the Draft Reliability Report.

We also understand that DWR may have done its own analysis of the impacts of climate change on SWP deliveries. On the official State of California Climate Change Portal (http://www.climatechange.ca.gov/climate_action_team/reports/index.html) there is a reference to a study done by DWR. However unlike all of the other references, no results are included. The Reliability Report should include the results of DWR's own analysis.

Omission of this information prevents planners and decision makers from preparing for the inevitable implications for their water supplies. If the CEC already is predicting that water

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availability, and thus SWP deliveries, will be substantially reduced in the near future, water planners must adjust to that reality. DWR must address this problem, and will do California an enormous disservice if it continues to pretend that this problem does not exist.

Information in the Reliability Report will be used by local planners to make infrastructure investments and development decisions. The decisions made today about where to place infrastructure and where to approve development are long term commitments that will have impacts for hundreds of years into the future.

For instance, local decision-makers may chose not to place purple pipe in new development on the basis of assumed high level of delivery reliability from the SWP. Instead, decision-makers could choose to invest in new infrastructure to provide traditional supplies, including SWP supplies to new development. Once development is approved, the local area has foregone the opportunity to increase water supply reliability through use of recycled water. Should SWP supplies become significantly lower than predicted in the Reliability Report due to foreseeable impacts of climate change, significant local and statewide investments in infrastructure and housing would be stranded.

If local decisions are predicated on information from DWR that does not fully acknowledge potential constraints on DWR deliveries, they run the risk of producing excessive groundwater pumping and a host of other detrimental environmental consequences " (See *Planning and Conservation League*, 83 Cal. App. 4th at p. 915.)]

The long term nature and the resulting implications for the future of local areas as well as California as a whole, demand that the Reliability Report provide accurate, realistic information that fully discloses foreseeable uncertainty and risks.

The Report's unreliability also creates financial risks for the state. In many cases bonds will be committed to infrastructure built on expectations generated or encouraged by the Reliability Report. As with any financial investment, the risks associated with these investments must be fully disclosed to those who buy the bonds, those who approved the bonds, and those who invest in that infrastructure or in the developments supported by that infrastructure. As the state has learned in the past with levee liability, there is a potential risk that the State may be held accountable for decisions and investments made by others on the basis of false interpretation of the State's ability to protect and guarantee those investments.

The Reliability Report should include risk analysis and impacts from catastrophic failure in the Bay Delta Estuary from earthquake or flood

The Draft Reliability Report correctly identifies the availability and means of conveyance as a primary factor in determining reliability of SWP supplies. However, like climate change impacts, the Draft Report fails to include analysis or discussion of serious and eminent risks to the Bay Delta

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Estuary, an essential component of the SWP conveyance system. Significant risks to the ability of the SWP to export water from the Bay Delta Estuary are posed by the vulnerability of levees to flood, sea level rise and earthquake, as well as environmental degradation and continued declines of important fish species.

Dr. Jeffery Mount from the University of California, Davis, recently completed a risk analysis estimating that there is a 64 percent probability that the Bay Delta Estuary will experience abrupt changes resulting from flooding or seismic activity within the next fifty years. These changes would permanently alter the hydrology, water quality and ecosystem of the Estuary. Furthermore, Dr. Mount found that there is no institutional capacity to address these permanent changes. (Subsidence, Seismicity and Sea Level Rise: Hell AND High Water in the Delta; presented by Dr. Jeffery Mount to the California Bay-Delta Authority October 14, 2004. http://calwater.ca.gov/CBDA/AgendaItems_10-13-14-04/Presentation/Item_13_6_Subsidence_Seismicity_Sea_Level_Rise.pdf)

In recent testimony to a joint committee of the California Legislature, Lester Snow, Director of DWR, outlined the serious risks to SWP water supply availability associated with Bay Delta levee failure. In his presentation, "How a Delta Earthquake Could Devastate California's Economy," Director Snow stated that extended impacts to water availability would include:

- Using most optimistic projection, levee repairs will require at least 15 months. More realistically, the repairs will take much longer.
- Southern California water agencies are drawing from reserves. Some will last up to 36 months; others will go dry sooner.
- Extreme water conservation measures enacted
- Ground water basins drawn dangerously down – may lead to contamination
- Water conservation and transfer programs enacted

(Slide 16 of Lester Snow's presentation to the joint legislative committee, November 1, 2005 http://www.publicaffairs.water.ca.gov/newsreleases/2005/11-01-05DeltaEarthquake.pdf)

Director Snow further indicated that recovery of the conveyance through the Delta could be abandoned. (Slide 19 of Lester Snow's presentation). Director Snow told the Legislature that "... we also need to recognize the Statewide impacts ...if Delta water supplies are reduced or eliminated as a result of a catastrophic failure of our levee system." (Quote taken from DWR Press Release, November 1, 2005, http://www.publicaffairs.water.ca.gov/newsreleases/2005/11-01-05flood.cfm)

Accordingly, the Reliability Report should incorporate Director Snow's recommendation to recognize the risk to SWP reliability from flood, sea level rise and earthquake.

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In addition to vulnerable levees, ecosystem degradation poses a significant risk to the ability to convey SWP water reliably through the Bay Delta Estuary. Recently, data from the Department of Fish & Game's Fall Mid Water Trawl signaled that there is a serious ecosystem collapse in the Estuary, with four important pelagic fish populations at historic lows, including the California and Federally Endangered Species Act listed Delta Smelt.

In response, many agencies, including DWR are participating in an emergency science review called the 'Pelagic Organism Decline' (POD) investigation. The most recent report from the POD investigations indicates that increased exports, which increase fish entrainment and decrease available habitat, may be a primary contributor to the fisheries declines ("Interagency Ecological Program Synthesis of 2005 Work to Evaluate the Pelagic Organism Decline (POD) in the Upper San Francisco Estuary," November 2005 http://science.calwater.ca.gov/pdf/workshops/IEP_POD_2005WorkSynthesis-draft_111405.pdf).

The final Reliability Report should acknowledge the current pelagic organism decline and disclose the possibility that decreases in exports may be necessary in order to reverse those declines. Lastly, while the pelagic species decline currently is the most salient of the Bay-Delta Estuary's environmental problems, it is not the only problem that might compel delivery reductions. Bay-Delta water currently does not meet federal or state water quality standards, and many other species are listed as threatened or endangered. The final Reliability Report should acknowledge that fixing these other environmental problems also may require export reductions.

The Reliability Report should evaluate variable levels of demand, utilizing demand modeled in the Draft California Water Plan Update 2005

The Draft Reliability Report identifies the level and pattern of water demand in the delivery service area as the third primary component in determining SWP reliability. However, the Draft Reliability Report does not examine a significantly varied range of possible demand scenarios for the future. That omission is important, for such analysis would likely show that reliability is inversely proportional to California's overall level of demand.

Recent work completed by DWR for the California Water Plan provides a range of demand scenarios that should be included in the Reliability Report. The California Water Plan Update 2005 identifies three plausible demand scenarios: current trends continued; less resource intensive; and more resource intensive. Two of these three scenarios demonstrate that it is plausible that in 2030 California water demands will *decrease*, even with an expected 12 million more residents. The greatest decreases in water demands in every scenario occur in the SWP service area of Tulare Lake.

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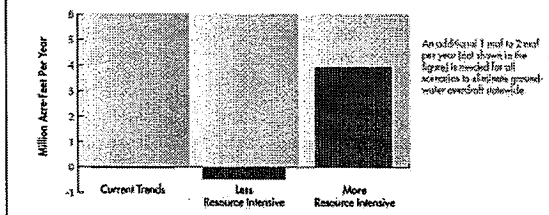
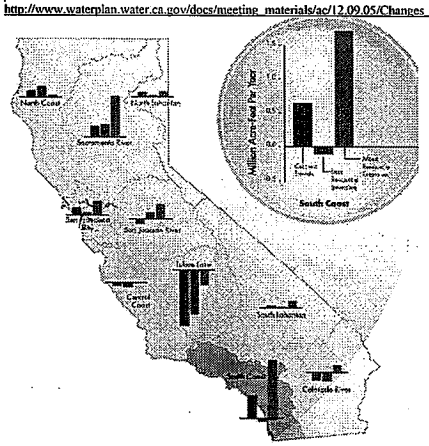
Figure 4-2 Net changes statewide in average year water demand for baseline scenarios, 2000-2030



Water demands may change between 2000 and 2030 for average water conditions. Statewide water demand changes are shown for three baseline scenarios.

http://www.waterplan.water.ca.gov/docs/meeting_materials/ac/12.09.05/Changes_to_PRD_Slides_(12-08-2005).pdf



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http://www.waterplan.water.ca.gov/docs/meeting_materials/ac/12.09.05/Changes_to_PRD_Slides_(12-08-2005).pdf

Recently, the California Court of Appeals determined that state and Federal water agencies erred when they failed to adequately assess a range of reasonable scenarios in the CALFED ROD EIR in part because the environmental document did not include an analysis of reduced pumping from the Bay Delta Estuary (*In Re Bay Delta Programmatic Environmental Impact Report Coordinated Cases* (2005) 133 Cal.App.4th 154). Consistent with this finding, and DWR's recent good work on the State Water Plan Update, the Reliability Report should evaluate reliability under the three demand scenarios presented in the California Water Plan Update.

The Reliability Report should be consistent with operations described in environmental reviews

The Draft Reliability Report assumes that SWP deliveries into the future will be much higher than historic averages. In the past, SWP deliveries have averaged about 2 maf per year, while the Draft Reliability Report proposes that future deliveries will average from 2.8 to 3.1 maf annually. The Draft Reliability Report also assumes that an additional maximum of 1.11 maf of water could be delivered under Article 21.

Because CalSim-II is an optimization model that does not necessarily reflect options available to water operators, it may predict these levels of exports. However, federal and state water quality and endangered species laws and regulations probably would prohibit such high export levels for water quality problems and if species impacts were chronic even at historic levels. In light of the recent pelagic organism declines in the Bay Delta Estuary, it is prudent to ensure the Draft Reliability delivery predictions would not violate conditions of the Federal Clean Water Act, the Federal or California Endangered Species Acts, or any other environmental permit condition, regulation, standard, or law.

In order to ensure that stated water deliveries would be legally feasible, the Reliability Report must explicitly state whether listed export levels are consistent with those modeled in environmental reviews, including the recently issued biological opinions. For instance, the Reliability Report should state whether the Biological Opinions for OCAP in 2004 accounted for impacts to listed species under a modeling scenario that contemplated deliveries of 1.11 million acre feet of Article 21 water.

The Reliability Report should not recommend that water agencies integrate Article 21 as firm annual supplies in planning documents

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Article 21 water is by definition interruptible water; indeed, the word "interruptible" replaces the formerly used "surplus" in the Monterey Amendments. It should not be used as the basis for uninterruptible demands. Yet in chapter 6 of the Draft Reliability Report, local agencies are encouraged to include Article 21 water in a table of average annual values.

As DWR is aware, water supplies accounted for in the Urban Water Management Plans become the basis for approval of water supply assessments for new development in California. It is not only imprudent, but would provide institutional cover for unreliable planning, to recommend that local decision-makers approve housing that will be dependent on water that is 'interruptible.'

Article 21 water should be removed from the recommended table of average annual deliveries.

Use of CalSim-II as the sole tool to determine reliability is inappropriate given the following significant and yet to be resolved deficiencies

The lack of calibration and other deficiencies of CalSim-II have been made known the DWR in formal comments on the 2002 Draft by several parties, specifically Arve Sjovold and Dennis O'Conner. In addition, a 2003 expert peer review report documented numerous problems in CalSim II, and concluded that its predictions should be treated as "hypotheses." A. Close et al., A Strategic Review of CalSim II and its User for Water Planning, Management and Operations in California 13 (2003). This Draft has not adequately addressed those deficiencies. Some of these previously-highlighted deficiencies are listed below.

- CalSim-II has not been calibrated or validated
- It is unclear whether CalSim-II incorporates limitations to groundwater use in the Sacramento Valley
- The CalSim-II model should not be used to make absolute predictions, such as those incorporated into the Reliability Report
- CalSim-II does not recognize or report uncertainty

Additionally, CalSim-II may produce results not consistent with reality, replacing the problem of paper water with an even greater problem of 'cyber water.' For example, in 2001, California experienced water supply associated with approximately the 75% exceedence level, and the State Water Project was able to deliver 1,607,570 ac-ft. However, the CalSim-II simulations predicted a 75% exceedence level of supply of roughly 2,500,000 ac-ft (as read from Figure 5.1). In other words, CalSim-II overpredicted deliveries by more than 50%. These discrepancies demonstrate the need to use multiple tools to determine reliability, as well as the need to articulate limitations of this particular model. Similarly, they demonstrate that local agencies will take enormous risks if they approve projects in reliance on CalSim II's predictions that future deliveries will be substantially higher than historic deliveries.

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The Draft Reliability Report attempts to respond to the recent to the recommendations and conclusions from the recent CBDA Peer Review, *A Strategic Review of CalSim II and its Uses for Water Planning, Management, and Operations in Central California* (Close and others 2003).

The Draft Reliability Report states:

> In *Peer Review Response,* DWR and USBR (2004) conclude the concern about overestimations of south-of-Delta deliveries is unwarranted because the 73-year study referenced by the panel is not designed to mimic historical conditions; rather it is intended to determine the reliability of the SWP when the demand equals the maximum Delta Table A amount (4.133 MAF) every year. The results of the referenced study are documented in *The SWP Delivery Reliability Report 2002* (DWR 2003b) as study 3 (2021B).
>
> A more appropriate method for assessing the ability of CalSim II to accurately model SWP operations is to compare the historical SWP deliveries with the simulated deliveries of the Historical Operations Study. DWR committed to conducting this study in *The SWP Delivery Reliability Report 2002* (DWR 2003b). The study is documented in the November 2003 Technical Memorandum Report *CalSim-II Simulation of Historical SWP/CVP Operations* (DWR 2003a). The Historical Operations Study is designed to assess CalSim II's ability to mimic historical operations of the SWP. In this study, historical input is used where reliable data are available. In situations where reliable historical record is not readily available, reasonable assumptions and estimates are made. (pages 10 & 11)

Before stating that this approach is the most appropriate response to the Peer Review concerns, DWR should reconvene the panel in order to review whether DWR's response satisfies the concerns raised in the original peer review. To verify that this response appropriately satisfies the concerns raised by that panel.

Additional specific comments on uses of CalSim-II in the Draft Reliability Report 2005 are attached in Appendix A.

Conclusion

PCL hopes that these comments assist DWR in arriving at a final version of the Reliability Report that corrects the serious deficiencies identified in the draft, and provides the

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additional analysis recommended here. Without these additional efforts, the report would not fulfill DWR's responsibilities under the settlement agreement and the Article 58 of the SWP contracts, and would fail to provide local decision-makers with a credible basis to ensure that development decisions are grounded in an accurate assessment of deliverable SWP supply.

Sincerely,

Mindy McIntyre
Water Program Manager
Planning and Conservation League

Cc:
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Antonio Rossmann, Rossmann & Moore, LLP
Roger Moore, Rossmann & Moore, LLP
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Senator Kuehl,
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Senator Kehoe
Senator Ducheny
Senator Perata
Assemblywoman Wolk
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APPENDIX A: **Specific comments on uses of CalSim-II in this Draft Reliability Report are highlighted below.**

Page 7: "Whatever assumptions are made, every responsible water delivery reliability analysis should expressly state the assumptions, methods and data used to produce its results. It should also be understood that those numbers depend on, and are no better then, the assumptions upon which they must necessarily rest."

This statement is entirely true. Yet this particular "water delivery reliability analysis" does not measure up to its own standard, because it does not adequately disclose the weaknesses of the key assumptions it makes and the key model upon which it relies. The reliability report should acknowledge that the simulated levels of SWP deliveries reported on the Draft Reliability Report are defined entirely by the explicit and implicit assumptions used in CalSim-II—they are CalSim-II's reliability results and not the results for the physical system itself—and should address the potential weaknesses in the "assumptions, methods and data" used to make those predictions.

Additionally, a statement such as this is so important that it should be made prominently, perhaps in a highlighted text box, rather than at the end of a paragraph in the body of the report.

Page 7: "For example, the demand 30 years ago for the SWP was not as high as it is currently or expected to be in the future. Because the need for SWP water then was relatively low, less water was exported through the SWP during normal and wet times then could have been if the demand had been higher. Simply put, less water was delivered because less water was needed."

The implicit assumption in this statement that there was no logic for contractors to take the water they were entitled to under Table A because 1) they had no need for it at that time, and 2) they had no place to store it for later use. If the assumption is that now and into the future the contractors will want to take delivery of their full Table A amounts—in other words, that circumstances have changed—then one or both of two conditions must be true 1) they need it and/or 2) they can store it. The reliability report should substantiate its reasons for assuming such a change in conditions.

On page 15, the Draft Reliability Report states that studies 4 and 5 were developed in discussions with SWP contractors and stakeholders involved with the development of the analysis associated with the environmental documentation for the Monterey Agreement. What analysis of current or future demand patterns and our available storage capacities is used to justify the assumption of a demand for the full Table A allotments? What are the assumptions about population growth, water use rates, availability of non-SWP supplies and available local storage capacity that lead to the conclusion that contractors will consistently ask for full Table A allotments?

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Page 7: "Conversely, the current or projected delivery capability of the a water project would be less if (1) demand for water from a water project was at its maximum level for many years, (2) no new facilities were built, and (3) the supply of the main sources of water was recently reduced because another entity with a prior water right increased its use of that source."

This statement is unclear and counterintuitive. The Draft Reliability Report often argues that higher levels of demand will increase the delivery capability not decrease it. DWR should clarify the point it is trying to make here or eliminate this statement altogether.

Page 8: "In the 2002 Reliability Report, the Department committed to conducting a comprehensive sensitivity analysis for assumptions contained in the CalSim-II model studies. This analysis is complete."

While this analysis is reported on in the Draft Reliability Report, DWR has made no attempt to use the results of that analysis to comment on the results of the CalSim-II modeling conducted for the reliability investigation. This seems to defeat the purpose of conducting and reporting on the sensitivity analysis. An attempt to consider the implications of the sensitivity analysis is included later in these comments.

Page 11: "The simulated deliveries in Figure 3-1 were adjusted for any differences between the historical and simulated carry-over storage in the SWP system reservoirs, Lake Oroville and SWP's portion of San Luis Reservoir."
Page 74 "(in Appendix E dealing with the Historical SWP/CVP Operations Simulation Technical Memorandum: Simulations of historically wet years, when the system was not supply constrained, may therefore be a poor indicator of the model's ability to accurately simulate future levels of development. Particular interest is therefore place on model results during the six-year drought of 1987-1992."

The Draft Reliability Report appears to offers up the Technical Memorandum Report entitled *CalSim-II Simulation of Historical SWP/CVP Operations* in order to support the legitimacy of the using CalSim-II to conduct the reliability analysis. If this is the goal then these two statements are problematic.

While the Draft Reliability Report gives no clear indication about what the adjustments referred to on page 11 entail, the fact that adjustments had to be made to generate the claimed correspondence shown in Figure 3-1 cannot stand without further explanation. The goal of the *CalSim-II Simulation of Historical SWP/CVP Operations* Technical Memorandum should have been to see if CalSim-II could be used to faithfully reproduce all aspects of system operations, not simply the SWP exports during the 1987-1992 drought. If the storage levels in SWP reservoirs were not faithfully reproduced and had to be adjusted in some unexplained way to generate the results in Figure 3-1, then the Technical Memorandum should not be used to build the creditability of the CalSim-II.

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In the same way, the comment in Appendix E that only the results for drought periods are critical for reliability analysis is not valid. The Technical Memorandum is being offered as support for the use of CalSim-II, not as a part of the reliability analysis itself. The claim that is being made is that the model faithfully replicated history and therefore has creditability in terms of simulating future conditions. The apparent recognition that the model did not do particularly well in normal and wet periods calls into question the validity of this claim.

In addition, even if CalSim II did accurately simulate deliveries in one past drought, that does not mean it can accurately simulate deliveries in a future drought, for constraints on the system are likely to be different. Water quality standards and endangered species protections have changed substantially since the 1987-02 drought, largely because the standards in place during that drought proved insufficiently protective. If the same drought conditions were to recur in the future, those heightened protections would likely prevent the SWP from exercising the same delivery capacity. CalSim II's predictions that those past diversions would be repeated therefore may prove the model's inadequacy rather than its credibility.

In keeping with the first comment, the inconclusive and somewhat opaque presentation of the *CalSim-II Simulation of Historical SWP/CVP Operations* Technical Memorandum results suggest that this report is about the reliability of SWP deliveries in the CalSim-II model and that the CalSim-II model is not a fully faithful representation of the how the system has been or presumably will be operated. Once again, it is fair to point out that if one wants to imagine future conditions then one must use some sort of model but the reader should not be left with the assumption that CalSim-II is a fully faithful representation of the system.

As an aside, Table 4 of the *CalSim-II Simulation of Historical SWP/CVP Operations* Technical Memorandum offers the most real, albeit limited, assessment of the reliability of the actual system if one is to assume that at some point in the future SWP contractors will consistently request their full Table A allotments. In 2001, contractors requested 4,124,126 ac-ft of SWP water and were allotted 1,607,570 ac-ft of supply. In 2003, contractors requested 4,126,929 ac-ft of SWP water and were allotted 3,714,233 ac-ft supply. These are two points on the exceedence curve of the real system reliability, certainly not enough to develop a robust reliability assessment. It is interesting to point out, however, that these delivery levels fall at roughly the 85% and 8% exceedence levels on the results for Study 4 that are meant to approximate current levels of development and demand (Figure 5.1). In terms of the hydrologic conditions 2001 and 2003 fall at approximately the 77% and 42% exceedence levels in terms of the Sacramento Valley water year index values for the period from 1922 to 1994 period simulated in CalSim-II. While far from a perfect metric for evaluating the performance of CalSim-II, this points out how the operations of the real system under roughly current conditions when nearly the full Table A amount was requested by the contractors compare with the simulated results.

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In terms of system reliability during dry periods, the most interesting conclusion to draw from this comparison is that actual operations in 2001, which benefited from a water supply associated with approximately the 75% exceedence level, provided a level of service of only 1,607,570 ac-ft while the CalSim-II simulations yielded a 75% exceedence level of supply of roughly 2,500,000 ac-ft (as read from Figure 5.1).

Page 16: "The Article 21 demand in the updated studies (4 and 5) is higher than the earlier studies for the December through March period."

It does not appear that DWR makes any attempt to explain why these higher levels were assumed. They are used in CalSim-II to prompt an export of water to SWP contractors when conditions warrant. While the Draft Reliability Report fairly comments on page 17 that "Incorporating supplies received under Article 21 into the assessment of water supply reliability is a local decision based on specific local circumstances, facts and level of water supply reliability required", including these numbers that are driven by a somewhat unjustified level of assumed Article 21 demand is not the clearest manner in which to present reliability analysis.

Page 25: "By referencing the curve for Study 5 in Figure 5-2, the following can be deduced":

- *In 75 percent of the years, the annuall delivery of the SWP is estimated to be at of above 2.7 maf per year (65 % of 4.13 maf).*

There is nothing special about the 75, 50 and 25% thresholds used in providing a narrative description of Figure 5.2 In fact it is equally valid to open and close the list of bullets with statements like:

- The maximum amount of water that can be delivered in response to full Table A demands with 100 percent reliability, in the CalSim-II model, is 187,000 ac-ft.
- Under the least supply constricted conditions the SWP will be able to deliver, in the CalSim-II model, the full Table A allotments.

Without even worrying about whether or not the assumptions used in the CalSim-II model are valid or not, these two statements are as valid as the three offered by DWR and they create a much different impression of SWP reliability.

Even if 100% reliability is not a valid standard, water utility plans for a system that will fail 25% of the time, as is the corollary of the 75% exceedence, are no more valid. Municipal utilities are often looking for, 90-95% reliability. According to these standards, Figure 5-2 suggests that the reliability of the system is between 1.4 maf and 0.8 maf. These numbers, which are no more or less valid than those reported by DWR, are perhaps more useful for water managers in assessing the reliability of a water supply.

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Page 26: "In the case of 1977, it is reasonable to assume that up to 500 taf of 1976 allocated Table A water could be carried over to 1977."

This sort of conditional post-processing of model output, which could have ripple effect across the rest of the simulation with potential changes in model results, is not valid and this whole section should be removed. To its credit DWR does not try and use any of this after the fact hand waving in the Table and Figures published in the Draft Reliability Report. Nonetheless, by including this narrative DWR is attempting to argue both that the model can be trusted and that the model cannot be trusted. This is not legitimate model interpretation.

Page 49: "The estimate could be viewed as too low because the Department of Water Resources (DWR) is planning to have facilities in place by 2025 that will increase the reliability of the SWP. The estimate could be viewed as too high because there is the potential for exports to be required to be reduced to protect endangered fish species."

It is inappropriate to speculate on what deliveries could be with new facilities when the information is to be used under the provisions of Senate Bill 221 to verify that water supplies are available for new developments.

Page 78: "Table E-1 Summary of the Expected Elasticity Index (EI) and Sensitivity Index (SI) for Selected Variables."

These very interesting results are included in the Draft Reliability Report and are then ignored completely interpreting the results of the reliability analysis. Let us for example attempt to recast the statement offered above:

- The maximum amount of water that can be delivered in response to full Table A demands with 100 percent reliability, according to the CalSim-II model, is 187,000 ac-ft.

If the sensitivity analysis is valid, it is legitimate to make the following statements.

- If the assumed levels of Banks Pumping vary by ±10% relative to the base level assumed in the CalSim-II simulation, then the maximum amount of water that be delivered in response to full Table A demands with 100 percent reliability, in the CalSim-II model, will very between 184,195 and 189,805 ac-ft.
- If the assumed levels of Oroville inflows vary by ±10% relative to the base level assumed in the CalSim-II simulation, then the maximum amount of water that can be delivered in response to full Table A demands with 100 percent reliability, according to the CalSim-II model, will very between 182,138 and 191,862 ac-ft.

DWR should either make these sorts of statements or they should not attempt to use the results of the sensitivity analysis to assert the legitimacy of the use of CalSim-II for SWP reliability analysis.

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LETTER 21

STATE OF CALIFORNIA -- THE RESOURCES AGENCY ARNOLD SCHWARZENEGGER, Governor
DEPARTMENT OF WATER RESOURCES
1416 NINTH STREET, P.O. BOX 942836
SACRAMENTO, CA 94236-0001
(916) 653-5791

April 20, 2006

Ms. Mindy McIntyre
Water Program Manager
Planning and Conservation League
921 11th Street, Suite 300
Sacramento, California 95814

Dear Ms. McIntyre:

This letter responds to your letter dated December 22, 2005 providing comments of the Planning and Conservation League on the draft of the State Water Project Delivery Reliability Report–2005 (DRR (2005)). Your letter expresses concern regarding the adequacy of the analysis, criticizes the timing of the release of the report, makes several recommendations for improvement, and includes an attachment with comments regarding specific statements in the draft report. The following addresses the body of your letter. Responses to the detailed comments in the attachment of your letter are included as an attachment to this letter.

Your letter states that the draft DRR (2005) should mention that it is required per the settlement agreement to the case *Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal. App. 4th 892. The final report includes such a statement. Your comment also says the draft DRR (2005) does not satisfy the requirements of the settlement agreement. This report is the first one issued since the settlement agreement became effective in May, 2003 and updates an earlier report (The State Water Project Delivery Reliability Report–2002). The 2002 report was designed to meet the requirements of the attachment to the settlement agreement, which was very near final at that time. Both reports include useful information for State Water Project (SWP) contractors, planners and interested parties on the delivery capability of the SWP. The Department of Water Resources (Department) believes these reports fulfill the requirements of Principle 1 in Attachment B of the settlement agreement. It should be noted that, although not a requirement of the settlement agreement, drafts of each report underwent public review. We believe this process improves the final report. The final of the first report was revised in response to public comments and the comment letters and their responses were included as an appendix. The final DRR (2005) has been modified in a similar way.

You comment that the use of CalSim-II as the sole tool for determining reliability is inappropriate due to the lack of calibration and other deficiencies as identified in comments on the draft 2002 report and due to inadequacies mentioned in the peer-review report, *A Strategic Review of CalSim-II and its Use for Water Planning, Management, and Operations in Central California* (Close and others 2003). The final 2002 report includes thorough responses to the comments received on the draft 2002 report. Updated responses to the issues regarding CalSim-II mentioned in your letter are included in Attachment 2 to this letter. As mentioned in the draft DRR (2005), several studies have been conducted analyzing the ability of CalSim-II to simulate water project operations. The results support the conclusion that CalSim-II is a useful and appropriate tool for assessing the delivery capability of the SWP. You also comment that the peer reviewers should be reconvened to review the Department's written response to their review. The peer review of CalSim-II was an intensive and expensive effort involving many staff hours to develop the background information for the reviewers and handle the administrative details for the participation of the panel members and the two-day public meeting of the review itself. Some of the panel members, as well as other experts who were not on the panel, are and will continue to be a great resource to both the Department and Bureau of Reclamation modeling staff. We do not, however, believe conducting a peer review of the response is an effective use of the Department's staff resources.

Several of the concerns within your letter relate to the uncertainty in future conditions that may affect water supplies, such as levee failures in the Delta, climate change, or declines in the population of Delta fishes. Information relevant to these factors is evolving rapidly but has not reached a level at which it can be quantitatively incorporated into delivery projections of the SWP. The Department is working on two projects that will improve our ability to make qualitative or quantitative statements about the reliability of conveyance across the Sacramento-San Joaquin Delta. The first is the Delta Risk Management Strategy, which will assess risks to the Delta from floods, seepage, subsidence, and earthquakes; evaluate the consequences of levee failure; and develop recommendations to manage the risk. The second is a broader public process to develop a shared vision of a sustainable Delta that continues to support societal needs related to recreation, land use, water supply, transportation, energy, and environmental health. This Delta Vision process incorporates the requirements of AB 1200, passed by the legislature and signed by the Governor in 2005. None of these efforts will be completed before release of the next Reliability Report, but they may yield some preliminary results and conclusions in time for the next report, and will be fully incorporated into subsequent Reliability Reports.

LETTER 21

As directed in the Governor's Executive Order S-3-05, the potential impacts of climate change are being analyzed. This effort and the results referenced in your letter are broad brush estimates of the potential impact upon the SWP 50 to 100 years into the future if no additional conveyance facilities or upstream reservoirs are built. This information is helpful in developing strategies for the future management and development of the State's water resources, including improvements to the SWP. The Department does not want to leave any reader of DRR (2005) with the impression that this developing information is being ignored. Therefore, the final report has been modified accordingly.

You comment that information planned to be used in the draft DRR (2005) should not have been given to the State Water Contractors in the spring of 2005 for incorporation into their Urban Water Management Plans. The Department provided the contractors results of the analyses planned to be used in the draft report because they were the best information available at that time. The information was conveyed in the Notice to State Water Project Contractors No. 05-08 as an excerpt from the draft technical chapter of an incomplete draft report. There was no intent of the Department to exclude this information from the public. This notice was not announced on the Department's Home page but all State Water Project Contractors' Notices are available at http://www.swpao.water.ca.gov/deliveries/. As soon as the Department learned that you wanted a copy of this information, it was provided to you. It is the Department's responsibility to provide the best available information to water supply contractors of the SWP.

You make the point that the report should be available to the public as a draft and finalized prior to deadlines for local agency Urban Water Management Plans. The Department agrees with this comment. It is unfortunate that the review of the draft report and completion of the final report could not be done in late 2004 or early 2005 for full incorporation into Urban Water Management Plans. The objectives of the Department for the Reliability Report are to encourage public discussion and understanding of the estimation of the SWP delivery capability, meet the conditions of the settlement agreement, and provide the best available quantification of SWP deliveries. Given the situation, the Department chose to provide the information to the contractors, as described above, and to delay the completion of the report to allow public review of a draft. The next time the Reliability Report is due in the same year as the Urban Water Management Plans, the Department will strive to complete it as early in the year as possible.

Your letter also makes the observation that the percentage of time the assumed demand is met decreases as the level of demand increases. This is correct. The results contained in the draft DRR (2005) are shown as percentages of the maximum Table A amount so the information can be easily interpreted by SWP contractors and incorporated into their analyses. Presenting the information as a percentage of the assumed demand would require additional calculations and would increase the potential for misinterpretation. For example, with the data presented as a percentage of the maximum Table A amount, a contractor can take this percentage and apply it to the specific maximum Table A amount for his or her district to determine how much water would be available to the district. If the information were presented as a percent of the demand, the amount of water that it equates to must be determined by referencing the assumed demand for a specific year and then calculating the amount of water associated with it. Attachment 1 is a plot of the results of the draft DRR (2005) as percentages of the assumed demand. It confirms your observation that the percentage of time the assumed demand is met decreases as the level of demand increases.

Your letter recommends the report include scenarios for future SWP demands that reflect the approach taken in the current California Water Plan. The Water Plan includes estimates for California's water demands which assume a continuation of current trends, a less intensive use of water, and a more intensive use of water. As noted in the Water Plan, the scenarios presented there are for demonstration of the kind of scenarios that should be looked at in more detail once the analytic tools are developed. The Department will undertake an effort to define a range of future demand scenarios for the SWP. This effort will not only provide information for future delivery reliability reports but also for the next Water Plan. As a point of clarification, your letter refers to the Tulare Lake hydrologic region analyzed in the Water Plan as an SWP service area. A few of the SWP agricultural contractors are in the Tulare Lake hydrologic region. Their service areas occupy a portion of the hydrologic region. The region is much larger than these service areas and includes the cities of Fresno, Visalia, and Bakersfield.

You express a concern about the consistency of the studies in the draft DRR (2005) with the description of the operation of the SWP in the Operations Criteria and Plan (OCAP), upon which the current biological opinions for the SWP and Central Valley Project are based. Studies 4 and 5 of the draft DRR (2005) use the same version of CalSim-II as the OCAP analyses and are, therefore, consistent with the OCAP project description. The Table A and Article 21 demands of the studies are within the range of the OCAP project description. If regulatory standards are modified in the future, the model will be updated to include any modified standards.

Ms. Mindy McIntyre
April 20, 2006
Page 5

Your letter states that Article 21 should not be recommended as a supply to be integrated as a firm annual supply in planning documents. This comment is regarding the examples shown in Chapter 6 which illustrate how to calculate water supplies from the information presented in the report. In response to your concern, a footnote alerting the reader to the variability of Article 21 deliveries and referring back to the discussion in Chapter 5 has been added to the tables addressing average values. Chapter 5 thoroughly discusses the limitations of Article 21 supply.

The final report will be issued soon and will include an appendix containing the comment letters on the draft report and the Department's responses. Thank you for your comments and recommendations. If you wish to discuss this report further, please contact me at (916) 653-1099 or kkelly@water.ca.gov. Francis Chung, Chief of the Modeling Support Branch of the Bay-Delta Office, should be contacted for technical questions on the CalSim-II modeling studies. He may be reached at (916) 653-5924 or chung@water.ca.gov.

Sincerely,

Original signed by

Katherine F. Kelly, Chief
Bay-Delta Office

Attachments

cc: (See attached list.)

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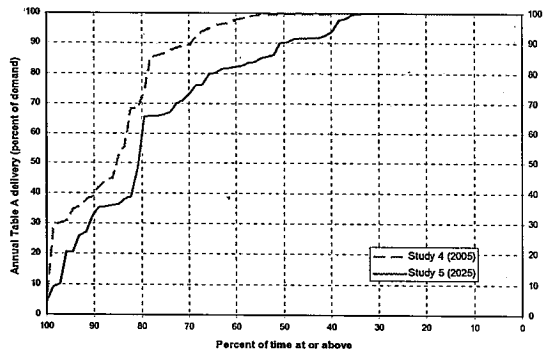
Will distribute to SWCs

LETTER 21

Attachment 1
Planning and Conservation League

SWP Delta Table A delivery probability for studies 4 and 5 as percent of Table A demand



Study 4 simulates a variable Table A demand of 2.3 – 3.9 million acre-feet (MAF) per year, dependent upon water-year type.

Study 5 simulates a variable Table A demand of 3.9 – 4.1 MAF/year, dependent upon water-year type.

Attachment 2
Response to PCL

Responses to comments from Planning and Conservation League (December 22, 2005) on Draft State Water Project Delivery Reliability Report – 2005

Responses to comments on the adequacy of CalSim-II

Comment: CalSim-II has not been calibrated or validated.

Response: CalSim-II is essentially a continuous accounting model, supplemented by a linear programming module to optimize the monthly operation of the system without foresight about the conditions in the next period. The primary physical law governing the simulation procedure is conservation of mass, maintaining a mass balance from one period to the next, while optimizing allocations of the available water in that period without foresight about the future periods of simulation. Models such as CalSim-II are inherently different from models that simulate hydrologic processes based on the physical laws governing the precipitation-runoff and the physical routing of water through a system of channels with defined geometry, roughness, streambed slope, etc. The classical model calibration process is difficult to apply to planning models, such as CalSim-II, that are primarily used to predict operations and water availability for a fixed level of development in the future. Continuing development of new supplies, along with changes in demands and the regulatory environment have all resulted in considerable changes to the management of the Central Valley Project (CVP)/State Water Project (SWP) system in the past 35 years. Project operations to meet future demands are often predicated on operation rules, storage and conveyance facilities, and demand levels which are necessarily different from historical conditions.

Although classical approach to model calibration can not be applied to models like CalSim-II, calibration of some of the important components of the model is possible, and has been done. For instance, one of the most important components of the model, its hydrologic component, has been calibrated by including closure terms in the form of local surface water accretions from every depletion study area (DSA) of the model network to match the historically available stream gage records. The routine used to determine the Sacramento River flows and the corresponding Delta exports that meet Delta water quality standards, is an Artificial Neural Network (ANN) model that is trained using the calibrated Delta Simulation Model (DSM2) prior to being used in CalSim-II simulation runs. Also, a revised groundwater-surface water interaction module is currently being developed that uses groundwater-surface water response functions produced by the simulation of the historical groundwater pumping

1

Attachment 2
Response to PCL

amounts that match the available historical data on groundwater levels and stream gage data. The above components of CalSim-II, that are either directly or indirectly calibrated, are three of the most important components of the model that have the most significant impacts on the simulation results, and as such, it would be inaccurate to claim that CalSim-II has not been calibrated. In the absence of a classical approach to calibration applicable to complex models like CalSim-II, the next best approach is generally to set model parameters for a simulation run relying on experience and then verifying the results of the simulation run by comparing to historical operations. To verify model results, the Department of Water Resources (DWR) conducted a 24-year simulation using historical input from 1975 to 1998. The results of this study showed remarkable matching of the simulated values of the major components of system operation to historical values. Components such as stream flows at key locations and the net Delta outflow index showed little difference between simulated and historical values. Therefore, it would be inaccurate to claim that CalSim-II has not been validated. For detailed examination of the validation study the reader is referred to *CalSim-II Simulation of Historical SWP/CVP Operations, Technical Memorandum Report*, November 2003.

Comment: It is unclear whether CalSim-II incorporates limitations to groundwater use in the Sacramento Valley.

Response: The issue of over-estimation of the water available in the Delta as a result of excessive pumping of groundwater in the Sacramento Valley was examined in the *CalSim-II Simulation of Historical SWP/CVP Operations, Technical Memorandum Report*, November 2003, and addressed in the *Peer Review Response* report of August 2004. The results of the simulation indicated that CalSim-II, in fact, under-estimates the long-term contribution of the groundwater when compared to the historical groundwater pumping in the Valley, and only slightly over-estimates this contribution in extended drought periods. The *Peer Review Response* report states:

> "The mix of surface water and groundwater used by the model to meet Sacramento Valley consumptive demands depends primarily on project water allocation decisions and levels of minimum groundwater pumping that are specified in the model. Over the 24-year period average annual net groundwater extraction in CalSim-II as compared to estimates based on the Central Valley Groundwater Surface Water Model (CVGSM) is lower by 378 thousand acre-feet (taf). The average annual net stream inflow from groundwater in CalSim-II is 190 taf greater than estimated by the CVGSM for the same period. The combined effect of dynamically modeling groundwater operations in CalSim-II (pumping, recharge and stream-aquifer interaction) leads to 188 taf per year less water being available to the Delta. For the 1987-92 period the combined effect results

2

Attachment 2
Response to PCL

in 46 taf per year additional water being available to the Delta. Thus the Historical Operations Study concludes that the current representation of groundwater in CalSim-II results, on average, in an under-estimation of water available at the Delta."

For more details on how groundwater-surface water interaction is modeled in CalSim-II, the reader is referred to pages A-2 and A-3 of the *Peer Review Response* report. As mentioned above, a revised groundwater-surface water interaction module is currently being developed and will be implemented in CalSim-III to use groundwater-surface water response functions produced by the simulation of the historical groundwater pumping amounts that match the available historical data on groundwater levels and stream gage data.

Comment: **The CalSim-II model should not be used to make absolute predictions, such as those incorporated into the Reliability Report.**

Response: It is true that a planning model like CalSim-II is best used in the comparative mode, when a "without project" scenario is compared with a "with project" scenario. However, this does not preclude the use of this model in studies like the ones used in the Delivery Reliability Report, provided that the users are sufficiently aware of the model assumptions and how to use the output data that CalSim-II simulations provide. The conversion of raw output data to usable information in planning studies requires judgment by the user. As discussed earlier, in the response to comments on the validation efforts by the Historical Operation Study, CalSim-II does very well in mimicking historical operations as evident by the comparisons made on the key system operation components. Furthermore, the reader is referred to the general comments made by the CALFED peer review panel in the executive summary of their December 2003 report. The panel proposes the following question: "Is the general CalSim modeling approach appropriate for predicting the performance of the general facilities and for use in allocation planning, assessing water supply reliabilities and for carrying out operational studies?" The panel's answer to this question is: "We believe the use of an optimization engine for simulating the hydrology and for making allocation decisions is an appropriate approach and is in fact the approach many serious efforts of this kind are using. It is a substantial improvement of the previous modeling approaches and provides a basis for consensus among federal and state interests. The modeling approach addresses many of the complexities of the CVP/SWP system and its water management decisions."

Attachment 2
Response to PCL

Comment: **CalSim-II does not recognize or report uncertainty.**

Response: Recognizing and addressing uncertainties in the CalSim-II simulations is an important issue that has been under consideration by the DWR and Bureau of Reclamation model development teams. After several discussions with the experts in the area, a research project is planned as a joint effort of DWR and the University of California at Davis to further investigate ways to identify and address uncertainties.

In addition to the planned joint effort with the UCD, DWR has recently completed the CalSim-II sensitivity analysis study focusing mainly on the Sacramento Valley hydrology, Sacramento-San Joaquin Delta water quality, and SWP operations. As a supplement to the sensitivity study, DWR will conduct a more focused statistical analysis of the impact of model input parameters on the modeled SWP.

Comment: **CalSim-II may produce "cyber water."**

Response: This comment does not indicate how the 75 percent exceedance level was estimated for the 2001 water supply. From the comments made later in Appendix A, it appears to refer to the Sacramento Valley water year index values for the period 1922 to 1994. The Sacramento Valley water year index data alone would not provide an accurate estimate of the capability of the SWP to deliver water since it does not consider project storage. Deliveries to the SWP south-of-Delta contractors in CalSim-II are not based on the Sacramento River Index, but on the storage in the SWP conservation facilities, Lake Oroville and SWP portion of San Luis Reservoir, the forecasted inflow to Lake Oroville, and other unregulated flows and accretions. Based on Figure 5-1 of the report, an annual delivery of 1.6 million acre-feet (maf) or more would occur in 85 percent of the years.

Attachment 2
Response to PCL

Responses to Comments in Appendix A

First comment regarding page 7 of the draft report

The report should highlight the weaknesses in the analysis and put the referenced statement in a text box.

The final Report (2005) has been modified to expound upon uncertainties associated with the analyses. Many of these modifications have been done in response to the comments of the PCL. We believe the final report sufficiently addresses the uncertainties associated with the projections.

Second comment regarding page 7 of the draft report

What analysis of current or future demand patterns is used to justify the assumption of a demand for full Table A allotments?

As stated on page 15 of the draft report, "The assumed demands for studies 4 and 5 were developed in discussions with SWP water contractors and stakeholders involved in the development of the analyses associated with the environmental documentation for the Monterey Agreement." SWP contractor's Table A requests for the real-time operations are developed and submitted to DWR by contracting agencies and their consultants. Examination of the historical requests show an increasing trend and they reach the full Table A request of 4.1 maf in 2001. As the following table indicates, contractors' requests were at full Table A amounts in 5 out of the 6 recent years.

Attachment 2
Response to PCL

Year	SWP Contractor's Table A Request (maf)
1986	2.4
1987	2.7
1988	2.6
1989	3.0
1990	3.1
1991	3.5
1992	3.6
1993	2.7
1994	2.7
1995	3.1
1996	2.7
1997	3.0
1998	3.2
1999	3.2
2000	3.6
2001	4.1
2002	3.9
2003	4.1
2004	4.1
2005	4.1
2006	4.1

Attachment 2
Response to PCL

Third comment regarding page 7 of the draft report

Statement: The following statement should be clarified or removed.

"Conversely, the current or projected delivery capability of the a water project would be less if (1) demand for water from a water project was at its maximum level for many years, (2) no new facilities were built, and (3) the supply of the main sources of water was recently reduced because another entity with a prior water right increased its use of that source."

The statement is revised as follows:
"Conversely, the projected deliveries of a water project would be less than the past if the water project had been operated at its maximum ability for many years, no new facilities were planned to be built, and the annual supply from one of its main sources of water was recently reduced and would remain at the reduced level."

Comment regarding page 8 of the draft report

The results of sensitivity analysis are not included in the report.
(See response to the last comment in this appendix.)

Response to comments regarding page 11 and page 74 of the draft report

Historical Operation Study as a means to validate CalSim-II

An objection is raised in Appendix A of the letter to the Department's claim that the results of the Historical Operation Study validate the CalSim-II model as an appropriate tool for planning studies. The specific objection seems to be to the statement in the Delivery Reliability Report, page 11 that states "The simulated deliveries in Figure 3-1 were adjusted for any differences between the historical and simulated carryover storage in the SWP system reservoirs, Lake Oroville and SWP's portion of San Luis Reservoir." The letter from the Planning and Conservation League raises the objection that "If the storage levels in SWP reservoirs were not faithfully reproduced and had to be adjusted in some unexplained way to generate the results in Figure 3-1, then the Technical Memorandum should not be used to build the credibility of the CalSim-II."

Attachment 2
Response to PCL

The detailed explanation of how and for what purpose the deliveries were adjusted to produce Figure 3-1 was deemed to be out of the scope of the 2005 update of the Delivery Reliability Report and the reader is referred to the Technical Memorandum Report, pages 18 and 19, for further detail. In summary, the resulting simulated annual deliveries during the 6-year drought of 1987-92 were adjusted by post-processing to account for the differences between the historical and simulated initial and end-of-year storages in the SWP system reservoirs. The adjustments were made to show the resulting year-to-year deliveries had the model's delivery for that particular year reflected identical use of stored water from the SWP reservoirs. In both the adjusted and the unadjusted case, however, the average annual delivery during the 6-year drought was 1,930 taf per year. The following table and the attached charts (Figure 1 for the unadjusted simulated deliveries, and Figure 2 for the resulting deliveries after adjustments) should clarify the post-processing procedure.

Calendar Year	Simulated SWP SOD Deliv (TAF)	Simulated January 1 Storage (TAF)	Simulated December 31 Storage (TAF)	Simulated Storage Withdrawal (TAF)	Historical Storage Withdrawal (TAF)	Storage Withdrawal Adjustment (Historical-Simulated) (TAF)	Adjusted Delivery (TAF)
1987	2567	4120*	2634	1486*	1182*	-304	2263
1988	1903	2634	2026	608	1050	442	2345
1989	2350	2026	2635	-609	-597	12	2362
1990	1851	2635	1738	897	1512	615	2466
1991	1266	1738	1730	8	-682	-690	576
1992	1652	1730	1748	-18	-110	-92	1560
Average**	**1930**						**1930**

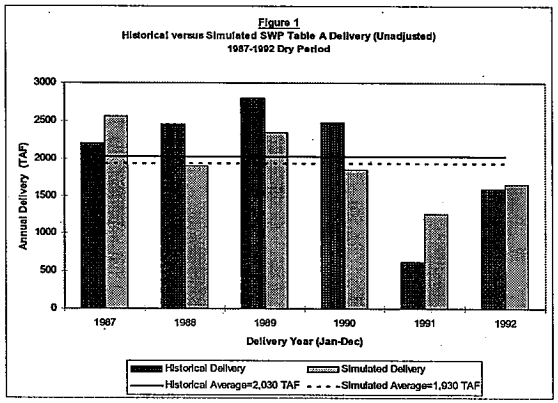
* This storage and the corresponding withdrawals are from April 1, 1987 to December 1987, because the 6-year drought is assumed to have started from April 1, 1987, the last month before the onset of the drought in which the system's reservoirs were full.

** Rounded off to the nearest 10 taf.

LETTER 21

Attachment 2
Response to PCL

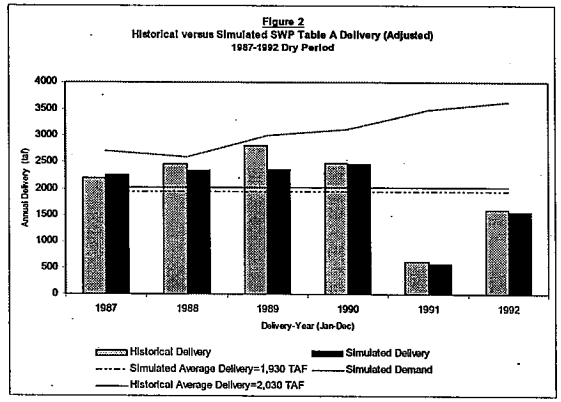
Figure 1
Historical versus Simulated SWP Table A Delivery (Unadjusted)
1987-1992 Dry Period



LETTER 21

Attachment 2
Response to PCL

Figure 2
Historical versus Simulated SWP Table A Delivery (Adjusted)
1987-1992 Dry Period



The simulated month-to-month operation of the system may vary substantially from the actual historical operation, although the long-term average flows and deliveries are typically close. Therefore, post-processing of some of the raw data resulting from the simulation run is sometimes necessary to account for some of the unavoidable differences between the historical and simulated results. Some of the factors that could contribute to these differences in the month-to-month operation are:

- Delivery versus carryover storage rules
- Delta outflow requirements to comply with SWRCB standards
- South-of-Delta demand assumptions
- Level of north-of-Delta groundwater pumping
- Rule curves to transfer water from north-of-Delta reservoirs to San Luis Reservoir
- Crop consumptive use of applied water and agricultural water use efficiency
- Assumptions on historical land use, and project versus non-project demands
- Stream-aquifer interactions

Attachment 2
Response to PCL

- Historical operation based on decisions that are made in shorter time resolutions that the monthly simulation model captures, such as flood control operations, hydropower operations, export curtailments due to fish take limits, system scheduled and unscheduled outages, etc.
- CVP reservoirs balancing north of Delta
- Compliance with the provisions of the Coordinated Operations Agreement
- Drought water bank and water transfers

The following summary should be helpful in determining how well the Historical Operation Study was able to reproduce the actual historical records on the key components of the system operation. Figure 10 on page 46 of the Technical Memorandum Report shows that the simulated long-term average SWP delivery to the south-of-Delta contractors exceeded the historical average delivery by only 1.1 percent. Figure 12 on page 48 (same as Figure 2 in this response) shows that the simulated average annual delivery in the 1987-92 drought was less than the historical average delivery by 4.9 percent. Figure 26 on page 62 shows that the total project exports from the Delta during the 6-year drought was less than the historical average by only 0.2 percent. Figures 31 through 35 on pages 67 through 71 show that the simulated average annual flows in various key locations along the Sacramento River vary from the historical values by 0.5 percent to 4.5 percent. Figure 37 on page 73 shows that the simulated long-term average annual net Delta outflow index is less than the historical value by 3.1 percent. There were many other simulated variables that were compared to their historical values in the Technical Memorandum Report that reflect a more complete picture of how well CalSim-II was able to mimic historical operations. These results, of course, should be examined carefully with an eye on what caused the variation, and how significant the variations were. In other words, how close is close enough to validate CalSim-II as an appropriate model in long-term planning applications, and whether the model reflects the historical record on important system performance measures with sufficient accuracy.

Response to comment regarding page 16 of the draft report

Updated Article 21 demand should be explained.

The demand for Article 21 water is submitted to DWR by the contracting agencies and the increase of 50 taf in December through March is due to the increased requests submitted to DWR by the Metropolitan Water District of Southern California.

Attachment 2
Response to PCL

Responding to comment regarding page 25 of the draft report

There is nothing special about the thresholds used to reference the curve in Figure 5-2. They should be changed as recommended.

The percentages of 75, 50, and 25 are chosen as simple examples to illustrate how to read the curve. These percentages are at or near the mid-range of the curve and the results are surrounded by several data points. Using the end points of the curve for an illustration is not as effective and, in the case of the lowest delivery value, focuses on the result for a single year.

Response to comment regarding page 26 of the draft report

DWR's attempt at post-processing 1976-77 deliveries is not valid

As stated on page 25 of the draft report, CalSim-II is a planning model and is best used for estimating SWP performance over long periods of time. Considerable judgment should be applied when evaluating CalSim-II results for shorter periods of time. This is especially true for estimates for the single driest year on record in a 73-year sequence.

Response to comment regarding page 49 of draft report

It is inappropriate to speculate on what deliveries will be with new facilities.

The paragraph is deleted.

Response to comment regarding page 78 of the draft report

Results of the sensitivity analysis should be applied to interpreting the results of the reliability analysis.

The Sensitivity Analysis Study is discussed in the draft report to inform the reader of the status of DWR's commitment to conducting such a study. The sensitivity study will be further analyzed in view of the SWP Delta deliveries and the results of that analysis will be incorporated as appropriate in the next Reliability Report.

It should be noted that the summary results on SI and EI shown in the Table E-1 are strictly applicable to the long-term (1922-1994) performance of the project. It is not appropriate to apply these results to a single year. In addition, these results should be applied with caution since they are applicable only within the investigated range of variation of the input parameters. The sensitivity study analyzed the response of the SWP total and Delta delivery for a 5 percent reduction in the Banks pumping capacity and ±5 percent variation in Oroville inflow.

California Department of Water Resources
SWP Reliability Report-Attn: Johnnie Young-Craig
P.O. box 042836
Sacramento, CA 94236-0001

December 19, 2005

Subject: The State Water Project Reliability Report 20005—Draft

Dear Sirs:

The report informs us that it is an update to the 2002 edition of the report of the same name. The foreword states that DWR will update this information every 2 years. However, the Department of Water Resources is derelict in not acknowledging that this report is a requirement of the amendments to the SWP contracts that was agreed to in the settlement negotiations pursuant to the Monterey litigation.

Purpose

The report is not simply information to help the contractors understand to what degree they can rely on SWP deliveries, but in fact is an essential requirement stemming from the need to eliminate "paper water" from the contracts. The Appellate Court was clear on the problems in planning that proceeded from the previous interpretations allowed by DWR that in effect created the notion of "paper water." In the settlement negotiations it was made clear that a well documented and unambiguous report of delivery reliability was essential to the elimination of "paper water." Accordingly, this report must be reviewed with that primary objective in mind.

Does the report fulfill that purpose? Its self-defined scope certainly allows for that possibility, but without serious calibrations of the main analytic tool, CALSIM II, used to perform the analysis, it is doubtful that it can. This deficiency has been pointed out many times over the past several years and DWR has still failed to come to grips with it. Their limited study, whose results are summarized in the draft, do little to meet the requirements of a legitimate calibration. Calibration, properly done, allows the program developers to assure that all elements of the computer program work properly. In the case of CALSIM II the calibration will show from where in the operational regimen of the SWP the increased amounts of water it predicts will materialize. Even the Scientific Peer Review Committee stated as much; they noted without a proper calibration there is no assurance that the results that are calculated from an optimization routine are a real solution. They must be shown to conform to realistic operations that are known to be feasible. No where in the report is this demonstrated or even hinted at.

Previously Noted Deficiencies

The lack of calibration and other deficiencies have been made known the DWR in formal comments on the 2002 draft. On reading this draft there seems to be no acknowledgement that any of these deficiencies have been addressed. The list of these previous deficiencies is highlighted below.

1.). The frequency diagrams are without statistical merit and therefore cannot be used to provide estimates of "reliability."

2.) The draft continually refers to CALSIM II as a "simulation." Until CALSIM II has been calibrated to show that it conforms to a real and feasible operational regimen, its results cannot be interpreted as though it is a simulation. Even then, its computerized configuration is not even close to what is ordinarily referred to as "simulation." CALSIM II is an optimization model in which the objective function is to maximize exports of water from the Delta given certain constraints. In typical optimization models not all solutions are feasible. Only calibration can establish that possibility. This model does not meet that criterion.

3.) The model makes certain assumptions about the individual contractors' demand for SWP deliveries. Those demand functions have not been vetted against the realistic capabilities of each contractor to take SWP water. In one case the assumption is factually wrong- San Luis Obispo County physically cannot take its full Table A amount of 25,00acre feet because it is limited by physical capacity of the SWP pipeline to only 4800 acre-feet. Nonetheless, the model assumes that SLO County will take 25,000 acre-feet when it is available at the Delta. Also there are some contractors that are unable to take their full Table A amount simply because they don't have the proper amount of equalizing storage to take the water when the SWP says it is available, The demand functions have not taken these and many other considerations into account. Because the model is an optimization against these demand functions the results cannot be taken at face value until the demand functions have been made realistic in terms of the requirements of the individual contractors.

4.) The report uses a definition of reliability that follows from their construct -ion of the frequency charts they use to summarize the results. When they state for example that the project can deliver 73% reliability, that is an incorrect interpretation of the data in the chart. In fact, the point at which 73% of the Table A water is delivered is actually the 50% point in the frequency chart. The correct statement would be: The project can deliver 73% of the water 50% of the time. However, this is not quite true either because the frequency charts are not statistically valid and insufficient to support an estimate of delivery reliability.

Additional Deficiencies

There are also some additional deficiencies that have since been revealed through careful studies of the CALSIM II model. These have to do with the assumptions on constraints and some fundamental errors in the statistical basis of the model's inputs.

LETTER 21

The model exercises for this report assume that SWRCB rules that operate to constrain export pumping will continue unchanged into the future. If the model results showed that future export pumping would continue at about the same level, that may perhaps be a defensible assumption. However, we have the case where the model results show that on average future export pumping will be 50% greater than the recent historical average under most all anticipated hydrologic conditions. Given that result it would seem prudent to examine to what degree SWRCB rules might be modified in anticipation of the environmental damage to be expected with such an increase in export pumping. The model does not do that. In fact, before these results can be used by anyone, the model's calculations should be explored to discover where and to what degree existing historic pumping regimens are expected to change. After all, the existing rules were developed in response to concerns with the operational problems that were demonstrated along the way during historic pumping. The rules certainly cannot be interpreted as definitive statements on what is acceptable for the Delta environment irrespective of the levels of export in the future.

The model also uses a sub-model to calculate the movement of the X 2 salinity threshold in the Delta as a function of hydrologic conditions. Unbelievably the sub-model calculational routine does not include the level of pumping. It is difficult to believe that the movement of the salinity threshold is independent of export pumping. Furthermore, given that CALSIM II predicts a 50% increase in exports over historic levels it would seem prudent to examine whether this simple routine is really applicable at that higher level. The research that went into the development of this calculational routine should be peer reviewed. The same may be said with the entire modeling of cross Delta transport calculations.

Perhaps the greatest problem with CALSIM II is its total disregard for proper statistical analysis in the development of the model. It is easy to verify that the input hydrology to the model represents a complex statistical distribution. In fact, it is what is referred to by statisticians as "bi-modal" meaning there are two main modes. One significant consequence of this feature is that the grand average of the total 73 year record is a very unlikely occurrence. All references in the report to average deliveries over 73 years are totally misleading.

The two modes clearly depict a collection of dry years and another of wet years. There are slightly more cases of dry years than wet ones although for practical purposes they are roughly equal. It is also the case that except for droughts there is virtually no serial correlation year-to-year. This means that a wet year may be followed with equal likelihood by either a dry or wet year. The fundamental problem that SWP operators must continually face is under what conditions is it prudent to pump given uncertainty in what kind of year the project will face. It is a classic operations research problem and involves tradeoffs between the objective of pumping water and the risk that too much will be taken. This operational problem is faced at the beginning of every water year beginning in the fall. A careful study of historic input flows from the Sacramento River in the fall and winter shows that it may be difficult to establish until late in January if the water year will likely be wet so as to allow higher levels of pumping. But a careful examination of SWP pumping capacity shows that the pumps must run at nearly maximum capacity for most of the year if export flows near 4 MAF are to be realized. Clearly, if the 73 average predicted by this model is near 4 MAF then we must assume that heavy pumping is

allowed during the fall and winter months before it is known that the year will indeed be wet. How is this reconciled with prudence and so call risk avoidance?

Because the model incorrectly deals with the statistical nature of the input hydrology it also includes some totally improper inputs. The model relies on a "water year index" which is a convolution of the spring and fall/winter runoffs across years. The affect is to produce an index which is uni-modal in contrast to the bi-modal hydrologic input. Because there is no significant year-to-year correlation in runoff, this convolution is without scientific merit and totally distorts the basic operational decision problem so that it no longer represents any reality. Furthermore, this water year index is further convoluted to a "water year type" designator that is used to establish Delta export/inflow ratios that ostensibly are used to protect the Delta environment.

The "water year type" is the index that is used in the CALSIM II model to establish what the required outflow in the Delta must be to satisfy the SWRCB rules. It is used in the model by a "lookup table" that predetermines the water year before it is fully developed. It does this by combining the previous spring's runoff with the current fall and/or winter runoff to decide whether the coming water year is going to be wet or dry. Needless to say, the statistical nature of the runoff record defies predicting what the upcoming water year will be. But by this simple mechanism the model is given fore knowledge of conditions before they are experienced. This departs radically from any notion of simulation. The convolution giving rise to this "water year type" has no demonstrable logical analysis for its existence. Clearly, the CALSIM II model cannot be taken as a valid model until some of these logical flaws are explained or corrected. By extension, the Reliability Report is without any scientific merit and is virtually useless for the purposes stated.

Additional Inconsistencies

There are additional problems that deserve explanation beyond what is stated in the Reliability Report. When one compares the set of tables documenting the past 10 years of deliveries to the various contractors and compares them to the same years reported in the 2002/2003 version there are some significant changes. Out of the ten years only one of the years appears to be the same in the two volumes. Most of the changes in deliveries seem to occur in the values reported for Kern Co. and Castaic Lake Water Agency. The latest report should explain these differences.

Sincerely,

Arve R. Sjovold

Plaintiff CPA Representative
In the Monterey Settlement
Negotiations

Plaintiff CPA Representative
To Monterey ++ EIR Comm.

RETURN ADD:

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STATE OF CALIFORNIA -- THE RESOURCES AGENCY ARNOLD SCHWARZENEGGER, Governor

DEPARTMENT OF WATER RESOURCES
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January 30, 2006

Mr. Arve Sjovold
186 Sierra Vista
Santa Barbara, California 93108

Dear Mr. Sjovold:

This letter responds to your letter dated December 19, 2005 commenting on the Draft State Water Project Delivery Reliability Report (Report 2005). Your comments have been thoroughly reviewed and the recommended changes considered and incorporated as appropriate.

Most of your comments are regarding the suitability of the CalSim-II computer simulation model for estimating the delivery reliability of the State Water Project (SWP). You state that the use of CalSim-II is inappropriate due to the lack of calibration and other deficiencies as identified in comments on the *State Water Project Delivery Reliability Report 2002 (2003)* and mentioned in the peer-review report, *A Strategic Review of CalSim-II and its Uses for Water Planning, Management, and Operations in Central California* (Close and others 2003). Many studies conducted by the Department of Water Resources (DWR), self-initiated or in response to public questions or criticisms, support the conclusion that CalSim-II provides a reasonable simulation of SWP operation and is a useful tool for assessing the delivery capability of the SWP.

The CalSim-II studies provide quantitative estimates of reliability based on historical rainfall and runoff data under the assumption that reliable conveyance capability will continue into the future. As we know, the Delta is a very dynamic environment. DWR is working on three projects that will improve the ability to make qualitative or quantitative statements about the reliability of conveyance across the Sacramento-San Joaquin Delta. These include: the Delta Risk Management Strategy, which will assess risks to the Delta from floods, seepage, subsidence, and earthquakes, evaluate the consequences of levee failure, and develop recommendations to manage the risk; implementation of AB 1200 (Laird, 2005) which calls for a similar evaluation of impacts on water supplies from catastrophic Delta failure; and a broader public process to develop a shared vision of a sustainable Delta that continues to support societal needs related to water supply, transportation, recreation, land use, energy, and environmental health. These efforts will not be completed before release of the next Reliability Report, but may yield some preliminary results and conclusions by then. Our intent is to fully incorporate this information into subsequent Reliability Reports.

The final Report 2005 includes a discussion of these uncertainties and a commitment to incorporate the above-mentioned information as it evolves. The final report also includes a statement regarding the report being required per the settlement agreement to the case *Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal. App. 4th 892.

Responses to the specific technical comments you make regarding CalSim-II are attached.

The final report will be available soon and will include an appendix containing copies of all commenting letters accompanied with the Department's responses. If you wish to discuss this report further, please contact me at (916) 653-1099 or kkelly@water.ca.gov. Francis Chung, Chief of the Modeling Support Branch of the Bay-Delta Office, should be contacted for technical questions on the CalSim-II modeling studies. He may be reached at (916) 653-5924 or chung@water.ca.gov.

Sincerely,

Katherine F. Kelly, Chief
Bay-Delta Office

Attachment

cc: Francis Chung, Chief
Modeling Support Branch
Bay-Delta Office
1416 Ninth Street, Room 252-6
Sacramento California 95814

LETTER 21

1. **CalSim-II has not been calibrated or validated.**

Models such as CalSim-II are inherently different from models that simulate hydrologic processes based on the physical laws governing the process that is being modeled. Although a classical approach to model calibration can not be applied to models like CalSim-II, calibration of some of the important components of the model is possible, and has been done. For instance, one of the most important components of the model, its hydrologic component, has been calibrated by including closure terms in the form of local surface water accretions from every depletion study area of the model network to match the historically available stream gage records. The routine used to determine the Sacramento River flows and the corresponding Delta exports that meet Delta electrical conductivity standards is an Artificial Neural Network (ANN) model that is trained using the calibrated Delta Simulation Model (DSM2) prior to being used in CalSim-II simulation runs. Also, a revised groundwater-surface water interaction module is being developed that uses groundwater-surface water response functions produced by the simulation of the historical groundwater pumping amounts. The above components of CalSim-II, which are either directly or indirectly calibrated, are three of the most important components of the model that have the most significant impacts on the simulation results. It is, therefore, inaccurate to assert that CalSim-II has not been calibrated.

In the absence of a classical approach to calibration, the next best approach is to set model parameters for a simulation run relying on experience and then verify the results of the simulation run by comparing them to historical operations. To verify model results, DWR conducted a 24-year simulation using historical input from 1975 to 1998. The results of this study showed the simulated values of the major components of system operation matched the historical values very well. Components such as stream flows at key locations and the net Delta outflow index showed little difference between simulated and historical values. For detailed examination of the validation study the reader is referred to *CalSim-II Simulation of Historical SWP/CVP Operations, Technical Memorandum Report*, November 2003.

2. **CalSim-II is an optimization model that has not been calibrated.**

CalSim-II is a simulation model of the Central Valley Project (CVP)/State Water Project (SWP) system. It is a continuous accounting model, supplemented by a linear programming module to optimize the operation of the system for the current period of simulation (a month) subject to physical, operational, and institutional constraints of the system without foresight about the conditions in the next period. It should be noted that although a linear programming module is used as a tool to allocate water subject to all the constraints of the system in that particular month, CalSim-II does not attempt to optimize the overall operation of the system over the 73-year study period, and therefore it is not an optimization model. The issue of calibration of the model has been addressed in item 1,

above. The model is not designed to maximize deliveries but to meet the assumed annual requested contractors' demands to the extent possible while meeting all physical and operational constraints. CalSim-II modeled operation has been critically reviewed by both SWP and CVP operators, and they are satisfied with the degree of mimicking actual real world operations done by the model. The CalSim-II model has been used extensively by State Water Contractors and the SWP operation staff to help them develop annual water supply guidelines.

3. **Demand functions have not been vetted against the realistic capabilities of each contractor to take SWP water; case in point San Luis Obispo County.**

It is true that San Luis Obispo County cannot currently take its maximum Table A amount of 25,000 acre-feet. Because of this limitation, their demand in the 2005 level study (study 4) was assumed to be 4,400 acre-feet/year. In the future level study (study 5), however, it was assumed that facilities will have been constructed by the year 2025 to allow delivery of their maximum Table A amount.

4. **The report uses an incorrect interpretation of the data in the chart.**

The proper interpretation of Figures 5-1 and 5-2 is outlined on page 25 of the draft report and the example given for interpreting Figure 5-2 is as follows:

By referencing the curve for study 5 in Figure 5-2, the following can be deduced:

- In 75 percent of the years, the annual water delivery of the SWP is estimated to be at or above 2.70 million acre-feet (maf) per year (65 percent of 4.13 maf).
- In 50 percent of the years, it is estimated to be at or above 3.50 maf per year (85 percent of 4.13 maf).
- In 25 percent of the years, it is at 4.13 maf per year.

5. **The model exercises assume that State Water Resources Control Board (SWRCB) rules will continue unchanged into the future.**

This is correct. The model is based on current SWRCB rules that govern project operations. The Delivery Reliability Report does not speculate on any future modification of the SWRCB rules.

6. **The sub-model does not include the level of pumping as a variable in the relationship that calculates the movement of the X2 salinity threshold.**

First, it is important to note that the level of project pumping in CalSim-II is determined after all Delta requirements, including the outflow to meet the required position of the 2 parts per thousand salinity line (X2), are met. Secondly, the computation of the X2 salinity threshold position in CalSim-II is based on the empirical relationship, developed in a collaborative effort by

Wim Kimmerer of BioSystems and Steve Monismith of Stanford University, which is based on observed data. The development process of this relationship and the back-up data were presented and thoroughly examined in the SWRCB hearing process that lead to the Board adopting 1995 Water Quality Control Plan (SWRCB Water Rights Decision 1641). The position of the X2 line in any given month in this empirical model is presented as a function of its location in the previous month and the current month's net Delta outflow. Net Delta Outflow, by definition, includes the total CVP and SWP diversions from the Delta. This relationship has been confirmed to be a good predictor of the movement and position of the X2 line. For more information on this subject, you may refer to the May 18, 1992 memorandum report to the San Francisco Estuary Project by Kimmerer and Monismith, titled *"Revised Estimates of Position of 2 PPT Salinity,"* and Chapter 10 of the June 1994 *Methodology for Flow and Salinity Estimates in the Sacramento-San Joaquin Delta and Suisun Marsh, 15th Annual Progress Report to the State Water Resources Control Board,* titled "Two Part per Thousand Isohaline Equation Analysis."

7. **The pumps must run at nearly maximum capacity for most of the year if export flows near 4 MAF are to be realized.**

   Model results for study 5 show that annual SWP pumping at Banks Pumping Plant would exceed 4 maf in 15 percent of the years. These higher pumping amounts generally only occur in wet years and the average annual SWP pumping at Banks for study 5 is 3.17 maf. The permitted pumping capacity of Banks Pumping Plant is normally 6,680 cfs, although additional pumping above this limit is allowed from December 15 to March 15 whenever the San Joaquin River flow at the Vernalis gage exceeds 1,000 cubic feet per second (cfs). The maximum pumping rate during this 3-month period is 8,500 cfs. Year-round pumping at the lower rate of 6,680 cfs would result in total annual pumping of approximately 4.8 maf. It should also be noted that export pumping is limited to actual demand for water and/or the amount needed to refill storage reservoirs.

8. **Use of the water-year type look-up table predetermines the water year before it is fully developed and this departs radically from any notion of simulation.**

   Water Year Type Indices for the Sacramento River basin and San Joaquin River basin are defined in the SWRCB Water Rights Decision 1641. The definition of the Sacramento Valley Water Year Hydrologic Classification is the computation of the following equation:

*INDEX (in MAF) = 0.4 * X + 0.3 * Y + 0.3 * Z*

Where: *X* = Current Year's April – July Sacramento Valley Unimpaired Runoff

Y = Current October – March Sacramento Valley Unimpaired Runoff

Z = Previous year's index (With a cap of 10 MAF)

The Sacramento Valley unimpaired runoff for the current water year (October 1 of the preceding calendar year through September 30 of the current calendar year), as published in California Department of Water Resources Bulletin 120, is a forecast of the sum of the following locations: Sacramento River above Bend Bridge, near Red Bluff; Feather River, total inflow to Oroville Reservoir; Yuba River at Smartville; American River, total inflow to Folsom Reservoir. Preliminary determinations of the year classification are made in February, March, and April, with the final determination in May. These preliminary determinations are based on hydrologic conditions to date plus forecasts of future runoff assuming normal precipitation for the remainder of the water year.

D-1641 mandates water quality objectives in and around the Sacramento/San Joaquin Delta Estuary to be met by the SWP and the CVP. Some of these water quality objectives vary according to the water year type of the given year. Real-Time project operators must therefore use the forecast of the water year type from Bulletin 120 in order to determine what level of water quality objectives need to be met. As the water year type forecast is updated, each passing month gives more data of the actual runoff for the current water year and thus firms up the forecast. Also, because the majority of annual runoff occurs in the winter and early spring months, the May forecast is generally very accurate.

CalSim-II uses the historic Water Year Hydrologic Classification Indices for the study period of 1922–1994, rather than the forecasted water year types, in a manner that parallels how the project is operated in real-time. In CalSim-II, the water year type indices do not change for the current water year until February, the same month that real-time operators receive their first forecast of year type. Standards set by in the SWRCB D-1641 for the Delta water quality objectives that vary according to the water year type are mostly specified for months after May. Therefore, the use of the historical water year type index for the Delta water quality objectives in CalSim-II would not be significantly different than how real-time operators arrive at operational decisions about water quality objectives, i.e., using the May forecast of year type. It is important to note that Water Year Type indices are not used in CalSim-II to determine SWP South-of-Delta contractor allocations.

9. **There are significant unexplained differences in the historical SWP delivery data between the last report and the current report.**

There are some minor differences in the historical SWP deliveries between the two reports, ranging from 528 acre-feet to 25,000 acre-feet. These differences come from two sources. The first is the periodic corrections that are made by the DWR State Water Project Analysis Office (SWPAO) in the historical deliveries. The second is the revised procedure by SWPAO to include articles 12d and 14b water types as a part of the Table A delivery in the year that it is requested, rather than the following year when the water is actually delivered to the contractor. In the previous report, amounts associated with these water delivery categories were separately listed and accounted for in the year that they were actually delivered.

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LETTER 21

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12/23/05

Lester Snow, Director
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c/o ddeanda@water.ca.gov

cc: Joe Grindstaff, Chief Deputy Director
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Katherine Kelly, Chief, Office of SWP Planning
Department of Water Resources
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RE: Comments on DWR's Draft Report "The State Water Project Delivery Reliability Report 2005"

Dear Lester,

I appreciate the opportunity to comment on the department's Draft Report: "The State Water Project Delivery Reliability Report 2005" dated November 16, 2005. I am commenting as an interested citizen, and not on behalf of any institution or organization.

Overview

An accurate assessment of the actual amounts of water the SWP can reliably deliver to users under various future conditions is important to the state. This draft report is DWR's second effort to characterize the reliability of the SWP. One might have expected that in light of current discussions (including your own statements) regarding levee failures (by whatever cause), impacts of climate change, vulnerability to "perturbations" ranging from earthquakes to terrorism, and budget and financing challenges, DWR staff would have made further efforts to characterize the range of risks and vulnerabilities affecting the reliability of the SWP. Unfortunately, the reliability report once again places inappropriate confidence in a single computer model as the sole basis for its findings, and it summarily dismisses analysis of these other factors. As such, it does not provide a reasonable representation of the reliability of the SWP for decision-making purposes.

Importance of the Issue

Why is an accurate and comprehensive assessment of SWP reliability important? Significant public and private investments are being made in water system infrastructure. More will be needed, as you have argued. Billions of dollars devoted to water systems have recently been approved by voters in bond funding, and more is anticipated

in the future. Thoughtful proposals for revenue streams to service this investment have been advanced, including your own ideas. All of these water system investments are linked to substantial private and public investments requiring reliable water supplies.

As voters weigh the options before them, it is critical that they have an accurate and reasonably complete understanding of the risks as well as the benefits of different options. The report fails to provide the information and analysis needed to properly assess the reliability of the SWP system.

Risk and Reliability

The reliability of SWP system deliveries in the future is of course impossible to predict perfectly. It is possible, however, to identify important factors that may impact system performance. The reliability of SWP deliveries will clearly be impacted by issues such as the following:

- Amounts and patterns (time, place, and form – rain/snow) of precipitation and runoff
- Climate change (e.g. impacting flows, timing, temperature, and dam operations for flood control)
- SWP operations impacts on ecosystems and listed species such as the delta smelt
- Reduction of flows into the basin, such as the Trinity River, and changes of flows within the basin
- FERC re-licensing (of Oroville and other facilities)
- Levee failures (due to floods, earthquakes, or other causes)
- Earthquakes impacting key pumping, storage, and conveyance facilities
- Operations of federal and other facilities to meet legal requirements for environmental factors

Issues have also been raised regarding factors that will influence SWP system reliability such as:

- "Take" permits for impacted species
- SWP water rights (vs. extraction and export of "surplus" flows)
- Delta ecosystem impacts

It is not clear that Calsim II is capable of providing a robust and reasonably complete assessment of system reliability, notwithstanding the numerous assertions on the model's behalf provided in the draft report. (I will refrain from reiterating key questions raised in the peer review and elsewhere with regard to Calsim II. Notwithstanding a steadfast assertion by DWR staff that the model is OK, serious problems remain with its use for this type of application.) Some of the issues listed above are factored into the Calsim II analysis at certain levels, others are not. Where they are included, the implications for system reliability are in many cases difficult to determine. It *is clear* that a robust reliability analysis should use more than one method and tool, and that the tools should be properly applied. Additional tools are in fact available to develop a more complete understanding of system reliability.

To suggest that these factors be taken into consideration does not imply that anyone expects DWR to have a crystal ball. Understanding a range of potential reliability factors is useful, and doable. It does not imply a perfect prediction. For example, climate scenarios can provide important information regarding a range of reliability levels under possible future conditions. (Indeed, researchers have undertaken just such studies, including recent ones with Calsim II as the key model for supply reliability analysis. These should be included in the report.)

Disturbingly, in addition to ignoring climate change, the report fails to discuss a number of current issues including: levee integrity and risks related to failure; environmental impacts and issues relating to delta water extractions impacting listed species; and vulnerability of key SWP system components. Nor does it comment on recent decisions in various courts invalidating EIR/Ss dealing with SWP contracts and delta operations. The

implications of these decisions, and the eventual environmental analyses, may include important constraints on system operations which would in turn impact system reliability.

A Comment on Timing

The 2002 reliability report was "finalized" in 2003. The 2005 report will presumably be finalized in 2006 (comments are due on December 23, 2005). There are two problems with this timing.

The first problem is that the Urban Water Management Plans (UWMPs), required every five years by law, are due in December 2005. Thus, the final SWP reliability report is not available to water managers as input into this important process to evaluate imported water reliability to the retail agencies served by the state contractors. (Though a draft document was reportedly provided to contractors in May 2005, the public and other interested parties – including land-use decision-makers concerned with water supply reliability – were not provided with a draft until mid-November 2005.) Clearly, the information from this report has not been readily available for use in the preparation of the 2005 UWMPs. To the extent that assertions of the SWP reliability may be in question, all of the UWMPs relying on SWP supplies for any portion of their water will be flawed. It is most unfortunate that DWR did not release the draft report much earlier (e.g. at least in May when it was provided to contractors) in order for the accuracy and validity of the report to be discussed.

This relates to the second problem, which is that the report is supposed to be provided every two years. The two-year cycle is not being met.

Conclusion

The 2002 reliability report acknowledged for the first time that the SWP cannot deliver full "Table A" volumes. This was an important step towards a more honest and accurate assessment of system reliability. It too, however, was strongly criticized for its over-reliance on the Calsim II model. The current draft report begins its defense of Calsim II in the *Forword* and continues it at tedious length throughout the document. Rather than mounting a protracted defense of an imperfect model, the SWP should be subjected to a credible reliability analysis with outside peer review. DWR staff should be directed to develop an open process that begins to account for the range of factors that will likely impact system reliability.

Sincerely,

Robert C. Wilkinson

STATE OF CALIFORNIA – THE RESOURCES AGENCY
ARNOLD SCHWARZENEGGER, *Governor*

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March 24, 2006

Robert C. Wilkinson, Ph.D.
1428 West Valerio
Santa Barbara, California 93101

Dear Dr. Wilkinson:

This is in response to your letter of December 23, 2005 commenting on the draft State Water Project Delivery Reliability Report–2005 (Report 2005).

In your letter, you state that the Report 2005 does not provide an accurate assessment of the delivery ability of the State Water Project (SWP) because it does not incorporate future uncertainties associated with such things as climate change, earthquakes, terrorism, etc. You also point out that the timing of Report 2005 is problematic because it was not released early enough to be publicly reviewed prior to being incorporated into Urban Water Management Plans and does not meet the two-year interval required for updating this information.

The estimates contained in the Report 2005 are the best quantifications available of the delivery ability of the SWP. These estimates are limited, however, because of the uncertainty of future conditions. The Department of Water Resources (DWR) will continue to use the CalSim model as appropriate for analyses but other information is being developed that will help us analyze, understand, and prepare for our uncertain future. Per the Governor's directive (Executive Order S-3-05), the potential impacts of climate change on the State's resources, including water supply, are being evaluated. Preliminary estimates have been done, using CalSim-II, of the potential impact upon the SWP in 50 to 100 years if no additional conveyance facilities or upstream reservoirs are built. As these estimates become more refined, they will be helpful in guiding strategies for the management and development of the State's water resources, including improvements to the SWP.

In addition, DWR is working on two projects that will improve our ability to make qualitative or quantitative statements about the reliability of conveyance across the Sacramento-San Joaquin Delta. They are: the Delta Risk Management Strategy, which will assess risks to the Delta from floods, seepage, subsidence, and earthquakes, evaluate the consequences of levee failure, and develop recommendations to manage the risk; and a broader public process to develop a shared vision of a sustainable Delta that continues to support societal needs related to land use, recreation, water supply, transportation, energy, and environmental health. The Delta Vision process incorporates the requirements of AB 1200 passed by the legislature and signed by the Governor in 2005. Although none of these efforts will be completed before release of the next Reliability Report, some preliminary results and conclusions may be completed in time for inclusion. Subsequent Reliability Reports will fully incorporate this information.

DWR does not want to leave any reader of the Report 2005 with the impression that this developing information is being ignored. Therefore, the final report includes a discussion of these uncertainties, the efforts to quantify them, and a commitment to incorporate the above-mentioned information as it is developed and refined.

You make the point that the report is supposed to be updated every two years and this condition has not been met. In addition, you state that the report should be available to the public as a draft and finalized prior to deadlines for local agency Urban Water Management Plans. I agree that the report should be available to the public as a draft and finalized prior to deadlines for local agency UWMPs. It is unfortunate that the review and completion of the Report 2005 could not be done in early 2005 for incorporation into UWMPs and well within the two-year interval specified in the settlement agreement (*Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal. App. 4th 892). The objectives of DWR for the Reliability Report are to encourage public discussion and understanding of the estimation of the SWP delivery capability, meet the conditions of the settlement agreement, and provide the best available quantification of SWP deliveries. Given the situation this year, DWR chose to provide the information to the SWP water contractors as a memorandum in May, 2005 and to delay the completion of the final Report 2005 to allow public review of a draft. Public review of the draft is not a requirement of the settlement agreement but the review encourages public discussion of the issue and improves the final report.

The final Report 2005 will be issued soon and will include an appendix containing the comment letters on the draft report and DWR's responses. Thank you for your comments and recommendations. If you wish to discuss this further, please contact Gerald Johns, DWR's Deputy Director at (916) 653-8045 or jjohns@water.ca.gov.

Sincerely,

Original signed by

Lester A. Snow
Director

cc: P. Joseph Grindstaff, Acting Director
California Bay-Delta Authority
650 Capitol Mall, Fifth Floor
Sacramento, California 95814

Attachment 2

MEMORANDUM OF UNDERSTANDING
BETWEEN
THE DEPARTMENT OF WATER RESOURCES OF THE
STATE OF CALIFORNIA
AND
KERN COUNTY WATER AGENCY
FOR
DEVELOPING AND OPERATING THE KERN WATER BANK

THIS MEMORANDUM OF UNDERSTANDING (MOU), made this 25th day of March, 1987, sets forth the principles for developing, operating, and managing the proposed Kern Water Bank, located within Kern County, as an additional conservation facility of the State Water Project (SWP). The Department of Water Resources (Department) executes this Agreement for and on behalf of the State Water Project. The Kern County Water Agency (Agency) executes this Agreement for and on behalf of its Member Units, local water districts, and all other parties within the Agency having a physical or economic interest in the Kern Water Bank. It is the intent of the parties that this MOU serve as the statement of principles on which the negotiation of a comprehensive contract between the Department and the Agency will be based, and will, among other things, be consistent with the SWP water service contracts, provide for definition of Elements of the Kern Water Bank, define program management and operation responsibilities, and provide for supplemental land use.

The Department and Agency hereby agree to the following principles:

1. Kern Water Bank: Definition and Purpose. All opportunities by the Department to store imported surface water in the Kern Ground Water Basin by contract with the Agency are collectively referred to as the "Kern Water

Bank". The primary purpose of the Kern Water Bank is to augment the dependable water supply of the State Water Project. Incidental to its primary purpose, the Kern Water Bank will produce local benefits in the form of conservation of local water supplies, ground water overdraft correction and improved ground water levels.

2. Contract. This memorandum of understanding shall constitute agreement between the Department and the Agency under Section 11258 of the Water Code for the Department to proceed with the purchase of land for the project, but a further contract shall be required for compliance with Section 11258 before construction and operation of the Kern Water Bank project can proceed. The Contract shall be consistent with the principles contained in this MOU.

It is recognized that there may be a number of phases or "Elements" to the Kern Water Bank. The Contract will provide that each Element to the Kern Water Bank be subject to Agency approval, consistent with Section 11258 of the California Water Code. The Department will consult with the Agency as to all substantive matters relating to the planning, construction and operation of Elements of the Kern Water Bank.

3. Consultation. The Department will consult with its State Water Project contractors and the Agency will consult with its Ground Water Storage Advisory Committee (GWSAC) as to the terms and conditions of this MOU, the Contract and all other substantive matters relating to the planning, construction and operation of Elements of the Kern Water Bank.

4. Kern Water Bank - General Provisions. The following provisions shall be applicable to all Elements of the Kern Water Bank:

(a) Kern Water Bank Elements. The Contract shall include provisions covering how the Department and the Agency will work with local districts in the development of Elements to the Kern Water Bank. Elements

shall be included only if agreement is reached as provided in paragraph 2 above, and the Department makes the determination that such Elements are engineeringly feasible, capable of producing water for the SWP, and economically competitive with alternative new SWP water supply sources. Elements to be considered shall include but not be limited to direct ground water recharge and in-lieu programs.

(b) Develop Plans. Prior to inclusion of an Element to the Contract, the Department shall prepare a plan of development. Criteria for development plans shall be included in the Contract.

(c) Management Responsibilities. The Department shall have overall management responsibilities for the Kern Water Bank. All decisions pertaining to the scheduling of water operations are considered management responsibilities.

(d) Responsibilities for Operations. The Department will contract with the Agency, and subject to Department approval, the Agency with local districts, for the physical operation and maintenance of Kern Water Bank facilities, including transportation of SWP water for storage and extraction and maintenance of canals, recharge basins, and extraction wells associated with Elements of the Kern Water Bank. The contract will provide for periodic reevaluation of the arrangements for operating and maintaining the facilities and shall allow for possible adjustments in the contract.

(e) Operational Criteria.

(1) The operation of the Kern Water Bank as an additional SWP conservation facility shall be integrated with overall SWP operations under the Rule Curve in effect at the time.

(2) No deliveries to storage in the Kern Water Bank shall be made if such deliveries would otherwise cause an increase in entitlement deficiencies to long-term SWP water supply contractors in the year of storage.

(3) The Contract will provide that Elements of the Kern Water Bank will minimize any interference with local ground water uses. Improved ground water conditions that result from the State Water Project Kern Water Bank program will be considered when evaluating any interference with local ground water uses.

(4) The Department and the Agency shall develop monitoring programs to evaluate the specific and cumulative effects of each Element's operation on local ground water operations. Significant adverse impacts on local ground water operations shall be mitigated by the Department. The Department and the Agency shall also develop technical models to predict potential such impacts of Kern Water Bank activities on local ground water operations.

(5) Significant adverse environmental impacts shall be mitigated to the extent required by law.

(6) The Contract shall specify the manner in which the maximum amounts to be extracted and the maximum rates of extraction from Elements of the Kern Water Bank in any one year shall be determined. Water may be extracted from the Kern Water Bank only to the extent that it was stored previously.

(7) The Department and the Agency shall agree on assumptions for water losses associated with Kern Water Bank activities. After allowances for losses and mitigation all remaining stored water shall be available for SWP extraction and use.

(8) The Contract shall specify for each element the amount of storage that will be available for SWP purposes in the Kern Water Bank.

(f) Local Uses. In consideration for SWP use of the local ground water storage capacity, the Contract will provide for local uses of land and improvements acquired or constructed for each Element of the Kern Water Bank. Such local uses shall be defined and compensation therefore, if required, shall be provided for in the Contract.

5. Kern Fan Element. The Department, assisted by the Agency, is conducting appraisals and studies to determine the desirability of acquiring up to 46,000 acres of property located on the Kern River Fan west of Bakersfield. Acquisition of the property and construction of related recharge, extraction and conveyance facilities is hereinafter defined as the "Kern Fan Element" of the Kern Water Bank. In addition to the other provisions contained in this MOU, the Contract shall include, but not necessarily be limited to, the following specific provisions associated with the Kern Fan Element:

(a) Agency Option of Purchase. The Agency shall have the option to acquire all or any portion of the land associated with the development of the Kern Fan Element, consistent with provisions of the Contract. If the Agency does not exercise this option in accordance with provisions of the Contract within 90 days of a decision by the Department to proceed with land purchase, the Department shall purchase the land as part of the State Water Resources Development System. For a period of ten years after the date of acquisition by the Department, the Agency shall have the right to purchase the land from the Department, under terms specified in the Contract, provided that the Department's right to use the area for project purposes will be preserved. Consistent with Section 11464 of the Water Code the Department shall not sell facilities constructed or acquired for the Kern Water Bank.

(b) Land Uses. The Contract will provide for a consultation process among the Agency, DWR and appropriate local agencies in determining nonwater related uses of the property acquired for the Kern Fan Element.

(c) Management and Operations and Maintenance. The Department will manage and the Agency will operate and maintain the Kern Fan Element property and facilities, including canals, recharge basins and extraction wells associated with direct recharge and extraction activities. The Agency's operation shall include transportation of imported water from the California

Aqueduct to storage facilities and from extraction facilities to the Aqueduct (Section 4(d)).

(d) Overdraft Correction. Farming operations associated with the property to be acquired for the Kern Fan Element shall be taken out of production over a five (5) year period from the date of purchase of the property. Water associated with the reduction of ground water overdraft as a result of said idling of land shall remain as a benefit to the local ground water basin, and shall not be exported, either directly or indirectly, from the basin. It is understood and agreed, however, that the reduction of overdraft shall be defined and agreed to in the Contract, and the resultant improvement in ground water levels will be considered when evaluating the adverse effects of project extractions on local ground water uses.

(e) Local Water Related Uses. The Contract will provide for local uses of the land acquired for the Kern Fan Element, and will provide that facilities constructed for use by the SWP be available for recharge and extraction of local water by the Agency. Such local uses shall be defined and compensation therefore, if required, shall be provided for in the Contract.

6. Legal and Policy Considerations.

(a) The Department and the Agency in consultation with the other SWP contractors and affected local districts will identify and resolve to the satisfaction of the Department any legal issues related to storage and extraction of SWP water prior to execution of the Contract.

(b) The Department will initiate no legal actions or other activities to adjudicate the Kern Ground Water Basin as a result of its interest in the Kern Water Bank. This will not restrict the right of the Department to take action other than basin adjudication to recover SWP water stored in the Kern Water Bank as provided in the Contract between the Department and Agency. The Contract will provide for remedial actions in the

event that the Department is prevented from recovering water, as provided in the Contract.

IN WITNESS WHEREOF, the parties hereto have executed this Memorandum of Understanding.

APPROVED AS TO LEGAL FORM
AND SUFFICIENCY:

By _____
Chief Counsel

STATE OF CALIFORNIA
DEPARTMENT OF WATER RESOURCES

By _____
Director

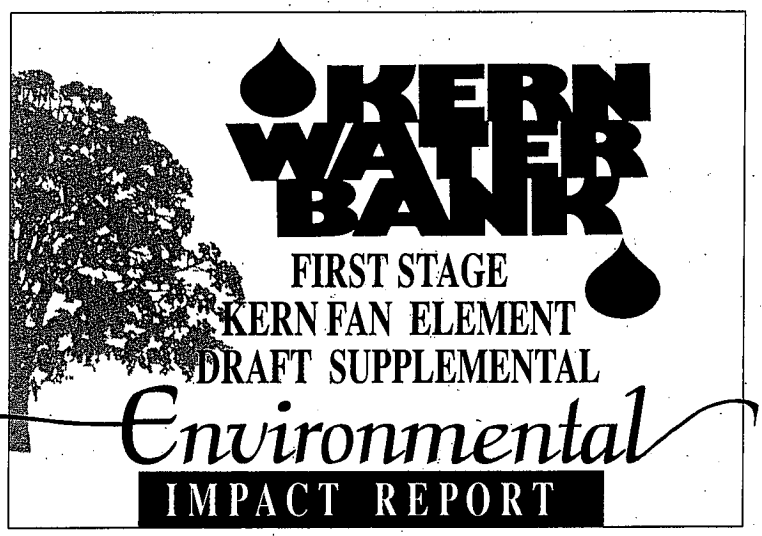
KERN COUNTY WATER AGENCY

By _____

Title President, Board of Directors

Attachment 3

LETTER 21



December 1990

FOREWORD

The Kern Water Bank, defined as all opportunities to store and extract State Water Project water in the Kern County ground water basin, will add operational flexibility and augment water supplies for the SWP. The Kern Water Bank will be operated for the SWP by the Kern County Water Agency, the SWP water contractor in the region.

The proposed First Stage of the Kern Fan Element is the initial component of the Kern Water Bank program. It is designed to increase SWP water supplies by more than 50,000 acre-feet annually at a competitive cost and open up even greater opportunities for ground water banking in Kern County.

Only a small amount of the 20,000 acres of land purchased for the Kern Fan Element will be used for long-term recharge. While a substantial portion of the remaining acreage could be used for intermittent recharge of local flood flows, this land and other acreage on the property will provide significant potential for restoring native habitat suitable for threatened and endangered wildlife species. Specific wildlife habitat measures are expected to be developed in the areas of the permanent recharge ponds as well. Over the next few years, an advisory process for comprehensive land use will unfold, and will be used to guide the conversion of much of this land from its present farming use to the potential uses set forth in this report.

The conversion of farmed land to the recharge and extraction program will save water, since irrigation on the property now contributes directly to ground water overdraft. Project benefits include this overdraft reduction, as well as reduced regional ground water pumping costs due to elevated water levels resulting from maintenance of an SWP storage account in the basin. Water would be pumped out only in dry years when SWP surface reservoirs could not fully meet SWP water delivery demands.

Studies are now under way to add more elements to the Kern Water Bank, in cooperation with the Kern County Water Agency and local water districts. Each of these programs will be addressed in separate environmental impact reports, as needed. The Department of Water Resources will continue to pursue ground water banking as one of the promising water management tools for meeting California's water needs.

David N. Kennedy, Director
Department of Water Resources

LETTER 21

State of California
GEORGE DEUKMEJIAN, Governor
The Resources Agency
GORDON K. VAN VLECK, Secretary for Resources
Department of Water Resources
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LETTER 21

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EXECUTIVE SUMMARY

The Department of Water Resources (DWR) proposes to construct and operate the First Stage of the Kern Fan Element (KFE) of the Kern Water Bank (KWB). The KWB was initially described in the Program Environmental Impact Report, entitled *Artificial Recharge, Storage and Overdraft Correction Program, Kern County, California* (Kern Water Bank), in December 1986. The purposes of the KFE are to increase the firm water supply of the SWP, to reduce overdraft in the Kern County Ground Water Basin, and to provide recharge opportunities for local users. In addition, opportunities for other land uses, such as restoring native habitat, creating wetland habitat, and providing opportunities for recreation are also envisioned. DWR is currently evaluating a staged development of the KFE. The First Stage will be a scaled-down operation of the ultimate one million acre-foot storage project described in the April 1987 *Kern River Fan Element, Kern Water Bank, Preliminary Technical Report* (Technical Report).

This draft Supplemental EIR covers the impacts of constructing and operating the First Stage of the Kern Fan Element and is intended to augment the 1986 Program EIR. The Draft SEIR incorporates the Program EIR by reference. The SEIR provides an opportunity for public review of the potentially significant effects of the proposed project. Additional comments received following the review of this document will be incorporated into the final SEIR.

Following release of the Program EIR, DWR began reconnaissance-level studies for the KFE portion of the KWB. The Technical Report described a ground water storage project with a maximum storage of one million acre feet. The report also described base conditions for ground water geology, soils, water quality, and water supply for the KWB property. Water would be conveyed from the California Aqueduct to the proposed recharge basins on the KFE property and to existing recharge basins within the City of Bakersfield's 2,800-Acre Recharge Area.

The First Stage is intended to evaluate the actual recharge rates for various soil types, identify potential operation problems, and optimize future operation. The principal components of the First Stage will be the construction of recharge basins, service canals and pipelines, and modifications and/or construction of new wells on the KFE property. The ultimate design and operation of the KFE program will be based on experience gained during the First Stage operation.

PROJECT DESCRIPTION

The KFE property consists of 20,000 acres located southwest of Bakersfield, in Kern County. The First Stage recharge facilities will require 1,100 acres of ponds, as well as use of the adjacent City of Bakersfield's 2,800-Acre Recharge Area. The First Stage program has been planned for a maximum ground water storage capacity of 350,000 acre-feet. Recharge facilities will provide a maxi-

mum recharge capacity of 90,000 acre-feet from November through April. Extraction facilities will provide the capacity to extract 75,000 acre-feet annually. Alternatives to the proposed project will be limited to relocating ponds and extraction wells within the existing KFE boundary.

RECHARGE AND EXTRACTION FACILITIES

The City of Bakersfield's recharge facilities and the six recharge basins on the KFE property will be used for the First Stage program. To the extent possible, existing facilities will be used. Ponds sites on the KFE property were selected to avoid known water quality problems or potential water quality threats until more is known about the area. A second criterion was to locate First Stage facilities a minimum of 500 feet away from oil pipelines to avoid recharging over potentially contaminated soils and to restrict mounding in pipeline areas. Five of the six recharge basins will be served by the Cross Valley Canal through new turnouts. The sixth will be served by an existing CVC turnout and the City's 2,800-Acre Recharge Area. The agreement with the City of Bakersfield for use of the 2,800-Acre Recharge Area requires that a minimum of 10 percent of the total recharge take place within their Recharge Area.

Extraction facilities will involve the use of 27 wells; 25 existing and two new wells. Use of the 27 wells with conservative long-term pumping capacity assumptions will result in an extraction capability of about 75,000 acre-feet per year. During extraction years, water will be pumped from these wells at a uniform rate and delivered to Kern County Water Agency, in exchange for a like amount of SWP entitlement that would otherwise be delivered from the California Aqueduct during that year. Ground water withdrawals and subsequent delivery would count as the fulfilled "advanced entitlement delivery", allowing a reduction in entitlement deliveries from the Aqueduct.

Water Supply Studies and Accomplishments

Computer simulation studies were conducted to evaluate the potential water supply accomplishments at three future levels of SWP annual delivery requests: 3.5 million acre-feet, 3.7 million acre-feet, and 4.2 million acre-feet. The first two studies assumed existing SWP facilities and operational constraints. The last study assumed that facilities and programs would be in place to allow full use of the four new pumps at the Banks Delta Pumping Plant. This would allow greater Delta exports to occur, and provide greater opportunities to recharge water during winter months.

All of the studies used a generalized version of the current "Risk Curve", a technical analysis to determine how much to deliver in the current year and how much to save in storage for delivery in future years. This concept, greatly refined in the past two years, has been the foundation of SWP operations in recent years.

The study results are shown on the following page.

FIRST STAGE KERN FAN ELEMENT WATER SUPPLY STUDY RESULTS
In 1,000s of acre-feet

	Level of SWP Demand, In MAF		
	3.5	3.7	4.2
Average Annual Dry Period Supply (AADPS)	52	54	70
57-Year Average	31	44	56
Average Delivery Increase in Years That Improvement Is Possible	59	68	72
57-Year Average	33	49	68
Average Delivery Increase in Years That Improvement Is Possible	64	73	84

The water supply accomplishments increase as demands increase. One reason is that the ground water storage account is operated more aggressively over time to meet the increased water delivery demands. In most years, increased deliveries can be made. A second reason is that additional pumping capability in the Delta at the 4.2 million acre-foot level of demand study allows for greater opportunities to recharge water, and allows the Kern Fan Element to operate more effectively as an integrated part of the SWP. This additional effectiveness is reflected in the additional water supply accomplishments, as well as additional operational flexibility in SWP reservoirs.

Operation of the Kern Fan Element will result in greater exports of water from the Delta. This will be through the combined action of diverting water during winter months for recharge, and delivering additional water to SWP water contractors as a result of accounting for KFE storage in the Risk Curve. The average increases in Delta exports are roughly equivalent to the average increases in water supply accomplishments for each of the three levels of study. The six-month period for recharge coincides with the period of winter runoff and the availability of higher Delta outflows, as well as being outside of the period of export limits for fishery protection.

Project Benefits

The proposed project will have the following beneficial effects:

- The interior of the recharge ponds will be managed to optimize recharge rates, minimize the area needed for recharge ponds, and minimize conflicts with wildlife. The surrounding vegetation would be managed for wildlife benefits.
- The vegetated areas immediately surrounding the ponds could be provided with water supplies from both the recharge and extraction systems and managed primarily for wildlife benefits.
- Naturally occurring topographical features within the ponds will be developed to the extent practicable into vegetated islands that would be maintained as nesting habitat for waterfowl and other birds. The nesting islands could be provided in a selected cell for each of the pond groups.
- During SWP recharge years and locally wet years, the First Stage recharge ponds and their nesting islands would provide additional wildlife benefits at a small cost for the additional water supply required in April through June.
- Wildlife watering devices will be connected to each of the extraction wells to provide a source of water during extraction years to complement the water supply available to wildlife during recharge years from open canals, ponds, and adjacent wetland/riparian habitat.

- Some lands not actively used or reserved for recharge basins can be developed as preserves for sensitive species, such as the San Joaquin kit fox, Tipton's kangaroo rat, and the blunt-nosed leopard lizard.

EFFECTS OF THE PROPOSED ACTION AND MITIGATION

Water Quality

A number of pesticides have been used that have a potential to contaminate ground water throughout that portion of the KFE property that was previously farmed. Other potential contaminants are associated with oil field activities. First Stage facilities have been designed and located to avoid areas with degraded water quality. In some cases, this resulted in locating First Stage facilities away from prime recharge areas, pending a determination of the extent of contamination, if any, in these areas. In areas of potential ground water contamination, recharge and extraction patterns will be carefully monitored to minimize movement of contaminated water to extraction wells. Extraction wells will be located away from areas with known contamination. Recharge facilities will not be located in areas with known soil contamination and will be operated in a manner that will not bring either recharge water or ground water into contact with areas of soil contamination.

An exploration and sampling program is being conducted at each recharge site to determine whether contaminants are present. To the extent that pesticides are present, solutions are expected to include on-site and/or nearby use of water from the affected well(s) for irrigation to the extent that water quality is suitable for that purpose, until the problem no longer exists. Additionally, there is sufficient flexibility in the number and capacity of first Stage extraction wells to shift pumping away from a problem area.

Petroleum hydrocarbon contamination from pipelines represents the most significant ground water quality threat on the KFE property. Contaminated areas on the property could limit use of some portions of the property for recharge. In order to minimize potential threats from pipeline leaks, all First Stage recharge basins will be set back 500 feet from identified pipelines.

Ground Water Level Concerns

Water levels are expected to rise on a regional basis during recharge operations. Local mounding is expected in the immediate area of the basins, however, no off-site problems are anticipated. To the extent that potential interference problems do occur, such potential problems will be handled by shifting KFE recharge to other areas and/or reducing recharge.

Extraction Water Level Concerns

Ground water levels will be monitored to prevent unacceptable water level impacts to surrounding users. If unacceptable impacts are apparent, pumping will be shifted away from potential problem areas or the affected parties will be compensated for direct impacts associated with the KFE operation.

Vegetation

No significant impacts to native vegetation are anticipated since no construction or operation activities are contemplated within areas of native vegetation.

Delta Impacts

The potential exists for winter–run salmon and other races of salmon to be impacted by additional Delta diversions required for the KFE. The potential adverse impact is not possible to quantify at this time. The KFE will result in diversions that will add only 1.5 percent to the total diversion. By itself, this would not be significant, however, due to existing concerns in the Delta, the winter–run is now considered endangered and any impact could potentially be significant.

An interagency winter–run team has been established to develop a recovery plan for the winter–run salmon in the upper Sacramento River. A joint federal/State recovery team has also been established pursuant to the endangered species acts. In addition, DWR is proceeding with informal consultation with the National Marine Fishery Service and DFG on the potential impacts of proposed Delta facilities and south of the Delta storage projects on winter–run salmon. If the recovery team and consultation process conclude that SWP pumping causes a take, DWR will work to provide the appropriate mitigation and/or measures to minimize the adverse effects. If an incidental take permit is required and appropriate, DWR will work with the respective regulatory agency in compliance with the State or federal Endangered Species Act.

Wildlife

Construction activities may cause potentially significant effects to the blunt–nosed leopard lizard, Tipton's kangaroo rat, and the San Joaquin kit fox, all threatened or endangered species.

Before construction begins, a qualified biologist will be retained to survey the area and determine site–specific conditions that should be avoided. Potential kit fox dens will be excavated or avoided. Buffer areas will be required around potential and natal dens. Speed limits will be posted during the breeding season to restrict vehicle traffic.

DWR will initiate formal consultation with DFG and the U.S. Fish and Wildlife Service, pursuant to the endangered species acts. DWR will prepare a conservation plan so future activities at KFE do not result in a take of endangered species.

Local Recharge

Kern County Water Agency wants to develop 4,000 acres of the KFE property for local recharge and extraction of Kern River floodwaters. To the extent KCWA makes use of the KFE recharge facilities, no additional wildlife disruption is anticipated beyond what is discussed in the SEIR. However KCWA envisions spreading flood flows over large areas of land outside the confined KFE recharge basins. No site–specific work has been conducted for proposed local recharge areas in sufficient detail to include in this Draft SEIR. Before KCWA could implement such a local recharge program, an environmental analysis of the effects of the proposed local facilities, particularly on surrounding water levels and sensitive wildlife species would need to be completed and adequate mitigation measures would need to be identified and/or implemented.

LETTER 21

Chapter 1. INTRODUCTION

The Final Program Environmental Impact Report (Program EIR), entitled *Artificial Recharge, Storage and Overdraft Correction Program, Kern County, California (Kern Water Bank)* was issued in December 1986. The proposed action described a conceptual "element," the Kern Fan Element (KFE) of the Kern Water Bank (KWB), which involved analyzing the potentially significant environmental effects of acquiring up to 46,000 acres of land in Kern County to develop a ground water storage program with the purpose of increasing State Water Project (SWP) water supply. The 1986 EIR reviewed a number of alternative KFE options and recommended a program that ultimately resulted in purchasing about 20,000 acres.

When the 1986 EIR was released, the Department of Water Resources (DWR) announced that full feasibility studies would be conducted in part to refine the design and operation of the proposed project. These activities were conducted to determine whether additional significant effects would occur that were not addressed in the earlier EIR. If additional environmental consequences could potentially occur, DWR would issue a supplemental EIR addressing the impacts. However, if future activities within the KWB (either the KFE or other elements) resulted in no new significant effects, then subsequent activities could be approved as being within the scope of the Program EIR (1986).

The feasibility studies conducted to date for the KFE indicate that there are additional effects that were not specifically addressed in the Program EIR. The construction and operation of recharge facilities for the KFE will result potentially in a take of endangered species known to inhabit the KFE property. Therefore, DWR prepared this Draft Supplemental EIR to evaluate the potentially significant environmental impacts associated with the construction and operation of the KFE.

DWR is currently pursuing a staged development of the KFE. The initial or "First Stage" will be a scaled-down operation of the ultimate one-million-acre–foot storage project, described in the April 1987 *Kern River Fan Element, Kern Water Bank, Preliminary Technical Report* (Technical Report). Subsequent development will increase the operation of the KFE to the ultimate size. Future long-term KWB activities also will include consideration of other "local elements." Separate environmental and feasibility studies for these proposed elements will be conducted, if required.

PURPOSE OF THE KERN FAN ELEMENT

The purposes of the KFE are to increase the firm water supply of the SWP, to reduce overdraft in the Kern County Ground Water Basin, and to provide recharge opportunities for local users. Opportunities for other land uses, such as restoring native habitat, especially for threatened and endangered species, creating wetland habitat, and providing local recreational opportunities, will also be pursued.

PURPOSE OF SUPPLEMENT TO THE PROGRAM EIR

This draft Supplemental EIR (SEIR), which is one stage of the Kern Water Bank program, is intended to augment the 1986 Program EIR by focusing on significant issues associated with the proposed specific ground water recharge and extraction project. The SEIR provides an opportunity for public review of additional potentially significant changes to the proposed KFE. This SEIR incorporates the Program EIR by reference. Before approving the proposed project, DWR will identify the significant effects associated with the proposed action, make appropriate findings for any significant impacts that are unavoidable, and specify how impacts will be either mitigated or minimized.

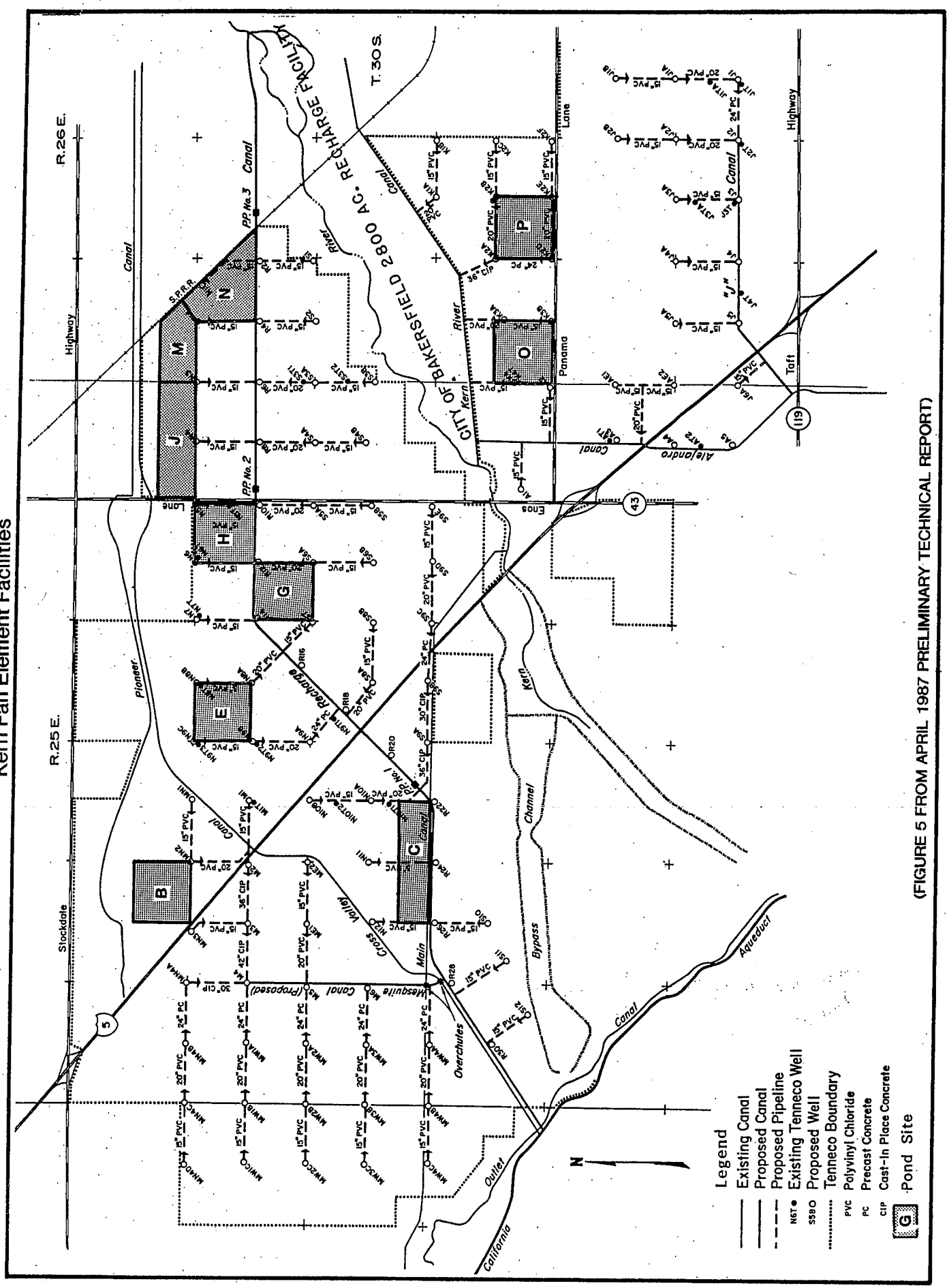
The Technical Report set forth the results of the reconnaissance-level studies for the KFE portion of the KWB. The Technical Report described base conditions of ground water geology, soils, water quality, and water supply for the property. The report set forth a specific proposed plan, and provided results of computer simulation studies for both SWP water supply augmentation and projected ground water basin impacts. The report also summarized the local element proposals as they existed at the time.

The Technical Report described a ground water storage project with a maximum storage of 1,000,000 acre-feet. Water was assumed to be conveyed from the California Aqueduct through a new State canal to the recharge basins on the property and to existing recharge basins in the adjacent City of Bakersfield's 2800-Acre Recharge Area. The State canal was proposed to have a capacity of 500 cubic feet per second. The proposed State facilities would have consisted of 1,600 acres of new recharge basins, and 110 extraction wells. Operating assumptions included a recharge rate of 30,000 acre-feet per month for nine months followed by a reduction to 25,000 acre-feet per month, and a sustainable extraction rate of 30,000 acre-feet per month (approximately 500 cfs). Most of the water would be conveyed back to the California Aqueduct through the new State canal, with a portion of the water pumped into the nearby Alejandro Canal for conveyance into the Buena Vista Aquatic Recreation Area Lakes and pumped back to the California Aqueduct through a proposed new pumping plant. Water supply studies of the proposed plan indicated an increase in SWP dry-period supply (firm yield) of about 145,000 acre-feet per year. Figure 1 shows the conceptual layout of the proposed facilities described in the Technical Report.

PROPOSED ACTION

The proposed action is to develop the First Stage KFE of the KWB. The First Stage program will consist of operating six recharge basins covering 1,100 acres, along with 27 extraction wells, with a maximum ground water storage of 350,000 acre-feet. The First Stage will also involve use of the adjacent City of Bakersfield's 2,800-Acre Recharge Area. Operational experience with the First Stage program will provide the flexibility to configure and refine the location of future facilities before complete build-out.

Figure 1 1987 CONCEPTUAL LAYOUT
Kern Fan Element Facilities



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LETTER 21

Chapter 2. PROJECT DESCRIPTION

GENERAL DESCRIPTION

This chapter describes the proposed project. Included in this description are the recharge and extraction facilities necessary for this program and the operational considerations to implement and operate the proposed project.

The Kern Fan Element (KFE) property, located in Kern County, southwest of the City of Bakersfield, covers about 20,000 acres. The principal components required to develop the First Stage facilities include: the construction of recharge and extraction facilities; the construction of service roads, canals, and pipelines; modifications to existing wells on the property; and construction of several new wells. To the extent possible, existing facilities will be used. The First Stage program has been planned for a maximum ground water storage of 350,000 acre-feet. Recharge facilities will provide a maximum recharge capacity of 90,000 acre-feet from November 1 through April 30. Extraction facilities will provide the capacity to extract 75,000 acre-feet annually. The First Stage recharge facilities will require use of about 1,100 acres of ponds on the property, as well as the adjacent City of Bakersfield's 2,800-Acre Recharge Area. The ultimate design and operation of the KFE will be based primarily on the operation of the First Stage program. Operation of the First Stage is designed to provide information and experience to help configure and locate future facilities and to provide the flexibility to refine operational parameters.

The First Stage will be operated initially under a concept of advance delivery of State Water Project (SWP) entitlement water (discussed later in this chapter). The general plan of the recharge, pumping, and conveyance facilities and the primary operating road network for the First Stage is shown on Figure 2.

Alternatives to the proposed project will be limited to relocating ponds and extraction wells within the KFE boundary. The development of alternative facilities outside the KFE lands for additional recharge opportunities is beyond the scope of this SEIR. The use of KFE lands by local water districts for recharge will also be considered. However, projects of this nature will require an agreement with DWR and KCWA and separate CEQA compliance before recharge and/or extraction will proceed.

A discussion of the proposed recharge and extraction facilities required for the First Stage is incorporated in the following sections. Additional information and description of these facilities are found in the Feasibility Report, First Stage, Kern Fan Element (December 1990) (Feasibility Report).

RECHARGE FACILITIES

The City of Bakersfield's recharge facilities and six recharge basins on the KFE property will be used for the First Stage program. Water will be conveyed from the California Aqueduct

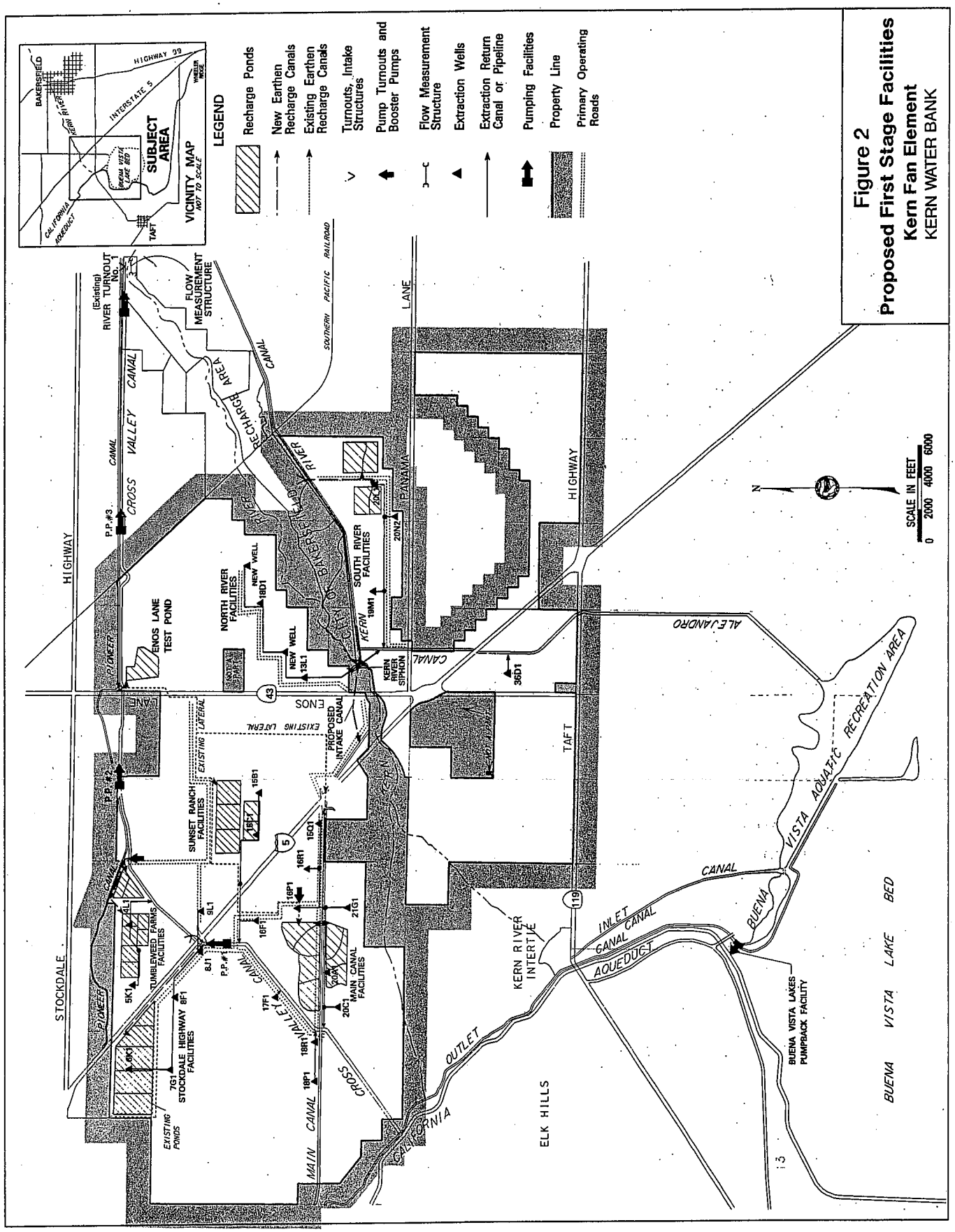


Figure 2
Proposed First Stage Facilities
Kern Fan Element
KERN WATER BANK
LEGEND
Recharge Ponds
New Earthen Recharge Canals
Existing Earthen Recharge Canals
Turnouts, Intake Structures
Pump Turnouts and Booster Pumps
Flow Measurement Structure
Extraction Wells
Extraction Return Canal or Pipeline
Pumping Facilities
Property Line
Primary Operating Roads
VICINITY MAP
NOT TO SCALE
SUBJECT AREA
BAKERSFIELD
HIGHWAY 99
INTERSTATE 5
KERN RIVER
BUENA VISTA LAKE BED
CALIFORNIA AQUEDUCT
TAFT
WHEELER RIDGE
SCALE IN FEET
0 2000 4000 6000
N
(Existing) RIVER TURNOUT No. 1
FLOW MEASUREMENT STRUCTURE
SOUTHERN PACIFIC RAILROAD
CROSS VALLEY CANAL
P.P.#3
HIGHWAY
PIONEER
ENOS LANE
RECHARGE AREA
KERN RIVER
CANAL
NORTH RIVER FACILITIES
NEW WELL
18D1
NEW WELL
13L1
ENOS LANE TEST POND
SOUTH RIVER FACILITIES
19M1
20N2
KERN RIVER SIPHON
36D1
ALEJANDRO
PROPOSED INTAKE CANAL
EXISTING LATERAL
SUNSET RANCH FACILITIES
15B1
16E1
15G1
16R1
16P1
21G1
P.P.#2
P.P.#1
8J1
9L1
4L1
5K1
6K1
TUMBLEWEED FARMS FACILITIES
8F1
STOCKDALE HIGHWAY FACILITIES
7G1
EXISTING PONDS
MAIN CANAL
16F1
17F1
18R1
18P1
20C1
MAIN CANAL FACILITIES
KERN RIVER INTERTIE
OUTLET
CALIFORNIA AQUEDUCT
INLET CANAL
BUENA VISTA LAKES PUMPBACK FACILITY
VISTA AQUATIC RECREATION AREA
BUENA VISTA LAKE BED
ELK HILLS
STOCKDALE
ENOS
TAFT
43
5
119
13

through the Cross Valley Canal (CVC) for recharge in both areas. Existing facilities to be used in the First Stage include: portions of the Pioneer Canal system and the Buena Vista Water Storage District Main Canal; the City of Bakersfield's 2,800-Acre Recharge Area; and an existing 320 acres of recharge basins in the northwest corner of the project area (the Stockdale Highway Ponds). New facilities and major rehabilitations include: five new recharge pond systems covering 790 acres; two gravity turnouts and one pump turnout from the CVC; a flow measurement structure below the CVC at River Turnout No. 1; a turnout from the City's ponds; a new intake channel for the Main Canal; a check structure in the Main Canal; two turnouts from the Main Canal; 1,400 feet of concrete lining of the Main Canal; a siphon under the Kern River Canal from the City's 2,800-Acre Recharge Area south to the KFE property; a connection from the City's 2,800-Acre Recharge Area via the Kern River to one of the KFE recharge sites; about 3.4 miles of new earth canals; and the rehabilitation of about 6.2 miles of the Pioneer Canal system laterals.

Separate negotiations are under way with the Buena Vista Water Storage District to develop agreements for use of the Main Canal, the Outlet Canal, existing spreading basins in the Tule Elk Reserve and other facilities to supplement the First Stage facilities. These facilities could provide extra recharge capacity in case of unexpected problems with First Stage recharge facilities, or if potential impacts of KFE extraction could affect nearby wells outside the property. Use of the existing Buena Vista Water District facilities will not require additional construction activity and therefore no other environmental documentation will be required.

Figure 3 shows a map of the pond sites and major recharge facilities for the First Stage program.

Recharge Ponds

A summary of recharge pond statistics, including surface area and estimated long-term recharge rates is presented in Table 1. The Feasibility Report describes criteria used for selecting the recharge sites and defining their boundaries. One criterion used in the selection of pond sites was to avoid areas with known water quality problems or potential water quality threats until more is known about those areas. This decision resulted in locating no recharge ponds east of Enos Lane (Highway 43) and north of the Kern River, other than the Enos Lane Test Ponds. Preliminary water quality data suggests that the portion of the aquifer beneath the Enos Lane Test Ponds may have been contaminated by brine disposal activities in the nearby oilfields. If on-going exploration confirms suspected problems, the Enos Lane Test Ponds will be removed from the First Stage project. A second criterion was to locate First Stage ponds a minimum of 500 feet away from oil pipelines to avoid recharging directly over potentially contaminated soils and to restrict recharge mounding in the pipeline area.

For flexibility, the pond system is divided into operationally independent cells. By allowing independent cell operation, ponds can be dried out when recharge rates decline, allowing maintenance to be performed and thereby improve average long-term recharge rates. Adjacent cells can be operated on an alternate wet/dry cycle to maximize the recharge rate of the pond system. The cells were designed to fit the existing topography with a target average pond size of about 20 acres. Because of variations in topography, the pond cell sizes varied from a minimum of 12 acres to a maximum of 40 acres.

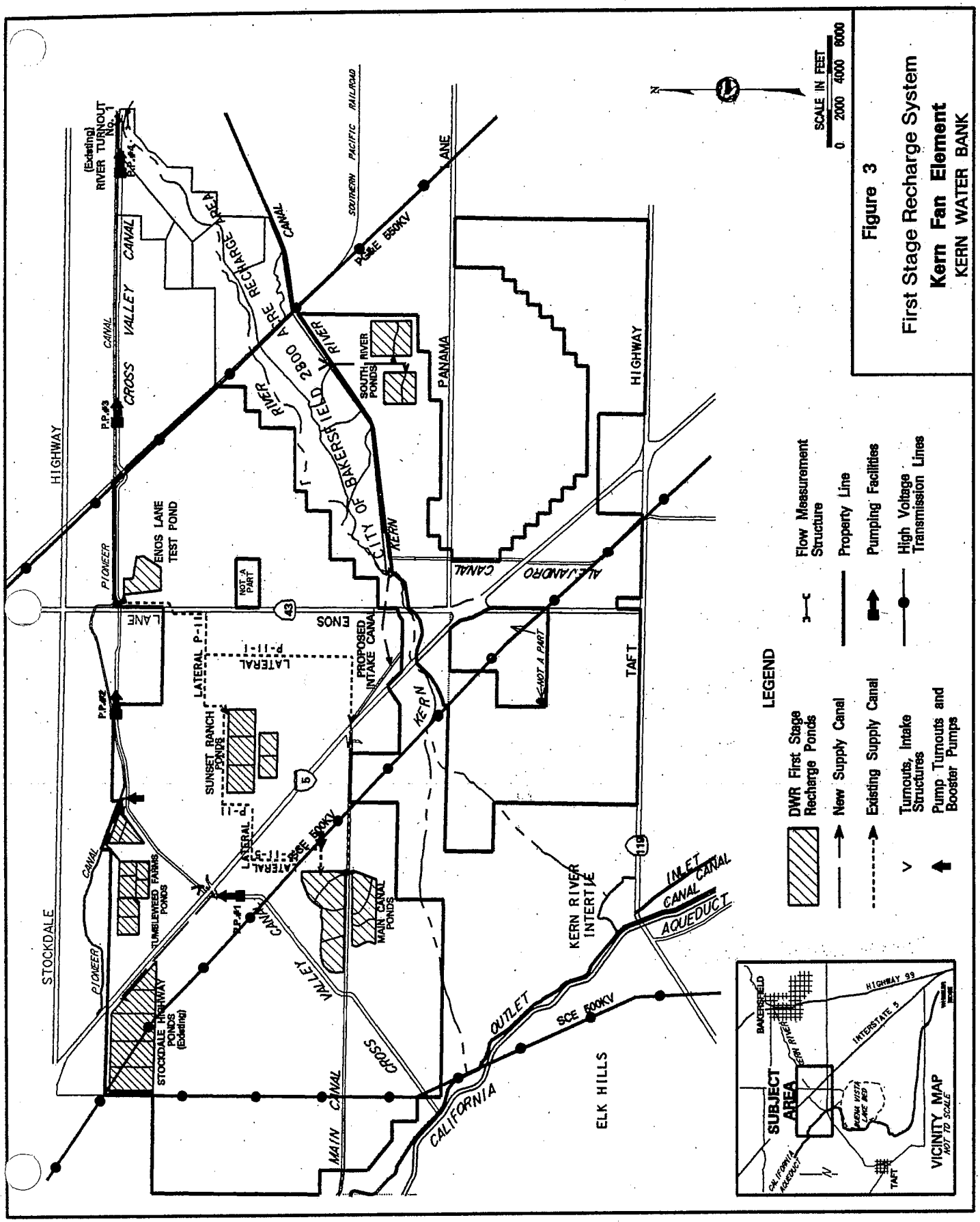


Figure 3
First Stage Recharge System
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 6000
N
LEGEND
DWR First Stage Recharge Ponds
New Supply Canal
Existing Supply Canal
Turnouts, Intake Structures
Pump Turnouts and Booster Pumps
Flow Measurement Structure
Property Line
Pumping Facilities
High Voltage Transmission Lines
VICINITY MAP
NOT TO SCALE
SUBJECT AREA
BAKERSFIELD
TAFT
HIGHWAY 99
INTERSTATE 5
KERN RIVER
CALIFORNIA AQUEDUCT
KERN VISTA LAKE BED
STOCKDALE
ELK HILLS
HIGHWAY
CROSS VALLEY CANAL
PIONEER
LANE
ENOS
PANAMA
TAFT
ALEJANDRO
CANAL
KERN
RIVER
CITY OF BAKERSFIELD
RECHARGE AREA
2800 ACRE
SOUTHERN PACIFIC RAILROAD
PG&E 550KV
SCE 500KV
ENOS LANE TEST POND
SOUTH RIVER PONDS
PROPOSED INTAKE CANAL
LATERAL P-11-1
LATERAL P-11-2
SUNSET RANCH PONDS
TUMBLEWEED FARMS PONDS
STOCKDALE HIGHWAY PONDS (Existing)
MAIN CANAL PONDS
KERN RIVER INTERTIE
INLET CANAL
AQUEDUCT
OUTLET
MAIN CANAL
VALLEY CANAL
(Existing) RIVER TURNOUT No. 1
P.P.#1
P.P.#2
P.P.#3
NOT A PART
43
5
119

Table 1. Recharge Pond Characteristics

Pond Complex	Water Surface Area	Assumed Average Long-Term Recharge Rates	
	Acres	Cfs	Inches per day
Tumbleweed Farms Ponds	164	20.5	3
Stockdale Highway Ponds	320	26.9	2
Main Canal Ponds	235	29.4	3
Enos Lane Test Ponds	38	4.8	3
Sunset Ranch Ponds	193	24.1	3
South River Ponds	160	20.0	3
Subtotal	1,110	125.7	
City's 2,800-Acre Recharge Area	NA	200.0	NA
TOTAL	NA	325.7	or 19,600 AF/mo

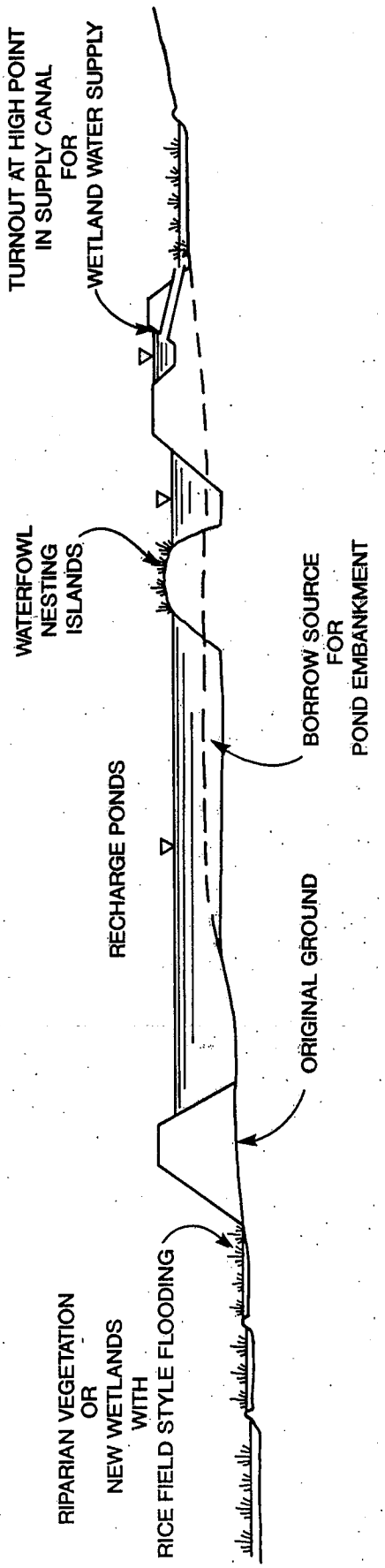
The existing 320 acres of recharge basins in the Stockdale Highway Pond System will require some modifications and improvements to correct embankment erosion damage and to provide better access to the Southern California Edison (SCE) transmission line towers. The five new recharge basins will be principally constructed on lands that are, or were recently, leased for agriculture. All embankment material to construct the recharge ponds and repair the Stockdale Highway Ponds will be borrowed from within the pond area.

Several measures are being considered to minimize wind erosion and dust problems, while sustaining recharge rates. Bermuda grass has been used successfully in nearby recharge facilities, and it appears to be the likely choice since it is easy to maintain.

Recharge rates for the various pond sites were estimated based on the experience of local agencies, soil surveys by the U.S. Soil Conservation Service, 50-foot hollow stem auger surveys by DWR, and site verifications with 20-foot hand-augured holes. With the exception of the Stockdale Highway Ponds, an assumed average long-term recharge rate of three inches per day has been used. While good recharge may be expected at the Stockdale Highway Ponds for relatively short-term recharge, recent DWR exploration indicates relatively extensive and impermeable clay layers under these ponds. Therefore, a more conservative long-term recharge rate of two inches per day has been assumed for this site.

Much consideration has been given to the manner in which water will be recharged on the KFE property as part of the SWP recharge program. Early on there were discussions of providing shallow ponds that would follow the natural topography. This concept could reduce construction costs and provide additional wildlife benefits in the form of in-pond vegetation. This concept has been modified in favor of a concept that integrates relatively vegetation-free recharge ponds that are surrounded by riparian and wetland vegetation. A conceptual cross-section of a typical recharge

Figure 4
CONCEPTUAL CROSS-SECTION
TYPICAL RECHARGE BASIN



Not to Scale

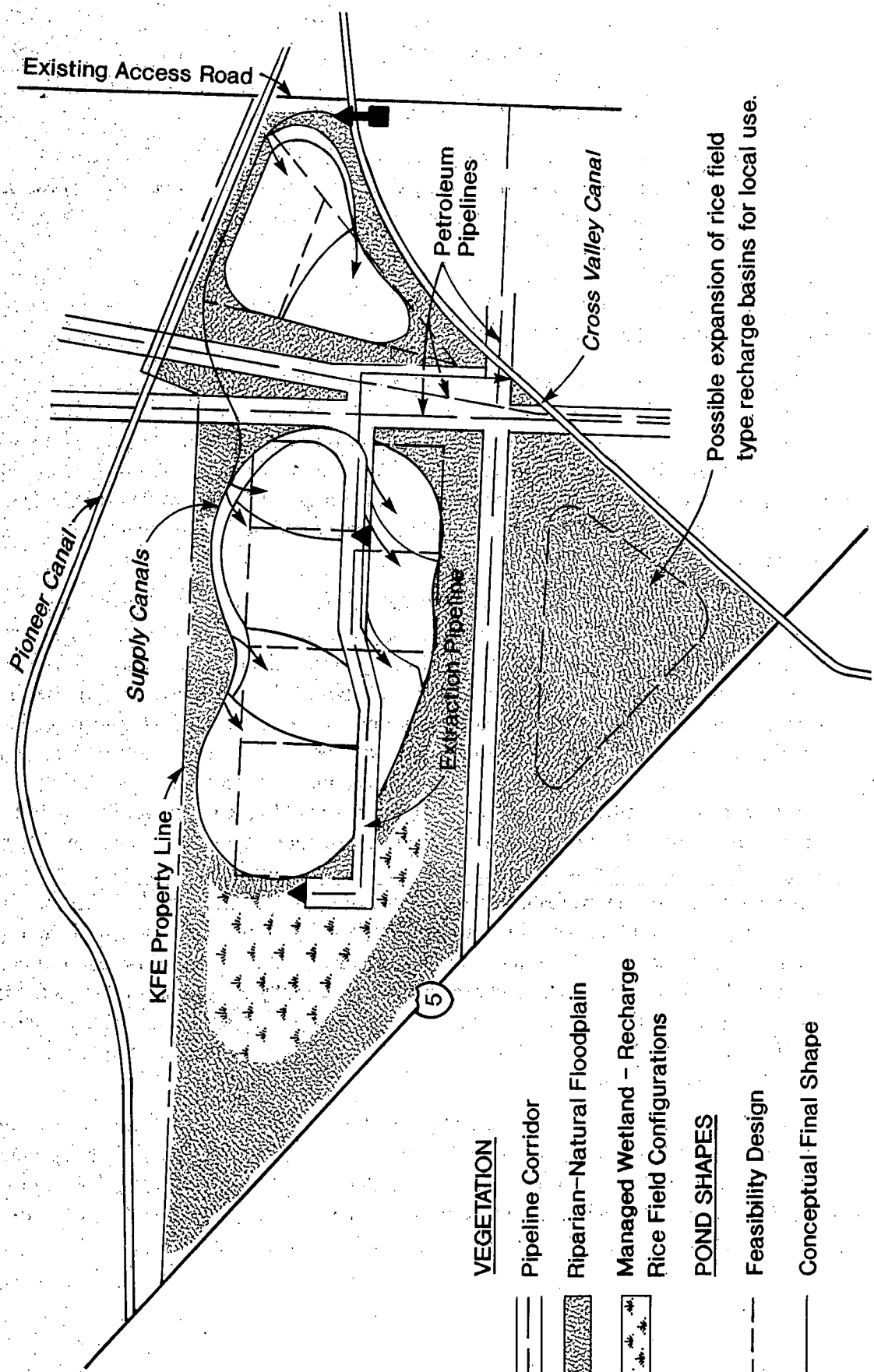


FIGURE 5
TUMBLEWEED FARM PONDS
CONCEPTUAL PLAN

pond with the surrounding riparian-wetland vegetation is shown in Figure 4, and a conceptual plan is shown in Figure 5. The interior of the ponds would be managed to optimize recharge rates, minimize the area needed for recharge ponds, and minimize conflicts with wildlife. The surrounding vegetation would be managed for wildlife benefits.

The vegetated areas surrounding the ponds could be provided water supplies from both the recharge and extraction systems and managed primarily for wildlife benefits. These surrounding wetland and riparian areas could also be integrated into the designs for recharge facilities proposed by KCWA. These recharge programs would be based on much less frequent events of much shorter duration. Due to the desire to spread large amounts of water over as large an area as possible, the recharge facilities for these programs could have more potential for integration with the shallow pond and habitat concept than the First Stage KFE recharge facilities.

The KFE ponds would be relatively deep, with an average depth of about 2 feet and a maximum depth of 3 feet. These depths allow for the storage of the equivalent of about eight days of recharge at average long-term rates. The ability to vary the amount of water in storage will allow operational flexibility that will assist in maintaining average delivery rates, while selected ponds within are drained for maintenance. The pond storage will also provide the flexibility to deliver water at twice the average long-term recharge rates at times when excess water or delivery capacity exist.

With the exception of the Main Canal Ponds where the topography is somewhat irregular, preliminary pond designs have resulted in recharge ponds that are generally rectangular. In many instances, the shapes of the recharge pond groups were dictated by the location of the pipelines and property boundaries. It is expected that the shapes of the ponds will be modified in the final design process to develop more rounded random shapes with a natural appearance that blends with existing topography and local features. Naturally occurring topographical features will be developed to the extent practicable into vegetated islands that would be maintained as nesting habitat for waterfowl and other birds. (If desired, islands could be constructed in any of the pond groups at minimal cost.) The nesting islands could be provided in a selected cell for each of the groups. In addition to the islands, the selected cell could be graded and equipped with simple controls to maintain water in the immediate area surrounding the nesting islands. With the resulting configuration, water could be maintained at a controlled elevation in the portion of the pond surrounding the nesting island until the end of the nesting season (about the end of June). It is intended that water will be delivered to the recharge ponds, principally for ground water recharge, During SWP recharge years and locally wet years, the First Stage recharge ponds and their nesting islands would provide additional wildlife benefits at a small cost for the additional water supply required in April, May, and June.

Figure 5 shows suggestions for typical pond shapes and conceptual land uses to provide for recharge, wildlife enhancement, operation, and maintenance of new and existing facilities and other activities for a selected sample area, the Tumbleweed Farm Pond system. In addition to the ponds, recharge canals, extraction facilities, property boundaries, and other limiting features, the figure delineates areas appropriate for the following land uses categories:

- A mixture of riparian vegetation and other natural vegetation that could be found on the Kern Fan Element.
- A managed wetland habitat that would be developed in land graded similarly to an irrigated rice field. These lands could also provide recharge.
- Corridors along existing pipelines that would allow access for inspection and maintenance of the facility. These lands could be planted to dry-land crops, or access could be maintained via a gravel surface roadway.
- Areas with potential for rice field-type recharge basins for local recharge programs.

Recharge Conveyance Facilities

The proposed conveyance facilities consist primarily of turnouts, earthen canals, road culverts, and other miscellaneous small canal structures. Five of the six recharge basin sites will be served by the CVC through new turnouts. The sixth site will be served via an existing CVC turnout and the City's 2,800–Acre Recharge Area.

New recharge system conveyance canals will be designed to the same standards as the existing Pioneer Canal laterals. New canal systems will be designed for twice the estimated long term recharge capacity of the pond systems they serve. Since water loss from the recharge canals adds to the recharge capability of the project, the canals will be of earthen construction with minimal compaction requirements. The bottom width and embankment top widths will be 10 feet to accommodate commonly used earth moving equipment. Canal sections are sized for a maximum velocity of 1.0 feet per second, 1.5 feet of freeboard and side slopes of 1.5 to 1.

Borrow material will be required to construct the new earthen canals. The borrow source will be adjacent agricultural fields. A shallow borrow operation that maintains existing drainage patterns or an alternative borrow operation designed to enhance the microtopography will be used to minimize the impacts on the land surface and local drainage. If borrow material is required from adjacent fallow fields, then DWR will initiate additional biological surveys to minimize adverse impacts to biological resources.

Standard conveyance canal structures include road crossing culverts, siphons under natural drainage channels and pipeline crossings, and check structures as needed to control the water surface will be provided. Siphons and culverts will be constructed of reinforced concrete pipe with reinforced concrete inlet and outlet structures.

The Stockdale Highway Ponds system will be supplied through a gravity turnout located downstream of CVC Pumping Plant No. 1 and Interstate Highway 5 (I–5). The turnout will discharge to the southeast of the CVC and will pass through an existing reinforced concrete pipe (RCP). The system is sized for a capacity of 100 cfs. About 3,700 feet of earthen canal will be constructed from the outlet of the RCP culvert to connect to the existing ponds. Minor modifications will be made to the existing ponds, including provision of adequate drainage for I–5 culverts, grading of existing embankments to repair erosion damages, and widening of ring dikes around SCE's transmission line towers to meet minimum SCE access requirements.

The Tumbleweed Farms Ponds system will be supplied from a new pump turnout located about 6,500 feet downstream of Pumping Plant No. 1. The new pump turnout will be comprised of two

xpumping units with a total capacity of about 50 cfs and a static lift of about four feet. About 3,700 feet of new earthen canal will be required to convey the water from the pump turnout to the two ponds in the system.

A third new turnout from the CVC will be located on the east side of Enos Lane. This will be a gravity turnout sized to deliver a total of 100 cfs. The Enos Lane Test Pond, the Sunset Ranch Ponds, and the Main Canal Ponds will be served by deliveries from this structure. Structural provisions will also be made to connect the Enos Lane turnout to the Pioneer Canal via the Lateral P-11 siphon under the CVC. This will allow use of the existing earth-lined Pioneer Canal as a recharge facility.

The Enos Lane Test Ponds will be connected to the Enos Lane turnout by about 800 feet of earthen canal. These ponds have been included with the First Stage facilities to test the recharge potential of a formation of permeable materials located in the northeast corner of the KFE property. These ponds are located near areas of potential contamination from pesticides, petroleum products, and oil well brine disposal. If the results of on-going explorations conclude that recharge in this area will exacerbate the existing water quality problems, these ponds will be eliminated from the First Stage program.

The Sunset Ranch Ponds System will be supplied from the Enos Lane turnout via existing Pioneer Lateral P-11. In order to meet the design water surface of these ponds, about 2,500 feet of Lateral P-11 will need to be reconstructed.

The Main Canal Ponds System will also be supplied from the Enos Lane turnout through the Pioneer Canal system. However, due to the limited capacity of the existing laterals, two routes will be used. The largest portion of the supply will be delivered through Lateral P-11-1 to the Main Canal. The water will enter the Main Canal through an existing structure near the northeast edge of I-5. The water will continue down the Main Canal to the east edge of the Main Canal pond complex. At this point a new control structure will be installed in the Main Canal, and turnouts will be constructed to deliver water to the pond systems on each side of the Main Canal. The total long term recharge rate for the Main Canal Ponds system is estimated to be about 30 cfs. Only 25 cfs can be delivered through Lateral P-11-1. To meet the anticipated recharge rate and provide some operational flexibility, an additional 15 cfs will be delivered to the north pond system via Pioneer Canal system Laterals P-11 and P-11-5. The connection from Lateral P-11-5 to the northeastern pond will be accomplished through an existing booster pump in Lateral P-11-5 connected to the ponds with about 1,100 feet of new earthen canal.

A portion of the Main Canal, near I-5, that will supply the Main Canal Ponds passes through an area where past petroleum leakage in the area of a Chevron oil pipeline has been observed. The portion of the Main Canal within 500 feet of the Chevron pipeline (1,400 feet) will be provided with a three-inch-thick concrete lining to minimize risks. The lined canal section will be sized for a capacity of 500 cfs to maintain the existing capacity of the Main Canal.

The new Main Canal Intake Channel will connect the Kern River and Buena Vista Water Storage District Main Canal. The new intake canal will replace an existing diversion weir and turnout that are inadequate for First Stage needs. This new Main Canal Intake Channel will begin at a turnout from the Kern River about 1,500 feet upstream of Enos Lane and immediately upstream from an existing diversion structure.

The City of Bakersfield's 2,800-Acre Recharge Area will be served from the CVC through existing River Turnout No. 1. This structure has a capacity of about 200 cfs and will supply the City's 2,800-Acre Recharge Area and the South River Pond System. Presently, there is no accurate means of measuring the discharge of River Turnout No. 1. As part of the First Stage the existing outlet structure will be modified and integrated with a new measuring weir. This structure has been designed and will be constructed by the Kern County Water Agency (KCWA). No additional work is needed to deliver water to the City's 2,800-Acre Recharge Area.

The South River Ponds system will be supplied from a turnout located at the southwest end of Pond No. 4 of the City's system. The connection to this system will require a 72 inch diameter pipe siphon under the River Canal and about 5,300 feet of earthen canal. The system will be designed for a maximum capacity of 100 cfs to provide adequate capacity for local use and future expansion of the recharge systems south of the river.

EXTRACTION FACILITIES

The First Stage program will involve extracting recharged water from 25 existing wells and 2 new wells. Modifications and improvements of existing well pumps, motors and appurtenant equipment will be required. Most of these modifications and improvements will be done under the 1990 KCWA emergency well extraction program and the La Hacienda water purchase extraction program (see Chapter 5 for a discussion summary of these programs). Other modifications may result from refinements that occur during the final design process.

Extractions from 19 of the wells will be conveyed to the CVC. The extractions from the remaining 8 wells will be conveyed to the Alejandro Canal system. In addition to the two new wells, about 7.3 miles of buried pipelines (12- to 24-inch diameter), 6.6 miles of concrete-lined canals with 1- to 2-foot bottom widths and maximum depths of 3.5 feet, a siphon crossing of the Kern River, and a pump back facility at the Buena Vista Aquatic Recreation Area Lakes will be required. While no wetland or riparian habitat is expected to be disturbed, before constructing any facilities at the Buena Vista Aquatic Recreation Area Lakes, the area will need to be surveyed for the Buena Vista Lake shrew, a very sensitive species that, if present, may be potentially impacted.

The extraction wells and conveyance facilities have been divided into seven separate systems that will discharge directly to either the Alejandro Canal or the CVC. The seven systems are: (1) the Tumbleweed Farms system, (2) the Stockdale Highway system, (3) the Sunset Ranch system, (4) the Main Canal system, (5) miscellaneous CVC connections, (6) the North River Well system, and (7) the Alejandro Canal system connections. A map of the various systems and facilities is presented in Figure 6.

Wells

All the existing wells, pumps, motors, and electrical systems will be rehabilitated and upgraded as needed. Most of the 25 existing First Stage wells have 16-inch diameter casings and are 700 feet deep. The average discharge potential for the 25 wells is estimated to be about 2,400 gallons per minute (gpm) per well.

Some of the existing wells used for the First Stage may be shared initially with agricultural lessees on the property prior to the end of 1993 when agricultural production is completely phased out.

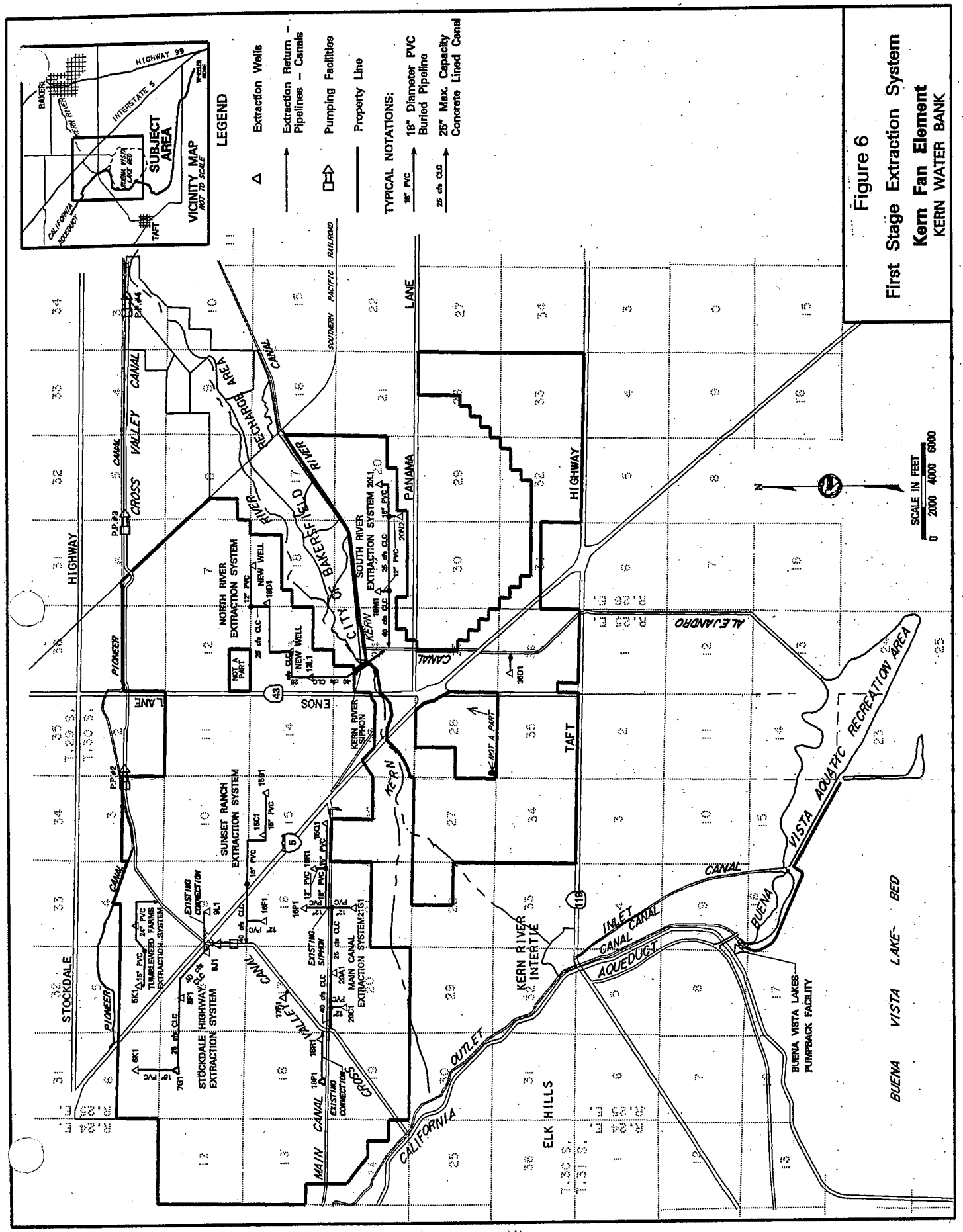


Figure 6
First Stage Extraction System
Kern Fan Element
KERN WATER BANK
LEGEND
Extraction Wells
Extraction Return – Pipelines – Canals
Pumping Facilities
Property Line
TYPICAL NOTATIONS:
18" Diameter PVC Buried Pipeline
25" Max. Capacity Concrete Lined Canal
VICINITY MAP
NOT TO SCALE
SUBJECT AREA
HIGHWAY 99
INTERSTATE 5
BAKER
KERN RIVER
KERN VISTA LAKE BED
CALIFORNIA AQUEDUCT
TAFT
WHITE WOLF
SCALE IN FEET
0 2000 4000 6000
N
CROSS VALLEY CANAL
PIONEER
HIGHWAY
LANE
ENOS
STOCKDALE
SOUTHERN PACIFIC RAILROAD
RECHARGE AREA
KERN RIVER
CITY OF BAKERSFIELD
PANAMA
ALEJANDRO
TAFT
NORTH RIVER EXTRACTION SYSTEM
SOUTH RIVER EXTRACTION SYSTEM
SUNSET RANCH EXTRACTION SYSTEM
STOCKDALE HIGHWAY EXTRACTION SYSTEM
TUMBLEWEED FARMS EXTRACTION SYSTEM
MAIN CANAL EXTRACTION SYSTEM
KERN RIVER SIPHON
EXISTING SIPHON
EXISTING CONNECTION
NEW WELL
NOT A PART
KERN RIVER INTERTIE
MAIN CANAL
CROSS VALLEY CANAL
CALIFORNIA AQUEDUCT
OUTLET
INLET CANAL
BUENA VISTA AQUATIC RECREATION AREA
BUENA VISTA LAKE BED
BUENA VISTA LAKES PUMPBACK FACILITY
ELK HILLS
T.30 S.
T.31 S.
R.24 E.
R.25 E.

There is the potential for conflict during the period that wells are shared. To avoid conflict, the pumps will be configured for low pressure discharge with the addition of temporary booster pumps that will attain sprinkler system pressures for the tenant systems using sprinklers.

Up to 80 percent of project recharge can be accomplished in the City's 2,800-Acre Recharge Area. Only five of the existing wells that will be used for extraction are located within one mile of the City's ponds. To lessen this imbalance, two new wells will be added in this area and will be constructed to the same depths and same general specifications as the rehabilitated wells.

Wildlife watering devices will be connected to each of the extraction wells. These devices will provide a source of water during extraction years to complement the water supply available to wildlife during recharge years from open canals, ponds, and adjacent wetland/riparian habitat. In years when neither recharge nor extraction occur, wetland/riparian habitat adjacent to the ponds could be operated to create an interim water supply to benefit wildlife.

Extraction Conveyance Facilities

The proposed extraction conveyance facilities consist primarily of buried PVC pipeline, small concrete-lined canals, inlet structures at the Cross Valley and Alejandro canals, road culverts and other miscellaneous small canal structures.

Buried pipelines (with diameters between 12 and 24 inches) will be used for extraction facilities because they are relatively watertight and easier to maintain than open channels. Pipes will be buried to a depth of two to three feet. A minimum cover of two feet will be maintained except over the pipelines at crossings of the SCE transmission lines where the minimum cover will be three feet.

Small concrete-lined canals with one- to two-foot bottoms and depths of 3 to 3.5 feet will be used for conveyance facilities requiring pipes larger than 24 inches diameter. Two standard sizes are proposed for the extraction facilities: a one-foot bottom width section with a maximum capacity of about 25 cfs, and a two-foot bottom width section with a maximum capacity of about 40 cfs. The lining will be a minimum thickness of 3 inches.

Borrow material will be required for construction of the concrete lined canals. The borrow materials will be obtained from a shallow surface excavation that maintains existing drainage patterns or from alternative areas designed to enhance the microtopography. Impacts of the land surface drainage will be minimized. Locations and sizes of proposed new extraction system pipelines and concrete lined canals, as well as the proposed use of existing buried pipelines are shown in Figure 4.

The extraction facilities shown in Figure 4 are based on preliminary designs prepared specifically for the KFE. Since the completion of the preliminary KFE designs, final designs and specifications have been prepared for portions of the KFE extraction facilities that will be used for the La Hacienda Program. The final designs include 23 of the KFE wells and the conveyance facilities that connect 19 of the wells to the CVC. The La Hacienda facilities have been designed to achieve a greater degree of reliability and require higher average well discharges than envisioned for the KFE. For these and other reasons related to the La Hacienda Program, minor changes to the facilities shown in Figure 4 may occur.

Inlet structures to the Cross Valley and Alejandro canals will be similar to the systems used for the existing Olcese Water District and KCWA wells. A steel pipe will project over the edge of the

concrete lining and discharge into the canals through a 45 degree elbow directed downward and downstream at an angle of 45 degrees from vertical.

Buena Vista Lakes Pumpback Facilities

At times, the extraction from the eight wells connected to the Alejandro Canal system will exceed the potential for exchange of SWP entitlements. In these instances the extracted water will flow to the Buena Vista Recreation Lakes and be returned to the California Aqueduct via the Buena Vista Lakes Pumpback Facility.

The facility includes an intake structure in the Buena Vista Recreation Lakes with a fish screen, a 72-inch diameter RCP siphon under the existing Rim Ditch, 600 feet of lined concrete canal, and a pumping plant. The pumping plant will be adjacent to the California Aqueduct with the discharge lines passing under the existing operating road. The plant will have outdoor units and will be similar in construction to the CVC pumping plants. The pumping plant has been sized for a capacity of 200 cfs at full project development with four 50 cfs units. For the First Stage, only two of the four pump units, discharge lines, and outlet structures will be constructed.

OTHER PROJECT FACILITIES

To provide operational access to the new facilities and to connect each of the recharge pond systems and extraction networks to the existing state and county roads, an additional 17.4 miles of primary and 21.1 miles of secondary roadways will be constructed. Most of the primary road construction will consist of upgrading existing field roads or will be incorporated with other new facilities. The balance of the primary roads required will be constructed to minimize impacts to native habitat and/or areas known to be used by sensitive wildlife. The primary roads will have a 4-inch-thick, 20-foot-wide gravel surfacing.

The secondary roads will have a 4-inch-thick, 8-foot-wide gravel surfacing. The secondary road network will provide access from the primary road network to each well and to each control structure for the recharge ponds, the recharge conveyance system, and the extraction system. About 17.4 miles of secondary roads will be located on recharge pond and conveyance canal embankments. Another 3.7 miles of the secondary roadway network will be constructed between facilities or along buried pipelines.

Warehousing facilities may be needed for construction activities for the KFE project. These facilities have not been included with the First Stage facilities, and their impacts will be analyzed in the environmental study for the stage in which they are constructed.

Climatic Monitoring Station. DWR will install a climate station on the KFE property to provide data for computing evaporation losses during recharge. An on-site climate station is essential for making reliable estimates of evaporation from recharge pond surfaces. In addition, a long-term record of weather data, collected under standardized conditions at the same geographic location, will be important to users throughout the southern San Joaquin Valley.

Possible locations for the climate station are shown in Figure 7. The station will occupy a ten acre site, with five acres consisting of irrigated and actively transpiring grass cover to provide a stable

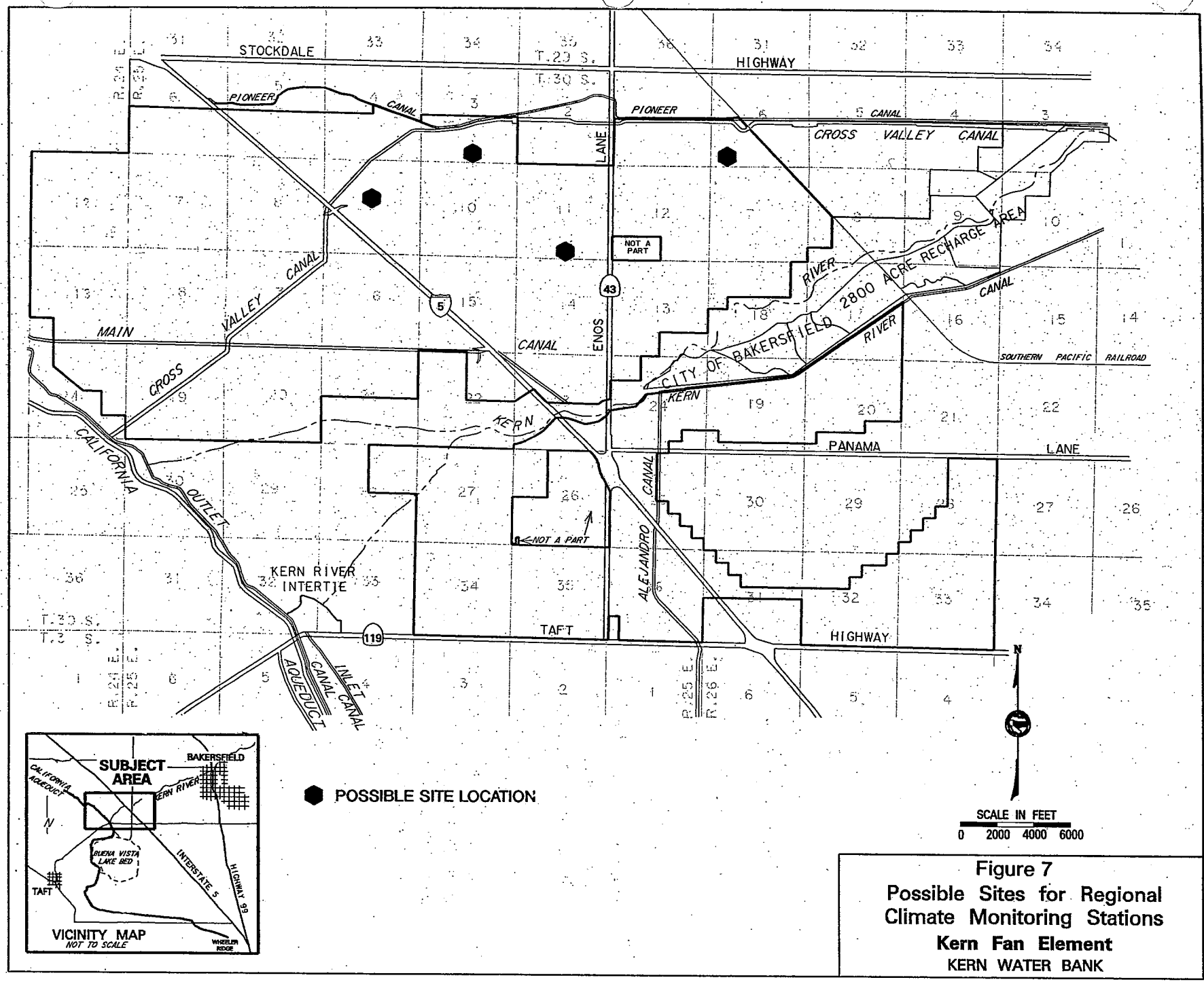


Figure 7
Possible Sites for Regional Climate Monitoring Stations
Kern Fan Element
KERN WATER BANK

environment for the instruments. The remaining five acres will remain unirrigated to allow measurement under "dryland" conditions. The following information will be collected for the irrigated environment:

- Solar radiation
- Air temperature
- Air humidity
- Evaporation
- Atmometer evaporation
- Wind speed at two miles
- Wind speed at 0.5 mile
- Wind direction
- Precipitation rate and amount
- Soil temperature at five standard depths
- Air pressure
- Drain gage Lysimeter

Evaporation, atmometer evaporation and soil temperature will be measured at the dryland site.

ADVANCE ENTITLEMENT DELIVERY

During 1989, staff from DWR and the State Water Resources Control Board (SWRCB) discussed the need to amend DWR's SWP water right permits to accommodate operation of the KWB. SWRCB staff indicated that DWR would need to amend several provisions of its permits if DWR were to be directly storing and extracting water in a manner similar to present activities at SWP surface storage facilities.

Any modification of the existing water right permits is expected to take some time and may not be possible until after the Board's current Bay-Delta Hearings process concludes. Therefore, near-term implementation of any of the KWB elements is unlikely if water right amendments are required. However, SWRCB staff indicated that they would not object if a water contractor received the water from DWR and then stored and later extracted the water.

As a result of these discussions, staff of DWR, KCWA, and the State Water Contractors developed the concept of advance entitlement delivery, to be used for initial stages of the KFE and appropriate local elements. This concept allows early program features to proceed, with the full development of the KFE proceeding following necessary water right permit amendments. KCWA has stated that at the expected near-term level of State Water Project development and the range of deliveries expected under water-short conditions, there is a limit to the magnitude of a program that can be covered by advance entitlement delivery.

From a practical standpoint, water would be delivered to KCWA at the California Aqueduct turnout to the CVC at Tupman in recharge years, KCWA would take control of the water and transport it to recharge areas on either the KFE property or the City of Bakersfield's 2,800-Acre Recharge Area.

During extraction years, water would be pumped from wells on the KFE property and delivered to KCWA in exchange for a like amount of SWP entitlement otherwise delivered from the California Aqueduct for that year. Ground water withdrawals and subsequent delivery would count as the fulfilled "advance entitlement delivery," allowing a reduction in entitlement deliveries from the Aqueduct. Extracted water would be exchanged for water that would have been delivered in either the CVC or the Alejandro Canal systems for local use to the extent possible. At times, some of the water will need to be returned to the Aqueduct for delivery to KCWA member units segregated from the KFE property. This is consistent with the advance delivery concept, since KCWA pays for and uses that portion of the California Aqueduct to distribute SWP water to its member units.

Extraction from the First Stage will be limited to the capabilities of the wells in the extraction system. Use of the 27 wells with conservative assumptions as to long-term pumping capacity results in an annual extraction capability of about 75,000 acre-feet per year, which is subject to deficiencies in water-short years. Almost 90 percent of this amount is for agricultural use, which is subject to the first level of deficiencies under the SWP water supply contracts. It would take a very severe SWP water delivery deficiency with almost full deficiencies to agricultural use to jeopardize the extraction of First Stage water as advance delivery of entitlement. Nonetheless, it is expected that appropriate changes in DWR water right permit conditions will be sought in the next few years for long-term operation of the First Stage, subsequent KFE expansion, and local elements.

Provisions for advance delivery of entitlement will be incorporated in the operating agreement between KCWA and DWR. Similar provisions will be incorporated into the agreement among KCWA, DWR, and the City of Bakersfield for use of the 2,800-Acre Recharge Area and the Kern River Canal.

KERN FAN ELEMENT OPERATIONS

Operation of the First Stage is planned to provide information and experience to help in refining future operations and to identify operational problems. The ultimate design and operation of the KFE will be based to a large extent on experience with the First Stage.

The First Stage has been planned for a maximum ground water storage of 350,000 acre-feet. Recharge facilities will provide a maximum recharge capacity of 90,000 acre-feet in a six-month period — November 1 through April 30. Extraction facilities will provide the capacity to extract 75,000 acre-feet annually.

Under an agreement (to be negotiated) between DWR and KCWA, DWR will manage the general scheduling of deliveries to and from the KFE (as well as all other potential elements of the KWB), while KCWA will operate the KFE Facilities at DWR's direction.

Recharge Operations

Water will be delivered to the KFE during wet years from the SWP's Oroville and San Luis reservoirs and the Sacramento–San Joaquin Delta via the California Aqueduct to the CVC turnout at Tupman. From the CVC, water will be diverted to six KFE recharge basins and the City of Bakersfield's 2,800–Acre Recharge Area. The First Stage facilities will be designed to accommodate an average annual recharge rate of 90,000 acre-feet.

The City's recharge facilities presently have an estimated maximum annual recharge capacity of 200,000 acre-feet. The City has first priority to spread water in the area, and permits KCWA and other local water districts to spread and extract water through separate agreements. Under the proposed joint operating agreement with the City of Bakersfield, the City's 2,800-Acre Recharge Area would be available for use by DWR when it is not being fully used for local recharge. A review of monthly hydrology on the Kern River and the operation of the 2800-Acre Recharge Area indicates that the facility would have available capacity to recharge SWP water at least 90 percent of the time.

Priority for KFE recharge will be given to new recharge systems that are closest to the CVC in order to minimize the CVC user fees and power costs. The first priority for recharge will be given to the rehabilitated Stockdale Highway Ponds, second priority to the Tumbleweed Farms Ponds, third priority to the Enos Lane Test Ponds, Sunset Farms Ponds, and Main Canal Ponds, and the remaining recharge delivered to the City's 2800-Acre Recharge Area. Deliveries from the City's ponds to the South River ponds will be made once inflow to the ponds exceeds the accumulated recharge through the City's Pond No. 4 and water is available to divert.

The proposed agreement with the City for use of the 2,800-Acre Recharge Area requires that a minimum of 10 percent of the total recharge take place on the City's facilities. At the estimated capacity of the First Stage recharge ponds, about 60 percent of the recharge must be done on the City's facilities to achieve the total project recharge capacity of 15,000 acre-feet per month.

The proposed joint use agreement for the City's Ponds requires the First Stage recharge facilities be used for the recharge of Kern River water to the extent that KFE operations in the City area have diminished recharge capability that otherwise would have been used by the City and its spreading contractors. The proposed South River Ponds and Main Canal Ponds (via the new intake canal) can be used to satisfy this requirement. Monthly operations will be carefully monitored to ensure that the amount of any impairment to the City's recharge is within the capabilities of providing compensating recharge on the KFE property.

The use of the City's area for recharge offers an opportunity for a water exchange. Through exchanges with local purveyors, SWP water could be exchanged for a like amount of local water (primarily Kern River Water) for recharge in the 2,800-Acre Recharge Area. Such exchanges could result in savings in user fees and power costs.

Due to capacity limitation of River Turnout No. 1, the recharge capacity of the City's ponds for SWP water will be limited to a maximum of 12,000 acre-feet per month. The estimated capacity of the recharge ponds on the KFE totals about 7,600 acre-feet per month. The total recharge capacity will therefore exceed the total needed capacity by 4,600 acre-feet per month, or 30.6 percent. This will allow any one of the six recharge pond sites on the KFE property to be taken out of service and the needed average monthly recharge rate maintained.

During recharge operations of the KFE, some portion of water delivered from the California Aqueduct will be lost. Two general types of losses are expected to occur: transportation losses in delivery of water from the Aqueduct to the recharge basins and operational losses in the recharge basins themselves. Transportation losses consist of seepage over unusable ground water areas and evaporation from conveyance facilities. Operational losses are expected to occur in the recharge

basins through evaporation from ponded water surfaces, phreatophyte use, and bare soil surface evaporation. Recharge basin losses constitute the bulk of the operational recharge losses.

Transportation losses during the First Stage are assumed to be minimal. The primary recharge conveyance facility during the First Stage will be the CVC, which passes over about one–half mile of higher salinity (greater than 1,000 mg/L total dissolved solids) ground water adjacent to the Elk Hills. Seepage losses in this stretch of the CVC will be treated as operational losses

First Stage losses are expected to range from about four percent for winter recharge to about seven percent for year-round recharge operations. The computation of recharge losses is explained in Appendix F of the Feasibility Report.

Extraction Operations

The planned maximum annual extraction rate for the First Stage is 75,000 acre–feet. Extractions will be made from the KFE during dry times in the SWP system. Stored water will be extracted at a uniform monthly rate through the use of the 27 production wells. Most of the wells will be connected for delivery into the CVC. Eight of the 27 wells will be connected to the Alejandro Canal. These wells are closest to the City's recharge facilities and effect the most direct use of the majority of the First Stage program recharge. These wells constitute about 30 percent of the project extraction capacity in comparison to the 60 percent of the total recharge accomplished through the City's facilities. Consequently, these wells are assumed to be run at full reliable capacity. To meet the uniform monthly extraction demands of 6,260 acre-feet per month for the First Stage program at the estimated average production capabilities, only 19 of the new and rehabilitated wells would be necessary. The 19 wells that discharge into the CVC will be operated at somewhat less than full capacity to meet the remaining portion of the project commitments. Lowest use would be given to the wells in the Main Canal system to avoid impacts to the nearby West Kern Water District well field.

Preliminary studies indicate that there should be adequate exchange potential to absorb the extractions from the 19 wells connected to the CVC. Additionally, the need to return extractions from the CVC to the California Aqueduct for local exchange is not anticipated for the First Stage operations. Since no definitive long term need has been identified for the First Stage program, neither temporary or permanent facilities to return water from the CVC to the California Aqueduct have been studied in detail.

The extractions from the eight wells connected to the Alejandro Canal will be delivered to the Buena Vista Aquatic Recreation Area Lakes. When the capacity for exchange exists, the extraction water will be exchanged with the Buena Vista Water Storage District and the Henry Miller Water District. The exchange would be made for SWP entitlement deliveries that would normally be delivered via the California Aqueduct to the Buena Vista Lakes. Since these water districts are on an agricultural demand schedule and the extractions are made at a uniform rate, there will be times during the year when exchanges are not feasible. In water-short years the entitlement will be reduced for deficiencies and the extractions will often exceed the reduced entitlement. This situation will also reduce the potential for exchange. In these situations, the water will be returned to the California Aqueduct via the Buena Vista Lakes Pumpback Facility. Estimates based on SWP 3.7 MAF level demands indicate up to 58 percent of the Alejandro system extractions could be returned to the California Aqueduct. Meeting the 6,260-AF-per-month extraction demands on the

First Stage program at the estimated average production capabilities would require only 19 of the new and rehabilitated wells, which would translate to a required reliability factor for the wells of about 0.70.

OPERATING CRITERIA

The basic KFE operating rules are summarized below:

Parameter	Criteria
Maximum recharge rate	15,000 acre-feet per month
Annual recharge period	November – April
Maximum extraction rate	6,200 acre-feet per month
Extraction months	Year-round

Beyond these basic rules are a number of operating criteria that will determine the water supply benefits from the program, as well as the local impacts. At this stage of project development, these rules are for planning and discussion. More detailed and/or revised operating criteria will likely be developed as the project moves into operation. The criteria are divided into recharge and extraction categories.

Recharge Operating Criteria

A key goal of the First Stage is to gain as much experience as possible operating recharge ponds at various locations on the property. This experience is expected to provide necessary information for expansion of the KFE to its ultimate storage, recharge, and extraction capacities as set forth in the Program EIR and Technical Report. First Stage recharge facilities are planned to be located at representative sites on the property. Another goal, as set forth as a requirement in the draft agreement for the joint use of the City of Bakersfield's recharge facilities, is that, over the life of the agreement, a minimum of ten percent of KFE recharge will be recharged in the City's facilities.

No problems are expected in meeting either of these goals. The First Stage is proposed to be operated in a six-month recharge mode, with maximum monthly recharge of 15,000 AF. Using conservative assumptions regarding expected recharge rates for designated areas on the KFE property, roughly 40 to 50 percent of monthly recharge is expected to occur in DWR recharge sites. The remaining will be recharged in the City's facilities. These recharge percentages are expected to be changed in the future by constructing additional recharge facilities on KFE property in a subsequent stage of project development. The percentages could also be changed if the recharge period were expanded or contracted.

Extraction Operating Criteria

The goal of extraction is to sustain adequate long-term pumping rates at each of the wells and avoid significant adverse impacts to surrounding ground water users. Extraction will occur when the SWP annual operating rules (Risk Curve) require that withdrawals from ground water storage be made. It is anticipated that extraction in the first year of a dry period would begin in March and continue month-to-month as long as needed. Based on the historical recurrence of dry years, most extraction periods would be two years or less. The exception to this is the 1928–1934 drought period, which is a primary basis for design and operation of SWP facilities. During this seven-year period, extraction would occur nearly continuously, with several months of recharge during the winters of 1930 and 1932.

Chapter 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

The comments received on the Notice of Preparation for the First Stage Kern Fan Element program conveyed interest regarding potential effects on water quality, wildlife, and wildlife habitat. The Department of Water Resources agreed, as part of the KFE program discussed in the 1986 EIR, to include a plan in the KFE development that would allow lands not actively used for recharge to revert to native habitat. Vegetation and wildlife studies are currently being conducted to inventory the status of species on the KFE property.

DWR acknowledges that sensitive wildlife species are present on the KFE property and that the construction of the KFE facilities will result in impacts to wildlife. These impacts will be fully mitigated within the KFE boundaries and in compliance with CEQA and other applicable regulations. In addition, the net long-term effect of converting the remaining KFE lands that are not reserved for recharge and extraction to native habitat (both wetland and upland) will be beneficial to wildlife, especially to threatened, endangered, and sensitive species that have been jeopardized by human disturbance and/or agricultural activities in this area.

Since some of the issues raised in the Notice of Preparation were not evaluated in the Program EIR, those issues will be examined in this document. This chapter describes the affected environment and sets forth those environmental matters that would potentially be impacted by implementation of the proposed project. Included are the results of the water supply studies and the resulting impacts on SWP operations and water deliveries; a discussion of the resulting increases in diversions from the Sacramento-San Joaquin Delta; a discussion of ground water basin water quality and the quality of water to be recharged and extracted; a discussion of potential impacts on local and regional ground water levels; a description of wildlife and vegetation and the potential impacts to those resources; and a description of existing land uses on the KFE property and how land uses may change in the future.

WATER SUPPLY STUDIES

First Stage deliveries to storage will occur from November to April. The First Stage has the capability of storing a significant amount of excess Delta flows and improving the delivery capability of the SWP. Excess Delta flow is water not subject to prior water rights and not needed to meet Delta water quality requirements. The First Stage is also capable of receiving storage transfers from Oroville and San Luis Reservoirs so that these reservoirs can capture additional runoff.

The additional water that can be delivered as a result of the proposed project is determined by modeling SWP operations. Operation studies are conducted to evaluate the existing or pre–project

water supply capability to define a "base case" condition. Studies are then conducted with the proposed project integrated with existing SWP facilities. The difference between the two capabilities is the additional water supply that would be developed as a result of the proposed project.

Water supply studies are performed using DWR's planning simulation model - DWRSIM. This model simulates the monthly operation of the SWP and Central Valley Project (CVP) system of reservoirs and conveyance facilities. It is a key tool for planning new facilities to meet California's future water needs. The model accounts for various capacity restrictions, reservoir operating criteria, wheeling agreements, instream flow requirements, water quality requirements, Delta export limitations, losses, and other related factors that might affect storage levels and flows in the system.

The studies performed for the First Stage evaluated the operations of the project at three future levels of SWP annual delivery requests:

- 3.5-million-acre-foot request
- 3.7-million-acre-foot request
- 4.2-million-acre-foot request

Model simulations used the historic hydrology for the 57-year period, 1922 to 1978, with adjustments to reflect present or future land use and other factors.

The proposed project was evaluated in two operational modes. The first assumed that recharge and extraction would operate within the total storage limit of 350,000 acre-feet. The second operational mode used a "surcharge" concept, whereby an annual encroachment of 50,000 acre-feet above the 350,000 acre-feet limit was allowed, with a requirement that this water would be pumped out and delivered during the same year. This annual encroachment, or "surcharge", was evaluated to determine if additional water supply accomplishments could be gained, and to demonstrate an alternative way in which a ground water program could operate. No specific detailed operational rules have been developed to refine this concept further.

Initial water supply study assumptions were developed in late 1989. At that time, it was decided to perform water supply studies at the three different levels of future SWP entitlement delivery demand. This provided a range from near-term demands when the KFE could be operational to the long-term maximum demands provided for in the water supply contracts. Assumptions were developed for additional specific SWP facilities that were expected to be operational to help meet those future demands. Such facilities included completion of the additional pumps and the SWP Banks Delta Pumping Plant, and development of the South Delta Improvements to allow full use of the additional pumps.

A more difficult matter is the assignment of years when these events were assumed to occur. In recent years, long-term requests for entitlement deliveries have been increasing. In fact, the demand of 3.5 MAF in the first level of the water supply studies corresponds to the level of SWP contractor requests for 1995 in the recently published DWR Bulletin 132-90, but it also corresponds to the requests submitted in the fall of 1990 for deliveries during 1991. Near-term requests for delivery of entitlement are fairly likely to vary in accordance with near-term prevailing water supply circumstances. Through much of California, 1990 represented the fourth consecutive dry year.

While the water supply studies were conducted at the three future demand levels, there is no absolute certainty as to when these levels of request would be reached. Initially, the years assigned to each demand level used in this study were based on the water delivery requests published in DWR Bulletin 132-90. Subsequent requests from SWP water contractors received in fall, 1990 (to be published in Bulletin 132-91 in fall, 1991) indicate that the near-term levels of demands could be reached sooner than assumed.

Given lack of absolute certainty concerning near-term SWP entitlement delivery requests, this report assumes that near-term requests at specific levels will be reached some time during the period of years shown below:

Demand Level	*Period During Which Demand Level Is Reached*
3.5 MAF per year	1991 – 1995
3.7 MAF per year	1996 – 2000
4.2 MAF per year	2010 and thereafter

A further matter is the set of assumptions used in these studies regarding timing of future SWP facilities. Completion of the four new pumps at the Banks Delta Pumping Plant is assumed for the 3.5 MAF studies (operated under existing pumping limitations), since these facilities are scheduled to be completed and operational in late 1991. Channel improvements and facilities in the South Delta (referred to as South Delta Improvements) are assumed to be completed and operational by 2000, but they do not show up in these studies until the 4.2 MAF demand level. This is because studies at the maximum contractual demand level of 4.2 MAF were needed, and no intermediate studies were made with the South Delta Improvements in place at lower demand levels.

The actual years assumed in the studies for demand level attainment have no effect on the water supply accomplishments output from each study. The studies just look at the demand levels and specific assumptions (including assumed future facilities). Specific years assumed for each study level have importance only in the evaluation of economic long-term benefits and costs in the SWP service areas.

The historic measure of the SWP's delivery capability has been the concept of "firm yield" operation. Defined in the water supply contracts as "minimum project yield," firm yield is the dependable annual water supply that can be made available without exceeding specified reductions ("deficiencies") in agricultural deliveries during extended dry periods. More specifically, firm yield has been classically defined as the maximum reliable amount of water that could have been delivered by the SWP to its water contractors during a recurrence of the historic seven-year dry period (1928–1934), subject to deficiencies applied under water contract criteria. Under past planning period assumptions, the firm yield amount would be delivered in several of the seven drought years, while deliveries in the remaining years would be less than this amount. The firm yield of existing SWP facilities historically has been calculated to range from 2.3 to 2.4 million AF per year. Since 1987, contractor requests for entitlement water have exceeded that amount.

In addition to the development of new project facilities to increase water supplies, DWR and the SWP water contractors have been examining alternative operational strategies to improve the average annual delivery capabilities. Particular attention has been focused on using an alternative

method of operating the SWP. This method involves using water supply forecasts and analysis of the risk of varying delivery amounts and hydrology to determine project deliveries under most conditions. Since 1978, operational decisions for the SWP have been based on an annual analysis of the risk of delivering more project water and carrying over less storage to meet future needs. Such a risk analysis provides a rational means of deciding how much water to deliver in a given year and how much to leave in storage to provide for subsequent dry periods. This has led to operating the SWP in a manner that does not seek to preserve "firm yield" for delivery during a repeat of the historic seven-year drought of 1928-1934. Rather, the SWP is now operated under an increased-risk concept (the "Water Delivery Risk Analysis," or Risk Analysis), which currently favors maximizing deliveries over a shorter drought period. Consequently, the return of the 1928–1934 drought cycle could reduce SWP deliveries to amounts less than those determined in earlier studies based on firm yield.

With the various possibilities in the delivery logic, it has become increasingly more complex to define the water supply benefits of a proposed future project by any one measure. The measures used in this report are: (1) the "average annual dry period supply" (explained below); (2) the average annual deliveries over the 57–year study period; (3) the average increase in deliveries during the 57–year period in years when improvement is possible; and (4) the potential changes in SWP operational flexibility resulting from the proposed new facility.

The average annual dry period supply (AADPS) is the average annual amount of increased SWP deliveries during the seven-year drought from March 1928 to February 1935 resulting from a proposed new SWP facility. The measure of delivery capability during this period has been the foundation for statewide water development in California for more than 50 years. Past use of the firm yield numbers is still in many people's minds. While the SWP is no longer operated on that basis, there is some interest in comparing past "firm yield" numbers to amounts calculated as AADPS. Firm yield is the *maximum* delivery in any one year during the 1928–1934 period (assumed in past studies to occur in three or four of the seven drought years) from which delivery deficiencies are applied, while the AADPS is simply the numerical *average* annual delivery during this same period. Firm yield studies did not use the Risk Analysis concept, while the AADPS numbers in this report are based on Risk Analysis operations. Unfortunately, firm yield and Risk Analysis operations and study results are not directly comparable, because the operational concepts differ and there is no consistent numerical relationship between the two. In some studies, the numbers are about the same. In other studies, there has been a difference of up to 20 to 30 percent. In addition, the firm yield and Risk Analysis concepts result in different reservoir operations, including changes in occurrence of reservoir spills and patterns of storage. Any comparison of firm yield numbers and AADPS numbers from a Risk Analysis study would require taking into account any differences between the studies in reservoir storage amounts.

At present, the SWP is operated on a year-to-year basis under the Risk Analysis concept. While the studies in this report assume Risk Analysis operation at future entitlement demand levels, no judgment or conclusion is made in this report as to the need for any future changes in the water supply contracts to reflect this operational mode.

The operation studies for the First Stage were conducted similarly to those prepared in the April 1987 "Preliminary Technical Report," with some changes in the operating criteria. Modifications

were made to reflect the recharge and extraction operation of the scaled-down project and the Risk Analysis operating procedures.

An objective in the water supply studies is to develop the greatest water supply benefits for the SWP within acceptable operating criteria. A new SWP storage project provides additional water supply benefits by providing more flexible operations for the entire SWP. It allows the SWP to store additional water that would not otherwise have been captured during wet periods. Historically, there have been many wet years in which Oroville Reservoir has been at full storage capacity and had to release water for flood control. During similar future periods, integration of new storage projects south of the Delta (such as the KFE) will allow the SWP to capture some of this excess water. In dry periods, increased storage and delivery capability of new storage projects will allow the SWP, as a whole, to deliver more water. New south-of-the-Delta storage projects also increase the probability of delivery in future years by transferring water from the northern SWP reservoirs to south-of-the-Delta storage before the wet season so that northern storage is available to capture more water. There is, therefore, a lesser degree of risk in releasing more water from storage than would have occurred without the project. In addition, new south-of-the-Delta storage facilities allow the SWP to divert and store more excess winter Delta flows.

A detailed description of the water supply studies is set forth in the First Stage Kern Fan Element Feasibility Report (December 1990).

Impacts on SWP Delivery Capability

The water supply accomplishments are summarized in Table 2. For the 3.5 MAF demand study, the First Stage increases the AADPS by 52 TAF and the 57-year average by 31 TAF. Results of the delivery capabilities for the surcharge operation are also shown.

Table 2. First Stage Kern Fan Element Water Supply Study Results In 1,000s of acre-feet

	Level of SWP Demand, in MAF		
	3.5	3.7	4.2
No Surcharge			
Average Annual Dry Period Supply (AADPS)	52	54	70
57-Year Average	31	44	56
Average Delivery Increase in Years That Improvement Is Possible	59	68	72
Surcharge Operations			
Average Annual Dry Period Supply (AADPS)	52	54	72
57-Year Average	33	49	68
Average Delivery Increase in Years That Improvement Is Possible	64	73	84

Figure 8 shows an increasing trend for several measures of SWP delivery capability. The AADPS increases from 52 TAF in the 3.5 MAF demand study to 70 TAF in the 4.2 MAF demand study. This increase occurs primarily due to the combined benefits of other proposed future SWP facilities. A key example is the completion and ultimate maximum operation of the four new pumps at

the Banks Delta Pumping Plant. There are several short wet months during the 1928–1934 dry period. The additional Delta pumping capacity could be used to recharge additional water during 1930 and 1932 for later delivery by the end of 1934.

Similar increases are noted for the 57-year average annual delivery increase in the studies, from 31 TAF in the 3.5 MAF demand study to 56 TAF in the 4.2 MAF demand study. There are two primary explanations for this increase. The first is that delivery demands are increasing over time, resulting in an increase in frequency when deliveries *would not* be fully satisfied. Over time, there is greater capability for the kind of water supply improvement that the KFE could provide.

The studies show that use of KFE storage would increase over time to meet these projected increased delivery deficiencies. The second explanation is that water supply benefits would increase from combined operation of future SWP facilities, as described above.

An additional measure is the average delivery increase in years that increased delivery is possible. While the 57-year average increase in deliveries is an important water supply measure, it includes years when all SWP demands would be met, even without the KFE. There, the 57-year average includes years when no delivery increases were needed. The number of years that full demands are met is expected to decrease as SWP demands increase. This measure of benefits was 59 TAF in the 3.5 MAF demand study, and it increased to 72 TAF in the 4.2 MAF demand study.

The "average delivery increase in years that increased delivery is possible" is a measure of benefits provided in years when they are needed. It is the sum of all water supply benefits for the 57-year period, divided by the number of years that such increased deliveries would be made.

Figure 8 also shows that the surcharge operation has an increasing benefit with increasing demand by consistently improving all three measures of increased delivery capability.

Decreases in Project Deficiencies

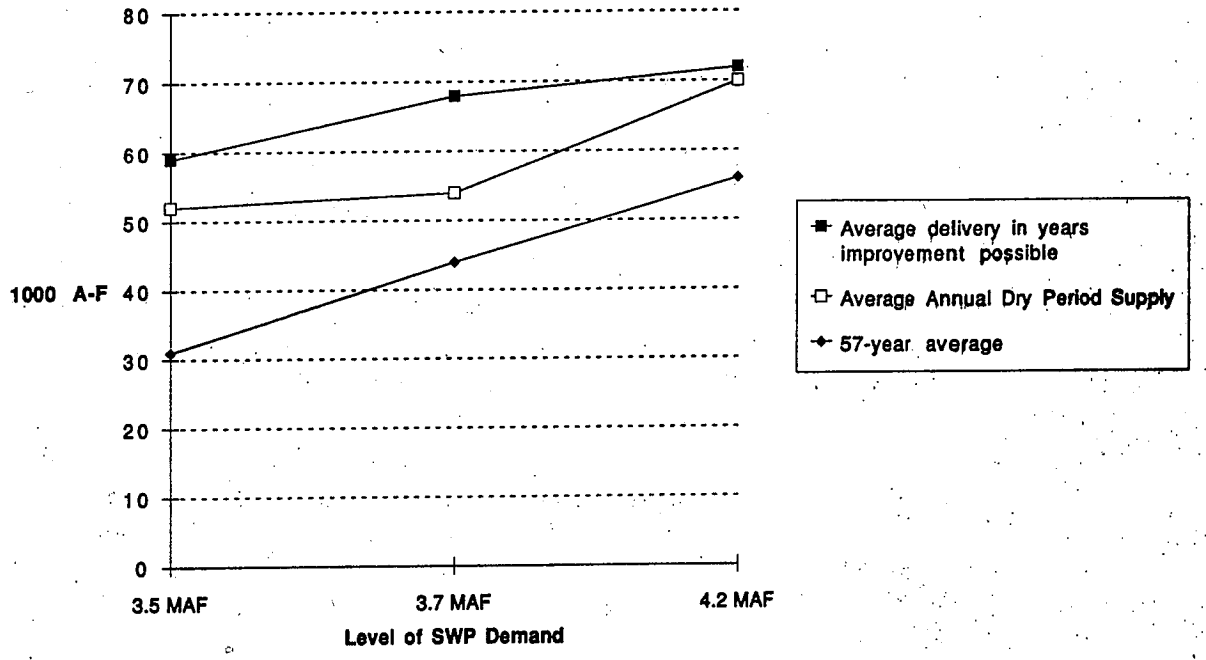
Figure 9 displays the probability distribution of deliveries associated with the Base Case condition, compared to the addition of the First Stage for the 3.5 MAF demand level. This figure indicates that the KFE would provide water supply benefits in the form of increased SWP deliveries over the full range of deliveries. This figure also shows that the First Stage would increase the probability of making full SWP deliveries from 47 percent to 49 percent.

As demands increase, the frequency of deliveries would be expected to decrease if limited new SWP facilities are brought on line. This is shown in Figure 10, which illustrates the probability distribution curves for both the 3.7-MAF and 4.2-MAF demand studies. A comparison of this figure with Figure 9 confirms the increased probability over time of not meeting full SWP demands. Note that at the maximum demand level of 4.2 MAF, the First Stage increases the probability of making full deliveries from 23 percent to 28 percent. Of course, this does not account for other potential SWP water supply additions being in place, such as the proposed Los Banos Grandes offstream storage reservoir.

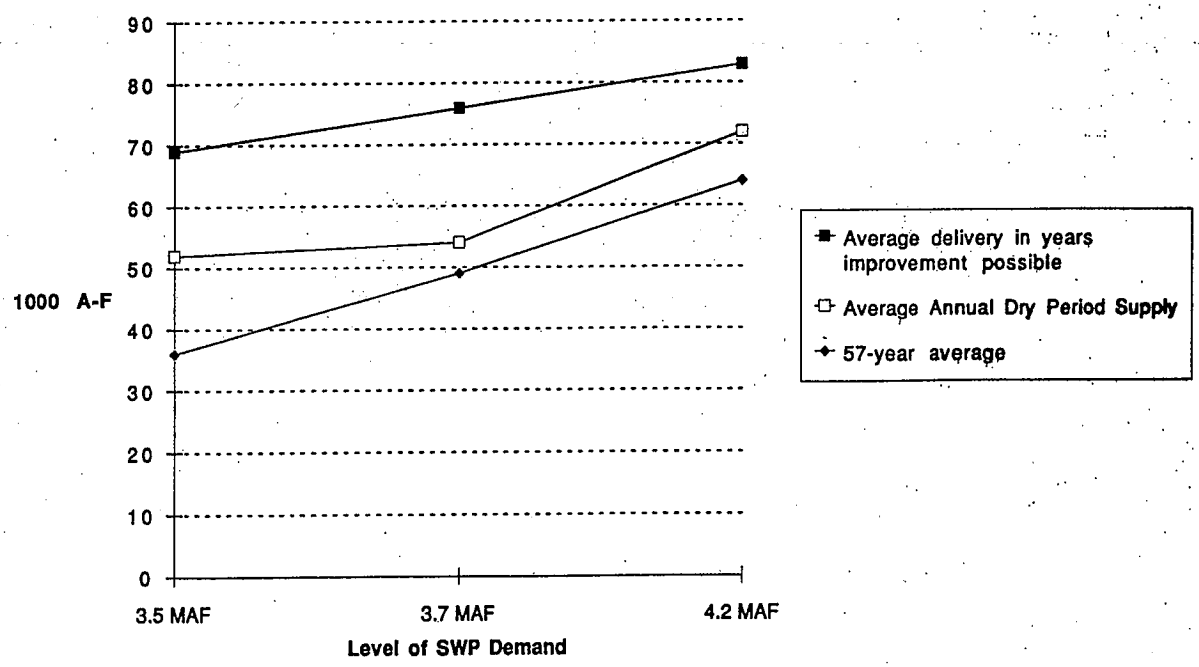
Figure 8 WATER SUPPLY IMPROVEMENTS

With and Without Surcharge

Water Supply Improvements Due To First Stage Kern Fan Element (No Surcharge)



Water Supply Improvements Due To First Stage Kern Fan Element (Surcharge Operations)



Kern Fan Element Storage Fluctuations

Figure 11 shows the storage levels at the 3.5-MAF demand level in the KFE for the 1922–1978 period. This figure indicates that storage drops to zero only during the 1928–1934 dry period, which is a steady-state study requirement. During other periods, the storage stays close to full. Even during the 1976–1977 dry period, storage drops only 150 TAF. This is due to the extraction limit of 74 TAF per year, which allows the full storage to be withdrawn during the seven-year dry period but leaves water in storage during shorter drought periods. Of course, the remaining storage is factored into the WDRA, resulting in greater use of other SWP facilities (and higher deliveries) than would otherwise occur.

Figure 12 shows the same tracking of KFE storage for the 3.7-MAF and 4.2-MAF studies. The purpose of these figures is to indicate that the KFE storage is used more as SWP deliveries increase.

The maximum extraction rate could have been increased to withdraw additional water from storage during a very severe, short-term period such as 1976-1977. While the additional extraction capability would increase water supply accomplishments during this two-year period, it would not increase deliveries for other circumstances. The storage fluctuations do not directly reflect increases in individual years in SWP deliveries. This is because reliance on KFE ground water storage as a "bank account" of water allows SWP surface reservoirs to deliver additional water and operate at lower levels. It is this integrated operation that provides the full measure of water supply accomplishments from the KFE. While it is possible to develop and connect additional wells to the extraction system to withdraw more water for a 1976-1977 circumstance, the economics of leaving such facilities idle for long periods of time would need to be evaluated. It is possible that this concept will be examined in the future. Use of additional wells would need to be evaluated from the standpoint of fluctuations in ground water levels.

State Water Project Operational Flexibility

The addition of the KFE adds to operational flexibility of the SWP by allowing reservoirs to be drawn down further to meet deliveries, thus providing greater capacity to store additional water during high flow periods. In addition, excess Delta flows in some winter months can be exported for KFE recharge when capacity is available at the SWP Banks Delta Pumping Plant. This is reflected in impacts of the First Stage on use of excess Delta flows, as well as impacts on Oroville Reservoir operations.

Figure 9 FREQUENCY OF SWP ANNUAL DELIVERIES (3.5 MAF DEMAND)

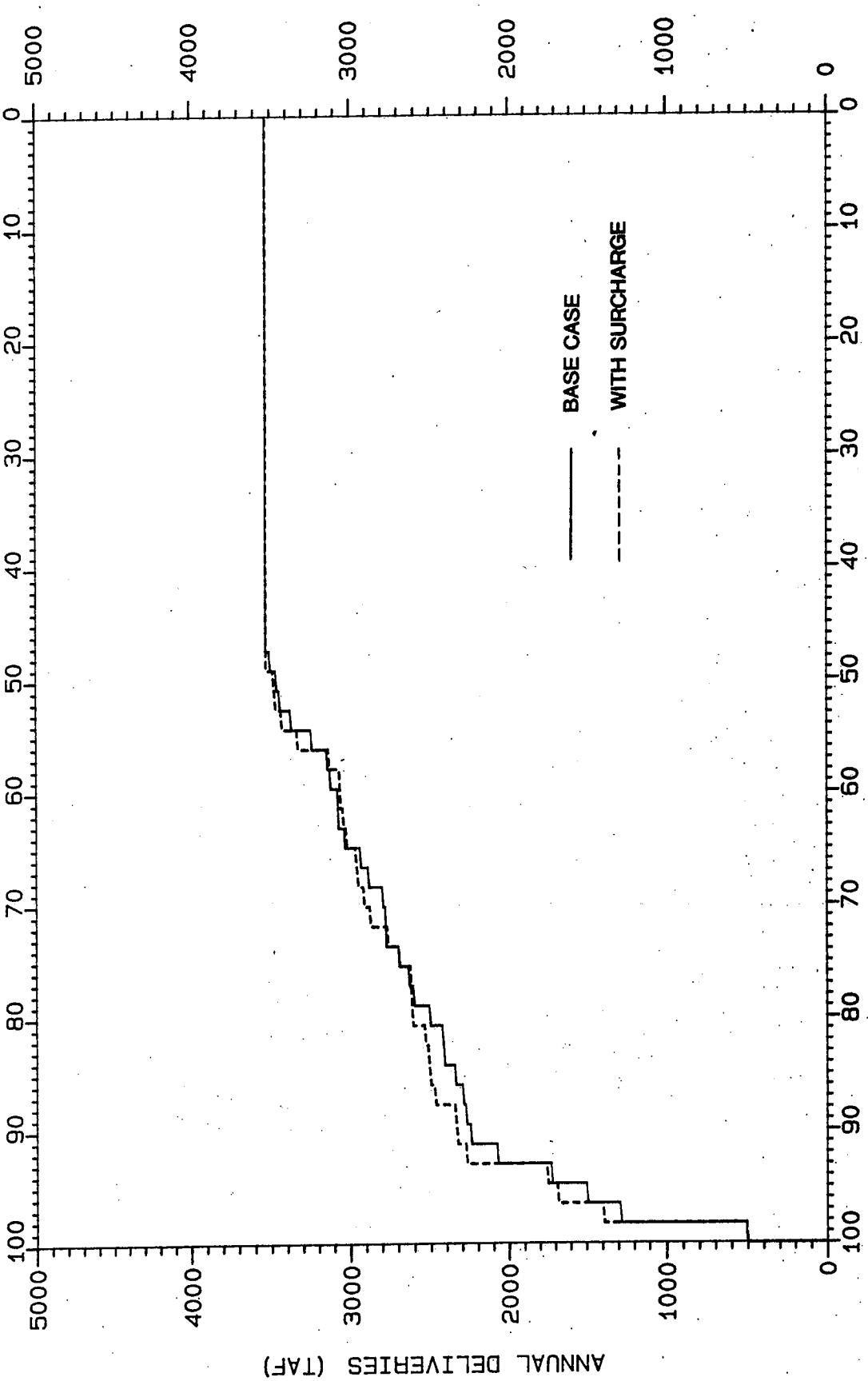
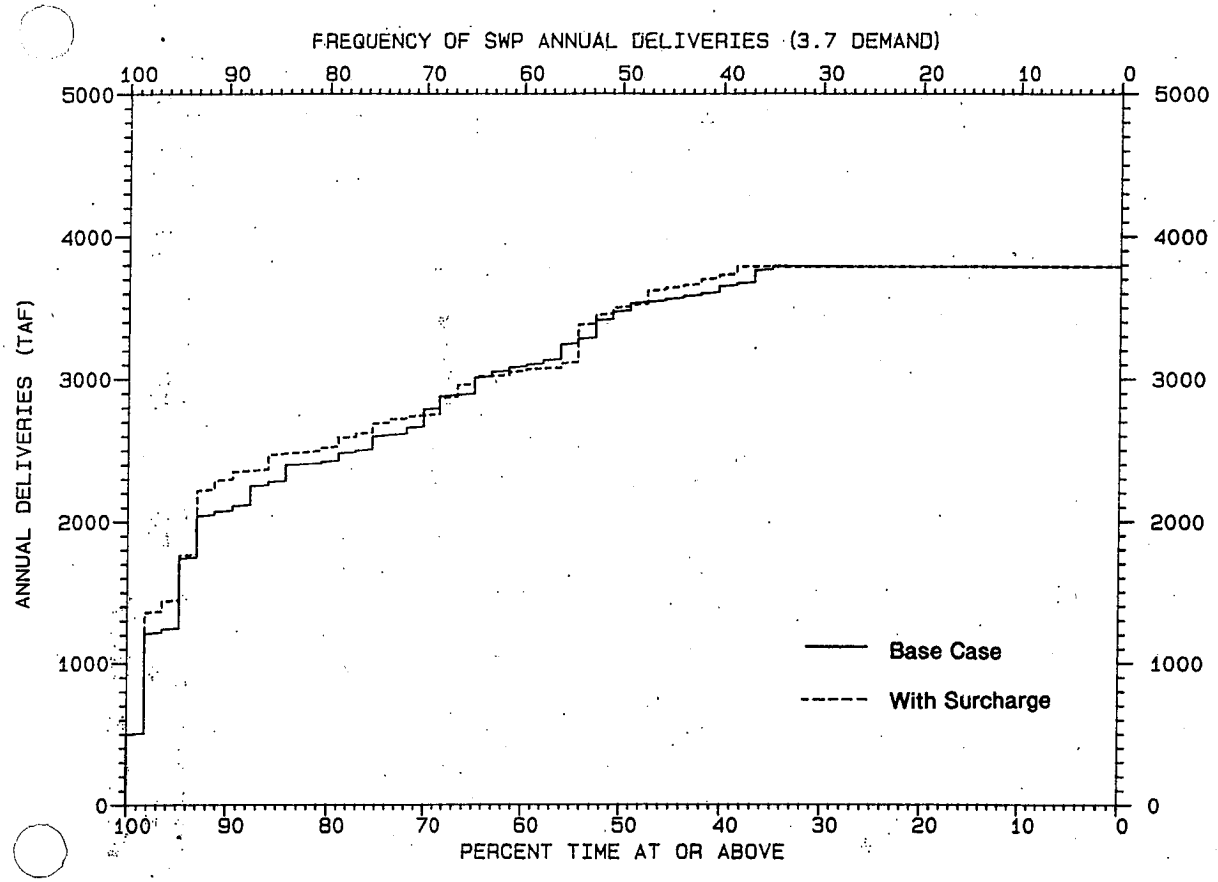
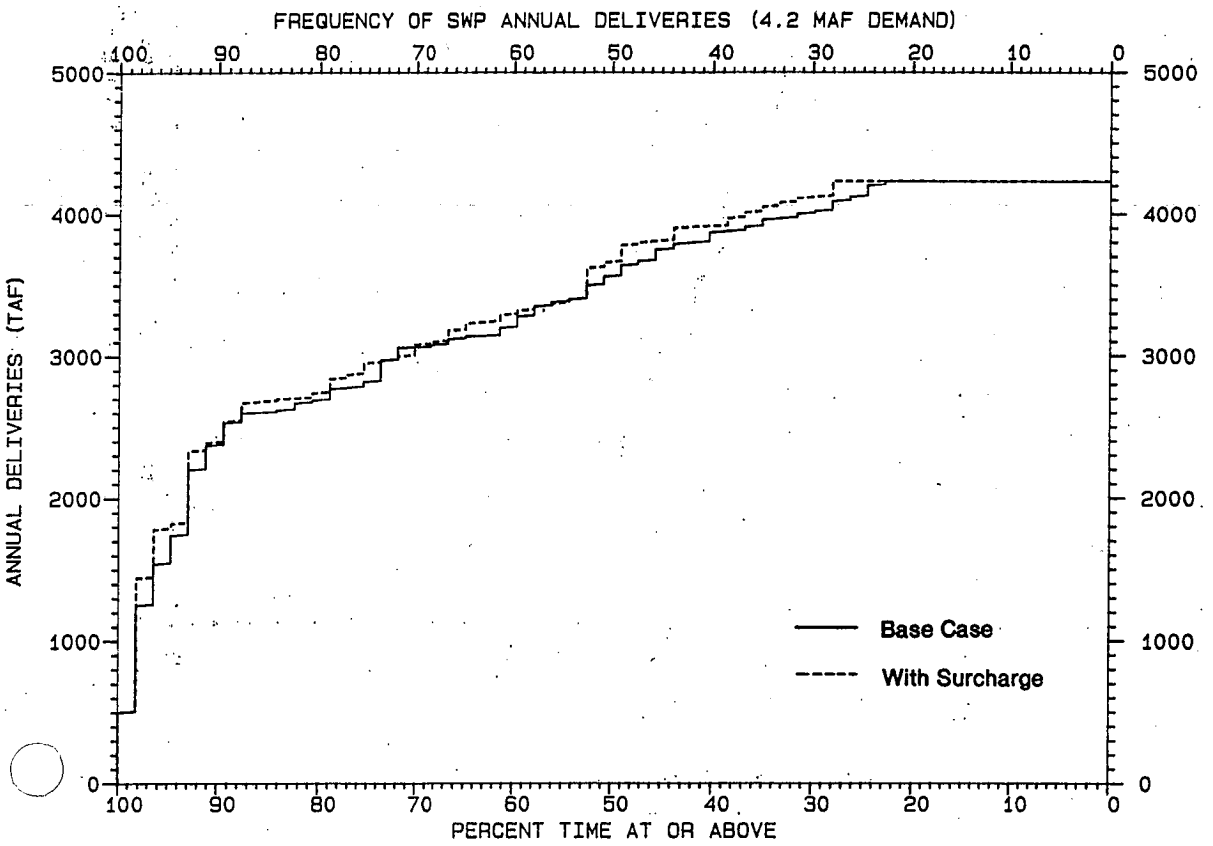


Figure 10. FREQUENCY OF SWP ANNUAL DELIVERIES (3.7/4.2 MAF DEMAND)





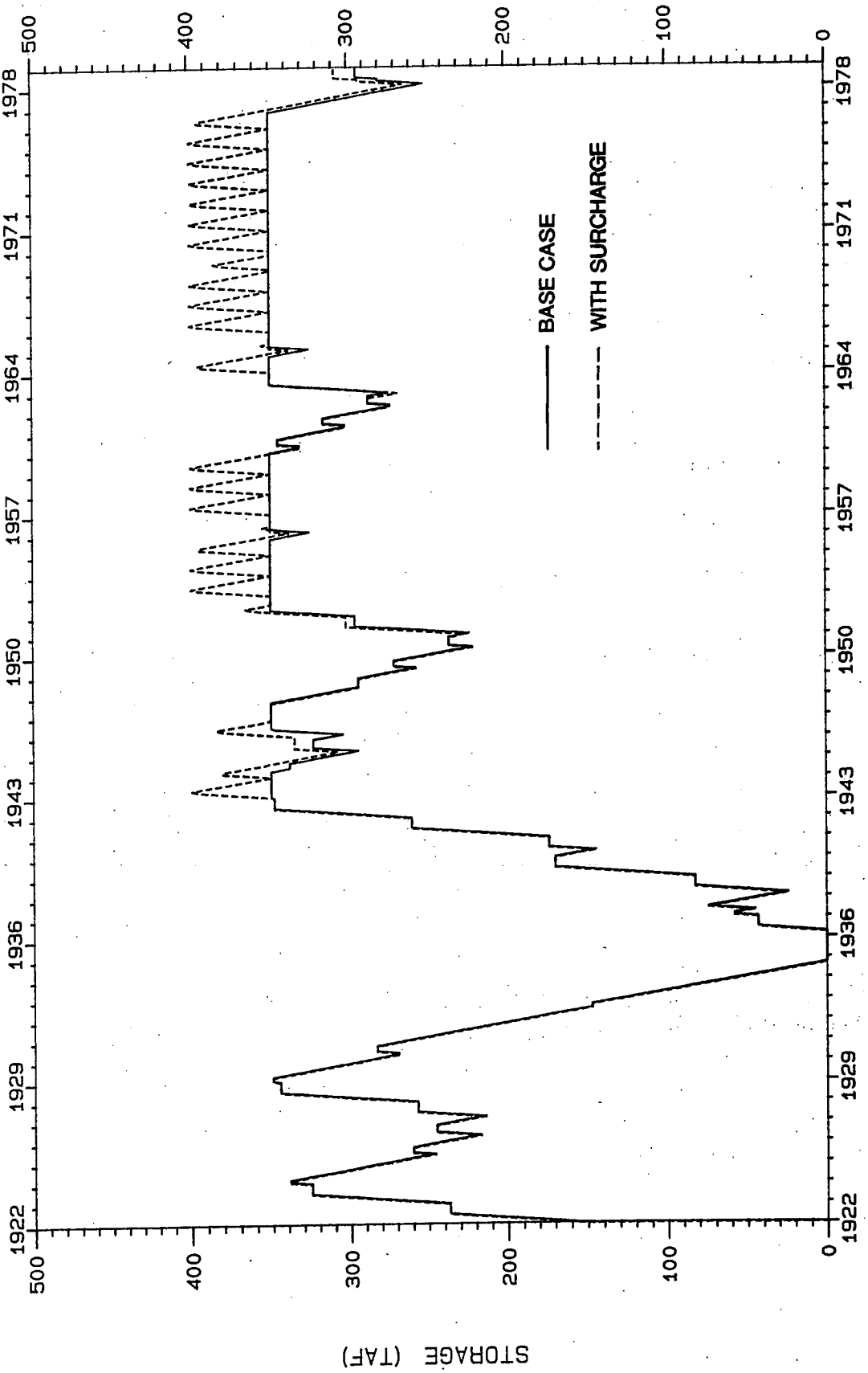
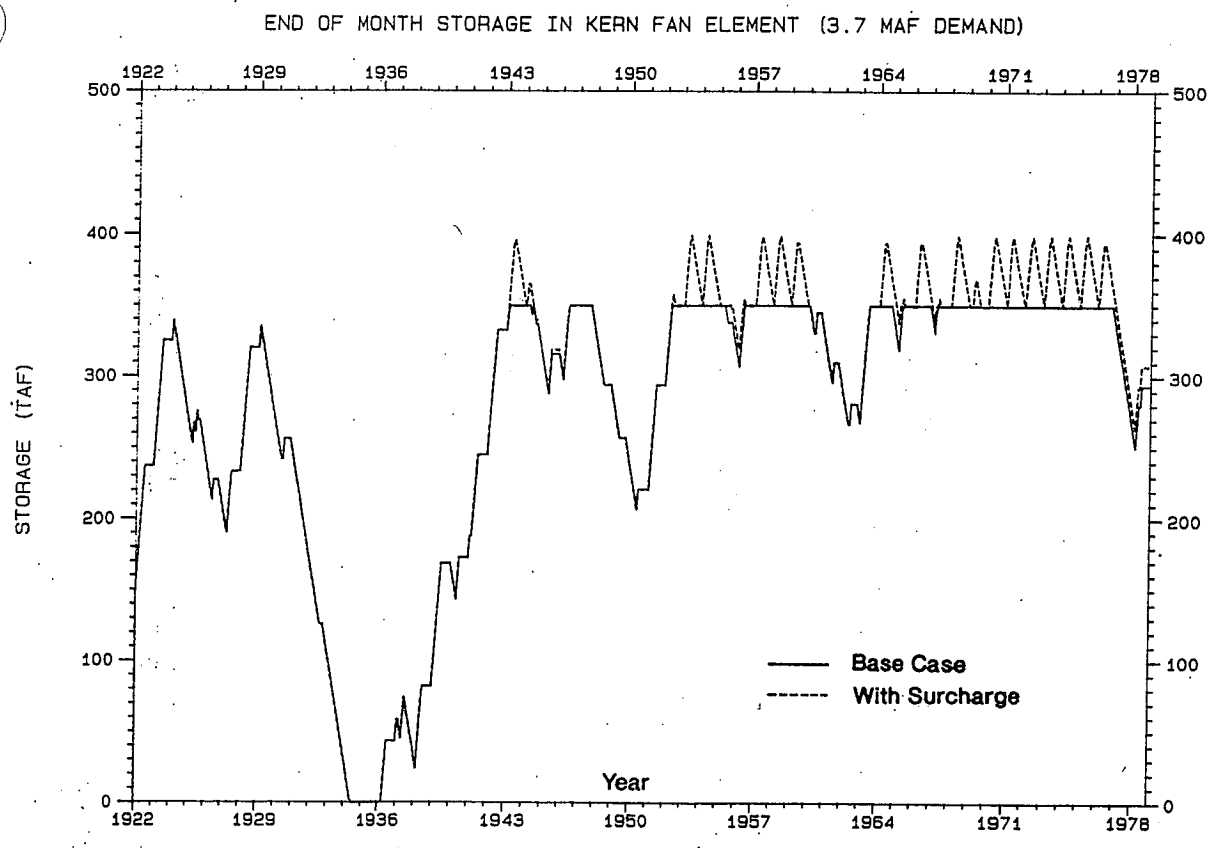
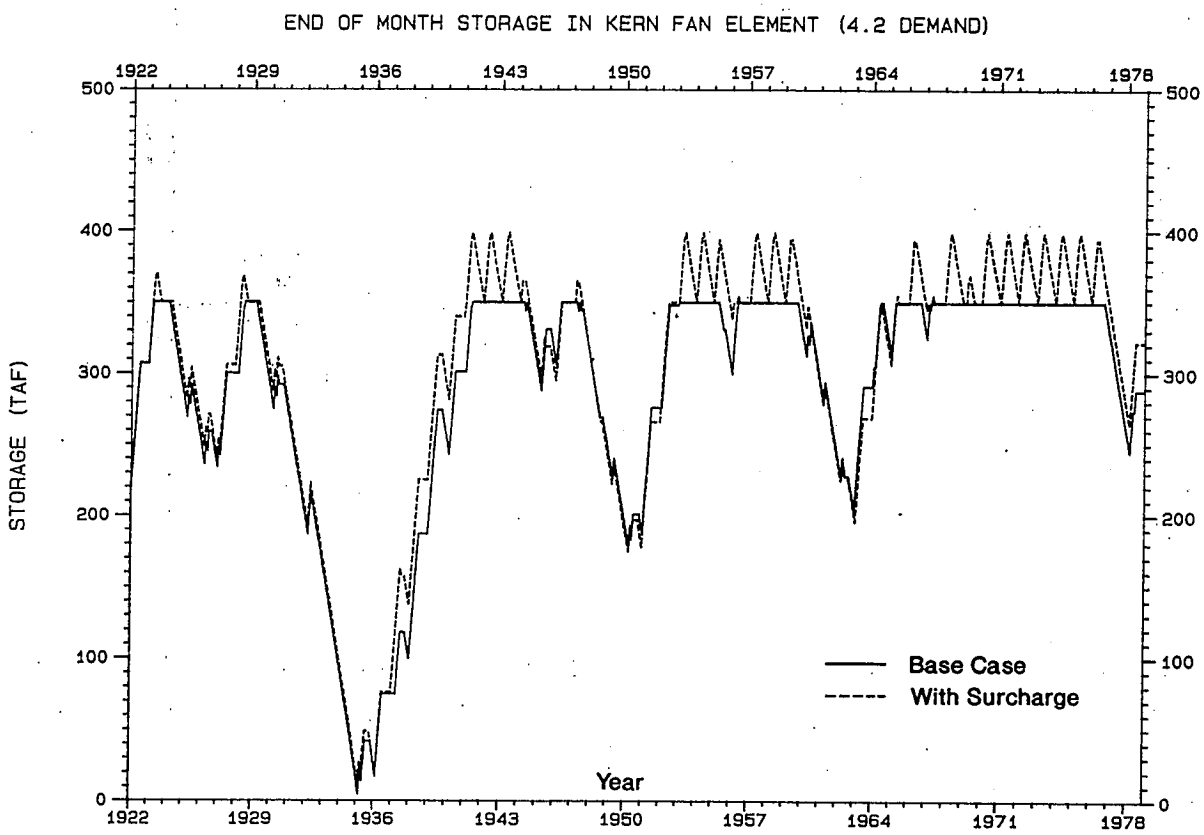


Figure 11 END OF MONTH STORAGE IN THE KFE (3.5 MAF DEMAND)

Figure 12 END OF MONTH STORAGE IN THE KFE (3.7/4.2 MAF DEMAND)





All studies conducted to date indicate First Stage KFE storage drops below 100,000 acre-feet only at the end of the critical dry period, 1928–1934. After the initial fill, these studies show that at least 150,000 to 200,000 acre-feet is in storage all the time outside the critical dry period (Figures 11 and 12).

During the 1928–1934 critical period, the KFE is drawn to its lowest levels. It is also a period during which Oroville Reservoir storage falls or threatens to fall below the minimum power pool. However, due to the severity of the 1976-1977 drought, Oroville Reservoir falls below minimum power pool for all studies during 1977. The maximum annual KFE extraction of 75,000 AF limits total storage withdrawals during short-term severe droughts such as the two-year period, 1976–1977. Therefore, the KFE would still have 200,000 AF in storage at the end of 1977.

Use of Excess Delta Flows. DWRSIM results were evaluated to determine impacts of capturing excess Delta outflows and the effects on the Delta carriage requirements over the 1922-to-1978 period. The quantity of excess water captured is similar to the quantity the First Stage can deliver on an annual average basis. The surcharge operation of the First Stage enables the SWP to capture a significant amount of Delta excess water in the 4.2 MAF study, since increased Delta pumping capacity was assumed. The results of the Delta carriage water requirements of the project indicate an increase in carriage water from the 3.5 MAF demand level study to the 3.7 MAF demand level study. In general, the quantities do not appear to be significant enough to affect the operation of the project. The surcharge operation appears to have some influence in decreasing the carriage requirements in the 3.5 MAF study. In the 4.2 MAF study, carriage water requirements decrease, due primarily to South Delta Improvements.

Impact on Oroville Reservoir. Results of monthly storage in Oroville Reservoir showed an average decrease of 64,000 AF over the 1922–78 period at the 3.5 MAF level of demand. In the 3.7 MAF and 4.2 MAF results, the average decrease was slightly higher than in the 3.5 MAF studies. Lowest storage levels in Oroville Reservoir increased by 11,000 AF at the 3.5 MAF level of demand. At the 3.7 MAF level, lowest Oroville storage was the same. These lowest levels occurred in 1977 for both the Base Case and the With Project studies. At the 4.2 MAF level, lowest storage occurred in late 1977 and decreased by 63,000 AF, compared to the Base Case. These variations in results indicate that Oroville Reservoir operations during the 1977 dry period are very sensitive to general SWP system operations.

POTENTIAL IMPACTS OF DIVERSIONS FROM THE SACRAMENTO-SAN JOAQUIN DELTA

Consideration has been given to potential impacts associated with the operation of the First Stage of the KFE on outflow from the Sacramento–San Joaquin Delta and associated impacts resulting from changes in export pumping.

State Water Project Planning

Past SWP future water supply planning programs emphasized construction of additional surface reservoirs in areas upstream of the Delta. Since the early 1980s, DWR has gradually shifted its focus from upstream facilities to the development of offstream storage facilities south of the Delta. Such facilities, especially ground water projects, have the advantage of: (1) avoiding inundation of significant fisheries and/or recreation streams; (2) reducing flooding of sensitive wildlife habitat, particularly ground water recharge projects; (3) avoiding the difficulties of moving additional water through the Delta to the export pumps during environmentally sensitive times of the year; and (4) providing increased opportunity for filling storage capacity with high Delta winter flows.

As an offstream facility, KFE has the additional advantage that (other than intermittent use of 1,100 acres of recharge ponds) all storage will be underground.

Impacts on Delta Outflow

The flow regime of the First Stage of the KFE involves recharge from November to April and year–round extraction. This six-month period coincides with the period of winter runoff and the availability of higher Delta outflows, as well as being outside the period of export pumping limits for fishery protection.

Water supply studies were done at the 3.5, 3.7, and 4.2 MAF levels of SWP delivery demands. Delta flow impacts will occur due to storage operations, when up to 15,000 AF per month (250 cfs) of water is diverted out of the Delta, conveyed through the California Aqueduct to Kern County, and spread in recharge basins. Impacts to Delta outflow will also occur as a result of re–operation of the State Water Project system in response to additional conservation storage. With the KFE, the SWP will be able to deliver additional water in many years, even under conditions when no water is pumped out of the KFE. The reason for this is that KFE storage will be accounted for in the SWP Risk Curve. Since surface storage can be refilled in most years, the Risk Curve sets a higher priority on use of surface storage than on the withdrawal of stored ground water. In part, this is due to the fact that the extraction rate, or "getaway capacity," of the KFE is only about 6,000 AF per month (100 cfs).

This operational mode is illustrated in Figure 11, which shows the year–to–year storage in the KFE account for a typical SWP operation study. This figure shows that for many years the KFE storage account is nearly full and is depleted substantially only during periods of prolonged drought. However, due to the effects of the Risk Curve, KFE benefits occur more frequently. Increases in SWP water deliveries due to the First Stage do not necessarily correspond to similar decreases in Delta outflow amounts in the same year, since a considerable portion of the addition-

al SWP deliveries is due to increased release and transfer of stored water from Oroville Reservoir. In addition, in some years following such storage transfer, Oroville Reservoir will be lower. Therefore, more water can be captured that would otherwise have contributed to Delta outflow during high-flow periods.

The KFE has the greatest opportunity to minimize adverse environmental impacts compared to potential surface water projects. In addition, potential conversion of some of the land from irrigated agriculture to native habitat will be beneficial to wildlife and will reduce overdraft in the Kern County ground water basin.

Winter-Run Salmon Impacts

The winter run of Sacramento River chinook salmon has been listed as endangered by California and as threatened by the federal government. It is a unique race of salmon that spawns during the May-August period in the upper Sacramento River between Red Bluff and Keswick Dam. Spawning, incubation, and juvenile rearing take place during summer months when Sacrament River water temperatures are typically warm. Before the construction of Shasta Dam, the winter run spawned in the cool reaches of the McCloud River. In the 1950s and 1960s, reservoir operation created favorable winter-run habitat due to generally colder summertime temperatures in the upper Sacramento River. The spawning population of winter-run salmon increased to about 170,000 in 1969.

For the past several years, the run has been quite low. For example, in 1989 the winter run consisted of about 550 spawners. Many biologists believe that the dramatic decrease over the past 20 years has been due to the construction and operation of the Red Bluff Diversion Dam and an increase in spring/summer temperatures in the upper Sacramento River. The dam itself caused delays in migration of adults upstream and juveniles downstream. Delayed adult migration can result in less than optimum spawning, and a delay of downstream migrants leads to increased predation by squawfish and other fish. Some winter run spawned below the Red Bluff Diversion Dam in water that was too warm for good survival of the embryos. In addition, inadequate screens at the intake to the Tehama-Colusa Canal resulted in juvenile entrainment. Temperature problems were particularly severe in dry years when low reservoir levels caused water released from Shasta Dam to come from the warm-water layer near the reservoir surface.

Other factors that have been identified as adversely impacting winter-run populations include:

- Impacts of acid mine drainage that enters the upper Sacramento River immediately upstream of Keswick Dam. The drainage comes from the inactive Iron Mountain mine site in the Spring Creek watershed.
- Limited spawning gravels in the upper Sacramento River.
- Fish losses due to entrainment at the Glen-Colusa Irrigation District intake and other water diversion structures in the Sacramento River and the Sacramento-San Joaquin Delta.
- Commercial and sport harvest

The potential impacts of the First Stage of the KFE on winter-run salmon would occur during their passage through the Delta as downstream migrants. The time when winter-run outmigrants are in the Delta is not well defined, but DFG believes that peak abundance is in the January-through-March period. During the winter months, river flows are generally high, temperatures are

cold, the Delta Cross Channel gates are closed, and local agricultural diversions are minimal. Although this combination of factors should generally result in good through-Delta survival, there have been no studies specifically designed to estimate survival of winter-run smolts.

During dry, critical, and below-normal precipitation years, river flows are generally low, even during winter months. SWP and CVP pumping may cause some winter-run juveniles to be lost at the pumps. Although there is no definitive means of distinguishing a winter-run juvenile from one of the other three races of salmon present in the Central Valley system, DFG has developed a size/time relationship that may help differentiate the winter-run salmon from the other races.

The probability of entraining winter-run juveniles during critical, dry, and below-normal years increases as pumping increases during the January-through-March period.

As described earlier, the First Stage may result in additional Delta diversions during the November-to-April period. The exact monthly diversions specifically for the KFE are variable, but they can be up to 15,000 AF. At this time, it is not possible to quantify the losses of winter-run salmon smolts due to the increased diversion.

The possible adverse impact on winter-run salmon as a result of increased Delta diversions for the First Stage will in any event be very small. In 1990, the SWP diverted about 3.1 MAF of water from the Delta. Future SWP deliveries are projected to increase independently of KFE operations. The First Stage would add an average of 50,000 AF per year to the diversions. This would be an increase of less than 1.5 percent in total diversions.

By itself, the increase in diversions for the First Stage would not have a significant effect on winter-run salmon. The problem is that a variety of factors have pushed the winter-run salmon to endangered status. Efforts to restore them to a healthy, sustainable population address many factors, with emphasis on conditions in the upper Sacramento River where most of the problems occur.

As a result of a prelisting cooperative agreement, an interagency winter-run team was established to develop a recovery plan. This agreement was to implement actions to improve the status of winter-run chinook salmon. The cooperating agencies are the Department of Fish and Game (DFG), the U.S. Fish and Wildlife Service, the U.S. Bureau of Reclamation (USBR), and the National Marine Fisheries Service (NMFS).

The agreement contains the following intended actions:

- Open the gates on the Red Bluff Diversion Dam from December 1 through April 1
- Develop more effective water temperature control capability at the outlet from Shasta Dam
- Develop measures to control squawfish predation at Red Bluff Diversion Dam
- Correct Spring Creek pollution problem
- Restore spawning habitat between Redding and Keswick
- Correct salmon-related problems at Anderson-Cottonwood Irrigation District Diversion Dam
- Restrict in-river harvest of winter-run chinook salmon
- Develop a winter-run chinook salmon propagation program
- Modify the Keswick fish trap to prevent mortality to winter-run chinook salmon
- Continue and expand studies on winter-run chinook salmon
- Develop fish ladders as an alternative to raising the Red Bluff Diversion Dam gates

A joint federal/State recovery team has been established pursuant to the endangered species acts. The team, which differs from the one established by the cooperative agreement, is under the di-

rection of NMFS and includes DWR as a participant. In addition to the recovery team, DWR is in the process of initiating informal consultation with NMFS and DFG on the potential impacts of proposed Delta facilities and changes in south-of-the-Delta storage projects on winter-run salmon

If the recovery team and the consultation process result in a finding that SWP pumping causes a taking so that an incidental take permit is required under the State or federal Endangered Species Acts, DWR will work to provide appropriate mitigation and offsetting measures. Measures being considered are:

- Participation in upstream measures that are critical to survival of the winter run. Examples include gravel restoration (such as now under way as part of the Delta Pumping Plant Agreement), construction and operation of a winter-run hatchery, and flow and temperature control accomplished through the Coordinated Operations Agreement
- Work with USBR to control diversion of winter-run smolts from the Sacramento River through operation of the Delta Cross Channel
- Work with DFG and other agencies to reduce losses at the SWP Banks Delta Pumping Plant intake by increasing screen efficiency and reducing losses to predators in Clifton Court Forebay.

The existing DWR/DFG agreement (described below) to mitigate the direct effects of SWP Delta pumping also established a program funded to benefit all races of chinook salmon in the Sacramento-San Joaquin system.

1986 Delta Pumping Plant Agreement

The primary impacts with additional Delta diversions associated with the First Stage will be direct fish losses at the Harvey O. Banks Delta Pumping Plant (Delta Pumping Plant). On December 30, 1986, the Directors of Water Resources and Fish and Game signed an agreement (Fish Agreement) to protect Delta fish populations by offsetting direct losses of fish at the Delta Pumping Plant. While many of the fish diverted are saved by fish screens at the pumping plant and returned to the Delta, others are lost due to predation, poor screening efficiency for small fish, and handling in the salvage process. These losses, called direct losses, occur from the time fish are drawn into Clifton Court Forebay until the surviving fish are returned to the Delta.

The Fish Agreement negotiations were aided by an advisory group consisting of representatives from United Anglers, Pacific Coast Federation of Commercial Fishermens' Associations, Inc., Planning and Conservation League, and the State Water Contractors. The agreement establishes a procedure for calculating direct losses on an annual basis and requires DWR to pay for mitigation projects that would compensate or offset such losses. In addition, DWR has provided $15 million to initiate a program to aid in the recovery of currently depressed fish populations.

Operation of the First Stage of the KFE is expected to result in minor increases in direct and indirect impacts to Delta fisheries. These impacts will result from additional diversions at the Delta during the period November – April, as well as the additional diversions and deliveries to SWP water users resulting from maintaining (and eventually withdrawing) this additional amount of SWP conservation storage.

Direct Delta impacts associated with First Stage operations will be handled by the existing December 30, 1986 agreement, which addresses Delta diversions with existing Delta Pumping Plant limitations imposed by the U.S. Army Corps of Engineers, and SWP contractual commitments for water deliveries. The First Stage is feasible and can be fully operated without additional pumping capacity.

Pursuant to Article VII of the Fish Agreement, DWR and DFG have commenced negotiations on further agreements which will address fishery impacts not considered in the December 30, 1986 agreement. These impacts include indirect effects from existing SWP operations and future additions to SWP facilities (including the First Stage of the KFE). USBR has joined in these negotiations, and the indirect impacts of the CVP are also being addressed.

If the Article VII negotiations have not been completed by the time recharge activities are scheduled to begin at KFE, DWR will establish a mitigation program that will implement some of the following provisions:

- Continue support for studies on the effect of temperature and flows and how project operations might be improved to benefit fish and wildlife.
- Install temporary barriers and monitor benefits to fish and wildlife.
- Support increased State federal funding for mitigation studies and projects.
- Support the feasibility of installing fish screens on other large Delta diversions.

A "Framework of Process to Address Fish and Wildlife Impacts of the State Water Project and Central Valley Project in the Sacramento-San Joaquin Estuary" was signed by DWR, USBR, and DFG in October 1990. This framework agreement forms the basis for subsequent agreement(s) that will cover the indirect impacts of both the SWP and CVP in the estuary.

WATER QUALITY

This section provides a discussion of the known and potential surface and ground water quality concerns on the KFE property.

Recharge Water Quality

The water that will be used for recharge, SWP and/or Kern River water, is generally of excellent mineral quality. It is also expected to be of good quality with respect to organic contaminants, although only limited historic data is available. Kern River water is a low total dissolved solids (TDS), sodium–calcium bicarbonate type water. The average TDS is about 90 milligrams per liter (mg/L) and ranges from about 50 to 190 mg/L. Water from the California Aqueduct averages about 250 mg/L TDS, with levels seldom falling below 150 mg/L and very rarely exceeding 500 mg/L.

Use of low TDS Kern River water for recharge may be detrimental on soils containing significant amounts of clay because of the tendency to cause deflocculation and thereby reduce permeabilities. At times Kern River and SWP water contain a high percentage of sodium which could also result in development of permeability problems on sensitive soils. In addition, during periods of local inflow to the California Aqueduct suspended solids content is sufficiently high to require cessation of recharge.

Water quality criteria for recharge will be established to guide project operation. Criteria will be established for the following parameters: (1) electrical conductivity as a measure of TDS; (2) sodium content; (3) total suspended solids; (4) turbidity; (5) organic constituents; and (6) nutrients. A start toward developing criteria are the TDS goals proposed in the agreement being negotiated for use of the City of Bakersfield's 2800–Acre Recharge Area. The proposed criteria limit TDS to 500 mg/L instantaneous, 440 mg/L as a 30–day average, and 300 mg/L as an annual average. These requirements can be met most of the time other than dry and critical years (when little recharge of SWP water would be expected to occur).

Salt Balance

The Kern County Ground Water Basin is essentially a closed hydrologic system and, as such, is experiencing an adverse salt balance. Each year salts dissolved in surface water deliveries from the Kern River, the California Aqueduct, and the Friant–Kern Canal arrive in the basin. Essentially, no salts leave. It is desirable to operate the KFE in a manner that does not significantly worsen the basin's adverse salt balance.

Mineral quality of ground water varies considerably (TDS ranging from about 100 mg/L to 4,000 mg/L and averaging 280 mg/L) in the project area. The average TDS of SWP water for recharge is expected to be about 203 mg/L, based on review of measured California Aqueduct water quality from January 1980 through December 1989 for wet and above–normal Sacramento River Index years. The wells selected for First Stage operations currently have an average TDS of 174 mg/L. This is lower than the 280–mg/L average TDS of KFE ground water for two reasons. First, extraction facilities selected for First Stage use are concentrated near proposed KFE recharge facilities and the City's 2,800–Acre Recharge Area -- both areas of good water quality. Second, extraction during First Stage operations will intentionally avoid areas of poor ground water quality along the western edge of the KFE property because of the potential that pumpage there could create high gradients that might induce migration of poor quality water from the west.

Operation studies conducted to date indicate a total of 1,356,000 AF will be delivered to the KFE over the 57–year study period. Assuming that SWP recharge has an average TDS of 203 mg/L, this will add 374,100 tons of salt to the ground water basin.

During extraction, all water recharged will eventually be withdrawn after reduction for losses. Based on preliminary loss estimates used for operation studies, 1,308,540 AF will be extracted. During the First Stage, an estimated 1,029,821 AF (79 percent) of the extractions will be exchanged locally and will remain in the Kern County Ground Water Basin. For that portion of extracted water that is exchanged, the export of salts from the Kern County Ground Water Basin will be that contained in SWP deliveries that would have been made in the absence of KFE extraction exchanges. The salinity of foregone SWP deliveries in KFE extraction years is estimated to be 319 mg/L, based on analysis of 1980–through–1989 California Aqueduct salinity during typical extraction years. The remaining 278,779 AF (21 percent) of KFE extractions that would be delivered directly to the California Aqueduct are assumed to have an average salinity of 174 mg/l. The total amount of salts removed during extraction operations, both directly and by exchange, is therefore estimated to be 512,353 tons. The net positive salt balance of the First Stage is 138,266 tons (512,353 tons less 374,100 tons). This net positive balance is likely to be greater, due to conservative assumptions regarding both recharge and extraction water quality.

Project recharge facilities will also be made available in high-flow years to recharge low-TDS Kern River water that would otherwise pass into the California Aqueduct through the Kern River Intertie. Prior to the KFE land purchase, there were high diversions of water onto the Tenneco lands. Recharge of flood waters is expected to be higher with the First Stage for two reasons. First, much of the water diverted by Tenneco was used directly for irrigation, offsetting ground water overdraft that otherwise would have occurred. Since the First Stage will have no irrigation, this factor increases the net recharge that would occur. Second, diversions of flood flows onto KFE lands are expected to be higher than if Tenneco had continued its ownership since there will be no crop lands to damage and since it is assumed that Tenneco historically diverted as much as possible. Such factors further support a projection of positive salt balance for operation of the First Stage.

Another consideration affecting the salt balance is the potential for leaching soluble salts now concentrated in soils above the water table. To evaluate the potential for mobilization of the salts in the vadose zone, DWR collected shallow, 50-foot soil samples to analyze for soluble salts. With irrigated agriculture being phased out, vadose zone soluble salts would remain immobilized unless flushed by percolation from recharge ponds (either First Stage or local flood flow recharge) or by water levels rising above current levels. Analysis of the soil samples indicates that only low levels of soluble salts are present in the vadose zone and that they do not represent a significant threat of salt loading to the ground water, should they be partially mobilized.

In the long term, present farming operations would have been imbalanced with respect to water supplies. From 1975 through 1985, a disproportionate amount of surface water was available, compared to the long-term conditions of the Kern River. Consequently, the KFE lands would have been in long-term overdraft. This is widely recognized, and it formed the basis for the provision in the 1987 MOU that phase-out of irrigation will contribute to ground water overdraft reduction. Phase-out of these irrigated lands also will reduce the concentration of salts from farming activities on KFE lands and thereby slow the Kern County Ground Water Basin salt buildup.

Ground Water Quality

Ground water samples from many of the production and monitoring wells on the KFE property have been collected and analyzed. The location of the wells sampled is shown in Figure 13. Analyses were performed for standard minerals and minor elements, volatile organics, selected pesticides, and radiological parameters. In addition, 57 shallow (50-foot) soil borings were drilled throughout the property to analyze for selected pesticides. No detectable residues (EDB, DBCP, Aldicarb, aldicarb sulfoxide, or aldicarb sulfone) were present in the soil samples. Hand auger samples were collected in areas with recognizable hydrocarbon contamination in the surface soil. In addition, 39 test holes are being drilled in the proposed First Stage recharge ponds. They are being sampled for those pesticides that were used in the area and have a significant probability of leaching to the ground water. Results from about one-third of these holes were available at the time this EIR was being prepared. No pesticide residues were detected.

Drinking water standards have been used as an indicator of the suitability of ground water for use as a municipal and industrial supply. The drinking water standards were established by the U.S Environmental Protection Agency and the California Department of Health Services. The Maximum Contaminant Levels (MCL) (Primary Standards) are established at levels that minimize the

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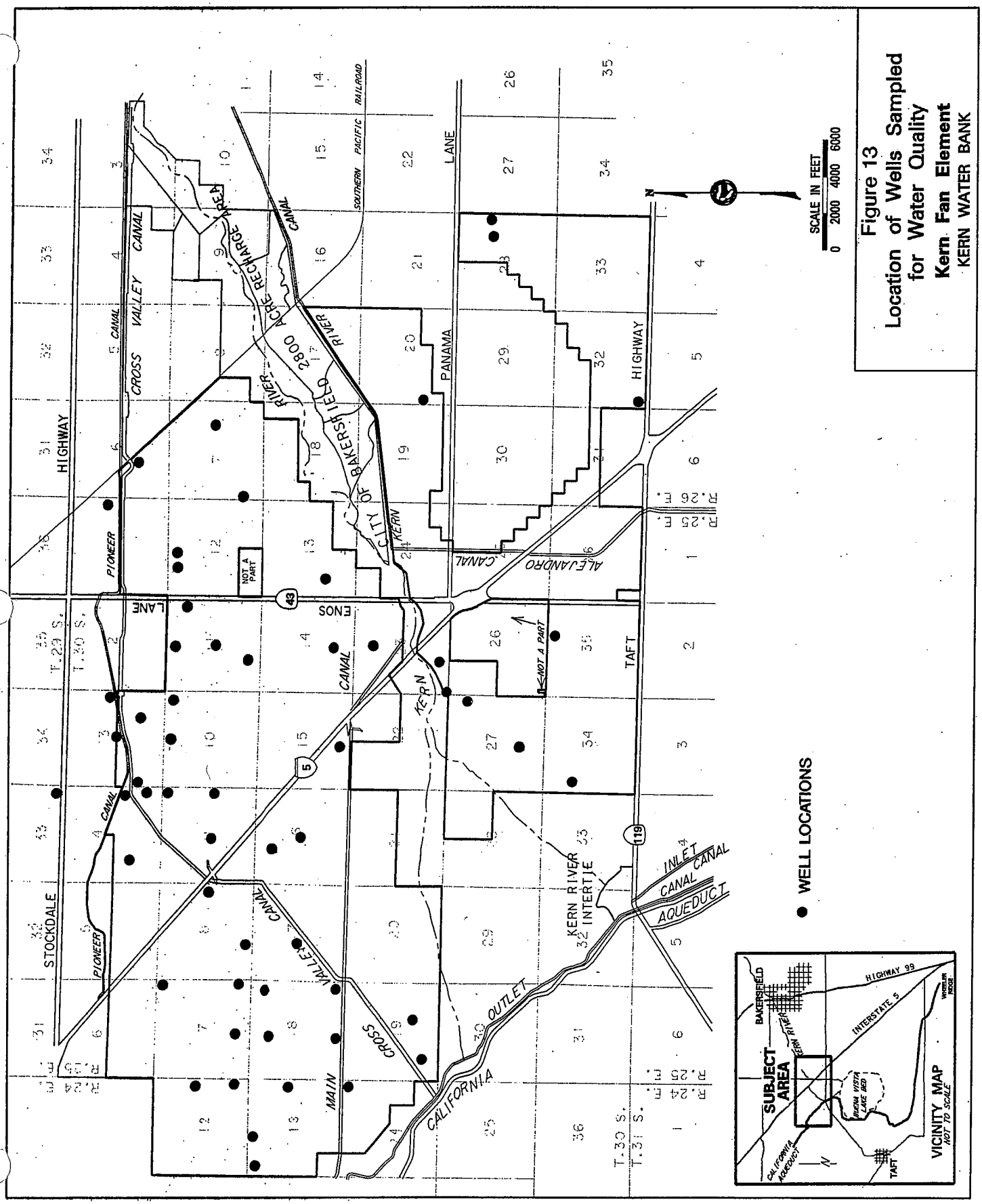
Figure 13
Location of Wells Sampled for Water Quality
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 6000
N
WELL LOCATIONS
VICINITY MAP
NOT TO SCALE
SUBJECT AREA
BAKERSFIELD
TAFT
HIGHWAY 99
INTERSTATE 5
KERN RIVER
BUENA VISTA LAKE BED
WHEELER RIDGE
CALIFORNIA AQUEDUCT
HIGHWAY
LANE
PANAMA
ENOS
STOCKDALE
PIONEER
CROSS VALLEY CANAL
2800 ACRE RECHARGE AREA
CANAL
SOUTHERN PACIFIC RAILROAD
RIVER
CITY OF BAKERSFIELD
KERN
ALEJANDRO
NOT A PART
TAFT
KERN RIVER INTERTIE
INLET CANAL
AQUEDUCT
VALLEY
MAIN
CROSS
OUTLET
CALIFORNIA
T.29 S.
T.30 S.
T.31 S.
R.24 E.
R.25 E.
R.26 E.

adverse health effects of specific chemicals and are mandatory requirements for public water supply systems. Secondary standards are established for aesthetic effects and are not mandatory requirements. The Department of Health Services is required to establish recommended public health levels (RPHL) for contaminants. RPHLs, when established, will be as stringent or more so than MCLs. As RPHLs are established, DWR will consult with the SWP contractors on the desirability of using them to guide projects.

The general mineral quality of the ground water in the project area is good. The TDS concentrations of ground water are usually less than 500 mg/L. The TDS concentrations in a small area north of the Kern River Bypass channel near Tupman approach 4,000 mg/L. However, this area appears to be relatively isolated from the main aquifer system. One monitoring well in Section 12, T30S, R25E, located one-eighth-mile down-gradient from sumps used for brine disposal, has EC values of about 7,500 micromhos per centimeter (μhos/cm) in the shallow zone, 3,800 μhos/cm in the middle zone, and 1,500 μhos/cm in the deep zone.

A few wells exceed the recommended drinking water criteria of 250 mg/l for sulfate and chloride. However, the blend of water that returns to a source of public supply (California Aqueduct or CVC) is not expected to exceed these criteria. Elevated levels of nitrate occur in a band across the northern portion of the project area. The elevated nitrate is believed to result from leaching nitrogen-bearing fertilizers during irrigation. Outside this area nitrate levels are uniformly low.

The band of elevated nitrate corresponds to areas that have been in irrigated agriculture since the 1950s and in wells that tend to be perforated at relatively shallow depths. Other parts of the property have only been irrigated since the mid-1970s or have never been irrigated. Wells in these areas are generally perforated at a greater initial depth than those with elevated nitrate. While there are currently low nitrate levels in these areas, it is possible that increasing levels in produced water may occur during project operation as water levels decline. However, levels will probably not increase beyond those levels found in the elevated band and, therefore, should not interfere with project operations.

Five wells exceed boron levels of 0.2 mg/L and would be detrimental to sensitive plants if used for irrigation. The highest concentration (0.6 mg/L) occurs in two wells located near Tupman, outside the high TDS region. The level of boron in these five wells is not expected to affect the project's ability to produce a blended water supply with low boron levels.

In two areas the concentration of arsenic exceeds the drinking water MCL of 0.05 mg/L, and in one monitoring well barium exceeds the MCL in the shallow zone. Water extracted from these areas will require blending to decrease contaminant levels to concentrations before returning to a public water supply source.

Known Ground Water Quality Problems

During feasibility study investigations for the KFE, several ground water quality problems were identified. In general, First Stage KFE facilities have been located to avoid these problem areas. The contaminants identified are discussed below:

Ethylene Dibromide. EDB is a nematicides that was banned in 1983. Before 1983, EDB was applied over fairly large areas of the KFE property. Low levels of EDB were detected in the

north central portion of the project area illustrated in Figure 14. The levels found exceeded the drinking water MCL of 0.02 microgram per liter (μg/L). Although data are inadequate to confirm this, the contaminated water in this area may be continuous with a large area of contaminated water in the Rosedale–Rio Bravo Water Storage District to the north. The boundaries of the area containing EDB cannot be accurately delineated, except to the west where it is fairly well defined by wells containing uncontaminated water.

Under present conditions, the contaminated water will slowly move downgradient to the north or northwest and be flushed from the project area. In addition, the present use of water in this area for agriculture will remove some of the EDB, but it will not have a significant impact in the time remaining before irrigated agriculture on the property ceases. Neither of these activities will eliminate the problem in the near term.

Ground water is thought to be stratified in this area. Based on this stratification, it is believed that water containing detectable levels of EDB are restricted to about the upper 250 feet of the aquifer system. In this situation, the potential for contamination of deeper zones is of concern. During the irrigation season, vertical gradients are created in the area that may permit movement of contaminated water downward through well bores. However, water levels largely equilibrate when pumping stresses are eliminated, greatly reducing the potential for water movement along this pathway. Furthermore, water moving into deeper zones through the wells will largely be extracted when the next irrigation season commences. Therefore, under existing conditions, the threat of deep contamination does not appear to be significant. However, if future extraction wells are perforated in deep zones, the potential for EDB contamination in the deeper part of the aquifer system would increase. Conversely, wells pumping from the shallower part of the aquifer would accelerate the removal of contaminated water.

While EDB has been applied on several parts of the KFE property, detectable levels in ground water have been found in only a limited portion of the area. Wells with detectable levels of EDB are older, poorly constructed wells that are perforated at relatively shallow levels and will produce water from near the water table where the highest levels of EDB would be expected. In the other areas where EDB has been used, most, but not all, wells were installed more recently and are not perforated above a depth of 250 feet. Due to the stratified nature of the aquifer system, samples withdrawn from these wells may not adequately represent the water most likely to be contaminated. The potential exists for the detection of expanded or new areas of contamination as water levels decline during project operation.

It is not expected that water contaminated with EDB will be extracted during First Stage operations. However, if contamination is detected in extracted water and if the MCL for drinking water is to be met, water containing EDB may require treatment before it is delivered to the California Aqueduct or the CVC, both of which are sources of public water supply. This would not apply to the CVC during times in which water is not being delivered to domestic users. EDB is volatile and treatment by air-stripping is possible. However, the low levels present and high removal efficiencies required would complicate the design of a treatment system. Transport in an open conveyance system would probably not result in sufficient removal to meet the MCL. Additional investigation is required to define the extent of contamination and to evaluate the feasibility of treatment options.

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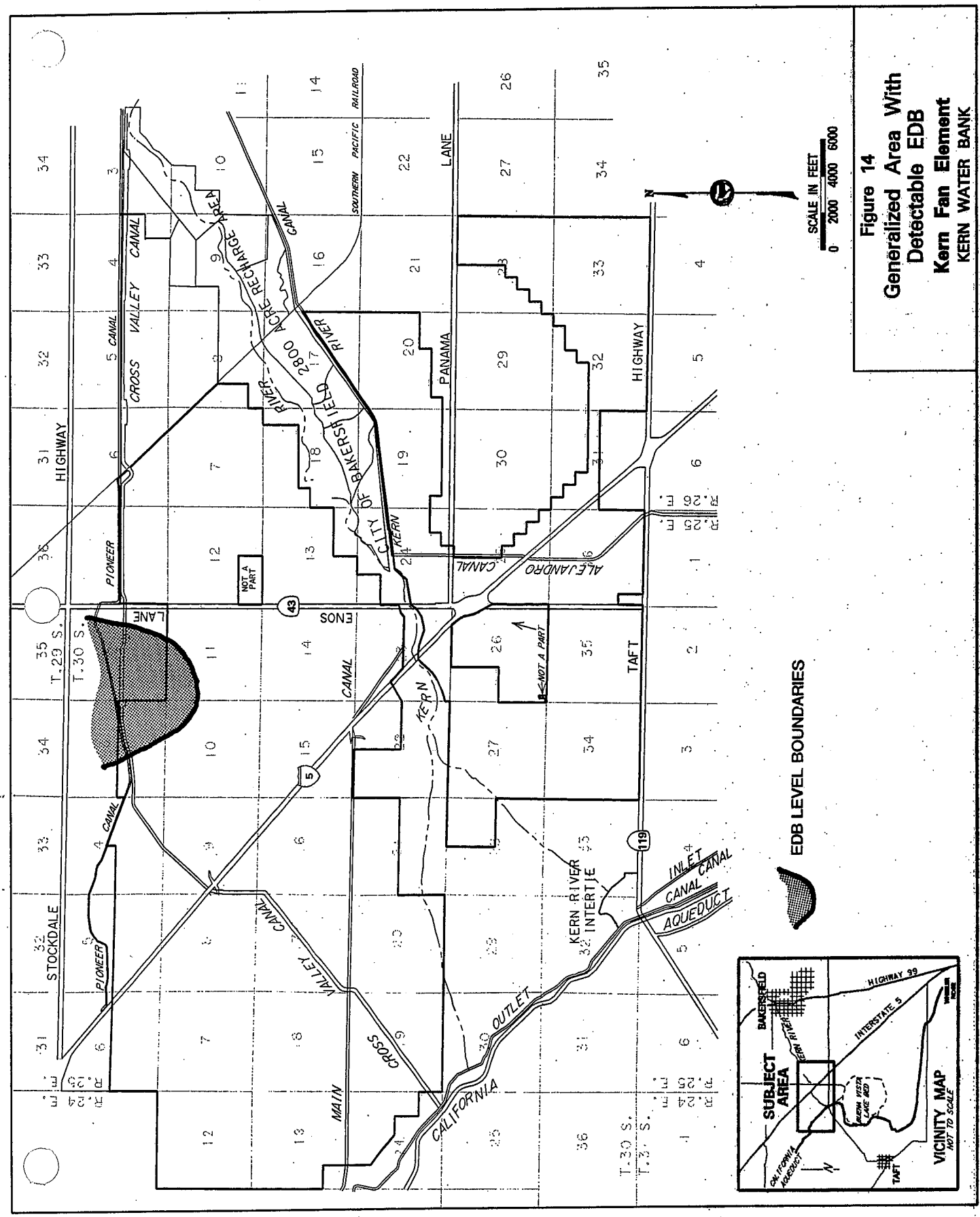


Figure 14
Generalized Area With Detectable EDB
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 6000
EDB LEVEL BOUNDARIES
VICINITY MAP
NOT TO SCALE
SUBJECT AREA
BAKERSFIELD
HIGHWAY 99
INTERSTATE 5
TAFT
CALIFORNIA AQUEDUCT
KERN RIVER
LAKE ISABELLA
HIGHWAY
PANAMA
LANE
ENOS
TAFT
STOCKDALE
PIONEER
CROSS VALLEY CANAL
5 CANAL
4 CANAL
ALEJANDRO CANAL
KERN RIVER INTERTIE
INLET CANAL
AQUEDUCT
OUTLET
MAIN
CROSS
CALIFORNIA
VALLEY CANAL
2800 ACRE RECHARGE AREA
RIVER
CITY OF BAKERSFIELD
KERN
SOUTHERN PACIFIC RAILROAD
NOT A PART
T.29 S.
T.30 S.
T.31 S.
R.25 E.
R.26 E.

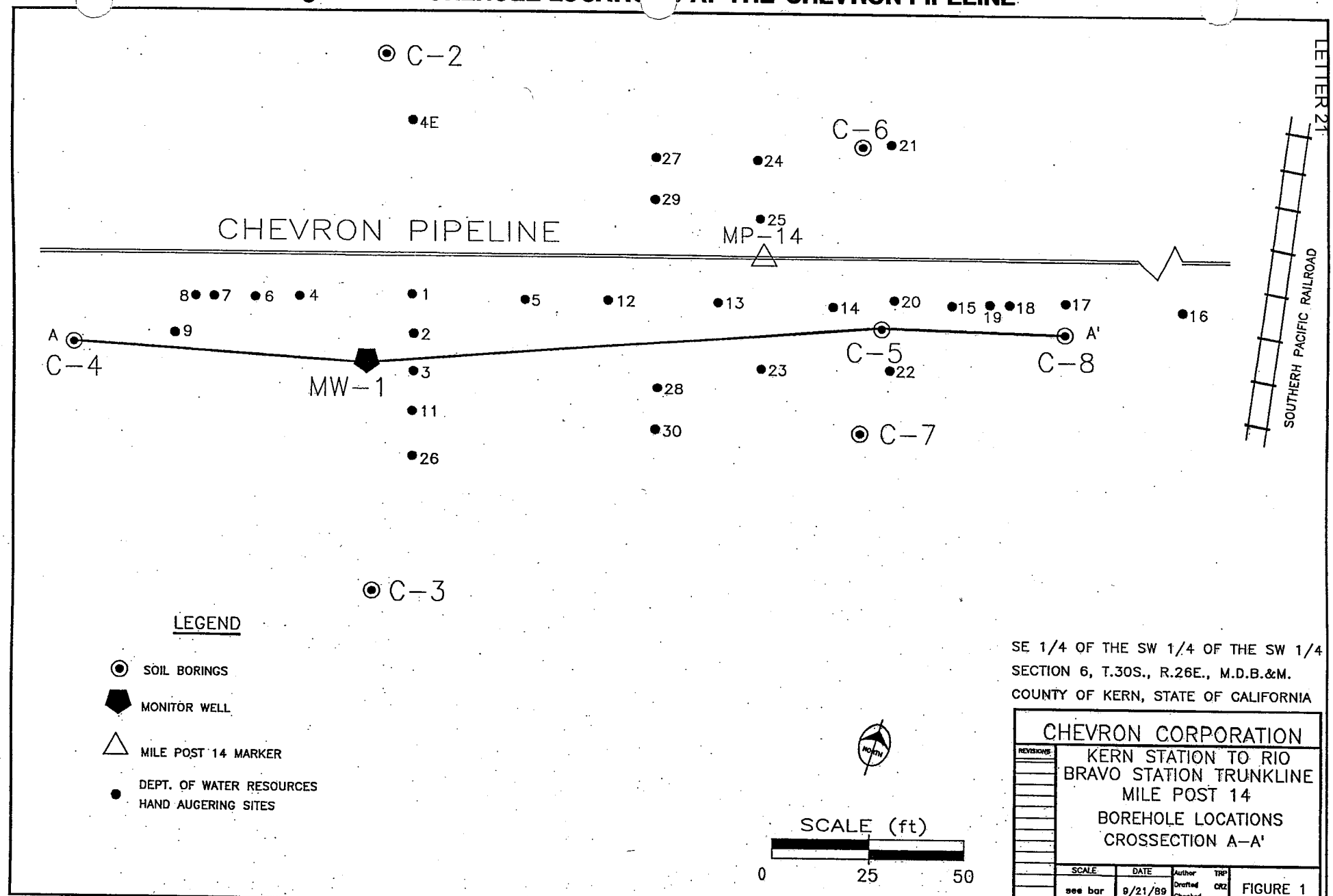
Toxaphene. Toxaphene, an insecticide commonly used on crop types that occur on the KFE, has been tentatively identified at a level of 9 μg/L in well 30/25–19Kl. The MCL for toxaphene is 5 μg/L. Toxaphene is not particularly mobile in the soil environment, but it does have some potential for reaching ground water through normal agricultural use. Contamination, if verified, could possibly have resulted from direct contamination of the well from nearby uses or through normal agricultural applications. No information exists to allow a choice between these alternatives. This well will be resampled periodically while agricultural use continues in this area. If the concentration declines this would suggest local contamination at the well site and greatly lessen concern about the possible extent of contamination.

Eptam (EPTC). Eptam has been identified in samples from well 30/25–8Pl at a level of 170 μg/L. At present, no action level or MCL exists for Eptam. There is no reported use of Eptam on KFE property. Eptam is a herbicide that is commonly applied in irrigation water. It is not highly mobile but has occasionally been reported as a ground water contaminant. Inspection of well 30/25–8Pl indicated that a functioning backflow prevention device was not present. This suggests that contamination resulted from movement of water containing Eptam into the well bore, resulting in very localized contamination. This is supported by the relatively high level of contamination found. However, more widespread contamination from applied Eptam cannot be ruled out at present. As with Toxaphene, this well will be sampled periodically to ascertain whether cleanup occurs through continued use.

Diuron. Preliminary sampling and analysis indicates that the herbicide Diuron is present at a concentration of 0.26 μg/L in the upper zone of monitoring well 30/26–19B. This zone is perforated at a depth of 120 to 220 feet and water levels were at a depth of about 90 feet at the time of sampling. At present, no action level or MCL exists for Diuron. Diuron has been used nearby for weed control and is relatively mobile in the soil environment. It has also been commonly found as a ground water contaminant in other areas. The extent of contamination cannot be determined with present information.

Petroleum Hydrocarbons. During routine shallow exploration of potential recharge pond sites, petroleum hydrocarbon contamination was detected along a pipeline owned by Chevron Pipeline Company in Section 6 of T30S, R26E. DWR made 30 hand borings at the site to define the extent of shallow soil contamination. In addition, Chevron drilled nine hollow-stem auger borings and collected split-spoon samples for hydrocarbon analysis. Chevron completed one of the auger holes as a monitoring well with a depth of 120 feet. The locations of the various borings are shown in Figure 15. This exploration resulted in the delineation of an area of contamination about 175 feet along the pipeline, with a maximum width of about 120 feet, and a maximum depth of about 65 feet (Figure 16). Selected soil samples were analyzed for total petroleum hydrocarbons by EPA Method 418.1. The greatest concentration, 12,200 milligrams per kilogram, was found at a depth of 20 feet at the monitoring well site. The results of analyses by EPA Method 418.1 indicate the extent of contamination by relatively immobile hydrocarbon fractions. However, the more mobile volatile fractions are lost during the extraction process used in this procedure. Initial sampling of the monitoring well indicated that benzene was present in the ground water at a level of 10.6 μg/L, significantly exceeding the MCL of 1 μg/L. Upon resampling, after a period of about two months, the level of benzene found was slightly below the MCL, and low levels of

Figure 15 BOREHOLE LOCATIONS AT THE CHEVRON PIPELINE



SE 1/4 OF THE SW 1/4 OF THE SW 1/4
SECTION 6, T.30S., R.26E., M.D.B.&M.
COUNTY OF KERN, STATE OF CALIFORNIA

CHEVRON CORPORATION

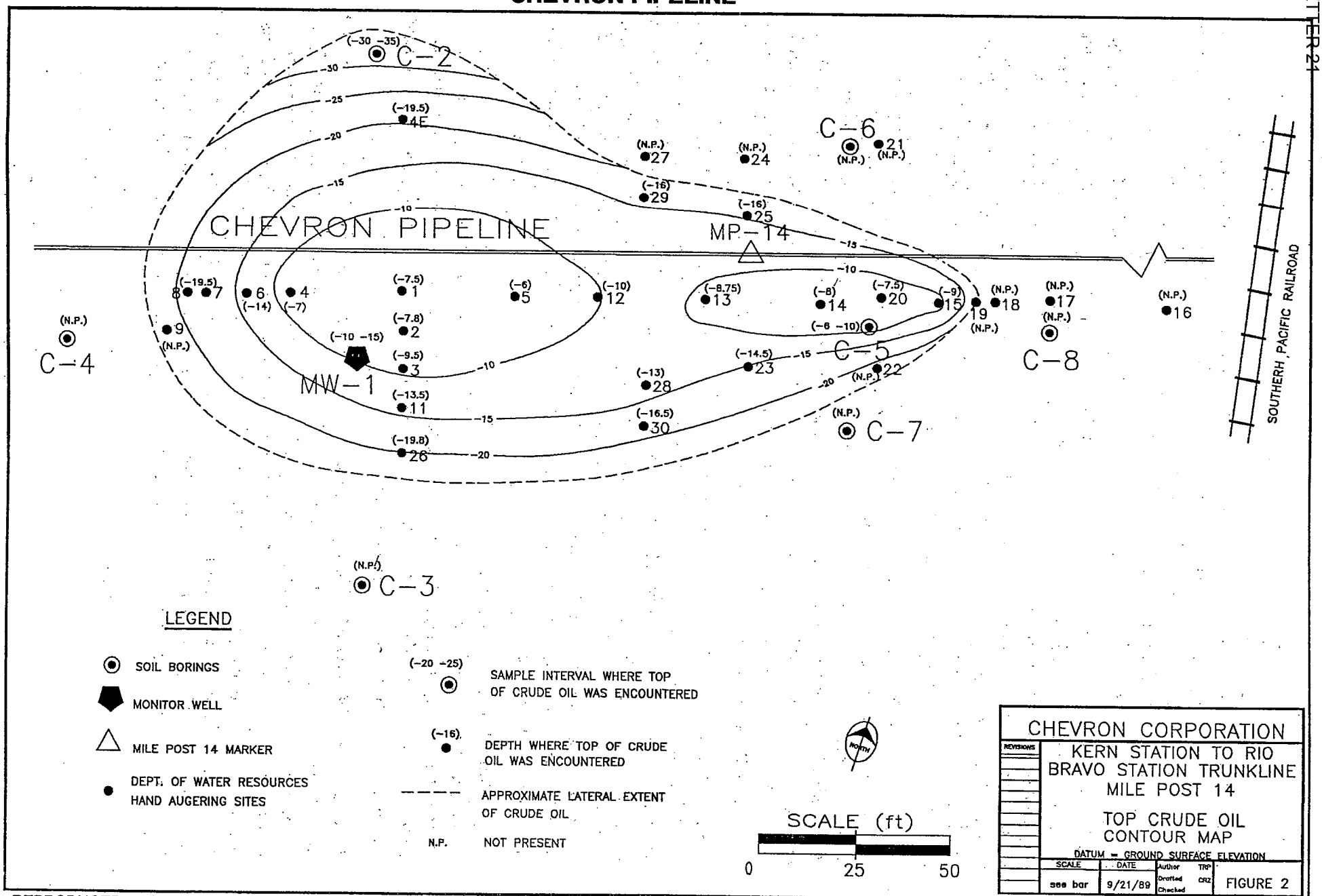
KERN STATION TO RIO BRAVO STATION TRUNKLINE
MILE POST 14
BOREHOLE LOCATIONS
CROSSECTION A-A'

REVISIONS	SCALE	DATE	Author	TRP
	see bar	9/21/89	Drafted	CRZ
			Checked	

FIGURE 1

REPRODUCED FROM CHEVRON REPORT: SUBSURFACE SOILS AND GROUNDWATER INVESTIGATION, MILE POST 14, KERN STATION TO RIO BRAVO STATION TRUNKLINE, AUGUST 22, 1989.

Figure 16 TOP OF CRUDE OIL CONTOUR MAP
CHEVRON PIPELINE



REPRODUCED FROM CHEVRON REPORT: SUBSURFACE SOILS AND GROUNDWATER INVESTIGATION, MILE POST 14, KERN STATION TO RIO BRAVO STATION TRUNKLINE, AUGUST 22, 1989.

toluene, ethylbenzene, and xylene were detected at levels below their respective MCLs. Chevron, at DWR's request, conducted additional sampling and installed five more monitoring wells to further define the extent of contamination. The results of this work are not yet available. This effort is being coordinated with the Regional Water Quality Control Board.

Concern at this site focuses on the potential extent of ground water contamination that could limit use of extracted water or require treatment before delivery into the CVC or California Aqueduct. Recharge has not occurred at this site for about three years. This suggests that a significant area may contain contaminated ground water and that the low levels of benzene, toluene, and xylene found in the monitoring wells, which are upgradient of the pipeline, may not be representative. This site is in one of the prime potential recharge areas on the KFE property, and unremediated soil contamination will restrict the extent to which water levels can be allowed to rise in response to recharge without risking the mobilization of hydrocarbons in the unsaturated zone.

As a follow-up to the discovery of contamination, DWR constructed shallow hand auger borings at intervals of 500 feet along this pipeline alignment (similar work will be done along other pipelines), and identified other areas of soil contamination, two of which show evidence of fresh hydrocarbons in the soil and several areas with weathered hydrocarbons (Figure 17). Chevron Pipeline Company submitted a proposal for staged investigation of these sites to the Regional Board. During the First Stage, the extent of shallow (to 20 feet) contamination will be investigated at each site, with additional exploration and monitoring to be developed, if needed.

Arsenic. Two areas on the KFE property contain arsenic exceeding the MCL of 0.05 mg/L (Figure 18). The southernmost area along Taft Highway is on the northern fringes of a regional area of arsenic contamination that probably extends eastward and westward along the southern boundary of the project area. This area has not been adequately sampled. The arsenic is thought to be naturally occurring in the aquifer, although there could be some contribution from arsenical pesticides and defoliants. The presence of arsenic is not expected to be a significant impediment to project operation because levels are expected to be diluted to below the MCL of 0.05 mg/L before delivery into the California Aqueduct.

Gross Alpha/Uranium. Two areas contain ground water that slightly exceeds the MCL of 20 picocuries per liter for uranium. Uranium is commonly found (as a natural component) in ground water in the San Joaquin Valley. The low levels found in the project area can be readily diluted to below the MCL before the water is returned to a source of public water supply and do not create a significant impediment to project operation.

Excessive Total Dissolved Solids. Figure 19 shows the generalized areas within the KFE with TDS greater than 500 mg/L. The high TDS area near Tupman is not expected to represent a significant problem because neither recharge nor extraction will occur here. The possibility of movement of this water during project operation will be monitored. The area of high TDS near the Enos Lane Test Ponds is more of a problem because it is in the best potential recharge area for the KFE. It has not been characterized for parameters of concern other than TDS and standard minerals, and the areal extent of high TDS water is unknown. The dimensions and character of the plume must be fully characterized before either recharge or extraction activities are conducted in the area.

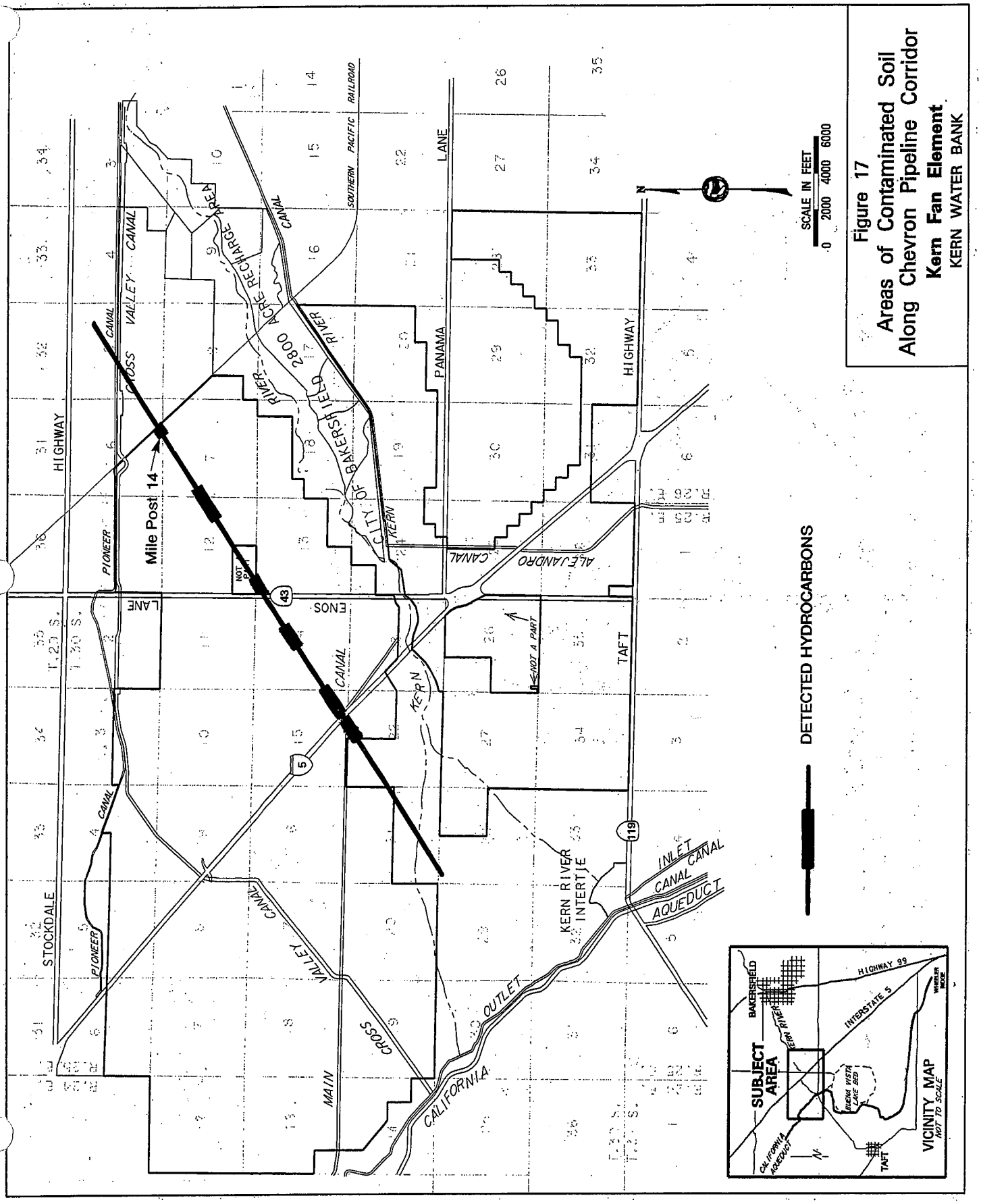


Figure 17
Areas of Contaminated Soil
Along Chevron Pipeline Corridor
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 6000
N
DETECTED HYDROCARBONS
Mile Post 14
CROSS VALLEY CANAL
PIONEER
HIGHWAY
LANE
ENOS
STOCKDALE
PANAMA
HIGHWAY
TAFT
ALEJANDRO CANAL
CITY OF BAKERSFIELD
KERN RIVER
2800 ACRE RECHARGE AREA
SOUTHERN PACIFIC RAILROAD
KERN RIVER INTERTIE
INLET CANAL
CANAL AQUEDUCT
CALIFORNIA AQUEDUCT
MAIN CANAL
OUTLET
NOT A PART
SUBJECT AREA
BAKERSFIELD
KERN RIVER
HIGHWAY 99
INTERSTATE 5
BUENA VISTA LAKE BED
WHEELER RIDGE
TAFT
VICINITY MAP
NOT TO SCALE

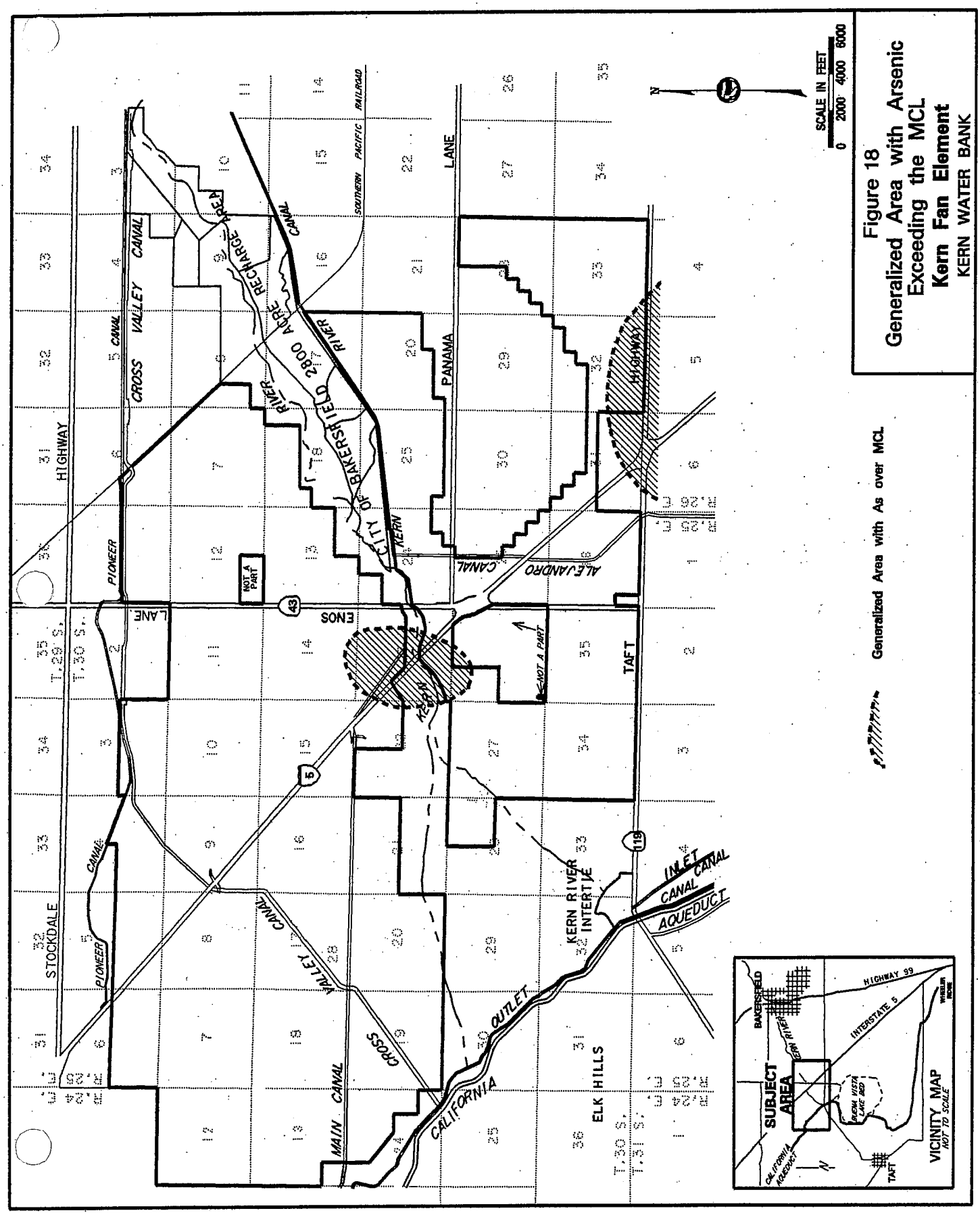


Figure 18
Generalized Area with Arsenic
Exceeding the MCL
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 6000
N
Generalized Area with As over MCL
SUBJECT AREA
VICINITY MAP
NOT TO SCALE
BAKERSFIELD
HIGHWAY 99
INTERSTATE 5
KERN RIVER
RECHARGE AREA
2800 AcFt
CROSS VALLEY CANAL
SOUTHERN PACIFIC RAILROAD
LANE
PANAMA
HIGHWAY
CITY OF BAKERSHFIELD
KERN RIVER
ALEJANDRO
CANAL
ENOS
TAFT
NOT A PART
PIONEER
STOCKDALE
HIGHWAY
KERN RIVER INTERTIE
INLET CANAL
CALIFORNIA AQUEDUCT
OUTLET
MAIN CANAL
CROSS VALLEY CANAL
ELK HILLS
T.29 S.
T.30 S.
T.31 S.
RECH. VISTA LAKE BED
CALIFORNIA AQUEDUCT

LETTER 21

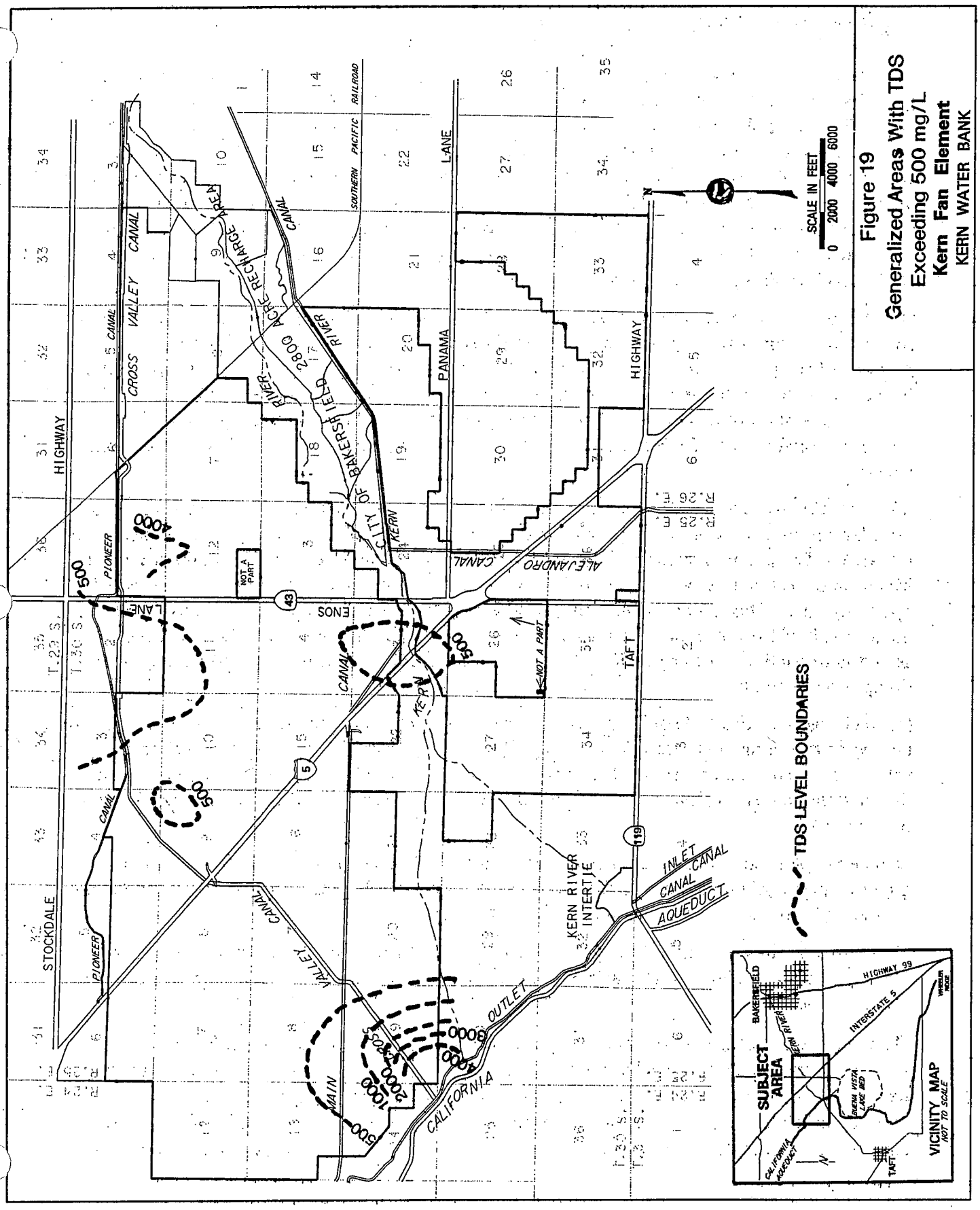


Figure 19
Generalized Areas With TDS
Exceeding 500 mg/L
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 6000
N
TDS LEVEL BOUNDARIES
SUBJECT AREA
VICINITY MAP
NOT TO SCALE
HIGHWAY 99
INTERSTATE 5
BAKERSFIELD
TAFT
CALIFORNIA AQUEDUCT
KERN RIVER
BUENA VISTA LAKE BED
WHEELER RIDGE
CROSS VALLEY CANAL
PIONEER
HIGHWAY
RIVER
ACRE RECHARGE AREA
2800
CITY OF BAKERSFIELD
KERN
CANAL
SOUTHERN PACIFIC RAILROAD
PANAMA
LANE
ALEJANDRO
ENOS
NOT A PART
TAFT
KERN RIVER INTERTIE
INLET CANAL
AQUEDUCT
VALLEY
MAIN
CALIFORNIA
OUTLET
STOCKDALE
500
1000
2000
4000
6000

Implications of Water Quality Problems

The presence of areas with degraded water quality and the potential for identifying other degraded areas or future contamination will add a substantial element of operational complexity to the KFE. During planning, it was necessary to limit facility locations to avoid adversely influencing areas of poor ground water quality and incurring treatment or other costs that might be required to adhere to a policy of meeting all applicable drinking water MCLs and action levels for water delivered to a source of public water supply. These limitations have resulted in locating First Stage facilities away from the prime recharge areas, pending characterization of the extent of contamination in these areas. The following concerns have been, and will continue to be, considered in facility siting and operation:

(1) In areas with ground water contamination, recharge and extraction patterns must be carefully controlled to minimize the movement of contaminated water to extraction wells, through larger portions of the project area, and off the site where it may adversely affect neighboring properties. In the future, it may be necessary to develop a ground water transport model to optimize the location and operation of facilities. During the First Stage, this will be of particular concern in the area contaminated with EDB and the nearby areas with a significant likelihood of such contamination.

(2) Extraction wells will be located away from areas with known contamination, except where acceptable dilution rates or natural volatilization in open conveyance facilities will permit meeting of the MCLs. Extraction in areas with significant contamination may be necessary in the future, at which time treatment may be required. This will result in operational limitations and increased operating costs. This is not a significant problem for a carefully designed and operated First Stage, but it will become more significant as the project expands. One option that has been suggested is to continue farming on KFE lands in areas served by contaminated wells as a cleanup/dissipation method.

(3) Recharge facilities will not be located in areas with known soil contamination, and they should be operated in a manner that will not bring either recharge water or ground water into contact with areas of soil contamination. The First Stage facilities have been located in compliance with this criteria and will maintain a setback of 500 feet from petroleum pipelines (the major features of concern).

Detailed exploration at recharge sites will be required to demonstrate the absence of soil or ground water contamination. The results of this exploration will be used to confirm or modify the location of First Stage facilities, as indicated in this report.

Concerns about the potential for future water quality problems focus on the possibility of pesticide residue contamination (by leaching), and petroleum production facilities leakage. These are discussed below:

Pesticides. Much of the project area has been under agricultural production for 20 to 40 years, and numerous pesticides have been applied (here used in a general sense to include fungicides, herbicides, nematicides, and other agricultural chemicals). However, long-term potential for contamination will decrease as farming is phased out. A number of pesticides (Table 3) that have a significant probability of reaching ground water have been identified for the ranking process de-

veloped for the AB 1803 program. While this list is not completely compatible with similar lists of contamination potential developed by others, it is considered to be reasonably representative. DWR will sample and monitor for those pesticides in Table 3 that have a history of use on KFE property.

Pesticide usage is a potential nonpoint contamination threat and, as such, is a threat throughout the portion of the project area that has been farmed. An exploration and sampling program is being conducted at each recharge site to identify the presence of potential contaminants. Four areas of potential point source contamination associated with pesticide storage and mixing are present on the property (Figure 20). The extent of soil and water contamination near these facilities is unknown and will require investigation prior to construction of any project facilities nearby.

Table 3. Pesticides That Have a Significant Probability of Reaching Ground Water[1]

Rank One		Rank Two	
Alachlor		Benomyl	Diphenamid
Aldicarb[2]		BHC	Disulfoton
Atrazine		Bromacil	Endosulfoton
Carbofuran		Chlordane	Endothall
DBCP		Chloropicrin	Fenamiphos
1,2-Dichloroproprane[3]		Cyanazine	Parathion
Dinoseb		Diazinon	Phorate
Diuron		Dimethoate	Prometryn
EDB (ethylene dibromide)			
Oxamyl			
Simazine			

1 Pesticides are potentially mobile and are applied directly onto or into the soil. Rank One pesticides have a very high probability of detection in ground water. Rank Two pesticides have some probability of detection in ground water.

2 Includes aldicarb sulfoxide and aldicarb sulfone.

3 Ingredient of concern in D-D mixture of a Rank Two pesticide.

Petroleum Production. Two oil fields and parts of three others are present on the KFE, with production dating from the 1930s. Numerous pipelines used to transport petroleum products (Figure 21) cross the property, resulting in a significant potential for future soil and possibly ground water contamination with petroleum hydrocarbons. Problems with leakage have been detected along one pipeline alignment and future leaks can reasonably be expected along other pipeline alignments on the KFE property.

The operation of petroleum transportation pipelines is governed by the California Pipeline Safety Act of 1981 administered by the State Fire Marshall. Under this Act, jurisdictional pipelines must be periodically hydrotested (every three to five years) to ensure structural integrity. The hydrotesting procedure allows for a leakage rate that can be as large as ten gallons per hour (depending on the pipeline diameter and length of test section). If otherwise undetected, leakage at this rate could result in significant soil and ground water contamination.

Aerial inspection of the pipeline alignment also occurs frequently. However, aerial surveillance has limited utility in detecting leaks involving light crude that could move downward through the

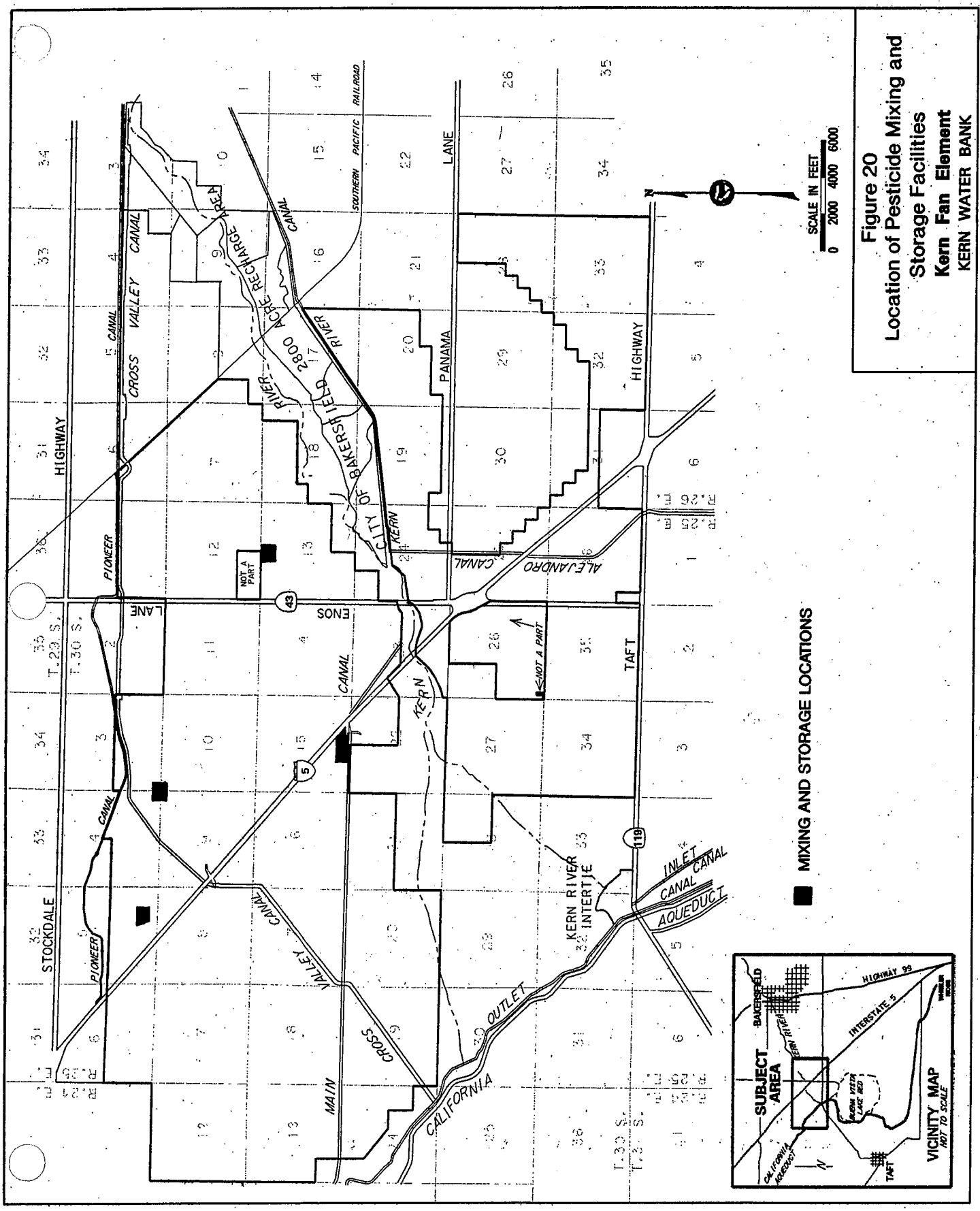


Figure 20
Location of Pesticide Mixing and Storage Facilities
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 6000
N
MIXING AND STORAGE LOCATIONS
SUBJECT AREA
VICINITY MAP
NOT TO SCALE
HIGHWAY 99
INTERSTATE 5
BAKERSFIELD
TAFT
CALIFORNIA AQUEDUCT
KERN RIVER
KERN WATER BANK CANAL
HIGHWAY
LANE
PIONEER
ENOS
STOCKDALE
CROSS VALLEY CANAL
RECHARGE AREA
SOUTHERN PACIFIC RAILROAD
RIVER
CITY OF BAKERSFIELD
PANAMA
ALEJANDRO CANAL
TAFT
KERN RIVER INTERTIE
INLET CANAL
AQUEDUCT
OUTLET
MAIN
CROSS VALLEY CANAL
NOT A PART
T.29 S.
T.30 S.
T.33 S.
T.32 S.
R.27 E.
R.28 E.

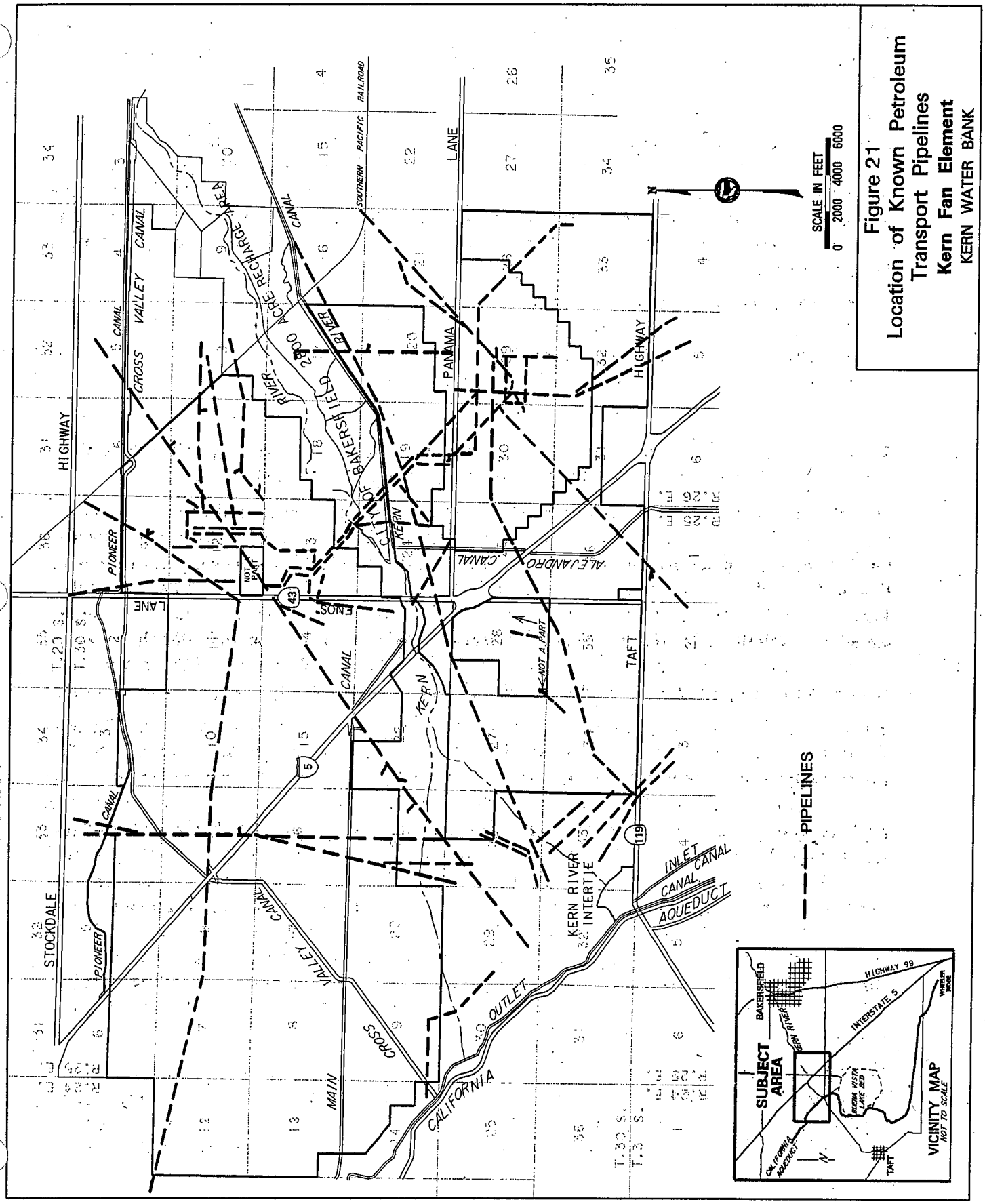


Figure 21
Location of Known Petroleum Transport Pipelines
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 6000
PIPELINES
SUBJECT AREA
VICINITY MAP
NOT TO SCALE
HIGHWAY 99
INTERSTATE 5
BAKERSFIELD
TAFT
CALIFORNIA AQUEDUCT
KERN RIVER
SOUTHERN PACIFIC RAILROAD
CROSS VALLEY CANAL
ACRE RECHARGE AREA
KERN RIVER
CITY OF BAKERSHFIELD
PANAMA LANE
HIGHWAY
PIONEER LANE
ENOS LANE
ALEJANDRO CANAL
KERN CANAL
NOT A PART
TAFT HIGHWAY
KERN RIVER INTERTIE
INLET CANAL
CANAL AQUEDUCT
OUTLET
CROSS VALLEY CANAL
MAIN
CALIFORNIA
STOCKDALE
T. 29 S.
T. 30 S.
T. 23 S.
T. 32 S.
T. 33 S.
R. 25 E.
R. 26 E.

soil column. Such surveillance is more effective with heavy crude, which more readily reaches the surface. In addition, some pipelines may be nonjurisdictional and escape even minimal surveillance.

The strategy adopted for avoiding problems with possible pipeline contamination is one of maintaining setbacks of recharge facilities from known pipeline alignments. Recharge pond sites will be surveyed for unknown pipelines during the exploration phase before construction. Given the inadequacy of present pipeline surveillance requirements for detecting small leaks, DWR will evaluate the options that are available for monitoring pipelines with sufficient sensitivity to detect small leaks and will work toward implementation of a suitable methodology. The following options are being evaluated:

- Continuous monitoring of pipelines, using pressure point analysis
- Initial transfer gas survey
- Periodic surface air sampling for volatile components
- Periodic soil gas sampling for volatile components
- Other geophysical methods

Since detecting small leaks is difficult in areas where existing hydrocarbon contamination is widespread, some degree of risk of nondetection will be present and may be significant.

Oil fields in and around the KFE property have been used for petroleum production for many years. These production activities have a continuing potential to contaminate soil and ground water. Oil fields are generally regulated by the State Division of Oil and Gas, which performs inspection and surveillance. Other agencies, such as the Regional Water Quality Control Board and the Kern County Fire Department, regulate specific oil field activities. Soil samples have been collected at locations within the oil fields where repeated incidents of soil contamination have occurred (tank farms) and areas where spills have occurred. High levels of contamination are largely restricted to the upper 2 to 3 feet of soil, although volatile fractions may have penetrated deeper.

The continued use of sumps for disposal of brines and associated hydrocarbons presents the potential for contamination of ground water with both brine and soluble hydrocarbon fractions. The use of sumps should be phased out as soon as practicable. Most produced brine is presently disposed of by deep well injection and use of sumps is limited. Deep well injection is regulated under permits issued by the Division of Oil and Gas, which requires an annual mechanical integrity test (usually a radioactive tracer test) to be performed to ensure that brine does not contaminate fresh water. Properly constructed and maintained injection wells, as well as production wells, represent minimal water quality threats. Wells that are abandoned to present-day standards are of minimal concern. However, older wells not properly abandoned by today's standards may lack plugs at the base of fresh water or at the surface. Improperly abandoned wells could serve as conduits for the vertical movement of brines or hydrocarbons. Discussions with Division of Oil and Gas staff indicate that the producing zones have been depressurized and that contamination of fresh water is unlikely.

While the oil fields are aesthetically displeasing, they are not a significant impediment to project development, provided that recharge facilities are properly located and that water quality is adequately monitored. In general, since project recharge facilities will not be located in active oil fields, the soil contamination is not expected to be a significant threat to the project. However, a

monitoring well network will be installed to detect existing ground water contamination or any resulting from mobilization of hydrocarbons in the vadose zone by rising water levels.

The First Stage will be operated to avoid known adverse water quality impacts and periodic water quality measurements will be made. If problems arise, operations will be modified accordingly. The First Stage is not expected to involve or require any water treatment.

Recharge and Extraction Concerns

It is impossible to plan for every concern that may arise from operation of the KFE. The following discussion describes general categories of potential problems and sets forth the kinds of solution that are possible. This discussion is organized into two topics: potential recharge water level and water quality concerns and potential extraction water level and water quality concerns.

Recharge Water Level Concerns. Water levels are expected to rise on a regional basis during recharge operations. Local mounding is expected in the immediate area of the recharge basins. No off-site problems are anticipated. Each of the recharge basins will have a separate network of monitoring wells to gage the performance of recharge and the presence of mounding. Off-site mounding will be averted, to the extent practicable, by shifting recharge to other locations if problems occur.

The primary concerns with rising water levels are interference with long-term recharge performance and potential for liquefaction in response to earthquakes. These potential problems will be avoided by maintaining suitable water levels by modifying project operations, as necessary.

Recharge Water Quality Concerns. The three primary recharge water quality concerns are: (1) percolation of water through contaminated soil; (2) elevation of regional ground water levels into contaminated soils within the current unsaturated zone (vadose zone); and (3) importation and recharge of water that has water quality problems (either higher salinity or potential pollutants).

A major concern to many of the SWP water contractors is the quality of the extracted water. Substantial field work and soil analyses in the areas of proposed SWP recharge basins indicates that the threat of percolating water through contaminated soil is minor. None of the soil sampled in the recharge basins to date has shown contamination. Shallow monitoring wells adjacent to each pond will be observed regularly, in addition to the deeper monitoring wells both on and off the property. Any areas that show potential contamination will be taken out of use until the problem is better defined and a solution is developed.

Recharge basins generally have been selected at locations that will limit water level increases in areas adjacent to pipelines and oil field operations. In the event of a problem (as evidenced by specific monitoring information), both recharge and extraction operations may need to be modified to provide some correction.

The potential for recharging water from the California Aqueduct having unacceptable levels of salt or other pollutants should not be significant since the First Stage recharge activities will occur primarily during the winter and spring months, when salinity in the Sacramento–San Joaquin Delta is relatively low. Delta salinity at the SWP export pumps is generally at or below the average salinity concentration of ground water on KFE property during the periods when recharge would occur. Salinity of both recharge and extraction water will be monitored to measure the net change

in salt load in the ground water basin. Potential pollutants will also be monitored. The First Stage is expected to improve salt balance conditions in the ground water basin.

Extraction Water Level Concerns. Ground water levels will be monitored to prevent unacceptable water level impacts to surrounding users. Two operational modes will be used to respond to potential adverse impacts. First, pumping will be shifted away from potential problem areas. Second, water users directly impacted by KFE operations will be compensated. Sufficient flexibility is expected to be provided in extraction facilities to avoid operational problems. First Stage extraction sites have been distributed over much of the property to avoid interference impacts. Most wells are considerably inside the property boundary. DWR has developed both on-site (described in the Mitigation Chapter) and off-site ground water monitoring networks that are acceptable to surrounding water districts. The off-site network will involve construction of a substantial number of monitoring wells within two miles of the KFE property boundary, as well as use of supplemental information from existing monitoring wells in surrounding areas. The off-site network will be constructed and placed in operation before First Stage extraction begins.

The project will be designed and operated to avoid adverse impacts. Therefore, compensation for adverse impacts should not be required. However, DWR will develop specific procedures as part of the operating agreement with KCWA for determining when adverse impacts have occurred or may occur, and provide a means to resolve the problem. Consideration will be given to the positive benefits to ground water levels projected to result from operation of the KFE, including the offsetting benefits of phasing out the 26,000 AF per year of net ground water use on the property. Such net annual use in the long term is assumed to have been met by continued overdraft of the ground water basin, leading to the conclusion that the phase-out of farming directly reduces overdraft.

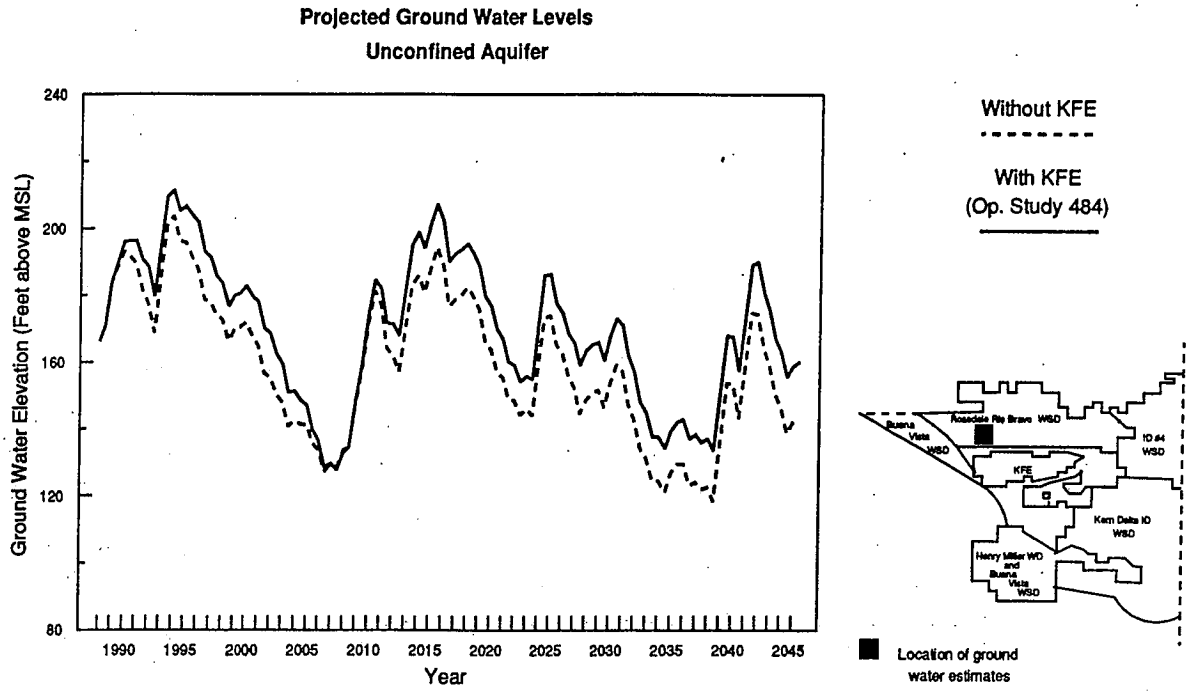
A basinwide ground water model (GWM) was used to project KFE impacts. The water model is an adaptation of the San Joaquin Valley Ground Water Model originally developed for DWR by Resource Management Associates and documented by RMA in 1982 (RMA, 1982). After its initial development, the Valley-wide ground water model was modified in DWR studies described in DWR reports in 1985 and 1989. The basinwide GWM used in KFE studies was adapted by truncation to exclude most of the Valley outside of Kern County and by addition of detail in the vicinity of the KFE.

The results of the basinwide GWM projections are summarized in two sets of figures: (1) hydrographs that show water levels at specific elements for each projection year and (2) contour maps that show ground water impacts adjacent to the KFE for specific projection years. Figure 22 shows hydrographs of projected GWM unconfined water levels for four elements. In reviewing these hydrographs, the reader should consider that any projected ground water level rises or declines reflect not only the projected KFE recharge and extraction activities but also the impacts of alternating wet and dry hydrologic cycles for Kern County as a whole.

Two periods of years in these hydrographs are especially important for project operations — the initial fill period and the critical period for extractions. The initial fill period starts in the second year of the projections, 1989, which is assumed to be a relatively wet year corresponding to hydrologic year 1974. As shown in Table 4, KFE recharge continues at large rates through projected year 1995, when the KFE reaches maximum project storage. This initial fill period includes the hydrologic sequence of 1974 through 1978, followed by 1922 and 1923. The critical extraction

Figure 22

Element 221 (Rosedale-Rio Bravo WSD)



Element 219 (Buena Vista WSD)

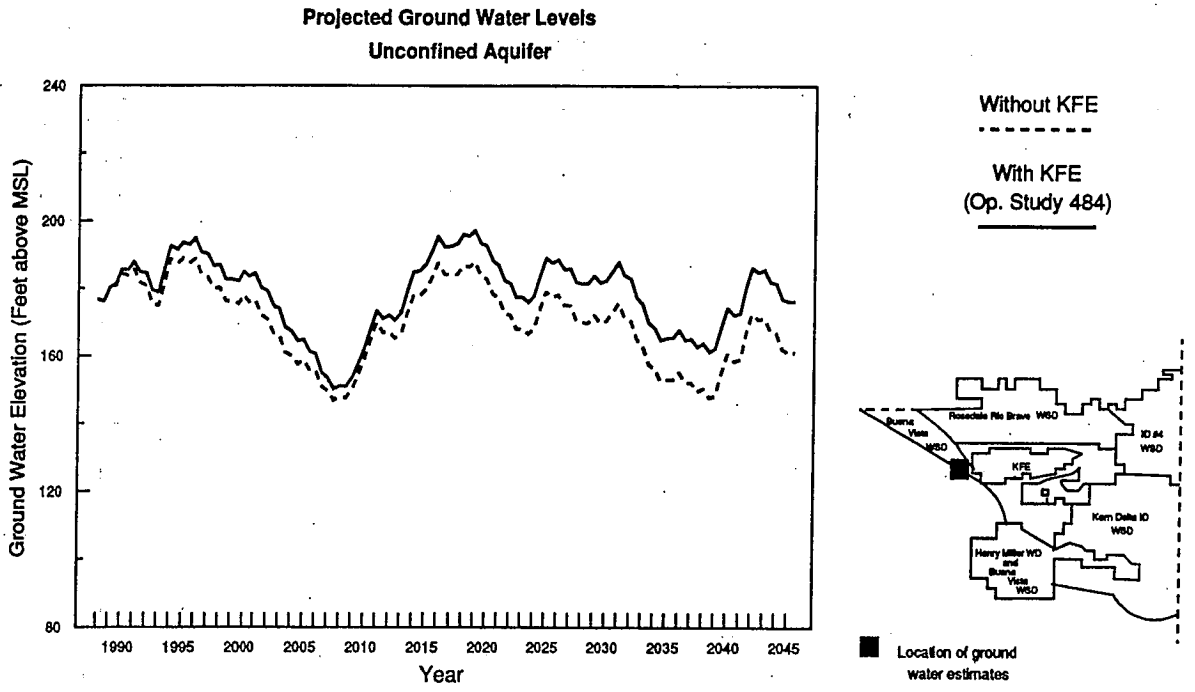
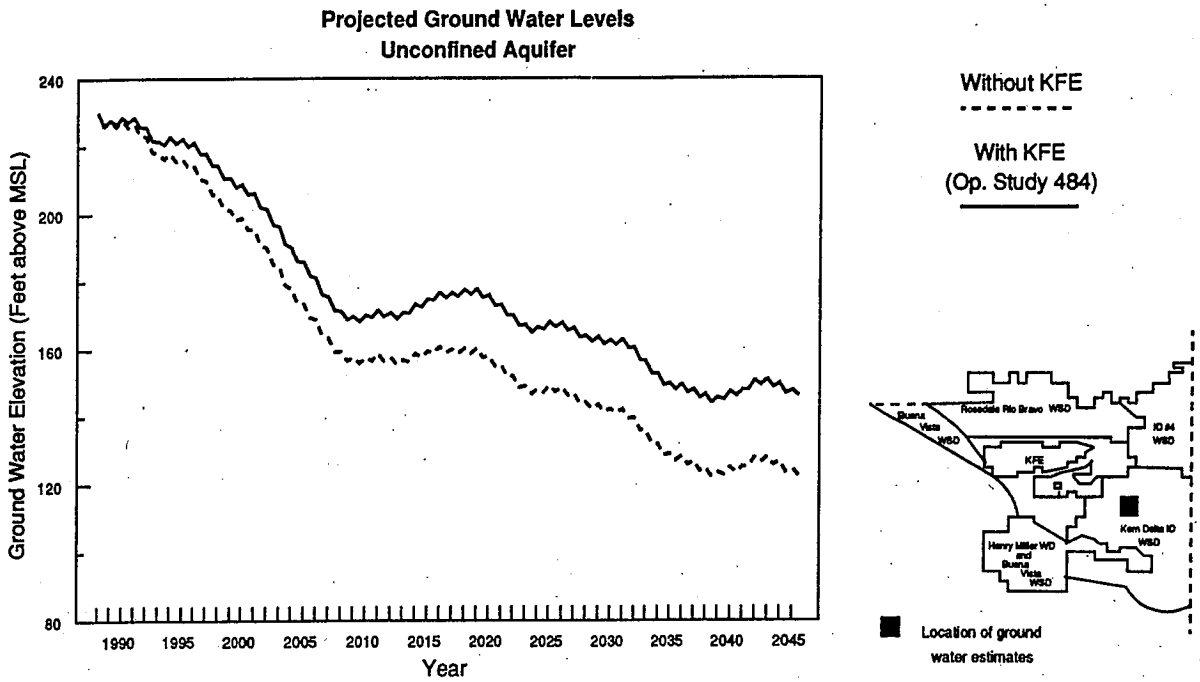
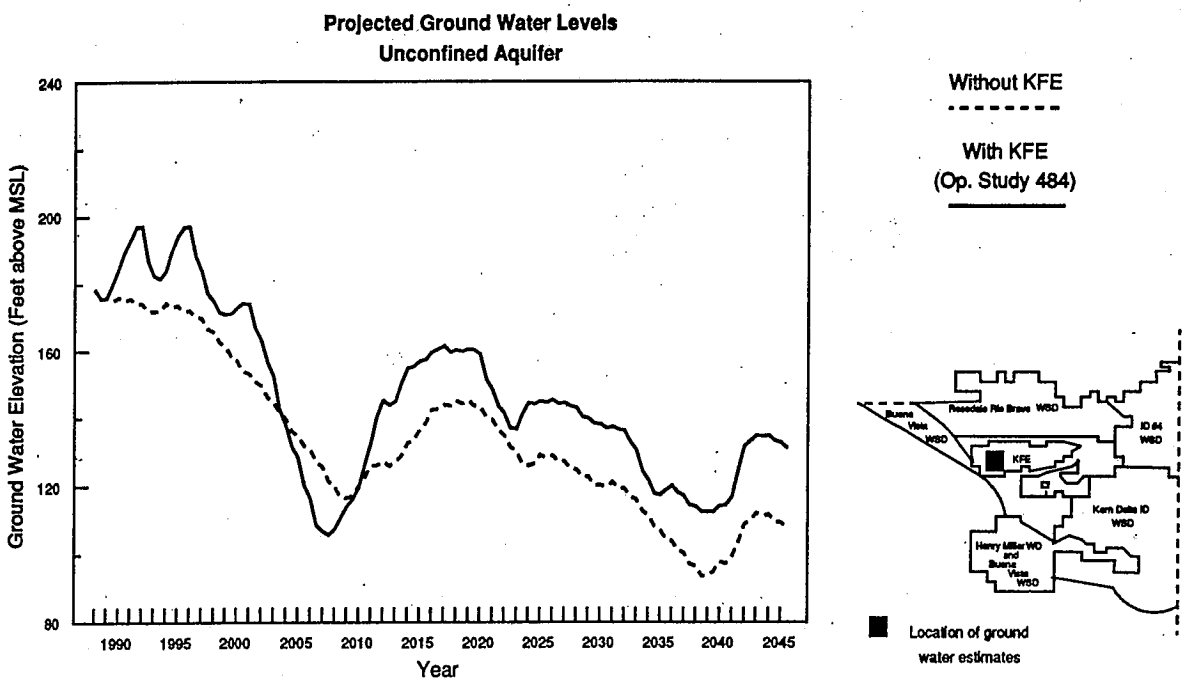


Figure 22 cont.

Element 250 (Kern Delta WD)



Element 224 (Kern Fan Element)



period corresponds hydrologically to the SWP's 1929-1935 seven-year critically dry period. The projection years equivalent to this critical period are 2001 through 2007.

The first of the hydrographs in Figure 22 is for Element 221, located in Rosedale–Rio Bravo WSD less than one mile from the northern boundary of the KFE. The hydrograph for this element shows higher water levels with KFE operations than without for all but one year near the end of the 1929–1935 dry period. Projected with–KFE water levels during 2007, which corresponds with hydrologic year 1935, are a maximum of 0.3 feet lower than projected without–KFE water levels. Over the entire 57–year simulation period, projected GWM unconfined water levels with KFE operations in Element 221 average 12.4 feet higher than without–project conditions. Because Element 221 is closer to the KFE than is most of Rosedale–Rio Bravo WSD, it somewhat exaggerates the impacts, both positive and negative, of KFE operations on ground water levels. The average water level increase throughout Rosedale–Rio Bravo WSD due to KFE operations is less than the 12.4 feet in Element 221, but most other elements also do not have any periods of time in which unconfined water levels are lower with the KFE than without it. Hydrographs for Elements 219 and 250, which are located in Buena Vista WSD and Kern Delta WD, respectively, both show projected unconfined water levels that are always higher with than without KFE operations. On the average, projected unconfined water levels are 8.5 and 11.4 feet higher for Elements 219 and 250 with the KFE.

The final hydrograph shown is for Element 224, which is located within the KFE. The benefits of higher water levels in recharge years are pronounced in this element, as are the impacts of dry year extraction. Water levels in Element 224 with the KFE are projected to rise about 33 feet higher than they would have without the project during intensive recharge during the initial fill period. Later, during peak extraction in the projected 2001-through-2007 period (which corresponds hydrologically with the 1929–1935 dry period), projected with–KFE water levels fall as much as 11.4 feet below without–project levels. These project impacts occur within the KFE itself and are not indicative of impacts to other basin water users.

A second summary of the GWM projections shows the impacts of project operations for two different periods. First, Figure 23 is a contour map that shows the difference between with–project and without–project water levels for projection year 1991, which corresponds hydrologically to spring 1976 conditions. These conditions represent the effects of three years of full recharge operations with KFE storage about 75 percent full. Figure 24 is another contour map that shows the difference between with-project and without–project water levels in the KFE for projection year 2007. This contour map shows the effects of complete withdrawal of SWP storage near the end of the 1929–1935 dry period.

Finally, a complete measure of KFE impacts is provided in Table 4. This table presents the difference between total pumping costs with and without the KFE for nearby Kern County DAUs. Using an interest factor of 6 percent, a real increase in energy costs of 1.7 percent, and a 50-year analysis period, the KFE results in present worth of reduced pumping costs of $2,500,000 for DAU 454 (Rosedale–Rio Bravo WSD and an adjacent unorganized area to the north), $500,000 for DAU 355 (Buena Vista WSD), and $9,500,000 for DAU 354 (KCWA Improvement District No. 4, Kern Delta WD and the non–SWP portions of the former James–Pioneer Improvement District).

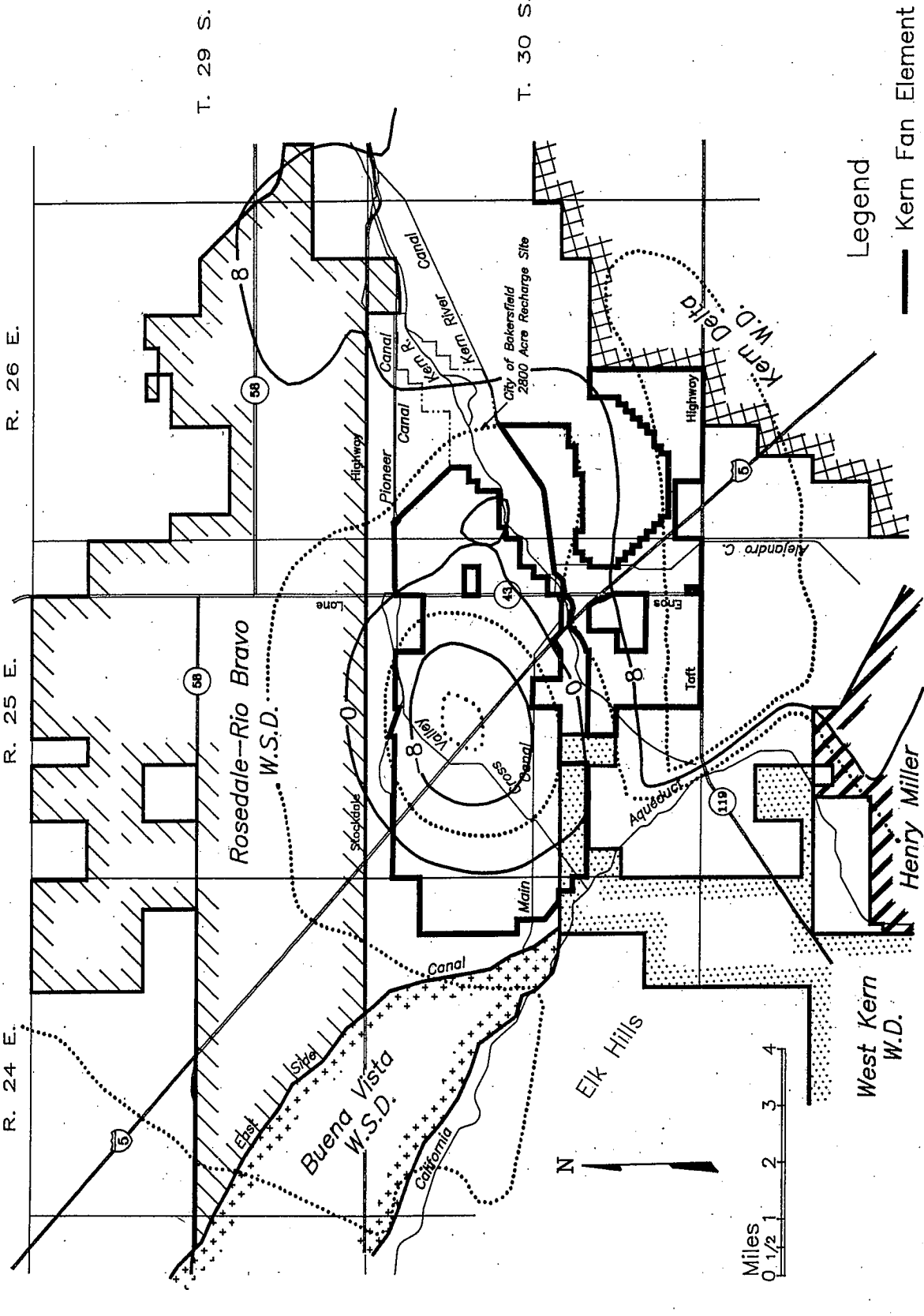


Figure 23 UNCONFINED WATER LEVEL IMPACTS (1975)

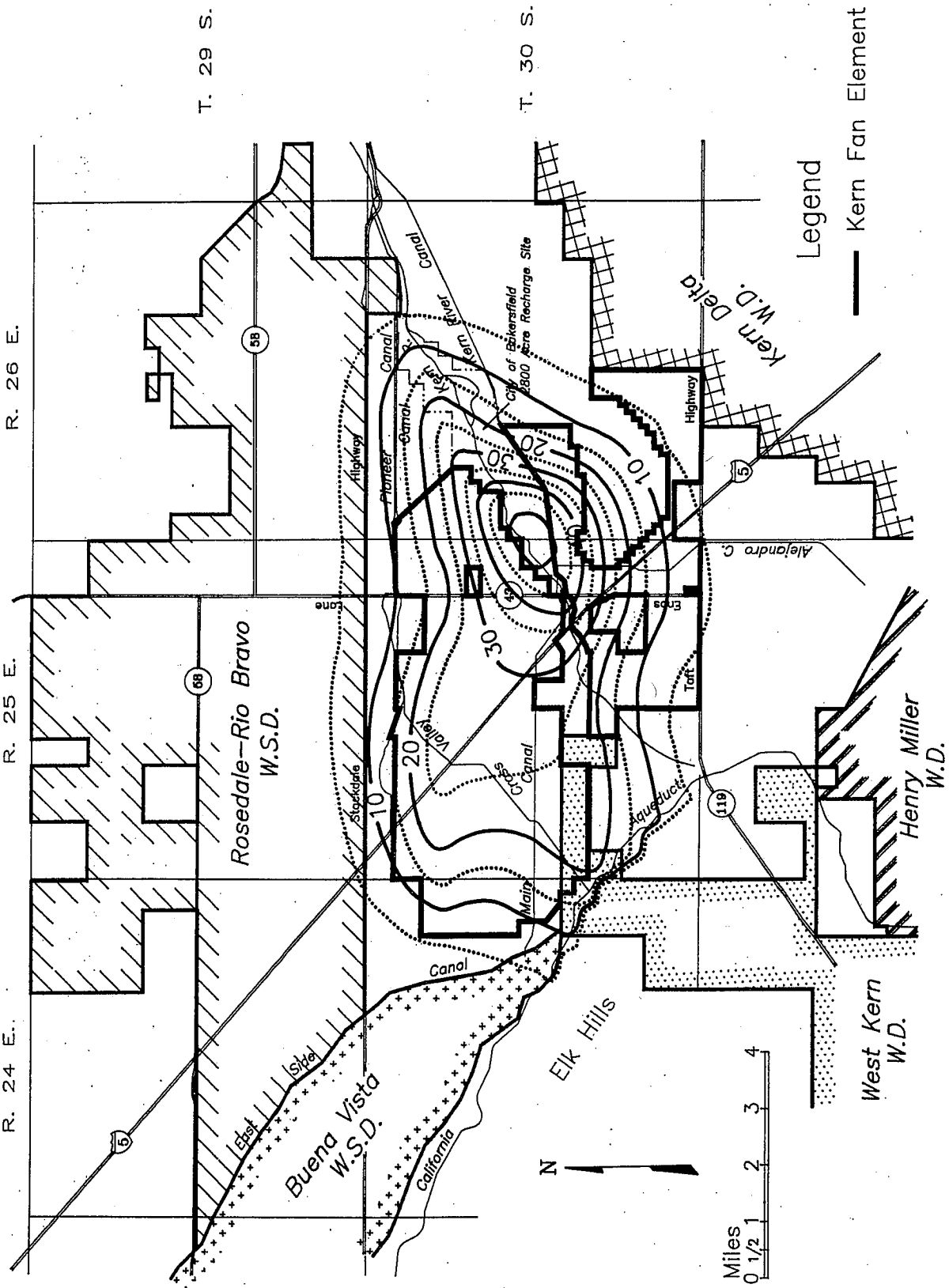


Figure 24 UNCONFINED WATER LEVEL IMPACTS (1935)

Table 4
PROJECTED TOTAL KERN FAN ELEMENT PUMPING COSTS SAVINGS
(Difference between total pumping costs with and without KFE)
($MILLIONS)

DAU	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
354	0.13	0.20	0.13	0.20	0.21	0.64	0.25	0.30	0.56	0.42	0.48	0.50
454	-0.01	0.01	0.05	0.10	0.08	0.10	0.14	0.19	0.17	0.17	0.18	0.20
554	-0.22	0.45	0.70	0.85	-0.95	-0.04	0.89	0.92	-0.49	-0.23	0.14	0.98
654	0.00	0.00	0.01	0.03	0.03	0.00	0.01	0.00	0.17	0.01	0.02	0.00
754	0.00	0.00	0.00	0.41	0.11	0.00	0.00	0.00	0.13	0.00	0.47	0.00
854	-0.01	0.01	0.04	0.06	0.03	0.03	0.06	0.07	0.05	0.06	0.06	0.07
355	0.00	0.00	0.00	0.05	0.00	0.00	0.00	0.01	0.14	0.02	0.03	0.00
455	0.00	0.00	0.02	0.07	0.01	0.02	0.04	0.06	0.44	0.04	0.05	0.08
555	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.01	0.02	0.01	0.00	0.01
256	0.00	0.00	0.00	0.02	0.04	0.01	0.03	0.04	0.19	0.08	0.10	0.08

DAU	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
354	0.56	0.85	0.72	0.79	0.61	0.62	0.65	0.49	0.68	1.34	1.40	0.68
454	0.22	0.21	0.22	0.18	0.18	0.13	0.11	0.12	0.15	0.12	0.14	0.19
554	1.13	-0.53	0.15	-1.70	-0.73	-1.95	-1.82	0.20	1.38	-1.05	0.00	1.53
654	0.00	0.19	0.05	0.11	0.02	0.06	0.03	-0.05	0.04	-0.01	-0.01	0.01
754	0.70	0.15	0.62	0.10	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00
854	0.08	0.07	0.07	0.04	0.05	0.03	0.02	0.03	0.05	0.02	0.03	0.06
355	0.03	0.18	0.08	0.10	0.02	0.03	0.04	-0.03	0.00	0.00	0.00	0.01
455	0.10	0.56	0.19	0.32	0.11	0.19	0.14	-0.11	0.24	0.01	0.10	0.14
555	0.01	0.03	0.02	0.02	0.01	0.01	0.02	0.00	0.01	0.01	0.01	0.01
256	0.11	0.30	0.21	0.28	0.16	0.20	0.24	0.12	0.17	0.05	0.05	0.18

DAU	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
354	0.85	1.60	1.21	1.72	1.30	1.57	1.39	1.41	1.36	1.53	1.45	1.32
454	0.23	0.25	0.30	0.33	0.35	0.34	0.38	0.40	0.37	0.35	0.34	0.40
554	0.93	0.00	0.89	0.00	0.43	-0.15	1.09	1.08	-0.49	-0.61	0.12	2.02
654	0.07	0.00	0.00	0.00	0.20	0.04	0.00	0.08	-0.01	0.10	0.00	0.00
754	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.14	0.53	0.00	0.00
854	0.07	0.06	0.10	0.10	0.11	0.10	0.11	0.11	0.09	0.09	0.09	0.12
355	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.09	0.05	0.13	0.05	0.00
455	0.40	0.18	0.17	0.18	0.72	0.28	0.22	0.39	0.12	0.46	0.17	0.27
555	0.02	0.02	0.02	0.02	0.04	0.03	0.02	0.03	0.03	0.03	0.03	0.03
256	0.27	0.09	0.16	0.11	0.42	0.23	0.24	0.41	0.39	0.51	0.42	0.37

DAU	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
354	2.33	1.66	1.66	2.22	2.05	1.80	2.62	2.48	2.80	2.81	2.54	2.53
454	0.41	0.46	0.49	0.53	0.53	0.56	0.55	0.60	0.59	0.58	0.58	0.63
554	0.00	1.58	1.98	1.74	1.07	2.18	0.47	2.29	0.66	-0.25	0.20	1.97
654	0.00	0.00	0.01	0.30	0.03	0.01	0.00	0.23	0.36	0.26	0.19	0.01
754	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.71	0.76	0.00	0.00
854	0.11	0.14	0.15	0.15	0.14	0.16	0.14	0.17	0.14	0.13	0.14	0.16
355	0.00	0.00	0.05	0.33	0.00	0.03	0.00	0.28	0.46	0.41	0.22	0.00
455	0.28	0.30	0.32	1.20	0.47	0.40	0.40	1.18	1.39	1.15	0.96	0.56
555	0.03	0.03	0.03	0.06	0.05	0.05	0.05	0.07	0.08	0.08	0.07	0.07
256	0.15	0.40	0.48	0.82	0.41	0.54	0.36	0.89	1.16	1.20	0.90	0.58

DAU	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045
354	2.65	2.53	2.88	3.87	3.09	2.69	3.72	3.30	3.58	3.65
454	0.67	0.70	0.76	0.74	0.79	0.78	0.83	0.88	0.90	0.91
554	2.28	2.36	2.91	0.00	2.47	0.00	1.84	2.82	2.96	1.92
654	0.19	0.03	0.18	0.00	0.14	0.00	0.25	0.05	0.04	0.00
754	0.33	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00
854	0.18	0.19	0.21	0.18	0.20	0.18	0.21	0.23	0.24	0.24
355	0.22	0.06	0.19	0.00	0.00	0.00	0.00	0.14	0.27	0.00
455	1.16	0.69	1.31	0.72	1.22	0.78	1.72	0.95	0.84	0.85
555	0.08	0.08	0.10	0.08	0.11	0.09	0.12	0.11	0.11	0.11
256	1.00	0.81	1.07	0.26	1.02	0.26	1.08	1.18	1.34	0.89

Extraction Water Quality Concerns. This category deals with potential problems with quality of water extracted from any of the wells on the property. Potential problems include pesticide residues left over from historical farming operations, hydrocarbon contamination from oil and gas operations, and high salt concentrations resulting from plumes of historically percolated oil field brine and/or intrusion of high-salinity water from the west side of the valley. The general solution to this category of problems is to identify the cause of the problem, shift production away from the problem well(s), and modify project operation. To effectively evaluate the impact of modified project operations and to define facility location and operational characteristics needed to control movement of contaminants may require development of a ground water transport model. The ultimate solution in the case of contamination includes control of the source (including clean-up as needed). In addition, it may require development of treatment options for extracted water if MCLs cannot otherwise be met before delivery into a source of public water supply. Treatment options will be very costly and should be resorted to only if operational modification is insufficient to control a water quality problem.

A low level of pesticide contamination is present in some areas, but the water quality is acceptable for irrigation. A potential clean-up option would involve continued use of the contaminated wells for irrigation on KFE lands, if such activity improves the quality of ground water. This solution would require amending the 1987 MOU and postponing a portion of the agricultural phase-out beyond the five-year requirement. Another potential solution is to allow the discharge of such contaminated water into the CVC when it is being used only for irrigation for a substantial period of time. This potential solution would have to be worked out with the CVC Participants and closely coordinated with the agricultural users and Improvement District No. 4.

VEGETATION

Six natural vegetation communities and five agricultural and/or disturbed areas are represented within the KFE project boundary. The acreage of the project is about 20,000 acres with native vegetation present on 1,510 acres. A more detailed description of vegetation communities is contained in the 1986 Program EIR. Vegetation types were delineated on 7.5 minute (1:24,000 scale) U.S. Geological Survey quadrangle maps. Vegetation maps were generated from these maps (see Figure 25). A list of "sensitive plants" (Appendix A) was compiled, using the rare plant inventory of the California Native Plant Society (CNPS, 1989), and the California Department of Fish and Game (DFG) and U.S. Fish and Wildlife Service (FWS, February 1990) lists of threatened, endangered, and/or candidate species. The following section describes vegetation types mapped and the dominant species found during the spring and summer of 1990. The vegetation types follow the designations defined by Holland (1985).

No significant impacts to native vegetation are expected since no construction or operation activities are contemplated in areas of native vegetation.

Valley Saltbush Scrub - Open/Dense (So/Sd)

This scrub community is found on sandy-loamy soils without surface alkalinity. The dominant species are *Atriplex polycarpa* with association of other *Atriplex* species. Open stands of valley saltbush scrub contain less than 35 percent cover of saltbush. Dense stands of valley saltbush contain greater than 35 percent cover. Saltbush communities may occur in association with other natural vegetation on the project areas, particularly as an understory of the mesquite savanna.

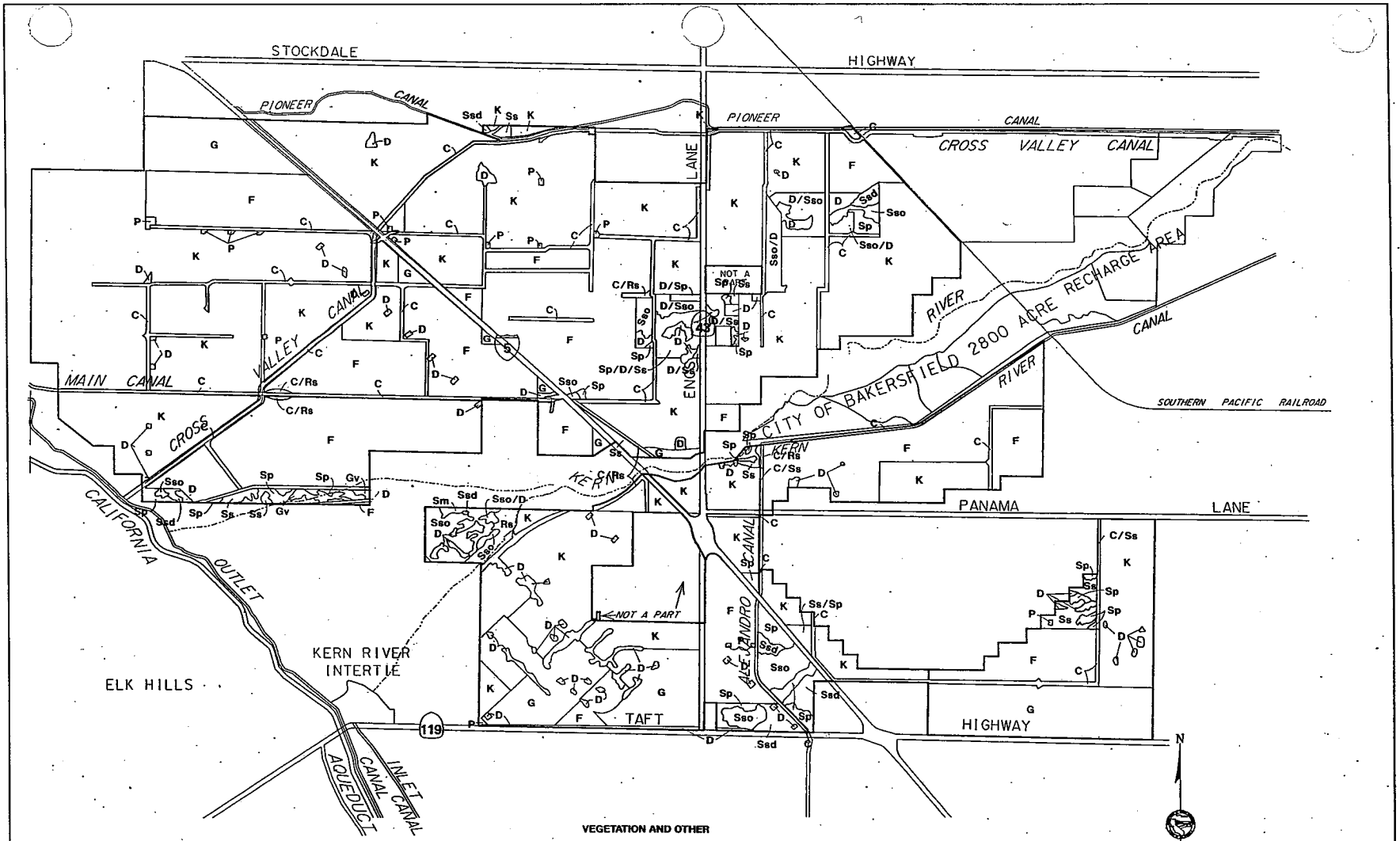


Figure 25

Vegetation Communities

Kern Fan Element

KERN WATER BANK

Non-Native Grassland (G)

This community is found on fine-textured, usually clay soils. A sparse to dense cover of annual grasses including *Avena* spp., *Bromus* spp., and *Erodium* spp. is generally found in this area. Non-native grass communities may occur in association with native annual forbs, especially in years of favorable rainfall. Typical species include *Avena barbata, A. fatua, Bromus mollis, B. rubens, Erodium botrys, E. cicutarium, Eschscholzia californica, Gilia* spp., *Hemizonia* spp., *Lasthenia* spp., *Layia* spp., *Lupinus* spp., and *Lepidium dictyotum.*

Valley Sacaton Grassland (Gv)

This community contains a mid-height (to 3 feet) tussock forming grassland dominated by *Sporobolus airoides.* The community occurs on fine-textured, poorly drained, usually alkaline soils. Most sites have seasonally high water tables or are overflowed during winter flooding. Typical species include *Distichis spicata, Hordeum depressum,* and *Sporobulus airoides.*

Mulefat Scrub (Sm)

This community is found along intermittent stream channels with fairly course substrate and moderate depth to the water table. The dominant species is Baccharis viminea which is maintained by frequent flooding. Typical species include *Baccharis viminea, Salix* spp., and species from the Family Cyperaceae.

Great Valley Mesquite Savanna (Sp)

This community is found on sandy loams of alluvial origins. The dominant species are *Prosopis juliflora* var. *torreyana* and *Atriplex* spp. Cover density ranges from open woodland to savanna. Understories are grassy in years of good rainfall, though usually dominated by introduced annuals. Mesquite is adapted to hot, dry summers and moist, foggy winters. Typical species include *Atriplex* spp., *Bromus rubens, Haplopappus acradenius,* var. *bracteosus, Prosopis juliflora* var. *torreyana.*

Southern Cottonwood Willow Riparian Forest (Rs)

This tall, open broadleafed winter-deciduous riparian community is dominated by *Populus fremontii* and several tree willows. The dominant species require moist, bare mineral soil for germination and establishment. Typical species include *Baccharis viminea, Populus fremontii,* and *Salix* spp.

Canal (C)

Canals have been constructed throughout the project area to transport water for irrigation. Where maintenance takes place, canal areas are devoid of vegetation. Other canals may include any of the above communities, particularly those with species including *Baccharis, Salix,* and *Populus.*

Pond (P)

Impoundment areas storing water for irrigation or livestock.

Disturbed (D)

This includes areas which have been impacted by heavy equipment and/or current or past construction leaving the ground devoid of vegetation.

Agriculture (K)

Areas currently used for agricultural production. Major crops include cotton, alfalfa, and grain.

Fallow Field (F)

Areas previously under agricultural use but which are currently fallow. Fallow fields may grade with or revert to non-native grassland.

WILDLIFE

DFG, under contract to DWR, conducted an inventory of the reptiles and amphibians, birds, and mammals inhabiting and/or foraging on the KFE property. The inventory began in June 20, 1990, and concluded at the end of November 1990. Special emphasis was given to listed species that potentially could be impacted by pond construction on the property. The primary species of concern are the federal and State endangered blunt-nosed leopard lizard (*Gambelia silus)* and Tipton's kangaroo rat (*Dipodmys nitratoides nitratoides)*, and the federally listed endangered, State listed threatened San Joaquin kit fox *(Vulpes macrotis mutica).*

Several field techniques were used to evaluate the potential use of the property by wildlife. The methodologies included: walking transects, riparian transects, raptors routes, spotlight surveys, track pads, variable circular plots, and small mammal trapping. Trapping efforts were random, with most of the effort concentrated in the proposed pond areas. The following sections identify species inventoried on the KFE property. Appendix B contains a list of the species found on the KFE property. Figure 26 shows the general locations of the threatened and endangered species on the KFE property.

A phased study approach was used by DFG to coincide with the First Stage program. The information that results from the DFG studies will be used, along with the operation and extraction results of the First Stage, to refine the ultimate layout of facilities for the KFE.

Reptiles and Amphibians

Intensive ground surveys for reptiles and amphibians were conducted from June through October 1990. The areas surveyed were the proposed First Stage recharge pond sites, fallow fields, and native habitat. Seven common reptile species and the State and federally listed endangered blunt-nosed leopard lizard were sighted on the KFE property. No amphibians were observed on the KFE property.

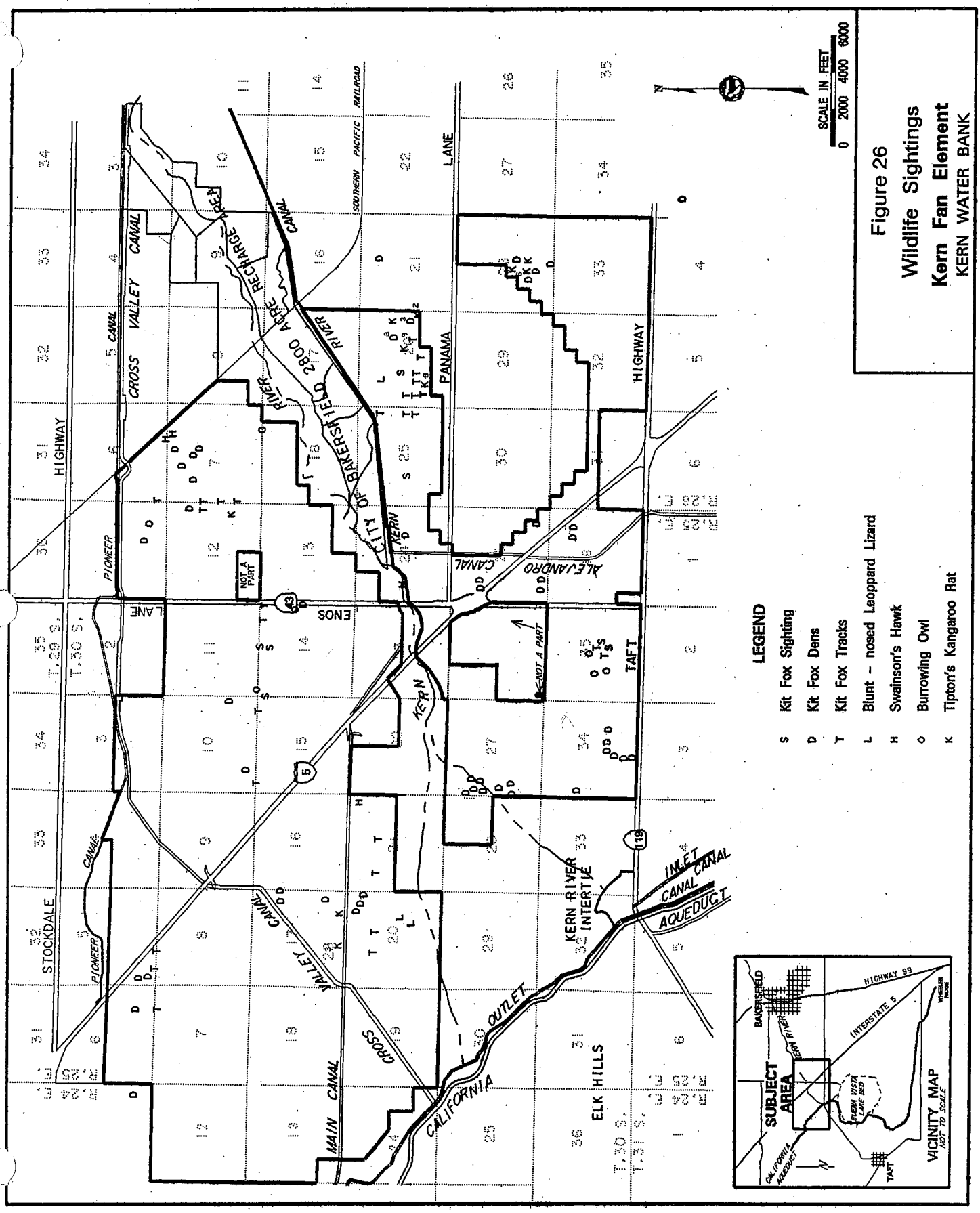


Figure 26
Wildlife Sightings
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 6000
N
LEGEND
S Kit Fox Sighting
D Kit Fox Dens
T Kit Fox Tracks
L Blunt - nosed Leoppard Lizard
H Swainson's Hawk
O Burrowing Owl
K Tipton's Kangaroo Rat
SUBJECT AREA
VICINITY MAP
NOT TO SCALE
BAKERSFIELD
HIGHWAY 99
INTERSTATE 5
KERN RIVER
BUENA VISTA LAKE BED
CALIFORNIA AQUEDUCT
TAFT
WHEELER RIDGE
CROSS VALLEY CANAL
RECHARGE AREA
SOUTHERN PACIFIC RAILROAD
LANE
PANAMA
HIGHWAY
PIONEER
CITY OF BAKERSFIELD
RIVER
KERN
ALEJANDRO CANAL
ENOS
TAFT
NOT A PART
STOCKDALE
CANAL
VALLEY CANAL
CROSS
MAIN CANAL
CALIFORNIA
OUTLET
KERN RIVER INTERTIE
INLET CANAL
AQUEDUCT
ELK HILLS
T.30 S.
T.31 S.
R.25 E.
R.24 E.

Blunt-nosed leopard lizard surveys were conducted concurrently with walking transect surveys for other species on KFE property. The optimum period for blunt-nosed leopard lizard activity is from mid-April to mid-June when air temperatures are between 22° C and 36° C (71° F and 97° F). An attempt was made to conduct surveys between 9:00 a.m. and 2:00 p.m. and when air temperatures were in the optimum range. The blunt-nosed leopard lizard was sighted on three occasions on the property. Two individuals were observed near the Main Canal Ponds and the third was observed within the area proposed for the South River Ponds. All sightings occurred before the end of July and were in concrete ditches or other supply canals in fallow agricultural fields. Additional ground searches will be required during the next field season to determine the distribution and use of the KFE property by blunt-nosed leopard lizards.

Birds

Avian survey techniques included riparian transects, raptor routes, variable circular plots, and incidental birding (random searches for avian species). These were conducted to establish avian activity and potential impacts associated with pond construction on KFE property. Avian surveys were conducted from June through October 1990. A total of 48 species of birds were recorded during the studies. Four are species of special status, including State or federally listed threatened, endangered, candidates for listing, or species of special concern. Common species observed include: mourning dove, western meadowlark, red-winged blackbird, and house sparrow.

Two 2-km (1.25 miles) riparian transects were established along the Kern River. Surveys were conducted twice a month during July and August and four times a month during September and October. The two riparian transects were surveyed a total of 27 times. Observation time along each transect was about 1½ hours.

Four raptor routes, ranging from 10.5 to 17.2 km (6.5 to 10.7 miles) were established and surveyed 93 times from June through November. Routes were driven at about 16 kmph (10 mph) for about one hour. The turkey vulture *(Carthartes aura)* was the most commonly observed species. The northern harrier *(Circus cyaneus)*, a species of special concern, and the Swainson's hawk *(Buteo swainsoni)*, State listed threatened, also were observed.

Variable circular plots (VCPs) were conducted from August through October in areas of native vegetation, fallow fields, and cultivated areas on KFE property. Stations were randomly chosen throughout the sampled area. A total of 119 VCPs were completed with a census time at each station ranging from 10 to 15 minutes depending upon the habitat type. No VCPs were conducted in riparian areas because these areas were surveyed via the riparian transects. Birds were identified either visually or by call. The distance to each sighting was estimated.

Incidental birding activity during the course of the study resulted in several sightings of listed and candidate species as well as other common species within the project area.

Mammals

Field survey techniques for small mammals inventoried on KFE property included: spotlighting, scent stations and track pads, small mammal live trapping, walking transects, and other incidental observations. Preliminary search of records included a search of records from DFG's Natural Di-

versity Data Base, review of information received from the Wildlife Habitat Relationship System for Kern County, and interviews with local persons (farmers and petroleum workers). The primary focus of the surveys was potential activity by sensitive species. The study team amassed 26 non-consecutive nights of spotlight surveys and about 1,000 small mammal trap nights. All observations were recorded by Universal Transverse Mercator (UTM) coordinate number for inclusion in DWR's Geographic Information System database.

Spotlight surveys were conducted on 32 occasions from the end of June and October, using two hand-held 400,000 (or greater) candle-power spotlights from vehicles driven at 16 kmph (10 mph) or less. When eye shine or animal movement was detected, binoculars were used to confirm the species or identify eye shine color. Mammals observed during spotlight surveys were mapped on a 7.5-minute USGS quad map. Twelve species of mammals were recorded during 48 hours of total observation time. Fourteen San Joaquin kit foxes were sighted. One badger, a species of special concern, also was sighted.

Scent stations and track pads were surveyed from mid-July through October on KFE property. Track pads were spaced at approximately 200 m (650 feet) intervals on or near roads within the study areas. A total of 428 scent stations and track pads were established along eight transects. Scent stations were placed on level ground that was cleared of vegetation. Stations were baited in the late afternoon and checked the following morning. Although many of the areas identified for pond construction are currently being farmed, substantial small mammal activity was recorded. Track pads recorded visits by kit foxes, coyotes, badgers, striped skunks, lagomorphs, small mammals, and birds (Table 5). Of the 428 scent stations on the KFE property, 135 registered San Joaquin kit fox activity. Sixty-seven percent of the kit fox activity was recorded in the area of the proposed South River Ponds (Table 6).

Small mammal live trapping, using Sherman live traps, was used to sample the rodent population on the property. A total of 953 trap nights of effort were expended from July through October. Most of the effort was concentrated within proposed recharge ponding basins. The Tipton's kangaroo rat, a State and federal endangered species, was captured on 22 occasions.

Walking transects, covering over 1,200 acres in and adjacent to areas targeted for construction of First Stage facilities, were used specifically to record San Joaquin kit fox, giant kangaroo rat, and San Joaquin antelope ground squirrel activity. Transects were walked between 15 and 50 meters (50 – 164 feet) apart. Observations of San Joaquin antelope ground squirrel, giant kangaroo rat, and kit fox were recorded. All kit fox dens, known and potential, were identified and recorded by UTM number. A total of 73 potential kit fox dens (simple and complex), including one natal den, have been identified and mapped. Figure 27 shows the area surveyed by walking transects and Table 7 denotes kit fox den locations with respect to recharge pond sites. Twenty-one dens were located within potential ponding basins. Eleven dens were found within the proposed South River Ponds site.

Table 5. Track Pad Results

Small mammal	190
San Joaquin kit fox	135
Dipodomys sp.	42
Lagommorph	34
Coyote	33
Bird	14
Striped skunk	10
Badger	9
Total	**442**

Table 6. Kit Fox Activity

Ponding Basin	# of Stations Recording Kit Fox Tracks	Percent
Stockdale Highway Ponds	7	5.2
Sunset Ranch Ponds	8	5.9
Mail Canal Ponds	4	3.0
South River Ponds	91	67.4
Outside ponding basins	25	18.5
Total	**135**	**100.0**

Table 7. Kit Fox Den Locations

Location	Potential Complex	Potential Simple	Known Complex	Known Simple	Natal	Total
Stockdale Highway Ponds	2	—	1	—	—	3
Sunset Ranch Ponds	1	1	—	1	—	3
Main Canal Ponds	2	—	1	1	—	4
South River Ponds	3	8	—	—	—	11
Other	23	26	2	—	1	52
Total	**31**	**35**	**4**	**2**	**1**	**73**

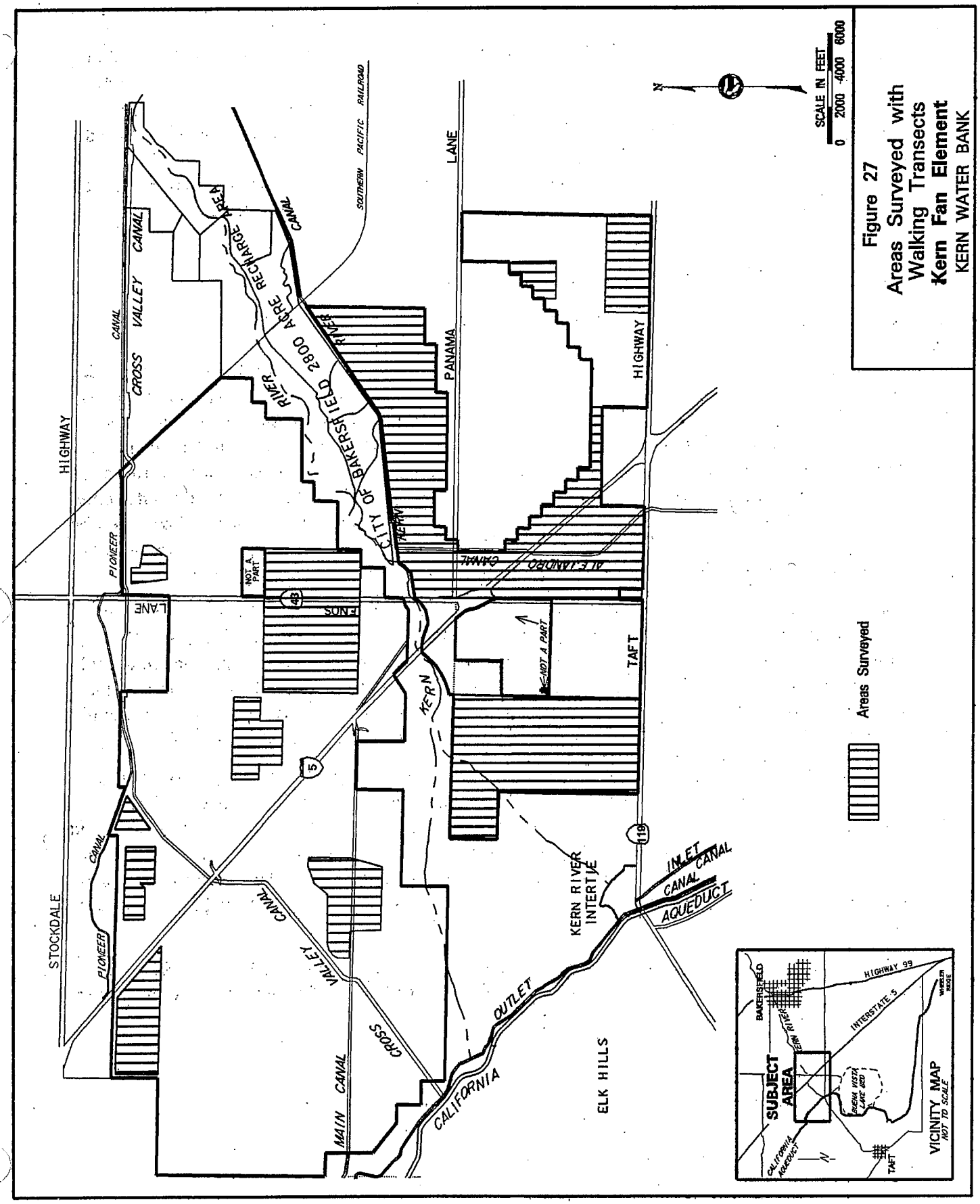


Figure 27
Areas Surveyed with Walking Transects
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 6000
N
Areas Surveyed
HIGHWAY
CROSS VALLEY CANAL
RECHARGE AREA
2800 ACRE
RIVER
CITY OF BAKERSFIELD
SOUTHERN PACIFIC RAILROAD
LANE
PANAMA
HIGHWAY
PIONEER
LANE
NOT A PART
FENCE
ALEJANDRO CANAL
KERN
TAFT
NOT A PART
STOCKDALE
PIONEER
CANAL
CROSS VALLEY CANAL
MAIN CANAL
KERN RIVER INTERTIE
INLET CANAL
AQUEDUCT
OUTLET
CALIFORNIA
ELK HILLS
SUBJECT AREA
BAKERSFIELD
KERN RIVER
HIGHWAY 99
INTERSTATE 5
WHEELER RIDGE
BUENA VISTA LAKE BED
CALIFORNIA AQUEDUCT
TAFT
VICINITY MAP
NOT TO SCALE

The comments received on the Notice of Preparation for the First Stage Kern Fan Element program conveyed interest regarding potential effects on water quality, wildlife, and wildlife habitat. The Department of Water Resources agreed, as part of the KFE program discussed in the 1986 EIR, to include a plan in the KFE development that would allow lands not actively used for recharge to revert to native habitat. Vegetation and wildlife studies are currently being conducted to inventory the status of species on the KFE property. The results of these studies and the mitigation requirements, if any, will be identified in the Final SEIR. Since some of the issues raised in the Notice of Preparation were not evaluated in the Program EIR (1986), those issues will be examined in this document.

Impacts of Construction and Operation Activities on Sensitive Wildlife

Construction activities for the KFE program may cause potentially significant effects to the federal and State endangered blunt-nosed leopard lizard and Tipton's kangaroo rat, and the federally listed endangered, State listed threatened San Joaquin kit fox. The First Stage program will require about 1,300 acres. A small portion (about 350 acres) of the disturbance will be confined to existing recharge basins, roads, or other facilities, while the remainder will consist of disturbance to areas that were previously in agriculture. Some of these lands have been fallow for quite some time and, with the re-establishment of native vegetation, these areas are now being reoccupied by wildlife. The presence of the blunt-nosed leopard lizard, San Joaquin kit fox, or the Tipton's kangaroo rat may potentially result in a take during the construction of the KFE facilities.

Sensitive species may be impacted and an incidental take may result from the operation of the KFE facilities. DWR recognizes this potential conflict exists. However, since lands not actively used for recharge will be allowed to revert to native habitat, potential impacts can be minimized by improving or restoring previously farmed areas to native habitat before lands needed for the KFE facilities are disturbed. By creating the new habitat first and relocating sensitive species to these areas, adverse impacts will be minimized and a net benefit will result for wildlife.

DWR will also design and implement a habitat conservation plan with the objective of restoring, preserving, and enhancing additional areas of native habitat to support threatened, endangered, and sensitive species. This conservation plan will be designed to meet the requirements of the federal and State endangered species acts and will comply with CEQA and NEPA. DWR will cooperate with the City and County of Bakersfield and other agencies to maintain a continuous open corridor between the foothills and the San Joaquin Valley for wildlife by restoring and/or preserving as much land as feasible on the KFE property.

DWR is also pursuing a Section 10(a) permit under the Federal Endangered Species Act. This section allows a take of a protected species if the party causing the take possesses a valid permit.

LAND USE

Most of the land acquired for the KFE is currently leased for agriculture. The Memorandum of Understanding between DWR and KCWA provides for the phase out of all agricultural production on KFE property by the end of 1993. The MOU also states that local benefits be allowed on the KFE, whether for ground water recharge or other use. Until agriculture is phased out, DWR is required to minimize potential problems with weeds and dust on the KFE property. After ultimate build out of KFE facilities, some form of initially managed vegetation will be needed throughout the property.

Formal planning for the land conversion is under way, and several potential uses are being considered. While some lands will be used for additional recharge ponds and facilities for completion of the KFE or for local recharge projects, other lands may be converted to wildlife habitat to mitigate for damage caused by the KFE facilities, other SWP facilities and programs, or possibly for mitigation of local development. Other possibilities include waterfowl and upland habitat development, other wildlife enhancement, and/or recreation development. Until a final land use plan is adopted, the deliberate establishment of habitat for threatened and endangered species in areas where future project facilities or other potentially conflicting uses are envisioned should be minimized.

Potential Near-Term and Future Land Uses

Ground Water Recharge and Conveyance Facilities. The proposed First Stage consists of about 1,300 acres of recharge ponds and conveyance canals as shown earlier in Figure 3 and detailed in Table 8. Preliminary delineation of corridors reserved for alternative Second Stage KFE conveyance facilities and areas reserved for Second Stage recharge ponds is shown in Figure 28. These reserved areas are based on a conceptual-level selection of the alternatives likely to be evaluated during the preliminary design of the Second Stage facilities. As such, it is expected that the actual land needs for the Second Stage facilities will be somewhat less than the total requirements estimated on the basis of Figure 28. The primary conveyance facility corridors are based on likely alternatives for the State Canal. The area of the primary conveyance facility corridors is estimated to be about 500 acres. The total length of primary corridors is about 14 miles, with an assumed width of 300 feet. The secondary corridors are based on the needs for smaller future recharge and extraction canals, pipelines, and project roadways similar to the First Stage facilities. A considerable portion of these corridors overlie existing farm roads and parts of the Pioneer Canal System. The area of the secondary conveyance facilities corridors is estimated to be 850 acres. The total length of secondary corridors is about 47 miles, with an assumed width of 150 feet. The reserves for future recharge ponds are based on the areas with the best potential recharge rates. Second Stage ponds will be selected from within the areas shown. The total area of the recharge pond reserves is about 1,900 acres.

Table 8. First Stage Facilities: Construction Corridors And Pond Areas

Item	CONSTRUCTION CORRIDOR Length	Width	DISTURBED AREA Acres
Recharge Facilities			
Existing recharge ponds	—	—	320
New First Stage recharge ponds	—	—	790
New supply canals	3.4	60	25
Rehabilitation of existing laterals	6.2	40	30
New Main Canal intake	1	100	12
Extraction Facilities			
Buried pipeline	7.3	30	27
Concrete-lines canals	6.6	45	36
Pumpback facility	—	—	3
Roadways			
Primary roads	8	50	48
Secondary roads	3.7	30	13
TOTAL			1,291
ROUNDED TOTAL			1,300

* Assumes that 6.7 miles of 14.7–mile total length of the primary road system are improvements to existing field roads.

KCWA proposes to use up to 4,000 acres of the KFE property for additional recharge ponds and conveyance facilities to capture and recharge flood flows in the Kern River that presently enter the California Aqueduct via the Kern River Intertie structure.

Agricultural Leases. All agricultural leases on KFE property will be phased out by the end of 1993 in accordance with terms of the 1987 MOU with KCWA. About 15,400 acres are currently leased on the property. Some non–irrigated crops may be allowed past 1993. However, the continuation of any agricultural leases involving ground water use after 1993 would require approval by, and a contract amendment with, KCWA.

In some areas, where the ground water is presently contaminated by agricultural chemicals, the best means of treatment may be use of the extracted water for irrigation. If ongoing investigations support this concept, irrigated agriculture could be continued in selected areas of the KFE as a means of correcting water quality problems.

Wildlife, Native Vegetation and Recreation. As part of the process for planning future additions to SWP conservation storage, DWR has examined opportunities for expanding recreation and fish and wildlife benefits.

Implementation of the KFE will provide opportunities for the development of areas to benefit wildlife and recreation. To achieve these benefits, DWR has initiated a local land use planning process (discussed in the following section) to develop specific areas of the property for wildlife habitat, recreation, and recharge of local flood waters. The land use process emphasizes providing

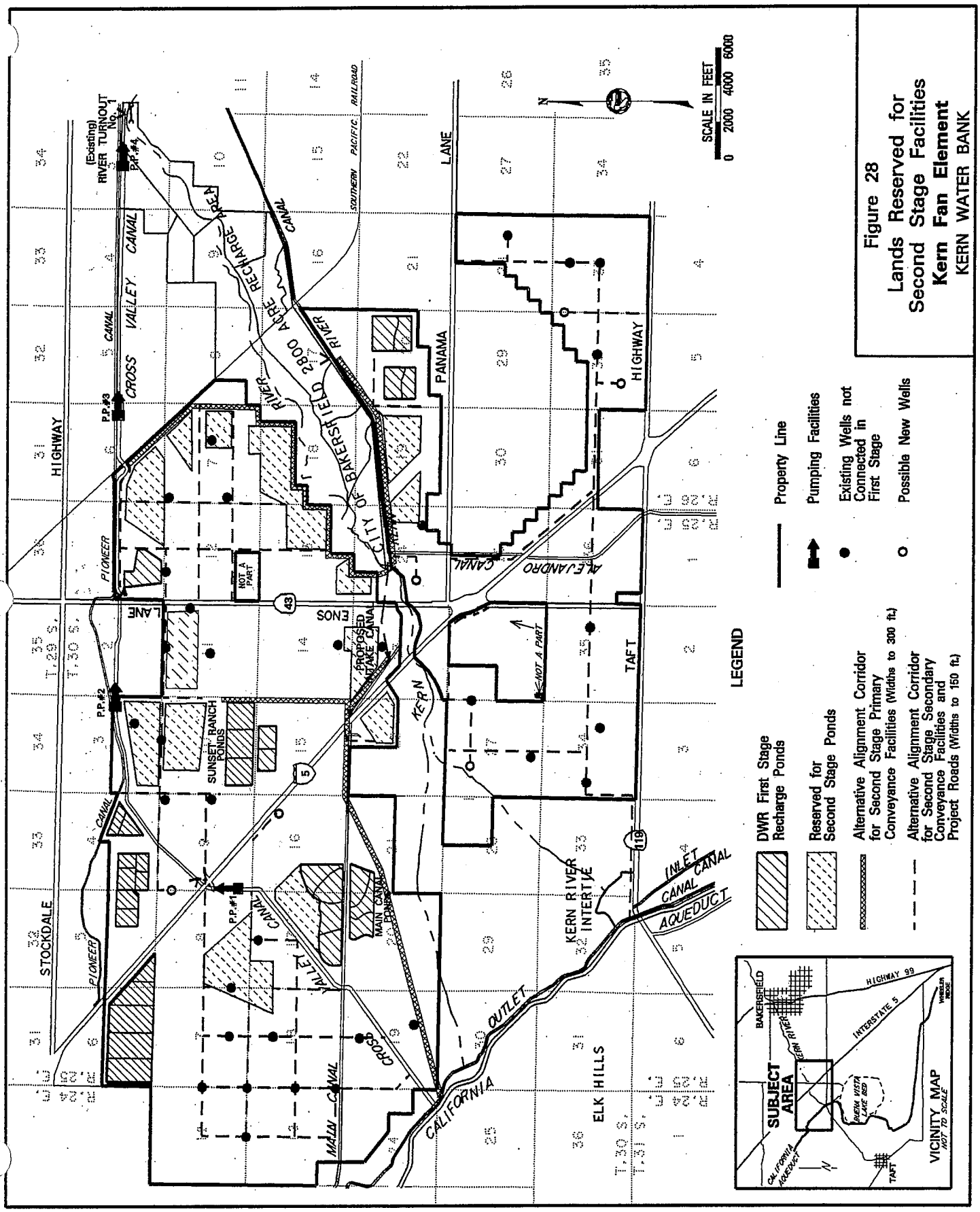


Figure 28
Lands Reserved for
Second Stage Facilities
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 6000
LEGEND
Property Line
Pumping Facilities
Existing Wells not Connected in First Stage
Possible New Wells
DWR First Stage Recharge Ponds
Reserved for Second Stage Ponds
Alternative Alignment Corridor for Second Stage Primary Conveyance Facilities (Widths to 300 ft.)
Alternative Alignment Corridor for Second Stage Secondary Conveyance Facilities and Project Roads (Widths to 150 ft.)
VICINITY MAP
NOT TO SCALE
SUBJECT AREA
BAKERSFIELD
HIGHWAY 99
INTERSTATE 5
KERN RIVER
BUENA VISTA LAKE BED
CALIFORNIA AQUEDUCT
TAFT
WESTSIDE PARKWAY
HIGHWAY
STOCKDALE
PIONEER
LANE
CROSS VALLEY CANAL
RECHARGE AREA
SOUTHERN PACIFIC RAILROAD
CANAL
RIVER
2800 ACRE
CITY OF BAKERSFIELD
PANAMA
ALEJANDRO
ENOS
PROPOSED LAKE LANA
NOT A PART
SUNSET RANCH PONDS
KERN
MAIN CANAL
VALLEY
CROSS
MAIN CANAL
OUTLET
CALIFORNIA
ELK HILLS
KERN RIVER INTERTIE
INLET CANAL
AQUEDUCT
TAFT
(Existing) RIVER TURNOUT No. 1
P.P.#1
P.P.#2
P.P.#3
P.P.#4
T.29 S.
T.30 S.
T.31 S.
R.25 E.
R.26 E.
R.24 E.

as much multiple use of the land as possible. For example, lands developed for local flood water spreading will also be retained as wildlife habitat in some form (conceivably a mix of upland habitat and intermittent wetlands).

While development of the KFE provides some unique opportunities for recreation and wildlife, there are some limitations. The August 1988 purchase agreement with Tenneco West, Inc., requires that land farmed at the time of sale will continue to be farmed or tilled for five years following purchase unless used for recharge and extraction facilities. Therefore, development of areas for wildlife are precluded through the end of 1993 on much of the property. Other limitations include: (1) potential interference with future water recharge areas; (2) potential conflicts with adjacent land uses (such as oil fields and farming); and (3) limitations related to physical factors such as location, geography, access to water, etc.

The planning for the KFE is being designed to accommodate the staged development of facilities as well as the five-year phase-out of agriculture. There is a possibility that some wildlife and recreation uses can be developed before 1993. However, it may require an amendment to the purchase agreement with ARCO (successor to Tenneco), to allow other uses to be developed in the near term. Specific plans for wildlife and recreation will be developed as part of the land use planning process.

Some land use changes, such as the development of riparian areas near some of the First Stage ponds, can occur prior to 1993. The specific design of these areas will be developed in cooperation with DFG and wildlife groups. Some of the recharge ponds can conceivably be operated and used as wetland habitat for waterfowl and other wildlife. This is the case with areas that may be developed for local recharge, which would not be flooded with great frequency. DWR intends to restore to native habitat those areas that are not proposed for potential recharge facilities. If feasible, DWR plans to create upland and wetland habitat mitigation areas contiguous to existing native wildlife habitat on the property, as well as within the Kern River corridor. This will help minimize the creation of habitat "islands" that limit the movement of wildlife and constrain habitat-carrying capacity for some wildlife species. DWR proposes to use as much of this native habitat as possible as a mitigation "bank account" to be used to offset mitigation required for ongoing or other proposed SWP facilities and programs. While the matter of mitigation banking is unresolved, the concept is expected to be developed over the next few years. DWR will work closely with DFG and the U.S. Fish and Wildlife Service in this matter, and will consult in the development of such areas with KCWA and the SWP water contractors.

Recreation activities currently being considered on the KFE property include bicycle and equestrian trails along Enos Lane and the proposed Kern River Parkway. Currently, a small parcel on the property is used by the Brittany Club, Inc. for dog training and trials. Dog trials are expected to continue and may be expanded. The Tule Elk Reserve, operated by the State Department of Parks and Recreation, is adjacent to a portion of the western boundary of the KFE property. A suggestion has been made to DWR that the western portion of the KFE property be opened for elk grazing during part of the year. DWR will consult with the Department of Parks and Recreation to determine the feasibility of this proposal.

Mineral Extraction. ARCO owns the mineral rights to much of the KFE property. Existing petroleum extraction activities will likely continue, and additional extraction facilities will probably be constructed on the property in the future. DWR is proposing to provide specific easements for oil

and gas extraction platforms and access roads to limit future intrusion and impact on restored and existing native habitat, while not constraining mineral rights. Seismic and drilling exploration for minerals will continue. DWR will propose agreements with mineral rights holders to minimize disturbance associated with mineral exploration.

Land Use Advisory Committee

In June 1990, DWR and KCWA held an initial public meeting to discuss current and future land uses on KFE property and to establish a land use advisory committee. Participants at the meeting included individuals representing the general public; local, State, and federal public groups; and private organizations. Interests included recreation, agriculture, mineral extraction, native habitat and wildlife conservation, water resources and local utilities.

The purpose of the initial meeting was to assess public interest in participating in a land use advisory process to formulate a long-term land use plan for the KFE property. In subsequent meetings, DWR assembled subcommittees representing the above interests as well as a general land use advisory committee to help formulate a long-term land use plan. Guidelines were developed and presented to the subcommittees for consideration in the development of compatible land use activities. This committee will consider recommendations from the subcommittees and submit final recommendations to DWR. The guidelines include the following provisions:

- All "reasonable" land use activities will be considered.
- DWR recharge ponds come first in time and use.
- Lands with the greatest recharge potential will be considered for recharge before other uses.
- No native habitat will be disturbed to create wetland habitat.
- Recharge and waterfowl ponds do not necessarily have to be combined.
- Mineral extraction on the property will continue.
- Wherever possible, DWR will select multiple use plans over single use options.

Since the interest in establishing areas of specific land use activities on the KFE site is greater than the area available, DWR, with recommendations from the land use committee, expects to combine compatible uses where possible. For example, compatible uses could include native habitat restoration, recreation, and tule elk access. Another potential combination could be recharge ponds and intermittent wetland habitat creation. DWR expects that the land use advisory process will extend into 1994 and be tied to the phase-out of irrigated agriculture and the construction of recharge and extraction facilities.

Geographic Information System

One tool being used to assist in the land use planning process is DWR's KWB Geographic Information System (GIS). A GIS is an electronic mapping/relational data base system which allows the user to illustrate multiple layers of landscape attributes such as soil type, vegetation cover, hydrography, and land use.

Currently, DWR has the following layers of information:

- Hydrography
- Land Use
- Native Vegetation Cover
- Recharge Pond Locations
- Land Ownership
- Pipeline and Utility Corridors
- Water Well Locations

Ultimately, DWR will have additional layers, including wildlife habitat and siting information, Metropolitan Bakersfield Habitat Conservation Plan conservation areas, Elk Hills Naval Petroleum Reserve information, soil type and infiltration rates, ground water levels, water quality patterns, and cropping patterns.

As the land use planning process progresses, the GIS is expected to be a valuable tool in helping identify compatible and conflicting land uses over the entire KFE property. In addition, the GIS will help show the spatial relationships between the proposed elements of the KWB and the connections between habitat conservation areas. The GIS will allow the Land Use Advisory Committee and DWR to explore different land use combinations and optimize the siting of recharge and extraction facilities and other proposed land uses.

Chapter 4. SIGNIFICANT EFFECTS OF THE PROPOSED PROJECT AND MITIGATION

This chapter sets forth those potentially significant environmental effects of implementing the proposed project and discusses the mitigation measures that would reduce adverse impacts to less than significant effects. Table 9 summarizes the potentially significant effects of the project and mitigation measures that will be used to reduce impacts to less than significant.

WILDLIFE

Adverse impacts to wildlife species could result from the construction of recharge ponds or other facilities proposed for the KFE lands. Several sensitive species are known to occur within the project area. Although proposed recharge areas have been located on currently farmed or recently farmed lands, some sensitive wildlife species have become established in these disturbed areas. Since there is the potential for project activities to result in the take of sensitive species, DWR initiated informal consultation with the Department of Fish and Game (DFG) and the U.S. Fish and Wildlife Service (USFWS), pursuant to the endangered species acts. DWR will obtain the appropriate clearances and permits to construct and operate KFE without jeopardizing the continued survival of sensitive species or habitat.

Before construction begins, DWR will retain technical specialists to survey the area to determine site-specific conditions that can be avoided, including San Joaquin kit fox burrows, Tipton's kangaroo rat precincts, and potential blunt-nosed leopard lizard habitat. Any potential dens found will be flagged. If a potential den is considered unavoidable, adequate surveys will be conducted to determine whether the den is occupied. If the den is occupied, it should be surveyed by night spotlighting during the pupping season (April through June) to determine if it is a natal den. Natal dens will be avoided. Nonnatal dens will be excavated, if unavoidable, by a qualified biologist before construction to ensure that no kit foxes are present. Mitigation measures for disturbance to kit fox habitat or dens by construction activities can be minimized by timing the activities and by creating substitute habitat with selective borrowing of the embankment materials required for the recharge pond and canal embankments.

Additional information is needed to determine whether the blunt-nosed leopard lizard and Tipton's kangaroo rat will be impacted by the construction and/or operation of the KFE. If future studies conclude that impacts to these species are likely, DWR will institute appropriate mitigation measures for these species and prepare a habitat conservation plan covering all DWR activities on the KFE property, in accordance with DFG and FWS mitigation policy and in compliance with A.B. 3180 (Mitigation Monitoring). Any impacts associated with the construction and operation of the KFE will be mitigated by converting lands acquired as part of the KFE from agriculture to other uses beneficial to wildlife. These conversions are expected to compensate for negative impacts caused by construction activities.

Table 9. Significant Effects And Mitigation Measures

Impact Category	Impact	Mitigation
Ground water quality	A number of pesticides have been used that have a potential to contaminate ground water throughout that portion of the property that was farmed.	An exploration and sampling program is being conducted at each recharge site to determine whether contaminants are present. A water quality monitoring program has been implem ented to detect potential contaminants in the ground water. To the extent that pesticide problems are identified, solutions are expected to include on-site and/or nearby use of water from the affected well(s) for irrigation to the extent that water quality is suitable for that purpose, until the problem no longer exists. In addition, there is sufficient flexibility in the number and capacity of First Stage extraction wells to shift pumping away from a problem area.
	Petroleum hydrocarbon contamination from pipelines represents the most significant ground water quality threat on the KFE property. Contaminated areas on the property could limit use of some portions of the property for recharge and restrict extractions from some areas if ground water is contaminated.	All recharge basins constructed during the First Stage will be set back 500 feet from identified pipelines. The ongoing water quality monitoring program includes petroleum hydrocarbons. Any identiied problem areas will be isolated from use and corrected. Operational flexibility with alternate wells and recharge basins will preserve the water supply benefits of the project.
Ground water level depression	Ground water levels will drop during extraction. Localized impacts could occur to wells immediately adjacent to the KFE property in some areas.	To the extent that adverse water level impacts occur, pumping can be shifted to other First Stage extraction wells elsewhere on the property or curtailed. Alternately, arrangements could be made to interconnect potentially affected wells with the KFE extraction system to compensate the users for adverse impacts.
Local mounding	Ground water mounding is expected in the immediate area of the recharge basins. Prolonged KFE and local recharge (including local recharge in areas adjacent to or near the KFE property) has the remote potential to impact a limited acreage of tree and vine crops in the area.	Water levels will be monitored via a regional ground water monitoring network developed by DWR. To the extent that any projected interference problems are associated with KFE recharge, such potential problems will be handled by shifting KFE recharge to other areas and/or reducing recharge. Nearby extraction wells could also be used if needed to depress water levels to avoid impacts.

Table 9. Significant Effects And Mitigation Measures (continued)

Impact Category	Impact	Mitigation
Delta impacts	The potential exists for winter-run salmon to be impacted by additional Delta diversions required for the KFE. During dry, critical, and below-normal precipitation years, some winter-run juveniles may be entrained at the Banks Pumping Plant during the January-through-March period. The potential adverse impact on winter-run salmon smolts as a result of increased Delta diversions for the KFE is not possible to quantify. The KFE will result in diversions that will add only 1.5 percent to the total diversions. By itself, this would not be significant; however, due to the winter run is now considered endangered and any impact potentially could be significant.	An interagency winter-run team has been established to develop a recovery plan for the winter-run salmon in the upper Sacramento River. A joint federal/State recovery team has also been established pursuant to the endangered species acts. In addition, DWR is proceeding with informal consultation with NMFS and DFG on the potential impacts of proposed Delta facilities and changes in south-of-the-Delta storage projects on winter-run salmon. If the recovery team and consultation process conclude that SWP pumping causes a take, DWR will work to provide the appropriate mitigation and/or measures to minimize adverse effects. If an incidental take permit is required and appropriate, DWR will work with the respective regulatory agency in compliance with the State or federal Endangered Species Act.
Wildlife	Construction activities may cause potentially significant effects to the blunt–nosed leopard lizard, Tipton's kangaroo rat, and the San Joaquin kit fox, all threatened or endangered species.	Before construction begins, a qualified biologist will be retained to survey the area and determine site–specific conditions that should be avoided. Potential kit fox dens will be excavated or avoided. Buffer areas will be required around potential and natal dens. Speed limits will be posted during breeding season to restrict vehicle traffic. DWR will initiate formal consultation with DFG and FWS, pursuant to the endangered species acts. DWR will prepare a conservation plan so future activities at KFE do not result in a take of endangered species.

GROUND WATER LEVEL AND QUALITY MONITORING PROGRAM

The proposed ground water banking project will require extensive monitoring to identify possible adverse water level and quality impacts and to provide data for design of optimal project operations. DWR has installed monitoring wells on the KFE property and in the 2,800–Acre Recharge Area (Figure 29), and will construct a regional monitoring well network and additional monitoring wells on KFE property in the future (Figure 30). Characteristics of the existing monitoring wells are given in Table 10.

2,800–Acre Area Network

DWR, the City of Bakersfield, and KCWA have installed clusters of multiple completion monitoring wells at ten locations within the 2,800–Acre Recharge Area. These wells provide discrete water

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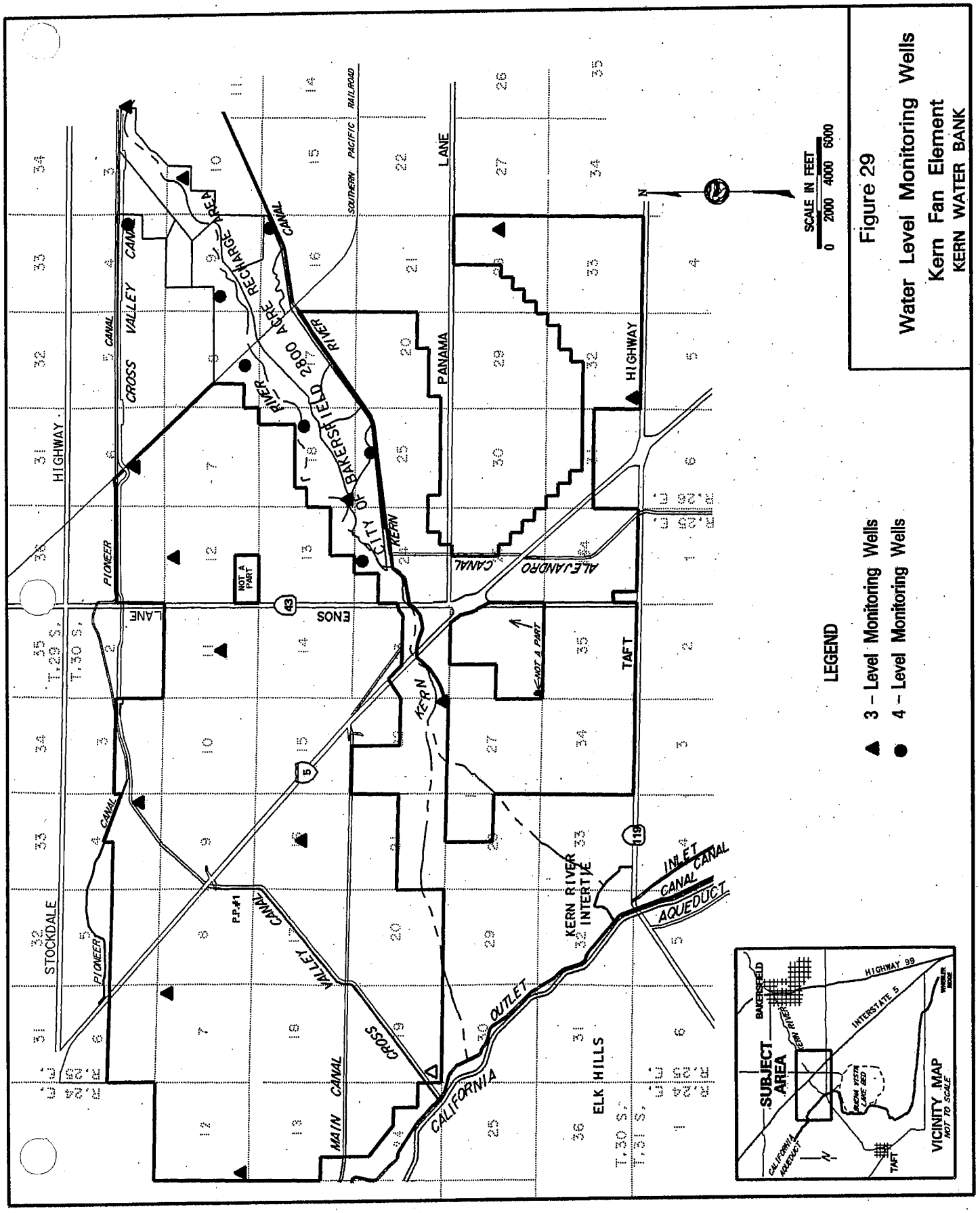
Figure 29
Water Level Monitoring Wells
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 6000
N
LEGEND
3 – Level Monitoring Wells
4 – Level Monitoring Wells
SUBJECT AREA
VICINITY MAP
NOT TO SCALE
BAKERSFIELD
HIGHWAY 99
INTERSTATE 5
TAFT
CALIFORNIA AQUEDUCT
KERN RIVER
WHEELER RIDGE
KERN VISTA LAKE BED
RECHARGE AREA
CROSS VALLEY CANAL
PIONEER
HIGHWAY
LANE
ENOS
PANAMA
HIGHWAY
SOUTHERN PACIFIC RAILROAD
KERN RIVER
CITY OF BAKERSFIELD
ALEJANDRO
CANAL
NOT A PART
TAFT
KERN
KERN RIVER INTERTIE
INLET CANAL
AQUEDUCT
P.P.#1
VALLEY CANAL
OUTLET
CROSS
MAIN CANAL
CALIFORNIA
ELK HILLS
STOCKDALE
T.30 S.
T.29 S.
T.31 S.
R.25 E.
R.26 E.
R.24 E.

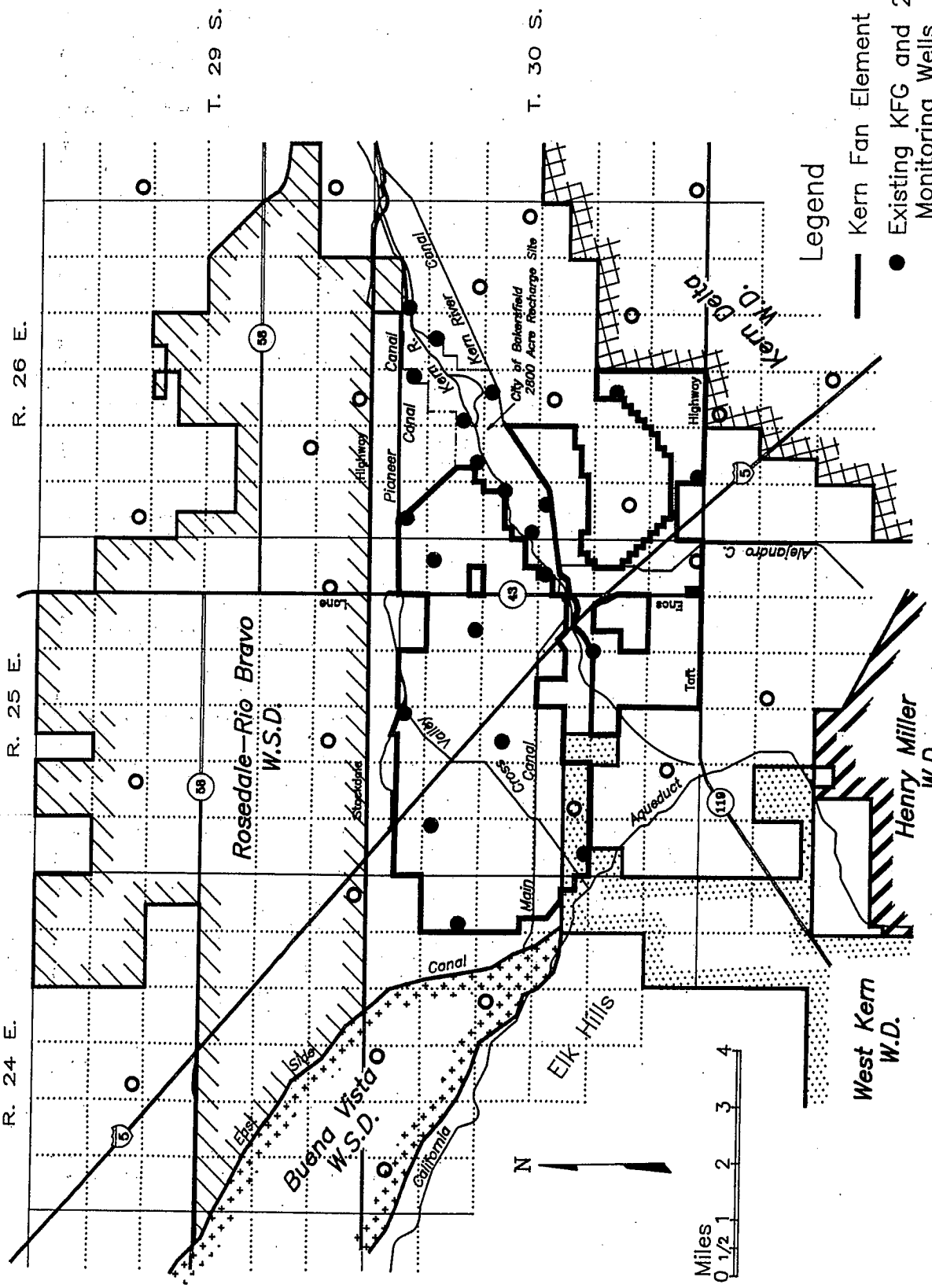

Figure 30 KERN FAN ELEMENT PROPOSED REGIONAL MONITORING WELL NETWORK

Table 10

Characteristics of Existing Monitoring Wells

Cluster Number	State Well Number	Depth (feet)	Measuring Point Elevation (feet)	Perforated Interval (feet)	Casing Diameter (inches)
1	30S/26E-02M01M	250	354.63	150-250	4
	30S/26E-02M02M	110	354.81	85-110	2
	30S/26E-02M03M	50	354.41	40-50	2
2	30S/26E-10C01M	250	350.05	150-250	4
	30S/26E-10C02M	100	350.45	75-100	2
	30S/26E-10C03M	50	349.34	30-50	2
3	30S/26E-09M04M	700	345.34	620-700	6
	30S/26E-09M01M	250	345.21	150-250	4
	30S/26E-09M02M	100	344.97	80-100	2
	30S/26E-09M03M	50	345.03	30-50	2
4	30S/26E-08P04M	680	334.96	600-680	6
	30S/26E-08P01M	250	334.86	150-250	4
	30S/26E-08P02M	100	334.80	80-100	2
	30S/26E-08P03M	40	334.36	30-40	2
5	30S/26E-18H04M	540	333.23	440-540	6
	30S/26E-18H01M	250	333.33	150-250	4
	30S/26E-18H02M	100	333.32	75-100	2
	30S/26E-18H03M	50	333.30	30-50	2
6	30S/26E-18N01M	250	328.91	150-250	4
	30S/26E-18N02M	90	329.03	70-90	2
	30S/26E-18N03M	60	328.68	35-60	2
7	30S/25E-24C04M	525	322.90	445-525	6
	30S/25E-24C01M	250	322.90	150-250	4
	30S/25E-24C02M	90	322.95	70-90	2
	30S/25E-24C03M	65	322.38	55-65	2
8	30S/26E-04J03M	650	350.84	560-650	6
	30S/26E-04J02M	375	351.08	223-375	6
	30S/26E-04J01M	150	351.32	100-150	6
	30S/26E-04J04M	65	350.97	45-65	2
9	30S/26E-16B03M	660	346.36	530-660	6
	30S/26E-16B02M	390	346.77	330-390	6
	30S/26E-16B01M	250	347.28	140-250	6
	30S/26E-16B04M	50	345.14	35-50	2
10	30S/26E-19B03M	590	326.91	500-590	6
	30S/26E-19B02M	390	327.38	300-390	6
	30S/26E-19B01M	220	327.86	120-220	6
	30S/26E-19B04M	45	325.66	35-45	2

Table 10 (cont.)

Characteristics of Existing Monitoring Wells

Cluster Number	State Well Number	Depth (feet)	Measuring Point Elevation (feet)	Perforated Interval (feet)	Casing Diameter (inches)
11	30S/25E-04J02M	250	313.01	190-250	6
	30S/25E-04J03M	455	312.50	345-455	6
	30S/25E-04J04M	625	312.00	565-625	6
12	30S/26E-06L01M	270	333.32	210-270	6
	30S/26E-06L02M	536	332.73	360-536	6
	30S/26E-06L03M	620	332.23	585-620	6
13	30S/25E-19N02M	120	296.77	90-120	6
	30S/25E-19N03M	230	296.31	190-230	6
	30S/25E-19N04M	385	295.78	310-385	6
14	30S/25E-22R01M	125	312.03	80-125	6
	30S/25E-22R02M	300	311.54	235-300	6
	30S/25E-22R03M	460	311.00	380-460	6
15	30S/26E-32N01M	330	314.12	210-330	6
	30S/26E-32N02M	440	313.67	390-440	6
	30S/26E-32N03M	610	313.17	570-610	6
16	30S/25E-12B02M	250	325.5±	150-250	6
	30S/25E-12B03M	500	325.0±	360-500	6
	30S/25E-12B04M	690	324.5±	590-690	6
17	30S/25E-11P01M	210	319.2±	150-210	6
	30S/25E-11P02M	470	318.7±	330-470	6
	30S/25E-11P03M	570	318.2±	520-570	6
18	30S/25E-16L01M	345	305.5±	285-345	6
	30S/25E-16L02M	555	305.0±	515-555	6
	30S/25E-16L03M	690	304.5±	645-690	6
19	30S/26E-28J01M	220	336.5±	120-220	6
	30S/26E-28J02M	330	336.0±	280-330	6
	30S/26E-28J03M	615	335.5±	540-615	6
20	30S/25E-07A01M	290	299.5±	220-290	6
	30S/25E-07A02M	470	299.0±	420-470	6
	30S/25E-07A03M	620	298.5±	530-620	6
21	30S/24E-13D01M	250	289.5±	150-250	6
	30S/24E-13D02M	360	289.0±	320-360	6
	30S/24E-13D03M	650	288.5±	520-650	6

level information on three or four zones in the aquifer system below the recharge area. They will provide reliable water level information for calibration of the ground water model being developed for the project, and provide information on aquifer properties as they respond to pumping from nearby extraction wells. In addition, the monitoring network is designed to identify the extent of vertical connection within the aquifer system by examining response to both pumping and recharge and to identify the effects of shallow, low-permeability materials on sustained recharge rates. In the future, it may be desirable to supplement the existing network with a series of very shallow (20 feet) monitoring wells to better define possible mounding effects.

Water levels have been measured in the monitoring wells on a monthly basis since 1988. In 1989, measurements were taken monthly during the nonirrigation season and biweekly during the irrigation season. Monitoring will be performed more often to evaluate the effects of extraction wells and recharge effects. Water levels are measured nearly continuously at four cluster locations by electronic data loggers.

No recharge has occurred in the 2,800–Acre Recharge Area since the monitoring well network was installed. As of October 1990, all the very shallow wells (about 50 feet deep) and most of the shallow wells (about 100 feet deep) were above the water table, and water levels continue to decline. Water quality sampling on a quarterly basis is being conducted in the deep monitoring wells and multiple completion wells constructed by DWR. Water quality monitoring is discussed in a later section of this chapter.

KFE Monitoring Network

Multiple Completion Wells. DWR has installed a network of 11 multiple completion monitoring wells on KFE property. The primary purpose of this network is to evaluate the response of different aquifer zones to pumping and recharge stresses. Some of the data collected will be used to calibrate and verify the ground water model being developed. The network is also suitable for identifying water level fluctuations near the project boundaries that may affect adjacent water districts. The water levels in these wells are measured at the same frequency as those in the 2,800–Acre Recharge Area. In addition, DWR will also continue to take spring and fall water level measurements on KFE production wells. To provide information on the amount and distribution of pumping on KFE property and its impact on the aquifer system, DWR has installed flow meters on all active production wells on the property. These meters are read monthly during the nonirrigation season and bimonthly during irrigation.

A secondary purpose of the monitoring wells is to provide ground water quality information on the property. In accordance with this objective, many of the wells were constructed downgradient from potential sources of water quality degradation. The wells are initially being sampled quarterly for a wide range of water quality parameters. Suitable production wells are sampled annually. The results of the sampling are discussed in the water quality section of this chapter.

Water Quality Monitoring Wells. In addition to the network of multiple completion monitoring wells, DWR will construct a series of wells designed specifically for water quality monitoring of potential sources of contamination. Figure 31 shows the tentative location of 11 water quality monitoring wells. All the wells, except for that located in Section 36, are placed to detect contamination from oil field operations. The monitoring well in Section 36 is designed to monitor possible adverse impacts of the sewage disposal operation to the south. The design of an effective water

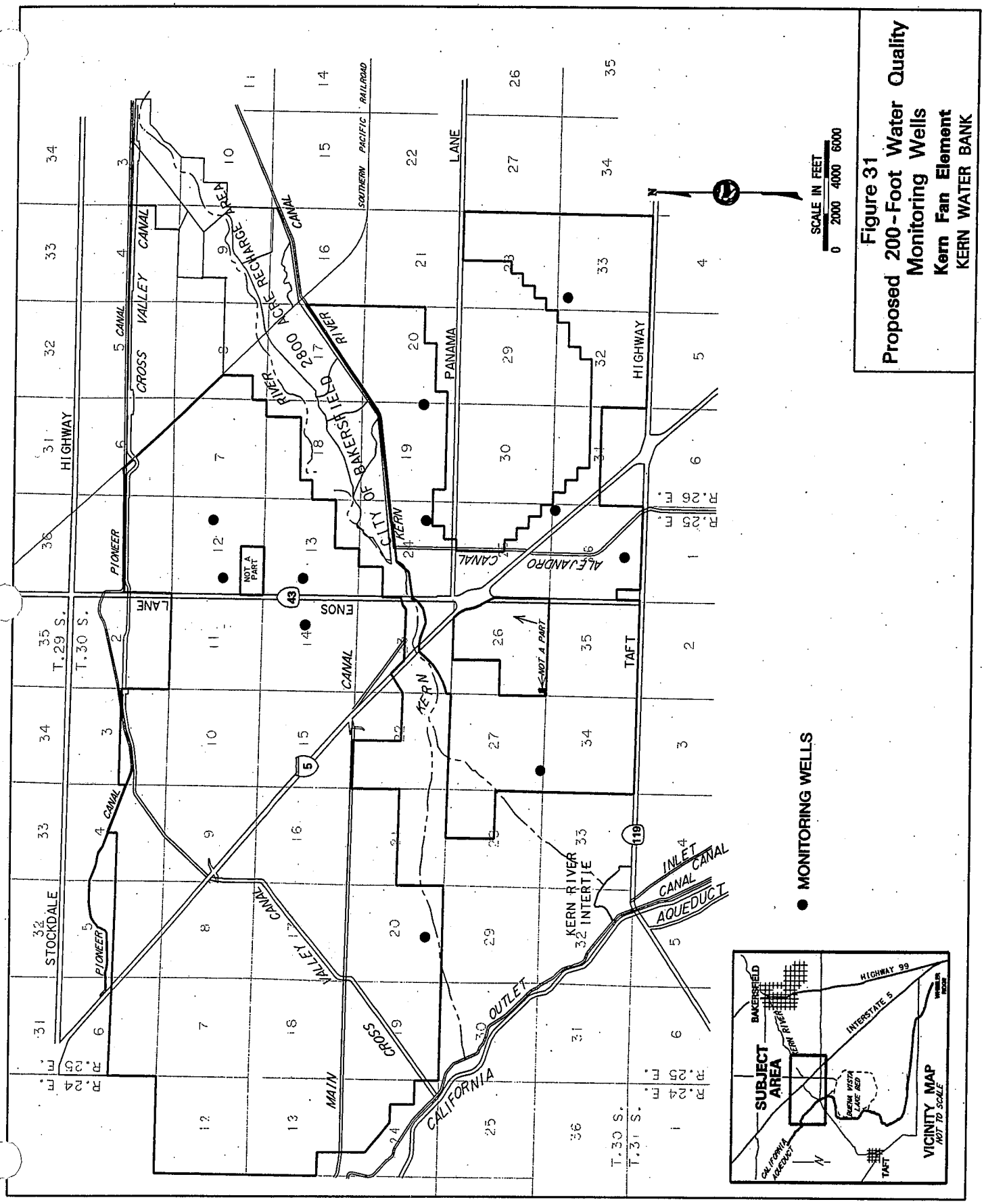
Figure 31
Proposed 200-Foot Water Quality Monitoring Wells
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 6000
MONITORING WELLS
SUBJECT AREA
VICINITY MAP
NOT TO SCALE
BAKERSFIELD
HIGHWAY 99
INTERSTATE 5
TAFT
CALIFORNIA AQUEDUCT
KERN RIVER
KERN VISTA LAKE RED
HIGHWAY
LANE
PANAMA
ENOS
TAFT
STOCKDALE
PIONEER
CROSS VALLEY CANAL
5 CANAL
4 CANAL
CANAL
VALLEY CANAL
MAIN
CROSS
OUTLET
CALIFORNIA
AQUEDUCT
INLET CANAL
KERN RIVER INTERTIE
ALEJANDRO CANAL
CITY OF BAKERSFIELD
2800 ACRE RECHARGE AREA
RIVER
SOUTHERN PACIFIC RAILROAD
NOT A PART
T.29 S.
T.30 S.
T.31 S.
R.24 E.
R.25 E.
R.26 E.

quality monitoring program in the oil fields is complicated by the dispersed nature of the threat, and by the need to obtain samples from near the water table (while water levels may fluctuate 200 feet or more over the life of the project). DWR has contracted for technical assistance in evaluating the monitoring options, as well as in identifying a suitable monitoring network. A monitoring network, when combined with an active surveillance and enforcement program, will help identify and minimize the potential for contamination from oil field operations.

A small area of DWR's property near Tupman (Figure 32) contains water with elevated TDS. This area of poor quality water is about 1.5 miles west of the West Kern Water District well field. West Kern Water District is concerned with the potential of movement for this water during project operation. DWR has delineated the areal extent of the poor quality water and will install monitoring wells to determine whether it is affected by project operation. DWR will characterize the extent of poor quality water to the south in the North Coles Levee Oil Field and, if needed, install additional monitoring wells in this area.

Recharge Pond Monitoring. A monitoring program will be developed for each recharge site, and a system of monitoring wells will be constructed there. The purpose of these wells is to evaluate the movement of water and mounding effects in response to recharge and to assist in regulating recharge operations. Mounding, should it develop, will adversely affect percolation rates and will require changes in pond operation to maximize recharge.

These wells will also serve to monitor water quality in the recharge areas and identify any problems resulting from leaching of contaminants during recharge. The number, location, and design of the monitoring wells will be defined following detailed exploration of the pond sites. During pond operation, inflow to individual ponds and water levels will be measured daily to determine percolation rate trends and to identify the need for pond rehabilitation.

Subsidence Monitoring. Land subsidence is not expected to be a significant problem. However, the occurrence of subsidence in nearby areas and the large drawdowns expected during project operation indicate that there is some potential for this to occur. DWR will develop a leveling network throughout the KFE property on which global positioning satellite technology will be used to establish elevations every five years to identify any subsidence, whether resulting from project operation, oil and gas production, or tectonic movement. To assist in differentiating the cause of any detected subsidence, an extensometer will be installed to detect compaction resulting from water level declines.

Regional Monitoring Network

Regional ground water impacts of the KFE operations are of concern to adjacent water districts and water users. In addition, regional water level information is needed to calibrate the ground water model being developed for use in evaluating and refining project operations. To address these needs, DWR has designed a regional monitoring well network as illustrated earlier in Figure 30. The network will consist of 25 multiple completion monitoring wells. Initially, most will be double completion wells that will monitor the unconfined upper aquifer and the deep (below mapped depths of the Corcoran Clay) confined aquifer. Those wells close to KFE property may be constructed as triple completion wells depending on the results of logging during drilling.

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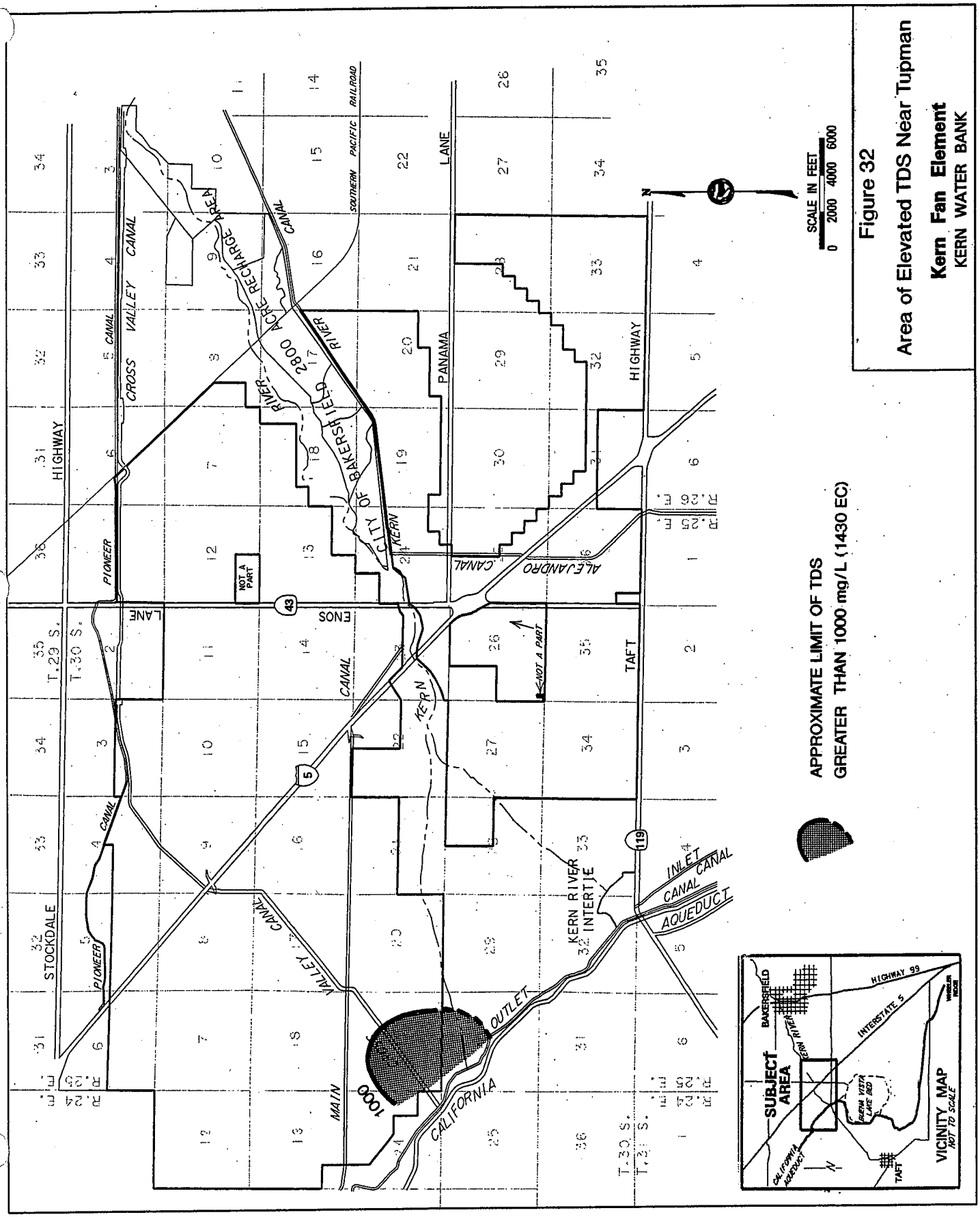
Figure 32
Area of Elevated TDS Near Tupman
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 6000
APPROXIMATE LIMIT OF TDS
GREATER THAN 1000 mg/L (1430 EC)
SUBJECT AREA
VICINITY MAP
NOT TO SCALE
BAKERSFIELD
HIGHWAY 99
INTERSTATE 5
KERN RIVER
BUENA VISTA LAKE BED
CALIFORNIA AQUEDUCT
TAFT
WASCO
ROAD
CROSS VALLEY CANAL
5 CANAL
4 CANAL
PIONEER
HIGHWAY
STOCKDALE
LANE
ENOS
CANAL
PANAMA
HIGHWAY
ALEJANDRO
CANAL
TAFT
KERN
RIVER
2800 ACRE RECHARGE AREA
CITY OF BAKERSFIELD
RIVER
SOUTHERN PACIFIC RAILROAD
KERN RIVER INTERTIE
INLET CANAL
CANAL
AQUEDUCT
VALLEY CANAL
MAIN
OUTLET
CALIFORNIA
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NOT A PART
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T.30 S.
T.31 S.
R.24 E.
R.25 E.
R.26 E.

The network will consist of two components. The first is a series of wells near the boundaries of a KFE property but located within the adjacent districts. These wells will form a continuation of the networks already installed on KFE property and in the 2,800-Acre Recharge Area. The entire network will be generally orthogonal to the Kern River and spaced on an approximate two-mile grid. The primary purpose of the first series of wells is to identify any water level impacts of project operations on adjacent districts, while providing reliable water level information for model calibration. The second series of wells will be used to define the boundary conditions for the model.

Those monitoring wells located in the southern portion of the Buena Vista Water Storage District and near the Henry Miller Water District well field were designed to monitor the possible incursion of poor quality westside water into the ground water basin. The KFE regional monitoring well network is intended to form the nucleus of a larger network that will include monitoring for any local elements that are developed.

Water Quality Monitoring Program

The historical land use of DWR's property, coupled with the expected use of much of the water as a source of public drinking water, necessitates an extensive water quality monitoring program. Ground water quality monitoring will focus on two areas. The first is monitoring of general minerals, selected minor elements, and selected physical parameters to give a general picture of ground water quality and any changes resulting from project operation. These data will also be useful in investigating the hydraulic characteristics of the project area. The second area of water quality monitoring will focus on toxic organics, primarily pesticide residues and petroleum hydrocarbons, and other parameters that may be of special concern.

A two-phase approach to monitoring has been adopted. The monitoring program discussed in this EIR can be considered detection monitoring. The program is designed to identify and alert project operators to water quality problems. When a water quality problem is identified, a more intensive corrective action monitoring program would be developed that would include additional exploratory drilling, monitoring well construction, sample collection and analysis. All sample collection and analysis would be conducted according to established protocols because of potential use in enforcement actions. The elements of the detection monitoring program are described below.

General minerals, minor elements, and physical parameters will be monitored quarterly for one year in all monitoring wells. The parameters being measured are shown in Table 15. After one year, sampling will be discontinued for those minor elements that have not been detected, unless a MCL or action level has been proposed or established for that constituent. Quarterly monitoring will continue through the first complete recharge and drawdown cycle during project operation, at which time it will be reduced to an annual basis.

Pesticides listed in Title 22 (Drinking Water Standards), those listed in Tables 12, 13, and 14, and Rank One and Two pesticides with a history of use on KFE property (Table 15) will be sampled quarterly. After one year, sampling for pesticides with established MCLs or action levels will be reduced to semiannually, and sampling for pesticides for which no MCLs or action levels have been established will be reduced to annually. After the first year of monitoring, sampling will be discontinued in the deep zone of each monitoring well, unless pesticide residues have been detected in the shallow or intermediate zones. The semiannual and annual monitoring will continue

through the first project fill cycle following the cessation of farming on the property. At that time, monitoring for pesticide residues that have not been detected will be reduced to a three-year cycle. Pesticide monitoring in those wells in the "interior" of DWR's property may be eliminated after the first three-year cycle, if residues are not detected. However, monitoring of the shallow and intermediate levels in monitoring wells on the perimeter of DWR's property (except those in the 2,800-Acre Recharge Area) will continue for the life of the project. This is necessary to detect movement of pesticide residues onto DWR's property from adjacent farmland. An initial sampling of all production wells for pesticide residues will be conducted and will be repeated on a three-year cycle through the first complete recharge cycle after farming on the property has ended. Confirmed detection of a pesticide residue will trigger a shift to corrective action monitoring and result in the involvement of the appropriate regulatory agency.

Pesticide application records are incomplete; therefore an element of risk is inherent in the above approach. Further, two pesticides (toxaphene and EPTC) have been detected that are neither Rank One nor Rank Two. However, the proposed approach is a reasonable balancing of cost versus the possibility of failing to recognize a contaminant.

Table 11. Standard Minerals, Minor Elements, and Physical Parameters Analyzed in the First Stage Monitoring Program

Sodium	Total Dissolved Solids	Zinc
Magnesium	Electrical Conductivity	Barium
Chloride	pH	Lead
Boron	Uranium	Silver
Copper	Germanium	Alkalinity
Manganese	Lithium	Total Hardness
Arsenic	Calcium	Temperature
Cadmium	Potassium	Total Chromium
Mercury	Nitrate	Vanadium
Molybdenum	Sulfate	Nickel
	Iron	

Table 12. Chlorinated Organic Pesticides

Diuron	Endosulfan I
BHC, alpha	Dieldrin
Chlorpropham	DDE
Dichloran	Endrin
Simazine	Endosulfan II
BHC, gamma	Endrin Aldehyde
BHC, beta	DDD
Atrazine	Endosulfan Sulfate
PCNB	DDT
BHC, delta	Methoxychlor
Chlorothalonil	Dicofol
Alachlor	Toxaphene
Heptachlor	PCB–1016
Thiobencarb	PCB–1221
Chlorpyrifos	PCB–1232
Aldrin	PCB–1242
DCPA	PCB–1248
Captan	PCB–1254
Heptachlor Epoxide	PCB–1260
Chlordane	

Table 13. Organic Phosphorus Pesticides

Mevinphos	Parathion
Demeton	Methidathion
Naled	Profenofos
Phorate	s,s,s–Tributyl Phosphorothrithioate (DEF)
Dimethoate	Ethion
Diazinon	Carbophenothion (Trithion)
Disulfoton	Phosmet
Methyl Parathion	Phosalone
Malathion	Azinphosmethyl
Chlorpyrifos	

Table 14. Carbamate Pesticides

Aldicarb Sulfoxide	Aldicarb
Aldicarb Sulfone	Carbofuran
Oxamyl	Carebaryl
Methomyl	1–Naphtol
3–hydroxycarbfuran	Methiocarb

Table 15. Rank One and Rank Two Pesticides With a History of Use of KFE Property

Rank One	Rank Two
Aldicarb	Dimethoate
Atrazine	Disulfoton
Carbofuran	Endothall
1,2,–Dichloropropane	Parathion
EDB	Phorate
	Prometryn

The potential for contamination by petroleum hydrocarbons will continue throughout the life of the project. The parameters to be measured are listed in Table 16. In addition, screening will be done for total petroleum hydrocarbons and for base/neutral/acid parameters quarterly for one year. Sampling will be done quarterly at all wells specifically installed to monitor oil field operations. Semiannual sampling will be conducted in the upper and middle zones of the multiple completion monitoring wells located downgradient of the oil fields. If significant contamination by petroleum hydrocarbons is detected, further exploration and testing will be conducted to identify the source, characterize the extent of contamination, and identify a responsible party for cleanup. Production wells will be screened for petroleum–related parameters on the same schedule as for pesticide residues.

Table 16. Purgeable Organics

Vinyl Chloride	Bromodichloromethane
Trichlorofluoromethane	Toluene
1,1,2–Trichlorotrifluoroethane	1,1,2–Trichloroethane
1,1–Dichloroethylene	Tetrachloroethylene
trans–1,2–Dichloroethylene	Dibromochloromethane
1,1–Dichloroethane	Ethylene dibromide
cis–1,2–Dichloroethylene	Chlorobenzene
Chloroform	Ethylbenzene
1,1,1–Trichloroethane	Xylene(s)
Carbon tetrachloride	Bromoform
Benzene	1,3–Dichlorobenzene
1,2–Dichloroethane	1,4–Dichlorobenzene
Trichloroethylene	1,2–Dichlorobenzene
1,2–Dichloropropane	1,2–Dibromo–3–chloropropane

Two facilities merit special attention for analysis of petroleum–related organics. These are the property leased to Grayson Services, Inc. and the area near the old carbon black plant. (The site is currently being used by Hondo Chemical to produce soil amendments). A monitoring well will be constructed on the Grayson lease and sampled quarterly for volatile and semivolatile organics. Chemicals used or present on the lease will be inventoried and monitoring parameters adjusted as appropriate. The situation at the carbon black plant is somewhat different in that it is located off DWR's property and normally will be downgradient. However, during extraction periods, the gradient may be reversed. The shallow and intermediate zones of monitoring well 30/26–6L will be sampled annually for volatile, semivolatile organics, and polynuclear aromatic hydrocarbons.

(DWR's well numbering system is explained in Chapter III of the KFE Feasibility Report.) During periods of gradient reversal, sampling will be performed quarterly.

Radiological screening will be conducted at all monitoring wells. Quarterly sampling will be done for gross alpha and gross beta for one year and one-time sampling will be conducted for tritium. Sampling for gross alpha and gross beta will continue on a four-year cycle. Samples with gross alpha values exceeding five picocuries per liter or gross beta values exceeding 50 picocuries per liter will undergo further analysis to determine the source of radiation.

Produced Water Quality Monitoring. A water quality monitoring program will be implemented at those points where extracted water returns to a public water supply source (California Aqueduct, CVC). An initial set of samples and then quarterly samples will be collected when extraction occurs. Analysis will include general minerals and minor elements, organic compounds for which MCLs and action levels have been established, other components exclusive of microbiological parameters for which MCLs or action levels have been established, and organic compounds detected by the KFE ground water monitoring program. Water quality criteria for water returning to a source of public water supply should require that water not exceed an MCL. If a detected chemical exceeds 0.6 times an MCL or action level, corrective action will be triggered to prevent further increases in concentration, identify sources of contamination, and implement appropriate cleanup/treatment programs. This will provide reasonable assurance that MCLs will not be violated during project operation. During extraction, monthly sampling should be conducted for wells extracting water from areas of known contamination and analyzed for the constituents of concern. This is to provide early warning of possible violations of the MCLs and allow timely corrective action.

Recharge Water Quality Monitoring. Water quality will be monitored at the turnout for each source water used for recharge. Electrical conductivity will be measured continuously and used to establish a predictive relationship for the total dissolved solids and sodium content of the water. Turbidity and suspended solids will be measured monthly, except when local floodflows are recharged or local inflow occurs to the California Aqueduct. At those times, measurements will be taken daily. Criteria will be developed to establish turbidity and/or suspended solids standards to be met before recharge is permitted. Nutrients (nitrogen and phosphorus) will be measured monthly during recharge. Recharge ponds are to be observed weekly by a trained professional to assess their biological condition. During the first recharge cycle at each pond site, monthly monitoring will be performed for all Rank One and Rank Two pesticides and total petroleum hydrocarbons. Subsequent water quality monitoring would be limited to those compounds identified during the first recharge cycle.

The proposed project may result in the loss of agricultural uses of the land. Permanent changes in land use also would occur where wells, canals, pumps, and other facilities are needed. Resources and energy required to manufacture the steel and concrete used for construction and long-term operation of the proposed project would be irretrievably committed.

Chapter 5. CUMULATIVE EFFECTS AND RELATED PROJECTS

This chapter discusses the cumulative effects on the environment that could potentially result from implementing the proposed project in conjunction with other existing and/or proposed programs that are related to the proposed project. This discussion also examines the use of local water supplies on the Kern Fan Element property, assuming implementation of the First Stage.

GROUND WATER RECHARGE/EXTRACTION PROJECTS

There are several proposed or recently implemented projects that are related to the project proposed in this Draft SEIR. These are the La Hacienda Program, the Goose Lake Slough property purchase, the 1990 Demonstration Programs, the 1987 Advance Storage Program, and proposed local elements to the Kern Water Bank. These projects are discussed below.

La Hacienda Program

The La Hacienda program involves the purchase of 98,000 acre-feet of water that is currently stored in the Kern County Ground Water Basin. This stored water resulted from the recharge of Kern River flood flows over the past ten years in the City of Bakersfield's 2,800-Acre Recharge Area by Olcese Water District. Olcese Water District has the contractual right to sell any stored water excess to its long-term needs to La Hacienda, Inc., who in turn desires to sell this water to DWR. DWR wants to purchase this water to deliver it within Kern County as part of SWP deliveries in future dry years, when SWP water supplies are low.

This water would be extracted by wells on the KFE property, and conveyed to the CVC and Alejandro Canal for exchange with water that would otherwise be diverted from the SWP California Aqueduct. DWR will renovate 23 wells on the property, and construct necessary pipelines and canals to convey the extracted water to the local canals for exchange. This program is targeted at extracting water as soon as April 1991, in case the current prolonged dry cycle continues.

At the time this report was being prepared, DWR was negotiating a purchase agreement with La Hacienda, Inc. DWR was also negotiating a separate operating agreement with KCWA whereby KCWA would operate and maintain the extraction facilities to implement this program.

Goose Lake Slough

In March 1990, DWR purchased some 550 acres of farmland along Goose Lake Slough, 2 miles north of the northeast corner of the KFE property and within the boundaries of Rosedale–Rio Bravo Water Storage District. This property was purchased due to its good potential for recharge. Some of the property has been used for recharge in the past.

The property was originally purchased to complement the recharge activities on the KFE property. While the property could be developed as part of the KFE, it is more likely to be developed as part of the local element proposed by Rosedale–Rio Bravo Water Storage District. No specific plans have yet been developed beyond the reconnaissance–level study recently completed by Rosedale–Rio Bravo.

1990 Demonstration Programs

During 1990 DWR entered into agreements with KCWA and five local water districts to transfer some 150,000 acre–feet of water in the SWP's San Luis Reservoir to storage in the Kern County Ground Water Basin. All of this water was delivered for direct irrigation use, and used to offset a like amount of ground water pumping that would otherwise have occurred. This water will be recovered for SWP use by exchanging it in future years with surface water deliveries that would otherwise be made from the California Aqueduct. The exchanges are made possible through payment by DWR for additional use of local irrigation wells. In general, most of the water would be exchanged over a two year period, when conditions are dry enough to require such exchange.

1987 Advance Storage Program

By agreement dated January 12, 1987, DWR and KCWA agreed to recharge a limited amount of water during 1987, as a trial recharge program in advance of implementing the Kern Water Bank. This program is known as the 1987 Advance Storage Program. During January and February 1987, DWR recharged some 7,379 AF in the City of Bakersfield's 2,800–Acre Recharge Area.

It is anticipated that this water will count toward initial storage for the First Stage.

KCWA 1990 Emergency Extraction Program

During the spring of 1990, KCWA became aware that water supplies available to its member water districts would be significantly below normal. This was based on the 50 percent reduction in SWP supplies, as well as substantially reduced water supplies from other sources. At that time, KCWA began discussions with DWR concerning eventual use of a number of irrigation wells on the KFE property to meet local water needs.

As the year progressed, water supply conditions in Kern County became very serious. The KCWA Board declared a drought emergency. At KCWA's request, DWR allowed KCWA to use seven of the wells on the property to extract water which had previously been recharged in the City of Bakersfield's 2,800–acre Recharge Area.

Implementation of this program resulted in some upgrades to the wells, and construction of several buried pipelines to transport the extracted water to the CVC. The seven wells will also be used as part of the La Hacienda Program, as well as the First Stage of the KFE.

Local Elements

The Kern Water Bank ultimately will consist of a series of "elements," geographically separate ground water storage and extraction projects that would be operationally integrated. The Kern Fan Element will be followed by local elements developed with a number of water districts in Kern County. At present, reconnaissance-level studies are underway or have been completed with Cawelo Water District, KCWA Improvement District No. 4, Kern Delta Water District, Rosedale-Rio Bravo Water Storage District, and Buena Vista Water Storage District in a combined program with West Kern Water District.

DWR, KCWA and Semitropic Water Storage District are completing a feasibility study for the proposed Semitropic Local Element. This program would consist of expanding the capacity of existing surface water distribution facilities to serve farms that presently irrigate with ground water. This expansion of the existing conjunctive water use facilities within Semitropic will allow the Local Element to store water by providing extra surface water in wetter years in lieu of pumping ground water. Likewise, additional pumping of ground water in dry years could be exchanged for surface water otherwise delivered to Semitropic's service area from the California Aqueduct. The program will be implemented through completion of a separate feasibility report and California Environmental Quality Act process, expected by mid-1991.

Local Uses of the Kern Fan Element

KCWA wants to develop up to 4,000 acres of the KFE property for local recharge and extraction. Provision for local use is included in the 1987 MOU between DWR and KCWA. The MOU states:

> The Contract will provide for local uses of the land acquired for the Kern Fan Element, and will provide that facilities constructed for use by the SWP be available for recharge and extraction of local water by the agency. Such local uses shall be defined and compensation, therefore shall be provided for in the Contract.

Local uses are divided into two general categories: (1) local recharge of Kern River and other local flood flows and (2) recharge of other water in non-flood years. Kern County water interests would like to keep as much of the local flood flows as possible in Kern County for recharge into the ground water basin. The second category includes SWP entitlement water which would be delivered to KCWA pursuant to Article 12(d) of the water supply contract with DWR. This water is "makeup" for entitlement water not delivered in previous years due to SWP delivery deficiencies. The second category also includes other sources of water in non-flood years. There is no definitive means of charting the amount of such water that may be available in any year. DWR anticipates that such recharge will be allowed, provided that it does not interfere with the SWP recharge and extraction program.

Potential Impacts From Local Recharge

The general guideline used in studies and discussions to date is that local recharge of Kern River floodwaters will have precedence over SWP recharge, and that SWP recharge will have precedence over recharge of other local supplies. Recharge of flood flows was considered and discussed in the 1987 Preliminary Technical Report, and assumed to take precedence when flows in the Kern River would otherwise cause water to go through the Kern River Intertie into the California Aqueduct.

To the extent that KCWA makes use of KFE recharge ponds, no wildlife disruption is expected beyond what is considered in this Draft SEIR. However, KCWA envisions spreading flood flows over large areas of land outside the confined SWP recharge basins, by constructing shallow embankments following land contours (similar to construction of basins used for growing rice). In May 1990, KCWA staff developed a map showing areas that could potentially be used for this purpose as soon as January 1991, subject to availability of flood flows.

Since that time, KCWA staff have directed their efforts at planning for and designing turnouts from the Cross Valley Canal and the Kern River, which would serve the dual purposes of providing capacity to divert flood flows to the property as well as diverting SWP water from the California Aqueduct for recharge. No site-specific work has yet been conducted for proposed local recharge areas in sufficient detail to include in this Draft SEIR. The general areas proposed by KCWA for near-term local recharge are shown in Figure 33. Basic selection criteria used by KCWA to lay out proposed recharge areas were:

- Recently farmed lands, but currently not leased.
- Lands in non-native vegetation.
- No lands would be developed initially in the northeast portion of the property, due to potential ground water quality problems in this area.
- To the extent practicable, lands adjacent to First Stage recharge ponds would be used.
- Lands easily served by the CVC, the Pioneer and/or James Canals lateral systems, the Kern River, or a combination of such facilities.

While no site-specific plans have been completed, some general observations can be made concerning potential environmental impacts of construction and operation of proposed local water spreading areas. KCWA will need to deal with similar mitigation issues that DWR will address in development of recharge areas. This will include provisions for wildlife that may be using the property that would be disrupted during construction and operation. As discussed elsewhere in this Draft SEIR, these provisions are likely to include relocation of habitat to other areas of the KFE property.

However, the KCWA proposed large-scale recharge areas have the potential advantage of being developed as combined upland/wetlands wildlife habitat as well as recharge areas, due to the proposed method of water confinement on the property, the resulting shallow water depths, and the expected duration of flooding. Such lands could be allowed to revert to native habitat, with provisions for intermittent flooding such as occurred prior to agricultural development of this portion of the San Joaquin Valley. Possibilities could include development of higher elevation "islands", travel corridors to the Kern River, and development of some areas as managed wetland habitat. It is expected that such development will require close coordination among KCWA, DWR, the Department of Fish and Game, U.S. Fish and Wildlife Service, the City and County planning departments, and regional wildlife groups. There is the potential to develop a program whereby significant quantities of local floodwaters could be recharged while providing meaningful wildlife benefits.

In addition, there are some water quality considerations that may affect the configuration of KCWA proposed recharge areas. A number of oil pipelines go through the KFE property, gener-

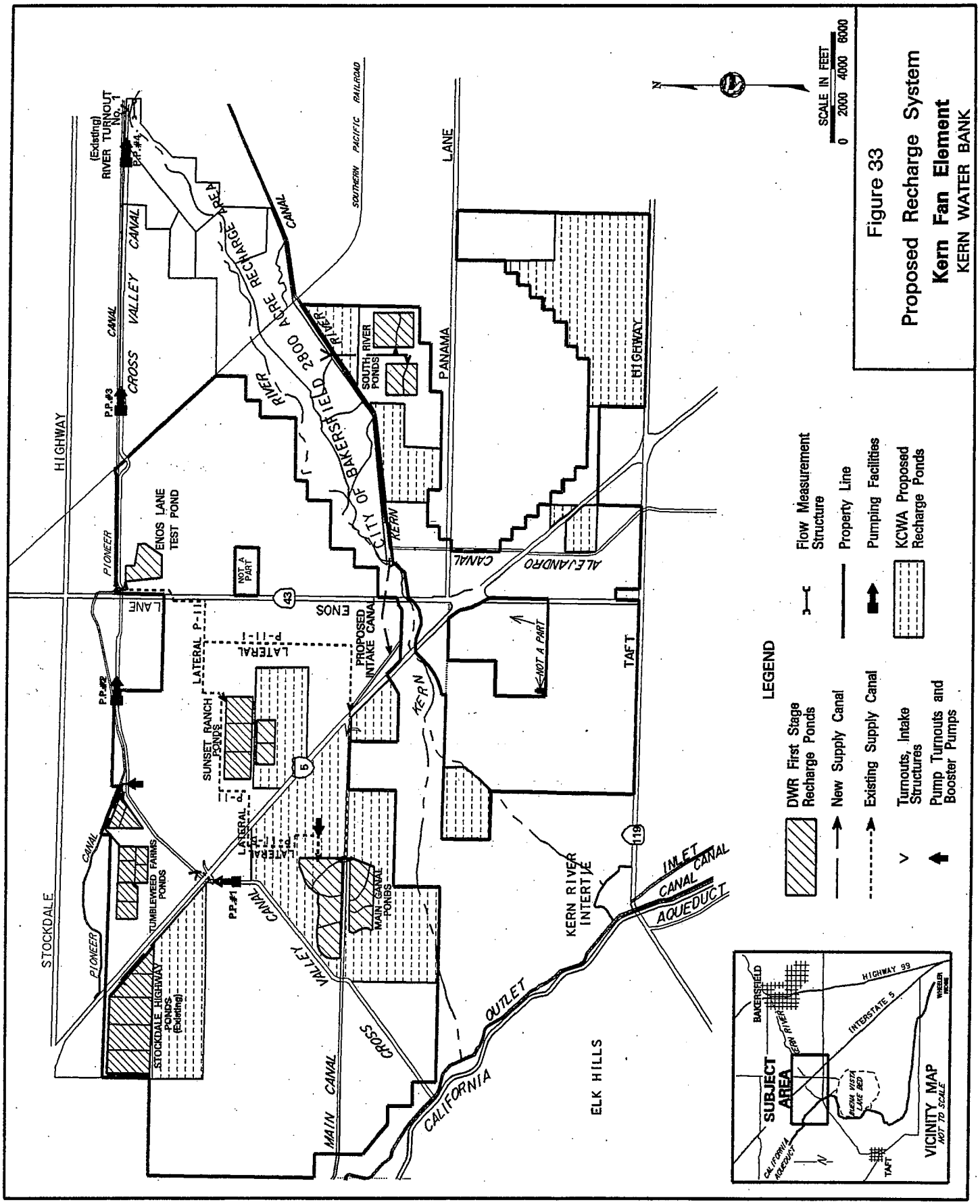


Figure 33
Proposed Recharge System
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 8000
N
LEGEND
DWR First Stage Recharge Ponds
New Supply Canal
Existing Supply Canal
Turnouts, Intake Structures
Pump Turnouts and Booster Pumps
Flow Measurement Structure
Property Line
Pumping Facilities
KCWA Proposed Recharge Ponds
HIGHWAY
STOCKDALE
PIONEER
LANE
ENOS
CROSS VALLEY CANAL
(Existing) RIVER TURNOUT No. 1
P.P.#4
P.P.#3
P.P.#2
P.P.#1
ENOS LANE TEST POND
NOT A PART
LATERAL P-11-1
SUNSET RANCH PONDS
PROPOSED INTAKE CANAL
KERN RIVER 2800 ACRE RECHARGE AREA
CITY OF BAKERSFIELD
KERN RIVER
SOUTH RIVER PONDS
SOUTHERN PACIFIC RAILROAD
PANAMA LANE
ALEJANDRO CANAL
HIGHWAY
TAFT
STOCKDALE HIGHWAY PONDS (Existing)
TUMBLEWEED FARMS PONDS
MAIN-CANAL PONDS
KERN RIVER INTERTIE
INLET CANAL
AQUEDUCT
OUTLET
CROSS VALLEY CANAL
MAIN CANAL
CALIFORNIA
ELK HILLS
SUBJECT AREA
BAKERSFIELD
KERN RIVER
HIGHWAY 99
INTERSTATE 5
WHEELER RIDGE
KERN VISTA LAKE BED
CALIFORNIA AQUEDUCT
TAFT
VICINITY MAP
NOT TO SCALE

ally buried 2-3 feet below ground level. There is substantial evidence that such pipelines can leak, and that relatively small leaks can go undetected for some period of time. To the extent that oil leaks exist or are likely to occur over time, DWR has taken the position that recharge areas be set back some distance from known pipelines. The same would be true for KCWA recharge areas. The local recharge areas shown in Figure 33 do not take into account this limitation. In addition, there is evidence that in some areas of the property, ground water contamination from historically used pesticides has occurred. DWR has undertaken an extensive soil and water monitoring program to address this issue, and has modified recharge and extraction plans accordingly. The same concerns need to be addressed in sufficient detail for proposed local recharge areas.

Potential Impacts From Local Extraction

KCWA has proposed an aggressive local recharge program on the property, although no specific information has been completed concerning either frequency or magnitude of expected recharge. In any case, any local recharge will only result in an increase in ground water levels, which is a benefit to ground water pumping in the region. It is only the extraction that could potentially cause negative impacts to ground water levels.

It is assumed that SWP use of extraction wells on the KFE property will have first priority. Based on water supply benefit studies, SWP use will generally be in the very dry years. However, it is possible that local use could include wells that are not developed specifically for the First Stage. Therefore, opportunities will exist for local use. Such use would presumably begin once a local storage account has been developed that would accompany an extraction program.

The frequency, magnitude, and other conditions for local use are speculative at this time, since such details have not yet been developed. It is likely that this matter will be addressed only in general terms in the initial operating agreement between DWR and KCWA, and that specific use provisions will be developed over time, as the need arises and as specific plans are developed. Consequently, potential environmental impacts resulting from local use of extraction facilities will need to be addressed in a subsequent environmental study conducted by KCWA.

OTHER RELATED PROJECTS

Metropolitan Bakersfield Habitat Conservation Plan (MBHCP)

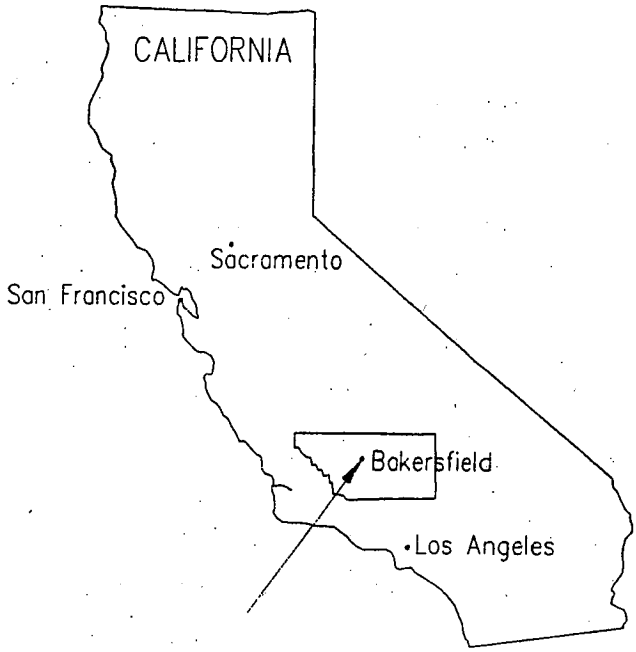
The MBHCP provides an opportunity to link KFE conservation lands with future habitat conservation areas proposed by the MBHCP Steering Committee. The "primary goal of the MBHCP is to acquire, preserve, and enhance native habitats which support endangered and sensitive species, while allowing urban development to proceed. . ."

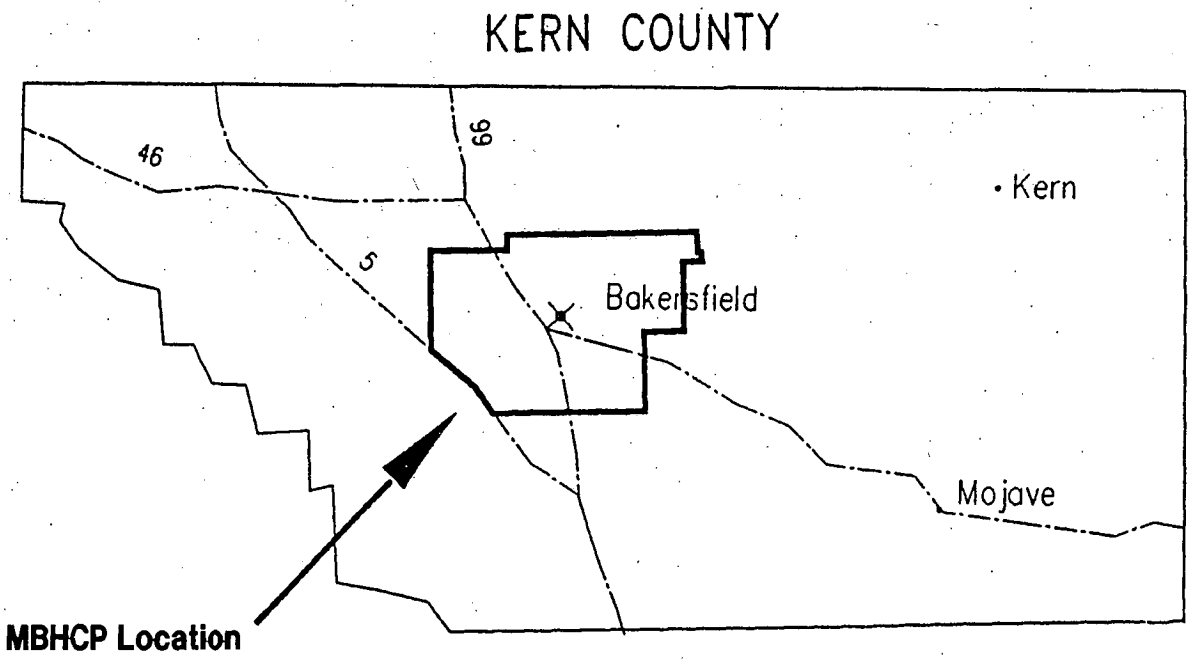
Conflicts between urban development and native species prompted the City of Bakersfield and Kern County to formulate a habitat conservation plan. Figure 34 shows the location of potential local preserve acquisition areas associated with the MBHCP.

Potential exists for local agencies to use MBHCP funds for restoration/enhancement of KFE lands to meet local habitat conservation requirements. Of course, issues of ownership, management, and meshing of multiple use goals will have to be resolved before any conservation plans are implemented on the KFE property.

Figure 34

METROPOLITAN BAKERSFIELD
HABITAT CONSERVATION PLAN





ARCO Oil and Gas Company – Bakersfield Arch Seismic Surveys

ARCO is proposing to conduct seismic oil exploration surveys on about 50 square miles of land west of Bakersfield (Figure 35). The Bakersfield Arch seismic survey area encompasses much of the KFE property. Consultants (Quad Consultants) to ARCO performed a preliminary (Phase I) reconnaissance study to identify and map potentially sensitive plant and wildlife habitat throughout the proposed seismic survey area. A second phase will include a survey for rare, threatened, and endangered plant and animal species and related habitat on and adjacent to the seismic survey area.

ARCO is requesting an information consultation with the USFWS and feels that it can avoid any significant negative impacts associated with its seismic surveys, including incidental take of threatened or endangered species that might be located in the project area.

DWR hopes to share wildlife habitat information and cooperate with ARCO in an effort to identify and preserve sensitive plants and animals, particularly on the KFE. In addition, DWR hopes to maintain direct cooperation through the land use advisory process and involve ARCO in any habitat conservation efforts.

Central Valley Habitat Joint Venture

The Central Valley Habitat Joint Venture is the California component of the North American Waterfowl Management Plan.

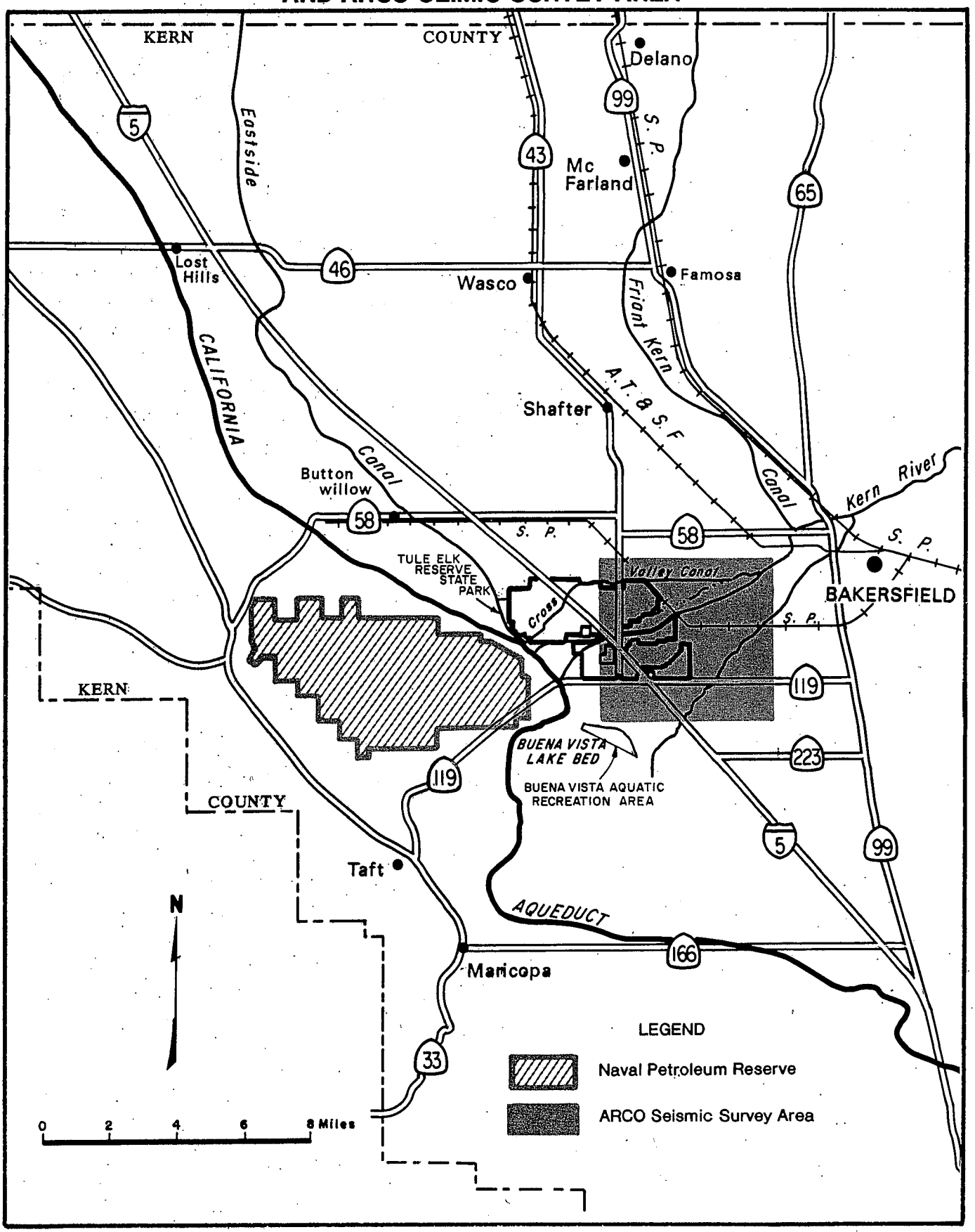
Briefly, the North American Waterfowl Management Plan is a joint Canadian and American (and Mexican) long-term cooperative effort to conserve North American waterfowl and their habitats. The plan provides a framework for waterfowl conservation and management within the foundations set by the 1916 and 1936 Migratory Bird Conventions. Waterfowl populations and habitat inventories have been taken and short- and long-term goals set for the protection and enhancement of waterfowl populations.

As part of the Pacific Flyway, California's Central Valley wetlands provide essential habitat for migratory waterfowl, as well as other native species. Some 60 percent of the migratory waterfowl of the Pacific Flyway winter in California's Central Valley, even though 95 percent of the valley's wetlands have been destroyed. Consequently, the Central Valley Habitat Joint Venture's goal is to protect and improve existing wetland habitat and restore degraded habitat to increase Central Valley waterfowl populations commensurate with goals set by the North American Plan. The objectives include:

- Protecting 80,000 additional acres of existing wetlands.
- Acquiring more than 400,000 acre-feet of firm water supply for use by federal, State, and local refuges and wildlife management areas.
- Securing affordable power for pumping water for public and private wetlands.
- Decreasing Central Valley wetland area by 120,000 acres.
- Enhancing 290,000 acres of public and private wetlands.
- Enhancing wetlands on nearly one-half million acres of agricultural land.

KFE provides an opportunity to re-establish some wetland habitat in the southern Central Valley through cooperation between State and local private and public agencies and organizations.

Figure 35 GENERAL LOCATION OF PETROLEUM RESERVE No.1 AND ARCO SEIMIC SURVEY AREA



Informal discussions have taken place between DWR and DFG concerning the creation of wetland habitat on KFE lands. In addition, wetland habitat creation has been discussed at several of the land use advisory committee meetings, and discussions will continue on the type, extent, and timing of wetland creation as part of the planning and implementation of a long-term KFE land use plan.

U.S. Naval Petroleum Reserve, No. 1

U.S. Naval Petroleum Reserve, No. 1, is a federally owned petroleum field just west of the KFE near the town of Tupman (Figure). Several threatened and endangered species are known to inhabit Petroleum Reserve, No. 1, lands. Consequently, the U.S. Department of Energy is in the process of assessing the impact of its lease oil operations on threatened and endangered species on Petroleum Reserve lands. Draft supplemental environmental documentation is expected to be released in early 1991.

U.S. Naval Petroleum Reserve, No. 1, lands are near the Kern River corridor and the KFE and could provide an excellent link in efforts to connect access corridors along and adjacent to the Kern River for native wildlife, including several threatened and endangered species.

Chapter 6. ECONOMIC EVALUATION OF SERVICE AND PROJECT AREA ALTERNATIVES

The purpose of this chapter is to establish economic justification for the preferred alternative vis-a-vis SWP service area and project area alternatives to the project's accomplishments. This section is consistent with discussions in the environmental documentation prepared for the North and South Delta Plans. SWP service area alternatives can be determined by identifying the effect of the project on the costs associated with service area demand and supply management and on the level of shortage-related losses. Because the project would provide for a reduction of ground water pumping costs to local users due to elimination of agriculture on the project site, a continuation of the current agricultural pumping cost regime is the project alternative in the project area. Although the recharge and storage operation of the First Stage is also expected to lower local pumping costs, this effect will be reduced during extraction. The results of the ground water model indicate the overall operation of the project will result in a net pumping cost reduction to local ground water users, but, to be conservative, this was not considered in the economic evaluation.

SWP SERVICE AREA ECONOMIC EVALUATION

The purpose of this section is to show how the proposed First Stage Kern Fan Element (KFE) project "fits" into overall SWP service area water management from an economic perspective. The primary method for this investigation is based on developing two economically preferred service area water management plans. One plan assumed that KFE was available during the period of analysis, and the other assumed that KFE was not available. The management plans were developed by using all local service area water supply enhancement and demand reduction options that have been identified as reasonably feasible. The two plans represent DWR's projection of the local short-term and long-term water management options that would be employed to reduce the impact of future water supply shortages, assuming that the criterion of economic efficiency would be used to select which options to employ.

Comparing the two plans is the best way to identify the effect of the project on the costs associated with service area water management and on the level of shortage-related losses. The result is a measure of the relative economic merit of KFE for meeting increasing water demands in the context of all feasible water management options. This approach is a broader one than is traditionally used since it employs a comprehensive analysis of local water management alternatives in determining the economic benefits of KFE for water supply enhancement.

Benefits were based on an analysis of the impact of the KFE on the use of SWP service area water supply enhancement and demand reduction measures.

SWP Service Area Water Management Options

The analyses that follow were prepared by region. Because of the detailed information available for the South Coast Region and its relative importance, a sophisticated risk management analysis of this region was used. It is described briefly here and summarized in Appendix D.

The water supply and demand reduction options examined in the South Coast Region are non-structural and structural options that are in addition to the demand reduction assumed in the calculation of water supply need for DWR Bulletin 160-87, *California Water: Looking to the Future* (November 1987).

South Coast Region. South Coast Region alternatives were evaluated by predicting what reasonable water management programs in the region would look like, both with and without the availability of the proposed facilities. The approach taken in this analysis takes a comprehensive view of water supply reliability, incorporating key information on the frequency, size, and impacts of shortages. Local water managers (and users) must respond primarily to actual year–to–year fluctuations in water supply availability, rather than to an average supply.

As shortages increase in magnitude and regularity, shortage management becomes an increasingly important tool for the local water manager. Shortage management contingency options have been incorporated in the economic risk management analysis prepared for the KFE.

The analysis also accounts for the value of avoiding extreme shortage events. Summary statistics, such as firm and average yield, do not show that one event of a specified shortage amount can be much more damaging than two events of half that magnitude, for example. This is particularly true when there are intervening years of no shortfall in the latter situation and when shortage management can mitigate some of the impacts of the smaller shortages.

Looking at year–to–year water supply availability in the context of what local shortage management contingency options can and cannot do to mitigate adverse impacts, and relating those impacts to shortages of specific sizes, is critical in assessing the value of enhanced reliability. This is especially important in light of the increasing environmental and economic costs of enhancement. The economic risk analysis evaluates the economic feasibility of the level of reliability enhancement provided by any combination of facilities, considering the shortage management techniques locally available.

Local water management program options were divided into three categories:

- shortage contingency demand management and supply enhancement options;
- long–term demand management and supply enhancement options; and
- risk management.

Shortage Management Contingency Options. Contingency water management options are measures implemented during shortages only (although they may be based on long–term plans and/or agreements) and are intended to minimize the impacts of those shortages. Such measures include (1) using banked local ground water, (2) using local carryover storage, (3) reducing water deliveries to interruptible programs, (4) purchasing water to augment normal sources of supply, (5) instituting extraordinary conservation measures, and (6) rationing.

The extraordinary conservation measures include: alternate–day watering, water patrols, emergency water pricing programs, and intensive public education campaigns. Rationing is assumed to

include setting allowable use quantities and providing for exemptions arising from extraordinary hardship for residential users and adverse economic impact for businesses (forced layoffs, for example) due to the severity of the shortage.

See Table 17 for a list of shortage management contingency options, the limit of their effect on demand, and their expected order of use. These options are assumed to be available in the South Coast Region throughout the study period.

Table 17. M&I Shortage Contingency Options in the South Coast Region (In expected order of use)

Option	Maximum Potential Effect	Use Constraints
1. Institute public relations campaign to heighten conservation awareness, use alternate-day watering, gutter-flooder patrols, etc.	7 percent of demand	Implementation limited if local stored water situation is excellent, compared to shortage.
2. Cut back on deliveries to MWD member agencies for ground water recharge through spreading.	140,000 acre-feet	Frequency of cutbacks affects participation in interruptible program.
3. Purchase emergency imported ,supply through long-term water marketing agreement.	50,000 acre-feet	Purchase frequency not to exceed once every five years.
4. Cut back on deliveries to MWD member agencies for reservoir carryover storage.	35,000 acre-feet	Frequency of cutbacks affects participation in interruptible program.
5. Cut back on deliveries to MWD member agencies for reservoir carryover storage.	175,000 acre-feet	Frequency of cutbacks affect participation in interruptible program.
6. Use local reservoir carryover storage.	As available	Rule curve limits use.
7. Use local ground water banked within the service area in previous year.	As available	Rule curve limits use.
8. Use local ground water banked through an exchange agreement with another agency.	As available	Rule curve limits use.
9. Cut back on deliveries to MWD member agencies made under the interruptible agricultural delivery program.	74,000 acre-feet	Cut back only after shortage in previous year and three-year cumulative cut not to exceed 100 percent.
10. Cut back on deliveries to MWD member agencies made under the interruptible agricultural delivery program.	50,000 acre-feet	Three-year cumulative cut not to exceed 100 percent.
11. Institute a rationing program designed to minimize adverse economic impacts (provide for business exemptions based on economic hardship).	N/A	Not imposed unless 20 percent shortfall remains after foregoing measures.

Long–Term Options. Local long–term water management options to increase reliability that were considered included (1) waste water reclamation, (2) desalinization of brackish drainage and ground water, (3) desalinization of seawater, and (4) the development of water by importation, using long–term conservation facilities in other geographic areas. Also included were ultra low–flush toilet retrofit and leak detection programs in the service area. All these programs are extraordinary measures; that is, they are beyond those assumed to be used in DWR Bulletin 160–87 and are intended to develop and/or conserve water continuously.

Table 18 is a summary list of local long–term options assumed to be available in the South Coast Region. For the year 2000, it was assumed that reclamation projects now in the conceptual stage, rather than in the planning stage, would not be available. The options are ranked in the assumed order of implementation (based on using those with the lowest unit cost first). The water reclamation options are weighted average values for individual projects. The options are described in the following paragraphs and are also described in detail in Appendix D.

Unit cost, water produced or conserved by each option, and cumulative quantities are also shown in Table 18. Costs shown are in 1989 dollars and are computed using noninflated dollars and a 6 percent discount rate. The energy cost component of each alternative is assumed to escalate at 1.7 percent per year during the study period. These criteria, which are used to compare alternatives, are consistent with those used for developing the costs of the proposed SWP action.

Table 18. Local Long-Term Options – South Coast Region

Order of Use	Local Option Type	Product (TAF)			Cumulative Product (TAF)			Unit Cost ($/AF)
		1995	2010	2035	1995	2010	2035	
1[1]	Water reclamation (set 1)	0	23	23	0	23	23	117
2[1]	Water reclamation (set 2)	13	13	13	13	36	36	224
3	Residential water audits	95	95	95	108	131	131	291
4[1]	Water reclamation (set 3)	49	59	59	157	190	190	350
5	Ultra low flush toilet retrofit	145	290	290	302	480	480	357
6	South Coast ground water desalting	78	78	78	380	558	558	386
7	Imperial drainage water desalting	302	302	302	682	860	860	417
8	San Joaquin Valley drainage water desalting	139	214	337	821	1,074	1,197	427
9[1]	Water reclamation (set 4)	9	22	22	830	1,096	1,219	441
10	Riverside County drainage desalting	42	42	42	872	1,138	1,261	468
11[1]	Water reclamation (set 5)	1	30	30	873	1,168	1,291	618
12[1]	Water reclamation (set 6)	19	32	32	892	1,200	1,323	781
13	Sea water desalting	5	5	5	897	1,205	1,328	1,783

[1]These groupings are based on unit cost; for more details, see Appendix D.

1. Water Reclamation (Set 1). See Appendix D. For year 1995, no projects are available in this group. For the period 2010 to 2035, it includes three projects producing a total of 23,000 AF. The weighted average cost of these projects is $117 per AF.

2. Water Reclamation (Set 2). See Appendix D. For the period 1995 to 2035, this option includes two projects producing a total of 13,000 AF at a weighted average cost of $224 per AF.

3. Residential Water Audits. These would be conducted by water agency representatives, following aggressive promotional campaigns by the water agency. The audits are free to the property owner, but since they are voluntary; the number of households benefiting from the audit was estimated at 50 percent. Under the program: (1) water uses are identified and discussed with householders; (2) low-flow shower heads, toilet tank displacement dams, and faucet aerators are offered for installation by the agency; (3) toilet leaks are repaired; and (4) advice on reducing landscape and other exterior water uses is provided. Water savings are estimated to be 94,700 AF per year.

4. Water Reclamation (Set 3). See Appendix D. For year 1995, this option includes six projects that produce 49,000 AF. For the period 2010 to 2035, this option includes seven projects that produce a total of 59,000 AF. The weighted average cost of these projects us $350 per AF.

5. Ultra–Low–Flush Toilets. These use 1.6 gallons per flush (gpf), compared to about 5.5 gpf for conventional toilets installed before 1978 and 3.5 gpf (low–flush) toilets installed beginning in 1978. (State legislation requires the installation of 3.5-gpf toilets after 1977.) For Bulletin 160–87, it was assumed that 1.6-gpf toilets would be required in all new construction after January 1, 1995. State legislation is pending. If most 5.5-gpf toilets were replaced with 1.6-gpf toilets, at a minimal savings of 0.018 AF per person per year, the potential savings is 290,000 AF per year. This program would require a 10–year conversion period. Half the ultimate savings of 290,000 AF could be available in 1995.

6. South Coast Region Ground Water Desalting. Locations and quantities of desalted water potentially available from this source are:

County	Annual Yield (AF)
Ventura	10,000
Los Angeles	12,000
Riverside	17,000
San Diego	20,000
San Bernardino	19,000
Total	**78,000**

7. Imperial Drainage Water Desalting. Imperial Irrigation District could use desalted agricultural water in lieu of Colorado River deliveries. As with the Imperial Valley conservation and transfer alternative, Metropolitan Water District would then divert a corresponding amount from the Colorado River Aqueduct. The costs of desalting and transportation through the aqueduct were taken into account. The cost of substituting poorer quality Colorado River water for urban use, was not considered.

8. San Joaquin Valley Drainage Water Desalting. A program of desalting brackish agricultural drainage water would allow further local reuse of that water as a substitute for water imported from the Delta so that more water would be available to Southern California. Whereas the quality of imported water (280 mg/L TDS) would differ from that of the desalting product water (500 mg/L TDS), blending small desalting product water flows with the much larger imported water flows would make little difference until the amounts of desalting product water reached very high levels. Due to the complexity of the water transfer facilities, no attempt has been made to calculate those differences, even with the maximum potential flows of desalting product water.

The estimated potential annual yield of desalted drainage water is 139,000 AF per year in 1995, increasing to 337,000 AF per year in 2035. This assumes that only drainage water from the Tulare Lake Basin is totally captured for desalting. Drainage water in the San Joaquin Basin will probably continue to be discharged to the San Joaquin River, as long as water quality objectives in that river are met. To the extent that the available drainage water will be either reused for agriculture, used for ground water management, or discharged to evaporation ponds, it will be unavailable for desalting.

9. Water Reclamation (Set 4). See Appendix D. For year 1995, this option includes four projects that produce 9,000 AF. For the period 2010 to 1035, this option includes ten projects that produce 22,000 AF. The weighted average cost of these projects is $441 per AF.

10. Riverside County Drainage Water Desalting. Water provided from this source was assumed to be available for agricultural reuse in Coachella Valley. Estimated yield is 42,000 AF per year by

1995 and thereafter. The cost of this option includes conveyance facilities for the desalted water and pumping for reuse and conveying exchange water from the Colorado River to the South Coast Region.

11. Water Reclamation (Set 5). See Appendix D. For year 1995, this option includes one project that produces 1,000 AF. For the period 2010 to 2035, this option includes nine projects that produce 30,000 AF. The weighted average cost of these projects is $618 per AF.

The small benefit to irrigated agriculture of using higher quality desalted water (500 mg/L TDS) rather than Colorado River water (700 mg/L TDS) was not subtracted from the cost of this alternative because of complexities such as leaching requirements. Estimated yield is 302,000 AF by 1990 and thereafter.

12. Water Reclamation (Set 6). See Appendix D. For year 1995, this option includes three projects that produce a total of 19,000 AF. For 2010 to 2035, the option includes six projects that produce 32,000 AF. The weighted average cost of these projects is $781 per AF.

13. Sea-Water Desalting. In seawater desalting, reverse osmosis is now competitive with more traditional forms of desalination, even in the case of a dual-purpose project involving both power production and desalting. In the past, desalting combined with power production almost automatically meant a distillation process using waste heat from the power plant. This is no longer true for the current reverse osmosis plant designs with improved membranes and energy recovery turbines.

Risk Management. Another long-term management strategy evaluated was the explicit evaluation of risk with regard to the optimal level of use of the long-term management options. Using this strategy calls for explicitly evaluating the economic cost of shortages based on their expected frequency and magnitude and available contingency shortage management measures. The results of that evaluation are then used in conjunction with an analysis of the cost and effectiveness of available long-term water management measures to determine which of these measures are reasonable from an economic standpoint.

Identification of South Coast Region Impacts. To evaluate the alternatives to the KFE, it was assumed that the shortage management contingency options available would be those that could reasonably be expected to be available during the study period, using the criteria of physical and political feasibility. Because the same options would be used, both with and without the KFE — their use dictated by the severity and duration of shortages — they can be considered as alternatives to the KFE only in terms of the frequency and extent of their use. It was also assumed that a risk management strategy, as described above, would be applied, whether or not the KFE was in place. This evaluation assumed South Delta Program facilities would be in place for the year 2010 and year 2035 runs. A revision of the U.S. Army Corps of Engineers' permit to allow pumping from the Delta at 10,300 cfs was also assumed. For the year 1995, it was assumed that the Cross Valley Canal wheeling agreement was in effect. The South Coast Region approach required the use of a simulation model that would approximate, to a reasonable degree, the use of local contingency measures that would actually be seen in response to shortages of various sizes and durations. The economic cost of shortages could then be determined by tying implementation costs to the use of these measures and adding these to an estimate of the economic losses that would be incurred by water users after all reasonable mitigation measures were employed. For this study,

the value of losses to users was derived from the current marginal cost of water to residential users and a recent residential user survey on the willingness to pay to avoid water shortages.

Table 19 shows the relationship between potential water shortages to households as a percentage of normal use and the median willingness to pay to avoid such shortages. These values were used in the simulation model in functional form to estimate losses.

Table 19. Willingness to Pay ($ per household)

Sufficiency Ratio	AF/YR Per Household		
	.75	.65	.50
.95	$ 25	$ 22	$ 17
.90	76	66	51
.85	151	131	101
.80	249	215	166
.75	366	317	366
.70	502	435	355
.65	654	567	436

Figure 36 is a flow chart of the Economic Risk Model. Appendix D contains a detailed description of the logic of the model, the parameters used, and the general assumptions.

In brief, the model was run on the 57-year (1922 to 1978) hydrologic record for year-1995 level, year-2010 level, and year-2035 level demands. The operational considerations cited previously were applicable. Two sets of runs were made at each demand level; the only difference was the existence of the KFE. One set assumed their existence; the other set did not. Within each set, runs differed only by the amount of additional water made available by the use of local extraordinary long-term water supply enhancement and demand management options. Runs were made by using increments of 20,000 AF of additional local water up to a maximum of 1 million AF.

Average municipal and industrial (M&I) consumptive use for the South Coast Region was based on numbers produced for DWR Bulletin 160-87. These numbers were updated in accordance with regional population allocations developed by DWR from statewide interim projections produced by the Department of Finance for years 2000 and 2010. These projections were also used by DWR to update the 2035 projection appearing in the South Delta Water Management Plan Draft EIR/EIS, June 1990, for the South Coast Region.

Variation in the year-to-year level of M&I consumptive use was simulated within the Economic Risk Model, based on historic climatic conditions in the South Coast Region during the 57-year period of hydrologic record. The variance in consumptive use driving the simulation was based on an estimate made in a study conducted for The Metropolitan Water District of Southern California by Chesnutt and McSpadden, *Statistical Analysis of Water Demands During the Current Drought* (January 1989). Each run (at a specified increment of local supply) was made 30 times for each of the 57 years of hydrologic record. This allowed for the resimulation of consumptive use each time to derive a sufficiently reliable estimate of the expected value of the economic costs and losses.

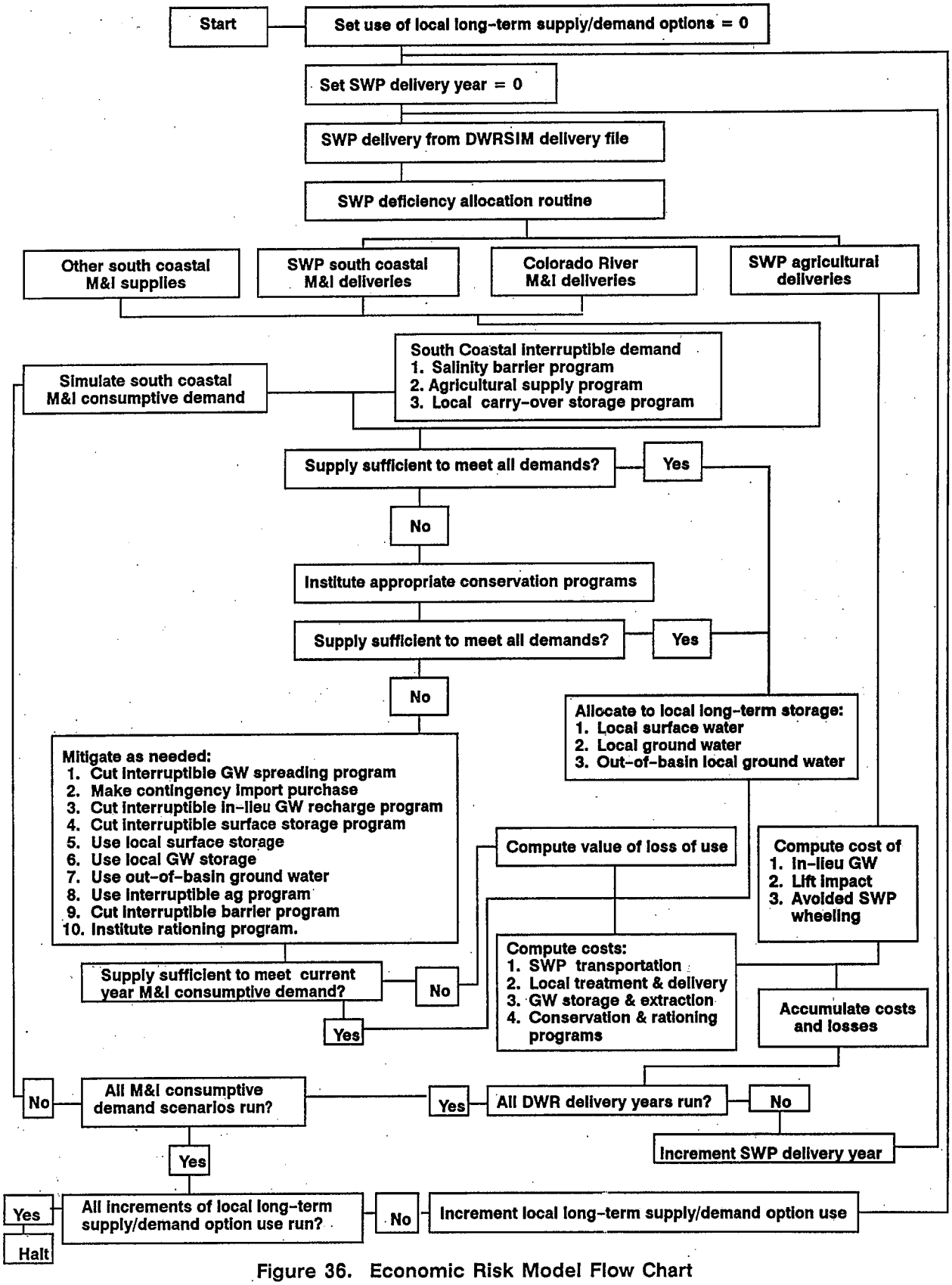


Figure 36. Economic Risk Model Flow Chart

For each of these runs, expected economic costs and losses were computed and compared to the cost of the local extraordinary long-term water management options used. On this basis, an optimal use of these options could be established using the risk management criterion. Because risk management is not costless, this level of optimal use of local management options still allows for an associated level of expected losses. Any further reduction in expected losses would not be cost-effective, compared to the higher cost of the remaining options.

Table 20 shows how the economic risk model run results were used to identify those local options that would no longer be needed under the risk management criterion, if the KFE were in place. For each of the study years, the option, part of the option, or combination of options no longer needed — along with the acceptance of additional risk — is properly designated as the alternative to the KFE. For each study year, the first column shows the use in thousands of acre-feet of local options without the KFE available. The second column shows the effect of the KFE on total local option use. The third column shows the change in local option use attributable to the KFE — the KFE local option use alternative.

Expected economic costs and losses were compared to the cost of the local extraordinary long-term water management options used. On this basis, an optimal use of these options could be established, using the risk management criterion.

Tulare Lake Region. Management options for this region were examined for two classes of users: agricultural and municipal and industrial.

Agricultural Users. For individual farmers using SWP agricultural deliveries in this region, local options for water supply and demand management include:

- Pumping ground water (if farm overlies a ground water basin).
- Increasing on-farm water application efficiency.
- Exchanging supplies within the local water agency from areas with alternative supplies to those without.
- Stressing crops by failing to meet full evapotranspiration requirements.
- Reduce planted acreage of annual crops.

Based on the 1976-77 drought experience, which included the drilling of many additional wells, it was assumed that any additional increment to SWP delivery curtailments due to the absence of the KFE will be compensated for by local ground water pumping. For areas that do not overlie ground water, the 1976-77 experience demonstrated local water agency flexibility in setting up contingency exchanges with those areas with available supplies. Reinforcing this expectation is the fact that potential net water savings from increased on-farm efficiency in the Tulare Lake region are small to nonexistent because of already high on-farm and basin efficiencies. In addition, crop stressing is a high-risk strategy and leaving non-program farmland idle is costly.

Table 20
Local Service Area Alternatives, Local Long-Term Option Use—South Coast Region (TAF)

Local Option ID	Available Product 1995	2010	2035	Year 1995 Without Project	Year 1995 With Project	Year 1995 Option Use Alt.	Year 2010 Without Project	Year 2010 With Project	Year 2010 Option Use Alt.	Year 2035 With Project	Year 2035 Without Project	Year 2035 Option Use Alt.
WR1	0	23	23	0	0	0	23	23	0	23	23	0
WR2	13	13	13	13	13	0	13	13	0	13	13	0
RWA	95	95	95	56	33	23	95	95	0	95	95	0
WR3	49	59	59	0	0	0	59	59	0	59	59	0
ULFTR	145	290	290	0	0	0	131	100	31	290	290	0
SCR GWD	78	78	78	0	0	0	0	0	0	78	78	0
IID DWD	302	302	302	0	0	0	0	0	0	126	105	21
SJV DWD	139	214	337	0	0	0	0	0	0	0	0	0
WR4	9	22	22	0	0	0	0	0	0	0	0	0
RC DWD	42	42	42	0	0	0	0	0	0	0	0	0
WR5	1	30	30	0	0	0	0	0	0	0	0	0
WR6	19	32	32	0	0	0	0	0	0	0	0	0
SWD	5	5	5	0	0	0	0	0	0	0	0	0
Total Quantity Used/Displaced				**69**	**46**	**23**	**321**	**290**	**31**	**684**	**663**	**21**

The cost of using ground water as an alternative in the Tulare Lake Region includes the cost of energy for the additional pumping in the year of curtailment related to the absence of the KFE and the cost of managing any exchange programs necessary to get additional water to areas without ground water pumping capability. Also, because the Tulare Lake Region is in a condition of long-term ground water overdraft, the additional pumping in any single year will cause an increase in pumping depth, which will result in a long-term increase in all pumping costs.

A conservative estimate of these pumping costs impacts made for this report is $75 per AF. This estimate was based on a March 1985 DWR San Joaquin District Memorandum Report, "A Method for Estimating the Value of Surface Water in Conjunctive Use Areas."

Municipal and Industrial Users. SWP M&I users in the Tulare Lake Region were assumed to have the same capability for ground water pumping and/or contingency exchange as the agricultural users in the region. The cost of these alternatives to the M&I users was assumed to be at least as high at the current cost of the M&I supply, minus the cost of local treatment and delivery. This value was estimated to be $230/AF, based on a DWR water price survey.

Sacramento River Region. The M&I water users in this region are assumed to have access to local surface water as a supply management option. Using the weighted average SWP equivalent unit water cost of $21 per AF as a conservative alternative cost, DWR assumes that the cost of using the alternative supplies is at least as great as the cost of the current SWP supply. DWR Bulletin 132-89, *Management of the California State Water Project* (DWR, November 1989), was the source of the equivalent unit cost.

South Lahontan Region. SWP deliveries are made to this region for both agricultural and urban uses. Because of the rapid urbanization taking place and the absence of supply options, urban users depend on both the phasing out of local agriculture and an increase in SWP deliveries to meet their future needs. Even with the use of additional local water exchanges and extraordinary

shortage-management programs, the growth in urban demands will result in even more frequent and severe economic losses due to shortages. Without the KFE, this situation would worsen.

Colorado River Region. Water management options in this region include additional waste water reclamation and water sharing with agricultural users on a contingency basis. The frequency and extent of sharing would have to be restricted to avoid unacceptable economic impacts within the agricultural sector. The acceptance of additional economic risk would also be a likely consequence of the absence of the KFE.

San Francisco Bay Region. Water management options in this region include additional wastewater reclamation, water exchange agreements among local water agencies, and the acceptance of additional economic risk. It is reasonable to assume that the value of the alternatives will exceed the current value of urban water of about $440 per AF. This value was obtained from a DWR water price survey.

Central Coast Region. The situation in this region is characterized by costly water supply options in the face of increasing use due to population pressure. After assuming extraordinary conservation measures, consisting of an ultra-low-flush toilet retrofit program and residential water audits, a combination of local water supply options will be required to meet urban demands. These options include reservoir construction ($800 per AF), pipeline construction ($435 per AF), and seawater desalination ($2,140 per AF). This conclusion was the result of research conducted for the Coastal Aqueduct Draft EIR prepared by DWR. In light of those costs, it seems reasonable to assume that shortage contingency demand and supply management strategies similar to those used for the South Coast Region analysis would be applicable to this region. Accordingly, the cost of local alternatives in this region was assumed to be proportional to those determined for the South Coast Region.

SWP Economic Benefits

Economic benefits of the proposed KFE were determined by using the Economic Risk Model directly for the South Coast Region and SWP agricultural contractors in Kings and Kern counties and indirectly for the Central Coast Region. Current water costs were used to estimate willingness to pay for water in the San Francisco Bay, Tulare Lake, and Sacramento River region.

South Coast Region Benefits. The benefits of the KFE for the South Coast Region depend on the extraordinary local water supply and demand management options that would be employed with and without the proposed KFE. Either the costs of the options that could be displaced by the existence of the proposed KFE, the expected economic losses that would be avoided with the proposed KFE, or both (if appropriate) could then be properly attributed to the KFE facilities as benefits.

Table 21 and Figure 37 were developed by using the procedure described for determining the optimal employment of local options and noting the expected loss values associated with each level of use of the options.

It is important to note that the lower the use of the local options, the higher the value of the KFE for reducing risk. The avoided economic loss benefit of the KFE would be more than proportionally greater to the degree that the extraordinary local options are not available or are more costly

Figure 37. Kern Fan Element
South Coastal Service Area Options Displaced by KFE Yield

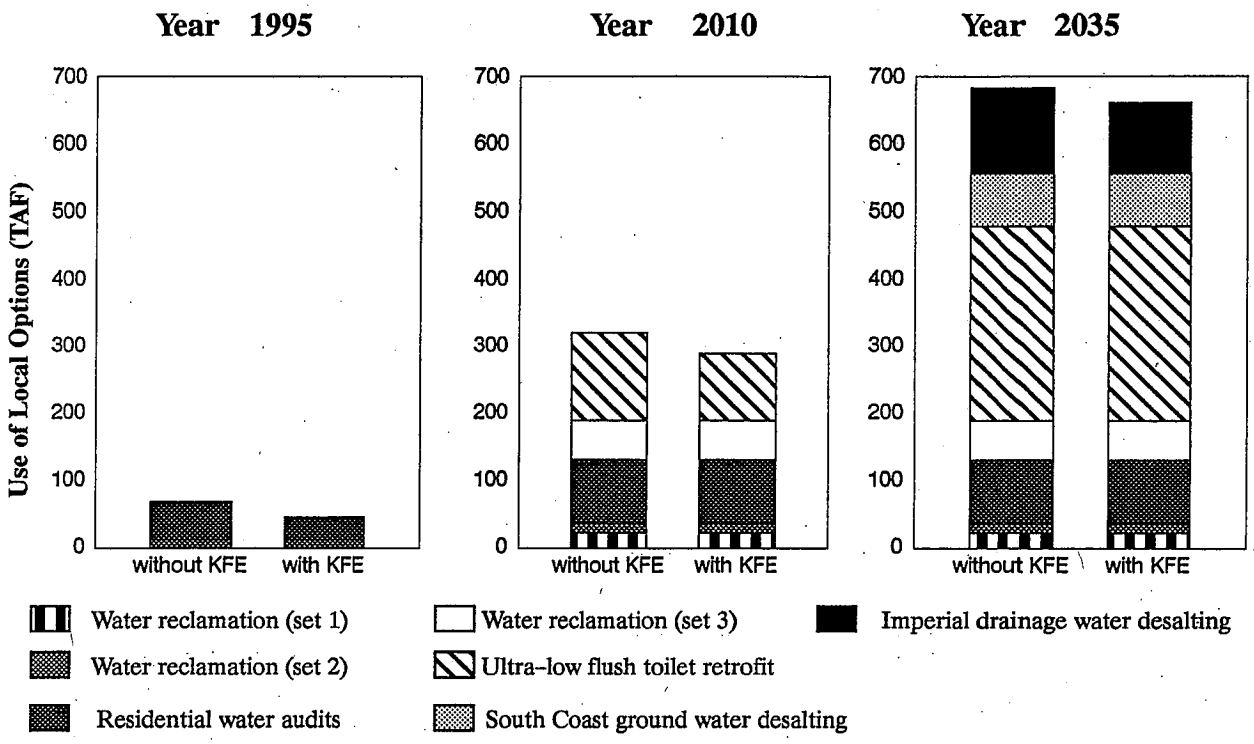


Table 21. Analysis of the First Stage Kern Fan Element, South Coast Region

Variable	Demand Level		
	1995	2010	2035
Water Use (TAF)			
Use of local options:			
Without KFE	69	321	684
With KFE	46	290	663
Avoided use of local options	23	31	21
Benefits (millions of dollars)			
Change in avoided losses due to reduction in use of local options	-7.5	-12.3	-15.1
Avoided local option costs	6.9	11.2	14.1
Net gain from reduction in use of local options	-.6	-1.1	-1.0
Benefit of KFE at reduced local option use	11.7	9.9	22.9
Adjusted KFE benefit	11.1	8.8	21.9

than assumed. This is an important observation because of the uncertainty about the environmental, legal, and health aspects problems associated with some of the options.

The analysis, based on the marginal value of expected losses avoided equated to marginal costs of local water supply/demand management options, is a conservative way of interpreting the model results with respect to estimating the benefits of the KFE. If local water managers (and users)are more risk-averse than indicated by this type of analysis — which is a reasonable assumption — the benefits will be higher than indicated. Under the assumption of greater risk-aversion, the avoided cost of the local options that would be displaced by existence of the facilities becomes more important. Because it is the increasingly costly options that would be displaced, the cost savings (that is, benefits) arising from use of the facilities to attain the desired level of risk become very large.

The conservative assumption of a linear build-up in demand between year-1995 and year-2035 demand levels was made to facilitate the computation of the equivalent annual benefits over the study period. This value for the South Coast Region was determined to be $10.6 million. The benefit build-up from zero in 1990 to the 1995 value was also assumed to be linear.

The basis for this computation was a 6 percent discount rate and a 50-year period of analysis. Benefits for the years after 2035 were assumed to remain at the 2035 level.

Agricultural Benefits for SWP Service Areas in the Tulare Lake Region. The Risk Model results were used directly for this benefit computation because of the conservative simplifying assumption that benefits are constrained to the alternative cost of pumping in lieu of SWP agricultural deliveries. This was felt to be conservative because facilities to bring ground water through intra-agency exchanges are not available for all areas that do not overlie ground water. In addition, the consequences of relying on in-lieu pumping in areas with critical overdraft problems were not addressed by this analysis. The model runs produced the following results for agricultural losses, adjusted for the avoided SWP transportation costs (Table 22). Based on this approach, the expected equivalent annual benefits were calculated to be $1.2 million.

Benefits in Other SWP M&I Service Areas. The Economic Risk Model has not been applied directly to other SWP municipal and industrial areas because the necessary information on either the reliability or cost of local supplies, the availability and effectiveness of local water supply, and demand management options was unavailable. The following regions were those in which the major portion of the KFE benefits were expected to occur.

Central Coast Region. The situation in this area is characterized by costly water supply options in the face of rising use from population pressure. On the basis of this knowledge, it was felt to be conservative, with respect to the value of the proposed KFE, to apply the benefits and results determined for the South Coast Region to this area. This was done by assuming benefits in proportion to relative entitlement. This amount was determined to be about $300,000 annually.

San Francisco Bay Region. Average urban water rates in the North Bay SWP service area are presently about $445 per AF. For the South Bay this figure is about $415 per AF. Adjusting these values for local treatment and delivery cost, plus SWP conveyance, would translate them to about $390 and $360 per AF, respectively, at the Delta. Assuming these values to be year 2000-level values is conservative. For 2035, it was assumed that they would rise linearly from year 2000 to $500

per AF, less than is currently being paid in Southern California high–cost areas. Using an average increment of yield from the proposed project to this area of 1,400 AF in 1995, rising to 3,400 AF in 2035, the benefit value was computed to the equivalent of about $1.1 million.

San Francisco Bay Region. Average urban water rates in the North Bay SWP service area are presently about $445 per AF. For the South Bay this figure is about $415 per AF. Adjusting these values for local treatment and delivery cost, plus SWP conveyance, would translate them to about $390 and $360 per AF, respectively, at the Delta. Assuming these values to be year 2000–level values is conservative. For 2035, it was assumed that they would rise linearly from year 2000 to $500 per AF, less than is currently being paid in Southern California high–cost areas. Using an average increment of yield from the proposed project to this area of 1,400 AF in 1995, rising to 3,400 AF in 2035, the benefit value was computed to the equivalent of about $1.1 million.

Table 22. Annual Agricultural Benefits ($ millions)

	Years		
	1995	2010	2035
Expected agricultural losses:			
Without NDP	16.7	30.0	45.7
With NDP	15.7	28.5	43.5
Avoided losses	1.0	1.5	2.2

Tulare Lake Region. The average urban water rate presently being paid for urban water in this area is $268 per AF. Adjusting this for SWP conveyance cost and local treatment and distribution results in a net value of $230 per AF. This value was assumed to remain constant throughout the study period. An average increment of yield from the proposed facilities to this area of 1,400 AF in 1995, rising to 1,800 AF in 2035, was used to estimate benefits. Based on this, an equivalent annual value of $300,000 was obtained.

Summary of Annual Benefits. The following table shows the benefits derived with the procedures described above. Total benefits of the KFE were estimated to be about $13.6 million annually.

Table 23. Summary of Annual Benefits

Region	Annual Benefit ($ millions)
M&I	
South Coast	10.5
Central Coast	0.3
San Francisco Bay	1.1
Tulare Lake	0.3
Subtotal	**12.2**
Agricultural	
Tulare Lake	1.2
Total	**13.4**

The foregoing benefit values should be used advisedly for the determination of economic justification for the proposed project for the following reasons:

- The model selects local project alternatives on the basis of a risk-neutral view of risk management. Risk-averse management (risk minimization) by local agencies—which has been the predominant mode—would result in the proposed project displacing more costly water management options than under the risk-neutral assumption.
- The costs developed for the local water management options must be considered very preliminary in comparison to the costs developed for the proposed project. In the preponderance of cases, when a detailed study is made of an option and commensurate refinements are made to cost estimates, the costs increase substantially.
- While the costs developed for the proposed project include mitigation, the costs for the local options do not. Mitigation costs, in those cases where it is required, can be a substantial portion of the final cost. Costs of local options which depend upon the construction of treatment plants and conveyance facilities are most likely to be underestimated for this reason.
- Local options which require the disposal of materials covered by hazardous waste regulations, such as desalting plants and some waste water reclamation plants, may have higher than anticipated costs.
- Some of the local options assumed to be available may not be politically, financially, and/or technically feasible as soon as the model expects or may not be feasible at all. For example, the reclaimed waste water options were based on very liberal assumptions regarding the acceptable uses for this source of supply in light of current regional Water Quality Control Boards and Department of Health Services regulations.
- The model assumes the maintenance of the existing D-1485 Bay-Delta water quality criteria. A new decision coming out of the current SWRCB hearing process is very likely to result in additional restrictions on Delta pumping during times important to fish survival. Projects which provide storage south of the Delta—such as the Los Banos Grandes Facilities—will provide relatively greater water supply accomplishments to the extent that such restrictions are tightened.
- The model assumes that both the South Coast and the Tulare Lake Regions have the facilities and institutional agreements in place to move water as needed to minimize the impact of shortages. Because this is unlikely to be the situation, especially in the case of agricultural use, the model tends to undervalue the benefits of the proposed project for this reason.

In light of the foregoing, the economic benefits must be considered as being a lower bound to the actual benefits of the proposed project.

LOCAL PROJECT AREA ECONOMIC BENEFITS

When DWR purchased the 20,000-acre KFE property, about 16,000 acres were in agricultural production. By the end of 1993, all agricultural activities on the Kern Fan Element property are planned to be phased out for the project. For the most part, these agricultural lands have relied on ground water for irrigation, except in very wet years on the Kern River when some surface water was available. The reduction and eventual phase-out of all agriculture on the property will result in a net long-term reduction in ground water use by as much as 31,000 AF annually. The project will therefore result in higher ground water levels than would exist without the project, as-

suming that no new lands are placed into production. This will benefit remaining ground water users near the property. The economic present worth of the avoided future pumping costs is about $35.0 million.

Chapter 7. SIGNIFICANT IRREVERSIBLE ENVIRONMENTAL CHANGES

The proposed project may result in the loss of agricultural uses of the land. Permanent changes in land use also would occur where wells, canals, pumps, and other facilities are needed. Resources and energy required to manufacture the steel and concrete for construction and long-term operation of the proposed project would be irretrievably committed.

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Chapter 8. RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF THE ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The proposed project would be capable of transporting water for recharge, storage, and extraction for many years, if the facilities were properly maintained. The short-term uses of the environment would occur primarily during and shortly after construction. The short-term effects would be minimal in relation to the long-term productivity resulting from construction and operation of the proposed facilities.

The project would help correct long-term overdraft conditions in Kern County, increase the delivery capability of the SWP, increase the reliability of imported water supplies, and increase the efficiency of the conjunctive operation of existing SWP facilities with ground water storage. The proposed plan would also provide long-term protection and enhancement of habitat for wildlife.

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CONSULTATION AND COORDINATION

Kern County Water Agency

Department of Parks and Recreation

Department of Fish and Game

Bakersfield Habitat Conservation Program Committee

Nature Conservancy

U.S. Fish and Wildlife Service

LETTER 21

GLOSSARY

Acre-foot. The quantity of water required to cover one acre to a depth of one foot; equal to 43,560 cubic feet or 325,851 gallons.

Air Stripping. The process of removing volatile organic contaminants from water by forcing air through it.

Anticline. A geologic structure in which beds have been arched upwards.

Aquifer. Geologic materials capable of yielding significant amounts of ground water to wells.

Artificial Recharge. The addition of water to a ground water reservoir by human activity, such as irrigation or induced infiltration from streams, wells, or recharge basins. See also **Ground Water Recharge; Recharge Basin.**

Average Annual Dry Period Supply. The average annual delivery of water to State Water Project contractors for the period March 1928 through February 1935.

Base Study. Operation study without the proposed project.

Basin Area. Measured basin surface area at full capacity.

Benefits. Net increase in the value of goods and services which result from the project, as compared to conditions without the project.

Carriage Water. Delta outflow required to protect the quality of water at the CVP and SWP pumping plants.

Channel Bar. A sand bar formed in a braided river system.

Conjunctive Operation. The operation of a ground water basin in coordination with a surface water storage and conveyance system. The purpose is to recharge the basin during years of above-average water supply to provide storage that can be withdrawn during drier years when surface water supplies are below normal.

Conservation Facility. A reservoir, either surface or ground water, that is used to capture or store water during wet periods for later use.

Coordinated Operating Agreement. An agreement between the United States Bureau of Reclamation and the Department of Water Resources to coordinate the operation of their projects including storage, releases, and pumping.

Corcoran Clay. Widespread geologic unit in the San Joaquin Valley that greatly restricts the vertical movement of ground water. It serves as a confining layer separating deep and shallow ground water systems.

Critical Dry Period. A series of water-deficient years, usually a historical period, in which a full reservoir storage system at the beginning is drawn down to minimum storage at the end without any spill.

Critical Dry Year. A dry year in which the full commitments for a dependable water supply cannot be met and deficiencies are imposed on water deliveries.

Decision 1485. A set of regulations formulated by the California State Water Resources Control Board to protect the beneficial uses in the Delta. They include, among other factors, determination of maximum salinity concentrations at different locations in the Delta.

Delivered Recharge. Measured net recharge deliveries into each pond.

Deltaic. Sediment deposited in a river delta.

Delta Water Charge. A charge to water service contractors under the water service contract used in the State Water Project. The Delta water charge to a particular contractor is intended to recover the portion of the cost of the water conservation facilities allocated to that contractor.

Dependable Supply (Water). The annual quantity of water that can be delivered under normal water supply conditions, and with allowable deficiencies during critical dry periods. See also CRITICAL DRY YEAR, FIRM YIELD, PROJECT YIELD.

Depositional Environment. The environment in which sediment is deposited (that is, an alluvial fan).

Detailed Analysis Unit (DAU). The smallest study area used in the analysis of water use and supply, generally defined by hydrologic features or boundaries of organized water service agencies in the major agricultural areas, a DAU typically includes 100,000 to 300,000 acres.

Electric Log. A record of the resistivity and electric potentials in materials exposed in a borehole.

Endangered Species. Any species which is in danger of extinction throughout all or a significant portion of its range, other than a species of *Class Insecta* determined by the Secretary to constitute a pest whose protection under the provisions of the Endangered Species Act would present an overwhelming and overriding risk to man.

Entitlement Water. Water from the State Water Project that has been contracted for under long-term agreements. The SWP contracts establish specific annual entitlement amounts that each long-term water contractor may request. These schedules reflect each contractor's estimate of future water needs at the time the contracts were signed (with some subsequent revisions).

Entitlement. The contracted amount of water for delivery from the State Water Project, as set forth in Table A of each contractor's water supply contract with the Department of Water Resources.

Evaporable Soil Moisture. Estimated volume of available soil moisture that could be evaporated or used consumptively by vegetation. Estimated on the basis of recharge basin surface acreage and vegetative acreage.

Evaporation Rate. Measured pasture pan evaporation (U.S. Weather Bureau Class A evaporation pan located in an irrigated pasture environment)..

Extensometer. A well designed to measure the amount of compaction that occurs in subsurface materials in response to falling water levels.

Firm Yield. The dependable annual water supply that can be made available for delivery with exceeding specific reductions (deficiencies) in agricultural deliveries during extended dry periods. Normally determined for the period 1928–1934.

First Stage, Kern Fan Element. The first stage of development of the Kern Fan Element program.First Stage, Kern Fan Element.

Fluvial. Sediment deposited in a river system.

Glacio-fluvial. An environment in which material derived from glaciers is deposited in a river system.

Gross Recharge. Computed difference between basin inflow and basin outflow.

Ground Water Overdraft. The condition in which the long-term withdrawals from a ground water basin exceed the long-term recharge.

Ground Water Recharge.

Hydrogeology. The study of the effect of geologic materials on the occurrence, movement, and quality of ground water.

In-lieu Recharge. The delivery of supplemental surface water for use in place of use of ground water, resulting in a comparable reduction in ground water use.

Kern Fan Element. Direct recharge and extraction program conducted on property overlying the Kern River alluvial fan, west of Bakersfield, purchased by the Department in August 1988.

Kern Water Bank. All opportunities by the Department of Water Resources to store and extract imported surface water in the Kern County Ground Water Basin under a contract with the Kern County Water Agency.

Lacustrine. Sediment deposited in a lake.

Liquefaction. The process in which a soil may lose strength and behave as a liquid in response to earthquake shaking.

Local Elements. Proposed direct and indirect ground water recharge and extraction programs with local water districts in Kern County, which are conducted within the boundaries of such districts using existing and proposed additional facilities.

Maximum Contaminant Level (MCL). The maximum amount of a chemical that may be in a public water supply. A drinking water standard.

Mounding. The rise in the water table below a recharge pond.

Multiple Completion Monitoring Well. A monitoring well in which two or more piezometers are installed to measure water levels in discrete zones.

Natural Gamma Log. A record of the amount of gamma radiation produced by materials in a borehole. A measure of the relative amount of clay present.

Nematicides. A pesticide designed to kill nematodes.

Perched Water. A condition in which shallow clay layers cause ground water levels to be near the surface.

Phreatophyte. A deep-rooted plant that obtains its water from the water table or the layer of soil just above it.

Phreatophyte Area. Estimated vegetation area surrounding each pond.

Point Bar. A sand bar formed at the bend of a river. Tends to form sheets of sand in the subsurface.

Pond Area. Measured pond surface area at full capacity.

Recharge Basin.

Resistivity Log. A record of the resistance to an electrical current in the materials exposed in a borehole. Used to estimate relative permeabilities.

Shaliness. The relative amount of silt and clay in materials exposed in a well bore.

Spontaneous Potential Log. A record of the natural electrical currents generated between geologic materials and fluids in a borehole.

Storativity. The volume of water released from or taken into storage from a unit volume of aquifer per unit change in head.

Subsidence. The sinking of the land surface, caused by compaction of subsurface material in response to declining water levels.

Sumps. Pits constructed to dispose of brine produced with oil.

Unconformity. A geologic surface at which the orientation of beds above and below is different. Represents a time when no material was being deposited.

Vadose. The unsaturated part of an aquifer.

ABBREVIATIONS AND ACRONYMS

AADPS	average annual dry period supply
AF	acre-feet
ASTM	American Society of Testing Materials
BVWSD	Buena Vista Water Storage District
CEQA	California Environmental Quality Act
cfs	cubic feet per second
CVC	Cross Valley Canal
CVP	federal Central Valley Project
DAU	Detailed Analysis Unit
DBCP	1,2-dibromo-3-chloropropane, an agricultural pesticide
DFG	California Department of Fish and Game
DHS	California Department of Health Services
DWR	California Department of Water Resources
DWRSIM	DWR water project supply planning simulation model
EDB	ethylene dibromide, an agricultural pesticide
EC	electroconductivity
EIR	environmental impact report
EPA	Environmental Protection Agency
ET	evapotranspiration
GIS	geographic information system
gpf	gallons per flush
gpm	gallons per minute
GWM	ground water model
HMWSD	Henry Miller Water Storage District
I-5	Interstate 5
ID4	Improvement District No. 4
KCWA	Kern County Water Agency

KDWD	Kern Delta Water District
KFE	Kern Fan Element
KFGWM	Kern Fan Ground Water Model
KWB	Kern Water Bank
M&I	municipal and industrial
MAF	million acre-feet
MCL	maximum contaminant level
mg/L	milligrams per liter
µhos/cm	micromhos per centimeter
MODFLOW	U.S. Geological Survey Modular Three-Dimensional Finite-Difference Ground Water Flow Model
MOU	"Memorandum of Understanding between the Department of Water Resources of the State of California and Kern County Water Agency for Developing and Operating the Kern Water Bank," dated March 25, 1987.
MSL	mean sea level
MWD	Metropolitan Water District
NRCP	nonreinforced concrete pipe
0&M	operations and maintenance
PG&E	Pacific Gas and Electric Company
ppm	parts per million
RCP	reinforced concrete pipe
RRBWSD	Rosedale-Rio Bravo Water Storage District
SCE	Southern California Edison
SRI	Sacramento River Index
SWAM	Surface Water Allocation Model
SWC	State Water Contractors
SWP	State Water Project
SWRCB	State Water Resources Control Board
TAF	thousand acre-feet
TDS	total dissolved solids

TWI	Tenneco West, Incorporated
USCE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VCP	variable circular plot
WD	water district
WDRA	Water Delivery Risk Analysis

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LETTER 21

APPENDIX A

Kern Water Bank Land Use Advisory Subcommittee Recommendations for the Kern Fan Element

Several Land Use Advisory Committee and Subcommittee meetings took place between July and November 1990. In October, the subcommittees were asked to present recommendations and provide maps showing their reasonable land use "wish lists." What follows is a summary of those recommendations and land use wants.

Water Resources. The primary purposes for purchasing the Kern Fan Element property were to provide land for ground water recharge and extraction facilities, partially correct overdraft conditions in the Kern Basin by removing land from cultivation and provide buffer area around recharge and extraction facilities to avoid adverse impacts on adjacent ground water users.

As one of the local benefits KCWA has proposed the creation of up to about 4,000 acres of additional recharge ponds to store Kern River flood waters. This is in addition to DWR's approximately 3,000 acres (at buildout) of SWP KFE recharge facilities (Figure A-1).

The Water Resources Subcommittee made the following recommendations:

1. The purpose of the KWB is to provide for the development of additional water supplies by local and State interests via the construction of recharge and extraction facilities. All other proposed land uses shall be subordinate to this purpose.

2. Proposed land uses other than for recharge and extraction should be permitted to the extent they are compatible with water recharge and extraction facilities.

3. The Land Use Plan for the Kern Fan Element should be prepared to conform with the ultimate plan of development of water recharge and extraction facilities, and should provide for phasing land uses in or out as additional phases of recharge and extraction facilities are developed.

4. Lands designed for development of recharge or extraction facilities should be maintained in their current land uses.

Wildlife/Habitat Conservation. Given DWR's desire to use some of the KFE property to provide environmental mitigation for some of the SWP's past and ongoing activities, and the local demand for wildlife habitat conservation, KFE will provide some opportunities for preservation of remnant native habitat (plants & animals) and restoration/enhancement of disturbed (alteration by man) lands to native conditions.

The Wildlife Conservation Subcommittee has recommended the following:

1. Lands designated for management as natural habitats will be managed in a manner consistent with the approved recovery plans for San Joaquin Valley endangered species (both plants and animals).

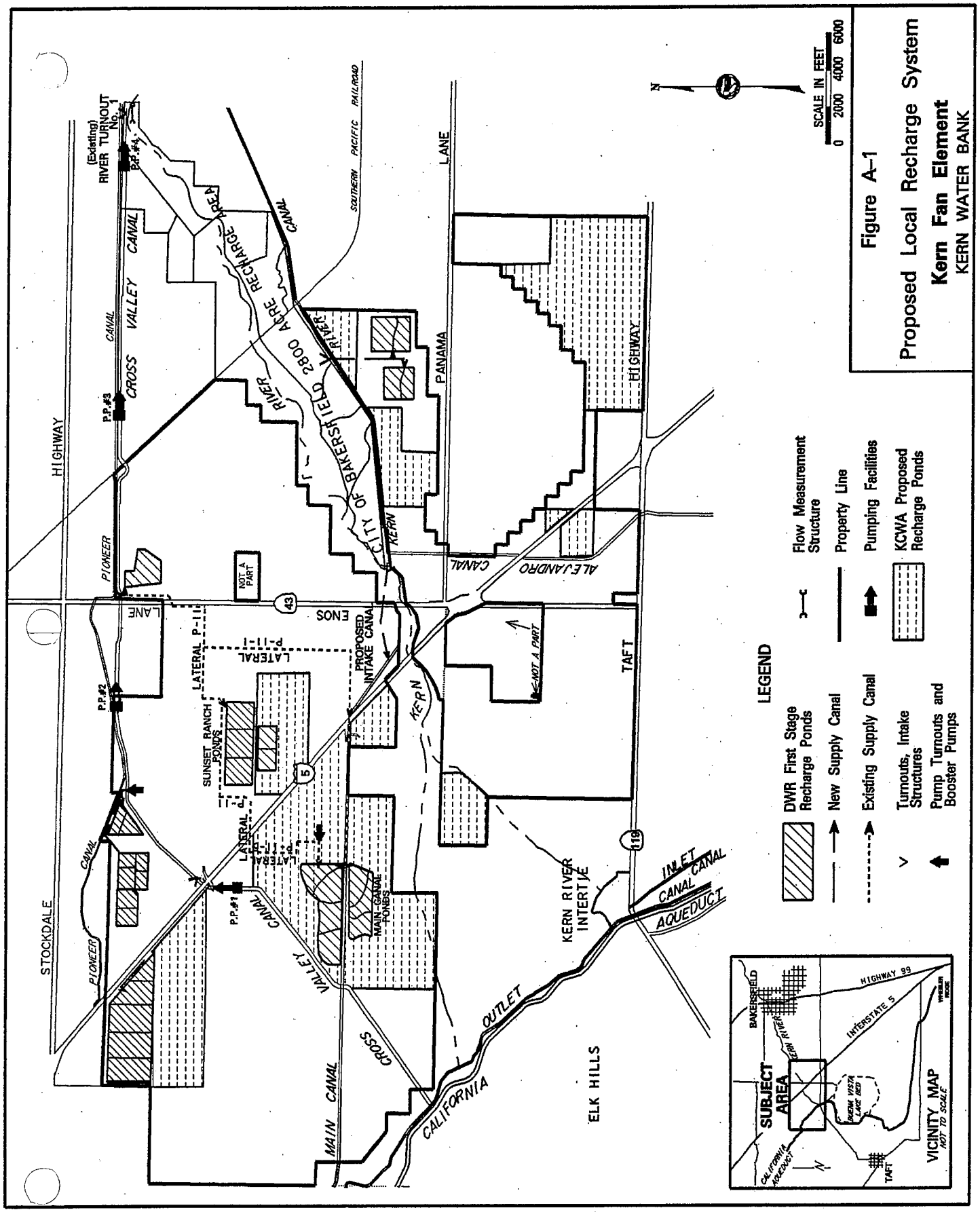
Figure A-1
Proposed Local Recharge System
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 6000
N
LEGEND
DWR First Stage Recharge Ponds
New Supply Canal
Existing Supply Canal
Turnouts, Intake Structures
Pump Turnouts and Booster Pumps
Flow Measurement Structure
Property Line
Pumping Facilities
KCWA Proposed Recharge Ponds
VICINITY MAP
NOT TO SCALE
SUBJECT AREA
BAKERSFIELD
HIGHWAY 99
INTERSTATE 5
TAFT
CALIFORNIA AQUEDUCT
KERN RIVER
BUENA VISTA LAKE BED
WHEELER RIDGE
HIGHWAY
PANAMA
LANE
SOUTHERN PACIFIC RAILROAD
CROSS VALLEY CANAL
(Existing) RIVER TURNOUT No. 1
P.P.#4
P.P.#3
P.P.#2
P.P.#1
RIVER 2800 ACRE RECHARGE AREA
CITY OF BAKERSFIELD
KERN
ALEJANDRO CANAL
PIONEER
NOT A PART
ENOS
LATERAL P-11
LATERAL P-11-1
SUNSET RANCH PONDS
PROPOSED INTAKE CANAL
TAFT
STOCKDALE
LATERAL 4
LATERAL 5
MAIN-CANAL PONDS
KERN RIVER INTERTIE
INLET CANAL
AQUEDUCT
OUTLET
CROSS VALLEY CANAL
MAIN CANAL
CALIFORNIA
ELK HILLS

2. Land use planning will consider linking KWB lands with other adjacent natural habitats, thereby creating or extending wildlife corridors. Areas to be connected include the Kern River corridor, Tule Elk State Reserve, Metropolitan Bakersfield and Kern County Valley Floor Habitat Conservation Plan protection areas, City of Bakersfield Sewer Farm, and Naval Petroleum Reserve No. 1.

3. All KWB lands not required for water management shall be managed for the benefit of the plants and animals native to the area, especially listed species.

4. Land use should be consistent with extension of the Kern River Plan.

5. Recreational uses should be compatible with resource management objectives, emphasizing low-impact recreational uses (i.e., bike trail, bird watching, photography, etc.).

6. Any hunting on KFE lands shall be restricted to designated areas and subject to State and Kern County regulations.

7. Lands previously used for agricultural production will be rehabilitated/enhanced as habitat for native plants and animals.

8. All KFE lands south of the Kern River Corridor (6,000+ acres shown in Figure A-2) should be fully dedicated for restoration/enhancement of native plant and animal communities. Funding sources for restoration work would likely be available from Habitat Conservation Plan funds.

9. Private holdings within the proposed 6000-acre restoration area should be investigated for future acquisition and inclusion into the water bank/restoration project.

10. The management of wetlands and recharge sites should be consistent with goals of the Central Valley Joint Venture Project.

11. Water impoundment areas should be designed for both water storage and wildlife benefits.

Metropolitan Bakersfield Habitat Conservation Plan. The MBHCP provides an opportunity to link KFE conservation lands with future habitat conservation areas proposed by the MBHCP Steering Committee. The "primary goal of the MBHCP is to acquire, preserve and enhance native habitats which support endangered and sensitive species, while allowing urban development to proceed. . ." (Metropolitan Bakersfield Habitat Conservation Plan and Draft EIR, September 1990)

Conflicts between urban development and native species prompted the City of Bakersfield and Kern County to formulate a habitat conservation plan. Figure A-3 shows the location of potential local preserve acquisitions associated with the MBHCP.

Potential exists for local agencies to use MBHCP funds for restoration/enhancement of KFE lands to meet local habitat conservation requirements. Of course, issues of ownership, management and meshing of multiple use goals will have to be resolved before any conservation plans are implemented on the KFE property.

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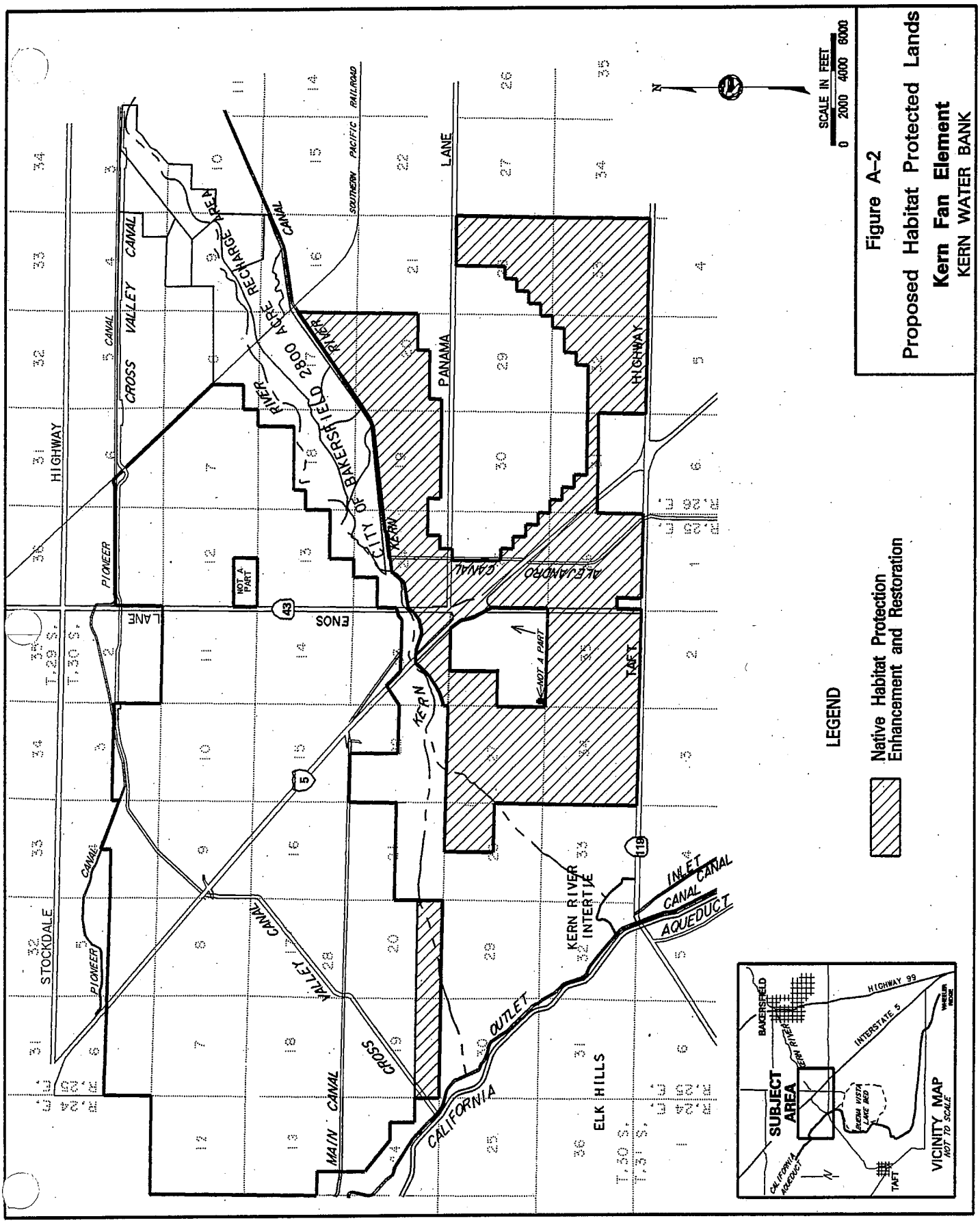
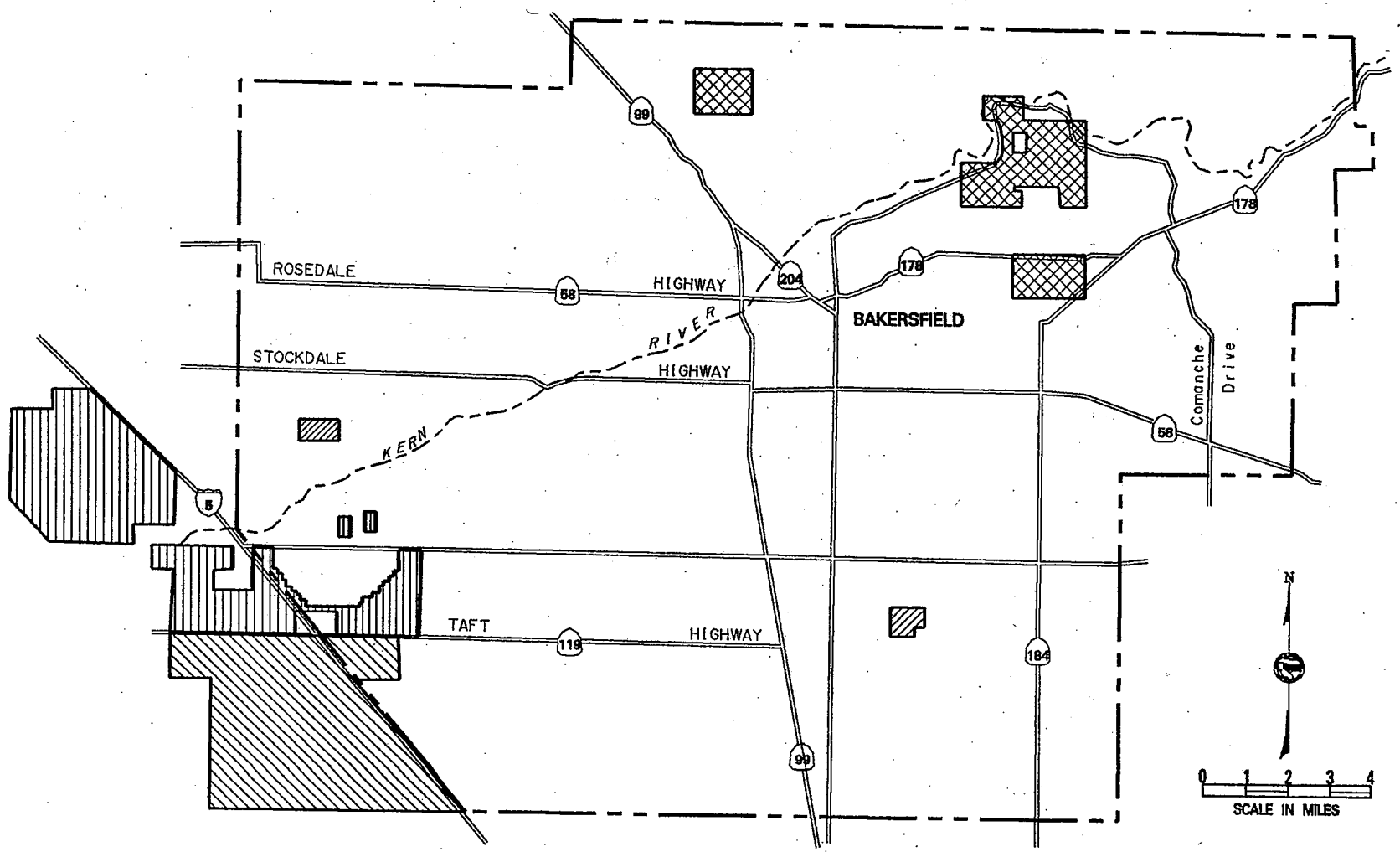


Figure A-2
Proposed Habitat Protected Lands
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 6000
N
LEGEND
Native Habitat Protection
Enhancement and Restoration
SUBJECT AREA
VICINITY MAP
NOT TO SCALE
BAKERSFIELD
HIGHWAY 99
INTERSTATE 5
KERN RIVER
CALIFORNIA AQUEDUCT
TAFT
WHEELER RIDGE
KERN RIVER RECHARGE AREA
CROSS VALLEY CANAL
SOUTHERN PACIFIC RAILROAD
LANE
PANAMA
HIGHWAY
CITY OF BAKERSHFIELD 2800 ACRE
RIVER
ALEJANDRO
CANAL
ENOS
TAFT
PIONEER
NOT A PART
KERN
INLET CANAL
AQUEDUCT
KERN RIVER INTERTIE
OUTLET
CROSS VALLEY CANAL
MAIN CANAL
CALIFORNIA
ELK HILLS
STOCKDALE
T.29 S.
T.30 S.
T.31 S.
R.24 E.
R.25 E.
R.26 E.



LEGEND

- Specialty Plant Preserve
- South West Land Preserve Acquisition Area
- Cactus Preserve Acquisition Areas
- DWR Conservation Enhancement Priority Lands
- HCP Area Boundary

Figure A-3

Metropolition Bakersfield Habitat Conservation Plan
Local Preserve Acquisition Strategy
Kern Fan Element
KERN WATER BANK

Recreation. Recreation probably provides the most significant opportunity for compatible multiple land uses on KFE property. Provision of bicycle and equestrian trails and the creation of parks can probably be integrated with both wildlife conservation and water resources features and areas.

The Recreation Subcommittee has recommended several features (see Figure A–4), and goals including:

1. Proposed recreational lands will not threaten water quality and will remain within project related land use constraints.

2. Proposed recreational land uses will not disturb/destroy native habitat.

3. Proposed recreational uses will be of low impact to the Kern Water Bank and will be mutually compatible to the other proposed recreational uses.

4. Equestrian Trails shall be a designated riding and hiking paths that accommodate horseback riding and hiking through areas removed from vehicular traffic. The north side of the River, along the secondary floodplain line can most readily be adapted. Equestrian staging areas can be developed at appropriate intervals near points of trail access.

5. The Bike Path is a separate path following the old levee along the south side of the Kern River. The path shall also reach bicycle access to the Tule Elk Reserve and the Buena Vista Aquatic Recreation Area along the Intertie, Inlet/Outlet Canals. Public facilities shall be placed at appropriate intervals including points of access at Enos Lane, Buena Vista Road, Lake Buena Vista, and the Intertie at Taft Highway.

6. Non–motorized watercraft shall have controlled access to bodies of water as created by water recharge ponds. Water bodies shall have deep interiors and shallow edges. Examples of non–motorized watercraft can include canoe, row boat, small sail craft, etc.

7. Field Trial (Dog) Area/Upland Game Bird Habitat Restoration shall include controlled, unimproved access, parking and native vegetation.

Agriculture. Though agricultural production is supposed to be phased–out by 1993, agricultural tenants of KFE lands have expressed interest in continuing some agricultural leases. The Agriculture Subcommittee has recommended the following:

1. Allow agricultural operations to continue on KFE property to some degree (Figure A–5).

2. Agricultural tenants could accept flood easements to accommodate local recharge of Kern River flood flows. Tenants would be released from lease obligations during the period their land is flooded.

3. Continued farming operations could provide for occasional spreading of recharge water as well as forage for some game species. In addition, at certain times of the year, agricultural lands could be used for dog field trails and training and for hunting (e.g., pheasant).

4. Tenants are willing to purchase surface water to help correct ground water overdraft.

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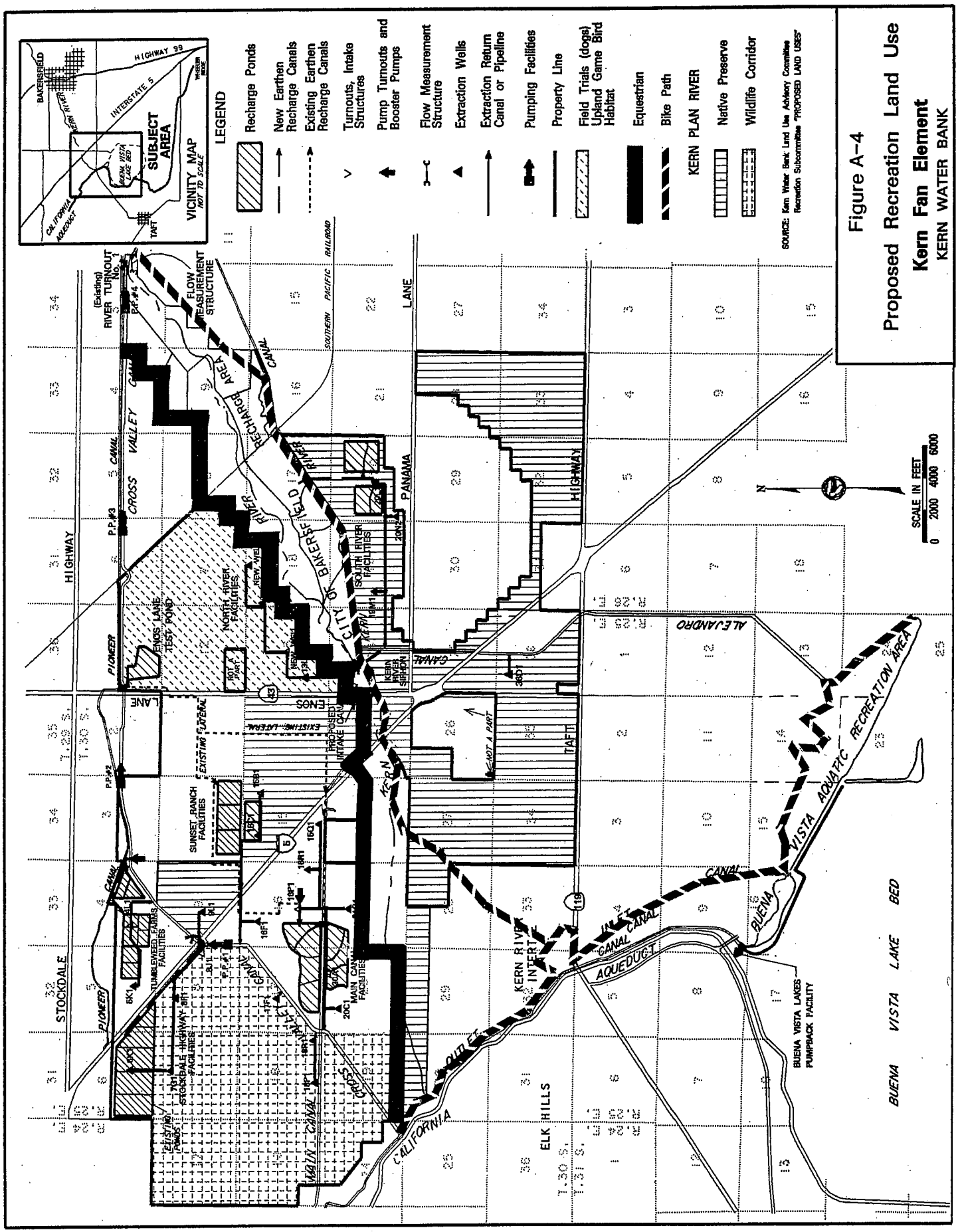
Figure A-4
Proposed Recreation Land Use
Kern Fan Element
KERN WATER BANK
LEGEND
Recharge Ponds
New Earthen Recharge Canals
Existing Earthen Recharge Canals
Turnouts, Intake Structures
Pump Turnouts and Booster Pumps
Flow Measurement Structure
Extraction Wells
Extraction Return Canal or Pipeline
Pumping Facilities
Property Line
Field Trials (dogs) Upland Game Bird Habitat
Equestrian
Bike Path
KERN PLAN RIVER
Native Preserve
Wildlife Corridor
SOURCE: Kern Water Bank Land Use Advisory Committee Recreation Subcommittee "PROPOSED LAND USES"
VICINITY MAP NOT TO SCALE
SUBJECT AREA
BAKERSFIELD
HIGHWAY 99
INTERSTATE 5
KERN RIVER
CALIFORNIA AQUEDUCT
TAFT
BUENA VISTA LAKE BED
WESTSIDE
SCALE IN FEET
0 2000 4000 6000
N
(Existing) RIVER TURNOUT NO. 4
FLOW MEASUREMENT STRUCTURE
P.P. #4
P.P. #3
P.P. #2
SOUTHERN PACIFIC RAILROAD
LANE
CROSS VALLEY CANAL
RECHARGE AREA
CITY OF BAKERSFIELD
RIVER
PANAMA
HIGHWAY
ENOS LANE
PIONEER
ENOS LANE TEST POND
NORTH RIVER FACILITIES
SOUTH RIVER FACILITIES
KERN RIVER SIPHON
ALEJANDRO
TAFT
EXISTING INTAKE CANAL
PROPOSED INTAKE CANAL
SUNSET RANCH FACILITIES
TUMBLEWEED FARMS FACILITIES
STOCKDALE HIGHWAY FACILITIES
MAIN CANAL FACILITIES
KERN RIVER INTERTIE
INLET CANAL
OUTLET
AQUEDUCT
CALIFORNIA
ELK HILLS
BUENA VISTA LAKES PUMPBACK FACILITY
VISTA AQUATIC RECREATION AREA
BUENA VISTA LAKE BED
STOCKDALE
HIGHWAY
1.29 S.
1.30 S.
1.31 S.
1.30 S.

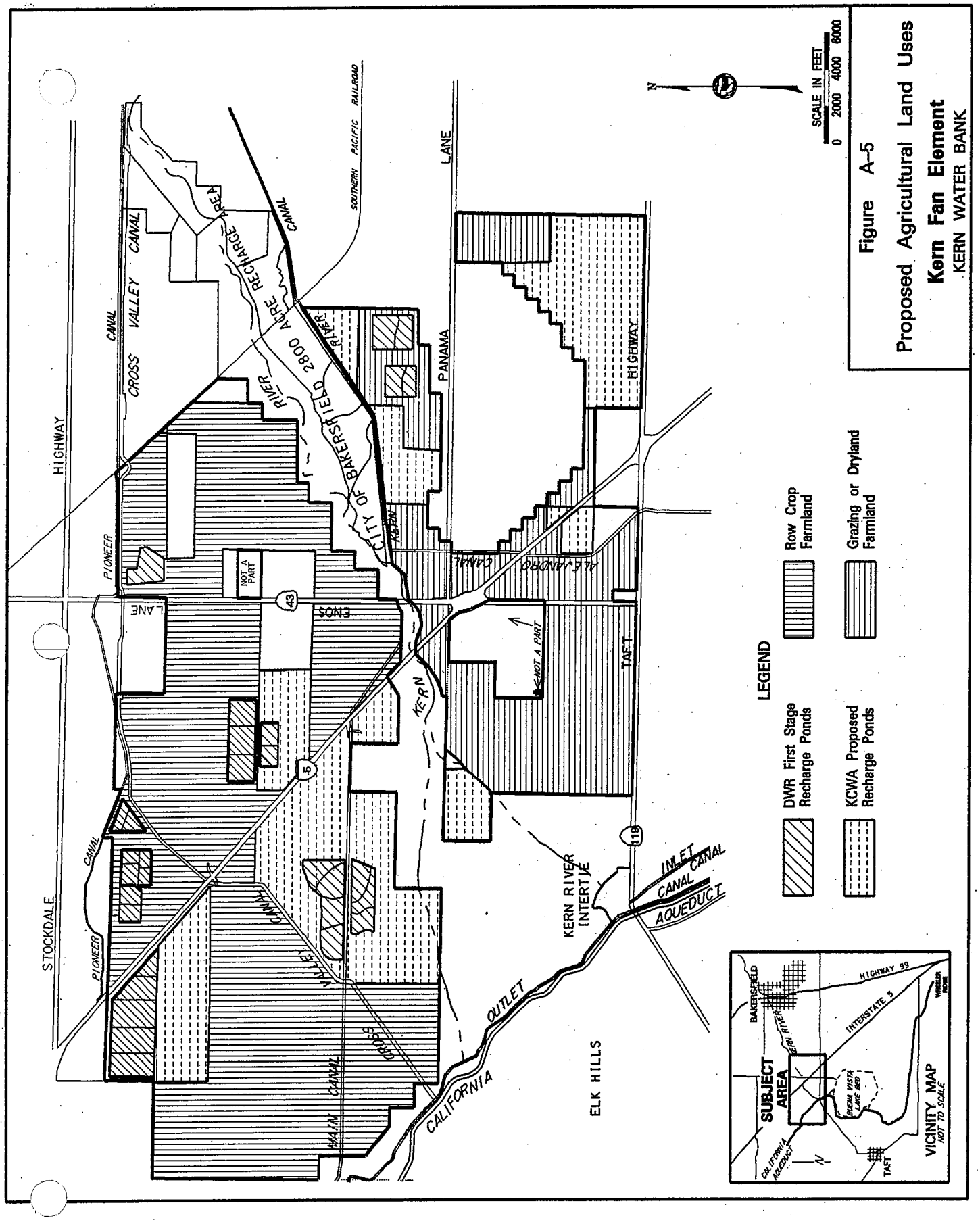
Figure A-5
Proposed Agricultural Land Uses
Kern Fan Element
KERN WATER BANK
SCALE IN FEET
0 2000 4000 8000
N
LEGEND
Row Crop Farmland
Grazing or Dryland Farmland
DWR First Stage Recharge Ponds
KCWA Proposed Recharge Ponds
HIGHWAY
CROSS VALLEY CANAL
RECHARGE AREA
SOUTHERN PACIFIC RAILROAD
LANE
PANAMA
HIGHWAY
PIONEER
CANAL
CITY OF BAKERSFIELD RIVER
KERN
ENOS
LANE
NOT A PART
43
ALE LANDRO
CANAL
NOT A PART
TAFT
5
KERN
119
KERN RIVER INTERTIE
INLET CANAL
AQUEDUCT
STOCKDALE
PIONEER
CANAL
CANAL
VALLEY
CROSS
MAIN CANAL
OUTLET
CALIFORNIA
ELK HILLS
SUBJECT AREA
BAKERSFIELD
KERN RIVER
HIGHWAY 99
INTERSTATE 5
WHEELER RIDGE
KERN VISTA LAKE BED
CALIFORNIA AQUEDUCT
TAFT
VICINITY MAP
NOT TO SCALE

5. Agricultural tenants may be able to extract ground water from contaminated wells for use on leased lands to remove (volatize) any contaminants.

6. Continued agricultural operations would allow for intermittent recharge and provide a positive cash flow from leased lands.

Mineral Extraction and Utilities. Because ARCO owns the mineral rights to KFE lands, ARCO has specific rights to explore for and extract minerals over the entire property. The purpose for inviting ARCO to participate in the land use advisory process was to have ARCO advise land use committee/subcommittee members on the institutional requirements ARCO must meet to carry out its mining activities. In addition, the land use advisory process provides a forum for ARCO to determine how proposed land use changes might affect its ongoing and future oil activities.

PG&E, Southern California Edison and other utilities have utility transportation facility easements across much of the KFE property. All these utility features would have to be taken into consideration when developing recommendations on and designing future land uses.

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APPENDIX B

Status of Potential Sensitive Plant Species for Kern Fan Element

Species		CNPS[1]	CDFG[1]	USFWS[1]
Scientific Name	**Common Name**			
Atriplex patula ssp. *spicata*	San Joaquin saltbush	3	–	C2
Atriplex tularensis	Bakersfield saltbush	1B	CE	C2
Atriplex vallicola	Lost Hills saltbush	1B	Special	
Cirsium crassicaule	Slough thistle	1B	Special	C2
Caulanthus californicus	California jewelflower	1B	CE	FE
Delphinium recurvatum	Recurved larkspur	1B	–	C2
Eremalche kernensis	Kern mallow	1B	Special	FE
Eriastrum hooveri	Hoover's wooly star	1B	Special	FT
Eriogonum gossypinum	Cottony buckwheat	4	Special	C3
Layia leucopappa	Comanche Point layia	1B	Special	C2
Lembertia congdonii	San Joaquin wooly-threads	1B	Special	FE
Opuntia basilaris var. *treleasi*	Bakersfield cactus	1B	CE	FE
Pseudobahia peirsonii	Tulare pseudobahia	1B	CE	C1

[1]Status references:

CNPS – Smith, J. P. Jr. and K. Berg. 1988. California Native Plant Society's Inventory of Rare and Endangered Plants of California, Special Publication No. 1, Fourth Edition.

1B = Plants rare and endangered in California and elsewhere
3 = Plants for which more information is needed
4 = Plants of limited distribution
5 = Plants too widespread for listing

CDFG – California Department of Fish and Game Nongame – Heritage Program. Natural Diversity Data Base Special Plants List (February 1988).

CE = California endangered
CR = California rare
CT = California threatened
Special = Under consideration for future listing by CDFG

USFWS – California Federally Listed Endangered and Threatened Species by County. August 30, 1990. (Sacramento Endangered Species Office)

FE = Federally listed, endangered
C1 – Enough data are on file to support federal listing
C2 = Threat and/or distributional data are insufficient to support federal listing (=candidate species)
C3 = Too widespread and/or not threatened

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APPENDIX C

Wildlife Species List

Scientific Name	Common Name
Reptiles and Amphibians	
Eumeces gilberti	Gilbert's skink
Uta stansburiana	Side-blotched lizard
Sceloporus occidentalis	Western fence lizard
Phrynosoma coronatum	Coast horned lizard
Cnemidophorus tigris	Western whiptail lizard
Croraphytus wislizenii silus	Blunt-nosed leopard lizard
Pituphis melanoleucus satenifer	Pacific gopher snake
Lampropeltis getulus	Common kingsnake
Birds	
Podilymbus podicops	Pied-billed grebe
Aechmophorus occidentalis	Western grebe
Ardea herodias	Great blue heron
Casmerodius albus	Great egret
Egretta thula	Snowy egret
Butorides striatus	Green-backed heron
Anas cyanoptera	Cinnamon teal
Carthartes aura	Turkey vulture
Elanus caeruleus	Black-shouldered kite
Circus cyaneus	Northern harrier
Buteo lineatus	Red-shouldered hawk
Buteo swainsoni	Swainson's hawk
Buteo jamaicensis	Red-tailed hawk
Buteo lagopus	Rough-legged hawk
Falco sparverius	American kestrel
Phasianus colchicus	Ring-necked pheasant
Callipepla californica	California quail
Fulica americana	American coot
Charadrius vociferus	Killdeer
Himantopus mexicanus	Black-necked stilt
Numernius americanus	Long-billed curlew
Calidris mauri	Western sandpiper
Larus californicus	California gull
Zenaida macroura	Mourning dove
Tyto alba	Common barn owl
Geococcyx californianus	Greater Roadrunner
Bubo virginianus	Great horned owl

Athene cunicularia	Burrowing owl
Calypte anna	Anna's hummingbird
Colaptes auratus	Northern flicker
Sayornis nigricans	Black phoebe
Tyrannus vociferans	Cassin's kingbird
Tyrannus verticalis	Western kingbird
Hirundo pyrrhonota	Cliff swallow
Corvus corax	Common raven
Turdus migratorius	American robin
Mimus polyglottos	Northern mockingbird
Toxostoma redivivum	California thrasher
Lanius ludovicianus	Loggerhead shrike
Dendroica coronata	Yellow-rumped warbler
Zonotrichia leucophrys	White-crowned sparrow
Agelaius phoeniceus	Red-winged blackbird
Sturnella neglecta	Western meadowlark
Icterus galbula	Northern oriole
Carpodacus mexicanus	House finch
Carduelis tristis	American goldfinch
Passer domesticus	House sparrow

Mammals

Didelphis virginiana	Virginia opossum
Sylvilagus audubonii	Desert cottontail
Lepus californicus	Black-tailed jackrabbit
Ammospermophillus nelsoni	San Joaquin antelope squirrel
Spermophilus beecheyi	California ground squirrel
Dipodomys heermanni	Heerman's kangaroo rat
Dipodomys nitratoides	Tipton's kangaroo rat
Peromyscus maniculatus	Deer mouse
Rattus rattus	Black rat
Canis latrans	Coyote
Vulpes macrotis mutica	San Joaquin kit fox
Procyon lotor	Raccoon
Taxidea taxus	Badger
Mephitis mephitis	Striped skunk
Lynx rufus	Bobcat

APPENDIX D

Measuring Economic Benefits of the Kern Fan Element

Water supply and demand reduction alternatives are considered ordinary and, in part, represent the actions that would be needed to cover potential shortfalls in dependable supplies listed in DWR Bulletin 160-87, *California Water: Looking to the Future,* November 1987.

The analysis presented in this appendix and discussed briefly in Chapter 6 is presented by region, including the South Coast Region, South Lahontan Region, Colorado River Region, San Francisco Bay Region, and Central Coast Region.

Local water management program options were divided into three categories:

- shortage contingency demand management and supply enhancement options;
- long-term demand management and supply enhancement options; and
- risk management.

Shortage management contingency options are measures implemented during shortages only and are intended to minimize the impacts of those shortages. Such measures include:

- use of banked local ground water;
- use of local carry-over storage;
- reduction of water deliveries to interruptible programs;
- purchasing water to augment normal sources of supply;
- instituting extraordinary water conservation measures; and
- rationing.

Long-term options considered include:

- waste water reclamation;
- desalination of brackish drainage and ground water;
- desalination of sea water; and
- development of water by importation.

Another long-term management strategy evaluated in this analysis is the explicit evaluation of risk with regard to the optimal level of use of long-term management options.

Economic benefits of the proposed KFE were determined by using the Economic Risk Model directly for the South Coast Region and State Water Project agricultural contractors in Kings and Kern counties. This is accomplished by using:

- the model results indirectly for the Central Coast Region, and
- current water costs to estimate willingness to pay for water in the San Francisco Bay and Sacramento regions.

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Attachment 4

KERN WATER BANK AUTHORITY
5500 MING AVENUE, SUITE 490 BAKERSFIELD, CALIFORNIA 93309
(661) 398-4900

MAIN MENU

- KWBA Info

General Info
Location Map
Key Dates
DWR & the KWB
Board of Directors

- Recharge & Recovery
- Wildlife & Vegetation
- Conservation Bank
- Geology
- Archeology
- GIS / Mapping
- Photo Galleries
- FAQs
- Contact Us

The Department of Water Resources and the Kern Water Bank

In the early 1980s, the Department began exploring the feasibility of developing a SWP groundwater storage facility in Kern County. In 1988, Tenneco West, Inc. sold approximately 20,000 acres of land in the Kern Fan Element to the Department. The Department encountered many legal, institutional, and political impediments to implementation of a groundwater storage facility. SWP contractors also expressed concerns regarding their ongoing costs for feasibility studies and ownership of the Kern Fan Element property compared to their evaluations of the likelihood of realizing a functional groundwater storage program. In 1993, uncertainties regarding the proposed groundwater storage facility ultimately convinced the Department to halt feasibility studies and design work on the project.[i] The uncertainties included proposed revisions of Delta water quality standards and measures to protect threatened and endangered species, which affected the SWP's ability to pump water from the Delta for recharge at the Kern Fan Element. Expected changes in arsenic standards in drinking water also raised questions regarding the ability of the project to meet California Aqueduct pump-in standards.[ii] In addition to environmental issues, the Department and KCWA could not reach agreement on measures to comply with Water Code Section 11258, which required approval of local agencies for development of the groundwater banks. The Department concluded that these uncertainties and constraints on Delta pumping made development of an SWP groundwater storage facility in the Kern Fan Element infeasible.[iii] In 1994, the potential of the Kern Fan Element for groundwater storage remained unrealized, and DWR sought to divest itself of the property.

[i] California Department of Water Resources, Bulletin 132-93:11-12, 1995.
[ii] Draft DWR memo dated October 6, 1993.
[iii] California Department of Water Resources, Bulletin 132-94:26, 1996.

Attachment 5

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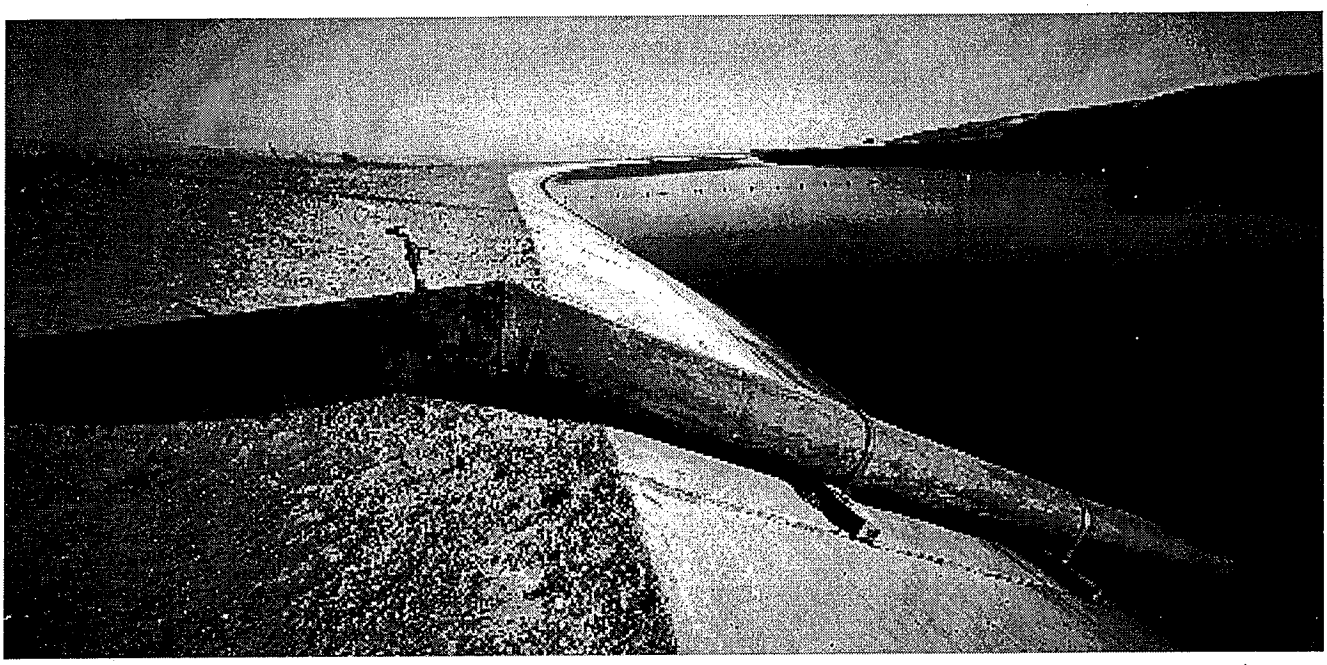

Water Heist

How Corporations Are Cashing In On California's Water

Public Citizen

WATER FOR ALL

CAMPAIGNING TO KEEP WATER AS A PUBLIC TRUST

California Office

December 2003

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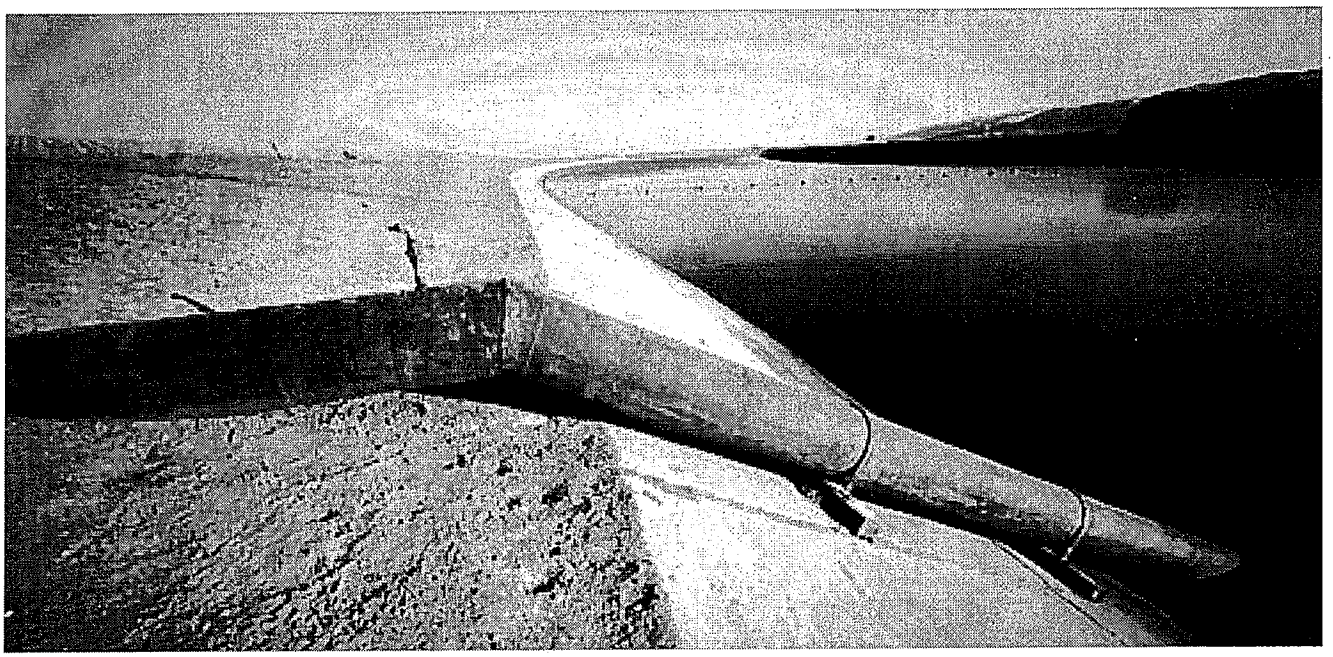

Water Heist

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WATER FOR ALL

CAMPAIGNING TO KEEP WATER AS A PUBLIC TRUST

California Office

December 2003

Public Citizen *is a national, nonprofit consumer advocacy organization founded by Ralph Nader in 1971 to represent consumer interests in Congress, the executive branch and the courts. We fight for openness and democratic accountability in government, for the right of consumers to seek redress in the courts; for clean, safe and sustainable energy sources; for social and economic justice in trade policies; for strong health, safety and environmental protections; and for safe, effective and affordable prescription drugs and health care. We have six divisions and two state offices.*

The California Office *Our campaigns protect the basics for life: food, water and democracy. We fight for safe and sustainable agriculture that provides locally-grown and nutritious food produced in a humane fashion. We advocate for democratic control and protection of public water resources in the face of international corporate strategies to privatize their ownership and distribution. And we continue to highlight how corporate-driven trade policy undermines environmental regulations, labor laws, and the democratic process.*

Public Citizen is campaigning to protect universal access to safe and affordable drinking water by keeping it in public hands. Public Citizen does not believe that citizens benefit from privatization of their water and wastewater systems because the sale of public works to private companies can foster corruption and result in higher rates, inadequate customer service and a loss of local control and accountability.

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Design *Nicola Ginzler Design*

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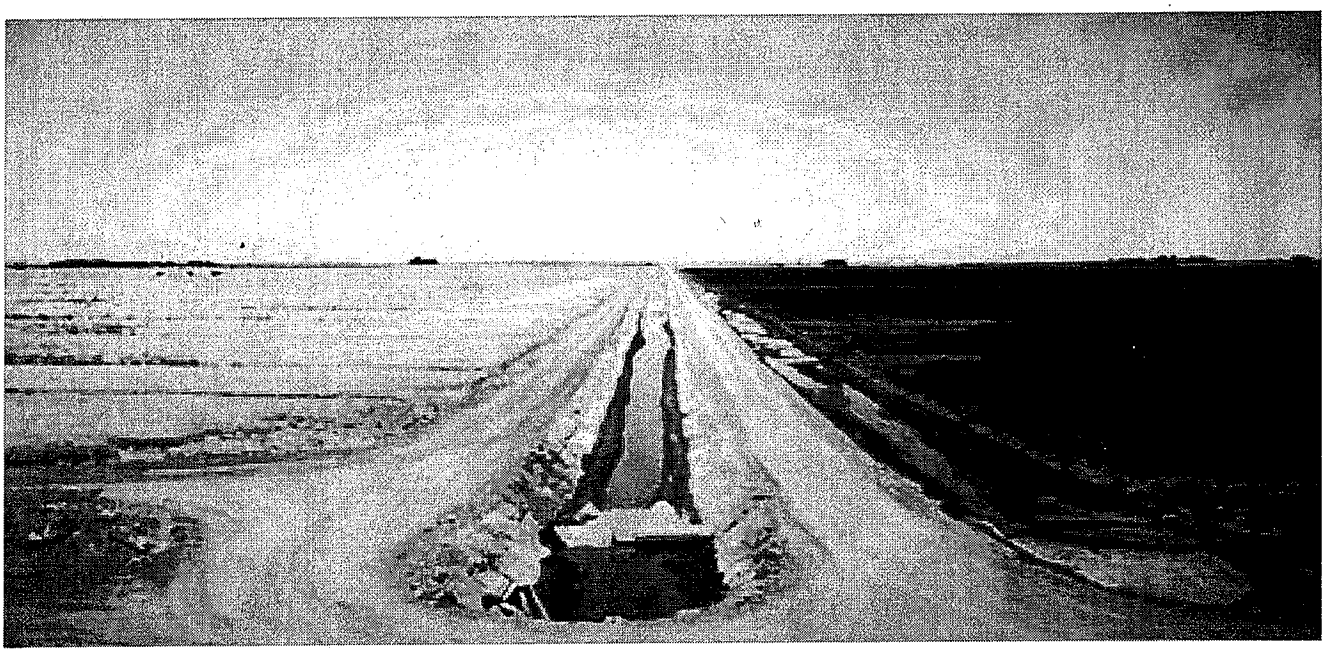


California's Great Central Valley receives between one and ten inches of rain a year. The diverted rivers sent south to be used as irrigation water provide the Midas touch that transforms the desert into the richest agricultural region in the world.

Executive Summary

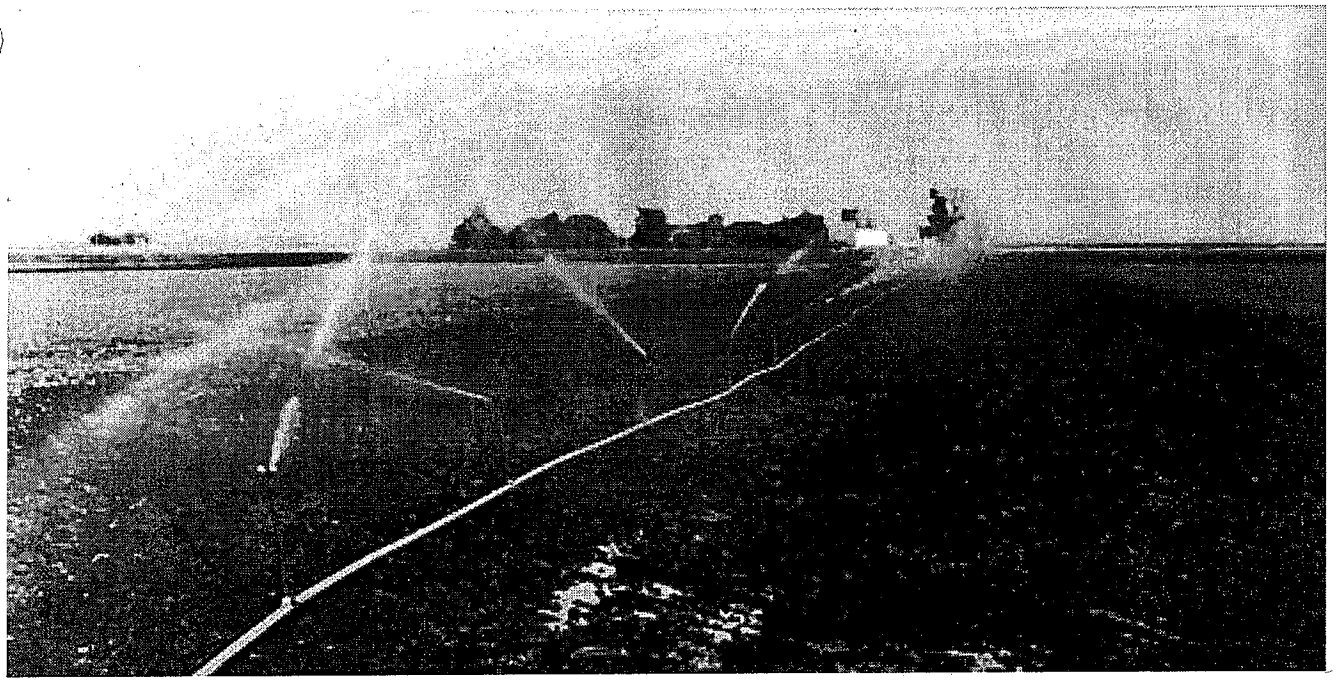
California's Central Valley is one of the largest contiguous swaths of land on earth to have been so completely altered by human activity. Lake beds and wetlands have been drained and planted with cotton and almonds, rivers dammed and diverted over hundreds of miles from their sources, the air filled with such quantities of dust and pesticides as to become the most polluted in the country, and the dry semi-desert floor turned into the most productive agricultural region in the world. Now, after a century of such cosmetology, the Valley is about to get yet another makeover from a boom crop: sprawl.

OVER THE PAST DECADE, a handful of the largest agribusiness and development corporations in the country have been rewriting California water policy in secret meetings to quench their thirst for unabated expansion and privatize the state's water supply. Displaying total disregard for the California State Constitution, representative democracy, and the environmental and social impacts of their actions, these players seek to "game" public water projects—much as Enron "gamed" energy deregulation. Their goal is to siphon as much of California's public water as possible to their corporate farms and "master-planned" cities in the desert while profiting from insider water sales.

In California state law, as laid out in the Constitution and the Water Code, water is a public good, held in trust by the state to ensure the greatest benefit to the public. In *Water Heist: How Corporations Are Cashing In On California's Water* we show how the public trust has been breached by an entrenched water plutocracy. The corporate interests that pervade the water districts that call the shots throughout the state are setting up insider water trading systems to facilitate the ease with which water flows to money. With direct corporate control over vital public water infrastructure—especially massive public water storage facilities—environmental protection and justice, urban renewal and smart growth face a desiccated future where profit rather than need dictates the destiny of California's water.

The abuses continue largely because they occur in closed meetings in hidden forms of government. Public Citizen aims to help cast the light of public scrutiny on the water deals taking place using the state's public water delivery system so that not just the CEOs of California have a voice in determining how our water is managed.

The water plutocracy includes some of the largest private agribusiness and development corporations in the country, who have created obscure and unaccountable water districts that act like "hidden government."



Usurping Democracy: The Monterey Amendments

In 1994, the largest contractors with the California State Water Project (SWP)—the state's largest water delivery system—called the Department of Water Resources (DWR) into a closed meeting. The agreements that the SWP contractors and the state reached in that meeting led to a document known as the Monterey Amendments, named after the city where the meetings took place. These "amendments" to the SWP contracts included denying that the SWP delivers half of what the contractors say it does and effectively deregulating the SWP so that the contractors can sell contracts for precisely the half of the water that doesn't exist. Sound confusing? It is. Welcome to the world of "paper water."

In the same Monterey meetings, the state also agreed to give away an underground water storage facility that DWR spent $74 million purchasing and developing.

State Giveaway of Essential Public Asset: The Kern Water Bank

The Kern Water Bank is an underground water storage facility—the largest of its kind—situated at the southern tip of the Great Central Valley, the region where the state delivers 80 percent of its surface water to industrial agriculture. The water bank is connected to the public canals and aqueducts that pipe water in from the northern, central and southern Sierra Nevada mountain range. The water bank can store about 1 million acre-feet of water and pump out over 200,000 acre-feet a year, according to official project descriptions.

The Kern Water Bank is an integral part of California's public water delivery system. It could store large amounts of water for times of drought or natural disasters such as fires or earthquakes. It could also provide a handful of private corporations with the keys to a virtual "switchyard" for controlling water deals between agribusinesses and real estate developers.

In 1994, DWR gave the Kern Water Bank to the Kern County Water Agency, which immediately signed it over to the Kern Water Bank Authority, a supposedly public entity comprised of a collection of water districts and one private company. The private company involved is a "paper company" with no listed telephone number or address: Westside Mutual Water Company. Westside is owned by perhaps the largest agribusiness in the United States: Paramount Farming Company.

Who's Behind the Kern Water Bank? Roll International Corporation and Paramount Farming Company

Roll International Corporation—a Los Angeles-based holding company—is one of the largest privately owned companies in the world, and everything that Roll owns claims to be the biggest at what it does. Roll International owns the Franklin Mint, Teleflora, and a collection of

agribusinesses—all of which operate in three California counties—including Paramount Citrus, Paramount Farming, and Paramount Farms, Inc. The California Farm Bureau Federation wrote that together "these firms constitute the largest farming company in the United States." Roll is privately owned by Stewart Resnick, a Beverly Hills billionaire and major campaign contributor who gave over $350,000 to the Gray Davis Committee and the anti-recall groups between 2000 and 2003. Governor Davis chose Resnick to co-chair his agriculture-water transition team with the champion of the failed Cadiz groundwater banking scheme, Keith Brackpool.

Although the Kern Water Bank Authority oversees a vital water resource, its staff is tucked away in the offices of Paramount Farming Company, without so much as a sign on the door. Executives from Paramount, who created an almond and pistachio empire over the past two decades, said that they went into the water bank to secure a firm water supply for their crops. Local newspaper articles, however, quote Paramount's vice president, who presides over the water bank's board of directors, as saying "sales from the water bank were contemplated from the time the bank was acquired." In fact, the paper reports, Paramount is particularly interested in selling water to its parent company's home town: Los Angeles. Paramount executives have already had "early talks" with the Los Angeles Department of Water and Power about selling "an as-yet-unspecified amount of water."

The website of Paramount's Los Angeles-based law firm clearly boasts about how the law firm advised Paramount Farming Company to set up a mutual water company (Westside Mutual Water Company) to "own and operate" the Kern Water Bank. Paramount, it seems, has been planning for some time to harvest more than just pistachios and almonds.

Irrigating Sprawl

California's population is expected to grow by 20 million in the next twenty years, and real estate developers are scrambling to get a hold of "secure" water supplies for their sprawling subdivisions. Public Citizen found a water sales contract between WV Acquisitions, a Roll International subsidiary whose president is also president of Paramount Farming Company, and Newhall Land and Farming Company, the largest developer in the state. Newhall has been taking advantage of the 1994 backroom deregulation of the SWP to go shopping for paper water contracts for the new "master-planned" city it plans to build in northern Los Angeles County. Such sales involve water supplies that are far from secure because they are based on allocated state water supplies: that is, paper water. Furthermore, this report raises the essential question: Should corporations like Paramount and Newhall be allowed to profit from buying and selling water that belongs to all Californians?

Usurping Democracy, Again: The Napa Proposition

In July 2003, just months after the seven-year lawsuit challenging the Monterey Amendments by a coalition of environmentalists, public advocates, and one State Water Project contractor was settled, the participants in the Monterey meetings met again, this time in Napa. The agreement that resulted from these meetings—called the Napa Proposition—plans to further integrate the SWP and the federal Central Valley Project (CVP). Such integration will allow landowners, principally in the San Joaquin Valley and Southern California, to trade off the federal project's superior storage capacity and the state project's greater pumping capacity with one goal in mind: to continue pumping water to agribusinesses, developers, and water marketing barons in Southern California, unabated by either federal or state endangered species acts, water quality issues in the Delta, or the unmet needs of communities in the Central Valley that don't have access to clean drinking water.

End Game: Water as Public Trust

California's public water utilities and resources are governed by a plutocracy—a select group of private corporations, individuals, and semi-public and public officials all working in tandem to "game" state water policy. They meet in closed sessions and rewrite public policy, tailoring their edits to the interests of monopoly-like agribusiness corporations and real estate developers. Is this a conspiracy theory? No. It is just business as usual.

The water plutocracy must be replaced with a vibrant water democracy.

Public Citizen strongly advocates returning the State Water Project to broad public use and oversight so that it can benefit all Californians, rather than only a select group of Los Angeles corporations. Water must be maintained as a public good, held in trust for broad and equitable use, *not* a commodity bought and sold by the highest echelons of the corporate elite.

We recommend the following concrete steps for accomplishing this goal:

Return Kern Water Bank to Public Control

Paramount and its Westside Mutual Water Company should never have been allowed to "own and operate the water bank." The privatization of this vital public resource should be reversed.

Repeal the Monterey Amendments

The Monterey Amendments should be repealed and the State Water Project contracts should be rewritten with an eye to water conservation and environmental restoration as well as the original stated purpose of the project: to reallocate California's water resources in an *equitable* manner.

Eliminate Paper Water

The Department of Water Resources continues to maintain on paper that the State Water Project can deliver almost twice as much as nature provides. The water "entitlements" of the twenty-nine State Water Project contractors should be re-drafted to fit the actual capability of the project to deliver.

No Resale of State Water Project Water

The individual contractors that receive state project water should not be allowed to profit from reselling that water, whether it is back to the state Environmental Water Account or to real-estate developers.

Democratize Water and Irrigation Districts

Water and irrigation districts that receive public water deliveries from the SWP should be transparent and accountable to the public. There should be elected, public representatives on the boards of such districts who would represent the non-landowning population affected by water policy decisions made most often in closed meetings.

NATURE PROVIDES ENOUGH WATER for California to meet all of its needs: to sustain water-efficient family farms and industries; to provide safe drinking water to present and future generations; and to restore and maintain California's much-abused environment. Nature provides enough water; that is, unless mismanagement and greed intervene and allow for the state's public water supplies to be manipulated for profit. Too much is at stake to let this water heist continue.

Background: The Monterey Amendments

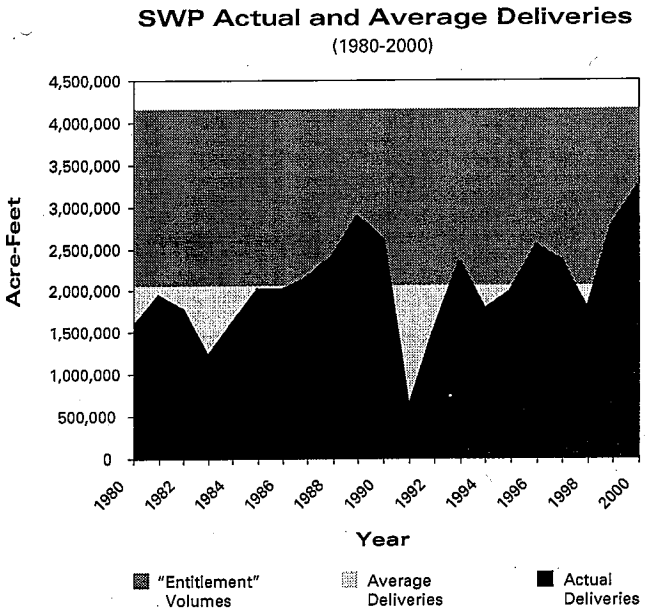
AFTER TWO YEARS of planning and negotiation, in 1988 the Department of Water Resources (DWR) purchased 19,900 acres alongside the Kern River.[1] DWR purchased the property for $31.4 million from Tenneco West Incorporated to build a subsurface reservoir to store State Water Project (SWP) water during years with above average rainfall.[2] On this property DWR first established the Kern Water Bank—an underground reservoir capable of storing a million acre-feet* of water. After conducting in-depth studies on the viability and potential environmental impacts of the project, DWR began putting in extraction pumps and building canals and conveyance facilities to connect the water bank to SWP aqueducts. All told, DWR spent $74 million on the project.[3]

From 1987 through 1992 and again in 1994, California experienced drought years. During the drought DWR significantly cut back deliveries to its agricultural contractors. In 1991 and 1992, DWR operated a Drought Water Bank to pay contractors willing to forgo their water entitlements. DWR then delivered the purchased water to agricultural contractors and urban areas with the strongest demand. The Drought Water Bank was the state's first experiment with water banking.[4]

Following the drought, the Kern County Water Agency (KCWA) was preparing to take DWR to court for cutting back its water deliveries.[5] The state legislature created the KCWA in 1961 under the tutelage of Kern County's corporate farmers to buy SWP water and then sell it to the local districts where the landowners formed the boards of directors. As an intermediary, the Agency spread out the cost of SWP water through a countywide property tax, principally paid by the Bakersfield urban population. Both the intent and the effect of the KCWA were to generate water subsidies for large landowners.[6]

In 1994, rather than call DWR to court, water brokers in Kern County and a select group of other SWP contractors held a series of closed meetings with DWR to rewrite the contracts that govern water allocation for the entire State Water Project.[7]

The backroom deal that resulted—in which participants produced a document known as the Monterey Amendments, named for the city in which the meeting took place—made several fundamental changes to the SWP contracts, all propitious for the agribusiness and real estate interests represented by the attendees of the meetings.[8] The agreement withdrew, for example, a requirement that water allotments be scaled back to fit available supplies in the case of permanent water shortages or the inability of



Source: Department of Water Resources Bulletin 132-90 and Bulletin 132-01.

the project to deliver as originally projected.[9] The SWP contracts for 4.2 million acre-feet of water but can only deliver an average of about 2 million acre-feet annually.[10] This modification permits SWP contractors to buy and sell entitlements to water that does not exist, otherwise known as "paper water."[11] California water historian Norris Hundley describes the Monterey Amendments as "[a]n 'institutional mirage' encouraging the notion that California can somehow find all the water necessary for development into the distant future."[12]

It was also through the Monterey Agreement that DWR first gave the Kern Water Bank to the Kern County Water Agency, who then signed a joint powers agreement—enabling different districts to cooperate in their exercise of common powers—to form the Kern Water Bank Authority (KWBA). The KWBA is a joint powers authority consisting of two water storage districts (Semitropic Water Storage District and Wheeler Ridge-Maricopa Water Storage District), two

An acre-foot is the amount of water necessary to fill an area of one acre to a depth of one foot, or 325,000 gallons. One acre-foot of water is roughly the amount that two families of four consume in one year.

water districts (Dudley Ridge Water District and Tejon-Castac Water District), one special district (Kern County Water Agency), and one private company (Westside Mutual Water Company).

The Third District Court of Appeal ruled that, in 1995, DWR illegally passed off its responsibility under the California Environmental Quality Act of conducting an Environmental Impact Report (EIR) on the potential impacts of the proposed changes to the SWP contracts.[13] The DWR gave the task to the Central Coast Water Authority—one of the participants in the secretive Monterey meetings. The Planning and Conservation League together with the Plumas County Flood Control and Water Conservation District and the Citizen's Planning Association of Santa Barbara County challenged the validity of the EIR and the legality of the Kern property giveaway. The plaintiffs lost in the trial court but won a unanimous favorable ruling from the Third District Court of Appeal. They went into mediated settlement negotiations with DWR and its major contractors, finally reaching an agreement in May 2003.[14]

The Settlement Agreement requires DWR to prepare a new EIR on the Monterey Amendments. It also allows for the Kern Water Bank Authority's continued ownership of the water bank while the new EIR is in process.[15] Throughout the lengthy litigation and negotiation process, however, the changes wrought to California's water infrastructure and water politics continued unabated. Although the environmentalists were hoping to have the whole deal scrapped in court, for the first time in California history the agriculture and real estate magnates behind these deals began setting up a paper water trading system. Moreover, they turned the state's $74 million gift of the Kern Water Bank into "the switchyard for controlling the water market."[16]

Tim Stroshane, editor of the California water journal *Spillway: California Land, Water and People*, called the Monterey deal a "bloodless coup."[17] He wasn't exaggerating. The changes made in the closed meetings usurped participatory democracy and overhauled California's most vital public utility, tailoring it to the demands of agribusiness corporations and developers seeking to create and corner a subsidized water trading system.

The water bank's administration—the Kern Water Bank Authority (KWBA)—is housed in Paramount's corporate office outside of Bakersfield. Paramount's vice-president also serves as chair of the Authority's board. There was no sign for the KWBA anywhere outside or inside the building when Public Citizen visited in July 2003.

The Kern Water Bank

"THINK OF THE BANK OF AMERICA, the way it operates with dollars, that's the way we operate with water," said Jonathan Parker, general manager of the Kern Water Bank Authority (KWBA) in Kern County.[18]

The Kern Water Bank claims to be the largest water banking project in the world. It can store a million acre-feet of water on a long-term basis and provide around 240,000 acre-feet per year for extraction.[19] To put this figure in perspective, 200,000 acre-feet, about 65 billion gallons of water, is the amount of water that would be transferred annually from the Imperial Irrigation District to the San Diego County Water Authority under the much contested deal between the two. The price tag on that deal now stands at $52 million a year.[20]

The water bank is located on the Kern River alluvial fan—the disintegrated rock deposited over thousands of years by the Kern River. According to the KWBA project description, the water bank works like this: "Water rapidly soaks down through the sand to fill in the voids between particles. When it is needed, water is easily recovered by high-flow wells."[21]

"Think of it like a bank," said Mr. Parker. "Participants have water. We're a nonprofit entity. What we do is provide a service. We store water at cost and then take water out of the ground, at cost. They pay us to provide that service in the least expensive manner. We operate only for participants."[22]

In 1994, the California State Legislature approved Assembly Bill 2014. Introduced in the Assembly on March 5, 1993, the bill was amended in the Senate on June 13, 1994, where the original language concerning water rights was entirely deleted and replaced with a single sentence authorizing mutual water companies to enter into joint powers agreements.[23] Also in 1994, DWR, the initial owner and developer of the Kern Water Bank, participated in the closed meetings in Monterey that led the state to transfer the property to the Kern County Water Agency, who called the meetings in Monterey.

The private company involved in the Kern Water Bank is Westside Mutual Water Company. Westside owns 48% of the bank. Westside is not a well-known company; in fact it does not have a listed telephone number or address. When asked about the participation of a private business in the otherwise public agency, the Bank Authority's staff responded that "Westside Mutual Water Company represents land holdings in other districts. They are not that different from a storage district. We don't see any difference in that."[24]

And whose land holdings does Westside represent? "Westside owns land, they represent their land," said Cheryl Harding, the Authority's administrator.[25]

"They're no different from a water district," Mr. Parker added.[26]

Westside Mutual Water Company is wholly owned by and operates exclusively for Paramount Farming Company, one amongst the cluster of agribusiness firms—all privately owned by Roll International Corporation—that together constitute what may be the largest agribusiness company in the United States.[27]

The KWBA staff appeared reluctant to mention the name "Paramount Farming." Such reluctance was peculiar considering where the interview took place: in the conference room of Paramount Farming Company's office on East Lerdo Highway, about 10 miles outside of Bakersfield.[28]

The KWBA leases its office space from Paramount. However, there is no sign either outside or inside the building to announce the offices of this supposedly public entity. Indeed, there is no distinguishing feature between the offices of KWBA employees and those of Paramount employees. Posters and maps published by the KWBA hang on the walls throughout the building. The Authority's geographical information systems (GIS) specialist works off of a lap-top in Paramount's GIS department.

"We lease space from Paramount because we're trying to do stuff on the cheap. We're not empire builders," Ms. Harding said.[29]

"We operate in the public, we serve a board of directors," added Mr. Parker.[30]

Ms. Harding then continued: "The 7 a.m. board meetings go on for a long time. Some people come, find it boring, don't come back. There's no smoking gun, just a meeting."[31]

The Corporate Players behind the Kern Water Bank Authority

KWBA Participant	Westside Mutual Water Company (WMWC)	Wheeler Ridge-Maricopa Water Storage District (WRMWSD)	Dudley Ridge Water District (DRWD)	Tejon-Castac Water District (TCWD)	Kern County Water Agency, Improvement District 4 (KCWA)	Semitropic Water Storage District (SWSD)
Ownership	48.06%	24.03%	9.62%	2.00%	9.62%	6.67%
Corporate Connection	William Phillimore: Chairman, KWBA Board of Directors; President, WMWC; ***Vice President, Paramount Farming Company***	Dennis Mullins: KWBA Board of Directors; WRMWSD Board of Directors; ***Vice President, General Counsel, and Secretary, Tejon Ranch***	Joseph MacIlvaine: President, DRWD Board of Directors; ***President, Paramount Farming Company***	Dennis Mullins: KWBA Board of Directors; President, TCWD Board of Directors; ***Vice President, General Counsel, and Secretary, Tejon Ranch***	See *Hidden Government*, p. 23	***Newhall Land and Farming,*** direct client, with 55,000 acre-feet of water storage capacity

The Kern Water Bank Authority (KWBA) is a joint powers authority consisting of two water storage districts (Semitropic Water Storage District and Wheeler Ridge-Maricopa Water Storage District), two water districts (Dudley Ridge Water District and Tejon-Castac Water District), one special district (Kern County Water Agency), and one private company (Westside Mutual Water Company).

Paramount Farming Company controls over 50 percent of the Kern Water Bank through Westside Mutual Water Company and Dudley Ridge Water District.

Another key player to keep an eye on is Tejon Ranch. Tejon Ranch, with 270,000 acres between Los Angeles and Bakersfield is "the largest contiguous expanse of land under single ownership in California," according to the company's website. Tejon Ranch, initially an agribusiness, plans to build a new town—even bigger than Newhall Ranch—with 24,000 houses, thus ushering in the trend of agriculture bowing to urban sprawl. Tejon's participation in the Kern Water Bank would allow them to store nearly twice as much water as their new town would require annually.

Sources: Kern Water Bank Authority, *Project Description*, Undated; Water Association of Kern County, *Who's Who in Kern County Water*, <http://www.wakc.com/whoswho.htm>; Dudley Ridge Water District, *Board of Directors*, Undated; Tejon Ranch, *Historic Tejon Ranch*, <http://www.tejonranch.com/HistoricTejon/HistoricTejonRanch.html>; and Vic Pollard, "Land not only issue in the mix," *Bakersfield Californian*, 07 June 2003.

Many industrial agriculturists in the Central Valley irrigate their almond orchards through routine flooding.

Who Controls the Kern Water Bank?

Power veils itself. From the mystery of what it does, what it owns, and, above all, who it is, it assumes added strength.

Gray Brechin, *Imperial San Francisco*

INFORMATION AVAILABLE to the public concerning Roll International Corporation is scant.[32] Roll is one of the largest privately owned companies in the world. Roll's 1998 sales were $1.57 billion.[33] Everything that Roll owns claims to be the biggest at what it does. Perhaps the most widely recognized company of the group is the Franklin Mint, "the world's largest direct marketer of collectibles."[34] In addition to the Franklin Mint, Roll International owns Teleflora, the nation's largest wiring service for flowers.[35]

Roll's agribusinesses—all of which operate in three California counties—include Paramount Citrus, the largest grower, packer and marketer of citrus in the country; Paramount Farming, the largest producer of almonds and pistachios in the country; and Paramount Farms, Inc., the largest pistachio processor and second-largest processor of almonds in the world. The California Farm Bureau Federation wrote that together, "these firms constitute the largest farming company in the United States."[36]

Roll International and its holdings such as Paramount Farming Company are Delaware corporations. Some of the perks of incorporating in Delaware include: incorporating without traveling to or living in Delaware; paying an annual corporate franchise tax as low as $50 regardless of income; and not paying a cent in income tax if you don't do business in Delaware.[37] Enron, for example, had 685 subsidiaries incorporated in Delaware.[38]

Roll International is owned and directed by Stewart Resnick. The Resnicks live in Beverly Hills, not Bakersfield. One visitor to the Resnicks' mansion commented that it was "like the Italian embassy but more tasteful."[39]

The Resnicks are active members in Los Angeles society. In the past few years they have received some of LA's highest awards such as the University of California Los Angeles (UCLA) Medal, the Duke Award and the City of Angels Award.[40] They give to numerous charities, universities, art museums and Democratic candidates, donating over $250,000 to the Governor Gray Davis Committee between 2000 and 2002 and $100,000 to anti-recall groups in June and September 2003.[41] In 1998, Davis, then governor-elect, appointed Stewart Resnick as co-chair of his "agriculture and water transition group."[42] Mr. Resnick's fellow co-chair was Keith Brackpool of the botched Cadiz water grab fame.

Paramount Farming Company has more than 5 million trees yielding billions of nuts a year. Growing, processing and marketing as one company, Paramount claims to be the largest vertically integrated supplier of pistachios and

almonds in the world.[43] The company currently has over 50,000 acres of pistachio and almond orchards in production in California. They also have the property holdings—and the plans—to expand into at least another 50,000 acres in the coming years.[44]

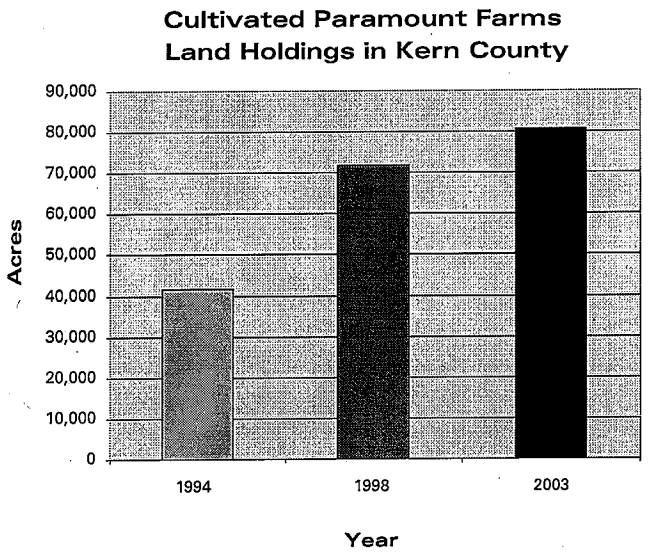
Almonds and pistachios are extremely lucrative crops. The California Farm Bureau Federation ranks almonds among California's top ten most valuable crops, generating $700 million in 2001 and over $1 billion in 2002.[45] Almonds are California's number one export crop, and also the top fruit and vegetable export crop in the United States.[46] Pistachios are not used as ingredients as often as almonds, making their demand significantly lower. Still, California's 2002 pistachio crop was valued at a solid $336 million.[47]

Paramount started buying pistachio, almond and olive orchards in 1986, after agricultural production dropped significantly in Kern County in the early 1980s.[48] Approximately 100,000 acres went out of production in Kern between 1982 and 1984.[49] Paramount and its associated companies, all held by Roll International, continued buying land into the 1987-92 drought that hit California agribusiness particularly hard. Roll purchased 12,000 acres of pistachio and almond orchards from Mobil Oil in 1986 and 77,000 acres of farmland from Texaco's central California agribusinesses in 1987.[50]

In 2000, Paramount bought most of Dole's citrus in California for $55 million, making it "the largest integrated grower, packer, and marketer of fresh citrus in the United States."[51]

In fact, while both the number of farms and agribusinesses and the total acreage of land in agricultural production in California dropped significantly throughout the 1990s, the Paramount group of agribusiness corporations doubled its acreage in cultivation from around 41,000 acres in 1994 to nearly 81,000 in 2003.[52] These figures come from analyzing Paramount's pesticide permits in Kern County alone. Paramount also has land holdings in Kings and Fresno counties.

Paramount has been steadily increasing its acreage and expanding production *against* the trend of the state's overall decrease in both agricultural acreage and production. Between 1992 and 1997 while Paramount was growing, California lost more than 3,500 farms.[53] Between 1998 and 2000, "90,000 acres of California farmland were lost to urbanization."[54]



Paramount has doubled its acreage in production in Kern County over the past ten years.

Source: Kern County Department of Agriculture, http://www.co.kern.ca.us/kernag/ftp/fileindx.html

Paramount's success is certainly a product of its agricultural technology and business organization.[55] Such success would not be possible, however, without water—indeed, enough water to satiate 100,000 plus acres of orchards depending upon year-round irrigation in a semi-desert.

Paramount and the KWBA's staff paint a picture of serious, risk-taking private enterprise saving the Kern Water Bank from the bungling hands of bureaucrats in Sacramento. In interviews they said repeatedly that DWR "couldn't get the project off the ground," and that the community prefers the water bank to be "under local control."[56] Paramount, a Delaware corporation, privately owned by one of the wealthiest residents of Beverly Hills, can hardly be considered "local."

The *Bakersfield Californian* also referred to the Kern Water Bank as a "local" asset. Under the headline, "Kern Water Bank will likely stay with county," the *Californian* describes the Kern Water Bank "property transfer" thusly: "One provision of the Monterey Agreement transferred ownership of the 20,000-acre water banking area along the Kern River bed west of Bakersfield from the state to a consortium of local districts, including KCWA."[57] The *Californian* does not mention Paramount Farming Company even though Paramount's water company, with 48% ownership, easily holds the largest share in the Kern Water Bank and Paramount's Executive Vice President, William D. Phillimore, is Chair of the Kern Water Bank Authority's

board of directors—a position that he is apparently able to carry out from his desk at Paramount.

Compare the *Californian's* take on the water bank acquisition with the following description provided by the Los Angeles law firm that represents both Paramount Farming Company and the Kern Water Bank Authority— Nossaman Guthner Knox & Elliott LLP:

> Paramount Farming Company was a key participant in the Kern Water Bank transaction, and Nossaman advised Paramount on all aspects of this transaction. The Kern Water Bank is a 20,000-acre property west of Bakersfield operated by the Department of Water Resources for groundwater storage. Pursuant to the Monterey Statement of Principles entered into by the Department and State Water Contractors in November 1994, the Department agreed to transfer the property. Nossaman advised Paramount regarding formation of a joint powers authority to own and operate the water bank, a mutual water company through which Paramount participates in the authority, relinquishment of entitlements, water rights, environmental issues and other issues regarding this transaction.[58]

Notice the language of intention: "Nossaman *advised* Paramount regarding the formation of a joint powers authority to *own and operate* the water bank."[59] Nossaman leaves little doubt that Paramount *planned* to acquire and control the Kern Water Bank.

Paramount grows pistachio and almond trees, some 5 million of them. Trees, unlike other crops such as rice or alfalfa, cannot be fallowed. In the semi-desert of the Southern San Joaquin Valley, no almond tree could survive without a constant supply of water. Kern County itself receives an average annual rainfall of less than six inches.[60]

The resource planning manager at Paramount Farming Company explained the motivation behind Paramount's participation in the Bank Authority as follows: "We're in the situation of growing almonds and pistachios without a firm water supply, so we went into the Kern Water Bank to secure a water supply."[61] He emphasized that Paramount's primary interest is in making a long term investment to grow their crops, and that "any sort of water marketing is very much secondary to crops."[62]

Should taxpayers and ratepayers foot the water bill for the self-described largest almond and pistachio producer in the United States to grow permanent specialty crops "without a firm water supply?" Is this the public's investment for a cheap supply of almonds? In 2001, Paramount's president, John McIlvaine, told the American Society of Farm Managers and Rural Appraisers that nearly 80% of California's almonds are exported—mostly to Western Europe and Japan—and that the almond industry is "on the move promoting foreign sales as its production grows larger and larger."[63] In fact, McIlvaine pointed out that California's tree nut exports have risen steadily over the past 15 years, a trend concurrent with Paramount's increase in acreage in production and the state's overall decrease.

Irrigating Sprawl

Water utilities exist primarily to nourish real estate, not people.

Gray Brechin, *Imperial San Francisco*

INTERSTATE-5 IS LITTERED with roadside banners facing the oncoming traffic with messages such as "Food Grows Where Water Flows" and "Farm Water Feeds the Nation." Is Paramount feeding the nation? Which nation?

The *Bakersfield Californian* reported that Paramount is "most interested in selling water to Los Angeles."[64] Though they said that such sales were most likely not going to take place any time too soon, officials from the Los Angeles Department of Water and Power have already "had early talks with representatives of Paramount Farming Co. and other participants in the Kern Water Bank about possible purchase of an as-yet-unspecified amount of water."[65] In an interview with the *Californian*, Paramount's Bill Phillimore said "sales from the water bank were contemplated from the time the bank was acquired by Kern County water agencies in 1995."[66]

Other sales have already taken place. WV Acquisitions, one of Roll International's Delaware corporations, recently sold Newhall Land and Farming Company 5,099 acre-feet of its SWP annual water entitlement.[67] Newhall Land and Farming Company plans to build a "new city" of over 20,000 housing units and 3.58 million square feet of commercial space in bone-dry northwestern Los Angeles County. After years of controversy and lawsuits, the project was recently approved by the LA County Board of Supervisors and the Superior Court.[68]

Newhall has gone on a buying spree where the most cherished item on sale is SWP contract entitlements, or "paper water." These entitlements are contract promises, so to speak, from the state. During wet years, DWR will deliver at best most of the contracted water. During drought years, it might not deliver any at all. This is why the changes to the SWP contracts ironed out in Monterey are so important to the brokers in water: holding the state accountable for its original—undeliverable—contracts enables the contractors to sell "paper water" that won't be missed by their parched crops.

The Third District Court of Appeal that ruled against DWR in the Monterey Amendments case of 2000 declared that "Paper water always was an illusion. 'Entitlements' is a misnomer, for contractors surely cannot be entitled to water nature refuses to provide or the body politic refuses to harvest, store, and deliver. Paper water represents the unfulfilled dreams of those who, steeped in the water culture of the 1960s, created the expectation that 4.23 million acre-feet of water could be delivered by a SWP built to capacity."[69]

Corporations and water agencies are trading in "paper water" as a way of "gaming" the water in California to keep the severely over-stretched public water projects pumping water to the highest bidder. Though the contracts referred to as "paper water" do not correspond to deliverable water quantities—as noted in the Third District Court of Appeals

PCL v DWR decision—they function as a siphon to pull as much water as technologically possible out of the Delta. Real estate development corporations can use "paper water" contracts to get their projects approved without having a secure water supply. Once the projects are built, and the people about to move in, the corporations can use the contracts to demand water deliveries from the state. Such deliveries would most likely come through purchasing water rights from small farmers (potentially driving them off their land), not to mention continuing to neglect existing rural communities without access to safe drinking water and the deteriorating Delta environment.

Newhall is trying to purchase SWP water entitlements from Castaic Lake Water Agency.[70] Castaic, in turn, is attempting to double its SWP water entitlements by purchasing more from such water dealers as the Kern County Water Agency, and its member districts Berrenda Mesa Water District and Belridge Water Storage District.[71] Paramount's president and vice-president are presidents of the boards of directors of Berrenda Mesa and Belridge respectively.[72] Paramount is apparently thus well poised to sell even more "paper water" to the largest prospective developer in California.

Newhall also purchased 55,000 acre-feet of storage capacity in the Semitropic Water Storage District—one of the participants in the Kern Water Bank Authority.

With control over water storage facilities, the largest agribusiness companies like Paramount can hold on to enough water to do the impossible in a severely over-drafted groundwater basin: increase their production *and* sell to developers. Also, with development companies able to buy in directly to the storage facilities as well as purchase "paper water," they can argue before the courts that their water supply is reliable, on paper.

Lynne Plambeck, an activist with the Santa Clarita Organization for Planning the Evironment (SCOPE) and an ardent opponent of the Newhall Ranch project, said that control over storage facilities like the Semitropic Water Storage District and the Kern Water Bank is "a way of controlling water without actually owning water."[73] Private facilities can favor developers over farmers and large corporations over small businesses by charging less to those who store large amounts of water. One company or individual, Ms. Plambeck said, "can take up the storage facility with a lot of water, and then a drought comes along...They can corner the market with no public oversight, just like Enron."[74]

Private storage facilities are not subject to public oversight through laws such as the California Environmental Quality Act (CEQA), Ms. Plambeck said: "When the water goes into storage facilities in the Kern Fan, there is no oversight, no CEQA. The public only has a chance if there is a CEQA process."[75]

And what happens when the water isn't there? With the houses built and the new dwellers moved in, the developers will push for new dams and more pumping of water from the north to save the stranded residents from drought. The losers will be the same: the rural communities in the north and throughout the valley, the tax and ratepayers who ultimately have to pay for it all, and the environment upon which all Californians depend.

Blaming the Environment

IN A SERIES OF ARTICLES written in 2002 on water issues in California, the *Sacramento Bee* profiled Kern County as "the hub of the water trade."[76] Dale Kasler, water correspondent for the *Bee*, reported that Kern water districts generated more than $100 million by selling water to cities throughout the state. In 2001, the Kern County Water Agency bought water from the SWP for $161 an acre-foot and then sold it back to the state's Environmental Water Account (EWA) for $250 an acre-foot, amassing $29 million. Paramount's Westside Mutual Water Company sold water it had previously "banked" in the Kern Water Bank to the EWA in 2000. All told, Kern Water Bank participants sold a total of 72,000 acre-feet to the EWA that year. Jim Nickel sold 10,000 acre-feet to the EWA for a total of $4.6 million, at "an eye-popping $460 an acre-foot."[77] What is even more "eye-popping" is that taxpayers throughout the state foot the bill for these sales.

The Environmental Water Account is a taxpayer-subsidized scheme that enables corporate agriculture to get around state and federal endangered species acts. It was created by CALFED, the state and federal collaborative effort to mitigate the continued devastation of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. CALFED is another step-child of the 1987-1992 drought that inspired the Monterey Amendments.

When the federal or state fisheries notify DWR of "high incidental intake"—when the pumps used to lift the SWP water uphill are sucking up too many endangered species—DWR slows down its pumping and monitors the amount of water *not* being pumped. DWR offers to purchase water from users south of the pumps and then deliver that water to contractors with higher value crops.[78] As a result, the water not pumped from the Delta is said to have been purchased for the environment. "Anytime by law exporters [SWP contractors] would have to stop pumping due to environmental or water quality conditions in the Delta, taxpayers buy replacement water for them," said Michael Jackson, a water attorney with the California Water Network who works with rural counties in Northern California.[79]

According to the chief of water transfers for the DWR, Jerry Johns, the EWA "is an example of a market remedy to help the environment."[80] The Public Policy Institute of California goes even further, saying that "[m]arket growth in the aftermath of the drought has been largely driven by environmental concerns."[81] Indeed, stronger environmental laws and advocacy have driven the largest SWP contractors to finagle market mechanisms to maintain undiminished SWP deliveries (secured by the "no net loss to exports" provisions for the EWA).[82]

The EWA enables market advocates to green-wash water sales. Advocates say that the program may be "a solution for creating more instream flows for endangered fish and habitat."[83] However, this is misleading. Agribusinesses and developers are not turning back water into the Delta. Rather, when their pumping threatens the continued existence of such species as winter-run salmon, the state pays to send them a quick fix.

The Napa Proposition

IN JULY OF THIS YEAR (2003) the Federal Bureau of Reclamation, the California Department of Water Resources (DWR), and representatives from the largest agricultural and urban water districts in California—including the Westlands Water District, the Kern County Water Agency, and the Metropolitan Water District of Southern California—met in Napa in a series of closed, mediated sessions (by the same retired judge who mediated the Monterey meetings in 1994) to, yet again, restructure the state and federal water projects.[84]

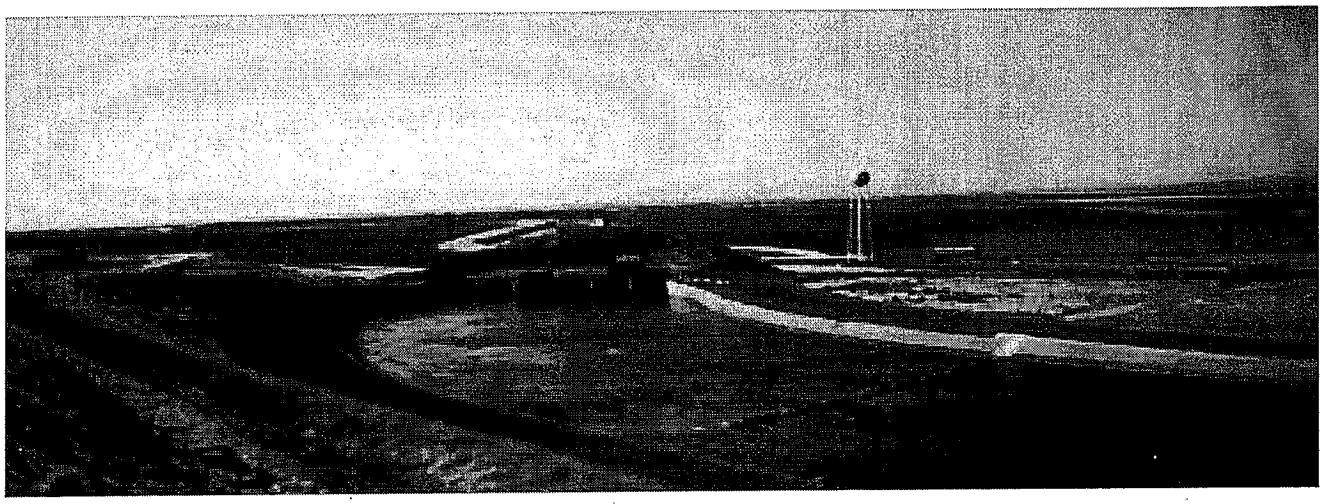
As noted by State Senator Michael Machado in a letter to the Editor of the *San Joaquin Record* on August 27, no "representatives of the Delta, environmentalists or anyone one else outside their small circle" were included in the meetings.[85]

The agreement that resulted from the meetings, called the Napa Proposition, plans to further integrate the SWP and the CVP. Such integration will allow landowners, principally in the San Joaquin Valley and Southern California, to trade off the federal project's superior storage capacity and the state project's greater pumping capacity with one goal in mind: to continue pumping water to agribusinesses, developers and water marketing barons in Southern California, unabated by either federal or state endangered species acts or water quality issues in the Delta.

Giving SWP contractors access to CVP storage capacity violates the later project's federal acreage limitations by enabling landowners, like Paramount, with over 100,000 acres to profit from federally funded infrastructure.

Increasing the SWP's pumping capacity violates the intent of the Delta restoration efforts and the federal and state endangered species acts by manipulating the technology to pump more water south at faster rates, ignoring the long-term effects of such levels of water exports on the environment.

The Napa Proposition would continue and greatly exacerbate the negative impacts of the Monterey Amendments, allowing the SWP and CVP to juggle water to maintain unsustainable exports for unsustainable development, unsustainable industrial agricultural practices and taxpayer-subsidized water sales among the state's largest landowners.



The State Water Project's California Aqueduct is a vital public asset that must be administered as an integral part of California's public utilities for all Californians, not as private property for a few.

Public vs. Private Property

WATER MARKETS, much less insider trading regimes, are incompatible with California's constitutional protection of water as a public trust. The concept of private property that is essential to functioning markets cannot justly be superimposed on the state's public trust doctrine or the taxpayer-funded public water projects that gather, deliver, and store water. The state grants the right to *use* water, not to *own* it.

California state law considers water to be public property, not private. Article 10, Section 2 of the California State Constitution states:

> It is hereby declared that because of the conditions prevailing in this State the general welfare requires that the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare.[86]

The architects of the backroom Monterey and Napa meetings, however, have come up with a way to privatize the state's water resources in violation of the constitution. What advocates are now calling a water market is actually a public rip-off designed by and for large corporations in monopoly-like situations.

Moreover, this "market" both survives and thrives on overstating water supply so as to make millions in profit on "paper water." The imbalance between supply and demand does not stop there: paper water sales allow massive developers like Newhall to create and profit from demands that were previously nonexistent. By building housing developments in the desert where no natural water supply exists, developers will use the "build it and the water will flow" logic to create further unsustainable reliance on water diversion from the north. Thus, far from making "more efficient use of existing supplies through reallocation," the architects of California's water market have rigged a system where water continues to flow to money. This is not efficient, much less just.

Joseph Sax, in his landmark essay *The Public Trust Doctrine in Natural Resource Law: Effective Judicial Intervention*, writes that, of the ideas that underpin the public trust doctrine in American law, the idea with the "greatest historical support holds that certain interests are so intrinsically important to every citizen that their free availability tends to mark the society as one of citizens rather than of serfs. It is thought that to protect those rights, it is necessary to be especially wary lest any particular individual or group acquire the power to control them."[87]

The state's giveaway of the Kern Water Bank and its backroom deregulation of the State Water Project have done just that: given the power to control California's water and the multi-billion dollar public projects that move that water to a particular group of private corporations.

Local and statewide activists and union members fight to keep water utilities under public control in Stockton, CA.

End Game: Time for a Vibrant Water Democracy

PREDICTIONS ESTIMATE that California's population will grow by up to 20 million over the next 20 years. Such growth places strong demands on the state's limited water supplies, and makes the need for a publicly accountable, equitable, and environmentally sustainable system of water distribution all the more imperative. It will be possible to meet the state's water needs, but not if private interests such as Paramount are allowed to control—and profit from—key public water resources like the Kern Water Bank.

Under the public trust doctrine, California's water is held in trust for the people of California, our future generations and the environment. Thus, California's water supplies should be managed with the greatest level of public accountability and oversight to ensure that water is distributed where it is needed most, not where it is most profitable.

California's public water utilities and resources are governed by a plutocracy—a select group of private corporations, individuals, semi-public and public officials all working in tandem to "game" water policy in the state. They meet in closed sessions and rewrite public policy, tailoring their edits to the interests of monopoly-like agribusiness corporations and real estate developers. Is this a conspiracy theory? No. It is just business as usual.

The water plutocracy must be replaced with a vibrant water democracy.

To protect California's water from profiteering:

Return Kern Water Bank to Public Control/ No More Public Giveaways

The Department of Water Resource's decision to give away the Kern Water Bank should be immediately reversed. The state's giveaway of this valuable resource to allegedly "local agencies" was in violation of the public trust doctrine and the California Environmental Quality Act and should never have taken place. Local control of this resource has become tantamount to private corporate control. Paramount and its Westside Mutual Water Company should never have been

allowed to "own and operate the water bank," especially in light of their confessions to Bakersfield reporters that sales from the bank were in their plans from the very beginning. The privatization of this vital public resource should be reversed.

Repeal the Monterey Amendments

The Monterey Amendments—the backroom restructuring of the State Water Project—usurped participatory democracy in California water policy. The "amendments" also perpetuate and gravely exacerbate the environmental detriment and social injustices established by the water plutocracy that has gamed tax and ratepayers for decades to raise agribusiness empires on subsidized water deliveries. The Monterey Amendments should be repealed and the State Water Project contracts should be rewritten with an eye to water conservation and environmental restoration as well as the original stated purpose of the project to reallocate California's water resources in an *equitable* manner.

Eliminate Paper Water

The Department of Water Resources continues to maintain on paper that the State Water Project can deliver almost twice as much as nature provides. After decades in operation, it is clear that the paper contracts do not match reality. The water "entitlements" of the twenty-nine State Water Project contractors should be re-drafted to fit the actual capacity of the project to deliver. Such re-drafting is provided in the original article 18(b) that contractors struck from the contracts in the closed Monterey meetings. Local and regional land-use planning decisions should be re-evaluated to ensure that developments have not been permitted based on water supplies that do not exist.

No Resale of State Water Project Water

The individual contractors that receive state project water should not be allowed to profit from reselling that water, whether it is back to the state Environmental Water Account or to real-estate developers. Furthermore, after decades of overdraft, pollution, and watershed devastation, the California and Federal cooperative venture known as CALFED requires that water quality be restored in the San Joaquin Delta and the rivers that feed into it. Clearly, there is no "surplus" water to be traded among corporations. Paramount and other private interests must not be allowed to hoard water to sell at a later date.

Democratize Water and Irrigation Districts

Water and irrigation districts that receive public water deliveries from the State Water Project (SWP) should be open, transparent, and accountable to the public. Most water and irrigation districts that receive SWP water are controlled by large-landowners driven by their interest in paying as little as they can for as much water as they can get. With the twin goals of expansion and profit, landowners such as Paramount make decisions over public resources without being held publicly accountable. There should be elected, public representatives on the boards of such districts who would represent the non-landowning population affected by water policy decisions made most often in closed sessions and meetings.

The Kern Water Bank's accounting of stored and transferred water—where the water deliveries come from, and where they end up—should be immediately disclosed to the public. All water trades and transfers should be publicly recorded with full disclosure of the financial terms of the agreement, as well as the identities of the buyers and the sellers. All water delivery, storage and transfer deals should be made with full and meaningful participation of the public.

NATURE PROVIDES ENOUGH WATER for California to meet all of its needs: to sustain water-efficient family farms and industries; to provide safe drinking water to present and future generations; and to restore and maintain California's much-abused environment. Nature provides enough water; that is, unless mismanagement and greed intervene and allow for the state's public water supplies to be manipulated for profit. Too much is at stake to let this water heist continue.

Get Involved

About Public Citizen's *Water for All* Campaign

Public Citizen is campaigning to protect universal access to safe and affordable drinking water by keeping it in public hands. Public Citizen does not believe that citizens benefit from privatization of their water and wastewater systems because the sale of public works to private companies can foster corruption and result in rate hikes, inadequate customer service and a loss of local control and accountability.

Public Citizen List Serves

Public Citizen maintains two water-related email lists. The Water for All list focuses on national and international efforts to protect water as a human right and includes action alerts, news articles, reports and the monthly newsletter of the Water for All campaign, Currents. The California Water for All list includes issue updates, campaigns action alerts, and Currents.

To subscribe to the Water For All list, send an email to cmep@citizen.org with "subscribe Waterforall" in the message.

To subscribe to the California Water for All list, send an email to cmep@citizen.org with "subscribe Waterforallca" in the message.

Groups Working on Water Issues in California

Alliance for Democracy
1223 Sequoia Place
Davis, CA 95616
phone 530.758.0726
http://www.theallianceforddemocracy.org

California Water Network
808 Romero Road
Santa Barbara, CA 93108
phone 805.969.0824 fax 805.565.3394

Center for Race, Poverty and the Enviroment
1224 Jefferson St., Suite 25
Delano, CA 93215
phone 661.720.9140 fax 661.720.9483

Community Alliance with Family Farmers (CAFF)
36355 Russell Blvd.
Davis, California
phone 530.756.8518 fax 530.756.7857
http://www.caff.org

Environmental Justice Coalition for Water
1010 11th St., Suite 305
Sacramento, CA 95814
phone 916.341.0612 fax 916.341.0401
www.ejwatercoalition.org

Santa Clarita Organization for Planning the Environment (SCOPE)
P.O. Box 1182
Canyon Country, CA 91386
phone 661.255.6899, extension 2
http://www.scope.org

Sierra Club, Angeles Chapter
3435 Wilshire Blvd., #320
Los Angeles, CA 90010
phone 213.387.4287 fax 213.387.5383
http://angeles.sierraclub.org

United Farm Workers (UFW)
1010 11th St., Suite 305
Sacramento, CA 95814
phone 916.341.0612 fax 916.341.0401

Glossary

Acre-foot An acre-foot of water is the amount of water necessary to fill an area of one acre to a depth of one foot, or about 325,000 gallons. One acre-foot of water is roughly the amount that two families of four consume in one year.

Central Valley Project (CVP) A Federal Bureau of Reclamation water project consisting of 20 dams and reservoirs, 11 power plants, and 500 miles of major canals. The project delivers about 7 million acre-feet of water annually.

Department of Water Resources (DWR) The California state agency that is responsible for managing the State Water Project.

Entitlement Also referred to as "Table A Allotment" in the Monterey Settlement, this is the volume of water contracted to State Water Project purchasers.

Environmental Impact Report (EIR) The study and report that is required under the California Environmental Quality Act for any large public or private infrastructure project as a means to assess the potential effects of the project on the environment.

Environmental Water Account (EWA) A component of the CALFED program, the EWA pays SWP water users when water deliveries are slowed down or reduced so that the SWP pumps decrease the amount of endangered fish species that get caught and killed in them.

Joint Powers Authority The agency created when two or more entities enter into a joint powers agreement. A joint powers agreement allows different (usually) public entities to join together in order to exercise their common powers toward a common objective.

Kern County Water Agency (KCWA) The KCWA was created in 1961 to distribute SWP water to Kern County water districts.

Kern Water Bank The largest underground water storage facility in the world. DWR spent $74 million purchasing the land, studying and developing the Kern Water Bank during the late 1980s-early 1990s. DWR gave the water bank to the KCWA in 1995.

Kern Water Bank Authority (KWBA) A Joint Powers Authority that consists of five water and water storage districts and agencies and one private mutual water company—Westside Mutual Water Company. Westside is in turn owned by Paramount Farming Company. The KWBA was formed immediately after DWR gave away the 20,000 acres that house the Kern Water Bank to the KCWA.

Monterey Amendments In 1994 DWR met in closed meetings with its largest contractors to rewrite the contracts that govern the SWP. At the end of the meetings the participants drafted a list of 14 principles which they called the Monterey Agreement, after the city in which the meetings took place. The changes to the SWP contracts that resulted from the Monterey Agreement are referred to as the Monterey Amendments.

Paper Water The original SWP contracts provided for an annual entitlement amount of surface water to be delivered to contractors upon availability. The SWP has never been able to deliver the contractors' full entitlements. The contractors, however, still treat the future expectations of the past as reality. One result of the Monterey Amendments was to enable contractors to buy and sell their entitlements. Hence, the entitlements, which stretch far beyond actual water deliveries, allow contractors to sell water that only exists on paper.

Roll International Corporation Roll International—a Los Angeles-based holding company, incorporated in Delaware—is one of the largest privately owned companies in the world. Roll International owns the Franklin Mint, Teleflora and a collection of agribusinesses—all of which operate in three California counties—that include Paramount Citrus, Paramount Farming, Paramount Farms, Inc. Paramount Farming is a member of the KWBA and owns 48% of the Kern Water Bank. Paramount also owns land in three of the other water districts and agencies that participate in the KWBA.

State Water Project (SWP) The SWP is a massive state water diversion and delivery project that comprises 662 miles of aqueducts, 19 dams with a combined surface area of more than 50,000 acres, 20 pumping plants, and ten energy plants producing about 6.5 billion kWh of energy annually. By 2000, Californians had paid more than $5 billion to build the project and another $11.9 billion to operate it and finance its debt.

Water Bank Water storage facility that operates like a bank. Participants or customers of the bank "deposit," or recharge, water and later "withdraw," or recover, water from their "account."

Appendix A—Historical Background

Water Flows Uphill to Money

CALIFORNIA IS A SEMI-DESERT. The mineral-rich soil of the Central Valley Region receives an average of 10 inches of rainfall a year, though far less falls in the southern portions of the Valley. Southern California's Imperial Valley receives 1 to 2 inches of rain a year. Yet, California's driest valleys are home to the richest agricultural region in the world.[88]

Step off to the side of Interstate 5 on a summer day, bend under a fence, and in the space of an inch you will see the sand turn into green fields. This is the unmistakable precision of industrial irrigated agriculture. Back on the interstate to the east and west, government-run irrigation systems douse crops with water. And as you proceed south on I-5 you will cross again and again one of the bond-funded arteries that makes this all possible: the State Water Project's California Aqueduct.

In California, agriculture consumes 77 percent of all usable fresh water.[89] Most of the water originates hundreds of miles north in the rivers bridled by the Oroville, Shasta and Trinity Dams. The state and federal projects that control the flow and destination of these rivers pipe and pump the water through a grid of nearly 4,000 miles of dams, aqueducts, canals, and reservoirs into the lands of the largest and wealthiest agribusinesses in the country.

By the 1930s, as a result of massive over-pumping, the earliest agribusinesses lowered the San Joaquin water table, the aquifer underlying the San Joaquin Valley, by as much as one hundred feet. Oak trees died and in places the valley floor itself dropped anywhere from 3 to 30 feet.[90] Fearing that they would run out of water within a matter of years, the largest landowners in the region began to push for publicly funded projects to pump water south from Northern California.

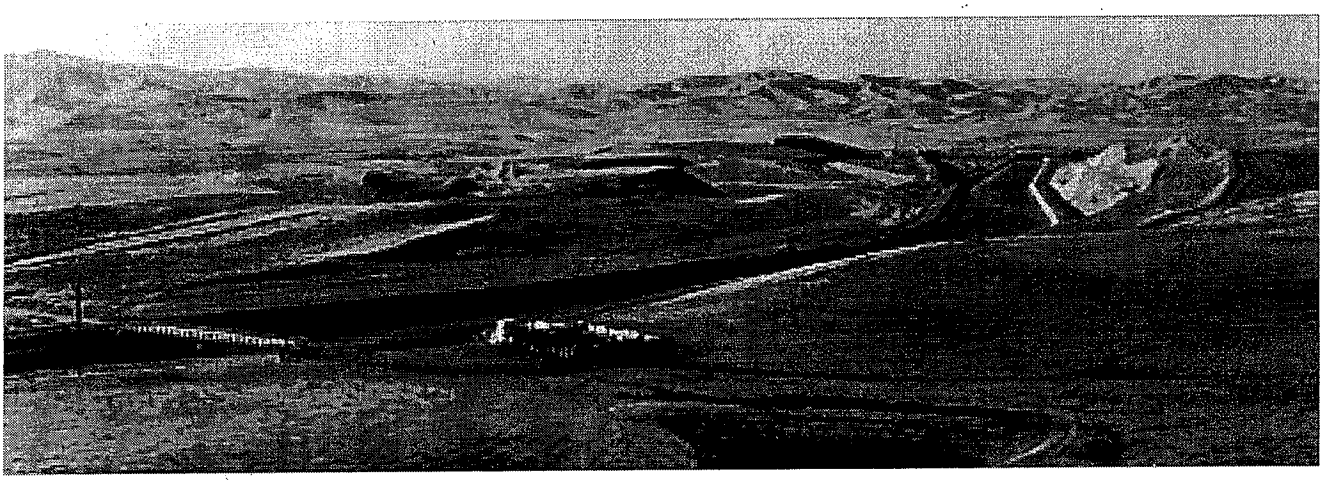
The Central Valley Project (CVP) began as a state initiative but failed for lack of funding until the federal government, and US taxpayers, came to pick it up in 1937. The CVP—the largest and most expensive public works project of its time—pipes some 9 million acre-feet of water from 20 dams and reservoirs to millions of city-dwellers and agribusinesses throughout the Central Valley and the urban San Francisco Bay Area.[91]

The Federal Bureau of Reclamation, the agency that administers the CVP, intended the CVP to break up land monopoly and promote small farms throughout the Central Valley. The project was subject to the 1902 Reclamation Law which put an acreage limitation of 160 acres—increased to 960 acres in 1982—on land eligible to receive CVP water for irrigation.

In 1978, when a federal team of investigators traveled into the largest district receiving CVP water—the Westlands Water District—they discovered that throughout the entire Westlands district there was not a single 160-acre farm. Through sleight of hand, family connections and sheer stubbornness, huge land owners failed to break up their farms and used the CVP water to build agribusiness empires.

California water historian, Norris Hundley, wrote that the CVP failed on both of its objectives: to combat monopoly and promote the family farm. Moreover, the result of the increasing power of landowners, Hundley wrote in *The Great Thirst*, was that "agriculture continued to concentrate in ever fewer hands. The number of farms over a thousand acres increased their combined property from 17.6 million acres in 1920 to 25 million acres in 1945. That trend... accelerated even more dramatically in the decades that followed. Thus did the family farm and local democracy fade from the California countryside."[92]

The California State Water Project (SWP), approved by the legislature in 1959 and by voters in 1960 made even greater



handouts to large growers in the state than the CVP. The state project was not subject to federal Reclamation Law, enabling large growers to expand production and increase acreage without the hassle of token acreage limitations. Moreover, the availability of state water as an alternative to federal water would make the Federal Bureau of Reclamation think twice before harassing the CVP recipients who were in "technical compliance" with the acreage limitations by deeding land to relatives or employees.[93]

The voter-approved bonds enabled the state to undertake the most ambitious water diversion project in history. The only way to get enough voters in Southern California to pass the statewide bond initiative—all assumed that Northern California voters would turn down a project to pay for pumping their water into the hands of Southern California landowners—was to lie about how much it would cost. Governor Pat Brown asserted that the project would cost about a billion dollars less than the estimated cost at the time.[94]

At present, the SWP comprises 662 miles of aqueducts, 19 dams with a combined surface area of more than 50,000 acres, 20 pumping plants requiring more than 60 billion kWh of energy annually, and 10 energy plants producing about 6.5 billion kWh of energy annually.[95] By 2000, Californians had paid more than $5 billion to build the project and another $5 billion to operate it and finance its debt.[96]

The Department of Water Resources (DWR) was created from 52 formerly independent state agencies to oversee the State Water Project and administer the delivery of water to the project's 29 contracting agencies.[97] These agencies range from the City of Yuba, 42 miles north of Sacramento, which had received a total of 10,260 acre-feet by 2000 to the Kern County Water Agency, which had received 26.3 million acre-feet by 2000.[98]

Kern County landowners advocated for both the CVP and the SWP as a way of improving the condition of the groundwater basin. However, with both projects, those very landowners increased the amount of acreage they held in production and thus exacerbated their overdraft of the basin.[99] Overdraft occurs when users pump more water out of the ground than nature can replenish or, in technical jargon, when extraction exceeds recharge. In Kern County, the increased overdraft of aquifers reached over 7 million acre-feet by the late 1970s.[100] According to the last *California Water Plan Update*, overdraft continues now at a pace of one million acre-feet a year.[101]

Marc Reisner, in his indispensable book, *Cadillac Desert*, described the SWP as "one of the country's foremost examples of socialism for the rich."[102] While urban water users bore the bulk of the expenses for the project, the corporate farmers got their water at bargain rates.[103]

In a 1981 report by the California Institute for Rural Studies, Don Villarejo writes that from the first SWP water deliveries in 1968 through to 1980, San Joaquin Valley contractors received 63% of the water delivered—almost entirely for agricultural irrigation—while mostly residential Southern California water users paid 70% of the costs of the project. "It is one of the many ironies of the SWP that those who get the most water pay the least, while those who get the least pay the bulk of the costs."[104] By the mid-1980s Norris Hundley estimates that Southern Californian water users were paying roughly $25 million a year in water subsidies for corporate agriculture in Kern County.[105]

According to DWR's Bulletin 132-01, by December 31, 2000, San Joaquin Area contractors had received 32.6 million acre-feet of water. They paid more than $1.3 billion for that water: an average of $40 an acre-foot. Meanwhile, contractors in Southern California received 22.5 million acre-feet of water

for a price of $6.65 billion. That makes SWP water $295 an acre-foot for Southern California's largely urban users.[106]

Hidden Government

The federal and state water projects propelled the creation of "hidden" forms of government in California: the water districts and agencies through which landowners exercise control over the state's water.[107]

Norris Hundley notes Kern County's legacy of spearheading the effort to create special water districts for the management of the new water supplies coming from the CVP and SWP. In *The Great Thirst*, he writes that bringing back the concept of property-weighted voting—the allocation of votes based on a property owner's total land value—led to the creation of a variety of new water districts, the further concentration of agriculture in ever fewer hands, and the withering of local democracy. Such districts, he writes: "are ordinarily managed by boards of directors made up of a homogeneous, single interest body of people representing the larger water users and guided by a rigid set of goals: maximization of water use at minimum cost with little or no regard for the environment or for the welfare of the people of California."[108]

The Kern County Water Agency (KCWA) , for example, was created by the state legislature in 1961 under the influence of the county's corporate farmers to buy SWP water and then sell it to the local districts where the landowners again formed the boards of directors. As an intermediary, the Agency spread out the cost of the water through a countywide property tax, principally paid by the Bakersfield urban population. Both the intent and the effect of the Agency were to generate water subsidies for large landowners.[109]

The Kern County Water Association—not to be confused with KCWA, the *Agency*—was established and run by the most powerful landowners in the county. It advocated for the creation of the KCWA by the legislature. As Gottlieb and Fitzsimmons note: "The water association had three key goals: subsidies, to keep the price of water low enough to encourage new irrigation; elimination of acreage restrictions, that is, the 160-acre limit imposed—at least in name—on certain federal projects such as the CVP; and creation of a contracting agency on a countywide basis to secure the tax base of the entire county."[110]

The arrival of SWP water through the California Aqueduct set off a "speculative spiral" in Kern County where landowners rushed to expand their acreage and set up water districts to contract for SWP water through the KCWA. "A handful of landowners dominated most of the key water districts affiliated with KCWA, and these districts, in turn, dominated the agency."[111]

KCWA now has 13 member "units" that together contract for an annual total of 1,000,949 acre-feet of SWP water. Agricultural water users hold 88 percent of the contracts while municipal and industrial users hold 12 percent.[112] Corporate farmers in Kern however, have been receiving *more* water than they contract for since the beginning of the SWP, owing to the questionable concept of "surplus" water.

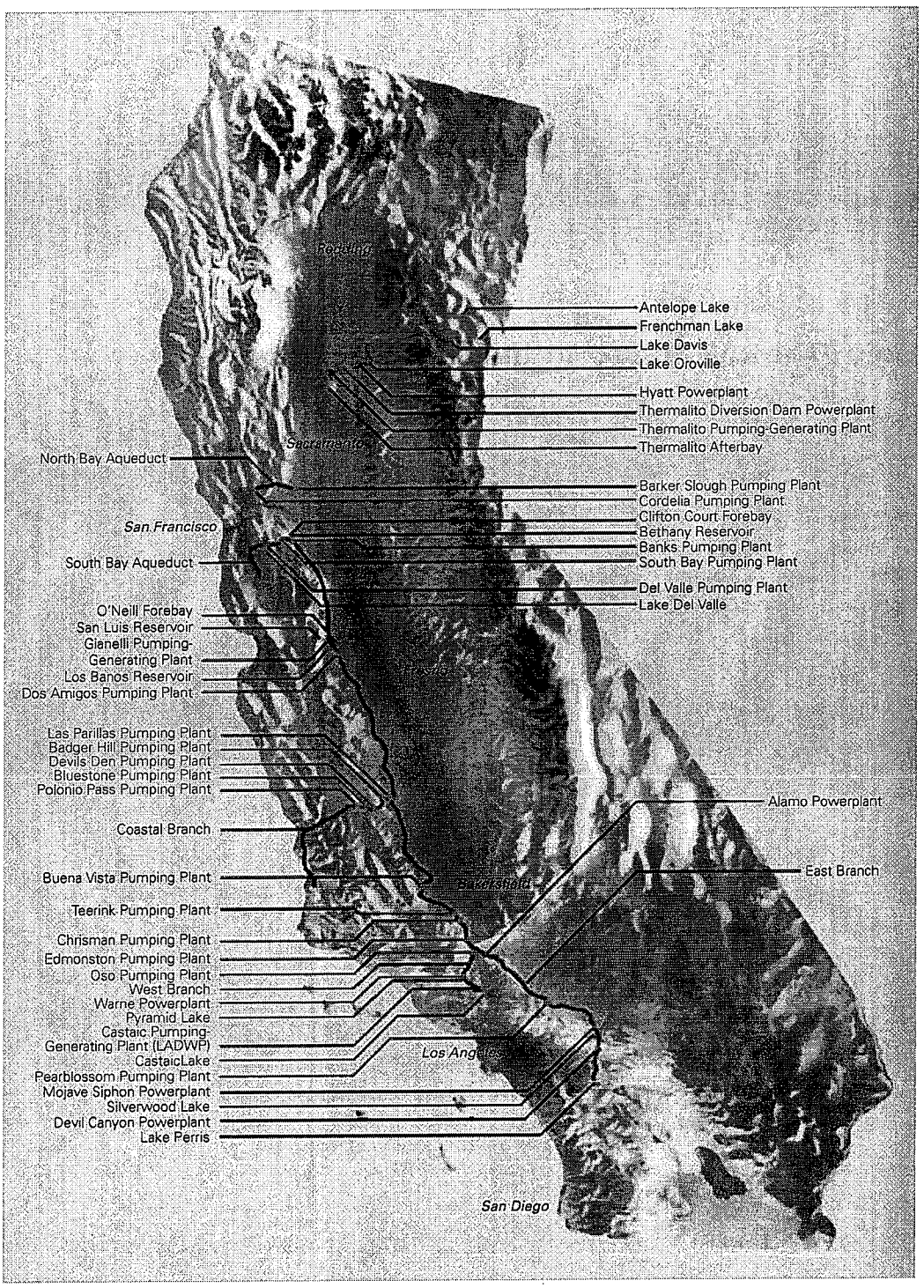
The SWP has never delivered the full 4.1 million acre-feet of water set forth in the original contracts. Average annual deliveries float at around half that amount. How then could there be "surplus" water?

The Metropolitan Water District of Southern California (MWD)—often referred to as The Met—is the largest water agency in California. MWD is a water wholesaler providing "supplemental" water to 27 clients, which in turn serve an area of over 5,000 square miles with a population of 15 million.[113] MWD is also the largest contractor with the SWP, contracting for over 2 million acre-feet of water.

MWD initially opposed the SWP, but signed on four days before the 1959 election.[114] MWD and the Kern County Water Agency came into conflict early on during negotiations over how to distribute the costs of the SWP. The agreement they reached enabled Kern to purchase water at discounted rates. MWD also had to pay for that same water creating "implicit subsidies for the agricultural agency [KCWA] which, by extension, penalized the district [MWD]."[115]

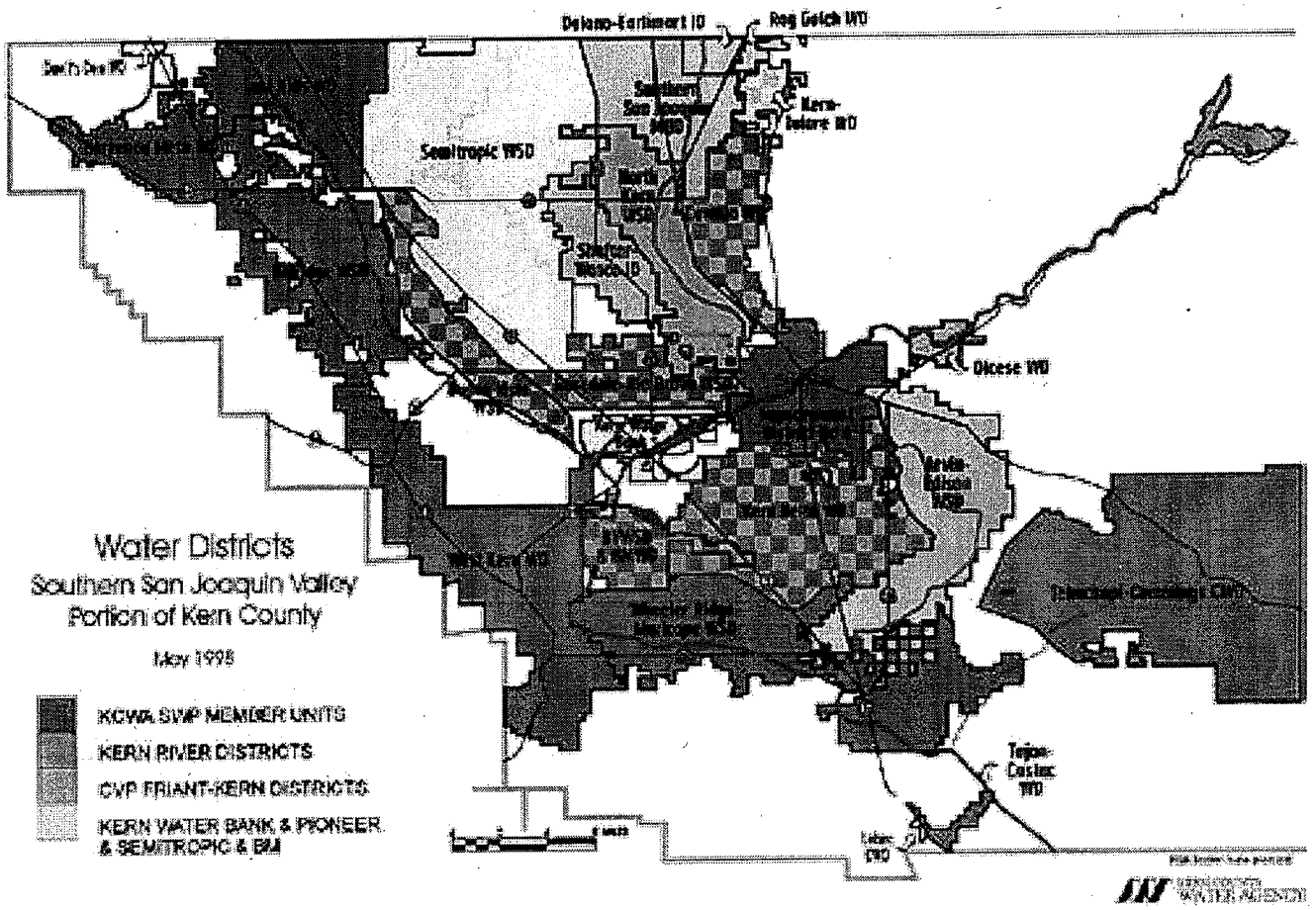
Kern landowners reaped the benefits instantly and have continued to do so ever since. For example, in 1979, KCWA entitlements had increased to 516,300 acre-feet, the agency purchased another 524,247 acre-feet of "surplus water" beyond their contract entitlements. That contracted water cost KCWA member agencies more than $15 million (or about $29 an acre-foot) while the same amount of "surplus water" only cost $2.3 million (or about $4 an acre-foot). This reduced the overall cost to $17 per acre-foot.[116]

Appendix B—Map of State Water Project



The SWP comprises 662 miles of aqueducts, 19 dams with a combined surface area of more than 50,000 acres, 20 pumping plants, and ten energy plants.

Appendix C—Map of Water Districts, Kern County



Appendix D—Roll International Corporation Holdings Diagram

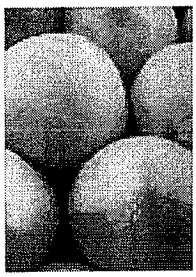
Stewart Resnick

Roll International Corporation

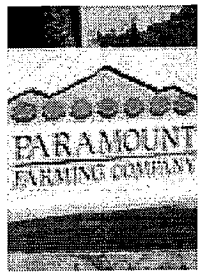
Franklin Mint

Teleflora

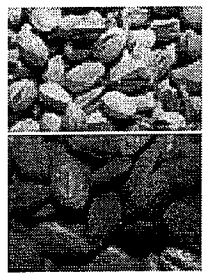
Paramount Citrus



Paramount Farming Company



Paramount Farms, Inc.



Westside Mutual Water Company

Kern Water Bank Authority, 48%

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2 California Department of Water Resources, "Management of the California State Water Project," *Bulletin 132-92* (Sacramento: California Department of Water Resources, Dec. 1992) 14-15 and 150-151. Dan Flory, Chief of State Water Project Analysis Office, personal interview, 20 August 2003.

3 Dan Flory, personal interview, 20 August 2003.

4 Josh Newcom and Elizabeth McCarthy, *Layperson's Guide to Water Marketing.* (Sacramento: Water Education Foundation, 2000), 17.

5 James Beck, Assistant General Manager, and Gary Bucher, Water Resources Manager, Kern County Water Agency, personal interview, 29 August 2003.

6 Robert Gottlieb and Margaret Fitzsimmons, *Thirst for Growth: water agencies as hidden government in California* (Tucson: University of Arizona Press, 1991), 94.

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8 For background information on the Monterey Amendments, see the California Water Network's white paper "The Monterey Agreement—The State Water Project Contracts (SWP)—The Kern Fan Element" (March 2003) and Tim Stroshane, "Monterey Agreement: A Bloodless Coup" *Spillway: California Water, Land and People* 1, no. 2 (2000).

9 This requirement was stated in Article 18(b) of the State Water Project contracts. The Monterey Amendments eliminated Article 18(b) from the contracts. See *Hatch and Parent Law Offices* "Monterey Amendments and White Paper" (September 1995) p.10.

10 *Planning and Conservation League v. Department of Water Resources* (15 September 2000) 83 Cal. App. 4th 892, 912-913 (hereinafter PCL v. DWR).

11 *PCL v. DWR.* Also, see California Water Network's white paper "The Creation of 'Paper Water' & State Water Reliability" (March 2003).

12 Norris Hundley, Jr. *The Great Thirst: Californians and Water: A History* (Berkeley: University of California Press, 2001), 525.

13 PCL v. DWR.

14 The Settlement Agreement may be accessed online at: California Department of Water Resources, *Monterey Agreement Overview,* <http://www.montereyamendments.water.ca.gov> (17 November 2003).

15 *Settlement Agreement by and among Planning and Conservation League, Plumas County Flood Control and Water Conservation District, Citizens Planning Association of Santa Barbara County, Inc. and The State of California Department of Water Resources, Central Coast Water Authority, Kern Water Bank Authority, and those State Water Project Contractors identified herein.* (5 May 2003) 22. Available at <http://www.montereyamendments.water.ca.gov/> (17 November 2003).

16 Carolee Krieger, President of the California Water Network, personal interview, 9 June 2003.

17 Tim Stroshane, "Monterey."

18 Jonathan Parker, General Manager, and Cheryl Harding, Administrator, Kern Water Bank Authority, personal interview, 11 June 2003.

19 Kern Water Bank Authority, "Project Description," (Bakersfield: Kern Water Bank Authority, undated) 2.

20 Michael Gardner, "Imperial-federal dispute could torpedo water deal," *San Diego Union Tribune,* 12 September 2003.

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LETTER 21

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Attachment 6

LETTER 21

An Environmental Review of CalSim-II:

Defining "Full Environmental Compliance" and "Environmentally Preferred" Formulations of the CalSim-II Model

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Preface

The "Environmental Review of CalSim-II" was undertaken at the request and under the sponsorship of Water For California, a non-profit organization dedicated to sound stewardship of the State's waters. The original work statement given to the Natural Heritage Institute requested that they examine the CalSim-II code to establish the requirements to meet two specific standards: one, to determine what changes in the data inputs and the code would be necessary to capture "full compliance" with the legal mandates under which the State Water Project (SWP) and the Central Valley Project (CVP) operate; and the second, to establish in a similar fashion the changes in data and code which would be required to perform an "an environmentally preferred" analysis.

This report is prompted by the use of CalSim-II by agencies as the preferred tool for environmental impact analysis, even though the model is constructed as an optimization model for maximizing exports given certain hydrology and constraints. This report raises a number of important questions and issues with regard to the way CalSim-II is being used.

The "full compliance" option was deemed necessary because present operations of the projects are not fully implementing measures sufficient to meet legal and regulatory requirements promulgated to protect and restore important fisheries and habitats. These deficiencies include directives of the State Water Resources Control Board, the CVPIA's Anadromous Fishery Restoration Programs (AFRP), and more. Each affects operational requirements on dam and pumping operations to protect fisheries and Delta water quality standards. It is important for the investigation to determine just how the code treats these legal directives on the operations of projects and to determine how the CalSim-II model could be used to investigate the impact on project operations if these directives were followed.

The "restoration planning" option was held to be necessary because it was plainly apparent that existing operations, even with expected stricter adherence to the spirit of the environmental limitations, were not effective in redressing the damage that has been incurred to the environment over the lives of these projects. Simply put, the projects, including the present format of CALFED, do not appear adequate to restore health to the Delta and the fisheries as was intended by these programs and as directed by the Endangered Species Act. Again the investigation was required to determine what additional requirements and changes might be added to CalSim-II to move us in the direction of environmental restoration.

We anticipate that implementation of the proposed changes to CalSim-II will elevate environmental objectives to the same level afforded consumptive water uses in water resource decision-making.

This report is prompted by the use of CalSim-II by agencies as the preferred tool for environmental impact analysis, even though the model is constructed as an optimization model for maximizing exports given certain hydrology and constraints. It raises a number of important questions and issues with regard to the way CalSim-II is being used. We anticipate that implementation of the proposed changes to CalSim-II will elevate environmental objectives to the same level afforded consumptive water uses in water resource decision-making.

Water for California
November, 2005

Executive Summary

CalSim-II is being used in almost every significant water planning process underway in California. When the outcome of a planning process hinges on modeling results, even partially, the assumptions and assertions that lead to these results should be accurate and transparent. Unfortunately, the 2003 peer review of CalSim-II raised a number of concerns about the applicability of the model to these important planning processes. The report published here, *An Environmental Review of CalSim-II*, was prepared in order to improve the transparency of CalSim-II and to measure the current version of the model against two important standards. This report is purposely focused on and limited to two specific questions.

1. **Does the representation of environmental regulations and objectives in CalSim-II represent full compliance with current legal requirements?**
2. **Can CalSim-II be used to plan for water management alternatives associated with improve environmental outcomes and habitat restoration?**

This report does not deal with any of the other CalSim-II issues identified in the CalSim-II Peer Review. The Natural Heritage Institute (NHI) was engage to carry our technical analysis needed to answer these questions.

Full Compliance

The first question is posed in order to assure that the current formulation of CalSim-II is consistent with all current environmental regulations on California's water resources. CalSim-II attempts to characterize all components of the regulatory structure. This report reviewed a significant but limited subset of these regulations. Those reviewed were selected based on the experience of a panel of environmental experts. This selection does not imply that characterizations of other regulation in CalSim-II meet the full compliance standard. In fact, it would be very valuable to complete a similar analysis on the model characterization of all environmental regulations.

Results With regards to the Full Compliance standard, NHI identified three areas where the assumptions and assertions in the current version of CalSim-II were at odds with the expert panel's interpretations of existing environmental regulations:

- **CalSim-II uses information not available to real time operators of the California water system.** This allows CalSim-II to relax environmental standards earlier than is the case in actual operations. As a result, the model under-allocates water needed to satisfy existing environmental regulations; in turn, the model makes that water available for export to south of Delta contractors or other uses.
- **CalSim-II is not faithful to Federal law that allocates water to meet ecosystem restoration objectives.** The 1992 Central Valley Project Improvement Act calls for 800 TAF of water to be allocated for environmental regulation and the logic of CalSim-II does not fully honor this requirement.
- **CalSim-II currently includes no requirement to maintain a minimum flow in the San Joaquin River below Friant Dam**, contrary to a court ruling requiring such flows. This allows for allocation of water to urban and agricultural uses in the Friant Service area rather than allocating that water to maintain water in the San Joaquin River.

For each of these deficiencies, this report proposes a series of actions that can be taken in order to improve the performance of the model. These should be considered the minimum steps required to meet the Full Compliance standard for the regulations reviewed as part of this effort.

Restoration Planning

The second question is motivated the failure to protect and restore the Sacramento-San Joaquin watershed as legally required. Long-term monitoring of the system suggests that threatened and endangered fish populations are in serious jeopardy. A prudent approach to water management planning would use modeling tools that evaluate the impact of various environmental regulations on water deliveries. CalSim-II has not been crafted to include this flexibility.

Results As examples of the kinds of new regulations that may need to be considered in CalSim-II, the expert panel identified the following regulatory changes that the model should be able to accommodate:

- CalSim-II should have the flexibility to shift salinity compliance points to allow more targeted tributary restoration action. For example, changing the location of the Vernalis salinity standard may reduce the burden on the Stanislaus River.
- CalSim-II should have the capacity to shift required salinity profiles in the Delta (X2) to benefit Delta-dependent species.
- CalSim-II should allow for the prioritization of tributary environmental objectives, such as targeted operation of the Nimbus/Folsom system for the American River.
- CalSim-II should allow for the modification of Delta export restrictions to target improvements in the Delta ecosystem.
- CalSim-II should not count, towards the satisfaction of environmental regulations, water that otherwise would have been releases as part of unavoidable reservoir spills.
- CalSim-II should allow for the definition of flow requirements that result in periods of spring high-flow and summer low-flow conditions in Central Valley rivers.

These changes are consistent with the need to comply with existing environmental laws (CEQA, NEPA, ESA) through the evaluation of alternatives, including those that are the most environmental beneficial. Given the historic difficulty associated with return the Central Valley water system to a viable ecosystem, these changes would allow policy makers to engage in more thoughtful restoration planning. This report includes a workplan to implement these changes. The responses to the proposed actions should be considered markers of the long-term utility of CalSim-II for restoration planning.

Conclusion

Having completed this environmental review of the CalSim-II model, we are left with the profound impression that it is not a tool that can – under its current formulation – fully address the legally required water management objectives. CalSim-II is, after all, a tool that has been designed to determine how best to operate the state's hydraulic infrastructure in ways that maximize the satisfaction of contractual demands. This reality is a result of both the history of water model development in California and a general analytical approach that has held sway for decades in the field of water resources planning and analysis. This approach holds that the environment is a constraint on system operations, not one of the objectives for which the system should be managed. In order to create a tool that can investigate water management innovations designed to comply with the law and restore the environment, it is not simply a matter of adjusting a few input parameters. Instead, a reformulation of the model along the lines described in this document is needed.

CalSim-II holds that the environment is a constraint on system operations, not one of the objectives for which the system should be managed. In order to create a tool that can investigate water management innovations designed to comply with the law and restore the environment, it is not simply a matter of adjusting a few input parameters.

This philosophy of including the environment as an objective in water resources management is gaining credence around the world. Unfortunately, in California we cannot get to this point if we limit ourselves to the current version of CalSim-II. On the positive side, it is clear that no one views the current version of CalSim-II as the final and definitive water planning tool. An effort is underway to develop CalSim-III, which will respond to many of the critiques that have been offered about the model in recent months and years.

The conclusions of this report are offered to constructively contribute to this evolution. We feel that they will elevate, when implemented, aquatic ecosystem restoration to a place alongside of the other water management objectives in the system as is consistent with the imperatives of law and policy. A failure to respond to these critiques would demonstrate, on the other hand, that the water management community has little interest in viewing ecosystem restoration as more that a nettlesome constraint that has to be dealt with, preferably in the most minimal fashion. This would represent a division more profound than some varying professional opinions about the best way to model a complex water resource system.

Approximating Natural Systems in Models

When modeling a natural system, especially a complex one like the Delta and the water systems that support life in it, it is important to consider the context for the modeling effort. This section of the report briefly describes some of the systems and processes impacted by water management decisions. The overall goal of this section is to highlight the need for modelers to understand the natural systems they attempt to represent and for stakeholders to understand the rationale behind assumptions used to represent environmental regulations within water management model logic.

The plants, fish, birds, and other animals that are native to California streams, rivers and wetlands evolved to flourish under the particular climatic and hydrologic patterns of their native watersheds. Prior to development, streams routinely flooded outside of their embankments during strong winter storms and heavy periods of spring snowmelt runoff. By late summer streams ran low and in drought years many sections of smaller rivers and streams dried up completely. In the fall, the first rains would refresh streams and rivers and attract anadromous fish like the fall run Chinook salmon to migrate back up into the watershed to spawning grounds in mid-elevation reaches. Dried-up floodplains and wetlands would begin to fill again in time for the migrating waterfowls to find refreshed habitat.

The riparian forest along California's streams also adapted to these conditions and contributed to the character of the ecosystems in California's rivers and streams. Being inundated throughout much of the winter and spring does not harm the willow, alder, cottonwood and other riparian plants, and the shallow waters around their trunks are important habitat for juvenile fish escaping the faster moving waters in the main currents. In addition, the riparian forest provided much of the food for the aquatic life around them as terrestrial bugs dropped into the waters below.

The seasonal pulses of flow down California's rivers and streams into the Delta interacted with the daily and seasonal tidal fluctuations in the San Francisco Bay to create a shifting pattern of freshwater, brackish water and salt water that was shaped by the complex and shifting flow patterns in the Delta itself to form a mosaic of aquatic habitats. This mosaic supported a complex assemblage of Delta resident plants and animals.

Californians value their native aquatic ecosystems. A system of environmental laws and regulations, including minimum flow requirements and restrictions on water diversions, has been developed in reaction to serious damage to ecosystems including declines and even loss of species and degradation and loss of habitat.

It goes without saying that conditions changed with the onset of water development in California. The building of levees isolated rivers from their floodplains and fragmented the mosaic of ecosystems in the Delta. The construction and operation of dams and diversion works for water extraction changed the natural flow regimes in ways which reduced the amount of flooding and increased the level of flows in managed rivers and streams during the low

flow period. In the Delta, the combined influence of channelization and changes in the flow regime vastly reduced the amount of certain habitat types used by Delta resident species. These changes were counter to the evolutionary tendencies of native plants and animals throughout the system and were often favorable to invasive species.

This synopsis of pre-development California aquatic ecology and the changes that accompanied water development is not intended to serve as a utopian alternative to the highly developed water system that has been constructed in California over the past century. Indeed, the vast majority of Californians, to one degree or another, rely upon the hydraulic manipulations that water development has accomplished. By the same token, Californians value their native aquatic ecosystems. A system of environmental laws and regulations, including minimum flow requirements and restrictions on water diversions, has been developed in reaction to serious damage to ecosystems including declines and even loss of species and the degradation and loss of habitat. This is the environmental regulatory structure that the developers of CalSim-II have attempted to capture in a simulation model of the California water system.

So just what is CalSim-II and how did it come to play such a central role in California water planning? In order to answer these questions a little bit of historical context is required. For several decades, the managers of the Central Valley Project and the State Water Project have used computer models to simulate the operations of their particular projects. The original models, which went by the names of ProSim for the CVP facilities north of the Delta, SanJaSim for the CVP facilities in the San Joaquin Valley, and DWRSim for the SWP facilities, where used to simulate the extent to which facilities could be operated to meet contractual water demands given a set of assumptions regarding legal requirement and the operating environment. They assumed that historic hydrologic conditions were a decent representation of the likely future. The models were not integrated and therefore it was difficult to evaluate the constraints and opportunities imposed by simultaneous operations of the projects. In addition, the models themselves were developed over many years in a somewhat ad hoc manner with new model logic being added over time as new operating and regulatory approaches were articulated. The end result was a set of codes that were complex, relatively unstable, and nearly impossible to navigate and support as many of the original developers had retired or moved on.

By the 1990s this was clearly an untenable situation on several counts. First, the Delta was in crisis. Ecosystem functions were negatively impacted, and salmon and other species were listed under the ESA. Delta water diversions and extraction over a period of decades was understood to be at least a part of the reason for the problems. The Coordinated Operating Agreement between the CVP and the SWP, and the CALFED Bay-Delta Program, called for closer coordination of CVP and SWP operations to respond to the problem and to legal mandates to restore the populations of listed species. Second, the stakeholder community was demanding a more flexible and transparent set of analytical tools at the very time when the pool of competent ProSim, SanJaSim, and DWRSim analysts was dwindling. Finally, advances in the field of water resources analysis and planning were providing more flexible approaches to water resource simulation modeling based on the application of user-defined priorities and preferences rather than the rigid, If-Then rules used in developing the original models. The time was

right to construct a new simulation model of the California water system, and the managers of both the CVP and the SWP committed resources in an effort to accomplish this task.

At this point, a few observations are warranted. While CalSim-II represents an improvement over the original simulation models in terms of its integration of the State's hydraulic infrastructure, it is clearly derivative from those earlier models. Much of the data and logic used in the original models was introduced to CalSim-II. As a result, CalSim-II still seeks to simulate the extent to which facilities could be operated to meet contractual water demands given a set of assumptions regarding the operating and regulatory environment, and assuming that the range of historic hydrologic conditions is representative of future conditions. As in the early codes, the logic of CalSim-II is designed to maximize the degree to which infrastructure can be operated to satisfy contractual demands. In addition, while CalSim-II is more flexible and stable than the earlier codes, it is not transparent to those outside of the relatively small CalSim-II modeling community.

As a result of this situation, significant questions regarding the model's suitability for multi-objective water resource planning have been raised at the very same time that CalSim-II analyses are being used to inform numerous planning and decision-making processes. There exists a nagging suspicion that the model is not amenable to a full consideration of environmental restoration objectives, and there is a real frustration that it is nearly impossible to address this doubt by examining the logic and assumptions contained in CalSim-II.

This report seeks to evaluate the degree to which CalSim-II captures the critical characteristics of the existing regulatory structure and explore how the model could be used to evaluate the implications of environmental management strategies that more closely mimic the natural hydrologic conditions under which native aquatic plants and animals in California evolved.

This report reviews a subset of CalSim-II logic dealing with environmental regulation and seeks to evaluate the degree to which this subset of the model captures the critical characteristics of the existing regulatory structure. A similar analysis should be completed on the entire model by the official CalSim-II development team. This report also explores how the model could be used to evaluate the implications of environmental management strategies that more closely mimic the natural hydrologic conditions under which native aquatic plants and animals in California evolved. The first goal is to assure that CalSim-II correctly models existing environmental regulations. A second goal is to create a model that can be used to explore objectives that go beyond maximizing deliveries to meet contractual demands and which instead seek to balance the restoration of California's aquatic environment with the demands for urban and agricultural water use.

Background on CalSim II

CalSim-II was developed collaboratively by the California Department of Water Resources and the United States Bureau of Reclamation. It is the primary water supply planning tool employed by the managers that extract water from the Central Valley water system. CalSim-II is being used to support numerous studies (e.g. the Integrated Storage Investigation) and environmental processes (e.g. the Monterey EIR), requiring that the model's logic, structure and limitations and their influence on the conclusions drawn from model output be both understood and accepted as valid by stakeholders involved in these efforts.

Developing a model that can be accepted as credible, relevant, and useful by those with an interest in the model results is a central challenge in the use of all water resource planning models. For the CalSim-II model, this challenge is magnified by the overall complexity of the Central Valley water system, and the scale at which operations need to be represented. An important response to this challenge occurred in 2003 when a panel of nationally recognized experts conducted a peer review of the CalSim-II model and published a strategic review of how the model could appropriately support water planning, management, and operations in California[1].

The peer review did not specifically address the manner in which CalSim-II represents the environmental regulations and objectives established for the Central Valley water system.

The peer review, which was managed by the CALFED Bay-Delta Program and published by the Association of Bay Area Governments, produced many important critiques of the overall CalSim-II approach. These included, among others:

- Its extreme reliance on the output of other models as CalSim-II model input without adequate consideration of the assumptions implicit in these other models;
- Its rudimentary representation of important groundwater resources in the system; and,
- Its failure to undergo a classic calibration and validation analysis prior to its deployment in numerous water resources decision-making processes.

The peer review did not specifically address, however, the manner in which CalSim-II represents the environmental regulations and objectives established for the Central Valley water system.

This report describes an effort specifically designed to consider the issue of environmental performance and compliance with environmental requirements. In implementing this review, which involved detailed examination of CalSim-II code and model output, two questions were posed:

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[1] Close, A., W.M. Hanemann, J.W. Labadie. D.P. Loucks (chair), J.R. Lund, D.C. McKinney, and J.R. Stedinger. 2003. **A Strategic Review of CALSIM II and its Use for Water Planning, Management, and Operations in Central California**. Association of Bay Area Governments. Oakland, California.

1. Does the representation of environmental regulations and objectives in CalSim-II represent full compliance with current legal requirements?
2. Can CalSim-II be used to plan for water management alternatives associated with improve environmental outcomes and habitat restoration?

In formulating a response to these questions, the effort specifically sought to define a series of actions that could be taken to make CalSim-II responsive to these "full environmental compliance" and "environmentally preferred" standards. For this assessment, compliance was defined as representing all current and pertinent environmental laws and regulations in a manner consistent with how they are actually implemented. Environmentally preferred includes environmental restoration measures that might emerge from on-going regulatory processes, different interpretations of existing regulations, or measures that go beyond current regulatory requirements but are appropriate for long-term planning studies. In particular, we are interested in how CalSim-II could be used to evaluate management strategies that contribute to the restoration of aquatic ecosystems and not the perpetuation of the declining situation under the status quo.

This environmental review was funded by Water for California and managed by the Natural Heritage Institute. Owing to its in-house technical capacity using CalSim-II, NHI was responsible for identifying and describing environmentally pertinent details of the CalSim-II model, including details of both the CalSim-II model logic and results from the Common Assumptions Baseline model runs. Through a series of meetings and one-on-one interactions, NHI collaborated with analysts from Wolf and Associates, the Bay Institute, and Environmental Defense to evaluate and measure these details against the full environmental compliance and environmentally preferred standards. NHI then used the results of this collaboration to formulate two distinct work plans that would (i) assure full environmental compliance and (ii) reflect desired and/or anticipated regulatory changes with regard to environmental services in the Central Valley system. The motivation for this effort is that the implementation of these work plans will increase the level of acceptance afforded the CalSim-II model by the environmental stakeholder community. Absent this acceptance, the usefulness of CalSim-II in multi-stakeholder planning and environmental review processes may be unnecessarily compromised.

Scope of the Review Process

In defining the scope of the CalSim-II environmental review, several general observations about the model proved instructive:

- The CalSim-II model treats environmental considerations as constraints on system operations rather than as objectives to be included in the water allocation optimization routine.
- While some environmental constraints are defined for a particular river/reservoir system, others, in particular the accounting logic associated with implementation of section 3406(b)(2) of the Central Valley Project Improvement Act, have system-wide implications.
- There are numerous local and system-wide sets of environmental constraints in CalSim-II, including regulations for 12 Central Valley rivers and creeks, in the Sacramento-San Joaquin Delta and associated with (b)(2) accounting.

The first observation is important because while treating environmental objectives as "constraints" assures that they will be satisfied, it also requires that certain *a priori* assumptions be made in defining the constraints. Some of these assumptions currently apply perfect foresight through the use of water year indices. This foresight influences the manner in which risk tolerance is captured in the CalSim-II water allocation logic that does not correspond with actual operational decisions made in pursuit of environmental objectives.

The second observation has implications because the approach taken in integrating different local regulations into a governing system-wide constraint set can be as important as the definition of the local constraints themselves. For example, the model logic that applies local environmental operations against (b)(2) obligations can be as important as the logic governing the definition of a minimum flow for a particular river reach.

The third observation this report reviewed a significant but limited subset of these regulations. Those reviewed were selected based on the experience of a panel of environmental experts. This selection does not imply that characterizations of other regulation in CalSim-II meet the full compliance standard.

The flow of this document turns first towards the role that water year indices play in the characterization of environmental constraints and objectives, with specific reference to the definition of risk tolerance in CalSim-II. The report then examines a set of specific environmental regulations in greater detail, examining the model logic that governs the establishment of environmental constraints on the CalSim-II water allocation logic. The report closes with detailed workplans designed to move CalSim-II towards full environmental compliance and environmentally preferred standards that were applied during this model review. While much technical detail has been included in the discussion of water year indices and specific environmental regulations, an honest attempt was made to limit the technical detail to those items that have a direct bearing on the proposed work plans. We ask for our reader's patience in working through the technical details and promise that the effort will be rewarded through a fuller capacity to evaluate the proposed workplans found in the final section of the report.

Water Year Indices and the Role of Foresight in CalSim-II Risk Tolerance

CalSim-II considers environmental objectives to be constraints on the water allocation optimization routine. While the current treatment of environmental regulations assures that environmental "constraints" are satisfied before any water is allocated to other purposes, *the model decides whether or not environmental flows are to be met in full* ***in advance*** *of all other allocations.* This reduces the many environmental unknowns and creates more manageable resource allocation problems but it also serves to optimize water exports rather than environmental outcomes.

This approach is inconsistent with the manner in which water resource allocations actually evolve between the months of February and May, when inflows are highly uncertain. Further, the formulation of environmental objectives as constraints removes the possibility that the environmental objectives for the system will benefit from the same level of optimization as other beneficial uses and hides the need to consider the real environmental impacts of water management activity, namely the condition of the ecosystem.

The formulation of environmental objectives as constraints removes the possibility that the environmental objectives for the system will benefit from the same level of optimization as other beneficial uses and hides the need to consider the real environmental impacts of water management activity, namely the condition of the ecosystem.

This approach to modeling environmental compliance is problematic in terms of responding to the two questions posed in this model review. These criteria focus on the actions necessary to restore California's aquatic ecosystems in order to comply with environmental law rather than simply meeting delivery targets. It also calls into question the use of CalSim-II as a tool for environmental impact assessment, since it is changes in the environment associated with specific projects and not the satisfaction of arbitrary constraints which is the critical focus of environmental review.

Discerning the contours of this problem involves understanding the source and environmental application of all the water year indices used in CalSim-II. Before examining specific indices, it is worth pointing out that water year indices are read into CalSim-II from look-up tables, and they are invariant for a 12-month period subsequent to the month in which they are updated. The index values themselves are pre-calculated from the historic 1921-1994 data used as input to the model. In other words, water year types are defined with *perfect foresight*. Text Box 1 presents a summary of indices that govern environmental standards in CalSim-II.

The following text describes these indices in greater detail and highlights the ways in which they are used to establish environmental constraints. This text is followed by a description of how these indices influence environmental constraints in the CalSim-II water allocation routine and, thereby, how this impacts the final service throughout the system vis-à-vis the risk tolerance logic applied to non-environmental deliveries. Prior to continuing, however, it is important to point out that this document's focus indices use, rather than on the scientific justification of the indices themselves, is not to be interpreted

as an acceptance of the actual indices. The use of data from the previous year has an inappropriate impact on the values of the individual indices.

D1485 Indices

Five water year indices defined by D1485 standards are used to determine Delta Outflow requirements, as they would have been executed under Decision 1485. In addition, they are used for accounting purposes in assigning 'costs' to the (b)(2) account. Each of the indices is updated during the February time step and remains invariant for the subsequent 12 months.

Text Box 1: Water Year Indices Used to Define Environmental Constraints

- D1485
  - D1485 Index
  - D1485 Subnormal Snowmelt Index
  - D1485 2-year Index
  - D1485 Fish and Wildlife Standards Index
  - D1485 Project Deficiency Index
- DWR Indices
  - 40-30-30 Sacramento Basin Index
  - 60-20-20 San Joaquin Basin Index
  - Feather River Basin Index
- CVP Indices
  - Shasta Index
  - American River D893 Index
- Miscellaneous
  - Trinity River Index
  - 8-River Index

D1485 WATER YEAR TYPE INDEX:

The D1485 index[2] has 5 levels: 1 = Wet, 2 = Above Normal, 3 = Below Normal, 4 = Dry, 5 = Critically Dry. The index is used in the calculation of the 1485 Fish and Wildlife Index.

D1485 SNOWMELT INDEX:

The D1485 Snowmelt index[3] has 2 levels: 1 = Above Normal, 2 = Sub-Normal. The index is used in defining Minimum Required Delta Outflow (MRDO) requirements under the D1485 regulatory simulation.

D1485 2-YEAR INDEX

The D1485 2-year index[4] has 2 levels: 0 = normal D1485 conditions, 1 = post-Critical Water Year conditions. Analysis of the input data reveals that the post-Critical Water Year conditions do not always follow years with a D1485 index value of 5, or Critically Dry. The index is used in the calculation of the D1485 Fish and Wildlife Index.

D1485 FISH & WILDLIFE STANDARDS INDEX

The D1485 Fish & Wildlife Standards Index is based on the current values of the D1485 Index and the D1485 2-year Index. Essentially, when the D1485 2-year Index is 1, post-Critical Water Year conditions, the value of the D1485 Index is increased by one increment corresponding to the next drier condition. The D1485 Fish and Wildlife Index

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[3] ...\D1485\Run\Lookup\wytypeSnow.table
[4] ...\D1485\Run\Lookup\wytype2yr.table

is then used to define the Rio Vista minimum flow requirement[5]. Additionally, this index is used to define Minimum Required Delta Outflow (MRDO) requirements under the D1485 regulatory simulation.

D1485 Project Deficiency Index

The D1485 Project Deficiency Index[6] has 2 levels: 0 = no deficiencies, 1 = deficiencies. This index is used in defining Minimum Required Delta Outflow (MRDO) requirements under D1485 flow requirements.

DWR Indices

Two DWR indices, which are defined in February and remain invariant for the subsequent 12 months, are used for setting minimum flow standards for certain rivers as well as Delta outflow standards.

40-30-30 Sacramento Basin Index

The 40-30-30 Sacramento Basin Index[7] has 5 levels: 1 = Wet, 2 = Above Normal, 3 = Below Normal, 4 = Dry, 5 = Critically Dry. The index is used in i.) defining the volume of water in the (b)(2) account, ii.) determining reservations of (b)(2) water to assure that (b)(2) is not entirely depleted in the fall, iii.) changing the salinity standards in the Delta, iv.) changing the Minimum Required Delta Outflow[8], and v.) defining the Rio Vista minimum flow requirement[9].

60-20-20 San Joaquin Basin Index

The 60-20-20 San Joaquin Basin Index[10] has 5 levels: 1 = Wet, 2 = Above Normal, 3 = Below Normal, 4 = Dry, 5 = Critically Dry. The index is used to define minimum flow requirements in certain river reaches. Flow requirements affected by the index include the minimum flows on the Calaveras and Mokelumne River, the San Joaquin ERPP (Ecosystem Restoration Program Plan) flows (May 1-10), as well as the VAMP (April 15 – May 15) and Vernalis (October) requirements, which can be relaxed when conditions are dry.

CVP Indices

The Shasta and American River CVP indices included in CalSim-II are used to determine minimum flow requirements in the Sacramento basin. Values of the CVP indices are updated in March and remain invariant over the subsequent 12 months.

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[9] ...\common\Delta\Riovista\riovista.wresl
[10] ...\Run\Lookup\wytypes.table

SHASTA INDEX (CVP)

The Shasta Index[11] has 4 levels, where a value of 4 is considered Critically Dry. The Shasta index is used to determine minimum flows in Clear Creek and at Red Bluff. When the index equals 4, reductions are made to Refuge Contracts North of the Delta[12].

AMERICAN RIVER D893 INDEX

The American River D893 Index[13] has 2 levels and is used to determine the H Street minimum flow requirements, specified in Decision 893. Requirements at H Street vary by month and are specified in a lookup table[14].

Miscellaneous Indices

Several stand-alone indices that are applied at various places in the system are also used to set environmental constraints.

THE TRINITY RIVER INDEX

The Trinity River Index[15] has 5 levels: 1 = Wet, 2 = Above Normal, 3 = Below Normal, 4 = Dry, 5 = Critically Dry. The Trinity Index is set in April and held constant throughout the year. The Trinity River Index is used to determine minimum flow requirements in the Trinity River. Requirements for the Trinity River vary by both month and are specified in a lookup table[16].

EIGHT RIVER INDEX

The Eight River Index[17] is a table of pre-calculated, invariant numbers derived from analysis of historic data. The Eight River Index is used to define Minimum Required Delta Outflow requirements in January.

The most fundamental observation that can be made based on the information presented in the preceding section is that some environmental standards are set based on perfect foresight about the values assigned to water year indices. This assumption can influence the operational logic of the model. Understanding how this operational logic ignores the risk of operating for dynamic environmental objectives is critical to the application of the full environmental compliance and environmentally preferred standards to the performance of CalSim-II.

The Influence of Water Year Indices on the Definition of Risk Tolerance

The most fundamental observation that can be made based on the information presented in the preceding section is that some environmental standards are set based on perfect

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[15] ...\Run\Lookup\wytypes.table
[16] ...\Run\Lookup\Trintymin.table
[17] ...\Run\Lookup\eightriver.table

foresight about the values assigned to water year indices. This assumption can influence the operational logic of the model. Understanding how this operational logic ignores the risk of operating for dynamic environmental objectives is critical to the application of the full environmental compliance and environmentally preferred standards to the performance of CalSim-II. The easiest way to explain how risk management for the environment could be improved is to illustrate how CalSim-II approaches risk management in promising water deliveries.

CalSim-II relies upon a series of curves to manage uncertainty in promising water to users throughout California: generally these curves define risk tolerance. Specifically, these curves illustrate the ability to promise water deliveries given a specific water year outlook (not to be confused with the water year indices). While the treatment of risk tolerance varies somewhat between the CVP and SWP systems, the procedure used in the CVP portion of the model is illustrative. CVP water allocations (i.e. monthly varying delivery promises) are set by the Water Supply Index-Demand Index (WSI-DI) curve, Figure 1. Here the promised CVP delivery (embedded in the Demand Index) is determined by the specific water year outlook (determined by the Water Supply Index). Unlike the water year indices, the water supply index (WSI) is calculated every month as the sum of storages *plus* an imperfect forecast of inflows.

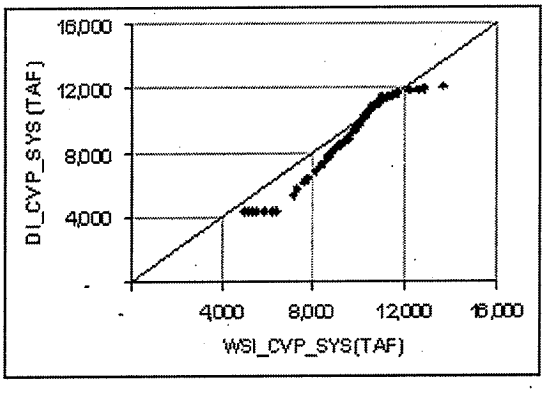

Figure 1 – WSI-DI Curve for CVP water allocations

Three interesting observations emerge from Figure 1. First, at very high levels of water supply the corresponding demand flattens out. This is associated with the fact that the system demand is not unlimited and that above a certain water supply threshold, all water demand can be satisfied. Second, at very low water supply values, the demand index is also flat. This corresponds to the hard water demand that will exist even in the driest conditions. Finally, intermediate to these two tails, an increase in water supply translates into an increase in the water demand that can be satisfied. At high water supply levels all of the available supply is allocated to meet demand. As the water supply decreases, however, the WSI-DI curve falls below the 1:1 line suggesting that a smaller percentage of the available supply is made available to meet demand. This is the first part of the CalSim-II's risk tolerance definition: when conditions are dry, caution is taken in promising water to meet demand.

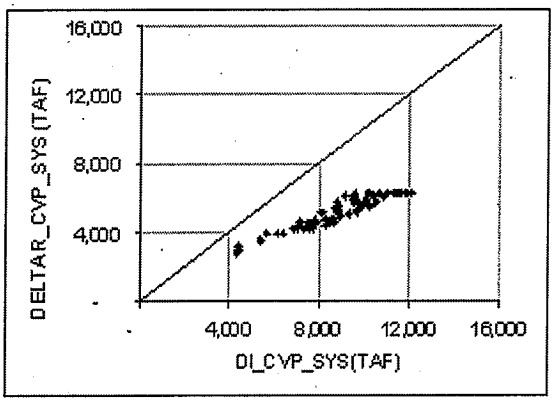

Figure 2 – Del-Car Curve for CVP water allocations

The Demand Index, however, is the sum of both delivery and carry-over storage demands. A second step in determining the CVP water allocations in CalSim-II involves partitioning of the available water between CVP contractors and storage in CVP reservoirs. The Delivery-Carry Over (DelCar) Curve, Figure 2, accomplishes this. Note that the curve has a high-end tail similar to the WSI-DI curve, which occurs during full contract deliveries to CVP contractors. As the Demand Index decreases in value, a smaller percentage of the available supply is committed to carry over storage relative to the amount that is delivered to meet current water demand. This is the second component of the risk tolerance included in CalSim-II: as conditions get dry, a larger percentage of available supply is used to meet current demands in the hope that future inflows will restore reservoir storage levels. Notice that at a DI value of roughly 4000 TAF, the nearly all of the water available to meet demand, is being delivered to satisfy current needs.

At this point the reader is probably wondering how the shape of these two curves are established. In other words, how is the acceptable level of risk tolerance defined? The answer is that some trial and error takes place to train the WSI-DI and DelCar curves. Before describing this process, however, a short digression is made to respond to the other question likely on the mind of the reader, namely how are forecasts of reservoir inflows used to define WSI?

CalSim-II makes a series of annual water allocation decisions starting in February of each water year. At that moment, based on an analysis of historic conditions that has been conducted outside of CalSim-II, knowledge of the snow pack above the major reservoirs in a given water year is added to the level of precipitation that, over the ensuing 5 months, has been exceeded 99% of the time in the historic record. A simple regression model developed by the Department of Water Resources is then used to translate the existing snow pack and anticipated rainfall into a predicted level of reservoir inflow that is added to the water already in reservoir storage to yield the Water Supply Index shown on the x-axis of Figure 1. Unless there is an unusually large snow pack in place in February, by anticipating such a low level of precipitation, CalSim-II likely forces the value of WSI to fall relatively low on the x-axis of Figure 1. This translates to a relatively modest commitment to satisfy demand that may results in delivery cuts being set by the allocation logic relative to full contract amounts.

The forecasted reservoir inflow is updated during the March, April and May time-steps using the process described above and historic information on the available snow pack and future precipitation at the levels exceeded 90, 75 and 50% of the time, respectively. These updated reservoir inflow forecasts are combined with the simulated level of reservoir storage to define a new value of WSI that is translated to a commitment to deliver water to satisfy current needs. If this leads to a higher level of delivery, then the cut logic invoked during an earlier time step is relaxed. By June, the value of WSI is considered fixed for the current water year.

One final comment is warranted. If the situation worsens as the process is implemented, for example if warm late winter temperatures deplete the snow-pack, forcing releases from reservoirs to comply with flood control obligations, and the actual precipitation is less than that which was forecast, the allocation logic will not reduce the quantity of deliveries defined during a previous time step, and end-of-year carry-over storage will be reduced as a consequence.

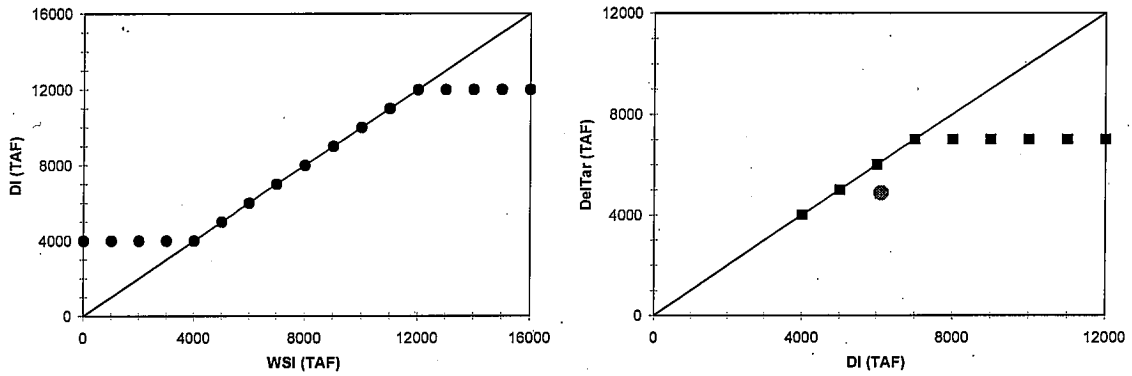

Figure 3 – Stylized Representation of Maximum Risk Tolerance

As alluded to above, the WSI values arrived at by implementing this iterative process drive the use of the WSI-DI and DelCar Curves shown in Figures 1 and 2. This brings us back to the question of how the shape of the curves is established. The most aggressive possible operational strategy for providing water to users would be to use all of the available supply to meet current needs. This posture is stylized in Figure 3. As in Figures 1 and 2, the tails at the upper and lower values of WSI and DI have been preserved. At intermediate values, however, all available water is used to satisfy the current need for water deliveries as both the WSI-DI and DelCar Curves follow the 1:1 line. This posture, however, presumes that the system is completely unconstrained in its ability to deliver all available water to demands throughout the Central Valley. Four primary constraints act to prevent this aggressive delivery policy.

1. There is uncertainly associated with the forecast value of WSI;
2. The actual physical capacity of installed infrastructure can limit water deliveries;
3. Carry-over storage is critical to meeting water management objectives in future years; and most importantly from the perspective of this review
4. Constraints related to environmental regulations may limit the delivery of water.

These factors could, therefore, conspire to create a situation whereby the actual deliveries to demands throughout the system would be somewhat less than promised (e.g. the circle on the right-hand graph in Figure 3). This failure to deliver promised water is in essence a "broken promise" to contractors, and was deemed unacceptable to the CalSim-II development team. To avoid this situation, the WSI-DI and DelCar Curves were developed to add prudence to the interpretation of how much water is available, and what fraction thereof is deliverable. Obviously, this is a departure from the most aggressive posture (Figure 3) toward the aversion to promise deliveries that ultimately cannot be made as expressed in Figure 1 and Figure 2.

The most fundamental observation from the review of CalSim-II is that the environmental constraints used to train the WSI-DI and DelCar Curves were based on a number of *a priori* assumptions, including perfect foresight associated with the use of water year indices. Our thoughts on the implications of the assumptions are found in the section discussing proposed work plans to meet the Full Compliance and Environmentally Preferred standards. The overall implications of perfect foresight should also be kept in mind as the reader reviews the details of specific environmental standards found in the following section.

Detailed Analysis of Specific Environmental Regulations

As mentioned earlier, CalSim-II includes representations of numerous environmental standards, more in fact than could be examined given the time and resources available to this review process. Starting from the input matrix that is typically used to describe a CalSim-II model formulation, the following table identifies the portions of CalSim-II Common Assumptions Baseline code that we evaluated as part of this study.

Regulatory Standards
Trinity River
Upper Sacramento River
Feather River
American River
Stanislaus River
Sacramento-San Joaquin Delta
Operations Criteria
Subsystem
• Stanislaus River
System Wide
• CVP Water Allocation
• CVPIA 3406(b)(2)

Before launching into the specific details of particular environmental regulations, it is probably worthwhile to present the logic of model cycles and model steps used in CalSim-II. CalSim-II is, in fact, run iteratively (recall the discussion of cycles) with different assumptions being applied to the model during each iteration. The pattern of iteration is shown in Figure 4.

Beginning in October, the first month of a water year, CalSim-II executes a series of model cycles that iteratively add objectives to the system. The first cycle involves meeting delivery requirements on the east side of the San Joaquin Valley. During the second cycle, base operations are checked against certain water quality standards for the San Joaquin River, and additional releases are made if required and possible. In the third cycle, it attempts to satisfy pulse flow requirements for the San Joaquin River and its tributaries. The fourth cycle checks that the San Joaquin River water quality standards are still being met after the addition of the pulse flows, and it makes adjustments if needed and feasible. The fifth and final cycle for the San Joaquin River applies specific objectives such as the Vernalis Adaptive Management Plan and the Stanislaus River dissolved oxygen standards.

At the end of the fifth cycle, the CalSim-II representation of San Joaquin River inflows to the Delta is established for the month. The next two cycles add in all of the model logic related to the water management in the Sacramento River, the Delta and the Export zone. Once releases under all seven cycles are calculated, CalSim-II moves on to the next month of the water year. The set of seven calculation cycles continues until calculations for the final month of the water year, September, are completed.

At this point, it is important to introduce and define a new term: "steps." Steps represent the final, monthly set of releases for a 12 month water year. CalSim-II utilizes several

steps before finalizing monthly releases made throughout each water year. Each step in CalSim-II corresponds with a particular water resource policy benchmark. CalSim-II is required to calculate releases under multiple policy regimes because policies (such as the (b)(2)) manage and account for water deliveries relative to releases that *might* have been made under prior regulatory environments.

The first CalSim-II step, referred to as D-1485, calculates releases that would have been made under the regulatory environment pre-dating the enactment of the Water Quality Control Plan. Older regulatory environments can present opportunities to deliver water that are greater than they would be under present conditions. These 'false' opportunities are not reported as the actual availability of water, but are instead used to measure changes in delivery as a result of changes in regulatory policy.

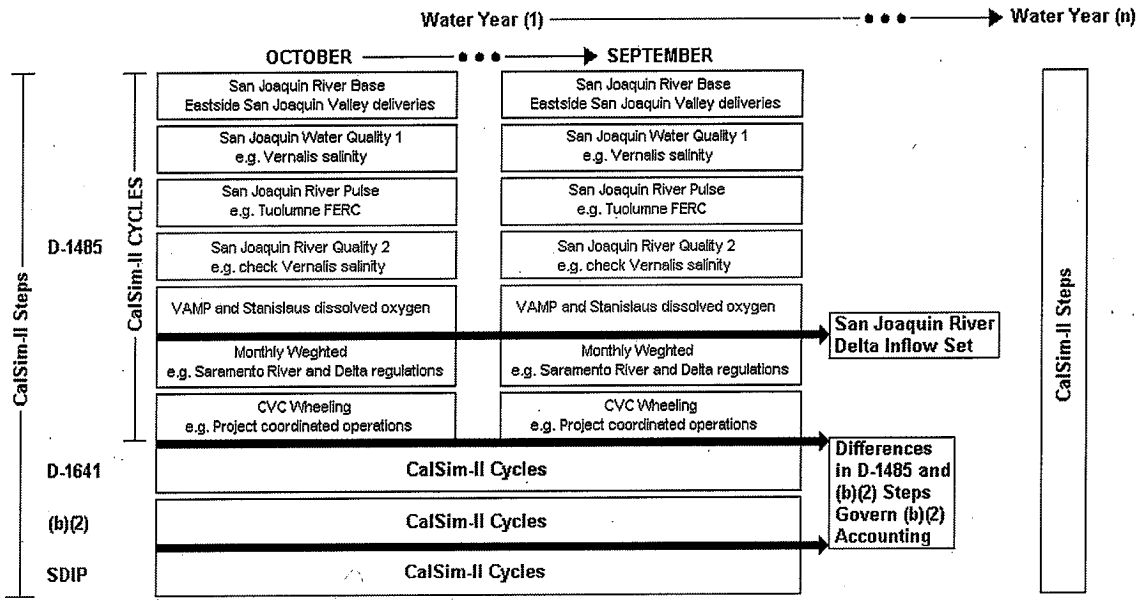

Figure 4 – CalSim-II model cycles and steps

The second CalSim-II model step assumes that the Water Quality Control Plan is in place, which increasingly constrains the ability to deliver water. Any reduction is accounted for as the cost of implementing the Water Quality Control Plan. The next model step assumes that the (b)(2) provisions of the CVPIA require between 600 and 800 TAF of CVP water to be rededicated to environmental objectives. During this step, in completing the seven cycles for the 12 months of a water year, CalSim-II invokes a series of actions that can provide the extra water relative to that which was used for environmental purposes in the D-1485 step. This implies that additional environmental water uses associated with implementation of the Water Quality Control Plan are counted against the (b)(2) obligation. Once all of the environmental considerations are addressed, CalSim-II completes a final step to resolve management considerations related to the adoption of the South Delta Improvement Plan. Only after all cycles and steps are completed for a given 12 month water year does CalSim-II move on to calculations for the following water year, beginning with October.

The implications of this pattern of iteration employed by CalSim-II should be kept in mind as the reader reviews details of specific environmental regulations presented below.

CVPIA 3406(b)(2) Accounting

Section 3406(b)(2) of the Central Valley Project Improvement Act states that the Central Valley Project will:

> "dedicate and manage annually 800,000 acre-feet of Central Valley Project yield for the primary purpose of implementing the fish, wildlife, and habitat restoration purposes and measures authorized by this title; to assist the State of California in its efforts to protect the waters of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; and to help to meet such obligations as may be legally imposed upon the Central Valley Project under State or Federal law following the date of enactment of this title, including but not limited to additional obligations under the Federal Endangered Species Act."

This prescription has, since the passage of CVPIA, been the focus of protracted legal and administrative wrangling. The key questions relate to whether or not the 800 TAF dedication to restoration efforts applies in all years and what actions taken in the operation of the CVP system can be considered as acceptable contributions to the (b)(2) account. In May 2003 the Department of the Interior issued what are considered to be the current rules for interpreting Congressional intent. These are summarized below.

A. Accounting Period

The accounting period for determining the use of the annual (b)(2) allocation will be October 1 through September 30.

B. Accounting Methodology

The appropriate accounting methodology for the dedication and management of (b)(2) water is based upon how and where the water is used. Interior's new methodology for accounting for (b)(2) will involve only two measurement methods, or metrics, to account for how the water is managed under (b)(2). The two metrics used will be upstream releases and Delta exports.

1. Upstream Actions – October 1 through September 30

   a. Accounting Methodology

      Upstream fishery actions from October 1 through September 30 will be accounted as the increase in releases from upstream reservoirs with the fishery actions, compared to releases from the reservoirs[18] that would have resulted from baseline CVP operations[19] during the same period without the fishery actions. The calculation of the increase in release with the fishery measures will be based on daily changes in releases resulting from the (b)(2) measures prescribed by the Fish & Wildlife Service (Service), accumulated over the period.

   b. Upstream Releases may Flow through Delta

      If specified by Interior, based on a written assessment of biological benefits to the fishery from the Service, steps will be pursued under California law to allow upstream releases to flow through the Delta. Upstream releases specified to flow through the Delta would be accounted for solely under this provision, and not as Delta actions.

2. Delta Actions that affect Exports – October 1 through September 30

[18] Releases from Trinity Reservoir for Trinity River flows pursuant to 3406(b)(23) of the CVPIA are excluded from the accounting under this provision. Releases to the river from Whiskeytown Dam, Keswick Dam, Nimbus Dam and Goodwin Dam comprise the basis for this metric.

[19] Interior is currently using the pre-1992 base CVP operations with D-1485 water quality obligations as the baseline CVP operation. The pre-1992 baseline includes the 1992 Winter Run Chinook Salmon Biological Opinion and other licenses and permits as construed at that time.

a. Accounting Methodology

Delta actions that affect exports will be accounted throughout the water year as the reduction in exports from the Delta resulting from the prescribed fishery actions. Any export reductions prescribed by the Service below the baseline operation will be accounted as (b)(2) actions. The calculation of decrease in Delta exports with the fishery measures will be based on daily changes in Delta exports with the fishery measures will be based on daily changes in Delta exports resulting from the (b)(2) measures prescribed by the Service, accumulated over the period.

b. Limitation on Delta Actions – February 1 through August 31

During the period February 1 through August 31 (the "low point" for CVP storage in San Luis Reservoir), (b)(2) prescriptions for export reductions will be limited to a maximum of 640,000 acre-feet (80 percent of 800,000 acre-feet of (b)(2) water). This maximum amount will be reduced up-to 80 percent when the overall water available to (b)(2) is reduced in Dry and Critical water years.

The Department of the Interior decision continues to state, "... for the purposes of classifying the water year type and developing operation plans, the 90-percent exceedence hydrology will be used."

Translating these legislative and administrative guidelines into CalSim-II model logic is a complicated endeavor. Two observations regarding the manner in which this was accomplished are particularly relevant to this environmental review. First, in spite of the suggestion that some notion of uncertainty be applied to the determination of water year type, CalSim-II employs perfect foresight in determining the amount of water that must be dedicated to (b)(2) actions. Based on the 40-30-30 Sacramento River Index which is read into CalSim-II during the February time step, CalSim-II sets the size of the (b)(2) account for the entire water year at the levels shown in Table 1.

CalSim-II employs perfect foresight in determining the amount of water that must be dedicated to (b)(2) actions.

Table 1 – Annual (b)(2) requirements based on Sacramento River water year type

Sacramento River Water Year Type	(b)(2) Requirement (TAF)
Wet	800
Above Normal	800
Normal	800
Below Normal	700
Critically Dry	600

The second pertinent observation is that CalSim-II employs the simulated operation of the system following the D-1485 step (see Figure 4, above) as a baseline against which additional ecosystem restoration actions called for under (b)(2) are measured. This implies that all CVP actions related to implementation of the D-1641 Water Quality Control Plan are considered to be acceptable charges against the (b)(2) account. This belies the fact that water quality actions can have little direct ecosystem benefit. These

observations will be taken up again the discussion of the full environmental compliance and environmentally preferred work plans. For the moment, the remainder of this sections deals with actions taken during the CalSim-II (b)(2) step in order to satisfy (b)(2) obligations.

This implies that all CVP actions related to implementation of the D-1641 Water Quality Control Plan are considered to be acceptable charges against the (b)(2) account. This belies the fact that water quality actions can have little direct ecosystem benefit.

As stated in the Department of the Interior guideline, either increases in releases from CVP regulating reservoirs (Whiskeytown, Keswick, Nimbus, and Goodwin), or decreases in CVP Delta exports relative to a pre-1992 baseline, can be considered to constitute contributions against the (b)(2) obligations. These are described in the standing interpretations, and in CalSim-II, as the Release Metric and the Export Metric. In operation, both are calculated daily. In CalSim-II, the release metric is calculated as the **increase** in total end-of-month releases from CVP reservoirs finalized in the (b)(2) step, relative to the simulated end-of-month releases from CVP reservoirs in the D-1485 step. In the event that the (b)(2) step reduces outflows from CVP reservoirs (relative to D-1485), the (b)(2) account is not credited.

Similarly, the Release Metric is defined as the reduction in end-of-month CVP Delta exports for the (b)(2) step, relative to the D-1485 step. Increased exports (relative to D-1485) are not credited to the (b)(2) account, and the total possible charge to the Release Metric is limited to a fraction of the (b)(2) account. Generally, one of three actions results in a charge to the Release Metric. 1) Changes to the Delta salinity standards between the (b)(2) and D-1485 steps could result in a reduction to exports, 2) exports could be curtailed in the months in April and May as part of the Vernalis Adaptive Management Plan (VAMP), or 3) exports could be curtailed in June in order to bring the (b)(2) account into compliance with the target ecosystem budget.

Table 2 - April and May VAMP export cuts for (b)(2)

Flow at Vernalis (cfs)	CVP Delta Export Restrictions		
	April 1 – 14	April 15 – May 15	May 16 – 31
< 5700	17.5% Inflow	750 CFS	3000 CFS
5700 – 8600	17.5% Inflow	Alternate 750 CFS and 1500 CFS	3000 CFS
> 8600	17.5% Inflow	25% Flow at Vernalis	3000 CFS

VAMP export restrictions from April 1 to May 31 are always activated for (b)(2) accounting purposes (Table 2). The (b)(2) export restrictions apply to CVP Delta exports from Tracy and Banks. During the first non-pulse period, April 1-14, total Delta exports from Tracy and Banks are limited to 35% of Delta inflow[20], with the CVP and the SWP

[20] The sum of Sacramento River flows at Hood, Yolo Bypass return flows, San Joaquin River flows at Vernalis, Mokelumne River, Calaveras River, and Marsh Creek inflows to the Delta.

each being apportioned 50% of the water. During the April 15 – May 15 pulse period, CVP Delta exports are restricted to 750 cfs if the VAMP requirement is less than 5700 cfs. If the VAMP requirement is greater than 5700 cfs then CVP delta exports are restricted to either 750 or 1500 cfs, depending upon the previous year's VAMP restriction. This export restriction alternates between years. Maximum CVP exports are increased to 25% of flows at Vernalis if they are greater than 8600 cfs. In the second non-pulse period, May 16-30, CVP Delta exports are restricted to 3000 cfs. If extending the pulse period restrictions through the end of May is more than what is needed to satisfy (b)(2) requirements then the pumping restrictions for May 16-31 will be adjusted to a level that brings the CVP into compliance with its (b)(2) obligations.

CVP delta exports in June are always restricted to a maximum of 3000 cfs. If there are remaining (b)(2) costs that are not met by projected WQCP actions then CVP pumping at Tracy and Banks will be curtailed. June CVP delta pumping can be reduced from the 3000 cfs standard, but cannot be reduced below the level of export pumping simulated during May. In addition, pulse period pumping restrictions can be applied for the first 7 days in June and increased to 3000 cfs for the remaining 23 days of the month. If extending the pulse period restriction through the first week of June exceeds the amount needed to satisfy (b)(2) requirements then June pumping restrictions will be adjusted to a level that brings the CVP into compliance with its (b)(2) obligations.

Keep in mind as you read the following sections and work plans that modeling (b)(2) correctly requires both correct representation and correct comparison. Representation is more or less an issue of capturing the regulated policy, e.g. there are 800 TAF for disbursement. Comparison is an issue of appropriately capturing the accounting baseline, and charging specific accounts at the appropriate point within the myriad of cycles and steps being performed to calculate operations.

A comment: CalSim-II contains an impressive bulk of code devoted specifically to the accounting of (b)(2) water. Literally, over half of the current model could be eliminated if the (b)(2) account were not being tracked. This demonstrates the power and flexibility of CalSim-II's environment for adopting incremental accounting regulations such as (b)(2). Conversely, this makes an enormous statement about the magnitude of effort required to track "packets" of water running through the Central Valley, as if water releases were so many parcels being ferried through a factory on conveyor belts. While tracking incremental quantities may be appropriate for contracted deliveries, it is an ill-conceived starting point for protecting environmental services because they depend more upon the 'state' of the system than upon raw quantities. There is a need to move away from incremental policies such as the (b)(2) toward dynamic water management decision making that is driven by targeted responses to current environmental conditions. This suggestion also speaks directly to a primary issue that stakeholders have with models: transparency. Quite simply, less complex accounting procedures require less code. Less code makes water resource

There is a need to move away from incremental policies such as the (b)(2) toward dynamic water management decision making that is driven by targeted responses to current environmental conditions.

models simpler to explain, to track and to understand: thereby making the dialogue over alternatives more accessible to stakeholders. While the authors harbor no great illusions about California's water resource system and regulatory environment getting simplified, we suggest it as a practical rule of thumb for future policy directions.

Trinity Operations

CalSim-II models releases of water from storage in the Trinity System along two arcs, marked in Figure 5 as C100 (Trinity River) and D100 (Clear Creek Tunnel). The logic dividing flows between the Trinity River releases and diversion towards the Sacramento River are relatively straightforward.

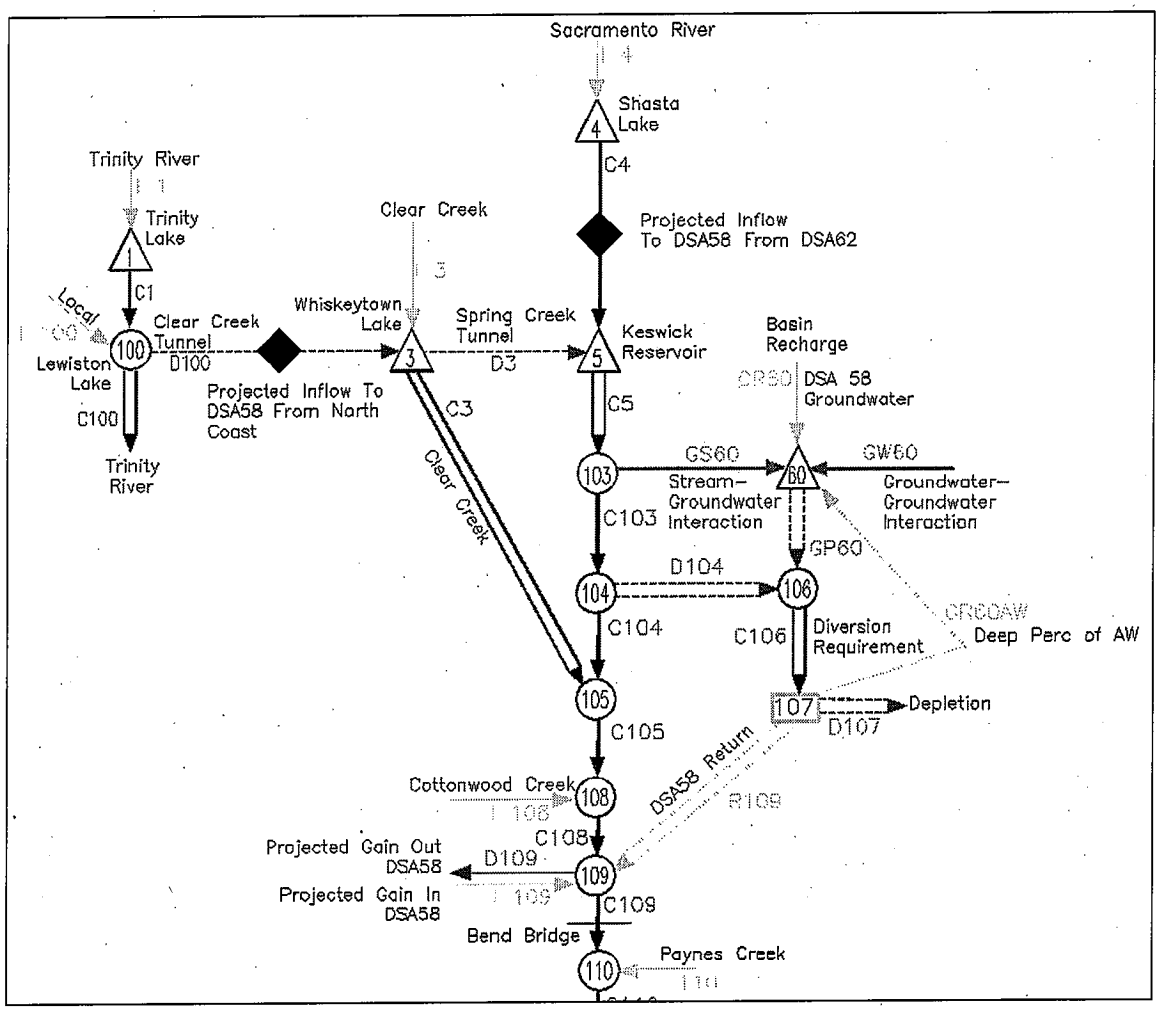

Figure 5 - Trinity Storage and Releases, represented on the CalSim-II schematic as reservoir 1 and arcs C100 (Trinity River) and D100 (Clear Creek Tunnel)

The Trinity River water year index determines the release schedule for the Trinity River[21]. The release schedule is referenced from a lookup table (Table 3), and is the same for each CalSim-II step.[22] Notice that there are significant differences between required releases to the Lower Trinity depending on the water year index, particularly during the late spring and early summer months. This is the kind of difference that has implications for the manner in which risk tolerance is established in CalSim-II, as discussed in the previous section.

[21] ...\common\NorthOfDelta\Trinity\Trinitymin.wresl
[22] ...\Run\Lookup\Trinitymin.table

Table 3 – Trinity River minimum flow requirements (cfs), set by the Trinity water year index

Month	Trinity River Water Year Index				
	Wet (1)	Above Normal (2)	Below Normal (3)	Dry (4)	Critical (5)
October	373	373	373	373	373
November	300	300	300	300	300
December	300	300	300	300	300
January	300	300	300	300	300
February	300	300	300	300	300
March	300	300	300	300	300
April	427	460	493	540	600
May	4570	4709	4189	2924	1498
June	4626	2526	2120	783	783
July	1102	1102	1102	450	450
August	450	450	450	450	450
September	450	450	450	450	450

Trinity river transfers to the Sacramento River basin are made through the 3300 cfs Spring Creek tunnel into Whiskeytown Reservoir. The transfer goal is set relative to the storage levels in Lake Shasta and in reservoirs on the Trinity River. In both cases, Storage Level 1 corresponds to the lowest storage zone, in which case a reservoir is extremely drawn down. At the highest reservoir storage levels, Level 5 for the Trinity reservoirs and Level 6 at Lake Shasta, reservoirs are so full that they are spilling water. Table 2 shows the assigned relationship between the Trinity to Sacramento transfer targets and the storage levels in the two reservoirs.[23] These transfer values can be exceeded when, for instance, Trinity is spilling and the "excess flows" in the Trinity River are used to augment CVP storages or to meet Delta outflow objectives. This is important because when the Trinity River transfers are increased between the D1485 step and the (b)(2) step, the transfer of this "excess flow" is accounted for as a charge against the (b)(2) obligations. As a result the model may be able to avoid clearly beneficial environmental actions called for under (b)(2) during the spring months.

This is important because when the Trinity River transfers are increased between the D1485 step and the (b)(2) step, the transfer of this "excess flow" is accounted for as a charge against the (b)(2) obligations. As a result the model may be able to avoid clearly beneficial environmental actions called for under (b)(2) during the spring months.

[23] ...\Run\Lookup\trinity_import.table

Table 4 – Trinity River Diversions through Clear Creek Tunnel (cfs)

Trinity Level	Shasta Level	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
1	1	0	0	0	0	0	0	0	0	250	250	250	250
1	2	0	0	0	0	0	0	0	0	250	250	250	250
1	3	0	0	0	0	0	0	0	0	250	250	250	250
1	4	0	0	0	0	0	0	0	0	250	250	250	250
1	5	0	0	0	0	0	0	0	0	250	250	250	250
1	6	0	0	0	0	0	0	0	0	0	0	0	0
2	1	250	100	100	100	100	100	100	100	250	1500	1500	1000
2	2	250	100	100	100	100	100	100	100	250	1500	1500	1000
2	3	250	100	100	100	100	100	100	100	250	1250	1250	1000
2	4	250	100	100	100	100	100	100	100	250	1000	1000	750
2	5	250	0	0	0	0	0	0	0	250	750	750	500
2	6	0	0	0	0	0	0	0	0	0	0	0	0
3	1	1250	750	250	250	250	250	250	250	1250	2500	2500	1750
3	2	1250	750	250	250	250	250	250	250	1250	2500	2500	1750
3	3	1000	500	250	250	250	250	250	250	1000	2250	2250	1500
3	4	750	500	250	250	250	250	250	250	750	1750	1750	1500
3	5	750	250	100	100	100	100	100	100	750	1500	1500	1000
3	6	0	0	0	0	0	0	0	0	0	0	0	0
4	1	1750	1000	250	250	250	250	250	250	1750	3250	3250	3250
4	2	1750	1000	250	250	250	250	250	250	1750	3250	3250	3250
4	3	1500	750	250	250	250	250	250	250	1500	2500	2500	2500
4	4	1250	500	250	250	250	250	250	250	1250	2000	2000	2000
4	5	750	500	100	100	100	100	100	100	750	1500	1500	1500
4	6	0	0	0	0	0	0	0	0	0	0	0	0
5	1	3250	3000	1000	250	250	250	250	250	3000	3250	3250	3250
5	2	3250	3000	1000	250	250	250	250	250	3000	3250	3250	3250
5	3	2750	2500	750	250	250	250	250	250	2500	3000	3000	3000
5	4	2500	1750	500	250	250	250	250	250	1750	2750	2750	2750
5	5	1500	1500	500	100	100	100	100	100	1500	1500	1500	1500
5	6	0	0	0	0	0	0	0	0	0	0	0	0

Shasta/Keswick Downstream Releases

CalSim-II models releases of water from storage in the Shasta/Keswick along two arcs, marked in the Figure 6 as C4 (Shasta releases) and C5 (Keswick releases). Model logic associated with these arcs account for minimum flow requirements in the Sacramento River.

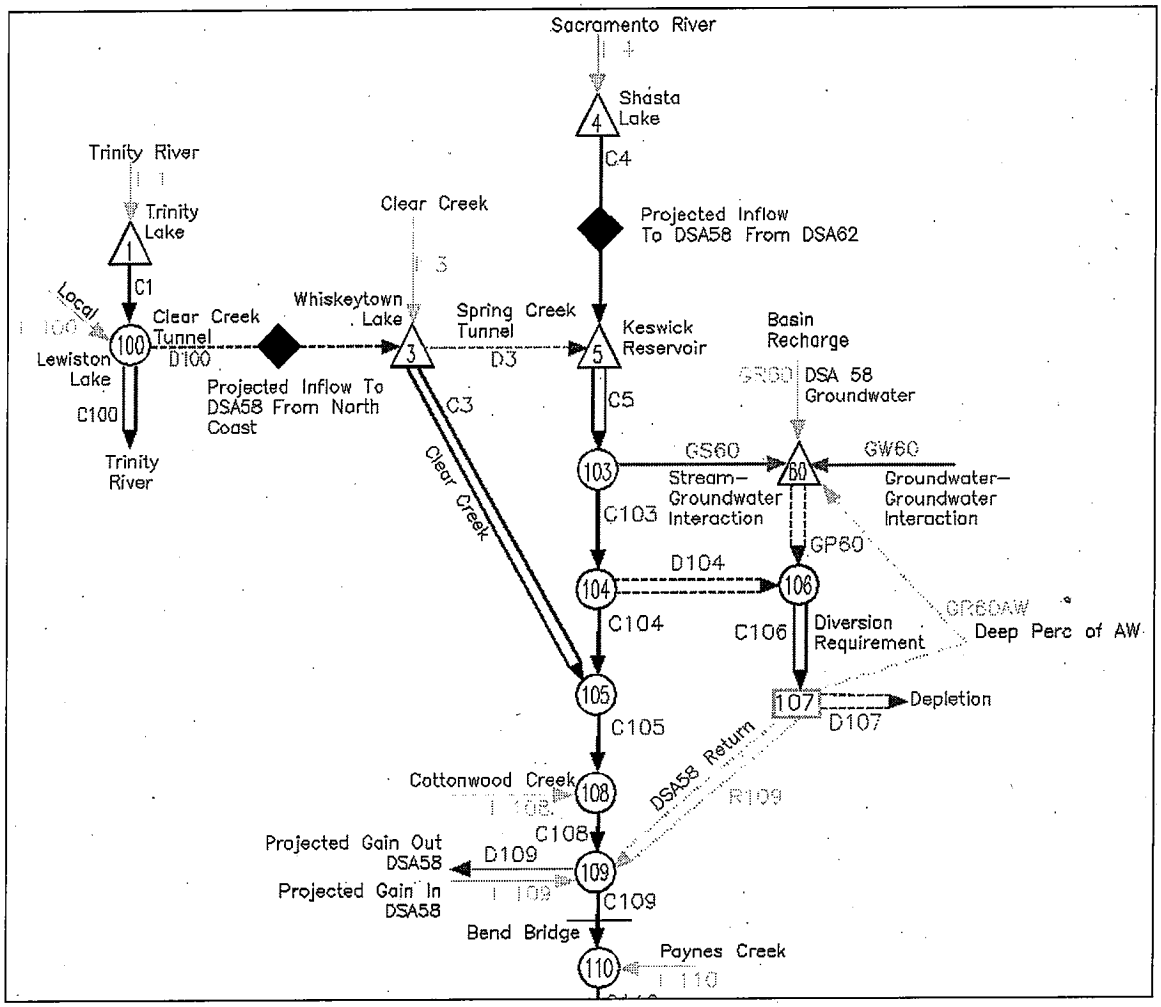

Figure 6 - Shasta/Keswick Storage and Releases, represented on the CalSim-II schematic through reservoirs 4 and 5 and arcs C4 and C5

The minimum flow requirement has three parts: (1) the Keswick Temperature Requirement, (2) the Stability Flow Requirement, and (3) the AFRP requirement. The Keswick Temperature Requirement is based upon the storage in Lake Shasta at the end of September. These values are taken from a look-up table[24] and applied continuously throughout the year (Table 5). Temperature requirements are applied in all CalSim-II model steps (D1485 through SDIP).

[24] ... \Run\Lookup\keswick_tempcntrl.table

The Stability Flow requirement exists to maintain the stability of the downstream levee systems against sloughing that could occur as a result of rapid, dramatic declines in river levels. If outflows from Shasta fall below a threshold, the current month's reservoir release must be maintained at a certain fraction of the previous month's reservoir release to sustain the structural integrity of the earthen riverbanks. The thresholds and fractions associated with this regulation are given in Table 6[25], and the Stability Requirement is only invoked when the previous month's flows are below the stability threshold. Stability requirements are applied only in the (b)(2) step and can result in charges to the (b)(2) account.

Table 5 – Temperature Releases from Shasta Dam (in cfs) corresponding storages

Storage in Shasta (TAF)	Oct	Nov through Mar	Apr	May	Jun	Jul	Aug	Sep
0	3,250		3,250	3,250	3,250	3,250	3,250	3,250
2,000	3,250		3,250	3,250	3,250	3,250	3,250	3,250
2,500	3,250		4,000	5,500	5,500	6,000	6,000	4,500
3,250	4,000	3,250	4,250	6,350	7,000	8,500	8,000	5,500
3,750	4,500		4,500	7,000	8,000	9,500	9,000	6,000
4,500	5,000		5,000	8,000	9,000	11,000	10,000	6,500
>4,500	5,000		5,000	8,000	9,000	11,000	10,000	6,500

Table 6 – Stability of Flow requirements for Shasta Dam, coded to represent FWS management of b2 under the May 2003 Department of Interior (b)(2) Decision

	Previous month's release from Shasta-Keswick (cfs)	Required Fraction of previous month's flow to maintain in current month
November	<6,000	65%
December	<4,500	90%
January	<4,500	80%
February	<4,500	80%
March	<4,500	80%

The Anadromous Fish Restoration Plan (AFRP) flow requirements for the Sacramento River below Shasta and Keswick are based on the previous month's Shasta storage or, between March and September, upon storage plus a forecast of inflows[26] (Table 7). These forecasts are based on 99%, 90%, 75%, and 50% exceedence probabilities for February, March, April, and May through September, respectively. AFRP requirements are applied in the (b)(2) step and can result in charges to the (b)(2) account.

Between the temperature, stability, and AFRP requirements the maximum requirement is not always applied. In conditions when large (b)(2) allocations have been made by the end of January, the AFRP requirement will be relaxed, and the next highest of the temperature and stability flow requirements will be applied[27]. Table 8 explains this

[25] ...\(b)(2)\Run\Lookup\SacStability.table
[26] ...\(b)(2)\Run\Lookup\sacramento_runoff_forecast.table
[27] ...\(b)(2)\Run\(b)(2)Actions\(b)(2)Action1.wresl

decision logic. The bottom two rows in Table 8 refer to "Expected AFRP Costs in January." This value is calculated as the sum of previous costs plus full AFRP flow requirements in January from Whiskeytown, Shasta/Keswick and Folsom/Nimbus. As indicated in the table, requirements that result in (b)(2) costs in excess of 200 TAF by the end of January will be relaxed. This relaxation is performed to conserve (b)(2) water through the spring.

Table 7 – AFRP flow requirements are specified (in cfs) by the storage in Shasta (TAF). Values marked "" were not tabulated, and are determined through linear interpolation**

Shasta Storage (TAF)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	3250	3250	3250	3250	3250	3250	3250	3250	3250	3250	3250	4500
1500	**	**	**	3500	**	**	**	3250	3250	3250	3250	**
1750	**	**	**	**	3500	**	**	3250	3250	3250	3250	**
2000	**	**	**	3750	**	3500	3500	3250	3250	3250	3250	6000
2200	3500	3500	3500	**	3750	**	**	3250	3250	3250	3250	6000
2300	3750	3750	3750	**	**	**	**	3250	3250	3250	3250	6000
2400	4000	4000	4000	**	**	3750	3750	3250	3250	3250	3250	6000
2500	4250	4250	4250	**	**	**	**	3250	3250	3250	3250	6000
2600	4500	4500	4500	4000	**	**	**	3250	3250	3250	3250	6000
2700	4750	4750	4750	4250	4000	**	**	3250	3250	3250	3250	6000
2800	5000	5000	5000	4500	4250	**	**	3250	3250	3250	3250	6000
2900	5250	5250	5250	4750	4500	**	**	3250	3250	3250	3250	6000
3000	5500	5500	5500	5000	4750	4000	**	3250	3250	3250	3250	6000
3050	5500	5500	5500	**	**	4250	**	3250	3250	3250	3250	6000
3100	5500	5500	5500	5250	5000	4500	**	3250	3250	3250	3250	6000
3150	5500	5500	5500	**	**	4750	**	3250	3250	3250	3250	6000
3200	5500	5500	5500	5500	5250	5000	4000	3250	3250	3250	3250	6000
3300	5500	5500	5500	5500	5500	5250	4250	3250	3250	3250	3250	6000
3400	5500	5500	5500	5500	5500	5500	4500	3250	3250	3250	3250	6000
3500	5500	5500	5500	5500	5500	5500	4750	3250	3250	3250	3250	6000
3600	5500	5500	5500	5500	5500	5500	5000	3250	3250	3250	3250	6000
3700	5500	5500	5500	5500	5500	5500	5250	3250	3250	3250	3250	6000
3800	5500	5500	5500	5500	5500	5500	5500	3250	3250	3250	3250	6000
4552	5500	5500	5500	5500	5500	5500	5500	3250	3250	3250	3250	6000

Table 8 – Minimum flow selection matrix, assuming that the Stability Requirement is evoked

Month	(b)(2) Account Condition	Shasta Minimum Flow Requirement
Dec	(b)(2) costs through Nov. >50 TAF	Max between (Temp, Stability), but not above the AFRP requirement
Dec	(b)(2) costs through Nov. <50 TAF	Max (Temp, Stability, AFRP)
Jan	(b)(2) costs through Dec. >150 TAF	Max between (Temp, Stability), but not above the AFRP requirement
Jan	(b)(2) costs through Dec. <150 TAF	Max (Temp, Stability, AFRP)
Jan	(b)(2) costs through Dec. + Expected AFRP Cost in Jan >200 TAF	Max between (Temp, Stability), but not above the AFRP requirement
Jan	(b)(2) costs through Dec. + Expected AFRP Cost in Jan <200 TAF	Max (Temp, Stability, AFRP)

Shasta's storage is treated as part of the larger, integrated Central Valley Project. As such, releases can be made from Shasta in order to fulfill obligations (e.g. delta outflow, instream requirements, export, wheeling, or COA) that are shared among CVP reservoirs. Generally, CalSim-II attempts to keep Shasta, Folsom, and Trinity reservoirs in the same storage zones, thereby balancing the obligations for water with both the capacity of the three dams, and probably the likelihood of being refilled. This balancing, however, is relevant to the 1993 Winter Run Biological Opinion that includes a provision for minimum carryover storage in Lake Shasta of 1.9 MAF at the minimum end-of-September. In CalSim-II, this storage goal is not made explicitly and the fulfillment of the requirement must be judged through an analysis of the output generated at the end of a particular simulation. For the common assumptions baseline, the time-series of simulated September End-of-Month storage is shown in Figure 7.

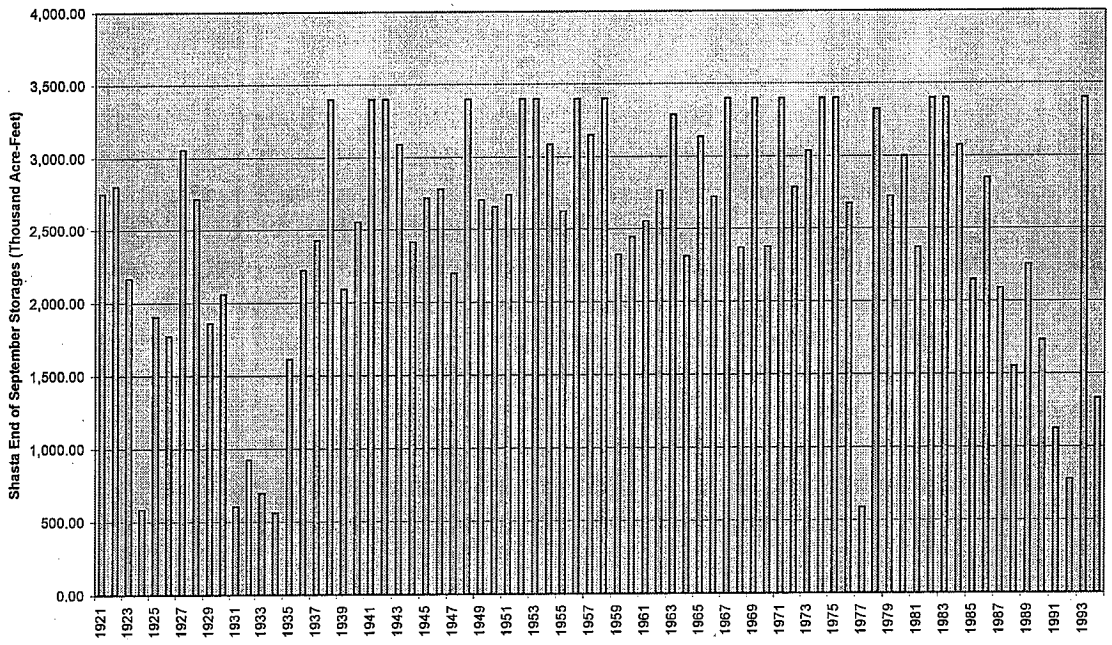

Figure 7 – End of September storages resulting from Baseline (CA_2020D09D_FutureSDIP_2_1) CalSim-II operations

Oroville/Thermalito Downstream Releases

CalSim-II models the combined releases from Oroville and Thermalito along one arc, marked in the Figure 8 as C203. There are three minimum flow requirements imposed on Feather River releases, all of which are expressed in one sub-arc, C203_MIF[28].

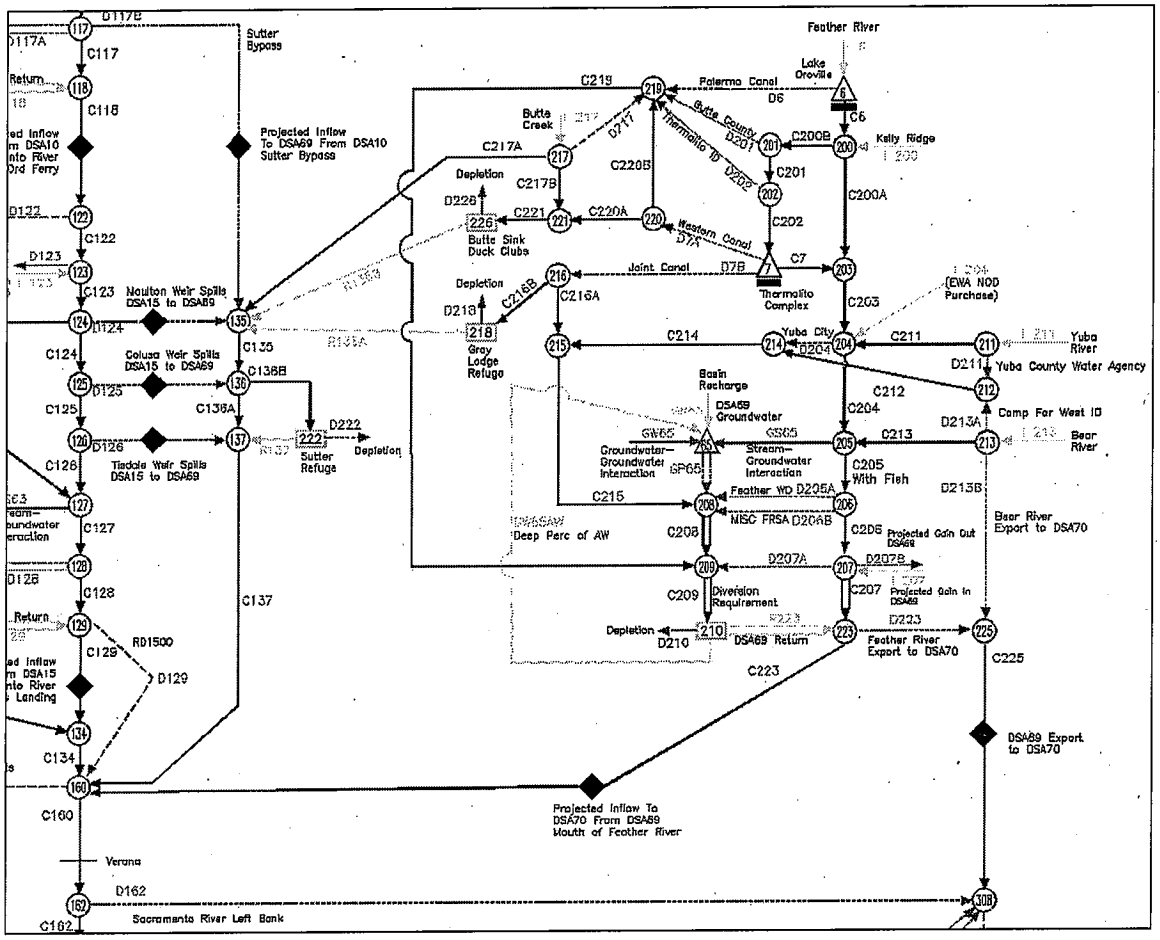

Figure 8 - Oroville/Thermalito Storage and Releases, represented on the CalSim-II schematic through reservoirs 6 and 7 and arc C6, C7 and (as a combined flow) C203

If flows on the Feather River exceed an average of 4,000 cfs in October, or 2,500 cfs in November, then the following months (through March) must maintain at least the previous months flow, minus 500 cfs. The only exception to this requirement is in the event of an October or November flood (expressed as Lake Oroville storage in zone 6), in which case no flow requirements are triggered for the following months. CalSim-II attempts to avoid this minimum flow requirement by placing a heavy penalty on flows above 4,000 cfs in October and 2,500 cfs in November.

There is also a minimum instream flow requirement set for the reach of the Feather River between Thermalito and Verona that varies between 750-1,850 cfs depending on the month and the water year.

[28] ...\common\NorthOfDelta\Feather\feather_special.wresl

Finally, between April and September, Lake Oroville is called upon to provide 2,800 cfs in addition to diversions along the Feather River, shown in the CalSim-II schematic as D7A, D7B, D206A, and D206B. Yuba River inflows count toward this requirement. Additionally, the instream flow requirement here is constrained such that the sum of the diversions and instream flow requirement will not exceed the monthly inflow to Oroville Dam. The implication is that maintaining reservoir levels is a higher priority than the satisfaction of downstream environmental flows.

Folsom/Nimbus Downstream Releases

CalSim-II models releases from Folsom and Nimbus along two arcs, marked in Figure 9 as C8 and C9. The Nimbus release arc is divided into three sub-arcs, to assist in accounting for release requirements.

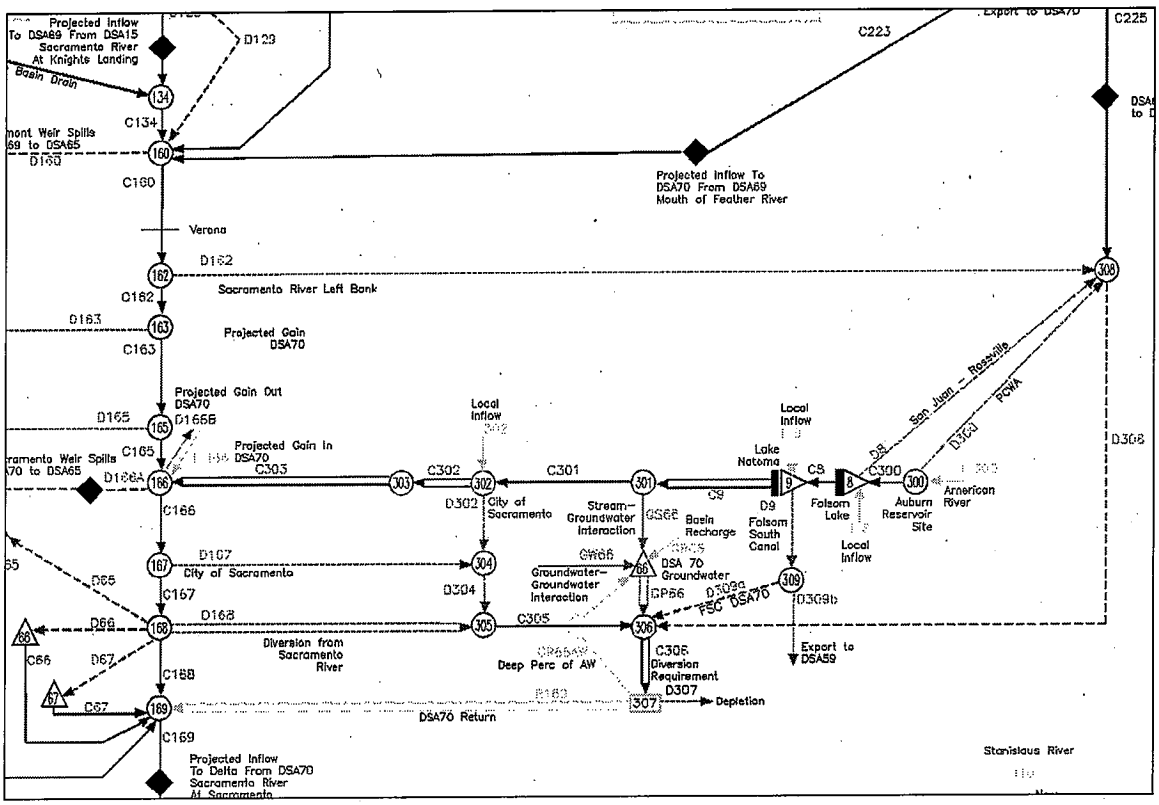

Figure 9 - Folsom/Nimbus Storage and Releases, represented on the CalSim-II schematic through reservoirs 8 and 9 and arc C8 and C9

The historic flow requirement at Folsom is based upon "modified D-1400" requirements, as they were modeled within the PROSIM environment[29]. This flow requirement calls for distinct downstream release actions depending on whether the Folsom storage is above or below 200 TAF. If storage is above 200 TAF, CalSim-II bases minimum flow requirements on either storage in Folsom (October – February) or storage plus a forecast of inflows until the end of the water yeas in September (March – September)[30]. Forecasts are based on 99%, 90%, 75% and 50% exceedence probabilities for February, March, April and May through September, respectively. Minimum flows resulting from the application of this logic are given in Table 9.

[29] ...\common\NorthOfDelta\American\NimbusHistMinQ.wresl
[30] ...\D1485\Run\Lookup\american_runoff_forecast.table

Table 9 - Historic flow requirements through Nimbus Dam, given storages (Oct. – Apr.) or storages plus forecasted inflows (Mar. – Sep.). Values marked "" were not tabulated, and are determined through linear interpolation.**

Folsom Storage (TAF)	Flow Requirement from Nimbus (cfs)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
80	**	**	**	**	**	188	188	188	188	188	188	281
100	500	500	500	500	500	250	250	250	250	250	250	375
200	600	500	500	500	500	**	**	**	**	**	500	375
300	**	500	500	500	500	500	500	500	500	500	500	**
400	750	500	500	500	500	500	500	500	500	500	500	**
500	**	**	**	**	**	500	500	500	500	500	500	**
550	**	**	**	**	**	**	**	500	500	500	500	**
575	**	1375	**	**	**	**	**	**	**	500	500	**
600	1250	**	**	**	**	**	**	**	**	500	500	**
635	**	**	1000	1000	**	**	**	**	**	**	**	**
650	**	**	**	**	**	**	**	**	**	**	**	500
685	**	**	**	**	1000	**	**	**	**	**	**	**
700	**	3000	**	**	**	**	**	**	**	**	**	**
760	**	3000	3000	3000	**	**	**	**	**	**	**	**
770	**	**	**	**	**	**	**	**	**	**	**	1000
772	**	3000	3000	3000	3000	**	**	**	**	**	**	**
800	2650	3000	3000	3000	3000	**	**	**	**	**	**	**
840	**	3000	3000	3000	3000	**	**	**	**		2000	**
960	**	3000	3000	3000	3000	**	**	**	**	2000	**	**
975	3000	3000	3000	3000	3000	**	**	**	**	**	**	**
1000	3000	3000	3000	3000	3000	750	750	**	**	**	2500	2500
1080	3000	3000	3000	3000	3000	**	**	**	2000	**	**	2500
1150	3000	3000	3000	3000	3000	**	**	**	**	2500	**	2500
1200	3000	3000	3000	3000	3000	**	**	2000	**	**	**	2500
1300	3000	3000	3000	3000	3000	**	**	**	2500	**	3000	2500
1450	3000	3000	3000	3000	3000	**	**	2500	**	**	3000	2500
1500	3000	3000	3000	3000	3000	**	1750	**	**	**	3000	2500
1600	3000	3000	3000	3000	3000	**	**	**	**	3000	3000	2500
1750	3000	3000	3000	3000	3000	1500	**	**	**	3000	3000	2500
1900	3000	3000	3000	3000	3000	**	**	**	3000	3000	3000	2500
2250	3000	3000	3000	3000	3000	**	3000	**	3000	3000	3000	2500
2300	3000	3000	3000	3000	3000	**	3000	3000	3000	3000	3000	2500
2500	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	2500
>2500	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	2500

Alternatively, when Folsom storages are below 200 TAF, CalSim-II defaults to the pre-CVPIA "18 MAR 1953 D-893 American River at H Street" baseflow requirement. This requirement varies by month, and is defined based on the value of the American River D893 Index. The resulting H-Street requirement is given in Table 10.

Table 10 - H-Street flow requirements for American River under the D1485 Step

Month	"H" Street Flow Requirement (cfs)	
	D-893 Water Year Type 1	*D-893 Water Year Type 2*
Oct	500	375
Nov	500	375
Dec	500	500
Jan	250	250
Feb	250	250
Mar	250	250
Apr	250	188
May	250	188
Jun	250	188
Jul	250	188
Aug	250	188
Sep	375	281

In addition to these historic flow schedules, Stability and AFRP flow requirements are set during the (b)(2) step of CalSim-II's runs. The Stability Flow requirement exists to maintain stable levee systems in the case of low-flow months. If outflows from Folsom fall below a threshold, defined in Table 11[31], then the current month's outflow must maintain a certain fraction of the previous month's outflow to sustain the structural integrity of the earthen riverbanks. Invocation of the stability requirements result in charges against the (b)(2) account.

Table 11 - Stability Flow requirements for Folsom Dam, coded to represent FWS management of b2 under the May 2003 Department of Interior (b)(2) Decision

	Previous month's release from Folsom-Nimbus (cfs)	Required Fraction to maintain in current month
November	<3,000	80%
December	<3,000	90%
January	<3,000	75%
February	<3,000	75%
March	<3,000	75%

The AFRP flow requirements, shown above in Table 12[32], are chosen based on storages in Folsom reservoir (October – April) or Folsom storage plus an inflow forecast (March – September). Forecasts for the American River change between February and May based on 99%, 90%, 75%, 50% exceedence probabilities for February, March, April and May through September, respectively.[33]

[31] ...\(b)(2)\Run\Lookup\AmerStability.table
[32] ...\(b)(2)\Run\Lookup\AFRP_AMER.table
[33] ...\(b)(2)\Run\Lookup\american_runoff_forecast.table

Table 12 – AFRP Flow Requirements for the American River as a function of Folsom storage or, between March and September, storage plus inflow forecasts through September. Values marked "" were not tabulated, and are determined through linear interpolation.**

Folsom Storages (TAF)	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
0	0	0	0	0	0	0	0	0	0	0	0	0
105	**	**	**	250	250	250	250	250	250	250	250	375
125	500	500	500	**	**	**	**	**	**	**	**	**
200	**	**	**	750	750	**	**	**	**	**	**	**
250	1000	1000	1000	**	**	**	**	**	**	**	**	**
300	1500	1500	1500	**	**	**	**	**	**	**	**	500
350	1750	1750		1500	1500	**	**	**	**	**	**	1000
400	**	**	1750	**	**	**	**	**	**	**	**	1250
450	**	**	**	1750	1750	**	**	**	**	**	**	**
500	**	**	**	**	**	**	**	**	**	**	500	**
575	**	2000	2000	2000	2000	**	**	**	**	**	**	**
600	**	2000	2000	2000	2000	**	**	500	500	500	1000	1750
650	1750	2000	2000	2000	2000	**	**	**	**	**	**	1750
700	2000	2000	2000	2000	2000	500	500	**	**	**	**	1750
725	2000	2000	2000	2000	2000	**	**	**	**	750	**	1750
750	2000	2000	2000	2000	2000	**	**	750	750	**	**	1750
775	2000	2000	2000	2000	2000	**	**	**	1000	1250	**	1750
800	2000	2000	2000	2000	2000	**	**	1250	1250	1500	**	1750
900	2000	2000	2000	2000	2000	750	750	1750	1500	**	1750	1750
950	2000	2000	2000	2000	2000	**	**	**	1750	**	1750	1750
967	2000	2000	2000	2000	2000	**	1000	**	1750	**	1750	1750
1000	2000	2000	2000	2000	2000	**	1250	**	1750	1750	1750	1750
1075	2000	2000	2000	2000	2000	**	1500	**	1750	1750	1750	1750
1150	2000	2000	2000	2000	2000	**	1750	**	1750	1750	1750	1750
1250	2000	2000	2000	2000	2000	1000	**	2000	1750	1750	1750	1750
1400	2000	2000	2000	2000	2000	**	**	**	2750	1750	1750	1750
1450	2000	2000	2000	2000	2000	**	**	3000	**	1750	1750	1750
1500	2000	2000	2000	2000	2000	**	**	3000	3000	1750	1750	1750
1750	2000	2000	2000	2000	2000	1500	**	3000	3000	1750	1750	1750
1800	2000	2000	2000	2000	2000	**	1750	3000	3000	1750	1750	1750
2050	2000	2000	2000	2000	2000	**	2750	3000	3000	1750	1750	1750
2100	2000	2000	2000	2000	2000	**	3000	3000	3000	1750	1750	1750
2500	2000	2000	2000	2000	2000	3000	3000	3000	3000	1750	1750	1750
>2500	2000	2000	2000	2000	2000	3000	3000	3000	3000	1750	1750	1750

Between the Historic, Stability, and AFRP requirements, the maximum requirement is not always applied. This results from the desire to conserve (b)(2) water for spring releases. In conditions when large (b)(2) allocations have been (or might be) made by the end of January, the AFRP requirement will be relaxed, and the next highest flow

requirement (between Historic and Stability) will be applied.[34] Table 13 explains this decision process.

Table 13 - Minimum Flow selection matrix, given that the stability requirement is invoked

Month	(b)(2) Account Condition	Folsom Minimum Flow Requirement
Dec	(b)(2) costs through Nov. >50 TAF	Max between (H St., Stability), but not above the AFRP requirement
Dec	(b)(2) costs through Nov. <50 TAF	Max (H St., Stability, AFRP)
Jan	(b)(2) costs through Dec. >150 TAF	Max between (H St., Stability), but not above the AFRP requirement
Jan	(b)(2) costs through Dec. <150 TAF	Max (H St., Stability, AFRP)
Jan	(b)(2) costs through Dec. + Expected AFRP Cost in Jan >200 TAF	Max between (H St., Stability), but not above the AFRP requirement
Jan	(b)(2) costs through Dec. + Expected AFRP Cost in Jan <200 TAF	Max (H St., Stability, AFRP)

The bottom two rows in Table 13 refer to "Expected AFRP Costs in January." This value is calculated as the sum of previous costs plus full AFRP flow requirements in January from Whiskeytown, Shasta/Keswick and Folsom/Nimbus. As indicated in the table, requirements that result in (b)(2) costs in excess of 200 TAF by the end of January will be relaxed. This relaxation is performed to conserve (b)(2) water through the spring.

[34] ...\(b)(2)\Run\(b)(2)Actions\(b)(2)Action1.wresl

New Melones/Goodwin Downstream Releases

CalSim-II models regulatory requirements for the Stanislaus River along three arcs, marked in Figure 10 as C10 (outflow from New Melones Reservoir), C16 (releases from Goodwin Dam), and C527 (a regulatory point upstream of Ripon). All releases from New Melones made for water quality and environmental purposes are routed through Goodwin Dam, and are unavailable for irrigation withdrawals.

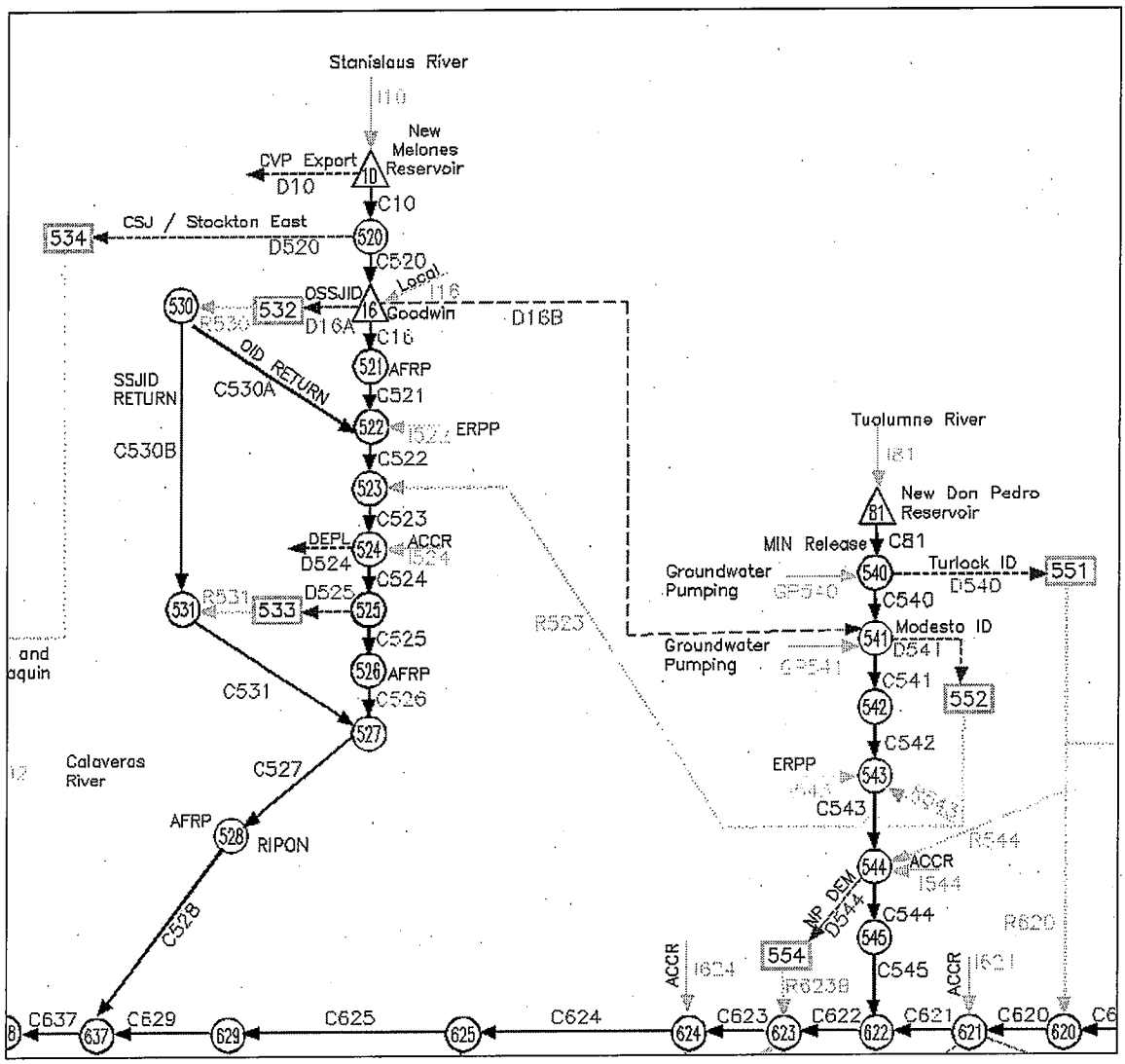

Figure 10 - CalSim-II schematic for the Stanislaus and Tuolumne Rivers

There are four general requirements governing minimum flows in the Stanislaus River below Goodwin Dam: dissolved oxygen standards, salinity standards, minimum flows and pulse flows for fish and wildlife in the Stanislaus River, and the Vernalis Adaptive Management Plan (VAMP) pulses.

Dissolved oxygen requirements for the Stanislaus River are defined below both New Melones and Goodwin[35]. As CalSim-II in its present form is incapable of simulating changes in dissolved oxygen concentrations, a surrogate flow prescription is given to represent the D.O. requirements. The flow prescription, shown in Table 14, is applied as part of all CalSim-II cycles.

Table 14 – Flow based dissolved oxygen criteria for the Stanislaus River[36]

Month	Requirement (TAF)
June	13.2
July	16.2
August	16.4
December	14.3

The Vernalis salinity requirements for the Stanislaus River are set below Goodwin.[37] If releases from Goodwin are sufficient to meet the standard, storage at New Melones will not be utilized for this purpose; otherwise the requirement will be meet through releases from New Melones. The requirement is based on limiting electrical conductivity (EC) values to not more than 700 and 1000 micromhos/cm for irrigation (April – August) and non-irrigation (September – March) seasons, respectively. CalSim-II approximates the required Stanislaus release by assuming a known salt concentration from several sources of flow in the Lower San Joaquin River system, specifically accretions and returns in the Stanislaus River, main-stem flows of the San Joaquin River before confluence with the Stanislaus River, and the west-side San Joaquin River return flows below the Stanislaus/San Joaquin confluence but upstream of Vernalis. Releases from Goodwin are made such that the aggregate concentration at Vernalis meets water quality standards.

All available water in the Stanislaus may be allocated to satisfy consumptive demands when in fact some portion should have been reserved to meet ecosystem objectives.

Pulse flow requirements for the Stanislaus River are defined as outflow from Goodwin and a point upstream from Ripon (node 525 in Figure 10)[38]. The flow requirement is determined through a three-step calculation. First the six-month New Melones forecast (NMF) is defined as the storage in February plus the sum of inflows through September based on a perfect forecast. Second, following the D1485 CalSim-II cycle, the NMF is used to determine an annual fishery allocation.[39] This allocation is given in Table 15. Finally, the fishery allocation is apportioned between pulse flow and minimum flow schedules, shown in Table 16 and Table 17.

[35] ...\Run\SanJoaquin\Stanislaus\DO.wresl
[36] ...\Run\Lookup\DO.table
[37] ...\common\SanJoaquin\WaterQuality\vernalis_wqmin.wresl
[38] ...\SanJoaquin\Stanislaus\stan_FW_pulse.wresl
[39] ...\Run\Lookup\stan_yr.table

Table 15 – Allocation to fisheries, based on New Melones Forecasts[39]

New Melones Forecast: NMF (TAF)	Fishery Allocation (TAF)
0	98
1,400	98
2,000	125
2,500	345
>3,000	467

Table 16 – Pulse flow requirement for the Stanislaus River, April 15 – May 15 [40]

Fishery Allocation (TAF)	Pulse Requirement (cfs)
0	0
98.9	500
>245.7	1,500

Table 17 – Minimum flow schedule for the Stanislaus River, in relation to Fishery Allocations [41]

	New Melones Forecast (x1,000 acre-feet)							
	0	98.9	155	200.6	256.2	311.5	410.2	466.4
January	-	125	150	250	275	300	350	400
February	-	125	150	250	275	300	350	400
March	-	125	150	250	275	300	350	400
April	-	250	300	300	300	900	1,500	1,500
May	-	250	300	300	1,500	900	1,500	1,500
June	-	-	125	200	200	250	800	825
July	-	-	125	200	200	250	300	625
August	-	-	125	200	200	250	300	525
September	-	-	125	200	200	250	300	400
October	-	110	110	200	250	250	350	350
November	-	200	225	250	275	300	350	400
December	-	200	225	250	275	300	350	400

The 1995 WQCP Vernalis minimum flow requirement is defined as soft constraints on releases from New Melones.[42] Releases from New Melones for Vernalis minimum flows are released through Goodwin, and cannot be diverted for other purposes. The standard is determined by (a) the San Joaquin water year type, (b) the day weighted average X2 requirement at Roe Island, Chipps Island and the Sacramento – San Joaquin River confluence (Table 18), (c) a restriction on flows at Goodwin and Ripon (1500 cfs) and (d) a cap set on the sum of New Melones releases between February and June. The New Melones outflow restriction is based on the New Melones forecast as shown in Table 19. Releases from New Melones are designed to make up any deficit in the Vernalis minimum flow requirement, up to release restrictions at New Melones, Goodwin, and Ripon.

[40] ...\Run\Lookup\stan_pulse.table
[41] ...\Run\Lookup\stan_monfish.table
[42] ...\SanJoaquin\Vernalis\vernalis_min.wresl

Table 18 – Vernalis Requirement, by Water Year and X2 Position

San Joaquin Water Year Type	IF X2 is East of Chipps Island, Vernalis Requirement (cfs)	IF X2 is West of Chipps Island, Vernalis Requirement (cfs)
1	2130	3420
2	2130	3420
3	1420	2280
4	1420	2280
5	710	1140

Table 19 – Annual Release Restriction at New Melones[43]

New Melones Forecast (TAF)	Release Restriction at New Melones (TAF)
0	0
1,400	0
2,000	0
NMF ≥ 2,500	1,000

VAMP are target flows in the San Joaquin River at Vernalis during April and May, the obligation for which is shared by water users on all of the eastside San Joaquin River tributaries and the beneficiaries of the exchange pool at Mendota. In the event that other CalSim-II operations leave a deficit in the VAMP account, a portion of the deficit must be offset by release to the lower Stanislaus below Goodwin Dam. Table 20 identifies the VAMP obligation of the Stanislaus River water users and other VAMP regulated rivers, as a function of the VAMP deficit.

Table 20 – New Melones release requirements (TAF), relative to VAMP deficits

VAMP Deficit (TAF)	Merced ID: Merced River	OID: Stanislaus River	Exchange: Mendota Pool	MID/TID: Tuolumne River
0	0	0	0	0
25	25	0	0	0
35	25	10	0	0
40	25	10	5	0
50	25	10	5	10
61.5	36.5	10	5	10
66.1	36.5	14.6	5	10
68.4	36.5	14.6	7.3	10
73	36.5	14.6	7.3	14.6
81.5	45	14.6	7.3	14.6
84.9	45	18	7.3	14.6
86.6	45	18	9	14.6
90	45	18	9	18
100	55	18	9	18
104	55	22	9	18
106	55	22	11	18
Deficit ≥ 110	55	22	11	22

[43] ...\Run\Lookup\stan_yr.table

CalSim-II sequences the access to storage in New Melones Reservoir to meet these various water quality and environmental flow requirements. The general sequence of access is as follows:

1) In the first CalSim-II model cycle, irrigators access storage and inflows to New Melones and Goodwin, up to their current monthly demand.
2) Throughout the remaining model cycles, inflows to and storage in New Melones and Goodwin are made available for water quality and environmental flow requirements in the Lower Stanislaus River and in the Delta.

This sequencing suggests that water delivery objectives are paramount relative to environmental flow requirements. The implication is that all available water may be allocated to satisfy consumptive demands when in fact some portion of available storage should have been reserved to meet ecosystem objectives.

Delta Outflow Requirements

CalSim-II represents the basic outflow requirements from the Sacramento-San Joaquin Delta through a demand arc marked as D407 in

Figure 11. Generally, the D407 flow requirement is a composite of the X2 requirement and other Delta outflow standards. This standard is set by evaluating (1) the Minimum Required Delta Outflow (MRDO) in concert with either (2a) the ANN Delta Outflow Requirement or (2b) the G-Model. In the CalSim-II model evaluated for this review, the final Delta outflow requirement is the maximum between MRDO and the ANN.

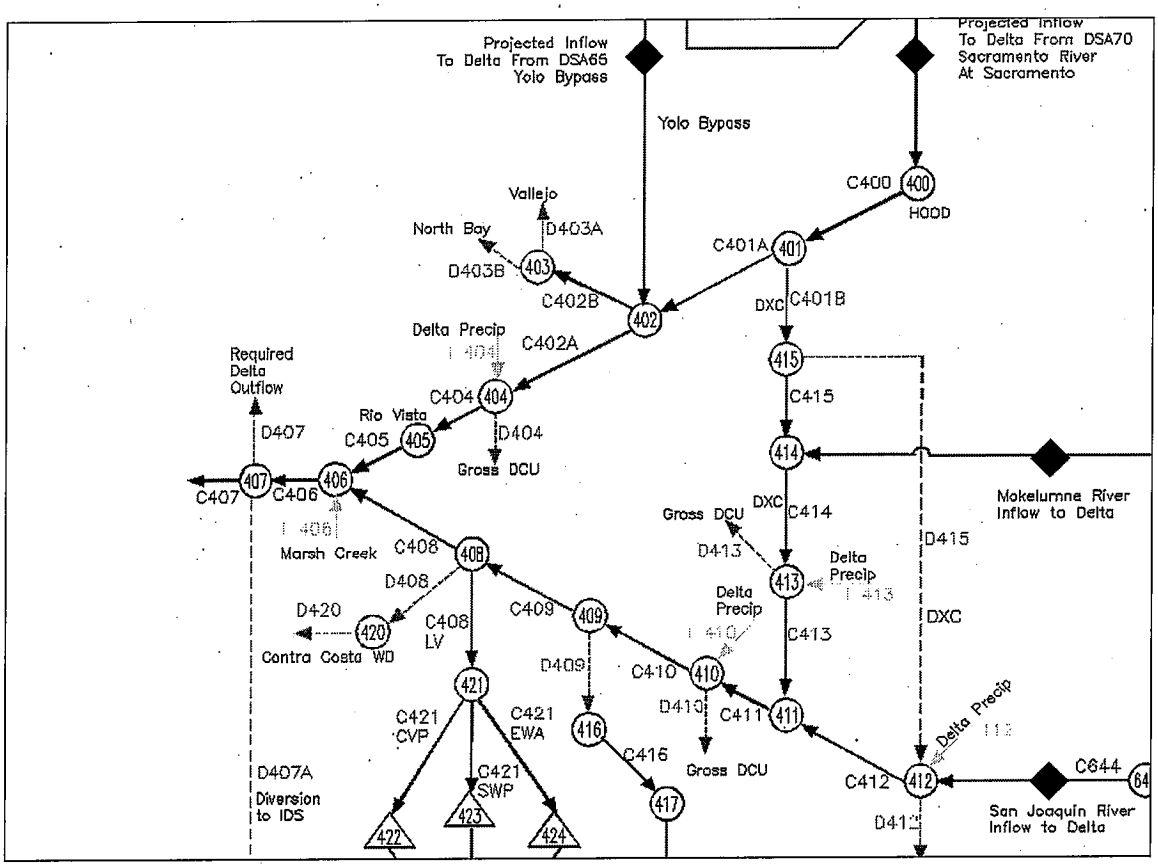

Figure 11 - CalSim-II Representation of the Sacramento-San Joaquin Delta

The Minimum Required Delta Outflow is calculated by evaluating eight separate flow requirements:

i.	Striped Bass Survival/Spawning	(D1485 Flow Requirement, for (b)(2) accounting)
ii.	Suisun Marsh Flow Requirement	(D1485 Flow Requirement, for (b)(2) accounting)
iii.	60-day Suisun Marsh Flow Requirement	(D1485 Flow Requirement, for (b)(2) accounting)
iv.	Flood Envelope Flow Requirement	(D1485 Flow Requirement, for (b)(2) accounting)
v.	X2 at Roe Island/Port Chicago	(D1641, (b)(2), and SDIP Flow Requirement)
vi.	X2 at Chipps Island	(D1641, (b)(2), and SDIP Flow Requirement)
vii.	X2 at the Sacramento-San Joaquin confluence	(D1641, (b)(2), and SDIP Flow Requirement)
viii.	Absolute Minimum Delta Outflow	(D1641, (b)(2), and SDIP Flow Requirement)

These requirements specify (a) the quantity of Delta outflow required to satisfy the requirement, (b) the day the requirement begins, and (c) the day the requirement ends. A composite of these standards is sent by CalSim-II to an external FORTRAN routine that determines the minimum required Delta outflow quantity by arraying the flow requirements across the days in a month, finding the maximum value for each day and averaging these daily maximums to get a monthly value. This procedure is required because CalSim-II runs on a monthly time step. While this is common for water resource planning models, it complicates the simulation of environmental regulation in the Delta which has been designed to manage day to day conditions in the system.

These standards are more related to protecting consumptive uses than creating optimal environmental conditions.

The first four flow requirements are considered by MRDO during the D1485 model cycle (requirements i-iv), but not during subsequent cycles. Increases in reservoir releases or decreases in South of Delta exports that result from changes to these policies during later model cycles are charged to the (b) (2) account.

Table 21 – Striped Bass survival and spawning Delta outflow schedules

	Delta outflow schedule (cfs) by water year designation						
	W[44] (1)	AN[44] (2)	D[44] (3)	C[44] (4)	Dry-Dry[44]	Wet-Dry[44]	Low Snow[45]
October	4000	4000	4000	4000	3000	2500	2500
November	4500	4500	4500	4500	3500	2500	2500
December	4500	4500	4500	4500	3500	2500	2500
January	2500	2500	2500	2500	2500	2500	2500
February	2500	2500	2500	2500	2500	2500	2500
March	2500	2500	2500	2500	2500	2500	2500
April	6700	6700	6700	6700	6700	6700	6700
May	14000	14000	11400	4300	3300	4300	6500
June	14000	10700	9500	3600	3100	3600	5400
July	10000	7700	6500	3200	2900	3200	3600
August	2500	2500	2500	2500	2500	2500	2500
September	2500	2500	2500	2500	2500	2500	2500

The Striped Bass survival and spawning requirement defines Delta outflows from May 6th – April 14th (excluding April 15th – May 5th). The level of flow required is set by three indices: the D1485 Fish and Wildlife Standards Index[46], the D1485 Subnormal Snowmelt Index[47], and the D1485 Project Deficiency Index[48]. Under normal circumstances, the flow requirement corresponds to the D1485 water year index, shown in the first four columns of Table 21. For sequential dry water years, the requirement

[44] ...\D1485\Run\Lookup\NdoBass.table
[45] ...\D1485\Run\Lookup\NdoBassSnow.table
[46] ...\D1485\Run\Wytypes\wytypes.wresl [NOTE: defined in wresl code as the product of 2 other wytypes]
[47] ...\D1485\Run\Lookup\wytypeSnow.table
[48] ...\D1485\Run\Lookup\wytypeDefic.table

goes to the Dry-Dry schedule. In a dry year following a wet year, the Wet-Dry schedule is invoked. If the water year type is either dry or critical *and* there is a low snowpack forecast (as determined by the D1485 Subnormal Snowmelt Index) the Low Snow schedule in the final column governs the standard.

When the D1485 Project Deficiency Index is triggered (an index value of 1), then the April 1st and 14th schedule can be reduced to 2,500 cfs. Likewise, in a critical D1485 water year the same reduction is allowed.

The Suisun Marsh flow requirement is set based on two water year indices: the D1485 Fish and Wildlife Standards Index[49], the D1485 Subnormal Snowmelt Index[50]. This requirement specifies a default 2,500 cfs Delta outflow flow throughout the year. Criteria for deviating from the default flow requirement are specified in Table 20.

Table 20: Conditional Wet Water Year Suisun Marsh spring flows

D1485 F&W Index	D1485 Subnormal Snowmelt Index	Flow Requirement	Period of Flow Requirement
Wet	Low Snow	10,000 cfs	February - April
Wet	Not Low Snow	10,000 cfs	February - May

The 60-day Suisun Marsh Flow Requirement operates between January and April. This requirement is 2,500 cfs by default. In non-wet (i.e. index $\neq$ 1) and non-dry (i.e. index $\neq$ 4) water years, the flows are required to be 12,000 cfs for two months between January and April. The months do not have to be sequential, and CalSim-II accounts for the months during this period when the requirement is met.

The three-reservoir Flood Envelope requirement is set by North of Delta storage conditions. In the case that two of the North of Delta projects (Shasta, Folsom, and/or Oroville) have storage in zone 5 (high/spill storage reservoir zone), Delta outflow is required to be 6,600 cfs. Otherwise, the flow requirement defaults to 2,500 cfs.

The Post-D1641 X2 Outflow Requirements (requirements v-viii) are calculated by tracking the 2ppt (X2) bottom isohaline line between the months of February and June. CalSim-II calculates a net monthly flow requirement for three locations (Roe Island/Port Chicago at river mile 39, the Sacramento-San Joaquin Confluence at river mile 50, and Chipps Island at river mile 74).

The first step in setting the X2 requirements is determining where the X2 isohaline line is situated at the beginning of a month or period (BOP). This is determined using the Kimmerer-Monismith equation[51], which references the previous month's North of Delta outflow (NDO) which enters the Delta and the X2 location at the beginning of the previous month (Equation 1).[52]

---

[49] ...\D1485\Run\Wytypes\wytypes.wresl [NOTE: defined in wresl code as the product of 2 other wytypes]

[50] ...\D1485\Run\Lookup\wytypeSnow.table

[51] It is important to note that this regression equations were develop using data from historic Delta export conditions and that future changes that include dramatic changes in Delta exports may compromise the use of these relationships.

[52] ...\Run\Delta\MRDO\X2\X2req.wresl

Equation 1	$X2_{BOP} = 122.2 + 0.3278 * X2\text{-}Location_{\text{beginning of previous month in kilometers}} - 17.65 * log_{10}(NDO_{\text{previous month in cubic feet per second}})$

If the calculated BOP X2 location is greater than 66.3 km (river mile 41) then the calculation of the Roe Island requirement is invoked. If the BOP X2 position is at, or below the 66.3 km point, then the Roe Island requirement is bypassed. If the Roe Island X2 requirement is triggered, the number of days that the Roe Island X2 constraint is expected to be a controlling Delta outflow requirement is referenced from a lookup table.[53] This number varies by month and by water year. The Delta outflow required to satisfy Roe Island is capped at 29,200 cfs, and is calculated Equation 2.[54]

Equation 2	$Q_{\text{Roe Island Requirement}} = 10 \wedge [(122.2 + 0.3278 * X2\text{-}Location_{\text{beginning of previous month}} - 64) / 17.65]$

If Roe Island is triggered, a further calculation (Equation 3)[55] determines where X2 will be situated at the end of the month as a result of meeting the Roe Island outflow requirement.

Equation 3	$X2\text{-}Location_{\text{Post Roe Island}} = 122.2 + 0.3278 * X2\text{-}Location_{\text{beginning of month}} - 17.65 * Log_{10}(Q_{\text{Roe Island Requirement}})$

In the case that Roe Island standard is invoked, the number of days in which the Chipps Island requirement controls the Delta outflow requirement (same lookup table as the Roe Island standard)[56] is reduced by the number of Roe Island days. The Chipps Island flow requirement is capped at 11,400 cfs, and is calculated using Equation 4[57].

Equation 4	$Q_{\text{Chipps Island Requirement}} = 10 \wedge [(122.2 + 0.3278 * X2\text{-}Location_{\text{Post Roe Island}} - 74) / 17.65]$

Equation 5[58] then determines where X2 will be situated as a result of meeting the Chipps Island outflow requirement.

[53] ...\D1641\Run\Lookup\x2days.table
[54] ...\Run\Delta\MRDO\X2\X2req.wresl
[55] ...\Run\Delta\MRDO\X2\X2req.wresl
[56] ...\D1641\Run\Lookup\x2days.table
[57] ...\Run\Delta\MRDO\X2\X2req.wresl
[58] ...\Run\Delta\MRDO\X2\X2req.wresl

Equation 5	$X2\text{-}Location_{\,Post\ Chipps\ Island} = \mathbf{122.2} + \mathbf{0.3278} * X2\text{-}Location_{\,beginning\ of\ month} - \mathbf{17.65} * Log_{10}(Q_{\,Chipps\ Island\ Requirement})$

The Sacramento-San Joaquin Confluence flow requirement is reduced by the number of days in which either the Roe or Chipps Island requirements are being met (the greater between the two). In the case that Roe Island is not triggered, then the number of days in which the Confluence requirement would be a controlling outflow requirement (same lookup table as the Roe and Chipps Island standards)[59] is reduced by the number of Chipps Island days. The Confluence flow requirement is capped at 7,100 cfs, and is calculated using Equation 6[60].

Equation 6	$Q_{\,Chipps\ Island\ Requirement} = 10\ \hat{}\ [(\mathbf{122.2} + \mathbf{0.3278} * X2\text{-}Location_{\,Post\ Roe\ Island} - \mathbf{74}) / \mathbf{17.65}]$

To generate the final X2 requirement, the Roe Island requirement is assumed to begin on day 1 and end after the pre-determined period of time. Any remaining Chipps Island requirements begin on the day after the Roe Island requirement is met. Lastly, any Sacramento-San Joaquin Confluence flow requirements begin on the day after the Chipps Island requirements are met. The Confluence requirement then continues through to the end of the month.

Observation of the results of CalSim-II evaluated during this review reveal that during May and June of the 1924, 1931, 1939, 1976, 1977, 1990, 1991 and 1994 water years, zero X2 days were required, apparently because the projected 40-30-30 Sacramento River Index fell below 8.1 MAF in the month of May. During these situations, a 4,000 cfs minimum flow standard is maintained.

The ANN Delta Outflow Requirement is computed in an external FORTRAN routine (an Artificial Neural Network). Current physically based models, such as the DSM-II, report salinity levels as a function of Delta inflows and exports, and not visa-versa. CalSim-II's ANN was designed to reverse this functional relationship in a procedure that would otherwise be a lengthy iterative process. The ANN bases its decisions on the current month's flow (the only variable), on antecedent flow conditions, and on the current level of salinity at each station. Standards that emerge from the ANN are designed to protect water quality at various points throughout the Delta. These standards are more related to protecting consumptive uses than creating optimal environmental conditions

CalSim-II takes a composite of all of the preceding flow standards in order to arrive at the minimum Delta outflow assigned to arc D407 shown in the schematic found in Figure 11.

[59] ...\D1641\Run\Lookup\x2days.table
[60] ...\Run\Delta\MRDO\X2\X2req.wresl

Full Environmental Compliance CalSim-II Formulation Work Plan

Based on the insights gleaned from this environmental review, it is possible to begin sketching out a work plan for developing a legal compliance formulation of the CalSim-II model. Before launching in to this exercise, however, it is worth forwarding a few general impressions that can place the recommended work plan items in a proper context.

1. Any water resources model, including CalSim-II, can be improved through continued refinement of its underlying assumptions. The following work plan is offered in the spirit of constructively contributing to continued improvements to the CalSim-II model.
2. Based on the sub-set of CalSim-II logic reviewed for this report we are confident in the validity of our conclusions that we used them to motivate the following proposed work plan.
3. Like most water resource planning models, CalSim-II is path dependent. Much of the model logic governing the simulated system operation is governed by the state of the system at a particular moment in time, and this state will evolve differently under alternative assumptions about the environmental regulations governing system operations. This means that examining model code is not a sufficient method for understanding the implications of different model formulations. In the end, changes in the code must be implemented and the implications of these changes must be measured by examining model output. For these reasons recommend that the CalSim-II development team implement this workplan and evaluate the magnitude of potential changes in model output.

With these impressions on the table, our conclusion after having completed the environmental review are that the work plan for creating a full environmental compliance formulation should focus on:

- Removing all vestiges of perfect foresight from the definition of environmental regulations governing system operations;
- Revising the (b)(2) accounting logic to align it with what we consider to be the current interpretation of the CVPIA; and
- Introducing a minimum flow standard from the San Joaquin River.

Removing Perfect Foresight from the Definition of Environmental Regulations

In developing the work plan for this CalSim-II model improvement, we adopt the assumption implicit in the definition of environmental regulations as constraints on system operations, namely that they are of a higher priority than any other water management objectives in the system. As such, at any particular moment in a CalSim-II simulation, the model should anticipate that environmental regulations should be met to the fullest possible extent, unless and until conditions dictate that environmental regulations can be relaxed. This is not the approach taken in the current CalSim-II formulation, which relies on water year indices defined during the February or March time step, to determine if environmental regulations can be relaxed.

For example, consider the definition of the obligation associated with the (b)(2) account as described in Table 1. In February, with the benefit of perfect foresight, a

determination is made regarding whether the annual (b)(2) obligation is 800 TAF, 700 TAF, or 600 TAF. In order to meet the full environmental compliance standard and honor the top priority assumption implicit in the definition of environmental constraints, the strictest possible regulations must be anticipated until enough information is available to decide otherwise. In much the same way that CalSim-II uses forecasts to introduce uncertainty into its promised water deliveries, uncertainty needs to influence the establishment of environmental regulations.

As discussed above, in calculating the value of WSI during the February time step, CalSim-II uses the level of precipitation that has been exceeded 99% of the time during the remaining months of the water year in order to forecast what reservoir inflow will be available for allocation during the coming months. This threshold drops to 90% during the March time step, 75% during the April time step, and 50% during the May time step. This is a prudent risk management strategy, as it assumes the worst when much is still unknown about what the future holds. A corollary to this prudent posture is to also assume that environmental constraints will be at their most stringent when much is still unknown about what the future holds. Perfect foresight is not consistent with this risk management posture.

To satisfy a full environmental compliance standard, all of the indices used in CalSim-II need to be calculated dynamically based on prudent forecasts about what the future may hold. In February the question should be what are the environmental constraints that will be in place going forward assuming that future inflows associated with the level of precipitation exceeded 1% of the time during the remainder of the water year is used to forecast the relevant indices. The answer to this question will surely be the most stringent set of environmental constraints. As time passes and the future becomes more certain then the level risk tolerance related to calculating water year indices can be increased. During the March time step the question would be what are the environmental constraints that will be in place going forward assuming that future inflows are associated with the level of precipitation exceeded 10 % of the time during the remainder of the water year are used to update the relevant indices. In April the threshold would drop to 25% and then to 50% in May. By applying this corollary to the risk tolerance already applied to project water supply availability, the top priority environmental constraints would not be weakened until there was justification for doing so.

Under this formulation, the calculation of the water supply index and use of the WSI-DI and DelCar Curves to translate WSI into a promised level of deliveries to meet current water demands does not change. During years when perfect foresight allowed for an early weakening of environmental constraints under the old formulation, however, under the new formulation the promised deliveries will be subject to more stringent environmental constraints during some portion of the February to June period. This may mean that CalSim-II could fail to meet the water delivery promises generated by the current set of risk management curves (the red dot in Figure 3). In keeping with the risk tolerance philosophy implicit in these curves, they should be retrained as part of the full environmental compliance formulation in the event that significant delivery shortfalls materialize so that less water is promised to other water uses in the system.

Activity 1: Internalize the calculation of water year indices used to set environmental regulations.
This activity involves moving the values of water year indices used to set environmental regulations from external look-up tables where they are stated with perfect foresight into the actual WRESL code where they will be updated continuously based on forecasted inflows.

Activity 2: Define risk tolerance posture with respect to anticipated environmental regulations.
We propose that the 1% exceedence probability of forecasted inflows be used for the months of October-February. This will assure that the strictest possible environmental regulations will be anticipated during that period when large amounts of uncertainly exist about the future. As a corollary to the risk tolerance implicit in the forecasts used to support water allocation, assume that the 10% exceedence inflow will be used in March, 25% in April, and 50% in May. By June that water year index can be set definitively for the remainder of the water year.

Activity 3: Construct the forecasted inflow data tables that will drive the continuous calculation of water year indices.
The forecasted inflows used to support water allocation are read in to CalSim-II from an external file. A similar set of anticipated inflow tables would need to be developed to capture the risk tolerance posture adopted for anticipating environmental regulations.

Activity 4: Implement WRESL code required to adjust environmental regulations based on the continuous evolution of water year indices.
In the current version of CalSim-II, the environmental regulations create a pre-determined constraint on simulated system operations. The new formulation would require WRESL code to look-up the regulations associated with an evolving series of water year indices.

Activity 5: Update the WSI-DI and DelCar curves to reflect the change in underlying constraint set.
As the underlying constraint set used to develop the WSI-DI and DelCar curves, which was based on the application of perfect foresight in setting environmental constraints, will be modified by implementing the preceding activities, it may be necessary to update these risk tolerance defining curves as higher environmental flows will likely be required during the late winter and early spring months.

REVISING THE (B)(2) ACCOUNTING LOGIC
While the method used in applying environmental actions against the (b)(2) account has been the subject of legal and administrative wrangling since the passage of CVPIA in 1992, we believe that the logic employed in CalSim-II to capture the currently accepted accounting methodology is not entirely consistent with the current legal interpretation of the Act. We recognize that this conclusion derives from our interpretation of current law, so it is probably worthwhile to articulate our position on this point.

First, we believe that the intent of (b)(2) was to rededicate a portion of the CVP yield back to fish and wildlife enhancement objectives, primarily the restoration of anadromous fish. While courts have found that Delta water quality actions, which benefit Delta resident fish and consumptive water users relying on water drawn from the Delta, could be considered as acceptable charges against the (b)(2) account, they stipulated *"as long as the allocation gives effect to the hierarchy of purposes established in section 3406(b)(2)"*. Here we believe the intent was clear as Section 3406(b)(2) of the Central Valley Project Improvement Act states that the CVP will:

> "dedicate and manage annually 800,000 acre-feet of Central Valley Project yield for the **primary purpose** of implementing the fish, wildlife, and habitat restoration purposes and measures authorized by this title; to assist the State of California in its efforts to protect the waters of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; and to help to meet such obligations as may be legally imposed upon the Central Valley Project under State or Federal law following the date of enactment of this title, including but not limited to additional obligations under the Federal Endangered Species Act."

We also believe that fish, wildlife, and habitat restoration purposes and measures specifically include the anadromous fish doubling goal included in the Act.

The current CalSim-II formulation turns this notion of primacy upside down by fully changing water quality actions to (b)(2), as well as other non-fish motivated actions, while using fish and wildlife actions to make up any remaining obligations to the (b)(2) account. This stems from the fact that the D-1641 step is run before the (b)(2) step and that all changes in the release and export metrics associated with the difference between the D-1485 and D-1641 steps are charged to (b)(2) with perfect foresight for the water year. In addition, in reviewing various environmental regulations we discovered several other actions of questionable fish and wildlife value that are charged to (b)(2). All this occurs before any fish and wildlife (b)(2) action occurs.

We propose an alternative course of action that envisions the implementation of a new step in the CalSim-II formulation. In keeping with its implicit focus on anadromous fish recovery, this new step is provisionally referred to as the salmon step. The sequence of (b)(2) actions currently used in CalSim-II, as shown in Table 21, is a good starting point for developing the elements of the salmon step. We feel that the highest priority should be assigned to AFRP releases (currently priority 3) as these are designed specifically to meet the anadromous fish-doubling target that was also part of the CVPIA. If this were the case, the type of limitations on AFRP releases that are contained in Table 8 and Table 13 would be unnecessary as these are intended to minimize AFRP flows when significant credits to the (b)(2) account can be derived from the D-1641 step.

A second level of priority would be assigned to the VAMP export priorities (current priority 2), as well as the pre- and post-VAMP restrictions (currently priorities 7 and 4 respectively). As all of these actions would occur after the October to March period during which AFRP flows would be implemented, it should be possible to consider the three components of the VAMP export limitations as a single action.

The final actions in the new salmon step would include the export ramping and the 3000 cfs export limit actions anticipated for the month of June. As these occur after the VAMP export restrictions, a decision will be made in June as to whether they are necessary.

Action Description	Priority of Action	Reserve* for Action (taf)	Balance† Req'd to Trigger Action (taf)	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
WQCP Support (D-1641)	1														
AFRP Releases	3		1												
Export Reductions (150 taf)	6	150	1+2+3+4+5+6												
VAMP Export Restrictions	2	115													
Post VAMP Export Restrictions	4	45	1+4												
Export Ramping	5	60	1+5												
3000 cfs Export Limit	2														
Pre VAMP Export Restrictions	7	40	1+2+4+4+7												
Export Reductions (35 taf)	8	35													

* Average reserve amount. Actual reserves may depend on water year type and/or other hydrologic conditions. Reserves for multi-month actions represent the amount required to complete the entire actions.

† (b)(2) balance after accounting for past costs and current month WQCP(D-1641) support. Values refer to the sum of the reserve amounts associated with the action priorities.

A couple of clarifying points are useful at this point in the discussion. Based on the removal of perfect foresight from the establishment of environmental regulations described above, the exact (b)(2) obligation will not be known as the AFRP actions are implemented between October and March. If this creates a situation whereby AFRP actions result in greater charges against (b)(2) than are finally called for based on the evolution of water year indices, the excess will be changed against the (b)(2) account during the following water year.

Second, several local environmental regulations that are of questionable fishery value, namely the stability criteria on the Sacramento and American Rivers and the diversion of water that would otherwise spill in the Trinity system, are currently charged against (b)(2). In implementing the new salmon step, these charges would not be allowed.

Finally, as the proposed salmon actions are implemented sequentially, there is no need to define and manage reserves and triggers as is the case in the current (b)(2) step. The proposed anadromous fish related actions would simply be implemented in sequence until the (b)(2) obligations is satisfied.

Following the completion of the new salmon CalSim-II step, the current D-1641 step would be implemented. This step contains regulatory drivers related to Delta water quality to protect Delta resident fish and water users who draw water from the Delta. It seems to us that these two drivers are so tightly bound in the D-1641 step that it is unreasonable to separate actions driven by fishery objectives from those driven by consumptive water needs. Therefore we acknowledge that should any remaining (b)(2)

obligations remain after the new salmon step, all D-1641 actions can be used to satisfy this obligation, even if they are designed primarily to protect the interest of consumptive water users. As in the case of the new salmon step, D-1641 actions will be implemented sequentially, although in this step, D-1641 actions will continue even after (b)(2) obligations are retired.

If additional (b)(2) obligations remain at the end of the D-1641 step, then a revised (b)(2) step will be implemented. This step will sequentially implement the December-January export reductions, the February-March export reductions, and the May export limit actions described in Table 21, as needed until the (b)(2) obligation for the year is retired. If (b)(2) obligations remain following this step, they will be forgiven.

While there will be surely be discussion of the legal underpinning of this alternative formulation of the (b)(2) accounting logic, we do not feel that the assignment of first priority to Delta water quality objectives relative to (b)(2) obligations complies with the intend of CVPIA or court findings. The following steps are needed to implement this aspect of the compliance work plan.

Activity 1: Create and implement the new salmon CalSim-II step.
This step will involve adding a new step that sequentially implements the AFRP, VAMP export reductions, and June actions up to the limit of the (b)(2) account that will evolve over the course of the water year according to the forecast based water year indices. Stability releases and Trinity transfers to avoid spills will not be charges against (b)(2) in this step.

Activity 2: Implement conditional logic to govern the implementation of the final revised (b)(2) CalSim-II step.
Under the proposed CalSim-II formulation the (b)(2) obligation may or may not be retired following the D-1641 step. CalSim-II logic must be developed to control the flow of the model depending on the status of the (b)(2) account at the end of the D-1641 step. This conditional flow is depicted in Figure 12.

INCLUDING MINIMUM INSTREAM FLOWS FOR THE SAN JOAQUIN RIVER BELOW FRIANT
The final proposed environmental compliance element is the inclusion of a minimum instream flow requirement for the San Joaquin River below Friant Dam. This is motivated by the recent ruling that called upon the Bureau of Reclamation to release sufficient water to restore the anadromous fishery in the reach between Friant and the Merced River confluence. While the ruling provided no specific guidelines as to release schedule required to satisfy this obligation, it is clear that a release regime will be a part of the environmental regulatory structure in the future and needs to be implemented in CalSim-II. The following work plan steps are needed to accomplish this goal.

Activity 1: Define a release schedule
As part of the failed settlement negotiations, several proposed release regimes for the lower San Joaquin River were developed. This task would involve deciding on two flow regimes from the proposed alternatives that will bracket the potential flow regime.

Activity 2: Implement the Friant Release Logic
Add WRESL code to CalSim-II that can read the release requirements from a look-up table.

Activity 3: Perform Sensitivity Analysis on the two Release Regimes
Run the model with both release regimes and assess the sensitivity of model results to the difference. If the model is highly sensitive, two baselines may be needed. If the model is insensitive, institute a compromise between the two as part of the CalSim-II baseline.

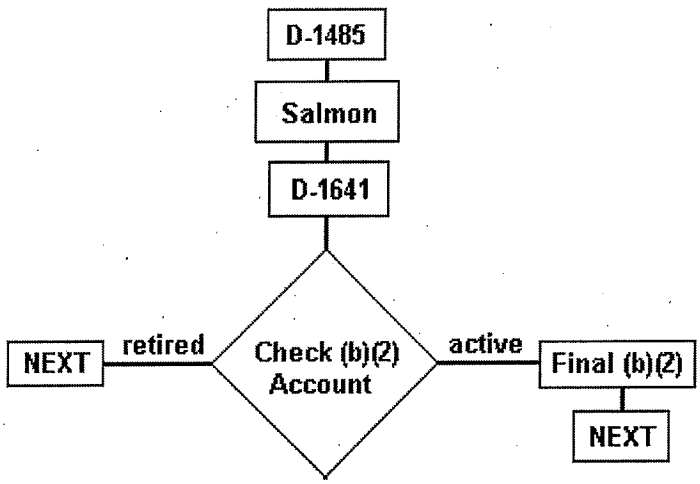

Figure 12: Proposed CalSim-II Flow Chart

Environmentally Preferred CalSim-II Formulation Work Plan

As could reasonably be expected, the definition of an environmentally preferred CalSim-II formulation is a more ambitious activity than the comparison of the current model formulation against a standard of regulatory compliance. It implies that the management of California water systems will be adjusted until the point that ecosystems protected under current law are restored rather than a legalistic determination of whether or not the model accurately represents current regulations that may not be meeting restoration objectives. While the preceding discussion focusing on the full environmental compliance workplan was quite focused and detailed, the following discussion of an environmentally preferred formulation will be broader. In addition, our suggestions regarding required modifications to the CalSim-II code associated with the environmentally preferred formulation will be more strategic and less prescriptive.

With this qualification on the table, our conclusions after having completed the environmental review are that the work plan for creating a full environmental compliance formulation should focus on:

- Adapting several existing regulations to conform more with future conditions that are either anticipated or desired and would avoid the legal impacts associated with a failure to achieve real aquatic ecosystem restoration.
- Introducing operational flexibility to the CalSim-II code so that alternative sets of environmental flow regimes, beyond the establishment of minimum instream flows, can be simulated and evaluated.

In each case, several existing regulations or alternative flow regimes are presented. For each, a possible approach for CalSim-II modifications associated with the specific regulation or regime are summarized without defining a specific set of activities required to implement these modifications. These activities can be developed once an agreement has been reached to implement a specific element of the environmentally preferred formulation.

Adapting the Representation of Existing Regulations

The following changes to specific regulations are proposed for the environmentally preferred CalSim-II formulation. As with the full compliance workplan, these items are not meant to be exhaustive as a comprehensive inventory of all existing regulations was not performed. They are representative, however, of the kind of incremental improvements in the environmental regulatory structure that may be of interest.

Changes to the Vernalis Salinity Standard

Action: CalSim-II should be reformulated to evaluate an EC standard on the San Joaquin River at a point upstream of the Stanislaus River confluence. The contribution of a San Joaquin River fishery release schedule from Friant Dam should be considered as a source of water to help meet this standard. Doing so will dramatically reduce the amount of water that needs to be released from New Melones Dam to dilute the salt load at Vernalis, shifting responsibility for San Joaquin salinity control to all water users on the San Joaquin River.

Possible Approach: This can be accomplished by reconfiguring reservoir release arcs upstream of the Stanislaus to include sub-arcs for meeting the salinity standard. CalSim-II is incapable of directly evaluating salinity as a function of flow, so this suggestion requires that new empirical relationships between flow and salinity be developed with higher spatial and temporal resolution than the flow salinity relationship now used to control the Vernalis salinity standard.

Shift the position of X2

Action: The X2 compliance point should be moved to the western Delta when this would most benefit conditions for Delta-dependent species. Closing the Delta Cross Channel Gates as recommended in the AFRP to assist salmon smolt outmigration will affect the location of X2 and move it further to the west than would otherwise be the case. Limiting Delta export pumping when smolts are in the Delta will also result in X2 being further to the west. The combined effect of changes and Delta operations and the maintenance of X2 in the western Delta needs to be evaluated in CalSim-II.

Possible Approach: Evaluate the latest scientific understanding concerning the estuarine water quality needs of key species during their various life stages in order to refine where the X2 standard should be set. Update the Kimmerer-Monismith equation and the supporting data tables to accommodate this refined understanding, including some consideration of the operation of the cross channel gates and restrictions on Delta exports. Introduce these changes into CalSim-II.

Changes to Folsom/Nimbus Operations

Action: A portion of Folsom reservoir storage space should be held in reserve to assure adequate water supply for maintaining targeted instream flows and water temperatures for salmonid fishes at levels identified by AFRP and/or Sacramento Water Forum.

Possible Approach: This can be accomplished through either the development of a dummy reservoir, or the adjustment of the "dead storage" level to absorb target storage reservations. Dead storages have very high weights, which means that the model resists releasing from the dead storage pool until the most severe conditions are encountered.

Action: Increases in Sacramento Water Forum demand above current levels should have lower priority than instream flow, temperature and reservoir reserves for environmental use.

Possible Approach: Incremental increases to Sacramento River withdrawals beyond the 2000 Level of Development could be performed in cycles subsequent to those considering environmental flow objectives, and be given a weight corresponding to junior water rights holders or interruptible deliveries.

Action: Reduce reliance on the American River for maintaining Delta water quality standards and cap Folsom/Nimbus releases for the purpose of meeting Delta outflow requirements at 4000 cfs. This would result in greater sharing of the responsibility for meeting Delta water quality standards between all Sacramento

Valley tributaries. It may also be possible to share this responsibility with San Joaquin Valley tributaries in light of the fact that upper San Joaquin River releases will most likely occur in the future.

Possible Approach: This suggestion requires the inclusion of non-CVP reservoirs (particularly Oroville) in the call for both X2 and the Water Quality standards within the ANN. The cap on reservoir releases is, however, relatively straightforward to achieve in CalSim, as it would require logic similar to the manner in which orchards downstream of New Melones are protected from high flows. Spreading responsibility for Delta water quality standards to the San Joaquin River tributaries would require the introduction of feedback between North of Delta operations and the simulated San Joaquin River Delta inflow contribution.

Modify Delta Export Restrictions

Action: The benefits of enhanced Delta outflow, as well as more balanced Delta inflows associated with changes to Folsom/Nimbus operations, should be complemented by increased constraints on exports. During the February 1-June 15 period, exports should be capped at 35% of total inflow and/or <200% of Vernalis flow (2:1 export:Vernalis ratio).

Possible Approach: The current configuration of CalSim-II could be changed to accommodate this policy suggestion without major revision.

Action: VAMP (enhanced San Joaquin tributary flows + curtailed exports) should be expanded from 31 days to 61 days (April 1- May 31). The upper San Joaquin River releases should be included as a potential contribution to satisfying VAMP.

Possible Approach: The current configuration of CalSim-II could be changed to accommodate this policy suggestion without major revision.

Action: From October 1-Feb 29, a total of 60 days of DCC gate closures should be allowed.

Possible Approach: The current configuration of CalSim could be changed to accommodate this policy suggestion without major revision.

Refinement of the (b)(2) Accounting Rules

Action: Offset and Reset accounting rules should be used. If (b)(2) water is released from a reservoir and the reservoir subsequently fills and spills, the amount of water released from the reservoir earlier in the water year should not be charged to the (b)(2) account. If (b)(2) water is used to curtail CVP exports and the CVP responds by concurrently reducing reservoir releases that had been supporting some (or all) of the higher export rate, (b)(2) should only be charged for the difference.

Possible Approach: When (b)(2) was originally implemented, the Offset/Reset accounting rules were coded into CalSim-II. Although CalSim-II has undoubtedly changed in configuration since Offset/Reset was abandoned, most of the former code should be usable in re-establishing the old accounting system in the current model.

Action: The "zero credit" treatment of the (b)(2) metric should be eliminated. When the (b)(2) step produces release and export metrics are less than the D-1485 "baseline" the (b)(2) account should be credited by the amount of the difference.
Possible Approach: The current configuration of CalSim-II could be changed to accommodate this policy suggestion without major revision.

ALLOWING FOR EVALUATION OF ALTERNATIVE FLOW REGIMES

As stated at the very beginning of this report, the natural flow regime that characterizes the rivers of the Central Valley has been significantly modified by the water development that has taken place over the course of the past 100 years. While fully recreating this natural hydrology is not possible given the extent to which California relies on the installed hydraulic infrastructure, it is important to explore the degree to which system operations could be modified to mimic the natural hydrology within the context of the multiple objectives to which these operations respond. Under an environmentally preferred formulation, CalSim-II would be able to contribute to this sort of evaluation. CalSim-II already is able to handle environmental constraints related to minimum flow and acceptable rates of change in stream flow. Under an environmentally preferred formulation, this functionality should be used to investigate alternative regulatory regimes, such as full implementation of the AFRP recommendations. In addition, however, CalSim-II functionality should be added to accommodate the following potential changes in the flow regime that are of interest to the environmental community.

1. Period High Flow Events

Action:

All streams should have regularly occurring high flows that help restore the riparian forest, move and sort gravel, clean out silt from deep holes in the river bed, topple trees to create large woody debris in the stream and help maintain the naturally occurring conditions that depend on periodic high water. These high flow events need to recede at a rate consistent with the needs of newly germinating plants in the riparian forest. Appropriate high flow levels and the rate at which they recede will need to be determined for each stream. Current ecological understanding suggests that such events should occur once every five to ten years.

All the streams do not need to flood in the same year, though when storm induced floods do occur, the ramping down of the high water should be done at the rate needed for new riparian seedlings to become established. When natural flooding and receding doesn't occur, it should be scheduled and the flows accounted for in the long-term operation of upstream dams. Done in a coordinated manner, these flood flow releases can arrive in the Delta to meet the needs of the export pumps. For example, while some rivers are "flooding" in one winter, other rivers could be experience "man made" drought conditions. The flows into the delta are stable but the streams are benefiting from periodic, scheduled "floods".

2. Summer Low Flows

Action:

It is not natural to have high summer flows on the Sacramento, Feather, Yuba, American and other rivers in California's Central Valley. Presently these streams run high in the summer to meet water export demands in the Delta. The preferred condition should be a changed in how water is stored and delivered to the south via the Delta so that stream flows can drop in the summer and rise in the winter.

Until the infrastructure of Delta island reservoirs, groundwater conjunctive use reservoirs or local southern California water supplies are built, the best that can be done is an adaptive management plan of rotating low flows for these different streams. Both the volume and duration of low flows need to be evaluated for invasive weed reduction and restoration benefits.

The ability to investigate these components of the flow regime will require the development of new WRESL code. The actual design of software upgrades will be developed should the proposed functionality be included in a future environmentally preferred formulation of the CalSim-II model.

Conclusions

Having completed this environmental review of the CalSim-II model, we are left with the profound impression that it is not a tool that can – under its current formulation – fully address the legally required water management objectives. CalSim-II is, after all, a tool that has been designed to determine how best to operate the state's hydraulic infrastructure in ways that maximize the satisfaction of contractual demands. This reality is a result of both the history of water model development in California and a general analytical approach that has held sway for decades in the field of water resources planning and analysis. This approach holds that the environment is a constraint on system operations, not one of the objectives for which the system should be managed. In order to create a tool that can investigate water management innovations designed to comply with the law and restore the environment, it is not simply a matter of adjusting a few input parameters. Instead, a reformulation of the model along the lines described in this document is needed.

CalSim-II holds that the environment is a constraint on system operations, not one of the objectives for which the system should be managed. In order to create a tool that can investigate water management innovations designed to comply with the law and restore the environment, it is not simply a matter of adjusting a few input parameters.

This philosophy of including the environment as an objective in water resources management is gaining credence around the world. Unfortunately, in California we cannot get to this point if we limit ourselves to the current version of CalSim-II. On the positive side, it is clear that no one views the current version of CalSim-II as the final and definitive water planning tool. An effort is underway to develop CalSim-III, which will respond to many of the critiques that have been offered about the model in recent months and years.

The conclusions of this report are offered to constructively contribute to this evolution. We feel that they will elevate, when implemented, aquatic ecosystem restoration to a place alongside of the other water management objectives in the system as is consistent with the imperatives of law and policy. A failure to respond to these critiques would demonstrate, on the other hand, that the water management community has little interest in viewing ecosystem restoration as more that a nettlesome constraint that has to be dealt with, preferably in the most minimal fashion. This would represent a division more profound than some varying professional opinions about the best way to model a complex water resource system.

Attachment 7

UNITED STATES DISTRICT COURT

EASTERN DISTRICT OF CALIFORNIA

NATURAL RESOURCES DEFENSE COUNCIL, et al.,

Plaintiffs,

v.

DIRK KEMPTHORNE, in his official capacity as Secretary of the Interior, et al.,

Defendants.

CALIFORNIA DEPARTMENT OF WATER RESOURCES,

Defendant-Intervenor,

STATE WATER CONTRACTORS,

Defendant-Intervenor,

SAN LUIS & DELTA-MENDOTA WATER AUTHORITY, et al.,

Defendant-Intervenors.

1:05-cv-1207 OWW GSA

INTERIM REMEDIAL ORDER FOLLOWING SUMMARY JUDGMENT AND EVIDENTIARY HEARING

Following the Court's May 25, 2007, Order Granting In Part and Denying In Part Plaintiffs' Motion for Summary Judgment, finding the Long-Term Central Valley Project Operations Criteria And Plan ("OCAP") Biological Opinion ("BiOp") unlawful and

inadequate, as well as the accompanying Delta Smelt Risk Assessment Matrix ("DSRAM") adopted to implement the 2005 OCAP BiOp, in violation of the Administrative Procedure Act, 5 U.S.C. § 705 et seq. (Doc. 323), a seven-day evidentiary hearing was held on August 21-24 and 29-31, 2007, to determine what interim remedies to impose. Based on the contemporaneous Findings of Fact and Conclusions of Law, after review of all the evidence, seven days of testimony, the parties' memoranda of law, and fully considering all the parties' oral arguments and proposed interim remedies, the Court enters the following:

I. INTERIM REMEDIAL ORDER

A. REMAND

1. Completion of New Biological Opinion

The Court orders the 2005 OCAP BiOp on the effects of the coordinated Central Valley Project ("CVP") and State Water Project ("SWP") operations on the Delta smelt, REMANDED to the United States Fish & Wildlife Service ("FWS") for further consideration consistent with this Court's orders and the requirements of law. This remand shall conclude not later than September 15, 2008, at which time FWS shall issue a new Biological Opinion ("BiOp") to the U.S. Department of the Interior, U.S. Bureau of Reclamation ("Reclamation"), and the California Department of Water Resources ("DWR"), as an applicant and joint operator, on the effects of the operation of the CVP and SWP upon the Delta smelt.

2. Vacatur

To avoid the potentially draconian consequences of operating the CVP and SWP without incidental take authority, this remand is made WITHOUT VACATUR. The operation of the CVP and SWP by Interior, Reclamation, and DWR, respectively, during this interim period, shall not violate the additional conditions set forth below.

B. INTERIM INJUNCTIVE RELIEF

Based on the previous findings of the imminent peril to the survival of the Delta smelt and adverse effects on its critical habitat, a preliminary injunction shall issue restraining Interior, Reclamation, and DWR, their officers, employees, agents, and all those acting in concert with them in those parties' operation of the CVP and SWP, respectively from taking any actions that are contrary to, inconsistent with, or that violate the following interim remedial measures to prevent the extinction of the Delta smelt, a threatened species, or that would destroy or adversely modify its critical habitat. This preliminary injunction shall remain in effect until the remand of and reconsultation on the BiOp is completed and a new BiOp is issued by FWS, on or before September 15, 2008, or further order of the Court, whichever shall first occur.

1. Surveys And Monitoring

a. Delta Smelt Surveys

Reclamation, DWR, and any other party shall take no action to prevent the full implementation of surveys for the Delta smelt which have been conducted by the California Department of Fish &

Game ("CDFG") including, but not limited to, the Fall Midwater Trawl ("FMWT"), Summer Townet, Spring Kodiak Trawl, and 20mm surveys.

2. Frequency of Sampling for Delta Smelt

Reclamation shall increase the frequency of sampling for Delta smelt that may be entrained at the Jones Pumping Plant to a minimum of twenty-five percent (25%) of the time, at regular intervals, whenever the Jones Pumping Plant is diverting water into the Delta-Mendota Canal.

a. Sampling Triggers

Sampling at this frequency shall commence upon either: (1) an increase in the average daily flow of the Sacramento River at Freeport to 25,000 cubic feet per second ("cfs"); or (2) when there is an increase in the average daily flow of the San Joaquin River at Vernalis by ten percent (10%) over three consecutive days after December 25; (3) survey data from the FMWT or Kodiak Survey indicate Delta smelt have moved to and are moving upstream of the confluence of the Sacramento and San Joaquin Rivers and into the Delta or January 15.

b. Larval Delta Smelt Monitoring

(1) Monitoring Triggers

Reclamation and DWR shall each monitor for the presence of larval or juvenile Delta smelt, that are less than twenty (20) millimeters (mm) in length, by Reclamation at the Jones Pumping Plant and by DWR at the Banks Pumping Plant. Such monitoring

shall occur when the pumping plants are diverting water into the Delta-Mendota Canal or the California Aqueduct, respectively. Such monitoring shall provide for sampling at least once every six (6) hours during periods in which the pumping plants are operating.

(2) Timing of Monitoring

Monitoring for the presence of larval or sub-twenty mm juvenile Delta smelt shall begin at the onset of spawning by Delta smelt as shown by: (1) the presence of spent female Delta smelt in the Spring Kodiak Trawl survey or at either export plant's salvage facility; or (2) when water temperatures in the Delta reach 12°C as determined by the average of the daily water temperatures at the Mossdale, Antioch, and Rio Vista Monitoring Stations; or (3) when larval Delta smelt are detected in the 20mm survey, whichever occurs first.

(3) Termination of Monitoring

Such monitoring shall end June 15 or a minimum of 5 consecutive days without detection of larval or juvenile Delta smelt at the CVP or SWP facilities, whichever comes last.

3. Flow Restrictions

a. Winter Pulse Flows

(1) If the triggering conditions set forth below in subparagraph I.B.3.a.(2) are met, Reclamation and DWR shall modify the operations of the CVP and SWP to achieve an average net upstream flow in Old and Middle Rivers ("OMR") not to exceed

2,000 cfs over the implementation period described in subparagraph (3).

(2) The action described in subparagraph (1) shall be initiated within three (3) calendar days after December 25 when the average daily water turbidity exceeds twelve (12) nephelometric turbidity units ("NTU") at Prisoner's Point, Holland Tract, or Victoria Canal, unless, at that time, the three-day average of flow in the Sacramento River at Freeport exceeds 80,000 cfs.

(3) This action shall end after a period of ten (10) days or when one of the following terminating conditions is met, whichever occurs first: (1) the three-day average of flow in the Sacramento River at Freeport exceeds 80,000 cfs; (2) the onset of spawning by Delta smelt occurs as shown by the presence of spent female Delta smelt in the Spring Kodiak Trawl survey or at either export plant's salvage facilities; (3) when larval Delta smelt are detected in the 20mm survey or at either export Plant's salvage facility; or when water temperature in the Delta reach 12°C determined by the average of the daily water temperatures at the Mossdale, Antioch, and Rio-Vista Monitoring stations.

b. Pre-Spawning Adults

(1) Reclamation and DWR shall operate the CVP and SWP to achieve a daily average net upstream (reverse) flow in the OMR not to exceed 5,000 cfs on a seven-day running average. In the event that the three-day average of flows in the Sacramento River is in excess of 80,000 cfs, when this action would otherwise commence, the action is not required to be undertaken until such

time as the three-day average of flow in the Sacramento River at Freeport falls below 80,000 cfs.

(2) This action shall commence immediately following the conclusion of the action described in subparagraph I.B.3.a., above, or on January 15, whichever is earlier.

(3) This action concludes at the onset of the spawning by Delta smelt as shown by: (1) the presence of spent female Delta smelt in the Spring Kodiak Trawl survey or at either export plant's salvage facility; (2) when larval Delta smelt are detected in the 20mm survey or at either export pumping plant's salvage facility; or (3) when water temperature in the Delta reaches 12°C determined by the average of the daily water temperatures at the Mossdale, Antioch and Rio Vista monitoring stations.

4. Larval And Juvenile Delta Smelt

a. Reclamation and DWR shall operate the CVP and SWP to achieve a daily average net upstream flow in OMR of between 750 and 5,000 cfs on a seven-day running average. The specific biological flow objective within this range shall be set by FWS, in consultation with Reclamation and DWR, to be determined on a weekly basis and based upon the best available scientific and commercial information concerning the distribution and status of the Delta smelt.

b. This action shall commence immediately upon the onset of spawning of Delta smelt as shown by: (1) the presence of spent female Delta smelt in the Spring Kodiak Trawl survey or at either export plant's salvage facility; (2) the larval Delta smelt are

detected in the 20mm survey or at either export plant's salvage facility; (3) when water temperature in the Delta reaches 12°C determined by the average of the daily water temperatures at the Mossdale, Antioch and Rio Vista monitoring stations.

c. This action shall continue at each facility until, when in the reasonable discretion of the Bureau, FWS, and DWR, the entrainment risk at each facility is abated, or June 20, whichever occurs first.

5. Vernalis Adaptive Management Plan

a. Reclamation and DWR shall continue to implement the Vernalis Adaptive Management Plan ("VAMP"), San Joaquin River flow enhancement and CVP and SWP export curtailment as specified under the VAMP experimental design.

b. This action shall commence on a date decided upon by the VAMP Steering Committee, but not later than May 1 and shall continue for thirty-one (31) calendar days after its initiation.

c. The requirement set forth in subparagraph I.B.4.a. shall not apply during the period in which the VAMP action is being implemented.

6. Barriers

a. Head of Old River Barrier

The installation of the spring Head of Old River Barrier by either DWR or Reclamation is prohibited until the end of VAMP action implementation.

b. Agricultural Barriers

Reclamation and DWR shall ensure that the tidal effects of the three south Delta agricultural barriers are minimized or avoided by tying open all flap gates on the barriers, from the time of their installation until the end of VAMP action implementation.

C. ADMINISTRATIVE DISCRETION

Nothing in this Order is otherwise intended to usurp or interfere with the exercise of Interior's, Reclamation's, FWS's, and DWR's discretion and expertise in their operation and management of the Projects, protection of the Delta smelt, and the implementation of the terms and conditions of this Interim Remedial Order.

It is the intent of this Interim Remedial Order that its terms and conditions be implemented to protect the interests of all parties and their constituents under the law and to achieve the minimum disruption and damage to their respective interests.

D. FEDERAL DEFENDANTS' ADDITIONAL MEASURES PENDING THE NEW BIOLOGICAL OPINION

Federal Defendants in their opening brief on injunctive relief identified measures that they committed to implement as necessary to prevent an irreversible or irretrievable commitment of resources under ESA Section 7(d) pending completion of a new Biological Opinion. [Fed. Def. Brief, Doc. 396 at pp. 19-20]. Federal Defendants committed, as of July 9, 2007, that:

a. The Bureau will not execute any long-term water service contracts with CVP contractors until the new Biological

Opinion is completed;

b. The Bureau will not implement new construction activities and long-term projects in the Delta until the new Biological Opinion is completed, including the South Delta Improvement Project, the Delta Mendota Canal/California Aqueduct Intertie Program, the Lower American River Flow Standards, and the Long Term Environmental Water Accounts;

c. The Bureau will "not increase exports from the south Delta and will operate Jones Pumping Plant within recent historical limits;" and

d. The Bureau has committed resources and staff to the continuing study of pelagic organism decline in the Delta.

These measures shall be implemented during the duration of this Order as Federal Defendants admit the measures are necessary to preserve the Delta smelt and its critical habitat.

E. PUBLIC HEALTH AND SAFETY EXCEPTION

This Interim Remedial Order shall not prevent Interior, Reclamation, or DWR from taking any action in operating the Projects that is reasonably necessary to protect human health or safety of the public, including, but not limited to, any act or omission reasonably necessary to protect the structural integrity of any CVP and SWP facility.

F. DURATION OF THIS ORDER

This Order shall take effect on the date it is filed and shall continue in effect until completion of the reconsultation on the OCAP and issuance of a new OCAP Biological Opinion, entry

of final judgment in this case, or further order of this Court; whichever first occurs.

G. STATUS REPORT

FWS shall provide the court and parties a status report on the progress of the Biological Opinion. FWS's status report shall be filed April 30, 2008.

IT IS SO ORDERED.

Dated: December 14, 2007

/s/ Oliver W. Wanger
UNITED STATES DISTRICT JUDGE

Attachment 8

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF CALIFORNIA

NATURAL RESOURCES DEFENSE COUNCIL, *et al.*, Plaintiffs, v. DIRK KEMPTHORNE, in his official capacity as Secretary of the Interior, *et al.*, Defendants, CALIFORNIA DEPARTMENT OF WATER RESOURCES, Defendant-Intervenor, STATE WATER CONTRACTORS Defendant-Intervenor, SAN LUIS & DELTA-MENDOTA WATER AUTHORITY, *et al.*, Defendant-Intervenors,	1:05-CV-01207 OWW (TAG) ORDER GRANTING IN PART AND DENYING IN PART PLAINTIFFS' MOTION FOR SUMMARY JUDGMENT (DOC. 231/232)

I. INTRODUCTION

This case concerns the effect on a threatened species of fish, the Delta smelt (*Hypomesus transpacificus*)[1], of the coordinated operation of the federally-managed Central Valley Project ("CVP") and the State of California's State Water Project

[1] The Delta smelt was listed as a threatened species under the ESA, March 5, 1992, 58 Fed.Reg. 12863.

("SWP"), among the world's largest water diversion projects. Both projects divert large volumes of water from the California Bay (Sacramento-San Joaquin) Delta ("Delta") and use the Delta to store water.

For over thirty years, the projects have been operated pursuant to a series of cooperation agreements. In addition, the projects are subject to ever-evolving statutory, regulatory, contractual, and judicially-imposed requirements. The Long-Term Central Valley Project and State Water Project Operations Criteria and Plan ("2004 OCAP" or "OCAP") surveys how the projects are currently managed in light of these evolving circumstances. At issue in this case is a 2005[2] biological opinion ("BiOp"), issued by the United States Fish and Wildlife Service ("FWS" or "Service") pursuant to the Endangered Species Act ("ESA"), which concludes that current project operations described in the OCAP and certain planned future actions will not jeopardize the continued existence of the Delta smelt or adversely modify its critical habitat.

The Delta smelt is a small, slender-bodied fish endemic to the Delta. Historically, Delta smelt could be found throughout the Delta. Although abundance data on the smelt indicates that the population has fluctuated wildly in the past, it is undisputed that, overall, the population has declined significantly in recent years, to its lowest reported volume in fall 2004.

[2] The biological opinion was first issued in July 2004. Then, after reconsultation, was reissued in February 2005.

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In this case, Plaintiffs, a coalition of environmental and sportfishing organizations, challenge the 2005 BiOp's no jeopardy and no adverse modification findings as arbitrary, capricious, and contrary to law under the Administrative Procedure Act, 5 U.S.C. §§ 702 et seq. Before the court for decision is Plaintiffs' motion for summary judgment. Among other things, Plaintiffs allege that the BiOp fails to consider the best available science, relies upon uncertain (and allegedly inadequate) adaptive management processes to monitor and mitigate the potential impacts of the OCAP, fails to meaningfully analyze whether the 2004 OCAP will jeopardize the continued existence of the Delta smelt, fails to consider the OCAP's impact upon previously designated critical habitat, and fails to address the impacts of the entire project.

Separate opposition briefs were filed by the Federal Defendants (Doc. 242), the Department of Water Resources ("DWR") (Doc. 246), and the State Water Contractors ("SWC") (Doc. 241), along with a final brief filed collectively by San Luis & Delta-Mendota Water Authority, Westlands Water District, and the California Farm Bureau Federation ("the San Luis Parties") (Doc. 247).

II. THE ENDANGERED SPECIES ACT

A recent Ninth Circuit opinion in *National Wildlife Federation v. National Marine Fisheries Service*, 481 F.3d 1224 (9th Cir. 2007) [hereinafter "*NWF v. NMFS*"], succinctly summarizes the relevant provisions of the ESA:

> The ESA requires federal agencies to "insure that any action authorized, funded, or carried out by such agency ... is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [designated critical] habitat...." 15 U.S.C. § 1536(a)(2). The ESA imposes a procedural consultation duty whenever a federal action may affect an ESA-listed species. *Thomas v. Peterson*, 753 F.2d 754, 763 (9th Cir.1985). To that end, the agency planning the action, usually known as the "action agency," must consult with the consulting agency. This process is known as a "Section 7" consultation. The process is usually initiated by a formal written request by the action agency to the consulting agency. After consultation, investigation, and analysis, the consulting agency then prepares a biological opinion. *See generally Ariz. Cattle Growers' Ass'n v. U.S. Fish & Wildlife Serv.*, 273 F.3d 1229, 1239 (9th Cir.2001). In this case, the action agencies are the U.S. Army Corps of Engineers and the Bureau of Reclamation, while the consulting agency is NMFS.
>
> The consulting agency evaluates the effects of the proposed action on the survival of species and any potential destruction or adverse modification of critical habitat in a biological opinion, 16 U.S.C. § 1536(b), based on "the best scientific and commercial data available," *id.* § 1536(a)(2). The biological opinion includes a summary of the information upon which the opinion is based, a discussion of the effects of the action on listed species or critical habitat, and the consulting agency's opinion on "whether the action is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat...." 50 C.F.R. § 402.14(h)(3). In making its jeopardy determination, the consulting agency evaluates "the current status of the listed species or critical habitat," the "effects of the action," and "cumulative effects." *Id.* § 402.14(g)(2)-(3). "Effects of the action" include both direct and indirect effects of an action "that will be added to the environmental baseline." *Id.* § 402.02. The environmental baseline includes "the past and present impacts of all Federal, State or private actions and other human activities in the action area" and "the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation." *Id.* If the biological opinion concludes that jeopardy is not likely and that there will not be adverse modification of critical habitat, or that there is a "reasonable and prudent alternative[ ]" to the agency action that avoids jeopardy and adverse modification and that the incidental taking of endangered or threatened species will not violate section 7(a)(2), the consulting agency can issue an "Incidental Take Statement" which, if followed, exempts the action agency from the

> prohibition on takings found in Section 9 of the ESA. 16 U.S.C. § 1536(b)(4); *ALCOA v. BPA*, 175 F.3d 1156, 1159 (9th Cir.1999).
>
> ***
>
> The issuance of a biological opinion is considered a final agency action, and therefore subject to judicial review. *Bennett v. Spear*, 520 U.S. 154, 178, 117 S.Ct. 1154, 137 L.Ed.2d 281 (1997); *Ariz. Cattle Growers' Ass'n*, 273 F.3d at 1235.

Id. at *2-*3.

III. FACTUAL BACKGROUND

For over thirty years the state and federal agencies charged with management of the CVP and SWP have operated the projects in an increasingly coordinated manner pursuant to a Coordinated Operating Agreement ("COA"). The COA, which dates to 1986, has evolved over time to reflect, among other things, changing facilities, delivery requirements, and regulatory restrictions. The most recent document surveying how the COA is implemented in light of these evolving circumstances is the 2004 Operating Criteria and Plan ("2004 OCAP" or "OCAP") issued June 30, 2004. (AR 489-728.)[3]

A. Overview of the 2004 OCAP.

The OCAP begins with a "Purpose of Document" section which states:

> This document has been prepared to serve as a baseline description of the facilities and operating environment of the Central Valley Project (CVP) and State Water Project (SWP). The Central Valley Project - Operations and Criteria Plan (CVP-OCAP) identifies the many factors influencing the physical and institutional conditions and decision-making process under which the

[3] All "AR" references are to the administrative record provided by the U.S. Fish and Wildlife Service..

> project currently operates. Regulatory and legal instruments are explained, alternative operating models and strategies described.
>
> The immediate objective is to provide operations information for the Endangered Species Act, Section 7, consultation. The long range objective is to integrate CVP-OCAP into the proposed Central Valley document. It is envisioned that CVP-OCAP will be used as a reference by technical specialists and policymakers in and outside the Bureau of Reclamation (Reclamation) in understanding how the CVP is operated. The CVP-OCAP includes numeric and nonnumeric criteria and operating strategies. Emphasis is given to explaining the analyses used to develop typical operating plans for simulated hydrologic conditions.
>
> All divisions of CVP are covered by this document, including the Trinity River Division, Shasta and Sacramento Divisions, American River Division and Friant Division.

(AR 506.)[4]

The introductory chapter provides an overview of all of the physical components of the CVP and SWP (AR 507-520), as well as all of the relevant legal authorities affecting CVP operations (508-512).

Chapter 2, explains, among other things, that water needs assessments have been performed for each CVP water contractor, to confirm each contractor's past beneficial use in order to anticipate future demands. (AR 521.) Chapter 2 also reviews the 1986 COA and how it is implemented on a daily basis by Reclamation and DWR. (AR 523-25.) Also provided is a detailed overview of the "changes in [the] operations coordination

[4] Whether the 2004 OCAP is a "final agency action" for the purposes of the National Environmental Policy Act is at issue in a related lawsuit, *Pacific Coast Federation of Fishermen's Associations v. Gutierrez*, 1:06-cv-00245 OWW (TAG) ("*PCFFA*"). This overview of the OCAP does not prejudge the merits of the pending motion to dismiss in *PCFFA*.

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environment since 1986," which include:

- Changes due to temperature control operations on the Sacramento River;
- Increases in the minimum release requirements on the Trinity River;
- Implementation of CVPIA 3406(b)(2) and Refuge Water Supply contracts;
- Commitments made by the CVP and SWP pursuant to the Bay-Delta Accord and the subsequent implementation of State Water Resources Control Board ("SWRCB") Decision-1641;
- The Monterey Agreement;
- The Operation of the North Bay Aqueduct (which was not included in the 1986 COA).
- The SWP's commitment to make up for 195,000 acre-feet of pumping lost to the CVP due to SWRCB Decision 1485;
- Implementation of the Environmental Water Account; and
- Constraints imposed by various endangered species act listings, including that of the Sacramento River Winter-Run Chinook Salmon, the Sacramento River Spring-Run Chinook Salmon, the Steelhead Trout, and the Delta Smelt (which resulted in the issuance of biological opinions in 1993, 1994, and 1995 concerning CVP/SWP operations and the South Delta Temporary Barriers Biological Opinion in 2001)

(AR 525-28.) The OCAP also reviews the regulatory standards imposed by SWRCB D-1641, which include water quality standards based on the geographic position of the 2-parts-per-thousand

isohale (otherwise known as "X2"), a Delta export restriction standard known as the export/inflow (E/I) ratio, minimum Delta outflow requirements, and Sacramento River and San Joaquin River flow standards. (AR 530-537.) In addition to imposing requirements, D-1641 granted the Bureau and DWR permission to use each project's capabilities in a coordinated manner. (AR 537-38.)

This is not a complete overview of the projects' operations covered in the OCAP. Numerous regulatory and operational changes have taken place in recent years. As the OCAP's "Purpose of Document" section explains, the immediate objective of the OCAP is to lay out all such regulatory and other operational information so that ESA Section 7 consultation can proceed to evaluate how project operations will effect the Delta smelt under various projected future conditions.

B. **Applying the ESA to Project Operations**.

Because endangered and/or threatened species, including the Delta smelt, reside in the area affected by the CVP and SWP, the 2004 OCAP, administered on behalf of the federal government by the Bureau of Reclamation ("Bureau"), must comply with various provisions of the ESA. Specifically, prior to authorizing, funding, or carrying out any action, the acting federal agency (in this case, the Bureau) must first consult with FWS and/or NMFS to "insure that [the] action...is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined...to be critical...." 16 U.S.C. § 1536(a)(2) [ESA § 7(a)(2)]. This form of

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consultation is called "formal consultation," and concludes with the issuance of a biological opinion. 50 C.F.R. § 402.02.

Alternatively, under certain circumstances, a federal agency may pursue "early consultation," on behalf of an agency or private party (referred to as a "prospective applicant") who will require formal approval or authorization to undertake a project. *Id.* Early consultation may be requested when the prospective applicant "has reason to believe that an endangered species or a threatened species may be present in the area affected by this project and that implementation of such action will likely affect such species." 50 C.F.R. § 402.11(b). The result of early consultation is a "preliminary biological opinion," the contents of which are "the same as for a biological opinion issued after formal consultation except that the incidental take statement provided with a preliminary biological opinion does not constitute authority to take listed species." § 402.11(e). Subsequently, the preliminary biological opinion may be "confirmed" after the prospective applicant applies to the federal agency for a permit or licence. Once a request for confirmation is received, the FWS must either confirm that the preliminary biological opinion stands as the final biological opinion or must request that the federal agency initiate formal consultation. § 402.11(f).

In this case, the 2004 OCAP BiOp[5] contemplates increases in

[5] The OCAP itself does not plan for increased pumping or the construction or operation of any new facilities, nor does it describe or model flow regimes under any of these future plans. These planned operational changes are set forth in the BA and the BiOp. (*See* AR 381-423 (describing the effects of those actions

water diversions and the construction of new facilities in the Delta. (AR 256-271.) The maximum daily diversion rate in Clifton Court Forebay will increase from 6,680 cubic feet per second (CFS) to 8,500 CFS (27% increase in pumping) and eventually to 10,300 CFS (54% increase). Permanent barriers within the south Delta will be constructed and operated. An intertie between the California Aqueduct and the Delta-Mendota Canal will be constructed and operated. Water deliveries from the American River will be doubled. New deliveries of CVP water to the Freeport Regional Water Project will be made. Water transfers resulting in an annual 200,000 to 600,000 acre-feet increase in Delta exports will result. (AR 256, 339-40, 357-59, 371, 382-83, 465.)

The Bureau submitted some of these operational changes for formal consultation with FWS concerning their impact on the Delta smelt, while other changes were subject only to early consultation:

> This biological opinion covers formal and early consultation for the operations of the CVP and SWP. The formal consultation effects described in this biological opinion cover the proposed 2020 operations of the CVP including the Trinity River Mainstem ROD (Trinity ROD) flows on the Trinity River, the increased

included in formal consultation, including re-operation of the Trinity River, increased demands on the American River, operation of the Freeport Regional Water Project ("FRWP"), and operation of an intertie between the Delta-Mendota Canal and the California Aqueduct); AR 357-61 (describing the "items for early consultation," including operation of components of the South Delta Improvement Project, which calls for pumping at Banks to increase to 8500 cfs, operation of permanent barriers in various places within the Delta, the operation of a long term EWA, the use of CVP/SWP capacity to facilitate expanded water transfers, and further integration of CVP/SWP operations.)

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> water demands on the American River, the delivery of CVP water to the proposed Freeport Regional Water Project (FRWP), water transfers, the long term Environmental Water Account (EWA), the operation of the Tracy Fish Facility, and the operation of the SWP-CVP intertie. The effects of operations of the SWP are also included in this opinion and include the operations of the North Bay Aqueduct, the Suisun Marsh Salinity Control Gates, the Skinner Fish Facility and water transfers.
>
> Early consultation effects include the effects of operations of components of the South Delta Improvement Program (SDIP). These operations include pumping of 8500 cubic feet per second (cfs) at the SWP and Banks Pumping Plant (hereafter referred to as 8500 Banks), permanent barrier operations in the South Delta, the long term EWA, water transfers, and CVP and SWP operational integration. There are two separate effects sections in this biological opinion, one for Formal Consultation and one for Early Consultation. In addition, there is an incidental take for formal consultation and a preliminary incidental take for early consultation.

(AR 2, 248.)[6]

C. History of This Lawsuit.

On July 30, 2004, FWS issued a Biological Opinion (the "2004 OCAP BiOp"), addressing both formal and early consultation for the above-described OCAP actions. (AR 1.)[7]

On August 4, 2004, the Ninth Circuit decided *Gifford Pinchot*

[6] The first step in the consultation process is usually the preparation of a Biological Assessment ("BA") by the action agency (in this case, the Bureau), the purpose of which is to "evaluate the potential effects of the action on listed [] species and designated [] critical habitat and determine whether any such species or habitat are likely to be adversely affected by the action...." 50 C.F.R. § 402.12(a). In this case, the Bureau issued its BA regarding the "Long-Term Central Valley Project and State Water Project Operations and Criteria Plan" on June 30, 2004. (AR 729.) The BA describes the project on which consultation is being held, both early and formal, in much the same terms as are used in the BiOp.

[7] Prior to 2004, the OCAP operated under Biological Opinions issued in 1993 and 1995.

Task Force v. United States Fish & Wildlife Serv., 378 F.3d 1059, 1069 (9th Cir. 2004), which held that the FWS's definition of "adverse modification" to critical habitat is an impermissible interpretation of the ESA because it focuses on whether critical habitat modifications would impact the survival of a species, effectively ignoring the statutorily-mandated goal of "recovery." On November 4, 2004, in response to this ruling, the Bureau requested reinitiation of consultation to address critical habitat issues.

Plaintiffs in this case, a coalition of non-profit conservation organizations, filed suit on February 15, 2005, alleging that the 2004 OCAP BiOp was legally inadequate in light of *Gifford Pinchot* and should be invalidated. (Doc. 1.) Plaintiffs named as defendants the Department of the Interior and the FWS. (*Id.*)

On February 16, 2005, FWS issued an amended BiOp (the "2005 OCAP BiOp," "OCAP BiOp," or "BiOp"), which superceded the 2004 OCAP BiOp. (AR 247.) The 2005 OCAP BiOp concludes that the coordinated operation of the SWP and CVP, including the proposed future actions, will not jeopardize the Delta smelt's continued existence. (AR at 469.) Although the BiOp recognizes that existing protective measures may be inadequate, the FWS concluded that certain proposed protective measures, including the EWA and a proposed "adaptive management" protocol would provide adequate protection. (*Id.*)

Since the filing of this complaint, Federal Defendants have reinitiated § 7 consultation and contend this case should be dismissed as moot, or stayed for a voluntary remand of the 2005

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BiOp without vacatur.

Plaintiffs filed a supplemental complaint on May 20, 2005, challenging the amended BiOp on various grounds. (Doc. 128 pt. 8.)

D. Delta Smelt Abundance.

Smelt once were one of the most common pelagic[8] fish in the Delta, having previously occupied the waters from "Suisun Bay and Montezuma Slough, upstream to at least Verona on the Sacramento River, and Mossdale on the San Joaquin River." (AR 365.) Smelt abundance has "declined irregularly" for at least the past 20 years. (AR 365-67.) FWS relies primarily upon two indices to monitor Delta smelt abundance, calculated from the Summer Tow Net Survey ("TNS") and the Fall Midwater Trawl ("FMWT"). (AR 366-67, 1022.) The TNS index, which measures the abundance and distribution of juvenile Delta smelt, constitutes "one of the more representative indices because the data have been collected over a wide geographic area (from San Pablo Bay upstream through most of the Delta) for the longest period of time (since 1959)." (AR 370.) Since 1983, except for three years (1986, 1993, and 1994), the TNS has remained consistently lower than ever previously recorded. (*Id.*)

The FMWT index, which measures the abundance and distribution of late juveniles and adult Delta smelt from San Pablo Bay to Rio Vista on the Sacramento River and Stockton on the San Joaquin River, is the second longest running survey

[8] Pelagic fish live in open water, generally away from vegetation or the bottom. (AR 365.) A significant amount of the smelt's habitat are the Delta waters and waters of surrounding areas.

(since 1967). The BiOp reviewed the FMWT trends as follows:

> Although this index has fluctuated widely (AR 9201-02, 9222), it has "declined irregularly over the past 20 years." (AR 370-71.) Since 1983, the FMWT has registered more low indices for more consecutive years than previously recorded. Until recently, except for 1991, this index has declined irregularly over the past 20 years. Since 1983, the delta smelt population has exhibited more low fall midwater trawl abundance indices, for more consecutive years, than previously recorded. The 1994 FMWT index of 101.7 is a continuation of this trend. This occurred despite the high 1994 summer townet index for reasons unknown. The 1995 summer townet was a low index value of 319 but resulted in a high FMWT index of 898.7 reflecting the benefits of large transport and habitat maintenance flows with the Bay-Delta Accord in place and a wet year. The abundance index of 128.3 for 1996 represented the fourth lowest on record. The abundance index of 305.6 for 1997 demonstrated that the relative abundance of delta smelt almost tripled over last years results, and delta smelt abundance continued to rise, peaking in 1999 to an abundance index of 863, only to fall back down to the low abundance indexes of 139 for 2002 and 213 for 2003.

(AR at 371.)

The 2004 FMWT index, which was not discussed in the BiOp, was calculated to be 74, the lowest ever recorded. (AR 9202.) (This omission forms the basis of one of Plaintiffs' challenges to the BiOp.) The survey was apparently released in December 2004, and was specifically cited to FWS in February 2005.

At the hearing on the summary judgment motions, Federal Defendants in substance argued that despite years of study, the abundance data for the annual Delta smelt population is fraught with uncertainties and "not enough is known about the species" to accurately and finitely measure with certainty the project's effects on Delta smelt. FWS maintains the one to two year life expectancy of the smelt also contribute to this lack of certainty.

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E. **Relationship Between Abundance and Project Operations.**

The BiOp cites several reasons for the smelt's decline. First, since the mid 1800s, mining, agricultural use, and levee construction caused the loss of a large portion of smelt habitat. (AR at 365.) Second, recreational boating in the Delta has resulted in the presence and propagation of "predatory non-native fish" and an increase in the rate of smelt erosion resulting from boat wakes. (*Id.*) Third, reduced water quality "from agricultural runoff, effluent discharge and boat effluent has the potential to harm the pelagic larvae and reduce the availability of the planctonic food source." (*Id.* at 366.) Finally, the BiOp acknowledges that "delta smelt have been increasingly subject to entrainment, upstream or reverse flows of waters in the Delta and San Joaquin River, and constriction of low salinity habitat to deep-water river channels of the interior Delta." (*Id.*) The BiOp acknowledges that these final adverse effects are "primarily a result of the steadily increasing proportion of river flow being diverted from the Delta by the Projects, and occasional droughts." (*Id.* (emphasis added).) The BiOp in no way quantifies the contribution of each of these factors to the smelt's decline. The parties dispute the extent to which project operations jeopardize the smelt.

F. **Relationship Between Smelt and "X2."**

Smelt are euryhaline (tolerant of a wide range of salinities), but generally occur in water with less than 10-12 parts per thousand (ppt) salinity. (AR at 362.) For a large part of its life span, Delta smelt are thought to be associated with the "freshwater edge of the mixing zone," where the salinity

is approximately 2 parts per thousand (often referred to as "X2"). (AR at 366.) The summer TNS index increases dramatically whenever X2 is located between Chipps and Roe islands. (*Id.*) Whenever the location of X2 shifts upstream of the confluence of the Sacramento and San Joaquin, either as a result of water diversions or natural conditions, smelt abundance decreases. (*Id.* at 371.)

G. **The Concept of "Salvage."**

The BiOp's "no jeopardy" conclusion relies on the concept of "salvage," which refers generally to the process of using mechanical devices to screen fish that would otherwise be entrained in project facilities (e.g., pumps) into holding tanks for transport to other parts of the Delta. (*See e.g.*, AR 321.) Unlike many other fish species in the Delta, Delta smelt do not survive the salvage process, "either due to stress and injury from handling, trucking and release, or from predation in or near the salvage facilities, the release sites, or in Clifton Court Forebay." (AR at 413.) As a result, for Delta smelt, FWS uses the terms salvage and entrainment essentially interchangeably. (*See id.* ("To simplify predictions of the difference in salvage (and by extension entrainment) between model scenarios....")[9]

Previous BiOps regarding CVP and SWP operations used salvage to set take limits. For example, the 1995 BiOp's incidental take statement set take exceedence levels for Delta smelt based on "[m]onthly average delta smelt salvage at the Federal and State

[9] The BiOp contradictorily acknowledges that "although salvage is used to index delta smelt take, it does not reliably index delta smelt entrainment." (AR 419.)

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Fish Facilities from 1980 to 1992 by water year type." (AR at 11765.) Essentially, take limits were set according to how much salvage had occurred in the past.

More recently, project managers, fisheries officials, and other experts came to the consensus that the salvage approach was insufficient on its own. For example, one DWR biologist noted that the singular focus on historic salvage had problems:

> Higher levels of take are allowed in below normal years merely because this is what the projects "took" historically. However, the population is more condensed in below normal years and possibly more vulnerable to entrainment.

(AR 5532.) Experts advocated (a) further research into the relationship between the position of the Delta smelt and environmental conditions (AR 4881); and (b) the adoption of a flexible management approach, which would allow new information to be "folded back into the operation and conservation strategies." (AR 4870.) The result was a "layered" approach to managing the smelt, made up of more protective take limits than previously imposed along with the implementation of an adaptive management protocol.

I. **Revised Take Exceedence Levels Used In the BiOp.**

The BiOp includes "hard" take limits,[10] based on historic "salvage density estimates," adjusted to account for operational constraints under the 2004 OCAP and presumed increased environmental water flows. Separate take limits were established for formal and early consultation purposes.

[10] These "hard" take limits, as the Defendants and Defendant Intervenors referred to them during oral argument are different from a separate take trigger that is part of the DSRAM process described below.

The revision of the take limits began with historic catch data from periodic samples of salvaged fish. (*See* AR 413.) Data about the volume of water diverted during the collection period is then used to estimate the fish per volume of water diverted. This is referred to as the "salvage density."[11] (*Id.*) Historically, salvage density varied greatly depending on whether the year was wet (above normal), dry (below normal, dry, or critical) year. Wet and dry year data were analyzed separately. (*Id.*) The estimates were then inputted into a computer modeling system, CALSIM II, to estimate take under varying assumptions about future project operations, including programs designed to improve environmental conditions, such as the Environmental Water Account. (AR 413-14.)

Several different scenarios or "Studies" were run through CALSIM II and included in the BiOp. For example, Study No. 1 reflects the 1995 regulatory base case, without any changes in project operations and without the addition of any environmental water programs. Study No. 4a estimates a take level for flow conditions planned under the operations subject to final consultation (changes to flows in the Trinity River, future development levels, and the operation of the Freeport Regional Water Project and the Intertie). Study 4a included flow adjustments required by D-1641 and VAMP, along with projected CVPIA (b)(2) flows, but did not include operation of the EWA.

[11] DWR insisted during oral argument that the data used to run the CALSIM II models was not "salvage" data but was rather "density data." The BiOp is explicit that the models were run using a "salvage density" estimate generated from periodic samplings of salvaged fish.

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Study No. 5a was similar to 4a, except that it added projected EWA flows. Separately, in Study No. 5, CALSIM II simulated flow modifications projected to occur as a result of "those projects subject to early consultation," specifically the increased pumping and permanent barriers called for in the planned South Delta Improvement Project ("SDIP"). (AR 374, 414-19; Sommer Decl. ¶5.) Each modeling scenario was run separately for various water year types (Wet, Above Normal, Below Normal, Dry, and Critically Dry) and independently estimated take at CVP and SWP facilities.

The BiOp based its conclusions for formal consultation on the results of the Study No. 5a, and for early consultation on the results of Study No. 5. The results of the modeling scenarios for Study No. 5a are set forth in several tables at pages 414 through 419 of the AR. The following table summarizes the changes in estimated take for Study No. 5a, for each type of water year, relative to the 1995 base case. In other words, the positive figures represent the number of additional smelt that will be taken per month under formal consultation relative to the 1995 base case (Study No. 1) while negative numbers represent how many fewer smelt will be taken per month relative to the 1995 base case.[12]

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[12] The information contained in these tables was derived by the court from the BiOp but was not presented in this form in the BiOp.

Table 1:
Summary of Results for CVP Salvage Under Study No. 5a

Month	Wet Year	Above Normal Year	Below Normal Year	Dry Year	Critically Dry Year
Adults					
December	-1	-1	-3	-3	-41
January	-13	-13	-12	-10	-98
February	-33	-36	+63	-60	+9
March	+29	-40	-83	-19	+1
Largely Juveniles					
April	0	0	-16	+5	0
May	0	0	-9017	-14469	-11652
June	0	0	0	-2910	0
July	0	+11	+7	-74	0
Net: December-March	-17	-89	-35	+28	-130
Net: April-July	0	+11	-9025	-17448	-11652

Table 2:
Summary of Results for SWP Salvage Under Study No. 5a

Month	Wet Year	Above Normal Year	Below Normal Year	Dry Year	Critically Dry Year
Adults					
December	-6	-6	-16	-15	-11
January	-76	-87	-82	-87	-104
February	+86	-94	0	0	+51
March	+98	+91	+63	0	+2
Largely Juveniles					
April	-60	-77	-365	-144	0
May	-27188	-25933	-31122	-32083	-7269
June	-1096	-129	-53	.1267	0
July	0	+282	+318	+493	+175
Net: December-March	+102	-95	-35	-102	-62
Net: April-July	-28346	-25857	-31213	-33000	-7095

For the CVP, CALSIM II predicts significant reductions in smelt salvage during the months of December through July in below normal and dry years, when compared to the regulatory base

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case.[13] However, under certain scenarios, CVP salvage increases during other months of the year relative to the regulatory base case, because pumping is predicted to increase during these months to make up for water released from storage for fish protection purposes. For the SWP, salvage stays relatively level for the months of December through March. However, salvage decreases for the months of April through July relative to the regulatory base case.

Based on CALSIM II Study 5a, FWS calculated the amount of "combined salvage" (i.e., for both projects) estimated under the formal consultation scenario, for each month, according to water year type. The BiOp rounded the numbers up to the nearest 100 and used those figures to set incidental take limits by water year type. (AR 471-472.)

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[13] The tables at pages 414 and 419 of the AR do not list the absolute number of smelt estimated to be taken in any given month under the 1995 regulatory base case (Study No. 1). However, the incidental take limits (set forth in the Table 3 below) were based on the absolute numbers of smelt that are projected to be taken under Study No. 5a. For example, the take limit for the month of May in a Critically Dry year, set at 30,500, under the CALSIM II results in a reduction of the 30,500 to 18,921 (representing 11,652 reduction in CVP salvage plus 7,269 reduction in SWP salvage) lower than the 1995 regulatory base case.

Table 3:
Incidental Take Limits by Water Year Type
(For Both CVP and SWP)

		Water Year Type	
	Month	Wet or Above Normal	Below Normal, Dry, or Critical
Monthly Incidental Take	October	100	100
	November	100	100
	December	700	400
	January	3000	1900
	February	2300	1700
	March	1300	1300
	April	1000	1100
	May	37800	30500
	June	45300	31700
	July	3500	2500
	August	100	100
	September	100	100

Because these incidental take levels are based on predictions produced by CALSIM II Study 5a, they do not assume any smelt protection actions under the DSRAM, but do assume continued availability of the EWA water. (AR 374, 471.)

FWS determined that the level of anticipated take "is not likely to result in jeopardy to the smelt because this level of take is at or below historical levels of take." (AR 474.)

However, the BiOp also acknowledges that "the operations of the Projects under formal consultation as described in the Project Description will result in adverse effects to delta smelt through entrainment at the CVP and SWP and by drawing delta smelt into poorer quality habitat in the south delta." (AR 422 (emphasis added).) The BiOp concludes that "with the inclusion of [certain] conservation measures described [in the BiOp] and the implementation of the [Delta Smelt Risk Assessment Matrix], these adverse effects would be avoided or minimized." (*Id.*

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(emphasis added).) "[W]ith these conservation measures in place, the re-operation of the Trinity River, the increased level of development on the American River, the Freeport Diversion, the Suisun Marsh Salinity Control Gates, the Barker Slough Diversion, or due to changes to X2...are not expected to result in adverse effects to delta smelt." (AR 423.)

FWS' conclusions admit project operations will result in adverse effects to delta smelt, which are unquantified, and can only be avoided by conservation measures and implementation of the DSRAM.

H. "Conservation Measures."

The "conservation measures" contemplated are listed in the Summary of Effects section of the BiOp and include: (1) the Environmental Water Account ("EWA"); (2) Central Valley Project Improvement Act (b)(2) water; (3) State Water Resource Control Board's Water Rights Decision 1641; (4) the Vernalis Adaptive Management Plan ("VAMP"); and (5) the DSRAM adaptive management plan. (AR 466-68.)

1. CVPIA(b)(2) Water.

According to the 1992 Central Valley Project Improvement Act, the CVP must "dedicate and manage annually 800,000 acre-feet of Central Valley Project yield for the primary purpose of implementing the fish, wildlife, and habitat restoration purposes and measures authorized by this title; to assist the State of California in its efforts to protect the waters of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; and to help to meet such obligations as may be legally imposed upon the

Central Valley Project under State or Federal law following the date of enactment of this title, including but not limited to additional obligations under the Federal Endangered Species Act." Title XXXXIV of the Reclamation Projects Authorization and Adjustment Act of 1992, Pub. L. 102-575, 106 Stat. 4600, 4706 (1992). (*See* AR 372.)

FWS, in consultation with the Bureau and other agencies, may use this "(b)(2) water" to meet Water Quality Control Plan (WQCP) obligations and any other requirements imposed by law after 1992. "For example, (b)(2) water has been used to maintain flows on Clear Creek to provide adequate spawning and rearing habitat for Chinook salmon. Water exports at the CVP have also been reduced using (b)(2) water to reduce entrainment of salmon or delta smelt at the salvage facilities. This ongoing action provides a benefit to delta smelt in most years." (AR 372.)

The base CVP yield committed to fish restoration is fixed by statute and is mandatory. This fixed supply is subject to reduction up to 25% in critically dry years under CVPIA § 3406(b)(2)(C).

2. Environmental Water Account.

The Environmental Water Account ("EWA") is "an adaptive management tool that aims to protect both fish and water users as it modifies water project operations in the Bay-Delta." (AR 373.)

> The EWA provides water for the protection and recovery of fish beyond that which would be available through the existing baseline of regulatory protection related to project operations. The EWA buys water from willing sellers or diverts surplus water when safe for fish,

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> then banks, stores, transfers and releases it as needed to protect fish and compensate water users for deferred diversions.

(*Id.*)

The EWA has been used to benefit smelt by allowing for the curtailment of project export pumping during critical time periods. (*Id.*) The EWA could also be used to increase in-stream flows or increase outflows in the Delta, both of which would benefit the smelt. (*Id.*) The EWA is not fixed by statute nor is annual funding assured, and the water supply it provides, though reasonably anticipated, is not immutable.

3. Water Rights Decision 1641.

State Water Resource Control Board Decision 1641 (D-1641) imposes certain minimum flow and water quality objectives upon the projects:

> D-1641 includes specific outflow requirements throughout the year, specific export restraints in the spring, and export limits based on a percentage of estuary inflow throughout the year. D-1641 obligates the SWP and CVP to comply with the objectives in the 1995 Bay-Delta Plan. The Service issued a biological opinion on the Bay-Delta plan to the Environmental Protection Agency on November 2, 1994. The water quality objectives in the 1995 Bay-Delta Plan and in D-1641 are designed to protect in-Delta agricultural, municipal and industrial, and fishery uses and vary throughout the year and by water year type.... D-1641 will also protect delta smelt by providing transport, habitat and attraction flows.

(AR 373 (citations omitted).)

The D-1641 requirements are mandatory under the projects' operating permits. The water to satisfy D-1641 comes from 3406(b)(2) yield and supplemental sources the Bureau utilizes.

4. Vernalis Adaptive Management Plan (VAMP).

The Vernalis Adaptive Management Plan (VAMP) is an experimental program that had its origin in D-1641. (AR 373.) It provides for flows on the lower San Joaquin River and export curtailments at the projects. (*Id.*) VAMP's purpose is to "provide pulse flows on the San Joaquin River and improve habitat conditions in the Delta by reducing exports at the CVP and SWP" over a 31 day period in April and May for the benefit of Chinook salmon and Delta smelt. (*Id.*) Currently, water used to reduce exports at the CVP under VAMP is accounted for as CVPIA (b)(2) water. (*Id.*) If export reductions are taken, the EWA is used to supply contractors to make up for the transfers. VAMP flows "allow larval and juvenile smelt to avoid becoming entrained at the export facilities and to move downstream to Suisun Bay." (*Id.*)

The VAMP water supply is not irrevocably fixed or assured.

I. Delta Smelt Risk Assessment Matrix (DSRAM).

The BiOp's other, primary protection for the smelt is the implementation of a new adaptive management protocol, known as the Delta Smelt Risk Assessment Matrix ("DSRAM"). The DSRAM utilizes a list of trigger criteria to precipitate responses. (AR at 344.) The criteria are:

(1) the previous year's FMWT index;

(2) the risk of smelt entrainment based upon the location of X2;

(3) the estimated duration of the smelt spawning period,

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based on water temperature;

(4) the presence of spawning female smelt;

(5) the proximity of the smelt to project pumping facilities; and

(6) a salvage trigger for adult and juvenile smelt.

(AR 346.)

1. The DSRAM Process.

If any trigger criteria is met or exceeded, a Delta Smelt Working Group ("DSWG") is convened. The DSWG consists of representatives from FWS, the California Department of Fish and Game, DWR, the United States Environmental Protection Agency, the Bureau, and the California Bay-Delta Authority. (*See* AR 344-45.) The DSWG then recommends corrective actions to a Water Operations Management Team ("WOMT"). (*Id.*) The OCAP BiOp identifies four specific actions that the DSWG and WOMT must consider taking if one or more trigger criteria occur: (1) export reductions at one or both of the projects; (2) changes in the south Delta barrier operations; (3) changes in San Joaquin River flows; and (4) changes in the operation of the Delta cross channel.[14] The DSRAM does not contain defined action criteria, but instead leaves any response wholly to the discretion of the two groups who administer the DSRAM (DSWG and WOMT).

2. DSRAM Implementation.

The BiOp acknowledges although FWS is "confident that use of

[14] The DSRAM also includes a chart illustrating when during the year each of these actions will be available. (AR 346.)

the DSRAM will reduce the frequency with which actual salvage exceeds the median predicted salvage, the exceedence frequency could be as high as 50%." (AR 471.) There is no analysis of the duration or consequences from such exceedence. The DSRAM provides no operating criteria or action schedule, specifying when mitigation actions must be taken. It is not possible to predict what, how and when DSRAM measures will be implemented.

J. Recent Experience with DSRAM.

DWR offered post-record evidence regarding the manner in which DSRAM has actually been implemented since its inception. This post-record activity could not have been considered by the agency. A motion to strike the proffered evidence was sustained. The offer of proof includes two "fish actions" that were taken in 2005 in response to "triggers" and a third that was planned but avoided when project water increased in early 2006, a wet year. DWR's offer of proof is to show positive experience in operation of the DSRAM.

K. Recent Procedural History.

The Federal Defendants acknowledge that "[s]hortly before the 2005 OCAP BiOP was completed, a fall midwater trawl survey of delta smelt revealed a substantial decline in the population index for the species" to the lowest ever. (Doc. 242-1, at 4.) The Federal Defendants do not concede that the existence of this data renders the BiOp arbitrary and capricious, because "limited analysis of this data existed, and the Service relied on the raw data, and its own professional judgments as the best available scientific and commercial data available." (*Id.*) Nevertheless,

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"the CALFED agencies have continued to assemble and analyze new data and information." (*Id.*) For example, scientists from CALFED agencies "recently" developed a document based upon the new data: the Interagency Ecological Program Synthesis of 2005 Work to Evaluate the Pelagic Organism Decline (POD) in the Upper San Francisco Estuary (the "IEP POD Synthesis"). This document led the Federal Defendants to conclude that the OCAP for the CVP and SWP may affect Delta smelt in a manner or to an extent not previously considered. (IEP POD Synthesis, Doc. 240, Attachment 1.)

On July 6, 2006, the Bureau requested that the FWS re-initiate consultation concerning the impact of the OCAP on the Delta smelt. (Doc. 240.) In a July 6, 2006 letter to the FWS, the Bureau acknowledged that "emerging data indicates an apparent substantial decline in the Delta smelt population index." (Doc. 240-2.)

1. No Dismissal or Stay.

In light of the second re-initiation of consultation, federal defendants sought dismissal on prudential mootness grounds, a voluntarily remand without vacatur, or a stay pending the completion of reconsultation. (*See* Docs. 242-1, 273.) The motion for stay was joined by the DWR (Doc. 277), and various Defendant-Intervenors (Doc. 274). Plaintiffs opposed because Federal Defendants refused to withdraw the challenged BiOp and stated their intent to continue CVP and SWP operations under the disputed BiOp and its incidental take statements during the time period necessary to complete re-consultation, now projected to be

July 2008, more than two and one-half water years following the effective date of the disputed BiOp. (*See* Doc. 279.)

Defendants' motion to dismiss on prudential mootness grounds was denied:

> Plaintiffs' concerns have not been fully addressed by the reinitation of consultation. Federal Defendants are relying in part on the challenged BiOps in operating the CVP and intend to continue to do so. The controversy over whether the BiOps and OCAP should have continued viability is real and substantial. and this court could provide relief, in the form of a decision invalidating the BiOps followed by hearings on interim remedies. Under these circumstances, it is not appropriate to deem this case prudentially moot.

(Doc. 301 at 18 (footnotes omitted).)

The motion for voluntary remand without vacatur was denied based on the general standard for vacatur set forth in *Natural Resources Defense Council v. U.S. Dept. of the Interior*, 275 F. Supp. 2d 1136, 1143 (C.D. Cal. 2002), which considers "the seriousness of the order's deficiencies" and "the disruptive consequences of an interim change that may itself be changed." No evidence or argument was presented regarding the nature of the prejudice that might result from invalidating the BiOp (*id.* at 20), and numerous factual and legal disputes exist regarding the seriousness of the order's deficiencies (*see id.* at 27). The court was left to speculate what consequences to the species would result if injunctive relief were ordered against continued implementation of the disputed BiOp.

The stay motion, based on the primary jurisdiction doctrine, was denied on the authority of *Lockyer v. Mirant Corp.*, 398 F.3d 1098, 1109 (9th Cir. 2005)(a party seeking a stay "must make out a clear case of hardship or inequity in being required to go

forward, if there is even a fair possibility that the stay for which he prays will work damage to someone else."). The order held: "Plaintiffs are entitled to have their complaint decided on the merits, particularly given the fact that Defendants continue to rely on the challenged BiOps as if they were lawfully enacted." (Doc. 301 at 33.) The apparent increasing jeopardy to the smelt by and after February of 2005 militates against further delay while FWS continue "to study" the issue of jeopardy, an exercise that has continued for almost a decade.

IV. POST-RECORD EVIDENTIARY DISPUTES

A. Objections to Declaration of Ted Sommer.

DWR offers the post-record declaration of Ted Sommer, Ph.D, to explain (1) the concept of salvage and its relationship to the take exceedence levels in the BiOp; (2) the operation of DSRAM; (3) and the manner in which DSRAM has been implemented since its inception.

Generally, "the focal point for judicial review should be the administrative record already in existence, not some new record made initially in the reviewing court." *Camp v. Pitts*, 411 U.S. 138, 142 (1973). However, the Ninth Circuit recognizes three main exceptions to this rule, allowing courts to consider extra-record evidence:

> (1) if necessary to determine "whether the agency has considered all relevant factors and has explained its decision," (2) "when the agency has relied on documents not in the record," or (3) "when supplementing the record is necessary to explain technical terms or complex subject matter."

Southwest Ctr. for Biological Diversity v. U.S. Forest Service,

100 F.3d 1443, 1450 (9th Cir. 1996). A court may also consider extra-record evidence "when plaintiffs make a showing of agency bad faith." *Nat'l Audubon Soc. v. U.S. Forest Serv.*, 46 F.3d 1437, 1447 n.9 (9th Cir. 1993).

DWR maintains that the Sommer declaration explains "technical or complex subject matters" admissible under the exception for evidence "necessary to explain technical or complex subject matters." (Doc. 246-1 at 5-6 n.5.) Plaintiffs move to strike the declaration on the ground that subject matters covered by Mr. Sommer are "neither technical nor complex." (Doc. 305 at 4 n.1.) Rather, Plaintiffs contend that the declaration is offered to explain the agency's post-BiOp experience with DSRAM in an effort to counter the Plaintiffs' argument that the DSRAM is wholly discretionary and contains no defined standards or enforceable requirements.

Generally, "post hoc rationalizations of the agency...cannot serve as a sufficient predicate for agency action." *Am. Textile Manuf. Inst. v. Donovan*, 452 U.S. 490, 539 (1981); *see also Sierra Club v. Bosworth*, 199 F. Supp. 2d 971, 986 (N.D. Cal. 2002)(refusing to consider post hoc explanations that were "neither addressed nor supported by the record"). DWR does not disagree with this general principle, but instead insists that the declaration is offered only to explain complex and technical aspects of the incidental take exceedence levels and the DSRAM.

Paragraphs 11 through 15 of the Sommer Declaration concern the implementation measures taken under the DSRAM after the BiOp issued. There is no basis in the law for the admission of this post-record evidence. DWR does not assert otherwise.

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Plaintiffs' motion to strike is **GRANTED** as to paragraphs 11 through 15.

The information contained in the remainder of the Sommers declaration is drawn directly from the BiOp itself, explaining in plain language how the incidental take limits were set and how DSRAM operates. Although, much of the same information can be found in the BiOp, the subject matters covered are technical and complex and Dr. Sommer's declaration clarifies or explains them. This exception saves the remaining paragraphs of the Sommers declaration to explain the incidental take limits.

The motion to strike is **DENIED IN PART** as to the past record evidence paragraphs only.[15]

B. Federal Defendants' Renewed Objections to Previously Admitted Extra-Record Documents.

The May 13, 2006 memorandum decision admitted certain extra-record documents, for limited purposes (Doc. 219), including Document 10 (a Powerpoint presentation by Michael Dettinger given to the Bay-Delta Authority on December 8, 2004 entitled "Uncertainties & CALFED Planning What Are Current Observations

[15] In a footnote at the end of Plaintiffs' motion to strike the Sommer Declaration, Plaintiffs also challenge Federal Defendants' reliance on the declaration of Ann Lubas-Williams, which Federal Defendants filed with their response to Plaintiffs' motion for summary judgment/cross motion to dismiss. (*See* Doc. 242-4.) The Lubas-Williams declaration concerns the implementation of DSRAM and the sources from which DWR plans to obtain water to protect Delta smelt in the near future. Federal defendants relied on her declaration primarily to support their motion to dismiss or for voluntary remand. No party has relied upon this declaration in the context of the pending motions; it was not considered by the court. It is unnecessary to rule on this motion to strike.

and Models Saying?") for two purposes. First, "for the limited purpose[] of determining whether []FWS failed to adequately consider the climate change issue and the scientific significance of any such failure....;" but not legal opinions. (Doc. 219 at 25.) Second, to the extent appropriate, all twenty two extra record documents presented by Plaintiffs, including Document 10, may be referenced to aid the court's understanding of various technical concepts under the "technical terms and complex subject matter exception." (*Id.* at 32.)

In the footnote to their opposition brief, Federal Defendants renew their objection to consideration of any of the documents under the technical terms and complex subject matter exception. (Doc. 242-1 at 22 n.12.) The May 13, 2006 memorandum decision notes: "Defendants and Defendant Intervenors suggest that Plaintiff has failed to establish that the existing record is inadequate to explain the technical terms, but point to no authority requiring such a showing." (Doc. 219 at 30.) Federal Defendants now assert: "numerous courts, including the Supreme Court and district courts in this Ninth Circuit, have held that a record may not be supplemented for explanatory purposes unless the existing record has been demonstrated inadequate." (Doc. 242-1 at 22 n.12.), citing an unpublished district court decision, City of *Santa Clarita v. United Stats Dept. Of Interior*, 2005 WL 2972987 at *2 n.3 (C.D. Cal. 2005):

> ...Plaintiffs bear the burden of making an initial showing that the administrative record is inadequate for effective judicial review and that one of the exceptions to record review applies. *Animal Defense Council v. Hodel*, 840 F.2d at 1436-38 (affirming district court order limiting review to administrative record and prohibiting discovery because plaintiffs did

> not show record presented was insufficient for review or that any of the exceptions to record review were applicable)....

(emphasis added).

A district court decision not cited by Defendants, *Karuk Tribe of Cal v. U.S. Forest Serv.*, 379 F. Supp. 2d 1071, 1087 (N.D. Cal. 2005), reiterated this holding:

> The Ninth Circuit allows a reviewing court to consider extra-record materials in an APA case only under four narrow exceptions: (1) when it needs to determine whether the agency has considered all relevant factors and has explained its decision; (2) when the agency has relied upon documents or materials not included in the record; (3) when it is necessary to explain technical terms or complex matters; and (4) when a plaintiff makes a showing of agency bad faith. Southwest Center for Biological Diversity v. United States Forest Service, 100 F.3d 1443, 1450 (9th Cir. 1996). For extra-record material to be considered, a plaintiff must first make a showing that the record is inadequate. *Animal Defense Council v. Hodel*, 840 F.2d 1432, 1437 (9th Cir.1988) ("The [plaintiff] makes no showing that the district court needed to go outside the administrative record to determine whether the [agency] ignored information"). At the *1088 same time, "[a] satisfactory explanation of agency action is essential for adequate judicial review, because the focus of judicial review is not on the wisdom of the agency's decision, but on whether the process employed by the agency to reach its decision took into consideration all the relevant facts." *Asarco, Inc. v. U.S. Environmental Protection Agency*, 616 F.2d 1153, 1160 (9th Cir.1980).

(emphasis added).[16] *Karuk Tribe*, and *Animal Defense Council v.*

[16] Federal Defendants also cite *Pension Benefit Guar. Corp. v. LTV Corp.*, 496 U.S. 633, 654-655 (1990), in which the Supreme Court reasoned: "Here, unlike in *Overton Park*, the Court of Appeals did not suggest that the administrative record was inadequate to enable the court to fulfill its duties under § 706."

Federal Defendants quote *Pension Benefit* entirely out of context. The quoted language is drawn from a part of the opinion addressing the Second Circuit's ruling about the adequacy of procedures used by the defendant agency. Specifically, that court ruled that the agency acted arbitrarily and capriciously

Hodel, 840 F.2d 1432, 1437 (9th Cir. 1988), on which it relies, do stand for the proposition that, before admitting documents under any exception to the general rule against extra-record evidence, a court should require that a plaintiff make an initial showing that the existing record is insufficient. Here, defendants maintain that those documents plaintiffs have referenced to explain complex or technical matters, are "the cart before the horse," because Plaintiffs have not shown the existing record is inadequate.

First, Federal Defendants objection is arguably untimely. They did not cite cases requiring a preliminary showing of insufficiency when the motion to augment was briefed and heard. Nor did Federal Defendants timely move for reconsideration of the May 13, 2006 ruling on the motion to augment. Striking the

because it failed to apprise the plaintiff of the material on which it was to base its decision, never gave plaintiff an adequate opportunity to offer contrary evidence, failed to proceed according to ascertainable standards, and failed to provide plaintiff a statement showing its reasoning. *Id.* at 653. One party claimed that *Overton Park* validated a court's order that an agency undertakes additional procedures. *Id.* The Supreme Court rejected this argument, reasoning that, at most, *Overton Park* "imposes a general 'procedural' requirement of sorts by mandating that an agency take whatever steps it needs to provide an explanation that will enable the court to evaluate the agency's rationale at the time of decision." *Id.* at 654. The Supreme Court then distinguished *Overton Park*, reasoning that "[h]ere, unlike in *Overton Park*, the Court of Appeals did not suggest that the administrative record was inadequate to enable the court to fulfill its duties under § 706." *Id.* at 655. This was a specific reference to language in *Overton Park* which criticized the lower courts for relying only on the litigation affidavits, rather than the whole administrative record. *Pension Benefit* sheds absolutely no light on the admissibility of extra-record evidence.

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challenged documents now, would cause prejudice to Plaintiffs, who relied upon these rulings to prepare their dispositive motions.

Even assuming a timely and specific objection, on the merits, Plaintiffs' extra-record documents were properly admitted. Of these twenty-two documents, Plaintiffs' papers only referenced eight: Docs. 9, 10, 11, 12, 13, 20, 21 & 22. With the exception of Documents 12 and 22, all were admitted on multiple grounds. (Documents 12 and 22 were admitted for the limited purpose of explaining technical materials.) The documents and the bases for their admission are as follows:

Document 9: Summary of Annual Joint Meeting of California Bay-Delta Authority and Bay-Delta Public Advisory Committee (December 8-9, 2004).

Admitted "for the limited purpose of determining whether USFWS failed to adequately consider the EWA/CVPIA(b)(2) issue," "for the limited purposes of determining whether USFWS failed to adequately consider the climate change issue and the scientific significance of any such failure...," and, as appropriate, to explain complex and technical matters.

Document 10: Climate Change Uncertainties & CALFED Planning: What Are Current Observations and Models Saying? Powerpoint presentation by Michael Dettinger, U.S. Geological Survey at the Scripps Institute for Oceanography, et al. to Bay-Delta Authority (December 8, 2004).

Admitted "for the limited purposes of determining whether USFWS failed to adequately consider the climate change issue and the scientific significance of any such failure," and as appropriate, to explain complex and technical matters.

Document 11: Summary of Annual Joint Meeting of California Bay-Delta Authority and Bay-Delta Public Advisory Committee (February 9-10, 2005).

Admitted for the limited purpose of showing that USFWS failed to consider relevant Delta smelt population data and its scientific significance," and, as appropriate, to explain complex and technical matters.

Document 12: Letter from H. Candee and K. Poole, NRDC, to S. Thompson re Consultation on OCAP: Significant New Delta Smelt Information, Service (Feb. 14, 2005).

Admitted only to explain, as appropriate, complex and technical matters.

Document 13: Delta smelt abundance trends, Powerpoint presentation by Chuck Armor, DFG, to Bay-Delta Authority

Admitted for the limited purpose of showing that USFWS failed to consider relevant Delta smelt population data and its scientific significance," and, as appropriate, to explain complex and technical matters.

Document 20: Supplemental Biological Opinion on CVP and SWP Operations, April 1, 2004 through March 31, 2006 (Feb. 27, 2004).

Admitted "for the limited purpose of determining whether USFWS failed to adequately consider the EWA/CVPIA(b)(2) issue," and, as appropriate, to explain complex and technical matters.

Document 21: Future Water Availability in the West: Will there be enough? Powerpoint presentation by M. Dettinger to 24th Annual Conference on Water, Climate and Uncertainty: Implications for Western Water Law, Policy, and Management (June 11-13, 2003).

Admitted "for the limited purposes of determining whether USFWS failed to adequately consider the climate change issue and the scientific significance of any such failure...," and, as appropriate, to explain complex and technical matters.

Document 22: Letter from John W. Keys, Bureau, to Hon. George Miller, House of Representatives re Bureau's renewal of CVP water contracts (Dec. 23, 2004).

Admitted only to explain, as appropriate, complex and technical matters.

With the exception of Documents 12 and 22, Plaintiffs were permitted to reference these documents to show whether FWS

adequately considered included subject matter to support the BiOp. Although Plaintiffs did not expressly demonstrate that the record was insufficient, a finding of insufficiency can be implied from the rulings admitting the documents. For example, Document 10, the powerpoint presentation regarding "Climate Change Uncertainties & CALFED Planning" presented to the Bay-Delta Authority on December 8, 2004, references climatological information and issues not otherwise discussed in the administrative record, bearing on whether FWS failed to adequately consider the climate change issue. The same reasoning applies to Documents 9, 10, 11, 13, 20 & 21. As for Documents 12 and 22, were which were only admitted under the complex and technical matters exception, no prior showing of insufficiency was made. However, Documents 12 and 22 were only referenced as secondary citations or for context. Even if, any document was admitted in error, no prejudice has resulted.

V. STANDARD OF REVIEW

Summary judgment is appropriate where there are no genuine issues of material fact and the moving party is entitled to judgment as a matter of law. Fed. R. Civ. Pro. 56(c). This is a challenge to the lawfulness of a biological opinion brought under the ESA and the Administrative Procedure Act ("APA"). Agency decisions made under the ESA are governed by the APA, which requires that the agency action be upheld unless it is found to be "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law," or "without observance of procedure required by law." 5 U.S.C. § 706(2)(A), (D). The inquiry is

designed to "ensure that the agency considered all of the relevant factors and that its decision contained no clear error of judgment." *Pacific Coast Fed'n of Fishermen's Ass'ns v. NMFS*, 265 F.3d 1028, 1034 (9th Cir. 2001). Agency action should only be overturned if the agency has "relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise." *Id.* In sum, a court must ask "whether the agency considered the relevant factors and articulated a rational connection between the facts found and the choice made." *Id.* "A biological opinion is arbitrary and capricious and will be set aside when it has failed to articulate a satisfactory explanation for its conclusions or when it has entirely failed to consider an important aspect of the problem." *Greenpeace v. NMFS*, 80 F. Supp. 2d 1137, 1147 (W.D. Wash. 2000). Alternatively, a biological opinion may also be invalid if it fails to use the best available scientific information as required by 16 U.S.C. § 1536(a)(2). *Id.* at 1150.

As a general rule, a court must defer to the agency on matters within its expertise. *See National Wildlife Federation v. National Marine Fisheries Service*, 422 F.3d 782, 798 (9th Cir. 2005). However, "[t]he deference accorded an agency's scientific or technical expertise is not unlimited." *Id.* "Deference is not owed when the agency has completely failed to address some factor consideration of which was essential to [making an] informed decision." *Id.* (internal citations and

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quotations omitted).

A final BiOp is final agency action for judicial review purposes. *American Rivers, infra*, 126 F.3d at 1124-25.

VI. SUMMARY OF PLAINTIFFS' MOTION

Plaintiffs move for summary judgment on the following grounds:

(1) First, the BiOp did not utilize the Best Available Science by: (a) failing to reference the "most recent Delta Smelt abundance data," namely the 2004 Fall Midwater Trawl Data; and (b) failing to consider the possible effects that climate change might have on the smelt's habitat.

(2) Second, the BiOp unlawfully relies upon the DSRAM as a mitigation measure because the DSRAM process is "entirely discretionary, uncertain, and unenforceable." In addition, Plaintiffs allege that Federal Defendants acted arbitrarily and capriciously by relying upon the EWA, CVPIA(b)(2), and/or VAMP programs as water sources necessary to implement the DSRAM. Plaintiffs allege that Federal Defendants have (a) failed to demonstrate that EWA, CVPIA and/or VAMP will continue to be available over the 20-year term of the BiOp and (b) failed to demonstrate that DSRAM can reliably operate without water assets from those programs.

(3) Third, there is no rational connection between the evidence in the record and the BiOp's "no jeopardy" conclusion. Specifically, Plaintiffs allege (a) that the BiOp's focus on salvage as the measure of harm to the species underestimates project impacts and results in a meaningless take limit; and (b)

that the BiOp fails to explain how its no jeopardy conclusion can be justified in light of the identified adverse effects of the project, along with indirect and cumulative effects.

(4) Fourth, the BiOp failed to adequately analyze whether the OCAP's impacts on the Delta smelt's critical habitat are consistent with the smelt's recovery. In addition, the Federal Defendants failed to adequately take into account smelt habitat areas other than defined by X2.

(5) Finally, the BiOp is unlawfully narrow in its scope because it (a) fails to provide a comprehensive analysis of the effects of constructing facilities required to carry out long term CVP and SWP operations and (b) fails to analyze the impacts of the projects delivering the full amount of water authorized under CVP and SWP water service contracts.

VII. DISCUSSION

A. Threshold Issues.

1. ESA 60-day notice requirement.

The San Luis Parties argue that Plaintiffs have not complied with the ESA's citizen suit notice requirement, 16 U.S.C. § 1540(g)(2)(A)(I), that written notice be given to "the Secretary, and to any alleged violator" at least sixty days in advance of filing suit. Failure to give this notice is a bar to bringing suit under the ESA. *Southwest Ctr. for Biological Diversity v. U.S. Bureau of Reclamation*, 143 F.3d 515, 520 (9th Cir. 1998).

In *American Rivers v. National Marine Fisheries Serv.*, 126 F.3d 1118, 1124-25 (9th Cir. 1997), the Ninth Circuit held that issuance of a biological opinion is a final agency action that is

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properly pled as a challenge under the APA, rather than as a citizen suit claim under the ESA. Failure to comply with the 60-day notice requirement does not deprive the court of jurisdiction. *Id.*

The San Luis Parties advocate an approach that ignores *American Rivers,*[17] taken in an unpublished district court opinion, *Pacific Coast Fed' of Fishermen's Ass'ns v. U.S. Bureau of Reclamation*, 2006 WL 1469390 at 27 n.8 (N.D. Cal. 2006). *Pacific Coast Federation* declined to apply *American Rivers'* general rule because the injunctive relief the Plaintiffs sought went beyond simply having the biological opinion invalidated. The *Pacific Coast Federation* Plaintiffs sought to have any new biological opinion first reviewed by the court. This requested relief, fell outside the scope of the APA but was "within the scope of the ESA and thus trigger[ed] the notice period requirement." *Id.* Here, the requested relief is invalidation of the BiOp, a remedy undeniably available under the APA. *American Rivers* controls. There was no need to comply with the ESA 60-day notice requirement. The district court has jurisdiction over APA review of the BiOp.

2. Jurisdiction to Review Challenges to Early Consultation and Preliminary Biological Opinion.

Defendants contend the case is not ripe for decision. The BiOp covers not only current operations, but also a variety of future actions, some subject to formal consultation, others to

[17] At least one district court has followed the holding in *American Rivers*. *See NRDC v. Rodgers*, 381 F. Supp. 2d 1212, 1230 (E.D. Cal. 2005).

early consultation:

> This biological opinion covers formal and early consultation for the operations of the CVP and SWP. The formal consultation effects described in this biological opinion cover the proposed 2020 operations of the CVP including the Trinity River Mainstem ROD (Trinity ROD) flows on the Trinity River, the increased water demands on the American River, the delivery of CVP water to the proposed Freeport Regional Water Project (FRWP), water transfers, the long term Environmental Water Account (EWA), the operation of the Tracy Fish Facility, and the operation of the SWP-CVP intertie. The effects of operations of the SWP are also included in this opinion and include the operations of the North Bay Aqueduct, the Suisun Marsh Salinity Control Gates, the Skinner Fish Facility and water transfers.
>
> Early consultation [issues address] the effects of operations of components of the South Delta Improvement Program (SDIP). These operations include pumping of 8500 cubic feet per second (cfs) at the SWP and Banks Pumping Plant (hereafter referred to as 8500 Banks), permanent barrier operations in the South Delta, the long term EWA, water transfers, and CVP and SWP operational integration. There are two separate effects sections in this biological opinion, one for Formal Consultation and one for Early Consultation. In addition, there is an incidental take for formal consultation and a preliminary incidental take for early consultation.

(AR 2, 248.)

The San Luis Parties object that the early consultation portions of the BiOp are not final agency action and any challenges to the early consultation process are not subject to judicial review. Early consultation, by definition, results in only a "preliminary opinion" and in a preliminary incidental take statement that "does not constitute authority to take listed species." 50 C.F.R. § 402.11(e). Upon request for "confirmation" of a preliminary biological opinion, FWS will review the proposed action to determine if there have been "significant changes in the action as planned or in the

information used during early consultation." § 402.11(f). Within 45 days of such request, FWS must either confirm the preliminary biological opinion or request formal consultation. *Id.*

Plaintiffs concede that they "are not challenging the validity of FWS's early consultation or its preliminary biological opinion regarding certain segregated components of the 2004 OCAP." (Doc. 306 at 37.) Rather, Plaintiffs argue that the portion of the BiOp covering formal consultation is flawed because it fails to examine the full impacts of all aspects of the 2004 OCAP. (Doc. 306 at 37.) Plaintiffs maintain the formal consultation should have covered certain planned actions included in the early consultation that are interdependent with other planned actions not included in either consultation. This claim is cognizable, as it challenges the scope of the formal consultation and the completeness of evaluation of overall OCAP operations on jeopardy to the smelt, not the lawfulness of the early consultation on future actions.

B. The Biological Opinion Unlawfully Relies Upon Uncertain, Unenforceable Mitigation Measures.

The BiOp concludes that the "operations of the Projects under formal consultation...will result in adverse effects to the delta smelt through entrainment at the CVP and SWP facilities and by drawing delta smelt into poorer quality habitat in the south delta. However with the inclusion of the conservation measures described above and the implementation of the DSRAM, these adverse effects would be avoided or minimized." (AR 467 (emphasis added).) The "conservation measures" mentioned in the

BiOp's conclusion are various regulatory mechanisms already in place to "provide protection to delta smelt and/or their habitats," including D-1641, the EWA, CVPIA (b)(2) water, and VAMP. (AR 421-22, 466-67.)

1. Law Governing Mitigation Measures.

Mitigation measures must be "reasonably specific, certain to occur, and capable of implementation; they must be subject to deadlines or otherwise-enforceable obligations; and most important, they must address the threats to the species in a way that satisfies the jeopardy and adverse modification standards." *Ctr. for Biological Diversity v. Rumsfeld*, 198 F. Supp. 2d 1139, 1152 (D. Ariz. 2002)(citing *Sierra Club v. Marsh*, 816 F.2d 1376 (9th Cir. 1987)); *see also NWF v. NMFS*, 481 F.3d 1224 at *12 & n.16 ("Although the record does reflect a general desire to install structural improvements [to benefit fish] where feasible, it does not show a clear, definite commitment of resources for future improvements.").

Plaintiffs allege that, in depending on the DSRAM and the other "conservation measures" to support its no jeopardy conclusion, the BiOp unlawfully relies upon uncertain, unenforceable mitigation measures which do not constitute a clear, definite commitment of resources. Specifically, Plaintiffs argue: (a) the DSRAM process is "entirely discretionary, uncertain, and unenforceable and (b) the biological opinion unjustifiably assumes that the other, currently operational "conservation measures" (e.g., the EWA and CVPIA(b)(2) water) will continue to be available for use by DSRAM in the future.

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2. The DSRAM is Unlawfully Uncertain and Unenforceable.

All Defendants argue that the DSRAM is an effective adaptive management program that provides the agency the necessary remedial flexibility that makes the BiOp lawful. The BiOp describes the DSRAM as follows:

> The delta smelt risk assessment matrix (DSRAM) consists of month by month criteria which, when exceeded will trigger a meeting of the Delta Smelt Working Group (Working Group). The purpose of the DSRAM is to take actions to protect delta smelt in a proactive manner prior to salvage events....The DSRAM is an adaptive management tool which may be further modified by the Working Group/WOMT as new information becomes available, without undergoing formal reconsultation.... Data will be updated at least weekly to determine the need for a meeting.
>
> Should a triggering criterion be met or exceeded, Reclamation and/or DWR will inform the members of the Working Group and the Working Group will determine the need to meet. Any member of the Working Group may set up a meeting of the Working Group at any time. A meeting of the Working Group may consist of an in-person meeting, a conference call, or a discussion by email. If needed, the Working Group will meet prior to the weekly meetings of the DAT and the WOMT and information will be shared with these groups.
>
> Should a meeting of the Working Group prove necessary, the group will decide whether to recommend a change in exports, change in south delta barrier operations, San Joaquin River flows, or a change in delta cross channel operations, and the extent and duration of the potential action. These potential actions are listed in the DSRAM by the months wherein each of these tools generally become available. The group will recommend actions which will be shared with the DAT and forwarded to the WOMT for discussion and potential implementation. This recommendation will include a discussion of the level of concern for delta smelt and will include who participated in the working group discussions. All dissenting opinions and/or discussion points will also be forwarded to the WOMT. The Working Group will meet at least weekly throughout the period in which the triggering criteria are met or exceeded, to determine the need to provide further recommendations to the WOMT.
>
> Notes and findings of Working Group meeting will be

> submitted to the Service and members of the WOMT for their records. The WOMT will respond to the Working Group's recommendations and the actions taken by the WOMT will be summarized by Reclamation and/or DWR annually and submitted to all WOMT agencies.
>
> If an action is taken, the Working Group will follow up on the action to attempt to ascertain its effectiveness. An assessment of effectiveness will be attached to the notes from the Working Group's discussion concerning the action.

(AR 344-45 (emphasis added).)

The trigger criteria, which vary slightly from month to month, are set forth in a table (or matrix) at page 100 of the BiOp. (AR 346.) The criteria include: (1) the previous year's fall midwater trawl recovery index; (2) the risk of smelt entrainment based upon the location of X2; (3) the estimated duration of the smelt spawning period based upon water temperature; (4) the presence of spawning female smelt; (5) the proximity of the smelt to the Project pumping facilities; and, (6) a salvage trigger for adult smelt (calculated as the ratio of adult smelt salvage to the FMWT index) and juvenile smelt (set at zero for May and June, the months of the year during which salvage of smelt is highest). (AR 346-49.)

Plaintiffs argue that the DSRAM is not "reasonably specific, certain to occur, and capable of implementation" because: (1) the DSWG has complete discretion over whether to meet and whether to recommend mitigation measures; (2) even if the DSWG meets and recommends mitigation measures, the WOMT group is free to reject any recommendations; (3) there are no standards to measure the effectiveness of actions taken; (4) reconsultation is not required should mitigation measures prove ineffective; and (5) ultimately, no action is ever required.

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DWR responds that implementation of the DSRAM process is "mandatory." For example, the incidental take statement requires that the projects shall be implemented "as described" in the BiOp. (AR 475.) Because the BiOp "describes" operation of the DSRAM, DWR asserts that its implementation is made mandatory by the incidental take statement's command that the project shall be implemented "as described;" if a DSRAM triggering criteria is met, the DSWG "will determine the need to meet." (AR 344 (emphasis added).) If circumstances warrant action, the DSWG will recommend fish protection actions and forward those recommendations to the WOMT. (*Id.*) The BiOp provides that the DSWG "will meet at least weekly throughout the period in which the triggering criteria are met or exceeded, to determine the need to provide further recommendations to the WOMT." (*Id.* at 345 (emphasis added).) The WOMT must then "respond" to DSWG's recommendations. (*Id.*) If actions are taken, the DSWG will monitor the action to determine its effectiveness. (*Id.*)

DWR correctly asserts that the DSRAM process must be followed; this does not address Plaintiffs' argument: that the DSRAM process itself does not require any mitigation actions be taken. Nothing in DSRAM requires the DSWG to make action recommendations, whatever the circumstances, and no criteria prescribe when the WOMT must act to effect DSWG's recommendations.

DWR responds that as adaptive management, "DSRAM is intentionally flexible, taking into consideration the uncertainties surrounding delta smelt population abundance and dynamics...[D]elta smelt abundance has fluctuated widely, without

a clear explanation why. While experts can monitor trends in delta smelt populations, estimating overall population abundance presently is 'not possible,' nor are the sources of year-to-year variability in abundance well understood." (Doc. 246-1 at 12.) DWR suggests that "hard-wiring" the DSRAM to require specific actions be taken when triggering criteria occur would impair the DSRAM's flexibility. For example, the trigger for salvage of juvenile smelt is set at zero. This trigger was designed not to precipitate a meeting every time that standard is exceeded, but to cause heightened awareness of conditions that might require protective action. (Doc. 246-1, at 12, citing AR at 8217-18.)

The conflict between Defendants' choice of a flexible management approach and Plaintiffs' concern to ensure enforceable protective actions are taken when necessary, highlights the extent to which overly flexible adaptive management may be incompatible with the requirements of the ESA. Commentators recognize that adaptive management schemes do not fit neatly within the ESA's existing regulatory structure. *See J.B. Ruhl*, Taking Adaptive Management Seriously: A Case Study of the Endangered Species Act, 52 U. Kan. L. Rev. 1249, 1284 (2004)("The [ESA] as a whole lacks a cohesive adaptive management architecture....")). H. Doremus, *Adaptive Management, The Endangered Species Act, and the Institutional Challenges of "New Age" Environmental Protection*, 41 Washburn. L. J. 50, 52 (2000)("Adaptive Management...runs counter to human nature and the current structure of our management institutions."); ("One key institutional challenge is to combine the flexibility required by adaptive management with the long-term certainty we

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often seek through our legal and political institutions.") 41 Washburn L. J. at 55.

The case law sheds little light on how to harmonize these competing objectives. The parties cite no cases applying the "reasonably specific, certain to occur, and capable of implementation" concept (or any closely related doctrine) to mitigation measures employed under an adaptive management protocol. Most cases the parties cite are either wholly inapplicable or factually distinguishable.

For example, mitigation measures have been found unlawfully uncertain because their implementation was not within the control of the relevant federal agencies. *National Wildlife Federation v. NMFS*, 254 F. Supp. 2d 1196, 1213 (D. Or. 2003), invalidated a 2000 biological opinion addressing the effects of the operation of the Federal Columbia River Power System ("FCRPS") on several listed fish species. A 2000 biological opinion concluded that continued operation of the FCRPS would jeopardize several of the species and adversely modify their critical habitat and adapted mitigation measures to avoid jeopardy. The mitigation measures included a variety of short- and long-term state, regional, tribal, and private off-site mitigation actions. The plaintiffs argued that reliance on such "uncertain and vaguely defined actions of third parties to protect and restore salmon habitat," violated the "reasonably certain to occur" standard. *Id.* at 1209. The district court agreed, concluding that the no jeopardy determination unlawfully relied on "non-federal off-site mitigation actions that are not reasonably certain to occur." *Id.* at 1214. *See also Sierra Club v. Marsh*, 816 F.2d 1376, 1385

(9th Cir. 1987)(invalidating biological opinion that relied on mitigation measure involving the transfer of 188 acres of marshland from private ownership to a publicly owned wildlife refuge; land remained under private control and subject to easements that rendered the land valueless for mitigation purposes, and private owners and local government indicated intent to increase use of one of the easements); *Oregon Natural Desert Ass'n v. Lohn*, --- F. Supp. 2d ---, 2007 WL 1170629 (D. Or. 2007)(setting aside biological opinion in part because it overly relied on the actions of private individuals who had a poor past record of compliance with standards); *Florida Key Deer v. Brown*, 364 F. Supp. 2d 1345, 1355-56 (S.D. Fla. 2005)(setting aside biological opinion that relied on mitigation measures to be implemented by private landowners; nothing compelled the landowners to act and "the record indicate[d] that some landowners entirely disregarded [prior mitigation measures]").

Here, the BiOp's mitigation measures are largely under the control of the action agency (the Bureau), which, operating in concert with the DWR, directly regulates water pumping and releases from upstream reservoirs. *Natural Resources Defense Council v. Rodgers*, 381 F. Supp. 2d 1212, 1241 (E.D. Cal. 2004), does not provide guidance. In that case, plaintiffs contended a BiOp's mitigation measures were not reasonably certain to occur because the action agency had a poor track record of following through on prior commitments. The acknowledging that the agency's track record was "discouraging" district court recognized that the agency had made some progress toward implementing its prior commitments, *id.*, and declined to find

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that the new commitments were not certain to occur. *Id.* However, the *Rogers* plaintiffs did not attack the efficacy of the mitigation measures themselves, only the likelihood that the agency would not satisfy its commitment to implement them. Here, Plaintiffs challenge the inherent uncertainty and unenforceability of the DSRAM and the other conservation measures.

Plaintiffs cite *American Rivers v. U.S. Army Corps of Engineers*, 271 F. Supp. 2d 230, 252 (D.D.C. 2003), where, despite the fact that a prior biological opinion required the Corps to implement flow restrictions to mitigate impacts to listed species, the Corps "made it perfectly clear" to the district court "that it ha[d] no intention of ensuring that its future operations will be consistent" with the mitigation requirements. *Id.* at 253. A motion for preliminary injunction was granted: "Plaintiffs will be likely to prove that the 2003 Supplemental BiOp violated the ESA and APA by improperly and unreasonably relying on future actions by the Corps that are virtually certain not to occur." *Id.* at 254 (emphasis added). Here, in contrast, there is no such "smoking gun" evidence of the agency's intent to disregard its mitigation responsibilities, just no definite, certain, or enforceable measures.

Center for Biological Diversity v. Rumsfeld, 198 F. Supp. 2d 1139, 1151-53 (D. Ariz. 2002) addressed a biological opinion that concluded the Army's continued operations at Fort Huachuca, Arizona would not cause jeopardy to listed species that relied on flows from the Upper San Pedro River, even though rapid development in the area and uncontrolled groundwater pumping at

the Fort posed threats to the species. The "no jeopardy" finding was premised on several required mitigation measures.

First, the Army had to develop and implement an on-base plan to protect and maintain populations of listed species and habitats; *id.* at 1148, even though the on-base plan was not designed to address the underlying problem of diminishing flows in the San Pedro River, *see id.* at 1153. Second, the Army had to develop a regional water resources plan, sufficient to maintain flows in the San Pedro River to sustain the protected species and their habitats. *Id.* at 1148. The biological opinion acknowledged, that the Army had no authority over the implementation of the regional plan and was only required to participate along with other stakeholders. *Id.* at 1153. Third, the Army had to monitor progress and report on the implementation of the various projects. *Id.* at 1149. Fourth, the biological opinion assumed the operation of a water recharge facility designed to temporarily delay the impact of groundwater overdraft, which the *Rumsfeld* court acknowledged was "subject to substantial uncertainty." *Id.* at 1145.

Leaving it to the Army and other interested parties to develop a regional water management plan "enables the Army to sidestep any direct responsibility for addressing deficit groundwater pumping," and was "an admission that what is currently on the table as far as mitigation measures is inadequate to support the [] 'no jeopardy' decision." 198 F.

Supp. 2d at 1153-54.[18]

DWR distinguishes *Rumsfeld*, claiming it is like *NWF v. NMFS*, 254 F. Supp. 2d 1196, where mitigation measures were unlawful because they depended upon third parties without any guarantee that those parties would implement the measures. Here, the DSRAM does not depend on actions by outsiders. *Rumsfeld* further found that the Army's on-base mitigation measures were insufficient because they did not require any measurable goals or an implementation schedule:

> There are no requirements in the Final BO to reduce reliance on groundwater pumping by any particular

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[18] *Rumsfeld* also found fault with the biological opinion's monitoring plan, characterizing it as a means of delaying the implementation of necessary mitigation measures:

> The Army may not delay identifying the measures necessary to mitigate the effects of its ten-year plan based on the monitoring provisions in the Final BO....
>
> The Final BO's monitoring requirements do not measure the success or failure of the on-base and/or regional mitigation measures to reduce the groundwater deficit. It only requires the Army to develop "a monitoring program designed to assess progress," and requires an annual review of the AWRMP, as to which projects have been implemented the past year and which are to be implemented in the coming year. Especially since the Final BO and the AWRMP fail to quantify the remedial value of the proposed projects, simply reporting project implementation is not a meaningful assessment of the success or failure of the mitigation measures in protecting the water umbel, willow flycatcher, and critical habitat from adverse impact. Such an assessment would require systematic monitoring of either San Pedro baseflows or the groundwater aquifer.

198 F. Supp. 2d at 1154 (internal record citations omitted). No such failure is alleged here. Plaintiffs do not suggest that the monitoring called for by the DSRAM is flawed.

> amount or to achieve any measurable goals with respect to water recharge. There is no date certain implementation requirement. The MOA includes a laundry list of possible mitigation measures related to water conservation and recharge that the Army may implement, but it does not establish which projects have to be undertaken, when, nor what the conservation objectives are for the respective projects. Without such specificity, the mitigation measures in the Final BO are merely suggestions.

Id. at 1153 (emphasis added). *Rumsfeld* stands for the proposition that, at a minimum, a mitigation strategy must have some form of measurable goals, action measures, and a certain implementation schedule; i.e., that mitigation measures must incorporate some definite and certain requirements that ensure needed mitigation measures will be implemented.

Here, the agency's BiOp admits that mitigation measures are essential. The no jeopardy finding is conditioned on conservation measures and the DSRAM. (*See* AR 422.)

DWR's protestations that hard-wiring the DSRAM would cripple its effectiveness ignore the ESA's requirements of reasonable certainty, timetables, and enforceability standards for mitigation measures. The existing DSRAM process provides absolutely no certainty that any needed smelt protection actions will be taken at any time by DSWG or WOMT. The DSRAM is in substance an organizational flow chart that prescribes that certain administrative processes (meetings) will be held whenever a trigger criteria is met or exceeded. Although mitigation measures are identified, no defined mitigation goals are required, nor is any time for implementation prescribed. Incorporating some ascertainable mitigation standards and enforceable mitigation measures is not inconsistent with avoiding

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unduly restrictive "hard-wiring" of the DSRAM.

National Wildlife Federation v. Babbit, 128 F. Supp. 2d 1274 (E.D. Cal. 2000) ("*NWF v. Babbit*"), addresses an adaptive management approach that accommodated uncertainty by allowing regulators to apply new information gathered through monitoring to adjust and employ well-defined mitigation measures. There, a Habitat Conservation Plan ("HCP") called for a development fee to be collected on all acreage developed in the Natomas Basin, north of Sacramento, home to a number of endangered species. The HCP also incorporated adaptive management provisions designed to allow the mitigation fee to be modified if new information justified an adjustment:

> The [HCP] recognizes that the current state of knowledge as to the conservation needs of protected species is imperfect, and that its assumptions as to the amount, location, and pace of development in the Basin and as to the adequacy of the mitigation fee to accommodate increased expenses may prove inaccurate. The Plan addresses these uncertainties through its "adaptive management" provisions, which permit the Plan's conservation strategy to be adjusted based on new information. The HCP's conservation program can be modified under the adaptive management provisions if: (1) new information results from ongoing research on the GGS or other covered species; (2) recovery strategies under Fish and Wildlife Service recovery plans for the GGS or the Swainson's hawk differ from the measures contemplated by the HCP; (3) certain of the HCP's mitigation measures are shown through monitoring to require modification; or (4) the HCP's required minimum block sizes for reserve lands are shown to require revision. The Plan anticipates that the NBC will make discretionary decisions in future years based upon new information. The NBC will decide, for example, which lands to purchase, depending on a variety of future considerations difficult now to predict, and whether to change the mix of in and out of Basin reserve lands and agricultural as opposed to marsh reserve lands.

Id. at 1281-82.[19]

Here, the adaptive management process has no quantified objectives or required mitigation measures. Although the process must be implemented by holding meetings and making recommendations, nothing requires that any actions ever be taken.[20] The BiOp asks the court to trust the agency to protect the species and its habitat. Notwithstanding any required deference to expertise, the ESA requires more.

All parties agree that adaptive management can be beneficial and that flexibility is a necessary incident of adaptive management. The law requires that a balance be struck between the dual needs of flexibility and certainty. The DSRAM, as currently structured, does not provide the required reasonable certainty to assure appropriate and necessary mitigation measures will be implemented. The DSRAM does not provide reasonable assurance admitted adverse impacts of the 2004 OCAP will be mitigated. This aspect of the BiOp is arbitrary and capricious

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[19] In *NWF v. Babbit*, the district court expressly approved the design of the HCP as a whole, but invalidated the permit issued in connection with the plan on grounds wholly independent from the design of the HCP and/or the adaptive management plan. *See 128 F. Supp. 2d* at 1298-99.

[20] The only clearly enforceable standard or benchmark in the BiOp is compliance with the BiOp's "hard" take exceedence limits. But, the existence of enforceable take limits does not shield the DSRAM from scrutiny. There is no provision to allow the "hard" take exceedence limits to be adjusted to reflect new information about the species. Moreover, the BiOp expressly recognizes that the take limits alone are not enough to prevent jeopardy, requiring, among other things, implementation of the DSRAM as a reasonable and prudent measure. (*See* AR 475 ("The Project shall be implemented as described.") This is exactly the reason why the DSRAM must be made more certain and enforceable.

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and contrary to law. Plaintiffs' motion for summary adjudication as to this claim is **GRANTED**. The agency has not provided a reasonable explanation showing the DSRAM will satisfy ESA requirements to assure survival and recovery of the Delta smelt.

The Ninth Circuit's *recent NWF v. NMFS* decision suggests that mitigation measures that are not reasonably certain to occur should be excluded from the agency's no jeopardy analysis. *See* 481 F.3d 1224 at *12 n.16.[21] Because mitigation is insufficiently certain to occur under the DSRAM, the DSRAM cannot cure other shortcomings of the BiOp.

3. Plaintiffs' Alternative Argument that the BiOp is Arbitrary and Capricious Because DSRAM Depends Upon EWA, VAMP, CVPIA(b)(2) Water, Programs that are Uncertain in Terms of Funding and Effectiveness.

Plaintiffs maintain that the DSRAM cannot feasibly be implemented without adequate water assets from the EWA, CVPIA(b)(2), and VAMP programs. Plaintiffs allege that Defendants have not demonstrated that adequate assets from these programs will be available during the 20 year term of the BiOp. (*See* Doc. 306 at 17.)

Plaintiffs correctly observe that the BiOp does not assure that adequate water assets from these programs will be available for future use under DSRAM. The BiOp itself acknowledges that "[a]lthough VAMP and [EWA] have helped to ameliorate these threats, it is unclear how effective these will continue to be over time based on available funding and future demands for

[21] As of the date of oral argument, the mandate has not yet issued in *NWF v. NMFS*.

water." (AR 367-68.) The BiOp recognizes that the "EWA Agencies envision implementation of a long-term EWA as part of the operation of the Project." (AR 335.) However, the BiOp cannot and does not commit to implement the EWA in the long run. (*Id.*)

The record reveals that the loss of EWA assets will "reduce the ability of the EWA agencies to provide [] fish protections...." (SAR 20.) Plaintiffs refer to statements made by FWS's D. Harlow during an annual joint meeting of CALFED and the Bay-Delta Public Advisory Committee, that a proposal to change CVPIA(b)(2) policy would "change fish protection envisioned in the Record of Decision (ROD)." (Doc. 9 at 4.) At the same time, Mr. Harlow also noted that this would "not necessarily diminish fish protection." (*Id.*) However, he opined that such a change would "necessitate an increase in the size of the EWA." (*Id.*) National Oceanic and Atmospheric Administration ("NOAA") staff questioned FWS's reliance on the EWA in the BiOp, noting that EWA assets would likely be used up for protective actions during the winter, before the peak months for Delta smelt salvage (May and June). (AR 8574.)

Plaintiffs' claim rests in part on the assumption that the EWA, CVPIA(b)(2), and VAMP programs are the only mechanisms by which DSRAM may be implemented. The record does not support this assumption. Under the BiOp, the DSWG is tasked to make recommendations regarding fish protection actions by selecting from a list of "tools for change," which include: (1) "export reduction[s] at one or both facilities"; (2) "change[s] in barrier operations"; (3) "change[s] in San Joaquin River flows"; and (4) "change[s] [in the] position of cross channel gates." (AR 346 and 348 n.7.) No mention is made of the EWA,

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CVPIA(b)(2), or VAMP in the DSRAM or its description of the "tools for change." DWR rejoins that, regardless of whether these programs are fully funded and/or remain functional mechanisms to provide water to the Delta, "the burden....falls on the Projects, not the smelt." (Doc. 246 at 10.)

The EWA is simply a means by which the SWP and CVP can obtain water by purchasing it from willing sellers. (AR 373.) EWA water may be used either to protect fish or to compensate project water users for reduced exports at the project pumps. (*Id.*) If money is unavailable to fund the EWA, Defendants are nonetheless required to prevent smelt take from exceeding permissible take limits.

The BiOp sets forth a three-tier process to supply water to protect the smelt:

> • Tier 1 (Regulatory Baseline). Tier 1 is baseline water and consists of currently existing BOs, water right decisions and orders, CVPIA Section 3406(b)(2) water, and other regulatory actions affecting operations of the CVP and SWP. Also included in Tier 1 are other environmental statutory requirements such as Level 2 refuge water supplies.
>
> • Tier 2 (EWA). Tier 2 is the EWA and provides fish protection actions supplemental to the baseline level of protection (Tier 1). Tier 2 consists of EWA assets, which combined with the benefits of CALFED's ERP, will allow water to be provided for fish actions when needed without reducing deliveries to water users. EWA assets will include purchased (fixed) assets, operational (variable) assets, and other water management tools and agreements to provide for specified level of fish protection. Fixed assets are those water supplies that are purchased by the EWA Agencies. These purchased quantities are approximations and subject to some variability. Operational assets are those water supplies made available through CVP and SWP operational flexibility. Some examples include the flexing of the export-to-inflow ratio standard required [] for meeting Delta water quality and flows, and ERP water resulting from upstream releases pumped at the SWP Banks Pumping Plant. Water management tools provide the ability to

> convey, store, and manage water that has been secured through other means. Examples include dedicated pumping capacity, borrowing, banking, and entering into exchange agreements with water contractors. Chapter 8 of this BA contains a more detailed description of EWA operations, as characterized in the CALSIM II modeling for the CVP OCAP.
>
> • Tier 3 (Additional Assets). In the event the EWA Agencies deem Tiers 1 and 2 levels of protection insufficient to protect at-risk fish species in accordance with the Act, Tier 3 would be initiated. Tier 3 sets in motion a process based upon the commitment and ability of the EWA Agencies to make additional water available, should it be needed. This Tier may consist of additional purchased or operational assets, funding to secure additional assets if needed, or project water if funding or assets are unavailable. It is unlikely that protection beyond those described in Tiers 1 and 2 will be needed to meet requirements of the Act.

(*Id.* at 336-37.) DWR emphasizes that, if all else fails, Tier 3 assets may be brought to bear, which include "additional purchased or operational assets, funding to secure additional assets if needed, or project water if funding or assets are unavailable." (*Id.* (emphasis added).)

There is a difference between the DSRAM's failure to require mitigation actions in response to trigger events, designed to assure the commitment of necessary resources to smelt protection, and the duty to have available or acquire those necessary resources. A court must leave to the agency the application of its expertise and authority to manage the complex hydrologic, legal, financial, physical, and logistical aspects of protecting the delta smelt. Plaintiffs motion for summary adjudication is **DENIED** as to the issue of the insufficiency of the EWA, VAMP, and CVPIA(b)(2) programs.

C. Best Available Science.

The § 7 formal consultation process is designed to "insure"

that any agency action "is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined...to be critical...." 16 U.S.C. § 1536(a)(2). "In fulfilling the requirements of this paragraph each agency shall use the best scientific and commercial data available." *Id.*

An agency has wide discretion to determine what is "the best scientific and commercial data available." *San Luis v. Badgley*, 136 F. Supp. 2d 1136, 1151 (E.D. Cal. 2000). Yet, an agency must make its decision about jeopardy based on the best science available at the time of the decision, and may not defer that jeopardy analysis by promising future studies to assess whether jeopardy is occurring. *Rumsfeld*, 198 F. Supp. 2d at 1156. While uncertainty is not necessarily fatal to an agency decision, *e.g.*, *Greenpeace Action v. Franklin*, 14 F.3d 1324, 1337 (9th Cir. 1992) ("*Greenpeace I*") (upholding agency decision even though there was uncertainty about the effectiveness of management measures because agency premised its decision on a reasonable evaluation of all available data), an agency may not entirely fail to develop appropriate projections where data "was available but [was] simply not analyzed," *Greenpeace v. NMFS*, 80 F. Supp. 2d 1137, 1149-50 (W.D. Wash. 2000) ("*Greenpeace II*") (where agency totally failed to develop any projections regarding population viability, it could not use as an excuse the fact that relevant data had not been analyzed). Here, EWS maintains the necessary data cannot be obtained.

1. Does a "Benefit of the Doubt to the Species" Presumption Apply?

The parties debate at length whether the best available scientific information principle includes a requirement that the agency "give the benefit of the doubt to the species." This language has its origins in the legislative history of the ESA, H.R. Conf. Rep. No. 96-697, 96th Cong., 1st Sess. 12, reprinted in 1979 U.S.C.C.A.N. 2572, 2576:

> Section 7(b) of the act requires the fish and wildlife service and the national marine fisheries service to render biological opinions which advise whether or not proposed agency actions would violate section 7(a)(2). Courts have given substantial weight to these biological opinions as evidence of an agency's compliance with section 7(a). The amendment would not alter this state of the law or lessen in any way an agency's obligation under section 7(a)(2).
>
> As currently written, however, the law could be interpreted to force the fish and wildlife service and the national marine fisheries service to issue negative biological opinions whenever the action agency cannot guarantee with certainty that the agency action will not jeopardize the continued existence of the listed species or adversely modify its critical habitat. The amendment will permit the wildlife agencies to frame their section 7(b) opinions on the best evidence that is available or can be developed during consultation. If the biological opinion is rendered on the basis of inadequate information then the federal agency has a continuing obligation to make a reasonable effort to develop that information.
>
> <u>This language continues to give the benefit of the doubt to the species</u>, and it would continue to place the burden on the action agency to demonstrate to the consulting agency that its action will not violate section 7(a)(2). Furthermore, the language will not absolve federal agencies from the responsibility of cooperating with the wildlife agencies in developing adequate information upon which to base a biological opinion. If a federal agency proceeds with the action in the face of inadequate knowledge or information, the agency does so with the risk that it has not satisfied the standard of section 7(a)(2) and that new information might reveal that the agency has not satisfied the standard of section 7(a)(2).

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(emphasis added).

In *Conner v. Burford*, 848 F.2d 1441, 1454 (9th Cir. 1988), the Ninth Circuit applied this "benefit of the doubt" language to hold that FWS violated the ESA by "failing to use the best information available to prepare comprehensive biological opinions considering all stages of the agency action...." At dispute in *Conner* was a biological opinion reviewing the proposed sale of oil and gas leases on National Forest land. The biological opinion analyzed the impact of the "initial lease phase," but failed to address the potential impact of post leasing activities, such as oil and gas development. FWS reasoned that there was "insufficient information available to render a comprehensive biological opinion beyond the initial lease phase," relying instead on "incremental-step consultation." *Id.* at 1452. The Ninth Circuit recognized that "the precise location and extent of future oil and gas activities were unknown at the time," but, "extensive information about the behavior and habitat of the species in the areas covered by the leases was available." *Id.* at 1453. With this information, "FWS could have determined whether post-leasing activities in particular areas were fundamentally incompatible with the continued existence of the species." *Id.* at 1454.

> In light of the ESA requirement that the agencies use the best scientific and commercial data available to insure that protected species are not jeopardized, 16 U.S.C. § 1536(a)(2), the FWS cannot ignore available biological information or fail to develop projections of oil and gas activities which may indicate potential conflicts between development and the preservation of protected species. We hold that the FWS violated the ESA by failing to use the best information available to prepare comprehensive biological opinions considering all stages of the agency action, and thus failing to

> adequately assess whether the agency action was likely to jeopardize the continued existence of any threatened or endangered species, as required by section 7(a)(2). To hold otherwise would eviscerate Congress' intent to "give the benefit of the doubt to the species."

Id. (emphasis added). *Conner* does not directly support the broader interpretation urged by Plaintiffs, that the agency should err on the side of the species when evaluating uncertain evidence. *Conner* stands for the proposition that an agency cannot abdicate its responsibility to evaluate the impacts of an action on a species by labeling available information "uncertain," because doing so violates Congress' intent that the agencies "give the benefit of the doubt to the species."

Center for Biological Diversity v. Lohn, 296 F. Supp. 2d 1223, 1239 (W.D. Wash. 2003)(rev'd on other grounds, --- F.3d ---, 2007 WL 1217738 (9th Cir.)), applied the *Conner* holding in conformity with Plaintiffs' interpretation. *Lohn* addressed the listing under the ESA of a population of orca whales. Despite considerable record evidence suggesting the Orca whales should be considered a separate species, the Orca population had not yet been identified as a separate taxon. NMFS decided not to list the species based on the scientific uncertainty that existed in the field of taxonomy, relying on the fact that the new taxon had not yet been designated. The district court ruled this decision was arbitrary and capricious:

> Given the considerable morphological, behavioral, and genetic evidence that the global Orcinus orca taxon is inaccurate and that residents and transients do not belong to the same taxon, the decision not to list the Southern Residents cannot be based upon a lack of consensus in the field of taxonomy regarding the precise, formal taxonomic redefinition of killer whales, particularly when that lack of agreement is compounded by the extreme difficulty in gathering

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> evidence to achieve consensus. The best available science standard gives "the benefit of the doubt to the species." Conner v. Burford, 848 F.2d 1441, 1454 (9th Cir.1988) (observing one of the purposes of the best available science standard in review of whether agency action may result in destruction or adverse modification of listed species' habitat pursuant to 16 U.S.C. § 1536(a)(2)). To deny listing of a species simply because one scientific field has not caught up with the knowledge in other fields does not give the benefit of the doubt to the species and fails to meet the best available science requirement.

Id. at 1239 (emphasis added).[22]

In response, Defendant Intervenors cite *Oceana, Inc. v.*

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[22] Plaintiffs cite another district court decision that applied the benefit of the doubt language: "To the extent that there is any uncertainty as to what constitutes the best scientific information, Congress intended for the agency to 'give the benefit of the doubt to the species.'" *Ctr. for Biological Diversity v. Bureau of Land Mgmt.*, 422 F. Supp. 2d 1115, 1127 (N.D. Cal. 2006)(citing *Conner*, 848 F.2d at 1454). However, that district court did not apply the "benefit of the doubt" concept in its analysis in any way, let alone as a presumption governing the agency's analysis of scientific information.

Another case Plaintiffs cite, *Rock Creek Alliance v. U.S. Fish & Wildlife Service*, 390 F. Supp. 2d 993, 1003 (D. Mont. 2005), does not support imposing a "benefit of the doubt" presumption to uncertain scientific evidence:

> Though the agency has discretion to make decisions based in its expertise, the ESA expresses a legislative mandate "to require agencies to afford first priority to the declared national policy of saving endangered species.... Congress has spoken in the plainest of words, making it abundantly clear that the balance has been struck in favor of affording endangered species the highest of priorities, thereby adopting a policy which it described as 'institutionalized caution.'"

Id. (quoting *Tennessee Valley Authority v. Hill*, 437 U.S. 153, 185 (1978)). However, as in *Center for Biological Diversity*, this language was part of a general discussion of the legal framework; the *Rock Creek* court never applied a benefit of the doubt presumption in the manner Plaintiffs suggest it should be applied here.

Evans, 384 F. Supp. 2d 203 (D.D.C. 2003), a challenge to NMFS's choice between two estimates of how much take a particular type of fishing gear would cause. The agency chose the lower estimate, reasoning that it was the "best estimate possible." The plaintiff argued that this estimate failed to give the "benefit of the doubt" to the species. *Id.* at 228. Although the lower estimate was uncertain, the district court reasoned that "the ESA does not require the agency to reject the 'best estimate possible' in favor of a more 'conservative' estimate that, according to the scientists, would be lacking in support." *Id.*

Lohn and *Oceana* appear irreconcilable, but, they can be harmonized. *Lohn* rejected an agency's decision to follow the taxonomy in the face of significant and compelling scientific evidence favoring a different conclusion. To side with the agency under such circumstances would "not give the benefit of the doubt to the species...." *Id.* at 1239. In contrast, *Oceana*, concerned an agency's choice of the "best estimate possible" over a more "conservative" estimate that lacked scientific support. The *Oceana* court refused to ignore the general rule that an agency must choose the best available science, simply because the ESA commands that the agency give the "benefit of the doubt" to the species. Both cases stand for the proposition that the agency must carefully examine the available scientific data and models and rationally choose the most reliable.

2. The BiOp's Failure to Address the 2004 Fall Midwater Trawl Data.

Plaintiffs assert that "one of the most egregious errors in the [BiOp] is its failure to consider available fall 2004 Delta

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smelt abundance data, which evoked grave concern among agencies involved in smelt management."[23] (Doc. 232 at 5.) On February 9, 2005, FWS and other CALFED members met to discuss Delta smelt abundance. Among other things, participants discussed data from the 2004 fall midwater trawl ("FMWT") survey, which revealed that "estimates of Delta smelt appear to be their lowest since 1964." (Doc. 11 at 5; AR 9199-9200, 9202; Doc. 12.) The February 16, 2005, BiOp, contained no mention of the 2004 FMWT data.

Plaintiffs assert that FWS acted arbitrarily, capriciously and unlawfully by "ignoring" the 2004 FMWT data and relying instead on the more favorable abundance data from earlier abundance surveys. (AR 366-67 (noting that the 2003 FMWT results were more favorable than those from 2002, while simultaneously acknowledging that the 2003 summer townet index (1.6) was "well below the pre-decline average of 20.4 in (1959).").) Despite the receipt of the new, even less favorable 2004 FMWT data, FWS made no substantive changes to its jeopardy analysis in the biological opinion and did not use or address the new data in any way, not even to explain why the data was not discussed. At oral argument, the agency maintained that ESA analysis cannot go on forever, that there must be a cutoff.

Plaintiffs note that the low population numbers revealed by the FMWT data were "not unexpected," as smelt abundance had been on a downward trend for at least two years prior. (AR 370-71;

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[23] Defendants and Defendant-Intervenors dispute whether the data "evoked grave concern." The degree of concern is irrelevant to the inquiry, as it is undisputed that the 2004 FMWT data showed the lowest smelt abundance on record.

9199-9200, 9202.) One prominent smelt biologist warned at a June 2003 OCAP symposium that managers should expect very low smelt abundance data in the near future and that water exports were a key factor in the population decline, noting that the "cumulative proportion of the population lost to exports relative to abundance" could be as high as 30 percent. (AR 5069.)

Federal Defendants suggest that Plaintiffs' entire argument should be rejected as internally inconsistent. (Doc. 242 at 26-27.) Plaintiffs contend that FWS should have revised the BiOp in light of the 2004 FMWT data and that additional evidence of a downward trend was "not unexpected." These contentions are consistent with the central premise of Plaintiffs' position -- that the 2004 FMWT data reflected a record low abundance (the data showed "estimates of Delta smelt appear to be at their lowest since 1964" (Doc. 11 at 5)); so low that the data should have been addressed in the BiOp, even if the agency already knew that smelt abundance was trending downward.

The State Water Contractors suggest that Plaintiffs' acknowledgment that the downward trend was "not unexpected," establishes that the BiOp fully recognizes the dire situation of the smelt. (Doc. 241 at 4.) The BiOp reflects that FWS had knowledge that smelt population levels were at extremely low levels, "[s]ince 1983, the delta smelt population has exhibited more low FMWT abundance indices, for more consecutive years, than previously recorded." (AR 367.)

> The results of seven surveys conducted by the Interagency Ecological Program (IEP) corroborate the dramatic decline in delta smelt....According to seven abundance indices designed to record trends in the status of the delta smelt, this species was

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> consistently at low population levels during the last ten years (Stevens et al. 1990). These same indices also show a pronounced decline from historical levels of abundance (Stevens et al. 1990).

(AR at 370.) The State Water Contractors' argument ignores that the 2004 FMWT data evidences record low (the lowest) smelt abundance. Plaintiffs maintain that FWS' acknowledgment of a downward trend is inadequate as it does not address or analyze in survival and recovery terms, that smelt abundance levels had reached the lowest ever recorded.

The State Water Contractors argue that, although the BiOp admits the fact of the smelt's declining population, it does not and cannot explain the cause of the decline, because there is no scientific consensus as to causation. (Doc. 241 at 5.) "Contributing to [this] uncertainty," "is the fact that SWP and CVP operations have been ongoing for decades - a period during which Delta smelt abundance has increased as well as declined." (*Id.* at 6.) The State Water Contractors assert that the DSRAM was adopted in part to protect the smelt while further monitoring and research is carried out to resolve these uncertainties. They conclude that even if the 2004 FMWT data had been addressed in the BiOp, the ultimate opinion reached would not have differed; i.e., that operation of the projects under the 2004 OCAP BiOp would not jeopardize the smelt because, among other things, take will remain at or below historic levels and the DSRAM will protect smelt from salvage at project facilities.[24] But, this is

[24] The State Water Contractors maintain that CVP/SWP operations have been on-going for decades, during which time Delta smelt abundance has fluctuated greatly.

post hoc argument; neither the agency or the biological opinion addressed the 2004 FMWT data and available scientific information opined that Project operations contributed to the decline of the smelt.

The cases the parties cite do not answer whether FWS did not have to analyze most recent data because it would not have altered the ultimate conclusion. Some cases suggest that FWS must use all available information to ensure that a biological opinion analyzes the threats to a species in a comprehensive manner. Plaintiffs refer to *Greenpeace II*, 80 F. Supp. 2d at 1149-50, for the proposition that failure to analyze and incorporate available data is fatal to a biological opinion. In that case, NMFS concluded in a biological opinion that the total groundfish catch authorized in the Bering Sea and Gulf of Alaska in a single fishing season (1999) would not jeopardize the endangered Stellar sea lion. NMFS limited the scope of the biological opinion to that single year of fisheries management activities. The district court ruled that the agency should have broadened the scope of the biological opinion to consider the overall fishery management regime, including relevant regulations and specifications. *Id.* at 1146-47. This failure to produce a comprehensive biological opinion permeated all other aspects of the agency's decision. The district court found fault with the BiOp's superficial analysis, emphasizing the agency's failure to address the overall effects of the fisheries upon the sea lion:

> As far as the Court can ascertain, the focus of BiOp2 is limited to analyzing whether the fisheries compete with the sea lion for prey. In particular, BiOp2 focuses on the potential for localized depletions of prey caused by the fisheries. BiOp2 at 90, 112. Even

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> with respect to this limited topic of discussion, meaningful analysis is virtually non-existent. NMFS itself repeatedly concludes in BiOp2 that it simply lacks the information to make any determination one way or the other. See BiOp2 at 111-118. Thus, NMFS's analysis is admittedly incomplete and its conclusions inconclusive. Although inconclusive data does not necessarily render a particular scientific conclusion invalid, the limited scope and quality of analysis that is contained in BiOp2 serves to highlight its overall inadequacy. For example, NMFS relies substantially on its conclusion that many of the target groundfish species are not important sea lion prey, despite uncertain evidence. BiOp2 at 114. That many of the target species may not individually constitute a major prey source, however, does not mean the cumulative impact of these fisheries is insignificant. In other words, limited analysis which suggests the fisheries do not jeopardize the sea lion does not obviate the requirement that NMFS address the full scope of the FMPs in order to ascertain their overall effects.
>
> In sum, BiOp2 is limited in scope, heavy on general background information, and deficient in focused and meaningful discussion and analysis of how these large fisheries, and the complex management measures which regulate them, affect endangered Steller sea lions. That NMFS now finds it necessary to undertake yet another "comprehensive consultation" is a final indication to this Court that BiOp2 is not the broad and in-depth consultation it was purported to be by NMFS, much less coextensive in scope with the FMPs as required under the ESA.
>
> A biological opinion which is not coextensive in scope with the identified agency action necessarily fails to consider important aspects of the problem and is, therefore, arbitrary and capricious. Here, BiOp2 not only fails to consider important aspects of the problem, the analysis it does contain is simply not adequate. Although an agency need not rely on conclusive scientific proof in a biological opinion, its conclusions must be based on "the best scientific and commercial data available." 16 U.S.C. § 1536(a)(2). Thus, an agency "cannot ignore available biological information or fail to develop projections" which may indicate potential conflicts between the proposed action and the preservation of endangered species. Conner, 848 F.2d at 1454.

Id. at 1149-50 (emphasis added).

In *Greenpeace II*, NMFS admitted that the information it needed to perform a more comprehensive review was available, but

argued that it "could not have been analyzed in the time allowed." *Id.* at 1150. The district court rejected this argument:

> A federal agency...is not "excused from [fulfilling the dictates of the ESA] if, in its judgment, there is insufficient information available to complete a comprehensive opinion and it takes upon itself [a more limited analysis]." Conner, 848 F.2d at 1455. This is not a situation where NMFS fully addressed the problem based on uncertain scientific data. *See Greenpeace Action v. Franklin*, 14 F.3d 1324, 1337 (9th Cir.1992). Rather, NMFS entirely ignored relevant factors and admittedly failed to analyze and develop projections based on information that was available.

Id. at 1150 (emphasis added); *see also Conner*, 848 F.2d at 1454 (biological opinion invalidated because agency failed to "use best information available to prepare comprehensive biological opinions considering all stages of agency action").

Plaintiffs analogize this case to *Greenpeace II*, because the agency has ignored available biological information. Here, Plaintiffs complain that FWS failed to incorporate into existing models and analyses that already reflected concern over an overall declining trend in smelt, the most recent survey information, evidencing a more pronounced decline in smelt populations than ever before recorded. In *Greenpeace II*, the agency entirely failed to perform a comprehensive review of threats to the sea lion. The difference in degree is not significant.

Federal Defendants cite *Oceana*, 384 F. Supp. 2d 203, where NMFS concluded that an amendment to the Atlantic Sea Scallop Fishery Management Plan would not jeopardize the protected loggerhead sea turtle, based on a population model that involved a degree of uncertainty, but that the agency determined was the

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"most reliable method." *Id.* at 215. The *Oceana* plaintiffs did not dispute that the model represented the "best available science," instead arguing that the model was "so ill-suited to the purpose for which it was used, and so fraught with uncertainties," that the agency could not rationally reach its no jeopardy conclusion. *Id.* at 218. The district court upheld the agency's use of the model, reasoning "[t]ime and again courts have upheld agency action based on the 'best available' science, recognizing that some degree of speculation and uncertainty is inherent in agency decisionmaking, even in the precautionary context of the ESA." *Id.* at 219. Though the ESA should not be implemented "haphazardly, on the basis of speculation, *id.* at 219, the model "bears a rational relationship to the reality it purports to represent" and no other alternative model was available, *id.* at 221.

The circumstances here are not analogous to those in *Oceana*, where the plaintiffs admitted that the challenged model was the best, albeit uncertain, available science. Here, Plaintiffs maintain the agency's failure to analyze the most recent smelt population information prevented consideration of the best available, consequential scientific information.

Federal Defendants also rely on *Greenpeace I*, 14 F.3d at 1337, an earlier challenge to a Stellar sea lion biological opinion. The *Greenpeace I* plaintiffs argued that the agency acted arbitrarily and capriciously by approving certain fishery management measures despite uncertainty about the effects of the measures on the sea lion. The Ninth Circuit concluded that the presence of some uncertainty did not violate the best available

science requirement in part because that BiOp analyzed all the available data:

> We hold that the Service has fulfilled its substantive duties as well. Despite Greenpeace's assertions to the contrary, the Service supported its conclusions with ample data and analysis. The June biological opinion indicates that the Service, the Alaska Fisheries Science Center, and the National Marine Mammal Laboratory "analyzed all the available data on the pollock fishery and Steller sea lions" in the Gulf of Alaska. The Service also sought the recommendations of the Steller Sea Lion Recovery Team. The opinion demonstrates that the Service evaluated the spatial and temporal distribution of commercial fishing across the Gulf of Alaska. It then addressed not only the total biomass of pollock in the Gulf and the effects of fishery removals on that biomass, but also the spatial and temporal distribution of pollock across the Gulf. And despite Greenpeace's claims to the contrary, the Service did not ignore hydroacoustic surveys of pollock biomass, but considered and compared them to bottom trawl surveys. Finally, while the Service has repeatedly conceded that it was uncertain about the effectiveness of its management measures, it premised these measures on a reasonable evaluation of available data, not on pure speculation.
>
> The biological opinions indicate that the Service, an expert agency, consulted with other teams of experts to consider all relevant factors pertaining to the effects of the Gulf fishery on the Steller sea lion. And they indicate that the Service did not ignore data, as Greenpeace suggests. The Service's decision to go ahead with the 1991 fishery under the proposed restrictions, despite some uncertainty about the effects of commercial pollock fishing on the Steller sea lion, was not a clear error of judgment.

(Emphasis added.) *Id.* at 1337. Here, unlike *Greenpeace I*, FWS failed to analyze all of the available data on the Delta smelt, as the 2004 FMWT data is not mentioned in the BiOp. Nor has FWS resolved uncertainties about the identified causes of the serious decline in Delta smelt abundance by adopting unenforceable management measures.

"Although a decision of less than ideal clarity may be upheld if the agency's path may reasonably be discerned, [a

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court] cannot infer an agency's reasoning from mere silence. Rather, an agency's action must be upheld, if at all, on the basis articulated by the agency itself." *Pacific Coast Fed'n of Fishermen's Ass'ns v. United States Bureau of Reclamation*, 426 F.3d 1082, 1091 (9th Cir. 2005)(internal citations and quotations omitted). "[W]hen reviewing a biological opinion, [a court may] rely only 'on what the agency actually said'...." *Id.* (quoting *Gifford Pinchot Task Force*, 378 F.3d at 1072 & n. 9). Had FWS examined the FMWT 2004 data in the BiOp, the weight it gave to that data would have been entitled to deference. The agency's silence cannot be afforded deference.

a. The timing of the 2004 FMWT Data relative to the issuance of the BiOp.

Federal Defendants complain the timing of the release of the 2004 FMWT data did not leave enough time to address the data before issuance of the biological opinion. The record shows at the very latest, the 2004 FMWT data was presented to FWS and other CALFED members on February 9, 2005, less than a week before the February 16, 2005, issuance of the biological opinion. Federal Defendants assert they were not required to rewrite the BiOp at the "eleventh hour." (Doc. 242 at 27).

Although the record shows the 2004 FMWT data was presented at the February 9, 2005 CALFED meeting, it is unclear when FWS first saw this data. Plaintiffs' claim that the data was available in December 2004, is not supported.[25] However, even assuming FWS was not aware of the 2004 FMWT data until February

[25] Plaintiffs' record citations, AR 9199--9202, are printouts of the FMWT data which post date the issuance of the BiOp.

9, 2005, the agency was not operating under a deadline. As in *Greenpeace II*, where the agency's statutory duty was not excused because the data could not be "analyzed in the time allowed," 80 F. Supp. 2d at 1150, here, FWS could have delayed releasing the biological opinion until it had reviewed and analyzed the new abundance data, which was especially significant as it showed Delta smelt abundance at its nadir.

Defendants and Defendant-Intervenors rejoin that the failure of the BiOp to directly address the 2004 FMWT is harmless, because one of the DSRAM's trigger criteria is an index based upon the previous years' FMWT results, calling for any new abundance data to be incorporated into the adaptive management process. However, even if the data were considered later in the DSRAM process, no designated protective actions are required to be taken in response to any of the triggering criteria.[26]

Federal Defendants raise a legitimate concern about having to prolong completion of the BiOp on the eve of its release. In theory, new scientific information could arrive on FWS's doorstep on a daily basis. If FWS was required to consider and address every new piece of information it received prior to publication of its decision, it would be effectively impossible for the

[26] Abundance data is relevant to aspects of the BiOp that are independent of the DSRAM process. For example, the agency's conclusion that the level of anticipated take "is not likely to result in jeopardy to the smelt because this level of take is at or below historical levels of take" (AR 474), is irrational because no consideration is given to the current decline in smelt abundance nor any explanation provided how the further decline of the smelt does not exacerbate jeopardy to the species' survival and recovery.

agency to complete a biological opinion. But, this is not such a case. The FMWT is a credible and reliable Delta smelt population abundance survey, regularly compiled on an annual basis, and relied upon by the agency in the past. There is no rational reason to ignore such important data. The BiOp places great weight on the FMWT as "the second longest running survey." (AR 366, 370). The agency does not suggest the time of receipt of the 2004 FMWT data was unexpected. The agency's failure to acknowledge and analyze the record low abundance levels revealed by the 2004 FMWT is unreasonable and violated its duty to use the best available scientific information. 16 U.S.C. § 1536(a)(2).

Plaintiffs' motion for summary adjudication is **GRANTED** as to this claim.

3. Global Climate Change Evidence.

Plaintiffs next argue that the BiOp ignored data about Global Climate Change that will adversely affect the Delta smelt and its habitat. (Doc. 232 at 7.) This is potentially significant because the BiOp's conclusions are based in part on the assumption that the hydrology of the water bodies affected by the OCAP will follow historical patterns for the next 20 years. (AR 375 (explaining that CALSIM II modeling involved making "adjustments to historic water supplies...by imposing future level land use on historical meteorological and hydrologic conditions").)

In a July 28, 2004 comment letter, Plaintiff NRDC directed FWS's attention to several studies on the potential effects of climate change on water supply reliability, urging that the issue be considered in the BiOp. (AR 8552-56.) The comment letter

stated:

> The best scientific data available today establishes that global climate change is occurring and will affect western hydrology. At least half a dozen models predict warming in the western United States of several degrees Celsius over the next 100 years (Redmond, 2003). Such sophisticated regional climate models must be considered as part of the FWS' consideration of the best available scientific data.
>
> Unfortunately, the Biological Assessment provided by the Bureau to FWS entirely ignores global climate change and existing climate change models. Instead, the BA projects future project impacts in explicit reliance on seventy-two years of historical records. In effect, the Biological Assessment assumes that neither climate nor hydrology will change. This assumption is not supportable.
>
> In California, a significant percentage of annual precipitation falls as snow in the high Sierra Nevada mountains. Snowpack acts as a form of water storage by melting to release water later in the spring and early summer months (Minton, 2001). The effects of global climate change are expected to have a profound effect on this dynamic. Among other things, more precipitation will occur as rain rather than snow, less water will be released slowly from snowpack "storage" during spring and summer months, and flooding is expected to increase (Wilkinson, 2002; Dettinger, 2003). These developments will make it more difficult to fill the large reservoirs in most years, reducing reservoir yields and will magnify the effect of CVP operations on downstream fishes (Roos, 2001). These developments will also dramatically increase the cost of surface storage relative to other water supply options, such as conservation.
>
> While the precise magnitude of these changes remains uncertain, judgments about the likely range of impacts can and have been made. *See e.g.*, U.S. Global Climate Action Report - 2002; Third National Communication of the United States Under the United Nations Framework Convention on Climate Change at 82, 101 (2002). [FN3]. The Service can and must evaluate how that range of likely impacts would affect CVP operations and impacts, including the Bureau's ability to provide water to contractors while complying with environmental standards. We therefore request that the Service review and consider the work cited above, as well as the background and Dettinger presentation at a recent climate change conference held in Sacramento, June 9-11, 2004 [citation omitted] and climate change reports [citation omitted].

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(AR at 8554-55 (emphasis added).)

A second presentation by Michael Dettinger at a December 8-9, 2004 CALFED meeting, attended by FWS staff, concluded that "warming is already underway..."; that this would result in earlier flows, more floods, and drier summers; and that "California water supplies/ecosystems are likely to experience [] changes earliest and most intensely." (Doc. 10 at 18.) Following Dettinger's presentation, members of CALFED noted "the need to reevaluate water storage policies and ERP [Ecosystem Recovery Program] recovery strategies, all of which would be affected by projected climate changes." (Doc. 9 at 3.) The record reflects that extreme water temperatures can have dramatic impacts upon smelt abundance. (AR 8979-80.)

In addition to the specific studies and data cited by NRDC, FWS scientists recognized the issue of climate change warranted further consideration. At a June 2003 symposium entitled "Framing the issues for Environmental and Ecological Effects of Proposed Changes in Water Operations: Science Symposium on the State of Knowledge," a number of questions regarding climate change were raised, including: "How does the proposed operations plan account for the potential effects of climate change (e.g., El Nino or La Nina, long term changes in precipitation and runoff patters, or increases in water temperature)?" (AR at 4839.)

Plaintiffs argue that, despite this evidence that climate change could seriously impact the smelt by changing Delta hydrology and temperature, the BiOp "did not so much as mention the probable effects of climate change on the delta smelt, its habitat, or the magnitude of impacts that could be expected from

the 2004 OCAP operations, much less analyze those effects." (Doc. 232 at 8.) Defendants and Defendant-Intervenors respond by arguing (1) that the evidence before FWS at the time the BiOp was issued was inconclusive about the impacts of climate change; and (2) that, far from ignoring climate change, the issue is built into the BiOp's analysis through the use of X2 as a proxy for the location and distribution of Delta smelt.

a. ***Inconclusive Nature of Available Information Regarding the Impacts of Global Climate Change on Precipitation.***

Federal Defendants and the State Water Contractors characterize Mr. Dettinger's presentation, as reflecting "a great deal of uncertainty that climate change will impact future precipitation." The presentation is entitled "Climate Change Uncertainties and CALFED Planning." (Doc. 10 at 1.) Dettinger acknowledges that, although current climate models "yield consistent warming scenarios for California" (*id.* at 6), there is no similar consensus regarding the impact of warming on future precipitation (*id.* at 7). Federal Defendants suggest that FWS "responsibly refused to engage in sheer guesswork, and properly declined to speculate as to how global warming might affect delta smelt." (Doc. 242 at 23.) But, the NRDC letter cited a number of studies in addition to Mr. Dettinger's presentations, all of which predict that anticipated climate change will adversely impact future water availability in the Western United States.

At the very least, these studies suggest that climate change will be an "important aspect of the problem" meriting analysis in the BiOp. *Pacific Coast Fed'n*, 265 F.3d at 1034. However, as with the 2004 FMWT data, the climate change issue was not

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meaningfully discussed in the biological opinion, making it impossible to determine whether the information was rationally discounted because of its inconclusive nature, or arbitrarily ignored.[27]

b. ***X2 as a Proxy for Climate Change.***

The State Water Contractors argue that the approaches taken in the DSRAM are "more than adequate to deal with the projected impacts of climate change - assuming they occur." (Doc. 241 at 8.) For example, Plaintiffs' suggestion that climate change will produce earlier flows, more floods, and drier summers is addressed by the DSRAM's X2 trigger. Flow level changes will be

[27] Plaintiffs argue that "[r]egardless of the uncertainty involved in predicting the consequences of climate change, FWS had an obligation under the ESA to address the probable effects on Delta smelt." (Doc. 232 at 7.) In response, the State Water Contractors quote the following passage from *Bennett v. Spear*, 520 U.S. 154, 176-177 (1997), in support of the proposition that the ESA intended to preclude exactly this kind of argument:

> The obvious purpose of the requirement that each agency "use the best scientific and commercial data available" is to ensure that the ESA not be implemented haphazardly, on the basis of speculation or surmise. While this no doubt serves to advance the ESA's overall goal of species preservation, we think it readily apparent that another objective (if not indeed the primary one) is to avoid needless economic dislocation produced by agency officials zealously but unintelligently pursuing their environmental objectives.

But, this passage from *Bennet* was part of a broader discussion holding that persons who are economically burdened by a decision made under the ESA fall within the zone of interests the statute protects for the purposes of standing. *Bennet* sheds little light on the current inquiry -- whether and to what extent the data that was before the FWS regarding climate change should have been considered and addressed in the BiOp.

reflected in the position of X2. If climate change alters water temperatures, DSRAM also includes a temperature trigger, that monitors the temperature range within which successful Delta smelt spawning occurs.

The DSRAM offers no assurance that any mitigating fish protection actions will be implemented if the X2 criteria is triggered. That X2 indirectly monitors climate change does not assuage Plaintiffs' concerns that the BiOp has not adequately analyzed the potential impact of climate change on the smelt.

The BiOp does not gauge the potential effect of various climate change scenarios on Delta hydrology. Assuming, *arguendo*, a lawful adaptive management approach, there is no discussion when and how climate change impacts will be addressed, whether existing take limits will remain, and the probable impacts on CVP-SWP operations.

FWS acted arbitrarily and capriciously by failing to address the issue of climate change in the BiOp. This absence of <u>any</u> discussion in the BiOp of how to deal with any climate change is a failure to analyze a potentially "important aspect of the problem."[28]

Plaintiffs' motion for summary adjudication is **GRANTED** as to this claim.

D. <u>**There is No Rational Connection Between the No Jeopardy Finding and the Status of the Species**</u>.

Plaintiffs next allege that there is no rational connection

[28] There is no basis to determine what weight FWS should ultimately give the climate change issue in its analysis.

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between the record evidence and the BiOp's "no jeopardy" conclusion. Plaintiffs first argue that the BiOp's approach to setting take limits is arbitrary and capricious because FWS failed to consider defined take limits in the context of current smelt abundance. Plaintiffs complain that the BiOp does not explain how its no jeopardy conclusion can be justified in light of the admitted adverse effects of the project, along with indirect and cumulative effects on the species.

In a formal consultation, the ESA requires FWS to "[f]ormulate its biological opinion as to whether the action, taken together with cumulative effects, is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat." 50 C.F.R. § 402.14; *see also* 16 U.S.C. § 1536(a)(2). The phrase "jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." 50 C.F.R. § 402.02.

Agency action may be overturned if the agency has "relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise." *Pacific Coast Fed'n*, 265 F.3d at 1034. A court must ask "whether the agency considered the relevant factors and

articulated a rational connection between the facts found and the choice made." *Id.* The agency must "examine the relevant data and articulate a satisfactory explanation for its action including a rational connection between the facts found and the choice made." *Motor Vehicle Mfrs. Ass'n v. State Farm Mutual Ins.*, 463 U.S. 29, 43 (1983).

1. Plaintiffs' Argument that Salvage Underestimates Project Impacts on the Smelt.

Plaintiffs assert that the BiOp's reliance on salvage is arbitrary and capricious because salvage is not a reliable basis for setting Project take limits. Plaintiffs cite record evidence, including statements made by smelt biologists and FWS employees, that salvage does not accurately estimate incidental take of young Delta smelt. (*See* AR 8403, 7578.) The BiOp admits that salvages does not fully account for all smelt losses. (AR 419 ("It should be noted that although salvage is used to index delta smelt take, it does not reliably index delta smelt entrainment. Furthermore, delta smelt salvage is highly variable at all time scales....).") Plaintiffs have not shown that a better measure of smelt take could have been generated from available data. The agency is entitled to rely on this approach as it appears to be the "best estimate possible," no party has suggested an alternative. *See Oceana*, 384 F. Supp. 2d at 228.

This objection standing alone is insufficient to justify summary adjudication.

2. The BiOp's Approach to Estimating Future Take Without Considering the Smelt's Current Abundance Is Arbitrary and Capricious.

The take limits are based on historic sampling from "salvage

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density" (number of fish taken per unit of water), which data is adjusted using CALSIM II modeling to reflect water flows anticipated under the circumstances of the final consultation. FWS's no jeopardy determination is based in part on flow modeling for the final consultation scenario that predicted lower than historic salvage levels during critical times. (AR 474 (finding that the level of anticipated take "is not likely to result in jeopardy to the smelt because this level of take is at or below historical levels of take.")

A close examination of the administrative record reveals that this conclusion relies upon an unsupported irrational assumption not justified by the record, i.e., that maintaining salvage at or below historic salvage levels will ensure that the 2004 OCAP is not likely to jeopardize the continued existence of the Delta smelt. First, by focusing only on how proposed operations will either increase or decrease smelt take, FWS effectively limited its analysis to determining whether the magnitude of the OCAP's impact upon the smelt would be different from the Projects' impact under the regulatory historical baseline. FWS did not analyze how the absolute number of smelt taken during any given period of Project operations will impact overall smelt abundance at the time of the 2005 BiOp or in the future. Nor does the finding the smelt "still persists," even at the lowest recorded abundance levels, have any meaning if the smelt's "persistence" is at a level at or near extinction. Evaluating "persistence" instead of smelt population abundance is irrational, arbitrary, and runs counter to the evidence before the agency.

The Ninth Circuit, in *NWF v. NMFS*, 481 F.3d 1224 at *8, invalidated a biological opinion in part because it failed to view the agency action "in the present and future human and natural contexts." Here, the BiOp similarly fails to provide a scientific explanation for why it is appropriate to set incidental take without considering the most current smelt population data. This methodology fails to take most recent available natural conditions (i.e., the smelt's current and/or future population abundance) into consideration. For example, if the smelt's population is currently 600,000, it might be justifiable to permit a monthly take of over 30,000. However, if the smelt's current population is only 60,000, allowing 30,000 to be entrained in the pumps in a single month would represent a 50% reduction in smelt population. Even if the 30,000 figure was significantly lower than historic take, Defendant-Intervenors agree "that salvage impacts cannot be accurately identified without a population estimate." (Doc. 247 at 9 n.13.)

DWR asserts that, in setting the take limits, the BiOp took into consideration concerns expressed by experts that using historic information alone would not create an appropriate take limit. (*See* AR 4880, 5532, 5543). The first of the citations offered by DWR, an email sent by FWS's Wim Kimmerer to several individuals at DWR, EPA and elsewhere, states that there was some discussion at FWS about "getting away from take as the principle criterion governing management and recovery of delta smelt." (AR 4880.) The next page of this email goes on to admit that "determining what level of mortality is acceptable or 'safe' is going to be difficult... Ultimately...this should be done through

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some sort of population model or viability analysis." (AR 4881 (emphasis added).) The other cited communications express similar concerns. (*See* AR 5532, 5543.) It is time to do it, yet FWS continues to profess the smelt population cannot be reliably measured.

DWR argues that, together, the take limits and the DSRAM address these concerns by moving the focus of management away from salvage. However, there is no way to know when or what measures will be taken under the DSRAM, which leaves the existing take limits as the only enforceable measures in the BiOp,[29] while the species heads toward extinction. Using flawed take limits and refusing to quantify smelt population and recent viability trends create substantial doubt about the reliability of the BiOp.

Defendants and Defendant-Intervenors suggest that sufficient information was simply not available to accurately determine smelt abundance.[30] Plaintiffs rejoin by referring to an email

[29] There is no recognized mechanism for introducing any population viability data, collected through the adaptive management process, into the setting of the take limits.

[30] The San Luis Parties mischaracterize Plaintiffs argument as a request for FWS to undertake additional research projects. (Doc. 247.) Defendant Intervenors are correct that FWS is not required to undertake new research, *Greenpeace Action v. Franklin*, 14 F.3d 1324, 1335 (9th Cir. 1992)(agency may proceed despite uncertainty about accuracy of modeling effort); Southwest Ctr for Biological Diversity, 215 F. 3d 58, 60 (D.C. Cir. 2000)(agency could rely on inconclusive data to make decision; not obligated to conduct new independent studies). Plaintiffs do point out that FWS acknowledges in the AR that an accurate determination of non-jeopardy would require knowledge of how many smelt existed, what proportion would be lost due to the projects, and what level of loss would be sustainable. (Doc. 232

sent by Zachary Hymanson to Ryan Olah at FWS, with copies to others at concerned federal and state agencies. Mr. Hymanson opined: "I think we are at the point where we should report and use quantified estimates of the total number of individuals at the various life stages monitories. Quantified population and life stage estimates of fishes around the world are routinely made with A LOT less data than we have for delta smelt." (AR 7542 (emphasis in original).)

The viability of Delta smelt has been under scrutiny for over ten years. No party has shown that producing a reliable population estimate is scientifically unfeasible. Information does not have to be perfect or infallible for the agency to be required to use it to create a population estimate. *See Greenpeace II*, 80 F. Supp. 2d at 1149-50 (finding it unlawful for agency to entirely ignore relevant factor and fail to analyze and develop projections regarding that factor based on information that was available); *see also Conner*, 848 F.2d at 1454 (biological opinion invalidated because agency failed to "use best information available to prepare comprehensive biological opinions considering all stages of agency action."). Without population estimates, it is arbitrary for the agency to conclude that project operations will not result in jeopardy simply because the projects will take relatively fewer smelt than they did in the past, in the face of the undisputed fact that the

at 23 (citing AR 8221).) However, the crux of Plaintiffs' concern is that FWS has not developed such population data and ignored important existing data on abundance in setting the take limits.

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smelt population has been declining steadily in recent years. Failing to incorporate any information about smelt population abundance into the setting of the take limits is a fundamental failure rendering the BiOp arbitrary and capricious.

The San Luis Parties' rationalization of FWS's approach, setting the incidental take limits using a model that does not take current abundance data into consideration, is that historic records reveal "either no, or perhaps a very weak relationship, between juvenile abundance measured by the TNS and adult abundance measured by the FMWT." (Doc. 247 at 5.) This "lack of [a] linear relationship between the two indices, shows that events after the TNS, in late summer and early fall, are probably affecting the number of juveniles that mature into spawners." (Doc. 247 at 6.) From the lack of a linear relationship, San Luis infers that something other than salvage (i.e. entrainment in the pumps) is causing the smelt's decline.[31]

The BiOp interprets the data differently:

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[31] The Administrative Record reflects various explanations for the lack of a linear relationship between the TNS and the FMWT. (AR 1025-26.) One possible explanation for why the number of spawning age smelt (indexed by the FMWT) seems to be a poor predictor of subsequent offspring (indexed by the TNS) is that there is some environmental factor (not directly related to entrainment at the projects) limiting survivability, inferring that there is a carrying capacity for the population. (*Id.*) Alternatively, some scientists question whether it is proper to try to draw statistical conclusions from the entire 1969-2002 data pool, given that the smelt experienced a precipitous decline in 1981. These scientists have postulated that the data "may reflect two different relationships from two time periods with different delta smelt carrying capacities." (*Id.* at 1026.) One study cited in the AR indicates that food supply may be the limiting factor during this time period. (AR 8976.)

> In a near-annual fish like delta smelt, a strong relationship would be expected between number of spawners present in one year and number of recruits to the population the following year. Instead, the stock-recruit relationship for delta smelt is weak, accounting for about a quarter of the variability in recruitment (Sweetnam and Stevens 1993). This relationship does indicate, however, that factors affecting numbers of spawning adults (e.g., entrainment, toxics, and predation) can have an effect on delta smelt numbers the following year.

(AR at 364 (emphasis added).)[32] Plaintiffs refer to other record evidence creating doubt that salvage is not a statistically reliable indicator of smelt abundance, including high entrainment events in the early 1980s and other "extreme events," including the El Niño of 1982-83, which caused significant declines in smelt abundance. (AR 8979.)

The BiOp acknowledges that salvage can have an impact on smelt abundance (although the statistical relationship is non-linear). It is arbitrary and capricious for FWS to base take limits on a projection of future salvage calculated without considering the most current or future smelt abundance and without reliable smelt population estimate.

Plaintiffs' motion for summary adjudication is **GRANTED** as to this issue. The BiOp's approach to setting incidental take limits is arbitrary and capricious because it fails to incorporate reliable smelt population data and the most recent

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[32] The San Luis Parties raise numerous questions regarding FWS's conclusion that there is a statistical relationship between the numbers of spawning adults and Delta smelt abundance the following year, criticizing the statistical analyses referenced in the BiOp. (Doc. 247 at 5.) It is unnecessary to adjudicate these issues, as the San Luis Parties have not separately challenged the conclusions reached in the BiOp on this ground nor have they moved for summary judgment on any issue in this case.

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information regarding smelt abundance.

3. Plaintiffs' Argument That the Biop Fails to Explain How its No Jeopardy Conclusion Can Be Justified in Light of the Identified Adverse Effects of the Project, along with Indirect and Cumulative Effects.

In formulating a biological opinion, the ESA requires FWS to determine "whether the action, taken together with cumulative effects, is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat." 50 C.F.R. § 402.14 (emphasis added). "Jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." 50 C.F.R. § 402.02 (emphasis added).

The BiOp concludes that the 2004 OCAP will have numerous direct and indirect impacts apart from salvage, including habitat loss, increased vulnerability of Delta smelt to predation, and increased vulnerability to adverse temperature effects. (*See* AR 399, 443-44.) Plaintiffs allege that, although the BiOp lists indirect impacts, it fails to explain how they relate to the potential for jeopardy.

Federal Defendants respond to this allegation with a single paragraph, asserting generally that "the biological opinion considers the effects of dozens of project components, each with a multi-layered analysis," and indicating how many times the topics of predation (18), temperature changes (180 references), life cycle impacts (75 references to the term "juveniles") are

discussed in the BiOp. (Doc. 242 at 30.) What Federal Defendants do not do is point to those portions of the BiOp which analyze these issues in a way that demonstrates why these indirect impacts will not cause jeopardy or how they relate to survival and recovery of the smelt. A review of the BiOp does not reveal such an analysis.

The State Water Contractors suggest that the DSRAM trigger criteria were designed to address all of the potential impacts identified in the BiOp. (Doc. 241 at 8.) This leaves for future consideration and speculation the impacts events activating DSRAM triggers will have.

a. *Cumulative Impacts*.

Plaintiffs also argue that the BiOp fails to meaningfully address cumulative impacts, "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." 50 C.F.R. § 402.02. The BiOp highlights a number of predicted cumulative effects:

> Any continuing or future non-Federal diversions of water that may entrain adult or larval fish would have cumulative effects to the smelt. Water diversions through intakes serving numerous small, private agricultural lands contribute to these cumulative effects. These diversions also include municipal and industrial uses. State or local levee maintenance may also destroy or adversely modify spawning or rearing habitat and interfere with natural long term habitat-maintaining processes.
>
> Additional cumulative effects result from the impacts of point and non-point source chemical contaminant discharges. These contaminants include but are not limited to selenium and numerous pesticides and herbicides as well as oil and gasoline products associated with discharges related to agricultural and urban activities. Implicated as potential sources of mortality for smelt, these contaminants may adversely

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> affect fish reproductive success and survival rates. Spawning habitat may also be affected if submersed aquatic plants, used a[s] substrates for adhesive egg attachment, are lost due to toxic substances.
>
> Other cumulative effects could include: the dumping of domestic and industrial garbage may present hazards to the fish because they could become trapped in the debris, injure themselves, or ingest the debris; golf courses reduce habitat and introduce pesticides and herbicides into the environment; oil and gas development and production remove habitat and may introduce pollutants into the water; agricultural uses on levees reduce riparian and wetland habitats; and grazing activities may degrade or reduce suitable habitat, which could reduce vegetation in or near waterways.

(AR 468.) There is no quantitative and qualitative analysis of the potential impact of these cumulative effects on the smelt and its habitat, except to identify the causes, the BiOp concludes without explanation, "[t]he cumulative effects of the proposed action [are] not expected to alter the magnitude of cumulative effects on the above described actions upon the critical habitat's conservation function for the smelt." (*Id.*)

The San Luis Parties argue that FWS's no jeopardy conclusion and impacts analysis is "rationally based on its determination that the proposed future changes will not significantly increase the magnitude of the ongoing Project's potential impacts." (Doc. 247 at 9.) This conclusion is the kind of analysis recently rejected by the Ninth Circuit in ***NWF v. NMFS***:

> To "jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." 50 CFR § 402.02; 16 U.S.C. § 1536(a)(2). NMFS argues that, under this definition, it may satisfy the ESA by comparing the effects of proposed FCRPS operations on listed species to the risk posed by baseline conditions. Only if those effects are

> "appreciably" worse than baseline conditions must a full jeopardy analysis be made. Under this approach, a listed species could be gradually destroyed, so long as each step on the path to destruction is sufficiently modest. This type of slow slide into oblivion is one of the very ills the ESA seeks to prevent.
>
> Requiring NMFS to consider the proposed FCRPS operations in their actual context does not, as NMFS argues, effectively expand the "agency action" at issue to include all independent or baseline harms to listed species. Nor does it have the effect of preventing any federal action once background conditions place a species in jeopardy. To "jeopardize"--the action ESA prohibits--means to "expose to loss or injury" or to "imperil." Either of these implies causation, and thus some new risk of harm. Likewise, the suffix "-ize" in "jeopardize" indicates some active change of status: an agency may not "cause [a species] to be or to become" in a state of jeopardy or "subject [a species] to" jeopardy. American Heritage Dictionary of the English Language (4th ed.). Agency action can only "jeopardize" a species' existence if that agency action causes some deterioration in the species' pre-action condition.
>
> Even under the so-called aggregation approach NMFS challenges, then, an agency only "jeopardize[s]" a species if it causes some new jeopardy. An agency may still take action that removes a species from jeopardy entirely, or that lessens the degree of jeopardy. However, an agency may not take action that will tip a species from a state of precarious survival into a state of likely extinction. Likewise, even where baseline conditions already jeopardize a species, an agency may not take action that deepens the jeopardy by causing additional harm.
>
> Our approach does not require NMFS to include the entire environmental baseline in the "agency action" subject to review. It simply requires that NMFS appropriately consider the effects of its actions "within the context of other existing human activities that impact the listed species." *ALCOA*, 175 F.3d at 1162 n. 6 (citing 50 C.F.R. § 402.02's definition of the environmental baseline). This approach is consistent with our instruction (which NMFS does not challenge) that "[t]he proper baseline analysis is not the proportional share of responsibility the federal agency bears for the decline in the species, but what jeopardy might result from the agency's proposed actions in the present and future human and natural contexts." *Pac. Coast Fed'n*, 426 F.3d at 1093 (emphasis added).

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481 F.3d 1224 at *7-8 (emphasis added) (footnote omitted).

Here, the BiOp does not consider the cumulative effects of any future DSRAM actions, which it relies on to avoid jeopardy, nor does it meaningfully relate the most current abundance of the species to future OCAP operations to assess jeopardy. The BiOp unlawfully fails to adequately analyze indirect and cumulative impacts of the 2004 OCAP. Summary adjudication on this issue is appropriate.

E. Did the BiOp Fail to Adequately Consider Impacts to Critical Habitat?

Plaintiffs allege that the BiOp fails to adequately consider critical habitat in two respects. First, by failing to analyze the impacts of the 2004 OCAP on the value of critical habitat for the recovery as opposed to just the survival of the smelt. Second, failure to consider impacts to all of the Delta smelt's critical habitat because it focuses only on X2.

1. Did the BiOp Fail to Consider Whether 2004 OCAP Would Diminish Value of Critical Habitat for Recovery?

The ESA requires FWS to determine whether the 2004 OCAP will destroy or adversely affect Delta smelt critical habitat. 16 U.S.C. § 1536(a)(2). "Destruction or adverse modification of critical habitat" means "a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical." 50 C.F.R. § 402.02

Initially, the critical habitat analysis was conducted

pursuant to agency regulations that defined adverse modification as:

> [A] direct or indirect alteration that appreciably diminishes the value of critical habitat for **both survival and recovery** of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical.

50 C.F.R. § 402.02 (emphasis added).

Following the issuance of the 2004 BiOp, the Ninth Circuit invalidated the adverse modification regulation, based on its own interpretation of the regulation's language, "alteration that appreciably diminish the value of critical habitat for both the survival and recovery of a listed species," "reads the 'recovery' goal out of the adverse modification inquiry." *Gifford Pinchot*, 378 F.3d at 1069-70.

The Bureau requested that FWS reinitiate consultation on the 2004 OCAP to ensure compliance with *Gifford Pinchot*. The result was the disputed 2005 BiOp, which expressly states that it does not rely on the invalidated regulation. (AR 248.) Rather, the BiOp "relied on the statutory provisions of the ESA to complete the analysis with respect to critical habitat." (*Id.*) The ESA defines critical habitat as including "the specific areas ... occupied by the species ... which are ... essential to the conservation of the species" and the "specific areas outside the geographical area occupied by the species ... that ... are essential for the conservation of the species...." 16 U.S.C. § 1532(5)(A). This statutory reference to "conservation" was the premise for the Ninth Circuit's *Gifford Pinchot* reasoning:

"Conservation" is a much broader concept than mere

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> survival. The ESA's definition of "conservation" speaks to the recovery of a threatened or endangered species. Indeed, in a different section of the ESA, the statute distinguishes between "conservation" and "survival." Requiring consultation only where an action affects the value of critical habitat to both the recovery and survival of a species imposes a higher threshold than the statutory language permits

378 F.3d at 1070 (internal citation omitted).

The 2005 BiOp uses the term "conservation," rather than "survival" and/or "recovery," several times in connection with its critical habitat analysis. In the "Critical Habitat Effects" section, the BiOp states that the "primary constituent elements essential to conservation of the species will not be affected by the proposed project." (AR 423.) In addition, after discussing critical habitat, including those areas essential to spawning, transport, rearing and migration, the BiOp acknowledges impacts, but explains that after the proposed diversions in the OCAP are implemented "the primary constituent elements [of critical habitat] essential to the conservation of the species still function." (*Id.* at 371.)[33] What specific effects any DSRAM

[33] Defendant-Intervenors argue that, because of these mentions of "conservation," FWS is entitled to a "presumption of regularity," and the court must assume that agency considered recovery. (Doc. 247 at 12.) In *Gifford Pinchot*, after invalidating the destruction and adverse modification regulation, the Ninth Circuit considered whether it should presume that the agency followed its own regulation that was valid at the time the biological opinion was issued. The Ninth Circuit concluded that, because the agencies must be afforded a "presumption of regularity," a court must assume that the agency followed the then applicable regulation. *Id.* at 1072. Applying this presumption here, given that the agency specifically applied the statute, not the invalid regulation, there is no evidence the agency applied an invalid regulation. However, Defendant-Intervenors' suggestion that the presumption should be applied to validate the BiOp's analysis of recovery is misplaced. The

measures will have on the smelt are not described, nor is there discussion of how the survival and recovery of the smelt will be accomplished.

The Ninth circuit explained in *NWF v. NFMS*, that the agency must conduct a "full analysis" of risks to recovery.

> The question before us is not whether, on the merits, recovery risks in fact require a jeopardy finding here, but whether, as part of the consultation process, NMFS must conduct a full analysis of those risks and their impacts on the listed species' continued existence. Although recovery impacts alone may not often prompt a jeopardy finding, NMFS's analytical omission here may not be dismissed as harmless: the highly precarious status of the listed fishes at issue raises a substantial possibility that considering recovery impacts could change the jeopardy analysis. The only reasonable interpretation of the jeopardy regulation requires NMFS to consider recovery impacts as well as survival.

481 F.3d 1224 at *9-*10 (emphasis added).[34]

Plaintiffs claim that although the BiOp includes generic promises to consider recovery of the smelt, it does not competently analyze nor provide for recovery. Federal Defendants and Defendant Intervenors respond that the BiOp's discussion of critical habitat effects, in conjunction with the BiOp's conclusion that "the smelt's primary constituent elements essential to the conservation of the species [will] still

agency still has an obligation to thoroughly consider the issue of recovery and to reach a reasoned conclusion based on the evidence in the administrative record.

[34] Although this portion of *NWF v. NMFS* concerned analysis of recovery in the context of the "no jeopardy" determination, as opposed to the "destruction or adverse modification of critical habitat" analysis, the holding is equally applicable to habitat jeopardy.

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function" (AR 371) under the 2004 OCAP, is a sufficient analysis of the impacts on recovery.

The BiOp's overarching conclusion is that "the smelt's primary constituent elements essential to the conservation of the species [will] still function." In designating critical habitat for a listed species, FWS must "consider those physical and biological features that are essential to the conservation of [the] species and that may require special management considerations or protection." 50 C.F.R. § 424.12. The features that must be considered include, but are not limited to, the following:

> 1. Space for individual and population growth, and for normal behavior;
>
> 2. Food, water, air, light, minerals, or other nutritional or physiological requirements;
>
> 3. Cover or shelter;
>
> 4. Sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and
>
> 5. Habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species.

Id. The BiOp explained that, in designating critical habitat for the Delta smelt, FWS identified the following primary constituent elements "essential to the conservation of the species":

> Physical habitat, water, river flow, and salinity concentrations required to maintain delta smelt habitat for spawning, larval and juvenile transport, rearing, and adult migration.
>
> ***
>
> Specific areas that have been identified as important delta smelt spawning habitat include Barker, Lindsey, Cache, Prospect, Georgiana, Beaver, Hog, and Sycamore sloughs and the Sacramento River in the Delta, and

> tributaries of northern Suisun Bay.
>
> Larval and juvenile transport. Adequate river flow is necessary to allow larvae from upstream spawning areas to move to rearing habitat in Suisun Bay and to ensure that rearing habitat is maintained in Suisun Bay. To ensure this, X2 must be located westward of the confluence of the Sacramento-San Joaquin Rivers, located near Collinsville (Confluence), during the period when larvae or juveniles are being transported, according to historical salinity conditions. X2 is important because the "entrapment zone" or zone where particles, nutrients, and plankton are "trapped," leading to an area of high productivity, is associated with its location. Habitat conditions suitable for transport of larvae and juveniles may be needed by the species as early as February 1 and as late as August 31, because the spawning season varies from year to year and may start as early as December and extend until July.
>
> Rearing habitat. An area extending eastward from Carquinez Strait, including Suisun, Grizzly, and Honker bays, Montezuma Slough and its tributary sloughs, up the Sacramento River to its confluence with Three Mile Slough, and south along the San Joaquin River including Big Break, defines the specific geographic area critical to the maintenance of suitable rearing habitat. Three Mile Slough represents the approximate location of the most upstream extent of historical tidal incursion. Rearing habitat is vulnerable to impacts of export pumping and salinity intrusion from the beginning of February to the end of August.
>
> Adult migration. Adequate flow and suitable water quality is needed to attract migrating adults in the Sacramento and San Joaquin river channels and their associated tributaries, including Cache and Montezuma sloughs and their tributaries. These areas are vulnerable to physical disturbance and flow disruption during migratory periods.

(AR 368-69.)

The BiOp acknowledges that this Delta smelt critical habitat has been adversely affected by numerous activities, but indicates that the 1994 and 1995 OCAP BiOps "provide a substantial part of the necessary riverine flows and estuarine outflows that allow smelt larvae to move downstream to suitable rearing habitat...outside the influence of marinas, agricultural

diversions, and Federal and State pumping plant." (AR 371.) The BiOp also explains that increasing demands for surface water "would likely result in lower delta outflows and increased entrainment," but that the impacts of these demands "have not altered critical habitat's conservation function for the delta smelt, and the smelt's primary constituent elements essential to the conservation of the species still function." (*Id.*) Finally, the BiOp concludes:

> In evaluating the Status of the Species for critical habitat and the Environmental Baseline, while there are current actions that result in adverse effects to delta smelt critical habitat, the primary constituent elements continue to remain functional for the smelt. In the effects section, the Service determined that the primary constituent elements of delta smelt critical habitat would not be affected by the proposed project since there will not be a loss of physical habitat in the delta, river flows will continue to provide habitat, salinity will not be affected by the proposed project, and no breeding habitat will be affected and the sustainability of the food base will not be affected. In the cumulative effects section, we determined that the cumulative effects of the proposed action are not expected to alter the magnitude of future actions' effects on critical habitat's conservation function for the smelt. Based on the analysis in these four areas, it is our conclusion that Critical habitat is not likely to be adversely modified or destroyed as a result of implementing the proposed project.

(AR 469 (emphasis added).)

These conclusions are not supported by most recent smelt data to corroborate that the primary constituent elements of Delta smelt habitat will still function in a manner consistent with conservation (i.e. recovery). The functions and their locations are identified, but impacts upon breeding habitat are not analyzed. Second, although "there will still be water in the Delta....whether the water will be of adequate quality and

quantity to allow the delta smelt to recover is an entirely different question." (Doc. 306 at 25.) The BiOp does not analyze the water supply, temperature, and quality under variable conditions with results that demonstrate the impact on smelt, nor is such an analysis found elsewhere in the administrative record.[35]

The analysis of the predicted movement of X2 is more specific. When X2 is located upstream of Chipps Island, smelt are vulnerable to entrainment and are located in an area that is not ideal for feeding or protection. (*See* AR 424.) FWS opines that smelt reproduce better when X2 remains in a specific area, west of the confluence of the Sacramento and San Joaquin Rivers. That smelt reproduction is increased and the fish may be located where there are better sources of food does not assure that the smelt are on a path to recovery. The DSRAM is to provide the means by which FWS will maintain X2 in the most beneficial location. As the DSRAM is uncertain, speculative, and lacking enforceable action measures, there is no reasonable assurance that X2 will be maintained in the necessary protective location.

DSRAM utilizes other trigger criteria, arguably aimed at the recovery of the smelt. (Doc. 241 at 13-14.) One criteria is the "recovery index trigger," derived from the September and October FMWT sampling. (AR 347; Sommer Decl. at ¶9a.) The number used

[35] There is also merit to Plaintiffs' argument that "[g]iven that the very same sorts of impacts to critical habitat have contributed to the species decline, one might expect FWS to examine carefully how the continuance and magnification of these kinds of impacts could allow for the survival of the species, much less its recovery." (Doc. 306 at 5.)

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to trigger the DSWG is 74, the median value of the recovery index for the 1980-2002 period. Whenever the recovery index falls below this median, the DSWG convenes to decide whether to recommend actions. (AR 346-47.) Use of the term "recovery" in the title of the trigger index, suggests that this index will serve to monitor the potential for the smelt population to recover. This title is inaccurate. All that this trigger criteria monitors is whether the abundance of smelt drops below the 1980-2002 median abundance. As smelt have been in decline throughout the period to February 2005, the opinion that maintaining abundance slightly above this median leads to recovery of the smelt is unjustified.

The temperature trigger criterion of 12 - 18°C, the range within which the most smelt spawning occurs, is more arguably focused on recovery. (AR 347.) If the number of days falling within the temperature range is 39 days or less by April 15, or 50 days or less by May 1, DSWG is triggered. This trigger is arguably related to the recovery of smelt, because it focuses on spawning. However, no action except a group meeting is required in response to the trigger. Moreover, maximizing the potential for smelt to spawn is only one aspect of recovery. If Project operations and/or other impacts kill more smelt than are produced during spawning, recovery does not occur. The existence of this trigger, alone, does not establish that recovery of smelt was adequately considered or addressed.[36]

[36] The San Luis Parties correctly note that the CALSIM II models indicate that increased pumping capacity and operational flexibility may actually increase the smelt's prospects vis-a-vis

2. The Biop Does Not Adequately Assess Impacts to All Areas of Critical Habitat.

Plaintiffs also allege that the BiOp arbitrarily ignores impacts to certain areas of critical habitat because it focuses on X2 as a proxy for Delta smelt habitat. Plaintiffs argue that the focus on X2 ignores other areas of designated critical habitat.

The BiOp focuses on the impact project operations have had and will have on the position of X2. Defendants and Defendant-Intervenors argue that critical habitat will be protected, because any impacts to the position of X2 will be addressed by the DSRAM. The State Water Contractors contend that protecting critical habitat outside X2 "makes no sense if they are not the areas in which the fish resides." (Doc. 241 at 17.)

Plaintiffs do not dispute the notion that X2 directly relates to where most smelt are located. Rather, Plaintiffs maintain that critical habitat is not coextensive with X2. The BiOp identifies numerous areas in which smelt occur (AR 362) and acknowledges that X2 "does not necessarily regulate smelt distribution in all years." (*Id.*) Delta smelt critical habitat is defined by physical boundaries:

> California--Areas of all water and all submerged lands below ordinary high water and the entire water column bounded by and contained in Suisun Bay (including the contiguous Grizzly and Honker Bays); the length of Montezuma Slough; and the existing contiguous waters contained within the Delta, as defined by section 12220, of the State of California's Water Code of 1969 (a complex of bays, dead-end sloughs, channels

the regulatory baseline. However, that the species will fare better than in the past does not assure that the totality of OCAP operations are consistent with the smelt's recovery.

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> typically less than 4 meters deep, marshlands, etc.) as follows:
>
> Bounded by a line beginning at the Carquinez Bridge which crosses the Carquinez Strait; thence, northeasterly along the western and northern shoreline of Suisun Bay, including Goodyear, Suisun, Cutoff, First Mallard (Spring Branch), and Montezuma Sloughs; thence, upstream to the intersection of Montezuma Slough with the western boundary of the Delta as delineated in section 12220 of the State of California's Water Code of 1969; thence, following the boundary and including all contiguous water bodies contained within the statutory definition of the Delta, to its intersection with the San Joaquin River at its confluence with Suisun Bay; thence, westerly along the south shore of Suisun Bay to the Carquinez Bridge.

59 Fed. Reg. 65,256, 65,277 (Dec. 19, 1994).

Federal Defendants respond that "the agencies have developed an operating and adaptive management system that adequately protects the existing critical habitat, that reasonably uses X2 as an evaluation tool, and that also ensures that 'additional measures' will be taken in accordance with the DSRAM to affirmatively and proactively manage habitat, as needed." (Doc. 242 at 26.) But, apart from the X2 analyses, Federal Defendants identify no other record evidence that reflects the agency analyzed impacts to critical habitat or that any "additional measures" will be required under DSRAM, as the DSRAM does not require any measure be implemented.

Defendant Intervenors assert that it is unnecessarily costly to accommodate impacts to all of the geographically designated critical habitats because the smelt are not located in the entirety of their critical habitat range all of the time. They argue the focus must be on protecting the habitat occupied by the smelt. Even if more sensible, the law requires that the agency analyze whether project operations will directly or indirectly

alter critical habitat in a way that "appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species." 50 C.F.R. § 402.02. "Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical." *Id.* The statute defines critical habitat to include both "the specific areas within the geographical area occupied by the species...on which are found those physical or biological features...essential to the conservation of the species" and "specific areas outside the geographical area occupied by the species...upon a determination by the Secretary that such areas are essential for the conservation of the species." 16 U.S.C. § 1532(5)(A). The definition of critical habitat is broader than the specific areas of occupation.

Here, the agency defined critical habitat to have a geographic scope. Absent any alterations to the critical habitat designation, the agency must address in the BiOp the full extent of impacts to the currently designated critical habitat,[37] which excluded "already degraded areas." Alternatively, the Delta

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[37] Plaintiffs raise an additional contention why the critical habitat analysis is insufficient; i.e., that the BiOp unlawfully "writes off" areas of critical habitat because they have already been degraded. For example, the BiOp concludes that "[a]n upstream movement of X2 of 0.5 km would not be significant when [X2] is located upstream of the [Sacramento-San Joaquin River] confluence because smelt habitat is already poor and the upstream movement does not result in any substantial additional loss of habitat or increase in adverse effects." (AR 443.) This issue need not be reached, as the critical habitat analysis is insufficient on other grounds. Federal Defendants are already revising the BiOp to reflect new information and new law.

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smelt's critical habitat should be redefined to reflect the actual location of the smelt, if such redesignation would be consistent with law.

This has not been done. Plaintiffs motion for summary adjudication is **GRANTED** as to this issue.

F. Did the BiOp Fail to Address the Impacts of the Whole Project?

1. Plaintiffs' Argument That the Biop Should Have Analyzed the Effects of Constructing the SDIP, Intertie, and FRWP.

Plaintiffs complain that the BiOp's scope is unlawfully narrow because it fails to consider all planned actions. The BiOp includes within its formal consultation, "delivery of CVP water to the proposed Freeport Regional Water Project (FRWP)" as well as the "operation of the SWP-CVP intertie." The BiOp designates as an early consultation issue "operations of components of the South Delta Improvement Program (SDIP)," which include "permanent barrier operations in the South Delta." (AR 248.) The effects of constructing the FRWP, the Intertie, and the permanent barriers are to be covered in separate formal consultations. (AR 256, 339, 341, 421.)

The ESA requires FWS to address impacts associated with the entire agency action. *See Conner*, 848 F. 2d at 1453-54 (holding that agency violated ESA by choosing not to analyze the effects of all stages of oil and gas activity on federal lands). According to ESA regulations, the effects of an agency action include "direct and indirect effects of an action on the species or critical habitat, together with the effects of other

activities that are interrelated or interdependent with that action, that will be added to the environmental baseline." 50 C.F.R. § 402.02. "The meaning of 'agency action' is determined as a matter of law by the Court, not by the agency." *Greenpeace II*, 80 F. Supp. 2d at 1146 (citing *Pacific Rivers Council v. Thomas*, 30 F.3d 1050, 1054 (9th Cir. 1994).)

The BiOp explains its approach to scope as follows:

> The proposed action is to continue to operate the CVP and SWP in a coordinated manner. In addition to current day operations, several future actions are to be included in this consultation. These actions are: (1) increased flows in the Trinity River, (2) 8500 Banks, (3) permanent barriers operated in the South Delta, (4) an intertie between the California Aqueduct (CA) and the Delta-Mendota Canal (DMC), (5) a long-term EWA, (6) delivery of CVP water to the FRWP, and (7) various operational changes that are identified in this project description. Some of these items will be part of early consultation including 8500 Banks, permanent barriers and the long-term EWA. These proposed actions will come online at various times in the future. Thus, the proposed action is continued operation of the Project without these actions, and operations as they come online.
>
> The actions listed in the preceding paragraph are not being implemented at present; however, they are part of the future proposed action on which Reclamation is consulting. Only the operations associated with the proposed activities are addressed in this consultation; i.e., the activities do not include construction of any facilities to implement the actions. All site specific/localized activities of the actions such as construction/screening and any other site specific effects will be addressed in separate action specific section 7 consultations.

(AR at 256 (emphasis added).) In sum, only those aspects of the 2004 OCAP that will be implemented without further approval were the subject of formal consultation. However, certain other changes that will be effectuated in the future were the subject of early consultation. With respect to future operational changes, including some subject to formal consultation, full

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implementation will require the construction of specified facilities. The impact of the construction activities themselves will be the subject of separate § 7 consultation.

Plaintiffs argue that the BiOp should have addressed the full impacts of construction of the Intertie, Freport diversion, and the SDIP because those projects are within the scope of the agency action as a whole and are "interrelated and interdependent" with the 2004 OCAP.[38]

In response, Federal Defendants cite the Endangered Species Consultation Handbook, which explains, in a hypothetical example, that operation of an existing dam project need not be considered an interrelated or interdependent activity, where the agency action being evaluated in a biological opinion was the addition

[38] The San Luis Parties cite *Gifford Pinchot* in support of the proposition that this is a properly "tiered" biological opinion. *In Gifford Pinchot*, the Ninth Circuit approved for the the tiering of a biological opinion for timber harvests in specified forest areas. The no jeopardy conclusion contained in that biological opinion relied on compliance with a very thorough, overarching forest management plan that was previously approved by the court. 378 F.3d at 1067-68. *Gifford Pinchot* allowed the agency to tier its BiOp of a timber harvest with a programmatic forest management plan that provided guidelines regarding the harvesting of timber. *Rodgers*, 381 F. Supp. 2d at 1228 n.27, interpreted the holding narrowly to apply tiering only to cases in which the programmatic opinion was particularly thorough. Tiering of future construction projects is not appropriate here, because the BiOp provides no programmatic guidelines regarding construction activities. However, just because the later projects cannot be "tiered" off the current BiOp does not mean they must be included in the current BiOp. The relevant inquiry is whether the construction projects are interrelated to and/or interdependent upon the BiOp and the 2004 OCAP.

of a new turbine to an existing dam.[39] (Handbook at 4-25 to 4-29.) Although not cited by the Federal Defendants for this purpose, the Handbook also describes a general approach FWS should use when determining whether certain actions are "interrelated or interdependent," so as to be considered part of the action:

> Interrelated and interdependent actions: Effects of the action under consultation are analyzed together with the effects of other activities that are interrelated to, or interdependent with, that action. An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. (Note: the regulations refer to the action under consultation as the "larger action" [50 CFR § 402.02])....
>
> As a practical matter, the analysis of whether other activities are interrelated to, or interdependent with, the proposed action under consultation should be conducted by applying a "but for" test. The biologist should ask whether another activity in question would occur "but for" the proposed action under consultation. If the answer is "no," that the activity in question would not occur but for the proposed action, then the activity is interrelated or interdependent and should be analyzed with the effects of the action. If the answer is "yes," that the activity in question would occur regardless of the proposed action under consultation, then the activity is not interdependent or interrelated and would not be analyzed with the effects of the action under consultation. There will be times when the answer to this question will not be apparent on its face. The biologist should ask follow-up questions to the relevant parties to determine the relationship of the activity to the proposed action under consultation. It is important to

[39] Federal Defendants correctly point out that the FWS uses as a guidance document the ESA Section 7 Consultation Handbook (March 1998), available at "http://www.fws.gov/endangered/consultations/s7hndbk/s7hndbk.htm" (last visited Apr. 27, 2006). *See e.g., Oregon Natural Res. Council v.* Allen, 476 F.3d 1031, 1039 n.7 (9th Cir. 2007); Ariz. *Cattle Growers' Ass'n v. U.S. Fish & Wildlife Serv.*, 273 F.3d 1229 (9th Cir. 2001); .

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> remember that interrelated or interdependent activities are measured against the proposed action. That is, the relevant inquiry is whether the activity in question should be analyzed with the effects of the action under consultation because it is interrelated to, or interdependent with, the proposed action. Be careful not to reverse the analysis by analyzing the relationship of the proposed action against the other activity. For example, as cited below, if the proposed action is the addition of a second turbine to an existing dam, the question is whether the dam (the other activity) is interrelated to or interdependent with the proposed action (the addition of the turbine), not the reverse.

Section 7 Handbook at 4-26.

Here, applying the Handbook test, the question is whether the other activities (construction and operation of SDIP, Freeport, and the Intertie) are interrelated to or interdependent with the proposed actions subject to formal consultation? The formal consultation, as described in the BiOp, covers

> ...the proposed 2020 operations of the CVP including the Trinity River Mainstem ROD (Trinity ROD) flows on the Trinity River, the increased water demands on the American River, the delivery of CVP water to the proposed Freeport Regional Water Project (FRWP), water transfers, the long term Environmental Water Account (EWA), the operation of the Tracy Fish Facility, and the operation of the SWP-CVP intertie. The effects of operations of the SWP are also included in this opinion and include the operations of the North Bay Aqueduct, the Suisun Marsh Salinity Control Gates, the Skinner Fish Facility and water transfers.

(AR 248 (emphasis added).) The formal consultation admittedly covers delivery of CVP water to the proposed FRWP and operation of the Intertie. But, the BiOp expressly excludes the impacts of construction associated with FRWP or the Intertie:

> The actions listed in the preceding paragraph [including permanent barriers in the South Delta, an intertie, and the FRWP] are not being implemented at present; however, they are part of the future proposed action on which Reclamation is consulting. Only the operations associated with the proposed activities are

> addressed in this consultation; i.e., the activities do not include construction of any facilities to implement the actions. All site specific/localized activities of the actions such as construction/screening and any other site specific effects will be addressed in separate action specific section 7 consultations.

(AR 256 (emphasis added).)

Is there a "but-for" relationship between the 2004 OCAP and the new projects? The FRWP and the Intertie are designed to more effectively distribute CVP and SWP waters. There is no evidence in the record indicating that construction of either project is tied in any way to the pre-approval of delivery of water to the projects. Flow operations could be approved after or simultaneously with the approval of new construction. Under the Handbook test, the construction projects are not considered interdependent and interrelated. These projects may be consulted upon separately. By approving a flow regime before the construction, the Bureau may plann for the possibility that the FRWP will be constructed in the future. The entire OCAP BiOp would not need to be revised should the projects be constructed. This is a reasonable approach.

With respect to the SDIP, the BiOp currently excludes both its operation and related construction coverage under the formal consultation. Plaintiffs allege that both should have been covered by the BiOp because they are interrelated with or interdependent on the agency action. Applying the Handbook analysis, the operation and construction of the SDIP (which includes increased pumping at Banks and operation of permanent barriers) will not occur "but for" the approval of the 2004 OCAP for CVP-SWP operations? Each action is independent of the 2004

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OCAP. The SDIP is a separate addition that may or may not be constructed. Project operations under the 2004 OCAP in no way depend upon the SDIP. There is no prohibition to addressing the future operation, if and when the construction of the SDIP will occur, in a separate consultation.

Plaintiffs' motion for summary adjudication is **DENIED** as to the future projects issue.

2. Plaintiffs' Argument that the BiOp Failed to Analyze the Impact of Full Contract Deliveries.

A biological opinion must consider the effects of the entire agency action, meaning "all activities or programs of any kind authorized, funded, or carried out," including "the granting of...contracts." 50 C.F.R. § 402.02. One of the primary purposes of the 2004 OCAP is to "deliver water supplies to affected water rights holders as well as project contractors." (AR 259.) The Bureau delivers water to numerous parties pursuant to long-term contracts ("CVP Contracts"), some of which were renewed shortly after the BiOp was issued. (AR 4732, 4796, 4855.)

The CALSIM II model incorporated water deliveries into its various flow scenarios, but only performed its analysis based on the effects of delivering between 11 and 89 percent of the full CVP Contract allocations. (*See* AR 1067; see also Doc. 242 at 31 (acknowledging that the agency "did not evaluate the impacts of 100% percent delivery of all contracted waters").) This range of delivery scenarios is based on historic average water deliveries.

Plaintiffs allege that, by failing to evaluate the impact of delivering full amount (100%) of contracted water, the BiOp

violates the requirement that the it evaluate the entire agency action. Plaintiffs cite *Rodgers*, 381 F. Supp. 2d at 1237-40, which examined a biological opinion approving long term water contracts in the Friant, Buchanan, and Hidden water units of the CVP. The BiOp only examined the impacts of the amount of historical water deliveries, which amounted to less than half of the water deliveries authorized under the long term water service contracts. *Id.* at 1237-28.

> The Friant long-term contracts cumulatively authorized the Bureau to deliver more than 2.1 million acre-feet of water per year, for twenty-five years. Rather than analyzing the effects of 2.1 million acre-feet of water delivery, FWS explained that its "effects analysis is conducted under the expectation that water will be delivered to CVP service contractors in quantities that approximate historic deliveries (1988 through 1997), as given in Appendix D of the November 21, 2000 programmatic long-term CVP contracts consultation." This assumption was made, the BiOp explained, because "delivery of full contract quantities is unrealistic."

Id. at 1238. *Rodgers* rejected FWS's approach, reasoning that the "ESA requires that all impacts of agency action-both present and future effects-be addressed in the consultation's jeopardy analysis."

> The fact that it was thought by FWS that "delivery of full contract quantities is unrealistic" and that "deliveries continue to be impacted by existing climate, hydrology, actions and statutes, ... socio-economic factors" does not excuse consulting on the "entire agency action," which was the authorized delivery of over 2.1 million acre-feet of water, and nothing less than that.

Id. at 1239.

Federal defendants assert that the *Rodgers* decision was wrong, arguing that "[a]bsent alternative information that the agency failed to consider, and given the fact that the agency did

use the best available information, the *Rodgers* court should have deferred to the agency." (Doc. 242 at 32.) It is not the province of another district court to decide whether *Rodgers* is "wrong." *Rodgers* is distinguishable as it specifically addressed the government authorization of CVP water users' long-term water service contracts. Those contracts authorized 2.1 MAF of water deliveries in total. *Rodgers* found unlawful the biological opinion's limitation in its scope to approximate historic deliveries, instead of the full contract allocations. Here, however, the agency action subject to consultation is not the authorization or merits of the water service contracts, rather, it is the operation of the CVP and SWP under the OCAP and whether those projected operations will cause jeopardy to the survival and recovery of smelt or smelt habitat. The government is entitled to make reasonable assumptions about the operational volume of water flows, water levels, temperature, and quality based on the historical and projected data in the administrative record. The BiOp explains that the delivery of full water service contract entitlements is expected only when excess water conditions exist, i.e., in a wet water year when sufficient water is available to meet all beneficial needs. (AR 259.) Plaintiffs do not suggest that this assumption is factually impossible. (Nor would it be unreasonable for FWS to model a full (100%) water contract delivery scenario, even if it has not happened in the past fifteen years.) The agency model for the worst case scenario is indispensable. Analysis of a "best of the best" case in a wet water year is not indispensable, as such "wet" water year conditions do not present any reasonable likelihood of

jeopardy, absent an additional showing. However, because such a scenario could eventuate, it is not unlawful for the agency to analyze the effects on the smelt of 100% water contract deliveries. However, the 100% delivery analysis is not required. This is a matter committed to the agency's expertise and discretion.

Plaintiffs motion for summary adjudication is **DENIED** as to this issue.

VIII. CONCLUSION

As the history of the many CVP water cases decided in this court evidences, the duty to defer to the agency's expertise is well recognized and honored, when the agency has acted reasonably and lawfully to discharge its statutory responsibilities. The disputed BiOp depends in material measure for its no jeopardy finding on the DSRAM, which is legally insufficient. The agency's recognition the Delta smelt is increasingly in jeopardy; that its operative BiOp is inadequate, as evidenced by its second initiation of reconsultation for the 2004 OCAP, now pending, and its insistence that it will nonetheless operate the Projects under the challenged BiOp is unreasonable. The agency could have, but did not, offer a viable protective alternative. Adaptive management is within the agency's discretion to choose and employ, however, the absence of any definite, certain, or enforceable criteria or standards make its use arbitrary and capricious under the totality of the circumstances.

The agency's failure to reasonably estimate the Delta smelt population and to analyze most recent smelt abundance data make

the take limits based on historical data unreliable and unreasonable. The Delta smelt is undisputedly in jeopardy as to its survival and recovery. The 2005 BiOp's no jeopardy finding is arbitrary, capricious, and contrary to law.

For all the reasons set forth above, the 2005 OCAP BiOp is unlawful and inadequate on the following grounds:

(1) The DSRAM, as currently structured, does not provide a reasonable degree of certainty that mitigation actions will take place, even if the agency retains the discretion to draw upon numerous sources of water, not just the EWA, CVPIA(b)(2), and VAMP programs, to support fish protection.

(2) The agency failed to utilize the best available scientific information by not addressing the 2004 FMWT data and the issue of climate change.

(3) The BiOp's historical approach to setting take limits fails to consider take in the context of most recent overall species abundance and jeopardy.

(4) The BiOp did not adequately consider impacts to critical habitat by (a) failing to analyze how project operations will impact the value of critical habitat for the recovery of the smelt and (b) failing to consider impacts upon the entire extent of known smelt critical habitat.

The Plaintiffs' motions for summary judgment are GRANTED IN PART AND DENIED IN PART, as delineated above.

Based on the legally flawed BiOp, an appropriate interim

remedy must be implemented. All parties agree that it is not prudent to impose a remedy without further input from the parties. A separate remedies hearing will be scheduled within thirty days at the parties' mutual convenience.[40] During oral argument, Federal Defendants and Defendant-Intervenors jointly requested a stay of any order finding the BiOp unlawful to avoid the draconian consequences of operating the CVP-SWP without a lawful take limit. Affording all parties the opportunity to participate in a remedies hearing will not jeopardize the species or the public interest during interim operation of the projects. Plaintiffs did not object to such an approach.

A Scheduling Conference is set for May 30, 2007, at 8:45 a.m. in Courtroom 3 to afford the parties time for discussions to set a remedies hearing, and to consider the entry of a stay, if necessary.

Plaintiffs shall submit a form of order on the motions for summary judgment consistent with this decision within five (5) days following service of this decision.

IT IS SO ORDERED.

Dated: May 25, 2007

/s/ Oliver W. Wanger
UNITED STATES DISTRICT JUDGE

[40] The parties stated that they may be able to reach an agreement as to interim remedies, avoiding the need for a remedies hearing.

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Attachment 9

The Web Site of The Sacramento Bee

Delta water exports halved

It was the first cut rising from a court ruling to protect threatened smelt.

By Matt Weiser - mweiser@sacbee.com
Published 12:00 am PST Saturday, December 29, 2007

Water exports from the Sacramento-San Joaquin Delta were slashed in half Friday to protect a threatened fish, marking the first action sparked by a federal court order earlier this month.

The Dec. 14 ruling by U.S. District Judge Oliver Wanger in Fresno requires state and federal water agencies to reduce their draw from the estuary under certain conditions to protect the Delta smelt. The agencies operate separate canal systems, which serve 25 million Californians and more than 2 million acres of farms from the Bay Area to San Diego.

But those water exports have contributed to a steep decline in the population of the smelt, a fragile fingerling protected by the Endangered Species Act. The fish are not strong enough to resist the pull of the pumps, which reverse natural water flows in the Delta.

Wanger's ruling requires pumping reductions under certain conditions that affect the smelt. One of those triggers was tripped on Christmas Day when water clarity declined at a South Delta monitoring site.

"It's a belated Christmas present to the Delta smelt from Judge Wanger," said Bill Jennings, executive director of the California Sportfishing Protection Alliance. "It is a historic occasion."

DWR and the U.S. Bureau of Reclamation had three days to respond after the trigger point was reached. They did so Friday morning by reducing combined pumping from 5,250 cubic feet per second to about 2,400, said Carl Torgersen, chief of operations and maintenance for the state Department of Water Resources.

The goal is to minimize reverse flows in the Delta to meet a threshold set by the court. The result, Torgersen said, will be about 5,600 acre-feet of water per day not delivered to users. That's enough water for about 10,000 average households for a year.

The cutback probably won't have an immediate effect. Torgersen said it will hinder the ability to refill San Luis Reservoir near Los Banos, a storage point for the southbound water.

But there could be long-term shortages, particularly if 2008 ends up being a drought year.

The pumping reductions must continue for 10 days unless rainfall substantially boosts natural runoff through the Delta.

"But we don't see that in the forecast," Torgersen said. "The effects of the Wanger decision can vary greatly and I wouldn't be able to say right now that it's actually putting us in a drought or not. That's a tough one."

The Zone 7 Water Agency, which serves about 200,000 customers around Livermore and Pleasanton, draws from the state's Delta canal before water reaches San Luis Reservoir. As a result, it could be among the first to suffer from pumping reductions.

"While this one cutback won't impact our customers' taps, it is going to reduce our supply of water for the year," said spokeswoman Boni Brewer. "Obviously the Delta habitat is in trouble and we're hoping there's some solution that can protect that habitat and long-term water supplies."

Zone 7 has already increased residential water rates by about $2.25 per month to pay for conservation measures and emergency supplies. Officials have also urged customers to reduce consumption by 10 percent.

The smelt's plight is viewed by many biologists as a warning of larger ecosystem troubles in the Delta. The smelt's decline is blamed on pumping effects as well as poor water quality, competition from invasive species, and loss of habitat and food.

Wildlife officials are preparing a new court-ordered management plan for the smelt, which may include water delivery rules that could make Friday's pumping reductions commonplace.

State officials are also studying long-term solutions, including major habitat restoration projects and new ways to move farm and domestic water around the Delta, such as a canal.

Go to: Sacbee / Back to story

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Attachment 10

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Attorneys for Defendant-Intervenor

IN THE UNITED STATES DISTRICT COURT

FOR THE EASTERN DISTRICT OF CALIFORNIA

NATURAL RESOURCES DEFENSE COUNCIL, et al.,

Plaintiffs,

v.

DIRK KEMPTHORNE, in his official capacity as Secretary of the Interior, et al.,

Defendants,

SAN LUIS & DELTA-MENDOTA WATER AUTHORITY and WESTLANDS WATER DISTRICT; CALIFORNIA FARM BUREAU FEDERATION; GLENN-COLUSA IRRIGATION DISTRICT, et al.; CALIFORNIA DEPARTMENT OF WATER RESOURCES, and STATE WATER CONTRACTORS,

Defendant-Intervenors.

05 CV 01207 OWW (LJO)

DECLARATION OF JOHN LEAHIGH IN SUPPORT OF THE CALIFORNIA DEPARTMENT OF WATER RESOURCES' PROPOSED INTERIM REMEDY

Hearing: August 21, 2007
Time: 9:00 a.m.
Courtroom: 3
Judge: Hon. Oliver W. Wanger

I, John Leahigh, declare as follows:

1. I am employed by the Department of Water Resources (DWR) as Chief of the Project Operations Planning Branch (POPB) within the Division of Operations and Maintenance. I have been in my current position since March 2005.

2. I am responsible for short-term planning of water operations for the State Water Project (SWP). These planning responsibilities include the estimation of delivery capabilities of the SWP and forecasted water export operations from the Sacramento/San Joaquin Delta (Delta) through the Harvey O. Banks Delta Pumping Plant (Banks), Skinner Fish Protection Facility (Skinner), and Clifton Court Forebay (CCF).

3. Prior to taking the position of Chief of the POPB, I worked within the branch in various engineering classifications from November 1996 through February 2005. I have worked for DWR since May 1992. I received a Bachelor's degree in Civil Engineering from the University of New Mexico in 1989 and a Master's degree in Civil Engineering with emphasis on Water Resources Engineering from California State University at Sacramento in 1999. I am a registered Civil Engineer in the State of California.

4. One of my responsibilities as Chief of the POPB is to supervise the work of engineering staff that develop and monitor studies, projections and delivery capabilities of the SWP. I coordinate with a team of engineers to plan and schedule water export operations based on water availability, water permit/quality restrictions, environmental needs, and projected hydrology.

5. I have personal knowledge of the facts stated herein, and, if called to do so, could and would testify competently thereto.

6. I am familiar with and contributed to the development of the proposed remedy actions, set forth in the Delta Smelt Action Matrix for Water Year 2008 (Action Matrix)[1/], proposed by the United States Fish and Wildlife Service (USFWS), as supported by DWR. The Action Matrix has been developed to minimize and prevent adverse impacts to delta smelt and its habitat from SWP and CVP operations during the interim period pending completion of the consultation on the delta smelt with USFWS. I am informed and believe that the USFWS will complete the consultation and issue its biological opinion before August 2008.

///

---

1. A copy of the Action Matrix is attached as Exhibit A to the Declaration of Jerry Johns in Support of the California Department of Water Resources' Proposed Interim Remedy, filed concurrently herewith.

7. I have worked with POPB staff to develop an estimate of the water costs associated with implementation of the Action Matrix through July 2008.

8. For the purposes of the following analysis, "water costs" are defined as the estimated export reductions and the estimated reductions in deliveries of water to CVP/SWP contractors for 2008 as a result of implementing the actions described in the Action Matrix.

9. The term baseline" is defined as the expected delivery of water without implementing the Actions proposed in the USFWS remedy matrix. Baseline water deliveries often vary depending on hydrology and the costs estimates are based on two different hydrology assumptions, as described in detail below.

10. Water supply forecasting requires a projection of initial reservoir storages and forecasted runoff as a foundation to delivery estimates. Reliable projections are available for the initial reservoir storages going into 2008, but the forecasted runoff is largely dependent on the amount of precipitation that will be experienced next year, which is unknown and could vary greatly. Water supply costs were analyzed for 2008 with two different assumptions on the amount of precipitation that may be experienced in 2008: dry and average.

11. A year with low precipitation or a "dry year" for the purposes of my analysis assumes the amount of precipitation in 2008 will be equal to the amount of precipitation that was exceeded 90% of the time over the past 85 years.

12. A year with average precipitation or an "average year" for the purposes of my analysis assumes the amount of precipitation in 2008 will be equal to the amount of precipitation that was exceeded 50% of the time over the past 85 years.

13. Although many different assumptions could be made for the amount of precipitation that could occur in any year, assumptions of precipitation at a 90% and 50% chance of exceedence are the most widely used water supply forecasting assumptions. These two hydrologic assumptions generally give a good analytical range for project operations.

EXISTING RESTRICTIONS ON WATER DELIVERIES

14. DWR provides water to twenty-nine (29) contractors throughout California under water right permits issued by the State Water Resources Control Board (SWRCB). These permits

include restrictions on water exports. The DWR permit most recently issued by the SWRCB resulted in a SWRCB decision, known as Water Rights Decision 1641 (D-1641). Details of the decision can be found at 14. DWR provides water to twenty-nine (29) contractors throughout California under water right permits issued by the State Water Resources Control Board (SWRCB). These permits include restrictions on water exports. The DWR permit most recently issued by the SWRCB resulted in a SWRCB decision, known as Water Rights Decision 1641 (D-1641). Details of the decision can be found at http://www.waterrights.ca.gov/baydelta/d1641.htm.

15. The water costs associated with the Action Matrix are measured against allowable deliveries under baseline operations, considering all flow and water quality objectives required by D-1641. Through D-1641, the SWRCB assigns responsibility for meeting water quality objectives adopted in the Water Quality Control Plan ("WQCP") for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. These WQCP objectives protect fish and wildlife, and the agricultural, municipal and industrial uses of water.

16. The WQCP was updated in 2006. The new plan did not result in any changes in the requirements of D-1641. The new WQCP can be found at http://www.waterrights.ca.gov/baydelta/docs/rev2006wqcp.pdf.

17. A team of engineers and I took into account the restrictions imposed by meeting the objectives of the WQCP when developing the estimates for water costs associated with the implementation of the Action Matrix.

ASSUMPTIONS FOR THE IMPLEMENTATION OF ACTIONS

18. I assumed in the analysis that Action 1 would be triggered and implemented as of December 25, 2007 and continue through January 3, 2008. December 25 is described as the first possible day to trigger this 10-day Action in the Action Matrix.

19. I assumed in the analysis that delta smelt spawning will occur on February 20, 2008. February 20 is the date on which DWR biologists have estimated that spawning has begun historically. This assumption establishes the durations of Actions 2 and 3, which could vary significantly. The end of Action 2 and the trigger for the start of Action 3 is the onset spawning

as described in the Action Matrix.

20. In the Action Matrix, Actions 3 and 4 assume a range of flow objectives. A range of Old and Middle River upstream flows between 0 and 4000 cubic feet per second (cfs) is explicitly described and assumed for analyzing Action 3.

21. Action 4 does not have targeted flow but allows a range similar to Action 3 (from zero to approximately 4000 cfs).

22. Because the Action Matrix describes Actions 3 and 4 flow objectives as a range I assumed a range for water costs as well. The high end of this range assumes that the Old and Middle River objective is 0 cfs for both Actions 3 and 4. For determining the lower costs in the range I assumed that Action 3 is implemented at the 4000 cfs flow objective and Action 4 is not triggered, resulting is no water costs.

23. This range of cost was necessary as part of the analysis because of the uncertainty related to the real-time distribution of delta smelt and the susceptibility of this distribution to the exports as noted in footnotes of the Action Matrix.

ESTIMATED EXPORT REDUCTIONS ASSOCIATED WITH THE USFWS'S REMEDY PROPOSAL

24. Implementation of flow objectives in the Action Matrix will require reductions in export operations by the SWP and CVP. My team of engineers and I estimated ranges of export reductions associated with each Action in the Action Matrix. The ranges are based on 2008 being dry or having average precipitation as defined earlier. In addition, Actions 3 and 4 have sub-ranges due to their adaptive nature.

25. Action 1 - Winter Pulse Flow to Benefit Adult Spawning: CVP and SWP target upstream Old and Middle River flow not to exceed 2,000 cfs for a 10-day period during late December or early January. This action is estimated to reduce combined project exports by 100 thousand acre-feet (taf) in a dry year and 160 taf in an average year.

26. Action 2 - Adult Salvage Minimized: CVP and SWP target upstream Old and Middle River flow not to exceed 4,500 cfs from early January to late February. This action is estimated to reduce combined project exports by 150 taf in a dry year and 500 taf in an average year.

27. Action 3 – Larval and Juvenile Protection: CVP and SWP target upstream Old and Middle River flow between 4,000 cfs to 0 cfs from late February through the end of May. This action is estimated to reduce combined project exports by 60 taf to 500 taf in a dry year and 640 taf to 1.3 million-acre feet (maf) in an average year.

28. Action 4 – Juvenile Protection: If triggered, the CVP and SWP may target upstream Old and Middle River flow of up to 0 cfs in June. This action is estimated to reduce combined project exports up to 130 taf in a dry year and up to 350 taf in an average year.

29. Action 5 - Barrier Operations: There were no additional export reductions associated with this action.

COMBINED SWP/CVP ESTIMATED DELIVERY REDUCTIONS

30. I assumed in my analysis that both the SWP and CVP are equally responsible for meeting the objectives in the Action Matrix. The estimated delivery reductions provided below represent combined CVP/SWP delivery reductions.

31. Export reductions do not result in a one-for-one impact on deliveries because of a multitude of complicating factors including system constraints, runoff patterns, annual delivery patterns, and operational flexibility.

32. The export reductions for each action were entered into an operational spreadsheet model developed by DWR staff that estimates the delivery capabilities of the SWP and CVP. We modeled the remedy period with the implementation of the Action Matrix and without implementation of the Action Matrix. A comparison of model output indicates what annual delivery reduction could occur in 2008 if all proposed actions are implemented.

33. The resulting delivery reductions are expressed as a range for each hydrologic assumption for the same reason that the export reductions were expressed as a range. Actions 3 and 4 of the Action Matrix have an adaptive management process that will vary the flow objective.

34. The conclusion of the analysis is that the sum of all these export reductions in a dry year is expected to decrease combined 2008 deliveries of the SWP and CVP by 6% (183 taf) to 25% (814 taf) from a baseline delivery of 3.2 maf.

35. In an average year, the delivery reductions are expected to be between 14% (820 taf) to 37% (2.17 maf) from a baseline delivery of 5.9 maf.

SWP SHARE OF ESTIMATED DELIVERY REDUCTIONS

36. The analysis showed that the SWP 2008 annual deliveries would be reduced 8% (91 taf) to 27% (305 taf) from a baseline delivery of 1.15 maf in a dry year.

37. In an average year, SWP 2008 annual deliveries would be reduced 8% (252 taf) to 31% (940 taf) from a baseline delivery of 3 maf.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct.

Executed this 9th day of July, 2007 at Sacramento, California

JOHN LEAHIGH, Declarant.

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Attachment 11

Update on Monterey Amendment

Water Planning and Stewardship Committee
6e
January 8, 2008

1

Monterey Analysis

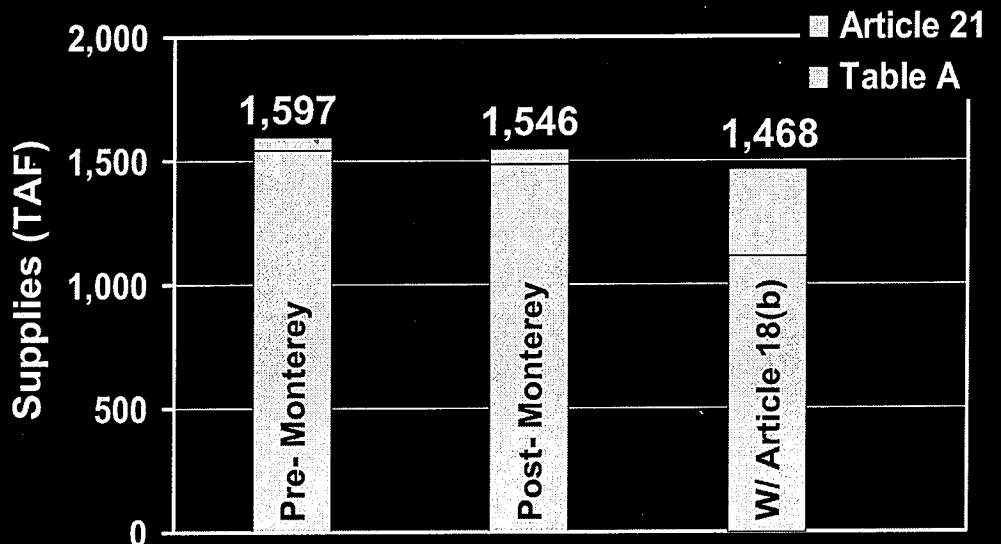
- Monterey Considerations:
  - Water Allocation Provisions
  - Water Management Provisions
  - Financial Provisions

Water Allocation Provisions

- **Initial Negotiation Issues**
  - Initial Ag deficiency (Art. 18(a))
  - Permanent yield reduction (Art. 18(b))
- **Additional Provisions**
  - Access to surplus
  - Retired Table A amount
  - Table A transfers

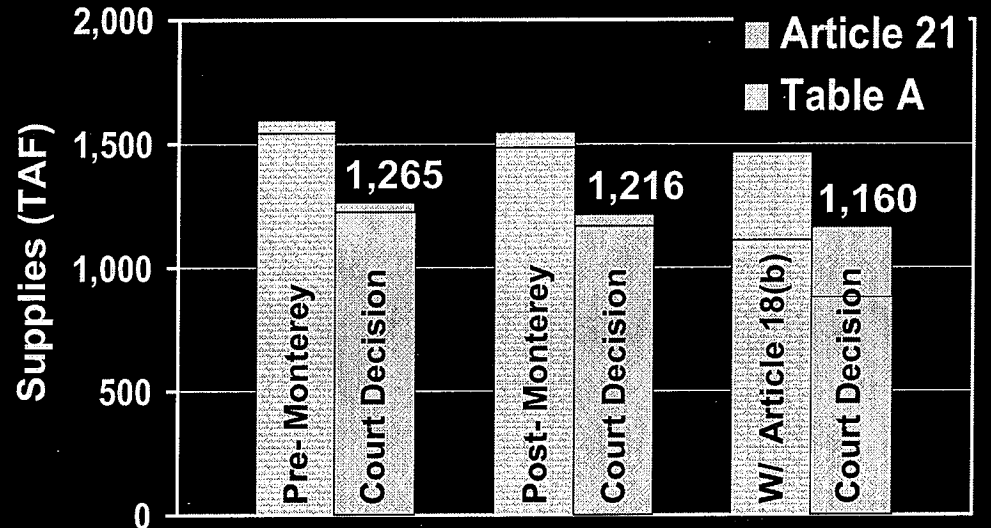
Water Allocation Provisions

- **Monterey provisions reduce risk due to Article 18(b) implementation**



Water Allocation Provisions

- Post Federal Court Decision



5

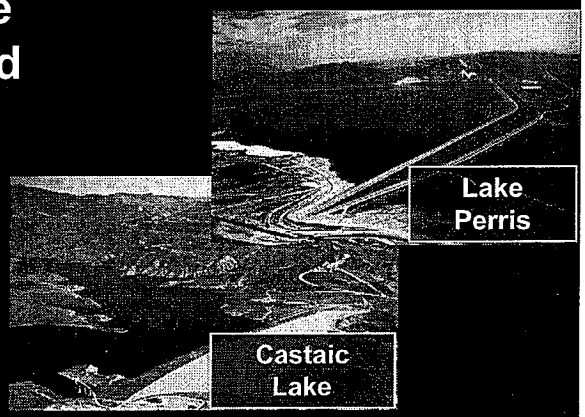
Monterey Analysis

- Monterey Considerations:
  - Water Allocation Provisions
  - Water Management Provisions
  - Financial Provisions

Water Management Provisions

Carryover and Flexible Storage

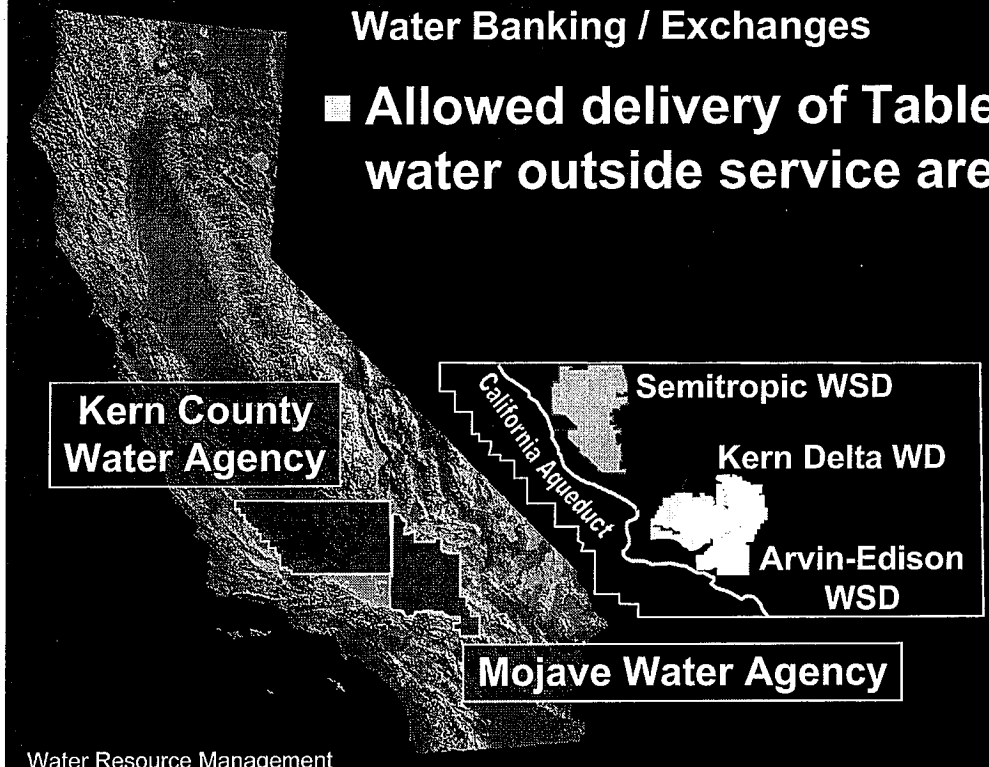
- 1,000,000 acre-ft (Art. 56 carryover) delivered to date
- 324,000 acre-ft flexible storage withdrawn and repaid to date



Water Management Provisions

Water Banking / Exchanges

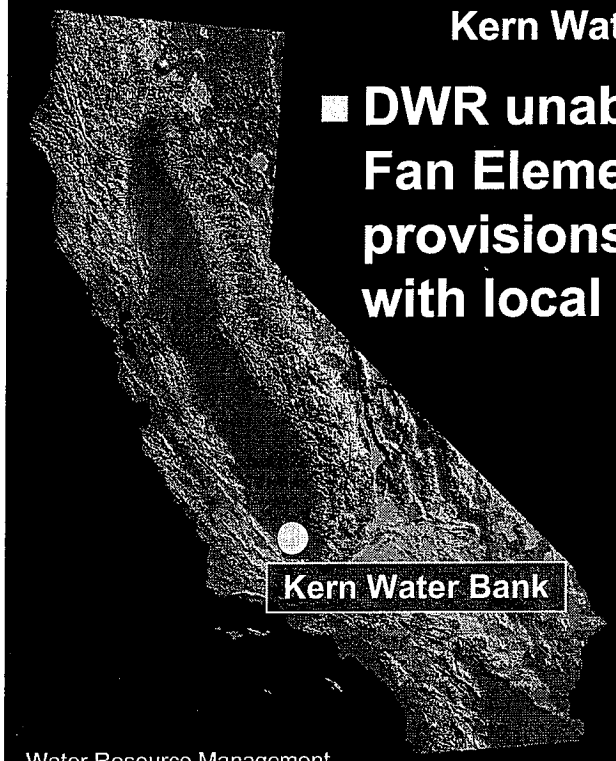
- Allowed delivery of Table A water outside service area



Water Management Provisions

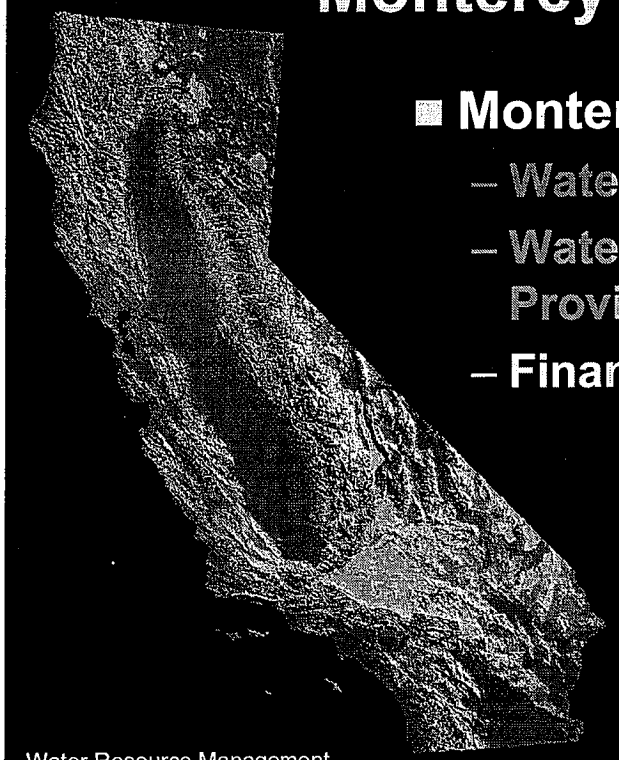
Kern Water Bank

- DWR unable to develop Kern Fan Element due to Water Code provisions requiring agreement with local agencies



Monterey Analysis

- Monterey Considerations:
  - Water Allocation Provisions
  - Water Management Provisions
  - Financial Provisions

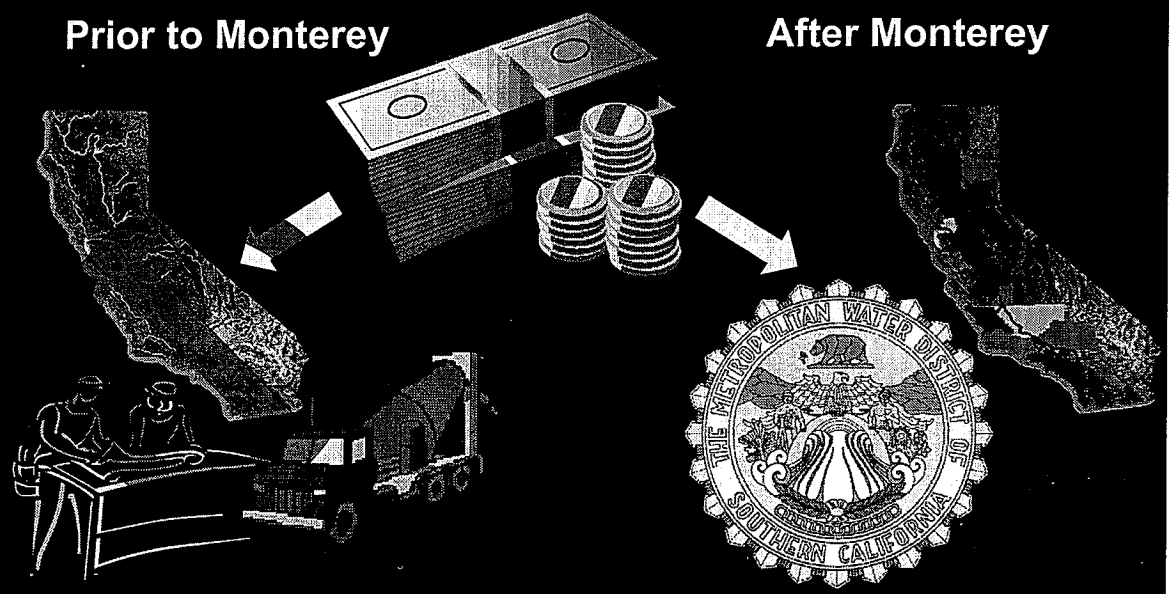


Financial Provisions

Rate Management Credits

Prior to Monterey

After Monterey



Water Resource Management

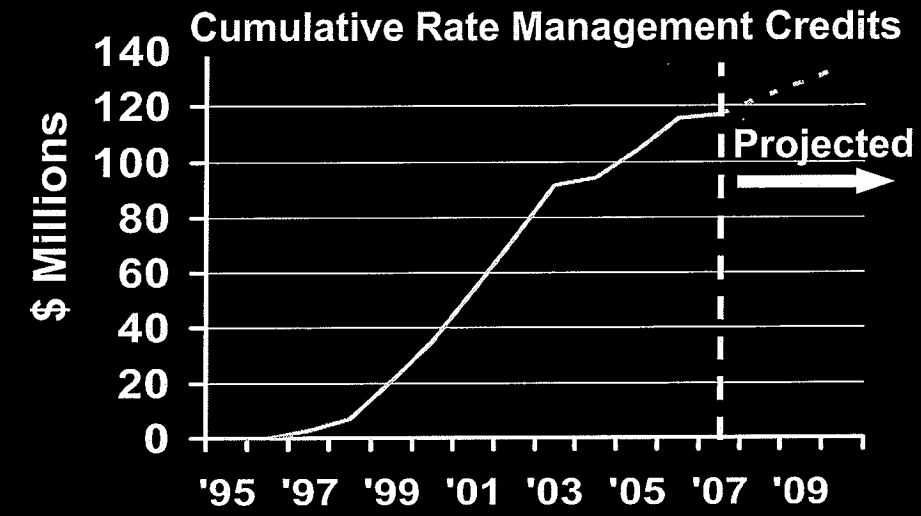
January 8, 2008

11

Financial Provisions

Rate Management Credits

- Approx. $117M total savings to date
  - Not impacted by fishery actions



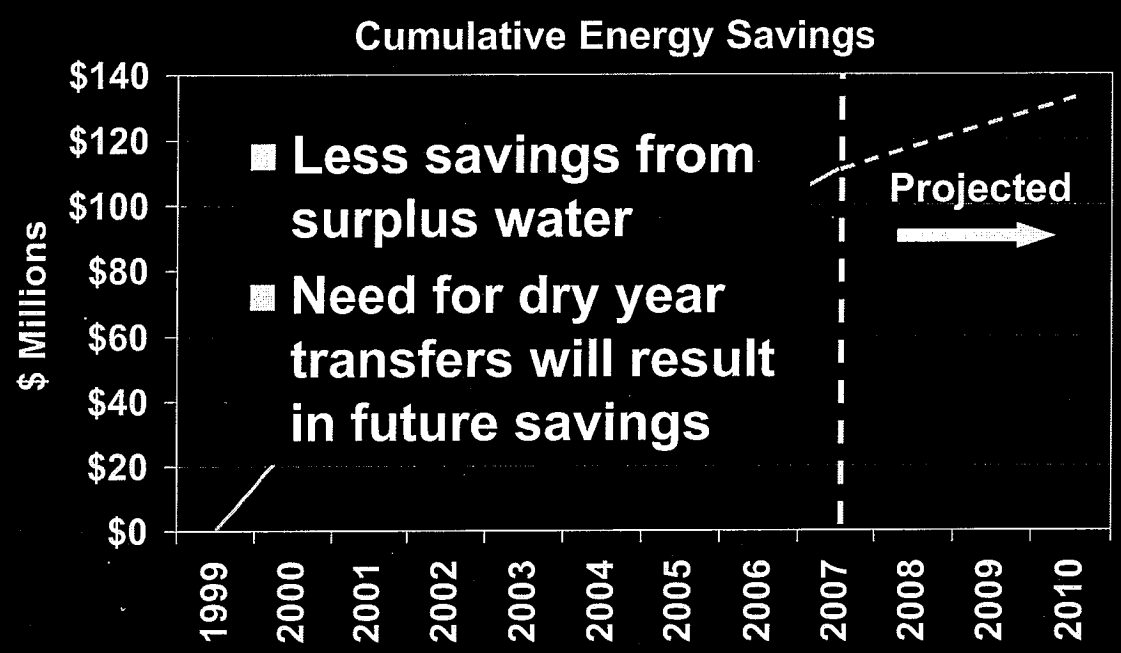
Water Resource Management

January 8, 2008

12

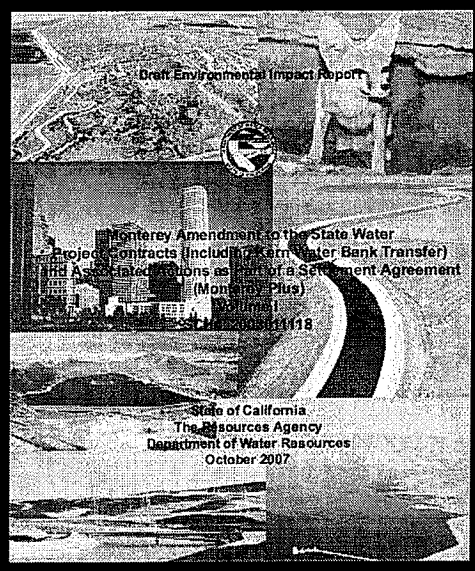
Financial Provisions

Surplus and Transfers at Melded Energy Rate



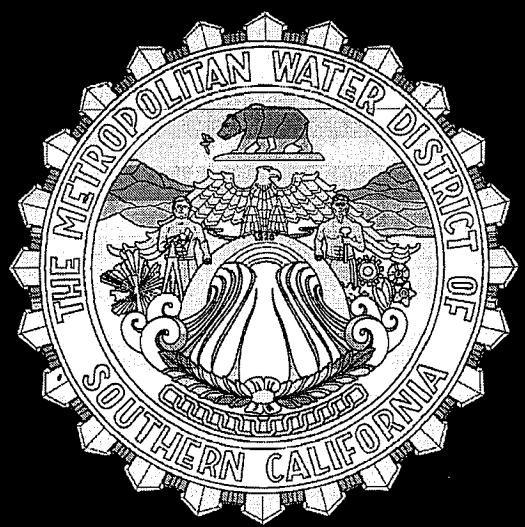
Monterey Plus Draft EIR

- Scope
- Alternatives
- Significant Unavoidable Impacts
- Comments due 1/14



Summary of Monterey Amendment Provisions

- **Water Allocation Provisions**
  - 4% reduction in Table A on average
  - Eliminate 18b and Ag preference to surplus
- **Water Management Provisions**
  - Programs incorporated into IRP
  - Surface storage at no incremental cost beneficial for managing variable deliveries
  - Existing groundwater storage will help in interim
- **Financial Provisions**
  - Rate management credits
  - Large energy cost savings on surplus and transfers



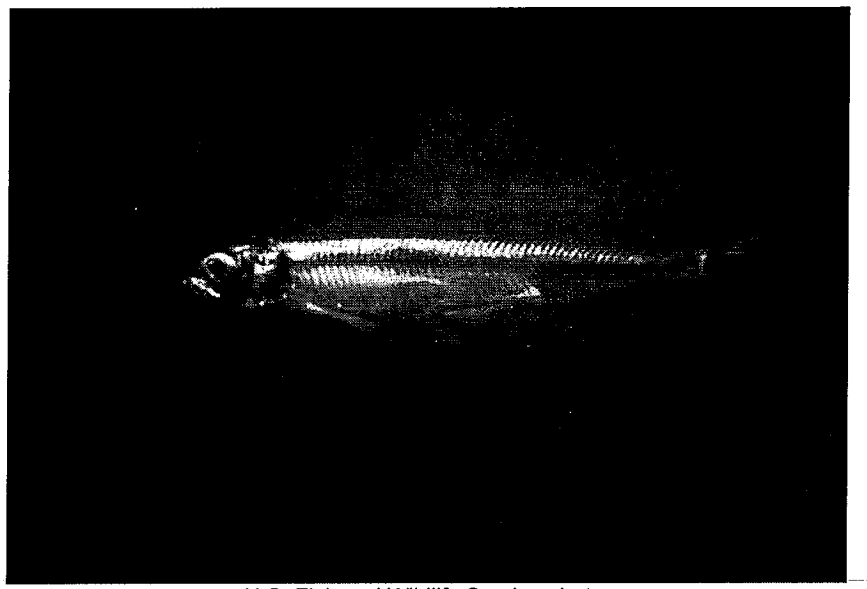
Attachment 12

LETTER 21

PETITION TO THE STATE OF CALIFORNIA FISH AND GAME COMMISSION AND SUPPORTING INFORMATION FOR LISTING THE

DELTA SMELT (*Hypomesus transpacificus*)

AS AN ENDANGERED SPECIES UNDER THE CALIFORNIA ENDANGERED SPECIES ACT



U.S. Fish and Wildlife Service photo

Submitted To: California Fish and Game Commission
1416 Ninth Street
Sacramento, CA 95814

Submitted By: The Bay Institute
Center for Biological Diversity
Natural Resources Defense Council

Date: February 7, 2007

EXECUTIVE SUMMARY

The Bay Institute, Center for Biological Diversity, and the Natural Resources Defense Council formally request that the California Fish and Game Commission change the state listing of the delta smelt (*Hypomesus transpacificus*) from threatened to endangered under the California Endangered Species Act, on an emergency basis. In the past few years, the delta smelt population has plummeted to the lowest levels ever recorded and, based on population viability analysis, the species is in imminent danger of extinction, the criterion for endangered status. Recent surveys indicate that environmental conditions in the delta smelt's critical habitat, the upper San Francisco Bay/Sacramento-San Joaquin Delta Estuary, have also declined, rendering large areas of the delta smelt spawning and rearing habitat lethal to the fish and threatening the planktonic food web upon which the species depends. The magnitude and frequency of occurrence of multiple known threats to the species are also increasing. The petitioners are conservation organizations with an interest in protecting the delta smelt and its estuarine habitat.

Delta smelt are endemic to the upper reaches of the San Francisco Bay Bay-Delta Estuary. The species requires specific environmental conditions (freshwater flow, water temperature, salinity) and habitat types (shallow open waters) within the estuary for migration, spawning, egg incubation, rearing, and larval and juvenile transport from spawning to rearing habitats. Delta smelt feed exclusively on plankton and most individual fish live only one year. Although they are restricted to a relatively small geographic range, delta smelt use different parts of the estuary at different life history stages. Throughout most of their life span, delta smelt inhabit low salinity habitat, at the interface of inflowing fresh water from the Sacramento and San Joaquin Rivers and salt water from the Pacific Ocean. Spawning adults, larvae, and young juveniles are found further upstream in the Delta, where they are vulnerable to lethal entrainment into federal, state, industrial, and local agricultural water diversion and export facilities.

As recently as thirty years ago, the delta smelt was one of the most common and abundant of the pelagic fishes in the estuary. In the early 1980s, its population declined by more than 80%, leading to threatened listings under both the federal and state Endangered Species Acts in 1993. During the 1990s, delta smelt abundance fluctuated and then increased in response to improved habitat conditions following the 1987-1992 drought. In 2002, the species' abundance again declined drastically, dropping more than 80% in just three years. For the past three consecutive years, delta smelt population abundance levels have been the lowest on record: in 2005 delta smelt abundance was the lowest ever measured, just 2.4% of the abundance measured when the species was state and federally listed in 1993, and the 2006 and 2004 abundance levels were the second and third lowest, respectively.

Population viability and extinction risk analyses indicate that delta smelt has fallen below its estimated "effective population size", with its present low abundance rendering the species vulnerable to inbreeding and genetic drift. The analyses, completed three years ago, predicted a 50% chance that the population would fall below its effective population size within two years, a prediction fulfilled by recent measurements of the species' record

low abundance in 2004, 2005 and 2006. Other analyses using the most conservative extinction criterion predicted a 26-30% probability that the delta smelt population would fall to just 800 fish (compared to the present record low population of an estimated 35,000 fish) in the next 20 years. These high probabilities of extinction for delta smelt exceed criteria established by the International Union for Conservation of Nature and Natural Resources for an "endangered" species.

There are multiple environmental and anthropogenic threats to the species, including: reductions in freshwater inflow to the estuary; loss of larval, juvenile and adult fish at the massive state and federal water export facilities and urban, agricultural and industrial water diversions; direct and indirect impacts of non-native species on the delta smelt's planktonic food supply and habitat; lethal and sub-lethal effects of toxic chemicals; and, as a result of their present low population size, potential loss of the species' genetic integrity.

The recent decline of the species coincides with significant increases in Delta water exports by the state and federal water projects (seasonal water exports in the 2000s are as much as 49% higher than in the early 1990s), higher incidental take of delta smelt by the pumps, and concomitant increased alterations in internal Delta flow patterns. New analyses have demonstrated statistically significant relationships between delta smelt population abundance and both Delta freshwater outflow and export rates: low freshwater outflows and/or high levels of water exports consistently correspond to low delta smelt population abundance. Hydrodynamic analyses of Delta flows and exports indicate that all larval and juvenile delta smelt present in the southern regions of the Delta, that part of the species' critical habitat closest to the pumps, are likely to be entrained and lost. Based on these analyses, current water management operations in the Delta are contributing to the current critically low numbers of delta smelt and are incompatible with recovery of the species.

Ecological conditions in delta smelt habitat have also deteriorated. Reduced freshwater outflows have shifted the location and degraded the low salinity habitat seasonally used by the fish. The invasive clam *Corbula amurensis* (formerly *Potamocorbula amurensis)* has reduced the abundance of the delta smelt's zooplankton food supply. All life history stages of the species are at least periodically exposed to lethal or sub-lethal concentrations of herbicides and pesticides discharged and transported from upstream into their habitat.

Current state and federal management and protective regulations have proved inadequate to protect delta smelt and their estuarine ecosystem. The current export criteria in the water rights permits issued by the State Water Resources Control Board regulations allow export operations at levels that exceed those necessary to maintain healthy delta smelt populations. Dedications of water for the environment and of money for supplemental acquisitions of environmental water mandated in the 1992 Central Valley Project Improvement Act intended to reduce the negative impacts of the federal water project on fish and wildlife have not been fully or aggressively implemented. The CALFED Bay-Delta Program has been largely ineffective in addressing environmental problems in the

Delta, and its future status is highly uncertain. The most recent Biological Opinion by the U.S. Fish and Wildlife Service (USFWS) for protection of the species relies nearly exclusively on the CALFED Environmental Water Account, an experimental fish protection tool that, after six years of implementation, has failed to provide detectable benefits for delta smelt or any other fish species. Despite precipitously declining populations of delta smelt (and other Delta fish species), the agencies charged with protecting the species under the state and federal Endangered Species Acts are in the process of approving the South Delta Improvements Program, which would increase Delta water exports and install permanent tidal barriers that further modify Delta flow patterns and habitat.

Less than three years ago, the USFWS completed a 5-year status review for delta smelt. Based on that review, the USFWS rejected a proposal to de-list the species, reaffirmed the threatened status of the species, and reported that the threats to the species had been neither eliminated nor mitigated. Since then, the condition of the species has worsened dramatically and threats to its continued existence have multiplied and escalated. The survival of delta smelt is threatened by the present and threatened modification of its habitat; human-related activities such as water diversions, entrainment and toxic chemicals; and predation, competition and other direct and indirect impacts of non-native species. The delta smelt, a potent indicator of the ecological health of the west coast's largest estuary, is at imminent risk of extinction and merits immediate listing under the California Endangered Species Act as an endangered species.

NOTICE OF PETITION

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Petitioners the Bay Institute, Center for Biological Diversity, and Natural Resources Defense Council formally request that the California Fish and Game Commission (Commission) reclassify the listing of the delta smelt (*Hypomesus transpacificus*) from a threatened species to an endangered species under the California Endangered Species Act (CESA), Fish and Game Code §2050-2068.

Under 14 CCR s 670.1(i)(1)(C) a threatened species may be uplisted to endangered if its continued existence throughout all or a significant portion of its range is in serious danger of becoming extinct by any one or any combination of the factors listed in subsection 670.1(i)(1)(A); 1) present or threatened modification or destruction of its habitat; 2) overexploitation; 3) predation; 4) competition; 5) disease; or 6) other natural occurrences or human-related activities.

Petitioners further request that the Commission review whether the species warrants emergency listing, and if so, that the Commission use its authorities to list the species as endangered on an emergency basis. The Commission may adopt a regulation that adds a species to the list of threatened or endangered species at any time if the Commission finds that there is any emergency posing a significant threat to the continued existence of the species (Fish and Game Code §2076.5).

The delta smelt is currently designated as a threatened species under the CESA. However, the recent and continuing population decline and new information published in peer-reviewed literature, and presented at scientific meetings and CALFED Bay-Delta Program workshops described in this petition demonstrate that the species' listing should immediately be changed to endangered – at risk of extinction. Evidence to support the listing change presented in this petition includes: record low population abundance in the last two years; current population levels below the "effective population size" for the species cited by the U.S. Fish and Wildlife Service (USFWS) in their most recent 5-year review (USFWS 2004); evidence for a significant stock recruitment relationship for the species; population viability and extinction risk analyses that indicate that the species is at high risk of extinction (Bennett 2003, 2005); and new information regarding the effects of Delta water exports on delta smelt population abundance. Due to this extreme situation, the threats documented in this petition constitute an emergency.

The Bay Institute is a non-profit organization that works to protect and restore the ecosystems of San Francisco Bay, the Sacramento-San Joaquin Delta, and the rivers, streams, and watersheds tributary to the Estuary, using a combination of scientific research, public education, and advocacy. The Center for Biological Diversity is a nonprofit, science-based environmental advocacy organization that works to protect endangered species and wild places throughout the world through science, policy, education, citizen activism and environmental law. Natural Resources Defense Council is a nonprofit, environmental organization that works to restore the integrity of the elements that sustain life – air, land and water – and to defend endangered natural places. The Bay Institute, Center for Biological Diversity, and Natural Resources Defense Council submit this petition on their own behalf and on behalf of their members and staff, with an interest in protecting the delta smelt and its habitat.

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I. NATURAL HISTORY AND STATUS OF THE DELTA SMELT

A. NATURAL HISTORY

1. Description

The delta smelt (*Hypomesus transpacificus*) is a small (50-80 mm in length for most adults), nearly translucent, steely-blue, osmerid fish endemic to the San Francisco Bay/Sacramento-San Joaquin Delta Estuary, in California. The delta smelt was described as follows by Moyle (2002):

> ...slender-bodied fish that typically reach 60-70 mm SL *(standard length; 2.36—2.76 in)*, although a few may attain 120 mm *(4.73 in)* SL. The mouth is small, with a maxilla that does not extend past the mid-point of the eye. The eyes are relatively large; the orbit width contained approximately 3.5-4 times within head length. Small pointed teeth are present on the upper and lower jaws. The first gill arch has 27-33 gill rakers and there are 7 branchiostegal rays. The gill covers lack strong concentric striations. The pectoral fins reach less than two-thirds of the way to the bases of the pelvic fins. There are 8-11 (usually 9-10) dorsal fin rays, 8 pelvic fin rays, 10-12 pectoral fin rays, and 15-19 anal fin rays. The lateral line is incomplete and has 53-60 scales along it. There are 4-5 pyloric caeca. Live fish are nearly translucent and have a steely-blue sheen to their sides. Occasionally there maybe one chromatophore (a small dark spot) between the mandibles, but usually there is none.

2. Taxonomy

Delta smelt is one of six species currently recognized in the *Hypomesus* genus (Saruwatari et al. 1997; as cited in Bennett 2005) and genetic analyses have confirmed that it is a well-defined species with a single intermixing population (Stanley et al. 1995; Trenham et al. 1998). Within the genus, delta smelt is most closely related to surf smelt (*H. pretiosis*), a species common along the western coast of North America. In contrast, delta smelt is a comparatively distant relation to the wakasagi (*H. nipponensis*), which was introduced into Central Valley reservoirs in 1959 and is now sympatric with delta smelt in the estuary. Delta smelt and wakasagi can also be distinguished using morphometric and pigmentation characteristics (Moyle 2002).

The U.S. Fish and Wildlife Service (USFWS) has repeatedly concluded the delta smelt is a distinct species: in an October 1991 proposed listing (56 FR 50075 50084), a March 1993 determination of threatened status (58 FR 12854 12864), a January 1994 revised critical habitat determination (59 FR 852 862), a December 1994 critical habitat determination for the species, and a 2004 5-Year Status Review for the species (USFWS 2004).

3. Range and Distribution

Delta smelt are restricted to the upper reaches of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. The species' overall distribution extends from San Pablo Bay upstream to Sacramento on the Sacramento River and Mossdale on the San Joaquin River (Radtke 1966; Moyle et al. 1992; Moyle 2002), with the actual location of the population varying seasonally and with freshwater outflow (Figure 1). The fish are found typically in shallow (<3 m) and/or surface waters in bays, river channels and sloughs, including in the Sacramento River, the Mokelumne River system, the Cache Slough region, the Delta, Montezuma Slough, Suisun Bay, Suisun Marsh, Carquinez Strait, the Napa River, and San Pablo Bay.

Critical habitat for the delta smelt, designated in 1994 (59 FR 65256 65279), encompasses the areas of all water, all submerged lands below ordinary high water, and the entire water column bounded by and contained in Carquinez Strait, Suisun Bay, Goodyear, Suisun, Cutoff, First Mallard and Montezuma Sloughs, and the Sacramento-San Joaquin River Delta (as defined in Section 12220 of the California Water Code). The area designated by USFWS as critical habitat does not encompass all areas within the estuary in which delta smelt have been found in the past or in which they are have been reported in recent years: for example, in most years with high winter and/or spring freshwater outflows, some portion of the delta smelt population spawns in the Napa River and larvae and juveniles rear in San Pablo Bay (including 2006; California Department of Fish and Game [CDFG] 20 mm Survey results, available at http://www.delta.dfg.ca.gov/data/20mm/). Throughout their life cycle, the fish use different areas and habitat types within their critical habitat at different life history stages (Moyle et al. 1992; Bennett 2005; and see Life History below). For spawning, delta smelt require fresh waters as well as suitable substrate for their adhesive eggs (probably rock or submerged vegetation, although spawning microhabitat is unknown; Bennett 2005). Juveniles and sub-adults use brackish water areas in the estuary, which, depending on freshwater outflow conditions, may be located in the Delta, Suisun Bay, or San Pablo Bay.

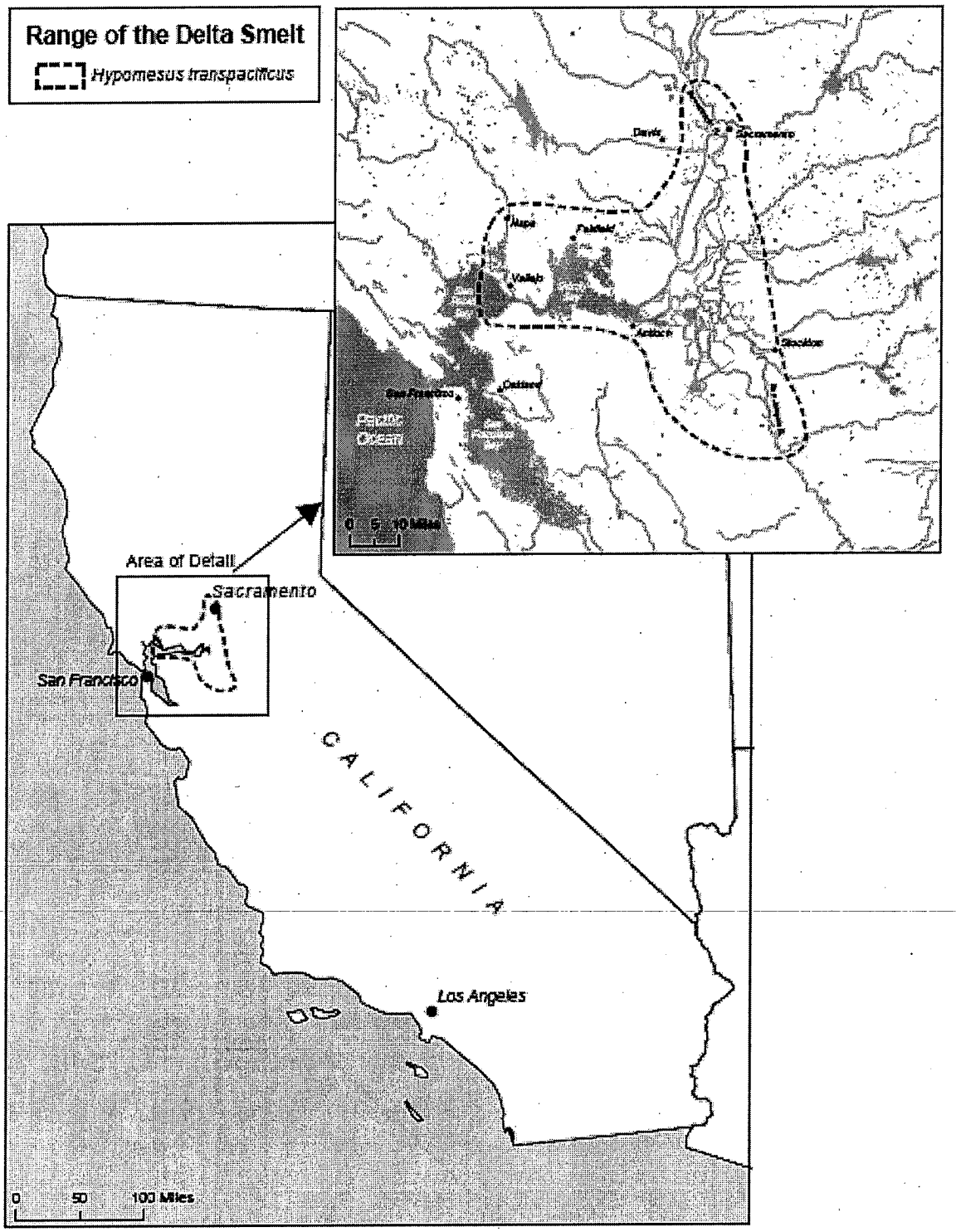

Figure 1. Distribution of delta smelt in California's Sacramento-San Joaquin Estuary. Map modified from Bennett 2005.

4. Habitat Requirements

Delta smelt are moderately euryhaline (capable of tolerating a wide range of salt water concentrations) and eurythermal (adaptable to a wide range of temperatures). The fish are found generally in brackish water (<10-12 psu [practical salinity units]), a range that corresponds well with measured salinity tolerance limits for the species (0 to 19 psu; Swanson et al. 2000). Except during the winter spawning season, most fish reside in the "low salinity zone" (0.2-2.0 psu; Bennett 2005). Delta smelt tolerate water temperatures from approximately 6°C to 25°C (depending on thermal acclimation history; Swanson et al. 2000). Temperature does not appear to control delta smelt distribution in the estuary, although temperatures >25°C may constrain delta smelt habitat during the summer and early fall (Bennett 2005).

The USFWS (1994) described the specific habitat conditions required by each life stage of delta smelt:

> *Spawning Habitat* - Delta smelt adults seek shallow, fresh or slightly brackish backwater sloughs and edgewaters for spawning. To ensure egg hatching and larval viability, spawning areas also must provide suitable water quality (i.e., low concentrations of pollutants) and substrates for egg attachment (e.g., submerged tree roots and branches and emergent vegetation). Specific areas that have been identified as important delta smelt spawning habitat include Barker, Lindsey, Cache, Prospect, Georgiana, Beaver, Hog, and Sycamore sloughs and the Sacramento River in the Delta, and tributaries of northern Suisun Bay. The spawning season varies from year to year and may start as early as December and extend until July.
>
> *Larval and Juvenile Transport* - To ensure that delta smelt larvae are transported from the area where they are hatched to shallow, productive rearing or nursery habitat, the Sacramento and San Joaquin Rivers and their tributary channels must be protected from physical disturbance (e.g., sand and gravel mining, diking, dredging, and levee or bank protection and maintenance) and flow disruption (e.g. water diversions that result in entrainment and in-channel barriers or tidal gates). Adequate river flow is necessary to transport larvae from upstream spawning areas to rearing habitat in Suisun Bay. Additionally, river flow must be adequate to prevent interception of larval transport by the State and Federal water projects and smaller agricultural diversions in the Delta. To ensure that suitable rearing habitat is available in Suisun Bay, the 2 ppt isohaline must be located westward of the Sacramento-San Joaquin River confluence during the period when larvae or juveniles are being transported, according to the historical salinity conditions which vary according to water-year type. Reverse flows that maintain larvae upstream in deep-channel regions of low productivity and expose them to entrainment interfere with those transport requirements. Suitable water quality must be

provided so that maturation is not impaired by pollutant concentrations. The specific geographic area important for larval transport is confined to waters contained within the legal boundary of the Delta, Suisun Bay, and Montezuma Slough and its tributaries. The specific season when habitat conditions identified above are important for successful larval transport varies from year to year, depending on when peak spawning occurs and on the water-year type. The Service identified situations in the biological opinion for the delta smelt (1994) where additional flows might be required in the July-August period to protect delta smelt that were present in the south and central Delta from being entrained in the State and Federal project pumps, and to avoid jeopardy to the species. The long-term biological opinion on CVP-SWP operations will identify situations where additional flows may be required after the February through June period identified by EPA for its water quality standards to protect delta smelt in the south and central Delta.

Rearing Habitat- Maintenance of the 2 ppt isohaline according to the historical salinity conditions described above and suitable water quality (low concentrations of pollutants) within the Estuary is necessary to provide delta smelt larvae and juveniles a shallow, protective, food-rich environment in which to mature to adulthood. This placement of the 2 ppt isohaline also serves to protect larval, juvenile, and adult delta smelt from entrainment in the State and Federal water projects. An area extending eastward from Carquinez Strait, including Suisun Bay, Grizzly Bay, Honker Bay, Montezuma Slough and its tributary sloughs, up the Sacramento River to its confluence with Three Mile Slough, and south along the San Joaquin River including Big Break, defines the specific geographic area critical to the maintenance of suitable rearing habitat. Three-Mile Slough represents the approximate location of the most upstream extent of tidal excursion when the historical salinity conditions described above are implemented. Protection of rearing habitat conditions may be required from the beginning of February through the summer.

Adult Migration - Adult delta smelt must be provided unrestricted access to suitable spawning habitat in a period that may extend from December to July. Adequate flow and suitable water quality may need to be maintained to attract migrating adults in the Sacramento and San Joaquin River channels and their associated tributaries, including Cache and Montezuma sloughs and their tributaries. These areas also should be protected from physical disturbance and flow disruption during migratory periods.

5. Life History

The life history of delta smelt has been extensively described by Moyle et al. (1992), Moyle (2002), Bennett (2005), and the most recent Biological Opinion for the species (USFWS 2005). Briefly, delta smelt is an annual species although there is evidence that, at least in some years, a small percentage of the population (<10%) survives to two years and may spawn in one or both years (Bennett 2005). Compared to other annual species,

delta smelt exhibit relatively low fecundity with most females producing fewer than 3,000 eggs (Bennett 2005; Mager 1996). Spawning occurs in fresh water during the winter and spring (February-June; peak spawning April-May) and at water temperatures between 12°C and 18°C, with the larger adults maturing, arriving in the Delta, and spawning earlier (i.e., February-April) and at cooler temperatures than smaller, younger fish (Bennett et al. 2006; Herbold et al. 2006). Hatching occurs approximately 8-14 days later depending on water temperature. Newly hatched larvae are small (4.5-6 mm) and, after yolk-sac absorption and development of the jaw and mouth parts, they begin feeding on unicellular algae, rotifers, and/or sub-adult copepods. As the fish grow, their diet shifts nearly exclusively to copepods. Larval and juvenile fish move and/or are transported by flow and tides downstream from freshwater areas in the upper Delta (and, in some years, the Napa River and upper Suisun Marsh) to the brackish low-salinity zone where they rear for the summer and fall. In late fall and early winter, maturing adults begin their diffuse upstream migration to freshwater spawning areas.

Delta smelt exhibit a significant stock recruitment relationship. Using data from California Department of Fish and Game (CDFG) surveys that measure the abundance of juvenile and sub-adult/adult delta smelt (see Historic and Current Abundance, below), correlation and regression analyses show that the abundance of juvenile fish is significantly and directly related to the abundance of the adults that produced them (Figure 2 and Equation 1).[1]

[1] Population abundance of delta smelt is monitored by two California Department of Fish and Game surveys. The Summer Tow Net Survey (TNS), conducted during June and July, measures the abundance of juvenile delta smelt. The Fall Mid Water Trawl (FMWT), conducted from September to December, surveys sub-adult and adult delta smelt. From each of these surveys, delta smelt population abundance is calculated as an annual abundance "index". Because the FMWT and TNS abundance index data are not normally distributed, for these and other statistical analyses, the indices were $\log_{(10)}$ transformed (similar to the approach used by Bennett 2005).

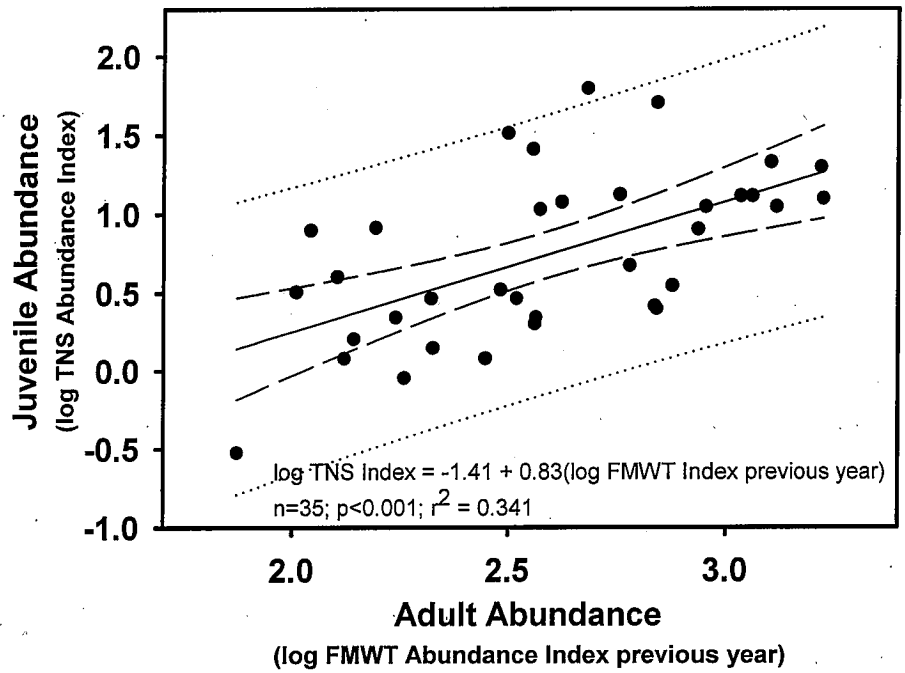

Figure 2. The relationship between the abundance of juvenile delta smelt (log TN Index) and the abundance of the adult fish that produced them (log FMWT Index for the previous year). Data are for 1969 to 2005. Regression equation and associated statistics are shown with the graph and are provided in the text. Data source: California Department of Fish and Game.

Log TNS Index = -1.41 + 0.83(log FMWT Index previous year) **(Equation 1)**
n=35; p<0.001; r^2=0.341
where: log TNS Index is abundance of juvenile delta smelt; and
log FMWT Index is the abundance of sub-adult/adult delta smelt.

Similarly, the abundance of adult fish measured the following fall is significantly and directly related to the abundance of the population as juveniles measured earlier in the year (Figure 3 and Equation 2).

Log FMWT Index = 2.21 + 0.46(log TNS Index) **(Equation 2)**
n=35; p<0.001; r^2=0.337

There is considerable disagreement among experts regarding the possible influence of density dependence (i.e., regulation of the size of the population by mechanisms that are themselves controlled by the size of that population, such as availability of food resources) on delta smelt population dynamics and abundance. Bennett (2003, 2005) suggested that the abundance of adult fish might be limited by density dependent effects on juveniles. The CDFG (2003) disagreed in their comment letter to the USFWS for the recent 5-year status review for delta smelt (USFWS 2004), citing lack of credible mechanism(s), the recent low abundance of delta smelt, and the weakness of the statistical evidence for density dependence. The fact that delta smelt are not currently abundant relative to their recent past abundance or relative to the other species living in

the Delta suggests that the species has not exceeded the carrying capacity of its habitat and that its abundance is not limited by density dependent effects. Regardless, Bennett's (2005) analysis indicated that, since the early 1980s, density dependent effects did not occur at population abundance levels lower than 400-450 (as measured by the Fall Water Trawl Abundance Index; and see Historic and Current Abundance below), levels that are roughly comparable to or somewhat lower than the recovery criteria identified for the species (Moyle et al.1996).

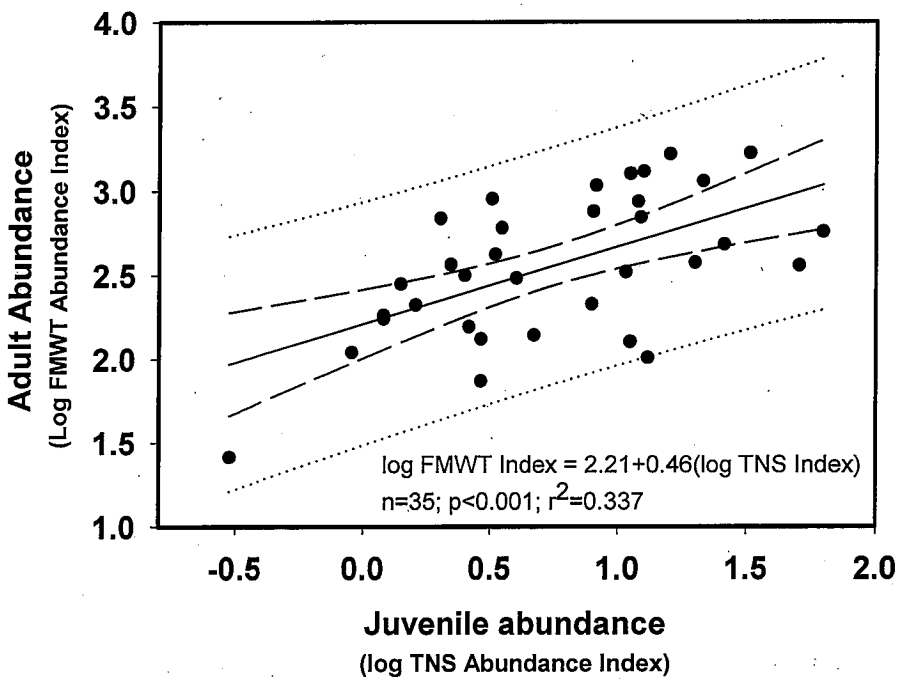

Figure 3. The relationship between the abundance of adult delta smelt (log FMWT Index) and the abundance of juvenile measured earlier in the same year (log TNS Index). Data are for 1969 to 2005. Regression equation and associated statistics are shown with the graph and are provided in the text. Data source: California Department of Fish and Game.

6. Natural Mortality

The most recent review of delta smelt status reports that there is insufficient evidence for effects of disease, competition or predation on delta smelt population abundance (USFWS 2004). However, diseases and parasites of delta smelt have not been well studied and numerous introduced species are abundant in the estuary. Competition and predation by introduced species has been shown to affect delta smelt size and condition (Souza et al. 2005; Teh 2005) but its role in affecting delta smelt population abundance has not been quantified (see discussion of Disease, Competition, or Predation below).

B. CHANGES IN DISTRIBUTION AND ABUNDANCE

1. Historic and Current Distribution

Historic distribution: The delta smelt's historic distribution extended from San Pablo Bay upstream to Sacramento on the Sacramento River and Mossdale on the San Joaquin River (Radtke 1966; Moyle et al. 1992; Moyle 2002), with the actual location of the population varying seasonally and with freshwater outflow. Based on results of CDFG sampling surveys for juveniles during the Summer Townet Survey (TNS) and adults during the Fall Mid Water Trawl (FMWT) survey conducted since the late 1950s as well as earlier published reports (cited in the references above), delta smelt were found in shallow (<3 m) and/or surface waters in bays, river channels and sloughs, including in San Pablo Bay, Carquinez Strait, the Napa River, Suisun Bay, Suisun Marsh, Montezuma Slough, the Sacramento River, the Cache Slough region, the Mokelumne River system, the San Joaquin River, Old and Middle Rivers, and all other channels and sloughs in the Delta with accessible subtidal, shallow-water habitat. In general, the rivers, channels, and sloughs in the Delta function as both rearing habitat for larval and juvenile delta smelt and a migration corridor for both the adult and juvenile life stages while the brackish, open bay areas serve as rearing habitat for older juveniles and sub-adult delta smelt (see Habitat Requirements and Life History).

Current distribution: Since the late 1970s, large areas of historic delta smelt habitat (and designated critical habitat) within the Delta have been degraded for a key life history stage of the species: the distribution of the species has been substantially reduced. Based on results from the summer TNS, which has been conducted annually since 1959, juvenile delta smelt have virtually disappeared from the Delta in areas south of the San Joaquin River (Miller 2000; CDFG 2003; Fleming and Nobriga 2004). Most of the environmental characteristics of these south Delta channels and sloughs known to be necessary for the species (e.g., temperature, salinity, water depth) have not changed. Recent surveys for adult delta smelt (CDFG Spring Kodiak Trawl) and larvae (CDFG 20 mm Survey) indicate that this region of the Delta is still used for spawning in the spring. But, by two to three months later, few or no juvenile delta smelt are collected during the summer TNS, a marked change compared to results of the first 20 years of the survey. This is the region of the Delta most directly affected by State Water Project (SWP) and Central Valley Project (CVP) water export operations and by the installation and spring-summer operations of three south Delta tidal gate barriers designed to maintain water levels and water quality for local agricultural water diverters. The period during which juvenile delta smelt disappeared from this portion of their historic habitat (i.e., the late 1970s) coincides with substantial increases in the amounts of water exported, increases in frequency of high volume export operations, and the initiation and increasing duration of south Delta barrier operations (Simi and Ruhl 2005; Fleming and Nobriga 2004; and see Figure 4).

Recent analyses by scientists with the California Department of Water Resources (CDWR) indicate that overall habitat quality and the area of habitat in the estuary suitable for delta smelt have declined during the past fifteen years (Feyrer et al. 2005, 2006).

Using water temperature, salinity, turbidity and delta smelt catch data from the CDFG's FMWT survey, the authors constructed a "habitat quality" index that related those environmental factors to the presence of delta smelt. Their results showed a long-term decline in fall habitat quality since the early 1990s and a more recent, sharp decline in the 2000s, coincident with the recent precipitous decline in the delta smelt population (see Historic and Current Population Abundance). The decline in habitat quality was driven by reduced freshwater outflows and resultant increased salinity in the western Delta.

2. Historic and Current Abundance

More than a dozen regular surveys collect data on delta smelt within the estuary (USFWS 2004) but the population abundance estimates used for most analyses and for tracking the species' population status are calculated from results of two surveys conducted by the CDFG: the TNS which samples juvenile delta smelt and the FMWT which samples sub-adult and adult delta smelt. From each survey, an abundance index is calculated by extrapolating the numbers of fish caught at 30 to 80 fixed stations, using a weighting factor that accounts for differences in water volume at various sub-regions from San Pablo Bay through the Delta (Bennett 2005). A subset of stations and months from the FMWT is also used to calculate the Recovery Index (Moyle et al.1996). None of these indexes provide direct measurements of actual population abundance. However, total population size calculated from the raw survey data and habitat volume estimates by Bennett (2005) show a good linear correspondence with the abundance indices, suggesting that the indices represent reasonable estimates of relative population abundance.

Historic abundance: As recently as 30 years ago, delta smelt was one of the most common and abundant of the pelagic fishes caught in the estuary, as indicated by its abundance in CDFG trawl catches (Erkkila et al. 1950; Radtke 1966; Stevens and Miller 1983). For the first 16 years of the FMWT survey (1967-1982), the most comprehensive survey for the species, the abundance index averaged 806, a value that roughly corresponds to an estimated 800,000 adult fish (Bennett 2005). But, in the early 1980s, the population declined by more than 80% (based on the FMWT Index; the decline was 95% based on the TNS Index; Table 1 and Figure 4). According to Bennett (2005) this precipitous decline was the result of the combination of extremely high winter and spring outflows, elevated springtime water temperatures and resultant short duration spawning periods, and two consecutive years of extremely high levels of incidental take at the SWP and CVP water export facilities. From 1983 through 1992, delta smelt abundance (measured as the FMWT Index) was consistently low, averaging just 33% of the 1967-1982 average abundance levels. In 1993, abundance increased considerably and, throughout the rest of the decade, population levels fluctuated but were, on average, roughly double those measured during the 1983-1992 period (Table 1). This increase prompted several stakeholder groups to challenge the listing, an action that ultimately led to the recent 5-year status review for the species (USFWS 2004).

Table 1. Abundance of delta smelt as measured by the CDFG Summer Tow Net Survey (TNS, juvenile delta smelt), Fall Mid Water Trawl Survey (FMWT, adult delta smelt), and the Recovery Index (based on FMWT data, adult delta smelt). NA= abundance index not yet available.

Year	TNS Index	FMWT Index	FMWT averages	Recovery Index	Comments
1959	12.1				Comparisons are based on FMWT Indices
1960	25.4				
1961	21.3				
1962	24.9				
1963	1.8				
1964	24.6				
1965	6.0				
1966	no data				
1967	no data	414		139	
1968	no data	696		251	
1969	2.5	315		128	
1970	32.5	1673		598	
1971	12.5	1303		352	
1972	11.1	1265		551	
1973	21.3	1145		305	
1974	13.0	no data		no data	
1975	12.2	697	1967-1982: 806	239	
1976	50.6	360		22	
1977	25.8	481		146	
1978	62.5	572		108	
1979	13.3	no data		no data	
1980	15.8	1653		312	
1981	19.8	374		78	
1982	10.7	330		37	
1983	2.9	132		17	Population declines 84% (from 1967-1982 FWMT).
1984	1.2	182		51	
1985	0.9	110		29	
1986	7.9	212		70	
1987	1.4	280	1983-1992: 267	72	
1988	1.2	174		67	
1989	2.2	366		76	
1990	2.2	364		81	
1991	2.0	689		171	
1992	2.6	156		26	
1993	8.2	1078		400	Delta smelt listed as threatened
1994	13	102		19	Abundance is 9% of 1993 level.
1995	3.2	899		252	Abundance is 83% of 1993 level.
1996	11.1	127	1993-2001: 572	28	Abundance is 12% of 1993 level.
1997	4.0	303		62	Abundance is 28% of 1993 level.
1998	3.3	420	1999-2001: 741	169	Abundance is 39% of 1993 level.
1999	11.9	864		322	Abundance is 80% of 1993 level.
2000	8	756		265	Abundance is 70% of 1993 level.
2001	3.5	603		314	Abundance is 56% of 1993 level.
2002	4.7	139		33	Population declines 81% (from 1999-2001 FWMT). Abundance is 13% of 1993 level.
2003	1.6	210		101	Some recovery criteria met (this year only). Abundance is 19% of 1993 level.
2004	2.9	74		25	Abundance is 7% of 1993 level.
2005	0.3	26		4	Abundance is 3% of 1967-1982 average, 4% of 1999-2001 average, and 2% of 1993 level.
2006	0.4	41		21	Abundance is 5% of 1967-1982 average, 6% of 1999-2001 average, and 4% of 1993 level.

Current abundance: In 2002, the delta smelt population again experienced a drastic population decline, dropping more than 80% from levels measured during the previous three years (1999-2001 average) (based on the FMWT Index; the decline was 77% based on the 2003 TNS Index compared to the 1999-2002 average; Table 1 and Figure 4). Since then, the population has continued to decline, falling to what was then a record low in 2004 (FMWT=74, or an estimated 60,000-70,000 adult fish) and then plummeting again by 65% to a FMWT Index of just 26 in 2005, the lowest abundance level ever recorded for sub-adult and adult delta smelt. The recently released 2006 FMWT Index, 41, is the second lowest level measured during the 40-year survey. Based on Bennett's (2005) analyses, the 2006 FMWT Index roughly corresponds to fewer than 35,000 adult fish.

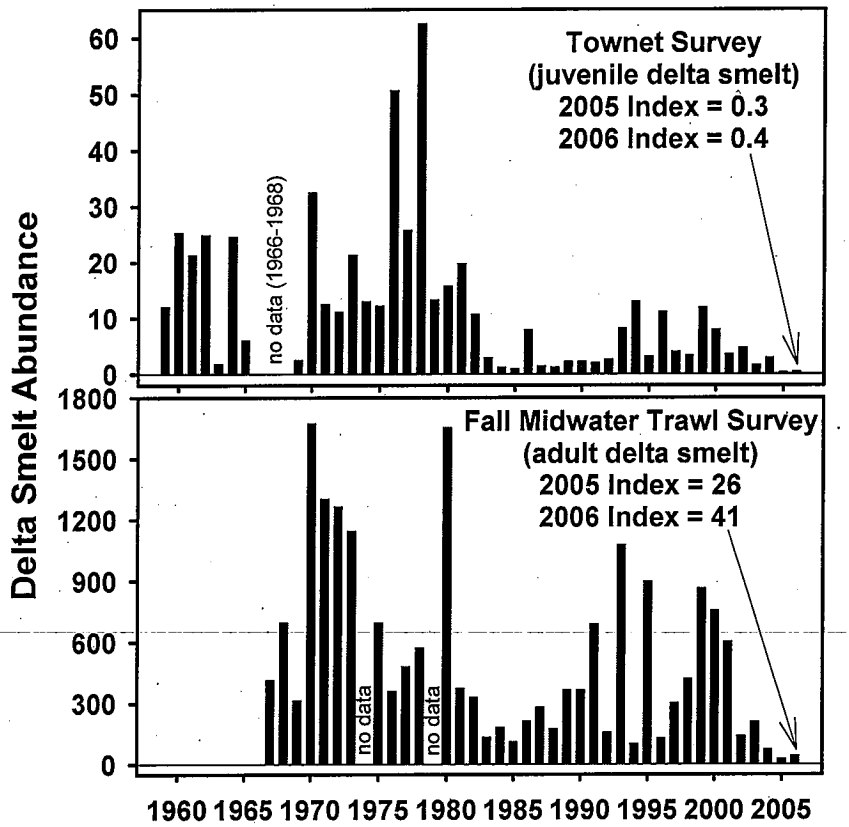

Figure 4. Trends in abundance of delta smelt as measured by two different surveys. The upper panel shows the abundance index calculated from the Summer Townet Survey (TNS, 1959-2006), which samples juvenile delta smelt. The lower panel shows the abundance Index calculated from the Fall Midwater Trawl Survey (FMWT, 1967-2006), which samples sub-adult and adult delta smelt. Data source: California Department of Fish and Game.

3. Population Trend and Extinction Risk Analysis

By the time the delta smelt was listed as threatened in 1993, the species had experienced a decade of chronically low population abundance followed by the beginnings of an apparent recovery, with both juvenile and adult abundance indices increasing (Table 1

and Figure 4). In 1993, delta smelt abundance was the highest measured since the major population decline in the early 1980s. During the rest of the 1990s, abundance fluctuated but generally continued to improve. This period corresponded with favorable water temperature and flow conditions. The most recent population decline began in 2000 and, in 2002, abundance of adult delta smelt dropped by more than 75% compared to the previous year. The following year, abundance of the juvenile fish was 66% lower than that measured in the previous year. Since then, population abundance as measured by both life-stage specific surveys has continued to decline. By 2005, abundance of juvenile delta smelt was just 3.7% of that measured in 1993 when the species was listed under the CESA and the abundance of adult delta smelt was just 2.4% of the 1993 level. Abundance levels measured in 2006 showed no signs of meaningful improvement.

Using data on past measured population abundance and variability, Bennett (2003, 2005) conducted a population viability analysis for delta smelt, calculating probabilities and predicted time frames for extinction of the species.[2] In the first step of his analysis, Bennett (2003) estimated the delta smelt population would be below its "effective population size", the population level below which a species is subject to inbreeding and genetic drift, if the FMWT Index fell below 100 for two consecutive years. At the time of this analysis, this abundance level was similar to the lowest FMWT Index ever measured for the species (1994 FMWT Index of 102, or an estimated 86,203 adult fish). The USFWS 5-year status review (2004) recognized this definition of an effective population size and noted that this population size reflected an "unprecedented low number of delta smelt." Based on this analysis, the current delta smelt population has been well below its effective population size for the past three consecutive years, with the 2004, 2005 and 2006 FMWT Index values of 74, 26 and 41 respectively (Table 1).

Using the now defined effective population size as a benchmark, Bennett (2003, 2005) then conducted an extinction risk analysis using three progressively more extreme population size criteria to simulate extinction: 80,000, 8,000, and 800 fish. For each population level, the analysis used FMWT data for the 1982-2003 period to calculate the median time to a 50% probability of extinction and the probability that extinction would occur within 20 years. For the highest population level, the analysis predicted that the median time to when there was a 50% chance that the population would fall below 80,000 fish was only 1.2 to 1.5 years, a statistic confirmed one year later when the FMWT Index fell to 74. Using the lower extinction levels, Bennett (2005) predicted that the median time to 50% probability of extinction defined as a population size of just 8,000 fish was only 20 years and, for a population size of 800 fish, 42 to 55 years. For this lowest extinction level (800 fish), there was a 26-30% probability that extinction would occur within 20 years. Bennett (2005) compared his results to criteria developed by the International Union for Conservation of Nature and Natural Resources, which defines an endangered species as one with a 20% probability of extinction in 20 years, and concluded that "delta smelt qualifies for Endangered ... status" (page 55).

[2] Another extinction probability analysis conducted by the San Luis & Delta-Mendota Water Authority (2002) was considered by the USFWS in their 5-year review (USFWS 2004). However, independent peer-review of this analysis by USGS (2003) concluded that this extinction probability analysis and estimate was seriously flawed.

II. CRITERIA FOR CALIFORNIA ENDANGERED SPECIES ACT LISTING

A. THE DELTA SMELT IS A "SPECIES" UNDER THE CESA

The Delta smelt is indisputably a species, as discussed in the section on taxonomy above. The California Fish and Game Commission acknowledged the delta smelt is a distinct species in the state threatened listing of December 1993. The USFWS has also concluded the delta smelt is a distinct species in the October 1991 proposed federal listing (56 FR 50075 50084), a March 1993 determination of threatened status (58 FR 12854 12864), a January 1994 revised critical habitat determination (59 FR 852 862), a December 1994 critical habitat determination for the species, and a 2004 5-year status review for the species (USFWS 2004).

B. THE DELTA SMELT IS ENDANGERED UNDER THE CESA

The CESA defines an "endangered species" as "a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease" (Fish and Game Code §2062). The threats to a species' survival are categorized according to the CESA as:

(1) Present or threatened modification or destruction of its habitat;
(2) Overexploitation;
(3) Predation;
(4) Competition;
(5) Disease; or
(6) Other natural occurrences or human-related activities.

According to the USFWS 5-year status review (USFWS 2004), there are sufficient data and analyses available to identify (1) present or threatened modification or destruction of habitat and (6) other natural occurrences or human-related activities as present and ongoing threats to the species. Additionally, the delta smelt is threatened with extinction by the inadequacy of current regulatory mechanisms and management efforts. In their recent 5-year status review for the species, the USFWS (2004) concluded that for delta smelt, "most threats which were discussed in the original listing remain." In this petition to list delta smelt as endangered under the CESA, we concur with the USFWS conclusion and we add new analyses and information to demonstrate that the nature, degree, and increasing severity of the threats of modification or destruction of habitat and the inadequacy of existing regulatory mechanisms to protect the species, arrayed against a dramatically reduced delta smelt population, combine to place the species in severe and immediate danger of extinction throughout its range.

Delta smelt are environmentally sensitive because they have a short life span, have a limited diet, have a low fecundity for a fish producing planktonic larvae, are poor swimmers, are easily stressed, and reside primarily in the interface between salt and fresh water within a limited geographic extent. In addition to these characteristics, the species

is highly vulnerable to extinction because of its present small population size. As noted by Moyle (2002), a substantial population is necessary to keep delta smelt from becoming extinct, and the species has recently fallen below the effective population size for viability (as defined by Bennett 2003) to an "unprecedented low number of delta smelt" (USFWS 2004). Multiple factors are thought to be contributing to the continuing population decline of the species, including: reductions in freshwater inflows and outflows to the estuary; direct and indirect adverse impacts of Delta water diversions and exports; effects of water management operations on estuarine habitat quality; reductions in abundance of prey food organisms; lethal, sub-lethal and indirect effects of toxic substances; disease, competition, and predation; and loss of genetic integrity. The magnitude and frequency of occurrence of most of these factors are increasing and current regulatory protections for the species and its habitat are clearly inadequate

The delta smelt indisputably merits immediate emergency listing under the CESA as an endangered species. The factors threatening the continued survival of the delta smelt are detailed below.

1. Present or Threatened Modification or Destruction of Its Habitat

Delta smelt reside entirely within the estuary, confined to a relatively small geographic range of low salinity and freshwater habitat. For some life history stages, the species is restricted to even smaller subregions within the estuary (e.g., the Delta for spawning in most years). Delta smelt live in the water column and, in their movements within their habitat, they often move "with the flow". For delta smelt, water is habitat. Therefore changes in the timing and amounts for freshwater inflow and outflow to and from the estuary, water export regimes, in-Delta hydrodynamics, water quality, and the estuarine food web have direct and significant impacts on the species.

The Delta, the heart of delta smelt spawning and early rearing habitat, is a major hub for California's water management system and a region of intensive irrigated agriculture. Water management operations of the massive SWP and the federal CVP in the Delta and its Sacramento and San Joaquin River watersheds have had major and often detrimental effects on freshwater inflow to the Delta, in-Delta hydrodynamics, freshwater outflow from the Delta, and water quality. For example, during periods of low freshwater inflow and high volume water exports, conditions that are common during periods when the bulk of the delta smelt population is distributed in the Delta, as much as 65% of the total freshwater inflow may be diverted, and net movement of water and entrained plankton, larvae and small fish in the central and southern Delta is towards the export facilities. At times, the net flows of the lower San Joaquin River in the Delta and several other important Delta channels are reversed, confusing and delaying migrating adult fish, impairing downstream transport of larval and juvenile delta smelt from the upper estuary where they were spawned to their brackish water rearing habitat, and lethally entraining large numbers of larval, juvenile, and adult delta smelt into state, federal, and local water diversions. The fish screens at the SWP and CVP fish facilities are known to be inadequate for protection of delta smelt (as well as for most other species; e.g., Bowen et al. 2004). Despite evidence of the limited effectiveness of these facilities for fish

protection, and evidence that this effectiveness is further deteriorating (Bowen et al. 2004), plans to upgrade or replace the facilities have been delayed indefinitely (SDFFF 2005).

Freshwater Inflows and Outflows

The Sacramento-San Joaquin Delta Estuary is a highly managed system: for much of most years, freshwater flows into the Delta from the estuary's largest tributaries, the Sacramento and San Joaquin Rivers, and freshwater outflows from the Delta are precisely managed by the federal and state water projects to support water export demands while minimally meeting water quality and outflow standards mandated by the California State Water Resources Control Board (SWRCB 1995). Historically, the San Joaquin River provided 21% of the total freshwater inflow to the Delta (based on data from the CDWR). In recent years, freshwater inflows from this river have declined substantially, averaging just 10% during the 2001-2005 period, with consecutive record low freshwater inflows in 2003 (6.4%) and 2004 (6.2%). Recent research by scientists from the U.S. Geological Survey (USGS) has shown that low San Joaquin River inflows, in combination with high water export rates, disrupt in-Delta tidal exchange and flows, cause negative (or "reverse") flows in important Delta channels such as the lower San Joaquin River, Old River and Middle River, and result in nearly all water and small pelagic organisms (such as delta smelt) in the central and southern Delta being drawn inexorably to the SWP and CVP pumps (Simi and Ruhl 2005; Ruhl et al. 2006). These researchers also showed that low San Joaquin River inflows, negative flows on Old and Middle Rivers, and high exports were significantly related to high levels of incidental take of delta smelt at the SWP and CVP facilities (see Water Exports and Diversions below), and that the frequency of occurrence of these conditions had increased during the past two decades.

New analyses by scientists from the Contra Costa Water District have demonstrated the negative effects of reduced freshwater outflows on delta smelt population abundance. Guerin et al. (2006) showed that reduced freshwater outflows during the fall, and resultant increases in western Delta salinity, significantly corresponded to reduced population abundance of juvenile delta smelt measured by the CDFG TNS the following year (Figure 5). Given the significant stock recruitment relationship for delta smelt (see Figure 2), these researchers further improved this statistical model for juvenile delta smelt abundance by inclusion of information on the size of the adult population that produced them. Equation 3 shows the multiple regression model for predicting the abundance of juvenile delta smelt based on western Delta salinity and the FMWT Abundance Index measured the previous fall.[3] Guerin et al. (2006) also reported that the frequency of occurrence of reduced fall freshwater outflows and elevated salinity in the western Delta had increased during the past ten years.

[3] Guerin et al. (2006) used untransformed TNS and FMWT Abundance Indices in their analyses. Because the FMWT and TNS abundance index data are generally not normally distributed, we have repeated their analyses using $\log_{(10)}$ transformed data (as with Equations 1 and 2, and similar to the approach used by Bennett 2005).

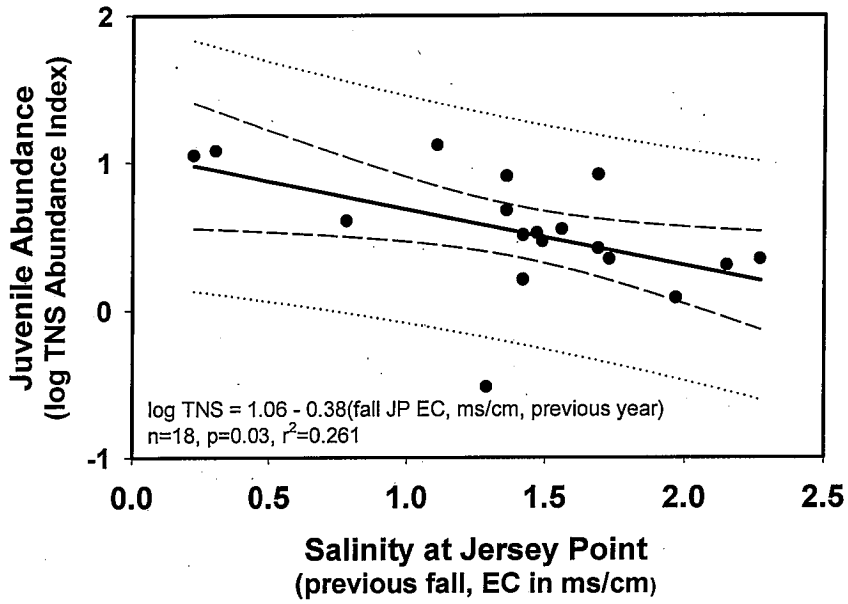

Figure 5. The relationship between fall salinity in the western Delta (Jersey Point EC [ms/cm], Oct.-Dec.) and abundance of juvenile delta smelt measured the following year (log TNS Abundance Index). Data are for 1988-2005. Regression equation and associated statistics, 95% confidence limits and the prediction limits are shown with the graph. A multiple regression model for this relationship that incorporates an additional variable is shown below in the text (Equation 3). Data sources: California Department of Fish and Game, Contra Costa Water District.

Log TNS Index =
-0.535 - 0.297(JP EC, prev. fall) + 0.593(log FMWT Index prev. year) **(Equation 3)**
n=18; p=0.004; r^2=0.522
where: log TNS Index is abundance of juvenile delta smelt;
JP EC is salinity (ms/cm) at Jersey Point (Oct.-Dec.) measured the previous year; and
log FMWT Index is the abundance of sub-adult/adult delta smelt measured the previous year.

These analyses indicate that seasonally reduced freshwater inflows and elevated salinity in Suisun Bay and the western Delta adversely alter delta smelt habitat (a conclusion also reached by Feyrer et al. [2005, 2006] using a different analytical approach; see Historic and Current Distribution). These conditions are related to establishment and increased abundance of the invasive clam, *Corbula amurensis*, in upper Suisun Bay and the western Delta measured in recent years (Thompson and Parchaso 2006). The negative impact of this invasive filter-feeder on the estuarine planktonic food web upon which delta smelt depends is well documented (Kimmerer and Orsi 1996; Thompson and Parchaso 2006).. In addition, reduced freshwater outflows and the consequent shift of the low salinity habit preferred by delta smelt further upstream increases the proximity and vulnerability of the fish to lethal entrainment at state, federal, industrial, and agricultural water diversions (Herbold et al. 2006). Guerin et al. (2006) suggested that both of these ecosystem

responses were potential mechanisms driving the relationship between reduced freshwater outflows and reduced delta smelt population abundance.

Water Exports and Diversions

In addition to the SWP and CVP water export facilities, more than 1,800 smaller diversions extract water for local consumptive use, and two power plants use Delta water for cooling (Herren and Kawasaki 2001). The USFWS (2004) concluded that the power plants at Pittsburg and Antioch, which use flow-through cooling and are located within the region of seasonal maximum abundance of delta smelt, can impose significant mortality on delta smelt. Fish screens at the SWP and CVP export facilities are known to be inadequate to protect delta smelt (Bowen et al. 2004) and the vast majority of the other Delta diversions are unscreened (Herren and Kawasaki 2001).

Water exports and diversions adversely affect delta smelt directly by entrainment (i.e., movement of fish due to the hydraulic effects of pumping and lethal removal of the fish from its habitat through unscreened or inadequately screened water diversions) or impingement (getting stuck on fish or debris screens at pumps); and indirectly by adversely modifying their critical habitat (e.g., by altering in-Delta hydrodynamics, reducing freshwater outflow and shifting the location of suitable low salinity rearing habitat, and/or removing planktonic food organisms). The species is at greatest risk from water diversions at two critical times in its life cycle, first as larvae and juveniles when the young fish move downstream to low salinity rearing habitat (spring and early summer) and then again as pre-spawning and spawning adults when maturing fish move up into the Delta for reproduction (winter and early spring). All of these life stages are known to be lethally entrained at government, urban, industrial, and agricultural diversions in the Delta (e.g., Matica and Sommer 2005; Nobriga et al. 2002; Moyle 2002). A portion of the entrainment loss of delta smelt >20 mm in length is monitored and reported as incidental take at only the SWP and CVP water export facilities.[4] Incidental take of delta smelt at the other diversions and of larval and juvenile fish <20 mm in length at the government water project facilities is neither monitored nor reported and no effort is made to rescue these fish. Therefore, the incomplete incidental take data are of limited value for evaluating the effects of water export activities on delta smelt population levels, although they do provide useful information on the timing and presence of the fish in the south and central Delta.

[4] Incidental take reported for delta smelt at the state and federal water export facilities is known to be a gross underestimate of the actual numbers of fish lethally entrained. The daily take number is calculated from counts of fish >20 mm in length collected in regular sub-samples of water bypassed through two sequential sets of louvers and/or fish screens. However, efficiency of the louvers to remove delta smelt from the diverted water is known to be low for delta smelt (i.e., under many conditions, more than half of the diverted fish pass through the louvers and are transported uncounted to the pumps; Bowen et al. 2004). Delta smelt larvae and juveniles <20 mm in length are not counted, but the loss of larval and juvenile delta smelt to entrainment is estimated at several million each year (USFWS 2004). In addition, unknown proportions of the fish entrained into the facilities are lost to predation and/or other mortality factors and never reach the fish salvage facilities to be counted.

Since the delta smelt was first listed as threatened under the CESA in 1993, annual water exports from the Delta have increased by more than 25% (1994-1998 average: 4.773 million acre-feet [MAF] per year; 2002-2006 average: 5.992 MAF per year).[5] In 2005, annual water exports reached a new record high of 6.305 MAF. Annual exports for 2006, 6.157 MAF, were the third highest on record. This increase continues a long-term trend of increases in Delta water exports (Figure 6, top panel). During the periods when delta smelt are vulnerable to entrainment, the relative increases in exports have been even greater, with a 49% increase in winter exports (December-March, when pre-spawning and spawning adults are in the Delta, Figure 6, middle panel) and a 30% increase in spring exports (March-July, when larvae and small juveniles are in the Delta, Figure 6, bottom panel).

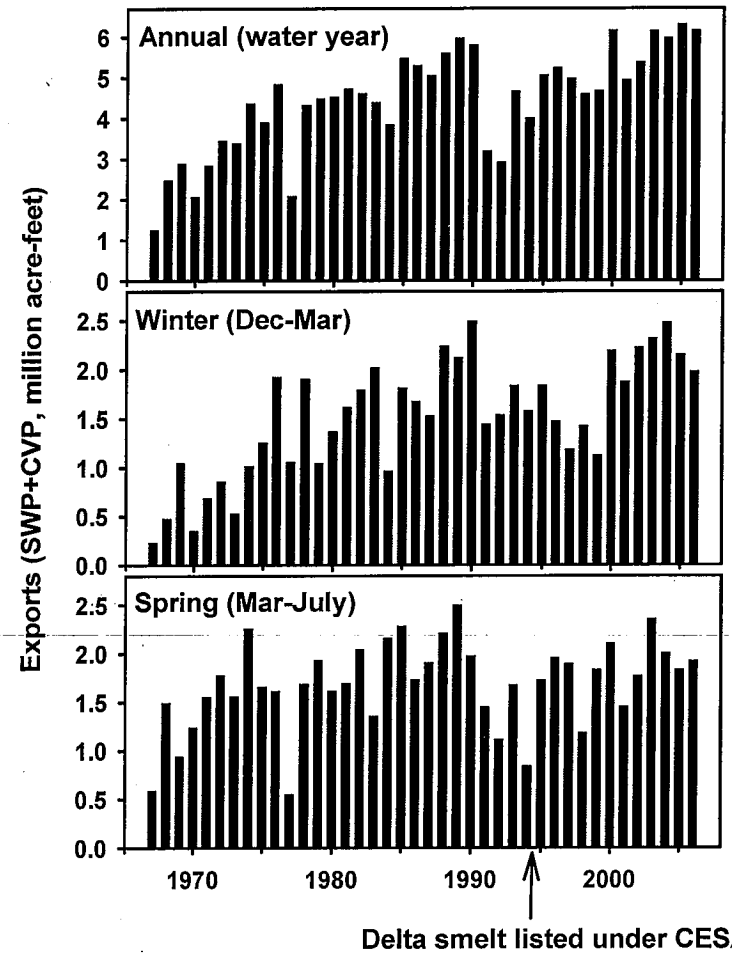

Figure 6. Combined water exports (million acre-feet, MAF) of the Central Valley Project and the State Water Project from 1967-2006. The upper panel shows total export volumes for each water year. The middle panel shows exports for the winter period (December-March). The lower panel shows springtime exports (March-July). Data source: California Department of Water Resources, Dayflow.

[5] Exports are calculated as the combined annual total (using the water year calendar) for Central Valley Project and State Water Project exports using data from Dayflow (California Department of Water Resources).

Direct Impacts: The CDFG (2003) expressed concern that entrainment of delta smelt at the CVP and SWP could be a major source of population impacts under certain conditions. Data from the summer TNS show an almost complete disappearance of juvenile delta smelt in south Delta sampling stations by the mid-1970s, coincident with a trend of increasing combined water exports from the south Delta (CDFG 2003). CDFG (2003) estimated losses of delta smelt juveniles to SWP and CVP operations to range from 11 to 46% of the population annually.

Analyses conducted by Herbold et al. (2005) as part of the ongoing multi-agency research program to investigate the recent pelagic fish declines in the Delta indicate that the direct impacts of water exports on delta smelt (and other Delta pelagic fish species) during the winter have increased in recent years, coincident with substantial population declines measured for all the affected species.[6] Beginning in 2000, incidental take (also referred to as "salvage") of adult delta smelt increased markedly (Figure 7, top panel), concurrent with substantial increases in exports during the same period (see Figure 6, middle panel). In 2003, direct loss of adult delta smelt at the pumps in relation to the species' population abundance reached its highest level in more than ten years (Figure 7, bottom panel). On the basis of these and other analyses conducted by researchers investigating the pelagic organism decline, the "Winter Adult Entrainment Hypothesis" is one of two leading hypotheses to explain the pelagic fish decline that will be the focus of continuing research in the next two years (Armor et al. 2005, Armor 2006).[7]

Recent analyses by scientists from the USGS have suggested a mechanism for the recent disproportionately high take of delta smelt (and other fish species) at the SWP and CVP facilities (Simi and Ruhl 2005; Ruhl et al. 2006). Using data from the past twenty years, these researchers reported a significant correlation between high incidental take and hydrodynamic conditions in the central and southern Delta caused by low San Joaquin River inflows and high water export rates. Under these conditions, normal tidal exchange and flows are disrupted (with the ebb tidal flow nearly eliminated); flows in two important Delta channels, Old River and Middle River, are negative; virtually all water in the central and southern regions of the Delta is drawn inexorably to the pumps; and incidental take of delta smelt is high. During the past twenty years, the frequency of occurrence of these types of conditions has increased.

[6] Herbold et al. (2005) used the November-March period for their analyses.

[7] In 2005 the Interagency Ecological Program began an intensive research program to investigate the cause(s) of the Pelagic Organism Decline (POD) in the Delta. Preliminary results of this research are available at: http://science.calwater.ca.gov/workshop/workshop_pod.shtml.

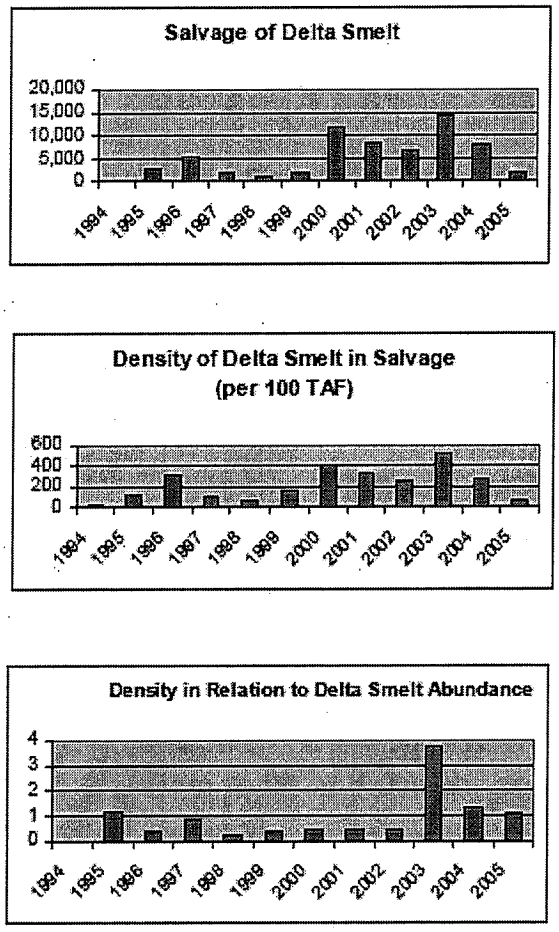

Figure 7. Recent patterns in incidental take (or salvage) of delta smelt during the November-March period. Top panel: total salvage (# fish); Middle panel: salvage density (# of fish/thousand acre-feet); and Bottom panel: salvage density in relation to preceding FMWT abundance Index (salvage density/FMWT Index previous year). Source: Herbold et al. 2005, Figure 3.

In addition to the direct effects of export rates on lethal entrainment of delta smelt at the SWP and CVP facilities, anthropogenic changes to Delta channel configuration, circulation and infrastructure have increased diversion-related mortality of delta smelt. During the spring, summer and fall, the CDWR installs and operates four "temporary agricultural barriers" in the south Delta (i.e., the Grant Line Canal, Old River near the Delta Mendota Canal, Middle River, and Head of Old River barriers) for the purpose of maintaining adequate water levels and quality for south Delta agricultural diverters under conditions of low Delta inflow and high SWP and CVP export rates. When these barriers are closed, they physically prevent delta smelt movement (e.g., block downstream migration of juveniles to low salinity habitat in Suisun Bay) and alter south Delta hydrodynamics, increasing central Delta flows toward the state and federal water export facilities (USFWS 2004). According to results of particle tracking modeling analyses conducted by CDWR and USFWS (USFWS 2004), this increases the incidental take of delta smelt at the SWP and CVP as well as lethal entrainment of the fish into unscreened

agricultural diversions (and see also Figure 10 below).[8] The number of days per year during which the barriers are closed, as well as the numbers of barriers installed, has increased significantly, from less than 150 days per year in the 1990s to well over 200 days per year since 2003, coincident with the recent precipitous delta smelt population decline (Figure 8; Simi and Ruhl 2005). The USFWS (2004) noted that the California Department of Water Resources (CDWR) and the U.S. Bureau of Reclamation (BOR) proposal to replace temporary barriers at the SWP and CVP with permanent barriers could result in additional effects to delta smelt. The proposed permanent barriers operations may include barrier closures during additional periods and may include different operations that could affect delta smelt (USFWS 2004).

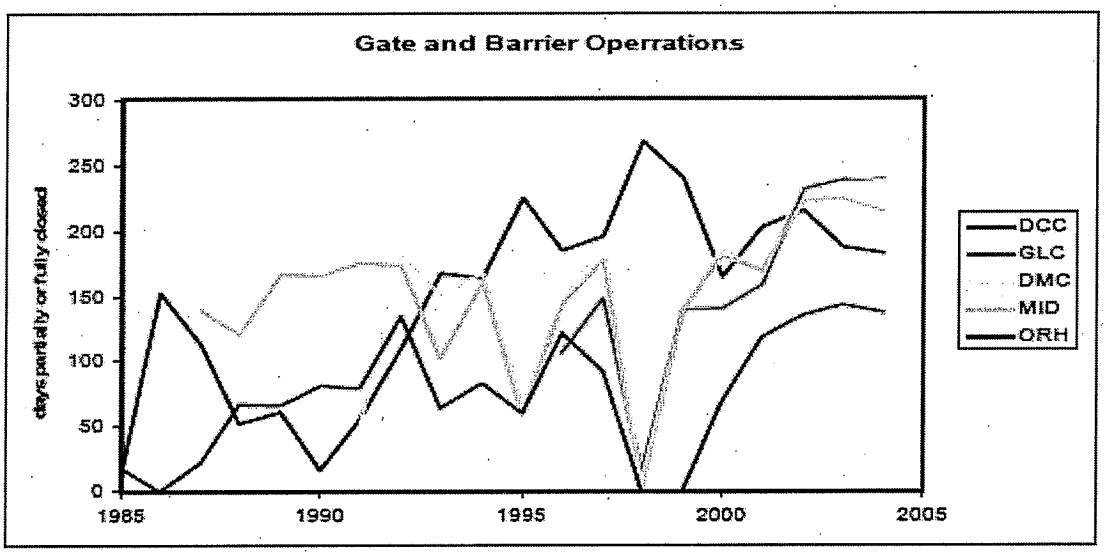

Figure 8. The number of days per year during which the four temporary agricultural barriers installed in south Delta channels are closed. Based on particle tracking model results, closure of the barriers corresponds to increased entrainment of small pelagic organisms such as juvenile delta smelt at SWP, CVP and local agricultural diversions. DCC=Delta Cross Channel; GLS=Grant Line Canal barrier; DMC=Old River near the Delta Mendota Canal barrier; MID=Middle River barrier; and ORH=Head of Old River barrier. Source: Simi and Ruhl 2005, Figure 15.

Population Level Impacts: Recent analyses have shown that delta smelt population abundance is significantly and inversely related to seasonal export rates (Swanson 2005).[9]

[8] CDWR uses a computer-based particle tracking model (a module of their Delta Simulation Model, DSM-2) to track and predict the fate of neutrally buoyant particles (which simulate small planktonic and pelagic organisms, or "virtual fish") injected at various location into the Delta under specified inflow, export and barrier operations. Results of particle tracking model studies can be used to evaluate the effects of different water management or barrier operations on fish entrainment rates at SWP, CVP and local agricultural water diversions.

[9] These analyses were conducted by C. Swanson and earlier versions of these results were presented at the CALFED Bay-Delta Program-sponsored Environmental Water Account Review Workshop, Dec. 7-8, 2005, Sacramento, CA. Presentation and supplemental report are available at: http://science.calwater.ca.gov/workshop/ewa.shtml. Analyses presented in this petition have been updated by C. Swanson to incorporate abundance and export data from 2005 and 2006.

Figure 9 and Equations 4 and 5 show that export rates during the winter (December-March) significantly and negatively correlate with the abundances of adult and juvenile delta smelt measured later that year: for both life stages, abundance decreased with increases in exports.[10]

Adult delta smelt (1967-2006):

Log FMWT = 3.11 – 0.37(Dec-Mar exports, MAF) **(Equation 4)**

n=38; p<0.001; r^2=0.263

Juvenile delta smelt (1967-2006):

Log TNS = 1.43 – 0.44 (Dec-Mar exports, MAF) **(Equation 5)**

n=38 p=0.006, r^2=0.194

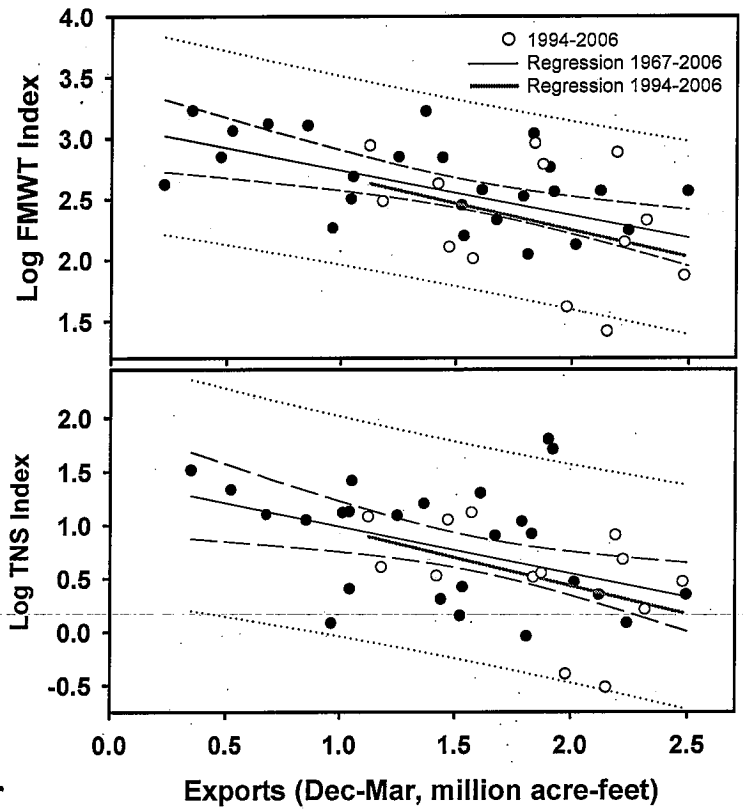

Figure 9. The relationship between winter (December-March) export amounts and subsequent abundance of delta smelt. a) sub-adult and adult delta smelt as measured by the FMWT Index (using data from 1967-2006); and b) juvenile delta smelt as measured by the TNS Index (using data from 1969-2006). For each graph, the regression, 95% confidence limits and the prediction limits are shown calculated for the entire datasets. The open symbols and the dark gray regression line highlight the years since the delta smelt was listed under the ESA (1994-2006). Data Sources: California Department of Fish and Game, California Department of Water Resources, Dayflow.

[10] For reference, export of 2.0 MAF during the December-March period corresponds to an average daily combined export rate of the SWP and the CVP of approximately 8,300 cubic feet per second (cfs).

Analyses for the alternative winter periods (November-February, November-March, and December-February) yielded similar and statistically significant results (although p values were somewhat higher and r^2 values were somewhat lower).

Large scale ecological changes have occurred in the Delta during the past 30 years, such as the establishment of the invasive clam *Corbula amurensis* and its impacts on the planktonic food web (Kimmerer and Orsi 1996), but they do not strongly affect the results of these types of correlation and regression analyses. For example, the significant relationship between winter exports and the subsequent population abundance of adult delta smelt was apparent in the 20 years prior to the clam's invasion (1967-1986, Equation 6).

Adult delta smelt (1967-1986):

Log FMWT = 3.109 – 0.353(Dec-Mar exports, MAF) **(Equation 6)**
n=18; p=0.013; r^2=0.329

Linear regression using smaller subsets of more recent years (e.g., post-*Corbula* invasion, 1987-2006; post-CESA listing, 1994-2006) were not statistically significant but both the slopes and intercepts of the relationships were very similar to those generated using the entire dataset (see Figure 9). The significant relationship between winter exports and abundance was not "driven" by the low abundances measured during the past three or four years. For example, after excluding the three most recent years for the FMWT abundance indices (2002-2006) from the dataset, the regression was still significant (p=0.02) and the slope and intercept were similar to those generated with the entire dataset. Given that the significant relationship between winter exports and adult abundance was detectable by 2002 (and before), this indicates that the low abundances measured during the past three years, a period during which winter exports were at near record high levels, were predictable as early as three years ago.

The abundance of juvenile delta smelt was also significantly affected by spring-summer exports (March-July). The linear regression for this relationship is:

Log TNS = 1.46 – 0.42(Mar-July exports, MAF) **(Equation 7)**
N=38; p=0.044; r^2=0.108

Recent analyses by scientists from University of California, Davis, have provided new insights into the negative effects of high winter and early spring export rates on delta smelt population abundance. Using data and analyses of water temperature, fish distribution, fish size and reproductive condition from CDFG surveys, fish birthdate and age data from otolith analysis, life history models and cohort analyses, Bennett et al. (2006) reported that larger adult delta smelt migrated into the Delta, became reproductively mature and spawned earlier in the season than smaller fish in the population. For most fish species, larger fish are more fecund, produce larger and better quality eggs, and their progeny are more robust and contribute disproportionately to the population (Mager 1996; Moyle and Cech, 2004). However, despite clear evidence of reproductive readiness and spawning by these fish in March and early April, Bennett et

al. (2006) reported that, based on the birthdates of juvenile delta smelt collected later in the year, virtually none of the progeny of these early spawners survived to contribute to the delta smelt population. In fact, only delta smelt hatched shortly before, during, or shortly after the 31-day Vernalis Adaptive Management Program (VAMP) survived to be collected by the CDFG summer TNS.[11] During the VAMP, exports are restricted to very low levels (e.g., 1,500 cfs, or approximately 15-20% of average export rates typical during the months immediately prior to and after the VAMP period) and San Joaquin River inflows to the Delta are increased. Bennett et al. (2006) concluded that the high export rates, low San Joaquin River inflows and associated adverse Delta hydrodynamic conditions during the late winter and early spring of recent years were the major contributor to this massive recruitment failure, lethally entraining both the early spawning adults and, although not reported as incidental take, their larvae and young juvenile progeny. These researchers further concluded that the repeated, near total loss of the most productive and robust component of the delta smelt population was a major contributor to the species' recent precipitous population decline during the 2000s.

Degree and Immediacy of Threat of Present or Threatened Modification or Destruction of Its Habitat

In 1993, when the delta smelt was listed as threatened under both the state and federal Endangered Species Acts, the USFWS identified 21 major federal, state, local or private organization proposals for increased exports (USFWS 1993). By 2006, multiple scientific analyses clearly document that modification and destruction of delta smelt habitat by adverse alteration in freshwater inflows, freshwater outflows, and water exports and diversions has increased significantly since 1993. During the past four years, the magnitudes of these harmful impacts have reached higher levels than have been recorded during the entire 48-year period for which data on delta smelt population abundance exist (1959-2006). Plans for future management of delta smelt habitat and federal and state water management operations, described in detail by USBR (2004a), include plans to increase the magnitude of most of these harmful habitat alterations. The recent 5-year review (USFWS 2004) noted that the potential threat of increased demands on surface water resources in the Central Valley and Delta was growing, citing planned or proposed new water diversion projects such as the Freeport Regional Water Project, increases in pumping capacity at the SWP pumping plant as part of the South Delta Improvement Project, the California Aqueduct/Delta-Mendota Canal inter-tie to allow increased pumping at the CVP pumping plant, Empire Tract on the San Joaquin River; and potential expanded water storage capacity projects at Los Vaqueros, north of the Delta off-stream storage, Shasta Reservoir, in-Delta storage, and south of the Delta surface and groundwater storage projects. Biological evaluations of the impacts of these changes on delta smelt conducted by both USBR (USBR 2004b) and USFWS (2005) conclude that these changes, reduced freshwater outflows, increased Delta exports, and increased lethal entrainment losses, will have negative impacts on the species. In addition, none of the above analyses have considered the predicted consequence of global climate change on delta smelt habitat or on state, federal and local water management operations. Finally, the current severely depressed population abundance of delta smelt,

[11] The Vernalis Adaptive Management Program is usually implemented from April 15 to May 15.

as well as the direct negative impacts of these habitat alterations on key life history stages (i.e., spawning adults) critical to the species continued existence, has reduced the resilience of the species and its capacity to withstand increased harmful habitat degradation.

2. Overexploitation

Overexploitation for commercial, recreational, scientific, or educational purposes is not known or thought to be a factor in the decline of the delta smelt population (USFWS 2004). Delta smelt may be harvested as a non-target by-catch in commercial bait fisheries for other baitfish species and some scientific collecting is conducted for the delta smelt, but the USFWS (1993) did not believe these activities were adversely affecting the species.

3. Predation, Competition or Disease

According to Moyle et al. (1996, 2004b), there is little evidence that predation, competition or disease has caused the delta smelt population to decline, although diseases and parasites of delta smelt have been little studied. However, introduced species are abundant and increasing in the estuary, including non-native invertebrates and fishes that feed on phytoplankton, zooplankton and/or small fish, and may adversely affect the delta smelt (USFWS 2004). There is some evidence that increased predation pressure on the planktonic food web by introduced species such as the invasive clam *Corbula amurensis* have reduced food availability for delta smelt (and other planktivorous fishes in the estuary; Kimmerer and Orsi 1996; Armor et al. 2005; Thompson and Parchaso 2006) and recent studies have related reduced plankton biomass to reduced delta smelt size (Souza et al. 2005) and liver glycogen levels (Teh 2005), although growth rates are unchanged (Souza et al 2005). However, to date, there is no quantitative evidence that competition for food or space with other aquatic organisms has affected delta smelt abundance.

Introduced striped bass may have caused an increase in predation on all size classes of the delta smelt (USFWS 2004). Efforts to enhance striped bass populations by planting large numbers of juveniles from hatcheries could have had a negative effect on other pelagic fishes in the estuary once the striped bass reached a size where they begin preying upon fish. The enhanced predator populations, without a concomitant enhancement of prey populations such as delta smelt, may have resulted in excessive predation pressure on prey species. Striped bass appear to have switched to piscivorous feeding habits at smaller sizes than they did historically following severe declines in abundance of mysid shrimp (CDWR 2003). The CDFG has completed a Habitat Conservation Plan for their striped bass management program which includes measures designed to help conserve delta smelt.

Introduced planktivores (fish that eat plankton) such as threadfin shad (*Dorosoma pretense*) and inland silverside (*Menidia beryllina*) compete for the zooplankton food of delta smelt, or alter the species composition of the zooplankton community, thereby further decreasing the ability of the delta smelt population to recover. Although the delta

smelt has managed to coexist with these species in the past, it is possible that, at low population levels, interactions with them could prevent recovery. In particular, inland silversides are frequently collected in areas where delta smelt may spawn and they could be major predators on eggs and larvae (Bennett 1995, 2005; CALFED 2001). Estimates of abundance of delta smelt and silversides are negatively correlated, suggesting that inland silversides may be an important predator on larval delta smelt and a competitor for copepod prey. Silversides often occur in dense schools near shorelines and their occurrence may detract from the value of shallow water habitat created to aid delta smelt restoration. Since the early 1980s, there have been increases in other potential larval fish predators such as tagged Chinook salmon smolts released in the delta for survival experiments and non-native centrarchids (CDWR 2003). Introduced species such as the chameleon goby (*Tridentiger trigonocephalus*) and yellowfin goby (*Acanthogobius flavimanus*) may prey on delta smelt eggs and larvae and interfere with recovery of the species.

4. Other Natural Occurrences or Human-Related Activities

Global Climate Change

The is gathering evidence that, in the San Francisco Bay/Sacramento-San Joaquin Delta Estuary habitat of delta smelt, the effects of climate change will manifest as:

(1) sea level rise;
(2) changes in timing and amounts freshwater inflow; and
(3) increased frequency and intensity of floods (CCAT 2006).

Sea level raise will shift the interface between inflowing fresh water and saline water from the Bay further upstream in the estuary, a condition known to adversely affect delta smelt habitat quality (Feyrer et al. 2005, 2006; Guerin et al. 2006; and see Historic and Current Distribution and Present and Threatened Modification or Destruction of Its Habitat, Freshwater Inflows and Outflows). Increases in air temperature in the estuary's high elevation watershed is predicted to reduce the volume of the snowpack (i.e., more precipitation will fall as rain rather than snow) and accelerate snowmelt (earlier snowmelt timing in the Sacramento-San Joaquin watershed is already detectable). These changes will result in more frequent and larger flood events, which will likely affect delta smelt habitat by increasing freshwater inflows during the winter and early spring rather than the late springtime freshwater inflows to which the species is adapted. In addition, these changes will have substantial effects on water management operations in the watershed and estuary, including the amounts and timing of upstream storage releases (and resultant Delta inflows), changes in carryover storage amounts (and the ability to provide habitat maintenance flows in sequential dry years), and Delta exports (Anderson 2006; Easton and Ejeta 2006). Recent evaluations of the effects of water management operations on delta smelt (including the most recent Biological Opinion; USFWS 2005) have failed to consider climate change-related effects on either water management operations or on delta smelt habitat.

Reduction in Prey Food Organisms

In recent years, untreated discharges of ship ballast water have introduced non-indigenous aquatic species to the Delta ecosystem (Carlton et al. 1990), several of which adversely affect the delta smelt and its habitat. The USFWS (2004) noted that the discharge of any ballast water into San Francisco Bay is not prohibited and that compliance with a Coast Guard requirement to discharge ballast water before entering U.S. ports is voluntary. Without strictly enforced prohibitions on ballast water discharge in the Bay, additional introductions of non-native species can be expected to continue (Moyle et al. 1996, Moyle 2003). The USFWS (1993, 2004, 2005) discussed the impacts of an introduced clam (*Corbula amurensis*) on the primary food of delta smelt and of non-native copepods that reduce food availability or feeding efficiency of delta smelt. The USFWS (1993, 2004, 2005) also discussed the altered plankton food web in the Delta that may have decreased the growth efficiency of delta smelt larvae.

Toxic Substances

The USFWS (1993, 2004, 2005) discussed the threat to delta smelt of poor water quality due to discharge and transport of agricultural and industrial chemicals from the Central Valley and Delta. Surveys of Delta waters have detected multiple pesticides and herbicides (Kuivila 2000; Houston et al. 2000). The USFWS (1993) noted that irrigation drain water can be harmful to other Delta fish larvae and embryos and to the planktonic food organisms for delta smelt. The SWRCB has designated all of the important water bodies in the delta smelt's range as impaired by one or more contaminants, commonly including pesticides such as diazinon, chlorpyrifos, malathion, chlordane, DDT and dieldrin. There is growing evidence that fish species in the Delta are suffering direct mortality, and physiological and/or developmental impairment from the presence of toxic substances in the water and in the plankton upon which the smelt feed, and that their planktonic food supply may being depleted by periodic, highly concentrated pulses of herbicides and pesticides through the Delta (see USFWS 1996, 1999).

Potential Loss of Genetic Integrity:

Species for which the population level falls below its effective population size are subject to inbreeding and genetic drift. This can result in depressed reproductive vigor and loss of genetic variation, reducing evolutionary fitness of the species and increasing its extinction risk. Using the effective population size criterion developed by Bennett (2003, 2005) and recognized by the USFWS (2004), three consecutive years of a FMWT Index less than 100, the delta smelt is now at risk for loss of its genetic integrity and at greater risk of extinction than when the species was listed under the CESA.

5. Inadequacy of Existing Regulatory Mechanisms

The recent delta smelt population decline, substantial increases in environmental and anthropogenic stressors already identified as threats to the species (e.g., Delta water exports), concurrent increases in incidental take, and statistical analyses that reveal

significant relationships between those stressors and the recent and long-term declines in the delta smelt population clearly show that current regulatory mechanisms do not provide adequate protection for the species. In addition, specific protections and management tools identified in the USFWS's 2005 Biological Opinion (USFWS 2005) have proved inadequate and, apparently, unavailable to state and federal fish agency managers attempting to use them to protect the species. Current regulatory mechanisms and their inadequacy to prevent the imminent extinction of the delta smelt are discussed below.

State Threatened Listing

The delta smelt was listed by the State of California as a state threatened species under CESA in December 1993. A CESA listing as threatened theoretically provides some minimal measure of protection to the species because state agencies are required to consult with the CDFG if any project they fund or carry out would adversely affect (or benefit) the delta smelt, and identify and implement protection measures needed to fully mitigate all adverse impacts. As far as we are able to determine, it is unclear if CDFG is enforcing compliance with CESA for the delta smelt: for example, for several important state projects, including recent substantial changes in the SWP (USBR 2004a), no specific mitigation measures have been proposed, no specific incidental take permits have been issued, and no formal or specific consistency determination with federal ESA requirements has been reported. In addition, no state recovery plan exists for the species. This, combined with the collapse of the delta smelt population since state listing, is de facto evidence that the threatened CESA listing is inadequate to protect the species. In contrast, a CESA listing of "endangered" would require evaluation of delta smelt management and the impacts of state-sponsored projects through a sharper lens, supported by the clear evidence provided in this petition that the species is at imminent risk of extinction largely as a result of anthropogenic habitat modification and degradation.

State Listing of Other Species Within the Range of the Delta Smelt

Two other fish species that periodically co-occur with delta smelt are listed under the CESA: winter-run Chinook salmon (*Oncorhynchus tshawytscha*) and spring-run Chinook salmon (*O. tshawytscha*). With the exception of periodic water export reductions using either the CVPIA or EWA (see sections below), most of the habitat restoration and protective actions for Chinook salmon have been implemented outside the geographic range of the delta smelt and therefore provide neither benefit to nor protection of the species.

Federal Threatened Listing

As demonstrated by the declining population trend since delta smelt was federally listed as threatened in 1993, a trend that has culminated in the recent catastrophic decline to record low levels, as well as the extinction risk analysis discussed above, the protections currently afforded by the federal threatened listing, and implementation and enforcement

of those protections, are clearly inadequate to protect delta smelt. During the past 13 years, many of the threats identified by the USFWS in the original listing documents have not been eliminated or mitigated and have instead, in a number of instances, increased. Proposals to further increase the level of several key threats to the species (e.g., Delta water exports) have been approved by USFWS with "no jeopardy" biological opinions (USFWS 2005, and see below). It is also apparent that the qualitative and quantitative recovery criteria specified for the species (Moyle et al. 1996) are insufficiently protective and inadequate to ensure continued existence of the species, particularly in the context of escalating threats to the species and inadequate regulatory protections.

1995 SWRCB Water Quality Control Plan

Overall water management operations in the Sacramento-San Joaquin Delta are regulated by the California State Water Resources Control Board, according to their 1995 Water Quality Control Plan (WQCP) (SWRCB 1995). One subset of the WQCP's water quality objectives is specifically for the protection of fish and wildlife beneficial uses. Among other protections, these regulations limit Delta water exports in relation to Delta inflow (the Export/Inflow, or E/I, ratio), allowing up to 35% of total Delta inflow to be exported during the spring (February-June) and up to 65% to be exported during the rest of the year (July-January).[12] However, depending on inflow conditions, this can allow exports to be as high as (or higher than) 600,000 thousand acre-feet (AF) per month (or >10,000 cubic feet per second [cfs]), levels that, according the analyses above, reliably correspond to low population levels for delta smelt.[13] For example, December-March exports have exceeded 2 million AF in nine of 40 years since 1967 (1983, 1988, 1989, 1990, 2000, 2002, 2003, 2004, and 2005). For those years, the delta smelt Recovery Index averaged 74, the level identified by the 2005 Biological Opinion to correspond to a "high level of concern" for the species and which is supposed to trigger additional protective actions (see Table 1). The Recovery Index fell below 74 in five of the nine years. By comparison, the Recovery Index exceeded 74 in 82% of years in which December-March exports were less than 1.5 million AF. Given that the Recovery Index has a threshold value of 239 that must be achieved in two of five sequential years for recovery of the species, this suggests that high export levels currently allowed by the WQCP and which have been implemented with increasing frequency during recent years (and which are predicted to occur even more frequently in the future; see 2005 Biological Opinion below) are incompatible with the recovery of delta smelt.

Export levels allowed under the WQCP also do not protect key areas of delta smelt critical habitat. Recent analyses using CDWR's Delta Simulation Model (DSM-2) and its Particle Tracking Module show that most particles (which are thought to reasonably

[12] In the WQCP exports are defined as the combined exports of the federal Central Valley Project and the State Water Project. For a 31-day period during the spring (usually April 15-May 15), lower exports are required by the San Joaquin River Agreement as part of the Vernalis Adaptive Management Plan.

[13] Average Delta exports rates for the December-March period exceeded 10,000 cfs in 1990 and 2004. Since 2000, average December-March exports exceeded 9,000 cfs in four of the last seven years (2000, 2002, 2003, and 2004).

simulate larval and small juvenile delta smelt but be somewhat less accurate simulations for adult delta smelt) released into the southern and central Delta were lost within two weeks to entrainment at either the government water project diversions or the many unscreened agricultural diversions located in this area of the Delta (Figure 10). For particles released at Bacon Island in the southern Delta, virtually all the particles were entrained at E/I ratios >20%, a level well within the currently allowed operations. For particles released in the central Delta (Twitchell Island), the percentage entrained increased linearly with the E/I ratio. This shows that E/I ratios allowed by the current WQCP may be effectively eliminating large areas of the southern and central Delta as usable habitat for delta smelt spawning and early rearing (see Historic and Current Distribution above).

Although the E/I regulations established in 1995 with the WQCP prevented extreme water management operations such as those that occurred in the late 1980s and early 1990s, since that time (and since the delta smelt was listed under the CESA), seasonal E/I ratios have increased by more than 90% for the winter period (from 14% in 1995-1999 to 27% in 2002-2006) and by 50% in the spring (from 16% to 24%) (Figure 11).

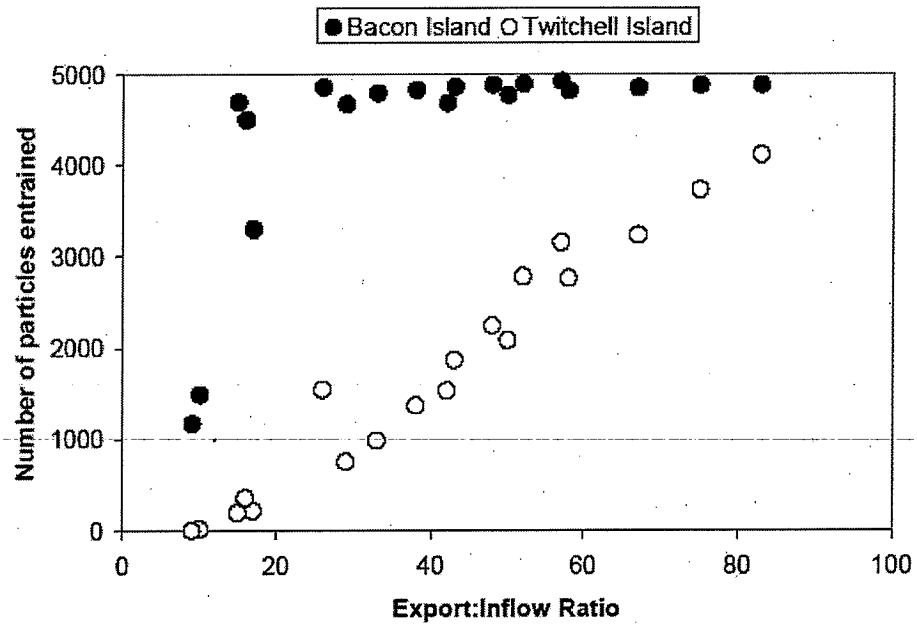

Figure 10. The relationship of the E/I ratio to the number of particles entrained (out of 5,000 particles released) over a series of Particle Tracking Model runs. Source: Herbold et al. 2005, Figure 8.

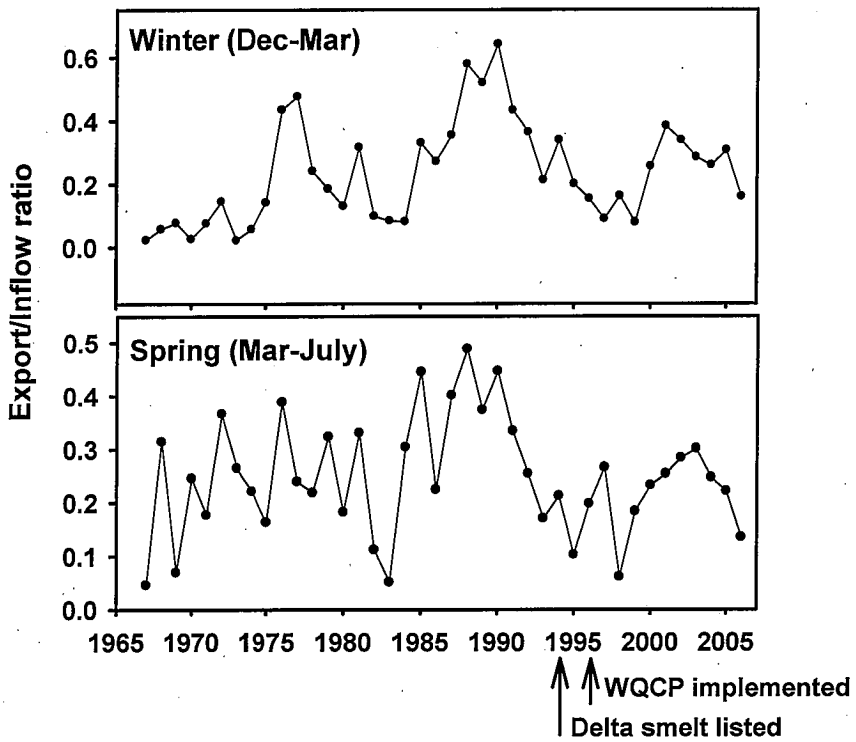

Figure 11. Trends in the Export/Inflow ratio (E/I) during the winter (December-March, upper panel) and spring (March-July, lower panel). The Water Quality Control Plan allows a maximum E/I of 65% during the fall and winter (July-January) and 35% during the spring (February-June). Data source: California Department of Water Resources, Dayflow.

In 2004 and 2005, the SWRCB began review of the 1995 WQCP, holding a series of informational workshops to evaluate the adequacy of the regulatory objectives designed to protect fish and wildlife beneficial uses in the estuary. Petitioners (The Bay Institute) submitted extensive comments on the status of the estuarine ecosystem and delta smelt, information and interpretation of the relevant science available at the time, and made a number of recommendations for changes in the regulatory objectives that were specifically designed to improve protection of the estuarine habitat and delta smelt (and other species).[14] However, despite clear evidence of the deteriorating condition of the species and its estuarine habitat (including well publicized reports of the dramatic pelagic organism decline in early 2005), the 2006 WQCP recently released by the SWRCB includes no changes in water quality, freshwater inflow and outflow, or export operation objectives known to affect delta smelt and which, based on information available then, were known to be inadequate to protect the delta smelt.[15]

[14] The Bay Institute's submissions to the SWRCB for the review of the 1995 WQCP are available at: http://www.waterrights.ca.gov/baydelta/exhibits_list.htm#bi

[15] The 2006 WQCP is available at: http://www.waterrights.ca.gov/baydelta/2006controlplan.html

2005 USFWS Biological Opinion

A 2005 Formal and Early Endangered Species Consultation on the Coordinated Operations of the CVP and SWP and an Operations Criteria and Plan (USFWS 2005) was intended to evaluate the impacts of the proposed future federal and state water management operations on delta smelt.[16] The Consultation resulted in a February 2005 Biological Opinion by the U.S. Department of the Interior concluding that federal and state water exports from the Delta could increase without jeopardizing listed delta smelt. The Consultation identified specific fish protection management tools, such as the CALFED Environmental Water Account (EWA), that will be used to mitigate the impacts of those actions on delta smelt using real-time management.[17] This regulatory mechanism provides inadequate protection for delta smelt for numerous reasons, including: 1) the effects of the proposed action are not adequately or correctly evaluated and adverse impacts are therefore seriously underestimated; and 2) the specified protective tools and management actions are known to be inadequate, not guaranteed to be available, and are not required to be implemented when requested by state and federal fish agencies for protection of the species.

The only evaluation of the impacts to delta smelt from the predicted increases in Delta water exports included in the 2005 Biological Opinion was based on estimates of increased incidental take. Increased take was calculated based on linear increases with increases in exports, an estimate that recent analyses by Herbold et al. (2005) suggest is seriously flawed (this analysis showed disproportionate increases in incidental take with recent increases in exports; see Figure 7). In addition, incidental take is known to be a poor predictor of either actual direct impacts or population level effects. The Biological Opinion lacks even basic statistical analyses of the effects of Delta exports on delta smelt population abundance. Given that statistically significant relationships between these important variables are detectable using the data that were available to the USFWS (and the BOR, which prepared the Biological Assessment) at the time the Biological Opinion was prepared (see Modification of Habitat, Population Level Effects above and Figure 9), this represents a failure to use best available science, a legal requirement for this type of regulatory mechanism. Further, the results of these types of analyses (as well as even a cursory review of recent abundance and export data) clearly show that export rates proposed in the described project are incompatible with stabilizing the population at levels above those identified in the Biological Opinion that trigger a "high level of concern", much less recovering the species.[18]

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[16] In July 2006, the USBR requested reintitiation of consultation for the effects of coordinated water management operations on delta smelt. They proposed, and the USFWS agreed, to leave the 2005 Biological Opinion in effect during the estimated 20-month period while the Biological Opinion was completed.

[17] The Environmental Water Account (EWA) is a supply of water managed by the state and federal fish agencies to facilitate periodic reductions in SWP and/or CVP exports at times when ESA-listed fish species are near the facilities and vulnerable to entrainment. EWA water is used to compensate the SWP and CVP for reductions in deliveries that might result from the export curtailment.

[18] In the action evaluated by the Biological Opinion, average December-March exports are predicted to be >9,000-10,000 cfs in nearly all years.

The 2005 Biological Opinion uses a "Delta Smelt Risk Assessment Matrix" (DSRAM) to identify conditions under which delta smelt are at risk from water project operations (primarily entrainment loss at the Delta export facilities) and identifies "export reduction at one or both facilities" as one its protective "tools for change".

To implement protective actions recommended by the multi-agency Delta Smelt Working Group (DSWG, also specified and described in the Biological Opinion), the Biological Opinion relies on the CALFED Bay-Delta Program's EWA to facilitate export reductions and to provide water resources to compensate for reduced deliveries that might result from the fish protection action. However, to date the EWA has been authorized and funded only on an annual basis and the likelihood of its continued existence beyond 2007 is unknown. In addition, the EWA's utility for fish protection and the ability of the state and federal fish agencies to use it to implement specific protective actions as recommended by the multi-agency DSWG appears highly uncertain. In 2005, two out of three recommendations for protective actions made by the DSWG based on the risk criteria in the DSRAM were not implemented as recommended by the state and federal water project agencies (despite adequate water assets in the EWA) (Poage 2005). For example, in January of 2005 at least three of the risk criteria were exceeded and the monthly incidental take limit was nearly exceeded before an export reduction was implemented, an inexplicable delay given the high level of concern based on the then record low FMWT Index. When the reduction was finally implemented, neither the recommended export level nor duration was agreed to by the Water Operations Management Team (WOMT), who opted instead for a smaller and shorter export curtailment. Later in the spring, the DSWG-recommended export level for the 31-day Vernalis Adaptive Management Plan (VAMP) was rejected by the WOMT, who allowed for exports 50% greater than the recommended level. Three weeks later the SWP unilaterally discontinued its export curtailment before the VAMP period was concluded. The following summer, the abundance of juvenile delta smelt reached a record low and, when adult fish were surveyed in the fall, their numbers were also at new record lows. More recently, the DSWG has explicitly declined to make recommendations for Delta exports actions that their analyses have determined would provide the benefit for delta smelt, citing concerns about the inadequate supplies of EWA water assets. In December 2006, the DSWG rejected a proposed protective action to eliminate negative flows on Old and Middle rivers in the south Delta during the delta smelt's winter spawning season that "would be better for delta smelt" because it "could consume all available environmental water, leaving no assets for spring actions for larvae or juveniles" (DSWG 2006).

Central Valley Project Improvement Act

The Central Valley Project Improvement Act (CVPIA), implemented in 1992, was intended to improve habitat conditions and reduce adverse direct and indirect impacts of CVP operations on fish and wildlife resources, with an emphasis on anadromous fish species. With the exception of small, short-duration water export reductions at the CVP export facility (usually timed to protect migrating juvenile salmonids), most of the habitat restoration and protective actions specified by the program (e.g., gravel restoration, stream flow enhancement, installation of fish screens and ladders) have been

implemented outside the geographic range of the delta smelt and therefore provide neither benefit nor protection to the species.

CALFED Bay-Delta Program

The CALFED Bay-Delta Program (CALFED) is a joint state-federal effort to restore the ecological health of the Bay-Delta system, protect and recover fish and wildlife species, increase water supply and reliability, and improve levee integrity and water quality. The delta smelt is identified by CALFED as a priority species. Within delta smelt habitat, CALFED has implemented three categories of restoration and protective actions intended, at least in part, to protect and recover the species: restoration of shallow water habitat; reduction of entrainment losses using the EWA; and installation of fish screens.

Habitat restoration: Restoration of shallow water habitat within the delta smelt's range has proceeded slowly and there is little evidence that the species derives benefit from the few small projects that have been completed (Brown 2003). There is no real evidence that access to shallow water habitat represents a limiting factor for the species (Bennett 2005).

Export curtailments and the EWA: The most recent Biological Opinion for delta smelt (USFWS 2005) relies heavily on use of the EWA, a tool to facilitate periodic export curtailments and reduce entrainment losses that was developed by CALFED as a four-year experiment. The USFWS (2004) cited the EWA and the 31-day-long spring VAMP export curtailment that is largely implemented using EWA water as examples of water management tools that are addressing specific needs of delta smelt. During the past six years, however, state and federal agencies have reduced by 300,000 to 400,000 acre-feet per year the amount of water required by the CALFED Record of Decision (ROD) to protect the Delta and fisheries under the EWA (Environmental Defense 2005). Moreover, the USFWS (2004) also noted that the delta smelt population declined during the three years of EWA actions that were analyzed in their 5-year review. In 2006, after six years of EWA implementation, Delta exports during seasons when delta smelt are vulnerable to direct and indirect impacts have continued to increase and the abundance of juvenile and adult delta smelt population has dropped to critically low levels.

The EWA is now in its seventh year of implementation. The program has been subject to five formal reviews by an independent science panel (2001, 2002, 2003, 2004, and 2006) and a sixth informal review in 2005. Despite these exhaustive reviews, the state and federal fish agencies managing the EWA have presented no evidence to indicate that the EWA is an effective tool for mitigating the adverse impacts of Delta export operations or even for reducing entrainment loss of fish at the SWP and CVP facilities. Similarly, there is no evidence that the EWA provides population level benefits to any of the ESA-listed species that are the focus of its actions. The current EWA is clearly not providing adequate protection to delta smelt. The USFWS (2004) reported that the EWA is currently being "resized" to account for proposed increases in water exports at the state and federal export facilities, however, the proposed future EWA actually has less water

than the original version described in the CALFED ROD. Therefore, a "resized" EWA will not likely provide adequate protection for delta smelt either.

Installation of fish screens: The USFWS 5-year review (2004) cited installation of two fish screens on water diversions within the range of delta smelt under the auspices of the CALFED Bay-Delta Program as representing "progress towards eliminating entrainment of delta smelt in unscreened diversions," but acknowledged that over 1,800 unscreened or inadequately screened diversions still operate in delta smelt critical habitat. Plans to renovate and upgrade the fish louvers and screens at the SWP and CVP fish facilities, which entrain the vast majority of larval, juvenile and adult delta smelt, have been indefinitely postponed (SDFFF 2005)

Federal Listing of Other Species Within the Range of the Delta Smelt

Four other fish species that periodically co-occur with delta smelt are listed under the federal ESA: winter-run Chinook salmon (*Oncorhynchus tshawytscha*), spring-run Chinook salmon (*O. tshawytscha*), Central Valley steelhead (*O. mykiss*), and most recently, the southern population of green sturgeon (*Acipenser medirostris*). With the exception of periodic water export reductions using either the CVPIA or EWA (see above sections), most of the habitat restoration and protective actions for these species have been implemented outside the geographic range of the delta smelt and therefore provide neither benefit to nor protection of the species.

CEQA and NEPA

The environmental review process under the California Environmental Quality Act, California Public Resources Code §21000 et. seq. (CEQA) should theoretically provide some protection to delta smelt. CEQA declares that it is the policy of the state to "(p)revent the elimination of fish or wildlife species due to man's activities, ensure that fish and wildlife populations do not drop below self-perpetuating levels, and preserve for future generations representations of all plant and animal communities." (California Public Resources Code, section 21001(c)). The CEQA process is triggered when discretionary activities of state agencies may have a significant effect on the environment. When the CEQA process is triggered, it requires full disclosure of the potential environmental impacts of proposed projects. The operative document for major projects is usually the Environmental Impact Report.

Theoretically, besides ensuring environmental protection through procedural and informational means, CEQA also has substantive mandates for environmental protection. The most important of these is the provision requiring public agencies to deny approval of a project with significant adverse effects when feasible alternatives or feasible mitigation measures can substantially lessen such effects. *Citizens for Quality Growth v. City of Mt. Shasta,* 198 Cal.App.3d 433, 440_441 (1988); CA. Pub. Res. Code § 21002; 14 Cal. Code Regs. §§ 15002(a)(3), 15021(a)(2) and (c), 15041(c), 15364, 15370. In practice, however, this substantive mandate has not been implemented, especially with regard to protection of the delta smelt. In practice, alternatives that would protect the

delta smelt and other wildlife are almost universally dismissed as "infeasible." Mitigation, when required, is often ineffective or only marginally effective.

The National Environmental Policy Act ("NEPA") also requires that federal agencies fully and publicly disclose the potential environmental impacts of proposed projects, but NEPA lacks even the minimal substantive provisions of CEQA.

III. RECOMMENDED MANAGEMENT AND RECOVERY ACTIONS

Since 1993, when the delta smelt was first listed under the state and federal ESAs, scientific understanding of the species and its estuarine habitat has increased substantially. During the same period, overall ecological conditions in the estuary have further degraded and the status of species has deteriorated to point where it is at risk of imminent extinction. While there are a number of ongoing monitoring, research and, to a lesser extent, habitat protection efforts underway, additional activities are necessary to protect and improve the status of delta smelt. Based on the results and interpretations of the best available science (much of it described in this petition), and review of current management of the species and its habitat, we recommend the following management and recovery activities.

Activities That Would Protect the Existing Population of Delta Smelt

1. Reduce Delta water exports and/or increase freshwater inflows from the San Joaquin River for a minimum of 30 to 60 consecutive days in the late winter/early spring (i.e., prior to implementation of the VAMP) to improve in-Delta hydrodynamic conditions and improve survival of early arriving adult delta smelt and their larvae. The management action should be timed to coincide with the early spawning period of delta smelt, as determined based on CDFG survey data and Delta water temperatures.
2. Increase freshwater flows through the Delta during the spring (February-June) beyond minimum levels currently required by the SWRCB's 1995 WQCP to improve estuarine habitat.
3. Increase freshwater outflows during the fall (October-December) to maintain low salinity habitat (as defined by X2) no more than 80 km from the Golden Gate to improve estuarine habitat, restrict the invasive clam *Corbula amurensis*, and reduce proximity of delta smelt to the zone of influence of the exports pumps.
4. Install fish screens on unscreened water diversions in areas of the Delta and Suisun Marsh that are determined to be in operation during periods when juvenile and/or adult delta smelt may be present.
5. Install fish screens on the cooling water intakes for commercial power plants and/or prohibit water intake operations during periods when delta smelt may be present (as based on life history and CDFG survey data).
6. Replace and/or renovate fish and debris screens at the SWP and CVP fish protective facilities and revise operational protocols (e.g., Clifton Court Forebay gate operations, day vs. night pumping regimes, fish collection, handling and transport methods) to reduce entrainment and mortality of delta smelt.
7. Restore and/or accelerate ongoing restoration of tidal marsh habitats in Suisun Marsh, which function to produce phyto- and zooplanktonic food organisms for delta smelt in the marsh and the upper estuary.

Monitoring Programs and Studies

1. Continue ongoing CDFG survey programs, including the FMWT, summer TNS, 20 mm Survey, Spring Kodiak Trawl Survey, Bay Study, and fish salvage monitoring at the SWP and CVP fish protective facilities.
2. Implement monitoring for larval and small juvenile (<20 mm in length) delta smelt entrained into the SWP and CVP export facilities.
3. Complete CDFG-sponsored Collection, Handling, Transport and Release (CHTR) studies and apply results to develop methods for improving survival of delta smelt salvaged at the SWP and CVP facilities.
4. Continue and expand multi-agency research studies of the pelagic organism decline.
5. Develop and facilitate implementation of large scale ecological experiments in the Delta that are designed to test alternative management strategies on the Delta ecosystem (e.g., effects of freshwater inflows or salinity on survival, distribution and abundance of native or invasive species), in-Delta hydrodynamics, and fish entrainment rates.
6. Facilitate the translation and transfer of scientific results to management actions, either as adaptive management experiments, species-specific protection actions, or regulatory objectives.

Needed Amendments to Existing Management and Land-use Plans

1. Revise the state's Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary (SWRCB 2006) to incorporate additional protections for estuarine habitat and the delta smelt.
2. Eliminate current waivers for regulation of agricultural discharges from farmlands in the Sacramento and San Joaquin valleys recently approved by the Central Valley Regional Water Quality Control Board (CVRWQCB). Require reductions in the types and amounts of toxic compounds that can be discharged into rivers and streams tributary to the Delta and upper estuary.

Benefits to Other Species

Implementation of additional protection, management and restoration activities for delta smelt (including the recommendations listed above) will, by improving estuarine habitat and reducing adverse in-Delta hydrodynamic conditions, provide benefits to many other sensitive species that reside in or use the estuary for some portion of their life cycle, including longfin smelt (*Spirinchus thaleichthys*), splittail (*Pogonichthys macrolepidotus*), winter-run Chinook salmon (*Oncorhynchus tshawytscha*; CESA-endangered, ESA-endangered), spring-run Chinook salmon (*O. tshawytscha*; CESA-threatened, ESA-threatened), steelhead trout (*O. mykiss*; ESA-threatened), green sturgeon (*Acipenser medirostris*; ESA-threatened), white sturgeon (*A. transmontanus*), and striped bass (*Morone saxatilis*). In addition, improved estuarine habitat will likely provide less favorable conditions for several harmful non-native species, including invasive plants

(e.g., *Egeria densa*), invertebrates (*Corbula amurensis*), and fishes (warm water basses, family Centrarchidae).

Agency Participation in Delta Smelt Protection

Protection of delta smelt will require cooperation and participation of state federal and local agencies and organizations, including USFWS, USBR, U. S. Army Corps of Engineers (which participates in repair and maintenance of Delta levees, and regulates maximum export rates at the SWP), CDFG, CDWR, SWRCB, CVRWQCB, Contra Costa Water District and other water districts which receive Delta water deliveries, and local irrigation districts.

Recovery Criteria for Delta Smelt

In 1996, USFWS sponsored development of a recovery plan for native Delta fishes, which included a section for delta smelt (USFWS 1996). The recovery plan included numeric criteria for delta smelt population abundance (based on the Recovery Index, see Table 1) and distribution of the fish within their habitat. Recovery was partially defined as the achievement of specific levels of the two numeric criteria during a period of five consecutive years in which specific hydrological conditions were required to have occurred. Other criteria for recovery included mitigation and/or elimination of threats to the species. In 2003, the numeric abundance, distribution and hydrological criteria were met within the specified five-year window, even though delta population abundance had already declined markedly. This demonstrated that these recovery criteria, developed more than a decade ago without the benefit of the substantial new understanding gained in recent years, were not reliable indicators to characterize a stable and sustainable delta smelt population. Development of new recovery criteria should build on this lesson and also incorporate the new information available on delta smelt extinction risk, population dynamics, subtle variations in life history patterns, habitat requirements and preferences, and emerging threats to the species (e.g., climate change).

IV. CONCLUSION

The USFWS (2004) recently concluded that the threats to delta smelt described in the original listing remain, including the destruction, modification, or curtailment of the delta smelt's habitat or range resulting from extreme freshwater outflow conditions (reduced outflow or high outflow), operations of the State and Federal water projects, and other water diversions. CDFG (2003) and Moyle (2002, 2003) concluded that these threats could result in the extinction of the delta smelt. In addition, any one of the many stochastic factors that affect delta smelt, such as predation, invasive species, change in food organisms, toxic substances, disease, competition, and entrainment losses to water diversions can cause their numbers to move towards extinction (Moyle 2002, 2003).

In 2003, the USFWS (2004) concluded that new information concerning the delta smelt's population size and extinction probability indicated that the population was at risk of falling below an effective population size and therefore in danger of becoming extinct. Since the USFWS status review, the delta smelt population has indeed fallen below an effective population size and is therefore in danger of becoming extinct.

Recent population viability and extinction risk analyses indicate that, conservatively, the delta smelt could go extinct within the next 20 years and new analyses have demonstrated a statistically significant relationship between delta smelt population abundance and both freshwater outflow levels and Delta export rates. Despite the availability of this new information regarding the likelihood of extinction of the species and the delta smelt's decline to record low levels for three consecutive years (2004, 2005 and 2006), neither the Commission, USFWS nor other agencies charged with protecting the delta smelt and its Delta habitat have taken major actions to reverse the decline. Indeed, state and federal agencies continue to proceed with plans to that would exacerbate current conditions for the delta smelt, including increasing export levels at the Delta pumping facilities and developing new water diversion and storage projects which will reduce Delta inflow and outflow and further degrade delta smelt habitat.

The warning signs could not be clearer: the delta smelt is at high risk of extinction. We urgently petition the California Fish and Game Commission to list the delta smelt as endangered under the CESA, and to immediately implement measures to curtail threats to the species and improve environmental conditions in its Delta habitat.

V. SIGNATURE PAGE

Submitted this 7th day of February, 2007

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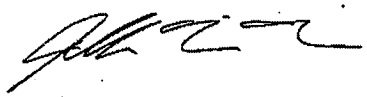

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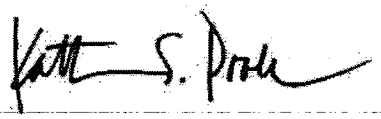

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Attachment 13

Finding the Water

NEW WATER SUPPLY OPPORTUNITIES TO REVIVE THE SAN FRANCISCO BAY-DELTA ECOSYSTEM

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ENVIRONMENTAL DEFENSE

finding the ways that work

LETTER 21

LETTER 21

Finding the Water

NEW WATER SUPPLY OPPORTUNITIES TO REVIVE THE SAN FRANCISCO BAY-DELTA ECOSYSTEM

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ENVIRONMENTAL DEFENSE

finding the ways that work

Cover image: Thomas B. Dunklin (salmon), California Department of Water Resources (river)

Our mission
Environmental Defense is dedicated to protecting the environmental rights of all people, including the right to clean air, clean water, healthy food and flourishing ecosystems. Guided by science, we work to create practical solutions that win lasting political, economic and social support because they are nonpartisan, cost-effective and fair.

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The complete report is available online at www.environmentaldefense.org.

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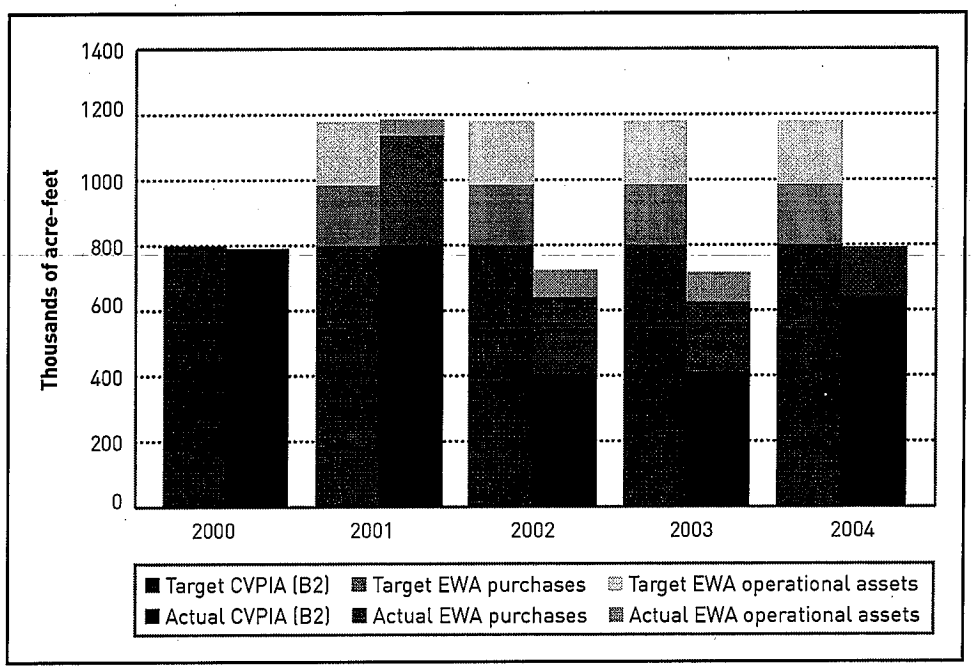
Executive summary

The San Francisco Bay-Delta is in crisis. Fish populations have dropped to record lows in the West Coast's largest estuary, which is a source of drinking water for 22 million California residents and supplies irrigation water for much of the state's agriculture industry. Now, new threats are on the horizon as the state of California plans to increase the capacity of its export pumps to divert even greater volumes of fresh water out of the Delta. At the same time, environmental water targets set forth in the CALFED Plan (specifically those of the Environmental Water Account [EWA] and the Central Valley Project Improvement Act [CVPIA]), intended to protect and restore the estuary and lessen the impacts of water project operations, have not been met for the last three years and face an uncertain future. If the Bay-Delta is to be restored, it is imperative that managing agencies follow through on their commitments to provide environmental water. Meeting the environmental water objectives set forth in the CALFED Plan is an essential element in restoring not only the estuary but also in renewing public confidence in our water management agencies.

In this study, Environmental Defense concludes, based on analysis of water operations data, that in the past few years the environment has been underendowed by approximately 420,000–460,000 acre-feet annually (Figure ES-1)

FIGURE ES-1
Unmet environmental water targets, 2000–2005



Since 2002, the EWA and CVPIA have been under endowed on average by 436,000 acre-feet. The EWA, which began in 2001, has seldom had adequate assets (i.e., water) available largely due to limited funding. CVPIA supplies began diminishing after the Interior Department's 2003 Decision (already in place in 2002), which offered far less protection than the previous policy. Current trends indicate that neither the EWA nor CVPIA water supplies are likely to be available in 2005 and beyond, as intended in the CALFED Plan, unless significant changes are made.

Source: California Department of Water Resources, U.S. Bureau of Reclamation

CALIFORNIA DEPARTMENT OF WATER RESOURCES

The San Francisco Bay-Delta is the hub of California's water supply system. In recent years, the health of this important estuary has significantly declined and populations of key fish species have dropped to record lows. Now additional threats are on the horizon as the State of California plans to increase the capacity of Delta freshwater exports.

The shortfalls in water dedicated to environmental protection are largely due to diminished state and federal funding, unavailable operational assets through the EWA and revised accounting rules for environmental water under the CVPIA. As a result, fishery agencies have been significantly constrained in their ability to dedicate water at key times of the year to protecting fisheries—particularly endangered species—as promised in the CALFED Plan.

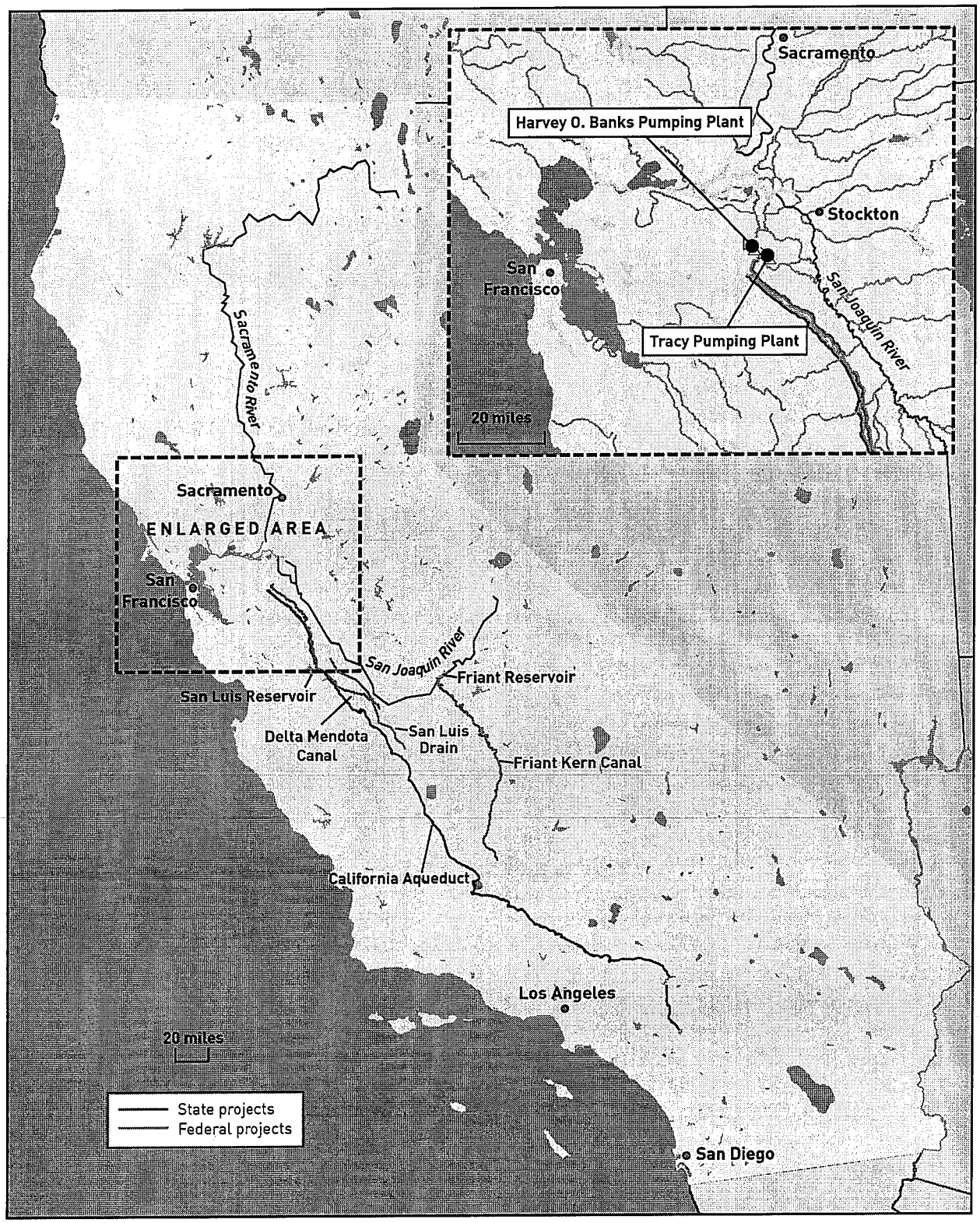
Fortunately, as actions are taken to modify and modernize water management in California, there will be opportunities for obtaining the water necessary to provide environmental protection. In this report, Environmental Defense identifies key opportunities to acquire water to finally realize the protective assurances promised in the CALFED Plan. These opportunities include:

- Increasing the usable storage in San Luis Reservoir
- Dedicating increased export capacity
- Integrating state and federal water projects
- Restoring the CVPIA's commitments to fisheries protection and restoration
- Implementing CALFED's Environmental Water Program (EWP) and Section B3 of the CVPIA
- Retiring drainage-impaired land in the San Joaquin Valley
- Implementing user fees

To ensure sustainable and reliable supplies, the water acquired through these opportunities could be required as part of the regulatory standards to which the water projects must adhere. As such, these regulatory standards could help protect fisheries by allowing pumping *only* when it is safe for fish, similar to both EWA and CVPIA protections.

With some creativity and foresight, it is possible to address the problems in the Bay-Delta. The health of the estuary largely depends on a reliable set of environmental safeguards, including dedicated water supplies. In order to ensure the availability of sustainable water supplies, a plan must be developed that identifies long-term supplies, provides assurances that water will be supplied and includes consequences for noncompliance. In light of the dire condition of the Bay-Delta and the looming threat of increased freshwater diversions, government agencies, water contractors and the interested public need immediately to develop a viable plan to assure adequate fresh water supplies for the long-term health of the San Francisco Bay-Delta.

FIGURE 1
The San Francisco Bay-Delta: the hub of California's water system



The San Francisco Bay-Delta is one of California's most valuable and unique ecological resources. The Bay-Delta also supplies drinking water for 22 million California residents and irrigation water for much of the state's agricultural industry via the state and federal pumping facilities, Harvey O. Banks and Tracy, respectively.

CHAPTER 1

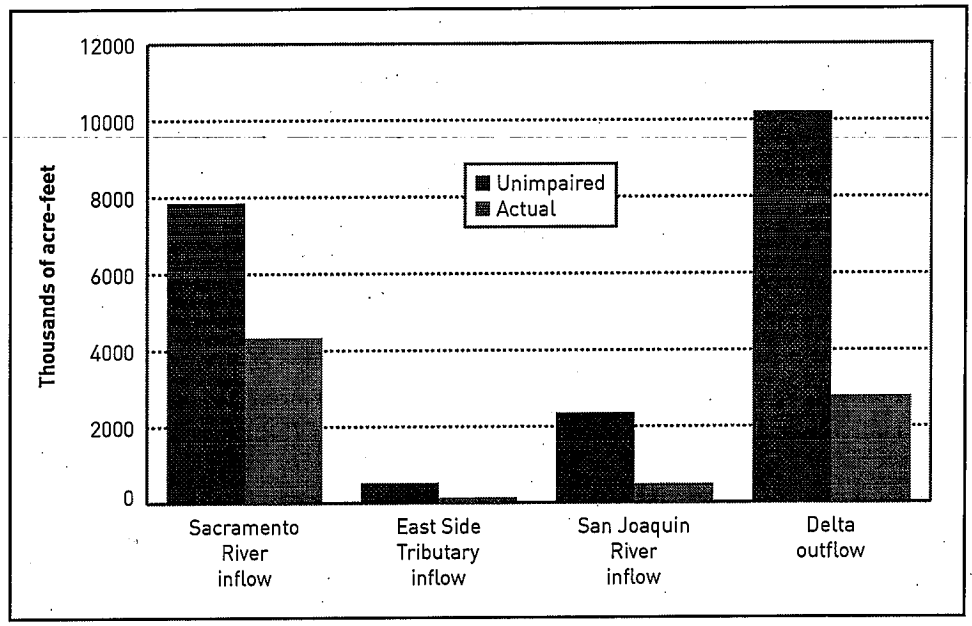
Introduction

The San Francisco Bay-Delta Estuary has been the hub of California's water supply system since the state's early days when farmers first diverted its freshwater inflows to grow food for hungry gold miners. As the state has grown, the Delta has become the center of a water system delivering supplies from the wetter northern region to the more populous and drier southern region. As Figure 2 shows, land conversion, water development and flood control projects throughout the Central Valley have drastically altered freshwater flows in the estuary.

Since the completion of Friant Dam in the 1940s, most years the entire flow of the upstream reaches of the San Joaquin River is diverted, leaving a dry riverbed upstream of its confluence with the Merced River. In 1956, the federal Central Valley Project (CVP) began to export large volumes of water into the Delta Mendota canal to assist farmers along the San Joaquin River whose supplies had been diverted south by the Friant project, as well as to support expanded agriculture on the arid west side of the San Joaquin Valley. Figure 3 illustrates how Delta exports have grown over the last 50 years. Exports sharply increased in the late 1960s, when the California State Water Project (SWP) was completed, principally to provide additional water supplies to urban southern California and the agriculture industry in Kern County. At the same time, the CVP completed its San Luis Unit, including a contract for more than 1,000,000 acre-feet with the Westlands Water District. Exports of fresh water steadily increased until 1991, when a lengthy drought forced their reduction.

FIGURE 2

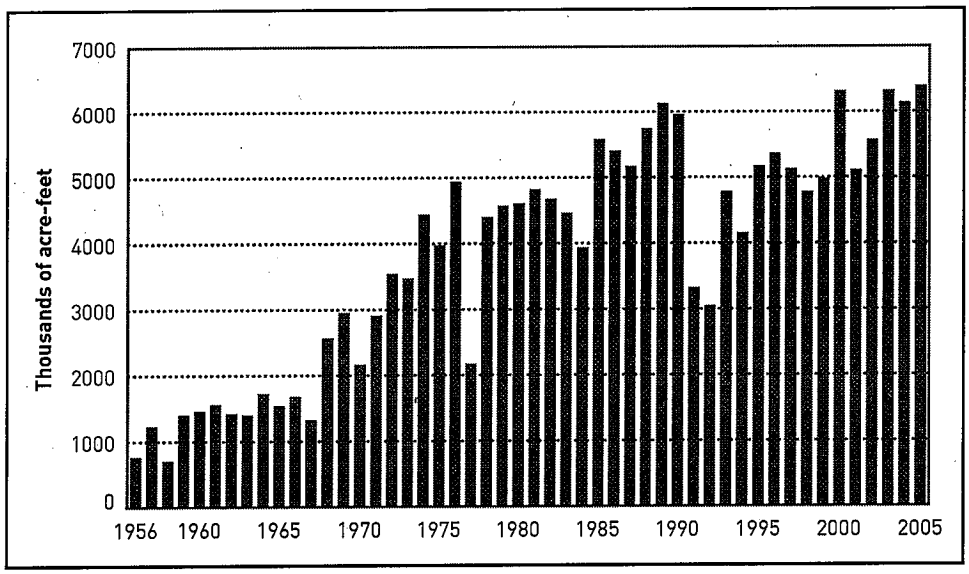
Changes to Delta flows, February–June, 1987–1992 drought



Land conversion, water development and flood control projects throughout the Central Valley have altered the volume and timing of flows into and out of the estuary. The changes are particularly noticeable in dry years such as the 1987–1992 drought.

Source: California Department of Water Resources, Interagency Ecological Project

FIGURE 3
Historic Delta exports, 1956–2005

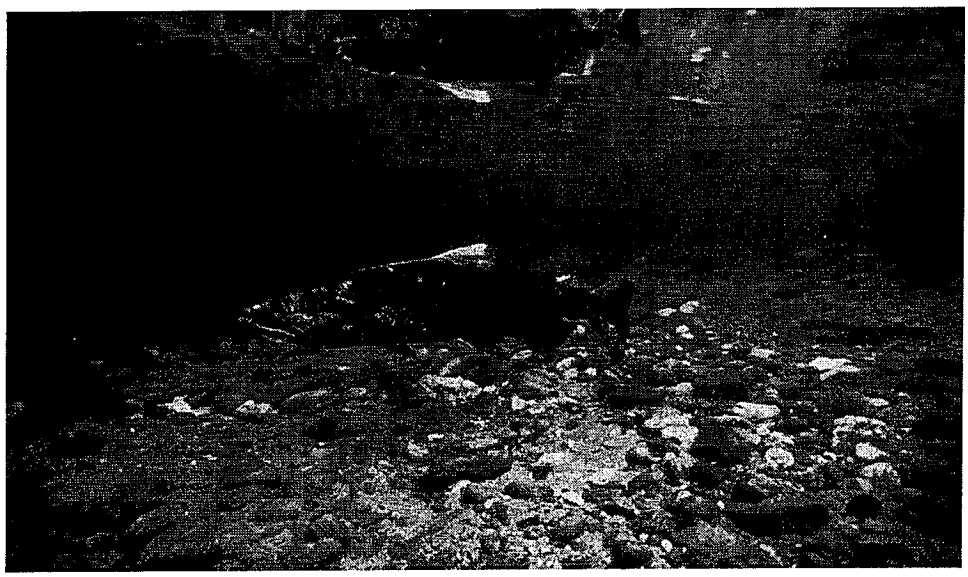


In recent years, both state and federal exports have been steadily rising, with three out of the past five years reaching record highs, and an all-time high of 6.4 million acre-feet was reached in 2005.
Source: California Department of Water Resources

Exports are once again on the rise, reaching the highest levels ever in three out of the past five years, with an all-time high of 6.4 MAF at the export pumps in 2005.

Historical impacts on the estuary

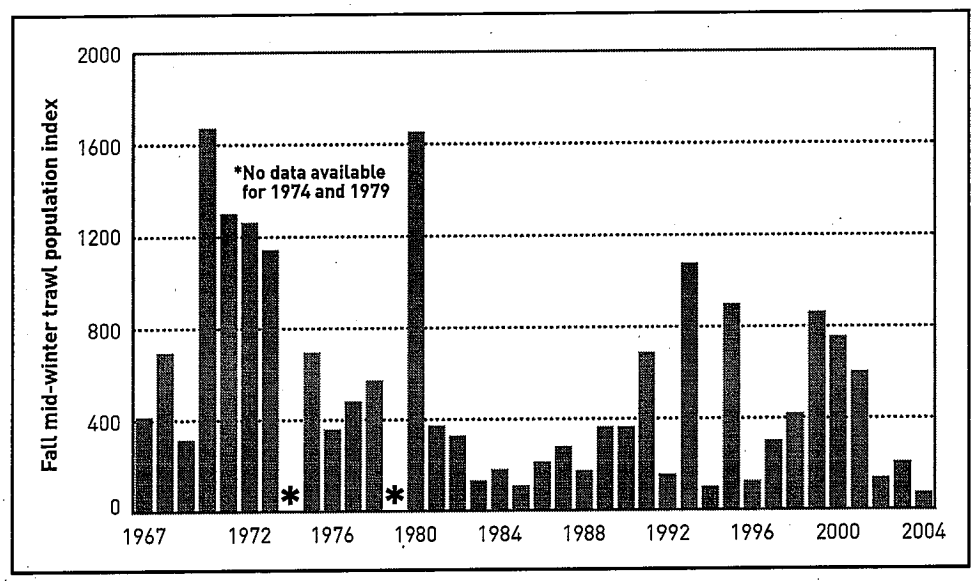
As the physical and ecological processes in the Bay-Delta system have changed, the estuary's fisheries have been devastated. By the late 20th century, the overall decline of the aquatic environments in the Central Valley and Bay-Delta was apparent. The winter-run Chinook salmon population had, until 1978, always been measured in the tens of thousands, but was down to 191 fish returning in 1994. Populations of



BRANDON D. COLE/CORBIS

Human demands on the Bay-Delta system have strained the species dependent on it. Chinook salmon spend most of their lives in salt water, but they spawn and hatch in freshwater streams. The winter-run Chinook salmon population had, until 1978, always been measured in the tens of thousands, but was down to 191 returning fish in 1994.

FIGURE 4
Historic Delta smelt abundance, 1967–2004



The protective mechanisms of the WQCP, the CVPIA and the EWA are in place to protect sensitive species such as Delta smelt, an estuarine fish found only in the Bay-Delta. Populations of Delta smelt, listed under the Endangered Species Act a decade ago, are at the lowest levels ever, down from a population index of 864 in 1999 to 74 in 2004. Source: California Department of Fish and Game fall mid-water trawl

both the Bay-Delta's resident fish and the salmon and steelhead that passed through the Delta en route to and from spawning grounds in Central Valley streams showed similar trends. Shortly after a severe drought from 1987–1992, a number of species were listed for protection under the state and federal Endangered Species Acts. The listing of Delta smelt is of special concern as its one-year life cycle makes it particularly vulnerable to extinction. One year of very low numbers could be devastating to the smelt population. Initial Endangered Species Act listings include:

- Winter-Run Chinook, Endangered, California ESA, September 22, 1989
- Delta Smelt, Threatened, Federal ESA, March 5, 1993
- Steelhead, Threatened, Federal ESA, May 18, 1998
- Spring-Run Chinook, Threatened, California ESA, February 6, 1999
- Splittail, Threatened, Federal ESA, March 10, 1999 (subsequently removed)

A declining resource

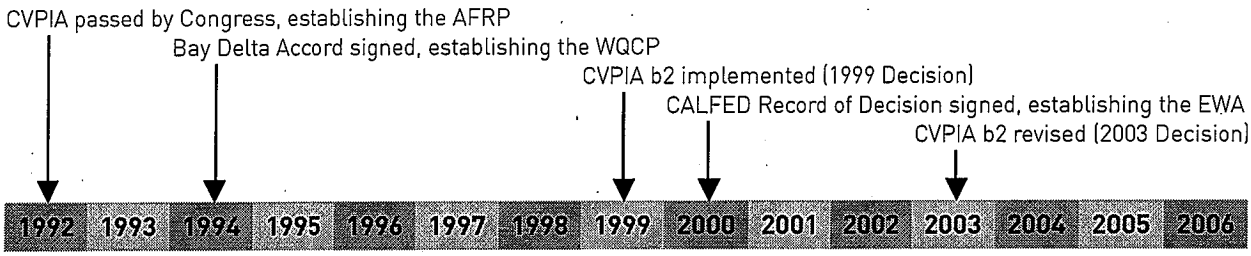
In recent years, the health of the Bay-Delta ecosystem has become increasingly precarious and new threats are on the horizon, in particular the proposed increase in capacity to export water from the Delta. As exports have continued to rise, recent surveys have shown a sharp decline in populations of estuarine fish. Delta smelt, listed under the Endangered Species Act a decade ago, are at their lowest level ever (Figure 4).[1] In addition, juvenile striped bass are at their lowest levels in four decades and both longfin smelt and threadfin shad populations are reaching near-record lows.[2] Contributing to these declines is a sharp reduction in the abundance of zooplankton, particularly a calanoid copepod, which is the primary food for young estuarine fish as

well as older life stages of Delta smelt. The Interagency Ecological Program, a collaboration of state and federal agencies focusing on the ecology of the Bay-Delta estuary, is currently conducting a comprehensive review of the possible causes of this most recent decline in Delta fisheries. The program will specifically investigate the degree to which pollution, invasive species and water project operations are responsible for the decline.

CHAPTER 2

Overview of environmental water requirements

Timeline of environmental water requirements



In response to the declining condition of the Bay-Delta in the 1990s, a number of environmental water requirements were developed to lessen the impacts of the water projects. These requirements were designed to provide increased instream flows or curtail export pumps at key times to protect fisheries. Today, three important requirements fall under the plan developed in 2000 by the state-federal CALFED Bay-Delta Authority.[3] In particular, the CALFED Plan provides three tiers of protection which include the Environmental Water Account (EWA), the Central Valley Project Improvement Act (CVPIA) and the Water Quality Control Plan (WQCP). An overview of these three environmental water requirements follows.

CALFED and the EWA

In 1995, to address the conflict over competing human demands in the Delta and declining fisheries, state and federal agencies, water contractors, public interest and environmental groups and others went to work on a long-term plan. Many elements of the vast program under CALFED's purview were contentious, though perhaps none so much as the rules governing export pumping. Fishery agencies and environmentalists asserted that additional protections were needed to reduce exports, especially when at-risk populations were in the vicinity of the pumps. Others agreed that some additional protection was necessary but pointed out that it was not always possible to identify in advance when export curtailments to protect fish from direct entrainment would be needed.

At the behest of then-Secretary of Interior Bruce Babbitt, CALFED agencies and stakeholders were tasked to find a mechanism for applying export reductions on a real-time basis, rather than on a fixed schedule. The idea was that the most efficient way to balance competing objectives for water export and environmental protection was not to determine in advance when exports ought to be curtailed to reduce fish mortality, but to provide a mechanism whereby fishery scientists with detailed monitoring capabilities could request reductions when fish would otherwise be entrained in large numbers at the export pumps.

After months of comprehensive "gaming" exercises, during which fishery scientists, project operators and others simulated how such real-time changes to project operations might be accomplished in response to monitoring data, a plan for the EWA emerged. Successfully negotiating the EWA was a key component that allowed the final CALFED Plan to be released in 2000.

The EWA was adopted as a water management tool intended to protect endangered fish from the harmful operational impacts of the federal and state water projects without reducing existing water supply or deliveries from the Delta. In general, U. S. Fish and Wildlife Service (FWS), National Marine Fisheries Service (NMFS), and California Department of Fish and Game (DFG) would act as management agencies, using monitoring data, scientific understanding and professional judgment to decide which actions were required to protect and recover Delta fish populations and ecosystem function. The U.S. Bureau of Reclamation and California Department of Water Resources (DWR) would act as the project agencies that oversee the operation of the EWA and implement those actions deemed necessary by the fishery agencies. EWA water supplies would be acquired either through applying a set of different tools used to gain supplies during system operations (i.e., operational assets) or through purchases (i.e., purchased assets) (Table 1).

The EWA would protect fish from mortality due to entrainment in the pumps and ensure reliable supplies for the water contractors while providing them with near-absolution from additional compliance with the Endangered Species Act. Without the EWA in place, additional pumping would increase the number of fish "taken" at the pumps, thereby increasing the likelihood of ESA non-compliance for water contractors. The EWA is thus effectively an insurance policy for water contractors—providing substantial economic benefits by assuring reliable supplies without fear that the

CALFED's three tiers of environmental protection

Tier 1: Consists of regulatory requirements including Delta smelt and winter-run Chinook salmon biological opinions, WQCP and 800,000 acre-feet of supplies pursuant to CVPIA Section 3406(b)(2).

Tier 2: Comprised of environmental benefits provided by the EWA and Ecosystem Restoration Program. Tier 2 is a mechanism to assure that water is provided for fish protection and recovery, without a reduction in deliveries to water users.

Tier 3: Founded on the commitment of state and federal agencies to make additional water available if the combined protections of Tier 1 and 2 were inadequate to protect ESA-listed species.[4]

TABLE 1
Proposed sources of water for the EWA

Action description	Water available annually (average)
Operational assets	**195,000 acre-feet**
SWP pumping of (b)(2)/ERP upstream releases	40,000 acre-feet[2]
EWA use of joint point	75,000 acre-feet
Export/inflow ratio flexibility	30,000 acre-feet
500 cfs SWP pumping increase	50,000 acre-feet
Purchased assets	**185,000 acre-feet**
Purchases—south of Delta	150,000 acre-feet
Purchases—north of Delta	35,000 acre-feet
Total	**380,000 acre-feet**

Source: CALFED Record of Decision

Endangered Species Act will diminish their supplies.

The CALFED Plan describes the EWA as the second of three "Tiers" of environmental water supplies (see sidebar). Tier 1 includes regulatory requirements that were already in place, including the WQCP, CVPIA supplies and rules for project operations, to protect Delta smelt and winter-run Chinook salmon under the Endangered Species Act. Given that the EWA would interact so closely with actions taken pursuant to the CVPIA, the CALFED Plan made clear that Tier 1 would include CVPIA supplies that were available under the federal policy for B2 supplies established in 1999 by the Department of the Interior.

During CALFED's gaming process, agency staff projected that an annual average of 195,000 acre-feet would be available for the EWA in the normal course of CVP and SWP operations (Table 1). Additionally, agencies elected to commit to purchasing supplies amounting to 185,000 acre-feet per year. Together, these operational and purchased assets would total 380,000 acre-feet per year on average.

In exchange for CALFED's three-tiered suite of protections, the fishery agencies agreed that they would require no further reductions beyond existing regulatory levels in CVP or SWP Delta exports for the protection of state and federally listed, threatened and endangered species. In essence, the water users were guaranteed a reliable supply of water, without unscheduled interruptions due to compliance with the Endangered Species Act. These ESA commitments were to be renewed annually and were contingent on full funding and availability of the three tiers of protections.

CVPIA and the Anadromous Fish Restoration Program

Prior to the EWA, Congress passed the CVPIA in 1992, largely in response to the ecosystem decline in the Bay-Delta and Central Valley watersheds. The Act made protection of fish and wildlife a priority and included a directive to achieve a reasonable balance between the requirements of fish and wildlife and other project purposes. The CVPIA contains a number of landmark provisions that substantially modify and

The Sacramento River and the San Joaquin River are the two main tributaries that flow into the Bay-Delta. Of the two, the Sacramento River provides the bulk of outflow to the Bay and is a critical spawning habitat for winter-run Chinook salmon.

modernize the CVP, including directives to provide additional water for the benefit of fisheries and wetlands in the Central Valley and Bay-Delta.[5]

The Act's most controversial element has been its Anadromous Fish Restoration Program (AFRP) and the subsequent authorization to modify water project operations to accomplish its goal of doubling anadromous fish populations by 2002.[6] To implement the AFRP, the Act provides three water management tools. The authorized modifications are usually referred to as B1, B2 and B3 supplies, named after the sections of the law in which they appear. In short:

- Section B1 instructs the CVP to modify project operations for fish protection as long as the timing and volume of deliveries of the Project's contractors are not impaired.
- Section B2 annually dedicates 800,000 acre-feet of the Project's water supplies for fish protection.
- Section B3 provides funding for additional flow purchases by levying a surcharge on water users.[7]

Due to its controversial nature, Section B2 was not fully implemented until seven years after the CVPIA had passed. In October 1999, the U.S. Department of the Interior released a final decision for administering Sections B1 and B2 jointly. Its principal provisions included measuring reservoir releases that were increased to improve conditions for fisheries on four federally controlled streams (Sacramento River, Clear Creek, American River and Stanislaus River), as well as any curtailments that were made at the Delta export facilities to reduce entrainment of fish in the pumps. Under most circumstances, these flow increases and export reductions were based on the cumulative net change to CVP operations during the course of a water year. The 1999 Decision also, in recognition of the Act's primary purpose of doubling anadromous fish populations, insisted that a significant portion of the CVPIA's B2 dedication be applied to protect salmon habitat on CVP-controlled streams for spawning and rearing, rather than simply providing safe passage through the Bay-Delta.

The Bay-Delta Accord and the WQCP

As the U.S. Department of the Interior struggled to implement the CVPIA, efforts to deal directly with the Bay-Delta's ecological problems continued. After the State of California withdrew from its own effort to develop alternative regulation for water project operations, the U.S. Environmental Protection Agency (EPA) threatened to promulgate water quality standards under the Clean Water Act.[8] Responding to this warning, federal and state agencies, water contractors and environmentalists negotiated a package of environmental protections, operations protocols and funds for habitat restoration. On December 15, 1994, state and federal agencies, joined by ten "interested parties" including Environmental Defense, signed the Bay-Delta Accord. The Accord established interim standards for water project management and encouraged parties to work together on a long-term solution. As a result, the state and federal government initiated the CALFED program, with a mandate of developing long-term solutions that would address water supply, water quality, levee stability and ecosystem issues facing the Delta.

The SWP and CVP agreed to bear the full responsibility for meeting the Accord's flow objectives, with the

expectation that the State Water Resources Control Board (SWRCB) would consider whether other water agencies should also provide flows for the Delta.[9] According to the agreement, the majority of this burden would be met by the CVP, using a portion of its B2 account. The SWP's contribution to the Accord's objectives was smaller on average, but significant in wet years. The Accord's objectives would be implemented as the newly-formed CALFED Program worked on a long-range plan.

The Bay-Delta Accord's standards were formally adopted in 1995 by the SWRCB as the WQCP for the San Francisco Bay and Sacramento-San Joaquin Delta Estuary. In particular, the WQCP limits state and federal export pumping to 35% of Delta inflow during February through June when estuarine fish breed, and to 65% of inflow during the rest of the year. The WQCP also implemented the Accord's "X2" recommendations for Delta outflow through requirements for low-salinity habitat during the February through June period.[10] In any given month during this period, Delta outflow requirements are determined based on the natural flows of the eight largest rivers in the Sacramento and San Joaquin Valleys.

Most elements of the WQCP have been incorporated by the SWRCB in its water rights orders. As a result, the WQCP's outflow requirements, export curtailments and Sacramento River inflow requirements are met annually through the operation of the CVP and SWP. The WQCP's inflow objectives for spring inflow to the Delta from the San Joaquin River, however, are only partially met by compensated contributions from local water agencies as part of the Vernalis Adaptive Management Plan.[11]

CHAPTER 3

Where are we today? Five years of CVPIA and EWA implementation

While some salmon populations have improved considerably, largely in response to improved instream flows in upstream tributaries and removal of upstream passage impediments, the Delta's estuarine fish are faring poorly. Populations of Delta fisheries have hit record lows at a time when project exports have reached record high levels. At the same time, the guarantees of environmental water envisioned in the CALFED Plan have fallen short of their objectives. As a consequence, the ability of fishery agencies to manage Delta exports through application of the CVPIA and EWA supplies has been significantly compromised. The following is an overview of the CVPIA's and EWA's performance and an estimate of how much the environment has been underendowed.

Diminished CVPIA fisheries commitments

Changes in the application of the CVPIA have significantly reduced its ability to protect fish both upstream and in the Delta. As a consequence, the EWA is now expected not only to do the job intended for it when the CALFED Plan was adopted but also to make up the water lost when the CVPIA's protections were weakened.

Though it was incorporated as a cornerstone of the CALFED Plan, the Interior Department's 1999 Decision for administering Sections B1 and B2 jointly was in force for only two years—2000 and 2001—after it was signed. During this period, only the annual increased use of CVP supplies for fishery enhancement, in terms of either additional reservoir releases for streamflow or export curtailment to reduce entrainment, was counted toward the CVPIA's 800,000 acre-feet of yield, as defined by Section 3406(b)(2). Occasions in which flow increases were subsequently "offset" by flow decreases, or vice versa, were attributed to the "reoperation" authorized by CVPIA Section B1, pursuant to the CVPIA, as they did not affect water contractors. Similarly if winter storms followed fishery actions and reservoir storage was "reset" as a result, the operational change was attributed as a reoperation and not charged to the B2 account. Also, in 2001, the 1999 Decision's provision that no more than 450,000 acre-feet of the 800,000 acre-feet B2 account would be charged to meet Delta obligations (i.e. WQCP standards), was applied. As a result, an additional 75,000 acre-feet of environmental water was purchased with CALFED funding.

The Interior Department's 1999 Decision was not to last, however. In 1997, CVP contractors initiated litigation against the United States challenging the Interior Department's initial interpretation of Section 3406(b)(2). Various environmental groups, including Environmental Defense, and fishing groups joined the suit soon thereafter. The U.S. District Court eventually ruled on a complex series of issues involving various Department of Interior decisions over a five-year period.

In January 2002, the court issued key rulings that forced Interior to revise its policies for "offset" and "reset." As a result, virtually all operational changes implemented to improve fisheries would be charged to the B2 account, even if the changes had no effect on con-

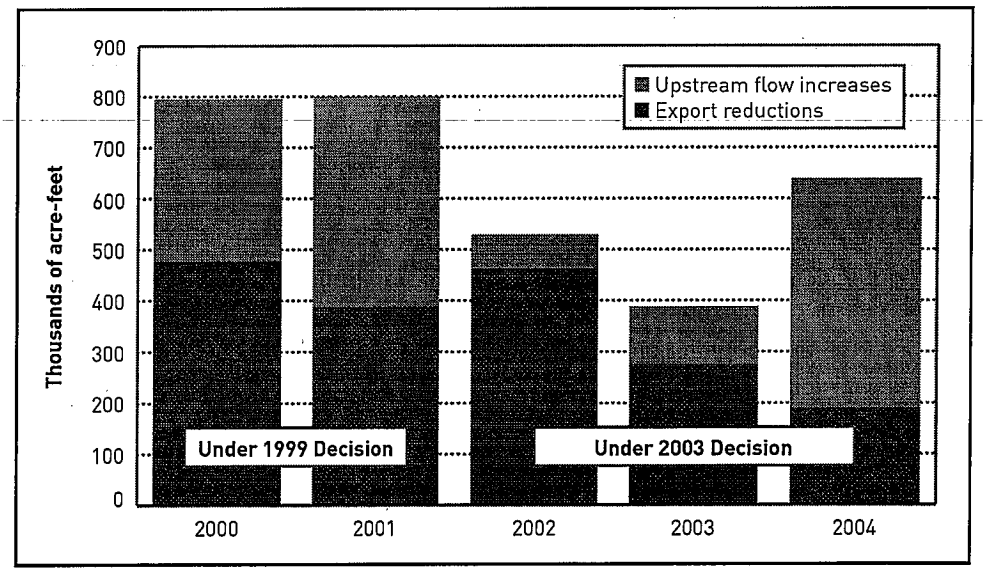
tractors. The ruling did not address how Interior should apply the fishery provisions in Section 3406(b)(1) which authorize the Secretary "to provide flows of suitable quality, quantity, and timing to protect all life stages of anadromous fish" as long as they "do not conflict with fulfillment of the Secretary's remaining contractual obligations to provide Central Valley Project water for other authorized purposes". In addition, the court ruled that the Interior Department had no discretion to limit how much of the B2 account could be used in meeting its share of WQCP obligations.[12] The effect of these rulings meant that, in many years, the entire B2 account might be applied to meet the WQCP obligations within the Delta, leaving no water to enhance spawning and outmigration of anadromous fish.

The Interior Department's 1999 Decision for use of CVPIA supplies was unofficially displaced in 2002 by a new policy incorporating the court's rulings. In 2003, Interior formally adopted a new policy that included not only the ruling but also further diminished how much environmental water it would provide in dry years. The 2003 policy allows water delivered to CVP contractors to be counted as water dedicated to fisheries protection.

Under the 2003 policy, the Fish and Wildlife Service is forced to make difficult choices with its limited B2 supplies between taking upstream actions to protect anadromous fish, or in-Delta actions to reduce direct entrainment. In 2002, for example, approximately 331,000 acre-feet was charged to the B2 account that would not have been charged under the 1999 policy (Figure 5).

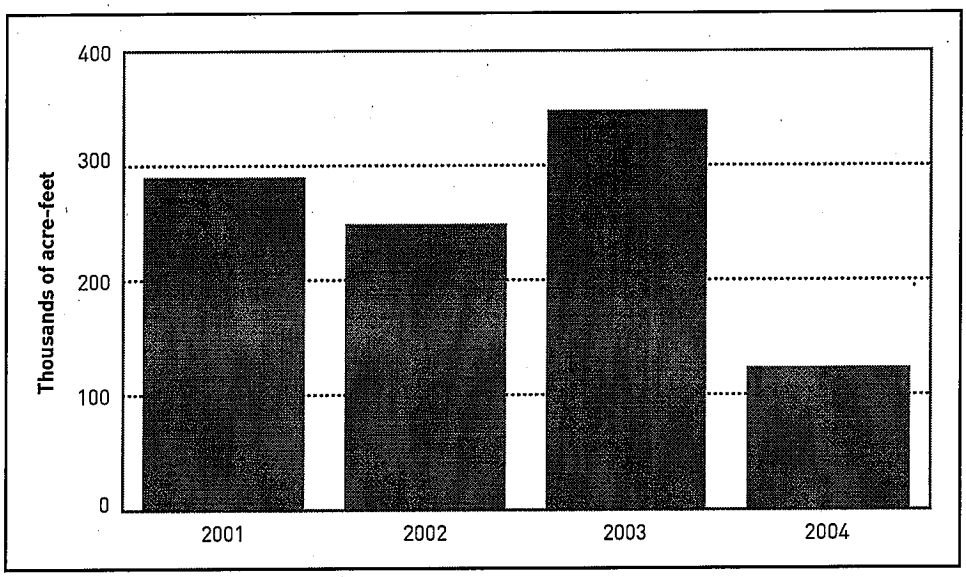
The court rulings and the Interior Department's revised policy have

FIGURE 5
Changes in Central Valley Project Improvement Act environmental "b2" water supplies



The Interior Department's 2003 change in policy for applying the CVPIA's environmental water significantly reduced the amount of water provided to protect and restore fisheries. This change has undermined the protections provided in the CALFED Plan and has put additional pressure on the EWA.
Source: U.S. Bureau of Reclamation provided daily operational data as well as the B2 accounting under its various policies. Environmental Defense applied the Bureau's accounting policy under its 1999 Decision to the 2002–2004 project operations.

FIGURE 6
Environmental Water Account export reductions to protect fisheries, 2001–2004



The EWA is principally used to curtail exports for the benefit of threatened Delta fish species. Since 2001, the ability of the EWA to do its job has been limited due to inadequate acquisition of both operational and purchased assets.
Source: CALFED EWA Team, a multi-agency stakeholder group helping to coordinate the implementation of the EWA.

effectively reduced CALFED's Tier 1 capabilities to near zero. As a result of these changes, the EWA has been expected not only to do the job intended for it as part of the CALFED Plan but also to make up the water lost as a result of the court's and the Interior Department's interpretations of the CVPIA.

Diminished EWA

The EWA has had significantly less water than expected to do its job. Combined, the CVPIA and EWA have been underendowed by an average of 436,000 acre-feet over the past three years.[13] Yet, the need for a sustainable and reliable supply of environmental water, in the context of both record levels of high exports and low fish populations, is even more important today.

The EWA was created as an innovative tool intended to solve some of the serious ecosystem problems in the Delta. Unfortunately, due to a combination of insufficient operational assets and dwindling funding, early on the EWA was effectively robbed of some of its potential (Figure 6). As a result, in its four years of operations, the EWA has received mixed reviews.

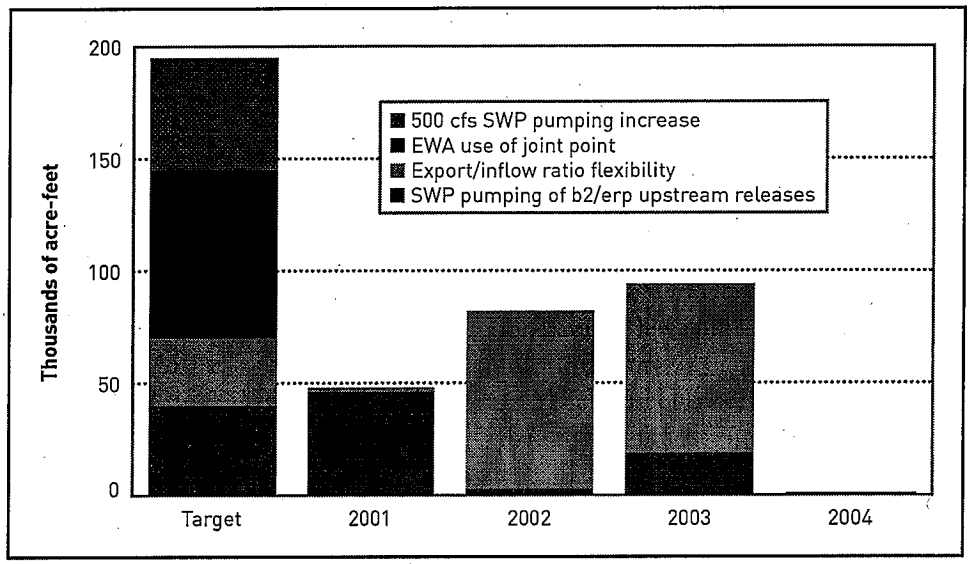
From an operational perspective, the EWA has worked well to ensure reliable supplies to water users and has had some positive effects on the Delta's aquatic habitat. EWA purchases, when executed, have provided some environmental protection, which CALFED's EWA Technical Review Panel has noted as one of the most effective elements of the program.[14] There have been various examples of fishery scientists using EWA supplies effectively to provide additional Delta inflows or decreasing export pumping to improve estuarine conditions.

Unfortunately, however, the EWA has never received the amount of water anticipated by the CALFED Plan. On average, only 29% of the expected

195,000 acre-feet of operational assets have been available. The initial assumptions from CALFED's gaming process that preceded the EWA, projecting the EWA could expect significant supplies through the normal course of project operations, have proven overly optimistic (Figure 7).

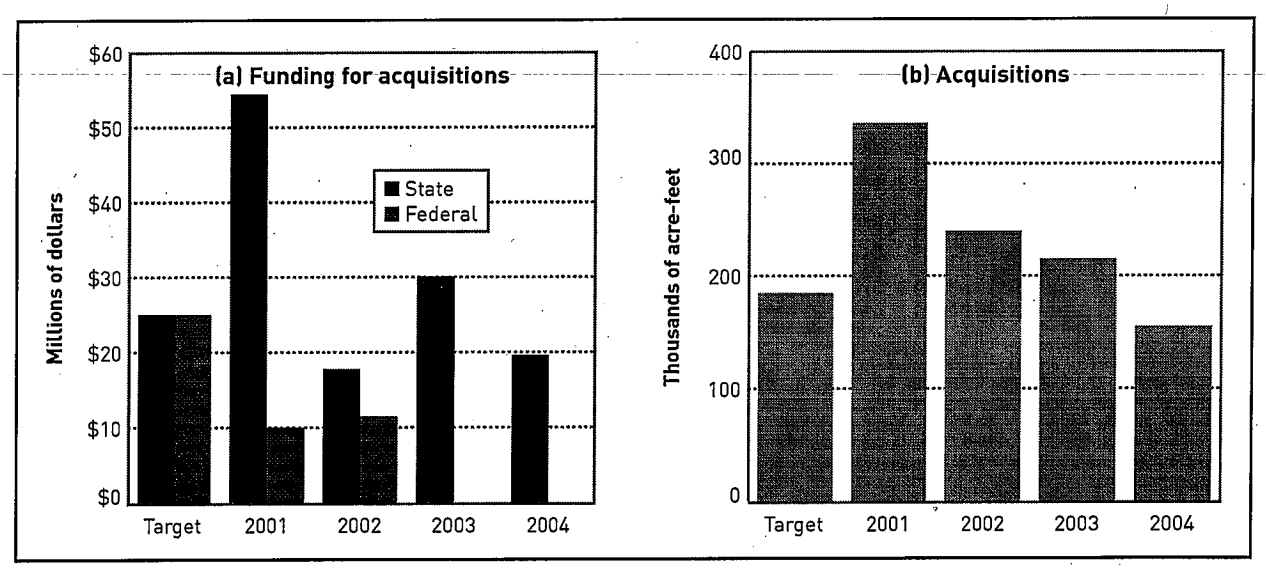
As a consequence, the EWA has had to rely almost entirely on purchases

FIGURE 7
Environmental Water Account operational assets, 2001–2004



The CALFED Plan targeted 195,000 acre-feet of operational assets for the EWA. Since 2001, many types of operational assets have seldom been available and have, on average, only produced 29% of the target.
Source: California Department of Water Resources, CALFED Plan

FIGURE 8
The Environmental Water Account

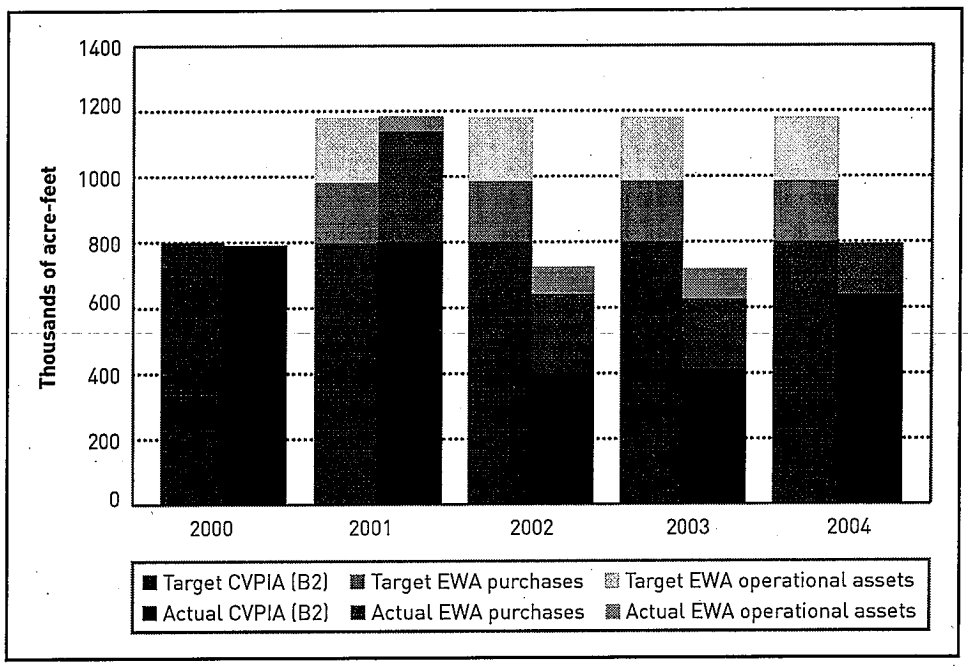


(a) The CALFED Plan targeted a 50/50 cost-sharing goal for the EWA among state and federal sources. Since 2001, however, the state has covered the majority of the EWA's costs. The state sources, comprised of various propositions, are running out and it is unlikely that the state will be able to continue to fund the EWA. (b) In the absence of available operational assets, the EWA has had to rely heavily on purchased assets to acquire water.[15]
Source: California Department of Water Resources, U.S. Bureau of Reclamation

from willing sellers to acquire its supplies.[16] This approach worked well the first few years when significant bond funds were available to endow the EWA with purchasing power.[17] As these various bonds, including Proposition 50, run out, it is uncertain how the EWA will be funded in the future (Figure 8). Without extensive changes, future prospects for a fully endowed EWA look poor, given the state's budget crisis and exhausted bond funding.

Dwindling assets have limited the EWA's ability to do its job. In a typical year, most EWA actions to protect fisheries are taken by curtailing export pumping to reduce entrainment and increase survival. Other actions have been taken to supplement upstream flow releases for spawning and to control water temperature. In recent years, the EWA has increasingly been unable to achieve desired fish actions, despite growing evidence of declining fish populations. In 2004, the only fish actions taken were to implement the Vernalis Adaptive Management Plan and extend its protections into the late spring. More recently, in February 2005, after monitoring indicated that Delta smelt populations were at record low levels, fishery biologists recommended that exports be curtailed to reduce entrainment. Agency managers, keenly aware that the EWA's supplies were scarce and concerned that there would be inadequate supplies avail-

FIGURE 9
Unmet environmental water targets, 2000–2005



Between 2002 and 2004, the EWA and the CVPIA have been underendowed, on average, by 436,000 acre-feet. CVPIA supplies began diminishing after the Interior Department's 2003 Decision (already in place in 2002), which offered far less protection than the previous policy. The EWA, which began in 2001, has never acquired the operational assets that were assumed in the CALFED Plan and its purchased assets dropped significantly in 2004 due to funding limitations. Current trends indicate that neither the EWA nor the CVPIA supplies are likely to be available in 2005 and beyond, as intended in the CALFED Plan, unless significant changes are made. Without adequate and reliable CVPIA and EWA supplies, it is unclear whether the EWA's role as an insurance policy protecting water contractors from the Endangered Species Act can or should continue.

Source: California Department of Water Resources, U.S. Bureau of Reclamation

able later in the year, sharply reduced the amount of EWA water that would be provided to the endangered fish and did not curtail exports as much or as long as was requested.[18]

In summary, it is apparent that fishery agencies now have more than 400,000 acre-feet *less* water per year in CVPIA and EWA supplies alone, compared with the requirements of the CALFED Plan, with which to comply with ESA objectives and restore the health of the Bay-Delta ecosystem (Figure 9). The backstop for this shortfall, CALFED's Tier 3, has no assets, no plan and has been virtually ignored. And, as the health of the Bay-Delta continues to spiral downward, exports from the estuary have reached record high levels.

CHAPTER 4

Future funding prospects are highly uncertain

Since its inception, funding for the CALFED program, and particularly the EWA, has largely relied on annual allocations from California's General Fund and financing from bond revenues. Both of these sources are quickly dwindling, contrary to the CALFED Plan's expectations that long-term funding would be available from the state and federal government. After its first year, funding for the EWA has steadily declined, hindering the ability of the account to purchase water. As sources of public funding are becoming scarce and without reliable operational assets, it is uncertain how the protections included in the EWA, as set forth in the CALFED Plan, will be assured.[19] Without a viable EWA, it is unclear whether its role as an insurance policy protecting water contractors from the Endangered Species Act can or should continue.

Given the funding uncertainty, the Bay-Delta Authority was charged with completing a ten-year finance plan in 2004 to determine how best to support CALFED in the long-term. Given the lack of available public funding, there has been a growing interest in looking to the "beneficiary pays" principle included in the CALFED Plan, which relates directly to the concept of a "user fee." Under this principle, the costs of a project are allocated to specific entities in the same proportion as the direct and indirect benefits the entity is intended to receive from the project.

The potential role of user fees and other finance strategies are currently coming into play as the CALFED program undergoes an audit to evaluate its finance strategy, program management, overall program effectiveness and governance. The review process is expected to be completed in late 2005 and will include recommendations for the future of the program. Our recommendations for providing and potentially increasing the environmental water supplies required in the CALFED plan are outlined below.

CHAPTER 5

Opportunities for greater environmental protection

There are many opportunities to realize the environmental water assurances promised in the CALFED Plan and to extend additional protection to the Bay-Delta estuary. The CALFED Plan clearly states that the EWA should be expanded with an appropriate share of newly developed water supplies.[20] The most logical approach to meeting CALFED's objectives for improving fisheries protection is to increase the water supplies available to fish when they are at risk through flexibility in project operations. Such protections should be required as operating guidelines included in the regulatory standards to which water projects much adhere.

As actions are taken to modify and modernize water management in California, opportunities will arise for obtaining the water necessary to provide additional flexibility. Some of the most promising opportunities for additional environmental water are as follows.

Flexibility through integration of existing projects

At a closed-door meeting in Napa in 2003, state and federal export agencies, along with their contractors, identified how integrated operation of the SWP and CVP could generate additional water supplies.[21] By integrating the conveyance-rich SWP with the storage-rich CVP, water contractors have shown that exports can be increased. These additional supplies should be provided to the environment as a first priority to ensure additional operating flexibility to mitigate the adverse effects of water project operations, rather than to the export agencies that are already enjoying historically high export levels.

Flexibility in increased export capability

Current proposals by the federal and state water projects and their contractors to increase the capacity to export water at the Delta pumping plants have met substantial resistance, given their potential impact on the Bay-Delta and its fisheries. In the event that pumping capacity is increased, however, we recommend that the additional capacity (estimated at 200,000 acre-feet) be dedicated to improving the timing of exports in order to protect fisheries. We also recommend that the overall volume of exports should not be increased until, and unless, there is a viable long-term upward trend in estuarine health. At a minimum, imposing such a constraint would motivate the water contractors to act creatively on behalf of estuarine recovery. Even with these caveats, however, it may well not be feasible to combine even higher levels of pumping with strong estuarine recovery programs, no matter how much flexibility is given to the operators in timing exports.

Increase usable storage in San Luis Reservoir

The CVP and SWP share San Luis Reservoir, a 2 million acre-foot storage facility located south of the Delta along the federal and state aqueducts. San Luis is the primary reservoir for storing EWA supplies, but the EWA has only junior rights in the reservoir and its supplies can "spill" when the CVP and SWP fill their shares of the reservoir. Due to poorly located outlets, San Luis Reservoir's current storage capacity is not fully usable without rendering the Santa Clara Valley Water District

(SCVWD) unable to access its supplies. Solving this "San Luis Reservoir Low Point problem" by physically modifying the reservoir would provide SCVWD with both improved water quality and year-round access to the CVP while creating another 200,000 acre-feet of additional active storage. The CVP and SWP have not, as of today, allocated this storage to a specific purpose. This additional capacity should be dedicated to the EWA to enhance the environment and provide additional protection without affecting water contractors. If, on the other hand, the additional storage is dedicated to increased water supply, it may increase exports by 200,000 acre-feet annually without mitigation and thereby exacerbate environmental problems in the Delta.

Restoring the CVPIA's commitments to fisheries protection and restoration

There are several opportunities to attain greater protection using the environmental water provided to the Central Valley and Bay-Delta by the CVPIA. The Interior Department should:

- Revise and greatly expand the use of "reoperation" pursuant to Section 3406(b)(1)(B).[22] Perhaps the single most useful application of the reoperation criteria is clarifying that B1 reoperation can be used to allow reduced late summer reservoir releases to compensate for increased springtime releases to aid outmigration, without additional charges to the B2 account.[23]
- Formally implement the May 2003 ruling of the Court of Appeals for the Ninth District regarding the "Primary Purpose" of B2. As a result, the WQCP would still be fully applied but significant portions of the B2 supply would in all years be dedicated to providing for the spawning and outmigration of salmon and steelhead. The WQCP would still be fully implemented. In 2004, the Interior Department did dedicate an additional 166,000 acre-feet to comply with obligations under the WQCP, but has shown no indication of how, or when, it will establish an official policy consistent with the court's ruling.
- Develop a policy to facilitate the authorized "banking" of B2 water (Section 3408(d)). Currently, the B2 account is in a "use it or lose it" situation, in which at the end of the water year (September 30) any remaining B2 water is eliminated. In the 13 years since the CVPIA became law, the U.S. Department of the Interior has made no serious attempt to implement the CVPIA's authorization of banking.

Implementing CALFED's EWP and Section B3 of the CVPIA

CALFED's Environmental Water Program and Section B3 of the CVPIA are tools created to purchase water to enhance instream flows on upstream tributaries. To date, however, neither tool has lived up to its potential largely due to a lack of dedicated funding. A serious commitment is needed to fully fund and implement these tools, which could result in improvements to both upstream and Delta environmental conditions.

Retiring drainage-impaired land in the San Joaquin Valley

The U.S. Bureau of Reclamation is currently reviewing alternatives to provide drainage service to dispose of salt-laden agricultural run-off on the west side of the San Joaquin Valley. The environmentally preferred alternative in the draft Environmental Impact Statement

involves the retirement of lands impaired by drainage which has left the soil saline and unproductive. A significant portion of the water saved as a result of land retirement should be dedicated to the environment to fulfill the assurances in the CALFED Plan.

Implementing user fees

The CALFED Plan included several commitments to user fees and to the beneficiary pays principle. In particular, it promised the creation of the Ecosystem Restoration Program, financed partially by user fees in the amount of $35 million per year. Revenues from such a water use fee (as opposed to the reallocation of existing user fees such as those in the CVP Restoration Fund, as has been proposed by some water users) could help assure that sufficient funds are available for additional operational flexibility and could be less subject to significant shortfalls than would be the case where reliance is placed on state and federal general funds.

A water use fee would also provide water contractors with significant incentives to manage their own supplies in the most efficient manner. If the fee is high enough, water contractors might find that rather than export additional water, they might better develop their own supplies or improve efficiency in their water use.

CHAPTER 6

Conclusion

State and federal projects are exporting record volumes of fresh water from the Bay-Delta while the Delta's fisheries and food web are severely distressed. Stakeholders have made great efforts over the years to forge creative solutions to meet a variety of program objectives, including Bay-Delta protection, but they have not been fully implemented. This report illustrates that while the environmental water supplies set forth in the CALFED Plan have not been provided, a number of opportunities exist to find the water needed to revive the Bay-Delta.

Debate will continue not only on how to balance the competing needs of environmental and developed water, but also how and when environmental water might best be applied. Research is needed to investigate the connection of introduced species, chemical contaminants and other factors to recent fishery declines. Regardless, the health of the San Francisco Bay-Delta estuary depends on a reliable set of environmental safeguards, including dependable water supplies. The EWA and CVPIA supplies that have been lost should be replaced, and potentially expanded, as soon as possible.

Any plan to sustain the estuary must include a methodology for using environmental water, assurances that water will be provided and consequences for non-compliance. It is necessary that fishery interests have a strong hand in the operation of the water projects that control the flows into and out of the Delta. Over the last five years, the failure to implement the protective operating criteria outlined in the CALFED Plan has been unacceptable. It is time for government agencies, water contractors and the interested public to implement a sustainable plan to guarantee the long-term health of the San Francisco Bay-Delta estuary.

Notes

[1] Abundance of Delta smelt and other estuarine species are estimated by a population index that is determined by the results of the "fall mid-water trawl," conducted monthly September through December at locations throughout the estuary.

[2] Interagency Ecological Program Workplan to Evaluate the Decline of Pelagic Species in the Upper San Francisco Estuary, 2005.

[3] The CALFED Plan was formally released as a "Programmatic Record of Decision," pursuant to state and federal environmental laws on August 28, 2000.

[4] Tier 3 was intended to be a set of actions that would be available if the EWA did not have sufficient assets to accomplish its objectives. Despite the erosion of Tier 2, Tier 3 assets have never been provided nor is there a plan in place to do so.

[5] The CVPIA also addresses pricing policies, contract renewal, water marketing and water conservation issues. All of these elements have been subject to at least some degree of controversy and have faced difficulties in their implementation.

[6] Anadromous fish live in the ocean but return to freshwater to breed. Most of the focus of the AFRP has been on the four runs of salmon native to the Central Valley: winter run, spring run, fall run and late-fall run. The AFRP lists as a primary purpose the doubling of the natural production of anadromous fish (an objective not met by the 2002 target date).

[7] Thoroughly addressing the use of Section B3 of the CVPIA is beyond the scope of this report. To date, the use of this tool has been limited.

[8] The EPA has no authority to directly affect water rights under the Clean Water Act but the practical consequence of requiring salinity reduction in the estuary is that outflows would need to be increased.

[9] Other "local" water projects, in both the Sacramento and San Joaquin basins, have negotiated for the sale of water, both as transfers to other agencies or for environmental protection, but have not been required to make any uncompensated contributions. For example, a group of water agencies have formed the San Joaquin River Group Authority to provide additional spring flows at Vernalis to assist with outmigration of salmon.

[10] X2 is the location, measured in kilometers from the Golden Gate Bridge, where average daily salinity is 2 parts per thousand. The scientific underpinnings of the X2 standard were established in a series of workshops. See "Managing Freshwater Discharge to the San Francisco Bay/Sacramento-San Joaquin Delta: The Scientific Basis for the Estuarine Standard," San Francisco Estuary Project, 1993, J.R. Schubel et al.

[11] The Vernalis Adaptive Management Plan (VAMP) is an experiment to determine the extent to which flows and exports impact San Joaquin River juvenile salmon survival as they outmigrate. The purpose of VAMP is to support the outmigration of San Joaquin River salmon and reduce exports at the federal and state pumps between April 15 and May 15 (or when San Joaquin smolts tend to be outmigrating). Challenges to VAMP that point out its inadequacies in meeting the salmon doubling objective on the San Joaquin River have not been squarely addressed by the SWRCB.

[12] The CVPIA states that the AFRP's primary purpose is to double populations of anadromous fish, leaving water quality objectives in the Bay-Delta and Endangered Species Act compliance as secondary purposes. The Court of Appeals later ruled that the Interior Department did in fact need to apply the CVPIA's primary purpose of giving anadromous fish first priority. The Interior Department has issued no ruling clarifying its adherence to the ruling, but did dedicate additional supplies to its WQCP obligations beyond the B2 account in 2004.

[13] EWA data was provided by the Department of Water Resources. CVPIA data was provided by the U.S. Bureau of Reclamation. Environmental Defense applied Interior's 1999 Decision to the Bureau's data for 2002–2004.

[14] Review of the 2003–04 Environmental Water Account (EWA). Submitted by the 2004 EWA Technical Review Panel, January 17, 2005.

[15] A target of $50 million annually for the EWA was initially proposed in "California's Water Future: A Framework for Action", released in June 2000 shortly before the CALFED Plan. This original estimate assumed that more than 80% of purchased supplies would be acquired south-of-Delta. Water managers have found it to be more cost-effective to purchase water north-of-Delta and move it south through the Delta export pumps when monitoring indicates that relatively few fish will be entrained in the Delta export pumps.

[16] Availability of willing sellers has not been the problem. Acquiring funding to pay the sellers has been the challenge.

[17] Whether bond funds were intended to be spent on annual operations, rather than on long-term or permanent capital improvements or acquisitions is an issue that has not explicitly been addressed in CALFED's decision-making.

[18] Summary of interagency "Data Assessment Team" conference call February 1, 2005.

[19] The acquisition of assets and assurance of reliable supplies need not be identical to those defined in CALFED's EWA. The key is to assure a sustainable and reliable supply of environmental water for the purpose of flexible and prescriptive actions for optimum environmental protection.

[20] CALFED Programmatic Record of Decision, August 28, 2000, p. 57.

[21] Formally titled "Draft Proposition Concerning CVP/SWP Integrated Operations", the Napa Proposition was made available to the public in August 2003.

[22] The California Resources Agency tends to agree with this suggestion. See January 15, 2005 letter from California's Department of Water Resources and Department of Fish and Game to the U.S. Bureau of Reclamation and the U.S. Fish & Wildlife Service regarding "Integration of Central Valley Project Improvement Act Actions with the Environmental Water Account."

[23] This amount of reoperation often approaches 195,000 acre-feet since the CVP no longer makes releases to support its own exports through "D1485 Wheeling" at the state's pumps in late summer. The CVP's export reductions at that time are properly considered to be charges to the B2 account.

LETTER 21

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Attachment 14

LETTER 21

NATURAL RESOURCES DEFENSE COUNCIL

December 10, 2007

Ms. Sammie Cervantes
Bureau of Reclamation
2800 Cottage Way, MP-140
Sacramento, CA 95825
scervantes@mp.usbr.gov

VIA ELECTRONIC AND U.S. MAIL

Re: Comments on the Draft Supplemental EIS/EIR for Extending the Environmental Water Account and OCAP Consultations

Dear Ms. Cervantes:

We are writing on behalf of the Natural Resources Defense Council (NRDC) and its more than 120,000 members in California with regard to the draft supplemental EIS/EIR ("DSEIS/EIR") for the Environmental Water Account ("EWA"). The DSEIS/EIR proposes to extend the existing EWA program, which is currently set to expire at the end of 2007, for another four years, through 2011. The U.S. Bureau of Reclamation and the California Department of Water Resources, the co-lead agencies for the DSEIS/EIR, propose to take this action without providing any analysis of how the EWA has functioned since its inception in 2001 or whether the EWA has succeeded in achieving its stated fish protection purposes. In fact, the EWA has *not* functioned as envisioned and, by placing artificial restraints on the amount of water ostensibly available for fish protection, has contributed to the *decline* of imperiled fish in the Delta, most of which are in worse condition today than they were in 2001. For these reasons, we urge the agencies to discontinue the failed experiment of the EWA, and to devote the taxpayer resources currently dedicated to the EWA to actions that could provide a real benefit to imperiled fish.

In previous biological opinions on the joint operations of the Central Valley Project and State Water Project (i.e., the "Operating Criteria and Plan" or "OCAP"), the agencies have considered the EWA a central feature to mitigate the harmful impacts of the projects on listed fish. The Bureau has reinitiated consultation on those OCAP biological opinions, and those reconsultations are ongoing. Apparently, the agencies have not yet defined the "project" for this reconsultation and it is unclear whether the agencies are contemplating including the EWA in the new project description. Because the EWA has failed to function as a fish protective measure and should not be considered an effective mitigation or conservation tool in the new biological opinions, we seek consideration of these comments in those ongoing consultations as well. Likewise, we request that this information be incorporated, by DWR and DFG, into efforts to comply with the requirements of CESA.

I. THE EWA HAS NOT FUNCTIONED AS ENVISIONED

There is no doubt that in past years the water promised for fish protection through both the Environmental Water Account and the CVPIA (b)(2) account has been significantly less than what was promised in the CALFED ROD. *Finding the Water: New Water Supply Opportunities to Revive the San Francisco Bay-Delta*, Environmental Defense, 2005 (appended as Exhibit 1). From 2001-2004, the EWA provided only 29% on average of the expected 195,000 acre-feet of operational assets. *Id.* at 12-13. Collectively, the EWA and b(2) have contributed as much as 500,000 acre-feet *less* water per year towards fish protection and restoration than anticipated in the CALFED ROD. These shortfalls have occurred while exports from the Delta have reached record high levels and the ecosystem has continued spiraling downward. Clearly, the EWA experiment has not performed as planned.

The failure of the EWA to function as envisioned is epitomized in the failure of the agencies to invoke Tier 3 this year – the intended backstop for any shortfall in EWA assets. EWA Tier 3 was supposed to ensure that if EWA was underfunded or failed to perform as anticipated (both of which have happened), sufficient water would be provided to ensure no jeopardy to listed fish. As explained in the Tier 3 Protocol, a copy of which is appended hereto as Exhibit 2:

> As part of the MSCS Conservation Agreement and the FWS and NMFS biological opinions, the CALFED agencies have provided a commitment, *subject to specified conditions and legal requirements,* that for the first four years of Stage 1, there will be no reductions, beyond existing regulatory levels, in CVP or SWP Delta exports resulting from measures to protect fish under FESA and CESA. *This commitment is based on the availability of three tiers of assets:*
>
> ...
>
> Tier 3 is based upon the commitment and ability of the CALFED Agencies to make additional water available should it be needed.
>
> ...
>
> Tier 3 is a fail-safe device, intended to be used only when Tier 1 and Tier 2 are insufficient to avoid jeopardy to the continued existence of an endangered or threatened species.
>
> ...
>
> The State and Federal Projects will be responsible for making preparations for the activation of Tier 3.

(Emphasis added). This language makes clear that the assurances provided under CALFED, and the ESA and CESA compliance of the EWA, were dependent upon the existence and availability of these Tier 3 assets.

Unfortunately, when the time came to call upon this Tier 3 "fail-safe", the agencies failed to trigger it, ensuring that listed species rather than water users would suffer the consequences of the failure of the EWA to live up to its stated purpose. There can be no question that Tier 1 and Tier 2 have been and are insufficient to avoid jeopardy to the threatened delta smelt. A federal court held in May of this year that the "delta smelt is indisputably in jeopardy as to its survival and recovery." *NRDC v. Kempthorne*, Order on Summary Judgment at 119 (May 25, 2007). This finding echoes the findings of several expert fisheries biologists, including staff of many

state and federal agencies. *See, e.g.*, DSWG Briefing Statement (May 15, 2007) ("the species has become critically imperiled and an emergency response is warranted") (attached hereto as Exhibit 3); Statement Presented by Ryan Broddrick, Director, CDFG, to House Subcommittee on Water and Power (July 2, 2007) ("it is DFG's position that actions must be taken to protect as many individual smelt as can be through manipulation of the water projects. Each reproducing organism is important to the survival of the species.") (appended hereto as Exhibit 4). Despite these findings and the continued take of large numbers of delta smelt at the Project pumps this past summer, *see* delta smelt May, June and July take tables (appended hereto as Exhibit 5), the Project agencies obstinately refused to invoke Tier 3.

Inexplicably, the DSEIS/EIR makes no mention of this breakdown of the EWA's "fail-safe", nor does it describe or analyze the historical shortfalls of the EWA or the program's failure to function as envisioned. These shortcomings are far more relevant to the foreseeable impacts of extending the program than any of the purely hypothetical modeled impacts contained in the DSEIS/EIR. The DSEIS/EIR must be revised to address these issues. Further, these historical realities belie the statement in DSEIS/EIR that "[i]f pumping would be likely to put at risk the continued existence of a species listed as endangered or threatened under the Endangered Species Act (ESA), the Project Agencies would curtail pumping even if purchases already totaled 600,000 acre-feet and all assets were used." DSEIS/EIR at ES-5. This is precisely the situation that presented itself to the Project Agencies this summer, and the agencies failed to curtail pumping once EWA assets were depleted even though continued pumping threatened the continued existence of the delta smelt.

Moreover, the DSEIS/EIR seeks to utilize the ESA/CESA process for coverage of the EWA initially established in the CALFED ROD, without addressing any of these fundamental failures of the process to operate as envisioned and which were essential to the CALFED analysis. *See generally* DSEIS/EIR Appendix C.[1] For example, Tier 3 no longer exists as a viable "fail-safe device." Yet, the CALFED assurances were explicitly "based on the availability of three tiers of assets." Tier 3 Protocol. The DSEIS/EIR makes passing reference to this change, obliquely noting that "[b]ased on current circumstances, these three tiers are no longer an accurate way to describe EWA assets." DSEIS/EIR at 2-4. But the document fails to acknowledge the implications of omitting this critical "fail-safe device" or to describe the replacement structure of the EWA going forward.

In short, the DSEIS/EIR fails to adequately describe the project to decisionmakers and the public or to disclose the environmental impacts associated with the policy choice of extending the EWA. The document should be revised to correct these shortcomings. We believe that an accurate description and assessment of the EWA will demonstrate that the program should not be extended.

[1] The DSEIS/EIR also fails entirely to discuss the state court decision finding that DWR lacks the necessary CESA coverage for operation of the SWP, which also likely impacts the CESA analysis in Appendix C. It is unclear, for example, how EWA assets pumped through the SWP facilities at Clifton Court forebay and Banks pumping plant have CESA take authority when the court found that the SWP lacked any take authority for its pumping operations. The DSEIS/EIR must be revised to address this issue.

II. THE EWA HAS LIMITED, RATHER THAN EXPANDED, THE AMOUNT OF WATER AVAILABLE FOR IMPERILED FISH

Since shortly after the first EWA ROD was signed in 2004, the program has been used as an excuse by the agencies to deny needed water to imperiled fish rather than to help protect and recover imperiled fish. For example, in February 2005, when delta smelt populations were at then-record low levels, fishery biologists recommended that exports be curtailed to reduce entrainment. However, because EWA supplies were scarce, project managers did not curtail exports as much or as long as was requested. *Compare* "Data Assessment Team" call notes (Feb. 1, 2005) (recommending combined exports be reduced to 1500 cfs for one week) (appended hereto as Exhibit 6, without attachments) *with* CVO smelt report (February 2005) (showing much higher combined export levels) (appended as Exhibit 7). Hundreds of delta smelt were taken at the pumps as a result. *Id.* The lawful and proper course of action would have been for the agencies to fully implement the recommended action, and then use non-EWA project water to meet fish needs later in the year if EWA supplies ran short. Instead, the program has been implemented to turn this requirement on its head, and to short fish without any consideration given to imposing uncompensated reductions on project contractors and other water users.

Unfortunately, the agencies have continued this pattern of using limited EWA assets to deny needed fish protection actions. In 2006, as the delta smelt continued its unparalleled decline in abundance, the Delta Smelt Working Group ("DSWG") evaluated a range of protective actions that could be taken to lessen the impacts of water project operations. One action that was evaluated was to address fall (September-December) Delta salinity levels by making releases from upstream reservoirs to increase Delta outflows. The discussions and analyses of this proposed action are reported in DSWG notes for July 10 (see also the notes from August 21, and Sept 26 (appended hereto as Exhibits 8). The DSWG determined that the fall action had a high likelihood of being successfully implemented and that the scientific basis for the action was supported by statistically significant correlations.

Ultimately, the fall action was not taken because it was determined that "the amounts of water needed to demonstrably improve fall habitat quantity/quality [were] unavailable". Based on analyses provided by DWR, the amount of water necessary for maintaining net Delta outflows at 7000 cfs for the September-December period would range from only 170-433 TAF. DSWG notes (Aug. 21, 2006). As a result of not taking this action, Delta outflows steadily declined, falling below 6000 cfs in October, and salinity levels shifted upstream of 80 km, the critical threshold identified by the DSWG for delta smelt habitat quality and subsequent abundance. Delta smelt abundance plummeted to a new record low the following year, indicating that the fisheries agencies were not sufficiently addressing adverse habitat conditions in the Delta and other stressors to ensure the delta smelt's survival and recovery.

Perceived unavailability of water assets was also the reason behind the DSWG rejecting a protective action in winter 2006 intended to set net flows in Old and Middle Rivers to zero cfs to better protect pre-spawning adults. Low San Joaquin River inflows and negative flows on Old and Middle Rivers, concurrent with high export rates, are likely creating hydrodynamic conditions that draw greater numbers of fish to the pumps and correspond to significantly higher

salvage rates. Protection of these biologically valuable spawning adult fish is essential for recovery and sustainability of this at-risk species. Despite the expected benefit of taking this action, it was rejected because "DWR staff have derived estimates of the water costs of the potential actions in the Resources Agency POD Action Matrix and found that the proposed winter action could consume all available environmental water, leaving no assets for spring actions for larvae or juveniles." DSWG notes (Dec. 11, 2006) (appended as Exhibit 9); *see also* DSWG notes (Oct. 10, 2006) ("The Working Group notes that some of the weaknesses of the DFG plan included the potential to exhaust all EWA and B2 assets in winter, leaving nothing in reserve for spring actions") (appended as Exhibit 10).

More recently, NMFS' biologists testified against taking actions to protect delta smelt based on a similar misperception that the total amount of water available to protect imperiled salmonids was limited to a pot of "environmental water" defined by EWA and b(2) assets, and that water used to protect smelt would necessarily deplete the amount of water available to protect salmon. *See* Declaration of Bruce Oppenheim in *NRDC v. Kempthorne* ((June 15, 2007) (appended as Exhibit 11). For example, Mr. Oppenheim explained that "the use of environmental water after VAMP on the San Joaquin River may have consequences later in the year on the Sacramento River." *Id.* at 3. This statement is only true if there is a limited pot of "environmental water" available to meet all fisheries needs – a position that is contrary to numerous requirements of state and federal law.

All of these decisions are based on the incorrect assumption that the amount of water available to protect listed fish species is limited to the assets of the EWA, CVPIA b(2), and other sources of water "dedicated" to the environment. The Bureau has perpetuated this fallacy, asserting that it must meet the needs of CVP contractors before meeting the needs of listed fish species. *See* Declaration of Ronald Milligan in *NRDC v. Kempthorne* (June 21, 2007) ("Reclamation operates New Melones to meet … project needs of the East Side Division CVP contractors" which leaves "no additional water available for out of basin releases from New Melones Reservoir" even if needed to prevent jeopardy to listed delta smelt) (appended as Exhibit 12); *see also see also* Transcript of Hearing re Interim Remedies Day 7, *NRDC v. Kempthorne*, Testimony of Ronald Milligan at 1553-54 (Aug. 31, 2007) (explaining that the WOMT rejected some recommendations of the DSWG because of concerns regarding "the ability for the EWA to function in a manner that it could, in essence, pay back the projects for curtailments without impacting operations in the long term sense or allocations to contractors") (appended as Exhibit 13). Similarly, DWR has asserted that it has no additional water available for fish protection, while simultaneously making hundreds of thousands of acre-feet of surplus "Article 21" and "turnback pool" water available to water users and contractors.

This presumed EWA limitation on the amount of water available to protect fish is simply not correct. Numerous courts have made it abundantly clear that the Bureau and DWR must provide sufficient water to protect and recover listed fish species, whether it exceeds the amount of the water the agencies may have earmarked for that purpose or not. *See, e.g., NRDC v. Kempthorne*, Order on Summary Judgment at 61 (May 25, 2007) ("The EWA is simply a means by which the SWP and CVP can obtain water by purchasing it from willing sellers. …If money is unavailable to fund the EWA, Defendants are nonetheless required to prevent smelt take from exceeding permissible take limits. … [I]f all else fails, [additional] assets may be brought to bear, which

include 'additional purchased or operational assets, funding to secure additional assets if needed, or project water if funding or assets are unavailable.'") (emphasis in original).

The agencies have turned the EWA on its head and, instead of using it to supplement the resources needed *and required* for fish protection, have used it as an excuse to short the environment and avoid committing those mandatory resources. Unless the agencies make very clear that limited EWA assets cannot be used as a reason not to take an action that would help protect or restore imperiled fish, it should be discontinued.

III. THE ANALYSIS FAILS TO DEMONSTRATE THAT THE EWA HELPS PROTECT AT-RISK FISH SPECIES AND CONTRIBUTE TO THEIR RECOVERY

In addition to the problems discussed above, the DSEIS/EIR fails to provide adequate support for its conclusion that extending the EWA would benefit fish protection and restoration.

First, the document recognizes in several places that a pumping "window" during which EWA assets may be pumped out of the Delta without increasing adverse impacts to listed fish no longer exists. The document explains that "[t]he EWA protects fish at the pumps by reducing pumping when it would help at-risk fish species, then transferring EWA assets across the Delta at other times to repay CVP and SWP users for water lost during pump reductions." DSEIS/EIR at 2-15. The DSEIS/EIR asserts that EWA assets should be used to reduce export pumping to protect fish from the months of December through July. DSEIS/EIR at 2-10 to 2-11. This proposal allows exports to increase to allow delivery of EWA water during the months of August through November. But several imperiled species are vulnerable to take at the pumps during this late summer/fall period. *See id.* at 2-13, 4-15. Moreover, the document notes that the alarming and continuing decline in four pelagic organisms in the Delta have corresponded to a period of "increased exports during June through December." DSEIS/EIR at 4-11. In addition, recent studies have indicated that decreased Delta inflows in late fall and winter may result in reductions in fall habitat quality and eastward movement of X2, which may result in adverse impacts to fish. DSEIS/EIR at 4-13. Thus, it is unclear when a safe pumping window exists for EWA to increase Delta exports. Instead, it is likely that an extended EWA would simply help sustain the current record high levels of exports pumped out of the Delta – export levels that have corresponded to many of the declining fish populations in the Delta. *See, e.g., id.* at B-3 to B-4 (Banks pumping would increase in July, August, and September to convey EWA assets).

Second, the DSEIS/EIR assumes with no support that "[w]hile the fish actions in … revised biological opinions [that are currently being developed for project operations] are unknown, they would likely be less than with the EWA program." DSEIS/EIR at ES-4. This statement reflects a fundamental misunderstanding of the nature of ESA and CESA requirements, which *mandate* that project operations cause no jeopardy to the existence *or recovery* of listed species, cause no adverse modification of critical habitat for survival *or recovery* of listed species, and that the impacts of project take be minimized and fully mitigated. In addition, Section 7 also imposes an affirmative obligation on federal agencies to "utilize their authorities in furtherance of the purposes of this chapter by carrying out programs for the conservation of endangered species and threatened species listed" under the Act. 16 U.S.C. § 1536(a)(1). A program of "conservation" is one that brings the species to the point of recovery and delisting. *Id.* § 1532(3). In short, the

project agencies are obligated to protect, recover and conserve listed species, whether or not the EWA is in place.

Third, the DSEIS/EIR explicitly bases its analysis of fish actions on the invalidated, reinitiated, and discredited OCAP biological opinions, claiming that it "would be speculative to assume that the fish actions in the BO will be the same as those described by Judge Wanger because the BO will be based on a comprehensive review of all available information and science." DSEIS/EIR at 1-6. In reality, Judge Wanger's decision is based on a more comprehensive and current review of the science regarding the delta smelt than the invalidated BO, which failed even to acknowledge the precipitous decline of the delta smelt in recent years. In addition, the OCAP BO on listed salmonids has been discredited by more than three independent science reviews, including a CALFED review panel, which concluded that the BO was not based on the best available science. The DSEIS/EIR's reliance on the fish actions encompassed in these discredited BOs for the basis of its analysis lacks a reasonable basis.

Fourth, the Bureau has reinitiated consultation with the U.S. Fish and Wildlife Service and the National Marine Fisheries Service on the OCAP. That consultation is ongoing. Until the Bureau meets the requirements of ESA §7 and, among other things, obtains a valid biological opinion at the conclusion of consultation, the ESA § 7(d) prohibition on making any irreversible and irretrievable commitment of resources applies to the Bureau's actions. Regional Director Kirk Rodgers has correctly recognized that reauthorization of the EWA during the pendency of the OCAP consultations would be a violation of §7(d), and has (twice) sworn to a federal court that such authorization would not occur before completion of the new BOs. *See* Declaration of Kirk Rodgers (Oct. 18, 2006), Declaration of Kirk Rodgers (July 9, 2007) (appended hereto as Exhibit 14). Reauthorization of the EWA as proposed in the DSEIS/EIR runs afoul of the 7(d) prohibition and contradicts Mr. Rodgers sworn statements in the pending OCAP lawsuits.

Finally, the DSEIS/EIR concludes that continuation of the EWA "would have a less than significant impact on X2 location during June through December." DSEIS/EIR at ES-9. However, as the document recognizes, emerging science indicates that moving X2 westward of its recent historic location in the fall could have a significant beneficial impact on listed species and their habitat. By reducing outflow in the fall, EWA could have a significantly detrimental impact on the ability of agencies to meet this new threshold.

IV. THE ANALYSIS FAILS TO EVALUATE THE EWA'S FAILURE TO ASSIST IN ECOSYTEM RESTORATION BEYOND ESA/CESA COMPLIANCE

To date, as discussed above, the EWA has primarily, even exclusively, been operated to limit protective ESA/CESA actions. However, the failure of the EWA extends even farther. The EWA was intended to "provide water for the protection and recovery of fish." CALFED Programmatic ROD at 54. Note that these benefits are not restricted to listed species. The ROD also states that the EWA will "acquire water for ecosystem and species recovery needs." CALFED ROD NCCP Determination at 21. Thus, the EWA was intended as a tool to provide restoration benefits beyond the requirements of ESA/CESA for listed species. These benefits were an important part of the Ecosystem Restoration Program and were the justification for

public funding for the EWA. The document does not analyze the failure of the EWA to provide these anticipated benefits.

Indeed, far from facilitating improved ecosystem health, by limiting ESA/CESA actions and by increasing diversions during the August to November period, the EWA has damaged ecosystem health. This failure is indicated by the fact that non-listed species, such as threadfin shad, are showing the same decline affecting listed species such as the delta smelt and that the Pelagic Organism Decline process has identified "water project operations" as a potential cause of the decline of Delta fishes. *See* Interagency Ecological Program 2006-2007 Work Plan to Evaluate the Decline of Pelagic Species in the Upper San Francisco Estuary (January 12, 2007) at 4 (appended hereto as Exhibit 15). The document does include one, inadequate mention of these impacts, by concluding that "(t)he entrainment indices for threadfin shad and American shad would be increase." DEIS/EIR at 4-36. Clearly, the EWA has undermined, rather than facilitated, the CALFED ecosystem restoration goal.

The document must be revised to fully and adequately evaluate the failure of the EWA to contribute to fisheries and ecosystem restoration beyond the requirements of ESA/CESA.

V. THE ANALYSIS FAILS TO EVALUATE THE EWA'S FUTURE USEFULNESS TO FACILITATE "REAL TIME" MANAGEMENT

The EWA was also intended to provide "real time diversion management" of Delta flows and the CVP and SWP Delta pumps. CALFED ROD NCCP Determination at 29. Such real time management assumes that the EWA has enough flexibility to modify Delta flows and the management of the projects beyond the relatively fixed prescriptive requirements of ESA/CESA compliance. The document fails to analyze the extent to which the EWA will provide such flexibility to achieve additional ecosystem or protective measures. Unless the management priorities or assets of the EWA are changed dramatically (a change that this document does not anticipate) it appears unlikely that the EWA will have much, if any, flexibility to provide additional protective measures. To the contrary, to the extent that the EWA provides real time management, this flexibility is designed to increase pumping, potentially causing additional impacts to the ecosystem, and designed solely to provide additional water supplies for South of Delta CVP and SWP contractors.

VI. THE FAILURE TO ANALYZE PAST PERFORMACE UNDERMINES A FUNDAMENTAL PURPOSE OF THE EWA -- TO FAILITATE ADAPTIVE MANAGEMENT

The CALFED ROD was designed with science-based adaptive management as a "central feature." CALFED Programmatic ROD at 4. This document repeats this assertion that "(a)daptive management is a key component of the EWA," and that "(a)daptive management provides a process to change fish actions or asset acquisitions." DSEIS/EIR at page 2-24. The careful evaluation of the past performance of management tools is the defining feature of adaptive management, in order to allow improved, adaptive future management. Indeed, the ROD explicitly commits CALFED agencies to "assess the success of EWA operations." CALFED ROD EWA Operating Principles Agreement at 4. Without such analysis, agencies

cannot "adapt" the management of the program in a manner that builds on past successes and responds to failures. The analysis of past performance of the EWA as an adaptive management tool is critical to the central purpose of this document – extending the EWA into the future. Such analysis is also important to agencies, such as the Delta Vision Task Force, the Bay-Delta Conservation Plan process, the Department of Fish and Game, NOAA Fisheries and the Fish and Wildlife Service, which may consider the merits of incorporating the EWA into future management for the Delta. Finally, such analysis is essential to the legislature and the Administration as they consider the justification for public funding for the EWA. An analysis of the past performance of the EWA will reveal that there is no justification for such continued public funding. As discussed above, the document fails to analyze past performance, a failure that cuts to the core of the purpose of the EWA as an adaptive management tool. The document must be revised to fully and accurately analyze the effectiveness of the EWA as an adaptive management tool.

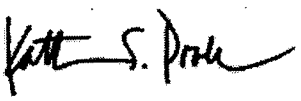
VII. THE DOCUMENT FAILS TO DESCRIBE ACCURATELY THE PROJECT PURPOSE

As discussed above, the document does not adequately analyze the EWA's failure to engage in real time management and adaptive management, to ensure ESA/CESA compliance and to contribute to broader ecosystem restoration. The document also does not include any meaningful provisions to address these failures. The document, however, largely maintains the old, inaccurate description of the purpose of the EWA. DSEIS/EIR at page 2-3. Thus, the document fails to adequately describe the purpose of the project. At the moment, the actual purpose of the EWA appears to be to limit protective actions under ESA and CESA, and to provide additional water supplies to south of Delta water contractors. The document should be revised to include an accurate description of the project.

VIII. CONCLUSION

In light of these many shortcomings in the operation of the EWA and the analysis of the DSEIS/EIR, we urge you to reject the proposal to extend the program beyond the end of 2007. In the alternative, we urge you to withdraw this document and issue a new, adequate draft that addresses the concerns outlined above.

Sincerely,



Katherine S. Poole
Senior Attorney

Barry Nelson
Senior Policy Analyst

Cc: Cay Goude, USFWS
Maria Rea, NMFS
John McCammon, DFG
Lester Snow, DWR

Attachment 14-A

EXHIBIT 2

Provisional
Updated April 26, 2004

TIER 3 PROTOCOL

Interrelationship of Tier 2 and Tier 3

Tier 3 is referenced on pages 57 and 58 of the CALFED August 2000 Record of Decision (ROD) in the following context:

> ***ESA Commitments***
>
> *As part of the MSCS Conservation Agreement and the FWS and NMFS biological opinions, the CALFED Agencies have provided a commitment, subject to specified conditions and legal requirements, that for the first four years of Stage 1, there will be no reductions, beyond existing regulatory levels, in CVP or SWP Delta exports resulting from measures to protect fish under FESA and CESA. This commitment is based on the availability of three tiers of assets:*
>
> ***Tier 1** is baseline water, provided by existing regulation and operational flexibility as described above. The regulatory baseline consists of the biological opinions on winter-run salmon and delta smelt, 1995 Delta Water Quality Control Plan, and 800 TAF of CVP Yield pursuant to CVPIA Section 3406(b)(2).*
>
> ***Tier 2** consists of the assets in the EWA combined with the benefits of the ERP and is an insurance mechanism that will allow water to be provided for fish when needed without reducing deliveries to water users. (These assets are shown in the table on page 58 of the ROD). Tier 1 and Tier 2 are, in effect, a water budget for the environment and will be used to avoid the need for Tier 3 assets as described below.*
>
> ***Tier 3** is based upon the commitment and ability of the CALFED Agencies to make additional water available should it be needed. It is unlikely that assets beyond those in Tier 1 and Tier 2 will be needed to meet ESA requirements. However, if further assets are needed in specific circumstances, the third tier will be provided. In considering the need for Tier 3 assets, the fishery agencies will consider the views of an independent science panel. Although the CALFED Agencies do not anticipate needing access to Tier 3 of water assets, the CALFED Agencies will prepare an implementation strategy for Tier 3 by August 2001, establishing a timely scientific panel process and identifying tools and funding should implementation of Tier 3 prove necessary.*

Provisional
Updated April 26, 2004

Tier 3 Protocols

1. **Tier 3 is not an operational reserve for Tier 2.** The CALFED Agencies agree that Tier 3 actions are separate from EWA and that the EWA should not rely upon the existence of Tier 3 assets in its planning or operations. Tier 3 is a fail-safe device, intended to be used only when Tier 1 and Tier 2 are insufficient to avoid jeopardy to the continued existence of an endangered or threatened species.

2. Tier 3 assets will be used when: (1) EWA assets are exhausted (see Item 3); and (2) the Management Agencies determine that jeopardy due to project operations will occur unless additional measures are taken (see Item 4 below).

3. EWA assets are defined as exhausted when all real assets have been used and the limit on borrowing has been reached. The real assets include (1) the purchased assets that are being acquired for 2004; and (2) any operational assets that have been accrued or can reasonably be acquired in the near future. For 2004, the initial limit on borrowing has been established as 100 TAF. This amount represents the amount of water that could be extracted from groundwater in any single year. Additional borrowing may be developed through the year, but would be on a case-by-case basis.

4. The appropriate Management Agencies will make the determination that a species is near jeopardy if project operations are not modified. The Management Agencies will request and consider the views of an independent science panel. At a minimum, this science panel will consist of the two EWA science advisors who are expected to respond within 48 hours. If sufficient time is available, additional independent scientists may be consulted. The Management Agencies have the discretion to take action while awaiting feedback from the science panel.

5. **Tier 3 assets will be used to the extent available to compensate the Projects and water users for impacts to their water supply from actions taken to avoid jeopardy.** If all Tier 3 assets are used, and additional actions are needed to avoid jeopardy, ESA consultation regarding project operations will be re-initiated. The biological opinion on re-initiation will include reasonable and prudent alternatives necessary to avoid jeopardy. Actions to avoid jeopardy will not be limited by the "no harm" principle (i.e.: there is no commitment that all water supply losses can be fully mitigated).

6. **The State and Federal Projects will be responsible for making preparations for the activation of Tier 3.** DWR and USBR are responsible for making preparations for the activation of Tier 3, just as they are responsible for acquiring EWA assets. Such preparations could include the acquisition or identification of water purchase options that could be converted easily into water. The cost of exercising the options would be paid by the Tier 3 fund. The Project Agencies should work cooperatively with the EWAT and other CALFED-related water purchase programs in developing a Tier 3 purchase plan.

Attachment 14-B

EXHIBIT 3

Briefing Statement

From: Delta Smelt Working Group

To: Water Operations Management Team

Date: May 15, 2007

Re: Recommendations for Spring Action

Problem:
To date, the 2007 20-mm Survey for juvenile delta smelt has collected record low numbers of juvenile delta smelt. After the fifth of eight surveys, only 25 individuals have been collected, about 7.7 percent of the 326 taken to this point in 2006, and only 7.1% of the 2000-2006 average of 353. The DSWG has reviewed the progression of catches that typically occur during the course of the 20-mm Survey to evaluate the chance that there will be an upswing in the number of larvae collected later this year that will bring 2007 catches more in line with previous years. The group considers such an increase in catches to be possible but unlikely.

The likelihood of a very low outcome creates a very high degree of concern for the Delta Smelt Working Group. Water temperatures in the Delta have risen above the range wherein the majority of delta smelt spawning occurs, meaning that very little additional spawning is likely to take place this year. Further, the most recent 20-mm Survey results shows that delta smelt are distributed in the central Delta, increasing the risk of entrainment. In fact, the first salvage of delta smelt juveniles were observed at the Federal water export facility on May 11. For an annual species such as delta smelt, failure to recruit a new year-class is an urgent indicator that the species has become critically imperiled and an emergency response is warranted.

Recommendation:
The goal is no further entrainment of delta smelt. To achieve this, the Projects should modify flows to achieve a non-negative daily net flow (meaning daily net flow should not be southward) in Old and Middle River. This should be implemented as soon as possible and continue until southern Delta water temperatures reach 25^0C, the lab-lethal limit.

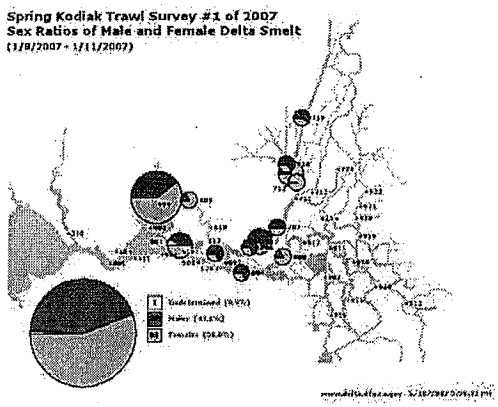
Uncertainties:
(1) The DSWG recognizes that water project operations are not the only forces driving down delta smelt numbers. Although we are confident the proposed action will reduce entrainment, it is uncertain whether it will substantially increase the percentage of this year's recruit class that survives to reproduce next winter. (2) The group also recognizes that it may not be possible, given flows and constraints on Project pumping, to achieve a zero net flow in Old and Middle River. (3) Given that delta smelt densities appear to be near the lower limit at which the 20-mm Survey may reliably detect them, our ability to accurately assess distribution of delta smelt larvae and to evaluate the efficacy of the recommended action is likely to be very low. (4) There is no prescriptive recommendation regarding the Head of Old River Barrier (HORB); however, it is possible that the HORB's influence on OMR flow may be significant. Removing the barrier may therefore be a possible management tool to achieve the Working Group's recommendation.

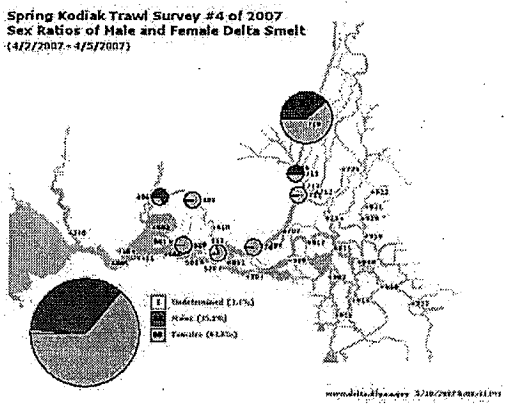
Management Implications:
The water cost of the recommended operational change is presently unknown, but may be significant.

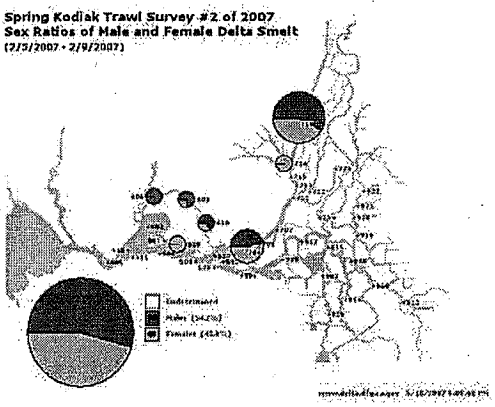
Attachments:

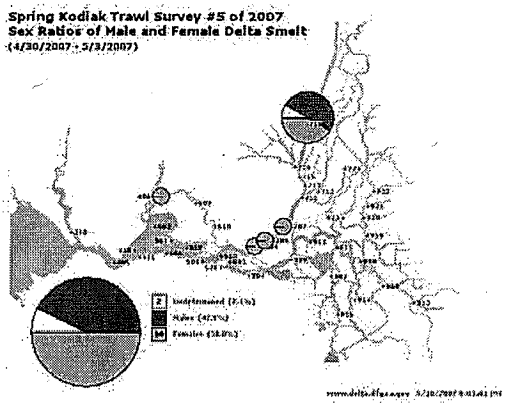
1. Summary of Spring Kodiak Trawl survey for pre-spawning adult delta smelt
2. Summary of 20-mm Trawl survey for juvenile delta smelt
3. Frequency Distribution for 20-mm Survey
4. Frequency Distributions of Delta Smelt in the 20-mm Survey, 1995-2007
5. Frequency Distribution of Delta Smelt in the 20-mm Survey, 1995-2007. Equal scale on x-axis.

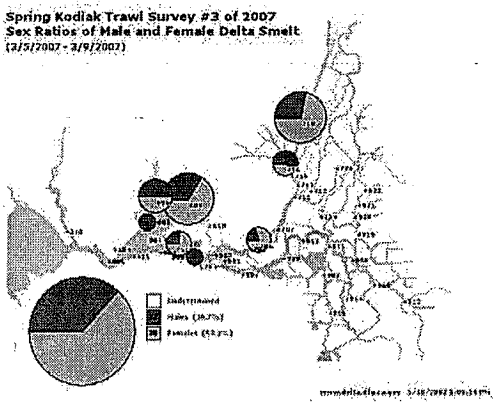
Attachment 1. Summary of Spring Kodiak Trawl survey for pre-spawning adult delta smelt, 2007. Note that the distribution of adult delta smelt appears to be favorable, with regard to risk of entrainment. Overall numbers collected were low relative to previous years.







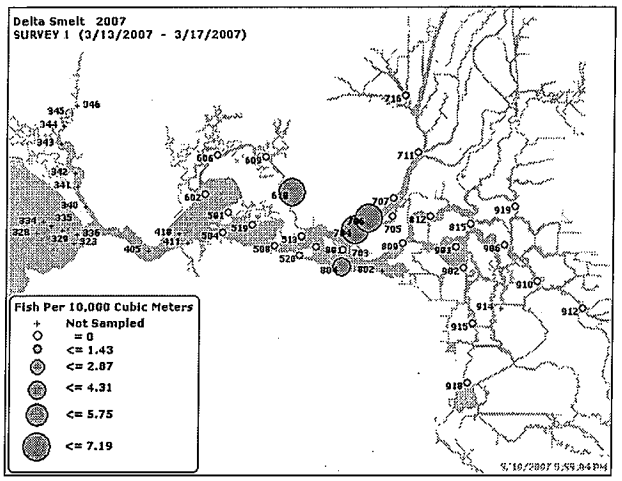


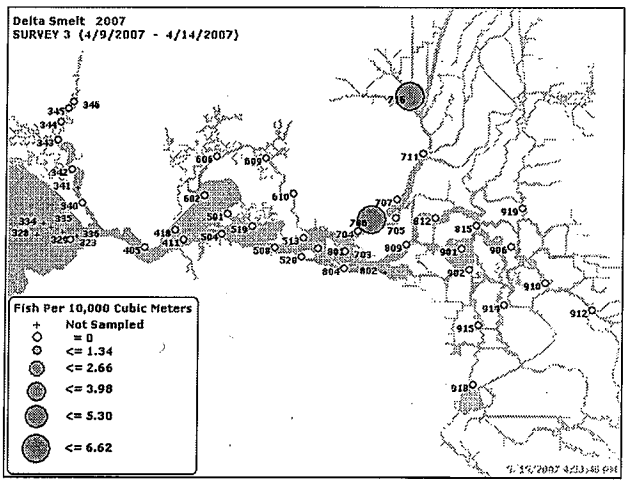


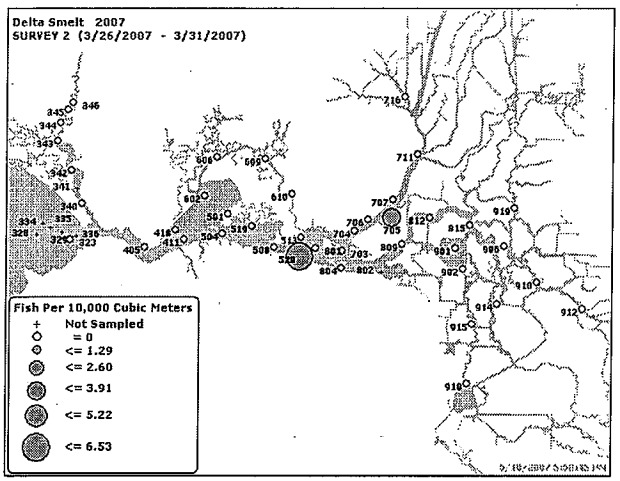
Comparison of SKT surveys, by year

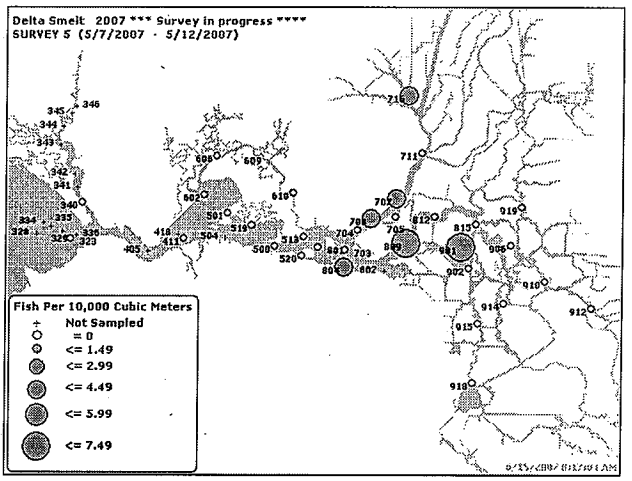
	2007	2006	2005	2004	2003	2002
1	109	42	220	380	232	261
2	107	84	218	300	373	392
3	60	70	27	196	43	238
4	94	77	28	62	33	-
5	28	14	-	13	-	-
N	398	287	493	951	681	891

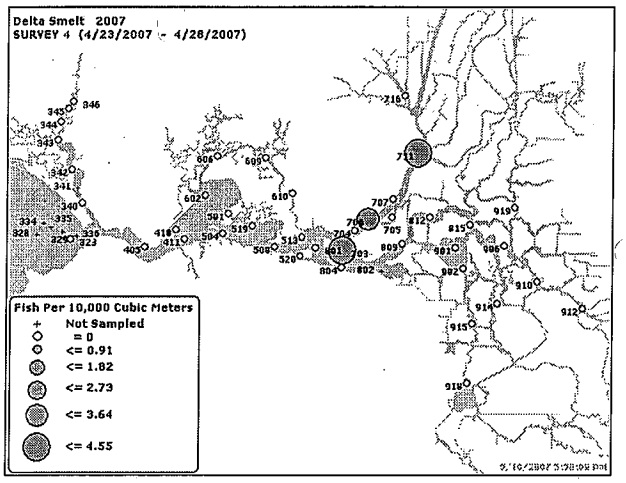
Attachment 2. Summary of 20-mm Trawl survey for juvenile delta smelt, 2007. Early distributions of juveniles were similar to adult distribution as indicated by SKT results, but the latest survey results are less favorable. Overall numbers collected were extremely low relative to previous years.



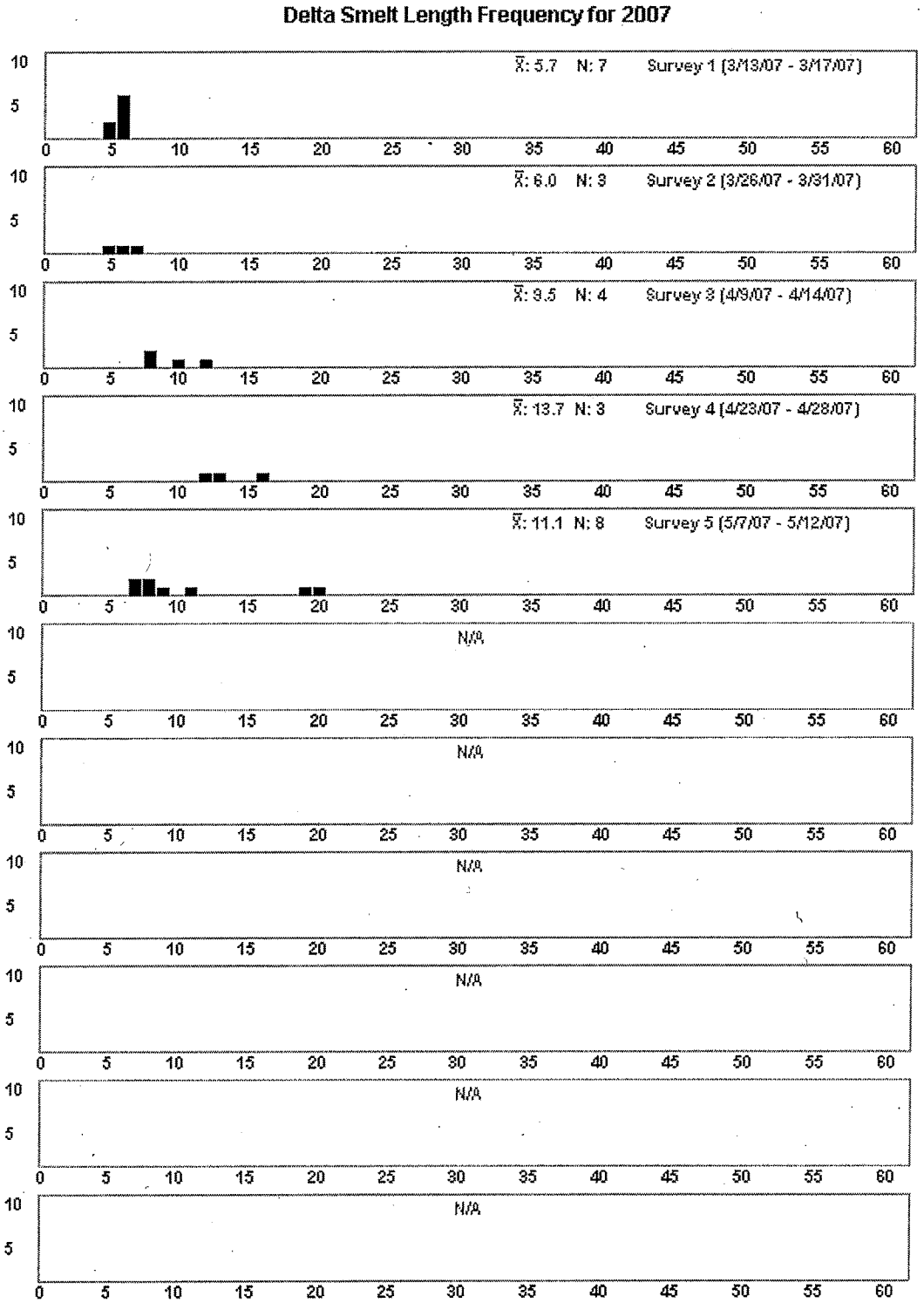




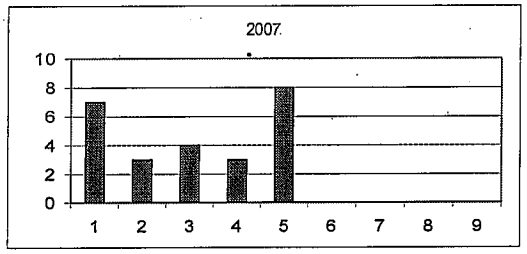


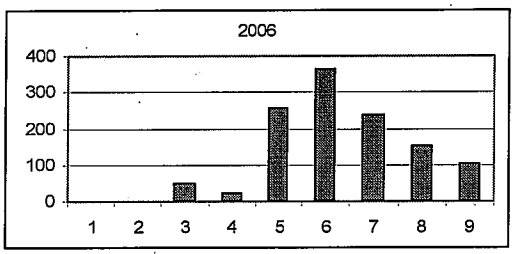


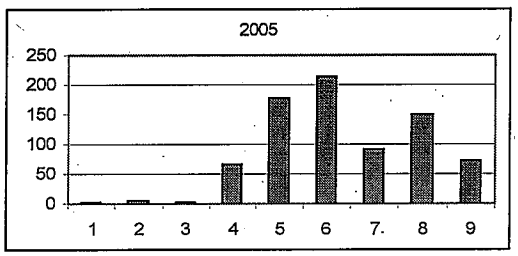
Attachment 3. Frequency Distribution of Catch, 20-mm Survey, 2007.

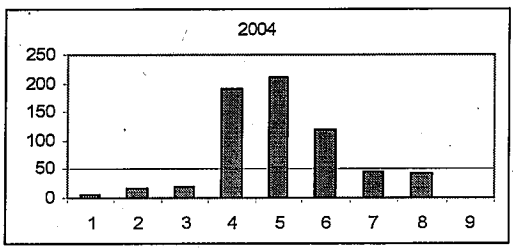


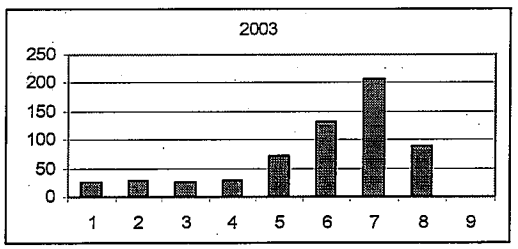
Attachment 4. Frequency Distributions of Delta Smelt in the 20-mm Survey, 1995-2007.

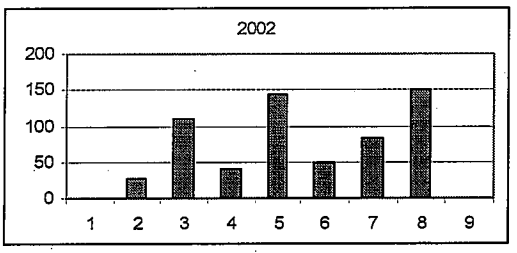


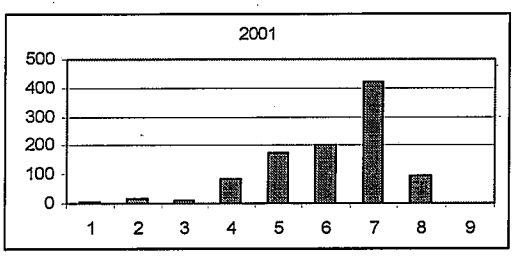


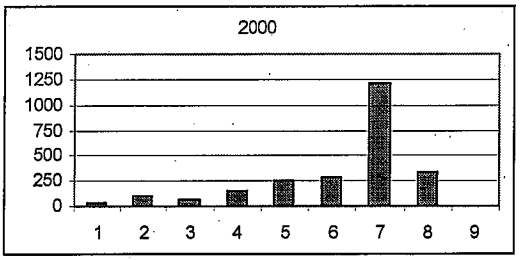


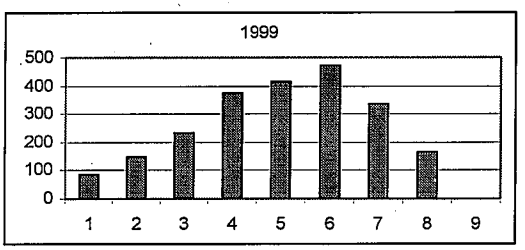


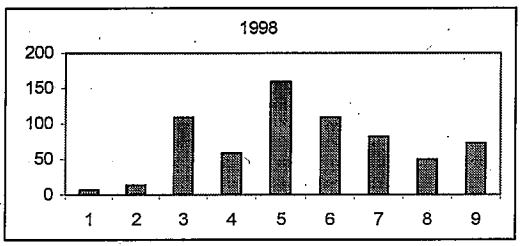


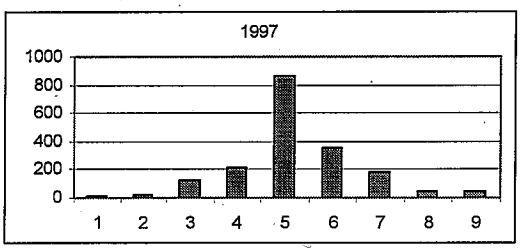


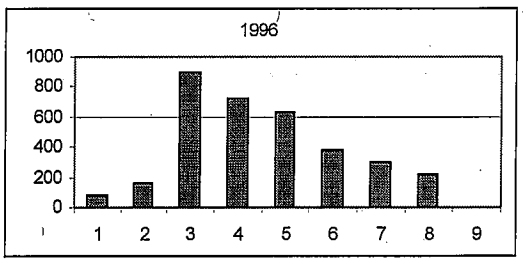


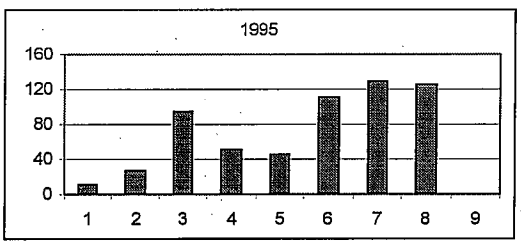






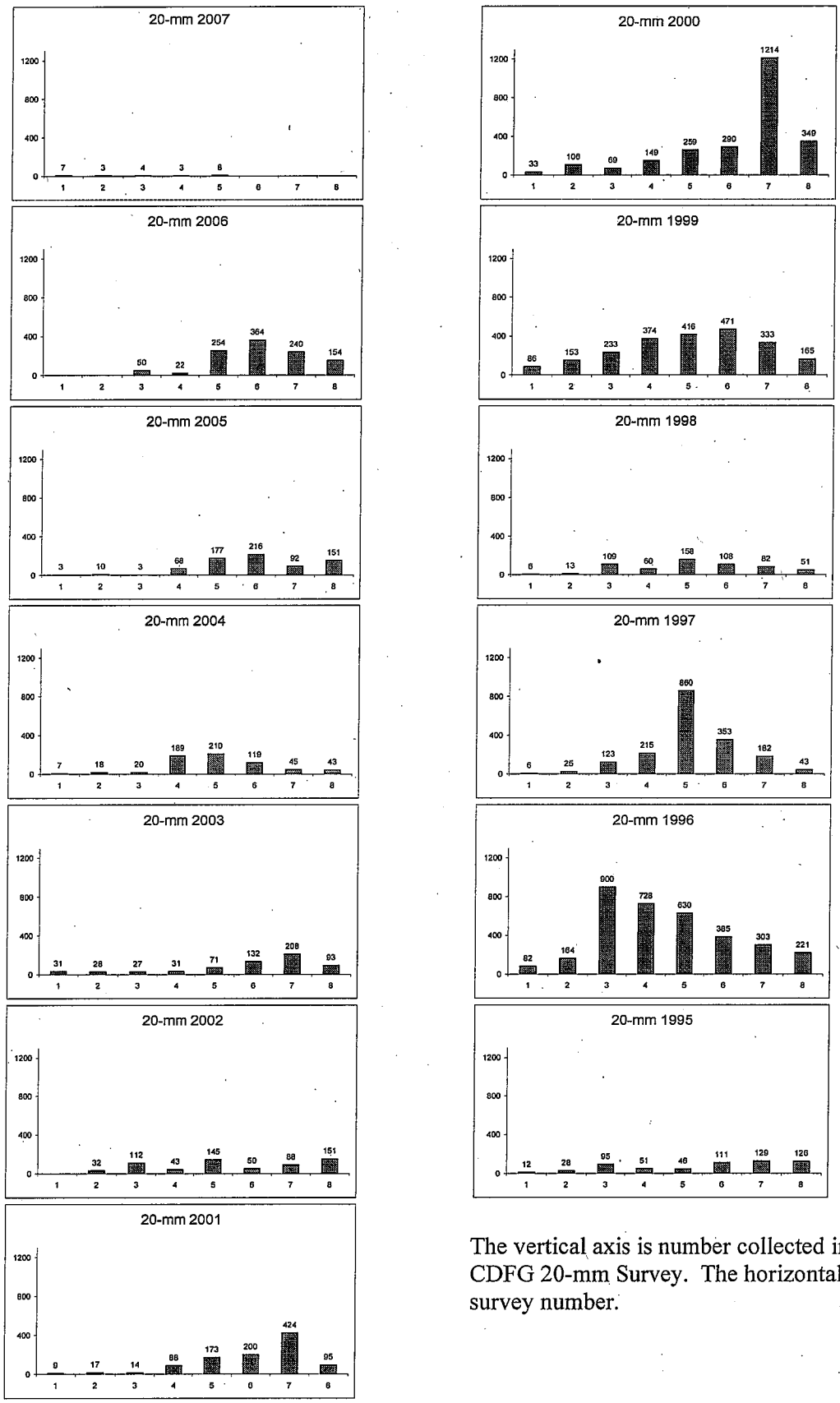






The vertical axis is number collected in the CDFG 20-mm Survey. The horizontal axis is survey number.

Attachment 5. Frequency Distribution of Delta Smelt in the CDFG 20-mm Survey, 1995 to 2007. Equal scale on x-axis.



The vertical axis is number collected in the CDFG 20-mm Survey. The horizontal axis is survey number.

Attachment 14-C

EXHIBIT 4

Statement Presented by
Ryan Broddrick
Director, California Department of Fish and Game
To
U.S. House of Representatives, Committee on Natural Resources
Subcommittee on Water and Power
Oversight Hearing on "Extinction is not a Sustainable Water Policy: The Bay Delta Crisis and the Implications for California Water Management"
July 2, 2007
Vallejo City Council Chambers, Vallejo, California

I appreciate the opportunity to provide input to this Subcommittee on the important and urgent matter of declining fishery resources in the San Francisco Bay/San Joaquin Delta Estuary. Of particular concern to us is the recent serious and unexpected decline (approximately 90%) in young Delta smelt produced this season. As alarming as the reduced numbers are, this decline is part of a more generally observed decline in other important fish and aquatic resources in the estuary. Anadromous fish (steelhead and salmon), sport fish (striped bass), other native fishes, and some important fish food organisms (invertebrates) of the Delta are in serious trouble and have been receiving our attention in planning and regulatory activities. The California Department of Fish and Game is actively involved in efforts to determine causes, implement response measures within our authorities, and develop a long-term strategy for Delta sustainability. The Federal Government's involvement is crucial to developing a comprehensive and long term solution to fix the "broken Delta".

There are many causes for the fish and invertebrate declines and our understanding of these causes is limited. Our cooperative efforts to determine the causes of the decline have pointed towards invasive species, toxics, predation and water diversions as having primary roles in the declining health of the Delta. We continue to monitor, evaluate and explore these issues in order to make further scientifically justified determinations as to the role of each factor and how issues may be addressed in order to ensure future Delta health.

Governor Schwarzenegger has initiated a comprehensive Delta Vision effort to rethink what the Delta should look like in the future. A Blue Ribbon task force has begun meetings designed to lead towards recommendations for actions by the legislature and Governor. In addition, many state and federal agencies, along with a growing number of environmental groups, signed a formal Planning Agreement in September 2006 and are developing the Bay Delta Conservation Plan (BDCP) for at-risk fish species under the provisions of the State Natural Community Conservation Planning Act (NCCPA) and Section 10 of the federal Endangered Species Act. These efforts will provide a framework, plan, and commitment for future action.

Background- The Pelagic Organism Decline

The Interagency Ecological Program (IEP), a multi-agency state and federal group, has monitored and studied biological and hydrological resources in the Estuary for almost 40 years. The data set generated by the IEP is one of the most complete data sets documenting relationships between fish and aquatic resources and water development projects in the world. The information developed during this time has provided the foundation for our understanding of the ecological implications of water resources management in this system. In early 2005, scientists from our IEP first observed serious declines in Delta smelt and certain other pelagic fish species (see Figure 1). In response, directors of the state and federal water and fish agencies directed approximately $2.5 million for establishment of a Pelagic Organism Decline (POD) team to investigate the reasons for the decline. The POD team developed a study plan that identified three likely hypotheses responsible for the observed declines and embarked upon an aggressive and comprehensive effort to identify and address all likely causes for this decline. The three most likely stressors, possibly acting in concert, were identified as water diversions, invasive species/food chain changes, and toxics.

One year after the POD studies began, the team presented their first Synthesis Report and developed two scenarios among other possible causes: winter exports and bad environmental conditions in Suisun Bay. Data from the State and Federal water project facilities showed that water exports had increased during the winter months of November - March during the years of the pelagic organism decline (See Figure 2). Salvage data also showed that increased numbers of those fish showing the decline (Delta smelt, threadfin shad, striped bass and longfin smelt- see Figures 3 and 4) had also been taken in increasing numbers during that time. The second most likely hypothesis called the "Bad Suisun Bay Hypothesis", suggested that conditions in the Suisun Bay area, a prime nursery area for young fish, had changed in some way to reduce its capability to sustain fish populations. The report suggested that some undefined combination of food production, invertebrate grazing rates, salinity regime changes, and introduced exotic species may be responsible for the declines. At that time toxics were not implicated as a major influence in the observed declines.

During the end of the first year of the POD investigations, researchers were beginning to develop information that could be helpful in understanding the declines and also for managing conditions to potentially reduce impacts. In the fall of 2006, the CALFED Program hosted the Science Conference and two significant findings were presented. First, a University of California researcher (Dr. Bill Bennett) suggested that the delta smelt females that reproduced early in the spawning season seemed to be most important in contributing to the next generation of smelt. This became known as the "Big Momma Hypothesis". This suggested that more attention needed to be paid to water management earlier in the year than had been done heretofore. The second finding, by a USGS researcher (Dr. Pete Smith) suggested that there was a significant relationship between flows moving UPSTREAM toward the state and federal pumping plants in Old and Middle Rivers and fish caught later in the trawls surveys. In other words when flows upstream were greater, the negative impacts on smelt populations were greater. Both of

these findings would play a significant role in how fish and water agencies would manage the water projects in 2007.

During the 2006 water year, conditions were better and greater outflows moved the smelt further downstream in the estuary and away from the influence of the pumps. The abundance indices reflected a positive response and the numbers of Delta smelt increased slightly from the previous year. Things were looking slightly better for smelt.

2007 Activities

Water Diversions-Armed with new scientific findings, the fishery and water management agencies began to manage the water projects to facilitate protection of delta smelt and other aquatic resources in the estuary. The life cycle of Delta smelt (Figure5) was constantly considered in this process. Clearly water diversions from the Delta can cause direct and indirect mortality of Delta smelt and other aquatic organisms. For this reason, the Delta diversions of the State Water Project (SWP) and the Central Valley Project (CVP) are some of the most carefully regulated and monitored water diversions anywhere. Early in January 2007, a team of agency managers (Water Operations Management Team- WOMT) began operation of the state and federal pumping plants by trying to reduce upstream flows in Old and Middle rivers so that the important early reproducing smelt ("Big Mommas") would not be drawn upstream toward the pumps and potentially removed from the estuary. Pumping rates were reduced using assets from the Environmental Water Account (EWA). By late May, the WOMT used over 300 thousand acre feet of Environmental Water Account water to implement fish protection actions, primarily protecting the spawning females during January, February and March. During winter and early spring the projects reduced net upstream flow in Old and Middle Rivers and no delta smelt were observed at the State Water Project and only a few at the Federal facility. Conditions looked good and the new management tools (reducing Old and Middle river flows to protect spawning females) seemed to be providing the desired impact avoidance. Field surveys showed the spawning smelt still securely distributed in Cache Slough and the Sacramento Ship Channel- out of the influence of the pumping plants.

On about May 15, field surveys (the 20 mm survey) carried out to monitor the relative abundance of juvenile smelt produced in the system produced alarming results. Numbers of young smelt were about 90 % below our previous year's estimates (See Figure 6). More alarming was the fact that the young smelt were located in an area influenced by the pumps- the lower San Joaquin River! The WOMT immediately took action and reduced pumping significantly at the pumping plants. Diversions from the SWP facilities were reduced to 350 cubic feet per second (cfs), a 90 percent reduction from customary seasonal pumping levels, as a precaution. The federal CVP reduced pumping rates to 850 cfs. Additionally, WOMT ordered the Head of Old River Barrier culverts opened and

maintained flows in the Stanislaus River so that flows would remain higher in the San Joaquin River to help keep the young smelt from the pumps.

When greater smelt take occurred at the SWP intake facility in late May, DWR and the DFG jointly announced further curtailment of SWP Delta diversions and asked for voluntary curtailments by other Delta diverters. DWR stopped SWP Delta diversions entirely on May 31, 2007 for 12 days with future protective actions continuing to be guided by the best science and adaptive management. Other water diversions from the Delta are not monitored or regulated as carefully. Nevertheless, on June 1, 2007, DFG wrote to over 300 water diverters in the Delta asking them to "voluntarily cease or substantially reduce your diversions from the south delta channels..." DFG also restricted all non-essential scientific studies and fish sampling/monitoring that may incidentally take Delta smelt. Concurrently, the CVP reduced Delta diversions to the operation of a single pump, drawing about 850 cfs. After taking no smelt for two weeks, the CVP increased pumping to 2500 cfs on June 13, 2007. Nine hours later several smelt were taken at the Federal pumps, a clear indication that young smelt were still in the south delta area and caution regarding increased pumping should be used.

On June 17, 2007, the SWP and CVP increased pumping but still far below seasonal normal rates. Agency Directors became directly involved and daily operational decisions were made to reduce take of smelt at the facilities. As smelt grew and began to move downstream out of the influence of the pumps and temperatures approached the lethal limits of young smelt, pumping rates were allowed to increase to meet demands for water use in the state. As of June 27 some young smelt continued to be taken at the SWP.

Agency biologists studying the population dynamics of smelt now believe that the abundance of smelt in the estuary has reached such a low level that numbers are now being affected by the "stock recruitment relationship". In other words, the most important factor affecting smelt numbers is the number of juveniles produced by the adult females. During other times when populations are higher, this relationship is not as significant and other factors contribute to the regulation of abundance (these are discussed below). **Therefore, it is DFG's position that actions must be taken to protect as many individual smelt as can be through manipulation of the water projects. Each reproducing organism is important to the survival of the species.**

Invasive Species-The San Francisco Estuary has been called the most invaded estuary on earth. Among the hundreds of introduced species, many cause competition, predation, or habitat modification that are detrimental to Delta smelt and other pelagic fishes. Collectively all of these species are profoundly affecting the ecological functioning of the estuary. For example, the Asian clam Corbula, which became established in Suisun Bay in the 1980s is a filter feeder so effective and numerous that it can filter the entire volume of Suisun Bay in less than a day. This has had a devastating effect on the primary production of Suisun Bay. Further upstream the freshwater Asiatic clam, Corbicula, can

have a similar effect. In the late 1990s a new zooplankton Limnoithona invaded the estuary. This new zooplankton may not be a good food source for many important pelagic fish like Delta smelt and has replaced the smelt's preferred food source. Limnoithona is now the most abundant zooplankton in the estuary. This shift at the base of the food web may prove to be a major factor affecting Delta smelt. The toxic blue green algae Microcystis has increased in abundance in the past several years in the interior Delta causing concerns with both fish and human toxicity although none has been documented in this system. Other introduced species such as striped bass and black bass prey upon smelt directly. The Brazilian water weed Egeria, has also proliferated in recent years. This aquatic plant not only clogs water ways for boating but slows water velocity and allows suspended sediment to settle out. It is hypothesized that increased water clarity may reduce Delta smelt feeding success and increase predation upon them. Although eradication is impossible, DWR and the Department of Boating and Waterways are partnering to implement a control program for Egeria budgeted at $3 million per year.

DFG and DWR are working aggressively to prevent new invasions. The two agencies responded swiftly when the quagga mussel Dreissena was discovered in Lake Mead and the Colorado River. If this prolific filter feeder were to invade the estuary it would likely cause further alteration in the food web. Much more effort needs to be exerted in order to deal with the problem of introduced species.

Toxics-Since 2005, scientists have been conducting toxicity screening of the waters in the Delta and Suisun Bay as part of the IEP Pelagic Organism Decline (POD) studies. Studies in 2005 and 2006 focused on the summer months when juvenile smelt are present in the Delta. To better characterize toxicity during the smelt spawning period, bi-weekly sampling and aquatic toxicity testing was initiated in January 2007. Preliminary evidence indicates potential toxicity in the Delta this winter and spring. The most troubling fact about these detections is that they occurred in the spawning grounds for Delta smelt this year when both adults and their young were present. Even though the number of adult Delta smelt this year was a little larger than last, the number of young smelt collected this year was about 90 percent less than last year (see above discussion). Although there is no evidence of direct toxicity to the Delta smelt, Delta toxicity could affect smelt directly or affect food availability for the species.

Researchers have initiated toxicity testing using cultured Delta smelt and are collecting samples upstream of the toxic sites in an attempt to identify the source and cause of the toxicity. The State Water Resources Control Board (State Water Board) and the Central Valley Regional Water Quality Control Board are actively evaluating all of this year's information to identify any necessary actions to prevent this type of toxic effect on endangered species from happening again next year.

Other new research provides an anecdotal suggestion that episodic toxicity could play a role in smelt survival. A study tracking tagged salmon in the south Delta collected apparent evidence in May of extensive salmon smolt mortality in a single area. This kind of event, if proven to be related to toxics, has the potential to seriously affect a species such as the Delta smelt and warrants further investigation.

The State Water Board held a workshop on June 19, 2007 to receive recommendations, and information to support these recommendations, on immediate, short term actions it should consider to slow or stop the decline of smelt and to improve fishery resources. The State Water Board is looking for information on both water quality and flow-related actions. Any increased involvement on the part of the federal government in these efforts would be welcome.

Current Restoration Efforts

In addition to near-real time management of the Estuary through processes discussed above, DFG is also involved in larger scale ecosystem planning to enhance the estuary. Early implementation of the Ecosystem Restoration Program (ERP) began three years prior to the signing of the CALFED ROD in August 2000 in recognition that ecological systems take time to show change. In the first nine years of implementation, ERP has made significant progress in improving the natural system. ERP has awarded more than $615 million to 493 projects. To date, 276 projects or about 56 percent have been completed. Grant recipients reported approximately $285 million in matching funds, which resulted in a combined total of about $825 million spent on habitat and species associated with the Bay-Delta and its watersheds. Many ERP actions addressed priority Multi-Species Conservation Strategy (MSCS) species listed in the milestones. Restoration planning for the Suisun Marsh through the Suisun Charter process will result in the restoration and protection of 7,000 acres of wetlands in San Pablo Bay and Suisun Marsh, exceeding the Stage 1 target for tidal marsh restoration in San Pablo Bay. Restoration of tidal action to restore brackish marsh ecosystems within the next two years on the Blacklock property and Meins Landing will aid in the recovery of several listed and special status terrestrial and aquatic species. Restoration of tidal action and associated wetlands habitat on the 1,166 acre Dutch Slough Tidal Restoration Project will improve our understanding of ecological processes and how ecosystems function at different spatial scales.

The ERP has funded 82 fish screen projects to reduce mortality of salmonids. The ERP has also implemented channel and floodplain restoration projects to improve spawning and rearing habitat for salmonids including projects on key tributaries to the Sacramento and San Joaquin rivers. Removal of impediments to fish passage on Butte Creek, Clear Creek, and other Sacramento River tributaries has contributed to the rebounding of spring-run and fall run Chinook salmon populations observed in recent years. The Battle Creek Salmon and Steelhead Restoration Project is an exceptional conservation opportunity to reestablish 42 miles of prime and uniquely reliable salmon and steelhead habitat on Battle Creek and its tributaries. Successful implementation of this project will help restore populations of winter-run Chinook salmon, spring run Chinook salmon and steelhead, all of which are in danger or threatened with extinction as defined by the federal Endangered Species Act (FESA). Battle Creek offers this unique restoration opportunity because of its geology, hydrology, habitat suitability for several anadromous species, historical water allocation, and land use compatible with a restored stream environment. Of these qualities, the area's unique hydrology is perhaps the most important Battle Creek feature supporting its restoration potential. The Lower Yuba

River Accord EIR/EIS was released for public review on June 26th. The purpose of the Yuba Accord is to resolve instream flow issues associated with the operation of the Yuba River Development Project in a way that protects and enhances lower Yuba River fisheries, maintains local water-supply reliability and protects Sacramento-San Joaquin Delta fisheries. The ERP this year also funded the Narrows 2 bypass project on the Yuba River to protect habitat for the wild salmon and steelhead on the lower Yuba River.

Summary

This brief discussion of stressors, management actions, and organism responses is intended to convey our understanding that the pelagic organism decline, including the recent sharp drop in Delta smelt abundance, is an extremely complex phenomenon. We do not expect that the solution to such a complex problem lies in just one category of action. We will continue to be guided by the best science and adaptive management as our scientists work to understand the situation and our agencies seek solutions to Bay Delta problems both in the near-term and for the future.

Whatever actions we may take, we must include interests of all parties. As you know, there are no independent actions that can be taken in this complex system. Fishery agencies constantly balance needs of various listed species, and important non-listed species. Actions that affect the water projects also can potentially affect other users of water in the State including state and federal wildlife refuges. Before any actions are implemented careful consideration of associated fish and wildlife impacts is needed.

DFG is supportive of the federal government taking actions necessary to protect and restore the pelagic species and in particular the Delta smelt. We will work with you and others to accomplish this important result.

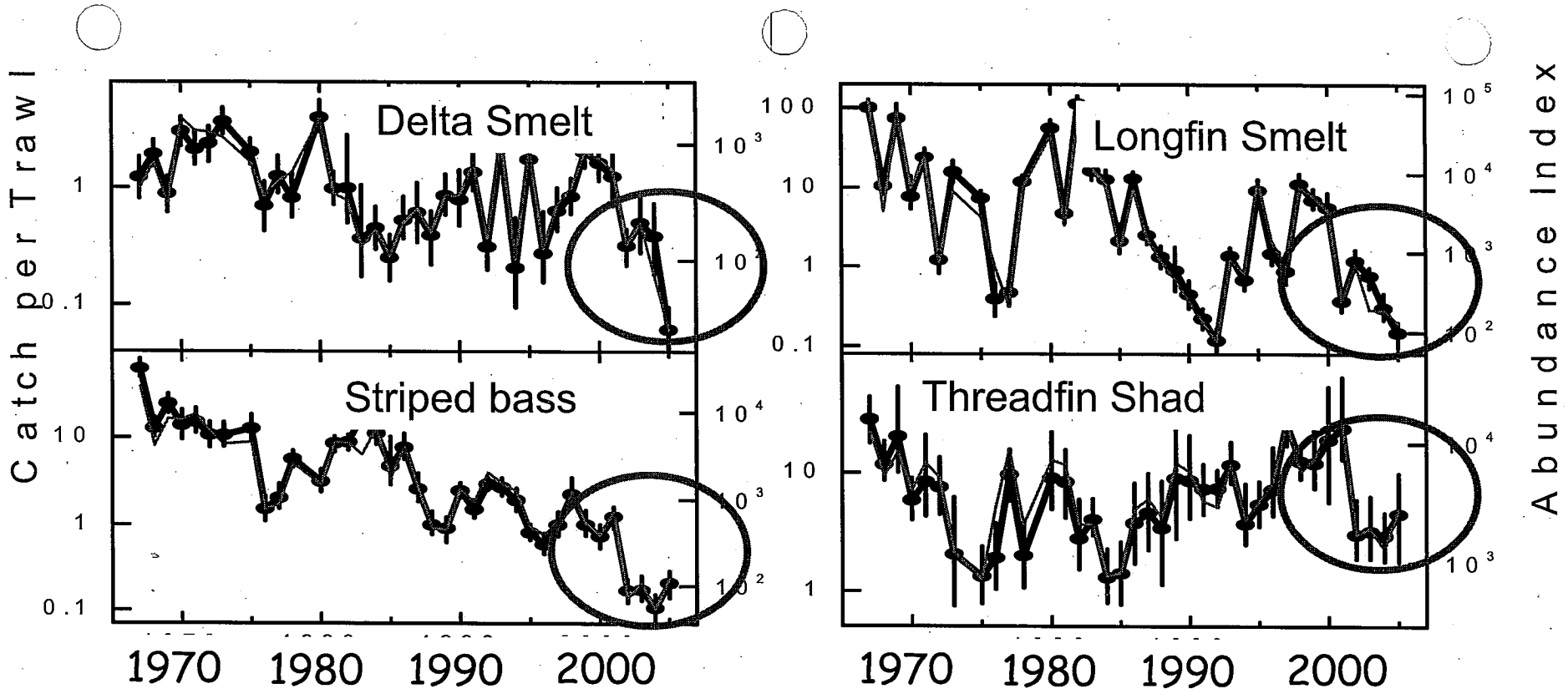


Figure 1. Annual abundance trends of four POD fishes based on Fall Midwater Trawl Survey data. Annual mean catch per trawl (black line) and annual abundance index (red line) are depicted.

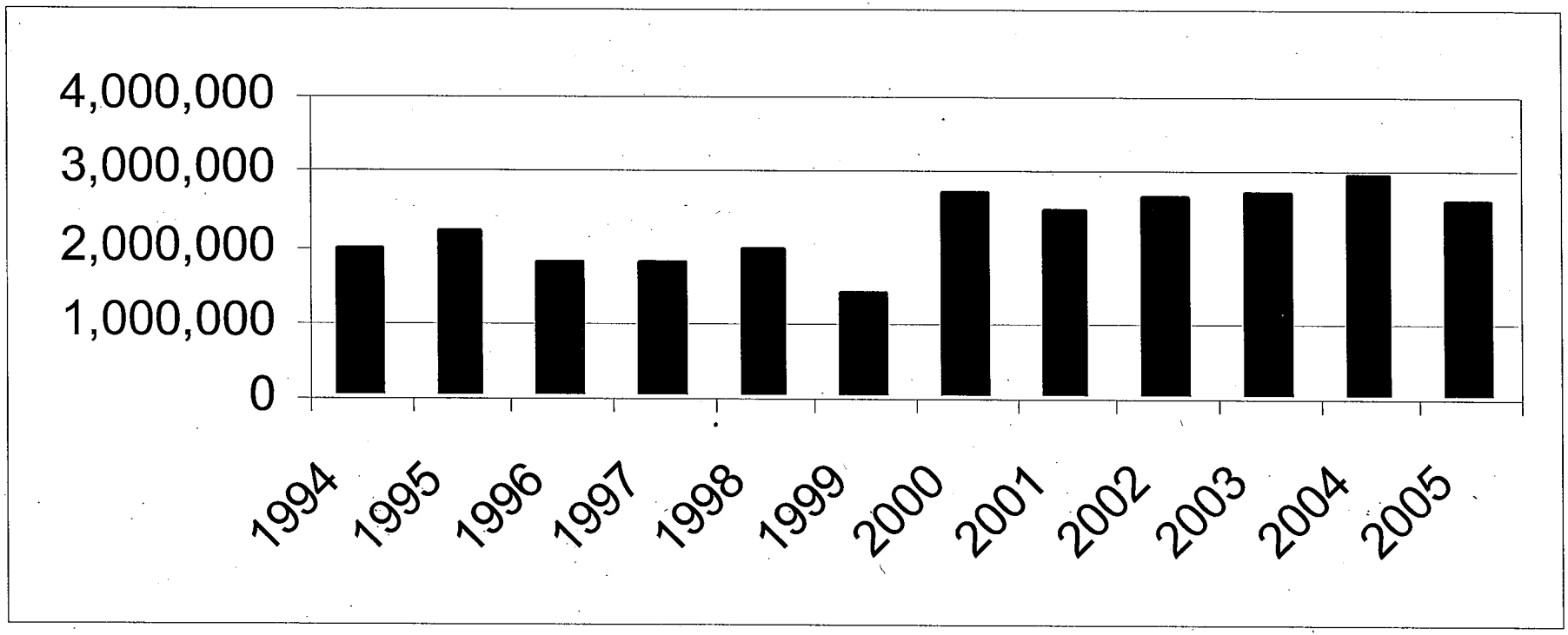


Figure 2. Total combined State Water Project and Central Valley Water Project winter exports (sum November through March) in acre feet plotted on year beginning in January.

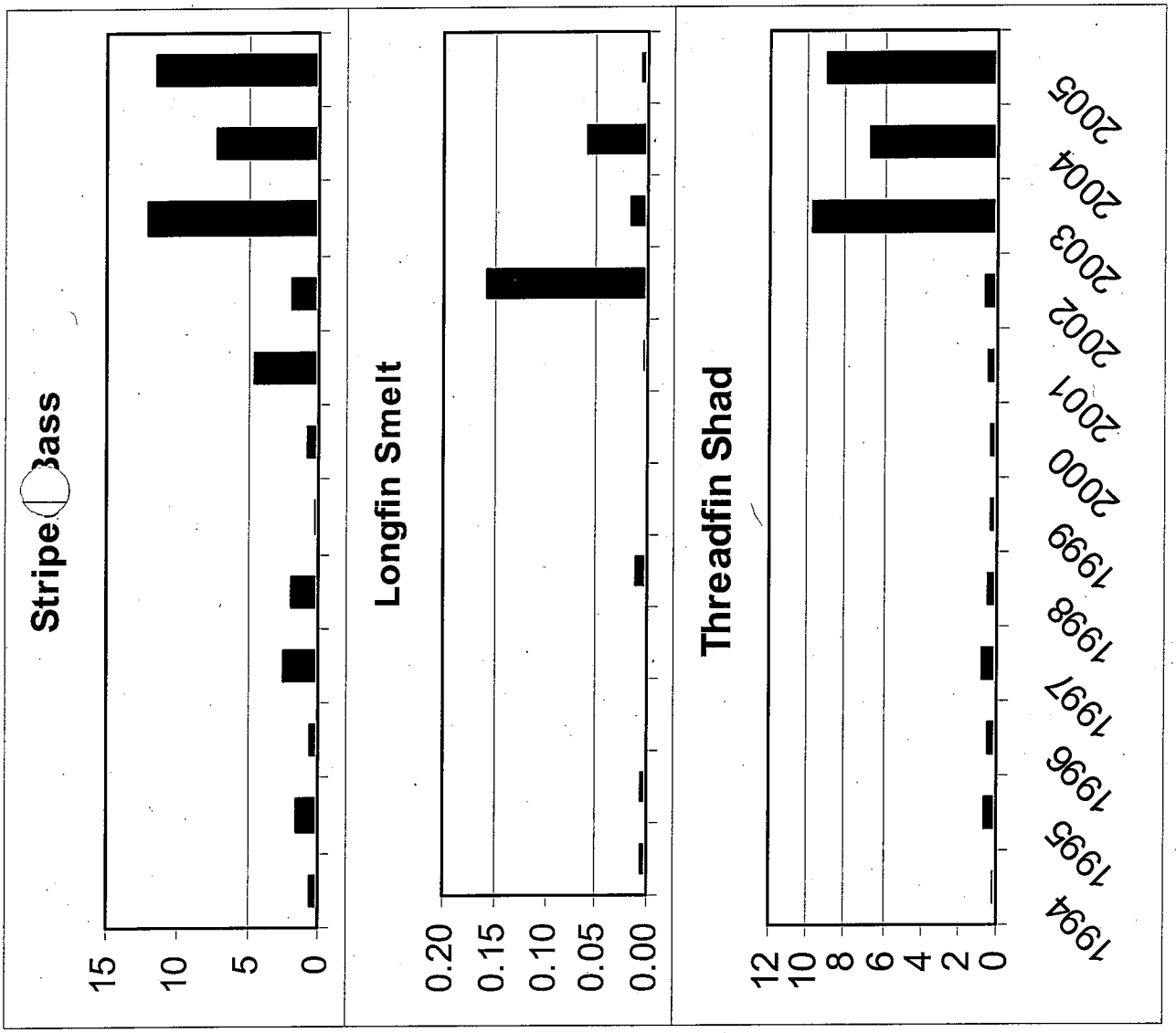


Figure 3. Winter salvage density (#/acre ft pumped) of three POD fishes scaled (divided) by the previous Fall Midwater Trawl abundance indices.

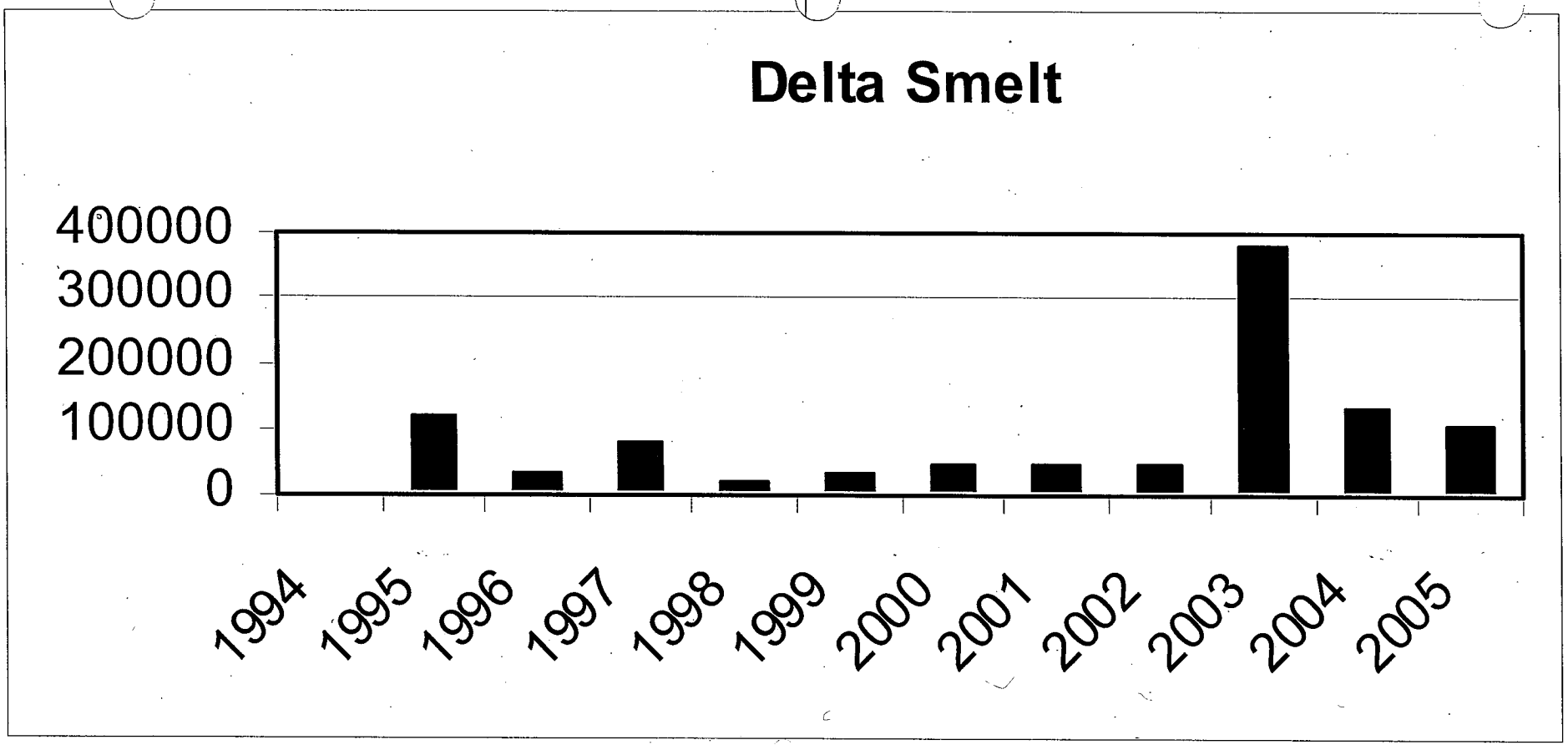


Figure 4. Winter salvage density (#/acre ft pumped) of delta smelt scaled (divided) by the previous Fall Midwater Trawl abundance indices.

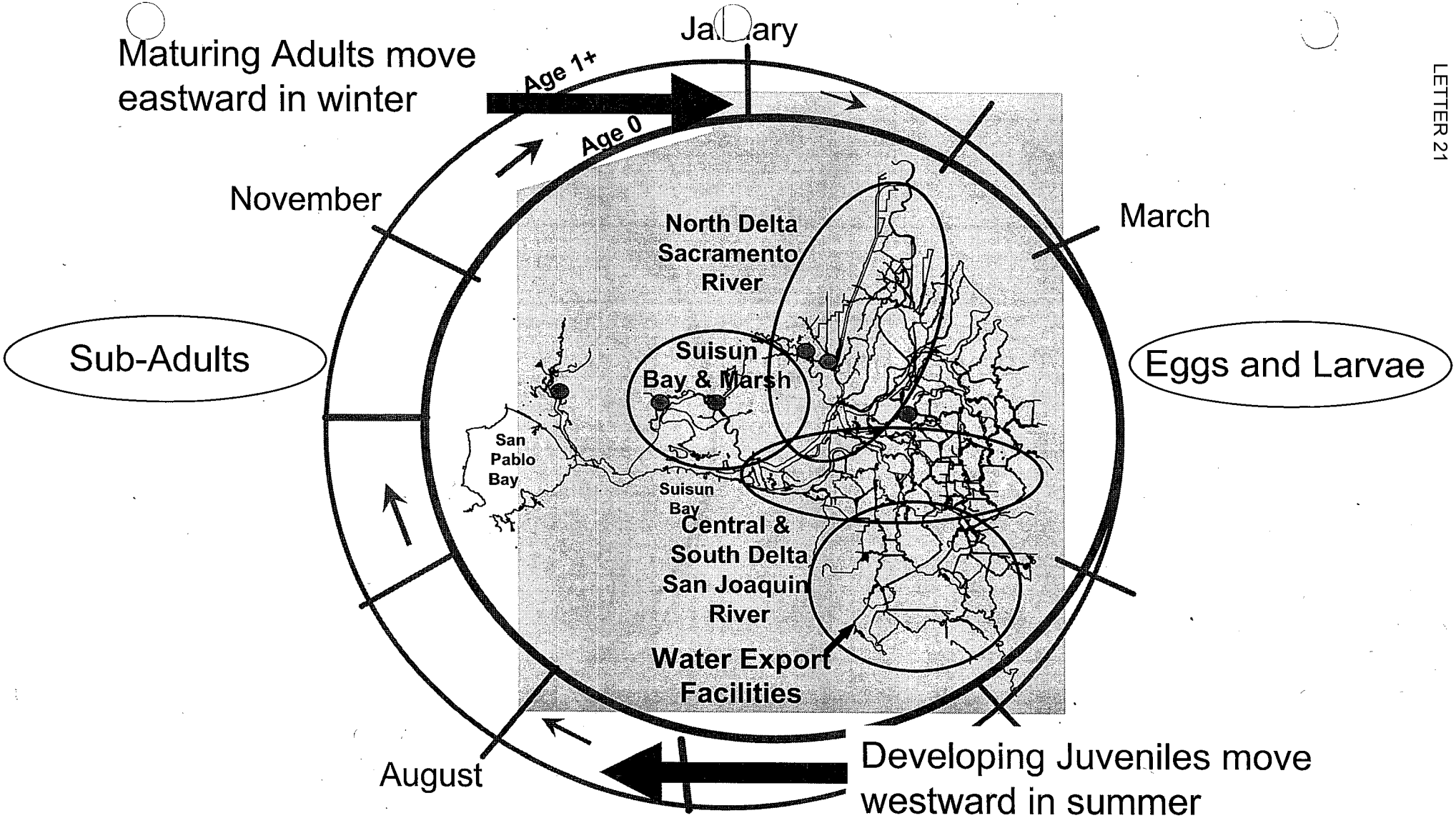
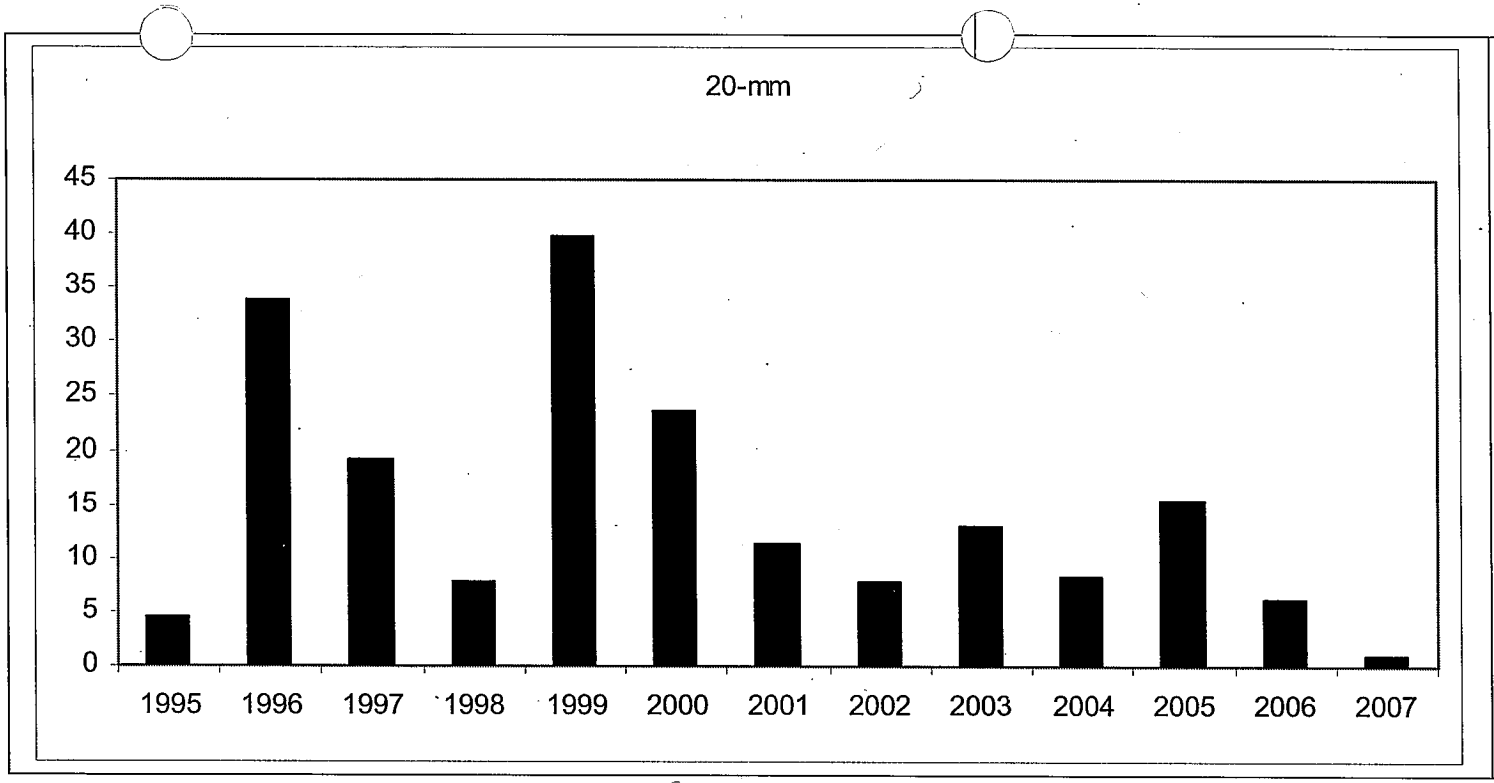


Figure 5. Delta smelt life history and general migration patterns: in winter and spring, maturing smelt move from the river confluence, Suisun Bay and Marsh eastward preparing to spawn, and become more vulnerable to entrainment by south delta export facilities. Subsequent progeny also remain vulnerable until they are able to swim and warm water temperatures drive them westward from the south delta.



Year	Index
1995	4.4
1996	33.9
1997	19.3
1998	7.7
1999	39.7
2000	23.8
2001	11.3
2002	7.7
2003	13.1
2004	8.2
2005	15.5
2006	6.2
2007	1.0

Figure 6. The 20mm survey delta smelt index by year, 1995-2007. Data processing for 2007 is not yet complete; data should be treated as preliminary and subject to revision.

Attachment 14-D

EXHIBIT 5

CENTRAL VALLEY OPERATIONS OFFICE

DELTA SMELT AND SPLITTAIL

May-07

Note: Bold numbers are not verified by DFG.

DATE	Salvage				Splittail				Pumping						Delta Smelt Daily Density	
	Daily Total		Combined		Daily Total		Combined		Daily Total In CFS			Daily Total In Acre Feet				
	SWP	CVP	Daily Total	14-Day Average	SWP	CVP	Daily Total	14-Day Average	Banks	Tracy	Combined	Banks	Tracy	Combined	SWP	CVP
1-May-07	0	12	12	2	4	0	4	2	531	849	1,380	1,054	1,684	2,738	0.0	7.1
2-May-07	0	0	0	2	0	0	0	1	872	560	1,432	1,730	1,110	2,840	0.0	0.0
3-May-07	0	0	0	1	4	0	4	1	677	848	1,525	1,342	1,682	3,024	0.0	0.0
4-May-07	0	0	0	1	0	0	0	1	676	846	1,522	1,340	1,679	3,019	0.0	0.0
5-May-07	0	0	0	1	0	0	0	1	675	844	1,519	1,339	1,674	3,013	0.0	0.0
6-May-07	0	0	0	1	0	0	0	1	673	855	1,528	1,335	1,695	3,030	0.0	0.0
7-May-07	0	0	0	1	0	0	0	1	679	693	1,372	1,347	1,375	2,722	0.0	0.0
8-May-07	0	0	0	1	0	0	0	1	578	852	1,429	1,146	1,689	2,835	0.0	0.0
9-May-07	0	0	0	1	0	0	0	1	652	853	1,504	1,293	1,691	2,984	0.0	0.0
10-May-07	0	12	12	2	0	0	0	1	532	853	1,385	1,056	1,691	2,747	0.0	7.1
11-May-07	0	48	48	5	0	0	0	1	538	849	1,387	1,067	1,684	2,751	0.0	28.5
12-May-07	0	0	0	5	0	0	0	1	530	849	1,379	1,052	1,683	2,735	0.0	0.0
13-May-07	0	12	12	6	0	0	0	1	786	850	1,637	1,560	1,686	3,246	0.0	7.1
14-May-07	0	0	0	6	0	0	0	1	661	844	1,505	1,312	1,674	2,986	0.0	0.0
15-May-07	0	0	0	5	0	0	0	0	521	853	1,374	1,034	1,692	2,726	0.0	0.0
16-May-07	0	0	0	5	0	12	12	1	302	852	1,154	600	1,689	2,289	0.0	0.0
17-May-07	0	0	0	5	0	0	0	1	275	855	1,130	545	1,696	2,241	0.0	0.0
18-May-07	0	0	0	5	4	0	4	1	317	852	1,169	629	1,689	2,318	0.0	0.0
19-May-07	0	0	0	5	0	0	0	1	273	855	1,127	541	1,695	2,236	0.0	0.0
20-May-07	0	0	0	5	0	0	0	1	272	850	1,122	540	1,686	2,226	0.0	0.0
21-May-07	0	0	0	5	0	0	0	1	271	856	1,127	538	1,698	2,236	0.0	0.0
22-May-07	0	0	0	5	4	0	4	1	273	852	1,125	541	1,690	2,231	0.0	0.0
23-May-07	0	24	24	7	2	24	26	3	798	848	1,646	1,583	1,682	3,265	0.0	14.3
24-May-07	0	24	24	8	0	0	0	3	359	849	1,208	713	1,683	2,396	0.0	14.3
25-May-07	2	0	2	4	0	0	0	3	358	851	1,209	710	1,688	2,398	2.8	0.0
26-May-07	22	24	46	8	0	12	12	4	358	845	1,203	711	1,676	2,387	30.9	14.3
27-May-07	24	24	48	10	0	48	48	8	260	854	1,114	516	1,693	2,209	46.5	14.2
28-May-07	20	0	20	12	0	24	24	9	321	853	1,173	636	1,691	2,327	31.4	0.0
29-May-07	58	12	70	17	0	0	0	9	315	853	1,167	624	1,691	2,315	92.9	7.1
30-May-07	46	24	70	22	0	12	12	9	315	854	1,169	624	1,694	2,318	73.7	14.2
31-May-07	40	0	40	25	0	0	0	9	261	856	1,116	517	1,697	2,214	77.4	0.0
Total	212	216	428	XXXX	18	132	150	XXXX	14,911	25,927	40,838	29,575	51,427	81,002	XXXX	XXXX

Delta Smelt Incidental Take Levels

Below Normal Water Year Type

Delta smelt risk assessment matrix (DSRM) Adult level of concern = 892

Re-consultation level for May = 30,500

LETTER 21

CENTRAL VALLEY OPERATIONS OFFICE

DELTA SMELT AND SPLITTAIL

June-07

Note: Bold numbers are not verified by DFG.

DATE	Delta Smelt				Splittail				Pumping						Delta Smelt Daily Density	
									Daily Total In CFS			Daily Total In Acre Feet				
	Daily Total		Combined		Daily Total		Combined									
	SWP	CVP	Daily Total	14-Day Average	SWP	CVP	Daily Total	14-Day Average	Banks	Tracy	Combined	Banks	Tracy	Combined	SWP	CVP
1-Jun-07	0	0	0	25	0	0	0	9	0	852	852	0	1,689	1,689	#DIV/0!	0.0
2-Jun-07	0	0	0	25	0	0	0	9	0	853	853	0	1,692	1,692	#DIV/0!	0.0
3-Jun-07	0	0	0	25	0	0	0	9	0	854	854	0	1,694	1,694	#DIV/0!	0.0
4-Jun-07	0	0	0	25	0	0	0	9	0	858	858	0	1,702	1,702	#DIV/0!	0.0
5-Jun-07	0	0	0	25	0	24	24	10	0	851	851	0	1,687	1,687	#DIV/0!	0.0
6-Jun-07	0	0	0	23	0	12	12	9	0	850	850	0	1,685	1,685	#DIV/0!	0.0
7-Jun-07	0	0	0	21	0	0	0	9	0	847	847	0	1,680	1,680	#DIV/0!	0.0
8-Jun-07	0	0	0	21	0	0	0	9	0	845	845	0	1,677	1,677	#DIV/0!	0.0
9-Jun-07	0	0	0	18	0	0	0	9	0	849	849	0	1,683	1,683	#DIV/0!	0.0
10-Jun-07	27	0	27	16	0	0	0	5	90	845	935	178	1,677	1,855	151.7	0.0
11-Jun-07	9	0	9	15	0	0	0	3	90	846	937	179	1,679	1,858	50.3	0.0
12-Jun-07	30	0	30	13	0	0	0	3	89	853	941	176	1,691	1,867	170.5	0.0
13-Jun-07	9	48	57	12	0	0	0	3	89	2,009	2,098	177	3,984	4,161	50.8	12.0
14-Jun-07	9	0	9	9	0	12	12	3	90	2,526	2,616	178	5,010	5,188	50.6	0.0
15-Jun-07	18	0	18	11	0	0	0	3	96	2,575	2,671	191	5,107	5,298	94.2	0.0
16-Jun-07	9	0	9	11	0	24	24	5	97	2,575	2,672	192	5,108	5,300	46.9	0.0
17-Jun-07	168	12	180	24	0	60	60	9	495	2,697	3,191	981	5,349	6,330	171.3	2.2
18-Jun-07	90	0	90	31	0	0	0	9	400	2,689	3,088	793	5,333	6,126	113.5	0.0
19-Jun-07	90	0	90	37	2	0	2	8	840	3,363	4,203	1,666	6,671	8,337	54.0	0.0
20-Jun-07	9	0	9	38	0	24	24	9	717	3,754	4,471	1,422	7,447	8,869	6.3	0.0
21-Jun-07	30	0	30	40	0	12	12	10	932	3,525	4,456	1,848	6,991	8,839	16.2	0.0
22-Jun-07	57	0	57	44	0	0	0	10	934	4,017	4,950	1,852	7,967	9,819	0.0	0.0
23-Jun-07	15	0	15	45	0	0	0	10	945	4,278	5,223	1,874	8,486	10,360	8.0	0.0
24-Jun-07	24	0	24	45	0	0	0	10	587	4,211	4,798	1,164	8,352	9,516	20.6	0.0
25-Jun-07	0	0	0	44	0	12	12	10	192	4,279	4,471	381	8,488	8,869	0.0	0.0
26-Jun-07	30	0	30	44	0	12	12	11	324	4,268	4,592	642	8,466	9,108	46.7	0.0
27-Jun-07	327	0	327	63	0	0	0	11	847	4,254	5,101	1,681	8,437	10,118	194.5	0.0
28-Jun-07	30	0	30	65	0	0	0	10	856	4,270	5,125	1,697	8,469	10,166	17.7	0.0
29-Jun-07	78	0	78	69	0	0	0	10	878	4,277	5,156	1,742	8,484	10,226	44.8	0.0
30-Jun-07	390	0	390	96	0	0	0	9	1,360	4,431	5,791	2,698	8,789	11,487	144.6	0.0
Total	1,449	60	1,509	XXXX	2	192	194	XXXX	10,946	74,199	85,145	21,712	147,174	168,886	XXXX	XXXX

Delta Smelt Incidental Take Levels

Below Normal Water Year Type

Delta smelt risk assessment matrix (DSRM) Adult level of concern = 892

Re-consultation level for June = 33,200

LETTER 21

CENTRAL VALLEY OPERATIONS OFFICE

DELTA SMELT AND SPLITTAIL

July-07

Note: Bold numbers are not verified by DFG.

DATE	Delta Smelt				Splittail				Pumping						Delta Smelt Daily Density	
									Daily Total In CFS			Daily Total In Acre Feet				
	Daily Total		Combined		Daily Total		Combined									
	SWP	CVP	Daily Total	14-Day Average	SWP	CVP	Daily Total	14-Day Average	Banks	Tracy	Combined	Banks	Tracy	Combined	SWP	CVP
1-Jul-07	246	12	258	102	2	60	62	9	5,301	3,926	9,228	10,515	7,788	18,303	23.4	1.5
2-Jul-07	311	0	311	118	7	12	19	10	6,032	4,452	10,484	11,965	8,830	20,795	26.0	0.0
3-Jul-07	13	0	13	112	1	0	1	10	5,485	4,442	9,926	10,879	8,810	19,689	1.2	0.0
4-Jul-07	18	0	18	113	11	48	59	13	5,833	4,385	10,218	11,570	8,698	20,268	1.6	0.0
5-Jul-07	21	0	21	112	0	48	48	15	5,301	4,440	9,741	10,514	8,807	19,321	2.0	0.0
6-Jul-07	9	0	9	109	0	24	24	17	5,755	4,358	10,113	11,415	8,644	20,059	0.8	0.0
7-Jul-07	12	0	12	109	36	0	36	20	5,562	4,346	9,909	11,033	8,621	19,654	1.1	0.0
8-Jul-07	6	0	6	107	3	0	3	20	5,459	4,344	9,803	10,828	8,617	19,445	0.6	0.0
9-Jul-07	6	0	6	108	21	0	21	20	5,807	4,354	10,161	11,518	8,636	20,154	0.5	0.0
10-Jul-07	6	0	6	106	0	24	24	21	5,624	4,406	10,031	11,156	8,740	19,896	0.5	0.0
11-Jul-07	0	0	0	83	24	12	36	24	6,200	4,385	10,585	12,298	8,697	20,995	0.0	0.0
12-Jul-07	6	0	6	81	9	0	9	24	6,258	4,386	10,644	12,413	8,699	21,112	0.5	0.0
13-Jul-07	0	0	0	75	6	0	6	25	6,423	4,391	10,815	12,741	8,710	21,451	0.0	0.0
14-Jul-07	6	0	6	48	36	0	36	27	6,985	4,365	11,350	13,855	8,657	22,512	0.4	0.0
15-Jul-07	6	0	6	30	36	12	48	26	7,986	4,354	12,340	15,840	8,636	24,476	0.4	0.0
16-Jul-07	24	0	24	10	6	0	6	26	6,441	4,353	10,794	12,775	8,635	21,410	1.9	0.0
17-Jul-07	6	0	6	9	16	0	16	27	6,878	4,376	11,254	13,642	8,680	22,322	0.4	0.0
18-Jul-07	3	0	3	8	15	12	27	24	7,055	4,382	11,437	13,993	8,692	22,685	0.2	0.0
19-Jul-07	0	0	0	6	36	12	48	24	7,317	4,367	11,684	14,514	8,662	23,176	0.0	0.0
20-Jul-07	0	0	0	6	0	0	0	23	6,930	4,363	11,293	13,746	8,654	22,400	0.0	0.0
21-Jul-07	0	0	0	5	0	12	12	21	6,993	4,391	11,384	13,871	8,710	22,581	0.0	0.0
22-Jul-07	**0**	**0**	0	5	**0**	**0**	0	21	6,893	4,379	11,271	13,672	8,685	22,357	0.0	0.0
23-Jul-07	**0**	**0**	0	4	**0**	**0**	0	19	6,681	4,385	11,066	13,252	8,698	21,950	0.0	0.0
24-Jul-07	**0**	**0**	0	4	**0**	**12**	12	18	6,895	4,418	11,313	13,676	8,763	22,439	0.0	0.0
25-Jul-07	**0**	**0**	0	4	**0**	**0**	0	16	4,799	4,458	9,256	9,518	8,842	18,360	0.0	0.0
26-Jul-07	**0**	**0**	0	3	**0**	**0**	0	15	8,024	4,443	12,467	15,916	8,813	24,729	0.0	0.0
27-Jul-07	**0**	**0**	0	3	**0**	**0**	0	15	7,732	4,467	12,199	15,336	8,860	24,196	0.0	0.0
28-Jul-07	**0**	**0**	0	3	**12**	**0**	12	13	7,271	4,427	11,698	14,422	8,781	23,203	0.0	0.0
29-Jul-07	**0**	**0**	0	2	**0**	**0**	0	10	7,144	4,464	11,608	14,170	8,855	23,025	0.0	0.0
30-Jul-07	**0**	**0**	0	1	**9**	**0**	9	10	6,983	4,434	11,416	13,850	8,794	22,644	0.0	0.0
31-Jul-07	**0**	**0**	0	0	**0**	**12**	12	9	6,999	4,420	11,420	13,883	8,768	22,651	0.0	0.0
Total	699	12	711	XXXX	286	300	586	XXXX	201,047	135,862	336,908	398,776	269,482	668,258	XXXX	XXXX

Delta Smelt Incidental Take Levels

Below Normal Water Year Type

Delta smelt risk assessment matrix (DSRM) Adult level of concern = 892

Re-consultation level for July = 2,500

LETTER 21

Attachment 14-E

EXHIBIT 6

From: Greene, Sheila [mailto:sgreene@water.ca.gov]
Sent: Monday, February 07, 2005 11:48 AM
To: calfedda@water.ca.gov
Subject: Summary of DAT Conference Call 2/1/2005
Attachments: COLFLOSS.xls; Fry_SmoltChinook2005.ppt; JuvenileChinook2005.ppt; WRLOSS05.ppt; WRSLV05.ppt; DAT20050201.wpd; DAT20050201.doc

Summary of DAT Conference Call 2/01/2005

Participants: SGreene, VPoage, PCadrett, JWhite, TBoardman, ROlah, BOppenheim, BKinnear, PCoulston, EChappell, CReiner, PManza, JSnow, TBui, DSchuster, BHerbold, MMosses, RSitts

Conclusions and Recommendations
Last Friday, 1/28/05, there was a WOMT conference call to discuss the Delta Smelt Workgroup recommendation to reduce exports to a combined 1,500 cfs for one week due to high delta smelt salvage, high delta smelt salvage compared to low fall midwater trawl delta smelt index, and the delta smelt distribution from the first few days of the kodiak trawl. The Delta Smelt Work group will evaluate delta smelt salvage, and if salvage density decreases significantly, they will recommend resuming normal export operations. WOMT agreed to the recommendation. Each project will export 700 cfs starting on 2/1/05 for one week, unless otherwise notified. The Delta Smelt Workgroup is scheduled to meet Thursday, 2/3 in the afternoon.

There was a pulse of juvenile Chinook catch in the tributaries and Sacramento River down as far as the north Delta, associated with the storm last week. But no significant catch of non-clipped Chinook in the Chipps Island trawl or at the Delta export facilities. There was a significant increase in the number of clipped juvenile Chinook at the export facilities, but the tags have not yet been read. Most are likely from the Coleman late fall production release, but with the number of outstanding tags, it is possible we could reach the first level of concern for the January yearling spring run surrogate release from Coleman hatchery.

The salvage of steelhead at the export facilities increased significantly last week.

Next DAT call Tuesday, 2/8/2005, at 9:00 am, at 916/657-4111.

Chinook Monitoring

Upper Sacramento River
Red Bluff Diversion - Flow peaked at 33,000 cfs on 1/27/05, but has decreased since. The traps were damaged, and not operating from 1/27 through 1/29. Starting 1/30, three of the four traps have been operating. Daily

fall length Chinook passage increased from 17,000 on 1/26 to 555,000 on 1/30. There were no older juvenile Chinook. There were 2 clipped Chinook and 7 clipped steelhead. Flows are decreasing and currently at ~7,500 cfs. FWS assumes the substantial numbers of fry Chinook passed RBDD when the traps were out.

FWS posts biweekly reports on the Bay-Delta and Tributaries Project website, at

http://baydelta.ca.gov/Php/Special_Reports/red_bluff.php4

Mill Creek - Flow increased from 200 cfs to a daily average of 625 cfs on 1/27, and then decreased to 336 cfs. Turbidity increased from 3 NTU to 21.6 NTU to 6.6 NTU. Spring run fry catch increased from less than 10/day to 268/day on 1/27, and is gradually decreasing. Yearling spring run catch went from 0 to 2 on 2/29, then decreased. There were 600 spring run fry and 3 yearlings last week. No steelhead.

Deer Creek - Flow increased from 220 cfs to 700 cfs on 1/28, then decreased. Turbidity increased from 2.2 NTU to 8.2 NTU, then decreased. Spring run fry catch increased from 0 to 240/day on 1/30. Yearling spring run increased from nearly 0 to 7/day on 1/30. There were 474 spring run fry, and 14 yearling spring run last week.

Butte Creek - Flow and spring run fry catch peaked on 1/27. Catch had been ranging from 2,600/day to 36,000/day, then peaked at 225,000/day on 1/27. DFG was operating the two rotary screws traps primarily for tagging. They tagged their 400,000 juveniles and removed the trap on 1/27. Last brood year, they had the second highest number of returning adults, 10,200, and very low pre-spawning mortality, 410. The high spring run fry emigration corresponds with the adult spawners.

GCID - Moderately low catch of mostly fry and smolts. 1 clipped Chinook on 1/25.

Knights Landing - Flow increased and peaked at 25,280 cfs on 1/29. Turbidity increased from 18 NTU to 300 NTU. Fry/smolt catch increased from 5/trap-day to 1,100/trap-day. Older juvenile catch increased from 0 to 6/trap-day. 19 clipped Chinook and 54 clipped steelhead last week.

Delta

Lower Sac River seine - 19 fry, 17 older juvenile, and 2 clipped Chinook in one day of sampling.
Sac Area seine - 439 fry/smolts, 2 older juvenile Chinook last week. About the same as last week.

Sac Trawl - only 2 fry/smolts. A significant decrease over last week. 5 clipped steelhead. No delta smelt.
North Delta seine - 224 fry/smolts. A significant increase.
Central Delta seine - Significant increase. 70 fry/smolts and 21 older juvenile.

South Delta, SJR and Bay seines - none
Mossdale trawl - None last week, but 22 fry/smolts on Monday, 1/31.
Chipps - Catch decreased. 1 older juvenile and 21 clipped Chinook 11 adult delta smelt.

Salvage Facilities
Chinook - SWP - No non-clipped Chinook salvage at the SWP. 62 clipped Chinook salvaged last week. They are all Coleman late fall origin. CVP - 24 non-clipped older juvenile, and 132 clipped Chinook salvaged last week.

The loss of clipped Chinook was high over the last week and a half. The tags have not been read, but the outstanding loss is about 2,472. We assume most are from the Coleman late fall production release, but It is possible that we could reach the first level of concern for the January yearling spring run surrogate release. We will distribute the tag reading results when we receive them.

Total winter run length non-clipped loss for the season is 250 at the SWP and 31 at the CVP, for a total of 281.

Steelhead - SWP - 15 non-clipped steelhead and 274 clipped steelhead salvaged last week. CVP - 24 non-clipped steelhead, and 48 clipped salvage last week. This is a significant increase for clipped steelhead salvage. There have been releases from Coleman, Feather, American and Mokelumne hatcheries recently.

Delta Smelt - SWP - Steadily salvaging delta smelt. 498 delta smelt salvaged last week. The January total is 1,107. CVP - 348 delta smelt savaged last week. The January total is 540. The combined total is 1,647. We got close to the consultation level for January of 1,900 . The consultation level for February is 1,700. There is no ripeness data taken at the salvage facilities. We did exceed the December through March adult cumulative salvage concern level of 892, with two months to go. Delta smelt salvage density increased for two weeks, but has been decreasing slowly in the last three days.

Splittail - Continuing to salvage splittail. SWP - 115 adult splittail salvaged last week. CVP - 128 adult splittail salvaged at the CVP last week.

Kodiak Trawl Delta Smelt
Survey number 1 is complete. There was a total of 220 adults. The sex ratio is 1:1. The size is normal with all stations

reported. The distribution is mostly in Montezuma slough and at the confluence of the Sacramento and San Joaquin rivers. There are not a lot of delta smelt in the south Delta, except at the export facilities. All stations were sampled last week and the next survey starts 2/7. The distribution and size is better than what was reported last Friday but the level of concern is still the same based on the high salvage and low fall midwater trawl index.

The delta smelt kodiak trawl distribution map is available on the website -

http://www.delta.dfg.ca.gov/data/skt//DisplayMaps.asp

Operations

SWP - 6,500 cfs today. DWR is scheduling 700 cfs for the delta smelt curtailment for the next 7 days. The estimated EWA cost is 80 taf. Prior to this export curtailment, DWR was expecting to fill San Luis next week, therefore the MAs expected the cost of this action to spill. But, with this export curtailment, the operators expect the debt will likely not spill. Article 21 was delivered last week due to a special condition which was O'Neill was full and the SWP was not able to send water to southern California due to their flooding problems. Article 21 may become available soon, but EWA wouldn't spill until there is water in excess of demands and Article 21.

In the absence of the delta smelt curtailment, SWP exports would have been about 6,000 cfs to comply with the 35% E/I ratio for February.

San Luis, - 1,013 taf. Full is 1,062 taf. Since they can't send water to southern California, they filled faster.
Oroville - 1,750 cfs.

CVP - 4,350 cfs today. The CVP operators are scheduling 750 cfs for the delta smelt curtailment for the next 7 days. The estimated b2 cost is 50 taf. They were projecting to spill in March before the export curtailment, but now they aren't sure they will fill.

San Luis - 797 taf. Full is 962 taf.
Trinity - 300 cfs.
Clear Creek - 200 cfs.
Keswick - 3,700 cfs and being supported by b2.
Nimbus - 2,500 cfs. In flood control.
Stan - 225 cfs.

Flows

Sacramento at Freeport ~ 31,236 cfs.
San Joaquin at Vernalis ~ 4,908 cfs.

Outflow ~ 27,900 cfs.
14-day E/I ratio - 38.7%.
X2 ~ The 14-day running average Port Chicago EC was 4.4 on 1/31. The daily EC was 1.6 microseimens/cm. According to the EWA biologists, they projects must meet Chipps Island the entire month of February.

Delta Water Quality
Water quality great.

Sheila Greene
Staff Environmental Scientist
CA Department of Water Resources
Division of Environmental Services
916/227-7538 voice
916/227-7554 fax

Attachment 14-F

EXHIBIT 7

LETTER 21

CENTRAL VALLEY OPERATIONS OFFICE
DELTA SMELT AND SPLITTAIL
February-05

Note: Bold numbers are not verified by DFG.

DATE	Delta Smelt				Splittail				Pumping						Delta Smelt Daily Density	
									Daily Total In CFS			Daily Total In Acre Feet				
	Daily Total		Combined		Daily Total		Combined									
	SWP	CVP	Daily Total	14-Day Average	SWP	CVP	Daily Total	14-Day Average	Banks	Tracy	Combined	Banks	Tracy	Combined	SWP	CVP
1-Feb-05	27	0	27	81	12	0	12	47	6,426	4,369	10,794	12,745	8,665	21,410	2.1	0.0
2-Feb-05	9	12	21	79	0	12	12	44	2,153	1,829	3,982	4,271	3,627	7,898	2.1	3.3
3-Feb-05	6	12	18	77	0	0	0	40	1,008	1,670	2,678	1,999	3,312	5,311	3.0	3.6
4-Feb-05	12	0	12	72	0	0	0	34	1,016	2,011	3,027	2,015	3,989	6,004	6.0	0.0
5-Feb-05	42	0	42	71	0	0	0	24	3,014	2,007	5,021	5,979	3,981	9,960	7.0	0.0
6-Feb-05	27	12	39	71	0	0	0	20	4,972	2,002	6,974	9,862	3,971	13,833	2.7	3.0
7-Feb-05	39	24	63	69	12	0	12	20	6,261	3,753	10,014	12,418	7,444	19,862	3.1	3.2
8-Feb-05	23	0	23	64	6	**12**	18	18	6,332	4,373	10,705	12,560	8,673	21,233	1.8	0.0
9-Feb-05	3	0	3	57	0	0	0	16	6,277	4,374	10,650	12,450	8,675	21,125	0.2	0.0
10-Feb-05	33	0	33	49	3	0	3	15	6,128	4,371	10,499	12,154	8,670	20,824	2.7	0.0
11-Feb-05	9	0	9	40	6	0	6	13	6,336	4,399	10,735	12,567	8,726	21,293	0.7	0.0
12-Feb-05	12	0	12	34	9	0	9	11	6,336	4,393	10,729	12,567	8,713	21,280	1.0	0.0
1[illegible]05	3	0	3	26	12	0	12	9	5,975	4,374	10,348	11,851	8,675	20,526	0.3	0.0
14-[illegible]-05	**12**	**0**	12	23	**0**	**0**	0	6	5,249	4,250	9,498	10,411	8,429	18,840	1.2	0.0
15-Feb-05	**6**	**12**	18	22	**0**	**0**	0	5	5,381	4,340	9,722	10,674	8,609	19,283	0.6	1.4
16-Feb-05	**0**	**36**	36	23	**0**	**12**	12	5	4,803	4,332	9,135	9,527	8,592	18,119	0.0	4.2
17-Feb-05	**0**	**0**	0	22	**6**	**0**	6	6	4,797	4,380	9,177	9,514	8,688	18,202	0.0	0.0
18-Feb-05	**0**	**0**	0	21	**0**	**0**	0	6	4,524	4,387	8,911	8,973	8,702	17,675	0.0	0.0
19-Feb-05	**0**	**0**	0	18	**0**	**0**	0	6	4,517	4,403	8,920	8,959	8,734	17,693	0.0	0.0
20-Feb-05	**0**	**0**	0	15	**0**	**0**	0	6	5,106	4,383	9,489	10,128	8,693	18,821	0.0	0.0
21-Feb-05	**0**	**0**	0	11	**0**	**0**	0	5	4,585	4,419	9,005	9,095	8,766	17,861	0.0	0.0
22-Feb-05	**0**	**0**	0	9	**13**	**0**	13	4	5,416	4,129	9,545	10,743	8,189	18,932	0.0	0.0
23-Feb-05	**0**	**0**	0	9	**0**	**0**	0	4	5,373	3,867	9,240	10,658	7,670	18,328	0.0	0.0
24-Feb-05	**0**	**0**	0	6	**6**	**0**	6	5	5,941	4,511	10,452	11,784	8,948	20,732	0.0	0.0
25-Feb-05	**0**	**0**	0	6	**6**	**36**	42	7	5,936	4,386	10,323	11,775	8,700	20,475	0.0	0.0
26-Feb-05	**0**	**0**	0	5	**6**	**36**	42	10	5,936	4,373	10,309	11,775	8,673	20,448	0.0	0.0
27-Feb-05	**0**	**0**	0	5	**15**	**24**	39	11	5,908	4,427	10,335	11,718	8,781	20,499	0.0	0.0
28-Feb-05	**0**	**0**	0	4	**6**	**12**	18	13	3,930	4,373	8,303	7,796	8,673	16,469	0.0	0.0
Total	263	108	371	XXXX	118	144	262	XXXX	139,636	108,882	248,518	276,968	215,968	492,936	XXXX	XXXX

Delta Smelt Incidental Take Levels
Below Normal Water Year Type
Delta smelt risk assessment matrix (DSRM) Adult level of concern = 892
Re-consultation level for February = 1,700

Attachment 14-G

EXHIBIT 8

Delta Smelt Working Group Meeting Minutes

July 10, 2006

Participating: Gonzalo Castillo (USFWS), Kevin Fleming (DFG), Bruce Herbold (USEPA), Ted Sommer (DWR), Matt Nobriga (DWR), Ann Lubas-Williams (USBR), Tracy Pettit (DWR), Tracy Hinojosa (DWR), Ryan Olah (USFWS), convener and scribe, Jim White (DFG), and Lenny Grimaldo (DWR).

For Discussion:
Continue discussions on possible fish actions for upcoming season

Recommendation for WOMT: The Working Group formally requests that DWR provide initial estimates of the cost in terms of water volumes to first achieve and then maintain a net outflow of 11,400 cfs at Chipps Island from September through November.

Minutes:

Ted Sommer presented an outline of potential actions (see attachment 1) that the Working Group used to rank potential actions to protect delta smelt. The Working Group developed a ranking system for each of the potential actions to clarify the action's biological basis and its likelihood of successful implementation in the next 12 months:

Biological Basis the next 12 months		Likelihood of successful implementation in	
0.	None (for the specific season)		
1.	Reasonable biology	A.	Not worth Doing
2.	Supporting pattern in data	B.	Maybe
3.	Correlation Present	C.	Very Likely
4.	Some causation known		
5.	Strongly supported by evidence		

Based on these criteria, the Working Group then assigned a ranking to each hypothesis under each season. These rankings were intended to apply only to water year 2007, and could change based on hydrology, new data, or species status.

Based on this exercise, the Working Group identified the need for a description of likely conditions this fall based on hydrologic forecast modeling. Since outflows may potentially be as low as 7,000 cfs net outflow, the Working Group requested that the following initial modeling take place:

- Based on the latest hydrologic forecasts, what would be the cost in terms of water volumes to first achieve and then maintain a net outflow of 11,400 cfs at Chipps Island from September through November? [Note that between the time that the meeting occurred and the notes were produced, DWR estimated that maintaining 11,400 cfs at Chipps Island would require

approximately 600 TAF of water in the median hydrology, and approximately twice as much in the dry hydrology.]

Additional modeling:

- Assuming that the 11,400 cfs net outflow was implemented, what would be the flows in Old and Middle River, given a variety of combined inflows and export rates? The best approach to this may be to vary San Joaquin River flow, export flow and Old/Middle River flow in a single nomograph at some specific Sacramento River flow. Several nomographs could be produced for various increments of Sacramento River flow; this concept needs to be refined and, perhaps, simplified before a formal request is made of DWR.

Action Items:

1. DWR will perform the initially-requested modeling and the group will then convene to discuss the results.
2. The Working Group will refine their request for additional modeling to examine flows at Old and Middle Rivers.

Next Scheduled Meeting: TBA, based on modeling results.

Submitted,

RO/vp

Attachment 1

ALTERNATIVES TO IMPROVE DELTA SMELT ABUNDANCE DURING THE NEXT YEAR

Draft Revised July 17, 2006

Assumptions

- This review focuses on actions that could be realistically conducted during the next year.
- The list is intended as talking points to evaluate the potential efficacy and feasibility of alternatives. It is not a set of recommendations.
- There are likely other actions—this is a starting point!
- Each action includes a partial list of useful metrics of the success of that alternative.
- Additional information is needed to document the supporting evidence for each alternative.

Fall Actions (September-November)

1. Habitat Improvements

Hypothesis: Higher fall flows (total delta outflow) will increase the amount of habitat for delta smelt.

Measures:

Fish: FMWT distribution, following year's TNS abundance, condition, size, energy density,growth.

Clams: Biomass, distribution, grazing rate(may be affecting habitat quality).

Food supply: Zooplankton density, Chlorophyll a, smelt diets.

Habitat: EQ index (turbidity, ec), X2

Ranking: 3/4 C-We have a relationship between habitat and summer production and fall flows are forecasted to be low (maybe around 7,000 cfs ouflow)

2. Reduce Entrainment Losses (Mortality)

Hypothesis: Increased (more positive) Old and Middle River flows will reduce losses of adults.

Measures:

Fish: FMWT distribution, TNS abundance, salvage,

Hydrology: Exports, OR & MR flows.

Modeling: ptm experiments

Ranking: 3C-based on Pete Smith of USGS's relationship

Hypothesis: Reducing Delta Cross Channel closures will reduce losses of adults.

Measures:

Fish: FMWT distribution, TNS abundance, salvage,

Hydrology: Exports, OR & MR flows.

Modeling: ptm experiments

Ranking: 2C-based on conceptual understanding of Delta hydrodynamics and recent ptm work.

3. Food Supply

Hypothesis: Increased San Joaquin River flow to Suisun Bay will deliver more phytoplankton and zooplankton to support adults and egg production.

Measures:

Fish: TNS & FMWT abundance, condition, size, energy density.
Clams: Biomass, distribution, grazing rate.
Food supply: Zooplankton density, chlorophyll a, smelt diets.
Hydrology: SJR flow, exports, OR & MR flows, particle tracking.

Ranking: 1B

Hypothesis: Increased flow from Yolo Bypass (e.g. managed wetlands) will deliver more phytoplankton and zooplankton to support adults and egg production.

Measures:

Fish: 20 mm abundance and distribution, TNS & FMWT abundance, condition, size, energy density, salvage.
Clams: Biomass, distribution, grazing rate.
Food supply: Zooplankton density, chlorophyll a, smelt diets.
Hydrology: Sac flow, Cache Slough flow, particle tracking, hydrodynamics?

Ranking: 1B

Overbite Clam Hypothesis: Additional outflow will restrict Asian clam abundance
Ranking: 2B

Winter Actions (December-February)

1. Habitat Improvements

Hypothesis: Higher flows during late winter will increase the amount of habitat (e.g. X2) for delta smelt.

Measures:

Fish: FMWT & Kodiak trawl distribution, subsequent TNS abundance, condition, energy density, growth.
Habitat: X2

Ranking: 0

2. Reduce Losses (Mortality)

Hypothesis: Export reduction during "first flush" of delta tributaries will reduce losses of adults.

Measures:

Fish: FMWT distribution, TNS abundance, salvage,
Hydrology: Exports, inflow, outflow.
Modeling: ptm experiments

Ranking: 4C-fish are entrained during these times, based on historical salvage and Pete Smith's USGS work

Hypothesis: Increased (more positive) Old and Middle River flows will reduce losses of adults and result in a better spawning distribution.

Measures:

Fish: FMWT distribution, TNS abundance, salvage.
Hydrology: Exports, OR & MR flows.
Modeling: ptm experiments

Ranking: 4C-fish are entrained during these times, based on historical salvage and Pete Smith's USGS work

Hypothesis: Reducing Delta Cross Channel closures will reduce losses of adults and result in a better spawning distribution..

Measures:

Fish: FMWT distribution, TNS abundance, salvage,
Hydrology: Exports, OR & MR flows.
Modeling: ptm experiments

Ranking: 2C-based on conceptual understanding of Delta hydrodynamics and recent ptm work.

3. Food Supply

Hypothesis: Increased San Joaquin River flow to Suisun Bay will deliver more phytoplankton and zooplankton to support adult spawners. This action may also help to lower entrainment of fish.

Measures:

Fish: FMWT distribution, subsequent TNS abundance, condition, size, energy density, salvage.
Clams: Biomass, distribution, grazing rate.
Food supply: Zooplankton density, chlorophyll a, smelt diets.
Hydrology: SJR flow, exports, OR & MR flows.

Ranking: 0-there is evidence that material if provided, but it is too late for spawning adults

Hypothesis: Increased flow from Yolo Bypass will deliver more phytoplankton and zooplankton to promote egg production.

Measures:

Fish: subsequent 20 mm abundance and distribution, TNS & FMWT abundance, condition, size, energy density, salvage.
Clams: Biomass, distribution, grazing rate.
Food supply: Zooplankton density, chlorophyll a, smelt diets.
Hydrology: Sac flow, Cache Slough flow, particle tracking, hydrodynamics?

Ranking: 0

Spring Actions (March-May)

1. Habitat Improvements

Hypothesis: Higher flows during spring will increase the amount of habitat (e.g. X2) for delta smelt.

Measures:

Fish: 20 mm abundance, TNS abundance, condition, energy density, growth.
Habitat: X2
Food: Zooplankton, chlorophyll a, diets.

Ranking: 2B-Supportive pattern-efforts have shown that more flow will increase habitat

2. Reduce Losses (Mortality)

Hypothesis: Increased (more positive) Old and Middle River flows will reduce losses of larval and juvenile smelt.

Measures:

Fish: 20 mm abundance and distribution, TNS abundance & distribution, salvage, larval losses (e.g. Kimmerer method).
Hydrology: Exports, OR & MR flows.

Ranking: 4C-based on USGS work

3. Food Supply

Hypothesis: Increased San Joaquin River flow to Suisun Bay will deliver more phytoplankton and zooplankton to support young smelt. This action may also help to lower entrainment of fish.

Measures:

Fish: 20 mm abundance and distribution, TNS abundance and distribution, condition, size, energy density.
Clams: Biomass, distribution, grazing rate.
Food supply: Zooplankton density, chlorophyll a, smelt diets.
Hydrology: SJR flow, exports, OR & MR flows.

Ranking: 2B-critical period, first feeding, these sources do provide food

Hypothesis: Increased flow from Yolo Bypass (inflow or managed wetlands) will deliver more phytoplankton and zooplankton to support young smelt.

Measures:

Fish: 20 mm abundance and distribution, TNS abundance and distribution, condition, size, energy density.
Clams: Biomass, distribution, grazing rate.
Food supply: Zooplankton density, chlorophyll a, smelt diets.
Hydrology: Sac flow, Cache Slough flow, particle tracking, hydrodynamics?

Ranking: 2B-critical period, first feeding, these sources do provide food

Summer Actions (June-August)

1 Habitat Improvements

Hypothesis: Higher flows during summer will increase the amount of habitat (lower salinity, somewhat higher turbidity) for delta smelt.

Measures:

Fish: 20 mm abundance and water quality data, TNS & MWT abundance and water quality data, condition, energy density, growth.
Habitat: X2
Food: Zooplankton, chlorophyll a, diets.

Ranking: 3B-Matt Nobriga's analysis does show a relationship

Hypothesis: Increased turbidity via macrophyte removal will increase the amount of habitat for delta smelt.

Measures:

Fish: TNS & MWT abundance, condition, energy density, growth.
Habitat: EQ (ec & turbidity)
Food: Zooplankton, chlorophyll a, diets.

Ranking: 2A-turbidity is higher in summer and smelt distribution is related to turbidity

2 Food Supply

Hypothesis: Increased San Joaquin River flow to Suisun Bay will deliver more phytoplankton and zooplankton to support juvenile smelt. .

Measures:

Fish: TNS & FMWT abundance, condition, size, energy density.
Clams: Biomass, distribution, grazing rate.
Food supply: Zooplankton density, chlorophyll a, smelt diets.
Hydrology: SJR flow, exports, OR & MR flows, particle tracking.

Ranking: 4B-good evidence here-these sources both provide food

Hypothesis: Increased flow from Yolo Bypass (inflow or managed wetlands) will deliver more phytoplankton and zooplankton to support young smelt.

Measures:

Fish: 20 mm abundance and distribution, TNS & FMWT abundance, condition, size, energy density.
Clams: Biomass, distribution, grazing rate.
Food supply: Zooplankton density, chlorophyll a, smelt diets.
Hydrology: Sac flow, Cache Slough flow, particle tracking, hydrodynamics?

Ranking: 4B-good evidence here-these sources both provide food

Delta Smelt Working Group Meeting/Conference Call Minutes

August 21, 2006

Participating: Gonzalo Castillo (USFWS), Mike Chotkowski (USBR), Kevin Fleming (CDFG), Lenny Grimaldo (CDWR), Tracy Hinojosa (CDWR), Ann Lubas-Williams (USBR), Matt Nobriga (CDWR), Ryan Olah (USFWS), Tracy Pettit (USFWS), Jim White (CDFG) and Victoria Poage (USFWS, convener and scribe)

For Discussion:
1. Potential fall actions
2. Other actions
3. Fish Food Farm proposal

Recommendation for WOMT:
The Working Group agreed that the most defensible, critical period for using environmental water to protect delta smelt is the spring, when there is a clear link between flow, population distribution and entrainment risk. No data presently exists to demonstrate that the use of environmental water can influence the distribution of spawning adults, and the amounts of water needed to demonstrably improve fall habitat quantity/quality are unavailable. At times other than spring, it is likely that food limitation is a more critical problem than entrainment. The available data for striped bass and longfin smelt suggest that food limitation cannot be managed through the application of environmental water (attachment, Figure 1). Thus, it is very unlikely that small flow additions during fall could be reasonably expected to improve food availability for delta smelt. The Working Group therefore provisionally decided to recommend forestalling the use of EWA and other environmental water assets until the March-through-June period, when such use would have the greatest likelihood of a positive effect. The Working Group will, however, monitor Delta conditions and incidental take of adults, as per the 2005 OCAP B.O. and the Delta Smelt Risk Assessment Matrix. The DSWG may still recommend winter actions if adult delta smelt entrainment rises above the established threshold. The Working Group does not endorse the proposed fish food farm at Sherman Island.

Minutes:
Entrainment. At last Tuesday's WOMT meeting, Wim Kimmerer presented the results of an analysis of delta smelt entrainment that is part of an evaluation of the EWA that he is working on with co-authors. He estimates that at times, entrainment of delta smelt larvae may be as high as 30%, making it an important source of mortality. Larval losses due to entrainment may be over-ridden by food limitation during summer, but the Working Group is confident that it can minimize entrainment losses whereas mitigating for food limitation is more problematic and will require longer-term experiments and/or restoration programs.

Fall Flows. The Working Group discussed a proposal to maintain Delta outflow at a minimum of 7,000 cfs during September-December. Due to the wet spring, this action may be possible with little or no water cost. The Working Group is not opposed to this action, but did not recommend it because 7,000 cfs is not enough flow to detectably change physical habitat quantity/quality for delta smelt and will not likely change overbite clam distribution or abundance (attachment, Figure 2). Note that the quality of delta smelt fall habitat has recently been correlated with improved Summer Tow-Net Survey indices the following year (see notes from July 10, 2006). DWR generated new estimates on the water costs associated with proposed fall actions, based upon the most recent available forecast, as indicated below:

Net Outflow	October – December			
7,000 cfs	50% Hydrology	170 TAF	90% Hydrology	443 TAF
Net Outflow	September - December			
11,400 cfs	50% Hydrology	911 TAF	90% Hydrology	1,460 TAF

A net outflow of 11,400 cfs will maintain X2 at about Chipps Island if it is already at, or seaward of Chipps Island. Currently, X2 is near Collinsville about 10 km landward of Chipps Island. Fall physical habitat parameters do not respond linearly to changes in X2 position. Over the range of fall X2 positions observed since 1970, delta smelt habitat quality does not increase detectably until X2 passes seaward of Broad Slough (Figure 2 and Figure 3). The amount of environmental water required to move X2 seaward of Broad Slough to Chipps Island and keep it there throughout the fall is 3-4 times the annual EWA budget. Absent a formal and well-thought out experiment to develop an understanding of mechanisms underlying the fall habitat-summer abundance correlation, the DSWG cannot justify the water cost to maintain X2 at Chipps Island throughout the fall.

The Working Group believes that any fall flow control action should be set up as a full-fledged experiment to test competing hypotheses (i.e., reduction in clam distribution or abundance or reduction in entrainment susceptibility of adult delta smelt during winter or reduction in larval susceptibility to entrainment the following spring, etc.).

Old River/Middle River Flows. The Working Group recognized that Old River and Middle River flow targets could be achieved either by increasing San Joaquin River flow or by reducing exports, or more likely, through some combination of those actions. The Working Group believes that OR/MR flows that are neutral or positive through the spawning period of dry years are needed to minimize entrainment of larval delta smelt. These conditions are usually achieved for part of the spawning period through implementing the VAMP. However, the Working Group thinks that the VAMP starts too late in many years to be maximally protective. The target flows would depend to some extent on hydrology; if conditions in the spring are relatively wet, less flow could be needed, but in a 90% hydrology, OR/MR flows should be neutral or positive during a variable spring period based on water temperatures suitable for delta smelt spawning. In any hydrology, the Working Group would need to track fish distribution from survey data and determine the most appropriate flow targets as conditions develop. This year, San

Luis Reservoir may fill as early as December or January, which would potentially allow the Projects greater operational flexibility during spring 2007.

First Flush. Last winter, the Working Group looked at Delta conditions that could potentially influence the timing of adult delta smelt movement into areas wherein they would be subject to entrainment, and noted that in plots of the hydrograph against incidental take, it appeared that take increased in the days following the first major storms, as Sacramento River inflows increased. Definition of a "first flush" event may be based on precipitation or inflow; the Working Group will need to return to this concept in the next meeting.

Fish Food Farm. At last Tuesday's WOMT meeting, Wim Kimmerer presented evidence that for several species the most important source of mortality in the Delta is food limitation. The Working Group was asked to review DWR's proposal for an experimental food production facility on Sherman Island. The Working Group does not believe that the proposal should be implemented for several reasons. First, the proposed project is too small to make a detectable difference in estuarine food availability. Second, the project proposes to create a very shallow farm "habitat" for lower trophic level production during summer. This is likely to generate anoxic water similar to what often happens during fall in Suisun Marsh duck clubs. This poor-quality water would be discharged into a core delta smelt habitat area. Lastly, the project proposes to divert water onto Sherman Island from the surrounding waterways. Although the diverted water would be screened to exclude fish, larval fish may not be screened effectively. Furthermore, it cannot be screened to prevent nuisance organisms like Microcystis and overbite clam larvae that might have undesirable influences on what grows on the 'farm.'

Action Items:
None

Next Scheduled Meeting: Conference call, Wednesday, August 30, 2006, 3:00 pm

Submitted,
VLP

Attachment 1.

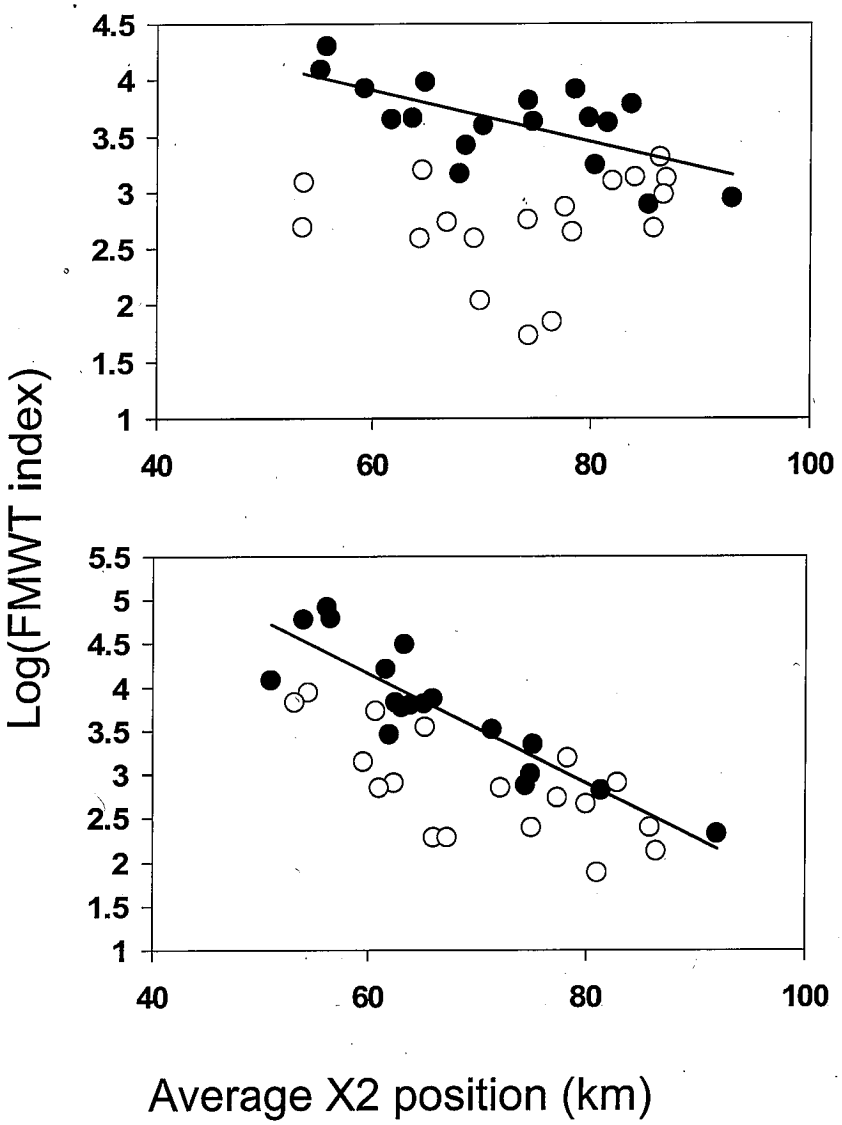


Figure 1. The 1967-2004 X2 relationships for striped bass (top panel) and longfin smelt (bottom panel) for before (solid symbols) and after (open symbols) the invasion of overbite clam, *Corbula amurensis*.

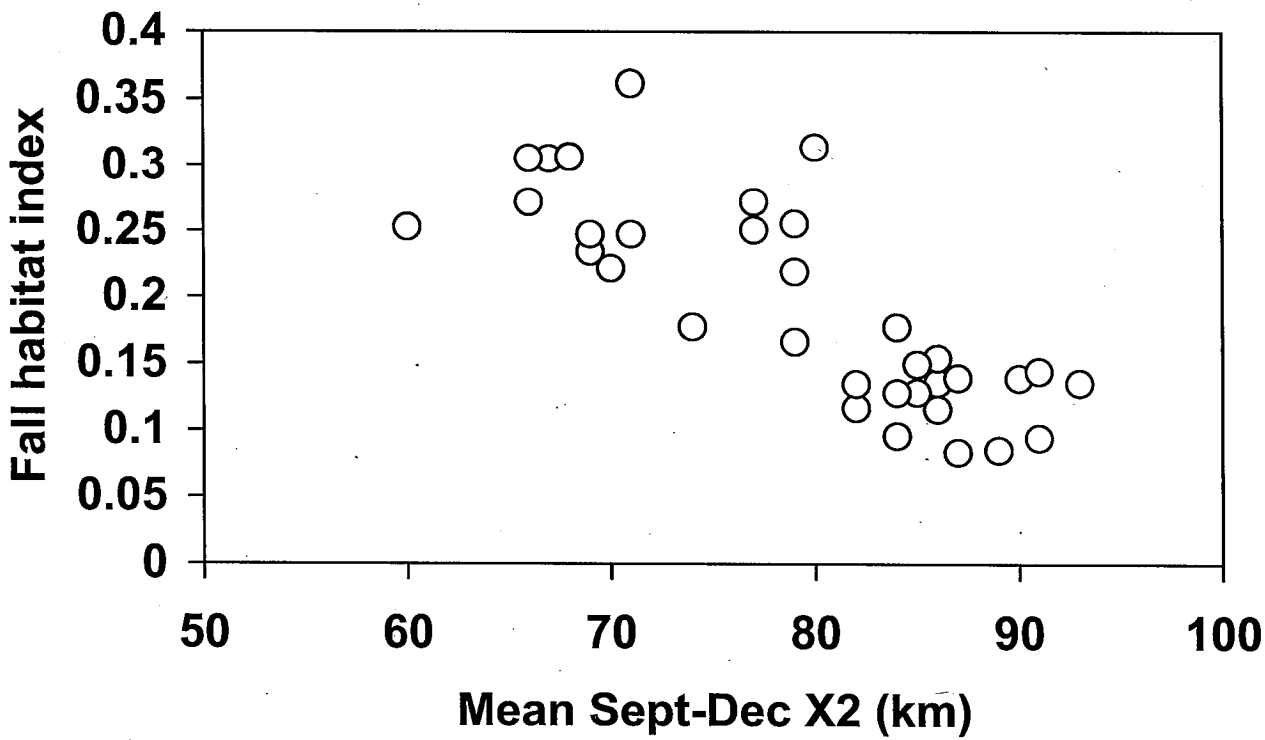


Figure 2. Relationship between fall X2 position and a delta smelt habitat index based on specific conductance, water clarity, and water temperature. Note that Chipps Island is approximately at X2 = 75 km and requires 11,400 cfs of Delta outflow to maintain its position there and higher flows to move it there from landward locations. Note that X2 was at approximately 85 km at the time of this meeting (August 2006).

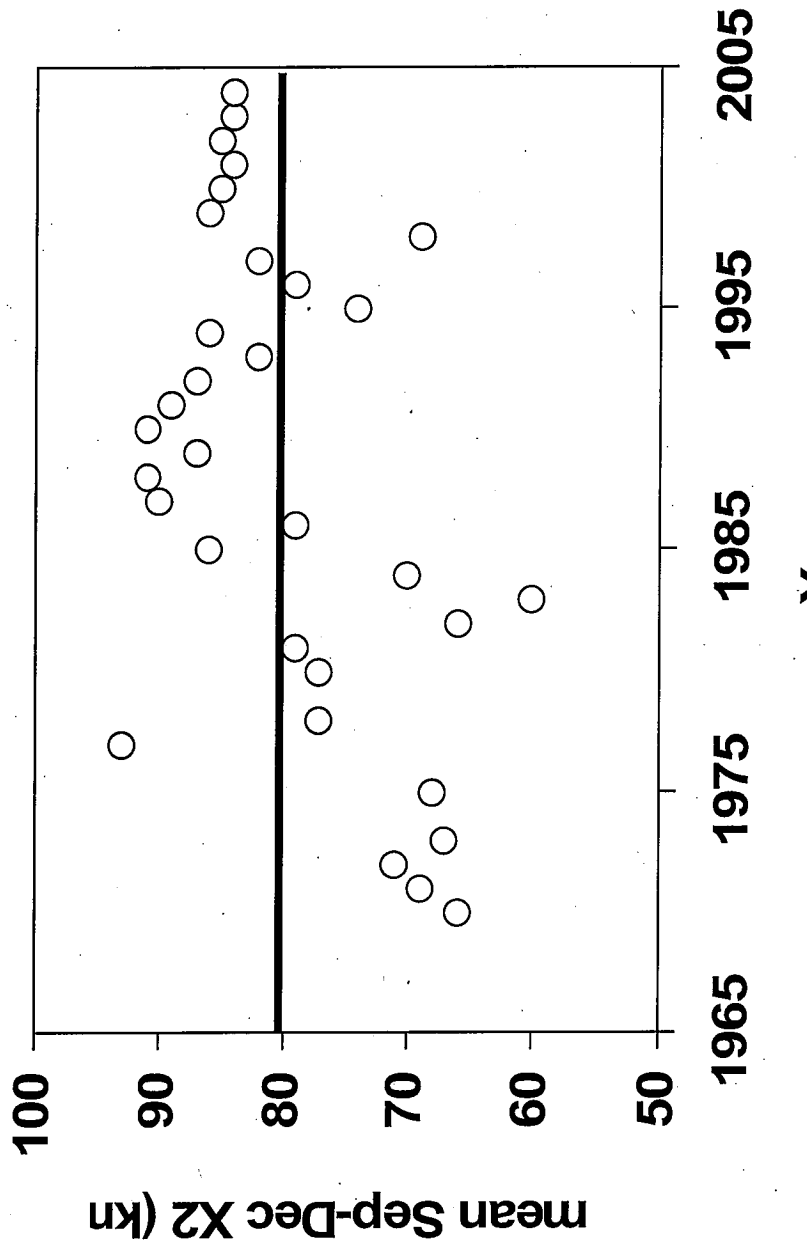


Figure 3. Time series of fall X2 positions for 1970-2004. The thick horizontal line denotes an X2 position near Broad Slough.

Delta Smelt Working Group Meeting Minutes

September 26, 2006

Participating: Gonzalo Castillo (USFWS), Mike Chotkowski (USBR), Kevin Fleming (CDFG), Bruce Herbold (USEPA), Tracy Hinojosa (CDWR), Peter Johnsen (USFWS), Ann Lubas-Williams (USBR), Matt Nobriga (CDWR), Kevin Sun (CDWR), Jim White (CDFG) and Victoria Poage (USFWS, convener and scribe)

For Discussion:
Action item from August 30:
1. Analyses of data pertinent to winter salvage events

Recommendation for WOMT:
The Working Group did not have a recommendation for WOMT.

The Working Group continued its August 30 discussion of the environmental factors that correspond to the onset or increases of salvage of pre-spawning adult delta smelt. The underlying hypothesis is that delta smelt cue on certain environmental factors when moving up the estuary to spawn, which may influence their vulnerability to entrainment at the export facilities. If environmental factors could be found that are sufficiently predictive of salvage, then modifications of Project operations could be designed to proactively avoid or minimize the entrainment of adult delta smelt. A small sub-group met previously to share data and prepare analyses for discussion by the entire Working Group. Analyses were intended to evaluate several hypothetical cues, including:

- Increases in Delta inflow
- Decreases in water temperature
- Changes in ambient light due to decreasing day lengths during late fall

Water temperatures and hydrodynamic indicator variables were plotted with historic salvage for the October-thru-January period and evaluated by eye (see attachment[1]). Evaluation of the resulting graphs revealed that an algorithm would be needed to identify where a salvage "event" actually occurs, since in all years there is a period of relatively modest salvage followed by one or more peaks. As discussed at the previous meeting, inflow alone is not a satisfactory predictor of salvage events. X2 position, which is considered a good indicator of delta smelt distribution, does not respond quickly enough to be a good predictor of salvage events. Drops in water temperature always precede salvage events, but such drops occur every year, so as a single environmental factor temperature is not an adequate predictor. However, a drop in water temperature, perhaps to some threshold value, followed by an increase in inflow should be evaluated as a predictor of salvage events.

[1] The reader is cautioned to pay close attention to the scale of the various graphs; also, cumulative salvage is denoted by blue circles in all graphics except for those depicting the average temperatures at Antioch, where cumulative salvage appears as red triangles.

The Working Group's next steps will be to refine the potential environmental triggers and guidelines and game them using historical salvage data. Adult delta smelt ride the tides to reach spawning habitats, so tide data could be added. An attempt must be made to define the amount and the extent of any potential curtailments. Curtailments would be defined in terms of Old River and Middle River flow targets, and the water costs of potential actions could be estimated. OR/MR flows allow for a certain amount of flexibility, as they can be achieved via reduced exports, increased SJR flow or various combinations of the two.

Potential scenarios to evaluate include:

- Export curtailment in response to an observed salvage event that triggers concern, i.e., business as usual
- A prescriptive curtailment, i.e., one beginning at a prescribed time and continuing for a prescribed period (more work would be needed)
- A curtailment triggered by an environmental predictor, e.g., temperature followed by flow as mentioned above

The same small subgroup will refine the analyses and report to the full Working Group at the next meeting.

On another topic, an evaluation of CDFG's Larval Survey sampling is needed. Thus far, the sampling has not collected very many larval delta smelt; its original intent was to evaluate gear types and sampling protocols, but last year it was subsumed by the POD effort in an attempt to determine larval distribution of species of concern. CDFG wishes to return to the original intent of the survey and use appropriate gears and deployment; however, the management questions that the survey is intended to address are unclear. If the question is when larvae become vulnerable to entrainment, it may be that this can be answered using a combination of data from spent adults, X2 and water temperatures. At a certain point, the 20-mm Survey is a more effective means of elucidating distribution. If the question is one of early detection so that actions can be taken to minimize entrainment, different gears and protocols may be needed. CDFG will submit a draft work plan to the Interagency Ecological Program.

Action Items:
1. Mike Chotkowski, Kevin Fleming, Matt Nobriga and Bruce Herbold will confer to refine the analyses, and will report back to the full Working Group at the next meeting.

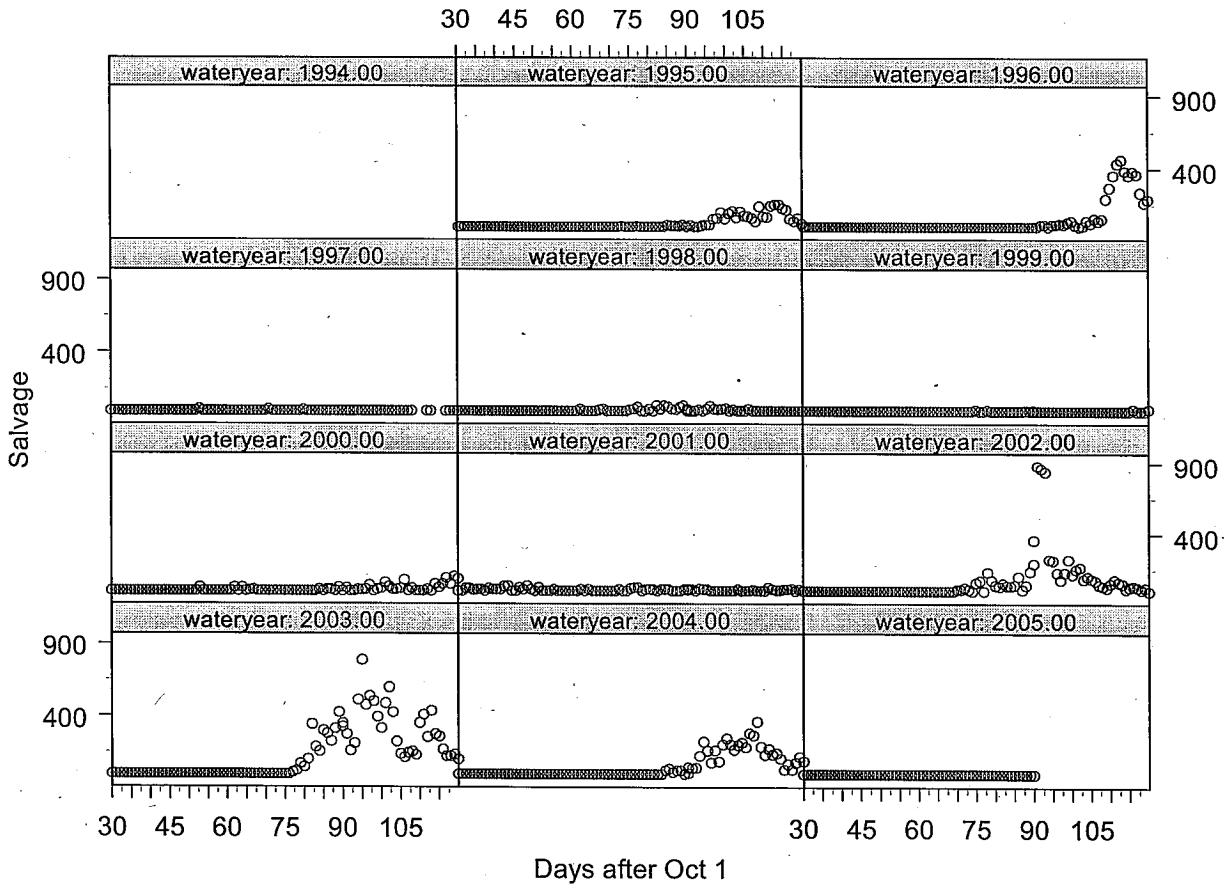
Next Scheduled Meeting: Tuesday, October 10, 2006, at 2:00 pm in room W-1931 at the Cottage Way federal building.

One attachment

Submitted, VLP

Attachment

Figure 1. Delta smelt salvage by date, with dates represented as days after October 1.



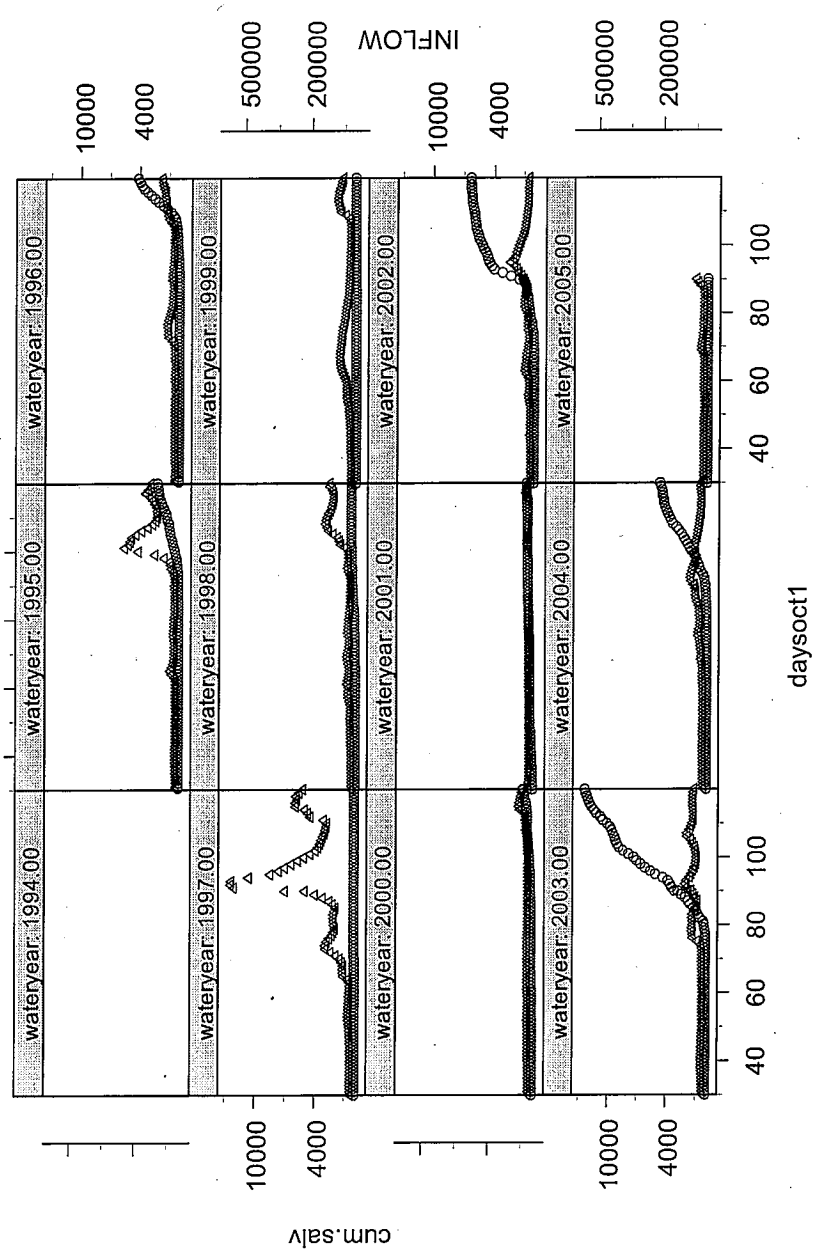


Figure 2. Cumulative delta smelt salvage with Delta inflow overlaid.

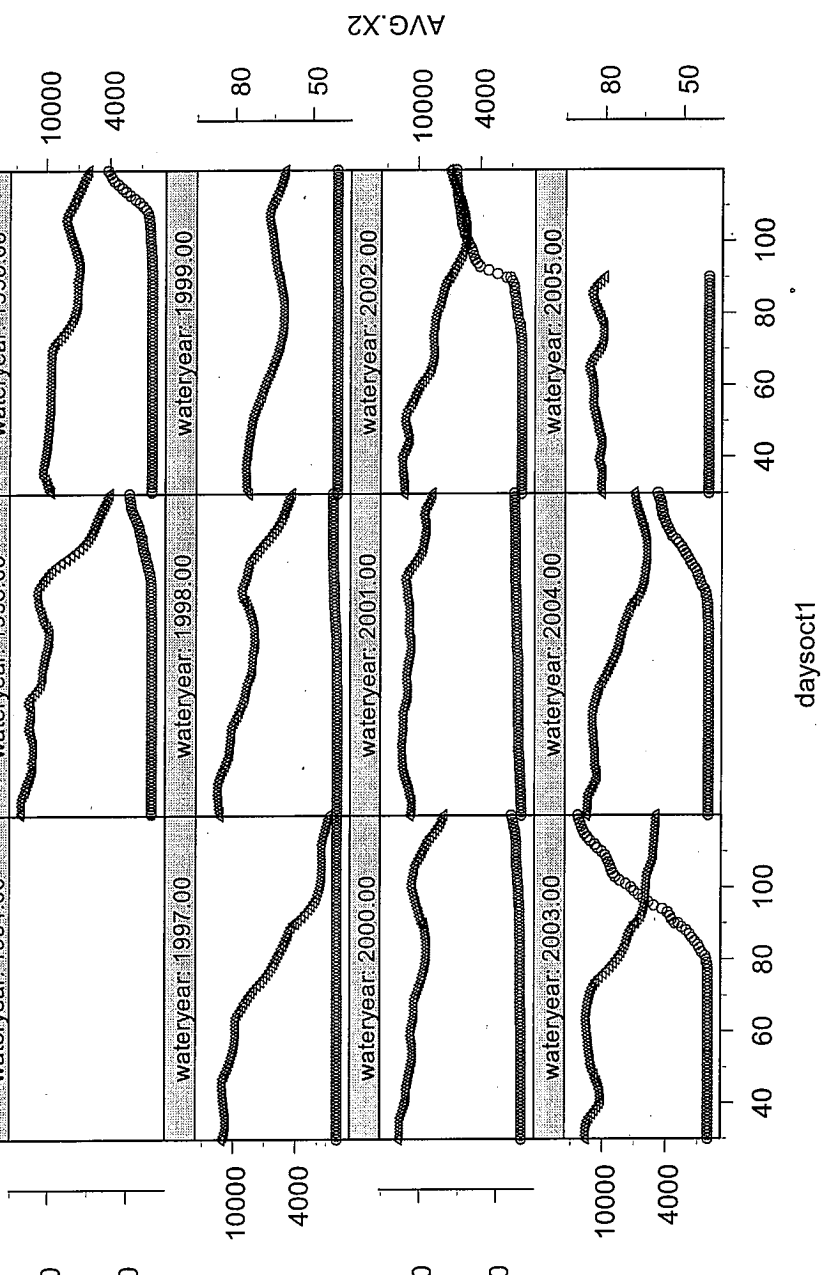


Figure 3. Cumulative delta smelt salvage with average X2 overlaid.

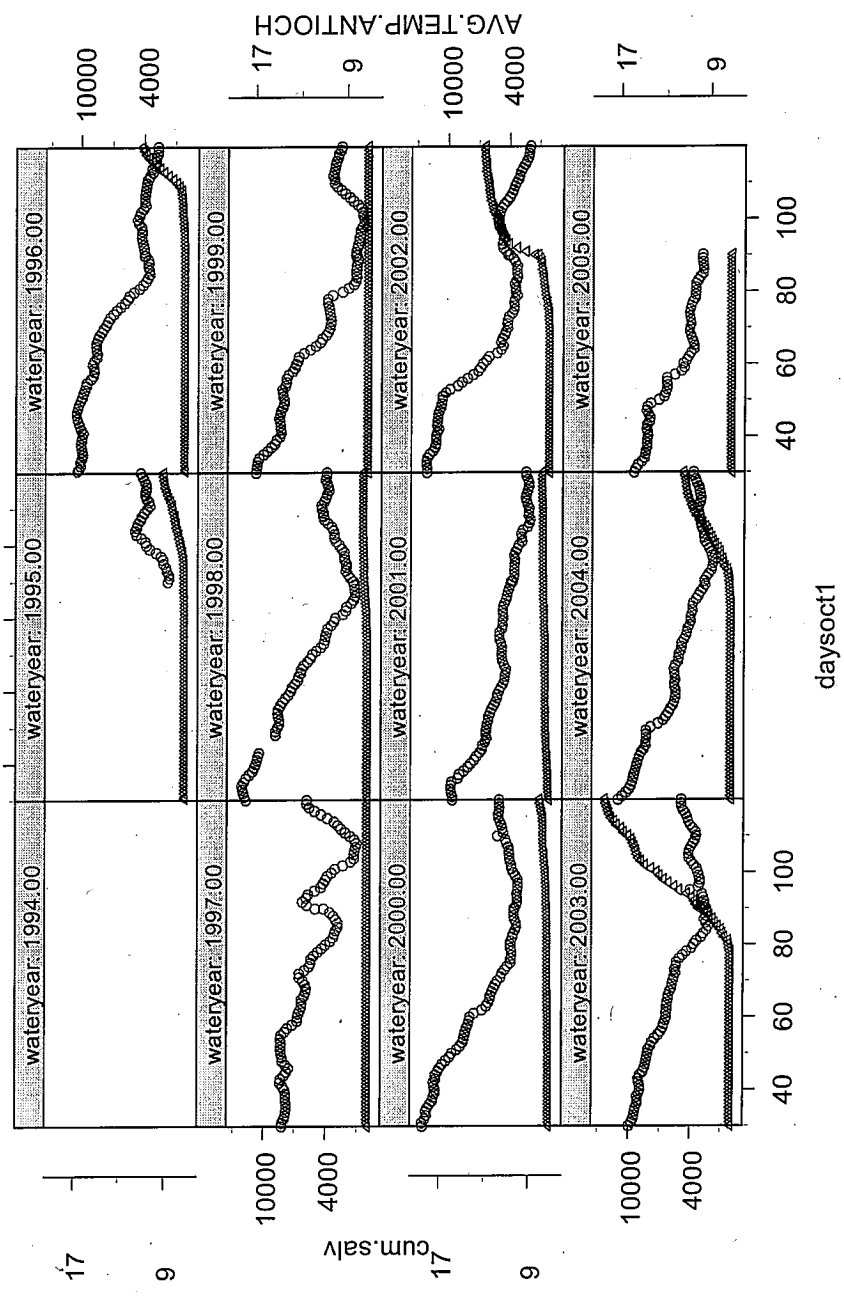


Figure 4. Cumulative delta smelt salvage with average water temperature at Antioch overlaid.

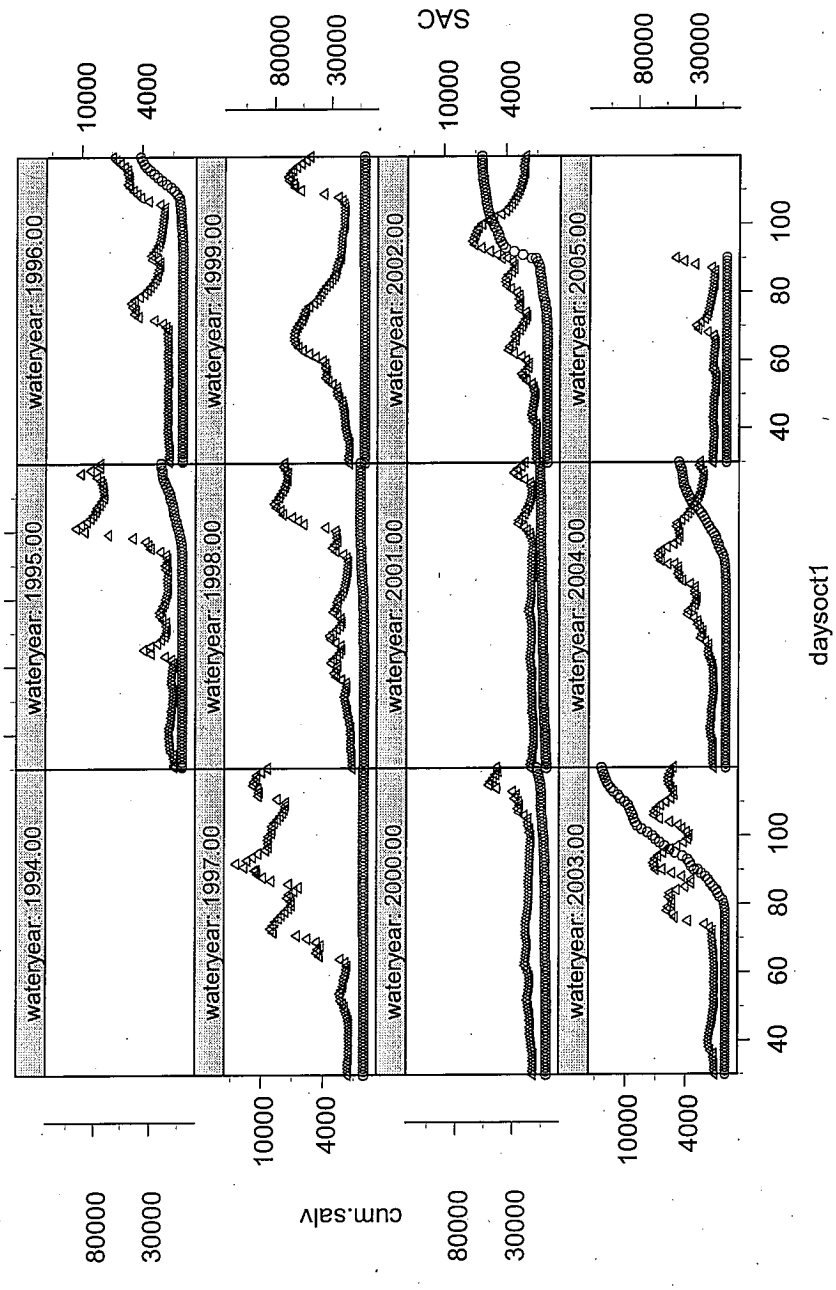


Figure 5. Cumulative delta smelt salvage with Sacramento River flow overlaid.

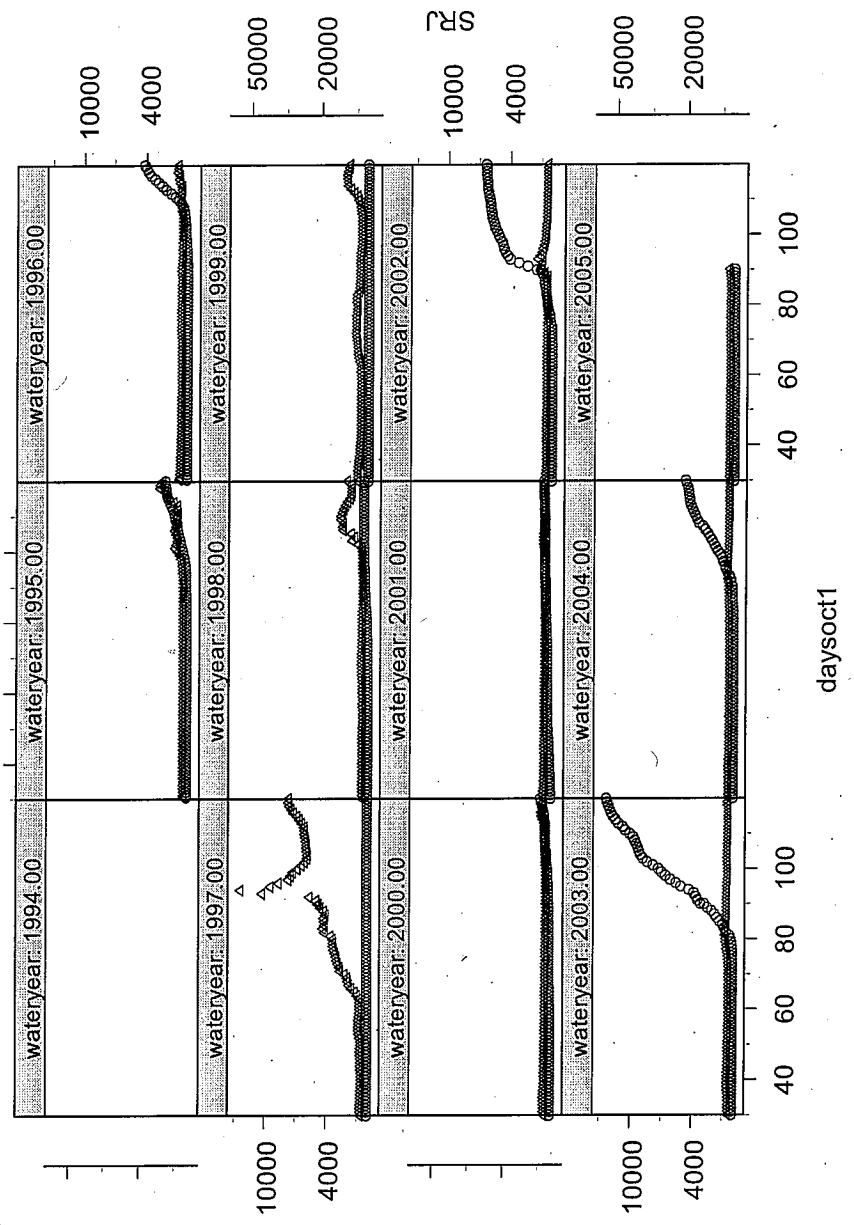


Figure 6. Cumulative delta smelt salvage with San Joaquin River flow overlaid.

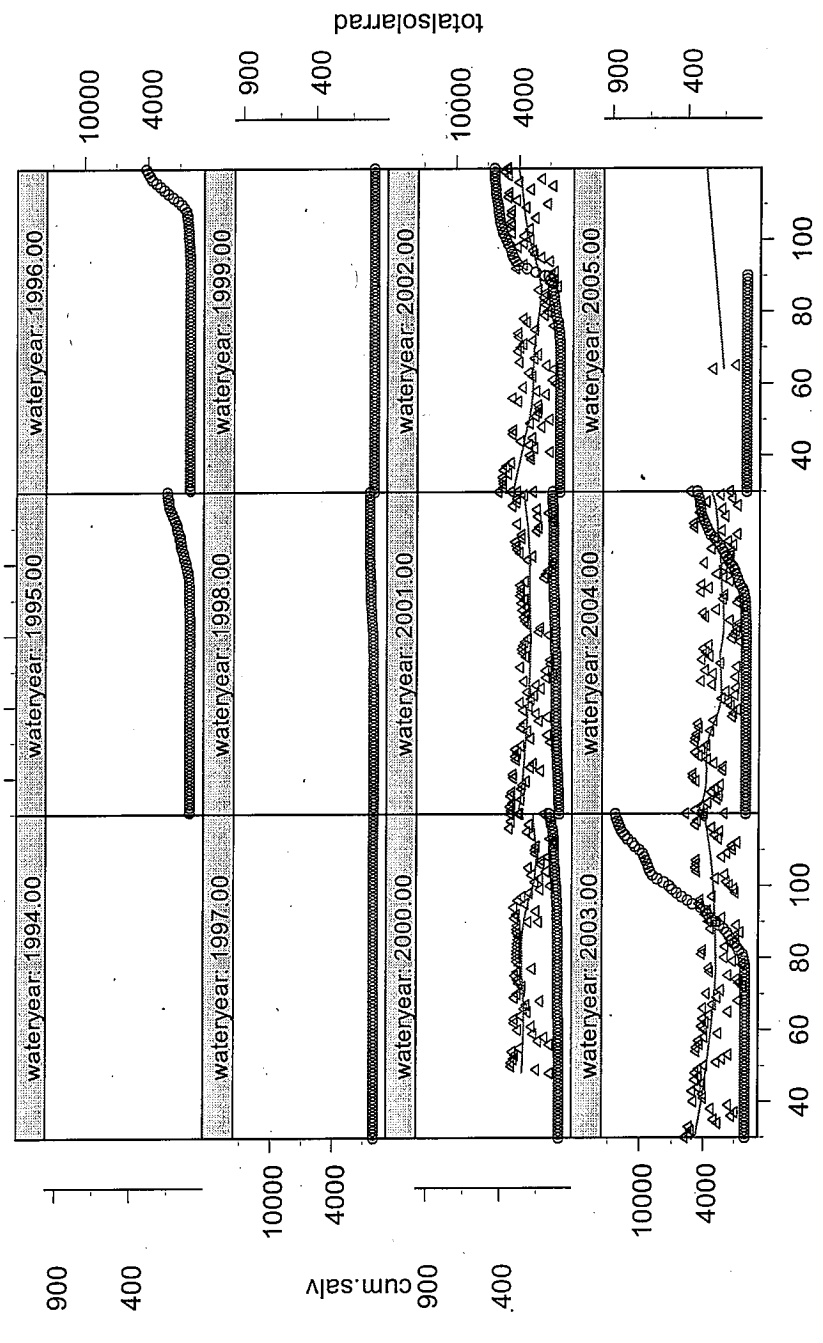


Figure 7. Cumulative delta smelt salvage with total daily solar radiation overlaid.

Attachment 14-H

EXHIBIT 9

Delta Smelt Working Group Meeting Notes

December 11, 2006

Participating: Gonzalo Castillo (USFWS), Mike Chotkowski (USBR), Kevin Fleming (CDFG), Lenny Grimaldo (CDWR), Tracy Hinojosa (CDWR), Ann Lubas-Williams (USBR), Matt Nobriga (CDWR), Ted Sommer (CDWR), Jim White (CDFG) and Victoria Poage (USFWS, convener and scribe)

For Discussion:

1. Revisit the preliminary recommendation for a winter action from the October 10 meeting
2. Future recommendations for spring South Delta barrier installation
3. Resources' POD Action Matrix and supporting documentation

Recommendation for WOMT: The Working Group had two recommendations for WOMT. These recommendations reflect conditions which the Working Group believes are likely to minimize salvage of pre-spawning adult delta smelt in winter and larval delta smelt in spring, but if high salvage occurs, then other actions may be warranted.

First, the Working Group finalized the preliminary recommendation from October 10 as follows:

- Implement a proactive winter action to address concerns about wintertime entrainment of adults during "first flush" conditions. It is unlikely that any action will be needed until after December 25th. Delta water temperatures have already dropped below 13^0 C (compiled from data from Mossdale, Antioch and Rio Vista). Once the time of year and water temperature cues are appropriate for smelt migration to spawning areas, the Working Group may recommend the following: no more than seven days after Sacramento River flow at Freeport rises above 25,000 cfs for at least three days, increase flows in lower Old and Middle Rivers to at least -3500 cfs until February 15th.
- If no Sacramento River pulse above 25,000 cfs occurs by January 15th then Old and Middle River flows should be moderated to a range of -5000 cfs to -3500 cfs until February 15th.
- If flows on the Sacramento River are above 25,000 cfs prior to Dec 25th, and remain above 25,000 cfs through Feb 15th, the Working Group does not anticipate requesting operational changes. However, actions may be considered if Freeport flows increase but are not sustained above 25,000 cfs or if high salvage events occur.

The Working Group will consider and/or generate additional analyses of existing data and continue to monitor conditions in the Delta and survey sampling results to determine whether further refinements to the recommendation are needed.

The second recommendation is to forego installation of the spring Head-of-Old River Barrier and to postpone installation and operation of the agricultural barriers until June 1.

Meeting Notes:

1. The Delta Smelt Working Group revisited the preliminary recommendation for a winter action made at its October 10 meeting. The Working Group retained its original "first flush" conceptual model, which assumes, based on an examination of salvage data and numerous environmental variables, that adult delta smelt movement up the estuary (which increases vulnerability to entrainment) follows decreases in Delta water temperature and increases in Sacramento River flow. The Working Group retained the temperature criterion of less than 13^0C at Mossdale, Antioch and Rio Vista and Sacramento River flow criterion of exceeding 25,000 cfs for at least three days as triggers for a winter action. It was noted that the EWA Technical Panel and others have asked the Working Group why, if we accepted analyses presented by Pete Smith, we did not recommend setting net flows in Old and Middle Rivers to zero (cfs) to better protect pre-spawning adults. The Working Group believes that while eliminating net upstream OR/MR flow likely would be better for delta smelt, operating to this target would be prohibitively expensive, and that significant protection could be achieved with flows of -3500 cfs. DWR staff have derived estimates of the water costs of the potential actions in the Resources Agency POD Action Matrix and found that the proposed winter action could consume all available environmental water, leaving no assets for spring actions for larvae or juveniles. The Working Group discussed assessing the expected benefit of alternative OR/MR flows for adult delta smelt, given that there are two key issues: (1) the rate of the flow reduction and (2) the duration of the flow reduction. In relative terms, contingency tables of flow versus duration could look something like this:

Adults

	1 week	4 weeks
0 cfs	Better	Best
-3500 cfs	Worse	Not So Bad

Juveniles

	1 week	4 weeks
0 cfs	Not So Bad	Best
-3500 cfs	Worse	Better

The Working Group discussed restructuring the recommendation so as to gain some of the expected benefit of zero cfs, if only for a short period of time, by prescribing zero cfs for two weeks, followed by -2000 cfs for 1 or two weeks, followed by -3500 cfs for one or two weeks, using the same criteria of temperature and flow to trigger an action. However, this flow regime would not alleviate the potential shortfall in available environmental water assets, so it was not added to the recommendation.

The Working Group decided to adopt its preliminary recommendation of October 10 as a formal recommendation for a winter action. It was noted that "first flush" conditions should not take anyone by surprise; Delta water temperatures will likely drop gradually, and significant increases in Sacramento River flows would likely become apparent three to five days before Freeport flows trigger an action. However, the Working Group believed that additional analyses of the relationship of salvage to OR/MR flows and of days post-flush to first salvage would be informative. Two families of recommendations, one for adults and one for juveniles, could conceivably be generated via additional analyses of salvage in relation to OR/MR flow. Some of this work may already have

been undertaken by others; the status of this work should be clarified and remaining analyses undertaken as appropriate.

2. Recent PTM modeling (see October 30 meeting notes) indicated that the South Delta barriers increase particle entrainment risk from the central Delta. The Working Group recommends against the installation of the spring Head-of-Old River barrier and postponement of the installation and operation of the agricultural barriers until June 1.

Discussion of the first two agenda items did not leave sufficient time for discussion of the supporting documentation for Resources' POD Action Matrix.

Submitted,
VLP

Attachment 14-I

EXHIBIT 10

Delta Smelt Working Group Meeting Minutes

October 10, 2006

Participating: Gonzalo Castillo (USFWS), Mike Chotkowski (USBR), Kevin Fleming (CDFG), Lenny Grimaldo (CDWR), Bruce Herbold (USEPA), Tracy Hinojosa (CDWR), Peter Johnsen (USFWS), Ann Lubas-Williams (USBR), Matt Nobriga (CDWR), Ted Sommer (CDWR), Jim White (CDFG) and Victoria Poage (USFWS, convener and scribe)

For Discussion:
1. CDFG's action plan matrix
2. Refined analyses of data pertinent to winter salvage events (triggering variables)
3. Parameters for PTM modeling of CCF gate ops

Recommendation for WOMT:
The Working Group made a preliminary recommendation to implement a proactive winter action to address concerns about wintertime entrainment of adults during "first flush" conditions. No action will likely be needed until after December 25th and after Delta water temperatures drop below 13^0 C (compiled from data from Mossdale, Antioch and Rio Vista). Once time and temperatures are appropriate for smelt spawning movements, Sacramento River flow at Freeport increases above 25,000 cfs should trigger operational changes to achieve flows in lower Old and Middle Rivers no more negative than -3500 cfs. If no Sacramento River pulse above 25,000 cfs occurs by January 15th then Old and Middle River flows should be moderated as much as possible until February 15th. This recommendation reflects conditions which the Working Group believes are likely to minimize salvage of pre-spawning adult delta smelt, but if high salvage occurs other actions may be warranted.

If flows on the Sacramento River are above 25,000 cfs prior to Dec 25th, and remain above 25,000 cfs through Feb 15th, no action should be necessary.

Salvage of adults or other conditions suggesting that adults are spawning in the South Delta are an indicator that springtime actions may also be beneficial. If salvage is low and flows in Old and Middle Rivers are not strongly negative in January and February, then springtime actions might not be warranted.

Minutes:
The second sampling period of the Fall Mid-Water Trawl survey is underway this week. No information was available.

CDFG has been asked to compile a supplement to the POD Action Plan that outlines any new actions that could potentially be taken to protect delta smelt. Kevin Fleming presented a draft document with separate potential actions for winter and spring (see attachment 1). The emphasis was on actions that could be implemented at the SWP. The first trigger would come with the Recovery Index, as before, but DFG proposed that if the

index is less than 74 and the net flow at Old and Middle Rivers is more negative than -5000 cfs, flows be increased so that net Old and Middle river flows are no more negative than -5000 cfs, either by reducing exports or increasing San Joaquin River flow. DFG proposed changing the level of salvage concern from reaching the 50th percentile of the ratio of salvage to the recovery index to reaching the 25th percentile of the ratio, and making both percentiles triggers for export reductions or increases in SJR flow. After reviewing the graphic of Old and Middle River flow plotted against salvage (attachment 2), the Working Group recommended that OR/MR flows be increased further, to no more negative than -3500 cfs. Although the graphic depicts a linear relationship, the Working Group discussed the possibility that it is likely more sigmoidal, with a threshold level of effect followed by a steep upward curve. The Working Group noted that some of the weaknesses of the DFG plan included the potential to exhaust all EWA and B2 assets in winter, leaving nothing in reserve for spring actions, and that the document specifies no magnitude or duration for the proposed export cuts/flow increases. The Working Group noted that if a winter action is triggered by a salvage event, indicating adult delta smelt are (or at least were) present in the southern Delta and will be spawning there, then the likelihood that a spring action would be needed is greater than if an action is triggered only by environmental factors. However, if the adult salvage concern level is not reached, a spring action may not be needed. These recommendations notwithstanding, decisions to implement the action would best be made in real-time, as circumstances dictate. Spring actions do not yet include a flow trigger; this needs further discussion, and may depend upon real-time conditions and the results of PTM modeling. Spring actions also include modifications to Clifton Court Forebay intake gate operations. Following the discussion, changes will be made to the document which will be circulated for further review and comment by the Working Group and then forwarded to DFG management for final review.

The Working Group continued its August 30 and September 26 discussions of the environmental factors that correspond to the onset or sudden increases in salvage of pre-spawning adult delta smelt. Preliminary analyses indicate that a drop in water temperature to about 13^0 C followed by an increase in Delta inflow may be a good predictor of adult salvage. More work is needed to refine these potential environmental triggers; however, the Working Group made the following preliminary recommendation:

1. action triggered by environmental factors (proactive mode)
    - when Delta water temperatures reach 13^0 C and Delta inflow increases to 25,000 cfs or greater, increase the net OR/MR flow to no more negative than -3500 cfs
    - if no Sacramento River pulse above 25,000 cfs occurs by January 15th then Old and Middle River flows should be moderated as much as possible until February 15th.
2. action triggered by salvage (reactive mode)
    - when the adult concern level is reached, be it the 25th or the 50th percentile of the ratio, respond as per the DSRAM

As always, the Working Group believes that reacting to a salvage event as it occurred would be far less effective than anticipating a salvage event; the former likely defers or extends salvage in time, whereas the latter is intended to avoid and/or minimize salvage.

A spring action could include reoperation of the CCF intake gates and modification of the schedule by which South Delta barriers (not just the HORB) are installed. Analysis of CCF gate operations and screening efficiency indicate that there may be a diel effect of pumping, and that decreases in approach velocities lead to increases in salvage, likely because of increased efficiency of the screens. Analysis of barrier operations indicates that all barriers, not just the HORB, affect South Delta circulation and particle fate. How this information may be used to reduce impacts to delta smelt warrants further discussion.

The Working Group has for some time been interested in Particle Tracking Modeling of the effects of CCF intake gate operations. Reoperation of the CCF intake gates could even out channel velocities, export pumping and approach velocities and therefore affect salvage. The Working Group proposed that the following PTM runs be performed:

	Barriers in:		Barriers out:	
SJR	4500	7000	4500	7000
Exports	1500 comb.	3000 comb.	1500 comb.	3000 comb.
Gates	Fully Open	Fully Open	Std. Ops	Std. Ops

The PTM would be run for VAMP-like conditions from April 15 – May 15. Particles would be released at 20-mm stations 815, 902 and 910, as in the runs performed last year. Rather than the traditional bar chart output, the Working Group requested a cumulative output of particle fates. Holding Sacramento River flows constant, potentially in the range of 20-30,000 cfs, for both San Joaquin flow values would avoid introducing a confounding factor. However, it may be more realistic to match historic SR flows to historic SJR flows.

Action Items:

1. Mike Chotkowski will work on refining the winter salvage trigger analyses.
2. DWR modeling staff will perform the requested PTM runs.

Next Scheduled Meeting: Not yet scheduled.

Attachments: 2

Submitted,

VLP

nent 1. DFG Draft Action Plan document

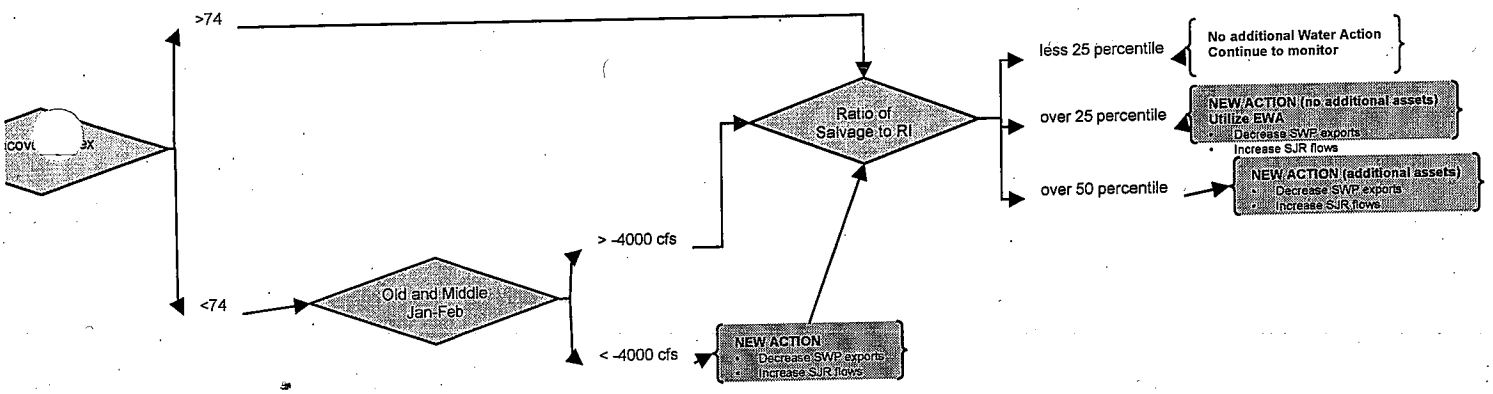
inter Action – DRAFT for discussion only

educe entrainment of POD fish (delta smelt, longfin smelt and striped bass)

lodify Old and Middle River flows (pre-emptive)

educe salvage (reactionary)

A B C D



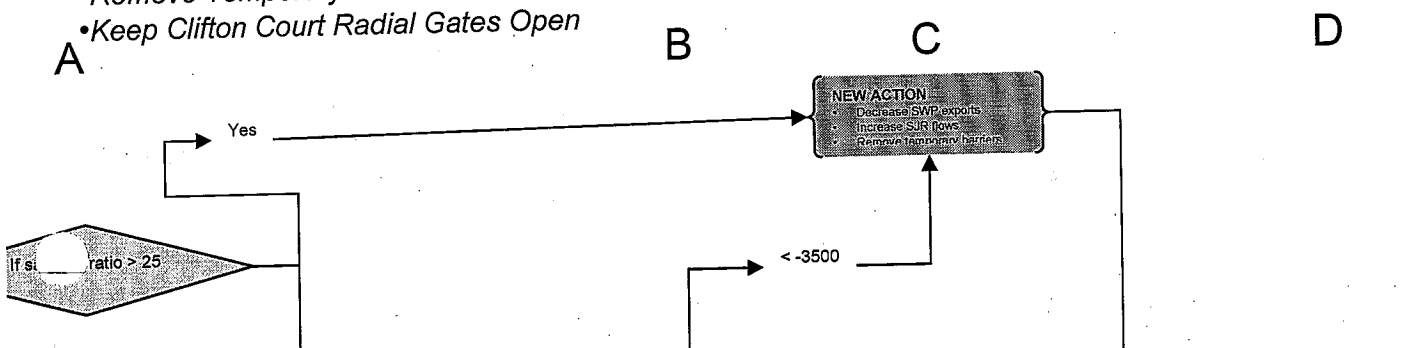
Recovery Index is based upon FMWT and will be available by mid October. The RI of 74 represents the median for all years. From the RI the salvage concern levels is calculated. This algorithm for the concern level is found in the 2005 USFWS OCAP BO.
January and February combined Old and Middle River flows should be projected based upon model runs with both current and projected operations. The -4000 cfs criterion is only a first approximation based upon a visual inspection of the graphs prepared by Pete Smith, USGS. The actual target criterion will require further input from DSWG an other Agency staff.
The amount and timing of the new action to reduce negative flows will require further input from DSWG an other Agency staff. It will likely determined by a combination of spawning migration cues (outflow and temperature) as well as historic patterns of salvage events.
This is a modification of the current DSRAM with the inclusion of a more protective criterion for concern. Given a low RI the differences in salvage numbers between 25 and 50 percentile is not anticipated to be great and the length of time between hitting the 25 and 50 percentile will be short. Therefore, additional water assets need to be identified prior to the need and readied for implementation.

Early Spring Action – DRAFT for discussion only

Reduce entrainment of POD fish (delta smelt, longfin smelt and striped bass)

Modify delta hydrology during early delta smelt early larval stage

- *Additional assets (SJR)*
- *Reduced SWP exports*
- *Remove Temporary Barriers*
- *Keep Clifton Court Radial Gates Open*



- *If there was a need for winter protection of the adults pre-spawn, there will be a need to protect the larvae.*
- *Relationship between early flows and subsequent delta smelt distribution. Based upon 20MM Survey "centroid" distribution, the higher the early flows the further downstream the resulting smelt distribution.*
- *The amount and timing of the new action to reduce entrainment will require further input from DSWG and Agency staff. It will likely determined by a spawning cues (temperature) as well as historic patterns of salvage events.*
- *This is would include a pre-VAMP use of EWA assets. It may turn out that the only time that the radial gates can be left open is during this pre-VAMP/VAMP period, in which case this is where that particular new action will be used.*

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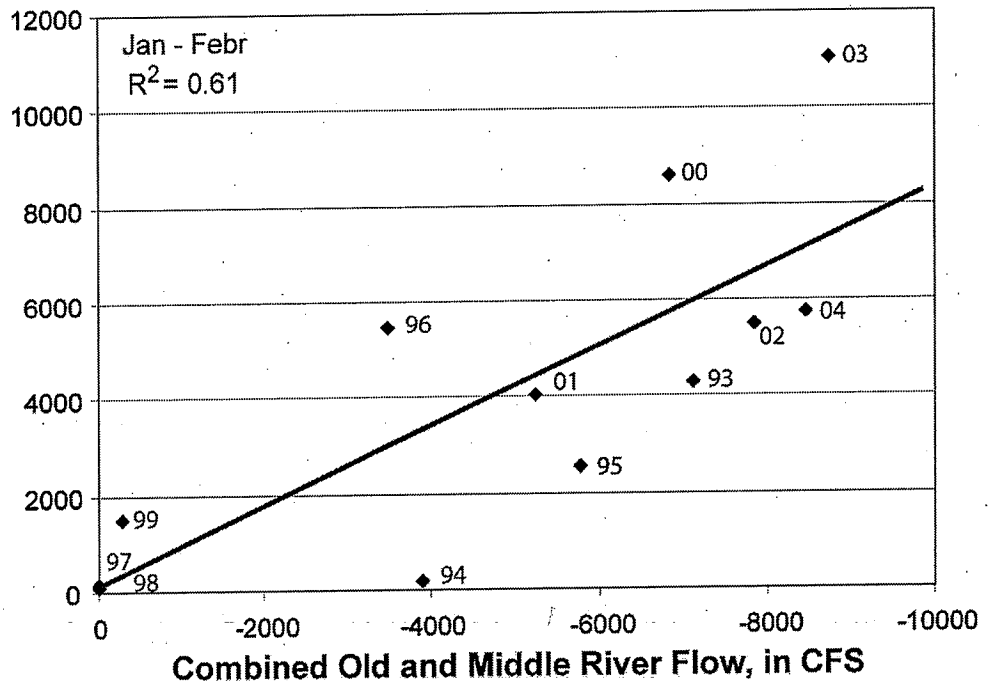
SWP)



Pete Smith, USGS

Attachment 14-J

EXHIBIT 11

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UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF CALIFORNIA
FRESNO DIVISION

NATURAL RESOURCES DEFENSE COUNCIL, et al., Plaintiffs, v. DIRK KEMPTHORNE, et al., Defendants.	Case No.: 1:05-CV-01207 OWW LJO **DECLARATION OF BRUCE OPPENHEIM**

I, Bruce F. Oppenheim, hereby declare as follows:

1. I am a Fishery Biologist for the National Marine Fisheries Service (NMFS), Southwest Region, Sacramento Area Office and have been employed by the NMFS over 7 years. In my capacity as a fishery biologist I have been responsible for implementing the Federal Endangered Species Act (ESA) within the Sacramento and San Joaquin River Basins (California's Central Valley). I have worked on various ESA section 7 consultations including the Central Valley Project (CVP) and State Water Project (SWP) Operations, Criteria, and Plan (OCAP) for the past 7 years. I have been involved with CVP and SWP operations throughout my career as the NMFS representative on the Water Operations Management Team, the Data Analysis Team, the B2 Interagency Team, the Environmental Water Account Team and the Sacramento River

Temperature Task Group. All of these teams are integrated into the adaptive management process described in OCAP. Previously, I was employed by the U.S. Fish and Wildlife Service in the Stockton Field Office (1999-2000), and the Arcata Field Office (1990-1999) where I was involved in salmon monitoring on the Klamath and Trinity Rivers.

2. There are four anadromous fish species in the Sacramento River/San Joaquin River system that are listed under the ESA over which the NMFS has jurisdiction: winter run Chinook salmon, spring run Chinook salmon, the Central Valley steelhead Distinct Population Segment (DPS), and the southern DPS of North American green sturgeon. In addition, fall run Chinook salmon are present in this system. While fall run Chinook salmon are not listed under the ESA, the federal actions affecting fall run Chinook salmon habitat are subject to provisions of the Magnuson-Stevens Fishery Conservation and Management Act.

3. The continued existence of these anadromous species depend in large part on decisions made by federal and state project operators that control the releases from upstream reservoirs. Decisions made to manage habitat conditions for delta smelt, a resident pelagic fish in the Sacramento-San Joaquin Delta (Delta), have direct consequences for other species that use the same Delta habitat, including the four fish species under NMFS ESA jurisdiction. The system of dams and water conveyance structures included in the CVP and SWP block access to a significant portion of historical habitat limiting the available habitat for spawning and rearing. Modification of planned releases of stored water in project reservoirs affects downstream flows and the ability to manage water temperatures for anadromous fish. A limited amount of cold water exists in project reservoirs and must be judiciously allocated during critical periods (spawning and egg incubation).

4. Adequate attraction flows in the fall are necessary to overcome the adverse effects of poor water quality and low flow conditions in the San Joaquin River for fall run Chinook salmon and steelhead. Water usually reserved for fall actions was purchased on the Stanislaus and Merced Rivers and released this spring in order to decrease reverse flows in the Delta.

5. Over the past several weeks, flows have fluctuated in the Stanislaus River. Historically, at the end the 4-week pulse of flows and reduced export pumping associated with the Vernalis

Adaptive Management Plan (VAMP), flows are ramped down on the Stanislaus River to queue remaining salmonid species (including juvenile fall run Chinook salmon and listed steelhead) to outmigrate before water temperatures in the Delta reach lethal levels. Recently, when the U.S. Bureau of Reclamation (Reclamation) contacted NMFS and inquired about raising flows on the Stanislaus River to increase Delta inflow from the San Joaquin River watershed (in order to protect delta smelt by minimizing or avoiding reverse flows in Old and Middle Rivers), NMFS did not oppose the action. However, NMFS encouraged Reclamation to ramp flows downward as soon as possible, to avoid potential impacts to salmonid species. NMFS intends to continue to work with Reclamation to ensure continued protection of salmonid species.

6. NMFS is concerned that the proposed remedial actions for delta smelt may reduce fall attraction flows in the San Joaquin River system, and the ability to meet water temperature requirements in the Sacramento River basin next spring and summer. Water temperature criteria for ESA listed fish species are non-discretionary conditions described in the NMFS 2004 OCAP biological opinion. Flow and temperature standards are considered part of the baseline operations required by the State Water Resource Control Board Decision Order 90-05 for the Sacramento River, and Water Right Decision 1641 for the Delta. The operations of the CVP are linked together, therefore, the use of environmental water after VAMP on the San Joaquin River may have consequences later in the year on the Sacramento River.

7. The 90 percent exceedence forecast for May 2007, shows the End-of-September (EOS) carry-over storage requirement in Shasta Reservoir will be about 1.902 million acre feet (MAF). This required storage level is considered necessary to protect the cold water pool available for winter run Chinook salmon spawning below Keswick Dam. Any additional releases from Shasta Reservoir could reduce EOS storage below the 1.9 MAF criteria and limit the ability to control water temperatures in upstream spawning areas. In addition, higher releases from Folsom Dam on the American River for delta smelt may reduce the ability to manage water temperatures for Central Valley steelhead and reduce the cold water available for commercially valuable fall run Chinook salmon spawning in November. This year (2007) is considered a "dry" water year, therefore, reservoir storage levels should be conserved in case of a subsequent "dry" or "critical"

year in 2008.

8. Remedial actions for delta smelt (such as export reductions and positive Old and Middle River flows) will have positive effects on juvenile salmonids through reduced entrainment at the Delta pumps and higher survival rates. However, some proposed actions such as opening the Delta Cross Channel gates early, and not installing the Head of Old River Barrier would reduce survival of salmonids, while being of questionable significance to delta smelt. The actions taken for delta smelt need to be balanced against the impacts on other listed fish species.

This declaration is made pursuant to 28 U.S.C. 1746. I declare under perjury that the foregoing is true and correct to the best of my current knowledge.

Respectfully submitted this 15th day of June, 2007, in Sacramento, California.

Bruce F. Oppenheim

Attachment 14-K

EXHIBIT 12

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UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF CALIFORNIA

NATURAL RESOURCES DEFENSE COUNCIL, CALIFORNIA TROUT, BAYKEEPER & ITS DELTAKEEPER CHAPTER, FRIENDS OF THE RIVER, and THE BAY INSTITUTE, all non-profit organizations,

Plaintiffs,

v.

DIRK KEMPTHORNE, in his official capacity as Secretary of the Interior, and H. DALE HALL, in his official capacity as Director of the U.S. Fish and Wildlife Service,

Defendants.

SAN LUIS & DELTA MENDOTA WATER AUTHORITY, WESTLANDS WATER DISTRICT, CALIFORNIA FARM BUREAU FEDERATION, GLENN-COLUSA IRRIGATION DISTRICT, et al., CALIFORNIA DEPARTMENT OF WATER RESOURCES, STATE WATER CONTRACTORS; and KERN COUNTY WATER AGENCY.

Intervenors/Defendants.

Case No.: 05-CV-01207 OWW LJO

DECLARATION OF RONALD MILLIGAN

I, Ronald Milligan, declare as follows:

1. I am the Manager of the Central Valley Operations (CVO) Office of the United States Bureau of Reclamation (Reclamation), Mid-Pacific Region. In my capacity as CVO Manager, I have responsibility for the day to day operations of the Central Valley Project (CVP). I have held this position since November, 2004.

2. CVP is currently pumping at 3500cfs from Jones Pumping Plant (Jones). Since May 30, there has been estimated salvage of 61 delta smelt (5 actual observed and one incidental observation) at Jones.

3. Water temperatures in the south delta have been have ranged from 20.4°C on May 23 to 25°C on June 18 for the three station average. On Monday, June 18, the three station average reached 25°C for the 1 pm to 6 pm period. Attachment 1 to this declaration shows the data collected from the monitoring stations for May 22, 2007 to June 20, 2007.

4. To date, Reclamation has spent approximately $5.2 million to augment flows on the San Joaquin River to improve Old and Middle River Flows. Releases from the Merced River (approximately 15,000acre feet in total releases) continue to reach Vernalis and should continue through the Delta for the remainder of this week. Reclamation also purchased approximately 20,000 acre-feet of water on the Stanislaus River, which was released in May and June. Reclamation did not seek further releases on the Stanislaus in order to maintain sufficient storage to provide fall flows for salmon, and to cue any salmon or steelhead remaining in the Stanislaus to move into the Delta before temperatures in the Delta reached lethal limits.

5. Current tidal projections should significantly improve Old and Middle River flows this week.

6. Reclamation operates two reservoirs in the San Joaquin watershed, Friant Dam on the San Joaquin River and New Melones on the Stanislaus River. Friant is hydrologically isolated upstream from the confluence of the Merced River in all but the wettest of years, and operations of Friant Dam are subject to a court approved settlement in the matter of Natural Resources Defense Council, et al. v. Kirk Rodgers, et al., Civ. No. S-88-1658 LKK/GGH (E.D. Cal.).

7. Reclamation operates New Melones Reservoir to meet obligations to senior water rights holders, instream fishery flow in accordance with a 1987 agreement with the Department of Fish and Game, water quality and flow criteria at Vernalis as specified in Water Rights Decision D-1641, water dedicated under Central Valley Project Improvement Act Section

3406(b)(2), and project needs of the East Side Division CVP contractors. There is no additional water available for out of basin releases from New Melones Reservoir and releasing additional water would impact Reclamation's ability to meet its water obligations from New Melones Reservoir this year and into future years.

8. CVP demands for water from contractors are currently being met through a combination of pumping at Jones and withdrawal of water from San Luis Reservoir. Withdrawal of storage from San Luis Reservoir is still limited to 2 feet per day to protect from sloughing of the dam face. As the reservoir lowers the maximum withdrawal rate produces less supply.

9. Given warm weather and maturing crops, current demands require pumping levels greater than the pumping that occurred on June 17 and 18, which was approximately 2500cfs at Jones and 500 cfs at Banks Pumping Plant (Banks), a State Water Project (SWP) facility. Even at these rates water levels in O'Neill Forebay were critically low for several days. Supply interruption caused by low O'Neill storage was narrowly averted this last weekend. Such an interruption would result in reduced deliveries to SWP contractors south of Dos Amigos pumping plant and could take up to 9 hours to restore full deliveries to the Delta Mendota Canal.

10. Additional pumping is needed to avoid excessive drawdown of San Luis Reservoir and eventual allocation reductions caused by very low water levels in San Luis Reservoir. Failure to increase pumping will also likely result in reduced water quality for municipal

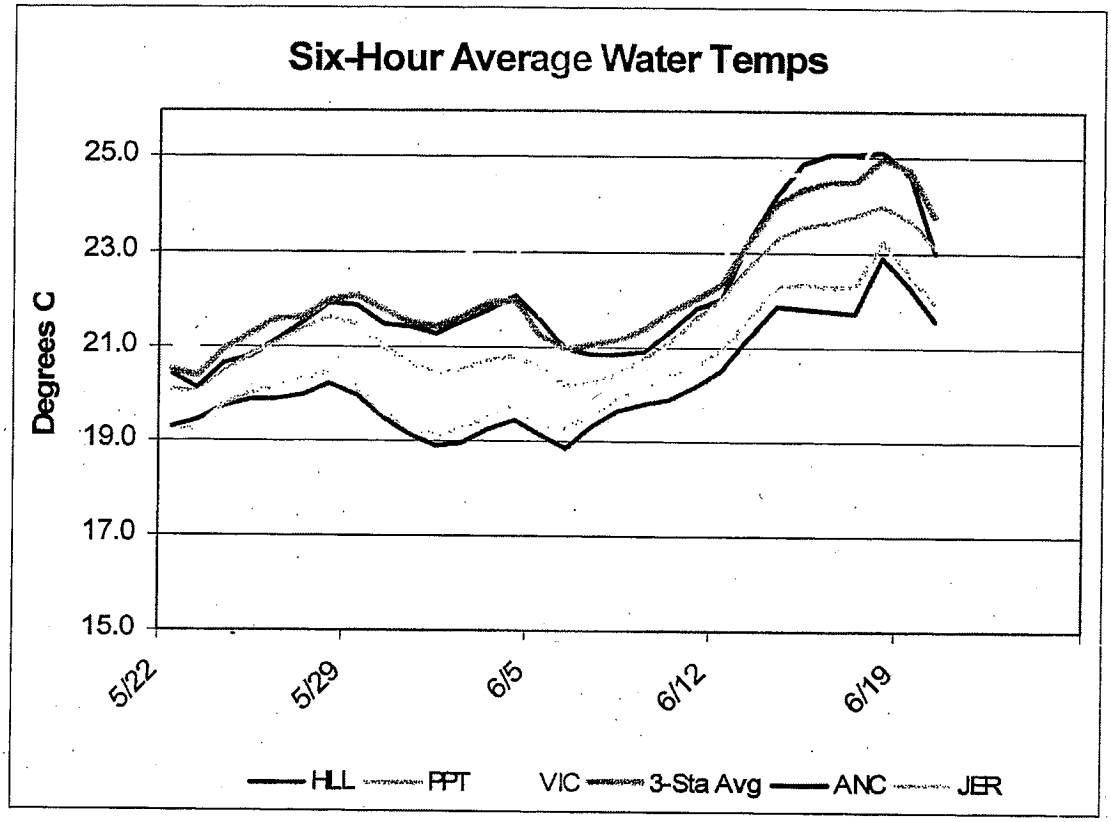
contractors in the San Felipe Division who receive water from San Luis Reservoir when the reservoir level reaches its lowest point in September (low-point).

I declare under penalty of perjury under the laws of the State of California and the United States, that the foregoing is true and correct.

Dated this 21th day of June, 2007.

Ronald Milligan
Manager, Central Valley Operations Office,
Mid- Pacific Region, U.S. Bureau of Reclamation

Attachment 1


Six-Hour Average Water Temps
Degrees C
25.0
23.0
21.0
19.0
17.0
15.0
5/22
5/29
6/5
6/12
6/19
HLL
PPT
VIC
3-Sta Avg
ANC
JER

Date	HLL	PPT	VIC	3-Station Average	ANC	JER
5/22/2007	20.4	20.1	21.1	20.5	19.3	19.2
5/23/2007	20.1	20.0	21.0	20.4	19.4	19.3
5/24/2007	20.6	20.5	21.8	21.0	19.7	19.8
5/25/2007	20.8	20.9	22.2	21.3	19.9	20.0
5/26/2007	21.1	21.1	22.5	21.6	19.9	20.1
5/27/2007	21.6	21.4	22.0	21.7	20.0	20.3
5/28/2007	21.9	21.6	22.4	22.0	20.2	20.5
5/29/2007	21.9	21.5	22.8	22.1	20.0	20.1
5/30/2007	21.5	21.0	22.9	21.8	19.5	19.6
5/31/2007	21.4	20.7	22.5	21.5	19.1	19.3
6/1/2007	21.3	20.4	22.5	21.4	18.9	19.1
6/2/2007	21.5	20.5	22.9	21.6	19.0	19.3
6/3/2007	21.8	20.7	23.3	21.9	19.2	19.5
6/4/2007	22.1	20.8	23.1	22.0	19.5	19.8
6/5/2007	21.6	20.6	21.7	21.3	19.2	19.4
6/6/2007	20.9	20.2	21.8	21.0	18.9	19.3
6/7/2007	20.9	20.2	22.1	21.1	19.3	19.5
6/8/2007	20.8	20.4	22.3	21.2	19.7	19.9
6/9/2007	20.9	20.8	22.6	21.4	19.8	20.1
6/10/2007	21.3	21.1	22.8	21.8	19.9	20.4
6/11/2007	21.8	21.6	22.6	22.0	20.2	20.6
6/12/2007	22.1	22.1	22.9	22.3	20.5	21.0
6/13/2007	23.3	22.7	23.8	23.3	21.3	21.6
6/14/2007	24.2	23.3	24.6	24.1	21.9	22.3
6/15/2007	24.9	23.5	24.7	24.4	21.9	22.3
6/16/2007	25.1	23.7	24.7	24.5	21.8	22.3
6/17/2007	25.1	23.8	24.6	24.5	21.8	22.3
6/18/2007	25.1	24.0	25.7	25.0	22.9	23.3
6/19/2007	24.6	23.7	25.8	24.7	22.3	22.5
6/20/2007	23.0	23.1	25.2	23.8	21.6	22.0

Attachment 14-L

LETTER 21

EXHIBIT 13

UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF CALIFORNIA
HON. OLIVER W. WANGER, JUDGE

NATURAL RESOURCES DEFENSE COUNCIL, et al.,
Plaintiffs,
vs.
DIRK KEMPTHORNE, Secretary, U.S. Department of the Interior, et al.
Defendants.

No. 05-CV-1207-OWW
HEARING RE INTERIM REMEDIES
DAY 7

Fresno, California — Friday, August 31, 2007

REPORTER'S TRANSCRIPT OF PROCEEDINGS

Volume 7, Pages 1396 through 1699, inclusive

Reported by: KAREN LOPEZ, Official Court Reporter

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PLAINTIFFS'	Marked
26	1511
27	1533
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DEFENDANTS'	
SL I	1407
SL J	1408
SL K	1408
SL L	1408
SL M	1408
DWR I	1438
DWR J	1438
DWR K	1440
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DWR N	1456
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PLAINTIFFS'	Received
27	1534
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Friday, August 31, 2007 Fresno California

8:32 a.m.

THE COURT: Good morning, ladies and gentlemen. Please be seated. We're back on the record in NRDC versus Kempthorne. Mr. Lee, are you going -- Ms. Wordham.

MS. WORDHAM: Your Honor, we are prepared to call Mr. Leahigh. However, there is the preliminary matter of DWR's objections to the declaration of Mr. Rosekrans.

THE COURT: All right. What I can tell you is that I have received -- apparently there is a party or parties who want to telephonically observe the proceedings and so they're being connected now.

THE CLERK: Hello. This is the Eastern District of California.

A VOICE: I've got Chris Stevens from the CALFED Bay-Delta program on the line.

MR. STEVENS: Hello this is Chris Stevens from the Bay-Delta Authority in Sacramento.

THE COURT: Okay. Thank you.

Mr. Stevens, can you hear me? This is Judge Wanger.

MR. STEVENS: I can, Your Honor. Thank you.

THE COURT: I understand that you want to observe the proceedings telephonically?

MR. STEVENS: That would be my preference.

THE COURT: All right. Well, with the understanding

that you're not going to participate. Does anybody object?

MS. POOLE: No, Your Honor.

MS. WORDHAM: No, Your Honor.

MR. WILKINSON: No, Your Honor.

THE COURT: All right. Well, then, you will be permitted to observe telephonically with the understanding that you're not going to participate. Do you agree?

MR. STEVENS: I agree, thank you, sir.

THE COURT: All right. Let me indicate that I have objections from the plaintiffs to the admission of the declarations of James Snow, Russ Freeman, Russell D. Harrison, Daniel G. Nelson, Joan Maher, G.F. Duerig. I have the State Water Contractors opposition to those objections. Now, those are the only evidentiary objections I've received.

MS. WORDHAM: Your Honor, the Department of Water Resources reserved its right to make oral objections this morning to the declaration of Spreck Rosekrans.

THE COURT: All right. This would be -- this was identified yesterday as Plaintiffs' Exhibit 24.

I thought there were two declarations of Mr. Rosekrans.

MS. WORDHAM: There are, Your Honor. 24 and 25. We are only objecting to a couple of exhibits in Mr. Rosekrans' July 23rd declaration, which is document No. 420.

THE COURT: All right. You may proceed.

LETTER 21

MS. WORDHAM: Your Honor, the Department of Water Resources objects to the Exhibits 4 and 5 of Mr. Rosekrans' July 23, 2007 declaration. The basis for the objection is that as to document 4, there is no citation to it or reference to it in the declaration itself. There's no basis, no foundation for it. Regardless of whether Mr. Rosekrans authored the document, there's no indication in the declaration itself that he relied on it in any part.

As to Exhibit Number 5, again, even though Mr. Rosekrans may have authored the document, there's one single reference to it at, I believe, the last paragraph of his declaration. But it provides no foundation for the document, it provides no support for any of the statements made in the document.

THE COURT: All right. Thank you very much.

MS. POOLE: Your Honor --

THE COURT: Ms. Poole.

MS. POOLE: With regard to Exhibit 4, Mr. Rosekrans' declaration, beginning at around paragraph 25, which is page 7 of 9, discusses alternative water supplies that have been developed in the State of California in the last 15 years. And that discussion relates, obviously, to how they'll respond to reductions in pumping. And that is what Exhibit 4 goes to. Those additional storage facilities.

THE COURT: But without any page and line references,

as I indicated yesterday, I wasn't simply going to read through hundreds of pages of exhibits that have been attached. Because there physically isn't the time to do it. And so he describes what he understands, if you will, additional storage capacity is.

And he doesn't refer to the exhibit nor am I directed to a place within the exhibit where I can find it. He refers, for instance, on page 8 to Article 21, surplus and unscheduled water. And Table A, deliveries. But to the Court's understanding, that would be Table A to Schedule 21.

MS. POOLE: If Your Honor would go to the top of that page, line 1 and 2.

THE COURT: Yes.

MS. POOLE: Looking at page 8 of 9, there's a reference to Diamond Valley Reservoir. That, for example, is one of the facilities identified on Exhibit 4 with the capacity of 800,000 acre feet. And also on paragraph 24 on page 7 of 9, there's a discussion about the contractors making significant investments -- excuse me, Your Honor, I'm at lines 21 through 26.

THE COURT: Yes. Well, I'm going to consider what he says here. The objection is only to the attached exhibit, which is not referred to, incorporated and doesn't appear to be any foundation for.

MS. POOLE: It's not directly referred to, Your

Honor. This discussion is based on information in that exhibit. So we would contend that it is -- should be submitted as a basis for the expert's opinion. But not necessarily for the truth of the matter asserted.

THE COURT: Ms. Wordham.

MS. WORDHAM: Your Honor, notwithstanding counsel's representation, there is nothing in the declaration to indicate that Mr. Rosekrans relied on this document in formulating this opinion.

THE COURT: That does -- go ahead, Ms. Poole.

MS. POOLE: Your Honor, that reference that I just gave to page 7 of 9 at line 22 does refer to Exhibit SR 4 as an explicit reference. That's Exhibit 4 to Spreck Rosekrans' declaration.

THE COURT: All right. I'm going to sustain the objection in part -- is the matter submitted?

MS. POOLE: Yes, Your Honor.

THE COURT: Ms. Wordham?

MS. WORDHAM: Yes, Your Honor.

THE COURT: I'm going to sustain the objection in part. I will consider the attached exhibit because there is a foundation of personal knowledge by the expert, Mr. Rosekrans. There is also a specific reference to SR 4, which is one of the objected to exhibits as providing a list of over 6 million acre feet in recently developed storage. And then there's a

listing about what entities have, in effect, to use the expert's words, invested in those storage facilities.

To that extent, I'm going to consider the declarations for no other purpose. I'm sorry, the exhibit, which is number 4.

Now, as to Exhibit Number 5, Ms. Poole, was there any reference in his declaration to Exhibit 5? And is there any need for Exhibit 5?

MS. POOLE: Yes, Your Honor. If you look at page 8 of 9, paragraph 27, lines 23 through 25. That's an explicit reference to Exhibit 5.

THE COURT: This reads "Finally, much of the water that the CALFED Record of Decision (2000) intended to provide environmental uses has not been made available during recent years. This shortfall, averaging approximately 420,000 to 460,000 acre feet for the 2002-2004 period, is documented in 'Finding the Water,' Environmental Defense 2005 (See Exhibit SR-5)."

There is that one specific reference without giving me a page cite in the exhibit. So that means I have to search the exhibit to find it. What I'll do is this. I'm going to make the same ruling if you'll provide me the page cite within SR-5.

MS. POOLE: I will do that, Your Honor.

THE COURT: All right. Are those the DWR's

objections?

MS. WORDHAM: That was the extent of DWR's objections, yes, Your Honor.

THE COURT: Thank you. Now we'll take up the objections of the plaintiffs to the State Water Contractors offerings and there may be other witnesses from other parties.

MR. O'HANLON: Yes, Your Honor. Daniel O'Hanlon. I -- you recall yesterday I did not have with me the redacted form of the declarations that we are offering that the plaintiffs are objecting to. So at this time I'd like to have marked and offered into evidence those declarations.

THE COURT: Yes. We had a little difficulty finding them this morning.

MR. O'HANLON: Sorry, Your Honor.

THE COURT: By the way, let me totally change the subject. A briefcase was left outside the courtroom yesterday. Did the person whose briefcase that is get it?

Yes? Good. All right. You may proceed.

MR. O'HANLON: Thank you, Your Honor. The first declaration that we're offering is a redacted declaration of James Snow. It was document 410 filed on July 23rd.

THE COURT: Which now is Exhibit Number SL --

MR. O'HANLON: SL I, Your Honor.

(Defendant's Exhibit SL I was marked for identification.)

MR. O'HANLON: The second declaration, which will be Exhibit SL J, is a supplemental declaration of Mr. Snow, document No. 462, filed on August 13th.

(Defendant's Exhibit SL J was marked for identification.)

MR. O'HANLON: The third declaration, which will be SL K, is a redacted version of the declaration of Daniel Nelson, document 460, filed on August 13th.

(Defendant's Exhibit SL K was marked for identification.)

MR. O'HANLON: The fourth declaration, which will be marked as Exhibit SL L, is document No. 459 filed on August 13th, 2007, declaration by Russ Freeman.

(Defendant's Exhibit SL L was marked for identification.)

MR. O'HANLON: And the final declaration, Your Honor, is Exhibit SL M, is document 463 filed on August 13th, 2007. It's the declaration of William Harrison.

(Defendant's Exhibit SL M was marked for identification.)

THE COURT: Thank you. Those are objected to declarations along with declarations from State Water Contractors. And so that we're clear, there are objections made on the grounds of relevance, lack of personal knowledge, time consuming, probative, less probative, prejudicial effect

under 403 to the James Snow declarations, Russ Freeman, William D. Harrison, Daniel Nelson, Joan Maher, G.F. Duerig.

And the opposition to State Water Contractors to these declarations, the Court has -- I received these at about 8:10 this morning and I've done my best to read them. So these are your objections, Ms. Poole or Mr. Wall.

MS. POOLE: Yes, Your Honor.

THE COURT: All right. Do you wish to -- I've read the papers. If you want to provide any argument, you can, otherwise I can rule on the objections.

MS. POOLE: Your Honor, I'm happy to submit it on the papers.

THE COURT: All right. Thank you.

MR. WILKINSON: We are as well, Your Honor.

THE COURT: All right.

MR. O'HANLON: Your Honor, if I may.

THE COURT: Yes, you may.

MR. O'HANLON: One additional point in addition to the points made by the State Water Contractors, which we join in. There's an additional reason why these declarations are relevant to the Court's consideration and that is under the Endangered Species Act, a major change to project operations can be required only if necessary to avoid jeopardy. These declarations help establish which of these actions will require major action meter changes to project operations and

therefore are relevant under the substantive provisions of the ESA as well.

THE COURT: Thank you very much. Ms. Poole.

MS. POOLE: May I briefly respond to that, Your Honor?

THE COURT: Yes.

MS. POOLE: There's no distinction within the Endangered Species Act injunctive relief guidelines for major changes versus minor changes. That's irrelevant as are all cost discussions. The issue is whether actions can go forward that will not jeopardize the species or cause adverse modification of habitat. That's the sole issue Your Honor should be focused on here.

THE COURT: All right. Thank you very much. Is the matter submitted?

MR. WILKINSON: Yes, Your Honor.

MR. O'HANLON: Yes, Your Honor.

THE COURT: The Court notes that the plaintiffs have, in their remedies proposal and their briefs in support of these proceedings, offered, and they haven't provided specific language, but they have indicated that they recognize that there should be a public health and safety exception to any interim order that the court were to enter.

And they distinguish between economic loss, costs that would be not only monetary but resource or other material

or tangible costs as allegedly irrelevant from actions that would directly cause a risk to human health, safety, the human environment, which they have from the outset indicated that such an exception should be part of any order that is issued.

The Court has based rulings on that general demarcation which applies under the Endangered Species Act. We have a Biological Opinion that was vacated under the authority of the Administrative Procedures Act.

And to the extent that we are going to be addressing the form, the substance, the effect, the scope, the operation and the intent of any remand, with or without vacatur, any other specific orders that the Court enters that would affect the agency, any operation of its ordinary course of business and the conduct of its statutorily mandated and authorized duties, the Court believes there is a two-fold, if you will, legal and equitable basis on which this relief is sought.

Because the Biological Opinion and its contents, including the take limits and remedial action measures, the DSRAM, D-S-R-A-M, all of that was done under the provisions of administrative law.

The Court believes that administrative law continues to apply in any relief that will be granted as well as, as of yesterday, there is now amended species or there are, I guess there's more than one, amended species claims before the Court which the Court understands, based on the form of remedy that

is sought, is in effect a claim for injunctive relief for violations that are alleged of the Endangered Species Act.

So this is, if you will, a dual proceeding. It proceeds both under the Administrative Procedures Act and that jurisprudence and the injunction jurisprudence that attaches to APA cases, judicial review of administrative actions under Title 5, Section 702, et seq.

And it is also an Endangered Species Act case now, at least as of yesterday, as to the action agency the Bureau of Reclamation. And so the law that applies, that has been correctly cited by the plaintiffs, continues to apply.

It is my view that because the Court has the responsibility to understand and to endeavor to protect all the interests that are represented in the litigation and that are before the Court, that for limited purposes, the effect on human health, safety and the environment would include water costs because those affect the operations of the projects.

The operations of both the state and the federal project have the potential not only to harm this species but other species. There is direct reference made to the winter-run Chinook salmon and other salmonid species that are potentially affected by actions that are proposed to be implemented under an order that the plaintiffs seek.

Day-to-day operations of the projects, because they directly impact water service districts, emergency service

districts, municipal water supplies and industrial power and related energy sources have direct effect on human health and the environment.

And so the Court is satisfied that that evidence is not irrelevant and that, in terms of being able to evaluate the overall effect of any injunctive relief, that to not consider it would be an abuse of discretion because the Court would, in effect, be foreclosing the exercise of its legal and equitable judgment and ultimately discretion to determine what remedies, if any, are appropriate. There's no way to fully analyze and determine the ultimate effect of those remedies without considering this evidence.

As to -- when we get to -- so that covers, I believe, the State Water Contractors, who are municipal and industrial users. It covers, to the extent that water districts supply water for not just irrigation purposes, but for related purposes because we know that there are additional purposes besides only irrigation purposes.

But to the extent that water shortages, if under certain scenarios there would be zero water available, for instance, for irrigation districts in the next water year if it continues to be dry, we would be looking at alternate water sources by the irrigation district members who would be, as the Court knows, could take judicial notice of it, relying on groundwater, water exchanges, other types of sources.

And given the potential effects of groundwater pumping with regard to overdrafting water tables, causing subsidence, creating air pollution potential, those kinds of risks are also both environmental and affect human health and safety. And so they really cannot be ignored.

In terms of ultimately, if the economic losses are converted into what would be, if you will, the human result, where employment is ended, jobs are lost, communities that depend on people who are employed in agriculture are unemployed and, in effect, although we're not, under the Endangered Species Act, concerned about the dollar effect of that on parties.

When what we are talking about is the health of a community, of the ability of its citizens and participants to have livelihoods and to be able to maintain themselves, that is an indirect -- it is somewhat remote, but it is an indirect potential effect.

And the Court -- because we have this, if you will, dual jurisdiction under the APA and the ESA, should not be entirely ignored. I don't intend to spend any time on it except to have what direct effects the parties who are relying on these matters in a declaration form. All I want in their arguments is for those to be summarized, cataloged and then I'll let the plaintiffs specifically respond to those. But I'm not considering it beyond that and for any other purpose.

So the objections are sustained in part consistent with my prior rulings, but adding the additional grounds that I have just added.

MS. POOLE: Thank you, Your Honor.

THE COURT: All right. Are we ready to proceed with --

MR. ORR: Your Honor, one other --

THE COURT: Yes, Mr. Orr.

MR. ORR: Good morning, Your Honor, Trent Orr for the plaintiffs.

THE COURT: Good morning.

MR. ORR: One brief housekeeping matter which Your Honor indicated he didn't want to fall between the cracks, which is this question of --

THE COURT: Oh, the time to respond. Yes.

MR. ORR: Yes. We've conferred and, you know, we would prefer something on the order of 30 days.

THE COURT: 30 days. That's what the Court was thinking.

MR. ORR: Yeah.

THE COURT: And we're not meaning to inconvenience you personally, Mr. Lee, but Ms. Wordham is in the case, she's been in it all the way, and so my inclination is to give all the responding parties 30 days to respond and we'll run that from the date that the second supplemental complaint was

filed, which was the 30th of August. Can you live with that?

MR. LEE: Could I just confer with my co-counsel just for a minute?

THE COURT: Yes, you may. What about other parties while they're conferring?

MR. O'HANLON: Yes, Your Honor.

MR. MAYSONETT: Your Honor, that's acceptable to the federal defendants.

MR. BUCKLEY: No problem with that, Your Honor, for the Farm Bureau.

MS. McDONALD: That is fine, Your Honor. Thank you.

THE COURT: Mr. Wilkinson?

MR. WILKINSON: We'll struggle through it, Your Honor.

THE COURT: We're all struggling. Mr. Lee? Ms. Wordham?

MS. WORDHAM: Your Honor, as Mr. Lee represented yesterday, he departs on vacation for about a three-week period beginning the end of this week. Next week. Sorry. My apologies. What I would suggest is that -- so an additional -- 45 days would be the minimum required for Mr. Lee to respond.

I would offer to respond, but I have a wealth of cases that have been neglected in the last couple of weeks as I'm sure other counsel have. And Mr. Lee has been the primary

attorney on this matter on behalf of the Department of Water Resources.

What I would suggest is, if the plaintiffs would agree to this, the Department of Water Resources could agree to comply with the Court's ordered remedy today voluntarily and then the issue of whether this Court ultimately has jurisdiction over the department for the plaintiffs' failure to serve a 60-day notice on the department for its EPA actions could be addressed subsequently following DWR submission of a 12(b) rule motion.

THE COURT: Mr. Orr?

MR. ORR: I would provided they're willing to submit themselves to the Court's jurisdiction in the interim, that would be fine.

THE COURT: That is what was just stated. And I believe that I can trust Ms. Wordham to be consistent with her representation.

All right. Then every party except the DWR shall respond within 30 days following -- let's have a date, please, Ms. Timken.

THE CLERK: You want it at 30 days from the August 30th; correct? October 1st.

THE COURT: It will be October 1st. And for DWR only, it's October 15th. Are those week days?

THE CLERK: Yes.

MR. ORR: Thank you, Your Honor.

THE COURT: You're welcome. With the condition that the DWR's response is on the express undertaking that the DWR consents to the Court's jurisdiction for the imposition of any remedy that may be pronounced in these proceedings. Ms. Poole.

MS. POOLE: Your Honor, one final housekeeping matter. I have that page reference for the Rosekrans declaration document 420, which has been marked Plaintiffs' Exhibit 25. On page 8 of 9 of that exhibit at line 25, the page reference to Exhibit 5 would be roman four.

THE COURT: Thank you very much. And I will look at that declaration now to make sure that I can find it. Is that in Exhibit 24 or 25? It's in 25.

MS. POOLE: I believe it's Plaintiffs' Exhibit 24.

THE COURT: I think it's 24 too.

MS. POOLE: Oh, you're correct, Your Honor.

THE COURT: It is 24. That was my concern because those exhibits are not present on this.

All right. And I'm just going to look at Exhibit 5. You said page roman numeral four?

MS. POOLE: Correct.

THE COURT: Is that the executive summary, page six of 32? Document 420-3.

MS. POOLE: Yes, Your Honor.

THE COURT: All right. I have it. Thank you very much.

All right. Are we ready to proceed with evidence?

MR. LEE: Yes, Your Honor.

THE COURT: You may proceed, Mr. Lee.

MR. LEE: We would like to divide it up in the following fashion. I would like to make a brief opening statement on behalf of the State of California and Ms. Wordham, then, will conduct the direct examination of our one witness.

THE COURT: All right. You may proceed with your opening statement.

MR. LEE: Your Honor, there have been extensive briefing in this case and we do not intend to repeat the vast quantity of material that has been presented. We see that there are basically two components to the evidence that are coming in. The first component we have heard a lot of to date, which is the biological evidence regarding the delta smelt and its condition.

The second component is what we are just commencing today, which is the operational consequences of the respective remedy proposals on project delivery.

In order to meet our requirement of having one live witness and to minimize duplicate testimony and also to encourage the best use of this Court's time, DWR has not and

will not be introducing any testimony regarding biological issues relating to the delta smelt.

We will rely instead on the biological testimony of Ms. Cay Goude as presented by the United States and the testimony of Dr. Charles Hanson as presented by the State Water Contractors and any declarations that are appropriately considered by this court.

DWR will limit its testimony on direct to the introduction of evidence through the Department of Water Resources engineer John Leahigh regarding the operational costs of the respective remedies in terms of water deliveries and exports.

We will have four general points. The first point will be Mr. Leahigh will discuss the water costs of the respective proposals. He will discuss the water costs, first of all, in plaintiffs' revised proposal.

Just by way of peek and summary, we have determined that the low end of that water cost in an average year would be 2.5 million acre feet and the high end of that cost, water cost in an average year might be as much as 3.5 million acre feet.

In a dry year, the plaintiffs' revised proposal would have a low end water supply cost of 1.1 million acre feet and a high end water cost of a 1.6 million acre feet.

These spreads in costs are due to the fact, as this

court is aware, that most of the remedy proposals have ranges of protections. And therefore, the ranges of the costs are reflective of the ranges of the protections.

THE COURT: I know we'll get there, but why is an average year a higher water cost than a dry year?

MR. LEE: Well, Your Honor, this will be explained in some detail by Mr. Leahigh. My understanding is that in a dry year, there is generally, notwithstanding the impositions of the remedies, significant reductions in deliveries already built into the system. And so it's a -- it's a narrower and smaller base.

THE COURT: All right. So those are the contractual terms that excuse delivery of water in shortage periods?

MR. LEE: If there isn't water in the system, we can't deliver it, Your Honor.

THE COURT: All right. Thank you.

MR. LEE: The next remedy proposal was the US Fish & Wildlife Service matrix that was presented by Ms. Goude. This has a lesser impact on water supply and the average year low end range of the water cost is roughly 820,000 acre feet. The high end average year water cost, however, could be as much as 2.1 million acre feet. In a dry year, the low end cost would be 183,000 acre feet with a high end cost of possibly 814,000 acre feet.

Now, the Department of Water Resources has embraced,

for the most part, the US Fish & Wildlife Service matrix, but we have two minor modifications which we will address in direct examination. Which does alter the water costs.

And in those situations, on an average year, the modified US Fish & Wildlife Service matrix, as proposed by the Department of Water Resources would have a low end cost in an average year of 476,000 acre feet and a high end cost of 1.4 million acre feet. In a dry year, the low end cost would be 84,000 acre feet and a high end cost could be 415,000 acre feet.

Now, there is one last proposal that we've had discussed here over the last seven days and that's the State Water Contractors proposal. We are -- will not be able to provide this Court, unfortunately, with a full water cost of this proposal.

We are going to be able to provide this Court with an estimate of the cost of tier one. Their Q west or westerly flow, which I believe will be 316,000 acre feet.

However, due to the contingent nature of the remaining State Water Contractor proposals tiers, and there's a tier two and a tier three and a tier four, the Department of Water Resources has been unable, in the short time frame in this trial, to be able to develop a full set of water cost estimates for the State Water Contractor proposal.

So that's the first issue.

THE COURT: Yes. And when we're talking about all of these quantitative measures of water, this is for the State Water Project only.

MR. LEE: No, Your Honor --

THE COURT: This is not -- is this combined or only State Water Project?

MR. LEE: We are going to provide you with a total package on this. This will be both for the State Water Project and the Central Valley Project.

THE COURT: Thank you.

MR. LEE: The second area which we will get into is some discussion of the issues raised in the plaintiffs' declarations by Spreck Rosekrans regarding the plaintiffs' view of the operational consequences of the remedy measures. In a nutshell, we will -- we will contend that reliance solely on past historic conditions is an unwise practice when projecting water delivery costs for new water year.

Such short term projections must rely on real world hydrologic data regarding runoff, storage and demand in order to secure an honest assessment of water supply costs.

If there's a simple principle here, Your Honor, it's a principle that all engineers in the water business seem to operate under. Which is you hope for the best, but you must plan for the worst.

Third issue, which we intend to address, is the fall

actions as proposed by the plaintiffs for salinity control in the western Delta --

THE COURT: Why don't we call that measure ten.

MR. LEE: Yes, that's measure ten on the project's operations with an emphasis on the adverse impacts, the potential adverse impacts on other listed species and on potential health and safety issues relating to project operations and project deliveries.

Lastly, Mr. Leahigh will touch upon the dispute the plaintiffs and the Department of Water Resources have had in our pleadings regarding the use of appropriate averaging period for the flow measures.

This is this question of whether we should be using a 14-day running average or a five-day running average. Mr. Leahigh will explain that and indicate why we believe a 14 or 7-day running average is appropriate given the hydrology of the system.

There will be a few miscellaneous operational issues, which we will address. But these are the key points.

THE COURT: All right.

MR. LEE: In conclusion, we anticipate that the plaintiffs may object to some of Mr. Leahigh's testimony. In response, we would note that the DWR stresses that we submit that this Court has a responsibility to narrowly tailor the remedy order --

THE COURT: I've already ruled on the objections. I'm going to offer the plaintiffs a continuing objection so we don't have to interrupt the testimony unless they want to do it otherwise.

MR. LEE: All right. We would just note that DWR received surprising support for this concept of narrowly tailored approach in Wednesday's testimony by Dr. Swanson. Dr. Swanson noted that the plaintiffs had, at the very 11th hour in this case, revised their fish actions four, five and seven to remove the inflexible target flow of 1500 cfs for Old and Middle River and to replace those flows with a more flexible range of flows from a lower end range to a higher end range.

Now, surprisingly Dr. Swanson did not justify this new range of flows based upon improved biological protection for the smelt, but instead said on Wednesday the range would make it easier for the projects to operate.

In setting this Court's remedy proposal, DWR simply asks this Court to adopt the same approach. If the evidence shows that more than one remedy proposal is biologically defensible, then this Court should also choose the remedy that is easier for the project to operate.

And with that, Your Honor, Ms. Wordham will be prepared to put on our case.

THE COURT: Thank you, very much, Mr. Lee. Ms.

Wordham, you may proceed.

MS. WORDHAM: Thank you, Your Honor. The Department of Water Resources calls Mr. John Leahigh.

MS. JAISWAL: Your Honor, Anjali Jaiswal on behalf of plaintiffs. I just wanted to inform the Court that plaintiffs will be accepting the continuing objections to Mr. Leahigh's testimony.

THE COURT: All right. Thank you very much. And I have sustained the objection in part consistent with the ruling I just announced on the evidence. Your objections that were submitted in writing to other, I'm going to call it omnibus cost, which I think is inseparable from human health and safety concerns. And so that's the basis for my ruling.

Any objection to the continuing objection?

MS. WORDHAM: No objection, Your Honor.

MR. WILKINSON: No, Your Honor.

THE COURT: All right. Please swear the witness.

JOHN LEAHIGH,

called as a witness on behalf of the Defendants, having been first duly sworn, testified as follows:

THE CLERK: Please state your full name for the record and spell your last name.

THE WITNESS: John Leahigh, last name is spelled L-E-A-H-I-G-H.

THE COURT: You may proceed, Ms. Wordham.

LETTER 21

DIRECT EXAMINATION

BY MS. WORDHAM:

Q. Good morning, Mr. Leahigh. Would you please provide the Court with your educational background.

A. Yes. I have a bachelors degree in civil engineering from the University of New Mexico. Also have a masters degree in civil engineering with emphasis in water resource management from California State University at Sacramento.

Q. Where are you currently employed?

A. Currently employed with Department of Water Resources. State Water Project Operations Planning Branch Chief.

Q. Your title is chief?

A. Yes.

Q. Of the plan --

A. Of the State Water Project Operations Planning Branch.

Q. How long have you been with the Department of Water Resources?

A. Been with the Department of Water Resources since 1992.

Q. And how long have you held your current position?

A. My current position for two years, although the current responsibilities I've had since 1999.

Q. Would you please describe your responsibilities?

A. Yes. I lead a team of engineers that are responsible for the water management decisions for the State Water Project. This would include forecasting the operations for the State

Water Project and its -- and the Central Valley Project.

We're responsible for recommending the water delivery allocations for the State Water Project to the director of the Department of Water Resources. We are responsible for short term and scheduling of releases from Lake Oroville to the Feather River. And the export of water in the south Delta at the SWP export facilities in compliance with all contractual and regulatory obligations.

Q. So your responsibilities include estimating water deliveries for the coming water year; is that correct?

A. That's correct.

Q. When estimating water deliveries, what factors do you consider?

A. Factors we consider is essentially we need estimates for the supply and the demand in the upcoming year. And we need to feed those into a model which represents all of the constraints that exist in the system.

Q. So you have supply, demand and system constraints; is that correct?

A. That's correct.

Q. Under demand, what components determine demand on an annual basis?

A. The demand estimates we get directly from our water users. And this is in terms of volume and also a demand pattern. So the timing of that demand is very important.

Q. What component do you consider when -- for determining supply on an annual basis?

A. For supply, it's really broken down to two aspects. Two components. One is the stored water available to the project, carried over from the previous year. So this would be storage in Lake Oroville, the state share of San Luis Reservoir. This can be reliably projected from one year to the next, going into the next year.

The other component would be the unstored flow or natural flows that would enter the system as a result of precipitation in the next year. And this is highly variable. So the estimates must be taken -- must be in terms of probabilities, in terms of what the observed hydrology has been in past years.

Q. Is there a way that you characterize your estimate for forecasted runoff?

A. Yes. As far as the estimate, as far as the official water supply allocations that we make to our contractors, that is based on what is called a 90 percent exceedance probability.

Essentially that's where taking a look at the past record hydrology, 90 percent of the years would have exceeded that assumption of hydrology. So it is a very conservative assumption for hydrology going into the next year. A very dry year type.

Q. So 90 percent exceedance would be considered a dry year;

is that correct?

A. That's correct.

Q. Do you ever estimate future runoffs based on any other exceedance level?

A. Yes. Typically we also look at a 50 percent exceedance level, where half the historical record is drier and half wetter. So this represents an average condition for hydrology for the coming year. And that's kind of supplemental information for planning purposes.

Q. But for purposes of your official allocation, you use the 90 percent exceedance; is that correct?

A. That's correct.

Q. Do you ever use an above normal or a wet year for projecting water deliveries?

A. Occasionally we will take a look at a wetter scenario, say, a 25 percent exceedance where only 25 percent of the historical record is wetter. There's less value to us in looking at those wetter cases. Typically, at the 50 percent hydrology we're able to meet most of the delivery requests for contractors. So the assumption is anything wetter than that, we're able to meet those commitments.

Q. You would never use an above average or a wet year for projecting official delivery allocations; is that correct?

A. Not for the official delivery allocation, no.

Q. In addition to demand and supply, you also mentioned

system constraints; correct?
A. That's correct.
Q. What are the system constraints that are factored in to your delivery estimates?
A. Well, the system constraints would include all physical and regulatory constraints on both the storage and conveyance in the system. So, for example, as far as Lake Oroville is concerned, physically we could store 3.5 million acre feet in storage. However, in the wintertime, we're restricted to 80 percent of that storage due to regulatory requirements for flood control purposes.
We have other constraints downstream, for example, minimum flow requirements on the Feather River for fishery --
THE COURT: Let me interrupt, if I could, for a second.
THE WITNESS: Yes.
THE COURT: Just so that we have it. Is this every winter that the flood control limit is 80 percent of capacity?
THE WITNESS: That's correct. And that's a requirement from the United States Army Corps of Engineers.
THE COURT: And so approximately 280,000 acre feet are not in the reservoir year in and year out for flood control purposes. It's release -- the water is released out of the reservoir?
THE WITNESS: If we encroach into that required top

20 percent that's reserved for flood control, we must release that water downstream and maintain vacant space in the event that there's a large storm event to capture the runoff.
THE COURT: And that's year round. So that is -- that's an operative level, that's the maximum capacity for Lake Oroville.
THE WITNESS: That makes a regulatory limit on the amount of storage that we can hold in the wintertime.
THE COURT: Winter.
THE WITNESS: Winter, right.
THE COURT: All right. Thank you. You may proceed.
BY MS. WORDHAM:
Q. You've just finished describing the storage capacity. Are there any other elements that -- any other system constraints that are factored in to your delivery estimates?
A. Yes. I think I talked about the minimum instream requirements to the Feather River. There are also a number of constraints related to managing the Delta. And that includes flow requirements. Delta outflow requirements. Salinity management. Number of salinity requirements. And there are also export limitations for fishery benefits as well.
Q. Are these objectives that you just described, are they the objectives that are outlined in State Water Resources Control Board Decision 1641?
A. Yes. All those Delta requirements are outlined in that

document.
Q. Are you responsible for estimating --
THE COURT: Let me ask one question before you continue.
MS. WORDHAM: Certainly, Your Honor.
THE COURT: Does the operational regime that you manage take in any consideration of the Central Valley Project Improvement Act?
MS. WORDHAM: You anticipated my question, Your Honor.
THE COURT: Do any of those requirements apply to the state operations?
THE WITNESS: No. Those requirements do not apply to the State Water Project. That is a Central Valley Project program.
THE COURT: Thank you.
BY MS. WORDHAM:
Q. Are you responsible for estimating Central Valley Project water deliveries?
A. It's important to -- yes, we have that capability in our model. We have all of their constraints built within our model as well. So we have the capability of estimating their delivery capabilities. And we get input from the CVP on their operations.
Q. But you're not responsible for estimating their

deliveries, you just have the capability?
A. That's correct.
MS. WORDHAM: Your Honor --
THE COURT: I'm going to ask a question. Do you operate the SWP under a cooperative regime, if you will, the OCAP, for coordinated operations or you operate independently?
THE WITNESS: No, we -- the two operations are very much intertwined. As far as the Bay-Delta requirements that we just described, both projects are responsible for meeting those. And there's a sharing formula for that that is part of our coordinated operations agreement or COA, which is an important component into determining the delivery capabilities of both projects.
THE COURT: Thank you. You may continue.
MS. WORDHAM: At this time, Your Honor, I would like to move that Mr. Leahigh be accepted as an expert on the State Water Project and, where it coordinates with the Central Valley Project, on the Central Valley Project as well, of the regulatory and hydrological conditions of the project operations as they relate to water exports and delivery.
THE COURT: Is there any objection?
MS. JAISWAL: No objections, Your Honor.
THE COURT: All right. The Court accepts the tender of Mr. Leahigh as an expert by background, experience, education and training on the subjects of the coordinated

operations of the State Water Project and the Central Valley Project, including compliance with all regulatory requirements, hydrologic management and water supply delivery concerns. You may continue.

BY MS. WORDHAM:

Q. Mr. Leahigh, you've just outlined the factors that you look at in estimating water deliveries. What do you do with these factors?

A. Well, the estimates of supply and demand are input into a simulation model that we have, which has all of the constraints, both physical and regulatory built in to it. We use this as a tool to estimate what the maximum deliveries that would be -- that we'd be capable of delivering, given all the constraints in the system.

THE COURT: Is this annual?

THE WITNESS: Yes. This is annual. And we actually update these estimates as we step through the year.

THE COURT: And when does the water year start for the state?

THE WITNESS: Well, the contract -- the delivery year is the calendar year.

THE COURT: Is there any different time period for operations?

THE WITNESS: Well, the water year is from October through September.

THE COURT: October 1st through September 30th. So it's the same as for the CVP?

THE WITNESS: The water year is the same. The CVP's contractual delivery year is slightly different, it is March through February.

THE COURT: Thank you.

BY MS. WORDHAM:

Q. The model you refer to, does that model have a name?

A. Yes, it's the Delta Coordinated Operations model or DCO for short.

Q. And this is the same model that you have used for estimating water cost associated with implementing the US Fish & Wildlife remedy proposal that was submitted in this matter?

A. That's correct.

Q. Is it the same model that you used for estimating the water cost associated with all of the remedy proposals submitted in this matter?

A. Yes.

THE COURT: And how long has that model been in operation?

THE WITNESS: We've used that model for estimating deliveries since about 1995, '96.

THE COURT: Thank you. You may continue.

BY MS. WORDHAM:

Q. Mr. Leahigh, you've just testified that the water year is

from October through September; is that correct?

A. That's correct.

Q. So we are currently in the 2007 water year; would that be correct?

A. That is correct.

Q. How would you characterize the current water year?

A. Officially, the water year type for the Sacramento basin is dry. For the San Joaquin basin, it's actually critically dry this year. And as you move south, it's -- it's very dry, in fact, Los Angeles is -- this is the driest year on record for Los Angeles in 130 years of record.

Q. Mr. Leahigh, you have projected water costs associated with the various remedy proposals submitted in this proceeding; is that correct?

A. I'm sorry? Would you repeat the question?

Q. You've projected water costs associated with each of the remedy proposals submitted in this proceeding?

A. Yes.

MS. WORDHAM: Your Honor, at this time, I'd like to mark the declarations of Mr. John Leahigh submitted in this matter. These will be DWR next in order.

THE COURT: What is the next exhibit?

MS. WORDHAM: I, I believe.

THE CLERK: I.

THE COURT: It will be DWR I for identification.

(Defendant's Exhibit DWR I was marked for identification.)

MS. WORDHAM: And that will be the declaration of John Leahigh filed on July 9th, 2007, document No. 398.

THE COURT: Any objection to its admission?

MS. JAISWAL: No, Your Honor.

THE COURT: Subject to my earlier ruling. Thank you.

All right. Subject to my earlier ruling on the evidentiary objections, DWR I is received in evidence.

(Defendant's Exhibit DWR I was received.)

MS. WORDHAM: And then the supplemental declaration of John Leahigh filed on August 3rd, 2007, document No. 428.

THE COURT: This will be DWR J.

(Defendant's Exhibit DWR J was marked for identification.)

THE COURT: And I will receive DWR J subject to the plaintiffs' objections and my ruling on those objections.

(Defendant's Exhibit DWR J was received.)

MS. WORDHAM: If I may approach the witness, Your Honor?

THE COURT: You may.

BY MS. WORDHAM:

Q. Mr. Leahigh, do you recognize the two documents I've just handed you?

A. Yes.

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Q. And could you please describe them?
A. Well, the first one is my original declaration dated July 9th. And the second is my supplemental declaration dated August 3rd.
Q. And if you will look at the exhibits to your August 3rd declaration, there are numerous exhibits; are there not?
A. Yes.
Q. Do you recognize all of these exhibits?
A. Yes, I do.
Q. There are several tables in this -- in your exhibits. Do you know who prepared these tables?
A. Yes, my staff under my direction.
Q. There's also a map that is your Exhibit E. Do you know how this map was prepared?
A. Yes. By my staff under my direction.
Q. And lastly, Exhibits A and B, would you please describe these exhibits.
A. Exhibits A and B define the water year type. Exhibit A is definition for water year type for the Sacramento Valley basin and Exhibit B is definition for water year type for the San Joaquin River basin.
Q. Where did these exhibits come from?
A. They come from -- originally from water quality control plan, which was incorporated into decision 1641.
MS. WORDHAM: At this time, Your Honor, I'd like to

move Exhibits -- DWR Exhibits I and J into evidence.
THE COURT: I've already received them in evidence subject to the plaintiffs' objections. They're in.
MS. WORDHAM: Thank you, Your Honor.
Q. Mr. Leahigh, if you would turn to Exhibits C and F of your August 3 declaration, which is DWR Exhibit J.
A. Okay.
Q. I think you have just testified that you prepared -- or your staff prepared these tables under your direction; is that correct?
A. That's correct.
Q. At this time, just for ease of reference, Your Honor, I would like to mark Exhibit C to Mr. Leahigh's August 3 declaration as DWR next in order K.
(Defendant's Exhibit DWR K was marked for identification.)
THE COURT: All right. DWR K is what? A table?
MS. WORDHAM: And Exhibit F --
THE COURT: Let me describe K. It is a water cost analysis. And it appears to be demonstrative or illustrative. Any objection to the admission of DWR K?
MS. JAISWAL: No, Your Honor. Just based on our earlier objections and your ruling.
THE COURT: Thank you. Subject to my rulings on plaintiffs' earlier objections, DWR K is received in evidence.

(Defendant's Exhibit DWR K was received.)
MS. WORDHAM: And similarly, I would like to move -- I would like to mark as DWR's next in order, L, Exhibit F to Mr. Leahigh's August declaration.
(Defendant's Exhibit DWR L was marked for identification.)
THE COURT: Any objection to L?
MS. JAISWAL: The continuing --
THE COURT: The same? All right. We will receive DWR L subject to my ruling on plaintiffs' objections. It's in evidence.
(Defendant's Exhibit DWR L was received.)
MS. WORDHAM: And just to get all of these tables in at once.
THE COURT: It is also a water cost analysis, Exhibit L.
MS. WORDHAM: Yes. For clarification, DWR Exhibit K is a comparison of the plaintiffs' remedy proposal as submitted on July 9th, 2007 with the US Fish & Wildlife Service Action Matrix also submitted to this Court on July 9, 2007.
Exhibit C -- I mean Exhibit F, I apologize, which is DWR Exhibit L is a comparison of the US Fish & Wildlife Action Matrix with the US Fish & Wildlife Action Matrix as modified by the Department of Water Resources.

Next I would like to mark as Exhibit DWR M a table which may need some foundation.
(Defendant's Exhibit DWR M was marked for identification.)
THE COURT: So you're going to lay a foundation for this?
MS. WORDHAM: Yes, Your Honor.
THE COURT: You may proceed.
MS. JAISWAL: Your Honor, we haven't received a copy. Thank you.
MS. WORDHAM: For identification, what has just been marked as DWR Exhibit M is another water cost analysis. And this is a comparison of the water cost associated with the plaintiffs' remedy proposal submitted, this says, on July 23rd. I believe that -- and I think that's correct. I think I had previously represented that the plaintiffs' proposal had been submitted on July 9th, so I stand corrected. So this --
THE COURT: You intended to say the 23rd.
MS. WORDHAM: I did, Your Honor.
THE COURT: All right. So that would be for DWR I.
MS. WORDHAM: That is correct, Your Honor. K. K.
THE COURT: Thank you.
MS. WORDHAM: So this compares the plaintiffs' proposal as submitted on July 23rd with their proposal as submitted on August 13th. If I may approach.

THE COURT: You may.

BY MS. WORDHAM:

Q. Mr. Leahigh, I've just handed you what has been marked as DWR Exhibits K, L and M. Do you recognize these documents?

A. Yes.

Q. Would you please briefly describe them?

A. Yes. The Exhibit that's marked DWR K is the water cost analysis which compares the plaintiffs' original remedy proposal with US Fish & Wildlife Service Action Matrix.

Exhibit L, DWR L is the water cost analysis comparing US Fish & Wildlife Service Action Matrix to that same matrix as modified by DWR. And both of those two exhibits were exhibits to my supplementary declaration.

The document, DWR M, is a water cost analysis comparing the plaintiffs' proposal, original proposal as of July 23rd with the revised plaintiffs' proposal dated August 13th.

Q. Mr. Leahigh, you testified that Exhibit C and F were prepared by your staff under your direction; is that correct?

A. That's correct.

MS. WORDHAM: At this time, Your Honor, I'd like to move Exhibits -- DWR Exhibits K and L into evidence.

THE COURT: I believe we've received K into evidence. We've also received L into evidence. And so all that is left is M.

MS. WORDHAM: Thank you, Your Honor.

Q. Mr. Leahigh, turning to DWR Exhibit M, did you prepare this table?

A. It was prepared by my staff under my direction.

Q. Using the same criteria as Exhibit C and F, which would be DWR's K & L?

A. Yes. Using the same model. Same methodology.

MS. WORDHAM: At this time, Your Honor, I would like to move DWR Exhibit M into evidence.

THE COURT: And I will admit it subject to the plaintiffs' objections and my ruling on those objections.

MS. WORDHAM: Thank you, Your Honor.

THE COURT: M is received in evidence.

(Defendant's Exhibit DWR M was received.)

BY MS. WORDHAM:

Q. Mr. Leahigh, would you please just generally describe what is contained in these exhibits? In these tables.

A. Yes. I mean, generally it -- it is a comparison of the various remedy proposals. And it is broken down by action. And what we attempted to do here was -- a lot of the actions are similar between remedy proposals. So we attempted to show -- to line up the appropriate action numbers for one proposal and the corresponding action that takes place in the alternative proposal.

Q. And you have broken it down by the different actions that

each proposal includes; is that correct?

A. Yes. For example, US Fish & Wildlife Service matrix is broken down into each of its five actions and the plaintiffs' proposals are broken down into actions one through ten.

Q. Thank you. Looking at the --

THE COURT: Let me ask one question. I withdraw my question. I see that you have addressed number ten here. You may continue.

MS. WORDHAM: Thank you.

Q. Looking at DWR Exhibit M, looking at the plaintiffs' revised proposal, would you please describe the costs that are associated with plaintiffs' action numbers one through three?

A. Well, there's no cost associated with those three. Those were -- those actions had to do with changes in monitoring.

Q. So those do not affect exports?

A. Those do not affect exports.

Q. Looking at plaintiffs' action in its revised proposal, action number four. Would you please describe the water costs associated with plaintiffs' action four?

A. Well, in all these proposals, we have a range given for potential impacts. And that was looking at each proposal under the average year scenario that was described earlier and the dry year scenario described earlier.

So for this particular action four, there are two components to their action four. One is a shorter duration,

ten-day export reduction. The other is a -- and this -- well, it's an objective for Old and Middle River flow.

And the way to meet that objective is with an export reduction is the assumption here. The cost associated with that particular action averaged, in an average year, estimated cost is a total of 800,000 acre feet. And in a dry year, 400,000 acre feet.

Q. Let's walk you through this a little more, in a little more detail, if you don't mind. And let me preface this, lay a little bit of a foundation.

You are familiar with the plaintiffs' revised proposal that was submitted on August 13th, 2007; is that correct?

A. Yes.

Q. And you are familiar with the flow recommendations they have included in their proposal; is that correct?

A. Yes.

Q. So for the first part of the plaintiffs' action four, the December 25 through January 3 period, as I read your flow objectives column, the plaintiffs' proposal would require that Old and Middle Rivers -- and I'm -- am I correct in assuming that "OMR" stands for Old and Middle Rivers?

A. That's correct.

Q. The objective would be to maintain flows in Old and Middle Rivers at zero cubic feet per second; is that correct?

A. Correct. Essentially achieving non-negative flows in Old and Middle River.

THE COURT: For ten days?

THE WITNESS: Yes. For ten days. The assumption here, that action could be triggered at any time during that period in the pre-spawning period. The assumption that we make here was that it was triggered at the -- the first day that would be possible to trigger it, which would be December 25th. And so it's triggered for ten days following December 25th.

THE COURT: What was the reason for choosing December 25th as opposed to December 1st?

THE WITNESS: I believe the plaintiffs' proposal identifies December 25th as the first possible date to trigger this action.

THE COURT: And that's the reason it was selected?

THE WITNESS: That was the reason it was selected.

THE COURT: Thank you. And this action lasts until when?

THE WITNESS: It lasts until -- the duration is ten days, so the ending date was January 3rd. And there are two components to that action four. There's that short ten-day period of achieving non-negative flows, but then for the remainder of that pre-spawning period, the objective is -- well, the original proposal is a negative 3500 cfs.

THE COURT: Well, the pre-spawning period ends when?

THE WITNESS: What we assumed is that it would end February 20th. That is -- it will vary from year to year when the spawning start -- begins to occur. But February 20th was the date which our biologist provided us, as far as an average spawning date.

THE COURT: But in operation, the plan would go through the actual or through the average date? Spawning?

THE WITNESS: The proposal talks about this action continuing until the onset of spawning. And we had to make some assumption as to when that date of --

THE COURT: Yes. But in operation, would you run the program to this pre-determined date or to the actual date?

THE WITNESS: Oh, we would operate to it until the actual date of spawning.

THE COURT: Which could be different?

THE WITNESS: Which could be different than February 20th.

THE COURT: Thank you. And that's what your calculation is based on.

THE WITNESS: Yes.

THE COURT: Actual date of spawning.

THE WITNESS: Well, no, our calculation is based on -- since we don't know what that date will be next year, we used the average date that has occurred in the past, which is

February 20th.

THE COURT: Thank you.

BY MS. WORDHAM:

Q. Mr. Leahigh, returning your attention to the plaintiffs' -- the first part of plaintiffs' action four, which the flow objective is zero or greater -- zero net negative flows on Old and Middle Rivers. In a dry year, what would be the export reductions associated with the first part of plaintiffs' action four?

A. 140,000 acre feet.

Q. And in an average year?

A. 200,000 acre feet.

Q. Now, turning to the second half of plaintiffs' action four, you have two flow objectives identified here; correct?

A. Yes.

Q. And why do you have two flow objectives identified?

A. Well, there were two different flow objectives identified in the plaintiffs' revised proposal.

Q. The plaintiffs' revised proposal provides a range of between negative 2,750 cubic feet per second and negative 4,250 cubic feet per second; is that correct?

A. That's correct.

Q. Of these -- of this range, which would you characterize as the more water costly flow objective?

A. Well, the more water costly would be the one that is least

negative, which is the negative 2750 cfs.

Q. In a dry year, what would be the water cost associated with plaintiffs' action -- the second part of plaintiffs' action four if the projects were required to operate at negative 2,750 cfs on Old and Middle Rivers?

A. 340,000 acre feet.

Q. Same question for an average year.

A. 680,000 acre feet.

Q. Those costs would be less if they were able to operate at the higher end of that range; is that correct?

A. That's correct.

Q. And those are the 180,000 acre feet and 530,000 acre feet respectively; correct?

A. Correct.

Q. In plaintiffs' action five, they also have a range of flow objectives; correct?

A. That's correct.

Q. If the projects were required to operate to the more water costly flow objective, which I understand from your previous testimony would be the negative 750 cubic feet per second, what would be the water cost associated with plaintiffs' action five in a dry year?

A. Estimate is 350,000 acre feet.

Q. And in a wet year -- in an average year?

A. 920,000 acre feet.

Q. Plaintiffs' action seven has the same flow objective -- range for flow objectives; correct?
A. Correct.
Q. In plaintiffs' action seven, what would be the water cost associated with complying with plaintiffs' action seven if the projects were required to operate at the more water costly flow objective?
A. 150,000 acre feet dry year.
Q. And in an average year?
A. 800,000 acre feet.
Q. For plaintiffs' actions eight and nine, what are the water costs associated with those actions?
A. We didn't have any cost associated with those two actions. They dealt with barrier configuration.
Q. So no water costs?
A. No water costs were estimated for those.
THE COURT: And the response to those two actions was positive or negative, as far as the change of the barriers?
THE WITNESS: Well, the not installing the Head of Old River Barrier would have -- would have a tendency to make the flow at Old and Middle River less negative, would allow more of the San Joaquin flow to come down Old and Middle Rivers.
THE COURT: And are you generally in agreement or disagreement with that proposal?

THE WITNESS: We have a similar -- we have the same recommendation in the Fish & Wildlife Service action matrix.
THE COURT: So that would be agreement?
THE WITNESS: Yes. I'm not sure all the details, but I believe that in general we are in agreement on that.
THE COURT: All right. And how about number nine?
THE WITNESS: I'm sorry. That was number nine.
THE COURT: That was number nine. All right. How about number eight? I think those are the gates.
THE WITNESS: Correct. That would be no ag barrier operation. And there -- there is very similar proposal in the Fish & Wildlife Service Action Matrix.
THE COURT: So there's general agreement on number eight?
THE WITNESS: I'd say there's general agreement. I'm not sure about all the details, but general agreement.
THE COURT: All right. Thank you.
BY MS. WORDHAM:
Q. And turning last to plaintiffs' action ten. You testified -- or you stated in your declaration, as I recall, that your cost estimate for action ten was based on an assumption that action ten would be met through a combination of export reductions and upstream storage releases; correct?
A. That is correct.
Q. With that understanding, what would be the water cost

associated with the projects having to comply with action ten in a dry year?
A. We're still talking about the revised proposal?
Q. Yes.
A. Actually either proposal, it doesn't matter. The dry year -- there's a -- in our analysis, we assume 350,000 acre feet of export reduction, but it would also require 310,000 acre feet of additional releases from upstream.
Q. Would all of that upstream storage come from State Water Project facilities?
A. No. That would -- the assumption that we made is this would fall under the coordinated operation agreement and therefore about two-thirds of it would come from the federal reservoirs, most likely Shasta and a third of it coming from Lake Oroville.
Q. So just looking at export reductions again, for action ten in an average year, if the projects attempted to comply with the plaintiffs' action ten relying on your allocation between export reductions and upstream water storage releases, what would be the water cost to the projects?
A. In an average year, we had estimated 490,000 acre feet export reduction in a small amount of additional releases from upstream.
Q. You testified in your declaration that there isn't a direct correlation or -- between export reductions and

delivery reductions; correct?
A. That's correct.
Q. So in this table immediately below the -- the summary -- or the detailed analysis of the cost, water cost associated with plaintiffs' revised proposal for August 13, 2007. Where you have summarized delivery reductions, the total acre feet, thousands of acre feet that you have there are not going to be the total of the costs in the table above; is that correct?
A. That's correct.
Q. What's the difference between export reductions and delivery reductions?
A. Well, the export reductions would be the immediate impact. Now, how that translates to an overall annual delivery impact will vary on a number of things. In -- for example, in a drier year, there could be an immediate export reduction that could be made up later. So in that case it wouldn't necessarily be according to delivery reduction.
But also, on the flip side, you could have -- in a winter type year, average year, you could have an export reduction that occurs at a very critical time, which in the demand pattern, when demands are peaking, that could actually result in much larger annual delivery impacts. It's rather complicated, but they're not going to match up necessarily.
Q. For purposes of this water cost analysis, how did you

estimate delivery reductions?
A. We -- as I said earlier, we inputted all of these -- well, we input all these export reductions into the DCO model that also has all the constraints of the system. We had our estimates of demand and the demand pattern and we had all of our estimates on hydrology. And the model allows us to simulate the operations and allows us to come up with a bottom line delivery for the entire year.
Q. So if the projects were required to comply with the plaintiffs' revised proposal submitted on August 13th, what did you determine would be the annual export reduction -- annual delivery reductions in a dry year operating under their less water costly proposal? Or range of flow objectives.
A. In a dry year, we -- we calculated 1.11 million acre feet.
Q. And in an average year?
A. 2.56 million acre feet.
Q. So what percent of -- percentage reduction in deliveries does the 1.117 million acre feet represent?
A. It represents a 35 percent reduction from our baseline delivery.
Q. And what percentage reduction does the 2.557 million acre feet represent?
A. 43 percent reduction from our baseline delivery.
Q. If the projects were required to operate to the most water

costly flow requirements of the plaintiffs' revised proposal, what would be the annual delivery reductions in a dry year?
A. 1.62 million acre feet.
Q. And what percentage of the delivery reductions does that represent?
A. 50 percent reduction in baseline delivery.
Q. And in an average year, what would be the acre foot reduction?
A. 3.57 million acre feet.
Q. And what percentage in delivery reductions does that represent?
A. 60 percent.
MS. WORDHAM: Thank you. At this time, Your Honor, rather than walking the witness through each of the tables for each of the proposals, I would like to mark as DWR Exhibit M, I believe --
THE COURT: N as in Nancy.
MS. WORDHAM: N.
(Defendant's Exhibit DWR N was marked for identification.)
THE COURT: After that's marked, we're going to take a ten-minute recess because we're going to go until 12:30 today because I have a short proceeding at 1:15. So our noon break is going to be 12:30 to 1:15.
MS. WORDHAM: Yes, Your Honor.

THE COURT: You know what? We've got a 10:30 proceeding as well. Okay. We're going to go until 10:30.
MS. WORDHAM: For purposes of identification, this is a table entitled Estimated Total 2008 State Water Project and Central Valley Project Delivery Reductions Associated with Interim Remedy Proposals.
MS. JAISWAL: Plaintiffs have not received it.
THE COURT: Beg your pardon?
MS. JAISWAL: I have not received the exhibit.
THE COURT: You now have?
MS. JAISWAL: Yes, Your Honor.
MS. WORDHAM: May I approach?
THE COURT: Yes.
BY MS. WORDHAM:
Q. Mr. Leahigh, do you recognize this table that I have now handed you?
A. Yes.
Q. Marked as DWR Exhibit N.
A. Yes.
Q. Does this table accurately summarize the water cost you had estimated for each of the remedy proposals that have been submitted in this proceeding?
A. Yes, I believe so.
MS. WORDHAM: At this time, Your Honor, I'd like to move DWR Exhibit N into evidence.

THE COURT: Any objection?
MS. JAISWAL: Continuing objection, Your Honor.
THE COURT: All right. Exhibit N is received in evidence. It appears simply to be a summary of the compilation of the cumulative totals of the underlying Exhibits I through M, therefore it's subject to the same ruling on the plaintiffs' objections.
(Defendant's Exhibit DWR N was received.)
MS. WORDHAM: Your Honor, did you wish to take a break at this time?
THE COURT: No. We have a proceeding at 10:30, so we're going to go until 10:30 and the court reporter is going to take a break then.
MS. WORDHAM: Thank you.
Q. Mr. Leahigh, if you will look at the left-hand column of this table. What is the caption across the top?
A. "Proposals."
Q. And underneath that, does it list the various proposals that have been submitted in this matter?
A. Yes, it does.
Q. And then the columns next to that, please describe them.
A. Yes. There's two columns, one that takes a look at the average year cost and the dry year cost. And it breaks it down in terms of the cost in acre feet, delivery reductions in acre feet and the percent that that represents from baseline

operations for both average and dry years.
Q. You have mentioned baseline operations a couple of times now. Could you please define what you mean by "baseline operations"?
A. Yes. Baseline operations, as I'm using it here, would be the delivery capabilities of both projects absent the implementation of any of the proposals. So in an average year, that's a combined of 5.9 million acre feet, I believe; and in a dry year, it's 3.2 million acre feet.
Q. Under the proposals, the first proposal is the US Fish & Wildlife Service Action Matrix or USFWS Action Matrix; correct?
A. Correct.
Q. And you have -- are you familiar with the US Fish & Wildlife Service Action Matrix?
A. Yes.
Q. Beneath the title "USFWS Action Matrix" are the words "upper range" and "lower range." Would you briefly explain what those refer to?
A. Yes. As part of the US Fish & Wildlife Service proposal, a couple of the actions, specifically three and four, although the process is very specific, it allows for a range of protective objectives at Old and Middle River. And so we -- in order to come up with the potential delivery impacts, we analyzed the proposal at both the upper range and the lower

range of those Old and Middle River objectives.
Q. So would it be fair to say that the upper range represents the more restrictive flow objectives and therefore the more cost -- water costly proposal?
A. Yes.
Q. And does the same hold true for the Fish & Wildlife Service action matrix as revised by the Department of Water Resources?
A. That's correct.
Q. And is this the same type of range that the plaintiffs included in their revised remedy proposal?
A. Well, the plaintiffs provided a range in their revised proposal. It's -- and so we analyzed it using each of the objectives indicated in that revised proposal.
Q. If the projects were required to implement the US Fish & Wildlife Service action matrix using the most restrictive flow objectives on Old and Middle Rivers, what would be the total impacts to the Central Valley Project and State Water Project?
A. I'm sorry, this is for the US Fish & Wildlife Service proposal?
Q. Yes.
A. That's --
Q. In an average year.
A. 2.17 million acre feet.
Q. And what percentage loss of delivery, water delivery does

that represent?
A. 37 percent.
Q. And in the lower -- if they were required to implement the US Fish & Wildlife Service action matrix using the less restrictive flow objectives, what would be the total impacts in an average year?
A. 820,000 acre feet.
Q. And what would be the percentage of loss --
A. 14 percent.
Q. -- in water deliveries?
Under the US Fish & Wildlife Service action matrix as modified by the Department of Water Resources, what would be the total impacts to the State Water Project and Central Valley Project if they were required to operate under the most restrictive flow objectives?
A. In a dry year, 814,000 acre feet. Or 25 percent reduction.
Q. Actually I'm referring now to the --
A. Oh, I'm sorry. You moved to the DWR's modification?
Q. Yes.
A. I'm sorry. Under DWR's modification to the Fish & Wildlife Service action matrix, under an average year, the -- in the most restrictive range, the cost would be 1.41 million acre feet.
Q. And in the lower range?

A. 476,000 acre feet.
Q. Now, in a dry year, the water delivery costs appear to be less; is that correct?
A. That's correct.
Q. And why would that be?
A. That's because the baseline deliveries are substantially less. And that's due to hydrology, just the water supply not being there, not being available.
Q. You have also estimated a water cost associated with the proposal of the State Water Contractors tier one; is that correct?
A. Yes.
Q. And you --
THE COURT: If you don't mind.
MS. WORDHAM: Beg your pardon?
THE COURT: Let me go back to these two answers that you gave. If you have, under the DWR revised proposal, I'm looking at the middle of Exhibit N and I don't find the figure that you mentioned. Is it on this exhibit? Or are you giving me that from some other source?
THE WITNESS: As far as the impacts --
THE COURT: Yes.
THE WITNESS: -- associated --
THE COURT: With the 1,400,000 dollar -- I'm sorry, 400,000 acre foot reduction.

THE WITNESS: Correct. That's on the exhibit. Under "upper range" under "average year."

THE COURT: I see. It just doesn't say "average year."

THE WITNESS: "Average year" at the top of the column.

THE COURT: There. I see. All right. Thank you.

BY MS. WORDHAM:

Q. Mr. Leahigh -- I apologize. May I continue?

THE COURT: Yes, you may.

BY MS. WORDHAM:

Q. Mr. Leahigh, these totals that are listed in this table are taken from your Exhibits F and C, which have been marked as DWR Exhibits L and K; is that correct?

A. That's correct.

Q. With the exception of the estimate for the State Water Contractors proposal?

A. Yeah. Actually with the exception of the revised plaintiffs' proposal and the tier one, Hanson tier one proposal.

Q. And the plaintiffs' revised proposal -- numbers for the plaintiffs' revised proposal come from DWR Exhibit M, the table that you authenticated earlier; is that correct?

A. That's correct.

Q. Going back to the Hanson tier one proposal. It states

here that you estimated that with Q west. Can you briefly describe what that means?

A. Yes. The tier one proposal essentially calls for non-negative flows on the lower San Joaquin River just before the confluence with the Sacramento River. And actually there is a parameter of Q west as an equation, a thresh equation that's been developed in order to essentially estimate that exact same thing.

So that equation takes into account inflows into the Delta, export rates and consumptive use in that -- in that part of the Delta and gives us an estimate for that flow, net flow on the lower San Joaquin River.

Q. In estimating the water delivery impacts from the Hanson tier one proposal, did you use the Delta coordinated operations model?

A. Yes, we did.

Q. What would be the total impacts to the Central Valley Project and State Water Project in an average year if the projects were required to implement the state water contract tier one proposal?

A. The estimate is 316,000 acre feet.

Q. And what percentage reduction in delivery, water deliveries does that represent in an average year?

A. Five percent.

Q. You testified that these percentages of reduction in water

deliveries is from a baseline; correct?

A. Correct.

Q. And in an average year, the baseline would be 5.9 million acre feet; correct?

A. Correct.

Q. So under the plaintiffs' revised proposal, if the projects were required to operate to the most restrictive flow level, meaning the most water costly flow level, of the 5.9 million acre feet baseline, how much would the projects be able to deliver?

A. Well, the difference between the 5.9 and 3.6. So 2.3.

Q. And in a dry year, if the projects were required to operate to the most restrictive of the plaintiffs' flow requirements in their revised proposal, from baseline of 3.2 million acre feet, how much would the projects -- how much water would the projects be able to deliver?

A. 1.6.

Q. Thank you. Mr. Leahigh, are you familiar with the Environmental Water Account?

A. Yes.

Q. Will you briefly describe your understanding of the Environmental Water Account?

A. Yes. The Environmental Water Account came about as part of the science the CALFED brought back in 2000 and it's a program that provides for the purchase of water assets to be

applied towards primarily export reductions for the protection of fish. And it's managed by five agencies, Department of Water Resources, Bureau of Reclamation, US Fish & Wildlife Service, Department of Fish & Game and NOAA Fisheries.

Q. When you were estimating your water costs associated with the various remedy proposals submitted in this matter, did you take into consideration the availability of water under the Environmental Water Account?

A. No. This -- these costs do not account for any mitigation that might be possible with the Environmental Water Account.

Q. Why is that?

A. Well, partly because at the time that we first put these proposals together, the financing for the Environmental Water Account was shaky at best for next year. I think another reason is it's not entirely clear how Environmental Water Account would be applied towards these -- Environmental Water Account water could be used for both protection of Chinook salmon as well as delta smelt. It's not entirely clear how this -- how it would be applied to any possible remedy.

Q. Do you have any idea how much water is generally available under the Environmental Water Account?

A. Yeah, typically the purchased amounts are between 200 and 250,000 roughly acre feet. In addition, there are opportunities under flexible operations for possibly another 100,000 acre feet or so.

Q. In your opinion, if the projects had access to Environmental Water Account water for the coming water year, would that significantly reduce the water costs associated with the various remedy proposals?
A. Well, to a certain extent it could mitigate the costs of -- it would mitigate, most likely, the costs of these proposals. Although the magnitude of these costs is, as you can see, for some of the more extreme costly proposals is -- you know, the full 300,000 would be a mere ten percent of the total cost of the most expensive proposal here.
Q. Mr. Leahigh, are you familiar with something that is sometimes referred to as B2 water?
A. Yes.
Q. Can you briefly describe your understanding of B2 water?
A. Well, B2 water does fall under the CVPIA that we -- that the Court mentioned earlier. It is a federal program that allows for the use of CVP supply of 800,000 acre feet from year to year for fishery protection.
Q. Did you take the availability of B2 water into consideration when estimating your water costs associated with the various remedy proposals?
A. No. Did not.
Q. And why not?
A. Well, as I said, this is a -- this is a federally run program. It has quite a complicated accounting system, which

we do not have the expertise to implement in our model. So we did not make an attempt to try to analyze how B2 might be applied to any remedy.

I mean, just in general, we do know that -- the amount of 800,000 that's available varies from year to year. Much of that 800,000 is applied to meeting the baseline standards, which is the D 1641. And I do know that in general, in dry years, there's typically -- there typically -- most or all of the 800,000 is used just to meet those baseline requirements.

So, for example, this year, essentially the entire 800,000 was used to meet the 1641 objectives and there would be nothing available to meet any remedy proposal.

THE COURT: Did you give any consideration to the provisions of B2 that refer to ESA and other requirements under state and federal law as to what applicability, if any, that would have to this, the issues here?

THE WITNESS: No.

BY MS. WORDHAM:
Q. Mr. Leahigh, are you familiar with the declarations submitted by Mr. Spreck Rosekrans in this proceeding?
A. Yes.
Q. I think these have been identified as plaintiffs' Exhibits 24 and 25.

Have you looked at Mr. Rosekrans' methodology for

determining water costs associated with the various remedies?
A. Yes.
Q. Does Mr. Rosekrans' methodology differ from the one that you used?
A. Yes. Very much so.
Q. Would you please explain how.
A. Well, as we reviewed earlier, we actually took a projection of next year's operations in order to determine -- estimate the delivery impacts. So we took into account such things as the estimate of the delivery demand patterns, the supply that's available, including carryover storage in reservoirs and the current regulatory environment that we're operating to.

Whereas Mr. Rosekrans took a look at historical operations and tried to apply these proposed -- his -- the plaintiffs' proposed remedy on to that historical data. So he actually did not model next year's operations.

And there's a number of -- one of the problems with that is there's a number of years that he analyzed the demand patterns to be quite different. The land use patterns upstream of the Delta, which affects the inflow would be quite different; the regulatory environment as far as the Bay-Delta standards would be quite different in most of those years; the beginning storages in the system that we have a good prediction of going into next year would be different in every

single one of those years than the unique set of circumstances we have this year.

So I believe our estimates would be much more reliable, as far as estimating the impacts into next year.
Q. Are there any other differences in your assumptions than Mr. Rosekrans' assumptions in estimating water supply impacts?
A. Yeah. There was another key difference as far as the assumption on the extent of the plaintiffs' action seven on how long that action would take place. Mr. Rosekrans assumed that that action would end June 15th.

In our analysis, we assumed it would end July 15th. And the reason we assumed July 15th was that this was five days beyond the average observation of delta smelt in salvage at the fish facilities. And that is the triggering mechanism identified in the plaintiffs' proposal for the end of action seven.

Now, this additional 30 days that we assumed for this implementation of this objective is critical, that 30-day period from June 15th to July 15th represents the peak of the demand, of the water demand on the system on both projects. So this really created a choke point in our delivery capability for the project.

Essentially meeting that objective would require us to minimize our exports during that 30-day period whereby we would have to meet the entire supply out of San Luis Reservoir

south of the Delta. There are limitations, physical limitations on how quickly we can withdraw water from San Luis Reservoir.

So in many cases we would not be able to meet the demand that occurred in that critical period.

Q. Mr. Leahigh, do you know why Mr. Rosekrans selected June 15th as their end of action?

A. Well, the triggering --

MS. JAISWAL: Objection.

THE COURT: I'm assuming that you're objecting on the ground of lack of foundation. And so you may lay the foundation.

MS. JAISWAL: Yes, Your Honor. And calls for speculation.

THE COURT: That is subsumed within my ruling.

BY MS. WORDHAM:

Q. Mr. Leahigh, is there any explanation in Mr. Rosekrans' declaration for why he selected June 15th as the date for estimating the end of action, of the plaintiffs' action seven, I believe.

A. Well, June 15th is identified as the end of action seven or the last detected delta smelt at the fish facilities, with whichever comes later.

I believe that in Mr. Rosekrans supplemental declaration, he talks about the justification for June 15th in

that he refers to Dr. Swanson's declaration that the taking of actions, taking of actions earlier in the year would influence how late into the year we would detect delta smelt at the facilities. So I think that's what he stated as his, if I understand it correctly, his reasoning for using June 15th.

Q. And if you will look at Plaintiffs' Exhibit 4, which should be somewhere in front of you there. It is the declaration of Christina Swanson filed on August 13th. Document No. 466-2. Do you have that?

THE COURT: Before you go on to this, let me ask a question. What is your analysis of the time frame that Mr. Rosekrans establishes there as opposed to the period that you have utilized for the combined operation response?

THE WITNESS: For action seven? For the end --

THE COURT: For action seven, yes.

THE WITNESS: What we did was we took a look at the historical salvage in each year, since '93. And what we did was we used the median of all those last dates of salvage detected at either facility, which turned out to be July 10th. The triggering -- the language for the trigger talks about five days beyond the last detected smelt, so that's why we used July 15th in our analysis. And there's --

THE COURT: Go ahead.

THE WITNESS: I was going to say, there's -- I mean, as far as the reasoning given by Mr. Rosekrans, there have

been a number of years in the past, wet years where we would have seen Old and Middle River flows at least meeting the objectives of the plaintiffs earlier in the year, if not more positive than the objectives proposed by the plaintiffs. But yet, many of those years, in fact most of those years, we saw salvage at the facilities into July. So I feel that our -- our assumption is the correct one.

THE COURT: Thank you. Did you have a question?

MS. WORDHAM: Yes, Your Honor.

Q. Mr. Leahigh, if you would turn to page 31 of Dr. Swanson's declaration, paragraph 38.

A. Got it.

Q. I'm going to read, beginning line 27.

"Based on particle tracking modeling and statistical relationships between Old and Middle reverse and take of adult delta smelt, these conditions" -- and I will say these are referring to conditions on Old and Middle River for the plaintiffs' action seven -- I won't make that representation because I'm afraid I'm going to misrepresent what all of paragraph 38 says.

MR. WILKINSON: Start over, please.

BY MS. WORDHAM:

Q. I think I'll start over from the beginning of paragraph 38.

"Mr. Leahigh's analysis of water cost for

implementation of the plaintiffs' recommended interim protection actions includes the assumption that salvage of juvenile delta smelt would continue through mid July." And then cites to Leahigh reply declaration at paragraph 24.

"He basis this on examination of historical salvage of delta smelt since 1993, which shows that in half of those years seasonal salvage of young delta smelt ended on July 10. However, during that period, reverse flows on Old and Middle Rivers averaged negative 3,265 cubic feet per second in June with a range of negative 8,853 to 8,747 and negative 7,760 cfs in July with a range of negative 897 to negative 10,819 cfs. Based on Particle Tracking Model and statistical relationships between Old and Middle reverse and take of adult delta smelt, these conditions correspond to high rates of entrainment of fish into the central and south Delta and into CVP and SWP fish salvage facilities. Under the much lower reverse flow conditions for Old and Middle Rivers specified in plaintiffs' action seven and the preceding months (i.e., plaintiffs action five and six) it is likely that the movement of young delta smelt from the Delta channels and sloughs where they were hatched to downstream rearing areas near the

confluence and in Suisun Bay and beyond the influence of the export pumps would have been improved and few or no fish would remain in the south Delta as late as July."

Mr. Leahigh, attached as Exhibit D to your August 3, 2007 declaration, which has been marked as DWR Exhibit F is a table entitled "Analysis of Last Date of Delta Smelt Salvage by Banks PP and Jones PP." Do you have that document in front of you?

THE WITNESS: Yes. Yes, that's -- is that DWR Exhibit J?

Q. DWR Exhibit F. It's a one-page table and it's Exhibit D to your supplemental declaration.

A. Oh, okay. Yes. I have it.

Q. You have that?

A. Yes.

Q. Mr. Leahigh, looking at year 1996, what type of year was that?

A. That was a wet year.

Q. And in 1996, how wet was it?

A. 1996?

Q. Well --

A. 1990 -- well --

Q. Perhaps I mean 1998.

A. Yes. 1998 was the last big El Nino year, so it was

a -- on the wetter side of wet, extremely wet year. In fact, we were curtailed at the exports for long periods of time in the spring, for a good deal of the spring. There was flooding going on in the San Joaquin basin. We actually had some flows actually coming in to the aqueduct rather than making deliveries. So we were shut down for most of -- or long periods during the spring. Old and Middle River flows were, in fact, positive from the end of February all the way through the middle of July.

THE COURT: All right. We're going to take the morning recess at this time. We'll stand in recess until 15 minutes before 11.

MS. JAISWAL: Your Honor, if we could just get some direction for the Court for the schedule for today. Given that we are at 10:30.

THE COURT: We're going until 12:30 and we're going to resume at 1:30 and we'll be going at least until five, I presume. We're in recess until 10:45.

(Recess.)

THE COURT: We're going back on the record in NRDC versus Kempthorne. And we're going to continue Mr. Leahigh's testimony.

Mr. Wordham, you may proceed.

BY MS. WORDHAM:

Q. Mr. Leahigh, before the break we were looking at DWR

Exhibit F, which I believe is Exhibit D to your August 3, 2007 declaration. Do you have that in front of you?

A. Yes, I do.

Q. And you had just described the water year 1998 as a very wet year; is that correct?

A. Yes.

Q. And it was so wet, in fact, I believe you testified that there were positive flows on Old and Middle Rivers from February through July of that year; is that correct?

A. That's correct.

Q. And it was so wet that there were periods of time when the projects were not even pumping; is that correct?

A. Yes. As far as State Water Project, there were long periods of time we were not pumping.

Q. In 1998, what was the last date of salvage taken by either the State Water Project or the Central Valley Project?

A. July 10th.

Q. Going back to paragraph 38 of Dr. Swanson's August 13, 2007 declaration. In your opinion, given the conditions that existed in 1998 and the last date of salvage for 1998, in your opinion is it possible that fish may -- smelt may be salvaged at the Jones or Banks Pumping Plants after June 15th --

MS. JAISWAL: Objection.

MS. WORDHAM: If I may finish the question.

MS. JAISWAL: I'm sorry. I thought you were done.

BY MS. WORDHAM:

Q. -- even if plaintiffs' actions five, six and seven were implemented?

A. That's what the historical data seems to indicate, yes.

Q. Thank you. We have been talking about Dr. Swanson's August 13 declaration. You are familiar with this declaration?

A. Yes.

Q. Are you familiar with the plaintiffs' proposed action ten of their remedy proposal?

A. Yes, I am.

Q. Would you please briefly describe your understanding of their action ten?

A. Yes. Action ten requires that the X2 line or two parts per thousand salinity be maintained at 80 kilometers from the Golden Gate or three-day outflow of 7500 cfs to be maintained for the period from September 1st through December 15th.

Q. If you look at paragraph 21 of Dr. Swanson's August 13 declaration, which is Plaintiffs' Exhibit 4, on page 19. At the bottom of page 19, Dr. Swanson -- in paragraph 21, Dr. Swanson states that, "The projects can -- well, let me read all of paragraph -- the first part of paragraph 21.

"There are at least three strategies that can be employed singly or in combination by the state and federal water projects to modify operations to

maintain Delta outflows at the levels that protect delta smelt critical habitat as proposed in plaintiffs' action ten without causing potential adverse impacts on listed salmonid species on the Sacramento River. First, the projects can reduce Delta export rates."

In your opinion, Mr. Leahigh, do you believe that the projects could meet the outflow requirements of plaintiffs' action ten strictly through export reductions?

A. In most years, we wouldn't be able to meet it through export reductions without some kind of impact to San Luis Reservoir.

Q. What would be those impacts?

A. They would be in terms of water quality and slope stability.

Q. And what would be the water quality impacts?

A. The water quality impacts are essentially, when you get down to the last ten to 15 percent of storage in San Luis Reservoir, all of the impurities in the water are consolidating. For example, you get the blue-green algae that's on the surface at that storage, low storage level, it's within -- starts to be brought into the intakes, into the San Felipe diversion, which is Santa Clara Valley Water District's diversion, which diverts directly out of San Luis Reservoir.

Q. At what point would you start experiencing these water

quality impacts?

A. Yes. This would be at about 300,000 acre feet and below is where you start to see those type of impacts.

Q. So once the storage level reaches about 300,000 acre feet, then you start experiencing these water quality impacts?

A. That's correct.

Q. What's the current storage level in San Luis Reservoir?

A. Current storage as of midnight last night was about 470,000 acre feet.

THE COURT: What is the capacity?

THE WITNESS: Capacity is a little over 2 million acre feet.

THE COURT: And what is the normal storage as of August 31st historically in the San Luis Reservoir?

THE WITNESS: As of August 31st, if you were to look back at the historical record, it's probably a bit higher than we are now. Although typically this is -- this is when we hit the low point in San Luis. This is when it is at its lowest point. This is the end of the agricultural season.

THE COURT: Thank you.

BY MS. WORDHAM:

Q. You have testified, I believe, Mr. Leahigh, that this current water year we are in, which ends at the end of September, is a dry water year; is that correct?

A. Yes.

Q. And that the conditions in the Sacramento and San Joaquin basins are dry; is that correct?

A. Yes. Dry. In fact, critically dry in the San Joaquin basin.

Q. And do you expect those conditions to continue into the fall?

A. Well, those conditions would continue until we get the first big rains of the year, which nobody knows when that will occur. But typically, the earliest we see significant precip, end of October possibly, but could be as late as into January or possibly in critically dry years, you don't see much of an event at all as far as precip.

Q. If the Department of Water Resources and the Bureau of Reclamation were required to implement plaintiffs' action ten and meet the flow objectives of plaintiffs' action ten strictly through export reductions, would the water level in San Luis Reservoir reach 300,000 acre feet this fall?

A. It's likely that we would reach that storage level before the end of October.

Q. If the projects were to implement plaintiffs' action ten solely through export reductions, but not impact San Luis Reservoir to the point of reducing the level of San Luis Reservoir to 300,000 acre feet or below, would that result in significant water delivery impacts to water contractors?

A. I'm sorry. Can you restate the question?

THE COURT: Read it back, please.

(Record read as requested.)

THE WITNESS: Yes.

BY MS. WORDHAM:

Q. Have you quantified that amount of that impact?

A. Yeah. We estimated that it would be on the order -- well, let's see, in order to maintain San Luis at 300,000 acre feet, and all of the delivery -- I mean, all of the -- action ten is met strictly through export reductions, would require delivery reductions of two to 300,000 acre feet in a short period of time. We're talking the next two months.

Q. And you testified that another impact of San Luis Reservoir could be structural stability; correct?

A. Correct.

Q. And what is that structural stability issue?

A. Well, we took a look at -- we analyzed if we were to meet action ten strictly through export reductions, what kind of draw down rates we would be looking at in San Luis Reservoir in order to meet -- because exports would be very low. All of the demand would be coming out of San Luis Reservoir. Those draw down rates would be on the same order as those that were experienced back in 1981 when we had a major slide on the inside face of Sisk Dam at San Luis Reservoir. That this would require taking the reservoir out of service, it was completely drained and repairs took about a year to repair the

damage. And we would anticipate if we saw a similar type failure, we would anticipate similar type outage.

Q. Referring back to Plaintiffs' Exhibit 4, which is the Christina Swanson declaration. And again looking at paragraph 21. Now on page 20. At line seven, Dr. Swanson states that "The CVP and the SWP could increase releases from their other upstream reservoirs, including Oroville, Folsom and New Melones instead of relying so heavily or exclusively on Shasta Reservoir" as one means of implementing plaintiffs' action ten. Do you see that?

A. Yes.

Q. In your supplemental declaration, you stated that one means of managing the projects if plaintiffs' action ten were implemented would be by a combination of reducing storage -- exports and releasing water from storage; correct?

A. Correct.

Q. How much water did you anticipate that the projects would need to release from storage to implement plaintiffs' action ten?

A. We analyzed it a couple of ways. In my declaration, it was assumed that under dry conditions, about 300,000 acre feet would be required from upstream in order to meet it. In order to avoid any impacts that we just discussed at San Luis Reservoir, we would require something closer to 500,000 acre feet from upstream.

Q. Is that the same estimate that Mr. Milligan -- let me rephrase. Or let me strike that and start over.

Are you familiar with the declaration of Ronald Milligan that was filed by the federal defendants in this matter?

A. Yes.

Q. Did Mr. -- Mr. Milligan, in his declaration, estimated that under dry conditions and the forecasted reservoir levels, export releases of up to 500,000 acre feet would be required to implement plaintiffs' action ten. Is that the level of releases that you're referring to?

A. Yes. That --

MS. JAISWAL: Your Honor, I'd like to restate our continuing objection.

THE COURT: All right. And the ruling is the same.

BY MS. WORDHAM:

Q. Mr. Leahigh.

A. Yes. That figure that Mr. Milligan quoted is consistent with our analysis in how much water would be required from upstream in order to avoid impacts at San Luis Reservoir in dry conditions.

Q. And the 310,000 acre feet that you estimated would be -- should be released to manage the projects if the plaintiffs action ten were implemented with a combination of export reductions and upstream releases could have an impact

on water quality in San Luis Reservoir; is that correct?

A. Yes. If we operated under dry year conditions as laid out in my declaration, it shows 300,000 necessary from upstream. But San Luis does drop well below that 300,000 mark in that particular analysis.

MS. WORDHAM: At this time, Your Honor, I'd like to mark as DWR next, I think it's O. This is an excerpt from the Biological Opinion on the long-term Central Valley Project and State Water Project operations criterion plan, which I believe is the subject of litigation in a companion case, PCFFA versus Gutierrez, which is case number 06-CV-00245.

THE COURT: It will be marked for identification DWR Exhibit O.

(Defendant's Exhibit DWR O was marked for identification.)

MS. WORDHAM: I'd also like to mark as DWR Exhibit P an agreement between the Department of Water Resources and the Department of Fish & Game concerning the operation of the Oroville division of the State Water Project for management of Fish & Wildlife.

(Defendant's Exhibit DWR P was marked for identification.)

MS. WORDHAM: And last, for the time being, I would like to mark as DWR Exhibit Q, if I remember my alphabet correctly, a US -- United States Federal Energy Regulatory

Commission order amending a Federal Energy Regulatory Commission license.

(Defendant's Exhibit DWR Q was marked for identification.)

MS. WORDHAM: If I may approach?

THE COURT: Yes, you may.

BY MS. WORDHAM:

Q. Mr. Leahigh, I have just handed you three documents which have been marked as Exhibits DWR O, DWR P and DWR Q. Looking at the first document, Exhibit DWR O, do you recognize this document?

A. Yes.

Q. Can you briefly describe it?

A. Well, this is an excerpt from our Biological Opinion for long term operations for both Central Valley Project and State Water Project Operations Criteria and Plan or OCAP.

Q. Is this a complete copy of the Biological Opinion?

A. No. This is an excerpt.

MS. WORDHAM: Your Honor, at this time I would like to request that the Court take judicial notice of the complete Biological Opinion, which is on file in the related case, PCFFA versus Gutierrez.

THE COURT: Any objection?

MS. JAISWAL: Your Honor, we are objecting on grounds of completion for the document.

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THE COURT: The request was just made that I take judicial notice of the entire Biological Opinion, which would include this document. Any objection to that?

MS. JAISWAL: No, Your Honor.

THE COURT: The request for judicial notice is granted. And I will -- if you tell me what part you want me to look at, if there's anything more than this, I will refer to the OCAP BiOp as the subject of case number 06-CV-00245.

BY MS. WORDHAM:

Q. Mr. Leahigh, to your knowledge, does the Biological Opinion for the long-term -- strike that.

Mr. Leahigh, do you know what bio -- what species are addressed in this Biological Opinion that we are now referring to?

A. Yeah. What I failed to mention is this is the Biological Opinion issued by National Marine Fisheries Service, so it covers Chinook salmon and steelhead spring-run -- more specifically spring-run Chinook salmon and steelhead.

Q. Are these species listed under the Endangered Species Act?

A. Yes.

Q. Do you know if they're listed as threatened or endangered?

A. I believe it's threatened.

Q. To your knowledge, does this Biological Opinion require that DWR maintain water temperatures on the Feather River at certain levels for protection of the spring-run and steelhead?

A. Yes.

Q. If I may turn your attention now to DWR Exhibit P. Are you familiar with this document?

A. Yes, I am.

Q. Would you please briefly describe it.

A. This is an agreement, an operating agreement between Department of Water Resources and Department of Fish & Game. Dated August 1983. And it has numerous provisions in it related to minimum instream flow requirements downstream of the Oroville complex on the Feather River. Also includes ramping criteria, change in those releases and also flow stability provisions where once a certain level of habitat is established at a certain level of flow, that those flows need to be maintained for a period of time.

Q. How is it that you are familiar with this particular document?

A. Well, it's -- it's essential that in order to operate the project, that we are familiar with this. These are the conditions on which we operate the project. The -- these provisions are -- as far as the minimum flow requirements, are built into our operations model that analyzes the operations and the delivery capabilities.

MS. WORDHAM: Your Honor, at this time I would like to move DWR Exhibit P into evidence.

THE COURT: Any objection?

MS. JAISWAL: Completion, Your Honor.

THE COURT: This appears to be a stand alone agreement. The objection is overruled. Exhibit P of DWR is received in evidence.

(Defendant's Exhibit DWR P was received.)

BY MS. WORDHAM:

Q. Mr. Leahigh, is the State Water Project required to operate to any specifications set forth by the Federal Energy Regulatory Commission?

A. Yes. The FERC license covers all operations of the Oroville complex. It has actually incorporated the flow provisions that are in this agreement between the Fish & Game and DWR.

Q. Would you turn your attention to DWR Exhibit Q. Are you familiar with this document?

A. Yes.

Q. Would you please briefly describe this document.

A. Well, this is the order amending our license, our FERC license, and this does incorporate these flow provisions from the Fish & Game agreement into our FERC license.

Q. So you are required to comply with the provisions of this order in operating Oroville Reservoir?

A. Yes.

MS. WORDHAM: Your Honor, at this time I would like to move DWR Exhibit Q into evidence. Any objection?

MS. JAISWAL: Your Honor, it appears we have pages one, two and five for this document. I'm not sure if this is a copy error or if it is not complete.

THE COURT: That does appear to be the case. Did you just omit a couple of pages?

MS. WORDHAM: Well, if I have, I've omitted them from all the copies I have here today, Your Honor.

THE COURT: Was that intentional or just inadvertent?

MS. WORDHAM: It was inadvertent.

THE COURT: All right. Well, what I'll do is this. Subject to your adding the two pages that are not present, I'll admit Exhibit Q into evidence.

MS. WORDHAM: I will make sure that the missing pages are provided to the Court and all parties as soon as possible, Your Honor.

THE COURT: Thank you very much.

(Defendant's Exhibit DWR Q was received.)

Q. Mr. Leahigh, is the Department of Water Resources, at its Oroville Reservoir facility, required to comply with the various flow restrictions and temperature restrictions that you just described in each of these documents?

A. Yes.

Q. This is a legal requirement?

A. Yes.

Q. Now, if the projects, being both the State Water Project

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and the Central Valley Project, were required to implement the plaintiffs' action ten by releasing water only from Lake Oroville, would that have an effect on DWR's ability to meet the flow restrictions and water temperature restrictions that you've just described in these documents?

A. Yes. Very much so.

Q. And how is that?

A. If we were required to meet -- if I understood your question correctly, if we were required to meet the Delta ten action solely, that the upstream portion of that, from Lake Oroville, there would be extreme impacts to Oroville storage. Most notably due to the provision three of the agreement with Fish & Game as far as having to provide releases above the threshold release identified in provision three.

Once that higher flow is established, we must maintain that higher flow from the fall through March of the following spring.

This would have a devastating effect on Lake Oroville storage and it would severely compromise our ability not only to meet the temperature requirements the following year, but most likely it could very well have impacts if this following winter is dry or critically dry on our ability to meet even our share of Delta requirements.

Q. By "Delta requirements," you mean the water quality standards and flow requirements of --

A. The flow standards, salinity standards for Fish & Wildlife purposes and agricultural uses, yes.

Q. Why would you be required to maintain such high flows from -- high release rates from Lake Oroville? What would be the purpose of maintaining those releases?

A. Well, the reasoning behind it is that once we make releases at the higher level, we establish new habitat for Chinook and steelhead in the Feather River. In order to avoid dewatering redds or straining fry later in the season, we have to maintain that same level of habitat. So thereby maintaining that same level of release through the spring of the following year.

Q. So these higher flows are intended to protect endangered species; is that correct?

A. That's correct. All species, including endangered species.

Q. Do you have any option -- any alternative to maintaining these flows --

A. No.

Q. -- at these higher --

A. It's in our legal requirements, it's in our agreement with Fish & Game and it's also legally binding in our FERC license.

Q. So the only way that you could avoid those impacts that you just described would be to violate your regulatory requirements under the FERC license, under the Fish & Game

agreement and as imposed by the biological opinions that we were just discussing; is that correct?

MS. JAISWAL: Objection, Your Honor.

THE COURT: Ground?

MS. JAISWAL: Assumes fact not in evidence.

THE COURT: Overruled. You may answer.

THE WITNESS: Yes.

BY MS. WORDHAM:

Q. Mr. Leahigh, in the remedies proposed by the US Fish & Wildlife Service and the Department of Water Resources -- you're familiar with all of those remedy proposals; correct?

A. Yes.

Q. There's certain actions that require the Old and Middle River flows to be maintained at a certain rate; is that correct?

A. That's correct.

Q. And this level is achieved by averaging flows over a period of days; correct?

A. That's correct.

Q. And what is that averaging period?

A. Well, the averaging period -- oh, in the Fish & Wildlife Service proposal specifically?

Q. Yes.

A. Is that what you're --

Q. I'll start with them.

A. It requires it to meet it on -- the objective on a 14-day average, less restrictive -- I'm sorry, more restrictive on a seven-day average. Sorry. Less restrictive on a seven-day average.

Q. Why is a 14-day average used?

A. Okay. To answer this question, I think I need to go into a little bit background on some more of the process of the tides and how they influence flows in the interior Delta.

Q. Okay.

A. There's been testimony, we've talked about the semi-diurnal sloshing of the tide, the two flood tides, two ebb tides each day. So that's one component of the tides and how it affects the interior channels in the Delta. And the result is a net either negative flow or net positive flow.

There is also an effect of the moon on the tides and on these flows in these interior channels. And so this is superimposed on the daily sloshing. There is approximately a seven-day filling of the Delta on a net flow basis and a seven-day draining of the Delta on a seven-day basis. So a cycle from -- and the filling is referred to as the spring tide and the draining is the neap tide. So there is essentially a 14-day period between -- from spring tide to spring tide because the spring tides occur both during the full moon and the new moon.

Q. Are there any other --
A. Um --
Q. -- influences -- are there any other factors that support a 14-day running average?
A. Well, I -- that's -- this cycle has been recognized in the other standards that we're required to meet as part of the D 1641, as far as the salinity requirements that are within the interior of the Delta that is influenced by this neap/spring cycle. All of those standards are based on a 14-day running average. And the Old and Middle River objective, Old and Middle River at this -- as measured is also affected by this neap spring cycle.
Q. I believe in your declaration you also testified -- stated that there were certain meteorological events that make a 14-day running average an appropriate measurement.
A. Well, yeah, the -- in addition to the astronomical effects on the tides, which are predictable based on movement of the moon around the earth, there are other aspects of the tide that are -- that are not predictable and not very well understood. And these would be the effects, the meteorological effects on the tides. And this would be winds, barometric pressure, storm surges.

And these have effects on the short-term on the stages and flows of the channels within the Delta, on a short-term basis, that overwhelm this longer term process of

the tides as far as the spring and neap.

So it would be extremely challenging to meet a short duration objective or running average objective, just for practical purposes of the projects being able to adjust their operations in a way to compensate for these very large effects from meteorological influences.
Q. Are you familiar with the 2006 Water Quality Control Plan?
A. Yes.
Q. Are you familiar with the quantitative flow objectives for river flows and Delta outflows as discussed in the 2006 Water Quality Control Plan?
A. Yes.
Q. How are those quantitative flow objectives determined in the water quality control plan?
A. The -- well, the main flow objective that's in the water quality control plan would be net Delta outflow index. And that is an index. It is not a measured flow. It is a calculated flow based on -- it's an equation based on inputs and outputs into the Delta. The inputs would be the inflows primarily from the Sacramento River as measured at Freeport, the San Joaquin River as measured at Vernalis. The outputs would be consumptive use within the Delta and the project exports in the south Delta. So you've got the plusses of the inflows, the minuses of the consumptive use and the exports and that gives you a net Delta outflow.

Q. Are the Delta outflow objectives met based on an averaging period?
A. Yes.
Q. And what is that period?
A. Well, most of the Delta outflow objectives have either have a 30-day -- based on a monthly average, usually with a provision for seven-day -- seven-day minimum as well.
Q. Are there any outflow objectives that are met based on a three-day running average?
A. Yes. There is. One of the ways to meet one of the more complicated standards in the D 1641, which is the X2 standards for protection of delta smelt, one of the ways to meet that objective is through a three-day running average for Delta outflow.
Q. Under the Water Quality Control Plan, is there a salinity standard?
A. Yes. There are numerous salinity standards. Yes.
Q. And where is salinity measured under the water quality control plan?
A. Well, there's various -- various ones. There's -- in the interior of the Delta, primarily Jersey Point, Emmaton, there are other requirement -- M and I salinity requirements at other places.
Q. Does the water quality control plan provide an averaging period over which the projects maintain salinity levels?

A. Yes. Those locations in the interior Delta for agricultural salinity are based on 14-day running average.
Q. Is there a reason why, on that one instance, Delta outflows can be measured using a three-day running average or can be maintained, rather, using a three-day running average while salinity levels require a 14-day running average?
A. Yes. The components, as I stated, that go into calculating the Delta outflow. The inflow, the observed inflow is at Freeport on the Sacramento River, Vernalis on the San Joaquin River. These are essentially on the periphery of the Delta and they are not influenced by this neap/spring tide cycle.
Q. In your --
A. So we could -- we could meet it in a shorter duration.
Q. The one, the Delta outflow requirement that's based on a three-day running average.
A. Yes.
Q. That could be met on a three-day running average.
A. Yes. And that's only one way to meet that particular standard.
Q. But the salinity levels need to be maintained on a 14-day running average; correct?
A. That's correct.
Q. And is that because they are more tidally influenced?
A. Yes. Essentially that would be to filter out the effects

of this neap/spring tidal cycle.
Q. Are the flows in Old and Middle Rivers also tidally influenced?
A. Yes.
Q. In your opinion, would it be possible for the projects to meet the flow objectives outlined in the plaintiffs' proposed remedy based on a five-day running average?
A. It would be very challenging, as I stated earlier, because of -- more so because of the meteorological effects. The astronomical effects could be -- can be predicted to a certain extent. But the meteorological effects cannot. And so it would be quite challenging.

If we had to meet it with a five-day running average, we would have to operate very conservatively. We'd have to target Old and Middle River flow objectives much more less negative than the objectives from the proposal, thereby incurring greater water costs than have been analyzed in our table here.
Q. And would the same hold true for attempting to meet Old and Middle River flows based on -- as outlined in either the Fish & Wildlife Service remedy or in the Department of Water Resources modifications to the Fish & Wildlife Service's remedy on a five-day average?
A. Yes, it would be just as challenging.

THE COURT: Give me, in succinct terms, why that is.

What is it about the five-day running average that makes this more difficult?

THE WITNESS: Well, it is -- in the short duration, you can have these meteorological effects, like I said, the winds, the Delta -- the onshore winds, the barometric pressure, when barometric pressure is very low, you tend to see a big increase in stage in the interior Delta, which is caused by this -- by the flows coming in from the bay and they're causing -- they tend to make the flows much more negative. And they actually overwhelm the normal predictable cycle of the tides. And this will happen for a period of a day or two as you get a storm system coming through the Delta.

And so we can predict this ahead of time, what the effects of those are going to be. And with only five days, and we're looking at an average, it would be very challenging to -- we'd have to make, for example, if we got one of these storm surges, we'd have to make a significant change in our export operations that may not even be enough in order to meet that requirement, that five-day average.

THE COURT: There have been seven-day averages referred to as well as the 14-day averages.

THE WITNESS: Right.

THE COURT: And for this particular measure, is there a preference as to a running average that is to be met?

THE WITNESS: Well, the preference would be the

14-day average. There is a provision in there for an upper cap of seven days that is not as restrictive as the 14 days. So that's kind of in recognition of -- well, that essentially puts a cap so we couldn't vary too greatly within that 14 days on meeting whatever the particular objective is.

THE COURT: And is the reason that the 14 days is more feasible because that gives more time for whatever natural conditions are to operate which would then enable DWR or CVP not to take affirmative measures?

THE WITNESS: I'm not sure if I fully understood --

THE COURT: What I'm saying is, in the most simplistic terms, you've described what are, in effect, natural causes that affect the direction of flow in the Delta. And these relate to all the different things you've talked about. Tides. Meteorological conditions. I thought I heard astrological, but I --

THE WITNESS: I meant to say astronomical.

THE COURT: Astronomical. All right. I don't think we're using astrology yet in this case. Before it's over, we may get there.

Does the longer period in effect permit the natural courses to operate to meet the running average without either reducing exports, putting more water into the system to try to effect the direction of flows? Is that --

THE WITNESS: Well, yeah --

THE COURT: -- the practical result?

THE WITNESS: That would be the practical result. Tend to stabilize the operations to a --

THE COURT: To require less action by the operators.

THE WITNESS: Yes. And -- that's correct. And as I said, as that duration of time gets shorter and shorter, we would have to operate more and more conservatively to actually target objectives further below or more restrictive than what's in any of these proposals in order to ensure that we do meet the proposals' objectives.

THE COURT: And do you see any net benefit to this shorter period?

THE WITNESS: I don't.

THE COURT: Thank you. You may continue.

BY MS. WORDHAM:
Q. Mr. Leahigh, are there any other operations that draw water from the Delta besides the State Water Project and Central Valley Project that could have an influence on the flows in Old and Middle Rivers?
A. Yes. There are other diverters in the south Delta upstream of the measuring point for Old and Middle River flows. These would be agricultural diverters as well as M and I diverters. Contra Costa Water District, for example.
Q. And have you had occasion to quantify the amount of their diversions?

A. Well, it varies throughout the year. But at their peak, it's estimated that the agricultural diverters upstream of the Old and Middle River sites could be in the order of 1,000, 1500 during the peak of their water -- their demand for agricultural uses. Contra Costa Water District probably -- and this is at their Old River pumping plant, is probably on the order of about 200 cfs or so.

Q. You're familiar with DWR's revised remedy proposal; is that correct?

A. That's correct.

Q. Under DWR's remedy actions three and four -- well, three, do you know what the flow requirements are?

A. The flow objective for Old and Middle River varies from 1500 -- negative 1500 cfs to negative 4,000.

Q. Is that different from the Fish & Wildlife Service's flow objectives for action three?

A. Yes. The Fish & Wildlife Service's is from zero or non-negative flow to negative 4,000 cfs.

Q. In your opinion, could the agricultural diversions and the -- and the M and I, or municipal and industrial diversions that you were just describing, have an effect on the project's ability to meet a zero or non-negative flow requirement in Old and Middle Rivers during the time period of action three?

A. Yes. In -- during the time period of action three, which is late spring, that's right at the time when the agricultural

users are starting to peak their diversions out of the Delta. If that's in combination with a low flow on the San Joaquin River, also if there were -- happened to be in the part of the spring/neap tidal cycle that is the spring, which tends the tendency to cause more negative flows on the interior Delta, it's possible we could see negative flows without any pumping at all at either facility. At either project, project export facility.

Q. So in your opinion, if the projects were required to operate to the slightly less restrictive requirements of DWR's proposal of negative 1500 cfs, would they be able -- would it be possible for them to -- let me rephrase.

Would it be easier for them to meet those flow objectives given the agricultural diversions and municipal and industrial diversions that you've described?

A. Yes. It would be much more practical to be able to meet that level of flow given all the other factors that are outside of our control.

MS. WORDHAM: One moment, Your Honor.

THE COURT: Yes.

MS. WORDHAM: Thank you, Your Honor. I have no further questions at this time.

THE COURT: Thank you very much. Do the plaintiffs wish to cross-examine?

MS. JAISWAL: Yes, Your Honor.

THE COURT: All right. You may proceed.

CROSS-EXAMINATION

BY MS. JAISWAL:

Q. Good morning, Your Honor. Good morning, Mr. Leahigh. I'm Anjali Jaiswal representing the plaintiffs. Before I begin the cross-examination, I just wanted to restate our continuing objection, Your Honor.

THE COURT: Yes. You may proceed.

BY MS. JAISWAL:

Q. Mr. Leahigh --

THE COURT: It is noted.

BY MS. JAISWAL:

Q. Mr. Leahigh, I am going to begin with the Department of Water Resources Exhibit N. Do you have that in front of you?

A. Yes.

Q. You've already read the title of this exhibit. And you've already testified that actions one through three propose monitoring; correct?

A. Correct.

Q. And that's for both the plaintiffs, the original as well as the revised; correct?

A. That's correct.

Q. And the charts for actions one, two, three -- excuse me. The chart states that for actions one through three, there will be no cost; is that correct?

A. Correct.

Q. Now, let's go to your Exhibit C, which has been marked -- let's see. That is contained in Department of Water Resources Exhibit J and it has also been separately entered, I believe, as Exhibit K. Do you have that in front of you?

A. Yes, I do.

Q. Thank you.

MS. WORDHAM: Your Honor, I'm having a hard time hearing counsel. I apologize, but I am having a hard time hearing counsel.

THE COURT: If you could try to speak directly into the microphone.

MS. JAISWAL: I will do my best, Your Honor.

THE COURT: Thank you. Yes, you have a soft voice.

BY MS. JAISWAL:

Q. Looking at Exhibit C attached to your supplemental declaration -- is that better?

MS. WORDHAM: Thank you.

MS. JAISWAL: Okay. I will hold it the best that I can.

Q. If I could direct your attention to the chart on the right. That is the service's action matrix; correct?

A. Correct.

Q. And there are -- there is no equivalent to actions one, two, three; correct?

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A. Correct.
Q. Now if I could go back to Exhibit N. Department of Water Resources Exhibit N. When you look at both charts for plaintiffs' action 6, that's VAMP; correct?
A. Correct.
Q. And for both of those across the board, there's no cost; correct?
A. That's correct.
Q. And just moving down quickly to eight and nine, again, the barriers. And for both of those across the board, there's no cost; correct?
A. Correct.
Q. Thank you. So in analyzing, you concluded that six of ten of the plaintiffs' actions had no cost; correct?
A. That's correct.
Q. Thank you. Moving on. Your analysis evaluated the remedy proposals only under a dry and average year hydrological condition; correct?
A. Correct.
Q. Mr. Leahigh, do you have in front of you your supplemental exhibit, which has been introduced as -- which has been entered as Department of Water Resources Exhibit I?
A. Yes. I have it.
Q. Take a look at Exhibit A. This exhibit indicates that there are five classifications for hydrological year types;

correct?
A. I'm sorry. Is this -- this would be my supplemental declaration?
Q. Yes.
A. I think that's DWR --
Q. I'm sorry. That is J.
A. J. Okay. Yes, I have that and I'm looking at Exhibit A to that supplemental declaration.
Q. Great. And -- is that better? Everyone can hear me better now? Great. Thank you for turning up the microphone.
So when you look at Exhibit A, you see five classifications for hydrological year types; correct?
A. That's correct.
Q. And in your analysis of the various proposals, you did not present any analysis for wet years; is that correct?
A. That's correct. The 50 percent exceedance, I believe, falls under above normal category.
Q. Thank you. And so if 2008 were a wet year, the water cost of plaintiffs' proposal would be less; correct?
A. It would depend.
Q. You testified that for conditions above normal, the projects could meet their contractor demands.
MS. WORDHAM: Objection. Misstates his testimony.
MS. JAISWAL: Could you please explain what you testified -- I'm sorry, Your Honor.

THE COURT: Let me rule on the objection. The objection is sustained. You may rephrase.
MS. JAISWAL: Thank you.
Q. Mr. Leahigh, would you please restate what you informed the Court today regarding wet year analysis.
MS. WORDHAM: Objection. Vague.
THE COURT: Do you understand the question?
THE WITNESS: I believe -- I believe I do.
THE COURT: Overruled. You may answer.
THE WITNESS: I think you're referring to a comment I made that doing an analysis on years wetter than the 50 percent exceedance, I believe I stated that we typically do not look at year types that are wetter because we're able to meet most of the delivery requests of our contractors. That -- I think that's what I stated earlier.
The question about wetter years, and I -- the reason I answered "It depends" is because it's possible, it depends on which basin receives more water. If, for example, Sacramento were wet, San Joaquin were drier, the cost could actually be greater than what was analyzed in our assessment.
If you've got a wet San Joaquin basin and a drier San Joaquin, then yes, those costs would tend to come down. On the most extreme wet years, it's possible that the cost could be zero for -- at least for the spring actions. There's the -- yeah, that's -- that would be my analysis of wet year

and the effect of a wet year on these proposals.
BY MS. JAISWAL:
Q. Thank you, Mr. Leahigh.
You testified that you reviewed Mr. Rosekrans' evaluation; correct?
A. Yes.
Q. His declaration.
A. Yes.
Q. Do you have Plaintiffs' Exhibit 25 in front of you?
A. I'm sorry. Which exhibit?
THE COURT: 25. I don't think he has it up there.
MS. JAISWAL: Your Honor, yesterday I gave the witness' copies to the Court --
THE CLERK: I put them over there.
THE COURT: If you can look, it should have a pink tag on it with 25.
THE WITNESS: I found it.
THE COURT: All right.
BY MS. JAISWAL:
Q. Mr. Leahigh, would you please turn to the last page of Mr. Rosekrans' exhibit.
A. Exhibit, the SR Supplemental 2?
Q. Yes. Thank you.
MS. JAISWAL: Your Honor, for ease of the Court, I would like to identify this separately as Plaintiffs' Exhibit

26.

THE COURT: All right. Any objection? 26 for identification.

(Plaintiffs' Exhibit 26 was marked for identification.)

BY MS. JAISWAL:

Q. Mr. Leahigh, looking at plaintiffs' 26, Mr. Rosekrans analyzed impacts over a range of hydrological year types; is that correct?

THE CLERK: Excuse me. Did you give me two copies of the same thing? One for the witness or --

MS. POOLE: I gave you two copies.

THE CLERK: Okay.

THE WITNESS: I'm sorry. Could you repeat the question?

MS. JAISWAL: Yes. Should I have the court reporter repeat it?

THE COURT: Can you read it back?

(Record read as requested.)

THE WITNESS: Not necessary -- no. I think what Mr. Rosekrans did was look at a number -- look at historical data from a number of years in the past that fell under different year types.

BY MS. JAISWAL:

Q. And those year types are critical to wet; correct? If you

look at the exhibit, there's critical, critical dry, below normal, above normal, normal wet. Those are the five year types?

A. The years that were analyzed, yeah, they fall under critical to wet with the exception of a "below normal." I don't see a "below normal."

Q. Thank you. There's -- if I could draw your attention to 2003.

A. Okay. On the San Joaquin Valley, you're correct, that was below normal.

Q. So the exhibit also shows that Mr. Rosekrans included beginning of year storage for purpose of this analysis; correct?

A. In his analysis, he states what the beginning of year storages were for each of those years, yes.

Q. Thank you. And Mr. Rosekrans determined that exports would be reduced on average by 1.652 million acre feet for plaintiffs' interim protections; correct?

A. He -- okay. I see that. He shows that as the average of all of those years that he analyzed. Yes.

Q. Thank you. And Mr. Rosekrans determined that exports would be reduced by 923,000 acre feet for a wet -- for wet year conditions; is that correct?

A. Well, for that particular year, 1995, under the conditions that existed in that particular year, that's what he came up

with.

Q. And 1995 was a wet year; correct?

A. 1995 was a wet year.

Q. Moving on, Mr. Leahigh. Do you have in front of you your exhibit, your supplemental exhibit, and that, again, is Defendants' J. Department of Water Resources J.

THE COURT: Before you move on, let me ask Mr. Leahigh two questions. Go back, if you would, to Exhibit 26. Look at the total storage. Do you agree that that is the total storage? Is this for both projects?

THE WITNESS: It looks as if it is for both projects.

THE COURT: And the historic exports, is that -- it's 5,201,000. Does that comport with your recollection? These are selected years obviously.

THE WITNESS: Right. You know, I have no way of verifying that right here, but I'll assume it's correct.

THE COURT: All right. Thank you. You may proceed.

THE WITNESS: And --

MS. JAISWAL: Thank you, Your Honor.

Q. Mr. Leahigh, if I could direct you to your Exhibit J, which has also been marked as Exhibit K, which is Exhibit C to your supplemental declaration.

A. Yes, I have it.

Q. Please let me direct your attention to the right box.

A. Okay.

Q. If you could go to the service's action item four.

A. Okay.

Q. Okay. For action item four, you assumed two assumptions; correct?

A. Yes.

Q. And you assumed Old and Middle River flows greater than zero and Old and Middle River flows greater than negative 4,000. I'm sorry. Greater than negative 4,000. Correct?

A. That's correct.

Q. Now, if you could please find federal Defendants' Exhibit A, I believe, that is a declaration of Ms. Goude.

THE COURT: Before you do that, let me ask about this second figure. Is it your understanding that the June 1st to June 30th period, this follows the Vernalis Adaptive Management Period, the flows are supposed to be maintained greater than zero and greater -- or should that be less than minus 4,000? Isn't that a bracket between zero and minus 4,000?

THE WITNESS: It is a bracket between zero and negative 4,000.

THE COURT: It should be a less than rather a greater than sign?

THE WITNESS: No, the objective should be to maintain a flow less negative than negative 4,000. So it should be greater than negative 4,000. I think that's stated correctly.

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THE COURT: Thank you.
MS. JAISWAL: May I continue, Your Honor?
THE COURT: Yes.
MS. JAISWAL: Thank you.
Q. Mr. Leahigh, if I could please direct your attention to Federal Defendants' A. That's the declaration of Ms. Goude that's docket number 396-5.
MR. MAYSONETT: Your Honor, I believe it's actually Federal Defendants' 3.
MS. JAISWAL: Thank you.
THE COURT: Do you have it?
THE WITNESS: Exhibit 3? These appear to be letters here.
THE COURT: The declaration of Ms. Goude.
MS. JAISWAL: I can separately introduce it.
THE COURT: Have you found it?
THE WITNESS: Thank you. I have it.
MS. JAISWAL: Thank you very much for finding it.
Q. Now, if you could please turn to what is Exhibit 2 and it is on page 8 of 24 on the top following the docket numbers.
A. Yes, I have it.
Q. If you could go down to action number four. This is the service's action number four that's attached to Ms. Goude's declaration. Please review action number four.
A. Okay.

Q. Nothing in the service's action matrix for action four requires the flows that you used in your analysis as described in your Exhibit C; is that correct?
A. Well, it doesn't explicitly state it on this particular document, but I believe it's referenced in the footnotes to this table.
Q. If you could go to the footnotes of the table.
A. It would be the next page.
Q. Please read the footnote to yourself.
A. Okay.
Q. Does anything in the footnote for action four specify the assumptions that you used in your analysis for action four?
A. Well, footnote six, although footnote six is not referenced for action --
Q. Thank you. For action four.
A. I believe that was the intent.
Q. But nothing in the footnote and nothing in the action matrix explicitly states the assumptions that you explicitly used in your exhibit and model; is that correct?
A. Well, I don't see it right now.
Q. Thank you.
A. But --
Q. The service's action four is actually a process. It's not a flow standard; correct?
A. It is a process. With actions three and four, the

objective can vary.
Q. Thank you.
A. But the process is the same.
Q. And it's a process that's not dissimilar to DSRAM, the Delta Smelt Risk Assessment Matrix; correct?
MS. WORDHAM: Objection. Exceeds the scope of this witness' direct.
THE COURT: The subject is action four and I will permit a comparison to be made. Objection's overruled. That subject was covered on direct. Although not the DSRAM. You may answer.
MR. WILKINSON: Your Honor, I'm also going to object on the grounds of vagueness.
THE COURT: All right. Do you understand the question?
THE WITNESS: I think it is somewhat vague.
THE COURT: Sustained. Rephrase, please.
BY MS. JAISWAL:
Q. Are you familiar with the Delta Smelt Risk Assessment Matrix, Mr. Leahigh?
A. Yes.
Q. The delta smelt risk assessment matrix set up a process; didn't it?
MS. WORDHAM: Objection. Vague as to "process."
THE COURT: Do you understand the question?

THE WITNESS: Sort of.
THE COURT: Well, you don't have to define your question. I'll sustain the objection. You may rephrase.
BY MS. JAISWAL:
Q. Could you please explain how DSRAM differs from the service's action four?
A. I think we're comparing apples and oranges. I don't think there is any comparison.
Q. Thank you, Mr. Leahigh. Moving on.
Your Honor, did the Court have anything further?
THE COURT: No, I don't.
BY MS. JAISWAL:
Q. Mr. Leahigh, you analyzed the water costs for plaintiffs' interim protective action seven; correct?
A. Yes.
Q. And in analyzing plaintiffs' action seven, you selected an end date of July 15th as the end of juvenile salvage; correct?
A. Yes.
Q. Earlier in your testimony, did you testify to the effect that relying on historical data is not useful?
MS. WORDHAM: Objection. Misstates his testimony.
THE COURT: Well, it seems to be an incomplete question. Are you able to answer the question in its present form? If you don't agree with it, you can simply say --
THE WITNESS: It's not clear enough.

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THE COURT: All right. Sustained. You may rephrase.
MS. JAISWAL: Thank you.
Q. Mr. Leahigh, this morning, did you testify and use as a criticism using historical data and using historical data is not useful? Do you recall testifying to something to that effect?
MS. WORDHAM: Objection. Vague.
THE COURT: Well, do you understand the question?
THE WITNESS: Yes. Yes.
THE COURT: If you don't, say so.
THE WITNESS: Yes.
THE COURT: All right. Overruled. You may answer.
THE WITNESS: I criticized the use of historical data when the parameter that you're looking at is known. So if you -- for example, if you know what carryover storage is going into next year, then you should use it. You shouldn't rely on historical data for that particular parameter.
BY MS. JAISWAL:
Q. Thank you. And for action seven, you relied on historical data; is that correct?
A. Yes. Because it's not known when the last salvage of data will be detected at the facilities. So this is not a known quantity. So that's the only estimate that we could have, that would be the best estimate available to us.
Q. You also testified earlier today -- and I'm probably not

going to get the testimony exactly right, so maybe you could help me out and restate what you said. But you testified something to the effect that selecting July 15th as your end date is a critical assumption. Is that correct?
A. Yes.
Q. And you testified, and please correct me if I misstate it unintentionally, because this time period of 6-15 to 7-15 is a peak demand time period. Is that correct?
A. That's correct.
Q. Are you aware that plaintiffs' proposal specifies an end date of June 15th or five days after the end of salvage?
A. Yes.
Q. Mr. Leahigh, you were here last week during Ms. Goude's testimony; weren't you?
A. For the first half of her testimony on Thursday, but not on Friday.
Q. Do you recall Ms. Goude evaluating the years for the end of juvenile salvage?
A. No.
Q. Okay. Sounds like you weren't here.
If I could direct your attention to your supplemental exhibit. I'm sorry. Your supplemental declaration. And that, for the record, has been identified as Exhibit J for the Department of Water Resources.
A. I have it.

Q. Okay. Please go to -- you've looked at this chart earlier today; haven't you?
A. Which chart? I'm sorry.
Q. It's Exhibit D -- I'm sorry. If you could go to your Exhibit D in that exhibit.
A. Yes. I am familiar with it.
Q. Thank you. Can you please look at 2006.
A. Yes.
Q. When does salvage end in 2006?
A. The last day of salvage is listed as April 22nd at the state facility.
Q. Thank you. In such years, plaintiffs' action seven would end on June 15th; correct?
MS. WORDHAM: Objection. Vague as to "such years."
MS. JAISWAL: In years --
THE COURT: Sustained.
MS. JAISWAL: I'm sorry.
Q. In years like 2006, plaintiffs' action seven would end on June 15th; correct?
A. Yes.
Q. In your analysis, you did not present the calculation of water costs in plaintiffs' action seven ended on June 15th; did you?
A. No, I don't believe so.
Q. Thank you. How about June 30th?

A. No.
Q. Thank you. Now, Mr. Leahigh, if you could please go to Plaintiffs' Exhibit 4, I believe, that is Dr. Swanson's supplemental declaration.
A. Okay. I have it.
Q. I believe you were referring to it earlier today.
A. Probably. I have it.
Q. Thank you. If you could please turn to page 32. And I'm going to read from line two starting with "Under the much lower reverse flow." And if you could tell me if I'm accurate.
"Under the much lower reverse flow conditions for Old and Middle River specified in plaintiffs' action seven and the preceding months (i.e., plaintiffs' actions five and six) it is likely that the movement of young delta smelt from the Delta channels and sloughs where they were hatched to downstream rearing areas near the confluence and in Suisun Bay and beyond the influence of export pumps would have been improved and few or no fish would remain in the south Delta as late as July."
A. That's what it says.
Q. Thank you. And that's Dr. Swanson's declaration; correct?
A. That's correct.
Q. So is it fair to say that plaintiffs' action seven could end as early as June 15th?

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MR. WILKINSON: Your Honor, I'm going to object on the basis that this calls for an answer that's beyond the scope of the witness' expertise.

THE COURT: It appears to be asking him what the exhibit says. Isn't the proposal for it to end on June 15th?

MS. JAISWAL: Yes, Your Honor.

MR. WILKINSON: If counsel is asking for his interpretation of when the last smelt would be taken, I believe that gets into biological expertise.

THE COURT: The question could be asked directly. I'm going to sustain the objection to the form of the question. You may rephrase it.

MS. JAISWAL: Your Honor, he offered his opinion exactly on that during direct.

THE COURT: Yes. No question about it. But are you asking him is it possible that the last salvage could be -- of juvenile could be taken on June 15th? Is that your question?

MS. JAISWAL: Yes, Your Honor.

THE COURT: Answer that question.

MR. WILKINSON: Goes beyond his expertise.

THE COURT: What?

MR. WILKINSON: I believe that goes beyond his expertise, Your Honor.

THE COURT: Well, here he's being asked to interpret and he covered it in direct. In fact, I think he expressed

his opinion that the last date of salvage would be July 15th. And that he chose.

MR. WILKINSON: Well, my recollection was that he read from certain data about smelt collections.

THE COURT: Let's ask him. Do you have that opinion that the most efficacious date for the last salvage of juvenile delta smelt is July the 15th? Do you personally hold that opinion or are you just --

THE WITNESS: Well, the historical data shows an example of where actions that were even more protective at Old and Middle River resulted in fish salvage into July.

THE COURT: So as the project leader, then you endorse July 15th as the last date of salvage for juveniles?

THE WITNESS: Yes. I believe that would be the more prudent way to assess potential water costs.

THE COURT: All right. Now you're being asked what about July 15th, is that a reasonable date for last salvage of juveniles?

THE WITNESS: June 15th?

THE COURT: June 15th. I'm sorry.

THE WITNESS: If I were to be shown evidence that supported some historical data that showed Old and Middle River flows similar to the plaintiffs' actions five and six taking place and also salvage, the last salvage occurring before June 15th, I could say yes. But I don't see that date.

THE COURT: You don't have any basis for that now?

THE WITNESS: I don't see that date in front of me.

THE COURT: So you don't have that opinion?

THE WITNESS: I don't have that opinion.

MS. JAISWAL: Thank you, Your Honor.

Q. If you assumed that what Dr. Swanson said in her declaration, which I read, is correct.

A. Would I assume that?

Q. If you would, please --

THE COURT: You're being asked.

THE WITNESS: Oh, I see. Okay. I will assume that.

BY MS. JAISWAL:

Q. Thank you. Would plaintiffs' action -- could plaintiffs' action seven end as early as June 15th?

A. If I assume what she's saying is correct?

Q. Yes.

A. Then --

Q. Could it end as early as June 15th?

A. I suppose so.

Q. Thank you. If I could direct your attention back to your supplemental declaration and your Exhibit C to your supplemental declaration, which is in evidence as Exhibit J as well as Exhibit K.

A. Okay.

Q. Your analysis goes for a two -month period; correct?

THE COURT: Analysis of what?

BY MS. JAISWAL:

Q. I'm sorry. Your analysis for action seven goes for a two-month period, from May 16th to July 15th; correct?

A. That's correct. That's the assumption.

Q. Thank you. The assumption. If you choose the June 15th as an end date, it cuts the duration of action seven in half; correct?

A. Yes. That would cut the assumption in half.

Q. It goes from a two-month period to a single month period; correct?

A. Correct.

Q. If you assume an end date of June 15th, which you've already done once, and all other factors remain the same, in your water cost modeling, plaintiffs' action seven would have significant -- excuse me, would have significantly less water cost for an average year; correct?

MS. WORDHAM: Objection. Vague as to "significantly."

MS. JAISWAL: I'm asking --

THE COURT: All right. Do you understand what is meant by the term "significantly"?

THE WITNESS: Not exactly, no.

THE COURT: Sustained. You may rephrase.

BY MS. JAISWAL:

Q. Would it be reduced by a quarter? Could it be reduced by a quarter?
A. The cost of just that action?
Q. Yes.
A. Probably. I don't have -- yeah, probably.
Q. Could it be reduced by half?
A. I don't know for sure, but it's possible.
Q. Thank you. Moving on.

Are you aware that in California water districts sell and exchange water amongst themselves?

MS. WORDHAM: Objection. Exceeds the scope of his direct.

THE COURT: Yes, it does. The objection is sustained.

BY MS. JAISWAL:

Q. I believe on direct you were asked about water districts and exchange of water among water districts.

MS. WORDHAM: Objection. Misstates his testimony. Misstates the direct examination.

THE COURT: Well, he was asked a question. I know because I asked it.

MS. WORDHAM: Fair enough, Your Honor.

THE COURT: So I guess you were asked such a question. Do you agree?

THE WITNESS: I guess I was.

THE COURT: You can contradict me.

THE WITNESS: I don't remember it, but if you say I did, I suppose I did.

MS. JAISWAL: Thank you.

Q. You did not adjust your delivery reduction estimates to reflect that water users can purchase additional supplies from other users; correct?
A. Did I -- did I testify to that? Is that what you're asking?
Q. No. I'm just asking you the simple -- I tried to format my question so that they would be yes or no type questions. So it would be great if we could follow that format. But if you don't understand, please let me know and I will clarify.
A. Okay. I'm sorry. Could you repeat the question?

MS. JAISWAL: Should I have the reporter repeat it.

THE COURT: Yes, you may. Can you read back the question, please?

(Record read as requested.)

THE WITNESS: No, because that wouldn't be relevant to my analysis as far as State Water Project's delivery capabilities.

BY MS. JAISWAL:

Q. So the answer is no; correct?
A. The answer is no.
Q. Thank you. You are aware of the Environmental Water

Account; correct?
A. Yes.
Q. Are you aware that water from the Environmental Water Account may be made available to compensate for export reductions to meet environmental requirements?
A. Yes, I testified as such.
Q. Now I'm going into the territory where I'm trying to get your testimony from earlier today. And I don't have an instantaneous transcript unfortunately. So if I don't get this right, please help me along and clarify what you testified to.

But you testified that there is somewhere -- 300,000 acre feet for the Environmental Water Account?

A. Typically that's a range of assets that would be available.
Q. Now, if I could draw your attention back to your Exhibit C attached to your supplemental declaration, which is in -- which is in evidence as J as well as K.
A. Yes.
Q. Actually, I'm sorry, if you could go to N, the new one.
A. Okay. I have it.
Q. Thank you. Now, when you look to plaintiffs' revised proposal and you look at the cost for some of these actions, some of the actions are less than 300,000 acre feet; aren't they?

A. The plaintiffs' proposals?
Q. In your analysis of the plaintiffs' revised proposal. It is the right-hand chart. Right-hand side of the chart. And if you look at the export reductions.
A. I'm looking at DWR Exhibit N, which is --
Q. I'm sorry. Exhibit M like Mary.
A. Oh, I'm sorry.

THE COURT: Oh.

THE WITNESS: Okay. I have it.

BY MS. JAISWAL:

Q. Thank you. Now for Exhibit M, if you look at the right-hand chart, which is the plaintiffs' revised proposal August 13th.
A. Yes.
Q. And when you look at the export reductions there, some of those reductions are less than 300,000 acre feet; is that correct?
A. Yes. Some of the individual actions or portions of actions are less than 300,000 acre feet.
Q. And for action ten, for a dry year, it's 350,000 acre feet; is that correct?
A. That is just the export reduction part of meeting that action. There's an additional 310,000 acre feet above stream required.
Q. Thank you. My question was to action ten.

A. Yes. And that's the one I'm referring to.
Q. Thank you. A final question on the Environmental Water Account. You didn't adjust your model -- your model delivery estimates to reflect the water that may be available to compensate for reductions from the Environmental Water Account; did you?
MS. WORDHAM: Objection. Asked and answered.
THE COURT: I'm not sure it was answered. Did you make any such adjustments? Did you assume Environmental Water Account availability?
THE WITNESS: No. I think I did state that earlier, that that was not applied to these costs, Environmental Water Account mitigation for these costs was not.
BY MS. JAISWAL:
Q. Thank you. I'm moving on now. Many customers of the State Water Project and Central Valley Project use non-project sources of water; right?
MR. WILKINSON: Objection.
MS. WORDHAM: Objection. Exceeds the scope of the direct.
MR. WILKINSON: We concur. Join in the objection.
THE COURT: Yes. The objection is sustained. It does exceed the scope of direct. You may ask your next question.
BY MS. JAISWAL:

Q. Mr. Leahigh, in your supplemental declaration, you stated that implementation of plaintiffs' action ten could be achieved by either export reductions or upstream storage releases or a combination; correct?
A. Yes. But there would be impacts associated with both upstream and --
Q. My question is what you stated in your supplemental declaration. And the question is: You stated in that declaration that implementation of plaintiffs' action ten could be achieved by either export reductions or upstream storage releases or a combination. Is that correct?
A. That's correct with a qualifier.
THE COURT: Yes. What is it?
THE WITNESS: The qualifier is that it could only be met with other impacts experienced elsewhere in system.
BY MS. JAISWAL:
Q. In your analysis, you choose to evaluate -- you chose to evaluate plaintiffs' action ten through a combination of storage and export reductions; is that correct?
A. Yes.
Q. Thank you. Increases in the San Joaquin River inflow could be used to help meet plaintiffs' action ten; is that correct?
A. Increases at San Joaquin River flow have a positive effect on Old and Middle River flow, yes.

Q. Thank you. In your water cost estimates, you assume that there would be releases from Oroville, Shasta and Folsom Reservoirs to meet plaintiffs' action ten; is that correct?
A. Yes.
Q. Thank you. Plaintiffs' recommended action ten doesn't specify a single reservoir; does it? Release from a single reservoir; does it?
A. No, it doesn't specify.
Q. And it doesn't require action ten solely based on releases from Oroville; does it?
A. No.
Q. In your water cost estimates, did you assume releases from New Melones Reservoir for plaintiffs' action ten?
A. No.
Q. Do you know what the current storage in New Melones reservoir is?
A. No, I don't.
MS. JAISWAL: Your Honor, if I could identify Plaintiffs' Exhibit 27. Let the record reflect that counsel has it before them. And if I may approach the witness, Your Honor.
THE COURT: Yes, you may.
(Plaintiffs' Exhibit 27 was marked for identification.)
BY MS. JAISWAL:

Q. Do you know what this document is?
A. This looks to be a printout from CDEC, California Data Exchange Center.
Q. Do you go on this website?
A. Yes, I do.
Q. Thank you. What is this exhibit?
A. Well, this looks to be data for New Melones Reservoir. And it looks to be -- it's a daily data. And this is data that goes through August 28th, 2007.
Q. Thank you. So for -- so looking at the chart, the storage level for New Melones, as of August 28th, is approximately 1.5 million acre feet; is that correct?
A. That's what this shows.
Q. Thank you.
MS. JAISWAL: Your Honor, if I may move to have Plaintiffs' Exhibit 27 admitted.
THE COURT: Any objection?
MR. WILKINSON: No objection.
THE COURT: Exhibit 27 is received in evidence.
(Plaintiffs' Exhibit 27 was received.)
THE COURT: What is your time estimate, Ms. Jaiswal?
MS. JAISWAL: Half an hour, Your Honor.
THE COURT: You may proceed.
MS. JAISWAL: Thank you. If I could identify Plaintiffs' Exhibit 28. Counsel has received a copy.

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(Plaintiffs' Exhibit 28 was marked for identification.)

MS. JAISWAL: May I approach, Your Honor?

THE COURT: You may.

BY MS. JAISWAL:

Q. Mr. Leahigh, do you know what this document is?

A. I'm not familiar with this particular report, but --

Q. Have you seen this kind of report before?

A. Similar, yes.

Q. And what is the title of this?

A. Daily reservoir storage summary.

Q. Thank you. And where does it appear from? To be?

A. It looks like it is -- it could be a CDEC report.

Q. Thank you.

A. Same database.

Q. And where is it from?

A. Excuse me?

Q. Which agency is it from?

A. If it is CDEC, that would be Department of Water Resources.

Q. Right. At the top, that top bar reads "California Department of Water Resources"; is that correct? At the very top of the exhibit.

A. Very top of the exhibit actually I don't see that, but --

Q. There is a black bar at the top of page one.

A. Is it on the right-hand corner?

Q. It is on the left-hand corner.

MS. WORDHAM: Your Honor, counsel's copy does not have a black bar at the top across the top of page one.

THE COURT: Nor does mine.

MS. JAISWAL: I'm sorry, Your Honor, it seems that the correct copies were not photocopied. I have one copy of the exhibit that I would like to use.

THE COURT: You'll have to show it to other counsel. You can use the Elmo, Ms. Jaiswal.

MS. JAISWAL: Okay. Thank you for the excellent suggestion, Your Honor.

THE COURT: That means --

MS. JAISWAL: If I may show it to the rest of counsel, to make sure --

THE COURT: You may show it to counsel.

MS. JAISWAL: If I may put the exhibit on the Elmo?

THE COURT: You have to move it into evidence first.

MS. JAISWAL: Thank you, Your Honor.

THE COURT: Did you show it to the witness?

MS. JAISWAL: I have identified it as Plaintiffs' Exhibit 29, Your Honor. And if I may approach the witness.

THE COURT: It's Exhibit 29. All right. So 28 is withdrawn?

MS. JAISWAL: Yes, Your Honor.

THE COURT: All right.

(Plaintiffs' Exhibit 29 was marked for identification.)

THE COURT: Does the witness recognize the exhibit?

THE WITNESS: Yes. Now it's clear to me that this is from the California Data Exchange Center database.

THE COURT: All right.

MS. JAISWAL: Just so that the record is clear and Mr. Leahigh is clear, I have withdrawn Exhibit 28 and I am not relying on it and I apologize for the error in the copies.

Q. Now, if I could put Exhibit 29, Plaintiffs' Exhibit 29 on the Elmo.

THE COURT: The witness identifies it. Are you moving it into evidence?

MS. JAISWAL: I was going to ask a few questions and then move it into evidence, Your Honor. But I could do it at this time.

THE COURT: Any objection?

MR. WILKINSON: No objection.

MS. WORDHAM: None, Your Honor.

THE COURT: Exhibit 29 is received in evidence.

MS. JAISWAL: Thank you, Your Honor.

(Defendants' Exhibit 29 was received.)

BY MS. JAISWAL:

Q. Mr. Leahigh, can you read that? Overall, can you see it?

A. Yes, I can.

Q. And can you please read the black bar on the top of that exhibit?

A. It says California Department of Water Resources, Division of Flood Management.

Q. And what is that document?

A. This is a report from the California Data Exchange Center database.

Q. Thank you. Now I'm going to put up page two. It's a continuation from page one.

Now, this chart is a daily reservoir storage summary; correct?

A. That is the title of the report, yes.

Q. And now looking on page two, you can see on the Elmo where it says "2 of 2" on the corner; correct?

A. Correct.

Q. And the first one listed is New Melones Reservoir; is that correct?

A. Yes.

Q. And if you look at New Melones, you see that New Melones storage is currently at 108 percent of historical average; is that correct?

MS. WORDHAM: Your Honor, I would like to request that at least we can see the captions for each of the columns. As it's presently displayed on the Elmo, we cannot tell what

column she's referring to.

THE COURT: All right. Thank you. All right. Well, the exhibit does speak for itself. You may ask your next question.

MS. JAISWAL: Thank you.

Q. Now, if you could move to Don Pedro Reservoir. Have you located Don Pedro Reservoir? It's up on the Elmo.

A. Yes, I see it.

Q. And Don Pedro Reservoir is currently at 91 percent historical average; is that correct?

A. As of the date of this report, it shows it as 91 percent of average, yes.

Q. Thank you.

THE COURT: We've actually gone five minutes over our time period. We've got to give the reporter a break. I'm exceedingly concerned. We are not going to have enough time to finish this proceeding. What are we going to do?

MS. JAISWAL: After the break, Your Honor, if I could have 15 minutes and I will wrap up the cross-examination.

THE COURT: That is going to further cut into our time. We were hoping to get to arguments this morning, quite frankly.

What we're going to do is this. We're going to take a recess now. We're going to return at 1:30 and I want counsel to consider what is in the best interest of all

parties insofar as proceeding. What kind of questions are any of the other intervenors or the United States going to have for this witness.

MR. MAYSONETT: Your Honor, the federal defendants will have only very brief questioning for this witness.

MR. WILKINSON: That would be true for us, Your Honor, I would imagine it would be less than ten minutes.

MR. O'HANLON: I agree as well, Your Honor. If not five minutes.

THE COURT: Let's stand in recess until 1:30.

(Recess.)

THE COURT: All right. We're going back on the record in NRDC versus Kempthorne. We're going to complete the testimony of Mr. Leahigh. With dispatch, please.

MS. JAISWAL: Your Honor, I only have two questions for Mr. Leahigh.

THE COURT: All right. Thank you.

MS. JAISWAL: You're welcome.

Q. Mr. Leahigh, you did not present any water cost analysis for Dr. Hanson's tier two and tier two proposal; is that correct?

A. That's correct.

Q. And that's because you couldn't determine what would be required under Dr. Hanson's tier two and tier three proposal; is that correct?

A. Well, the analysis could probably be done. We haven't had an opportunity to complete it.

MS. JAISWAL: Thank you.

THE COURT: Thank you very much, Ms. Jaiswal. Mr. Maysonett.

MR. MAYSONETT: Your Honor, I just have a handful of questions.

THE COURT: All right. You may proceed.

CROSS-EXAMINATION

BY MR. MAYSONETT:

Q. Mr. Leahigh, who operates the reservoir at New Melones?

A. Bureau of Reclamation.

Q. And do you know what operational restrictions make just on Bureau of Reclamation's operations at New Melones?

A. No, I'm not familiar with all the water rights restrictions.

Q. Do you know whether or not the Bureau of Reclamation has discretion to release water freely from the New Melones Water Reservoir?

A. No, I don't believe they do.

Q. And Mr. Leahigh, can you tell me who operates the Don Pedro Reservoir?

A. I'm not sure exactly, but I believe Turlock Irrigation District possibly, Modesto ID.

Q. But it's not the California Department of Water

Resources --

A. It is not --

Q. -- or the Bureau of Reclamation; is it?

A. No, it is neither of the project agencies.

MR. MAYSONETT: Thank you, Your Honor. I don't have any questions for Mr. Leahigh. I would say only as a result of the fact that the state and federal governments were restricted to two witnesses, as Mr. Lee explained, they relied on our biologist and we have relied on Mr. Leahigh as the operator.

We do have Mr. Milligan here in the courtroom. He is available for the Court if you have further questions for the details of CVP operations or if you conclude that these questions about reservoir operations are critical. But I understand that in the interest of time, it won't be possible to present them both.

THE COURT: Thank you very much, Mr. Maysonett. Mr. Wilkinson.

MR. WILKINSON: Your Honor, I had a few questions, but I frankly think there's nothing so earth shattering there that I have to take the time to do it. I'm going to waive in the interest of having this proceeding completed today.

THE COURT: Thank you very much, Mr. Wilkinson. Mr. O'Hanlon?

MR. O'HANLON: Your Honor, likewise, in the interest

of saving time and moving the proceedings along, I waive cross as well.

THE COURT: All right. Thank you very much. Is there any redirect?

MS. WORDHAM: Yes, Your Honor. Just very briefly.

REDIRECT EXAMINATION

BY MS. WORDHAM:

Q. Mr. Leahigh, would you please find the Federal Defendants' Exhibit Number 3 in front of you. This is the declaration of Cay Goude filed by the federal defendants on, I believe it was July 9, 2007.

A. Yes, I have it.

Q. If you will go to Exhibit 2, Attachment B of Ms. Goude's declaration.

Have you found that?

A. Yes, I have. I see it.

Q. Attachment B. Could you please describe that briefly?

A. Yes. Attachment B is a flow chart that is the -- identifies the specific process for ending action three and implementing action four.

Q. So in the -- one-third of the way in from the left-hand-hand column, there is a small box which indicates "start of action four" -- "start action four"; is that correct?

A. That's correct.

Q. And then there's an arrow pointing to the right; correct?

A. Yes.

Q. So if I understand this chart correctly, all the actions identified to the right of the box that says start action four would pertain to implementation of action four; is that correct?

A. Yes.

Q. And the boxes and diamond shapes in here describe what operations or how decisions would be made under plaintiffs' action -- or the service's action four; is that correct?

A. That's correct.

Q. If you follow the arrows to a conclusion, where, at the bottom right, not the diamond box, but the long rectangular box, it says, "Modify operations (footnote 1)." Is that correct?

A. That's correct.

Q. Turning to the footnotes for Attachment B immediately following the diagram, and going to footnote 1. Would you please read footnote 1 for the record.

A. Yes. "Operations of the two water export facilities will be modified in a manner similar to what is described in action three of Exhibit 2. Other actions may be taken that are found to appropriately avoid or minimize entrainment effects at the water export facilities."

Q. Now, when you estimated the water impacts, water costs

associated with the service's action four, you estimated a range of flows in Old and Middle Rivers at zero to negative 4,000 cfs; is that correct?

A. That is correct.

Q. And there is no specified flow in the chart, the action matrix itself, that says negative -- zero to negative 4,000 flows for action four; is that correct?

A. Correct.

Q. Did you rely on footnote 1 of Attachment B of Exhibit 2 to support your decision to include a flow objective of zero to negative 4,000 cfs in estimating your water costs for the service's action four?

A. Yes.

MS. WORDHAM: Thank you. No further questions.

THE COURT: Further cross?

MS. JAISWAL: No, Your Honor.

THE COURT: Ms. Jaiswal?

MS. JAISWAL: No, Your Honor.

THE COURT: Does any intervenor have any further questions for Mr. Leahigh?

MR. WILKINSON: No, Your Honor.

MR. O'HANLON: No, Your Honor.

THE COURT: May this witness be excused?

Thank you, Mr. Leahigh. You may step down. You are excused.

All right. I am going to ask Mr. Maysonett that we call Mr. Milligan for some brief questions.

MR. MAYSONETT: Yes, Your Honor.

MS. WORDHAM: Your Honor, I have one minor housekeeping matter if I might.

THE COURT: Yes.

MS. WORDHAM: During Mr. Leahigh's testimony, we offered an exhibit, order amending the Department of Water Resources Federal Energy Regulatory Commission license that was missing a page. We have since been able to obtain a complete copy of the order. I would like to substitute the order that was --

THE COURT: All right. If you would hand the original and duplicate to the courtroom deputy.

MS. WORDHAM: I will do that, sir.

THE COURT: And she'll give you back the old one and we can substitute the new one.

MS. WORDHAM: Yes, sir.

THE COURT: For the integrity of the record, let's keep the old one and we'll mark this as -- what was the old one? DWR Q, we'll make this DWR Q-1.

(Defendants' Exhibit DWR Q-1 was marked for identification.)

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LETTER 21

RONALD MILLIGAN,

called as a witness on behalf of the Federal Defendants, having been first duly sworn, testified as follows:

THE CLERK: Please state your full name for the record and spell your last name.

THE WITNESS: My name is Ronald Milligan, last name spelled M-I-L-L-I-G-A-N.

EXAMINATION BY THE COURT

THE COURT: Please have a seat. You have just stated your name for the record. Can you tell us by whom you're employed?

THE WITNESS: I am employed by the US Bureau of Reclamation.

THE COURT: For how long?

THE WITNESS: Since -- since November of 1999.

THE COURT: What's your present assignment?

THE WITNESS: I am the operations manager for the Central Valley Operations Office in Sacramento.

THE COURT: Does that operations office at Sacramento include responsibility for operation of the Central Valley Project?

THE WITNESS: Yes, it does.

THE COURT: How long have you held this position?

THE WITNESS: Since November of 2004.

THE COURT: And have you had direct knowledge of the

work on the 2004-2005, what's referred to as the OCAP and the Biological Opinion that was prepared relative to that?

THE WITNESS: Not in the direct preparation, but upon its completion, we've been operating to that in part, within our other operations, since that time.

THE COURT: If I understand your answer, then you had no role in the preparation of any portion of the materials that comprised the administrative record or the Biological Opinion and the evaluation of the OCAP?

THE WITNESS: That is correct. That was completed -- at least the reclamation part of that, was completed before I took my position at the CVO.

THE COURT: Commencing in March of 2005, were you familiar with the process known as the DSRAM?

THE WITNESS: Yes, I was -- I am familiar with that.

THE COURT: And what is the basis for your familiarity?

THE WITNESS: Primarily working as a -- say the week to week operations of what's referred to as the Water Operations Management Team. I act as the co-chair for that group. And then the work with receiving the information from the Delta Smelt Working Group every fall depending on the fall midwater trawl that would trigger -- or other triggers as to when the Delta Smelt Working Group would convene and basically be apprised of what their discussions had been on a weekly

basis.

THE COURT: And so you had regular communication, including observation, of the delta smelt Working Group's activities in this, if you will, implementation of the DSRAM?

THE WITNESS: Not in their -- not directly to their deliberations, if you will, or their meetings. I have a staff person that's under my direction that attends typically to provide information to the working group along with a person from the state project. Provide them information about current operations and what projected operations would be over the next week, month. What standards in the Delta may be controlling at a particular time.

And then if there's any information or recommendations that may come out of that group, it would come then to the WOMT, who would then discuss those recommendations or those findings or information to see if there was any operational changes that would be appropriate for the coming week.

THE COURT: I'm not going to ask you to summarize it at all, but I am going to refer to testimony that has been given here by various biologists concerning the decline of the, if you will, health of the delta smelt species. You're familiar with that information?

THE WITNESS: Yes, I am.

THE COURT: And in the years commencing with 2005,

after these, the DSRAM, the DSWG and the WOMT were actually constituted and started their work, you've been on the WOMT, an active participant in that process?

THE WITNESS: Yes. Yes, I have.

THE COURT: Now, is it true that there were recommendations made in the year 2006 starting in the spring by the Delta Smelt Working Group that called for actions, protective actions to be taken with regard to delta smelt?

THE WITNESS: There were recommendations from the working group that started prior to that. But then they continued through the late winter into the spring. Is your -- are we going to talk about at all the earlier recommendations or findings or are we going to focus more on the later ones?

THE COURT: If you want to start with the earlier ones. I don't want to prolong this or extend it.

THE WITNESS: Sure.

THE COURT: But start with the earlier ones and then move into the 2006 water year.

THE WITNESS: Well, within the 2006 water year, there were some recommendations that were -- that were made in conjunction with some triggers about the hydrology. This last winter was dry, so there were several occasions where some of the -- some of the recommendations were not -- the trigger did not occur. Some of those were in the early winter months

where the trigger would have been, if I recall without having them in front of me, if we had flows on the Sacramento River near Rio Vista that would get above a certain three-day average, then a particular set of curtailments that may relate to Old and Middle River flows would come into play. Those triggers did not occur and there were no modifications to operations.

I think there were probably -- there was some times we certainly operate to Old and Middle River flows in January and February, we would continue to touch base week to week. If I recall, the management to Old and Middle River was in the range of about negative 5,000. I think there was a time that may have been near 4,000, negative 4,000. I can't remember the exact dates. But it was in that range.

We had discussions back and forth, because this was a fairly new way of managing the central Delta's hydrodynamics. So we had some spirited discussions as to -- as to what's the proper averaging period, how the projects could -- what would be construed as being consistent with the recommendations or the spirit of them.

Because typically although both the USGS and the Bureau of -- USGS and the Department of Water Resources have some empirical equations that would predict an approximation in Middle and Old River flows, they do vary and they are -- there is some error bounds around those.

To get an actual measured reading from the USGS on those -- to get a middle and Old River flow takes several days, it's several days in arrears. And we found that when we're working, I think, if I remember correctly, a five-day averaging period. So we were trying to modify operations in terms of pumping and reservoir releases in the upper -- mostly in the Sacramento watershed to be able to maintain a negative Old River flow in a range that seemed appropriate.

But with the several days in arrears from the USGS, we were -- I won't say that we were struggling, but we were really looking to see and document what the response was to the gauges to different actions. And there were times that there were lags.

It was not instantaneous or one-day response to, let's say, a pumping curtailment or a reservoir -- or say a flow increase at -- let's say at Rio Vista, that -- or even at Vernalis, that would respond very quickly. So -- and there would be some swings. It wouldn't be a smooth transition either. So we had some observations for further consideration if we were to use this as a tool in subsequent years.

THE COURT: Are you aware that in this case, the plaintiffs have referred to recommendations made in the spring, the late spring of 2006, action recommendations that then were communicated to the WOMT and ultimately resulted in no action being taken? Are you familiar with the plaintiffs'

claims about that?

THE WITNESS: Yes, I am.

THE COURT: And relative to the fact that no action was taken in regard to the Delta Smelt Working Group recommendations, would you say that that was accurate or not accurate?

THE WITNESS: There were some -- there were some -- I'm trying to find the right word. There were some actions that were referred to as recommendations by the Delta Smelt Working Group in the later -- let's say in the spring period, particularly, I believe, after the VAMP pulse, which was --

THE COURT: Yes.

THE WITNESS: -- delayed a week this year because of the size of hatchery fish within the San Joaquin River basin.

But as we were coming out of the VAMP period, there were some recommendations made. I do remember one in particular recommendation to keep cross-channel gate in an open position. That was, upon review, countered to both the Water Quality Control Plan, which would have necessitated an urgency change petition with the state board, and subsequent discussions with NOAA Fisheries, they were concerned about leaving it open because there were some out-migrating salmon in the system. So that is one aspect of a recommendation that was not followed.

There were certainly, later on, as it became apparent that both EWA assets or the ability for the EWA to function in a manner that it could, in essence, pay back the projects for curtailments without impacting operations in the long term sense or allocations to contractors, that -- this is my characterization of that circumstance. This situation was elevated to the director's level of each of the five agencies, meaning DWR, Bureau of Reclamation, NOAA Fisheries, Department of Fish & Game and the Fish & Wildlife Service.

There were discussions there about what should be done at that point because we had exhausted the typical asset set, if you will, that was described within the Biological Opinion and project description in the biological assessment.

The work that was -- after discussions at that level, it came back that the recommendation would be -- there would be some modification and continued assessment of the circumstances. But the -- the work of the Delta Smelt Working Group was taken certainly under advisement by the directors. But some subsequent changes in operations were -- came out of that particular sets of meetings. And some of those meetings were two or three times a week.

THE COURT: All right. And going into the '07 water year, you're familiar with the June actions where pumps were stopped --

THE WITNESS: Yes.

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THE COURT: -- relative to both recommendations and conditions?

THE WITNESS: Pumping was curtailed significantly. I will use the example of at the Jones Pumping Plant in the Central Valley Project. We were at one unit pumping, which is one of the large pumps there with the capacity of 850 cfs, which started the beginning of the VAMP period. And that lasted for 31 days. And then we had another subsequent 19 or 20 days where we sustained our pumping at one unit.

The recommendation at the time, if I'm not mistaken, from the Delta Smelt Working Group was to try to achieve a zero Old and Middle River flow. Zero to positive. It was for a number of reasons that had been discussed about the hydrodynamics of the Delta and the pumping within the interior itself for non-project purposes, and also the base flow in the San Joaquin River after the pulse flow period, even if it was a critically dry year from the San Joaquin River basin.

Even if the project, both projects had cut to zero, it was our assessment that a Middle and Old River flow of at zero could not be achieved. The Bureau of Reclamation assessed our particular demand for our project at the time and we assessed that some flow was necessary to -- for several reasons.

One, to maintain deliveries to the upper Delta Mendota Canal contractors, who would have -- in essence, some

portions of those districts had no other source of water that they could rely on quickly. Other portions of those districts would have had to begin pumping from the San Joaquin River to be able to meet some of their demands. Which would have further reduced the influence of the Delta, which would have further compounded the middle and Old River situation. The reclamation used some authorities that we had within the -- both within EWA and B3 of the Central Valley Project Improvement Act to make some purchases of water from known sellers to augment flows in the San Joaquin River to, if you will, compensate for the one unit operation at Jones Pumping Plant.

THE COURT: In your opinion, did the Bureau -- and let me ask one question foundationally before I ask that opinion. Is the WOMT, is that the final authority on whether or not a recommended action is going to be implemented or does it go higher?

THE WITNESS: The documentation of the WOMT is somewhat different in a couple of places. Typically WOMT will be representatives designated by the individual directors to represent them on a weekly basis. And that's ordinarily how we operate.

In other places, the WOMT, in essence, is the director's level. And that when we elevated a discussion of 22 directors, that is still really within the WOMT structure.

I will say that the project agencies, because they are the ones who actually have to issue the order to make a change, whether it's in the pumping or releases, ultimately have the final decision that's made about what is done. But in this case, most often it would be an extreme circumstance of some emergency where an agency would override, let's say, consensus of the WOMT.

THE COURT: Now, I'm going to ask for your opinion. Relative to the plaintiffs' claims that the Delta Smelt Working Group action recommendations for protection of the delta smelt were not followed or implemented, can you express your opinion about whether or not there was a response and whether actions were or were not taken in response to the recommendations?

THE WITNESS: In my opinion, as an observer and one who was providing some information to that collective group, and meaning at this point the director's level, who had recommendations from the Delta Smelt Working Group, that certainly the recommendations were taken very seriously for consideration. Those were balanced with other considerations of the other species, the economic effects of making changes or curtailing deliveries that occur at the time both from an M and I and an agricultural standpoint.

Considerations were given to the withdrawal rate at San Luis Reservoir. We've touched on that with some of the

testimony. And staying within a safe limit there without causing some major structural damage.

At that time we had several periods where O'Neill Forebay elevations were very low, which would have -- could have potentially triggered shutting off of the pump generation plant associated with that facility, which would have been interruption of supply.

So the projects collectively were operating as close as they could to the edge in terms of trying to minimize pumping as much as we could during this period. And also looking very carefully at what the salvage was at both facilities, trying to determine if any fish that were in the southern Delta were taking -- were being -- were being taken in. We had very little fish taken during this period at the Tracy fishery facility.

And there was a number of discussions about the dynamics of the Clifton Court Forebay and potential for some fish to -- whether they were maybe coming in from Old River into the forebay somehow before they got to the Tracy Fishery Facility or if they had been around in that area from some period of time before.

There was a great deal of focus on the temperatures in the southern Delta and the survivability of any juvenile smelt. Certainly continued observations of smelt distribution that came from the 20 millimeter trawls.

Initially there was some concern about the low numbers being such that it may not be readily apparent as to a distribution given the low numbers. But as we got into this, you know, four, six weeks at a time, the distribution -- a pattern of finding of the few fish that were found indicated that although it wasn't a strong indication of distribution, the distribution of the fish tended more towards the northern Delta out towards the bay.

THE COURT: Would you agree with the biological assessment that the status of the delta smelt is presently at a critical stage in terms of its jeopardy for survival?

THE WITNESS: I assume you mean that in a small b, small a, not a biological assessment as a document.

THE COURT: I'm sorry. You're exactly right.

THE WITNESS: Okay. Given -- again, this is not my area of expertise, I am an engineer.

THE COURT: I am looking to you as the executive who runs these operations.

THE WITNESS: Certainly as a concern to the Bureau of Reclamation that for the last three years, the fall midwater trawl, which we would agree from, at least my discussions with our biologists and those at the service, is the key indices on the smelt, to give us some indication of the status of the species.

We are very concerned about that. Reclamation,

beyond the operation of the projects, have invested in the Pelagic Organism Decline effort. We fund roughly half of that. Plus provide a number of key staff to participate in the 30 some odd scientific studies. Because there seems to be something that's happened in the estuary that has changed, probably since about the year 2000.

And to this point, we're not -- I don't think anybody can say that it is not entirely that the project has some effect because there is some hydrodynamic effect there. But there are a couple of other stressors in the system that have been discussed in court that we feel are worthy of investigation. And to get -- because we actually think if we were to just focus solely on the operations of the project, that we would see further declines potentially.

THE COURT: There isn't any question, as an operating executive, that you recognize your full responsibilities under the Endangered Species Act on behalf of the Bureau of Reclamation? Not asking for a legal conclusion.

THE WITNESS: I believe --

THE COURT: As an operator.

THE WITNESS: So. I will submit that Bureau of Reclamation, under my signature, requested reconsultation with the Fish & Wildlife Service based on the status of the species. And that was July of a year ago. July of '06. Reclamation, me and my office, who is responsible for

preparing the biological assessment, requested reconsultation. We've also requested reconsultation with NOAA Fisheries on our other opinion, and that's based more upon the listing of the green sturgeon and some critical habitat designation. But --

THE COURT: We don't have to have any concerns, any judicial concerns about the agency following the law.

THE WITNESS: No. We've also stated some 7(d) responses, if you will, that may not be the proper word. But under the -- let's say, we -- there's certain actions that we have indicated that they are going to put on hold and not commit long-term to until we have a re-worked re consultation Biological Opinion in place.

THE COURT: And are you familiar with the Fish & Wildlife Service proposed action matrix that has been presented in the context of these proceedings?

THE WITNESS: I am familiar with these.

THE COURT: And were that or some other remedy to be ordered by the Court, do you foresee any difficulties, impediments to the implementation of any such remedies?

THE WITNESS: I will say that all of the matrices of actions that I have seen would present some difficulties, yes, in operating the projects. Is there a reason that we could not do that, reclamation would make every attempt to find within its authorities to implement those actions and work in a coordinated matter with the state project.

In particular, for the Fish & Wildlife Service matrices, we believe that that is implementable, if that word makes sense.

THE COURT: It does.

THE WITNESS: Is that it could be done. It would be with significant effects, depending on the hydrology. Would it be beyond the current B2 EWA set of assets that -- as laid out in the biological assessment for the last opinion? It very well could. And reclamation would try to find other ways within its authorities to account for those effects as they are related to the CVP.

THE COURT: Thank you very much. Those are my questions. Do you wish to question, Mr. Maysonett?

MR. MAYSONETT: Your Honor, I don't have any followup questions in addition to the Court's unless there's some area that the Court would like me to --

THE COURT: Do the plaintiffs wish to address any questions to Mr. Milligan?

MS. POOLE: Two questions, if I may, Your Honor.

THE COURT: Yes.

CROSS-EXAMINATION

BY MS. POOLE:

Q. Good afternoon, Mr. Milligan, my name is Kate Poole, I'm an attorney for the plaintiffs. I have a clarifying question for you.

I believe that the judge was asking you about Delta Smelt Working Group recommendations and WOMT responses in two different time periods during this testimony you just gave. Spring, '06 and spring, '07. I understood your answer to be only addressing spring '07 operations. Is that correct?

A. That is not my recollection of our conversation just now. I think the two periods we spoke of were certainly the spring of '07, but I believe it was the earlier winter '07 that we were -- that I was referring to in terms of some actions that were contemplated by the Delta Smelt Working Group that were not triggered.

THE COURT: Did you mean to say winter '06?

THE WITNESS: Yes, I did. Well --

THE COURT: We haven't got to winter '07.

THE WITNESS: It was the January/February '07 that I'm referring to. There was some late -- there were discussions among these lines in December of '06. I don't -- I don't remember anything that we discussed that related to the spring of '06.

MS. POOLE: Thank you.

Q. And if I understood you correctly, I believe you just testified that during the period when the Delta Smelt Working Group recommendations were in place this May and June of '07, that the bureau was, quote, "operating as close to the edge as we could." Is that correct?

A. My reference to "close to the edge" in terms of operations were primarily south of Delta, withdrawals from San Luis Reservoir and the operational range within O'Neill Forebay.

Q. So you were not referring to Delta export rates from the bureau and Tracy pumps?

A. I think I mentioned that we had one pump unit going at 850 cfs, which is the minimum we can pump at that location. And that we were simultaneously at that time making purchases and having water released into the San Joaquin River to compensate for that. However, the collective hydrodynamics in the Delta did not allow for that combined operation or collective operations to get to the zero in middle and Old River flow.

Q. Thank you. In the second half of June, the bureau's pumping rate from banks ranged between over 2,000 cfs and close to 6,000 cfs; is that right?

A. I'm confused by your question because I'm not sure if you mean Jones Pumping Plant.

Q. I'm sorry. Yes, I do mean the Jones Pumping Plant.

A. I believe early in the month of June, there was a time that we transitioned up to a three-unit operation, which would probably be -- I'm not sure what the lower end of your range was that you discussed.

Q. 2000 cfs.

A. Approximately 2000. It probably was 2100 potentially. But probably a little over 2,000 cfs with three units in place

to be able to meet demands as they were also being elevated within the State Water Project. Not to delay or -- delay the answer, but the circumstances at the time were the State Water Project had for a period allowed the CVP to take more than its 47 percent share, if you will, of withdrawal from San Luis Reservoir.

Circumstances within the State Water Project south of that point necessitated that they needed to take a larger share of their withdrawal much closer to their 52 percent, 53 percent. So the -- at that time, again, under consultation with the directors of the five agencies, a decision was made to put several more units online at Jones Pumping Plant given the low salvage numbers at the Tracy fishery.

And the intent there was to monitor that very closely and see how that was to respond. And as we got closer to the end of the month, as temperatures rose in the south Delta, several more units were brought online.

Q. For a pumping rate of close to -- of more than 4,000 cfs; is that right?

A. Our five unit operation would have been at 43 to 4400 cfs.

MS. POOLE: Thank you, Mr. Milligan.

THE COURT: Mr. Lee, Ms. Wordham, does the DWR have any questions?

MR. LEE: We have no questions.

THE COURT: Thank you. Mr. Wilkinson, any questions?

MR. WILKINSON: Yes, Your Honor, I do have just a couple of questions.

CROSS-EXAMINATION

BY MR. WILKINSON:

Q. Mr. Milligan, I believe you testified that part of the action matrix requires the maintenance of a zero cfs or a potential zero cfs flow in Old and Middle River at certain times of the year?

A. I believe several of the matrices have that as one end of the bounds, yes.

Q. And was it your testimony that maintaining a zero cfs flow would be difficult for both the state and federal projects?

A. Thinking of the projects combined overall, during periods where the San Joaquin River inflow at Vernalis is low and there is, let's say, at least some degree of pumping by in-Delta diverters, and particularly at times where the tide cycle was such coming from the neap tide to the spring tide that, as Mr. Leahigh referred to, is the kind of filling of the Delta, if you will, that a very low Middle and Old River flow, whether it's negative 1,000 or down to zero or even trying to achieve positive, is probably beyond the ability of the projects, within their pumping.

Q. Is it also true that there are diversions made by the Contra Costa Water District and agricultural diversions on Old and Middle Rivers as well?

A. When I referred to in-Delta diversions, those are the two primary areas. Both the agricultural diversions and also Contra Costa's pumping.

Q. If you were required to meet a zero flow in Old and Middle River, and you already had your project pumps shut off, how would you try to meet that flow?

A. Realizing that modifying the tides toward -- the meteorological condition that might also affect, low pressure systems, winds, storm surges that were a concern at the time, one might send -- I believe, that the State Board actually sent out letters to those diverters asking them to curtail as much as they could. The only other option that the projects might have available to them is finding water on the San Joaquin River, whether it's in the form of rolling cellars or, in the case of reclamation, potentially operations at New Melones to provide additional flow into the San Joaquin River.

Now, New Melones, as a point in fact, for the coming year would be very difficult. Reclamation doesn't have any extra water, so to speak, within New Melones.

Q. Even if you were able to follow one of those actions, Mr. Milligan, do you have any assurance that doing so would result in zero flow in Old and Middle River?

MS. POOLE: Objection. Incomplete hypothetical.

THE COURT: Do you have enough information to answer this question?

THE WITNESS: I would probably ask as a hypothetical, if you could add just a little more detail to that.

THE COURT: All right. The objection is sustained.

BY MR. WILKINSON:

Q. Mr. Milligan, are you aware that the Department of Water Resources has made one change to the proposed Fish & Wildlife Service action matrix?

A. I am aware that within Mr. Johns declaration, he has proposed -- I would have thought changes. I'm not aware there's just one change. But I'm aware --

Q. Let me ask you --

A. I am aware of a change.

Q. Let me ask specifically. Are you aware that the Department of Water Resources has suggested that the zero flow, the lower end of the range in the Fish & Wildlife Service action matrix, action number three, be changed to a negative 1500 cfs.

MS. POOLE: Your Honor, I'm going to object. This is beyond the scope of any direct testimony.

THE COURT: I'm going to overrule the objection. I'll permit the witness to answer this question. This is about a proposed remedy and feasibility of implementation. This would be one of the implementing agencies. You may answer.

THE WITNESS: I am aware of that suggestion.

BY MR. WILKINSON:

Q. I'm sorry, Mr. Milligan. Did you complete your answer?

A. I am aware of that suggestion from Mr. Johns' declaration.

Q. As project operator, Mr. Milligan, would you support that change?

A. From a -- from the context of treating these tables as -- let's say the same par as the tables that we've been looking at from the D 1641, for example, I would certainly support making the lower range or the upper range, depending on your point of view, as achievable for the projects if possible.

I would probably also, as a steward of resources, probably say that that's probably, as a remedy or as a standard or as an objective, would be appropriate to move to a negative 1500. There probably are times on the reverse of the out -- of the water leaving the Delta, that it also seemed it was possible to add another level of protection that would be maybe a reasonable thing to do, depending on the input from the biologists.

MR. WILKINSON: Thank you very much.

THE WITNESS: But as an objective, I would say negative 1500 would be -- would allow the projects the greater ability to actually meet what's being asked of us.

MR. WILKINSON: Thank you very much. I have no further questions.

THE COURT: Mr. O'Hanlon.

MR. O'HANLON: Yes, Your Honor.

THE COURT: Do you have any questions?

MR. O'HANLON: Yes, Your Honor.

CROSS-EXAMINATION

BY MR. O'HANLON:

Q. Mr. Milligan, since you joined the Bureau of Reclamation, how much money has the Bureau of Reclamation spent on efforts to protect the delta smelt?

MS. POOLE: Objection. Beyond the scope. And also calls for economic costs.

THE COURT: All right. I will allow the question to be answered for the limited purpose of showing any action by the agency to respond to the status of the species as threatened or endangered. You may answer.

THE WITNESS: I am afraid that I am not fully aware of all the budgetary costs that may have gone into doing that. I'm not entirely sure if you are referring to just monetary budgetary-wise or, let's say, water costs.

BY MR. O'HANLON:

Q. Let me modify my question then, given your area of responsibility. Since you joined the Bureau of Reclamation, how much water has the Bureau of Reclamation dedicated to efforts to protect the delta smelt?

A. Whether directly or indirectly, I would some -- I have

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seen some indication of, at least indirectly, virtually all the B2 assets that are spent in the course of a year have some benefit to delta smelt. So whether it's meeting the incremental Water Quality Control Plan costs above Decision 1485 in the Delta, to some degree the fall releases that may primarily be for the benefit of the salmon species or steelhead species in CVP controlled rivers and streams.

Some might say that the cold water releases in Clear Creek may have very little effect on delta smelt. We've never tabulated it that way. But I would say at least a very high majority of the B2 water that's used in a given year has at least an indirect benefit to smelt.

THE COURT: And is that approximately 800,000 acre feet you're referring to or some different quantity?

THE WITNESS: The 800,000 I'm speaking to. Now, some piece of that, Clear Creek flows may have a very minimal and some might argue no effect. But that's not the large -- that's not a majority of that water, even a large portion.

BY MR. O'HANLON:

Q. So can you give us --

A. I guess I'd add to that, reclamation does also provide funding to the Environmental Water Account, both from a staffing perspective, and then also as budgetary constraints allow also for the purchase of water for EWA. Many of those

actions are also for the benefit of smelt, either directly or indirectly.

Q. Can you give me an estimate -- of 800,000 acre feet dedicated under B2, can you give me an estimate of approximately how much of that water is dedicated annually for delta smelt measures or that benefits delta smelt indirectly?

MS. POOLE: Objection. Asked and answered.

THE COURT: Is there a different figure from what you've just stated?

THE WITNESS: I am -- I am searching to see if I can try to make an attempt to quantify, let's say Clear Creek flows, let's say above 700,000 I would say.

THE COURT: Thank you.

MR. O'HANLON: Thank you, Mr. Milligan. I have no further questions, Your Honor.

THE COURT: All right. I have no further questions. Do the plaintiffs have any recross?

MS. POOLE: Two questions, Your Honor.

RECROSS-EXAMINATION

BY MS. POOLE:

Q. Mr. Milligan, I believe you just stated that meeting the D 1641 salinity standards benefit delta smelt as assisted by the B2 releases. Would additional fresh water outflows to the Delta benefit delta smelt?

A. Beyond what's in D 1641?

Q. Yes.

MR. WILKINSON: I'm going to object on the basis it's beyond the area of expertise.

MS. POOLE: The witness just testified that --

THE COURT: Yes. I'm going to overrule the objection. As an operator, he can answer in the context of his operational responsibilities in performance of his duties. Not as a biologist. You may answer.

THE WITNESS: To help me formulate my answer, will you please repeat the question, so I --

THE COURT: Read it back, please.

(Record read as requested.)

THE WITNESS: I will say as an operator that -- let's say an increased net Delta outflow index would move the X2 position further to the Golden Gate. To the degree to which that would be moved and to the degree that that would provide additional habitat, I could not tell you given the current population levels that that is a significant -- or would benefit the population significantly. That would be beyond my expertise.

MS. POOLE: Thank you, Mr. Milligan. That's all, Your Honor.

THE COURT: Anything further, Mr. Maysonett?

MR. MAYSONETT: I have nothing further, Your Honor.

THE COURT: Mr. Lee?

MR. LEE: No, sir.

THE COURT: Mr. Wilkinson?

MR. WILKINSON: No, Your Honor.

THE COURT: Thank you, Mr. Milligan. You may step down.

THE WITNESS: Thank you.

THE COURT: You're excused.

Does any party have any further evidence?

MR. WALL: Your Honor, we have a very brief rebuttal. I think it will take about five minutes.

THE COURT: Proceed.

MR. WALL: Dr. Swanson, if you'd come forward.

THE COURT: You're still under oath, Dr. Swanson.

THE WITNESS: Thank you, Your Honor.

CHRISTINA SWANSON,

called as a rebuttal witness on behalf of the Plaintiffs, having been previously sworn, testified as follows:

THE COURT: Mr. Wall, you may proceed.

DIRECT EXAMINATION

BY MR. WALL:

Q. Dr. Swanson, there's going to be a stack of papers in front of you. And if I could ask you to find Plaintiffs' 19, which I'll put on the Elmo.

A. Could you describe it for me, please?

Q. Should be on your screen.

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A. Yes.
Q. This is plaintiffs' 19 for identification. Are you familiar with this document?
A. I am.
Q. Could you describe it, please.
A. This document shows three graphs which plot daily delta smelt salvage rates at the two facilities combined for the months of December, January, February and March for the years December, 1999 to -- through March 2000. December 2000 through March 2001 and December 2001 through March 2002. The -- below the graphs, I have also -- is also shown the average monthly Old and Middle River flow for those months.
Q. How did you come to become familiar with this document?
A. I created this graph.
Q. How did you create it? Where did you get the data from?
A. I used the data from the Central Valley Operations website for daily salvage rates for delta smelt and I used data from the US Geological Survey sensors in Old and Middle River to calculate daily flows for Old and Middle River from which I calculated the monthly averages.
MR. WALL: Your Honor, I move that Plaintiffs' 19 be entered into evidence.
THE COURT: Any objection?
MR. WILKINSON: No objection.
THE COURT: Exhibit 19 is received in evidence.

(Plaintiffs' Exhibit 19 was received.)
BY MR. WALL:
Q. Dr. Swanson, your proposed remedies in this proceeding call for monitoring of larval juvenile smelt at the project export facilities; correct?
A. That is correct, yes.
Q. Were you here for the testimony of Dr. Hanson?
A. Yes.
Q. And do you recall Dr. Hanson testifying regarding whether he thought that monitoring was necessary or not?
A. Yes.
Q. Do you have a view on the necessity or the importance of monitoring for larval smelt at the project export facilities?
A. In my judgment, monitoring for larval delta smelt represents an essential component necessary for us to be able to protect the delta smelt in this interim period. And I believe into the future.
We currently have inadequate information for us to evaluate the risk of entrainment for this early lifestage of delta smelt and, given the current low population abundance and the limited detection ability of our existing surveys, we cannot rely on those.
Particle Tracking Model can only get you so far, especially if you don't know where the larval delta smelt are. And current monitoring at the two export facilities does not

detect, measure or count delta smelt smaller than 20 millimeters in length.
Q. Dr. Swanson, were you here for the testimony of Dr. Miller?
A. I was.
Q. Do you have any response to his testimony?
A. I remain concerned about the analyses and interpretation that Dr. Miller presented in regards to his efforts to understand what are the driving forces controlling delta smelt population abundance.
Dr. Miller's principle conclusions, I have two general responses. One is Dr. Miller appears to view the only -- the only aspect of water project operations that he considers in his analyses appear to be related directly to water export operations.
And I think it's extremely clear that operations of the two water projects and their impacts on delta smelt and delta smelt critical habitat are far greater than that. And therefore, analyses that focus exclusively on exports are not particularly useful, particularly with reference to trying to determine how we need to modify operations to minimize their adverse impacts on the species and its critical habitat.
With regard to his analyses of the effect of zooplankton density on delta smelt population abundance, I continue to find those analyses highly questionable with

regard to his statistical techniques and I think they represent another example of Dr. Miller's selective use of data.
And I'll just give one example for that. And that is in his analyses to determine whether or not the availability of zooplankton food for delta smelt is a limiting or critical or driving factor for delta smelt population abundance, he has limited his analysis to looking at just two of the copepod species which are present in the Delta. Eurytemora and Pseudodiaptomus.
He has actually also admitted that one of those species is, in fact, no longer present in the Delta and ignores the fact that we know delta smelt eat many more copepod species than just those two. That alone is enough to provide a lot of questions as to how he can interpret those analyses.
Q. Dr. Swanson, you mentioned --
THE COURT: Did you mean to say that there are known species of zooplankton that exist that are present in the water column that are not included in the analysis?
THE WITNESS: Yes, that is correct, Your Honor, at least several.
THE COURT: And the inference that the expert would have the Court draw is that there are only two sources of food present in these zooplankton for the delta smelt?

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THE WITNESS: His analysis examines only the abundance of those two zooplankton species with regard to delta smelt and ignores the fact that we know, based on gut content analysis, that delta smelt eat many more species than just the two that he included in his analysis.

THE COURT: And can you identify some of those?

THE WITNESS: I will hope to pronounce the names correctly. One of them is Limnolthona.

THE COURT: Help the court reporter, please.

THE WITNESS: That's, oh, my goodness, L-I-M-N-O-I-T-H-O-N-A.

Another one is called Acartiella, and I'm probably going to spell that one wrong, but I think it's A-C-A-R-T-I-E-L-L-A.

And after that, I'm running out of species names, Your Honor.

THE COURT: Thank you. You may proceed.

BY MR. WALL:

Q. Dr. Swanson, is the abundance of any of the species of zooplankton on which delta smelt feed increasing?

A. Yes. The abundance of Limnolthona has increased dramatically in recent years.

Q. And that's a time period when delta smelt population has declined; correct?

A. Yes, it is.

Q. Dr. Swanson, you testified that you were here for the testimony of Dr. Hanson. Do you recall him mentioning new survey data that's come out?

A. Yes, I do.

Q. And that's new survey data from the Summer Townet Survey; am I correct?

A. Yes.

Q. Have you become aware of this new survey data since your earlier testimony a few days ago?

A. Yes, I have.

Q. Could you briefly describe for us what the new Summer Townet Survey data shows?

A. Yes. Last night I went on to the internet and I accessed the website of the Department of Fish & Game and reviewed the most recent data from the Summer Townet Survey. I've written myself a little note. A cheat sheet with some of the results, which I hope is okay. The summer townet typically consists of --

THE COURT: If you don't have any independent recollection and you need to refer to the notes to refresh your recollection, it's okay.

THE WITNESS: Thank you, Your Honor.

THE COURT: That is the case?

THE WITNESS: Could you --

THE COURT: Do you need the notes to refresh your

recollection?

THE WITNESS: Yes. Thank you, Your Honor.

THE COURT: You may proceed.

THE WITNESS: The Summer Townet Survey consists of six sequential surveys. At the point where I prepared my testimony and my declarations, four of those had been completed. Or the results for the four were up. And they now have completed surveys five and six. And the numbers of delta smelt found in these last surveys is extremely low.

And, in fact, the other thing that I find equally disturbing is that the numbers of different stations, sampling stations within the Delta that are surveyed by the townet survey, the numbers of stations at which delta smelt are being detected is extremely low.

For example, the fifth survey of the 2007 Summer Townet Survey found delta smelt at just two of more than 20 stations sampled. And the sixth survey found delta smelt at only one survey and, in fact, only found a total of five delta smelt. The total number of delta smelt collected in the six surveys for 2007 summed to 55 fish. This is compared to A2 fish --

Q. If you could just pause and I'll write those down on the Elmo.

A. Certainly.

Q. If you could tell us the number of delta smelt found in

the first six surveys, Summer Townet Surveys in 2007.

A. 55 delta smelt were collected in 2007.

Q. And do you have that information for 2006?

A. I do.

Q. What is that?

A. 82 fish.

Q. Do you have that information for 2005?

A. Yes. It was 119 fish.

Q. How about for 2004?

A. In 2004, 189 fish were collected.

Q. Do you have that information for 2003?

A. Yes. In 2003, 338 delta smelt were collected.

Q. Do you have information on the number of stations at which delta smelt were found by the first -- or the sixth Summer Townet Survey in each of those years?

A. Yes. For survey number six, which would you like, in 2003? Delta smelt were found at six stations. In 2004, they were also found at six stations. In 2005 -- oh, I beg your pardon. 2004 is four stations. In 2005, they were found at five stations. In 2006, they were found at five stations. And in 2007 for survey number six, they were found at only one station, which was located in the lower Sacramento River near Decker Island.

Q. Dr. Swanson, do you have any conclusions from this new data?

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A. As I testified earlier, both the abundance and distribution of a species are critical indicators of its risk of extinction and population status. I think these new data, they have re-emphasized my very high level of concern for the species because they indicate that, in fact, the population is in decline compared to last year and all previous years. And, in fact, the distribution of the species is becoming much more limited.

And I think the new data reemphasized the very high risk of extinction for the species right now. And re-emphasized, in my judgment, the critical need to implement all possible actions to minimize and hopefully eliminate, to the extent that we can, the adverse impacts of water project operations both on the fish itself, in terms of direct lethal take at the facilities, as well as the adverse impacts of operations on its critical habitat, including, during this period when the fish is distributed in low salinity brackish water habitat, beyond the direct influence of the pumps, but, in fact, that habitat is being affected by water project operations.

Q. Dr. Swanson, where was the one station where delta smelt were found in the sixth Summer Townet Survey this year?

A. It was located on the lower Sacramento River near Decker Island. I do not recall the station number.

Q. And is that the Delta smelt's preferred habitat for this

time of year?

A. Typically at this time of year delta smelt are distributed in low salinity habitat, wherever that habitat is in the Delta. Under most conditions, and certainly in the recent and historical past, that habitat would have been located further downstream in the Delta beyond the confluence and Suisun Bay because outflows would be higher than they are right now.

Q. Do these new survey data have any implications for your proposed action number ten, the fall action?

A. Our fall action was developed based on scientific research conducted by DWR scientists that show that during the fall, the September through December period, the quality and quantity of delta smelt habitat was determined in part by salinity and, in particular, outflows which drive the location of low salinity habitat preferred by delta smelt.

The location of low salinity habitat right now, on the basis of outflow in X2, is at approximately 85 to 89 kilometers. Analyses of the results of that research conducted by DWR scientists on habitat quality that were followed up by work by scientists on the Delta Smelt Working Group, some of whom are the same scientists, showed that habitat quality, which they defined using these three water quality metrics, was, in fact, related to the location of X2 or the location of low salinity habitat. And they found that when low salinity habitat was located upstream of 80

kilometers, comparable to where it is located right now, that overall habitat quality for delta smelt was low.

Our fall action was designed to increase Delta outflows and to shift the location of low salinity habitat downstream to or downstream of Kilometer 80. And those locations, the quality of habitat, as defined by this habitat quality index developed by these scientists, is better than it is where -- compared to where it is currently located right now. Our action was designed to achieve these conditions.

Q. Dr. Swanson, is it your understanding that the location of X2 is regulated by operations of the CVP and SWP reservoir facilities?

MR. WILKINSON: Your Honor, I wonder if I could interrupt just for a moment. Yesterday Mr. Wall was asked what the length of his rebuttal testimony was going to be and he said 15 minutes. This afternoon he told us it was five minutes. We've now gone three times that length of time. And I want to assure the Court I did not waive my cross-examination of Mr. Leahigh in order to allow Mr. Wall to expand his rebuttal testimony of Dr. Swanson. So I'd appreciate an accurate estimate of what the rebuttal time is going to be.

MR. WALL: This is my last question, Mr. Wilkinson.

MR. WILKINSON: Thank you.

THE COURT: Thank you.

MR. WALL: Except for getting the document admitted into evidence.

THE COURT: All right.

MR. WALL: Could you read back my question, please?

THE COURT: Yes, you may.

(Record read as requested.)

THE WITNESS: It's a combination of the operations of the reservoir facilities and the Delta export facilities.

BY MR. WALL:

Q. Dr. Swanson, I put on the Elmo a piece of paper on which I was doing my best to scribble down the numbers that you gave me for the number of delta smelt found in the three surveys, the Summer Townet Survey, the number of stations delta smelt were found in that survey. Is that -- did I scribble those numbers down accurately?

A. Yes.

Q. Your Honor, I can mark this piece of paper as Plaintiffs' 30 and I'd like to ask it be moved in evidence.

THE COURT: Is there any objection?

MR. WILKINSON: None, Your Honor.

THE COURT: Exhibit 30 is received in evidence.

(Plaintiffs' Exhibit 30 was received.)

MR. WALL: Thank you, Your Honor. That's our rebuttal testimony.

THE COURT: Mr. Maysonett, do you wish to

cross-examine?

MR. MAYSONETT: Just a moment, Your Honor.

Your Honor, in the interest of time, we're going to waive cross-examination.

THE COURT: Mr. Lee?

MR. LEE: Similarly in the interest of time, we're going to waive cross-examination.

THE COURT: Mr. Wilkinson.

MR. WILKINSON: No questions, Your Honor.

THE COURT: Mr. O'Hanlon?

MR. O'HANLON: No, Your Honor.

THE COURT: It appears that the examination on rebuttal of the doctor is complete.

Thank you, Dr. Swanson. You may step down. You are excused.

Does any party have further evidence?

All right. That then concludes the taking of evidence in this proceeding. We are now at the hour of 2:45. And we had planned to allocate three hours to argument and half an hour for the Court to announce a decision. That would take us to some time after 6:30 p.m. And as I have previously indicated to the parties, I do not ask the Court staff -- I stay, but I don't ask the Court staff to stay after the hour of five p.m. and they aren't necessarily in the position to do that. Plus the building closes now at five p.m. and the Court

security officers, as I understand it, leave only a skeleton staff. And although I think you will now notice that the HVAC has come on in the room, to our mutual comfort, after five they turn the HVAC off in the building. So that might also be a limiting factor.

So I am going to propose that you try to attenuate your presentations here to that which is ultimately essential and that we try to make our way through this by 5:30 p.m. We're going to have to give the court reporter breaks because this testimony has been very rapid, it's very complicated and it's very, very difficult to take, as you all know.

So at this point, we can simply take the time and mathematically divide it, we'll all reduce our respective shares of the time that's left.

MR. WALL: Your Honor, that would be acceptable to us. It would be, if I calculate correctly, a little bit more than half an hour for each of the three groups. It would help me focus my testimony if the Court gave some indication of the areas of its greatest interest. If the Court would like me to make that decision, I'm happy to try to do it.

THE COURT: All right. Let me say this to all of you. You don't need to talk about the law. I understand the law and I'm going to cover the law in my decision. And so what I think we need to focus on is the seminal issues that have been raised.

First of all, the status of the species as to how critical jeopardy is, both to its survival and recovery and to the impacts on its habitat of current and future conditions.

We are focused on, as part of that analysis then, what the present, if you will, information -- and that's mathematical quantitative information -- shows us on the nature and extent of the distribution of the species.

The intervenors have raised issues about causes for decline and they have -- and I think, by way of tentative rulings, so you can direct your arguments, as I see this now, Dr. Hanson, even Dr. Miller and all of the -- Mr. Milligan, the operator for the action agency, nobody is arguing that the species is in critical status.

And the question, I guess, is how does that translate into the legal term of jeopardy. And there is, in the NMFS case, a very specific definition of jeopardy that the Ninth Circuit has very recently promulgated. It's a 2006 case.

And so the intervenors, primarily San Luis and Delta Mendota Water Association and Westlands have essentially said, well, we've got a problem here, but it has nothing to do with the project operations and nothing to do with, in effect, what's going on except as may be related to causes other than water operations. I think that's a trial strategy that you selected and that you have proceeded on.

I will tell you simply that in light of the

scientific evidence that's been presented on both sides, that evidence doesn't preponderate.

And so in terms of the requisite foundational elements of the critical jeopardy and the status of the species and the threats to the deprivation of its habitat are found to exist, then we are essentially on to the question of what remedy is going to be necessary in the interim because that then leads us to three more legal than factual issues.

And that is the agency has requested, as have all the parties who are opposing the plaintiffs, they have requested that, one, there be a remand. Well, there's no doubt there's going to be a remand, the law requires it and there has to be -- in effect, there's already been reinitiated consultation as Mr. Milligan indicated to us.

And so the question then becomes all the parties have requested that there be no vacatur of existing Biological Opinion. However, again, by way of tentative ruling, what you have is you have the indication of every expert who has testified, there is no controversy or dispute among any expert that at the current time the take limits are inadequate.

And we don't have to worry about the Biological Opinion because that's been ruled unlawful and so that is the operative status. We have an illegal Biological Opinion with take limits that are admitted by all experts in this case who are biologists and have the competence to say so, it's

inadequate to protect the species.

And given the requirements for the establishment of the take limit, there isn't any party in this case who provided us any legal authority on what we do about that in terms of whether there is vacatur or non-vacatur of the Biological Opinion and the take limits, when the evidence tells us that the take limits aren't legally or actually factually sufficient to protect the species. And so you better spend some time on that.

And that will lead us then to remedies. And we have, as I see it, the plaintiffs' ten element action. I'm not going to call it a matrix because they haven't called it a matrix. Their ten proposals, action proposals I'll call it. I believe that's how Dr. Swanson has referred to them.

We have the Fish & Wildlife Service's five point action matrix, they do call it a matrix so I'll call it a matrix. It is proposed to be amended, it's not under Robert Rules of Order, but as I understand it, DWR would like to modify it in accordance with Mr. Leahigh's testimony this afternoon.

Then we have Dr. Hanson for the State Water Contractors who has proposed a three-tier approach which I think essentially we can fold in to the Fish & Wildlife Service as proposed to be modified by DWR.

And Mr. O'Hanlon has indicated that these Delta

Mendota and Westlands parties have some proposals, but candidly, I've kind of lost them or maybe I don't understand them in what we've been going through. So you can tell me about those if you think they're going to add anything.

Otherwise it would be more productive for you to focus on the other remedies that are proposed and tell me what's wrong or right about any of them because that's going to be most helpful. And then if Mr. Buckley is going to be taking some time, hopefully this gives us clear direction.

That's what I'd like to hear from you about. Does that help?

MR. WALL: That does, Your Honor. And I'm sure the Court will feel free to give me further direction as I proceed.

THE COURT: Yes. A break first says the reporter and she's the boss. So we're going to stand in recess until 10 minutes after three.

(Recess.)

THE COURT: We're going back on the record in NRDC versus Kempthorne. Please be seated.

All right. We are going to now hear from the plaintiffs. Bear with me one moment. Mr. Wall, you may proceed.

MR. WALL: Thank you, Your Honor. Your Honor, the delta smelt teeters precariously on the edge of extinction.

We don't know exactly why. We don't know the exact population level. But we do know that the species could go extinct within the next year. We also know, without any dispute, that the Central Valley Project and the State Water Project operations, both at the export facilities and in their management of flow through the Delta, are killing delta smelt and adversely modifying its critical habitat.

Your Honor, this proceeding is not about assigning blame or determining relative causation. The sole question here is whether, in the face of considerable scientific uncertainty, the defendants have proven that their proposed operations will be deepen the jeopardy of delta smelt and will not stand as an obstacle to this fish swimming back from the edge of the cliff of extinction toward recovery.

Your Honor, by every reliable scientific measure, the Delta smelt's population has crashed. All four indices by which state and federal agencies measure smelt abundance have set record lows. Delta smelt are hard to find in areas of the fishes' critical habitat where they once thrived. These facts are not disputed.

We also know that the geographic dispersion of the delta smelt has been reduced. As Dr. Moyle and Dr. Swanson testified, the delta smelt once spawned throughout both the northern Delta and the southern Delta. No more. In 2007, the delta smelt spawned only in the Sacramento River in a tiny

part of their historic range. And as the recent Summer Townet Survey indicates, they remain confined at this time to a tiny part of their historic range.

This is a critical condition for the delta smelt. As Dr. Moyle explained, when the fish are concentrated in one small place, they are vulnerable to any environmental catastrophe, they only have one population. As Dr. Moyle put it, they have no backup or insurance policy.

Your Honor, the diversity of this species has diminished as well. Delta smelt spawn over several months. But according to the recent findings of Dr. William Bennett, on whose research all of the parties here have relied to some extent, the only delta smelt that are surviving to reproduce at present are those delta smelt hatched during the period of VAMP. Months of delta smelt on either side -- yes.

THE COURT: Excuse me just one second. I'm going to ask the court security officer -- what we'll do is if it appears that we don't have enough seating in the courtroom, those of you who are standing can take seats in the jury box. We'll let the court security officer help you do that if you wish. Otherwise try to find seats for them.

I'm sorry for the interruption, Mr. Wall.

MR. WALL: Should I continue?

THE COURT: Please.

MR. WALL: Literally months of delta smelt that are

hatching before and after VAMP are disappearing from the population.

Now, when thinking about the question of jeopardy, one naturally asks the question how many delta smelt are left. And the most we can say about that is that no one really knows. The only published peer review literature that contains a population estimate is that of Dr. Bennett. And he estimated, for 1994, a population of 86,000 delta smelt give or take about 86,000. In other words, he didn't know. And he acknowledged that the assumptions he made were not reliable.

There have been population numbers put forward in the course of this trial. 1.8 million juvenile smelt. 600,000. But Dr. Hanson's testimony put those estimates in perspective. As he explained, and I'm quoting here, "A million fish may sound like a lot to a layperson. In the context of a pelagic species like delta smelt, a million larval and early juvenile fish is a remarkably low number."

Your Honor, the species is not only in jeopardy, it is at the tipping point. Every day seems to bring new bad news. Dr. Moyle, who is widely recognized as the leading expert on California native fishes and has been studying delta smelt for decades and began studying them because when he started they were easy to find, testified that, quote, we're at a point where we need every small smelt out there we can get to contribute to the survival of this species.

Ms. Goude told us that if the Biological Opinion she authored a year or so ago were carried out today, delta smelt could go extinct within a year. Dr. Hanson testified that, quote, given the extremely low population abundance levels conducting more sampling for delta smelt was too risky because it might cause take in the hundreds of fish. Quote, "take in the hundreds of fish," he said, "would certainly be high." This species could go extinct this year.

The question in this trial is whether the proposed CVP and SWP operations have the potential to tip this species a little bit further over that edge. They clearly do. And I think if the burden were on us, we would have carried it, but of course the burden is not on us. The operations of the projects affect delta smelt in various ways. They affect delta smelt by impinging on their habitat quality in the fall.

The projects regulate flow of water through the Delta in the fall, which in turn affects salinity, which, according to the findings of Feyrer, et al., scientists at the Defendant Department of Water Resources, affects delta smelt abundance. This study found that salinity levels in the Delta, that complement of their water quality index, explained 19 percent of delta smelt abundance.

Reduced fresh water outflows through the Delta changed the location and amount of low salinity habitat, moving it further away from the nutrient rich Suisun Bay

towards the deeper less protective upstream channels and, in particular, in the Sacramento River channel where those fish are now confined.

Those reduced outflows are caused when water is kept in storage or exported. The projects also affect the Delta smelt's habitat in the southern part of the Delta.

Your Honor, Plaintiffs' Exhibit 1 is a map of the Delta smelt's critical habitat. At present, the delta smelt find themselves right up here in the northern part of the Delta. And the testimony of Dr. Swanson and Dr. Moyle establishes that a good third of their critical habitat in the southern part of the Delta is entirely inhospitable to them because of operations of the export facilities.

THE COURT: Why don't you use the letter and number designation from the other map so that we'll have it for the record where the north part of the Delta is.

MR. WALL: Your Honor, I'm not sure this other map was admitted in evidence.

THE COURT: Then let's admit it now. Whose exhibit was it?

MR. WALL: Well, we were intending to use it. We ultimately thought this one was cleaner. But if there's no objection, I think we --

THE COURT: No. I'm referring to the map that had -- used by Dr. Hanson. It broke down the various areas of

the Delta where sampling in effect and measurements were taken. Where is that exhibit? Can you help us, Mr. Wilkinson?

MR. WILKINSON: I'll find it, Your Honor, if I may.

THE COURT: Thank you. That's it. All right. Does that have an exhibit tag on it, Mr. Wall?

MR. WILKINSON: Yes, Your Honor, it's State Water Contractors Exhibit H.

THE COURT: All right. If -- the color diagram is helpful, but just in terms of a locational reference, let's use the letter and number as close to the north Delta where you are arguing the delta smelt now exist.

MR. WALL: Your Honor, I believe Dr. Hanson, in his testimony, said that this past year the delta smelt spawned in the area of A4 on the Sacramento River.

THE COURT: All right. I agree.

MR. WALL: The southern part of the Delta, which would be in the area of perhaps A8 and A10 and A12, which contain critical habitat, is no longer regularly occupied by the delta smelt. Some of the smelt are entrained on their way in or out of that area.

And Dr. Moyle also testified that when the pumps in the Delta operated at high or moderate levels, they change the hydrodynamics of the Delta. They may confuse these fish as they try to swim into that area or be pulled off course into

less favorable environments.

Your Honor, and then there's the issue of entrainment, of course, which the defendants have principally focused and it is an important issue. We know that fish are being entrained at the project export facilities. We don't know how many. We know some are lost to predation before they're salvaged. We know some of them get pulled through the louvers at the fish screens. We know that the littlest smelt under 20 millimeters are not counted at all and no one has a precise idea of how many are lost.

What we do know is that this past summer, when the projects were allowed to operate without being subject to a court order, there were repeated days on which the projects counted not tens, but hundreds of delta smelt in salvage. And that was only the take of which we were aware.

Each of these adverse project impacts pushes the delta smelt a bit further towards extinction. Delta smelt is a species with no reserves, no spares, no back ups. And the projects are chipping away at its population. Most of these impacts are either not addressed by the defendants' proposed remedies at all or are addressed only partially.

Now, Your Honor, I won't reiterate the law. The Court is familiar with the NWF decision and the Court is familiar with the burden of proof. I will say this. In the face of uncertainty, the NWF decision, the Gifford Pinchot

decision, which has a similar ruling for criminal habitat, and the burden of proof require that uncertainty be resolved in the Delta smelt's favor.

Dr. Swanson has proposed ten remedial measures. And let me briefly review the evidence on those measures.

The first three involved monitoring. Continuation of existing monitoring or improvement of monitoring at the facilities, for example, that detect larval smelt. Larval monitoring at the project facilities is critical because we have no direct information at this time on when or how many larval smelt are being taken. They just aren't counted.

Better information about the presence and location of larval smelt is critical to effective operation of these projects, to avoid taking large numbers of delta smelt.

Defendants have raised no meaningful objections to this proposal. The agencies have contended that they might need to train some additional staff --

THE COURT: I believe they're also proposing that if we get to their remedies.

MR. WALL: I'm sorry, Your Honor?

THE COURT: I believe they're also proposing the monitoring if we get to their remedies.

MR. WALL: Your Honor, I believe the Fish & Wildlife Service does not. And I believe that Dr. Hanson's proposal, he mentions the possibility of exploring or developing

monitoring but he has no concrete proposal.

THE COURT: All right.

MR. WALL: If the agencies -- the contention they've raised is that they have to train some additional staff or perhaps buy some new equipment. If the agencies do not believe they're up to the task of training a few additional staff to conduct this monitoring, it's difficult to see how they could be entrusted with the more weighty work that they propose to be left to their discretion.

Dr. Swanson also proposes measures four through nine that are principally addressed at entrainment and improving the habitat of the southern part of the Delta as it's affected by the export operations.

Now, there's several of these about which there's no real contention. Dr. Swanson's action six is essentially -- it's just a continuation of the VAMP.

And actions eight and nine, which involve agricultural barriers, I don't believe any of the parties dispute those actions are a good idea as well.

So the focus of the contention here is on actions four and then actions five and seven. Much of the debate has been around the particular flow levels that Dr. Swanson proposed for her action four. And this is a measure that is timed to protect delta smelt adults before they spawn. These are the fish that have survived all the many causes of

mortality.

You recall that there is a very tiny percentage of the hatched fish that survive to reproduce. These are those fish. They are the mothers of the next generation, hopefully not the last generation of delta smelt. And it is critical that they be protected.

Dr. Swanson modeled her fourth protective measure, her action four, on a recommendation of the Delta Smelt Working Group, which is composed of the agency scientists. They proposed a range of flows and she chose the more conservative protective side of that range of flows, given the present status of the species that careful conservative approach is warranted.

Your Honor, Dr. Swanson's measures five and seven would essentially provide for Old and Middle River flows like those found during the VAMP period. But would begin those flows earlier and continue them later extending the period of protection that Dr. Bennett's work suggests VAMP provide.

Dr. Swanson took this approach because Dr. Bennett's work provides compelling, if new evidence that entire age classes of delta smelt, entire months of hatched fish are dying in mass.

Dr. Swanson also took this approach because, as she testified, she does not have confidence that the very statistical relationships between flow on the Old and Middle

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River and take provide the necessary resolution to decide an appropriate level of Old and Middle River flows, if there is better information, such as that provided by Dr. Bennett.

These VAMP like flows would end once salvage ends. And there's some dispute about what that end date would be. Dr. Swanson is the only biologist who's addressed that point. And she's testified that the fish would likely exit the system sooner under the flow conditions she's proposed.

The testimony of the DWR witness looked at a -- looked specifically at 1998, which was a very unusual hydrological condition, where there was flooding throughout the San Joaquin Valley that might have brought numerous delta smelt into that area that would not normally be there.

And I respectfully submit, Your Honor, that is not a typical condition and certainly is not the condition that Dr. Swanson has specified in her proposed remedial action.

THE COURT: When she does say that salvage ends?

MR. WALL: June 15th or five days after the last date of salvage. But she doesn't know the date when that will be, but she says she expects, based on the response of these fish to favorable conditions, that they would move out of the system sooner than they have under higher export rates.

Dr. Swanson's tenth and final measure is designed to protect delta smelt sub-adults during the fall. There's clear peer reviewed persuasive evidence, both from the -- well, the

Feyrer work and also the work of the Delta Smelt Working Group, and Dr. Moyle's research on the habitat needs of rearing delta smelt that more fresh water outflow during the fall will help push the low salinity zone down towards more favorable habitat in Suisun Bay where it would be, but for operation of the projects.

Defendants have argued that this measure is risky. It is not risky. We know what habitat conditions are beneficial to delta smelt. Creating habitat conditions that are beneficial by moving the low salinity zone further downstream may or may not prove sufficient to allow the species to recover. But the trajectory of which this fish has displayed in recent years at least indicates that providing good habitat is a necessary condition for recovery.

Dr. Swanson's tenth measure is the only measure proposed by any party to address this critical lifestage of delta smelt. Now, this is a one-year species with high mortality during the course of the year. We simply cannot afford to ignore any lifestage nor may the projects' impacts on that lifestage be ignored consistent with the Endangered Species Act.

Your Honor, I'd like to briefly address the defendants' and defendant intervenors' proposed remedies. And I'd like to do that first by identifying some common deficiencies in their proposals. The first is that these

remedies give the agencies extraordinary discretion at where to set flow levels.

Ms. Goude's action four is a process. And though it illustrates what might be done, it doesn't require anything specific. It's effectively a new version of the DSRAM process that this Court already held insufficient.

Similarly, Dr. Hanson's tier two remedy sets wide sideboards between minus -- I believe it's minus 1,000 cfs and minus 6,000 cfs for flow in the Old and Middle River. These sideboards are so wide you could get lost in their waters. Now -- he now says that the prudent thing to do would be to operate at the protective end of that range. His proposal does not require the agencies to do so. And in the past, the agencies have not demonstrated a willingness to operate the projects in a fully protective manner.

Dr. Hanson's third tier measure sounds strict. Once you have substantial salvage, dramatic increase in salvage, I think he says, then you curtail pumping operations at the level necessary to protect the public health and safety. But this only lasts four days and after that the agencies get to consider what they're going to do.

Well, what happened this past summer? Once they began increasing their pumping operations, we saw days after days of high levels of take that continued for the better part of the month.

A second flaw with the defendants' remedies is that they rely on imperfect monitoring data. In many instances, they are triggered by identification of delta smelt in the vicinity of the project export facilities. The present surveys and salvage measurements do not even count larval smelt.

One of the surveys does look at larval smelt, but the present abundance of larval smelt is so low that these surveys are increasingly having difficulty detecting them even in areas where they do exist.

The defense remedies are also deficient because they don't look at protecting the fall lifestage of the species. They're deficient because they, in the face of uncertainty, err against more protective precautionary levels, which is contrary to the requirements of the Endangered Species Act.

And finally, the defense experts were not willing to testify that these remedies met the necessary legal standard. This is really quite extraordinary.

Ms. Goude pointedly and repeatedly declined to offer her opinion on whether the project's proposed operations would cause jeopardy or avoid adverse modification. "I wouldn't proffer an opinion on that," she said. I don't see how the federal defendants can carry their burden of proof if their expert won't testify that their project meets the legal standard.

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Dr. Hanson, for his part, asserted that his proposal would be sufficient to prevent jeopardy or adverse modification attributable to the project export facilities depending on how they are operated. But he isn't saying that if they operate at the less protective end of his range, they would necessarily avoid jeopardy.

He also admitted that he had not even considered the incremental contribution of any factor other than export facilities. That apparently means in reaching a no jeopardy decision or opinion, he did not consider the operations of the remainder of these projects, the reservoirs that are withholding outflow in the Delta in the fall.

Your Honor, I'm going to only say two things about Dr. Miller's hypothesis. The first is that facts are stubborn, but statistics are pliable. If I understood Dr. Miller correctly, he has taken two variables, delta smelt at a juvenile stage and food abundance, and put them into one variable and related this to later delta smelt abundance.

This is a little bit like saying I'm going to try to relate the co-occurrence of tomato plants and gardening gloves with later tomatoes. Well, the fact that you get the tomatoes later doesn't mean that they were caused by the gardening gloves, they were caused by the tomato plants.

It's statistically invalid and it's consistent with the findings of the peer review on his earlier conclusion,

which he proved through statistics just a few years ago that delta smelt had recovered.

Your Honor, I'd like to briefly address the health and safety and water supply issues. Plaintiffs propose an explicit exception to their remedy to protect public health and safety. There is a definition of public health and safety in this context in federal law.

What this means is that under plaintiffs' proposal, the defendants would not be required to take any action that would impair the projects' ability to meet public health and safety needs. This is a safety valve.

If the Court issues an order, it would have a safety valve, an escape hatch, that if they need to do something else to protect the public health and safety, they could do so.

This approach, under my understanding of the Court's rulings about the evidence, makes the water cost information presented to the Court irrelevant. Predicting the quantity of water that would be needed to meet public health and safety obligations in advance without information on the hydrology of the coming year would probably be impossible and certainly be unwise. Under our approach, the Court doesn't need to make that prediction.

Beyond that, this Court has no warrant -- excuse me, I'm losing my voice after several nights of no sleep. Get some water. This Court has no warrant to consider costs

economic water or otherwise in deciding what remedy is necessary to avoid increasing the Delta smelt's jeopardy or adversely modifying its critical habitat.

This case is remarkably similar to TVA v Hill decided by the Supreme Court, in the landmark and defining ESA decision. In that case, also involved a federal water project, it also involved a small uncharismatic fish.

The federal water project had cost something on the order of 100 million dollars to build, which was a lot of money back then. It was designed to provide electricity for 20,000 homes as well as flood control benefits, jobs and recreational benefits. The Court said one might argue that the burden on the public through the loss of millions of unrecoverable dollars would greatly outweigh the loss of the snail darter.

But neither the Endangered Species Act nor Article 3 of the constitution provide federal courts with the authority to make such fine utilitarian calculations.

Congress viewed the value of the endangered species as incalculable. Quite obviously, it would be difficult for a court to balance the loss of a sum certain, even 100 million dollars, against the Congressionally declared incalculable value. Even assuming we had the power to engage in such a weighing process, which we emphatically do not.

Your Honor, Congress has provided a process in

which -- by which the Section 7 obligations may be waived by the executive branch to address public health and safety emergencies or other problems of national and regional significance.

Section 7 creates the endangered species committee made up of high ranking executive branch officials in a politically accountable branch of the government. And upon proper application, this committee is empowered to exempt an action agency from the requirements of Section 702 if doing so is in the public interest.

The courts, however, are not empowered to do so. Whether the delta smelt survives or fails finally over the cliff of extinction, may well be decided in the next 12 to 18 months. Every biologist who has appeared before this Court has reached that same conclusion. The science on what is necessary to protect the delta smelt from falling over the edge into extinction, let alone the science on what is necessary to comply with the adverse modification requirement is uncertain. We cannot look at a textbook, even Dr. Moyle 's textbook, and be as confident as we would like that flows at one level or another are protective while flows at another level are not.

This uncertainty could make the Court's duty seem difficult. This court's duty is not difficult, it is weighty, but its duty is clear. The Court's duty is clear because we

stand in a courtroom, not in a legislative chamber. Congress has made a choice to preserve endangered species, whatever the cost. The judicial branch's duty is to enforce Congress' will. The agencies have failed to carry out their duty to prevent jeopardy and adverse modification. This Court must, however reluctantly, assume that responsibility. In doing so, the Court must, under controlling precedent, resolve uncertainties in favor of the delta smelt.

Your Honor, you asked about the issue of take limits and let me briefly address that. Our concern is protection of the delta smelt. We do not believe the present take limits are protected. On the other hand, invalidate -- or vacating the Biological Opinion doesn't put in place new take limits. And it may cause some take concerns for the agencies in operation of these projects.

We do not require vacatur of the Biological Opinion if the Court layers on top of it a protective remedy that ensures that these project operations will not deepen the jeopardy of the delta smelt or cause adverse modification of their critical habitat.

But the Court's order must accomplish those purposes. If the delta smelt loses its grasp, if the agency officials and defendant scientists who have guessed wrong in the past are guessing wrong again, if this Court's remedial order shaves the protections too closely, there will be no second

chance. One of the species placed on this earth, a species of little consequence to some, but incalculable value to Congress, will disappear forever.

Your Honor, the defendants have not carried their burden and this Court's duty is clear. We respectfully ask the Court to adopt the proposed remedies described by Dr. Swanson. Thank you.

THE COURT: Thank you, Mr. Wall.

MR. WALL: I'd be happy to answer any questions if you'd like.

THE COURT: I don't think we have time for questions. Mr. Maysonett.

MR. MAYSONETT: Your Honor, am I correct in understanding that I should try to limit my comments to 15 minutes? Is that where we are?

THE COURT: I'm going to leave it to both the defendants and the intervenors to divide the time as you see.

MR. WILKINSON: Yes.

MR. MAYSONETT: Thank you, Mr. Wilkinson.

THE COURT: So your colleagues will tell you. I will not.

MR. MAYSONETT: Your Honor, every scientist that has appeared before the Court has expressed serious concern over the current status of the delta smelt and the decline that it has experienced over the last four or five years. I'm not

going to dwell on those issues.

One question that I have heard the Court ask over and over again is what have the agencies that operate these projects been doing during that time to respond to the Delta smelt's decline? I'd lick to answer that question on behalf of the Bureau of Reclamation and the US Fish & Wildlife Service.

First, as the Court is aware, reclamation has consulted with Fish & Wildlife Service repeatedly under the Endangered Species Act on the effects of its operations on the delta smelt.

It's operated the projects in compliance with the Biological Opinion since 1995. It's implemented the Vernalis Adaptive Management Program and other measures to benefit of the delta smelt.

This summer, for example, as we heard Mr. Milligan testify, reclamation took extraordinary steps for the benefit of the delta smelt, limiting pumping down to one pump, which Mr. Milligan testified was minimum, from April 22 until June 12th. First as part of the VAMP, and then later under adaptive management.

Reclamation spent 5.2 million dollars to buy water to augment flows on the San Joaquin River for the benefit of the delta smelt.

As Mr. Milligan testified, as data came in showing

this decline of the delta smelt, reclamation reinitiated consultation of the service in 2006 before the Court had invalidated the most recent Biological Opinion.

Because it reinitiated consultation, reclamation also took steps under Section 7(d) of the Endangered Species Act. It has committed to not entering into any new long-term water service contracts until the new Biological Opinion is complete. It's halted progress on several major construction projects, including the Delta Mendota Canal, California Aqueduct Intertie. It's committed to maintaining pumping within recent historic levels.

Reclamation and the service also participate in the Pelagic Organism Decline group, which is sponsoring dozens of studies to investigate the cause of this decline comprehensively. And that the POD is -- which is the Pelagic Organism Decline -- is staffed and funded in large part by the Fish & Wildlife Service and Reclamation.

Now, in addition to those steps, Your Honor, the service has convened an interagency team of biologists to devise a matrix of actions that in the service's opinion will protect the delta smelt over the coming years. That proposal and its basis were described in Ms. Goude's declarations and her testimony.

As Ms. Goude testified, the service's proposal is based firmly in biology and was developed without the

consideration of potential economic impacts or reductions in exports. And importantly, the service has concluded that it will adequately protect the delta smelt over this interim period.

In many ways, the service's proposal is not entirely dissimilar from the suite of actions that the plaintiffs themselves have proposed. Throughout their proposal, however, the plaintiffs have generally, although not always, used more restrictive flow levels.

And they have included additional actions, including their action ten, the fall action, which would require certain minimum outflows from the Delta during the fall.

As a result, the plaintiffs' proposal will use significantly more water than the service's for benefits that the service concluded were marginal or uncertain.

Now, the plaintiffs have objected throughout these proceedings to any discussion of water costs. But I submit, Your Honor, that the Court not only can, but that it must consider the relative water costs of these proposals for interim relief.

And when I say "water costs," Your Honor, allow me to be clear. I'm not talking about the potential economic consequences of reduced exports, although those are considerable. I'm talking about the amount of water that would be required to implement the actions.

As Ms. Goude explained, the service and the Bureau of Reclamation cannot afford to look at project operations just over one year -- without considering how those operations will resound into the future. We have -- we are coming off a dry year on the Sacramento and a critically dry year on the San Joaquin. Storage at many reservoirs is below normal.

While there is disagreement over exactly how much each of the -- these proposals will cost, there is broad agreement that the plaintiffs' proposed action ten, the fall action, will by itself use about half a million acre feet of water.

So we know the plaintiffs proposed actions will use more water. Depending on conditions in the basin, that increased use of water could lead to low reservoir levels and if conditions remain dry, the effects of those operations could carry over through those reduced reservoir levels into next year.

In deciding how the projects are going to be operated over the next year, Your Honor, the Court cannot assume that we're going to have a wet year. The Court has to at least consider what will happen if we implement these actions and we are entering the second of a series of dry years. The Court has to consider the potential effects of a drought. And it has to consider those issues not just because of economic impacts, but because using water now may affect our ability to

meet the needs of listed species, including the Delta smelts and listed salmon in the future.

Your Honor, with introductory remarks done, I'd like to turn to the issue of remand and whether it should be with or without vacatur.

What I hear the Court saying, at least in its tentative ruling, is that it is considering remanding the Biological Opinion, of course it's going to remand the Biological Opinion, but doing so and vacating the Biological Opinion at the same time. And we have grave concerns over that result.

Because vacating the Biological Opinion will vacate the incidental take statement contained in that opinion and that incidental take statement shields reclamation and its employees from civil and criminal liability under the Endangered Species Act from take of delta smelt that occurs at the pumps.

THE COURT: What is the legal authority for the Court to leave in place an acknowledgedly insufficient scientifically inadequate take measure that does not offer the legally required protection of the species?

MR. MAYSONETT: Your Honor, I would say the cases we've identified in our briefs support the conclusion that vacatur can be without remand, where that --

THE COURT: Remand without vacatur.

MR. MAYSONETT: Is that -- the remand could be without vacatur.

THE COURT: You got it backward.

MR. MAYSONETT: Vacatur without remand, I'm not sure what that --

THE COURT: Nor am I.

MR. MAYSONETT: The remand could be without vacatur or it would result in serious disruption. And without an incidental take statement, we may have to shut the pumps down. We'll have to obviously evaluate the legal status there very carefully, but the pumps can't be operated with literally no risk of causing take. And we will have to look at that issue very, very carefully. We will have to operate the projects at our peril.

I think the plaintiffs are correct, what we should do is remand without vacatur, but then the Court should order whatever interim relief it believes is appropriate based on the evidentiary proceedings we've had to protect the delta smelt over the next year. In that way, we will both protect the delta smelt --

THE COURT: And they're willing to stipulate to that if the level of protect they seek is imposed. That's what Mr. Wall just said.

MR. MAYSONETT: Well, I understand that, Your Honor, of course we --

THE COURT: Did you hear him?

MR. MAYSONETT: I did hear him, Your Honor. And we would accept that stipulation, of course, we take the position that the level of protection that should be imposed is the level of protection proposed by the service.

Let me turn briefly, Your Honor, to some of the important distinctions between the proposals before you. And I'm going to focus on the differences between the plaintiffs' proposals and the service's.

One of the obvious ones is this action ten, the fall action, which would require us to keep X2 at 80 kilometers or minimum outflows of the 7500 cfs, whichever is less water. The theory is that it will increase the quality of the habitat for the delta smelt.

As I've already said, the measure has a very significant water cost. It's likely to use -- it depends on the water year, of course, but it's likely to use about a half a million acre feet of water.

As Ms. Goude testified, the service considered including this kind of requirement in its proposal, but ultimately decided that the benefits were too uncertain and the water cost too high.

And in reaching that conclusion, the service wasn't alone. None of the groups that have considered this kind of fall action have actually recommended it, or at least not

without significant reservations. When the Delta Smelt Working Group looked at this --

THE COURT: You know, let me ask. It wasn't presented -- at least if it was presented, it certainly was referred to, I haven't had a chance to read it.

But the Bennett study, any recommendations that came out of the Bennett study. I know it wasn't for this project, but do the most recent peer-reviewed scientific analysis of the status, does that study recommend or address fall remedial action?

MR. MAYSONETT: My understanding, Your Honor, is that the plaintiffs' action ten is not based on the Bennett study, but rather on the Feyrer study, which is Plaintiffs' Exhibit 5. The Feyrer study cautions that the degree at which -- the Feyrer study had that analysis of environmental quality for the delta smelt. And they caution that the degree to which their analysis could be used for management purposes remain unclear.

And I'd like to point out that one of the co-authors of that Feyrer study was, in fact, sitting on the Delta Smelt Working Group when the Delta Smelt Working Group considered a very similar fall action. This is in Plaintiffs' Exhibit 10. And the Delta Smelt Working Group thought about it and decided not to recommend because it concluded that it was not likely to result in a significant increase in the amount of habitat

quality or quantity.

And the Delta Smelt Working Group also cautioned that before we did any kind of fall action like this, it should be set up as an experiment first so that we could test the competing hypotheses about what effects it might have. And that hasn't been done.

It's also worth noting that the California Department of Fish & Game and the Department of Water Resources in their Pelagic Fish Action Plan thought about a similar action that would maintain X2.

Now, that action did go from May to December instead of just September to December, so it was a much longer term. But they describe the effects of that action as having a high scientific uncertainty. And they caution that it should not be undertaken in below normal years because then it would have potentially dramatic effects on storage levels and temperature conditions for fish upstream in the fall. And that's at State Water Contractors Exhibit C at page 48.

So the benefits of the proposed fall action, Your Honor, are uncertain. It's not clear that it will significantly increase the quantity or quality of habitat available to the smelt. And as Dr. Hanson testified and Dr. Swanson acknowledged, it's unclear how the smelt will respond to whatever increase in habitat quality or quantity occurs.

What is certain is that the fall action will use a

lot of water and, depending upon conditions in the basin, using that water may have long-term effects. It may ultimately impair our ability to provide flows for the delta smelt and for listed endangered salmon species in future years.

For those reasons, Your Honor, we think the service was right to reject it.

Turning briefly to monitoring, Your Honor, the plaintiffs have proposed several monitoring actions. The third, action three, would propose a new monitoring program for sub-20 millimeter delta smelt. You had a brief colloquy with counsel about that. We don't think that's appropriate. I'm not sure that's clear.

We think that it suffers from important legal scientific and simply practical problems. Legally, we don't think there's a basis in the Endangered Species Act to order an agency to conduct new monitoring. We believe that the Endangered Species Act requires agencies to rely on the best scientific and commercial data available. That's the standard of the statute.

The statute doesn't allow the service to wait for more better data to be developed and we think that the relief here should be found on the same standards.

Significantly, I'm not aware of any case where a Court ordered, under the Endangered Species Act claim, some

agency to conduct new monitoring.

We think there are scientific reasons to be skeptical about the value of this data as both Dr. Swanson and Ms. Goude explained. One of the reasons we have such valuable data on the delta smelt is that so much of these surveys and so many of this monitoring has been conducted for a long period.

And finally, there are practical problems, Your Honor, in the sense that we wouldn't just have to hire new staff, but it will take time. Telling two five-millimeter fish larvae apart is very difficult. And the time it takes to identify those larvae may create backlogs, it could jeopardize our ability to create the real time salvage data that we have been able to provide in previous years.

I think I'm going over my time here, Your Honor. I'm getting that look from my co -- or the other counsel. So let me just wrap up and say that in conclusion, Your Honor, the service has developed a matrix of proposed actions that we believe will protect the delta smelt over the next year. We think it's supported by the science, that it's appropriately flexible, give the operators the flexibility they need to both protect the smelt and respond to conditions on the ground. And that it makes the best use of water that we have, which is important not just for other reasons, but because it will help us in future years with smelt and other listed species. And for that reason, it is narrowly tailored and it is the

appropriate injunctive relief.

THE COURT: And as I understand it, your position is, for the federal defendants, remand without vacatur implementing the protective conditions that are proposed in the five point action matrix?

MR. MAYSONETT: Yes, Your Honor. That's correct. That's what we advocate.

THE COURT: Thank you. Mr. Lee for the state.

MR. LEE: Your Honor, I just want to begin to say I support that position of federal government. And I just want to get that out of the way so we can go into the basis of the statement.

Your Honor, all parties before this Court recognize that the delta smelt are in a state of significant decline. The California Department of Water Resources does not doubt that this Court has repeatedly stated that business as usual is not an option for the delta smelt or for the California State Water Project.

At this end, the Department of Water Resources embraced with two minor modifications the delta smelt action matrix for water year 2008 prepared by the US Fish & Wildlife Service and attached to the July 3rd, 2007 declaration of Cay Goude. The Department of Water Resources takes this step fully aware of the water supply consequences of this decision.

As the testimony of John Leahigh has disclosed,

adoption of a modified US Fish & Wildlife Service proposal could cost the communities of this state that rely on Central Valley Project and State Water Project water, as much as 1.4 acre feet of water in an average year and as much as 415,000 acre feet of water in a dry year.

Nonetheless the Department of Water Resources recognizes that protection of the delta smelt at this time in this proceeding is a first order priority for the state.

THE COURT: Let me ask one more question of Mr. Maysonett because you reminded me of it.

MR. MAYSONETT: Yes, Your Honor.

THE COURT: Do you accept or reject the proposed modification that Mr. Leahigh discussed this morning?

MR. WILKINSON: Negative 300 cfs instead of zero.

MR. MAYSONETT: It's not part of the service's proposal, Your Honor, I think it's something that we would have to evaluate. I don't know if the service has had a chance to review it.

THE COURT: Between now and five p.m., I suggest that you evaluate and have the Court an answer.

MR. MAYSONETT: Thank you, Your Honor. I'll get right on that.

MR. LEE: Hopefully that came out of the federal government's time, Your Honor.

THE COURT: Thank you, Mr. Lee, as always.

MR. LEE: In sorting out the appropriate protective measures, I would like to focus on three categories of smelt protection relating to three lifestages that were addressed by the testimony before this Court.

One, what new measures are necessary to protect pre-spawning adult smelt during that late winter period.

Two. What measures are necessary to protect juvenile and larval smelt in the winter through spring period.

And three, is the plaintiffs' fall action designed to impose the salinity level in the western Delta justified based upon evidence that is before this Court.

Let's go straight to that first issue, Your Honor. The protection of pre-spawning adults during the winter and early spring period. As the testimony shows, beginning roughly in December, adult delta smelt began to move upstream from the confluence of the San Joaquin River and Sacramento River into the Delta.

The Department of Water Resources supports two actions to protect the smelt during this important lifestage.

First, the Department of Water Resources supports the US Fish & Wildlife action number one. This action would commence on or after December 25th or upon the occurrence of certain turbidity events. For a ten-day period, negative flows at Old and Middle River could not exceed negative 2,000 cubic feet per second.

Now, in reviewing the testimony over the last six days, the primary dispute as to this action appears to be the competing proposal of the plaintiffs in their action four. The plaintiffs' action four proposes a zero negative flow value for this period.

However, Ms. Cay Goude of the US Fish & Wildlife Service testified that based upon the advice of her biologists, biologist colleagues at the US Fish & Wildlife Service, quote, negative 2,000 cfs would be sufficient for this period." And that can be found in her August 23rd testimony on pages 161 through 162.

This position is also reinforced by the testimony today of Mr. John Leahigh, who indicated the very practical problems given tidal and atmospheric conditions and other diversions of meeting a zero flow requirement. DWR is not aware of any contrary testimony directly disputing the adequacy of the negative 2000 cfs value in action one and we would therefore urge the Court to adopt this measure.

The second part of action one involves a separate kind of action. DWR endorses this modified version characterized -- I'm sorry -- in US Fish & Wildlife Service action number two. The US Fish & Wildlife Service recommends that upon onset of spawning, that the daily net upstream flow of old Middle River not exceed negative 4,500 cfs for a 14-day running average and a negative 5,000 cfs for a seven-day

running average.

The Department of Water Resources would recommend modifying this measure, and this is one of the two modest modifications, to negative 5,500 cfs for a 14-day running average, and negative 6,000 cfs for a seven-day running average at Old and Middle River.

Now, what is the scientific basis for this? Because that is -- in the end is where we are at. The Department of Water Resources bases its modification after reviewing the only scientific data presented to this Court on statistical relationship between project salvage of smelt and the Old and Middle River flows.

One, the graph prepared by Dr. Pete Smith contained in Figure 8 of the July 23rd 2007 declaration of Dr. Swanson, that would be Plaintiffs' Exhibit 11. And 2, Exhibits B and C attached to the July 9th, 2007 declaration of Jerry Johns, DWR Exhibit G.

Let's go to the Pete Smith declaration. Excuse me. The Pete Smith figure. As both plaintiffs' experts Dr. Moyle and Dr. Swanson have affirmed in their testimony, Dr. Smith's -- Dr. Smith's graph contains altered data points. This concession can be found on Dr. Moyle's testimony on August 21st at page 119 and Dr. Swanson's testimony on August 23rd.

Dr. Moyle testified that the practice of altering

data and preparing a regression analysis was not consistent with acceptable scientific practice. And that it was his estimate that the R-squared value would decline if erroneous data points were removed. That again can be found in Dr. Moyle's August 21st testimony.

Moreover, Dr. Swanson testified that she was aware that Mr. -- that Dr. Smith's graph contained altered data before she prepared and submitted her declarations to this Court. But explained -- but failed to explain that fact to this Court in her declarations.

Given these circumstances, the Department of Water Resources submits that this Court should not -- should not give any weight or very little weight to Dr. Smith's regression analysis. The submittal of an analysis based upon altered, dare we say falsified data, even for a noble purpose, should not be encouraged by this Court.

Now, to the contrary, the graphs contained in Exhibits B and C of Jerry Johns' July 2007 declaration do not contain any altered data points. That can be found at DWR Exhibit G. A review of these graphs disclosed that for the months of January and February, smelt take significantly increases at the point where Old and Middle River flows exceed negative 6,000 cfs. Plaintiffs contend that splitting data between January and February somehow, quote, "distorts," end of quote, the information.

However, when forced to move beyond the hypothetical and to consider the actual real world data displayed in the graphs, the plaintiffs have not been able to point to any real world data example of how splitting the data between the two months had any policy consequences for recommended negative flows in Old and Middle River. Exhibits B and C to Jerry Johns July declaration therefore represents the best available science regarding the relationship between project salvage and Old and Middle River flows.

In summary, the testimony before the Court supports the US Fish & Wildlife Service action number one and supports action number two as modified by Exhibits B and C to the Johns declaration.

If I can move on now to the second lifestage that I'd like to talk about, which is the protection of juvenile and larval smelt during the winter through spring. Here, Your Honor, we have two clear choices. Do you want to rely upon the US Fish & Wildlife Service as they have proposed in their actions three and four of their matrix to assess real time data from sources such as temperature data, Kodiak Trawl Surveys, Particle Tracking Models, salvage data and the 20 millimeter survey, and to make flow decisions within a designated range of flows based upon this data or do you want to adopt the plaintiffs' inflexible flow requirements that would mandate specific flows regardless of what the real time

data would tell you. These are the two choices that the plaintiffs and the defendants have presented with regard to their competing remedy proposals.

Now, plaintiffs have objected to the US Fish & Wildlife Service's actions three and four on the grounds they are triggered by allegedly unreliable monitoring data. So I would urge the Court to go back and look at the testimony, both of Dr. Moyle and Dr. Swanson. They contend that the unreliability derives from the unreliability of the 20 millimeter survey and that it does not adequately detect larval smelt.

Let us assume that's true, Your Honor. The review of Attachment A to the US Fish & Wildlife Service matrix discloses that the matrix relies on multiple sources for real time data. Not just the 20 millimeter survey. And that would be DWR Exhibit A.

Both Dr. Moyle and Dr. Swanson testified that temperature data and the Kodiak survey data provided reliable information regarding spawning adult smelt and therefore provided a reliable predictor of the likely presence of smelt larvae one to two weeks later. This can be found in the August 21st testimony of Dr. Moyle and the August 22nd testimony of Dr. Swanson.

So notwithstanding the plaintiffs' assertion, reliable tools for detecting larval smelt do exist and have

been applied.

However, Your Honor, there's a bigger dispute here than a simple quibble over the efficacy of monitoring. The heart of the plaintiffs' objection to the US Fish & Wildlife Service's action three and four is the plaintiffs simply believe that the US Fish & Wildlife Service cannot and should not be trusted to choose among the range of flows for this time period based upon sound biological science.

Now, if this Court believes that the US Fish & Wildlife Service cannot be trusted to make these judgments, then I cannot see any other conclusion than having the Court side with the plaintiffs and reject actions three and four.

THE COURT: Well, let's look at the evidence and you can respond to this. I specifically asked questions of the operator, at least the federal operator, for that very purpose. Because in light of conditions that caused the experts who had been constituted under the Biological Opinion DSRAM to do exactly that, they made recommendations. Those recommendations were certainly considered. They were neither implemented nor followed. So in terms trusting the agency, that's exactly what that speaks to.

MR. LEE: Your Honor, may I respond directly to that?

THE COURT: That's what I'm asking you to do.

MR. LEE: I think that rather proves or supports the point that I'm trying to make rather than contradict it. The

profound and dividing distinction between the DSRAM that was in the 2006 Biological Opinion and the US Fish & Wildlife Service matrix presented is as Ms. Goude said, the service in the matrix makes the final call. That was never clear from the DSRAM process and it is clear certainly to the Department of Water Resources' position that the final call for measures that are adapted in the matrix will be made not by a collective group such as the WOMT, not by service heads, but by -- not by agency heads, but by the service and the service alone.

I might say this is sort of difficult for a lawyer for the State of California to say in a federal court, but in this situation, we agree that the federal agency, the US Fish & Wildlife Service is where the buck stops. And that is a material difference from the DSRAM process, Your Honor.

Now, to the contrary, the plaintiffs' flow regime for this time period are based upon what we would submit is uncertain science. The plaintiffs have grounded their flow recommendations for this time period on the 2006 PowerPoint of Dr. William Bennett. The presentation that has been colorfully called the Big Mama theory.

However, Dr. Moyle, in his own testimony, repeatedly characterized the Bennett presentation not as settled scientific consensus view, but as a, quote, "hypothesis," end of quote.

As noted by most of the testimony, Dr. Bennett's hypothesis has not yet been reduced to writing and it appears, from the testimony of Dr. Miller, that Dr. Bennett has not been willing to even share the PowerPoint presentation or its underlying data with others. We submit that this is a very slender reed to support a fish action that may cost the projects hundreds of thousands of acre feet solely based upon a preliminary hypothesis.

With one minor modification, the Department of Water Resources supports the US Fish & Wildlife Service action. As has been noted earlier, the action has a zero to negative 4,000 cfs range.

Based upon the testimony of John Leahigh, which we heard this morning, the Department of Water Resources would submit that hydrologic justification submits for upping the low end from zero to negative 1500. But in all other respects, the Department of Water Resources supports that measure.

THE COURT: And leave the upper end at negative 4 ,000?

MR. LEE: Yes, Your Honor. Last point, Your Honor. The fall measures for habitat protection. I first wanted to put aside a straw --

THE COURT: This is number ten.

MR. LEE: Yes, this is fall action number ten, Your

Honor. First of all, I want to put aside a straw man argument raised by plaintiffs, which is that the claim that -- the matrix by the US Fish & Wildlife Service does nothing for smelt habitat. We can argue repeatedly what the matrix says, but we would ask the Court to look at the testimony of Dr. Moyle on August 21st, 2007 on page 108 of the transcripts.

"Question: If the projects were, in fact, to reduce pumping and minimize or reduce the amount of negative flow in the San Joaquin or Old and Middle Rivers, would that have a beneficial effect on the smelt's habitat in the south Delta?

"Answer: Yes. I think it would."

So the issue is not whether the plaintiffs' proposal addresses habitat issues and the US Fish & Wildlife proposal ignores them, the issue is which habitat measures are supported by the best available science. DWR would submit that the best available science is -- does not justify the fall action suggested by the plaintiffs.

I want to move quickly through this, simply to comments related to Feyrer paper, which appears to be the only source of data that has not been established to be statistically insignificant. The Feyrer article should be read alongside the recommendation for the Delta Smelt Working Group, who have considered this issue on numerous occasions.

On page 732 of the Feyrer article, this will be

Plaintiffs' Exhibit 5, the authors conclude, quote, "The degree to which EQ could be used for management purposes remains unclear."

In its August 21st, 2006 delta smelt meeting notes, the delta smelt group addressed the fall X2 issue and concluded, quote, "It did not recommend it because 7,000 cubic feet per second is not enough flow to detectably change physical habitat quantity and quality for the delta smelt." That's Plaintiffs' Exhibit Number 10.

On page 732 of the Feyrer piece, the article states, "For the water quality" -- "that for the water quality data to be most effect tough for species management, additional information is needed." End of quote.

The delta smelt Working Group's August 21, 2006 meeting notes similarly state that there is need for further experimentation to test this hypothesis.

Thus the two non-advocacy biological experts who have offered opinions in this case agree that there is no need for fall salinity action today and there is need for additional study. This is not surprising since the authors of the delta smelt -- of the Feyrer paper and the members of the Delta Smelt Working Group overlap.

In conclusion, DWR would recommend that the interim remedy, the US Fish & Wildlife Service matrix with the modifications be adopted. It is the intent of the Department

of Water Resources to follow such a modified matrix as a first order of protection for the smelt. Where consistent with this matrix, the Department of Water Resources would otherwise continue to operate the State Water Project as described in the 2005 BiOp, including the continuation of the EWA.

We are now very close to the end of a very long period for all of us. We ask this Court to adopt a remedy that we think is both -- that we think is protective, that we think is feasible and that we think is fair. That remedy, we submit, is the modified US Fish & Wildlife Service matrix as we've described it.

THE COURT: Thank you, Mr. Lee. We're going to do one more before we break.

MR. WILKINSON: Thank you, Your Honor.

THE COURT: Mr. Wilkinson.

MR. WILKINSON: Your Honor, I'm going to dispense with the preliminaries. I don't think you need them and I don't have the time. I'm going to start by going through the actions in the order in which they would take effect. I'd like to give you then our comments on those as they would occur.

THE COURT: Well, just tell me where -- the fundamental position the State Water Contractors have. Tell me where you are.

MR. WILKINSON: Our fundamental position is that Dr.

Hanson's tier one, tier two and tier three measures are the ones we believe the Court should impose.

I'm going to start, though, with Dr. Swanson's action ten, which is proposed to begin tomorrow. We believe the evidence is insufficient to support that measure. No one, including Dr. Swanson or Dr. Moyle, could tell us whether or by how much smelt abundance could increase if that measure was implemented. And there has been absolutely no demonstration that this action is needed.

Instead, the evidence is uncontradicted that the state project and federal project are already meeting water quality objectives that will provide suitable salinities for the smelt and particularly for the sub-adult delta smelt and will continue to do so through the fall. Those salinities, Your Honor, that will result at Kilometer 80 are well within the salinity tolerance of the species.

Now, as Mr. Maysonett mentioned, Dr. Swanson's action would require about half a million acre feet of water to implement. Because of that, we think it's important to ask what is it based on. The answer is it is based on a single article whose authors have already indicated that the extent to which their work can support management actions is unclear, that there is no statistically significant relationship between their EQ measure and smelt abundance at Kilometer 80 and that more information is needed to understand the

mechanisms that may underlie an EQ abundance relationship.

And as was mentioned by Mr. Lee, two of the authors of that article sit on the Delta Smelt Working Group, Mr. Nobriga and Mr. Sommer. And when that group considered a fall action, Mr. Nobriga was on the group and the group declined to recommend the action.

They did so because they concluded that releasing a rate of water, about 70,000 cfs, very similar to that proposed by Dr. Swanson, would not be sufficient to make any detectable change in physical habitat quality or quantity. And also that it would not likely change the distribution of the overbite clam and the -- I guess it's the underbite clam, the fresh water clam.

And it's -- as I think Mr. Maysonett mentioned, the Pelagic Fish Action Plan was another indication, another instance where the fall action measure was not recommended.

Simply put, we believe that Dr. Swanson's action number ten is built on insufficient science, is supported by no one other than Dr. Swanson and would impose enormous water supply costs to achieve unknown impacts on smelt abundance. It should not, we believe, be part of any remedy that the Court imposes.

Now, the next action that would come up in chronological order would be Dr. Hanson's tier one measure. This action would commence on December 1 of this year. That's

almost a month earlier than Dr. Swanson's action number four and a month earlier than the Fish & Wildlife Service's action matrix.

Dr. Hanson's tier one measure is intended to maintain a positive net westerly flow in the lower San Joaquin River in order to push young smelt out of the influence of the projects and prevent the intrusion of turbidity.

And Your Honor, it is costly. According to Mr. Leahigh's testimony this morning, it would require about 300,000 acre feet to implement if 2007 or 2008 are dry or average. It is not by any means or any stretch of the imagination business as usual. And it would not put the smelt at risk at all. There is no down side for the species by implementing Dr. Hanson's tier one measure.

The up side for those who rely on the projects, and the reason we are willing to bet almost 300,000 acre feet of water on it, is that we believe it will work and it will avoid the need for more restrictive measures to be implemented in the winter and spring. And Your Honor, if it doesn't work, we have Dr. Hanson's tier two measure, a modification of the Fish & Wildlife Service's matrix to rely on.

Now, the next actions chronologically that would come up as the calendar proceeds would be Dr. Swanson's action number four and the Fish & Wildlife Service's action number two. Both actions would commence about Christmas Day.

Dr. Swanson's action four would require the management of Old and Middle River flows to achieve a target negative 3500 cubic feet per second from about Christmas Day to the end of February or the onset of spawning. The only science cited by Dr. Swanson to support her measure number four is the Pete Smith graph that attempted to plot delta smelt salvage against reverse flows in Old and Middle River.

But we do know that Dr. Smith altered the data in his graph. We also know that Dr. Smith has now decided that his graph is not final, it is, quote, "preliminary" and, quote, "subject to modification."

In addition, Your Honor, we know that Sheila Greene of the Department of Water Resources reanalyzed the same data that was used by Dr. Smith and found that the salvage of pre-spawning delta smelt shows no significant increase below Old and Middle River flows of negative 6,000 cfs.

Now, the difference in allowing Old and Middle River flows of negative 6,000 cfs instead of negative 3500 cfs is enormous in terms of the water supply impacts. It is 5,000 acre feet of water per day or 150,000 acre feet per month or 300,000 acre feet over the two month period that Dr. Swanson's action number four is proposed to be in effect.

Now, not only does Dr. Hanson's tier two measure and action number three of the Fish & Wildlife Service matrix offer more flexibility in adjusting project operations to real

time circumstances, they are more protective than Dr. Swanson's actions since they allow for lower as well as higher Old and Middle River flows if the circumstances warrant.

Now, we do have concerns, however, with the action number three in the Fish & Wildlife Service matrix and I think Your Honor has identified those. The low end of the Fish & Wildlife Service range of Old and Middle River flows is zero. This --

THE COURT: Or negative 15 --

MR. WILKINSON: No, it's zero. The negative 1500 is the DWR modification.

THE COURT: Modification. That's right.

MR. WILKINSON: Correct. That's right. We believe that modification is appropriate. Certainly the Fish & Wildlife Service action number three is more protective than Dr. Swanson's negative 3500, but we believe it's too low.

THE COURT: Let me ask you a legal question.

MR. WILKINSON: Yes, sir.

THE COURT: We've had strenuous objection from San Luis and Delta Mendota and Westlands to the Court's authority to do anything immediate. In effect what they say legally is that the Court has no jurisdiction to tell the agency to do anything. What's your legal position?

MR. WILKINSON: What is my position on that?

THE COURT: Yes. The State Water Contractors. What

is the legal position of the State Water Contractors?

MR. WILKINSON: Your Honor, we have not taken the position that the Court has no authority. We do believe that the Court needs to narrowly tailor any release that it does grant. We believe that the Court, if it is presented with multiple remedies, each of which would prevent jeopardy and avoid adverse modification, that the Court not only may, but should and is obligated to choose the measure which is the least damaging. And here we think that is the case with regard to this question about zero or negative 1500 cfs.

As Mr. Milligan testified when Your Honor questioned him, it would be extremely difficult for the projects to meet that flow. Because even if they completely shut down, there are others within Old and Middle River who divert. And those diversions cause reverse flows.

So by requiring projects to mitigate those reverse flows, to bring them down to zero, the service's matrix in effect is obligating the projects to make up for the impacts caused by those who are not project water users. We think that's not only unfair, but it's probably illegal. We don't think that authority extends that far.

So we believe that both Dr. Hanson's tier two measure and the modification of the matrix proposed by the Department of Water Resources is highly appropriate in these circumstances because it would tailor the remedy to the damage

caused by the projects in terms of reverse flows.

THE COURT: Is the answer to my question that if the agencies consent, then the authority exists?

MR. WILKINSON: I think I could support that view.

THE COURT: You may proceed.

MR. WILKINSON: I want to talk next, Your Honor, about Dr. Swanson's actions five, six and seven. These actions are intended to mimic the low end of the VAMP export rates. In their entirety, they are based upon work by Dr. Bennett that is unpublished, that has not been peer reviewed and that is not publically available. There is not a single party to these proceedings who has been able to see anything other than the PowerPoint presentation mentioned by Mr. Lee. Dr. Bennett has issued no paper. He has not made his underlying data available to anyone.

To impose that measure, those measures based upon that underpinning, we believe would be not only inconsistent with the principles of scientific method, but would be incompatible with the legal requirements of the Endangered Species Act itself. This is not science that is available as the Act requires. And this is a significant matter.

Those actions five, six and seven that have been proposed by Dr. Swanson would target flows at Old and Middle River at negative 1500 cfs for the entire period of time from February through early to mid July. It's a long period of

time.

Now, by contrast, the Fish & Wildlife Service matrix would manage flows during that period to a range from zero to 4,000, negative 4,000 cfs. If the flows are at negative 4,000 cfs, the difference between Dr. Swanson's measures, based upon this Bennett unpublished work versus the matrix could be up to 5,000 acre feet a day. Again, that would be 150,000 acre feet a month or about 300,000 acre feet over the period that Dr. Swanson proposes to implement her measures.

THE COURT: And doesn't DWR want these modified as well, these flows?

MR. WILKINSON: DWR is content, I believe -- and Mr. Lee correct me -- to go with the zero to 4,000. We believe, during this period of time, that the flows should be negative 1,000 to negative 6,000 cfs. And Mr. Lee, am I correct about that, in terms of the department's position?

MR. LEE: Are you talking about -- excuse me, are you talking about action three?

MR. WILKINSON: Yes, it's over the period of time.

THE COURT: No, we're in five, six and seven now.

MR. WILKINSON: Swanson's five, six and seven, states --

MR. LEE: As I understand it, Swanson's five, six and seven are in the same time period as three and four. We -- the range here would be consistent with your

understanding, which would be negative 1500 cfs to 4,000.

MR. WILKINSON: Thank you.

MR. LEE: That would be our modest modification to this particular element of the matrix.

MR. WILKINSON: Our modifications over that period, Your Honor, are about the same on the low end, they go a little higher on the upper end to negative 6,000. As the testimony indicated, that modification would be based on the work of Sheila Greene. That was the sort of L shaped curve that you saw in a couple of graphs that indicated the uptake --

THE COURT: That is the zone of danger, negative 6,000 --

MR. WILKINSON: 6,000. Right. And so we believe that the upper end of that range should not be 4,000, but should be 6,000 based on the work done by Ms. Greene.

Now, the next action that would take effect potentially would be Dr. Hanson's tier three measure. This is the only proposal before the Court, the only one, that provides for an immediate curtailment of project operations in the event that project pumps are found to be taking a significant number of delta smelt. This proposal would shut down the project pumps in that event and would give the agencies the time to decide what should be done to further protect the smelt.

THE COURT: We can't, as we learned in June, have a complete shut down because that disables the pumps.

MR. WILKINSON: It could potentially do that.

THE COURT: At least disables the federal system's pumps.

MR. WILKINSON: It could potentially do that. And Dr. Hanson's measure, I think the question was asked yesterday, are there triggers for that action. There are triggers, Dr. Hanson testified that he would rely on the Kodiak trawl, the fall midwater trawl data and the Particle Tracking Model to implement that tier three measure.

So in that sense, our proposal goes beyond those of any of the other parties. We think it may be appropriate -- we would be content, frankly, Your Honor with the Fish & Wildlife Service action matrix if the lower end of that zero to 4,000 range was increased to negative 1500 and if the upper end of the range was increased to negative 6,000 to correspond with the data from Sheila Greene.

To conclude, Your Honor, all of the proposals that you have heard are going to prevent jeopardy to the delta smelt and will prevent adverse modification to the critical habitat. Dr. Swanson's proposal, we believe, is enormously consumptive of water resources. The testimony this morning was that it could take up to 60 percent of the combined yield of both projects. And we think it largely ignores real time

data and that that is inappropriate in the circumstances facing the smelt.

These real time data around which the matrix is constructed of the Fish & Wildlife Service, the modified matrix of DWR and our proposal are the best available science. And they are integral to both those matrices and ours.

Because Dr. Hanson's modifications are the most narrowly tailored remedy, we believe, we think that remedy should be the one that you adopt.

THE COURT: Thank you, Mr. Wilkinson.

MR. WILKINSON: Thank you, Your Honor.

THE COURT: Now, what, Mr. O'Hanlon, Mr. Buckley, what are you going to do with regard to your arguments?

MR. O'HANLON: Your Honor, I have a few comments. I have significantly reduced the scope of my comments in response to the Court's direction, but I would like to make --

THE COURT: I haven't directed you to reduce them at all. I've only asked questions so that the questions could be addressed. I didn't in any way suggest that you attenuate or limit the arguments you will present.

MR. O'HANLON: I understand, Your Honor. I didn't mean to say direction. I meant to say Court's comments. I changed the focus of my comments in response to the Court's comments.

THE COURT: And can you address the issues I've raised about your client's positions in the litigation?

MR. O'HANLON: Yes, Your Honor, I can address issues that the Court has indicated are still relevant. In terms of a remedy proposal, I don't have an alternative remedy proposal to make and we do not endorse any of the remedy proposals made by the other parties.

THE COURT: Understood. Mr. Buckley, what's your --

MR. BUCKLEY: Yes, Your Honor, I think as you know, I sat quietly through most of the proceedings here.

THE COURT: Yes, you have.

MR. BUCKLEY: I would like to make a closing argument of approximately six or seven minutes. We do have a position with respect to the remedy proposals. We will, in a qualified way, endorse one of them. I would like to address some of the comments plaintiffs have made about the cause of this problem, which I don't think, on behalf of my client, I can leave unanswered.

THE COURT: All right.

MR. BUCKLEY: I but I don't think it will take more than six or seven minutes.

THE COURT: Thank you. Mr. Wall, are you planning on making a rebuttal?

MR. WALL: Your Honor, there are a few specific factual assertions have been made that I do feel I need to

respond to.

THE COURT: Can you do it in five minutes?

MR. WALL: I will -- I'll tailor it to five minutes.

THE COURT: Thank you. All right. Let's stand in recess until 15 minutes before five.

(Recess.)

THE COURT: Please be seated, ladies and gentlemen. We're going to proceed with closing arguments. Mr. O'Hanlon. You may proceed.

MR. O'HANLON: Thank you, Your Honor. We respectfully disagree with the Court's decision to impose an order against project operations. The Court has indicated that it found the evidence does not preponderate in our favor. I will not try to further argue that evidence now.

The Court has explained that it will consider the impacts of the remedy for limited purposes. I will address that. I cannot overstate the seriousness of the impacts that these proposals would impose. The farmers in the CVP service area south of the Delta are already perpetually short of water. These impacts would be on top of those impacts. They will feel these measures directly and acutely. In a sense, they are in peril too.

Now, Mr. Leahigh calculated the combined export reductions for the CVP and the SWP. We submitted the declaration of James Snow, two declarations, that translate

those delivery reductions for the CVP into the delivery reductions for CVP contractors taking into account two factors. One, the application the CVPIA Section 3406(b)(2) and, two, the differing priorities among CVP contractors.

Mr. Snow, in his declaration, calculated the delivery reductions as follows: For ag service contractors south of the Delta, in an average year, their current base supply is 55 percent contract entitlement. Under the plaintiffs' proposal, they will receive a zero allocation. In a dry year, their base allocation is 30 percent. Under the plaintiffs' proposal, they again will receive zero allocation. No water under the plaintiffs' proposal.

The US Fish & Wildlife Service matrix actions are a bit better, but still very severe. Instead of a base supply of 55 percent in an average year, their deliveries will be reduced to 20 to 40 percent. In a dry year, under the Fish & Wildlife proposal, deliveries would be reduced to five to 25 percent of the contract entitlement.

Under the DWR revised proposal, in an average year, from the base of 55 percent contract entitlement, they will receive 25 to 45 percent. And in a dry year, 20 to 30 percent of their contract supply. And these figures, Your Honor, are set forth in San Luis Exhibit I at paragraphs 9 and 10 and San Luis Exhibit J at paragraphs 7.

For municipal and industrial contractors, CVP

contractors south of the Delta, in an average they would go from a base supply of 80 percent to a 50 percent supply under the plaintiffs' proposal. And the same number for a dry year. And that, Your Honor, can be found in San Luis Exhibit J in paragraphs 5 and 7.

The declarations of Russ Freeman, Westlands Water District, San Luis Exhibit L; William Harrison, San Luis Exhibit M; and Daniel Nelson, San Luis Exhibit K, translate those shortages into the fiscal impacts within the CVP service area.

Mr. Freeman's declaration describes how the loss of CVP water within Westlands would affect the lands within Westlands. As he explains, it would be a much increased reliance on groundwater with risk of subsidence, land will be fallowed, with all the consequent impacts, including dust emissions.

Mr. Harrison's declaration describes the impacts in the Del Puerto Water District. As he describes, there are 23,000 acres of row crops within his district. Under plaintiffs' proposal and zero allocation, there will be no water for that land.

Finally, Mr. Nelson, who was executive director of the San Luis and Delta-Mendota Water Authority declares that similar impacts will be felt throughout the remaining service, ag service districts.

There's municipal industrial impacts which are described in declaration of Joan Maher, the State Water Contractors exhibit. In a word, Your Honor, the impacts of plaintiffs' proposals in particular would be brutal within the CVP service area. The other measures are not much better. And again, pose severe, severe shortages.

I'll briefly address the measures to limit entrainment at the project pumps. There's been lots of debate about what the levels reverse flows should be allowed. In all the analyses, though, one important factor was left out. Both in the analyses by the DWR and the analysis put forth by the plaintiffs by Dr. Pete Smith. That is none of those analyses considered abundance in their calculations. And accordingly, they overstate the effect of reverse flows on salvage.

With respect to action number ten, in the plaintiffs' proposal, fall outflow requirement, Dr. Miller did what we think is a very practical and sensible analysis, which is to ask whether in past years of high fall outflow more delta smelt were produced.

So he analyzed whether, in those high outflow years, the fall midwater trawl index went up, either within the same year or in the subsequent year. And the answer is no. There's no relationship. And that's in San Luis Exhibit F.

And I won't respond further to counsel's comments about Dr. Miller other than to say to his analogy, tomatoes do

not eat gloves.

There's uncertainty under all of these proposals. If anything characterizes the basis for these actions, it is uncertainty. There is no quantification of the benefit that each measure will provide in terms of increased abundance of delta smelt. There's been no comparison, even, of what the abundance will be with and without the measures.

Plaintiffs at least say no one can estimate how many delta smelt there are or how many there need to be to ensure their long-term survival.

I disagree with counsel that this case is like TVA versus Hill. It is not anything like TVA versus Hill. In that case, it was undisputed that completion of the dam would cause the extinction of the snail dart.

Here, what the projects are, what the benefits of their proposed measures will be are very much in dispute and very uncertain.

The Court asks about vacatur of the Biological Opinion. We would urge the Court not to vacate the Biological Opinion. The Court has concern about the incidental take statement in that Biological Opinion, that it's outdated, that it doesn't reflect current abundance levels.

Our suggestion would be that in its order of remand without vacatur, the Court could set a time for the Fish & Wildlife Service to develop a new incidental take statement.

There is some time to do that before take would occur again as a result of project operations.

THE COURT: Let me ask Mr. Maysonett. Is that feasible?

MR. MAYSONETT: Your Honor, an incidental take statement is written as part of the Biological Opinion. It's an issue that the service is going to be developing as it develops a new Biological Opinion. Until the analysis, the opinion is complete, I don't know that it makes sense to require the service to write a separate interim incidental take statement.

THE COURT: Thank you. You may proceed, Mr. O'Hanlon.

MR. O'HANLON: Thank you, Your Honor. Plaintiffs' counsel said that the federal government has the burden of proof here. I disagree. The cases that plaintiffs cite all involve circumstances where the action agency was found to be in violation of its obligations under Section 7(a)(2) as the Thomas v Peterson case and the Washington Toxics case.

This Court in its summary judgment ruling did not find that reclamation is in violation of its obligations under Section 7(a)(2). Those cases are inapposite. The burden is on the plaintiffs and it is their burden to prove that the Bureau of Reclamation's assessment of its obligations are arbitrary and capricious.

With respect to a remedy proposal, Your Honor, I cannot in good conscience endorse on behalf of my clients any of the remedy proposals currently before the Court.

As the Court knows, we do not believe that the projects are the cause of the decline of the delta smelt, including particularly the recent decline since 1999. We do not believe that imposing further restrictions on the projects will provide any benefit to the delta smelt. However, those measures will impose severe impacts as I described.

Your Honor, this phase of the case is certainly not the end of this case. No doubt there will be further consideration of what is causing the decline of the delta smelt and what is necessary to address that. Every biologist that came before the Court agreed that the decline of the delta smelt has many causes. Invasive species, toxics, food limitations, in-Delta diversions, there's a lengthy list.

But repeatedly, and for years, all of the focus has been on the projects. The measures imposed on the projects benefit the smelt and look where that what has gotten us. Look where that has gotten the delta smelt. Look where that has gotten those who depend on the projects for their water supply.

What must happen is that the same focus that has been put on the projects must be brought to bear on the other factors that are affecting the delta smelt. And we will

continue to advocate for that. And we may come to this Court at a later time for assistance with that. Thank you, Your Honor.

THE COURT: Nobody has commented on Dr. Miller's suggestion that the food supply be studied. Seems to me like that's an excellent selection. I don't know why you wouldn't do it, but there apparently is no discussion of it. His proposal that a preserve be established with a million here and a million there sounded a little ambitious to a non-biologist. And so I'm not clear whether that would be feasible or not feasible. But certainly there are more issues to look at.

MR. O'HANLON: Yes, there are, Your Honor.

THE COURT: Thank you, Mr. O'Hanlon.

Mr. Buckley, now is your time.

MR. BUCKLEY: Thank you, Your Honor. Your Honor, particularly given the lateness of the hour, I appreciate the opportunity to address the Court. I'd like to start off by making three very basic points and then expand a bit.

First of all, based on the evidence presented by Dr. Miller, and we think worked on by others, we don't believe that any restrictions on pumping, even a total shut down of the projects, is going to make a difference in the long run for the delta smelt.

We do not believe that the projects are appreciably

increasing jeopardy to the survival of the delta smelt. Which we believe is the issue. We believe that the fate of the delta smelt is going to be determined by how other factors are resolved, particularly the food supply factor to which Your Honor alluded a moment ago. However, Your Honor has indicated an intention to implement a remedy.

THE COURT: Well, I'll tell you why. How can it be denied that the Old and Middle River flows, reverse flows don't have an impact on the smelt and don't move the fish to their extinction or at least extinguishment. I'm not talking about the species. That I think is indisputably established by the evidence. There isn't anybody who says that doesn't happen.

MR. BUCKLEY: Well, Your Honor, I think there's a distinction. I don't think anybody said that fish are not entrained at the pumps. And I didn't hear anybody say that the flow problem at Old and Middle Rivers doesn't have an impact on that.

The real question, however, is whether, even if entrainment occurs, it has any effect at the end of the day on the abundance of the species. And we think --

THE COURT: Oh, I heard Dr. Hanson say that you would take a quarter of the population that's in the central Delta in its migratory phase and essentially push it into the south Delta where we know it's either going to die or be salvaged.

MR. BUCKLEY: But the -- but when you analyze the question whether the abundance of the smelt has been affected by any of these things, X2, outflows, entrainment, the exports generally, the answer is always no.

And Dr. Miller is not an outlier, he's not a crack pot. He's not somebody who is rounded up to come in here and make these representations. Other people, as he testified, have tried to make the same correlation, have tried to determine whether any of these factors have an effect on abundance and nobody has been able to do it.

And our position basically is that given all of the correlations that have been done, even when -- even when the smelt were close to the pumps, Dr. Miller took the worst years, the years when it could be established that the smelt were closest to the pumps, and looked for an impact on the abundance of the species as measured by the fall midwater trawl and found nothing.

So, you know, our view is that regardless of the extent of entrainment, the problem with the species is not being affected -- that the well being of the species is not being affected at the end of the day by the projects, but by other things.

The -- let me just move on and make my second point because I'd like to kind of get back to the cause issue. You asked, I think, each of us to come to a view as to whether we

would support a remedy or had a view on a remedy and what our view was. Speaking for the Farm Bureau, and understanding that Your Honor intends to implement a remedy, we -- and understanding the impact that any remedy the Court enters is going to have, as just described by Mr. O'Hanlon, we would support the remedy that has been proposed by the Fish & Wildlife Service as amended by the suggestions made by the Department of Water Resources.

Understanding that Your Honor is going to enter a remedy, implement a remedy, we believe that that's a remedy that is overly protective, particularly given our view that the projects are not, at the end of the day, going to affect the well being of the species one way or the other. And also given the tremendous --

THE COURT: You understand the doctrine of contributing cause?

MR. BUCKLEY: I do, Your Honor, but the question is --

THE COURT: Tort law. And you're telling me, as Mr. O'Hanlon did, that the operation of the projects are not a cause?

MR. BUCKLEY: I'm telling Your Honor that my -- our view is that the operation of the projects is not appreciably increasing the jeopardy to the survival of the species, that's right. And we do not see any evidence that that's the case.

Everybody who's looked for evidence that that's the case has failed to find it.

There's no question that fish are dying at the pumps. There's no question that we don't have an accurate count of that. There's no question that the fish dying are not just sub-adults and adults, but also juveniles who are so small that they can't be found and measured. But at the end of the day, every analysis aimed at finding an impact on --

THE COURT: We had the analysis by Dr. Miller, but we may have been in different courtrooms.

MR. BUCKLEY: Well, but, Your Honor, Dr. Miller testified he's not the only one who's tried to do this. He mentioned other people. He mentioned Dr. Manly, who's one of the foremost statisticians, ecological statisticians in the world. He mentioned Dr. Kimmerer, who hasn't appeared in this courtroom on behalf of anyone.

It's not Dr. Miller alone who has made an effort to find the correlation between the project and abundance. And the testified he looked every way he could. He used every analytic technique he could think of, he used every combination of years he could think of and he couldn't find anything. And he said -- he testified that other people have made the same effort he's made and no one has been successful.

THE COURT: There's one last point I'm going to make. I'm not arguing with you, but I want you to understand. You

aren't the only parties here. The party who has responsibility under the law of protecting the species is here. That's the federal government through its Department of Interior and the action agency, the Bureau of Reclamation.

And what I do see and what the evidence does show the Court is that there is more to be done than they are doing. Now, that doesn't have anything to do with you, but it does impact you. And the impacts are extreme and severe. There's no question about it.

MR. BUCKLEY: Well, I think a question that has been addressed at considerable length here is whether the projects are doing enough. And I've sat now through at least two hearings and listened to Your Honor, and I think I know what's concerning the Court.

The concern is whether the Bureau of Reclamation is going to do what it's supposed to do. Whether when certain triggers are reached, indicating that there may be a problem at the pumps, the Bureau of Reclamation is going to take the action its own triggers, if you will, indicate it should take or whether it's going it rationalize away somehow the need to do that. Whether it's in the interest of exports or for some other reason.

I think that was probably what bothered Your Honor with the DSRAM process. It was too discretionary and Your Honor was concerned that there was some evidence in the record

that it wasn't being used in an objective way to protect the species.

And so I think I understand where you're coming from and I do understand that you intend to implement a remedy.

THE COURT: I'm not being facetious because I have the utmost respect for Mr. Milligan and I very much appreciated his testimony and I learned a lot from his testimony. But in a way it does sound like DSWG, those are the scientists, they meet, they study, they recommend, the WOMT then looks at it, it's complicated, there are so many competing issues, they're impossible decisions to be made, so then it goes to the department heads or the agency heads and, again, I'm not being disrespectful, sounds to me like the agency heads get on planes and head to Washington. And here we are.

MR. BUCKLEY: I recognize that, Your Honor. And I think I would expect that Your Honor is considering some ways of dealing with that. Time limits, other ways of strengthening the process so that an objective result is reached in the interest of the species. The problem is that if you hardwire a solution which doesn't allow for the dynamics in the system and the permutation and combinations of things that can happen --

THE COURT: I'm going to be getting to this, but the law doesn't permit me to hardwire anything.

MR. BUCKLEY: I agree, Your Honor.

THE COURT: I can't interfere with the agency's discretions, I can't run the projects. I suppose in a theoretical sense I can tell them what to do. But that's neither my inclination nor what the law provides for.

MR. BUCKLEY: I recognize that, Your Honor, and I agree with that.

Let me just sum up my discussion of the causation point by saying that, as I might have said a moment ago, given all the work that's been done to determine whether the projects have an impact on the abundance of the species, you would expect that somehow somebody somewhere would have found a correlation between any of these projects involving the factors of the abundance of the species. And that really hasn't happened.

I'd like to turn to one other thing. And that is -- well, if is isn't the projects, what is it? And Your Honor, I think heard Dr. Miller yesterday and alluded to the food problem today. And I'd like to touch on that briefly. We know, not because of any statistical analyses really but because of data collected that species have transformed the Delta's ecosystem.

As Dr. Miller testified yesterday, if you ran a net through the Delta's waters, 95 percent of the fish you catch are alien species. We know that the summer abundance of the

zooplankton Eurytemora crashed in or about 1986 coincident with the arrival of two clams, Corbula and Corbicula, which Your Honor has heard a great deal, fresh water clam and salt water clam. Why did this crash occur? Because these clams eat zooplankton, including Eurytemora. We know that Eurytemora was replaced when it crashed in 1986 by another zooplankton, Pseudodiaptomus, which is an alien.

THE COURT: And two more species that we heard about in the rebuttal testimony from Dr. Swanson, not mentioned by anybody. So I think on that score that that's an uphill --

MR. BUCKLEY: Well, I want to get to that, Your Honor, let me deal with it right now. Dr. Miller did testify yesterday that he -- the reason he chose those two species to study was because he talked to a lot of biologists and was told that those two species were the principle food source for the -- for the delta smelt. And so he used them. He wasn't told that Limnolthona was a principle food source, he was told that Eurytemora and Pseudodiaptomus were. So those were the species he used.

Furthermore, Dr. Swanson's testimony to the effect that there are other species, there are other species of zooplankton that the delta smelt eats doesn't explain away the very tight, almost overwhelming correlations that have been developed with respect to the abundance of the delta smelt and the abundance of those two species. It's an unbelievable fit.

It has an R-squared of way over 80 percent.

So you can say, well, there are other -- there are other things that the fish eat. But when you look at it, when you statistically analyze it, you see a clear relationship between the abundance of those two zooplankton species and the abundance of the delta smelt.

We think that Dr. Miller has established a very powerful correlation between those factors. It's a correlation that leaves less than a one in 25,000 likelihood that the correlation was achieved by chance. He did the same thing with longfin smelt and achieved an even tighter correlation. And I would add that I think, as Dr. Miller testified in response to the questions from the Court yesterday, it's not as though he's totally out there a voice in the wilderness. He was the first person to get on this. But in recent months, I think it would be fair to say, that this finding is achieving traction and it's starting to be discussed.

Dr. Moyle, for example, testified on the first day of the proceedings, and I refer Your Honor to page 61 of the transcript of the first day, that he agreed that inadequate food supply was a cause of the decline in delta smelt abundance. Dr. Miller established that it wasn't just a cause, it was the overwhelming cause. We -- I'm sorry, Your Honor, go ahead.

THE COURT: I'm not meaning to be inattentive, but even with my questions, you're way beyond seven minutes that you had --

MR. BUCKLEY: All right. Your Honor, I'll just sum up by saying that I recognize the projects are essentially the only knob you have to turn. But in view of -- at least in our view, that the projects --

THE COURT: Let me ask you one rhetorical question.

MR. BUCKLEY: Yes.

THE COURT: Why is it, do you suppose, that given what we're facing here, the consequences for everybody, that the action agencies, both the state and the federal, didn't essentially come in and say it's the food supply? It's other causes, it has nothing to do with our projects and we cannot be accountable for this. They didn't do it.

MR. BUCKLEY: I think if I were asked that question, Your Honor, on direct examination, I'd probably -- or somebody would probably object to it because I'd be getting into the minds of the government. I don't know the answer to that question. But --

THE COURT: Well, there is something you could draw an inference by, but I think we're out of time to do it.

MR. BUCKLEY: I would just ask, Your Honor, in turning the knob I know you intend to turn, you take into account the significant impacts that will result.

THE COURT: Thank you very much, Mr. Buckley.

MR. BUCKLEY: Thank you, Your Honor.

THE COURT: Mr. Wall, are you going to reply?

MR. WALL: Hit a few key points very quickly.

First, Your Honor, the defendants have tended to agglomerate the Fish & Wildlife action three and four. They're very different. Action four is a process. It doesn't have any hard sideboards on flow.

Second, when asked, the operator, Mr. Milligan said this morning that ultimately the operators, he means the bureau, had the final say on how to implement or whether to implement proposals.

Third, Dr. Swanson's tier one measure has as its apparent basis particle tracking modeling. Tier one is supposed to protect adult smelt. Adult smelt do not behave like particles. Of course, his Particle Tracking Modeling has never been presented even at a scientific form let alone published. So I'm hard pressed to understand counsel's criticism of Dr. Swanson's reliance on Dr. Bennett's research.

Fourth, Dr. Hanson has proposed a rather wide range in his declaration of minus 1,000 to minus 6,000. But at trial, he said in light of the new evidence about the abundance of delta smelt, he would recommend operating at the low end of that range.

He says, and this is at page 100 of the 8-29

transcript, "With the lower number of delta smelt in the population, it would strongly urge that more protective actions, hence operating at the lower ends of the ranges Old and Middle River flows, would be an appropriate action in the event that there's evidence that delta smelt are at risk of salvage mortality."

And of course that's when he's implementing his tier two, when there's risk of salvage mortality. He is testifying -- he does it again at page 149, that he thinks you need to operate at the low end of this range. Well, Dr. Swanson's proposal is at the end low end of the range. Minus 6,000 cfs is not.

THE COURT: Where is his low end?

MR. WALL: Minus 1,000. You know, he would have been somewhere closer to minus 1,000 than minus 6,000, I suppose.

With respect to the Feyrer article, I think this has been repeatedly mischaracterized. They did find a relationship between habitat quality and delta smelt abundance. They found that one complement of habitat quality, salinity, accounted for 19 percent of delta smelt abundance.

There is this caveat at the end, it says, "For the water quality data to be most effective for species management, additional information is needed to better define the mechanisms for the effects of water quality variables on aquatic organisms."

But nonetheless, they found this relationship and we know that improved habitat improves the opportunities for delta smelt to survive. There is no dispute about that.

There was a question about the US Fish & Wildlife Service's acceptance of the proposed modifications before the DWR and I do not know the government's position. But I would refer the Court to Ms. Goude's testimony, both in her declaration and at trial, where she says that the various actions identified in her proposal are expected to provide the minimum in protective actions necessary to protect delta smelt.

She said that in her August 3rd declaration at paragraph 9 and she said that again in her August 23rd declaration -- or testimony at page 220.

If the Fish & Wildlife Service were now to conclude that these proposals were not the minimum action based on the few minutes of hallway consultation, I would submit it's the world's faster Section 7 consultation and directly inconsistent with her prior testimony, sworn testimony to this Court.

There is also some discussion of the Delta Smelt Working Group rejection of a fall action. The Delta Smelt Working Group looked at a fall action that had a lower flow level than Dr. Swanson's and found that it would not move the salinity point out far enough. Dr. Swanson took that into

account and proposed a higher outflow level that would move the salinity point out far enough.

Lastly, I want to just address the issue of protection of salmon very quickly. There has been no calculation that the available water supply at the different reservoirs, including New Melones, which is over its historic average, is insufficient to protect salmon if these measures are implemented.

I'm sure the Court is aware that my clients are also interested in protection of salmon. We would not be proposing this measure if we had any reason to believe that it would harm that species.

That's it, Your Honor. Thank you.

THE COURT: Thank you very much, Mr. Wall. Mr. Maysonett.

MR. MAYSONETT: Your Honor, I have an answer to the question you posed to the federal defendants before about whether or not the federal defendants accept the modifications to the service's matrix.

THE COURT: Yes.

MR. MAYSONETT: Your Honor, short answer is no. The slightly longer answer is that, you know, the proposed changes, Your Honor, would be this movement from -- I'm looking at DWR Exhibit L, in action two from negative 4500 to negative 5500 and then, in action three, from a floor of zero

to a floor of negative 1500.

THE COURT: All right. Thank you very much.

MR. MAYSONETT: And I would just say, Your Honor, that, well, the short answer is no. The long answer is that the service's proposal is grounded in the other assumptions that are set out in the service's proposal. For example, use of a 14-day running average and the process for setting this level is described in the attachments. I think those to some degree address some of the concerns with those lower flow levels. If these numbers were taken out of this proposal, the service's -- the position of the federal defendants might change.

THE COURT: Thank you very much, Mr. Maysonett.

Is the matter submitted?

MR. WILKINSON: Yes, Your Honor.

MR. WALL: Yes, Your Honor.

MR. LEE: Yes, Your Honor.

MR. O'HANLON: Yes, Your Honor.

MR. MAYSONETT: Yes, Your Honor.

THE COURT: All right. I'm going to start by reviewing the law that applies in this proceeding. And as I have said, based on the recent amendment by way of supplement to the complaint, we have action that is alleged to be unlawful or omission by an agency of the United States, the DWR. I'm sorry, the Bureau of Reclamation as well as the

Department of the Interior. That the way in which the Central Valley Project is being operated is both presenting present jeopardy to the survival and recovery of the species and that it is also impairing the critical habitat of the species.

And the ESA prohibits agency action that is likely to jeopardize a continued existence of any listed species, and in this case, the delta smelt is listed as a threatened species. And the regulations, that's 16 United States Code, Section 1536(a)(2) referred to as Section 7 of the ESA, 7(a)(2) violation.

And the regulations that are at 50 CFR, Section 402.02 provide that this law prohibits any agency action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild.

The word "jeopardize" or "jeopardy" as it is used in the act means to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction numbers or distribution of that species.

The complaint also sought and a summary judgment in the case has been entered that essentially found the 2004/2005 Biological Opinion that covered the operation of the OCAP for the, if you will, day-to-day running of these coordinated

projects and operations of the State Water Project and the Central Valley Project. That finding was that the Biological Opinion was unlawful, arbitrary and capricious for the reasons that are stated and they don't need to be stated now because that has already been decided.

The further finding was that the decision of, in addition to the Biological Opinion, that the remedial action measures that had been adopted as part of that decision and belated actions and also a take limit that has been established as required by the Endangered Species Act was also invalid.

After those findings, the Court set, in consultation with the parties, this evidentiary hearing, which has now consumed eight full court days, to determine what remedies, if any, should be imposed by the Court to address the unlawful actions by the Department of the Interior and the Bureau of Reclamation, the latter is the action agency.

The State Department of Water Resources, which is a coordinated operator of the State Water Project, which is operated in tandem and cooperatively with the federal project and, as the parties all know, the federal project has state permits for its water entitlements that are used to perform its operations both of water service, that is performed under contract to water districts, who in turn have members who contract for water.

And we have constituencies here, not only San Luis and Delta-Mendota Water Authority, Westlands Water District, Del Puerto Water District, Glenn-Colusa Irrigation District.

We have the State Water Contractors, who include not only contracting districts, but also municipal and industrial agencies who provide water service that isn't for agricultural purposes. It is for municipal purposes.

And additional to those parties are the Farm Bureau, who we have just heard from.

In addressing the remedial approach to the case, the plaintiffs have sought initially for the invalidation of the Biological Opinion and a vacatur of the take standards and all aspects of the Biological Opinion. Today in argument, they offered that if -- and I interpret the offer as a conditional offer, the condition being that if the Court were to pronounce and apply the remedies that are in the revised recommended interim protection actions for delta smelt that Dr. Swanson has authored, if all of those are adopted as a remedy in the case pending the reconsultation, remand and, if you will, the correction and/or repromulgation of a lawful Biological Opinion, that that would be acceptable to the plaintiffs.

The federal defendants have, after taking the initial position that there was no entitlement to relief because there were no violations of law, they haven't waived those positions, say that if there are remedies to be imposed, that

for all the reasons that have been stated by their witnesses, primarily Cay Goude, that the five featured action matrix should be pronounced by the Court to be a remedy that is to be operative in the interim period between today and the time that a lawful Biological Opinion is issued concerning the OCAP for the Central Valley Project and the State Water Project.

The Department of Water Resources, as intervenor, essentially for the reasons stated by Mr. Lee, agrees with the proposed action matrix of the Fish & Wildlife Service and would modify to make, if you will, less stringent the flow or water consumption requirements.

The State Water Contractors, without waiving their position that the original BiOp was lawful and that no remedies are needed, have proposed an alternative three-tiered remedial approach. And they do not agree with the Fish & Wildlife Service, I'm just going to call it the federal defendants' proposed remedy and/or the modification to that remedy proposed by the Department of Water Resources.

The Delta-Mendota Water Authority and Westlands Water District intervenors, one, do not believe the BiOp is unlawful, have not waived that position. They, joined by the Farm Bureau, take the essential position that the evidence in this proceeding, through Dr. Miller's testimony, has established that there are a number of causes for the decline of the delta smelt, including but not limited to toxicity,

predation, the disappearance or reduction of the food supply caused in material part by the invasion of alien species, primarily two types of clam that filter the planktonic organisms that are the food supply to the smelt, among others.

They also believe that in-Delta actions by other diverters, who are not under the direct control or operation of either the state agencies and meteorological conditions, such as storms, winds, temperature changes and the like, all have effects on the movement, the existence, the location and the health of the species.

And so the San Luis and Westlands defendants agree to nothing and essentially do not support any remedy. They say there should be no remedy because the projects have no causal relation that is significant to any of the problems the smelt is now encountering or has encountered.

The Farm Bureau takes the same position, but arguendo, if a remedy is going to be imposed, support the federal defendants' five point action matrix as modified by the Department of Water Resource proposals.

This case is also brought under Title 5 United States Code, Section 702, et seq. United States Administrative Procedure Act and it addresses action by an agency of the United States that is arbitrary, capricious or unlawful, which requires the intervention of Court to make such a finding.

And Mr. Wall was very accurate in his recitation of

the law. It is not the function nor necessarily the jurisdictional authority. It might be the prerogative, but in the eyes of this Court, deference is required by law to an agency that has the expertise, the competence and the legal charge that is essentially invested by the elected representatives of the people who make the laws and then charge experts in the executive branch to carry out the functions of the agency, here the operation of the projects.

And so a judge, who is neither a scientist, a biologist, an administrator or elected by the people, ordinarily is confined to determining the legality of actions and, if necessary, and appropriate -- and here, I take it that because of the alternative positions that are taken by the governments, and I'm more concerned with that of the federal defendants because by their consent and waiver of any Eleventh Amendment immunity, the state is here, they have acquiesced to the jurisdiction and authority of the Court, there by removing the jurisdictional objection.

My understanding is that by the position that the United States has taken, they are in effect impliedly, if not expressly consenting to the imposition of a remedy, particularly one without waiving their legal position as to the propriety and legality of their actions as to the BiOp.

And also with respect to any finding on the issues of remand, vacatur and the status of the take limits, as I

understand the government position, their preference is to consent to a remedy rather than face a remand with vacatur where there will be no effective Biological Opinion or take limits.

And we have looked for some time now at the law and we have asked the parties to provide the law, and no party has provided the law that says that the 1995 Biological Opinion, which has obviously been superseded by the government's 2004/2005 BiOp. The Court has no understanding that it would have the authority to, if you will, resurrect what is a superseded and obviously outdated, and, if the current one is unlawful, it has to be more unlawful than the current BiOp, recognizing that the take limits in the '95 BiOp were 55,227 up to 224,409 delta smelt per year in a dry year.

The current incidental take limit was 70,500 and, as the parties all know, nobody knows what the population of the species is, but the '05 BiOp could approach it and the '95 take limit very well could exceed it.

We have uncontradicted testimony of some experts on the plaintiff side, Dr. Swanson, Ms. Goude, Dr. Hanson, even Dr. Miller told us that the species is in a critical state. It could become extinct within a year and it could become extinct if everything that anybody's asked for here was implemented, it could still become extinct if we put all these measures into effect.

It appears to the Court, based on the facts most of which have been discussed by counsel, that the most responsible and the most prudent decision is -- and there's no question that the BiOp has to be remanded and consultation has been reinitiated for repromulgation in lawful form. And so that is one of the remedies that the Court is going to order.

The next issue is whether the BiOp is remanded with or without vacatur. And that then presents the Court with the question do we leave the status quo, because the temporary restraining order in this case was not granted and the voluntary pumping cessation, or reduction would be the better description, ended in June.

Do we leave the status quo where the agency is left to manage the projects without any intervention by the Court or does the Court impose, with the express or implied consent of the action agencies, remedies that will address the Section 7(a) issues of the jeopardy to the species, its survival and recovery, and the impairment or alteration of its critical habitat.

And in looking at this question, I asked the parties to consult among themselves and to determine if there was a result they could reach that we could all be proud of. And that effort apparently has not been one that has come to fruition.

And so it devolves to the Court to determine what the

result should be now with regard to the issue of vacatur or non-vacatur. And in the final analysis, the Court is persuaded by science, which it must be, because the law requires that the best available science be brought to bear on the issues that are presented.

As the Court noted and the plaintiffs in their brief on remedies repeated, the law doesn't give the Court a choice. If the Court sees that agency action or inaction not only threatens, but doesn't have to bring it to extinction, but has that potential, then the law requires intervention. There must be action taken by the Court.

In this case, given the history, which I have alluded to earlier, that the approach the agencies were taking and here the Court believes that the evidence shows that the Department of Water Resources of the state essentially deferred to the Bureau of Reclamation and Department of the Interior for it to implement the delta smelt Recovery Action Plan and the Delta Smelt Working Group, Water Operations Management Team and the agency heads have certainly addressed, they have spent time on and they have endeavored to remediate the present jeopardy which has been defined as critical.

And that was agreed to by the operator, Mr. Milligan, as well as the scientists. And that effort, all those efforts, have been unsuccessful because we see continuing declines and every survey that comes in that we have been

furnished in the last two years so shows that the condition of the species is worsening.

And so contrary to -- and I do think it is a selective study that was done by Dr. Miller. I'm not criticizing his competence, his ability or the application of his science as an engineer or water engineer, or Dr. Manly's competence or renown as an ecological statistician. But as has been indicated, the correlative studies that were undertaken by those experts certainly provide a major issue about cause. But I think that the answer I got from Mr. Buckley is telling. The law recognizes concurrent causes, even though it's a doctrine that has its origins in the law of torts.

But here the Court can't find that the sole cause is the food supply and that the absence of a statistical correlation in the studies that Dr. Miller performed explains the jeopardy of the species when there is indisputable evidence of entrainment, of salvage, the pumps grind these fish up. That's caused by, in some cases, the natural migration of the fishes, it's caused by flow conditions in the central Delta at the confluence of the Sacramento and San Joaquin Rivers, it's caused going east from there, going north from there, going south from there, and those are to the south and into the Clifton Court Forebay areas of hazard.

And the evidence is uncontradicted. There isn't any

question about it, that these project operations move the fish. Of course we don't know how many. But the fact is it happens. And the law says that something has to be done about it by the action agency.

Now, the Court from that concludes that it is under a legal duty to provide a remedy. And if it is in the form of an injunction, there would be two standards, the traditional injunctive relief standard and the ESA standard.

The traditional standard looks at the likelihood of success on the merits, it balances hardships, it looks at the public interest; and the ESA standard essentially evaluates the threat of harm to the species and discounts hardships of an economic or other nature, except for human health and safety.

And the Court recognizes that, as I said earlier today, that that isn't just emergency water supplies for schools, for hospitals, for fire departments. That can include the absence of water if the supplies to contractors are zero and land is fallowed, subsidence from groundwater pumping which contributes to the fallowing or the absence of water creates air pollution conditions. Those are threats to human health and the environment, just as the absence of emergency water service is.

How this is going to be accomplished is something that the Court cannot prescribe. Because the law doesn't

permit it. I'm not going to tell the Bureau of Reclamation how to run its agency, how its scientists should think, what conclusions they should reach, what recommendations they should make or how they should be implemented. But I do have proposals that the parties are offering, and I'm going to use those proposals they are offering to do the best in what the Court views as an impossible situation.

In one of these water cases that have been going on for over 30 years in the Eastern District of California involving water supplies to the Central San Joaquin Valley and the Sacramento and central Delta areas, and most of the agencies that are involved in this litigation, Judge Trottin, in one of the decisions said -- this was in the drainage case -- that sometimes problems are so intractable, they're so difficult that they're beyond the competence of the judiciary, they are matters that need to be left to the legislative branch for the legislature to address.

Well, it would be very nice if I could do that. But I can't. Because the law requires otherwise. And I am going to formulate an order and I am going to need the assistance of the parties with this -- to not vacate the 2005 Biological Opinion, but I am going to put into effect a preliminary injunction.

And I recognize the difference between a mandatory injunction and the law's preference for a prohibitory

injunction. And therefore I'm going it to phrase my injunctive relief in prohibitory terms. I'm not playing a game here in trying to exalt form over substance, but rather I'm trying to comply with the law.

And the Court is going to order that Bureau of Reclamation and the State Department of Water Resources take no actions that are inconsistent with or that violate the following remedial prescriptives.

First, there will be year round monitoring actions that fully implement all current surveys that are being conducted for the delta smelt, which will include but not be limited to the Spring Kodiak survey, the 20 millimeter survey, the Summer Townet Survey and the fall MWT.

There was a proposal in what is the second remedial action which would increase the frequency of sampling for entrained fish at the CVP protective facilities to a minimum of 25 percent of the time, which is a minimum of a 15-minute count per hour.

I'm going to also include within that, the measure that was proposed by Dr. Swanson that steps be taken to evaluate presence and condition of larval or juvenile delta smelt that are in the sub-20 millimeter size range, recognizing that there are difficulties in doing that. But as the Court understood it, it's entirely feasible based upon the type of seine or net the interval that would be within the

physical test device itself.

I do recognize that at least two of the experts said that any sampling could be further jeopardizing to the species. But it appears that all parties, with the exception of the San Luis and Delta-Mendota parties, agree that sampling needs to continue and that it is feasible.

The trigger for this that was proposed by the Fish & Wildlife Service was an increase in Delta outflow where the Sacramento River flow at Freeport reached 25,000 cfs or in the San Joaquin River more than 10 percent over a three-day average. And in the fall midwater trawl and/or Kodiak survey data on delta smelt, where fish are moving upstream of the confluence and into the Delta or by January 15th of the water year, whichever comes first.

The next remedial action that will be implemented is -- and I think that I have already in effect adopted action number three of the Fish & Wildlife Service, which was to implement a monitoring program for the protection of larval delta smelt with the trigger that is prescribed. I don't see any reason to modify or to, if you will, change that. And I should correct myself. I'm actually using, at this point, the plaintiffs' remedial actions.

As to the remedial action number three that is submitted by the Fish & Wildlife Service as proposed to be modified by the DWR, the parties can correct me if I'm wrong,

but an area of -- and Dr. Hanson spent a lot of time on this. For determining the upstream Old and Middle River flows, rather than adopting a zero cfs as the lower range of that, I remember a lot of discussion about a negative 750 to a negative 2250 range. I recognize that this was not necessarily addressing only larval and juvenile smelt, but the Court is going to adopt the low end of that low range at -- for the third proposed action by the Fish & Wildlife Service at negative 750 to a negative 5,000 cubic feet per second. And the Court thinks that 6,000 is an acknowledged and undisputed area of jeopardy and recognizing that it's easier to -- less consumptive to achieve, the Court is concerned by what it believes are the legitimate reasons given by Dr. Swanson. And in the interest of time, I'm going to let the parties submit findings, which will document the reasons for these choices of remedies.

Now, the fifth action is the same as the plaintiffs' actions, which were, if I have them correctly, and the parties can help me here, was it six and seven where we have the head gates at the --

MR. ORR: Eight and nine, Your Honor.

MR. WALL: Plaintiffs' eight and nine.

THE COURT: Eight and nine. All right. Eight and nine are the same, I think, all the parties have acknowledged as Fish & Wildlife Service measure number five. So that would

be the next remedial.

If you want to do them as two, because I'm going to ask for the parties to prepare an order that is faithful to the decision that I am now announcing. So those remedies are going to be also prescribed.

Now, in turning to the plaintiffs' action number four and the triggers, the Court has determined that -- let me have one -- Mr. Maysonett, if you would repeat, please, the objection to plaintiffs' four so I have the basis for it. Or Mr. Lee, either one of you can do that. Mr. Lee was most specific about it. Do you want to address that right now, Mr. Lee?

MR. LEE: Number four, as I understand it, is designed to protect pre-spawning adults. I'm talking about revised number four set forth in plaintiffs' proposal contained in the August 13th, 2007.

THE COURT: That is correct.

MR. LEE: And that proposal would start out -- is multi-part, as I understand it. They would have a zero cfs requirement for a minimum ten days and then -- and then following that, there would be a requirement that would have Old and Middle River flows between 2750 and 4250 cfs.

We had objected to the zero flow because we did not believe there was any science in the record to support it. The zero flow, as I understand this requirement, is roughly of

the same nature as in action number one in US Fish & Wildlife Service measure. And that had a negative 2,000 cfs, which we believed science fully supported.

So we would have recommended that the Court adopt action number one for that time period for -- under the US Fish & Wildlife proposal.

As to the follow-on proposals, we submitted that, first of all, the five-day running average was inappropriate, it should be a 14-day running average or seven-day running average subject to some bans and constraints.

But most importantly, we were of the view that the range of flows was too narrow, that the flows should be, according to our view, not in excess of -- sorry, make sure I got right -- negative 5500 for a 14-day running average or negative 6,000 for a seven-day running average. As you can see, as the running average days get shorter, the band gets larger. As the running average days get longer, the band, the level of authorized exports, gets lower. So that was our proposal for the protection of pre-spawning adults.

And our objection to action number four is we did not believe it was supported by the regression analysis submitted to the Court which we discussed in closing argument. Is that clear?

THE COURT: That is clear. But you did have a proposal that covered in part this time period?

MR. LEE: Yes, we did, Your Honor. The two -- the two-part proposal, one would be action one in the US Fish & Wildlife Service proposal. The other would be a modification of action two of the US Fish & Wildlife proposal. And that modification would read -- and I would just look at action two and put in the State's modifications -- the daily net upstream Old and Middle River flow not to exceed 5500 cfs. The low will be a 14-day running average simultaneously, the seven-day running average will not exceed 6,000 cfs. That would be the proposal for this lifestage of the smelt, which is the pre-spawning adult smelt.

THE COURT: And the State Water Contractors have proposed that this start December 1st. I'm going to leave it at December 25th. I'm going to essentially reduce those flows from 6,000 on the seven-day running average to 5,000 cubic feet per second. And there was objection to the 14-day running average -- well, you had proposed a 14-day running average. Leave it at the seven-day running average and don't do a 14-day running average.

MR. LEE: So, in effect, Your Honor, you're adopting one-half of action two of the US Fish & Wildlife proposal? They have a 4500 cfs average for a 14-day running average and a 5,000 cfs for a 7-day running average. Are we abandoning the 4500 cfs.

THE COURT: What does it add?

MR. LEE: I'm sorry?
THE COURT: What does it add?
MR. LEE: I would probably defer to the US biologists. They are --
THE COURT: Do you know, Mr. Maysonett?
MR. MAYSONETT: Your Honor, my understanding is that the targets of 4500, negative 4500 negative flow in the Old and Middle River is 14-day average and that by -- the 14-day average, of course, allows certain ebbs and flows of the tides and the other influences that is hard for the projects to operate to eliminate entirely.
The seven-day average at negative 5,000 would help to limit the highs and lows a bit. So my understanding is that the two work in tandem to ensure that flow levels remain in certain -- within a certain range.
THE COURT: All right. Well, I'm going to order the prescription that I've just described. And if we have to adjust the language, we will.
As to action measure number ten. The Court is not persuaded that the evidence preponderates here to support this action. It was very well explained by Dr. Swanson. The justifications were very articulately presented. It does not appear to me that there is support necessarily in peer reviewed or analysis by others who are studying this issue.
The Court certainly recognizes that water quality and

the improvement of habitat has the potential to increase benefit to the species. But I am very impressed by the fact that the Delta Smelt Working Group, one or two of whom essentially were presented with this proposal in a different form, in a different context, but didn't support it.
And because of the material uncertainty that is described by reviewing scientists about the benefit at a very, very large commitment and a -- resource commitment, the Court does not believe that the evidence preponderates to justify this measure and therefore it will not be included in the remedies.
And so if I have it, then, we have those that I've just gone over. And I'll now invite the parties to -- action nine is the same as, I believe, five of the Government's Fish & Wildlife Services, that is to prohibit installation at the Head of Old River Barrier in connection with the triggers and the end of the actions. Those are agreed on. And the other management of the gates, which was, I'm going to indicate -- well, I don't see it.
I don't see, Mr. Orr, number six, that's implementing the Vernalis Adaptive Management Plan river flow and enhancement, I am going to order that as a prescriptive remedy.
And so I believe I have addressed the remedies that I intend be prescribed as part of the injunctive relief. If

anybody wants to address anything now that you believe has either been overlooked or not addressed, now is the time to do it.
MR. WALL: Your Honor, I have a couple of clarifying questions.
THE COURT: Yes.
MR. WALL: If I might. The first half of plaintiffs' four parallels the Fish & Wildlife Service one and I didn't hear if the Court was doing anything with that.
THE COURT: I'm adopting it.
MR. WALL: Fish & Wildlife Service one?
THE COURT: Yes.
MR. WALL: Okay. And the -- you were also adopting the plaintiffs' eight and nine, which are the same as plaintiffs' Fish & Wildlife Service five?
THE COURT: Yes. And six, that were agreed to by all the parties except Mr. O'Hanlon's clients.
MR. LEE: Your Honor, just for the clarity of the record, we did not agree to action six. The reason why we -- oh, let's see. The reason why we did not agree to it is because action six is basically the implementation of the Vernalis Adaptive Management Plan. And that is mandated already on the projects by water right decisions. We had noted in our, I believe it was cross examination, that this was unnecessary.

THE COURT: Well, it might be redundant, but out of an abundance of caution, we have it. Let's include it in the order.
MR. WALL: Your Honor, if I could, one other clarifying matter. The Fish & Wildlife Service had action four, which is post VAMP, and we had an action seven, which is post VAMP. Did the Court intend anything for the post VAMP period?
THE COURT: I thought that there was a -- let me have what the Fish & Wildlife Service's proposal was on post VAMP. It is number --
MR. WALL: Number -- Fish & Wildlife Service action four.
THE COURT: Four. I had ordered that. And I had not -- I modified it to take the low flow from zero to minus 750. Negative 750.
MR. LEE: Your Honor, it is my understanding that action four, in its original format with the US Fish & Wildlife Service, was intended to have flows similar to those in action three. And we've mentioned that in, I believe, footnote 1, was that not the case? Of attachment B. If the Court's view is that action four should simulate action three, then --
THE COURT: The flow levels would be the same.
MR. LEE: The flow levels would be the same. Is that

your desire?
THE COURT: That is what I was attempting to describe.
MR. WALL: So action three would be extended to last until the end of -- the end date for action four? Basically action three would continue on?
THE COURT: That is correct.
MR. WILKINSON: And Your Honor, those flows again were a range of negative 750 to negative 5,000; is that correct?
THE COURT: That is correct.
MR. LEE: Your Honor, mixing the two charts a little bit sometimes leaves me a little lost. We have certain end of action timings that are in the US Fish & Wildlife Service proposal, and they are clearly not identical to those that are in --
THE COURT: That is correct. And what I'm going to suggest that you do is that you now reduce to writing the orders that I have pronounced. The court reporter will provide you the transcript. I'd prefer for there to be a joint submission, but if you can't agree on it, then you can submit competing proposed orders. And I'll resolve any differences.
MR. LEE: All right.
THE COURT: All right? I intend for this injunctive

relief to be binding upon the United States Department of the Interior, its Bureau of Reclamation, the State Department of Water Resources, their agents, officers and employees and those acting for, under and in concert with them and anybody in those agencies who has actual notice of this order.
The order is to remain in effect pending entry of final judgment in this case or further order of the Court.
Is there anything further?
MR. LEE: Your Honor, I think we'd like to look at the transcripts and work on them.
THE COURT: You may. And the one other thing I'm going to do is I'm going to ask for the parties to submit proposed findings of fact and conclusions of law that support this judgment that I have pronounced.
MR. LEE: What time frame, sir, are you talking about?
THE COURT: It would be my preference that they obviously be joint. You give me a reasonable time frame. I think that there is concern that the order go into place. But because we will not be starting any of the remedies September 1st, we don't have that level of urgency.
MR. LEE: Okay.
THE COURT: So what is reasonable?
MR. LEE: May we consult just for a moment on the timing?

(Discussion among counsel, not reported.)
MR. LEE: Your Honor, I've had a chance to consult with the United States, with San Luis and Delta-Mendota, with the Farm Bureau and State Water Contractors, and given our delayed vacations, Your Honor, we would like 60 days to get the order -- get the findings of fact and conclusions of law and the orders to you. That should give us time to consult and see whether we can do something joint. If we can't, to prepare alternate orders and findings of facts.
THE COURT: What's the plaintiffs' timetable?
MS. POOLE: Your Honor, we would propose something much shorter than that. We were thinking more in the order of two weeks.
THE COURT: Well, the court reporter is going to need time to produce the transcript. And so she can give us her transcript estimate now, as to what time.
THE REPORTER: I'd need 30 days.
THE COURT: She needs 30 days to produce the transcript.
MS. POOLE: And Your Honor's order regarding the rough transcripts, you'd like us to rely on the finals.
THE COURT: I will if -- I think we should have a final official transcript for the preparation of the judgment. At least the remedial aspect of the judgment that has been announced today. And so, yes, let's do that. And my estimate

is that you at least need 20 days after you have the transcripts in hand. And so that would be 50 days.
For findings and fact and conclusions of law, there's going to have to be an official transcript. So let's make the period 50 days. When is that? October 22nd, 2007.
Is there anything further?
MR. LEE: That's fine with the date, Your Honor.
MS. POOLE: We very much appreciate --
MR. WILKINSON: Thank you, Your Honor.
MS. POOLE: -- the time and effort you've devoted to this, Your Honor.
THE COURT: Thank you very much. Thank the Court staff, please, they're the ones who have had to stay way, way past their hours of operation.
MR. LEE: Thank you.
THE COURT: Everybody have a good weekend. We will stand in recess.
MR. MAYSONETT: Thank you, Your Honor.
MR. WALL: Thank you, Your Honor.
MR. O'HANLON: Thank you, Your Honor.
MR. BUCKLEY: Thank you, Your Honor.
(Off the record.)
THE COURT: I'd should add that the Department of Water of Resources, the Bureau of Reclamation and the Department of the Interior shall be reserved the right on

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reasonable notice to deviate from the prescriptive remedies, if necessary to protect public health, safety and the human environment.

(The proceedings were concluded at 6:11 p.m.)

I, KAREN L. LOPEZ, Official Reporter, do hereby certify that the foregoing transcript as true and correct.

DATED:_____

_____
KAREN L. LOPEZ

Attachment 14-M

EXHIBIT 14

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UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF CALIFORNIA

NATURAL RESOURCES DEFENSE COUNCIL, CALIFORNIA TROUT, BAYKEEPER & ITS DELTAKEEPER CHAPTER, FRIENDS OF THE RIVER, and THE BAY INSTITUTE, all non-profit organizations,

Plaintiffs,

v.

DIRK KEMPTHORNE, in his official capacity as Secretary of the Interior, and H. DALE HALL, in his official capacity as Director of the U.S. Fish and Wildlife Service,

Defendants.

SAN LUIS & DELTA MENDOTA WATER AUTHORITY, WESTLANDS WATER DISTRICT, CALIFORNIA FARM BUREAU FEDERATION, GLENN-COLUSA IRRIGATION DISTRICT, et al., CALIFORNIA DEPARTMENT OF WATER RESOURCES, STATE WATER CONTRACTORS; and KERN COUNTY WATER AGENCY.

Intervenors/Defendants.

Case No.: 05-CV-01207 OWW LJO

DECLARATION OF KIRK C. RODGERS

I, Kirk C. Rodgers, declare as follows:

1. I am the Director of the United States Bureau of Reclamation (Reclamation), Mid-Pacific Region. In my capacity as Regional Director, I have overall responsibility for the various functions of the Mid-Pacific Region, which includes the operations of the Central Valley Project (CVP).

2. Reclamation understands that during the pendency of the reinitiated Section 7 consultations on ongoing CVP/State Water Project (SWP) operations that section 7(d) of the Endangered Species Act (ESA) applies to its actions.

3. As committed to in my declaration of July 13, 2006, Reclamation will not execute long term water service or repayment contracts with the CVP contractors listed in that declaration during the pendency of the Section 7 consultation on ongoing CVP/SWP.

4. As described in my declaration to this Court filed in October, 2006, Reclamation identified several longer term actions that were scheduled to reach approval or implementation during the pendency of the ongoing reinitiated Section 7 consultations. Reclamation will use the process outlined in that declaration to determine if approval or implementation of those actions remain appropriate in light of Reclamation's obligations under Section 7(d), however, Reclamation will not approve or implement the following actions analyzed in the 2005 Biological Opinion issued by the U.S. Fish and Wildlife Service: (1) South Delta Improvements Program, (2) Delta Mendota Canal/California Aqueduct Intertie Program, (3) Lower American River Flow Standards and (4) Long Term Environmental Water Account.

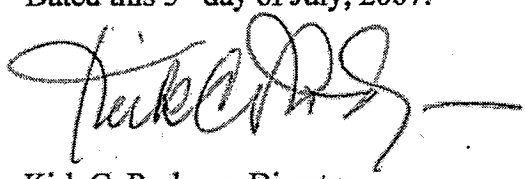
5. In my previous declaration submitted in October, 2006, Reclamation committed to operate Tracy Pumping Plant (now called Jones Pumping Plant) within existing historic levels as a 7(d) measure.

6. In my declaration submitted in October, 2006, Reclamation committed to using its authorities and available funding to implement additional measures during the pendency of the consultation. Reclamation did just that during May and June of this year to implement several actions aimed at reducing entrainment of delta smelt at Jones Pumping Plant. Reclamation held pumping to 850 cfs or one unit at Jones Pumping Plant for approximately three weeks at the end of the Vernalis Adaptive Management Plan pulse flow period. Additionally, Reclamation spent approximately $5.2 million to acquire

35,000 acre feet of water for release on San Joaquin River tributaries to supplement flows on the San Joaquin River and improve Old and Middle River flows. These actions have been explained to this Court in more detail in the declarations filed in this case by Ronald Milligan, Manager of the Central Valley Operations Office. Reclamation is committed to using the authority granted to Reclamation by Congress to take actions that are protective of delta smelt.

I declare under penalty of perjury under the laws of the State of California and the United States, that the foregoing is true and correct.

Dated this 5th day of July, 2007.



Kirk C. Rodgers, Director
Mid- Pacific Region, U.S. Bureau of Reclamation

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UNITED STATES DISTRICT COURT
EASTERN DISTRICT OF CALIFORNIA

PACIFIC COAST FEDERATION OF FISHERMEN'S ASSOCIATIONS/INSTITUTE FOR FISHERIES RESOURCES, THE BAY INSTITUTE, BAYKEEPER AND ITS DELTAKEEPER CHAPTER, CALIFORNIA TROUT, FRIENDS OF THE RIVER, NATURAL RESOURCES DEFENSE COUNCIL, NORTHERN CALIFORNIA COUNCIL OF THE FEDERATION OF FLY FISHERS, and SACRAMENTO RIVER PRESERVATION TRUST, all non-profit organizations; and the WINNEMEM WINTU TRIBE,

Plaintiffs,

vs.

CARLOS M. GUTIERREZ, in his official capacity as Secretary of Commerce, WILLIAM T. HOGARTH, in his official capacity as Assistant Administrator for Fisheries, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, DIRK KEMPTHORNE, in his official capacity as Secretary of the Interior, and WILLIAM E. RINNE, in his official capacity as Acting Commissioner, United States Bureau of Reclamation,

Defendants,

and

SAN LUIS & DELTA MENDOTA WATER AUTHORITY, WESTLANDS WATER DISTRICT, CALIFORNIA FARM BUREAU FEDERATION, GLENN-COLUSA IRRIGATION DISTRICT, et al., and STATE WATER CONTRACTORS, et al.

Intervenors/Defendants.

Case No. 1:06-CV-00245 OWW LJO

DECLARATION OF KIRK C. RODGERS

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NATURAL RESOURCES DEFENSE COUNCIL, CALIFORNIA TROUT, BAYKEEPER & ITS DELTAKEEPER CHAPTER, FRIENDS OF THE RIVER, and THE BAY INSTITUTE, all non-profit organizations,

Plaintiffs,

v.

DIRK KEMPTHORNE, in his official capacity as Secretary of the Interior, and H. DALE HALL, in his official capacity as Director of the U.S. Fish and Wildlife Service,

Defendants.

SAN LUIS & DELTA MENDOTA WATER AUTHORITY, WESTLANDS WATER DISTRICT, CALIFORNIA FARM BUREAU FEDERATION, GLENN-COLUSA IRRIGATION DISTRICT, et al., CALIFORNIA DEPARTMENT OF WATER RESOURCES, STATE WATER CONTRACTORS; and KERN COUNTY WATER AGENCY.

Intervenors/Defendants.

Case No.: 05-CV-01207 OWW LJO

DECLARATION OF KIRK C. RODGERS

I, Kirk C. Rodgers, declare as follows:

1. I am the Director of the United States Bureau of Reclamation (Reclamation), Mid-Pacific Region. In my capacity as Regional Director, I have overall responsibility for the various functions of the Mid-Pacific Region, which includes the operations of the Central Valley Project (CVP).

2. Reclamation understands that during the pendency of the reinitiated consultations on ongoing CVP/State Water Project (SWP) operations that section 7(d) of the Endangered Species Act (ESA) applies to its actions.

3. For this reason, and for the reasons outlined in my declaration of July 13, 2006, Reclamation will not execute long term contracts with the contractors listed in that declaration during the pendency of the Section 7 consultation on ongoing CVP/SWP operations.

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4. Reclamation is reviewing all longer term actions associated with CVP/SWP operations[1]/ that are scheduled to reach the approval or implementation stage during the Section 7 consultation to determine if approval or implementation of each action remains appropriate given the obligations of the ESA. The review of each of these actions will include determinations on (1) whether there is a sufficient analysis of effects on threatened and endangered species to ensure that the action will not jeopardize any listed species, either through the revised Biological Opinions on CVP/SWP operations or project specific Biological Opinions or concurrence letters, and (2) whether the action would constitute an irreversible or irretrievable commitment of resources that would foreclose the formulation or implementation of any reasonable and prudent alternatives.

5. During the pendency of the consultation, Reclamation will operate the Tracy Pumping Plant within recent historic pumping levels. These pumping levels were included in the 2004 Biological Assessment and analyzed in the Biological Opinions.

6. The 2004 Biological Assessment contains conservation measures to benefit species. These conservation measures will continue to be implemented during the pendency of the consultation. One example of a conservation measure included in the Biological Opinions is the Vernalis Adaptive Management Program (VAMP). VAMP is one of the highest priority actions that benefits delta smelt and salmonids, and involves both increased flows and export reductions. Additionally, depending on the water year and the take at the pumps, we may take actions in the winter to reduce entrainment of adult delta smelt. A third example is maintaining fall flows at a level to benefit the salmon using CVPIA section 3406(b)(2) water. As mentioned in the delta smelt section VAMP will be done in April and May with flows and export reductions at the CVP and SWP.

7. In addition to the actions to ensure compliance with the ESA described above, Reclamation is considering actions to supplement the operations described in the project

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[1] These actions would include, but are not limited to, the South Delta Improvements Program Stage 1, Delta Mendota Canal/California Aqueduct Intertie Project, Yuba Accord, Sacramento Valley Water Management Program, the Lower American River Flow Standards and the Long Term Environmental Water Account Program.

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description in Reclamation's 2004 Biological Assessment for the Operations Criteria and Plan (OCAP) that will provide benefits for listed species during the pendency of the consultation. These actions will include, but may not be limited to, the actions described below.

Delta Smelt

8. Since the discovery of the decline in pelagic organisms in the Bay-Delta, Reclamation has worked with other federal and state agencies to determine the causes for the decline. Reclamation has committed substantial resources and staff to this effort and will continue to do so for as long as necessary.

9. During the pendency of the consultation, Reclamation is prepared to implement additional measures to benefit delta smelt that may be recommended to the extent they are consistent with Reclamation's authority and available funding.

10. Reclamation has the following water assets available at this time to implement recommended actions for the next water year:

a. 2006 CVPIA section 3406(b)(2) water (b(2) water): Reclamation has banked approximately 195,000 acre feet of unused b(2) water from the 2006 water year to be used in the 2007 water year, consistent with the pilot banking study. Interior has experimented with banking unused b(2) water for the last two water years, in accordance with the revised 2003 policy on implementation of CVPIA section 3406(b)(2). This water may be used for actions for delta smelt as recommended by the FWS,

b. EWA Purchased Water: Reclamation has a contract to purchase up to 25,000 acre feet of water for EWA during the 2007 water year. Reclamation is in negotiations with other willing sellers to secure potential assets. These assets will be combined with assets acquired by the State of California for the EWA program.

c. CVPIA section 3406(b)(1), (b)(2), (b)(3): Reclamation will continue to operate consistent with CVPIA section 3406(b)(1), (b)(2), (b)(3). CVPIA Section 3406(b)(1) provides for modification of the CVP operations to meet the fishery

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restoration goals of the CVPIA, so long as the operations are not in conflict with the fulfillment of the Secretary's contractual obligations to provide CVP water for other authorized purposes. CVPIA section (b)(2) provides for the dedication of 800,000 acre feet of CVPIA yield for the purposes articulated in that section. Additionally, Interior is currently authorized to acquire water to supplement (b)(2) water, pursuant to Section 3406(b)(3).

Salmonids

11. As stated above, the 2004 Biological Assessment contains conservation measures to benefit species which will continue to be implemented during the pendency of the consultation. As an example,

12. In addition to the actions described in the Biological Assessment, Reclamation intends to address salmonid passage issues in the Sacramento River by continuing its environmental review of the Red Bluff Diversion Dam. Reclamation will be recirculating a draft EIS for public comment by the end of this year.

13. The water assets described in paragraph 8 above are also available for actions to benefit salmonids. Reclamation will continue to work with FWS, the National Marine Fisheries Service, the California Department of Water Resources and the California Department of Fish and Game through the Water Operations Management Team to determine the best use of these assets given the needs of the multiple listed species.

I declare under penalty of perjury under the laws of the State of California and the United States, that the foregoing is true and correct.

Kirk C. Rodgers
Director, Mid- Pacific Region, U.S. Bureau of Reclamation

Attachment 14-N

EXHIBIT 15

LETTER 21

Interagency Ecological Program 2006-2007 Work Plan to Evaluate the Decline of Pelagic Species in the Upper San Francisco Estuary
January 12, 2007

Prepared by: Chuck Armor (DFG), Randall Baxter (DFG), Rich Breuer (DWR), Mike Chotkowski (USBR), Steve Culberson (CBDA), Marty Gingras (DFG), Bruce Herbold (EPA), Anke Mueller-Solger (DWR), Matt Nobriga (CALFED), Ted Sommer (DWR), and Kelly Souza (DFG)

Executive Summary

Abundance indices calculated by the Interagency Ecological Program (IEP) through 2005 suggest recent marked declines in numerous pelagic fishes in the upper San Francisco Estuary (the Delta and Suisun Bay). Although several species show evidence of long-term declines, the recent low levels were unexpected given the relatively moderate winter-spring flows of the past several years.

In response to these changes, the IEP formed a Pelagic Organism Decline ("POD") work team to evaluate the potential causes. The product of this effort was a 2005 study to provide insight into the best lines of inquiry for 2006-2007 studies. The major findings through 2005 were synthesized using two conceptual modeling approaches. First, we developed species matrix models. We used the matrix models to examine which stressors (entrainment, toxic effects on fish, toxic effects on fish food items, harmful algal blooms, clam *Corbula* effects on food availability, and disease and parasites) were most likely to be important. Here we use importance to mean either stressors supported by the available data or stressors which could not be ruled out based on the available data. Secondly, we constructed narrative explanations for the recent step decline in abundance of pelagic species in the context of their long term trends or previous patterns. Narratives have been developed for the major components: 1) *previous abundance levels*, which describes how continued low abundance of adults leads to juvenile production; 2) *habitat,* which describes how water quality variables (including contaminants and toxic algal blooms) affect estuarine species; 3) *top-down effects*, which posits that predation and water project entrainment affect mortality rates; and 4) *bottom-up effects*, which focuses on food web interactions in Suisun Bay and the west Delta.

The overall approach for 2006-7 is intended to evaluate and refine the evidence for the conceptual models. To address the matrix models, the study design is based on *temporal*, *spatial* and *species* contrasts for selected fish and zooplankton. For each contrast, the variables to be evaluated include: abundance, growth rate and fecundity; and feeding success, condition factor, parasite load and histopathology (fish only). To the extent possible, these data will be collected simultaneously to help evaluate the relative importance of different stressors. The narrative model, on the other hand, posits linkages among different stressors and their possible pathways to produce the observed declines of more than one species. The work plan elements that are based on the narrative model, therefore, emphasize analyses of the proposed linkages among stressors.

The proposed studies represent an interdisciplinary, multi-agency effort including staff from DFG, DWR, USBR, USEPA, USGS, CBDA, SFSU and UCD. Project components were selected based on their ability to evaluate the conceptual models, and their feasibility in terms of methods, staffing, costs, timing and data availability. The proposed work falls into three general types: 1) an expansion of existing monitoring (five expanded surveys); 2) ongoing studies (17 studies); and 3) new studies (25 studies). None of the work will affect the mandated monitoring currently under performed by IEP. The initial cost estimate for 2007 is approximately $3,260,000 annually.

The program will be run by the existing IEP Project Work Team (Pelagic Organisms Decline – "POD PWT" to develop, direct, review and analyze the results of the effort. The program will yield a range of products and deliverables including management briefs, publications and reports, web-based monitoring data, and presentations at conferences, workshops and meetings.

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Introduction

In the last several years, the abundance indices calculated by the Interagency Ecological Program (IEP) Fall Midwater Trawl survey (FMWT) and Summer Townet Survey (TNS) showed marked declines in numerous pelagic fishes in the upper San Francisco Estuary (the Delta and Suisun Bay) (IEP 2005a,b). The abundance indices for 2002-2004 include record lows for delta smelt and age-0 striped bass and near-record lows for longfin smelt and threadfin shad. In contrast, the San Francisco Bay Study did not show significant declines in its catches of marine/lower estuary species. Based on these findings, the problem appears to be limited to fish dependent on the upper estuary.

While several of these declining species - including longfin smelt and juvenile striped bass have shown evidence of long-term declines - there appears to have been a precipitous "step-change" to very low abundance by at least 2000 (IEP 2005a,b). Moreover, the record or near-record low abundance levels are remarkable in that winter-spring river flows into the San Francisco Estuary were moderate during this period. Many estuarine organisms including longfin smelt and striped bass typically produce poor year classes in dry years (Jassby et al. 1995); delta smelt abundance is generally lowest in very wet or very dry years (Moyle et al. 1992). Thus, we expected the moderate hydrology during the past three years to support modest production.

In response to these changes, the IEP formed a Pelagic Organism Decline ("POD") work team to evaluate the potential causes. The product of this effort was a 2005 work plan, which provided an overview of the problem, a conceptual model, and description of a "screening level" study to examine some of the suspected major causal factors (IEP 2005a). Note that the 2005 work was not designed to "prove" which stressor(s) was responsible for the observed trends. Instead, this effort was intended to provide insight into the best lines of inquiry for the 2006-2007 studies. Highlights of the 2005 results included the following initial results. More details are available in IEP (2005b).

Pelagic fishes. 1) In 2005, the highest spring outflow conditions since 2000 failed to improve fish abundance; 2) there was no evidence of a recent decrease in the amount of "physical habitat" for delta smelt or juvenile striped bass; 3) there was no evidence of a recent major decline in apparent growth rates for delta smelt, longfin smelt, or striped bass; 4) in 1999 and 2004, delta smelt in Cache Slough had higher residual growth/condition than other locations; 5) striped bass age-fecundity relationships in 2005 did not differ substantially from relationships developed in the 1970s and 1980s; and 6) otolith analyses indicated that in 1999 delta smelt spawned throughout the upper estuary recruited to the adult population, whereas in 2004, only fish spawned in the Delta recruited.

Food web/exotic species. 1) Reanalysis of the zooplankton data revealed that there was no recent step-change in calanoid copepods; however, we are still determining whether regional e.g. Suisun Bay, declines occurred; 2) there has been no recent major decline in chlorophyll *a* (an index of phytoplankton biomass); however, we are still determining whether regional e.g. Suisun Bay, declines occurred; 3)the toxic blue-green alga *Microcystis* was present throughout the Delta at substantially higher levels in summer 2005 than in summer 2004; 4) although there has been a recent expansion in the range of the clam *Corbula*, recent occurrence is comparable to the 1987-

1992 drought; and 5) changes in sediment composition and benthic assemblages occurred estuary-wide in 1999-2000.

Toxics. 1) Studies on contaminants found that there have been changes in the patterns of use for herbicides and pyrethroid pesticides. It is plausible, but unclear if these changes pose serious risks for aquatic species; 2) significant acute or chronic toxicity to the amphipod, *Hyalella azteca*, was detected at four out of ten sampling sites, however the cause(s) was not identified; 3) no significant toxicity to the cladoceran, *Ceriodaphnia dubia*, the delta smelt or the juvenile striped bass was observed during the study period; 4) delta smelt are more sensitive to copper than previously reported and are 10-12 times more sensitive than juvenile striped bass; and 5) delta smelt from 2003 and 2005 (limited) showed more liver lesions at two locations representing general regions in Suisun Marsh (near and in Nurse Slough) and the Sacramento River at Cache Slough and the Sacramento Deepwater Ship Channel.

Water Project Operations. 1) There have been changes in the input flows to the Delta in recent years, including a slight increase in average Sacramento River flow since 2001 and a substantial reduction in peak San Joaquin flows since 1999. 2) There was no evidence of a recent major change in residence time, consistent with the lack of change in chlorophyll *a*. 3) Increases in the pattern of wintertime salvage are consistent with hydrodynamic changes occurring each winter since 2001. 4) Nonconsumptive water use by Contra Costa and Pittsburg power plants may reach 3200 cfs (both facilities combined). The fish population impacts of these diversions have not been evaluated since the early 1980s, but given their location and the potentially large cooling water flux through them, the impacts could be substantial.

Conceptual Model

Initial Conceptual Model

Based on the initial hypothesis that fish abundance declined abruptly by 2002, we developed an initial conceptual model (IEP 2005a). Specifically, we proposed at least three general factors that may have been acting individually or in concert to lower pelagic productivity: 1) toxic effects; 2) exotic species effects; and 3) water project effects (Figure 1). The conceptual model used these categories to illustrate the potential pathways by which pelagic species in the Delta could be affected (Figure 1). For each group of "boxes" shown in the model, one or more examples are provided in italics. The arrows represent the potential mechanisms for changes. Note that not all of the organisms shown in each box are necessarily responsible for each of the mechanisms. Some of the rationale for these components is described below.

Toxins could affect fishes directly or indirectly by reducing lower trophic level quantity or quality. Herbicides could directly affect phytoplankton, zooplankton and fishes, while insecticides are most likely to affect zooplankton and fish. Toxic effects at lower trophic levels may reduce food supply for fishes and/or their invertebrate prey. Blooms of the blue-green alga (cyanobacteria) *Microcystis aeruginosa* have been observed in the Delta since 1999 (Lehman and Waller 2003, Lehman et al. 2005). This species complex often produces toxic metabolites collectively known as microcystins. Microcystins are cancer-causing to humans and wildlife, including fish (Carmichael 1995), and reduce feeding success in zooplankton (Rohrlack et al.

2005). Microcystins have been found in Delta zooplankton and clam tissue and could impact organisms at higher trophic levels through bioaccumulation (Lehman et al. 2005). The switch from organophosphate to pyrethroid pesticides increased substantially through the 1990s (see Oros and Werner report in Attachment A of 2005 POD Synthesis Report). Pyrethroid pesticides have been shown to be less harmful to humans and terrestrial wildlife but more harmful to aquatic organisms. The rising use of organic herbicides and copper-based compounds to control nuisance aquatic weeds and algal blooms in the Delta may also pose a threat to desirable aquatic organisms.

The negative effects of invasive exotic species in the estuary have been well-established. Some notable examples were the substantial declines in lower trophic level productivity that followed the introduction of *Corbula amurensis* (Nichols et al. 1990; Kimmerer and Orsi 1996; Jassby et al. 2002, Kimmerer submitted) and the reduced abundance of native nearshore fishes associated with proliferation of *Egeria densa* and centrarchid fishes along Delta shorelines (Brown and Michniuk in review; Nobriga et al. 2005). At this time, we have limited information about quantitative aspects of the estuarine food web needed to estimate *Corbula* grazing rates or predict whether nearshore and pelagic food webs are coupled in ways relevant to the production of pelagic fishes.

Kimmerer (2002a) showed that water project operations have resulted in lower winter/spring inflow and higher summer inflow to the Delta. As noted previously, the actions by the CALFED implementing agencies have restored some spring inflow, but have also increased summer inflows to meet increasing summer export demands. Winter exports have also increased by about 50% in recent years. These shifts were implemented based on the assumption that it would be more protective to sensitive early life stages of key estuarine fishes and invertebrates. However, it is possible that high export during summer-winter months has unanticipated food web effects by exporting biomass that would otherwise support the estuarine food web. Other possible mechanisms include increased entrainment of fishes during the summer-winter months, or a reduction in habitat quality downstream (e.g. less area of the appropriate salinity). Total annual exports have continued to increase. It is also possible that the total volume diverted on an annual basis influences estuarine productivity (Livingston et al. 1997, Jassby et al. 2002).

Delta Pelagic Species Conceptual Model

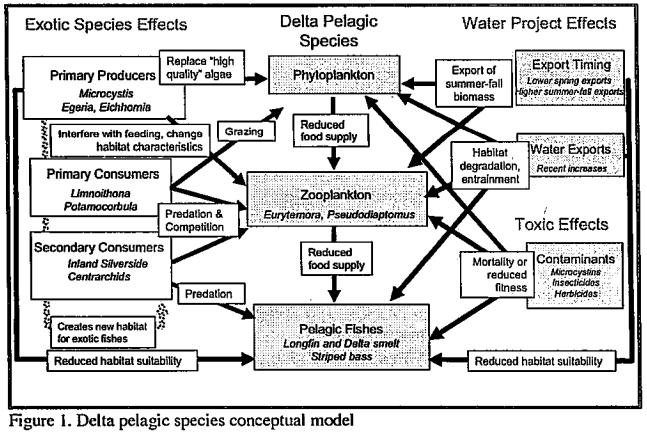

Figure 1. Delta pelagic species conceptual model

Revision of 2005 Conceptual Model

We had planned to use the initial conceptual model (Figure 1) as the basis of the synthesis. However, this conceptual model was based on earlier data showing a system-wide decline in calanoid copepods, which a re-examination of the data in 2005 did not support. Moreover, we found that the model did not adequately reflect spatial and temporal variation in the stressors on pelagic organisms. Initial results from 2005 also suggested that some stressors might act independently of the estuarine food-web that was central to our conceptual model. Though the model provided a useful basis to design the 2005 study program, we chose a somewhat different approach for the 2006-2007 effort.

The 2006-2007 models represent an improvement over the 2005 model, but it is important to recognize that there are still potentially numerous limitations (IEP 2005b). Much of the 2005 data is preliminary or unavailable at this writing and has not yet been peer-reviewed, so the new models should be considered equally preliminary. Moreover, we acknowledge that our models may have been influenced by potential biases in the sampling programs. Several changes in the size and distribution of the target species have the potential to change our perceptions of trends in abundances and distributions. This, in turn, has the potential to affect our conceptual models. Finally, it is important to recognize that the recent step decline in pelagic fish species is superimposed over long term declines for several of them and long term relationships of these fish with other environmental factors.

The major findings through 2005 were synthesized in two general ways (IEP 2005b). First, we developed species matrices to examine which stressors were most likely to be important based on the available data or which could not be ruled out because we had no data to base such a conclusion. Secondly, we constructed narrative explanations for the recent step decline in abundance of pelagic species in the context of their long term trends or previous patterns. Note that both types of models were specifically developed for the purposes of designing the work plan for 2006 and beyond—they were not intended to be the basis of setting resource management priorities.

Matrix Model for Species and Stressors

Matrix models were developed for the four target fish species (delta smelt, longfin smelt, threadfin shad and juvenile striped bass) to summarize the potential role of various stressors in the recent decline. The matrices depict our current consensus of whether or not each stressor impacted each species-life stage during 2002-2004, possibly influencing the decline. The level of information used to support our consensus is also ranked. Though we attempted to develop information on most of the stressors listed, there are numerous cases where data are unavailable or have not been analyzed. In such instances we indicate no information, but have an expectation that information will be available soon to refine the models. The stressors evaluated are listed below:

- Mismatch of larvae and food. This stressor focuses on the separation of larval fish and food items in time and geographical space. If young fish are not co-located with food, they will starve or have increased vulnerability to predation (Cushing 1990). For the purposes of the matrices, the stressor is considered to apply only to larvae—it is considered separate from fish that can swim strongly enough to search large areas to locate food.

- Reduced habitat space. Amount of open-water habitat as defined by physical and chemical parameters that limit the distribution of species.

- Adverse water movement/transport. Changes in Delta hydrodynamics that direct fish to unsuitable areas due to water project operations. Transport refers to movement of a life stage as influenced by Delta hydrodynamics which can be altered by water project operations (i.e. exports, gate operations, reservoir releases, barriers). Delta hydrodynamics affects transport through its effects on migratory cues, habitat quality or hydrologic resident times. This stressor specifically excludes entrainment, but may include thermal effects of power plant effluent.

- Entrainment. Mortality of pelagic fishes caused by loss to water diversions for exports, in-Delta uses, and power plant cooling.

- Toxic effects on fish. Acute and chronic effects sufficient to increase mortality and/or reduce fecundity of pelagic fishes.

- Toxic effects on fish food items. Acute and chronic effects sufficient to increase mortality and/or reduce fecundity of pelagic fish food items.

- Harmful *Microcystis* blooms. Acute and chronic effects of *Microcystis* sufficient to result in one or more of the following in pelagic fishes: increase mortality; reduce fecundity, reduced feeding; or habitat avoidance.

- *Corbula* effects on food availability. *Corbula* decreases phytoplankton and zooplankton, which is reflected in the production of larger zooplankton, invertebrates or fish especially in early lifestages.

- Disease and parasites. Disease or parasites that result in reduced survival or fecundity of pelagic fishes.

The species matrices are included as Figures 3-7. Annotations for the matrices are provided in Appendix A. Columns represent key times of the year, with reference to the corresponding life stages. The rows describe the relationships between life stages and the major stressors. Within each cell is an idealized "map" containing sub-cells to represent the major regions of the upper estuary (Figure 2). The various regions of the Delta have been described differently by different authors. For aquatic organisms, we believe the tidal nature of the estuary overrides many of the geographic features. Thus, in our discussion of the areas of the Delta, we intentionally use overlapping areas to better account for the fact that water frequently moves from area to area while still bearing in mind that the stressors and processes in different areas are different. This overlap is most pronounced in discussing "Suisun Bay" and the "Northern Delta" (i.e. the blue and green areas in Figure 2). Marine influences, including X2 position can have impacts up the axis of the estuary as far as Decker Island, while significant factors, such as sediment plumes from the Yolo Bypass are at times prominent downstream to at least Chipps Island. Similarly, the San Joaquin River is not representative of a single area's influences but rather the southern limit of Central Delta processes and the northern limit of South Delta processes. Therefore, we have included the San Joaquin River within both areas in our delimitation of the Delta. The actual areas of overlap may also be taken to represent the tidal excursions in each area, such that areas of overlap are much longer in the western regions than in the more upstream locales. Overall, we are concerned with identifying the areas where stressors and processes originate and less concerned with their exact locations of impact.

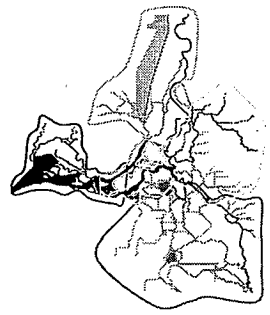

Figure 2. Map of the Delta to identify the regions specified in the matrix.

The geographic boundaries roughly correspond to: Suisun Bay (Suisun Bay, river confluence area downstream of Decker Island and Big Break); Central Delta (South of Rio Vista, North of Franks Tract): North Delta/Lower Sacramento River; South Delta/San Joaquin River (Franks Tract and south/east Delta). The symbols within the "map" are designed to reflect a binary potential for the impact of each stressor (described below) and the degree to which available data support our assertions. Additional details about the logic for each symbol are provided as annotations in Appendix B in 2005 POD Synthesis Report.

Impact

Plausible Impact = The factor (stressor) is likely to have a substantial influence on lifestage survival (*Large Symbol*).

No Likely Impact = The factor (stressor) is unlikely to have a substantial influence on lifestage survival (*Small Symbol*).

Information

Strong = Substantial information exists for directly addressing the stressor influence on the specific lifestage (*Dark Symbol*)

Limited = Either available information or current data analysis is too limited to support strong conclusions regarding stressor) influence on the specific lifestage (*Grey Symbol*).

None = Either information is not available, or no available data have been appropriately analyzed, to address stressor influence on the specific lifestage (*Clear Symbol*).

Figure 3. Legend for Matrix Models

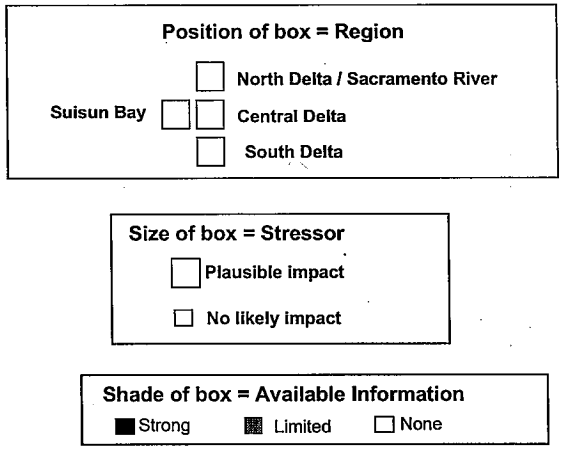

Figure 4. Longfin smelt matrix model

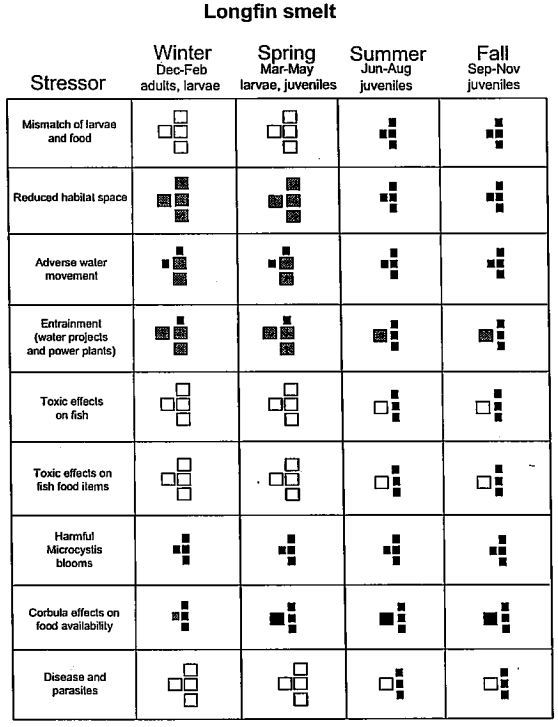

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Figure 5. Threadfin Shad matrix model

Threadfin shad

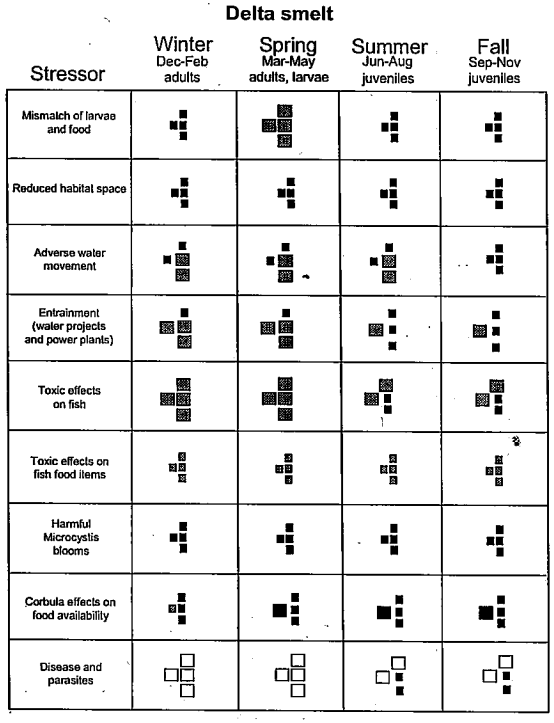
Stressor	Winter Dec-Feb adults, juveniles	Spring Mar-May adults, larvae	Summer Jun-Aug adults, larvae, juveniles	Fall Sep-Nov adults, juveniles
Mismatch of larvae and food				
Reduced habitat space				
Adverse water movement				
Entrainment (water projects and power plants)				
Toxic effects on fish				
Toxic effects on fish food items				
Harmful Microcystis blooms				
Corbula effects on food availability				
Disease and parasites				

Figure 6. Striped Bass matrix model

Striped bass

Stressor	Winter Dec-Feb juveniles	Spring Mar-May larvae, juveniles	Summer Jun-Aug larvae, juveniles	Fall Sep-Nov juveniles
Mismatch of larvae and food				
Reduced habitat space				
Adverse water movement				
Entrainment (water projects and power plants)				
Toxic effects on fish				
Toxic effects on fish food items				
Harmful Microcystis blooms				
Corbula effects on food availability				
Disease and parasites				

Figure 7. Delta Smelt matrix model



Narrative Model

Guided by available results, we developed a narrative model to describe possible mechanisms by which a combination of long-term and recent changes in the ecosystem could produce the observed declines in catch of pelagic fish species. The model is based on the simple schematic shown in Figure 8. The major components contained in the narrative model are as follows: 1) *prior fish abundance*, which describes how continued low abundance of adults leads to juvenile production; 2) *habitat*, which describes how water quality variables (including contaminants, disease and toxic algal blooms) affect estuarine species; 3) *top-down effects*, which posits that predation and water project entrainment affect mortality rates; and 4) *bottom-up effects*, which focuses on food web interactions in Suisun Bay and the west Delta. These narrative model components are described in detail in the following sections.

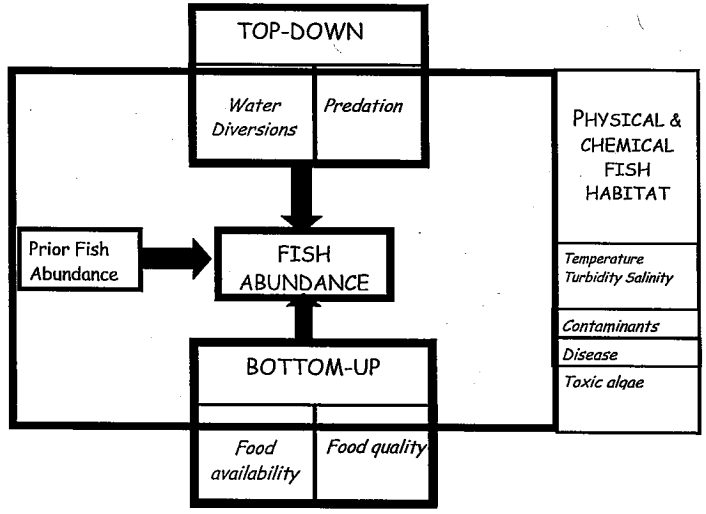


Figure 8: Components of the narrative model for the pelagic fish decline in the upper San Francisco estuary.

Note that these narrative model components are not exclusive of other explanations for the observed changes in fish abundance, nor are they intended to suggest priorities for resource management. Instead, they were intended as examples of how the different stressors may be regionally linked. Moreover, no single narrative component can explain the declines of

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all four species though both in tandem plausibly could. The narrative models will be developed and refined as data become available. In the meantime, we believe that the two initial narrative models provide a useful basis for the development of more detailed hypotheses and studies for 2006-2007.

Previous Abundance Narrative

The relationship between numbers of spawning fish and the numbers of young subsequently produced are known as stock-recruit relationships. Stock-recruit relationships have been described for many species and are a central part of the management of commercially and recreationally fished stocks. Different forms of stock-recruit relationships are possible, including density-independent, density-dependent, and density-vague types. The latter refers to situations where there is not a statistically demonstrable stock-recruit relationship observable in available data. Of particular importance for the POD is that adults are needed to make young, so in any form of a stock-recruit model, there is likely a point at which low adult stock will result in low juvenile stocks even under favorable environmental conditions while the stock 'rebuilds' itself. Currently, the adult striped bass stock is not very low, so the previous abundance narrative does not apply to striped bass. However, it may apply to the other three species. It is not currently known what level of abundance index would represent a "point of no return", or a point of slow return. This is partly due to the density-vague nature of delta smelt stock-recruit relationships (see Bennett 2005).

Habitat Narrative

Aquatic habitats are the suites of physical, chemical, and biological factors that species live in (Hayes et al. 1996). The maintenance of appropriate habitat quality is essential to the long-term health of aquatic resources (Rose 2000; Peterson 2003). In our narrative model, a key point is that habitat effects occur on all other components of the model (Figure 8). Hence, changes in habitat can not only affect pelagic fishes, but also their predators and prey. Moreover, we expect that this habitat is especially vulnerable to future climate change.

Pelagic Fish Habitat: Habitat for pelagic fishes is water. More specifically, it is water with suitable concentrations of natural physical-chemical properties such as salinity, turbidity, and temperature; suitably low levels of contaminants, and suitably high levels of prey production to support growth. The four POD fishes use a variety of tidally-assisted swimming behaviors to maintain themselves within open-water areas where water quality and food resources are favorable (Bennett et al. 2002). The four POD fishes also distribute themselves differentially along the estuarine salinity gradient (Dege and Brown 2004), so at any point in time, salinity is a major factor affecting these fishes' geographic distributions. Water clarity is also an important factor influencing the distribution of young-of-year striped bass and delta smelt (Nobriga et al. 2005; Feyrer et al. accepted manuscript). Water temperatures are important to spawning windows for the POD fishes, but do not appear to exert strong influence on population distributions during summer-fall.

The San Francisco Estuary is a tidal river estuary (also known as a river-dominated estuary). In tidal river estuaries, habitat quality varies rapidly because the sizes, shapes, and general

suitability of nursery areas change as river flow changes (Stoner et al. 2001; Manderson et al. 2002). In the SFE, pelagic habitat quality is thought to be indexed by changes in the location of the 2 psu isohaline because the abundance of numerous taxa increases when flows into the estuary are high and the 2 psu isohaline is pushed seaward (X2; Jassby et al. 1995). Recent research has shown that X2 is a close surrogate for fall habitat quality for the POD fishes, but only a weak surrogate for summer habitat quality. Recent research has also shown that the *Corbula amurensis* invasion in the late 1980s changed the X2-abundance relationships, at least for longfin smelt (Kimmerer 2002) and young-of-year striped bass (IEP unpublished data). This is strong evidence that the present-day food web responds differently to flow than the pre-Corbula food web did. Food web changes also may have affected delta smelt (Bennett 2005). All of these analyses strongly suggest that a biologic aspect of pelagic fish habitat (food availability) has been degraded. Recent results of POD investigations also show that fall habitat suitability has declined due to increased salinity and water clarity in Suisun Bay and the Delta, respectively.

The IEP monitoring data show a trend toward increasing water clarity in the Delta (Jassby et al. 2002). The most likely reasons for this trend are decreasing sediment supply from the Sacramento River basin (Wright and Schoellhamer 2004) and proliferation of *Egeria densa* (Brazilian waterweed; Brown and Michniuk in press). We do not know whether *Egeria* continues to spread into new areas or whether it has filled all suitable shallow water habitats. In lakes, high densities of *Egeria* and similar plants can mechanically filter suspended sediments from the water column (Scheffer 1999). Increased water clarity may be detrimental to at least two of the POD species, young-of-year striped bass and delta smelt because these species/life stages appear to avoid water that is not very turbid.

In addition to habitat changes from salinity, turbidity and invasive species, contaminants can change ecosystem function and productivity through numerous pathways. The trends in contaminant loadings and their ecosystem effects are not as well understood as the natural water quality and zooplankton trend effects on pelagic fish habitat quality. We are currently evaluating general toxicity and Microcystis toxicity looking both for direct toxic effects on the POD fishes and evaluating indirect contaminant effects such as inhibition of prey zooplankton production.

Habitat for Other Aquatic Organisms: Much of the previous discussion about how physical conditions and water quality affects pelagic fishes is also relevant to other aquatic organisms including plankton and the benthos. Particularly for planktonic species, the residence time of water must also be considered. Lower residence time generally results in lower plankton biomass, but also may reduce cumulative entrainment effects. In contrast, higher residence time may result in higher plankton biomass build-up and increased food availability for planktivorous fishes; however, it may also promote high temperatures, invasion by *Egeria*, and nonnative fishes, *Microcystis* blooms, etc., and subject small fishes to increased cumulative entrainment. Recent particle tracking modeling results for the Delta show that San Joaquin River residence times are much lower than residence times in the Sacramento River, indicating differences in habitat conditions along a north-south gradient.

Climate Change Effects on Habitat: Climate change may have substantial influences on pelagic habitat in the long-term. There are several mechanisms by which climate change could degrade

habitat quality for one or more POD fishes. First, there has been a trend toward more Sierra precipitation falling as rain. This increases the likelihood of floods and may further change Central Valley hydrographs. Altered hydrographs interfere with pelagic fish reproduction, which is usually tied to historical runoff patterns (Moyle 2002). Second, there is the potential for sea level rise. Sea level rise will increase salinity intrusion unless sufficient freshwater resources are available to repel the seawater. This will shift fish distributions upstream and possibly reduce habitat area for some species. Third, climate change is projected to result in warmer temperatures in Central California. As stated above, water temperatures do not currently have a strong influence on POD fish distributions. However, summer water temperatures throughout the upper estuary are fairly high for delta smelt. The lethal temperature limit for delta smelt is 25°C (Swanson et al. 2000). Median July water temperatures in the upper estuary are typically 20-23°C (IEP unpublished data). If climate change resulted in median temperatures in the upper estuary reaching 25°C, delta smelt would have little chance of maintaining viable populations.

Top-Down Narrative

This narrative component proposes that the most recent fish declines can be envisioned as the result of the interactive, top-down influence of two kinds of "predators"; piscivorous fishes, and water diversions. The 'top-down' narrative is predicated on the hypothesis that consumption or removal of fish biomass by piscivores (principally striped bass) and water diversions (SWP/CVP exports; power plant diversions) mattered more after the late 1990s because several bottom-up mechanisms interactively reduced the potential of the low-salinity zone and Delta to produce pelagic fish biomass.

Predation Effects: We hypothesize that striped bass predation on pelagic fish biomass had increased in all water year types by the latter 1990s due to an increase in the age-1 and older striped bass population during the 1990s. In the San Francisco estuary, adult striped bass have been at very high population levels in recent years (DFG, unpublished data), potentially exerting an unusually high predation pressure on smaller pelagic fishes.

A change in predation pressure may, in part, be an effect of interactions between biotic and abiotic conditions. Natural, co-evolved piscivore-prey systems typically have an abiotic production phase and a biotic reduction phase each year (e.g., Rodriguez and Lewis 1990). Changing the magnitudes and durations of these cycles greatly alters their outcomes (e.g., Meffe 1984). Generally, the relative stability of the physical environment affects the length of time each phase dominates and thus, the importance of each. Biotic interactions like predation will have stronger community-structuring influence in physically stable systems (e.g., lakes). Historically in the estuary, winter-spring flow variation was the abiotic production phase and the biotic reduction phase probably increased in importance during low-flow periods in summer-fall. Multi-year wet cycles probably increased (and still do) the overall 'abiotic-ness' of the estuary; drought cycles likely increased the estuary's 'biotic-ness' (e.g., Livingston et al. 1997). Our managed system has reduced flow variation much of the time and in some locations more than others. This has probably affected the magnitudes and durations of abiotic and biotic phases (e.g., Nobriga et al. 2005). In other words, reduced flow variability in the estuary may have exacerbated predation effects.

High river flow generally increases fish carrying capacity in the upper estuary (Jassby et al. 1995; Kimmerer 2002). This 'fundamental' relationship has been affected by overbite clams for most of the POD species, but not for all fishes responding to flow (e.g., American shad, splittail; Kimmerer 2002). Thus, because there are more prey fish available in wet years, we hypothesize that flow still increases carrying capacity for piscivorous (age-1 and older) striped bass even though it no longer improves age-0 striped bass carrying capacity. If this is true, the string of wet years between 1993 and 2000 likely allowed the adult striped bass population to rebound even though age-0 production declined. Note that juvenile striped bass also were stocked during this period. We hypothesize that this upsurge of piscivorous striped bass may have interacted with increased entrainment (see below) to reduce POD species abundance. This is analogous to long-term dynamics in cannibalistic fish populations where periods of high adult abundance result in low juvenile production until adult mortality reduces predation pressure on younger cohorts (e.g., Henderson and Corps 1997).

Entrainment: Major water diversions in the delta include the SWP and CVP export facilities, power plants, and agricultural diversions. Of the three, the patterns of agricultural diversions are the least likely to have changed during the pelagic fish decline. As a consequence, our narrative focuses on power plant and export effects.

The two power plants of concern are located in the western delta at Antioch and Pittsburgh. Nonconsumptive water use by the power plants may reach 3200 cfs, which may be enough to create a substantial entrainment risk for fishes residing in that region of the estuary. Studies in the late 1970s indicate that losses of pelagic fishes can be very high. The recent effects of the diversions are unknown; however, the distribution of some pelagic fishes including delta smelt is centered near the diversions. There may also be some risk to fishes created by thermal pollution or residual chlorine from antifouling activities. The magnitude of these risks is unknown.

Dramatic increases in winter CVP and SWP salvage occurred contemporaneously with recent declines in several pelagic fish species. These unexpected increases in salvage density coincide with the step decline of pelagic fishes by at least 2000. The changes in export timing following the Bay-Delta Accord also have the potential to increase entrainment of longfin and delta smelt larvae during late winter and early spring and threadfin shad larvae during summer. The ***Winter Adult Entrainment Hypothesis*** posits that these events are causally linked. Evidence for the hypothesis includes the following. Additional details are available in IEP (2005b).

(1) Since at least 2001, there appears to have been a step increase in salvage density of most pelagic fishes.
(2) During the same time period, similar increases in salvage have also been observed for many non-pelagic fishes including centrarchids and inland silverside.
(3) There appears to have been a step decrease in the Fall Midwater Trawl indices of adult delta smelt, threadfin shad, and longfin smelt between 2001 and 2002.
(4) Winter exports from the CVP and SWP have increased since the late 1990s.
(5) Since 2000, San Joaquin River inflow has decreased, while Sacramento River has increased.

Increased winter entrainment of delta smelt, longfin smelt and threadfin shad represents a loss of the pre-spawning adults and all potential progeny. The altered fall-winter hydrodynamics

(salinity intrusion, export to inflow ratios, Old and Middle river flows) also may result in more fish spawning in regions where their larvae are vulnerable to entrainment before protective measures begin in April. This means on a per capita basis loss of each adult fish may be equivalent to the loss of hundreds or even thousands of juveniles later in the year. Entrainment impact specifically affecting adult fishes has the potential to be strong, so we regard finding an explanation for this coincidence a high priority.

The main explanations for why winter salvage densities may have increased since 2001 include: (1) the source of exported water has been changed to an area where more of these fishes occur during the winter; (2) the affected fishes have moved to areas from which exports are drawn; and/or (3) winter exports have increased past a hydrodynamic threshold below which fish were better able to avoid entrainment.

We have only just begun to examine the data on wintertime salvage, but they reveal a consistent pattern across species that corresponds with the period of fish declines. Three main areas of explanation must all be considered. Three main questions need to be considered. Are the recent salvage trends reliable, or the result of data error? Assuming data are correct, why did salvage levels increase? Finally, do increases in salvage result in population-level effects? Some of these factors can be rapidly assessed with data already in hand or that can be gathered in the coming months. Assessing the population impacts will be a difficult task since reliable numbers for the number of fish entrained or in the source population are available. If it can be shown that a large part of the field sampled populations are within the range of entrainment that is probably the most compelling argument for a population level impact of entrainment.

Bottom-Up Narrative

Suisun Bay/Marsh has historically been a major rearing habitat for striped bass, delta smelt and longfin smelt (Stevens and Miller 1983; Steven et al. 1985; Moyle et al. 1992; Matern et al. 2002). The marshes and other adjacent shallow habitats are also used by threadfin shad (Matern et al. 2002; Nobriga et al. 2005). Pelagic productivity was reduced and trophic linkages were altered in Suisun Bay coincident with the invasion of the clam *Corbula amurensis* (Kimmerer and Orsi 1996; Jassby et al 2002, Feyrer et al. 2003; Kimmerer submitted manuscript). The ***bottom-up hypothesis*** posits that, particularly in drier years, *Corbula* depresses phytoplankton and zooplankton production in Suisun Bay, resulting in decreased availability of food for larval and juvenile striped bass, longfin smelt, and delta smelt. In addition to changes in food availability, changes in food quality due to shifts in phytoplankton and zooplankton species composition may also impact pelagic fish species. Evidence for the hypothesis includes the following.

1. Pelagic productivity in the upper San Francisco estuary is poor relative to other estuaries.
2. Phytoplankton densities and productivity are especially low in the Suisun region.
    - There has been a significant long-term decline in phytoplankton (chlorophyll a) to very low levels in the Suisun region and the lower Delta, with no significant recovery (but also no further declines) over the most recent decade (Jassby et al 2002, Jassby et al in prep.).

    - In contrast, phytoplankton did not decline significantly at the upstream Delta monitoring stations and actually significantly increased at the southern-most Delta monitoring stations over the last decade.
3. Phytoplankton species composition has changed more in the Suisun region than elsewhere.
    - Coincident with changes in phytoplankton abundance in the upper estuary, there were also shifts in phytoplankton species composition from more diatom to more flagellate dominated communities (Lehman 1996).
    - This shift was more pronounced in the Suisun region than elsewhere (Jassby et al. in prep).
4. The Suisun region experienced dramatic changes in zooplankton densities and composition.
    - The Suisun region experienced more pervasive long-term declines in the densities of three calanoid copepod species (*Eurytemora affinis, Sinocalanus doerri,* and *Pseudodiaptomus forbesi*) than the Delta (Mueller-Solger et al in prep.). These zooplankton species are important food organisms for pelagic fishes.
    - *P. forbesi* continued to decline in the Suisun and confluence regions over the last decade, while its numbers increased in the southern Delta. These trends may be related to increasing recruitment failure and mortality in the Suisun region due to inadequate food supplies, *Corbula* predation on copepod nauplii, and insufficient replenishment from more productive upstream regions (Durand et al in prep, Kimmerer et al in prep, Mueller-Solger et al in prep).
    - Coincident with the decline in *P. forbesi* abundance in the Suisun region, densities of a more recent invader, the cyclopoid copepod *Limnoithona tetraspina* significantly increased in the Suisun region. It is now the most abundant copepod species in the Suisun and confluence region, but does not occur in the freshwater upper Delta. (Kimmerer et al in prep, Mueller-Solger et al in prep.) This zooplankton species is thought to be inferior food for pelagic fishes including delta smelt.
    - *Acartiella sinensis*, a calanoid copepod species that invaded at the same time as *L. tetraspina,* also reached considerable densities in the Suisun region over the last decade, but not in the upper Delta. Its suitability as food for pelagic fish species remains unclear.
5. Benthic grazing may be a major mechanism for both the long-term and recent changes in the Suisun food web.
    - *Corbula* abundance and distribution in the Suisun region during 2001-2004 was higher than during the 1995-1999 wet period but similar to the 1987-1992 drought (IEP 2005, Vayssieres et al in prep.).
    - There is evidence that benthic changes have major effects on the pelagic food web and fishes (Kimmerer 2002).

5. Indicators of growth and condition support the hypothesis that there is food limitation in pelagic fishes in the Suisun region (IEP 2005).
    - In 1999 and 2004, residual delta smelt growth was low from the Sacramento-San Joaquin confluence through Suisun Bay relative to other parts of the system.
    - In 2005, delta smelt collected from the Sacramento-San Joaquin confluence and Suisun Bay had high incidence of liver glycogen depletion.
    - In 2003 and 2004, striped bass condition factor decreased in a seaward direction from the delta to the bay.

6. There is less evidence for other types of habitat changes in Suisun Bay (IEP 2005).

- Suisun Bay ambient water bioassays in the summer of 2005 were not toxic to *Hyalella azteca, Ceriodaphnia*, juvenile striped bass, or delta smelt.
- *Microcystis* biomass was low in the Suisun Bay region in the summer of 2004 and 2005.

Thus far, there is little evidence that the unusually poor growth rates, health, and condition of fishes in the Suisun Bay region is due to the effects of toxic contaminants or other adverse chemical or physical habitat conditions. Therefore, our working hypothesis is that the poor fish growth and condition in this region are due to food limitation. If fishes are food limited in Suisun Bay during larval and/or juvenile development, then we would expect greater cumulative predation mortality, higher disease incidence, and consequently poorer abundance indices at later times. Slower growth rates might also distort trawl abundance indices if large numbers of fish do not grow large enough to be sampled efficiently by annual surveys.

Note that there are some inconsistencies that make this hypothesis unlikely as a single mechanism for the recent pelagic organism decline. Specifically, it is unclear why there has been a substantial recent decline in some Suisun Bay calanoid copepod species, but not in phytoplankton chlorophyll *a* concentration. Second, recent *Corbula* levels are not unprecedented; they are similar to those found during the 1987-92 drought years, so it is unclear if and why benthic grazing would have a greater effect on the Suisun Bay food web during the POD years than during the earlier drought years. It is possible that shifts in phytoplankton and zooplankton community composition and perhaps related changes in the microbial food web in the Suisun region could provide a more consistent mechanism

Study Approach

The overall approach recommended by the POD PWT in 2005 was a "triage" model to better define the degree to which toxics, exotic species and water project operations may be responsible individually, in sequence, or in concert for the apparent long-term fish abundance declines and step-changes. Based on the work in 2005 and on previous information, the following represents the proposed approach for 2006-2007. A key difference is that the work is based on entirely different conceptual models (see previous section). In addition, we have developed a more integrated strategy to evaluate contaminant effects, an issue that has not been evaluated extensively by IEP or the 2005 POD effort.

Approach to Address Matrix Models

Many of the studies described in the next section are designed to address questions arising from the matrix models. Much of the rationale for the study design is based on *temporal*, *spatial* and *species* contrasts for selected fish and zooplankton. For each contrast, the variables to be evaluated include: abundance, growth rate and fecundity; and feeding success, condition factor, parasite load and histopathology (fish only).

Temporal Contrasts. Temporal contrasts will be made seasonally and interannually. Analyses of monitoring data and additional samples will identify if there are specific times of the year in

which stressors are most pronounced. To the extent possible, these results will be contrasted with historical data or samples to determine if current observations are consistent with earlier years. For example, the hydrology in 2005 provided an excellent opportunity for a "natural experiment"—flow conditions were consistently high throughout the spring, which typically results in good abundance levels for many pelagic species (Jassby et al. 1995). Kimmerer (2002b) updated analyses that suggest these relationships have remained reasonably consistent through 2000, despite the invasion of the clam *Corbula*. As noted previously, pelagic fishes did not increase substantially in 2005, so we have more confidence that the apparent step change is real.

Working Hypotheses for 2006-2007:
- The response of pelagic species to flow will continue to deviate from relationships with abundance developed prior to the recent step change.
- Stressor effects have increased relative to historical data.

Spatial Contrasts: Monitoring data and new samples will be thoroughly evaluated to determine whether there is a specific region(s) of the estuary where stressor effects are strongest and to the extent possible, whether regional effects have changed in recent years. For example, one of the key spatial contrasts is whether fish and zooplankton show similar responses (e.g. growth, survival, fecundity, toxicological indicators) in the Delta and Napa River because some key stressors (*Microcystis*, waterweed treatment compounds) appear to be largely absent from the latter.

Working Hypotheses for 2006-2007:
- Pelagic species will show the strongest responses to stressors in specific regions of the estuary.
- Stressor effects have increased in specific regions of the estuary relative to historical data.

Species Contrasts: Fish species (delta smelt, striped bass, longfin smelt, threadfin shad and inland silverside) will be the focus of the 2006-2007 effort. These species were selected because they form convenient contrasts: The first four are declining in abundance – striped bass and longfin smelt over the long-term, delta smelt and threadfin shad more recently, while the last is increasing. Our rationale is that contrasts among these species will help to clarify the relative importance of different stressors.

Working Hypotheses for 2006-2007:
- The more recent invaders (inland silverside) will show less response to stressors.
- Nearshore fishes (e.g. inland silverside) will show less response to stressors.

Approach to Address the Narrative Model

The matrix models highlight the stressors in each season and each geographical area that might affect each species. Work based on the matrix models ask fundamentally qualitative questions; is the stressor likely to have an effect? The narrative model posits linkages among different stressors and their possible pathways to produce the observed declines of more than one species.

The work plan elements that are based on the narrative model, therefore, emphasize analyses of the proposed linkages among stressors. Questions addressed by the narrative model are much more quantitative; to what degree do these stressors affect the species of concern? The basic narratives comprising the model are shown in Figure 8. The approach to address each narrative component is described below. Table 1 provides a coded list of studies that will be used to address each of the narratives. Finally, we include a synthesis section to summarize the studies that will be used to integrate the effects of each of the model components, thereby addressing the ultimate question in the POD studies--what is the population level effect of each of the stressors?

An important point regarding the narrative model approach is that each of the component narratives should be considered as an integrated program, not as "stand-alone" programs. As one example, much of the data on abundance and other population measures (e.g. growth, origin) collected in the first narrative model element, "Previous Abundance and Current Abundance", will be used as part of the evaluations in all of the other narrative model elements. Similarly, the "Habitat" narrative element will collect data on hydrology, water quality, and other habitat measures that will be used as the basis for analysis by all of the other narrative elements.

Previous Abundance and Current Abundance

This narrative element will collect a variety of monitoring data that can be used by all of the other narrative elements, and the synthesis efforts. However, the data will also be used specifically to evaluate the role of previous abundance (i.e. adult stock) play in long-term population dynamics of the POD fishes. The major tasks are as follows: Two major types of data will be collected: 1) trends in fish abundance and population size; and 2) trends in other measures of population status.

Trends in fish abundance and population size will be evaluated using the following study elements:

- Summer Townet Survey (2007-007; DFG). This component provides a juvenile abundance index for striped bass and delta smelt.
- Fall Midwater Trawl Survey (2007-003; DFG). This component provides a juvenile abundance index for striped bass and longfin smelt, and adult abundance estimates for delta smelt and threadfin shad.
- Gear Efficiency Studies (2007-086; DFG). This element will explore potential limitations to interpretation of fisheries monitoring datasets that may limit their ability to be used for population abundance estimates.
- Estimation of Pelagic Fish Population Sizes (2007-043; DFG/USFWS-Ken Newman). This component will explore the ability of current IEP data to develop population abundance estimates for POD fishes.
- Threadfin Shad Data Analysis and Population Dynamics (2007-039; DWR). This component will take the first comprehensive look at long-term datasets for threadfin shad.
- Trends in fish biomass (2007-119; DWR). Building on previous estimates by Wim Kimmerer (SFSU), this component will use population data to develop regional estimates of trends in fish biomass.

- Historical population dynamics (2007-084; USBR). Consultant Bryan Manly will continue work with USGS staff on historical population dynamics to assess temporal and special trends in different fish species and communities.

A variety of other studies will collect fish for the evaluation of other useful measures of population health and status:

- Directed Field Collections (2007-089; DFG). This component provides additional fish samples for the elements listed below on an as-needed basis.
- Evaluation of Apparent Growth Rates (2007-051; DFG). This component provides a long-term time series of plausible growth trajectories for POD fishes.
- Delta Smelt Otolith Microchemistry (2007-060 and 2007-040; UCD). This component provides an empirical check of delta smelt growth rates in recent years.
- Delta Smelt Histopathology Investigations (2007-061; UCD). This component provides a basic health assessment for delta smelt to evaluate mechanisms for growth rate changes.
- Striped Bass Health Investigations (2007-042; UCD). This component provides a basic health assessment for young-of-year striped bass to evaluate mechanisms for growth rate changes.
- Disease as a Factor in the POD (2007-036; FWS). FWS will conduct surveys of disease occurrence in delta fishes.

Habitat Effects

This narrative element will collect a variety of physical, chemical and biological data that can be used by all of the other narrative elements, and the synthesis efforts. The data will also be used specifically to evaluate several habitat-specific questions: 1) what are the trends in basic habitat variables? 2) what changes in habitat quantity and quality affect pelagic fishes? 3) what changes in habitat quantity and quality affect other organisms in the estuary? 4) how do toxics, disease and toxic algal blooms affect the previous two groups of organisms? Although the last question is essentially a subset of the second and third, we have chose to include it separately because we have relatively little baseline information on this issue as compared to other water quality measurements.

Trends in basic habitat variables: General patterns in estuarine habitat will be assessed with water quality and hydrological data.

- Environmental Monitoring Program (2007-072; DWR). This component provides simultaneous water quality and relevant non-fish data (e.g., zooplankton, Corbula) throughout the year.
- Changes in Water Project Operations (2007-097; USGS). One result of this "data mining" effort will be to describe trends in the hydrology of the delta and its tributaries.
- CASCADE (2007-081; USGS) The potential effects of climate change on estuarine habitat will be addressed through a computational assessment of scenarios.

Effects of changes in habitat quantity and quality on pelagic fishes: The goal of this series of studies is to characterize trends in pelagic fish habitat suitability. We will pursue the following

questions: Has the surface area of suitable habitat changed for one or more of the POD species? Does interannual variation in estuarine hydrology influence the spatial extent of pelagic fish habitat? What factors have affected the spatial extent of pelagic fish habitat? What are the trends in physical habitat area in the Delta versus Suisun Bay? Do the previous findings differ when the availability of zooplankton prey are factored into the analysis? How do flow changes alter the size and/or shape of pelagic fish habitat zones? Two main study elements are proposed:

- Evaluation of Changes in Pelagic Fish Habitat Quality using the IEP Long-Term Monitoring Data (2007-066; DWR). This element is a continuation of earlier work by DWR based on analyses of Fall Midwater Trawl and Summer Townet Survey data.
- Spatial Analysis of Habitat and Fish Co-occurrence (2007-120; TBD). The goal of this study element is to use GIS methods to evaluate short time-scale changes in habitat shape in relation to fish distribution and life history needs.

Effects of habitat quantity and quality on other organisms: The approach to evaluating the effects of habitat on other organisms involves several elements intended to improve our understanding of large-scale ecosystem changes.

- Evaluation of Changes in Pelagic Fish Habitat Quality using the IEP Long-Term Monitoring Data (2007-066; DWR). While this study focuses on fish effects (see above), the investigation will also include similar analyses for key zooplankton species, and to the extent possible, for Corbula.
- Corbula Salinity Tolerance and Grazing Rates (2007-076; SFSU). In a new study element, SFSU will use laboratory methods to analyze Corbula salinity tolerances, and the effect of salinity on clam grazing rates.
- Submerged Aquatic Vegetation (SAV) abundance and distribution (2007-102; UCD/USGS). The negative effect of SAV on native fishes in the Delta is now well-established in the literature (Grimaldo et al. 2004; Nobriga et al. 2005; Brown and Michniuk in press). Thus, our primary SAV study question is: Is the distribution of SAV continuing to expand through the Delta? The importance of turbidity as a necessary component of young striped bass and delta smelt habitat also is now recognized, so a second study question is: How much does SAV contribute to increased water clarity in the Delta?
- Delta and Suisun Bay Particle Tracking Investigations (2007-031; DWR). Residence time represents a key variable affecting planktonic organisms. This component will use the DWR DSM-2 model and its particle tracking model to evaluate trends in modeled particle transit times through the Delta. We expect this element to provide data pertinent to larval transport and entrainment of prey resources originating in the San Joaquin River.

Effects of contaminants, disease, and toxic algal blooms: The 2005 findings did not clearly support or eliminate contaminants as a possible significant cause or additive stressor in the POD. The toxicity work in 2005 was limited due to spatial and temporal restrictions on the sampling and analyses. The focus on pyrethroids and aquatic herbicides investigations was based on the overall hypothesis of a step decline coinciding with a major change in contaminant loading due to a change in land use coinciding with the decline. Research into these two areas was in the form of white papers, and did not include field level work. Though aquatic toxicity to *Hyalella*

was observed in the Delta in 2005, there was little evidence from the review of aquatic herbicide application data indicating this is a source of toxicity.

Although there is a relative lack of information about contaminant effects, we recognized the need to develop an integrated strategy to make the best use of the available resources for contaminant studies. To summarize briefly, the approach for 2006-2007 is to expand the toxicology testing to additional sites over a greater period of time. Toxicity tests will be run on *Hyalella*, since this organism has established TIE procedures. Delta smelt and striped bass will be tested with water samples from some of the sites: if toxicity is observed, analyses will advance to TIE procedures to try and isolate the compound. Fish exhibiting toxicity will be submitted for histopathology to be compared with hatchery fish to characterize organ effects. These results will provide a useful comparison with field and archived fish samples that would be analyzed for histopathology. Additional information about potential toxic effects will be gleaned from histopathological analyses of recent and archived fish samples collected from the field. Biomarkers may also be used to help identify specific causes, although more work is needed to identify the most appropriate assays. Moreover, related studies on trends in contaminant use and *Microcystis* bloom location and toxicity will help to illuminate the mechanisms responsible for observed effects.

The components of the contaminant approach are discussed below, with additional detail in the Study Components section. The relationships among these components are shown below in Figure 9.

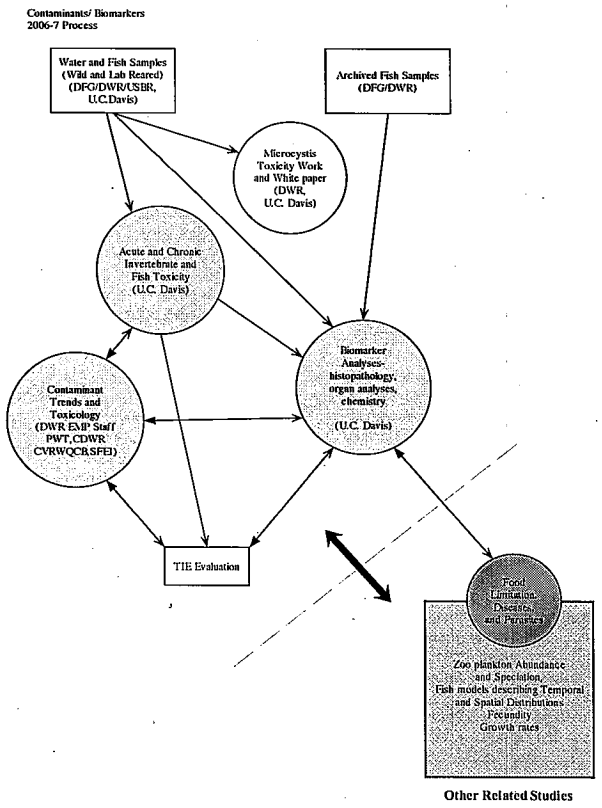

Figure 9. Relationship between components of the POD contaminant investigations.

Water and Fish Samples: Work in 2006-07 will consist of a spatially and temporally expanded sampling for toxicity testing program. As part of this effort, Directed Field Collections (2007-089; DFG) will follow the 2005 pilot program, and additional sites will be sampled in accordance with the prevalent distribution patterns of fish species of concern. A subset of these samples will also be used for *Microcystis* studies. Additional analyses will be conducted using archived samples of fish held by DFG (delta smelt) and UCD (striped bass).

Acute and Chronic Invertebrate and Fish Toxicity Tests/TIE Process: As noted above, the 2006-2007 toxicity work includes a substantial expansion of the 2005 effort (2007-063; UCD). The indigenous amphipod species, *Hyalella azteca*, will be used for routine toxicity testing throughout the year. This species is resident in the Delta, sensitive to contaminants, and routinely used in toxicity testing programs throughout the Nation. Moreover, it can be used to identify the causative agents of toxicity through Toxicity Identification Evaluation (TIE) procedures. If toxicity is observed at a site through initial screening, TIEs will be initiated immediately. Adequate quantities of water will be collected to proceed with TIEs in case toxicity is observed.

Two fish species of concern (delta smelt and striped bass) will be used to test water samples from selected Delta sites, from larval to juvenile stages during periods when the respective life stages are rearing in the Delta. Fish from these tests will be preserved for biomarker and histopathological analyses. These laboratory tests will identify sites that are acutely toxic to larval/juvenile stages of delta smelt and striped bass, and help differentiate the effects of toxic contaminants from the effects of food depletion (fish will be fed during the laboratory trials), and natural stressors such as water temperature and/or oxygen depletion (laboratory tests are performed at constant temperature and water is oxygenated).

Histopathology/ Biomarkers: Histopathological analysis of fish tissues can identify a variety of tissue lesions resulting from exposure to environmental stressors such as contaminants, disease and food limitation. Histopathological lesions often manifest themselves over longer periods of time, and therefore integrate the effects of multiple stressors. It is a useful tool to identify affected organs and can help identify certain groups of contaminants with known mechanism of action (e.g. carcinogens, endocrine disruptors) and target organs (e.g. liver, gonads). Histopathologic studies therefore play an important role in directing and focusing special studies.

The main study elements include POD studies 2007-042 and 2007-061 (UCD), and 2007-036 (FWS). Work in 2006-07 will focus on the examination of fish exposed to water samples or collected from sites where: 1) 2005 results indicated that fish were affected by environmental stressors; 2) where invertebrate toxicity tests indicate the presence of toxic compounds. Lesions in fish from laboratory studies should be compared to lesions observed in fish from field sites, but keeping in mind that actual exposure duration may differ between laboratory-exposed and field-collected fish. Additionally, wild fish may be exposed to natural stressors (water temperature, oxygen levels, and food depletion). IEP staff also will collaborate with EPA staff on a pilot endocrine disruptor study (2007-112).

Additional analyses may be conducted with biomarkers, the molecular, biochemical, physiological and histological changes inside an organism which are indicative of exposure to and/or the effects of environmental stressors (2007-121; DWR). For the POD program, it is important to identify and apply biomarkers that can be applied to the fish species of concern, and help differentiate and quantify stressor groups. Not all biomarkers that are presently being explored in research labs fulfill these requirements, and careful consideration should be given to a work plan for future POD work involving biomarkers. A "Fish Biomarker Task Force" consisting of experts in this field could provide state-of-the-art information on biomarkers. This task force should examine and describe 1) available biomarkers according to a number of criteria including specificity and cost; 2) identify which biomarkers are applicable to Delta fish species of concern and what information they can provide; 3) identify research objectives and timelines for developing specific biomarker tools for Delta fish species of concern.

Microcystis aeruginosa Bloom Biomass and Toxicity: Field surveys will be conducted to measure *Microcystis aeruginosa* bloom biomass and toxicity (2007-079; DWR). The 2006 surveys will build on the 2004-2005 survey and be closely coordinated with the fish surveys (Summer Townet Survey and Fall Midwater Trawl) and toxicity assays. Sample collection at fish survey stations will help elucidate the link between *Microcystis* biomass and toxicity and its direct effect on zooplankton and fish. Zooplankton, benthos, and fish toxicity will be evaluated based on microcystin content in whole animal (zooplankton and benthic) or liver and muscle tissue (fish). Animals for these analyses will be collected during fish surveys.

Top-Down Effects

Predation: The predation portion of the top-down study approach will focus on two major questions: 1) what are the status and trends of the major predators? and 2) what are the effects of changing predation pressure? The first question will be examined using the following suite of studies:

- Status and Trends of Predators in the Delta (2007-118; DFG). Several IEP fish surveys will be analyzed to evaluate the trends in predators, particularly adult striped bass, and largemouth bass. Because most surveys do not effectively sample littoral communities or subadult stages of striped bass, the effort will include exploratory analyses of SWP/CVP salvage, FWS beach seine, and delta bass fishery CPUE data.
- Data from standard Peterson methods will be used to update adult striped bass population estimates for the estuary (2007-116, DFG).

Evaluation of the effects of predation of fish communities is expected to be a more complicated effort, involving some methods that have not traditionally been used for IEP studies.

- Modeling Striped Bass Predation in the Delta (2007-115; DWR). Population estimates developed from the first question will be used as the basis for a bioenergetic model (Fish Bioenergetics 3.0) that will evaluate trends in predation pressure in the delta. The general approach will be to combine age-specific data on growth and abundance of striped bass with bioenergetics modeling to estimate the consumption demand of the striped bass

population through time. We will try similar analyses for largemouth bass if sufficient population age structure and growth data are available.
- Modeling of Predator Population Dynamics (2007-116; DFG). Population estimates from the previous study element will be used to model compensatory population mechanisms in the striped bass population. Specifically, the model will examine the likelihood that the present high abundance of adult bass may suppress earlier life stages.

Entrainment and other Facility Impacts: Our overall approach to address the entrainment hypothesis is to focus on the following three the major questions: 1) are the salvage trends valid, or are they an artifact of data error or changes in fish facility operations? 2) assuming that the data are valid, what is the mechanism for the increase in winter salvage? 3) what are the effects of power plant diversions on pelagic fishes.

The study approach includes two studies to address the first question, salvage data quality. Some of these factors can be rapidly assessed with data already in hand or that can be gathered in the coming months.

- Fish Facility History (2007-107; USBR and DFG). One component of this study element will evaluate whether changes that have occurred at the state and federal fish facilities since 1956 have substantially impacted the reported number of salvaged fish
- South Delta Studies (2007-015, -016, and -17; DWR and USGS): The South Delta studies will include a component to examine whether the salvage data are consistent between the SWP and CVP facilities, and whether the salvage changes occurred in winter rather than other months. The logic is that if both observations are true, then it is unlikely that the observed increases in winter salvage are invalid.

To evaluate the second question (Why Did Salvage Increase?), we have identified three primary mechanisms (1) the source of exported water has been changed to an area (e.g. west Delta) where more of these fishes occur during the winter; (2) the affected fishes have moved to areas from which exports are drawn; and/or 3) winter exports have increased past a hydrodynamic threshold below which fish were better able to avoid entrainment. With regard to the second mechanism, a shift in distribution may have occurred because south Delta habitat conditions were attractive (e.g. food), or because habitat conditions deteriorated in some regions of the Delta (e.g. contaminants, toxic algae). By analyzing these potential mechanisms at local and region scales, we hope to differentiate the major pathway(s).

- South Delta Hydrodynamic Effects (2007-015, 2007-016, and 2007-017; DWR and USGS). A major focus of the south Delta studies is to determine the effect of hydrodynamics and physio-chemical variables near the SWP on fish behavior and entrainment during relatively short time scale (i.e., hours and days) events.
- Particle Tracking Modeling (2007-031; DWR, USGS and SFSU). Particle tracking using the model DSM2 will be used to evaluate the entrainment risk for different export/inflow scenarios and historical conditions. An additional task will be to model adult delta smelt migratory "behaviors" to evaluate potential entrainment risk during late fall and early winter.

- Changes in Water Project Operations (2007-068; USGS). One result of this "data mining" effort will be to describe any recent changes in water project operations that may have influenced entrainment rates.
- Statistical Effects of Environmental Conditions on Salvage (2007-084; USBR). Consultant Bryan Manly's work USGS staff on historical population dynamics will include statistical analyses of factors affecting entrainment rates.
- Regional indicators of habitat quality, described in detail in earlier sections on Prior Abundance and Habitat. Examples include:
  -Regional comparisons of fish health, growth and origin (2007-060, -061, -062, -018, -036, -121; UCD, DFG, FWS). These studies are designed to evaluate the origin of fish in the south Delta, and whether they show different health, growth or condition than other regions. This should allow us to determine whether there is evidence that environmental factors made fish more vulnerable to entrainment.
  -Regional comparisons of toxicity (2007-063; UCD). Regional toxicity testing will allow us to determine whether water toxicity was different in the south Delta than other areas.
  -Microcystis studies (2007-079; DWR, UCD). Regional sampling will evaluate whether toxic algal blooms were more prevalent in the south Delta than in other regions.

Our study approach to address the third question, the extent of power plant impacts, will be at a much more fundamental level than for the SWP and CVP. Because there have not been detailed studies on power plant entrainment since 1979, much of the focus of this study element will be to collect basic information about species loss, abundance and time. These issues will be addressed in a single study element, "Investigation of power plant impacts" (2007-087; DWR).

Bottom-Up Effects

The approach for to address the bottom-up narrative will focus on factors that may be disrupting the food web for pelagic fishes. Much of the emphasis will be on the greater Suisun Bay region, where it appears that pelagic productivity was reduced following the invasion of the clam *Corbula amurensis*. The major study questions to be addressed are: 1) What are the trends in plankton? 2) What factors influence food availability for pelagic fishes? 3) Are there regional or temporal differences in food quality for pelagic fishes?

Studies in support of the first question will be a continuation of work initiated in 2005. These include the following:

- Trends in Delta Phytoplankton. (2007-045; UCD). This UCD-study will evaluate long-term patterns and trends in phytoplankton production and biomass and other water quality variables in different Delta subregions.
- Zooplankton Trends (2007-072; DWR). As part of analyses for the IEP Environmental Monitoring Program, DWR staff will continue analyses of the zooplankton database to evaluate long-term and regional trends in zooplankton community structure.
- Zooplankton Fecundity and Population Structure (2007-044; SFSU). This new POD element will evaluate whether there are changes in zooplankton fecundity and population structure that may have influenced the pelagic food web.

The second question, food availability, will be addressed by evaluating food web linkages, particularly benthic effects. Several new studies are included.

- Food Web Disruption (2007-082; SFSU). In this CALFED-funded POD element, SFSU will lead an effort to evaluate how the food web has changed in recent years.
- Benthic Biomass and Abundance (2007-065; DWR). This POD element will continue to develop estimates of benthic abundance and biomass.
- Fish Diet and Condition (2007-062; DFG). To help develop an understanding of pelagic fish feeding ecology, DFG will continue with diet analyses of the primary pelagic fishes.
- Food Match/Mismatch (2007-122; DFG). This POD study element will use larval fish and zooplankton data from the 20 mm trawl survey to evaluate whether there is a mismatch between the locations of young pelagic fish and their zooplankton prey.

In addition to food quantity, there is substantial evidence in the literature that food quality can also play an important role in growth and survival of pelagic fishes. Because IEP has little experience with this issue, we are proposing an exploratory effort to identify whether food quality is likely to be an issue in the San Francisco estuary. As a first step, we intend to identify biomarkers that have been found to indicate the nutritional quality of fish diets. This will be combined with identification of biomarkers for contaminant exposure.

- Biomarkers of Contaminant Exposure and Food quality (2007-112; DWR). A new POD study will organize an expert panel to develop a suite of biomarkers that could be used as indicators of contaminant exposure or food quality.

Synthesis for the Narrative Model

The ultimate question for each of the stressors in the narrative model is the degree to which each has population-level effects. This question will be difficult to determine since population estimates are currently unknown. The gap will be addressed, in part, by one of the POD study elements to develop population estimates (see below); however, we acknowledge that the estimates may not be available until late in the study. To avoid delaying synthesis activities, synthetic study elements will emphasize modeling approaches that do not necessarily require absolute population estimates.

- Population modeling of delta smelt and striped bass (2007-041 and 2007-038; UCD, SFSU, LSU). These projects will include both age-structured matrix models and individual-based models that will help to evaluate the effects of each of the stressors on pelagic fishes. The striped bass effort will include a dose-response model to evaluate contaminant effects.
- Statistical analyses of pelagic fish abundance data (2007-084; USBR, consultants). Statistician Bryan Manly will continue his efforts to analyze the environmental factors that affect variation in pelagic fish abundance.
- Population estimates for pelagic fishes (2007-043; USFWS, USBR). Statistician Ken Newman will be working with IEP staff to determine whether existing trawl data could

be used for population estimates. As noted above, this issue is an important first-step in the evaluation of the population effects of different stressors.

- Analyses of historical abundance trends (2007-084; USBR). Consultant Bryan Manly's work with USGS staff on historical population dynamics will include statistical analyses of environmental factors affecting abundance trends.
- Comprehensive synthesis (2007-046; USFWS, USGS, DWR, DFG). Much of the synthesis effort for the POD program will be led by National Center for Environmental Analyses and Synthesis (NCEAS), who will organize a series of work teams of IEP and outside experts.

Study Components

Linkages among work plan elements: All work plan elements relate to the narrative and matrix models. Identifying these linkages ensures that all stressors are pursued; linkages among stressors and studies are identified and should help in future syntheses of the POD results. The following table allows easy identification of the justification for each work plan element

Table 1. Relationships among POD work plan elements and narratives.

1. Expanded Monitoring

PEN[1] #	Title	Narrative model connection	Matrix model link: Main stressors	Matrix model link: Minor stressors
2007-003	Fall Midwater Trawl	Both	1-9	
2007-007	Summer Townet Survey	Suisun	1-9	
2007-072	Environmental Monitoring program	Suisun	1,2	6,7,8
2006-089	Directed field collections	Both	5-7,9	
2007-096	Larval Fishes Survey	Suisun	1,3,4,5,9	

2. On-going work

PEN #	Title			
2007-015, 2007-016, 2007-017	South Delta fisheries and hydrodynamic studies	Salvage	3,4	
2007-031	Delta and Suisun Bay particle tracking investigations	Both	3,4	1
2007-042	Striped bass health investigations	Suisun	5,6,9	
2007-045	Phytoplankton primary production and biomass	Suisun	1,8	3,6,7
2007-051	Apparent growth rates of pelagic fishes	Suisun	1	2,4-9
2007-060	Evaluation of delta smelt otoliths	Both	1	2,4-9
2007-061	Pelagic fish liver histopathology	Both	5,9	1,4,6-8
2007-062	Fish diet and condition	Both	1	2,4-9
2007-063	Acute and chronic invertebrate and fish toxicity tests	Suisun	5,6,7	2,9
2007-065	Trends in benthic macrofauna abundance and biomass	Suisun	8	1,2
2007-066	Evaluation of changes in pelagic fish habitat quality	Both	2	1,7,8
2007-068	Analysis of recent changes in water operations	Both	2,3,4	8
2007-078	Retrospective analysis of long-term benthic data	Suisun	8	1,2
2007-079	Field survey of Microcystis bloom biomass and toxicity	Both	7	2
2007-084	Analysis of historical population dynamics	Both	1-9	
2007-087	Investigation of power plant impacts	Suisun	4	

3. New work

PEN #	Title	Conceptual model connection	Main stressors	Minor stressors
2007-018	Striped bass disease and contaminant loads	2D	5,9	1,6,7,8
2007-036	Disease as a factor in the POD	2D	5,9	1,6,7,8
2007-038	Development of striped bass and longfin smelt models	5	1-9	

2007-039	Analysis of threadfin shad data - population dynamics	1A	1-5,7,9	
2007-041	Modeling delta smelt populations in the S.F. Estuary	5	1-9	
2007-043	Estimation of pelagic fish population sizes	1A	1-9	
2007-044	Zooplankton fecundity and population structure	4A	1,2,6	6,7,8
2007-046	Overlap/Synthetic analyses of fish and zooplankton	5	1-9	
2007-076	Corbula salinity tolerance	2C	8	1,2
2007-081	CASCadE	2A	2	3,4,8
2007-082	Food web support for delta smelt and other estuarine fishes	4B	1,8	2,4,5,6,7
2007-086	Gear Efficiency Studies	1A	1-9	
2007-097	Hydrologic changes and Suisun Bay increased salinity	2A, 3A	3	2
2007-102	SAV abundance and distribution	2C	2	
2007-107	Fish facility history	3A	4	
2007-108	Delta smelt culture facility	2D, 3	3,4,5	
2007-112	Biomarkers Workshop	2D,4B	5,6	
2007-115	Striped bass bioenergetics	3B	1,2	
2007-116	Striped bass adult population dynamics	1A, 1B	1,2	
2007-118	Data mining for status and trends of predators	3A	1,2	
2007-119	Delta fish biomass estimation	1A	1-9	
2007-120	Relationship between habitat and distribution	2B	1,2	1,7,8
2007-121	Endocrine disruptor study	2D	5,6	1,7,8
2007-122	Food match-mismatch study	4B	1,2, 3	6, 8
[1] Program Element Number				

Stressor number and Stressor	
1	Food-fish mismatch
2	Habitat space
3	Adverse water movement
4	Entrainment
5	Toxic effects on fish
6	Toxic effects on fish food
7	Harmful algae
8	Corbula
9	Disease

Conceptual Model Components	
1	Prior and current fish abundance
1A	Abundance trends
1B	Trends in other population indicators
2	Habitat effects
2A	Habitat changes
2B	Habitat effects on pelagic fishes
2C	Habitat changes for other organisms
2D	Disease and contaminants
3	Top down effects
3A	Water Diversions
3B	Predation
4	Bottom up effects
4A	Food availability
4B	Food quality
5	Synthesis

Expanded Monitoring

Expanded monitoring in 2006-2007 emphasizes gathering life-stage specific information on the target fish species, but effort will also include expanded collection of introduced jellyfish and a newly introduced shrimp, *Exopalaemon modestus* and updated distribution and abundance analyses. Jellyfish in the San Francisco Estuary are known to feed on copepods and rarely larval fish, and anecdotal evidence suggests that introduced species have recently increased in abundance in the upper estuary (Rees and Kitting 2002). The distribution and seasonal abundance of jellyfish has been investigated (Rees and Kitting 2002, Moreno 2003), but until recently data for trend analyses has been absent. Starting in the early 2000s the San Francisco Bay Study and the Fall Midwater Trawl Survey began identifying and counting jellyfish (Honey et al. in prep). These data will be summarized and additional collections started (see Summer Townet Survey below) to investigate whether jellyfish might be a factor in the pelagic fish decline. The freshwater shrimp, *Exopalaemon modestus*, has dramatically increased in abundance since it was first documented in the estuary in 2000 (Brown and Hieb in prep). Based on the diet of a similar species (Sitts 1978, Siegfried 1982), this shrimp could affect abundance of mysids, amphipods and copepods within its range. We plan to update and expand abundance and distribution information summarized in Brown and Hieb (in prep). Additional revisions are summarized by elements below.

I. Expanded Monitoring
Fall Midwater Trawl (FMWT)
IEP 2007-003
Point person: Randy Baxter (DFG)
Lead Agency: DFG
Questions: What is the relative abundance (via abundance index) of striped bass, delta smelt and other pelagic fishes of the upper estuary? Can these data be used to estimate apparent mortality?
Description: This survey targets age-0 striped bass and other pelagic species 30-150 mm in length using a midwater trawl towed through the water column for 12 minutes in a stepped oblique manner (Stevens and Miller 1983). There are 116 stations located from San Pablo Bay upstream through Suisun Marsh and Bay and into the Delta. In September 2005 a zooplankton tow at 32 selected sites was conducted, and for a subset of 10 sites, water was collected for invertebrate toxicity tests (Werner, 2005 3e). Delta smelt and striped bass heads and bodies were

preserved separately for otolith and histopathological analyses, respectively (Bennett 2005 3a and Teh 2005 3b) or fish were preserved intact for diet and condition analyses (Gartz and Slater 2005 3c). In 2006, sampling continued as described above, except that water collections for toxicity testing (2007-063) will employ a separate boat and crew, longfin smelt, threadfin shad, and inland silversides will be collected for diet and condition, zooplankton sampling will take place only in September and October.

Time period: Sampling is conducted monthly from September through December and takes 2 weeks to complete.

Resources required

Cost: The IEP FMWT budget is $328,000. An additional $3,000 required to do this work was already obtained in 2006 from POD sources.

PI(s): Randy Baxter (DFG) and Dave Contreras (DFG)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: The field component of this project requires 1 boat operator, 1 biologist, and 1 scientific aide. The laboratory component requires numerous personnel for preseason preparation, fish identification, data validation, diet and condition procedures, and stomach content analysis.

Equipment: A boat with davits and hydraulics appropriate to pull a midwater trawl net, (such as the *R/V Scrutiny)*, laboratory facilities, warehouse space, formalin, ethanol, and suitable containers for sample collection and preservation.

Deliverables and dates: Survey by survey indices will be calculated and checked by the end of each month and annual indices for POD fishes will be complete by the first of the new year. An article is completed each spring for the Status and Trends edition of the IEP Newsletter. Also trends in distribution and abundance of jellyfish will be examined for data collected since 2001. Zooplankton identification and CPUE calculation will be completed at the end of the year, and will contribute to the fish and food-item match –mismatch analysis (2007-122).

Comments: The FMWT Survey collected delta smelt and striped bass for otolith and histopathology investigation, but did not collected sufficient numbers of either to support all the projects in 2005, so additional field collections were necessary. A similar circumstance is expected for 2006 and 2007. This survey currently reports annual abundance indices for 6 fishes and has collected count data on jellyfish since 2001. The ratio of same-year FMWT to TNS indices for age-0 striped bass is used as an index of summer survival (Stevens et al. 1985). This survey is mandated in the 2004 OCAP Biological Opinion for delta smelt.

Summer Townet Survey

IEP 2007-007

Point person: Randy Baxter (DFG)

Lead Agency: DFG

Questions: What is the relative abundance (via abundance index) of striped bass and delta smelt? Can these data be used to estimate apparent mortality? How are juvenile striped bass and delta smelt distributed in relation to potential food items? Is the density of food items related to fish condition, growth rate or health indices?

Description: The Summer Townet Survey (TNS) has collected juvenile fishes in the range of 20 to 50mm since 1959 (Turner and Chadwick 1972). Samples are collected using a conical net

with a 1.5 m^2 mouth and 12.7-mm (½ in) stretched mesh nylon lashed to a hoop frame and mounted on skis. Three, 10-minute oblique tows are made against the current at each of 32 stations located from eastern San Pablo Bay to Rio Vista on the Sacramento River and Stockton on the San Joaquin River. This survey was expanded in 2005 to include simultaneous zooplankton sample from each station, water collections for invertebrate toxicity tests (Werner, 2005 3e) at a subset of 10 stations, and a water quality profile at every station. The water quality measurement was be conducted with a YSI 6600 Sonde that collects temperature, depth, dissolved oxygen, turbidity, chlorophyll *a*, conductivity, salinity, pH, date, and time. Also, delta smelt and striped bass heads and bodies were preserved separately for otolith and histopathological analyses, respectively (Bennett 2005 3a and Teh 2005 3b) or were preserved for diet and condition analyses (Gartz and Slater 2005 3c). In 2006, sampling continued as described above, except that: water collections employed a separate boat and crew; due to time and equipment limitations, only bottom and surface water quality measures were taken; longfin smelt, inland silverside and threadfin shad were collected along with delta smelt and striped bass for diet and condition; and numeric and volumetric estimation of jellyfish abundance did not begin.

Time period: Every other week from June through August.

Resources required

Cost: The IEP TNS budget is $273,000. The POD TNS budget is $23,000. An additional $60,000 required to complete this work was already obtained in 2006.

PI(s): Randy Baxter and Jason Dubois (DFG)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: The field component of this project requires 1 boat operator, 1 biologist, and 1 scientific aide. The laboratory component requires numerous personnel for preseason preparation, larval fish identification, zooplankton identification, data validation, length weight procedures, and stomach content analysis.

Equipment: A boat with an A-frame and hydraulics appropriate to pull a sled-mounted townet (such as the *R/V Scrutiny or Munson)*, laboratory facilities, warehouse space, formalin, ethanol, and suitable containers for sample collection and preservation.

Deliverables and dates: Survey indices for striped bass (38-mm Index) and delta smelt will be produced by September 1 of each sampling year and reported to all Agencies through the POD Management Team. These indices will be part of any conference abundance-trend updates for CALFED Science or IEP, and will be published the following spring in the Status and Trends edition of the IEP Newsletter. Also trends in distribution and abundance of jellyfish will be examined for data collected since 2001. Zooplankton identification and CPUE calculations will be completed at the end of the year and will contribute to the fish and food-item match – mismatch analysis (2007-122).

Comments: The TNS collected delta smelt and striped bass for otolith and histopathology investigations, but did not collect sufficient numbers of either to completely support those projects in 2005, so additional field collections were necessary and were added in 2006. A similar circumstance is expected for 2007. TNS catch data are used to calculate the striped bass 38.1 mm index (Turner and Chadwick 1972) and an annual abundance index for juvenile delta smelt (Moyle et al., 1992). This survey is part of the long-term monitoring carried out by IEP and is mandated in the 2004 OCAP Biological Opinion for delta smelt.

Environmental Monitoring Program
IEP 2007-072
Point person: Randall Baxter (DFG)
Lead Agency: DWR and DFG
Questions: How well is abundance (density) of microzooplankton estimated by the historical and alternative methods for common and uncommon taxa? What can be inferred about the effectiveness of historical methods and data from these results? Can microzooplankton data be used to estimate mortality rates and construct a vertical life table? What changes in protocol are recommended for the future long-term monitoring?
Description: As part of the environmental monitoring program (EMP), water quality, chlorophyll a, benthos and three types of zooplankton samples are taken monthly at up to 21 locations distributed from eastern San Pablo Bay upstream into the Sacramento and San Joaquin rivers. Since 1972, microzooplankton samples have been collected by lowering a 15 L/min pump from the surface to the bottom and back to the surface two times, capturing the discharged water in a large carboy and taking a 1.9 L subsample of this mixture preserved with formalin to examine completely for zooplankton. The accuracy and precision of resulting density estimates has been questioned, so a study commenced in fall 2005 to compare traditional methods and gear including: 1) examination of a larger sample volume collected with the same pump and 2) examination of a much larger sample volume collected using a higher capacity pump. In the latter 2 cases, sub-sampling methods will be used, which were not necessary with the low volume of traditional sampling. The 3-types of pump samples will be collected and examined from each sampling location monthly through at least June 2006. Initially, only a fall and spring subset of samples will be examined to identify the optimal gear and method and additional samples archived. If analyses indicate increased volume or the new pump substantially improves accuracy and precision, then the program will adopt the new method or pump and 2006 samples collected in the selected manner will be completely examined.
Time period: Sampling has been concluded in 2006. Sample and data analysis will continue in 2007.
Resources required
Cost: The POD EMP budget is $122,000. The IEP EMP budget is $3,034,000.
PI(s): Dean Messer, Anke Mueller-Solger (DWR)
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel: A single supervising laboratory assistant identifies organisms from all samples. EMP staff at DWR is responsible for data analysis.
Equipment: Lab equipment available at the DFG lab in Stockton.
Deliverables and dates:
Comments: Recommendations for changes in sampling derived from this investigation will likely be incorporated into Program protocol. This program is mandated by Water Rights Decision 1641.

Directed field collections
IEP 2007-089
Point person: Randy Baxter (DFG)

Lead Agency: DFG and DWR
Questions: There are no questions related to the Directed Fish Collections effort. Questions are listed under the project description that the fish are being collected for (2007-040, 2007-042, 2007-060, 2007-061, 2007-062, and 2007-063).
Description: Directed, short-term field collections. In 2005 and 2006 directed collections were used to increase the number of delta smelt and striped bass available for otolith analyses and histopathology, and to collect inland silversides for diet and condition. Directed collections were also used to collect water for fish toxicity tests. In 2007, directed collections will be used to collect water for both invertebrate and fish toxicity tests (see 2007-063) and they may be used for some gear efficiency tests, if time permits. Regular once or twice monthly sampling efforts were made to enhance POD fish collection and to allow time for field examination of larval and young juvenile fishes. As staff and boat time permits, directed sampling will continue to be used to enhance collection of target fishes.
Time period: As needed and when staff and boats are available. For water collections, sampling will take two weeks per month.
Resources required
Cost: The 2007 IEP budget for Directed Field Collections is $75,000 from POD sources. $143,000 required for this work was already obtained in 2006.
PI(s): Inge Werner (UCD), Swee The (UCD), Bill Bennett (UCD), David Ostrach (UCD), Steven Slater and Randy Baxter (DFG).
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel: Water sampling - one boat operator and one crew member from participating research group; Fish sampling - one boat operator, one scientific aid or biologist and 1-3 researchers from participating research group. In addition, the point person contributes substantial time coordinating logistics for PIs and field crews.
Equipment: Water sampling – 20-32 ft. vessel with sufficient deck space for 8-10 large coolers. Fish sampling – 25-42 ft. vessel capable of deploying trawl gear targeting late stage larvae through juveniles; vessel and gear will change as life stage of fishes progress.
Deliverables and dates: See specific project descriptions listed above for this information.
Comments:

Larval Fish Survey
IEP 2007-096
Point person: Randy Baxter
Lead Agency: DFG
Questions: In 2006, we addressed the question – "Can the distribution of larval delta smelt be effectively determined using surface-oriented plankton nets when compared to catches from traditional ichthyoplankton gear and methods?" – and found the answer to be no. For 2007
Description: Using 2005-2006 sampling data, this survey compared catches of delta smelt larvae and those of other species between surface-towed nets and nets retrieved in the traditional oblique manner (IEP 1987; Rockriver 2004, Dege and Brown 2004) to determine if surface catch is sufficient to effectively document species distribution. Two field seasons of data collection (2005-2006) were planned as the basis for evaluating the surface oriented nets. If surface-oriented larva tows prove sufficient (they may not, see Rockriver 2004), then concurrent larva

and 20mm Survey sampling could take place to simultaneously target larva and post-larva to small juveniles. The alternatives of conducting two oblique tows in succession or two separate surveys for larva and 20mm fish are not feasible with current staff and boats. In 2006, sampling will begin in January to facilitate capture of larval longfin smelt, will include collection of zooplankton samples and will cover the 41 20-mm Survey stations plus 3 additional locations in the main channel of central and eastern San Pablo Bay.
Time period: Every other week from January through early July.
Resources required
Cost: The POD DSLS budget is $97,000. The IEP DSLS budget is $177,000. An additional $80,000 required to do this work was already obtained in 2006.
PI(s): Kevin Fleming (DFG) and Julio Adib-Samii (DFG)
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel: The field component of this project requires 1 boat operator and 2 scientific aides. Numerous lab personnel are associated with preseason preparation, lab processing of samples, zooplankton and larval fish identification.
Equipment: This project requires the use of the *RV Munson* since it is the only boat equipped with fore-mounted larval nets. It also requires wet lab space to process approximately 400 quart jar samples that are collected throughout the field season.
Deliverables and dates: Completion of data analysis is planned for fall 2006.
Comments: The 2005 and 2006 surveys replaced the North Bay Aqueduct monitoring on a pilot basis as required by the USFWS 2005 OCAP Biological Opinion for delta smelt. The Delta Smelt Workgroup designed this survey as a two year trial. Protocol and methods developed in 2005 were used in 2006. Surface tows proved ineffective for larval delta smelt (Mayfield in prep.) so the USFWS asked the Delta Smelt Workgroup to modify the sampling design for 2007. The timing and locations of delta smelt larva sampling in 2007 will be guided by catches of ripe and spent adult delta smelt caught in the Spring Kodiak Trawl Survey (Kevin Fleming, DFG, pers. comm.).

II. On-going Studies

Larval fish behavior study
IEP 2007-017
Point person: Ted Sommer
Lead Agency: USBR, USGS and DWR
Questions: What are the behaviors of larval fishes in the south Delta and how is behavior likely to affect entrainment risk under different hydrologic conditions?
Description: This is part of the separately-funded South Delta Hydrodynamics and Fisheries investigation that was initiated in 2004. Its goal is to develop a behavioral model of larval fish behavior to support estimation of entrainment risk in the south Delta under differing hydrologic and operations scenarios.
Time period: The second phase of field data collection was completed during spring 2005; a summary report should be available shortly. Further work will be ongoing through 2007.
Resources required

Cost: This element is funded by non-POD sources.
PI(s): Lenny Grimaldo (DWR)
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel:
Equipment:
Deliverables and dates: The second phase of field data collection was completed during spring 2005; a summary report should be available shortly. Further work will be ongoing through 2007.
Comments:

Delta and Suisun Bay hydrodynamics investigations relying on particle tracking models
IEP 2007-031
Point person: Ted Sommer (DWR)
Lead Agency: DWR and USBR
Questions: How does the spatial distribution of entrainment risk vary under different hydrologic (flows and exports) and operations (DCC, south delta barriers) scenarios? How does risk of (power plant) entrainment in Suisun Bay and environs vary with environmental conditions and power plant operations? How does risk of exposure to adverse physical or chemical conditions created by power plant operations vary with environmental conditions and power plant operations? What geographical areas do samples taken at IEP trawl stations actually represent?
Description: This is a three-pronged element. The first prong shares the goals of the South Delta Hydrodynamics and Fisheries studies: to understand the transport of fishes through the delta and to determine whether adjustments to water project operations may allow a useful reduction in entrainment of protected fish species. For the foreseeable future this work will be conducted using DSM2 and the DSM2 particle tracking model. While this part of the element is fish-oriented, we plan to adapt the investigation if possible to couple model outputs with distribution data and production models for lower trophic level organisms to assess the likelihood that water diversions could significantly influence regional productivity under certain circumstances. The second prong of the element is an investigation that will consist of particle tracking studies of Suisun Bay and surrounding waters to support the power plant operations element of the work plan. The intent will be to estimate entrainment risk and risk of exposure to high temperatures and/or chlorine produced by the Pittsburg and Contra Costa power plants. Initial work will rely on DSM2 and its PTM, but we plan to replace it with more sophisticated 3-D tools during the study period. The third prong is PTM support for development of population size estimation in the IEP field surveys. We plan to use reverse-PTM to help estimate the boundaries of sampling regions represented by fixed stations in the surveys. This work will rely on DSM2 and its PTM.
Time period: Follow-up 2005 PTM studies underway. Other applications will be ongoing through 2007.
Resources required
Cost: $49,000 from POD sources. Use of 3-D technologies will require contracting with an outside entity and the cost of this is unknown at present.
PI(s): The key staff includes Mike Mierzwa, Ted Sommer and Bob Suits (DWR) and Mike Chotkowski (USBR).
Contract needed / in place: N/A
Contract manager: N/A

Term of contract: N/A
Personnel:
Equipment:
Deliverables and dates:
Comments: Additional study questions will be developed by the POD Flows and Operations PWT.

Striped bass health investigations
IEP 2007-042
Point person: Marty Gingras (DFG)
Lead Agency: UCD, support from DFG
Questions: Does the condition of adult or larval striped bass suggest that contaminants and diseases could be depressing the populations of striped bass in the estuary? If present, have these effects increased in recent years? What life stages are most critical?
Description: This work will assess the health status of larval, juvenile, and adult female striped bass collected from selected locations in the Bay Delta using morphometric, histopathological, otolith (aging, growth and microgeochemical analyses) and biochemical metrics. Comparison with archived samples will allow for estimation of the contribution of this type of stressors to the long vs. short-term declines in abundance of young striped bass.
Time period: Analysis of archived samples can begin as soon as contracts are in place. Gravid females will start arriving on the spawning grounds in April and May, and be sampled by DFG as part of their normal operations.
Resources required
Cost: $416,000 from POD sources.
PI(s): David Ostrach (UCD)
Contract needed / in place: In place.
Contract manager: Ted Sommer (DWR)
Term of contract: Through September 14, 2007.
Personnel:
Equipment:
Deliverables and dates: Reports on results of the adults and larvae are due by March 30, 2007 and September 14, 2007.
Comments: The investigator has a great deal of experience and unpublished information on this topic. Transforming new and accumulated data and information into peer-reviewed literature must be an essential part of this element. The additional laboratory and modeling work proposed by the investigator would cost another $240 but may not be available separately in 2007. The additional proposed work not funded in 2006 is more experimental and may not be as conclusive as the work proposed for funding.

Phytoplankton primary production and biomass in the Delta
IEP 2007-045
Point person: Anke Mueller-Solger
Lead Agency: UCD, DWR-DES
Questions: What are long-term patterns and trends in phytoplankton production and biomass and other water quality variables in different Delta subregions and at specific locations? How do they compare to Delta-wide trends? What factors may be responsible for these patterns and trends?

How may the Delta food web be affected by these patterns and trends? Have changes in water exports affected phytoplankton in different Delta areas? Do the previous questions differ when only "nutritious" algae are considered? Can monitoring data be used to evaluate benthic grazing rates?
Description: This is an extension of an ongoing data analysis project with CALFED-ERP funding granted to Dr. Alan Jassby at UC Davis and collaborators at DWR-DES. The full title is "Primary Production in the Delta: Monitoring Design, Data Analysis and Forecasting." Phytoplankton production is at the base of the pelagic food web leading to the zooplankton and fish species currently experiencing rapid declines. One goal of this ongoing project is to analyze available historical data on chlorophyll *a* concentrations and other water quality variables in Delta sub regions or at specific long-term monitoring stations in order to determine processes underlying changes in primary production and biomass. This is an extension of similar analyses conducted at the Delta-wide scale (Jassby and Cloern 2000; Jassby et al. 2002). Results from this study will help assess the potential for sub-regional and local bottom-up food web effects on pelagic zooplankton and fish, effects of changed export patterns on phytoplankton production in different Delta areas, etc.
Time period: Ongoing through 2007.
Resources required
Cost: $50,000 per year from POD sources.
PI(s): Dr. Alan Jassby (UCD), in collaboration with DWR-DES staff (Anke Mueller-Solger & Marc Vayssières)
Contract needed / in place: In place
Contract manager: Ted Sommer (DWR)
Term of contract: Through June 30, 2008.
Personnel:
Equipment:
Deliverables and dates: An IEP newsletter article, progress report, and a presentation (CALFED or IEP) are due by June 30, 2007. By June 30, 2008, the deliverables will be an IEP newsletter article, a final report (an IEP technical report is intended), and at least one peer-reviewed journal article.
Comments:

Apparent growth rates of pelagic fishes and relationship to abundance
IEP 2007-051
Point person: Randy Baxter (DFG)
Lead Agency: DFG
Questions: Have species' apparent growth rates or year-end mean lengths declined, particularly those of 2001-2004 versus previous years? Are environmental factors, such as X2 position or zooplankton abundance, predictive of apparent growth rates or year-end mean size?
Description: Complete growth rate analyses based on existing length frequency data from the trawl surveys to determine if the apparent growth rates of target pelagic fishes have changed over the long-term and/or recently (2002-2004).
Time period: We are examining various data sets for these analyses and propose to complete analyses by March 2007.
Resources required

Cost: The 2007 POD budget for this element is $38,000 from POD sources. $39,000 required to complete this work was already obtained in 2006.
PI(s): Randy Baxter, Kathy Hieb, Kevin Fleming, (DFG)
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel: Existing IEP staff and funds can be redirected to this analysis.
Equipment: There are no field or laboratory requirements for this project.
Deliverables and dates: Two progress reports; March and August 2007.
Comments:

Evaluate delta smelt otolith microstructure and microchemistry
IEP 2007-060 and 2007-040
Point person: Randy Baxter (DFG)
Lead Agency: UCD
Questions: Do growth rates of delta smelt vary seasonally or geographically? When and where in the estuary are delta smelt produced?
Description: Analysis of otoliths from delta smelt to determine daily growth rate and area of origin. Analysis of otoliths that includes microchemical work can provide detailed information on fish origin and growth that can be related to histopathology analyses and potentially to ambient water toxicity for 2005 and 2006. This work has been done successfully on delta smelt (Bennett submitted). Fish samples for this element will be collected by TNS and FMWT surveys, with supplemental sampling based on availability of boats and crew. In addition IEP has archived delta smelt samples from 1995 through 2005 that might be added to these analyses.
Time period: Work should be started as soon as practical and continue for at least one year.
Resources required
Cost: Estimate is $350,000 to process approximately 500-600 samples per year. Funding to come from a CALFED ERP grant. $76,000 funding for J. Hobbs is from CALFED – Sea Grant.
PI(s): Dr. Bill Bennett (UCD) and James Hobbs (UCD)
Contract needed / in place: In place
Contract manager: Steven Rodriguez (DFG)
Term of contract:
Personnel: Field personnel are supplied by DFG Townet, Fall Midwater Trawl and 20-mm surveys, and targeted sampling.
Equipment:
Deliverables and dates:
Comments: This work will be an extension of the delta smelt work (Bennett submitted) and striped bass work carried out by Dr. Bill Bennett and colleagues (Bennett et al. 1995). This work would be most effective if coupled with the histopathology work (2007-061) and diet/condition work (2007-062) to provide a comprehensive timeline of the relative condition of the fish that we could compare to timing of potential stressors.

Delta smelt histopathology investigations
IEP 2007-061
Point person: Randy Baxter (DFG)
Lead Agency: UCD

Questions: Does fish histopathology suggest recent increases in toxic exposures and/or food limitation? Does the histopathological condition vary in severity by life stage within or among species and/or geographic regions? What percentage of fish is affected by environmental stressors? What are the target organs of these stressors, and can the observed effects lead to population declines? What are the stressors affecting the fish?
Description: Histopathological examination of fish. Work in 2006-07 will focus on the examination of fish exposed to water samples or collected from sites where 1) 2005 results indicated that fish were affected by environmental stressors; 2) where invertebrate toxicity indicate the presence of toxic compounds. Lesions in fish from important studies should be compared to lesions observed in fish from filed sites, but it is important to keep in mind that actual exposure duration may differ between laboratory-exposed and field-collected fish, and that wild fish may additionally be exposed to natural stressors (water temperature, oxygen levels, and food depletion.)
Time period: 2006-2007.
Resources required
Cost: $350,000 from CALFED ERP grant
PI(s): Dr. Swee Teh (UCD)
Contract needed / in place: In place
Contract manager: Steven Rodriquez (DFG)
Term of contract:
Personnel: Field personnel are supplied by DFG Townet, Fall Midwater Trawl and 20-mm surveys, and targeted sampling.
Equipment: Field sampling vessels and nets, as well as laboratory supplies needed for storage and preservation of specimens are supplied by DFG. Laboratory analysis is conducted at UCD.
Deliverables and dates:
Comments: Histopathological analysis of fish tissues can identify a variety of tissue lesions resulting from exposure to environmental stressors such as contaminants, disease, and food limitation. Histopathological lesions often manifest themselves over longer periods of time, and therefore integrate the effects of multiple stressors. It is a useful tool to identify affected organs and can help identify certain groups of contaminants with known mechanism of action (e.g. carcinogens, endocrine disruptors) and target organs (e.g. liver, gonads). Histopathological studies play an important role in directing and focusing special studies.

Quantitative analysis of stomach contents and body weight for pelagic fishes
IEP 2007-062
Point person: Randy Baxter (DFG)
Lead Agency: DFG
Questions: Is there evidence of reduced feeding success during specific times of the year or in certain parts of the estuary? If so, are these changes associated with changes in growth rate, relative weight or liver condition? Do stomach content, condition (weight at length) or histopathology vary between salvaged fish and fish collected elsewhere?
Description: Food habit studies have been done on many of the fish and zooplankton found in the estuary (IEP 1987; Orsi 1995; Lott 1998; Nobriga 2002; Feyrer et al. 2003); however, many of these studies were done more than 10 years ago and the feeding habits of the local inland silverside and threadfin shad populations have only been studied in a limited geographical range

(Grimaldo 2004). As evidence that feeding success may be an important issue for survival, initial studies by BJ Miller suggest that delta smelt survival in different parts of the estuary was linked to whether there was co-occurrence of prey. The only previous evaluation of parasite load was an evaluation of cestode infection in striped bass (Arnold and Yue 1997). However, information on gut parasites can be collected quickly during the processing for stomach contents analysis. Parasite load can influence susceptibility to other stressors (Moles 1980). In 2003, IEP started a study of fish length-weight relationships needed to estimate species biomass and to develop a program to monitor trends in relative weight. Work on diet and condition will be continued in 2006 and 2007, and be expanded to include longfin smelt among the target species and the periodic collection of all target fishes (delta smelt, striped bass, longfin smelt and threadfin shad) from Salvage. In 2006, examination of parasite load was transferred to researchers conducting histopathological investigations (2006-061, 2006-042).

Time period: 2006 and 2007

Resources required

Cost: The 2007 POD budget is $11,000. $66,000 required to do this work was already obtained from POD sources in 2006.

PI(s): Randy Baxter and Steve Slater (DFG)

Contract needed / in place: N/A

Contract manager: N/A

Term of contract: N/A

Personnel: Field collection is conducted by all long-term fish monitoring surveys. Fish are retained after reaching quotas for otolith and histopathology samples; all POD fishes are retained by Bay Study for condition and diet analyses. Laboratory personnel (3 scientific aids and part time Sr. Lab Assistant) are directed in sample processing by a Biologist.

Equipment: Current long-term monitoring vessels and gear will be employed; some gear modification may occur for directed sampling. Laboratory equipment is currently available at DFG Stockton.

Deliverables and dates: Posters for CALFED Science Conference, October 2006. Oral progress report, December 2006. Poster and oral presentation for IEP Asilomar Workshop, February 2007. Fish length-weight and diet databases will be added to until the start of 20mm Survey redirects lab staff in March of each year. Additional specimens will be archived for future investigation or increased sample size when staff time permits.

Comments: DFG staff will collect samples and process diet information. The IEP has extensive experience with these techniques, but lost staff leading part of this work. Lab work was delayed substantially in 2006 by the loss of a biologist and long delays in hiring Scientific Aides and Senior Lab Assistants.

Acute and Chronic Invertebrate and Fish Toxicity Tests

IEP 2007-063

Point person: Randy Baxter (DFG)

Lead Agency: UCD

Questions: Is water in the Delta and the Napa River toxic to pelagic fish and fish food organisms? If yes, where and when? How does fish and zooplankton distribution and abundance compare to bioassay results? What is the spatial and temporal distribution of water column toxicity in relevant areas of the Delta? What are the primary toxicants?

Description: Work in 2006-07 will consist of a spatially and temporally expanded sampling and toxicity testing program. Spatial distribution of Delta sampling sites will follow the 2005 pilot program, and additional sites will be sampled in accordance with the prevalent distribution patterns of fish species of concern. The indigenous amphipod species, *Hyalella azteca*, will be used for routine toxicity testing throughout the year. This species is resident in the Delta, sensitive to contaminants, and is routinely used in toxicity testing programs throughout the Nation. Moreover, it can be used to identify the causative agents of toxicity through Toxicity Identification Evaluation (TIE) procedures. If toxicity is observed at a site through initial screening, TIEs will be initiated immediately. Adequate quantities of water will be collected to proceed with TIEs in case toxicity is observed.

Two fish species of concern (delta smelt and striped bass) will be used to test water samples from selected Delta sites, from larval to juvenile stages during periods when the respective life stages are rearing in the Delta. Fish from these tests will be preserved for biomarker and histopathological analyses. These laboratory tests will identify sites that are acutely toxic to larval/juvenile stages of delta smelt and striped bass, and help differentiate the effects of toxic contaminants from the effects of food depletion (fish will be fed during the laboratory trials), and natural stressors such as water temperature and/or oxygen depletion (laboratory tests are performed at constant temperature and water is oxygenated).

If multiple stressor effects are suspected to play a role (e.g. food limitation plus contaminants), laboratory experiments could help quantify the combined effects. Fish could be reared in the laboratory under a normal and a food-limited regime, examined for resulting histopathological lesions, then exposed to water from different Delta sites, or to specific contaminants identified as toxicants present in the Delta.

Time period: 2006-2007

Resources required

Cost: $644,000 from POD sources.

PI(s): Inge Werner (UCD)

Contract needed / in place: Yes

Contract manager: Ted Sommer (DWR)

Term of contract: Through December 2007.

Personnel: Field water collection will be facilitated by a DFG boat operator; otherwise, UC Davis personnel will conduct all preparation and processing.

Equipment: Field collection via a 20-32 foot research vessel supplied by DFG. Bioassay and TIE equipment currently available at UC Davis Aquatic Toxicology Lab.

Deliverables and dates: Quarterly progress reports to Contract Manager; oral progress reports to IEP project work teams by September 2006 and September 2007; oral progress report at the IEP Annual Workshop in February 2006; peer-reviewed professional journal article and/or report in the summer 2007 IEP Newsletter.

Comments: In addition, information will be gathered on land use (e.g. PUR) to ascertain the potential class of toxicant(s) that could potentially be present at the sampling sites (see contaminant trends). This will aid in the TIE process, and also direct focused studies on timing and duration of potential toxic effects.

If TIE work identifies specific contaminants as toxicants of concern, focused laboratory studies should be designed and performed to expand our knowledge of the specific effects and biological effect levels of these toxicants. Specific biomarker responses can then be selected for identifying the effects of these toxicants in field studies

Trends in benthic macrofauna biomass
IEP 2007-065
Point person: Anke Mueller-Solger (DWR)
Lead Agency: DWR
Questions: At central & northern Delta locations, what are the long-term trends in biomass, production, and grazing rates of benthic species? How are these changes related to physical-chemical gradients? How do changes in benthic functions such as production and grazing affect the pelagic food web?
Description: Over the past three decades, the Interagency Ecological Program (IEP) Environmental Monitoring Program (EMP) has collected benthos community composition and abundance information at 22 sites, including four long-term monitoring stations. Trends at the four long-term stations are the subject of an ongoing investigation. Though it is presently recognized that biomass data are crucial in determining the role of benthic organisms in the ecosystem, (especially the feeding potential of various functional groups, potential availability and transmission of contaminants bioaccumulated in benthos, and trends in production as well as the ecological significance of changes in benthic community composition and abundance) measurements of benthic macrofauna biomass have never been conducted by the EMP. Fortunately, the EMP has developed a comprehensive plan to analyze archived benthos samples dating back to 1975 which can be used for biomass estimation using a simple wet-weight method. The objective for 2006 was to measure and examine the biomass of benthic organisms collected quarterly from 1975 – 2004 at two long-term stations located in the central and northern Delta. Data analysis is conducted as part of work plan element IEP 2007-078 and other ongoing EMP data analyses. This work will continue in 2007.
Time period: 2006-2007
Resources required
Cost: Redirected staff from the EMP (2007-072) will be used to accomplish this work. Additional funding for an expansion of this project has recently been granted by the CALFED Science Program. This funding will likely become available by the end of 2007 or early in 2008.
PI(s): Dean Messer (DWR), Karen Gehrts (DWR), Wayne Fields of Hydrobiology would provide identification help and Dr. Janet Thompson, USGS, would provide additional expertise.
Contract needed / in place:
Contract manager:
Term of contract:
Personnel: Scientists: 365 hours = $31,400; 1 Scientific Aide: 550 hours = $21,110; Wayne Fields: 30 hours = $3000.
Equipment: Supplies: $10,000
Deliverables and dates:
Comments: Investigation does not depend on the availability of new field data. Special analytical techniques that are required are well-known.

Evaluation of changes in pelagic fish habitat quality using the IEP long-term monitoring data
IEP 2007-066
Point person: Ted Sommer (DWR)
Lead Agency: DWR and DFG

Questions: Has the surface area of suitable striped bass and/or delta smelt habitat changed? Does interannual variation in estuarine hydrology influence the spatial extent of striped bass and/or delta smelt habitat? Have export changes affected the spatial extent of striped bass and/or delta smelt habitat? What are the trends in physical habitat area in the Delta versus Suisun Bay? Do the previous findings differ when the availability of zooplankton prey are factored into the analysis?
Description: Long-term monitoring data are being used to characterize physical habitat for delta smelt and striped bass and to test the hypothesis that there has been no long-term change in the amount of physical "habitat" for these pelagic fishes. The basic approach used in 2005 was similar to instream flow methods (IFIM) that have been applied to rivers and streams. First, we developed habitat criteria to define the physical and chemical conditions that were suitable for striped bass and delta smelt. Second, we divided the study region into smaller area units based on the location of sampling (TNS and MWT) stations. Third, we applied the habitat criteria (step 1) to long-term water quality monitoring data for each station to determine which stations provided suitable habitat. Finally, we summed the area units (step 2) representing suitable habitat to provide an estimate of total suitable area. Note that a major difference between our approach and traditional IFIM methods is that we relied on actual water quality monitoring data at sampling stations to calculate suitable habitat, while IFIM typically uses model simulations to generate data for each station. In 2006-2007 we propose to: 1) Complete the initial analyses of habitat area for the TNS and MWT; 2) submit results to a peer-reviewed journal for publication; 3) evaluate the results based on trends in physical habitat for major geographical areas (e.g. delta vs. Suisun Bay); and 4) evaluate the feasibility of using zooplankton prey availability as an additional habitat suitability criterion.
Time period: 2006-2007
Resources required
Cost: $184,000 from POD sources
PI(s): Matt Nobriga, Fred Feyrer, and Ted Sommer (DWR)
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel: Two Environmental Scientists at 25% time. Additional assistance of redirected IEP staff may also be needed.
Equipment: There is no field or lab component to this study.
Deliverables and dates: Two peer-reviewed journal articles will be prepared by June 30, 2007.
Comments: This study component is a continuation of the successful 2005 effort.

Recent changes in water project operations
IEP 2007-068
Point person: Rich Breuer (DWR)
Lead Agency: DWR
Questions: This element will address two major questions: 1) how have water project operations changes in recent years; and 2) what is the cause of fall salinity increases in the delta?
Description: This project will use hydrologic data from the delta and upstream areas to identify changes that have occurred in water project operation during the pelagic fish decline.
Time period:
Resources required

Cost: There are no additional funds required to accomplish this work.
PI(s): Lenny Grimaldo (DWR)
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel: Existing staff members will be redirected to accomplish this task.
Equipment:
Deliverables and dates:
Comments:

Retrospective analysis of long-term benthic community data
IEP 2007-078
Point person: Anke Mueller-Solger (DWR)
Lead Agency: DWR & USGS
Questions: At the 4 core sites, how do benthic community assembly and structure change over time? How are these changes related to physical-chemical gradients? Can spatial or physical thresholds be identified for benthic macrofauna, especially for species of concern such as invasive species, species with important trophic effects, (e.g. *Corbicula fluminea* and *Corbula amurensis* which act as a sink for suspended organic particles), and other benthic species that are important prey items for higher trophic levels such as bird, fish and mammals? What is the environmental significance of changes in species assemblage?
Description: This is an ongoing data analysis project with IEP and CALFED-Science funding. The goal of this project is to investigate long-term trends and ecological processes involving benthic organisms from historical data collected by the IEP Environmental Monitoring Program (EMP) at its four long-term benthos monitoring stations. Specifically, this analysis seeks to uncover historical trends in community composition in relation to environmental variability, hydrology, and exotic species invasions.
Time period: ongoing through 2007
Resources required
Cost: Existing staff will be redirected to accomplish this task.
PI(s): Key staff includes Heather Peterson (USGS), Marc Vayssieres (DWR), and Dr. Janet Thompson (USGS).
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel:
Equipment: No equipment is required.
Deliverables and dates:
Comments:

Field survey of Microcystis aeruginosa Bloom Biomass and Toxicity
IEP 2007-079
Point person: Rich Breuer (DWR)
Lead Agency: DWR-DES, DFG
Questions: Is *Microcystis* biomass or toxicity increasing over time in the Delta? Does *Microcystis* bloom biomass or microcystins toxicity occur in areas important to pelagic fish

species in the Delta? Is there a relationship between bloom biomass and toxicity with zooplankton and fish abundance? Is there a relationship between the bloom biomass, microcystins in algal tissue or microcystins dissolved in the water column, and microcystins toxicity in zooplankton, benthic, epibenthic and fish tissue? Do regions of high zooplankton and benthic tissue microcystins toxicity coincide with high microcystin tissue content, lower density and poor health of planktonic feeding fish? Are dissolved microcystins produced during the decomposition phase of the bloom sufficiently toxic to impact fish and zooplankton survival and health based on densities at sampling stations and toxicity bioassays? What are the origins of the *Microcystis* blooms?
Description: Field surveys to measure *Microcystis aeruginosa* bloom biomass and toxicity. The 2006 surveys will build on the 2004-2005 survey and be closely coordinated with the fish surveys (TNS, FMWT) and toxicity assays. Sample collection at fish survey stations will help elucidate the link between *Microcystis* biomass and toxicity and its direct effect on zooplankton and fish. Water samples for *Microcystis* biomass and both algal tissue and dissolved microcystins toxicity will be collected monthly by DWR-DES staff at selected fish survey and zooplankton and fish toxicity assay stations, as well as stations with high *Microcystis* biomass identified in the 2004 survey. Zooplankton, benthos, and fish toxicity will be evaluated based on microcystin content in whole animal (zooplankton and benthic) or liver and muscle tissue (fish). Animals for these analyses will be collected during fish surveys. Epibenthic and benthic organisms will be collected by Ponar dredge or box sampler (C. Messer, personal communication) as a part of the bloom sampling effort or fish survey as appropriate. Environmental conditions associated with the bloom biomass and toxicity will be measured at each station with an YSI 6600 Sonde and by water samples for a suite of discrete water quality measurements including nutrient concentration. Qualitative observations of *Microcystis* surface blooms will be recorded by fish survey staff during all fish survey dates and at all sites.
Time period: Summer and fall 2006-2007.
Resources required
Cost: 250,000 from CBDA Prop 50 Science Program PSP.
PI(s): Peggy Lehman (DWR) and Dan Riordan (DWR).
Contract needed / in place: In place.
Contract manager:
Term of contract:
Personnel: This work would be conducted by redirected and additional hired temporary DWR-DES staff including a boat operator; microcystins toxicity analyses by Dr. G. Boyer at State University of New York.
Equipment:
Deliverables and dates:
Comments: Toxicity analysis will be done by Dr. G. Boyer of the State University of New York, an expert on cyanobacterial toxicity. His group has extensive experience in determination of cyanobacterial toxins and routinely analyzes samples for NOAA, CDC, and departments of health and conservation for several states. They also participated in the previous surveys. Future analyses may be possible at DFG's Water Pollution Control Laboratory.

Analysis of historical population dynamics
IEP 2007-084
Point person: Mike Chotkowski (USBR)

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Lead Agency: USBR
Questions: The examination will extend the 2005 analysis of FMWT and Bay Study data to include other fish datasets, including the FWS JFMP seine dataset. This will include the evaluation and search of, (i) long-term trends, (ii) discernable epochs in the data, (iii) notable point or short-duration events, and (iv) coordinated or contemporaneous changes in multiple species that suggest a common explanation. We will also examine relevant historical data to evaluate historical support for the two "narrative" hypotheses developed in 2005.
Description: These investigations were a component of the 2005 investigations. Based on results to date, we believe continuation is warranted to complete work already started, complete work that could not begin in 2005 due to unavailable data, and to extend the investigation in ways intended to comport with reviewer recommendations.
Time period: Ongoing through 2007.
Resources required
Cost: The 2007 budget is $62,000 from POD sources. Some funds may be required for contracts with external parties in the future.
PI(s): Mike Chotkowski (USBR) and Dr. Bryan Manly
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel: Personnel other than the CO-PI's are not required.
Equipment: There is no field or lab equipment associated with this project.
Deliverables and dates: In 2006 we will submit at least two manuscripts for publication. One will be a methods paper dealing with the new regime change analysis developed by Bryan Manly; the other will be an account of the 2005 analysis of FMWT and Bay Study data, and what the findings imply.
Comments: Statistician Bryan Manly has agreed to assist. San Luis Delta Mendota Water District has generously agreed to support Dr. Manly's work. Other outside assistance may be required in the future.

Power Plant Operations
IEP 2007-087
Point person: Ted Sommer (DFG)
Lead Agency: DWR and others
Questions: What are the characteristics of the cooling water diversions associated with the Contra Costa and Pittsburg power plants, and what effects might they have on pelagic fishes? Have there been recent increases in pelagic fish entrainment?
Description: This study was previously a component of the 2005 work element, "Analysis/summary of recent changes in delta water operations". Based on the initial data review, we believed that the issue warranted a focused study. The purpose of this element is to closely examine power plant operations to identify whether there were effects strong enough to contribute to the long-term and recent apparent step change in pelagic fish abundances.
Time period: Ongoing through 2007.
Resources required
Cost: Any additional costs for agency work will be absorbed by existing DWR personnel.
PI(s): Randall Mager and Stephanie Sparr (DWR)
Contract needed / in place: N/A

Contract manager: N/A
Term of contract: N/A
Personnel:
Equipment:
Deliverables and dates:
Comments: Although we were unable to obtain detailed data on recent project operations and fish entrainment for the 2005 synthesis report, we have had new and promising contacts regarding power plant data.

III. New studies

Contaminant loads in pelagic fish eggs
IEP 2007-018
Point person: Randy Baxter
Lead Agency: DFG, UCD
Questions: Has there been a change in amount and/or type of contaminants contained in striped bass eggs since 1999.
Description: Striped bass are long-lived predatory fish with the potential to accumulate toxic materials either through food or across the gill surface. Their high fat content makes eggs likely physiological targets for toxic effects of fat-soluble contaminants. Unpublished work on egg and larval health of striped bass provides strong grounds for concern. This project will assess the contaminant load of striped bass eggs collected in 2005 and compare that to work done in 1999 and 2000 following the methods developed by David Ostrach. The shorter-lived smelt and shad are less likely to display "maternal gift" impacts, so this work focuses on striped bass. This work will complement and fit in with that described in element 2007-042.
Time period: Chemical analyses of archived samples will take place as soon as DFG water pollution lab can process the samples and analysis of the results will follow soon thereafter.
Resources required
Cost: $10,000 required to conduct this work was obtained in 2006.
PI(s): David Ostrach (UCD)
Contract needed / in place:
Contract manager: Ted Sommer (DWR)
Term of contract: See Element 2007-042.
Personnel:
Equipment:
Deliverables and dates: See Element 2007-042.
Comments:

Preliminary investigations of disease as a factor in the POD
IEP 2007-036
Point person: Randy Baxter (DFG)
Lead Agency: DFG, USFWS, and UCD
Questions: What are the incidences and severities of indicators of disease or parasites for each target fish species? What can be inferred from these data about the impacts of disease and parasites on POD fish populations?

Description:
Time period: In addition to the collection of striped bass and delta smelt for histopathology in 2006, sampling will be augmented to allow collection and as needed on-board processing of fresh specimens of all four target fishes for several time periods. Sampling will be repeated in 2007 with enhanced effort for some or all target species.
Resources required
Cost: $24,000 from POD sources.
PI(s): Scott Foot (USFWS)
Contract needed / in place: In place
Contract manager: Ken Lentz (USBR)
Term of contract:
Personnel:
Equipment:
Deliverables and dates:
Comments: This work is moderately feasible and will depend upon our ability to supply field crews at the proper time, coordinate field assistance with diverse PI's and collect sufficient specimens in a limited number of field days.

Development of striped bass life cycle models
IEP 2007-038
Point person: Ted Sommer
Lead Agency: UCD, SFSU-RTC, LSU, and consultants
Questions: What factors are the dominant drivers of striped bass population dynamics? What are the best management strategies for each of these species?
Description: Life cycle models are need for both striped bass and longfin smelt, but we will pursue a model for striped bass first. Significant information exists and for striped bass some existing models may be able to be modified to meet these purposes. Synthetic modeling capabilities are a very powerful means of evaluating the interactive influences of multiple stressors on fish population dynamics (Rose 2000).
Time period: 2006-2007
Resources required
Cost: $224,000 required to conduct this work was obtained in 2006 from POD sources.
PI(s): Frank Loge (UCD) and Kenny Rose (LSU)
Contract needed / in place: In progress
Contract manager: Ted Sommer (DWR)
Term of contract: TBA
Personnel:
Equipment:
Deliverables and dates:
October 2006 - 1st progress report and CALFED Science Conference presentation.
April 2007- 2nd progress report, IEP Newsletter article, and IEP Workshop presentation.
October 2007 - 3rd progress report and CALFED Science Conference presentation.
April 2007- 4th progress report, IEP Newsletter article, and IEP Workshop presentation.
June 2008 - Submission of 3 peer-reviewed manuscripts addressing description, calibration, hypothesis testing, and comparison of a) dose-structured population dynamics, b) IBM, and c) matrix models. Additionally, computer codes for each model and supporting documentation explaining use, inputs, and outputs.
Comments:

Threadfin shad data analysis and population dynamics
IEP 2007-039
Point person: Ted Sommer (DWR)
Lead Agency: DWR
Questions: What are the seasonal and spatial trends in threadfin shad abundance? What factors affect their abundance and distribution? Do salvage estimates seasonally or cumulatively appear related to the longer term relative abundance of threadfin shad?
Description: In 1959, threadfin shad were introduced into reservoirs in the Sacramento and San Joaquin drainages, and from these introductions the species expanded throughout the freshwater portions of the system. Little is known about their population dynamics within the delta and until about 2002 even their abundance trends were not regularly reported (e.g., their absence IEP Newsletter 2001 (2)). We propose to continue the examination of the distribution and abundance patterns of threadfin shad within the Delta and expand analyses to include investigation of fish entering from upstream.
Time period: 2006-2007
Resources required
Cost: $57,000 from POD sources.
PI(s): Fred Feyrer (DWR)
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel: 2 Scientific, 1 Environmental Scientist, and 1 boat operator are needed.
Equipment: Equipment: $1,000, Toxicity analysis: $20,000.
Deliverables and dates: Poster presentation at CALFED, October 2006; Oral presentation at IEP Annual Workshop, February 2007.
Comments: Substantial catch, length and distribution data exists in state and federal survey databases that can be used to address the study questions.

Modeling the delta smelt population in the San Francisco Estuary
IEP 2007-041
Point person: Randy Baxter (DFG)
Lead Agency: USGS, SFSU-RTC, LSU and consultants
Questions: What are the best management strategies for this species?
Description: This element is a CALFED Science PSP grant that will use three different modeling approaches for looking at delta smelt population dynamics.
Time period: 2006-2008
Resources required
Cost: $332,000 per year for 3 years. Total is $997,000.
PI(s):
Contract needed / in place:
Contract manager:
Term of contract: 3 years, beginning in 2006

Personnel:
Equipment:
Deliverables and dates:
Comments:

Estimation of Pelagic Fish Population Sizes
IEP 2007-043
Point person: Mike Chotkowski (USBR)
Lead Agency: DFG, DWR, USBR, consultants and contractors.
Questions: What are the most efficient regions (strata) for each target species sampled by the TNS, MWT and Kodiak surveys? Do fixed sampling stations in a highly tidal system approximate random distributions? What are the population sizes for each of the target pelagic species? Should strata variance be calculated based upon a normal distribution? What are the most efficient regions (strata) for each target species sampled by the TNS, MWT and Kodiak surveys? Do fixed sampling stations in a highly tidal system approximate random distributions? What are the population sizes for each of the target pelagic species? Should strata variance be calculated based upon a normal distribution or another type of distribution?
her type of distribution?
Description: Except for adult striped bass, the status of pelagic fish populations has primarily been assessed using relative abundance indices. IEP has been reluctant to translate these data into population sizes because of sampling selectivity (i.e., non-random site selection), gear efficiencies are unknown for each of the sampling programs and fish tend be patchy, likely adding substantial variability. Other approaches for pelagic fish population estimation are unreasonable (e.g., direct counts, mark-recapture, and change in ratio). However, the POD effort would benefit greatly from at least crude population estimates, allowing calculation of mortality rates and population modeling. The development of mean-density expansion estimators based upon stratified random trawl sampling represents the most practicable alternative. As initial steps to estimate population size, Bennett (2005) has used the TNS and MWT data, and Miller (2005) has analyzed the Kodiak trawl data. This element will build on those earlier efforts to develop population estimates for as many of the target pelagic species as possible. Refinements of their efforts may include the use of known salinity and temperature effects on target species distributions, updated bathymetry and the particle tracking models to: 1) post-stratify survey data (i.e., set more efficient region boundaries); 2) improve habitat volume estimates represented by fixed stations and regions for each of the surveys; and 3) test the assumption of randomness in the data.
Time period: Ongoing through 2007.
Resources required
Cost: $42,000 required to conduct this work was obtained in 2006 from POD sources.
PI(s): Ken Newman (USFWS)
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel: Ken Newman (USFWS)
Equipment:
Deliverables and dates:

Comments: Although there are substantial obstacles to measurement of population sizes, the recent efforts of Bennett (2005) and Miller (2005) provide a reasonable foundation for future work.

Zooplankton fecundity and population structure
IEP 2007-044
Point person: Anke Mueller-Solger (DWR)
Lead Agency: SFSU-RTC
Questions: Has there been a downward shift in egg production and/or nauplius survival that resulted in lowered ratios of copepodites to adults? Has there been a change in copepodite survival?
Description: This is an analysis of *Pseudodiaptomus forbesi* and *Eurytemora affinis* life stage structure and fecundity from archived zooplankton samples (1996-2005) and associated water temperature data. The goals are to determine whether the recent increase in *Corbula* abundance was associated with an increase in mortality of sub-adult (i.e., copepodite stage) *P. forbesi* and *E. affinis*, and/or a reduction in adult *P. forbesi* and *E. affinis* fecundity.
Time period: 2006-2007
Resources required
Cost: $80,000 from POD sources.
PI(s): Wim Kimmerer
Contract needed / in place: In progress
Contract manager: Ted Sommer
Term of contract: Through December 30, 2008.
Personnel:
Equipment:
Deliverables and dates: See Element 2007-076.
Comments: Feasibility is high because the samples have already been collected and pilot work indicates the methods are appropriate to answer the study questions.

Overlap/Synthetic analysis of POD data
IEP 2007-046
Point person: Randy Baxter (DFG)
Lead Agency: USGS, DFG, DWR
Questions: Specific questions and working groups have not been determined at this time. More discussions with NCEAS members need to occur before determining the most valuable questions to pursue.
Description: The overall goal for the proposed NCEAS working groups is to conduct and/or guide the integration, analysis, and synthesis of POD and other relevant data and information in a more efficient, sophisticated, unbiased, and synergistic manner than would be possible with local resources alone. The focus of the NCEAS working group should be identification of and testing of hypotheses about individual and interacting stressor(s) associated with the observed POD trends, the linkages among these stressors, and the mechanistic pathways leading to the observed trends. Continuous analysis of POD data will help to examine overlap in space and time of pelagic species, food organisms, toxicants, toxic algae, and diversions. Effort will tie together and analyze field data, environmental data, operations information and information from otolith, histopathological and bioassays.

Time period:
Resources required
Cost: The 2007 POD budget for this element is $656,000; an additional $290,000 was already obtained in 2006 from POD sources.
PI(s): Larry Brown (USGS), and Gonzalo Castillo (USFWS)
Contract needed / in place: In process.
Contract manager: Kim Webb will manage the NCEAS contract.
Term of contract: Scientifically sophisticated approaches and defensible conclusions require substantial time. We envision the IEP/POD-NCEAS interaction to continue beyond the term of this contract and at this time would like to establish a working relationship through the end of 2008, with the possibility of an extension.
Personnel: Other key staff members include Fred Feyrer (DWR) and Randy Baxter (DFG).
Equipment:
Deliverables and dates: Fall 2007: Draft synthesis report authored by NCEAS POD working team members, perhaps with the help of an NCEAS postdoc. A comprehensive synthesis report would follow one year later. Additionally, scientific presentations and presentations geared at lay audiences would be authored by individual POD or NCEAS working group members.
Comments: Existing staff members from the above agencies are being redirected to work closely with NCEAS to participate in the synthesis of IEP data as it relates to the POD.

Corbula salinity tolerance, distribution and grazing rates
IEP 2007-076
Point person: Ted Sommer (DWR)
Lead Agency: DWR, USGS and SFSU
Questions: What is the salinity tolerance of *Corbula amurensis?* How well do salinity tolerances explain the distribution of *Corbula*? What are regional trends in benthos and grazing rates?
Description: A central part of the "Bad Suisun Bay Hypothesis" is that *Corbula* distribution has changed, perhaps in response to recent salinity increases during autumn. To better evaluate this hypothesis, we need to develop salinity tolerance information for the clam. This will be performed in a controlled laboratory setting, likely at SFSU Romberg Tiburon Center. To provide additional insight into the "Bad Suisun Bay Hypothesis", we need better fine-scale regional data on the distribution and grazing rates of benthic organisms. Towards this end, field surveys will be performed by EMP staff in 2006 and 2007. Two spatially intensive (~250 samples/event) surveys will be performed each year to assess the distribution, abundance, size (and therefore grazing rate) of benthic bivalves.
Time period: Mid-2006 through 2008.
Resources required
Cost: The 2007 POD budget is $65,000, however $117,000 is the total amount for laboratory studies of salinity tolerances through the contract period. No additional costs for the field surveys and data analyses.
PI(s): Jonathan Stillman and Wim Kimmerer (SFSU)
Contract needed / in place: In place
Contract manager: Ted Sommer
Term of contract: July 2006 through December 2008

Personnel: Key staff includes Marc Vayssieres and Karen Gehrts (DWR), Dr. Janet Thompson and Heather Peterson (USGS).
Equipment:
Deliverables and dates:
October 2007: Submit Year 1 progress report to IEP. This will be provided as one or more IEP Newsletter articles or manuscripts, depending on the results to date.
February 2008: Present preliminary results at Asilomar.
December 2008: Final reports, which will comprise draft manuscripts for submission to journals or the IEP Newsletter, as appropriate.
Comments:

CASCaDE computational assessment of scenarios
IEP 2007-081
Point person: Steve Culberson (CALFED)
Lead Agency: USGS
Questions: This study will establish a model-based approach for placing quantitative bounds on water resource and ecosystem responses to a plausible range of future changes in the Bay-Delta Rivers and Watershed system – critical information that will allow resource agencies to anticipate changes and develop flexibility in their strategic planning to accommodate those changes before they occur. While this project has broad relevance to many goals of the CALFED Science Program, it is most directly relevant to the third priority research topic identified in the 2005 Science Program PSP, which solicits "analytical frameworks that will support assessments and refined predictions of how likely future changes such as population or climate-related hydrological shifts may affect water operations, ecosystem processes, and CALFED projects".
Description: The goals of this project are to develop and apply a model-based approach of ecological forecasting (Clark 2001) to project future states of the Delta ecosystem under prescribed scenarios of change, and to communicate the outcomes of those scenarios to resource managers. Specific objectives include: 1) Develop/refine/calibrate/verify a set of mechanistic numerical models of climate, watershed hydrology, Bay-Delta hydrodynamics, sediments and geomorphology, and water quality; 2) Link these models to project system dynamics from prescribed forcings, beginning with the climate system (including sea level) and then cascading to the watershed (water, sediment, contaminant runoff), river system (flow, heat, sediment and contaminant transport), and Delta-Bay (hydrodynamics, water temperature, salinity, primary productivity, suspended sediments, geomorphology); 3) Compare projections under prescribed scenarios of within-Delta habitat change and catastrophic levee failures; 4) Apply model projections to assess changes in water and habitat quality, potential habitat expansion of key alien species (*Egeria, Corbicula, Potamocorbula*), incorporation of contaminants such as mercury and selenium into food webs, and qualitative population responses of native fishes, and; 5) Work in collaboration with CBDA agencies and interested stakeholders to develop flexible strategic plans based on a range of plausible, quantitative depictions of the Bay-Delta Rivers and Watershed system as it changes during the 21st century.
Time period: 2006-2008
Resources required
Cost: $554,000 per year. This is a CALFED Science PSP-funded study through contract with the USGS.
PI(s): Jim Cloern

Contract needed / in place: In place
Contract manager: Michelle Shouse
Term of contract: 3 years
Personnel:
Equipment:
Deliverables and dates:
Comments:

Food-web support for delta smelt and estuarine fishes in Suisun Bay and upper Estuary
IEP 2007-082
Point person: Steve Culberson (CALFED)
Lead Agency: SFSU-RTC
Questions: Within the Low-Salinity Zone of the northern estuary:
1. How do benthic grazing, available solar irradiance, and the concentrations of and composition of nitrogenous nutrients interact to influence the species composition and production of phytoplankton?
2. How does bacterial production respond to changes in particulate and dissolved organic carbon (POC & DOC) delivered primarily through river flow?
3. What is the role of the microbial food-web in supporting higher trophic levels?
4. To what extent is copepod production dependent on these alternative energetic pathways (phytoplankton and bacterial production)?
Description: This is a CALFED Science Program-funded study focused on two related topics:
Topic 1: The threatened delta smelt (*Hypomesus transpacificus*) is now the principal species of concern for management of freshwater flow and diversions in the Sacramento-San Joaquin Delta, and the principal target for restoration in the upper San Francisco Estuary. The abundance of this federally-listed threatened species has been low since the early 1980s, and it has not recovered to the point where it can be considered for delisting; indeed, the 2004 abundance index was the lowest on record. Potential reasons for its low abundance are many, but evidence points to the direct and indirect effects of export pumping of freshwater in the south Delta, toxic substances, and low food supply as likely contributing factors. We believe that the feeding environment of delta smelt may be implicated in the continued low abundance of this species. Delta smelt feed for their entire lives on zooplankton, principally copepods, mainly in the brackish waters of the western Delta and Suisun Bay. As outlined in the submitted proposal, copepod abundance is depressed in this region.
Topic 2: Previous work on the responses of the estuarine ecosystem to interannual variation in freshwater flow has demonstrated a decoupling between the abundance of lower trophic levels and that of fish and shrimp (Kimmerer 2002a, b, 2004). This decoupling may imply that variability in food-web support is unimportant to variability of higher trophic levels, but there are some important pieces missing from the puzzle. Chief among these is the fact that the supply of labile organic matter from freshwater to the LSZ varies with freshwater flow, and this flux has not been accounted for in analyses of the estuarine food-web.
The funded proposal includes efforts aimed at understanding and possibly improving the food-web supporting delta smelt and other estuarine species.
Time period: 2006-2008
Resources required
Cost: $390,000 per year. This is a CALFED Science PSP-funded grant.

PI(s): Wim Kimmerer
Contract needed / in place: This is a CALFED Science grant
Contract manager: Ladd Lougee
Term of contract: 3 years
Personnel:
Equipment:
Deliverables and dates:
Comments:

Gear Efficiency Studies
IEP 2007-086
Point person: Randy Baxter (DFG)
Lead Agency: DFG
Questions: What is the retention efficiency (fish in the net that remain held) of trawl nets and how does it vary by fish species and individual size? What is the capture efficiency of trawl nets for target species? With this information, can existing monitoring data be used to estimate fish population sizes?
Description: Trawl fishing gear is selective for fishes inhabiting open water or a relatively smooth bottom. In addition, trawl dimensions and mesh sizes affect the size of fishes enclosed and retained. We propose to review existing information, conduct data analyses and plan new experiments to show the effective retention size range(s) for fishes and estimated capture efficiencies of trawl nets currently used by DFG long-term fish monitoring. Review and planning will probably take most of 2006, and field experiments commence in 2007. One step was taken in September 2005 with the addition of a 1/8" mesh cover to the cod-end of the Fall Midwater Trawl (FMWT) net to document the sizes of fishes retained and of those that passed through the net during sampling. Concern about the additional cod-end material on the behavior of the net in the water (slower decent at deployment), lead to limited experimentation during 2005 FMWT sampling. We intend to develop field studies for 2007 to examine retention and capture efficiencies.
Time period: As time becomes available during 2007.
Resources required
Cost: $10,000 required to do this work was obtained in 2006.
PI(s): Staff time to complete this task has not been identified.
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel: Staff time to complete this task has not been identified.
Equipment:
Deliverables and dates:
Comments: The feasibility for this element is moderate for 2007 assuming improved staffing. Literature review can be accomplished with temporary personnel and some permanent time.

Hydrologic changes and Suisun Bay Salinity
IEP 2007-97
Point person: Ted Sommer (DWR)
Lead Agency: USGS

Questions: This work will investigate what hydrologic or climatic changes have resulted in increased fall salinity in the western Delta. Watershed events such as reservoir operations, rice field flooding, and sea level rise will be used to help answer this question.
Description:
Time period:
Resources required
Cost: The $62,000 required to conduct this work was obtained in 2006.
PI(s): Cathy Ruhl (USGS)
Contract needed / in place: In place
Contract manager: Erwin Van Nieuwenhuyse
Term of contract: N/A
Personnel:
Equipment: No equipment is required.
Deliverables and dates: A summary report has already been produced and a finalized report will be delivered in the second quarter of 2007.
Comments:

SAV abundance and distribution
IEP 2007-102
Point person: Bruce Herbold (EPA)
Lead Agency: USGS and UCD
Questions: Has Submerged Aquatic Vegetation (SAV) increased in the Delta? Has SAV altered the habitat to effect fish populations? Has SAV increased retention of suspended solids to create a less turbid environment, which is less hospitable to Delta Smelt?
Description: Using hyperspectral imagery, this project will provide annual acreage calculations of submerged aquatic vegetation (SAV) and quantify SAV regional distribution trends in the Delta for the past four years (2003-2006).
Time period: 2006-2008
Resources required
Cost: $204,000 required to conduct this work has already been obtained 2006.
PI(s): Susan Ustin (UCD) and Dave Schoellhamer (USGS)
Contract needed / in place: Yes
Contract manager: Ken Lentz (USBR) and Fred Feyrer (DWR)
Term of contract:
Personnel:
Equipment:
Deliverables and dates: Fall 2007-progress report as part of Fall 2007 Synthesis. Write up by February 2008.
Comments:

Fish Facility History
IEP 2007-107
Point person: Marty Gingras (DFG)
Lead Agency: DFG, USBR
Questions: What changes have occurred at the state and federal fish facilities that would change the reported number of salvaged fish?

Description: This project will identify changes that have occurred at the state and federal fish facilities from 1956 to 2006 that may have impacted the reported number of salvaged fish. However, this investigation will not report potential items that may have impacted the retention of fish in the holding tanks (holding tank screen size changes) or survival of fish once counted (debris loads in holding tanks and impacts on released fish).
Time period: 2006 and 2007
Resources required
Cost: The 2007 POD budget for this element is $26,000; an additional $26,000 required to complete this work was obtained already obtained in 2006 from POD sources.
PI(s): Jerry Morinaka (DFG) and Brent Baskerville-Bridges (USBR)
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel: 3 months of each PI's time, spread out over 6 – 9 months.
Equipment: No equipment is required for this analysis.
Deliverables and dates:
Comments:

Delta smelt culture facility
IEP 2007-108
Point person: Rich Breuer (DWR)
Lead Agency: UCD
Questions: Reliable supplies of all life stages of delta smelt are valuable to management and scientific communities for a number of reasons. Cultured delta smelt provide specimens with known rearing history, required for toxicological experiments; aids research and design of fish screen efficiency, and pre-screen losses; allows investigations into basic biology with application to wild populations; and enables the development of a formal delta smelt refugia population.
Description: This program will collect sub-adult broodfish via purse seine from the wild each year, and spawn and rear all life stages of delta smelt in the following year in accordance to the Delta Smelt Culture Manual (Baskerville-Bridges et al. 2005). Delta smelt would be housed and reared at the newly expanded Fish Conservation and Culture Laboratory (FCCL) located on Department of Water Resources (DWR) property near DWR's Skinner Fish Facility in Byron, CA.
Time period: This money will be used to produce F1 generation delta smelt from broodstock collected in December 2006.
Resources required
Cost: $165,000 from USBR Tracy operations, and $165,000 from POD sources.
PI(s): Drs. Raul Piedrahita, Joan Lindberg and Bradd Baskerville-Bridges
Contract needed / in place: Needed
Contract manager: Rich Breuer
Term of contract: TBD – Needs to be in place by July 1, 2007.
Personnel:
Equipment:
Deliverables and dates: 5,000 adults (>50mm) and 10,000 juvenile (20-50 mm) delta smelt specimens for 2007, and a Production Report.
Comments: A scope of work was submitted to IEP.

Biomarkers Workshop
IEP 2007-112
Point person: Rich Breuer (DWR)
Lead Agency: CALFED
Questions: Do biomarkers currently being evaluated for the pelagic organisms indicate a population level effect from stressors? Are current biomarker analyses techniques being used for POD adequate to discern the stressor source? C
Description: For the POD program, it is important to identify and apply biomarkers that can be applied to the fish species of concern, and help differentiate and quantify stressor groups. Not all biomarkers that are presently being explored in research labs fulfill these requirements, and careful consideration should be given to a work plan for future POD work involving biomarkers. A "Fish Biomarker Task Force" consisting of experts in this field would provide state-of-the-art information on biomarkers. This task force would examine and describe 1) available biomarkers according to a number of criteria including specificity and cost; 2) identify which biomarkers are applicable to Delta fish species of concern and what information they can provide; 3) identify research objectives and timelines for developing specific biomarker tools for Delta fish species of concern.
Time period: Summer 2007
Resources required: POD PI's conducting Biomarker work and solicited experts in biomarkers. CALFED would solicited experts and organize a workshop where currently applied Biomarker analyses for POD would be discussed, as well as emerging biomarker analyses and their applicability to Delta fish.
Cost: $13,000 (USBR → CALFED) required to conduct this work was already obtained in 2006.
PI(s): Steve Culberson (CALFED)
Contract needed / in place: In place.
Contract manager: Steve Culberson
Term of contract:
Personnel:
Equipment:
Deliverables and dates: Fall, 2007: Findings from task force on biomarker applicability to discern population level effect stressors in the Delta.
Comments:

Striped bass bioenergetics evaluation
IEP 2007-115
Point person: Ted Sommer (DWR)
Lead Agency: DWR and DFG
Questions: What are the trends in estimated population consumption demand of age-1 and older striped bass? Has age-1 and older striped bass consumption demand decreased more slowly than prey relative abundance/relative biomass?
Description: This element will couple bioenergetics analyses to data provided by element 2007-116 (Adult striped bass population dynamics) to estimate the long and short-term (i.e., POD years) trends in consumption demand of piscivorous striped bass.

Time period: Calendar year 2007; assuming the population demographic data are available in early 2007.
Resources required:
Cost: $23,000 for an Environmental Scientist 25% time.
PI(s): Marty Gingras (DFG)
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel: Matt Nobriga and DFG staff to be determined.
Equipment: None required – this is a data mining/data analyses effort.
Deliverables and dates: Draft manuscript for publication by December 2007.
Comments:

Adult striped bass population dynamics
IEP 2007-116
Point person: Marty Gingras (DFG)
Lead Agency: DFG
Questions: What are the age-specific estimates of annual abundance, harvest rate, survival rate, and growth rate among striped bass aged >= 3 years?
Description: Estimate the age-specific annual abundance (including confidence intervals), harvest rate, survival rate, and growth rate among striped bass aged 3 years and older. Abundance will be estimated using a modified Peterson calculation, data from fish tagged during spring, and data from fish observed during a year-long creel survey. Ages will be determined primarily from interpretation of marks on scales known to be made annually but will be estimated using an age-length table as needed. Harvest rate will be determined using returns from a high-value reward tagging program. Survival rate will be determined from changes in the return-rate of tags from each of the two years following application of tags to a cohort and by analysis of the catch-curve of fish captured during tagging. Growth rate will be determined from mark-recapture data and from analysis of length-frequency distributions.
Time period: Through December 2007.
Resources required:
Cost: No increase over base budget.
PI(s): Kyle Murphy (DFG)
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel: Kyle Murphy; Nina Kogut; Mike Harris; Mike Donnellan (DFG).
Equipment:
Deliverables and dates: An IEP Technical Report, an IEP Status and Trends article, and an IEP Quarterly Highlights submission.
Comments:

Data mining for status and trends of predators
IEP 2007-118
Point person: Larry Brown (USGS)
Lead Agency: USGS

Questions: Have populations of predators that prey upon pelagic fishes increased in recent years in either a relative (in relation to populations of other fishes) or an absolute (total number) sense?
Description: The questions about population sizes will mainly be address through summarization and integration of recent analyses of IEP data sets and possible some data analysis of other pertinent existing data. These data will be used by a companion study for the construction of an individual based bioenergetics model for striped bass and then applying the model to the striped bass population.
Time period: To be determined.
Resources required:
Cost: Remaining funding in a CALFED contract to L. Brown. Other analyses will be conducted with redirected staff effort.
PI(s): Larry Brown (USGS) and Fred Feyrer (DWR)
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel: Brown and Feyrer
Equipment: N/A – this is a data mining effort.
Deliverables and dates: Progress report by November 2007
Comments:

Delta Fish Biomass estimation
IEP 2007-119
Point person: Ted Sommer (DWR)
Lead Agency: DWR and DFG
Questions: What are the trends in fish biomass in the San Francisco estuary? Are there specific changes in biomass that coincided with the POD years?
Description: The questions about biomass will mainly be address through summarization and integration of recent analyses of IEP data sets and possible some data analysis of other pertinent existing data. The work will largely be based on initial biomass estimates by Wim Kimmerer. The present study will update Wim's work through 2006.
Time period: Calendar year 2007.
Resources required:
Cost: This work will be conducted with redirected staff.
PI(s): Fred Feyrer (DWR) and Randy Baxter (DFG)
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel: Feyrer, Baxter, and Kimmerer
Equipment: N/A
Deliverables and dates: Progress report by November 2007.
Comments:

Relationship between habitat and distribution
IEP 2007-120
Point person: Bruce Herbold (USEPA)
Lead Agency: TBD

Questions: Have temporal-spatial shifts in the habitats required by pelagic fish reduced their likelihood of finding adequate amounts of different habitats? Have changes in the temporal-spatial distributions of habitats exposed them to new or more severe stressors?
Description: Habitat, as defined by studies of Feyrer and Nobriga of DWR, will be combined with physical data gathered throughout the estuary to allow GIS projections of suitable summer and fall habitats for delta smelt, threadfin shad and young of year striped bass. These habitats will be examined for several biologically important parameters: location, size, proximity to other habitat patches of the same sort, proximity to other sorts of habitat needed sequentially, and proximity to known or suspected sources of mortality or stress.
Time period: January through September 2007
Resources required:
Cost: $100,000 (very approximate) from POD sources.
PI(s): TBD
Contract needed / in place: Needed, unless this can be covered under existing contracts or redirected IEP staff.
Contract manager: TBD
Term of contract: TBD
Personnel: TBD
Equipment: None.
Deliverables and dates: Draft report by September 15, 2007. Final report by October 15, 2007.
Comments: This work can probably best be done by USGS personnel or by consultants working in concert with DWR personnel.

In Situ Biomarker Study
IEP 2007-121
Point person: Rich Breuer (DWR)
Lead Agency: *DWR/ EPA Office of Research and Development, Cincinnati Ohio*
Questions: Do fathead minnows exposed to the Sacramento and San Joaquin Rivers show evidence of endocrine disrupters?
Description: For the POD program, it is important to identify and apply biomarkers that can be applied to the fish species of concern, and help differentiate and quantify stressor groups. Not all biomarkers that are presently being explored in research labs fulfill these requirements, and careful consideration should be given to a work plan for future POD work involving biomarkers. EPA-ORD and the DWR EMP program will conduct two one-month studies in November 2006 and February 2007. Batches of Fat Head Minnows will be exposed in a flow through system to Sacramento and San Joaquin River water. The minnows will be processed and sent to ORD where they will be analyzed for endocrine disruptors. The tissue will be preserved and future biomarker work for Organo-phosphates and Pyrethroids.
Time period: Fall 2006 -Winter 2007
Resources required
Cost: Funding required for this element will be absorbed from existing program costs.
PI(s): Dan Riordan (DWR)
Contract needed / in place: Not needed
Contract manager: N/A
Term of contract: N/A
Personnel:

Equipment:
Deliverables and dates: Fall 2007, findings from analyses.
Comments: CALFED would solicited experts and organize a workshop where currently applied Biomarker analyses for POD would be discussed, as well as emerging biomarker analyses and its applicability for Delta fish.

Food match mis-match
IEP 2007-122
Point person: Randy Baxter (DFG)
Lead Agency: DFG
Questions: Are spring mesozooplankton densities and proximity to/overlap with larval delta smelt and striped bass related to feeding success, fish body condition and eventual recruitment? Do environmental factors – temperature, turbidity, and salinity – have an apparent role in feeding success?
Description: Larval growth-rate variability can influence recruitment by affecting the duration of early life stages -- those most vulnerable to predation (Houde 1996). Growth-rate in turn is influenced by feeding success (Margulies 1988), which may be mediated by the overlap of larva preferred temperature and salinity zones with areas of highest prey concentration (North and Houde 2001). Here we examine the relationships between the geographical distributions of food-sized zooplankton and larval delta smelt and larval striped bass in conjunction with water temperature, turbidity, salinity, and relate those to fish feeding success, body condition (relative weight at length) and recruitment (fall abundance indices). We use historical paired zooplankton and fish samples from tandem-fished Clark-Bumpus (CB; zooplankton) and 20 mm Survey (or Townet) nets to obtain organism densities and select fish for condition and stomach content measures.
Time period: 2007 - 2008
Resources required
Cost: No additional cost, redirected DFG staff will be used to accomplish this analysis.
PI(s): Steve Slater and John Budrick (DFG)
Contract needed / in place: N/A
Contract manager: N/A
Term of contract: N/A
Personnel: 3 laboratory staff for fish measurements and diet examination.
Equipment: Laboratory space, a balance and microscopes for length-weight measurements and diet examination.
Deliverables and dates: Tri-annual progress reports (April, August, December 2007); presentation Asilomar 2008, manuscript for submission to regional peer-reviewed journal summer 2008.
Comments: Personnel for this element have only recently (late fall 2006) become available. Sampling design and analyses have yet to be completely developed.

Feasibility:

The IEP consists of individuals in institutions, agencies and companies uniquely qualified for this study effort. Our program combines the experience and expertise of staff and researchers at multiple agencies including CDWR, CDFG, USFWS, USGS, USBR, USEPA and UC Davis.

The 2006-2007 study components have been carefully selected based on their feasibility and potential to help differentiate among potential stressors. As demonstrated by the successful 2005 effort, the research team has extensive experience with all of the proposed methods and sampling locations. The proposed monitoring component is a slightly expanded version of sampling that has been conducted for many years, some of which comprises field work that has been performed for 30 to 45 years. Focused data analyses have been proposed as a study component because of the extent of the long-term data sets, and because of the relatively low cost and efficiency. The extensive studies conducted by other groups including Department of Waterways and the Regional Water Quality Control Board will be a major additional asset for the contaminant analyses. To perform the data analyses, only modest redirection of IEP staff will be required. Obviously, the ongoing studies represent a highly feasible study component as these efforts are already underway—they have already been peer-reviewed and have secured funding from IEP or CBDA. Finally, the proposed new studies are based largely on proven field and laboratory methods. Most of these studies are essentially an extension of pilot-scale or shorter-term efforts during the past five years. Examples include otolith studies and histopathology (Drs. Bennett, Hobbs and Teh for 1999 samples) and *Microcystis* surveys (Dr. Lehman for 2004).

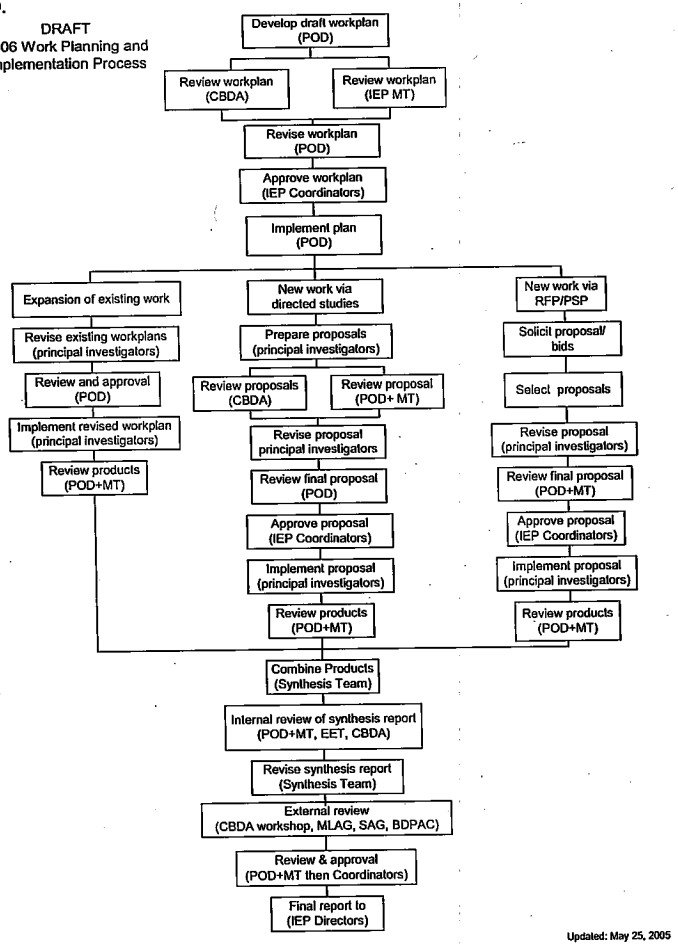
The studies will be completed using the existing Endangered Species Act "take" levels authorized by U.S. Fish and Wildlife Service and NOAA Fisheries. The expansion of sampling is relatively modest and should result in minimal change in "take" because smelt population levels are relatively low (i.e. low catch in sampling) and the sampling methods are unlikely to collect substantial numbers of winter- or spring-run Chinook salmon.

Adaptive Management:

An annual and intra-annual adaptive work planning process will be used for the investigations into the observed decline of the pelagic guild (Figure 9). The work in 2006 was designed to look at the range of possible causative factors from a broad perspective in an effort to remove some from consideration and to focus future efforts in the most appropriate directions. The results of the 2006 work will be used to define and focus the efforts needed in subsequent years. For example, if the statistical analysis of historical trends suggests other species or time period should be considered, they will be added to the 2007 program. Actions considered for 2006 may also include changes in water project operations as an adaptive experiment to evaluate effects on entrainment or food web production. Similarly, there may also be recommendations for adaptive regional efforts to reduce contaminant load, reducing populations of exotic species, or increasing food web inputs (e.g. habitat restoration). This effort would likely be coupled with hydrologic and perhaps biological modeling to help screen the range of alternatives. Within any year as information is developed and evaluated, changes in emphasis and direction may be needed. The POD PWT will provide this oversight and evaluation function.

Figure 9.

DRAFT
2006 Work Planning and Implementation Process



LETTER 21

Project Management, Coordination, and Oversight:

The study is exceptionally complex, including multiple agencies, research topics and principal investigators. Responsive management, close coordination among study participants, and some degree of oversight by independent experts will be critical to the successful completion of the study. We propose the components summarized below for project management, coordination, and oversight. Similar models have been used for IEP and CALFED projects in the past. We hope this level of coordination and oversight will assure the success of this study without overly burdening project staff.

Project Management Team: The project will be managed by a collection of State and Federal agencies: Chuck Armor (DFG), Randall Baxter (DFG), Rich Breuer (DWR), Mike Chotkowski (USBR), Pat Coulston (DFG), Steve Culberson (CBDA), Bruce Herbold (EPA), Anke Mueller-Solger (DWR), Matt Nobriga (DWR) and Ted Sommer (DWR). As in 2005 and 2006, the group will typically meet weekly to evaluate the progress of the effort. This is the same group that prepared this study plan.

POD Project Work Team: Project design, coordination, and discussion of preliminary results will occur in the newly formed POD PWT. This is a proven model that has been used for a variety of different interdisciplinary IEP studies. This is intended as the primary forum for all principal investigators, and will also be open to other parties, including other regional experts, provided they are willing to actively contribute to the effort. The PWT would meet a minimum of every 2 months, with project management team members alternating as meeting chair. Satellite PWT's would also be formed to allow more intensive communication about technical areas (see below).

POD PWT Satellite Teams: We expect that the parent POD will be fairly large, making it difficult to have detailed discussions about each component. To provide an opportunity for more intensive communication and planning, at satellite project work teams have been formed: 1) food web (Wim Kimmerer); 2) Contaminants (Swee Teh); 3) water exports (Ted Sommer and Mike Chotkowski); 4) sampling (Bill Bennett); and 5) geographical variability (Rick Sitts). At least one additional satellite team is being considered to handle data management and analysis. The lead person(s) from each subject area will routinely be in contact with the appropriate principal investigators and will conduct subject area meetings with principal investigators as needed. Subject area e-mail reflectors may also be set up to further facilitate communications.

Email reflector: Much of the communication for the project would be conducted via a new POD PWT email reflector. The reflector would primarily be used for communication and coordination among the principal investigators; however, it may also be a useful outlet for other scientists who wish to contribute.

Oversight: Project oversight will be provided by the project management team, the POD PWT and an additional group of regional and national experts on the various aspects of this study. These scientists will be part of IEP Science Advisory Group (SAG), with additional support from CALFED and other agency science advisors. This "POD-Science" group will oversee the scientific soundness of this project and provide recommendations for improvement. This group is invited to attend any of the meetings mentioned above and receive e-mails via the newly

established list serves. Meetings with POD PWT members may be arranged as needed. In addition, the POD-Science group will meet in the end of each year to discuss project results, synthesis, and further studies with POD PWT members.

Outreach: Various products and deliverables (see below) will be completed as part of the project. Staff will give a presentation at the numerous conferences (see below) to describe the status of the fish decline and the efforts to identify causes. In addition, the POD PWT will organize an IEP workshop by late 2007 to present preliminary results. A substantial portion of the 2006 and 2007 IEP Annual Meetings will provide opportunities to update the results and present key information.

Budget:

The initial cost estimate for 2007 is approximately $3,260,000. CALFED grants that directly support various POD efforts or that will supply information useful to the POD effort are estimated at $2,302,000 for 2007. Cost estimates for individual program components are provided in Table 2 and in the previous section as part of the project summaries. In some instances, money for 2007 work was obtained in 2006, therefore not reflected in the table below.

Table 2. 2007 POD Budget (amounts are in $1,000)

	PEN[1]	POD Total	DWR POD	USBR POD	CALFED	Comments
I. Existing Monitoring						
Summer Townet Survey	7	$23	$23	$0		
EMP - Water Quality Monitoring	72	$122	$96	$26		
Field support for additional work	89	$75	$75	$0		
Larval fish survey	96	$97	$97	$0		
I. TOTAL for EXISTING MONITORING		**$317**	**$291**	**$26**	**$0**	
II. Ongoing Work						
Delta and Suisun Bay particle tracking investigations	31	$49	$49	$0		
Delta smelt otolith geochemistry and stock structure	40	$76	$0	$0	$76	CBDA Science
Striped bass health investigations	42	$416	$416	$0		
Phytoplankton primary production and biomass in the Delta	45	$50	$50	$0		
Apparent growth rates of pelagic fish	51	$38	$38	$0		
Otolith analysis of delta smelt fish	60	$512	$39	$123	$350	CALFED-ERP
Liver histopathology for pelagic fish	61	$350	$0	$0	$350	CALFED-ERP
Fish diet and condition	62	$11	$11	$0		
Acute and chronic invertebrate and fish toxicity	63	$644	$0	$644		
Changes in pelagic fish habitat	66	$184	$184	$0		
Field survey of Microcystis bloom biomass and toxicity	79	$250	$0	$0	$250	CBDA Science
Analysis of historical population dynamics	84	$62	$0	$62		
TOTAL for ON-GOING STUDIES		**$2,480**	**$787**	**$829**	**$1,026**	
III. New Special Studies						
Preliminary investigations of delta fish diseases	36	$24	$16	$8		
Analysis of threadfin shad data	39	$57	$57	$0		
Modeling delta smelt population in the SF Estuary	41	$332	$0	$0	$332	
Estimation of pelagic fish population sizes	43	$0	$0	$0		
Zooplankton fecundity and population structure	44	$80	$80	$0		
Overlap analyses of fish, zooplankton, etc. and NCEAS	46	$656	$96	$560		
Corbula salinity tolerance, distribution and grazing rates	76	$65	$65	$0		
CASCaDE computational assessments of scenarios	81	$554	$0	$0	$554	CBDA Science
Foodweb support for delta smelt and estuarine fishes	82	$390	$0	$0	$390	CBDA Science
Gear efficiency studies	86	$0	$0	$0		
Fish facility history	107	$26	$0	$26		
Delta smelt culture facility	108	$165	$165	$0		
Biomarkers workshop and ORD study	112	$0	$0	$0		
Striped bass bioenergetics	115	$23	$23	$0		
Relationship between habitat and distribution	120	$100	$50	$50		
Statistical support	123	$0	$0	$131		
TOTAL for NEW STUDIES		**$2,472**	**$552**	**$644**	**$1,276**	

	Overall POD	DWR POD	USBR POD	CALFED
2007 POD TOTAL	**$5,562**	**$1,630**	**$1,630**	**$2,302**

Products and Deliverables:

The monitoring and assessment program developed by this multi-institutional collaboration will yield a range of products and deliverables. The POD PWT oversight team above is responsible for the timely completion of all deliverables and serves as the principal contact for IEP staff and other stakeholder groups. The deliverables can be grouped into four general categories:

Monitoring Data. As in previous years, all data collected from the monitoring elements of this study program will be uploaded to the Bay Delta and Tributaries (BDAT) Project Site (http://bdat.ca.gov). BDAT contains environmental data concerning the San Francisco Bay-Delta and provides public access to that data. Over 50 organizations contribute data voluntarily to this project. The database includes biological, water quality, and meteorological data that are used to gauge the health of the estuary and to manage water and environmental resources. Also zooplankton, macroinvertebrate and fish monitoring data will be available directly via the web (http://www.delta.dfg.ca.gov).

Conferences and Workshops. The results of the study will be presented at a special session at the IEP Annual Workshop each year during 2006-2008. A special CDBA workshop will also be considered to discuss the project's final report. Several members of the program will also present their results at a special POD session at the spring 2006 American Fisheries Society meeting. Similar group presentations will be made at the CALFED Science conference (October 2006) and the State of the Estuary Conference (autumn 2007).

Publications and Reports. The researchers in this effort all place high value on the publication of peer-reviewed information. In 2005, the short timeline and management importance of the study effort limited our ability to produce journal articles. For 2006, we propose to submit a minimum of four articles to peer reviewed journals on: 1) analysis of trends in estuarine species (2 articles); 2) trends in physical habitat (1 article); 3) particle tracking results (1 article). By 2007, we propose to submit an additional 4-5 articles on diverse topics including regional analysis of factors affecting primary productivity (Jassby, UCD), toxic effects (e.g. Teh and Werner UCD), and food limitation (e.g. Bennett, Hobbs and Teh UCD). If appropriate, a feature article or collection of articles on the results of the overall effort will be submitted to the IEP Newsletter by winter 2007.

LETTER 21

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Appendix A
Annotations for the Species Matrix Models (Figures 3-7)

Longfin Smelt

Mismatch of larvae with food
In winter-spring larvae are present throughout region (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.), but no feeding data are available. In summer-fall young fish are beyond larval stage.

Reduced Habitat Space
The longfin smelt has a strong X2 relationship (Jassby et al. 1995) and the 20 mm survey shows its distribution is centered on X2 (Dege and Brown 2004). There is evidence that habitat space can vary with X2 for delta smelt; this may also apply to longfin smelt (See POD 2005 Synthesis Report Appendix A: 2g, Feyrer et al; 2g, Nobriga et al.). Beyond the winter and spring larval period, habitat extends to marine waters (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.), so habitat limitation is less likely.

Adverse Water Movement
The increased amount of Sacramento River water pulled towards export facilities in winter (POD 2005 Synthesis Report Appendix A: 2h, Simi and Ruhl) could potentially increase false attraction to upstream migrating adults and the retention of their larvae. In north Delta and Suisun Bay, as well as summer and fall, fish are distributed away from major water project influence (POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.).

Entrainment (Water Projects, Power Plants)
In winter-spring adults and larvae are present throughout region (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al), and increased salvage has been observed during winter in recent years (See POD 2005 Synthesis Report Appendix A: 2h, Herbold et al.) In summer-fall young fish are beyond export facility influence. In addition, salvage rates are lower in wetter years, when survival is also higher (Jassby et al. 1995; Sommer et al. 1997). In Suisun Bay, effects from power plant operations are possible year-round (See POD 2005 Synthesis Report Appendix A: 2h, Matica and Sommer).

Toxics Effects on Fish
In winter-spring adults and larvae are present throughout region (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). The juvenile and adult population is located downstream (Suisun and farther) in summer and fall. However, there is no current information on direct toxicity or histopathological evidence of toxicity.

Toxics Effects on Fish Food Items
Copepods and larger crustaceans are present throughout range of longfin (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). Results to date, for summer only, indicate that toxicity to standard organisms (*Ceriodaphnia dubia* and *Hyalella azteca*) was sporadic in space and time (see POD 2005 Synthesis Report Appendix A: 3e, Werner).

Harmful Microcystis Bloom
There is no likely impact from *Microcystis* due to mismatch of summer algal blooms in the south and central Delta and longfin smelt habitat, which extends from the north Delta through central San Francisco bay at that time (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.; 3d, Lehman et al.).

***Corbula* Impacts on Food Availability**
Corbula reduces availability of zooplankton (Kimmerer and Orsi 1996), which may have declined in Suisun Bay and the west Delta with a recent rebound in clam abundance and distribution. Kimmerer (2002b) reported a step change in longfin smelt abundance following the introduction of *Corbula*. However, *Corbula* is still only abundant in Suisun Bay (See POD 2005 Synthesis Report Appendix A: 3g, Vayssieres and Peterson). Lower grazing rates are suspected to occur in winter.

Disease and Parasites
There is a plausible impact everywhere longfin smelt are present and throughout the year (POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.), but no current information on disease or parasites.

Delta Smelt

Mismatch of larvae with food
In spring larvae are present throughout region (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.) with some feeding data available (Nobriga 2002). In other months young fish are beyond larval stage.

Reduced Habitat Space
There is evidence that habitat space can vary with X2 for delta smelt, but it does not show a strong relationship with abundance or a time trend (See POD 2005 Synthesis Report Appendix A: 2g, Feyrer et al; 2g, Nobriga et al.). There is some evidence that south Delta habitat has degraded seasonally (DFG, unpublished data); however, this is a long-term pattern (e.g. 1940s).

Adverse Water Movement
The increased amount of Sacramento River water pulled towards export facilities in winter (POD 2005 Synthesis Report Appendix A: 2h, Simi and Ruhl) could potentially increase false attraction to upstream migrating adults and the retention of their larvae. In north Delta and Suisun Bay, as well as in mid summer through fall, fish are distributed away from major water project influence (POD 2005 Synthesis Report Appendix A: 2a, Baxter et al).

Entrainment (Water Projects, Power Plants)
In winter-spring adults and larvae are present throughout region (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al), and increased salvage has been observed during winter in recent years (See POD 2005 Synthesis Report Appendix A: 2h, Herbold et al.) In Suisun and north Delta, young fish are beyond export facility influence. In addition, salvage rates are lower in wetter years (Sommer et al. 1997). In Suisun Bay, effects from power plant operations are possible year-round (See POD 2005 Synthesis Report Appendix A; 2h, Matica and Sommer).

Toxics Effects on Fish
Adults and larvae are present throughout region during winter-spring but the juvenile population is distributed away from central and south Delta in summer and fall (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). A single ambient water toxicity test in 2005 failed to show an impact to juvenile delta smelt (See POD 2005 Synthesis Report Appendix A: 3e, Werner), but limited histopathology analysis showed liver lesions, potentially indicators of toxics exposure (See POD 2005 Synthesis Report Appendix A: 3b, Teh).

Toxics Effects on Fish Food Items
Copepods are present throughout range of delta smelt (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). Results to date for summer only indicate that toxicity to standard organisms (*Ceriodaphnia dubia* and *Hyalella azteca*) is sporadic in space and time (see POD 2005 Synthesis Report Appendix A: 3e, Werner).

Harmful Microcystis Bloom
There is no likely impact from *Microcystis* due to mismatch of dense summer algal blooms in the south and central Delta and delta smelt habitat, which extends from the north Delta through

Suisun Bay at that time (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.; 3d, Lehman et al.).

***Corbula* Impacts on Food Availability**
Sweetnam (1999), Bennett (2005) and Souza et al. (POD 2005 Synthesis Report Appendix A: 2b) report a decrease in size of delta smelt following the introduction of *Corbula*. Similarly, Teh (POD 2005 Synthesis Report Appendix A: 3b) reports a chronic depletion in liver glycogen levels, possibly a result of food limitation. *Corbula* reduces availability of zooplankton (Kimmerer and Orsi 1996), which may have declined in Suisun Bay and the west Delta with a recent rebound in clam abundance and distribution. However, *Corbula* is still only abundant in Suisun Bay (See POD 2005 Synthesis Report Appendix A: 3g, Vayssieres and Peterson). Lower grazing rates are suspected to occur in winter.

Diseases and Parasites
There is a plausible impact everywhere delta smelt are present and throughout the year (POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.), but no information on disease. A very low incidence of macroscopic internal parasites was detected in the 50 delta smelt examined in 2005 (POD 2005 Synthesis Report Appendix A: 3c, Gartz).

Threadfin Shad

Mismatch of larvae with food
In summer larvae are present throughout region except Suisun Bay (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.), but no feeding data are available. In other months young fish are beyond larval stage.

Reduced Habitat Space
Threadfin shad are present everywhere, but less abundant in Suisun Bay (see POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.), but no information was developed on habitat trends or criteria.

Adverse Water Movement
Present everywhere (see POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). Mechanism unknown, but hydrodynamic effects likely regionally limited to central and south Delta

Entrainment (Water Projects, Power Plants)
Adults and larvae are present throughout region (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). Increased salvage has been observed during winter in recent years (See POD 2005 Synthesis Report Appendix A: 2h, Herbold et al.). However, north Delta is likely outside of entrainment influences. Threadfin shad are less abundant in Suisun, where effects from power plant operations possible year round (See POD 2005 Synthesis Report Appendix A; 2h, Matica and Sommer).

Toxics Effects on Fish
Adults and juveniles are throughout region, but less abundant in Suisun Bay (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). There is no current toxicology or histopathology information.

Toxics Effects on Fish Food Items
Copepods and cladocerans are present throughout range of threadfin shad (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). Results to date for summer only indicate that toxicity to standard organisms *Ceriodaphnia dubia* and *Hyalella azteca*) was sporadic in space and time (see POD 2005 Synthesis Report Appendix A: 3e, Werner).

Harmful Microcystis Bloom
Dense blooms are present in south and central delta during summer and fall, when threadfin larvae, juveniles and adults are also present, posing a plausible impact (See POD 2005 Synthesis Report Appendix A: 2a Baxter et al.; 3d, Lehman et al.).

***Corbula* Impacts on Food Availability**
There are no likely impacts at anytime. There is little distributional overlap between threadfin shad and *Corbula*. (POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.; 3g, Vayssieres and Peterson).

Diseases and Parasites

There is a plausible impact everywhere longfin smelt are present and throughout the year (POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.), but little current information on disease and parasites. A very low incidence of skin lesions was observed for threadfin shad in 2005 (POD 2005 Synthesis Report Appendix A: 3c, Gartz).

Striped Bass

Mismatch of larvae with food
In spring and summer larvae are present throughout region (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.), with some feeding data available (Bennett et al. 1995; Bryant and Arnold, In press). In other months young fish are beyond larval stage.

Reduced Habitat Space
Striped bass survival has a strong X2 relationship (Jassby et al. 1995) and 20 mm survey shows its distribution is centered upstream of X2 (Dege and Brown 2004). However, X2 has no time trend (Kimmerer 2002a). There is evidence that habitat space can vary with X2 for young striped bass, but it does not show a strong relationship with abundance or a time trend during summer and fall (See POD 2005 Synthesis Report Appendix A: 2g, Feyrer et al; 2g, Nobriga et al.).

Adverse Water Movement
Increased amount of Sacramento River water pulled towards export facilities in spring and summer (POD 2005 Synthesis Report Appendix A: 2h, Simi and Ruhl) could potential increase the retention of eggs and larvae. Sacramento River flow can also affect transport of eggs and larvae. Flows in the Sacramento River were relatively low in winter and spring of 2001, but increased during subsequent years (POD 2005 Synthesis Report Appendix A: 2h, Simi and Ruhl). In Suisun Bay, fish are away from major water project influence (POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.).

Entrainment (Water Projects, Power Plants)
Striped bass are present throughout region at all times (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al), and increased salvage ahs been observed during winter in recent years (See POD 2005 Synthesis Report Appendix A: 2h, Herbold et al.). Jassby et al. (1995) found that exports may help to explain variability in striped bass survival. In Suisun Bay, effects from power plant operations are possible year-round (See POD 2005 Synthesis Report Appendix A: 2h, Matica and Sommer).

Toxics Effects on Fish
Juveniles are present throughout region at all times and larvae in late spring-summer (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). Although earlier work showed some evidence of larval toxicity (Bennett.et al. 1995), a pair of ambient water toxicity tests for striped bass in 2005 failed to show an impact to juveniles (See POD 2005 Synthesis Report Appendix A: 3e, Werner).

Toxics Effects on Fish Food Items
Copepods, larger crustaceans and small fishes are present throughout range of striped bass (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). Results to date for summer only indicate that toxicity to standard organisms *Ceriodaphnia dubia* and *Hyalella azteca*) was sporadic in space and time (see POD 2005 Synthesis Report Appendix A: 3e, Werner).

Harmful Microcystis Bloom

Dense blooms are present in south and central Delta during summer and fall, when juvenile striped bass also present, posing a plausible impact (See POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.; 3d, Lehman et al.).

***Corbula* Impacts on Food Availability**

Corbula reduces availability of zooplankton (Kimmerer and Orsi 1996), which may have declined in Suisun Bay and the west Delta with a recent rebound in abundance and distribution. A diet shift and decrease in abundance of striped bass occurred following the introduction of *Corbula* (Feyrer et al. 2003; Bryant and Arnold, in press; DFG unpublished data). However, *Corbula* is still only abundant in Suisun Bay (See POD 2005 Synthesis Report Appendix A: 3g, Vayssieres and Peterson). A lower grazing rate is suspected to occur in winter.

Diseases and Parasites

There is a plausible impact everywhere striped bass are present and throughout the year (POD 2005 Synthesis Report Appendix A: 2a, Baxter et al.). Recent evidence of disease and parasites has been found in young bass (POD 2005 Synthesis Report Appendix A: 3c, Gartz; 3h, Ostrach; Arnold and Yue 1997).

Attachment 15

Multidecadal trends for three declining fish species: habitat patterns and mechanisms in the San Francisco Estuary, California, USA

Frederick Feyrer, Matthew L. Nobriga, and Ted R. Sommer

Abstract: We examined a 36-year record of concurrent midwater trawl and water quality sampling conducted during fall to evaluate habitat trends for three declining fish species in the San Francisco Estuary, California, USA: delta smelt (*Hypomesus transpacificus*), striped bass (*Morone saxatilis*), and threadfin shad (*Dorosoma petenense*). Generalized additive modeling revealed that Secchi depth and specific conductance were important predictors of occurrence for delta smelt and striped bass, while specific conductance and water temperature were important for threadfin shad. Habitat suitability derived from model predictions exhibited significant long-term declines for each species; the southeastern and western regions of the estuary exhibited the most dramatic changes. Declines in habitat suitability were associated with anthropogenic modifications to the ecosystem. For delta smelt, an imperiled annual species endemic to the estuary, the combined effects of fall stock abundance and water quality predicted recruit abundance during recent years of chronically low food supply. Our results are consistent with existing evidence of a long-term decline in carrying capacity for delta smelt and striped bass and demonstrate the utility of long-term data sets for evaluating relationships between fish and their habitat.

Résumé : Nous avons examiné des données concomitantes d'échantillonnage au chalut en pleine eau et d'échantillonnage de la qualité de l'eau faites à chaque automne pendant 36 années dans l'estuaire de San Francisco, Californie, É.-U., afin d'évaluer les tendances de l'habitat chez trois espèces de poissons en déclin, soit l'éperlan du delta (*Hypomesus transpacificus*), le bar rayé (*Morone saxatilis*) et l'alose fil (*Dorosoma petenense*). Un modèle additif généralisé montre que la profondeur de Secchi et la conductance spécifique sont d'importantes variables explicatives de la présence de l'éperlan du delta et du bar rayé, alors que la conductance spécifique et la température de l'eau le sont pour l'alose fil. Les prédictions du modèle indiquent une diminution significative à long terme de la qualité de l'habitat pour chaque espèce; les régions du sud-est et de l'ouest de l'estuaire montrent les changements les plus spectaculaires. Le déclin de la qualité de l'habitat est associé à des modifications anthropiques de l'écosystème. Chez l'éperlan du delta, une espèce annuelle, menacée et endémique à l'estuaire, les effets combinés de l'abondance des stocks à l'automne et de la qualité de l'eau expliquent l'abondance du recrutement durant les années récentes de sources de nourriture chroniquement limitées. Nos résultats confirment les indications existantes d'un déclin à long terme du stock limite de l'éperlan du delta et du bar rayé; ils démontrent l'utilité des banques de données couvrant de grandes périodes pour l'évaluation des relations entre les poissons et leur habitat.

[Traduit par la Rédaction]

Introduction

There have been worldwide declines in production and yield of many estuarine-dependent fishes resulting from overfishing, pollution, and habitat alterations (Houde and Rutherford 1993). These trends have coincided with substantial long-term changes in fish species composition and abundance in developed North American estuaries (Matern et al. 2002; Hurst et al. 2004). Declining yields and changing fish communities suggest that current understanding of fish population dynamics is insufficient to ensure proper management.

The processes underlying fish population dynamics are complex because multiple interacting factors contribute to interannual variation in recruitment and abundance. A fundamental component in the study of population dynamics is the interaction between fish and their habitat. In the broadest sense, habitat can be characterized as the abiotic and biotic factors that are required to support healthy fish populations (Hayes et al. 1996). The abiotic components of habitat often strongly influence the biotic components, particularly in estuaries where freshwater inputs and associated salinity effects are important community-structuring mechanisms (e.g., Bulger et al. 1993; Jassby et al. 1995). Quantifying

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fish–habitat relationships and long-term trends in habitat suitability is critical because abiotic habitat components can affect the population dynamics of fishes in most habitat types (e.g., Cardinale and Arrhenius 2000; Claramunt and Wahl 2000; Rose 2000). Here, we use the term environmental quality (EQ; Rose 2000) to describe abiotic habitat variables that may affect fish population dynamics.

Long-term data sets are essential for the development and evaluation of fish–EQ relationships and time trends (Bray 1996; Rose 2000). Long-term data sets that include a wide range of environmental conditions are particularly useful because they allow researchers to more effectively model the linkages between EQ and fish occurrence (Rose 2000). Moreover, analyses of long-term data sets are needed to understand the effects of management actions. If rehabilitation is desired, then management actions aimed at improving EQ to a pre-existing state can often be determined from existing data. One limitation of empirical data, however, is that it frequently focuses on a particular life stage or time period when sampling was conducted. Thus, it is important to understand the temporal relevance of the sample collections in subsequent model development (Levin and Stunz 2005).

In this study, we quantified fish–EQ relationships in San Francisco Estuary (Fig. 1) using a long-term record (1967–2004) of fish and water quality data concurrently collected during fall (September–December). Our objectives were to (1) develop models relating fish occurrence to EQ, (2) examine temporal and spatial trends in EQ, and (3) determine whether the water quality variables that define EQ can also be linked to fish abundance. Understanding fish–EQ linkages is a principal goal in fisheries science and is of great practical interest in San Francisco Estuary. The estuary is well known for anthropogenic modifications that have highly altered most natural elements of the system, and there have been long-standing concerns about the effect of these modifications on fish populations (Nichols et al. 1986; Bennett and Moyle 1996). Indeed, many fish species have exhibited declines in abundance since long-term monitoring began in the 1950s (e.g., Stevens et al. 1985; Moyle et al. 1992). In recent years, there has also been an apparent step-decline in the abundance of three pelagic species — delta smelt (*Hypomesus transpacificus*), striped bass (*Morone saxatilis*), and threadfin shad (*Dorosoma petenense*) (Fig. 2). These species are the focus of our study. Concern is perhaps greatest for delta smelt, a rare and delicate endemic species listed as threatened under both the California and US Endangered Species Acts; a petition is currently being considered to downgrade delta smelt status to endangered. Water management actions in the estuary are closely tied to protecting delta smelt, even on a daily basis during some portions of the year. Management actions in the estuary receive great attention throughout the state because water diversions from the estuary supply drinking water to over 22 million people in California, in addition to supporting a multibillion dollar agricultural industry. Striped bass and threadfin shad are both introduced species; because they comprise a substantial portion of fish biomass in the ecosystem and support valuable recreational fisheries, their declines are also cause for concern.

Materials and methods

Study area

San Francisco Bay (Fig. 1) forms the largest estuary on the Pacific coast of the United States. The estuary is a drowned river valley separated into different basins by complex bathymetry. Water enters the estuary primarily from California's two largest rivers — Sacramento (from the north) and San Joaquin (from the south) — which drain a 100 000 km^2 watershed encompassing 40% of California's surface area. The rivers converge in the upper estuary to form the Sacramento – San Joaquin Delta, a 3000 km^2 network of tidal freshwater channels. From the delta, water flows west into Suisun Bay, through the Carquinez Strait, and enters San Pablo Bay before reaching San Francisco Bay and ultimately the Pacific Ocean. Owing to the Mediterranean climate, freshwater flow entering the estuary varies seasonally, occurring mainly in late winter through spring. The estuary is also subject to extreme interannual variation in freshwater flows, with periodic droughts and floods.

Anthropogenic modifications in this highly altered estuary include the loss of wetlands via draining and diking for agriculture, channel modifications for flood control and navigation, and a variety of water reclamation activities, including storage, conveyance, and large-scale water diversion from the southern delta (Nichols et al. 1986). Major dams located on the Sacramento and San Joaquin rivers, including most of their major tributaries, control flows entering the estuary. One result of these modifications is that water movement through the estuary is highly managed. Through the many large upstream dams; smaller, within-estuary flow control structures; and large water diversion operations in the southern delta, managers have an unparalleled ability to control water movement in the system. One of the ways in which flows are managed in this estuary is to benefit fishes and other organisms by manipulating the position of the estuarine salinity gradient.

Similar to most estuaries, many of the ecosystem components and functions of the San Francisco Estuary exhibit measurable responses to flow (Stevens and Miller 1983; Jassby et al. 1995; Kimmerer 2002). In particular, the abundance or survival of many fishes and invertebrates exhibits a strong relationship with flow entering the estuary, as indexed by the position of the 2‰ isohaline (Jassby et al. 1995; Kimmerer 2002). This index, termed X_2, is defined as the distance (km) from the Golden Gate Bridge to the location in the estuary where mean bottom salinity is 2‰ (Jassby et al. 1995; Kimmerer 2002). The position of X_2 is seasonally variable based primarily on river flow variation. However, its position can be manipulated and is closely managed to be located in certain regions during specific times of the year to benefit aquatic species.

Data sources and analytical methods

We analyzed long-term data collected from a fall midwater trawl survey (FMWT) conducted by the California Department of Fish and Game (Stevens and Miller 1983). The survey has been conducted each year since 1967, except that no sampling was done in 1974 and 1979. The FMWT collects a sample (10- to 12-minute tow) at 100 sites four

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Fig. 1. Map of the San Francisco Estuary (California, USA) showing fall midwater trawl survey sampling stations. The location of the State Water Project (SWP) and Central Valley Project (CVP) export pumping facilities are also shown.

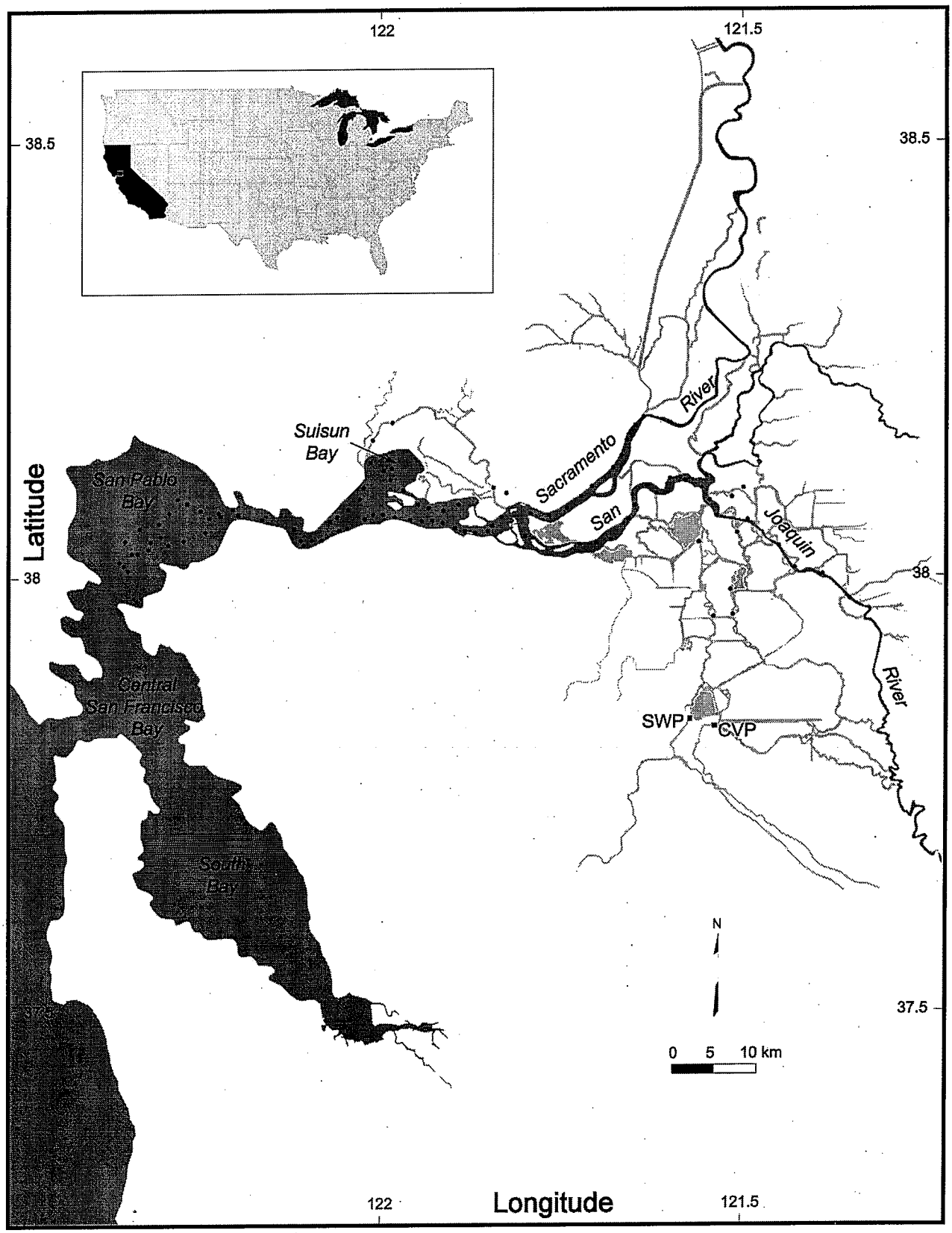

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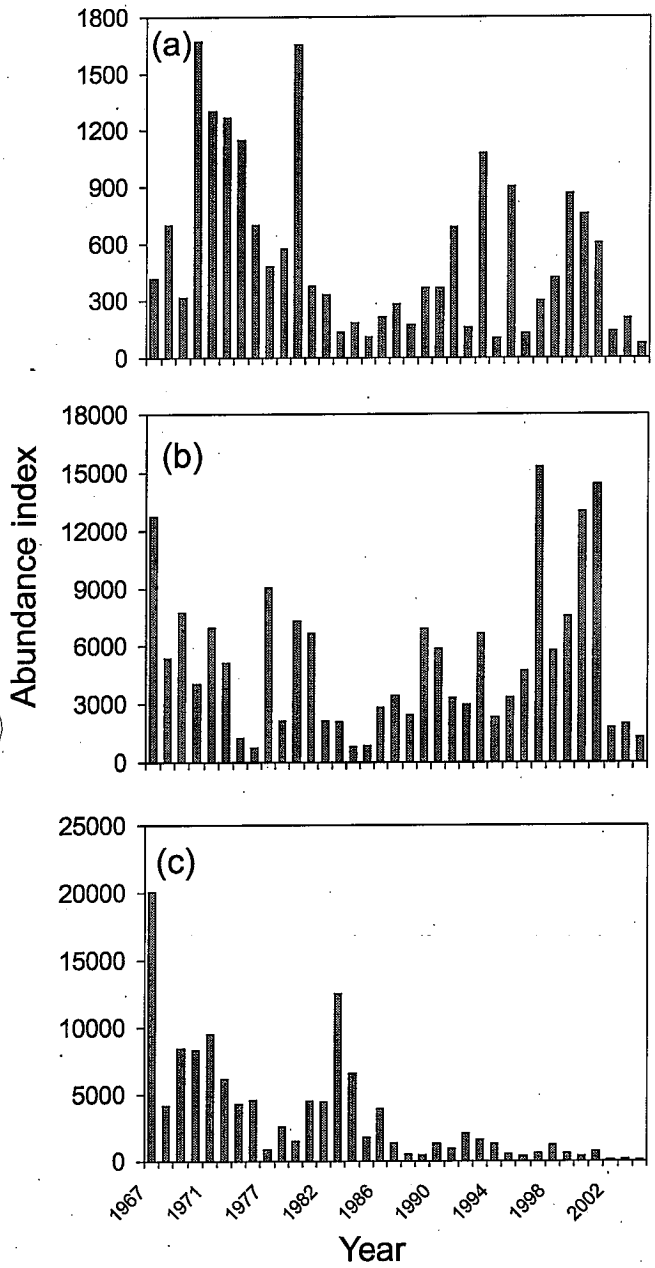
Fig. 2. Time series of abundance indices for (*a*) delta smelt (*Hypomesus transpacificus*), (*b*) threadfin shad (*Dorosoma petenense*), and (*c*) striped bass (*Morone saxatilis*) for the fall midwater trawl survey.



times per year — each month from September to December throughout the freshwater to mesohaline portions of the upper estuary (Fig. 1). The FMWT was originally designed to index the abundance of age-0 striped bass, which is reflected in the dimensions of the net: 17.6 m long with a mouth opening of 3.7 m^2 and nine tapered panels of stretch mesh from 14.7 to 1.3 cm in the cod end (Stevens and Miller 1983). The FMWT data have been used extensively in analyses of striped bass and delta smelt population dynamics (Turner and Chadwick 1972; Stevens et al. 1985; Moyle et al. 1992). Our analysis focused on age-0 striped bass, delta smelt, and threadfin shad, for which the FMWT is most efficient at capturing. The FMWT stations encompass the distribution of these species and life stages in the estuary. Delta smelt have been observed at 85% of the stations, while striped bass and threadfin shad have been observed at every station. Similar to many river-dominated estuaries, inflow to the system varies substantially from year to year. Thus, while the position of the sampling sites remains consistent, water quality varies interannually, which shifts the center of distribution of the fishes (Dege and Brown 2004). Three water quality variables — temperature (°C), Secchi depth (m), and specific conductance ($\mu S \cdot cm^{-1}$) — were measured concurrent with each tow, providing a 36-year time series (12 109 samples) of fish and environmental data (Fig. 3).

The FMWT data set provided a uniquely long time series to quantify fish occurrences in relation to water quality. For study objective 1, we used generalized additive models (GAMs) to describe these relationships (Norcross et al. 1997; Stoner et al. 2001). GAMs are semiparametric extensions of generalized linear models that are effective for describing nonlinear relationships between predictor and response variables (Guisan et al. 2002). GAM techniques are data-driven; they do not presuppose a particular relationship between predictor(s) and response variables. Rather, they employ smoothers to characterize the empirical relationships between predictor and response variables (Guisan et al. 2002). Link functions are used to establish relationships between the response variable and a smoothed function of the predictor variables; we used the cubic spline as our smoothing technique in the S-Plus language (Venables and Ripley 1997). Similar to previous studies (Maravelias 1999; Stoner et al. 2001), we used a binomial GAM with logit link function to relate fish occurrence to log-transformed environmental variables. A binary response (fish presence or absence, i.e., occurrence) was used instead of fish abundance to minimize the influence of outliers (i.e., extremely anomalous abundance values) and bias associated with previously reported abundance declines through time. We assumed that habitat preference was constant and that fish would continue to be present under preferred habitat quality conditions, albeit possibly in increasingly lower numbers. We modeled each species separately. Based on our knowledge of the range of each species and laboratory physiology studies (Swanson et al. 2000), we expected that each species would exhibit a unimodal occurrence probability to salinity and temperature and a declining occurrence probability to increasing Secchi depth. We assessed the statistical significance of the GAM results with a χ^2 approximation that tests the ability of each explanatory variable to reduce the null deviance in the model (Venables and Ripley 1997).

The GAM analyses generated predicted occurrence probabilities for each species in each sample. We used these capture probabilities as an indicator of habitat suitability through time, which we defined as EQ (study objective 2). We visually evaluated long-term spatial variation in annual trends throughout the estuary using maps created with ArcMap geographic information system (GIS) software (ESRI, Redlands, California). Employing ordinary least squares, we linearly regressed the EQ data for the three fish species at each of the 100 stations against year and used the magnitudes of the slopes to examine long-term EQ trends among sampling stations and across regions of the estuary.

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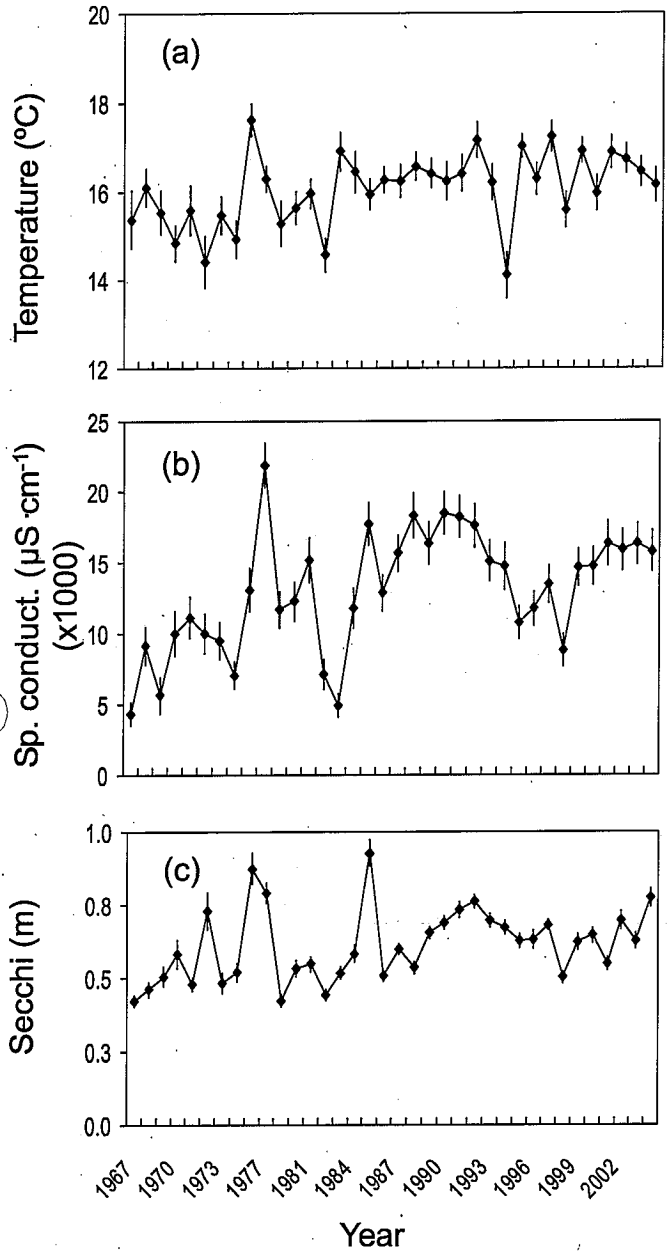

Fig. 3. Time series of (*a*) water temperature, (*b*) specific conductance, and (*c*) Secchi depth for the fall midwater trawl survey. The average and variation based on two standard errors are shown for each variable.

This approach generated 300 separate linear regressions. We incorporated the regression results into GIS maps by scaling GIS polygons representing surface area estimates for each sampling station (R. Baxter, California Department of Fish and Game, 4001 North Wilson Way, Stockton, California, unpublished data) by the corresponding regression slope. This procedure allowed us to create a continuous grid of the water surface area of the estuary with individual cells (polygons) scaled (by color shading) according to the slope coefficients for each species.

Lastly, we tested the ability of the water quality variables that composed EQ to predict delta smelt abundance (study objective 3). We limited this analysis to delta smelt because it is an annual species. The longevity of striped bass and threadfin shad makes modeling the effects of abiotic factors on abundance markedly more complex and beyond the scope of this paper (e.g., Kimmerer et al. 2001). Further, recent stock–recruit modeling supports the possibility of density dependence for delta smelt (Bennett 2005). In that study, Bennett (2005) hypothesized that a shrinking volume of physically suitable habitat combined with a high density of competing planktivorous fishes were the primary factors contributing to the decreasing carrying capacity for delta smelt. Our analysis was designed to test the hypothesis that the combined effects of fall stock abundance and fall water quality affect recruit abundance the following summer. We compared eight simple stock–recruit models to evaluate this hypothesis. Comparing the relative fit of models with differing conceptual interpretations is generally superior to simply examining the fit of any single model (Hilborn and Mangel 1997). The abundance indices we used for these models were derived by the California Department of Fish and Game and are available at www.delta.dfg.ca.gov/. Similar to previous studies (Moyle et al. 1992; Bennett 2005), we used the FMWT abundance index as an estimate of fall stock abundance and the Summer Townet abundance index as an estimate of summer recruit abundance. The basic model was a simple linear regression of adult stock versus recruit abundance. The other models included fall stock abundance and various combinations of mean annual fall Secchi depth or specific conductance in multiple regressions.

We separated the time series into two segments for this analysis: 1968–1986 and 1987–2004. This separation delineates a major ecological change in the food web of the estuary stemming from the invasion of the clam *Corbula amurensis* (Kimmerer 2002). Intense filtering of the water column by large populations of this clam essentially eliminated phytoplankton blooms in the lower estuary and caused major declines in the abundance of most planktonic invertebrates, including copepods, which are the primary prey of delta smelt (Kimmerer and Orsi 1996; Moyle 2002). Separation of the two time periods allowed us to examine the role of water quality when food was relatively abundant versus when it was not.

We compared the models in each time series by traditional means (level of statistical significance and comparison of r^2 values), but also evaluated the relative fit of each model with an information-theoretic approach based upon Akaike's information criterion (AIC; Burnham and Anderson 1998). This technique allows for a comparison of models with varying numbers of parameters and is based upon a strength-of-evidence context rather than traditional statistical tests of null hypotheses. Candidate models were evaluated based upon AIC, Δ_i, and w_i (Burnham and Anderson 1998): Δ_i (AIC differences) provides a level of empirical support for each model and is evaluated in relative rather than in absolute terms (values of 0–2 provide substantial support for a given model (0 being best), 4–7 considerably less support, and >10 virtually no support); w_i provides a relative weight of evidence in support of a given model with the largest value being best. We further evaluated the fit of the regression models by visually examining residual plots for homogeneity of variance and used the Anderson–Darling test to determine if the residuals were normally distributed.

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Table 1. Generalized additive modeling results.

Model	Species		
	Delta smelt (*Hypomesus transpacificus*)	Striped bass (*Morone saxatilis*)	Threadfin shad (*Dorosoma petenense*)
Temperature (T)	11 805 (0.1)	16 542 (0.4)	14 285 (4.4)
Secchi depth (S)	10 295 (12.9)	14 356 (13.6)	14 748 (1.3)
Specific conductance (C)	9 620 (18.6)	14 928 (10.1)	13 066 (12.5)
T + S	10 250 (13.3)	14 290 (14.0)	14 125 (5.4)
T + C	9 537 (19.3)	14 893 (10.3)	12 608 (15.6)
S + C	8 856 (25.1)	13 549 (18.4)	12 874 (13.8)
T + S + C	8 780 (25.7)	13 460 (19.0)	12 387 (17.1)

Note: Residual deviance and percentage of total deviance explained (in parentheses) are given for each model. Null deviance is 11 822 for delta smelt, 16 608 for striped bass, and 14 935 for threadfin shad. The variables in each model were all statistically significant ($P < 0.0001$) based on approximate χ^2 tests.

Results

GAMs

For each species, we found that all three environmental variables were statistically significant predictors of fish occurrence (Table 1). The global model, which included all three water quality variables, accounted for 25.7%, 19.0%, and 17.1% of total deviance in the models for delta smelt, striped bass, and threadfin shad, respectively (Table 1). Relationships between predicted occurrence (based on the global model) and individual water quality variables generally matched our expectations for Secchi depth and specific conductance, but not for water temperature (Fig. 4). Predicted occurrence of each species decreased as Secchi depth increased. Predicted occurrence of striped bass and delta smelt peaked at relatively low values along the specific conductance gradient, whereas for threadfin shad it exhibited a gradual negative relationship. There was no clear trend in the predicted occurrence of striped bass with temperature. For delta smelt, predicted occurrence was highest at the lowest temperature, and for threadfin shad it was highest at the lowest and highest temperatures. The addition of temperature to the GAMs for striped bass and delta smelt did not appreciably improve the amount of the deviance explained (0.4% for striped bass and 0.1% for delta smelt; Table 1). Hence, we concluded that a GAM including Secchi depth and specific conductance was the most appropriate for generating annual EQ trends for further analysis for these species. For threadfin shad, Secchi depth accounted for only 1.3% of the deviance; thus we selected temperature and specific conductance as a final model for threadfin shad.

Trends in EQ

Overall, EQ values were highest for striped bass, intermediate for threadfin shad, and lowest for delta smelt, reflecting both their relative abundance and distributional range in the estuary (Fig. 5). There was an overall negative trend in EQ for each species, with delta smelt and striped bass exhibiting the most apparent declines. The declines in EQ appeared to be most apparent following the mid 1980s. Long-term spatial patterns in EQ (Fig. 6) were generally similar across species in that a high percentage of stations exhibited statistically significant ($P < 0.05$) declines: threadfin shad (64% of stations), delta smelt (63% of stations), and striped bass (65% of stations). There was only one instance of a station exhibiting a statistically significant increase in EQ; it was near the confluence of the Sacramento and San Joaquin rivers for delta smelt. The western and southeastern regions of the estuary exhibited the most substantial long-term declines in EQ for striped bass and delta smelt, as indicated by consistently steeper negative slopes and statistically significant regressions. The lower Sacramento River exhibited virtually no significant EQ changes for any species. For delta smelt, there were also some nonsignificant regressions for stations in the lower San Joaquin River. The southeastern region of the system exhibited few EQ changes for threadfin shad.

Water quality – delta smelt abundance linkages

The results of the regression modeling support the hypothesis that water quality was an important predictor of delta smelt abundance during the 1987–2004 post-*Corbula* period (Table 2). None of the 1968–1986 pre-*Corbula* regression models were statistically significant ($P > 0.05$). However, all 1987–2004 post-*Corbula* models were statistically significant ($P < 0.02$). The residuals from these significant models were normally distributed (Anderson–Darling P values ≥ 0.05) and exhibited no apparent trend with the fitted values, suggesting the models adequately fit the data. A comparison of the r^2 values suggested that the stock + specific conductance model and the stock + specific conductance + Secchi depth model produced similar results (~60% of variance explained) and were superior in that they accounted for ~30% more variance than the other models. The AIC results also suggested that these two models provided similar fits to the data set and were superior to the other models (Table 2).

Discussion

Understanding fish–habitat relationships is a fundamental step in characterizing EQ, as well as the effects of habitat manipulations on EQ, and ultimately, fish populations. In this study, we used statistical and graphical techniques to establish and evaluate EQ for selected fishes in the San Francisco Estuary. Our ultimate goal was to determine if changes in the water quality variables that defined EQ could have contributed to declines in fish abundance. Our approach was relatively novel in that most similar studies have been of much shorter duration and have been used merely to identify, not further analyze, fish–EQ relationships (Norcross et

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Fig. 4. Generalized additive model (GAM) predictions of fish occurrence (based on all three water quality variables) versus the observed individual water quality parameters ((*a*) water temperature, (*b*) Secchi depth, (*c*) specific conductance) for threadfin shad (*Dorosoma petenense*) (black triangles), delta smelt (*Hypomesus transpacificus*) (black circles), and striped bass (*Morone saxatilis*) (gray circles).

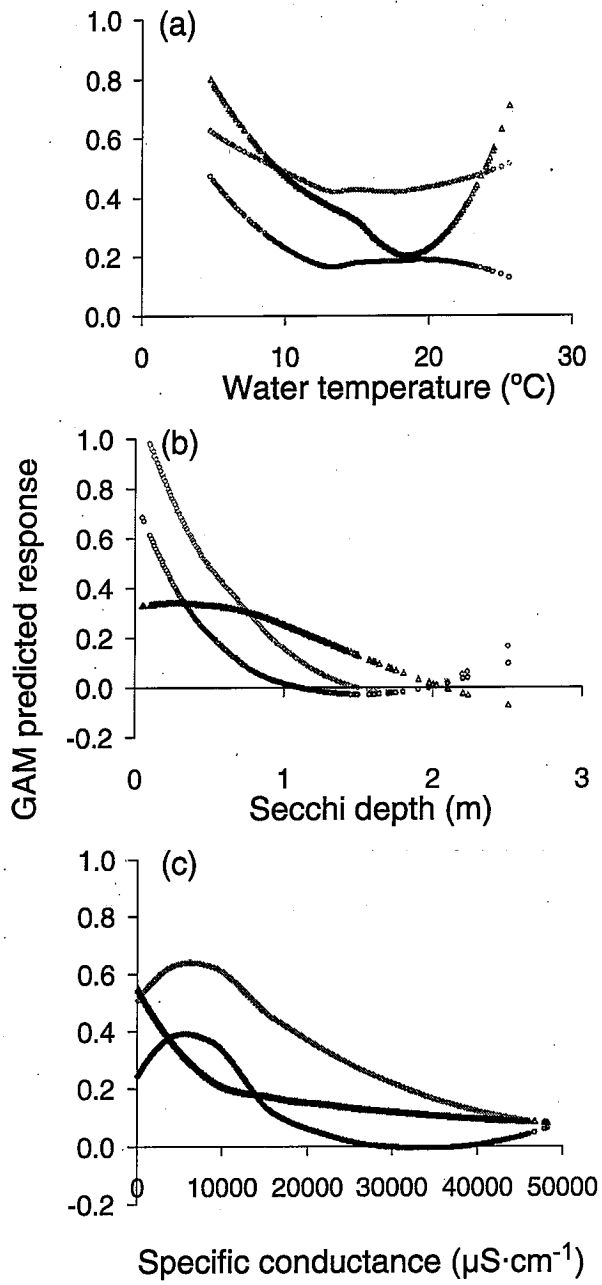
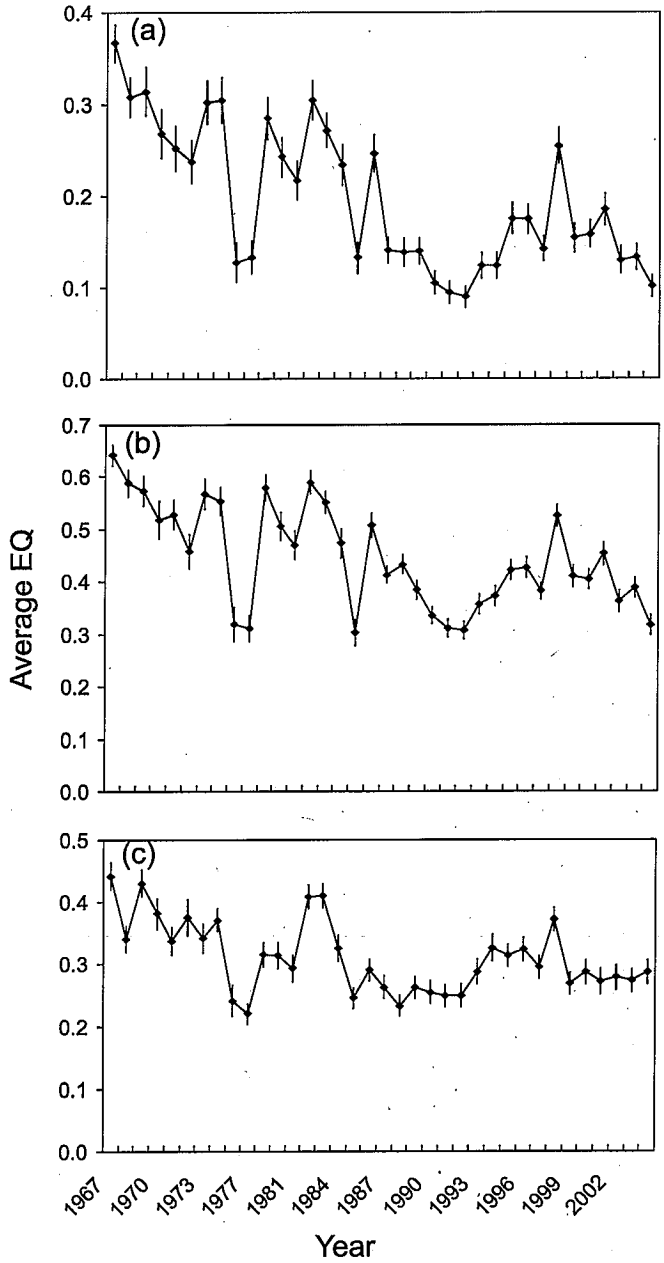


Fig. 5. Environmental quality (EQ) time series for threadfin shad (*Dorosoma petenense*), delta smelt (*Hypomesus transpacificus*), and striped bass (*Morone saxatilis*). The average and variation based on two standard errors are shown for each species.



al. 1997; Stoner et al. 2001). Whereas these previous studies sometimes used GAM results to make inferences about the likelihood of fish occurrence at new or unsampled locations, the extensive temporal (36 years) and spatial (100 stations) coverage of the FMWT survey afforded us an unusual opportunity to examine multidecadal trends throughout the estuary and in multiple geographic locations.

The first objective in our study was to relate fish occurrence to water quality variables to establish EQ for the three investigated species. We found that Secchi depth and specific conductance were important factors explaining the occurrence of delta smelt and striped bass, while specific conductance and water temperature were important for threadfin shad. Our GAMs using all three variables reduced null deviance between 17% and 26%, levels comparable with other studies (Maravelias 1999; Stoner et al. 2001). The GAM analysis results are consistent with information about the life history of each species. Delta smelt and age-0 striped bass are low-salinity zone specialists (Turner and Chadwick 1972; Moyle et al. 1992), and threadfin shad are mostly confined to freshwater zones, so it is reasonable to expect specific conductance to affect their occurrence. For delta smelt,

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Fig. 6. Spatial distribution of long-term trends in annual environmental quality (EQ) for (*a*) delta smelt (*Hypomesus transpacificus*), (*b*) threadfin shad (*Dorosoma petenense*), (*c*) striped bass (*Morone saxatilis*) in San Francisco Estuary shown for the region bordered downstream at Carquinez Strait. Color shading represents the coefficient for the year term for individual linear regressions of EQ versus year for each station. Lighter shading represents a more negative slope. Open circles and solid circles represent stations with nonsignificant ($P \geq 0.05$) or significant regressions ($P < 0.05$), respectively.

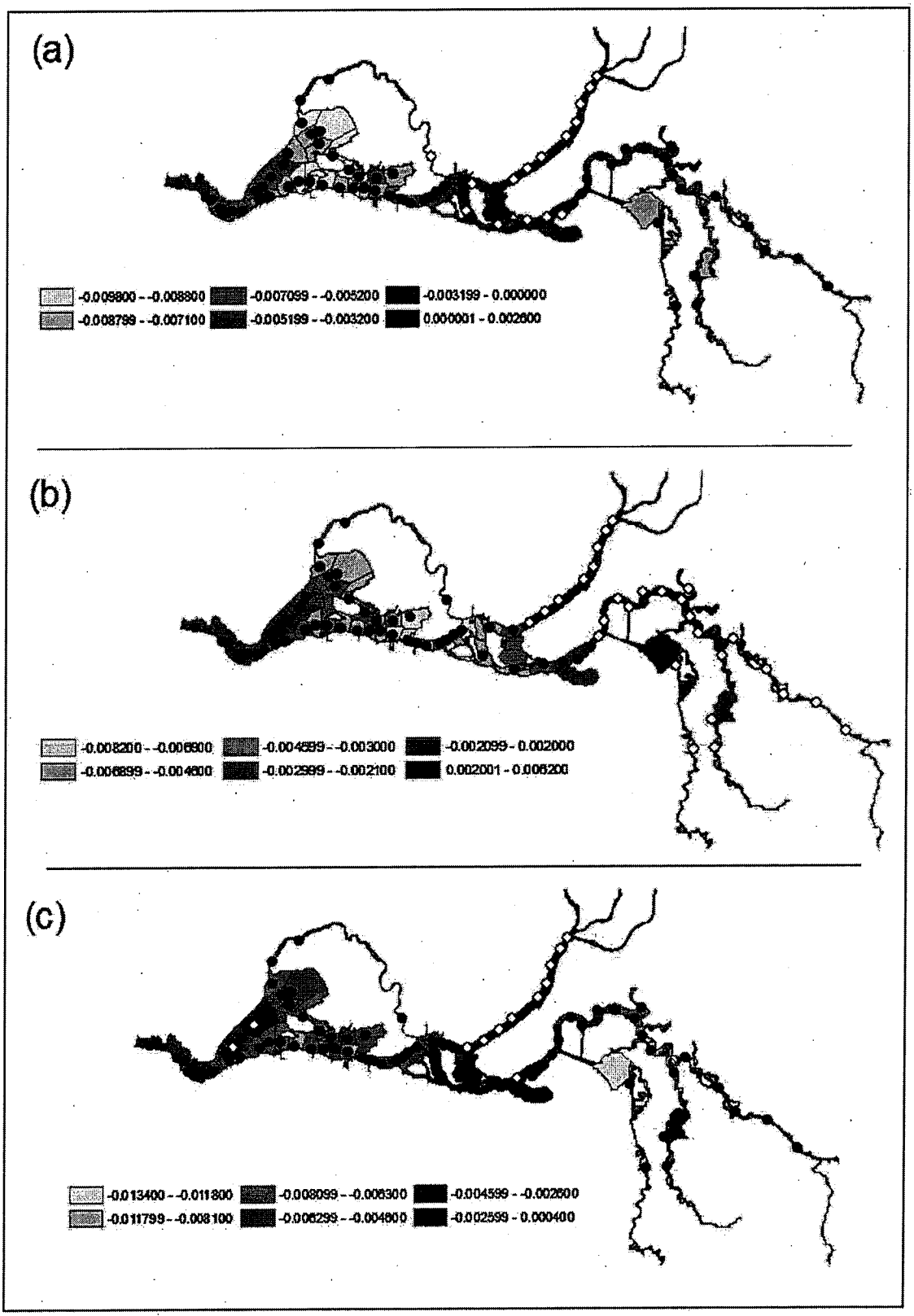

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Table 2. Regression statistics for various stock–recruit models for delta smelt (*Hypomesus transpacificus*) for the 1987–2004 post-*Corbula* time period.

Fall stock	Specific conductance	Secchi	Constant	df	P	r^2	AIC	Δ_i	w_i
0.0078	—	—	1.5	16	0.005	39.5	96.08	6.0	0.003
0.0067	–0.00068	—	12.3	15	0.001	59.6	90.08	0.0	0.06
0.0076	—	–7.9	6.7	15	0.018	41.6	97.4	7.3	0.002
0.0068	–0.00069	1.6	11.5	14	0.0004	59.6	92.8	2.7	0.02

Note: The same models were developed for the 1968–1986 pre-*Corbula* time period but are not shown because none were statistically significant ($P > 0.05$). The dependent variable for all regression models was the delta smelt recruit abundance index, as measured by the Summer Townet Survey. Candidate models were developed based on the possible combinations of the fall stock abundance index, with average fall values of specific conductance and Secchi depth as independent variables. Akaike's information criterion (AIC), AIC differences (Δ_i), and AIC weights (w_i) are also shown.

our results are consistent with laboratory studies on their physiological tolerances to salinity (Swanson et al. 2000). Because delta smelt require turbidity for successful feeding (Baskerville-Bridges et al. 2004) and because predation is mediated by turbidity, it is possible that long-term increases in Secchi depth may have affected feeding success and predation pressures.

Factors affecting fish distribution often interact along spatial and temporal gradients (Jackson et al. 2001). Thus, it is critical to understand their spatiotemporal trends (study objective 2). The long-term EQ trends showed similar declines for each species across a broad geographical range. However, the steepest declines and highest levels of statistical significance occurred in the western, eastern, and southern regions. These results suggest that the lower Sacramento River has exhibited the least long-term habitat alteration as compared with the rest of the estuary, at least with respect to the evaluated abiotic factors. For delta smelt, there was some evidence that EQ had not declined as substantially in the lower San Joaquin River, suggesting that EQ in the region just upstream of the confluence of the Sacramento and San Joaquin rivers has remained relatively stable for delta smelt.

The spatial and temporal trends in EQ can largely be explained by an interaction of climate variability and anthropogenic factors. The increase in Secchi depth during the study period is primarily a function of a decline in total suspended solids, one of the long-term effects of upstream dam construction (Jassby et al. 2002). Wright and Schoellhamer (2004) documented that sediment transport to the estuary from the Sacramento River has declined by 50% since 1957. Nobriga et al. (2005) hypothesized that this change in sediment dynamics and corresponding changes in hydrodynamics have had dramatic effects on fish assemblages and the proliferation of alien fishes in the system. In addition, Nobriga et al. (2005) observed that submerged aquatic vegetation, especially the invasive Brazilian waterweed (*Egeria densa*), became increasingly abundant in the system during the past 20 years. This macrophyte increases water clarity by trapping suspended sediments and also has had measurable effects on the fish community. The increase in specific conductance during the study period is likely a function of decreasing river flow entering the estuary during the fall. There has been no significant long-term trend in runoff entering the watershed of the estuary during September–December (Dettinger and Cayan 1995). Thus, the positive specific conductance trend appears to be the result of water operations; the change could be a consequence of less water released from upstream dams into the system during this time of the year, or more water exported from the south delta, or a combination of both effects.

The third objective of our study was to determine if changes in water quality could explain the observed declines in the abundance of delta smelt, an annual fish species. The simple statistical models evaluated for delta smelt suggest that water quality may indeed be an important factor, at least during the past two decades, when food availability was severely reduced by the invasion of *Corbula*. This finding is consistent with previous analyses on population dynamics of delta smelt and striped bass, which revealed long-term declines in carrying capacity (Kimmerer et al. 2000; Bennett 2005). A decline in suitable physical habitat and decreases in prey availability are two of the likely mechanisms for the changes in carrying capacity. Studies on the physiological tolerances of delta smelt suggest that they can survive in salinities higher than those at which they have been found in the wild (Swanson et al. 2000). This suggests that recent patterns of fish recruitment and abundance are probably controlled by multiple interacting factors. Current efforts in parameratizing life cycle models for delta smelt and striped bass are likely to better quantify the relative importance of water quality on their population dynamics.

Although we believe that our results are robust given the substantial amount of data, we acknowledge that our analysis did not include all potential water quality, physical, or biological factors that affect fish occurrence and habitat. With respect to water quality, dissolved oxygen is perhaps the most important variable that we could not evaluate because of a lack of suitable data. Dissolved oxygen requirements for delta smelt are poorly understood; however, both striped bass and threadfin shad are sensitive to low levels of dissolved oxygen (Moyle 2002). In general, dissolved oxygen levels are not a major problem in most regions of the San Francisco Estuary. Problem areas include the extreme upstream limits of the south Delta during summer and fall (Lehman et al. 2004) and in the sloughs of Suisun Marsh during fall drainage of reclaimed marshlands (P. Moyle, University of California – Davis, Wildlife, Fish and Conservation Biology, Davis, California 95616, USA, personal communication). Both of these regions are outside of the sampling area covered by the FMWT.

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Physical habitat features such as substrate type (e.g., sand, mud, detritus, etc.), depth (e.g., shoals versus channels), and cover (e.g., woody debris or submerged aquatic vegetation) can also be important variables for fish habitat. Although data of this type are relatively scarce for fishes in San Francisco Estuary, we have no reason to believe that there have been major changes in these variables except for vegetative cover. As noted previously, there have been substantial increases in the amount of submerged aquatic vegetation during the past 20 years (Nobriga et al. 2005). We evaluated the increase in Secchi depth, one of the potential effects of this invasion, but were not able to analyze the effects of the increase in physical structure in the estuary.

Biotic variables, most notably competition, predation, and food availability, could have also played a major role in controlling the distribution of the three fishes (Hayes et al. 1996). Including competition in explanatory models would be extremely difficult in a practical sense because it is complicated to measure and is affected by many other variables. There have been some limited diet studies of piscivorous fishes in the estuary (e.g., Turner and Kelly 1966; Feyrer et al. 2003; Nobriga et al. 2006); however, the bioenergetics of predation within the estuary have remained largely unmeasured or modeled (but see Lindley and Mohr 2003 for a paper modeling striped bass predation on winter-run Chinook salmon (*Oncorhynchus tshawytscha*)).

Perhaps the greatest opportunity for improving our analyses of EQ distributions and trends lies with additional studies on the effects of food availability. Food availability has been successfully incorporated into similar GAMs (Maravelias 1999; Stoner et al. 2001). Moreover, some work in San Francisco Estuary suggests that prey availability can affect fish populations, especially striped bass (Kimmerer et al. 2000, 2001; Feyrer et al. 2003) and delta smelt (Bennett 2005). Although we did not include a direct measure of food availability in our models because there were no comparable invertebrate data at the spatial and temporal resolution of the FMWT data, our comparison of stock–recruit models for delta smelt suggests that food availability plays an important role.

We also acknowledge that our study is focused on conditions during a single season of the year, but it represents 1/3 of a year. Conditions during other seasons undoubtedly play a role in the population dynamics of the fish species we examined, but the changing physical habitat conditions during fall are likely important for several reasons. For age-0 striped bass, conditions during their first autumn play a role in the density-dependent survival exhibited by this species from age-0 to age-3 (Kimmerer et al. 2000). This is especially true given that food web changes have affected diet composition (Feyrer et al. 2003). Fall conditions may be even more important for delta smelt and threadfin shad, since these fish represent prespawning adults. In general, less suitable habitat constricts the range of these fishes, which combined with an altered food web, may affect their health and survival.

Overall, our study illustrates that ecological knowledge gained from long-term monitoring data can be a valuable tool to understand changes in aquatic ecosystems. First, they highlight the utility of long-term data sets to describe fish–EQ relationships, derive EQ, and track EQ trends for a variety of species. The long-term declining EQ trends and the apparent link to delta smelt abundance detected in this study corroborate previous hypotheses that the area of suitable physical and chemical habitat has played a role in the decline in fish abundance. However, the degree to which EQ could be used for management purposes remains unclear. Flow standards in San Francisco Estuary are based largely on a surrogate for salinity (X_2), particularly during winter and spring. While X_2 is a valuable generalized variable that is relatively easy to measure and is correlated with long-term abundance trends of multiple species (Jassby et al. 1995; Kimmerer 2002), the recent step change in the abundance of pelagic fishes suggests that salinity alone may not be sufficient to explain long-term trends in estuarine management. Our analyses of EQ showed that water transparency might also be an important consideration. For example, the combined effects of specific conductance and Secchi depth improved the stock–recruitment relationship for delta smelt, a species that has proven difficult to model using a variety of environmental data (Bennett 2005). Nonetheless, it is questionable whether there are simple ways to use variables such as Secchi depth for species management, at least during the fall period that we studied. Moreover, for the water quality data to be most effective for species management, additional information is needed to better define the mechanisms for the effects of water quality variables on aquatic organisms.

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Attachment 16

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Effects of Flow Diversions on Water and Habitat Quality: Examples from California's Highly Manipulated Sacramento-San Joaquin Delta

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ABSTRACT

We use selected monitoring data to illustrate how localized water diversions from seasonal barriers, gate operations, and export pumps alter water quality across the Sacramento-San Joaquin Delta (California). Dynamics of water-quality variability are complex because the Delta is a mixing zone of water from the Sacramento and San Joaquin Rivers, agricultural return water, and the San Francisco Estuary. Each source has distinct water-quality characteristics, and the contribution of each source varies in response to natural hydrologic variability and water diversions. We use simulations with a tidal hydrodynamic model to reveal how three diversion events, as case studies, influence water quality through their alteration of Delta-wide water circulation patterns and flushing time. Reduction of export pumping decreases the proportion of Sacramento- to San Joaquin-derived fresh water in the central Delta, leading to rapid increases in salinity. Delta Cross Channel gate operations control salinity in the western Delta and alter the freshwater source distribution in the central Delta. Removal of the head of Old River barrier, in autumn, increases the flushing time of the Stockton Ship Channel from days to weeks, contributing to a depletion of dissolved oxygen. Each shift in water quality has implications either for habitat quality or municipal drinking water, illustrating the importance of a systems view to anticipate the suite of changes induced by flow manipulations, and to minimize the conflicts inherent in allocations of scarce resources to meet multiple objectives.

KEYWORDS

Sacramento-San Joaquin Delta, diversion, water management, numerical modeling, water quality

SUGGESTED CITATION

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INTRODUCTION

Water flow through California's Sacramento-San Joaquin Delta (Delta) is manipulated to satisfy multiple objectives, including: exports to meet distant agricul-

tural and municipal demands and routing of flows with barriers or gates to facilitate migration of salmon, enhance flushing to prevent anoxia, or repel salt intrusion that degrades drinking water quality. Each hydraulic manipulation is implemented to satisfy a specific, often geographically localized objective. However, localized diversions can have regional-scale consequences, some unintended and conflicting with other management objectives.

Hydrodynamic models can be applied to identify and measure the processes through which localized diversions influence regional-scale flow paths and water quality, building toward a broad ecosystems perspective of the exceedingly complex and highly manipulated Delta. While a systems perspective is inherent in single-objective water operations, it has not been developed to guide the broader challenge of optimizing allocation of California's water supply to satisfy agricultural and municipal demands and sustain effective strategies of ecosystem restoration. Increasingly challenging conflicts of water allocation motivate the search for a consensus vision of the Delta's future (Lund et al. 2006), and the visioning process requires quantitative approaches for assessing the ecosystem-scale consequences of multiple hydraulic manipulations. Here we illustrate how diversions through gate, barrier, and pump operations can rapidly change water quality conditions within the Delta. These changes have important implications for habitat quality and sustainability of the Delta's native biota.

The spatial patterns and temporal variability of water-quality indicators in the Delta are complex and driven by natural processes, such as seasonal river flow or tidal oscillations of salinity gradients (e.g. Figure 1A,B) or oscillations of dissolved oxygen over the diel light cycle (Figure 1C). Water-quality indicators also shift, sometimes rapidly, in response to water diversions. Here we use a tidal hydrodynamic model to explore cause-effect relationships between flow manipulations and shifts in water quality using three diversion events as case studies: salinity increase in the central Delta when pumped exports were curtailed (Figure 1A); salinity increase in the lower San Joaquin River when gates were closed at the Delta Cross Channel (Figure 1B); and oxygen depletion in the Stockton Ship Channel when a temporary barrier across Old River was removed

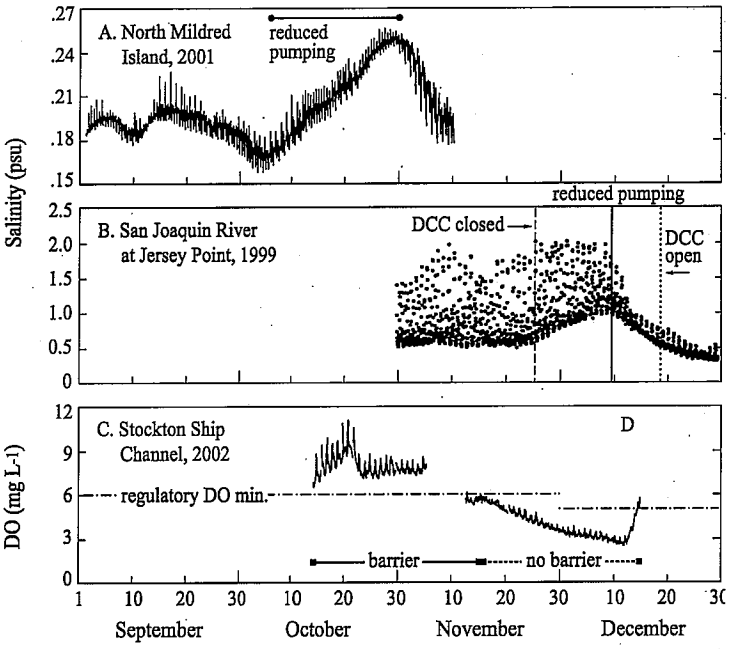

Figure 1. Water quality time series data used in three case studies. (A) Salinity measured 1 m above the channel bottom at the northern opening of Mildred Island. (B) Salinity measured at Jersey Point (San Joaquin River). (C) Dissolved oxygen concentration 1 m below the surface in the Stockton Ship Channel at Rough and Ready Island.

(Figure 1C). Model simulations explain how each diversion alters the flow path, source mixture, and flushing rate of water within the Delta, providing mechanistic and spatially-explicit representations of how diversions influence water quality.

The effects of individual water operations on water quality have been learned empirically over time, but the underlying mechanisms of those effects, their interactions, and their spatial complexity have not been clearly established. Our goal here is to illustrate the value of simulations with hydrodynamic models to understand how diversions modify the routing and rates of water flow through the Delta, and how these modifications influence water quality through their alteration of source mixtures and flushing rates. We view this as a step toward a comprehensive understanding of how diversions interact with other processes to influence habitat quality and sustainability of diverse native biota, including species on the brink of extinction in the Delta ecosystem.

BACKGROUND AND STUDY DESIGN

The Delta is the convergence zone of two large rivers (Figure 2), the Sacramento and San Joaquin, draining a 153,000 km² watershed that captures runoff from winter-spring rainfall in the Central Valley and spring snowmelt in the Sierra Nevada mountains. The Delta, formerly a 1,400-km² wetland (Atwater and others 1979), has been transformed into a patchwork of agricultural tracts surrounded by leveed channels, tidal lakes and remnant patches of marsh. As the transition zone between a large river-watershed and San Francisco Bay, the Delta is a migration route for anadromous fish such as salmon, sturgeon, and shad, and permanent habitat for native species such as Delta smelt and Sacramento splittail.

The Delta is the hub of a water-development infrastructure that captures runoff during the wet season and transfers an average of 7.1 km³/year (1995 level of development) from the north to the south and coast during the dry summer-autumn (CDWR 1998). The Sacramento contributes the largest volume of freshwater inflow to the Delta, with daily median flows ranging seasonally from 320 to 1230 $m^3 s^{-1}$. The San Joaquin, which has several significant diversions upstream of the Delta, is a smaller river by volume with daily median flow between 36 and 150 $m^3 s^{-1}$ (www.iep.water.ca.gov/dayflow/, median based on data from water years 1956-2001). In contrast, tidal flow at the Delta's western boundary is typically in the range of ±8500 $m^3 s^{-1}$.

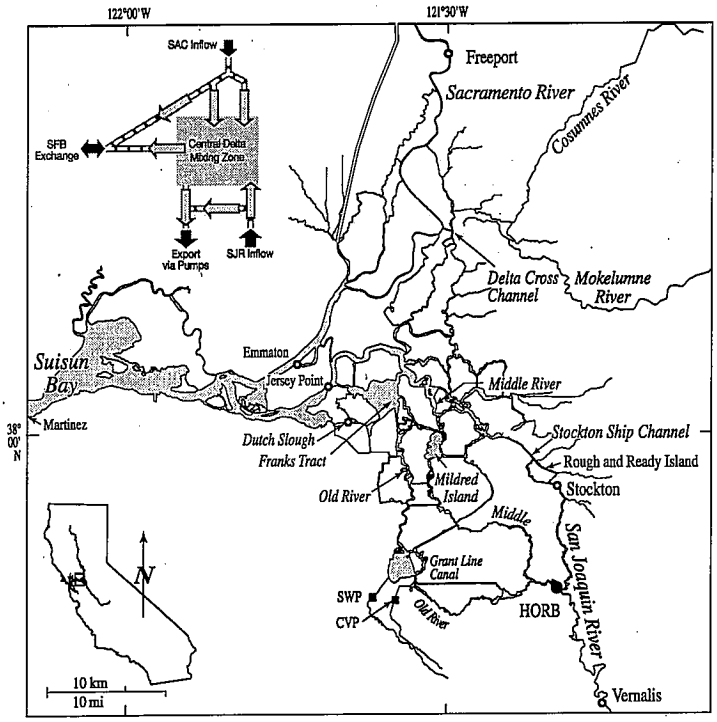

Figure 2. Map of the Sacramento-San Joaquin Delta. Inset: schematic illustrating the base flow routes through the Delta.

Upstream reservoir releases are routed across the Delta to provide drinking water for 22 million people in coastal cities, and supply water to over 18,000 km² of irrigated farmland producing crops valued over $13 billion annually (CDFA 2002). These interbasin transfers are pumped from the south Delta (Figure 2) by the State Water Project (SWP) and the Central Valley Project (CVP). The daily median export from the SWP and CVP ranges between 63 and 292 $m^3 s^{-1}$ (www.iep.water.ca.gov/dayflow/, median based on data from water years 1956-2001). Over 2,200 diversions from Delta channels also supply water for municipalities and irrigation of local farmland (Herren and Kawasaki 2001).

The challenge of satisfying multiple demands on the Delta's water resource is complex because this critical habitat for native species is a mixing zone of estuarine brackish water and three primary sources of fresh water, each having distinct water chemistry (Table 1). The San Joaquin River contains a large fraction of irrigation drainage and has high concentrations of dissolved salts, nutrients, organic carbon, and toxic contaminants such as selenium (Table 1). The Sacramento River is less impacted by upstream agricultural inputs and has low concentrations of these constituents. Agricultural drainage from peat-rich Delta soils is highly enriched in dissolved organic carbon. In addition to these freshwater sources, tides transport brackish estuarine water into the Delta during periods of low river inflow, degrading drinking water quality and agricultural supplies.

Inflows to the Delta are manipulated by an array of diversions, and we illustrate examples from operations of three diversion types: (1) exports from the South Delta through pumping by the SWP and CVP; (2) gates that divert flows from the Sacramento River into the

Table 1. Water quality comparison between the Sacramento River, San Joaquin River, and In-Delta Agricultural Return water for water years 1999-2001.

Water Quality Parameter	Sacramento at Freeport [1]	San Joaquin at Vernalis	In-Delta Agricultural Return Water [2]
Specific Conductance (mmhos cm^{-1})	144 ± 28	621 ± 183	562 ± 206
pH	7.8 ± 0.2	8.0 ± 0.4	6.8 ± 0.4
Alkalinity (mg $CaCO_3$ L^{-1})	55 ± 12	85 ± 24	83 ± 18
Dissolved Oxygen (mg L^{-1})	9.8 ± 1.4	9.6 ± 1.4	5.5 ± 2.1
Nitrite+Nitrate (mg N L^{-1})	0.12 ± 0.05	1.62 ± 0.59	
Orthophosphate (mg P L^{-1})	0.024 ± 0.007	0.107 ± 0.054	
Dissolved Organic Carbon (mg C L^{-1})	1.84 ± 0.53	2.83 ± 0.47	14.1 ± 7.7
Total Dissolved Selenium[3] (nmol L^{-1})	0.91 ± 0.27	8.6 ± 2.5	Negligible[4]

[1] USGS Water Quality Database (WY1999-WY2001) for Sacramento (USGS 11447650) and San Joaquin (USGS 11303500) rivers unless otherwise noted.

[2] California Department of Water Resources Municipal Water Quality Investigations Program (WY1999-WY2001) for Bacon Island Pumping Plant (DWR B9V75881342), and Twitchell Island Pumping Plant 1 (DWR B9V80661391) (CDWR 2003); DOC data only from Bacon Island. Different crops produce varying levels of DOC, agricultural return water DOC is expected to vary significantly throughout the Delta.

[3] Sacramento river average from two studies (1984-2000). San Joaquin average from 1997-2000 sampling period. (Cutter and Cutter 2004)

[4] Personal communication AR Stewart, 14 May 2003

central Delta via the Delta Cross Channel; and (3) a barrier placed at the head of Old River to maintain flows in the San Joaquin River (see Figure 2). We use selected time series data to illustrate the coherent responses of water-quality indicators to operations of these diversions, and then use a hydrodynamic model to identify the transport mechanisms of those responses. We use salinity as an example of an indicator that is influenced by changing source mixtures of water within the Delta, and dissolved oxygen (DO) as an example of an indicator influenced by both transport processes and biogeochemical reactions.

METHODS

Data Sources

The primary data source was the archive of federal and state monitoring data maintained by the Interagency Ecological Program (IEP, www.iep.water.ca.gov). Electrical conductivity is measured at Emmaton, Jersey Point, and Dutch Slough (Figure 2) by the U.S. Bureau of Reclamation. Salinity at these locations was computed from electrical conductivity using water temperature measured by the California Department of Water Resources (CDWR) at Rio Vista (Sacramento River) and Antioch (San Joaquin River). We used these salinity records as an indicator of water-quality responses to operations of the Delta Cross Channel gates during autumn 1999. The CDWR measures near-surface DO continuously within the Stockton ship channel, and the U.S. Geological Survey (USGS) measures San Joaquin flow both at Vernalis, upstream of Old River, and at Stockton directly upstream of the Stockton ship

channel (Figure 2). We used flow and DO measurements during autumn 2002 to illustrate effects of a barrier diversion.

We also used results from a study to measure transports and water quality dynamics in Mildred Island, located in the central Delta (Figure 2). Moored instruments measured electrical conductivity, temperature, and velocities through the major entrances to Mildred Island and surrounding channels every 10 minutes from 22 August through 14 November 2001 (for detailed methods see Lucas et al. 2006). Velocity was converted into flow (Simpson and Oltmann 1993), and salinity was computed from temperature and electrical conductivity measured with Seabird sensors. We used flow and salinity measurements around Mildred Island to illustrate shifts in freshwater source resulting from changes in export pump operations.

Numerical Modeling

We used the multi-dimensional hydrodynamic model Delta TRIM3D to identify the transport processes of water quality variability induced by each diversion. Gross et al. (1999) incorporated scalar transport routines into the TRIM3D hydrodynamic computation core developed by Casulli and Cattani (1994). Monsen (2001) created a Delta specific version of the model (Delta TRIM) that incorporated Delta bathymetry and hydraulic structure operations. Delta TRIM has been calibrated and compared to measured stage, flow, and salinity under a variety of flow boundary conditions and hydraulic operations (Monsen 2001). The model was run in two-dimensional mode to calculate depth-averaged stage, velocity, and scalar concentrations at 150,000 points on a 50-m grid with a 40 second time step. All model simulations were ramped up for at least a 24 h simulation period before the introduction of scalars or discrete particles.

Delta TRIM was run for the periods August-December 2001 and August-December 2002, using a tidal boundary condition as measured stage at Martinez and flow boundary conditions as discharge of the Sacramento River at Freeport and San Joaquin River at Vernalis (Figure 2). All pump and gate operations, within-Delta diversions and placement/removal of barriers were represented in the model. Model simulations were used to compute source mixtures of water from concentrations of conservative scalars introduced at the model boundaries as tracers, and flushing times from the displacement of discrete particles.

Water Source Composition

Water at any location was assumed to be a mixture of three sources: Sacramento, San Joaquin, and "other" water. The "other" category included bay, agricultural return, and "old" water (having a residence time greater than the simulation period). The total scalar mass (M_{TOT}) in a water column is the sum of scalar masses from each source:

$$(1) \quad M_{TOT} = M_{SAC} + M_{SJR} + M_{OTHER}$$

Re-writing equation (1) in terms of source concentrations (C_{SAC}, C_{SJR}, C_{OTHER}) and water column volume (V_{TOT}):

$$(2) \quad C_{TOT}V_{TOT} = C_{SAC}V_{TOT} + C_{SJR}V_{TOT} + C_{OTHER}V_{TOT}$$

where C_{TOT} is the scalar concentration from all sources. We divided equation (2) by $C_{TOT}V_{TOT}$ to calculate the mass fraction from each freshwater source at any location (equation (3)).

$$(3) \quad 1 = \frac{C_{SAC}}{C_{TOT}} + \frac{C_{SJR}}{C_{TOT}} + \frac{C_{OTHER}}{C_{TOT}}$$

Because the numerical model conserves mass (Gross et al. 1999), we traced Sacramento and San Joaquin source waters as two different scalars. The total scalar concentration, C_{TOT}, was fixed at a constant value at each river boundary. Boundary conditions for the Sacramento source scalar were $C_{SAC} = C_{TOT}$ at the Sacramento boundary (Freeport) and $C_{SAC} = 0$ at all other boundaries. Similarly for the San Joaquin source scalar, the boundary conditions were $C_{SJR} = C_{TOT}$ at the San Joaquin boundary (Vernalis) and $C_{SJR} = 0$ at all other boundaries. In the domain interior, both the Sacramento and San Joaquin tracer concentrations were initialized to zero at all grid cells at the beginning of the simulation.

During the simulation, scalar concentrations at all grid cells in the region of interest (e.g. Mildred Island) were

recorded hourly. Although inflows, exports and gate operations changed constantly, tracer concentrations approached quasi-steady state distributions. Based on equation (3), the fraction of water originating from any source (i.e. Sacramento or San Joaquin) in a grid cell was the scalar concentration divided by the total concentration (C_{TOT}).

Flushing Time

Flushing time is an integrative parameter that describes the general exchange characteristics of a water body. We used Delta TRIM to compute an e-folding flushing time in which a number (P_0) of neutrally buoyant particles was introduced into the model domain of interest (Monsen et al. 2002). Trajectories of each particle were calculated each time step based on the model velocity field (e.g. see Lucas et al. 2002, Figures 3-5), using the method of Cheng et al. (1993). The e-folding flushing time (T_f) was calculated from a linear regression of the time series of the number of particles, P(t), remaining in the domain of interest every hour using the equation:

$$(4) \quad \ln P(t) = -\left(\frac{1}{T_f}\right)t + \ln P_0$$

RESULTS AND DISCUSSION

The effects of each diversion are generalized in schematics showing water sources and transport paths linked to the central Delta (Figure 3). Fresh water is delivered as inflows from the Sacramento and San Joaquin Rivers, exported as pumped diversions by the SWP and CVP, and mixed with estuarine waters by tidal exchange with the San Francisco Estuary. The central Delta network of channels and open water regions is a dynamic mixing zone where the source mixture of water changes with fluctuating river discharge, tides, and export rates (Figure 3A). The source mixture is not uniform throughout this mixing zone. For example, the mixture on Middle River (Figure 2) can be different from Old River at any time. Flow paths are modified by closure of DCC gates that route fresh water into the Sacramento River (Figure 3B), and by seasonal construction of the head of Old River barrier to route flows into the San Joaquin River (Figure 3C).

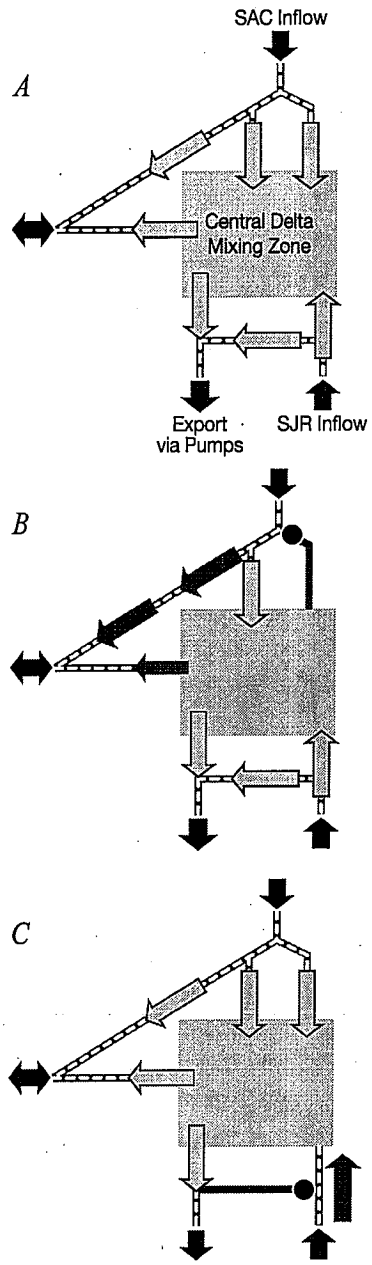

Figure 3. Schematics illustrating how diversions alter flow routing through the Delta. Dark blue arrows represent fresh water inputs to and exports from the Delta. The bi-directional arrow represents tidal exchange of Delta water with San Francisco Bay. Red denotes flow alterations caused by each diversion. (A) Base flow routes repeated from Figure 1, inset. (B) Closing gates at the Delta Cross Channel redirects flow to the Sacramento River toward San Francisco Bay and away from the central Delta. (C) The head of Old River barrier directs San Joaquin flow to the central Delta mixing zone rather than to the south Delta toward the export pumps.

Export Diversions Alter Regional Flows and Salinity Distributions

The SWP reduced its exports between 7 October and 31 October 2001 (Figure 4A). This pumping curtailment allowed more fresh water to exit the Delta through its western boundary (Figure 3A), which, as intended, lowered salinity in the western Delta. However, the salinity response in the central Delta (Mildred Island) was opposite and unexpected: bottom salinity increased steadily at the northern opening of Mildred Island (Figure 4B) and at all other sampled locations in/around Mildred Island between 7-31 October 2001. Flow measurements and model simulations indicate that this salinity increase was caused by a shift in dominant freshwater source from the low-conductivity Sacramento (Table 1) to the high-conductivity San Joaquin.

The SWP and CVP pumps draw water from both the south Delta and the central mixing zone (Figure 3A). The draw of the pumps is large enough to redirect the net flow in nearby channels toward the export facili- altering regional circulation patterns. Mildred Island is bounded by two north-south channels (Middle River and Latham Slough) and two east-west channels. It is separated from these deeper channels by (leaky) levees with discrete openings at the north and south. Flow measurements revealed an altered circulation pattern throughout the Mildred Island region as a result of altered pump operations. During the September period of high SWP export, the mean net (tidal residual) north-to-south flow via Middle River just north of Mildred Island was 100 $m^3 s^{-1}$. In October when exports were curtailed, the mean flow fell to 56 $m^3 s^{-1}$. Because less water was drawn toward the pumps, the net southerly residual flow was reduced in the Mildred Island region. In some locations, the direction of net flow reversed.

The shift in net north-to-south flow around Mildred Island was primarily due to changes in pump operations rather than significant changes in Delta hydrology. During September and early October 2001, the tidally averaged Sacramento inflow (at Freeport, Figure 2) ranged from 350-380 $m^3 s^{-1}$ and the San quin inflow (at Vernalis) ranged from 35-45 $m^3 s^{-1}$. uring the period of pump reduction, the tidally averaged Sacramento inflow (at Freeport) ranged from 200-300 $m^3 s^{-1}$ and the San Joaquin inflow (at Vernalis) had a pulse inflow that peaked at 82 $m^3 s^{-1}$ on 28 October.

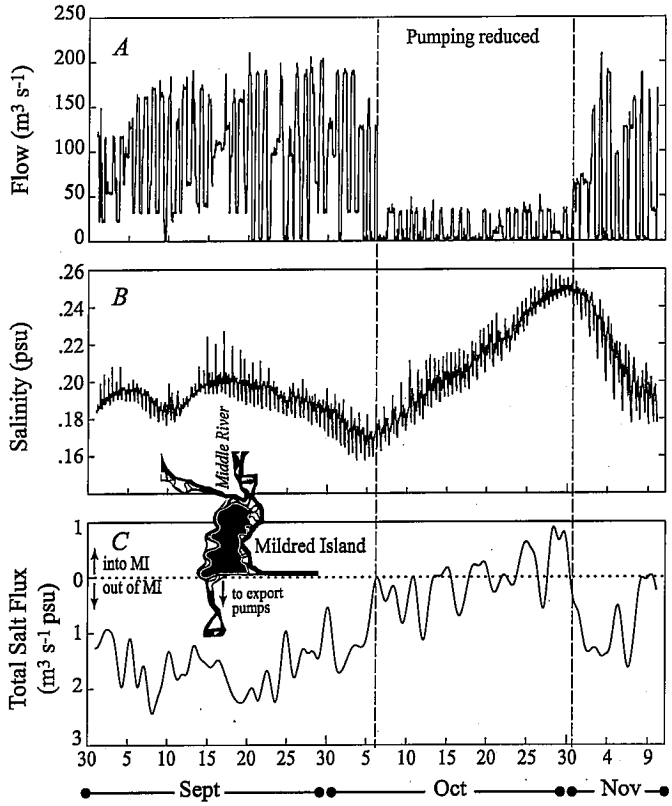

Figure 4. State Water Project exports alter salinity in Mildred Island (central Delta) in autumn 2001. (A) SWP export rate from 1 September–14 November 2001. (B) Salinity 1 m above the channel bottom at the northern opening of Mildred Island. (C) Advective salt flux at the southern opening of Mildred Island. Inset: map of Mildred Island and the surrounding channels. Data sources: State Water Project pump operation data: IEP database station CHSWP003. Salinity and flow data (22 Aug 2001–14 Nov 2001) from Lucas et al. (2006).

Simulations with Delta TRIM show how this modification of circulation altered water composition as a shift in dominance from Sacramento to San Joaquin water. Sacramento water can be transported toward the export pumps through either Old or Middle River (Figure 2). When export pumps operate at high capacity, Old and Middle Rivers become a freshwater corridor of

Sacramento-derived water. On 6 October 2001, immediately prior to pumping reduction, the Mildred Island region was dominated by Sacramento-derived water (Figure 5a). However, San Joaquin source water dominated the region on 6 November, after a month of pump curtailment when the Sacramento freshwater corridor was constricted to Old River (Figure 5b). The San Joaquin source of water increased inside Mildred Island (Figure 5d) because the regional mass balance changed: less Sacramento-derived water entered from the north and more San Joaquin derived water exchanged with Mildred Island from the channel at its southeast corner.

Pumping curtailment also altered the exchange rate between Mildred Island and its surrounding channels. Total salt flux (<qc>) was computed for the south opening of Mildred Island as the tidally filtered product of flow (q) and salinity (c) (Fischer et al. 1979). During peak SWP exports in late September, the salt flux was directed out of Mildred Island toward the export pumps (Figure 4C). After pumping was curtailed, the salt flux was significantly reduced and, during some short periods, it reversed as salt entered Mildred Island from the channels adjacent to its southeast corner.

The coherent changes in flow and salinity around Mildred Island with pump operations illustrate how exports generate regional responses. Salinity in the central Delta changed almost instantaneously with changes in export diversions occurring 25 km away. Simulations with a hydrodynamic model reveal how pump curtailment altered local exchanges and regional flows such that low-conductivity Sacramento water was gradually replaced with high-conductivity San Joaquin water. However, this shift in source mixture was not spatially uniform (Figure 5) because the routing of Sacramento-derived water was modified differentially within Old River and Middle River. Hydrodynamic models provide a tool for discovering and understanding the spatial complexity of water quality dynamics and their responses to diversions.

Delta Cross Channel Diversions Alter Source Water Distributions

The Delta Cross Channel (DCC), a 1,100 m long, 8 m deep trapezoidal channel in the north Delta (Figure 2),

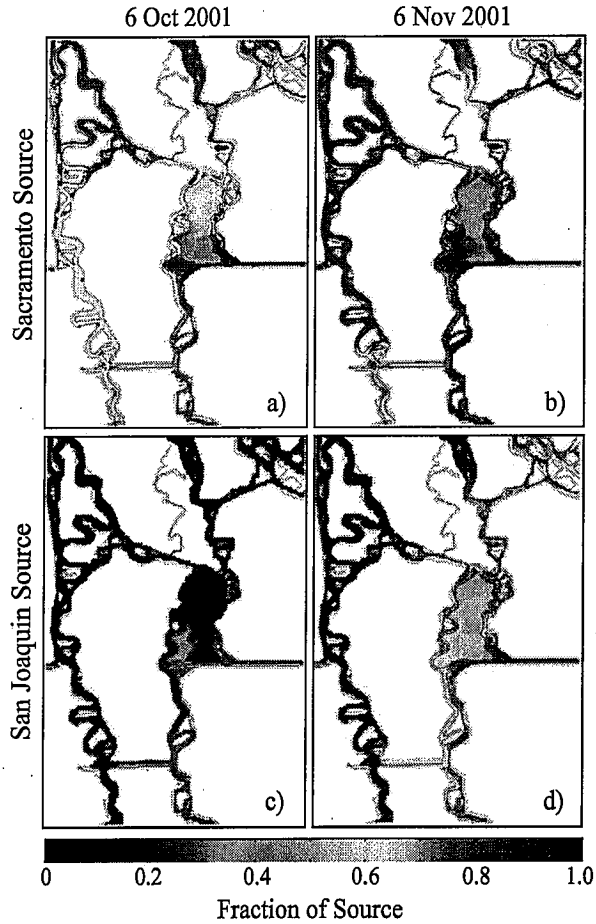

Figure 5. Model-computed fractions of Sacramento (a, b) and San Joaquin River (c, d) source water at each grid cell around Mildred Island on 6 October 2001 (a, c), immediately prior to reduced pump operations, and on 6 November 2001 (b, d) after a month of pump curtailment.

diverts high-quality Sacramento River water into the central Delta. Flows are controlled by gates that are normally kept open to maintain cross-Delta flows. The DCC gates are closed in late summer and autumn, when inflows are low and estuarine salinity intrusion peaks, to facilitate salmon emigration. During an extreme salinity intrusion event in November 1999, low river flow and high pump exports co-occurred and created a conflict between DCC operations to (a) repel salt intrusion to meet salinity standards (gates open, Figure 3A) and (b) route flows and juvenile salmon down the Sacramento River (gates closed, Figure 3B). Salinity across the western Delta changed rapidly in response to DCC operations during this period (Figure 6A-C).

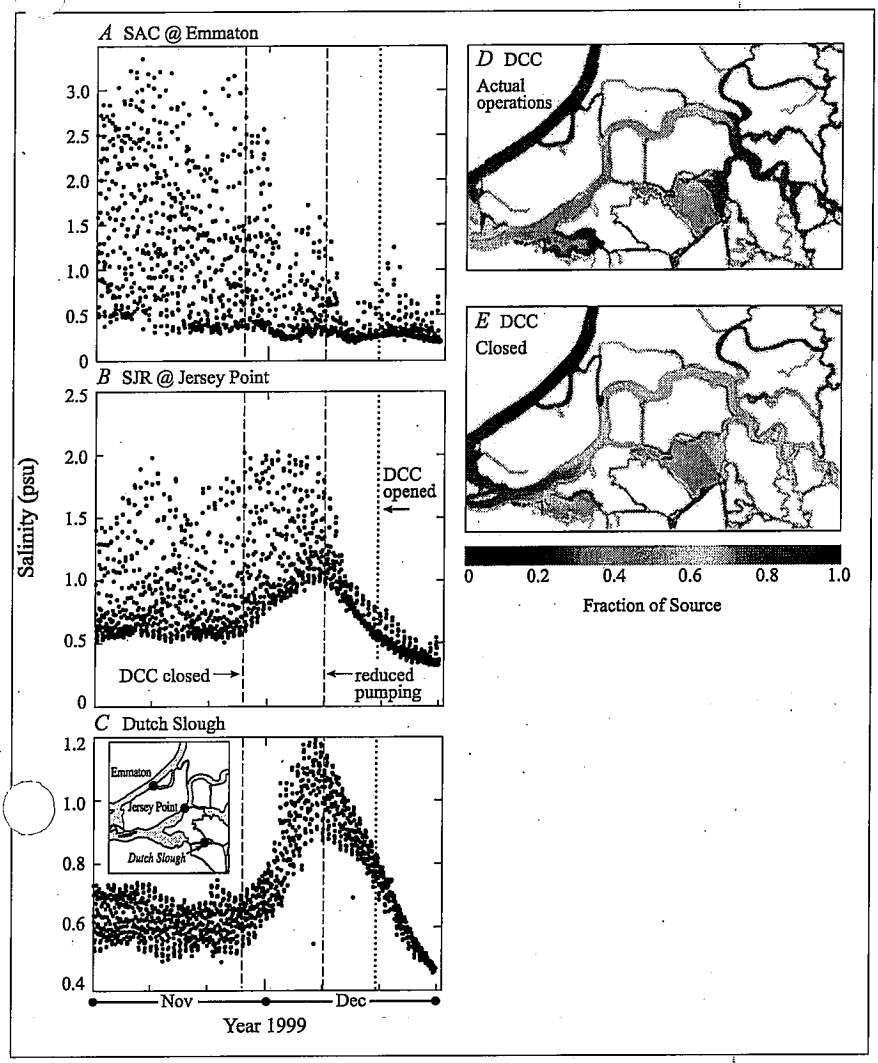

Figure 6. Influence of Delta Cross Channel gate operations on salinity intrusion during November-December 1999 at (A) Emmaton, (B) Jersey Point, and (C) Dutch Slough (inset: map of the region). Data source: IEP Database: electrical conductivity (Station: RSAC092, RSAN018, SLDUT007), water temperature (Station: RSAC101, RSAN007), Delta Cross Channel gate operations (Station: RSAC128), and export pump operations (Station: CHSWP003, CHDMC004). (D) Color maps show the distribution of modeled Sacramento source water on 13 September 2001, comparing simulations with (D) actual operation of the Delta Cross Channel and (E) Delta Cross Channel gates closed for the entire simulation.

The DCC gates were closed on 26 November as the salmon migration began. This closure altered the circulation pattern in the north Delta by directing more Sacramento water down the main stem of the Sacramento away from the central Delta (see Figure 3B). As a result, less fresh water was available in the central Delta to prevent salinity intrusion on the San Joaquin stem of the western Delta. Salinity decreased at Emmaton on the Sacramento River, but tidally-averaged salinity increased almost immediately on the San Joaquin at Jersey Point and Dutch Slough (Figure 6A-C). Salt intrusion into the San Joaquin progressed until export pumping was curtailed on 10 December in an effort to prevent chloride concentrations from exceeding the 250 mg L^{-1} chloride standard at Rock Slough (CDWR 2001). Export pump curtailment resulted in more San Joaquin-derived fresh water entering the western Delta, repelling intrusive sea water and reducing salinities at both Jersey Point and Dutch Slough. Despite reduced export pumping, the chloride level continued to rise at Rock Slough eventually averaging 258 mg L^{-1} on 20 December. Although the salmon emigration was still in progress, DCC gates were re-opened on 15 December to repel salt intrusion on the San Joaquin stem of the western Delta, further lowering salinity at Jersey Point and Dutch Slough (Figure 6B,C).

To investigate how regional circulation patterns are altered by DCC gate diversions, we compared two modeling simulations using autumn 2001 hydrologic conditions to represent typical autumn inflows and exports. Delta hydrodynamics were simulated for 9 August-13 September 2001, under scenarios of: (a) actual DCC operations in which the gates were open except for short (4-6 h) closures during 2 weeks in August; and (b) closure of DCC gates for the entire period. We then mapped the fractions of Sacramento River water after 35 days of simulation, when the model attained a quasi-steady state.

When the gates were open, the eastern central Delta, including northeast Franks Tract, was dominated by Sacramento water (Figure 6D). In contrast, when the DCC gates were closed, less Sacramento water reached the eastern side of the central Delta because less Sacramento water was transferred to this region via

Mokulemne channels (Figure 6E). Since the Sacramento and San Joaquin rivers have different electrical conductivity (Table 1), changes in DCC operations altered salinity across the central Delta including the large shallow habitat of Franks Tract.

This second example illustrates how a localized diversion in the north Delta can influence regional-scale water quality through its modification of the flow paths of Sacramento- and San Joaquin-derived river water. The spatial complexity of this response is evident in monitoring records showing concurrent salinity decreases in the lower Sacramento River and salinity increases in the lower San Joaquin River (Figures 6A-C). Simulations of scalar transport provide a clear visualization of the hydraulic response to DCC gate closure. These visualizations reveal the fine-resolution spatial complexity underlying the differential salinity responses measured at a few fixed locations (Figure 6D,E). The Delta is subjected to multiple diversions and this example highlights the compounding effect of gate and export operations on salinity distributions (Figures 6A-C).

Old River Barrier Diversions Alter Flushing and Dissolved Oxygen

The San Joaquin River splits into two channels as it enters the Delta: Old River carries flows west toward the export pumps, and the San Joaquin River carries flows north toward the central mixing zone (Figure 3A). The head of Old River barrier (HORB), a temporary rock wall (~ 70 m x 5 m), is constructed at this branch twice a year. In spring this barrier directs emigrating salmon seaward via the San Joaquin River, and in autumn it amplifies flows through the Stockton Ship channel to preclude oxygen sags that occur under stagnant hydraulic conditions (Figure 3C, Jones and Stokes 2005b). This barrier is removed each year during the wet season to protect local levees from flooding.

The linkage between barrier operations and oxygen dynamics is illustrated with monitoring data showing the progressive decrease of DO concentration in the Stockton ship channel, a deep section of the San Joaquin River downstream of the HORB, immediately after the barrier was removed on 15 November 2001 (Figure 7A). San Joaquin flows above and below the Old River junction during autumn 2002 illustrate the effect of this barrier on the routing of river inflow. The San Joaquin inflow (at Vernalis, Figure 2) was relatively steady (~45 $m^3 s^{-1}$) from mid-October to mid-December (Figure 7B). Similar-magnitude flows below the Old River branch (at Stockton, Figure 2) show that most of the San Joaquin inflow was, as intended, routed along the northerly transit when the HORB was in place. After the barrier was removed on 15 November, most San Joaquin inflow was routed into Old River and, as a result, the net flow at Stockton fell near or below zero (Figure 7B). These records reveal barrier-controlled modification of south Delta circulation, dominated by northerly San Joaquin flow (Figure 3C) when the head of Old River barrier is present, and westerly flow (Figure 3A) when it is absent.

The Stockton ship channel has chronic problems of DO depletion below 6 mg L^{-1}, the regulatory level set to protect biota sensitive to hypoxia (CVRWQCB 1998). Several studies have identified residence time as a key mechanism of hypoxia (Jassby and Van Nieuwenhuyse 2005, Jones and Stokes 2005a), but none have explicitly calculated transport time scales in the Stockton ship channel and their sensitivity to barrier placement and removal. Model simulations provide a tool for quantifying the hydraulic flushing rate of water in the Stockton Ship Channel under scenarios of HORB emplacement and removal.

We used Delta TRIM simulations driven with autumn 2001 and 2002 hydrologic conditions to compute flushing times in Stockton ship channel when the HORB is in place and removed. Neutrally buoyant particles were released in the Stockton ship channel. Particle trajectories and the number of particles remaining within the Stockton ship channel were recorded each hour. Because the phase of the tide at release time influences particle trajectories, 24 different initial release times were simulated for each day. Three hundred and fifteen particles were introduced at the beginning of each release time. We recorded the number of particles remaining in the Stockton ship channel hourly for 145 hours after release on 14 August 2002 (barrier in, Figure 7C) and 5 December 2002 (barrier out, Figure 7D).

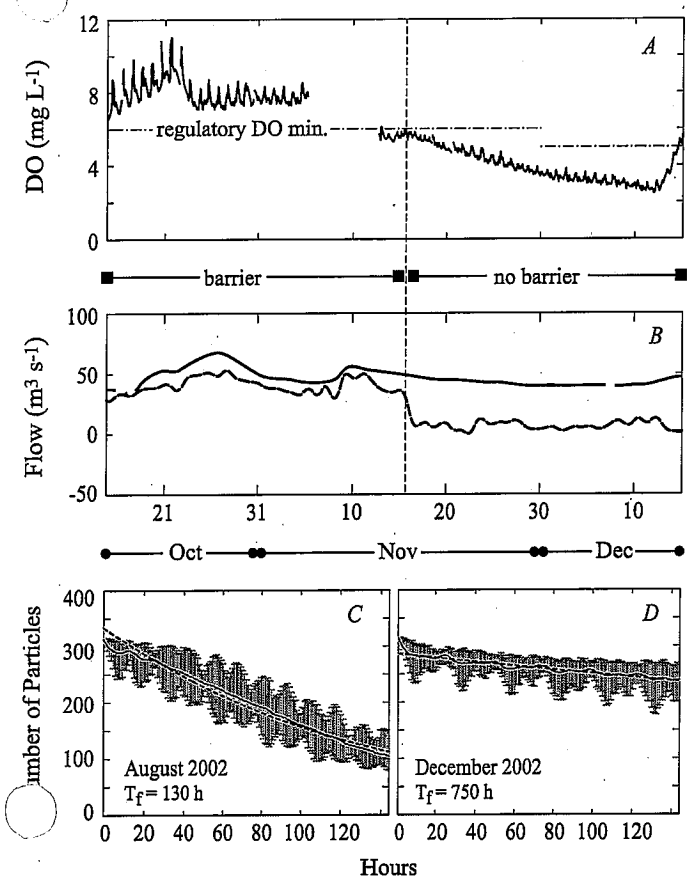

Figure 7. Influence of head of Old River barrier removal on DO concentrations in the Stockton Ship Channel during autumn 2002. (A) Dissolved oxygen 1 m below the surface in the Stockton Ship Channel at Rough and Ready Island; (B) San Joaquin flow at Vernalis (solid line) and tidally-averaged flow at Stockton (dashed line). (C-D) Model-based calculations of flushing time Tf for (C) August 2002 (Tf = 130 h) and (D) December 2002 (Tf = 750 h). Vertical bars represent the range of particle numbers remaining after t hours for all 24 simulations. The solid line represents the mean number of particles each hour. The dotted lines are time series of mean particle numbers from equation (4). Data sources: IEP database: dissolved oxygen (CDWR; Station: RSAN058) and San Joaquin flow (USGS; Station: RSAN063, RSAN112) and, CDWR Bay-Delta Office: Temporary barrier operating schedule (http://sdelta.water.ca.gov/web_pg/tempmesr.html).

These simulations showed > 5-fold increase in flushing time in the Stockton Ship Channel after the HORB was removed: in August 2002 (HORB in) the mean flushing time Tf was 130 h; in December 2002 (HORB out) Tf was 750 h. During early December, the tidally-averaged flow at Stockton was almost zero (Figure 7B). As a result, Tf calculated by the model during this period are highly sensitive to the model representation of tidally-averaged flow, which is underestimated by Delta TRIM because of poorly resolved bathymetry and model representation of the Old River-San Joaquin River junction. Therefore, Tf calculated for 5 December 2002 (Figure 7D) is best interpreted as an upper bound on the flushing time for this December 2002 period.

To test the sensitivity of model representation of flushing time with respect to San Joaquin flow, we did a second series of simulations forced with autumn 2001 hydrology when inflow at Vernalis was more variable, ranging from 40-60 $m^3 s^{-1}$. The flushing time for 8 August 2001 (HORB in) was 100 h, similar to the August 2002 simulation result. The flushing time for 5 December 2001 (HORB out) was 400 h, approximately half the value calculated for December 2002. In the December 2001 simulation, the tidally-averaged flow represented by the model at Stockton was close to the tidally-averaged flow measured in the December 2002 case. Therefore, T_f calculated for December 2001 by the model is an estimate of the lower bound on flushing time in the Stockton Ship Channel for December 2002 hydrology when the HORB is removed.

Based on these simulations, we concluded that, as a rule of thumb, the flushing time for the Stockton Ship Channel during autumn periods is on the order of days when the HORB is in place, and on the order of weeks when this barrier is removed. The calculation of flushing time was highly sensitive to the model representation of tidally-averaged flow, especially in low flow conditions. As with any calculation of transport time, the specific values calculated by a model are only applicable to the specific time period simulated and should not be assumed as absolute values for all periods (Monsen et al. 2002).

CONCLUSIONS: IMPLICATIONS FOR THE DELTA ECOSYSTEM

Diversions to meet society's demand for reliable water supply have often had surprising consequences. The Egyptian High Aswan Dam reduced nutrient inputs from the Nile to the Mediterranean Sea, resulting in

collapse of sardine and prawn fisheries (Nixon 2003). Diversions exposed the Aral Sea bed, creating salt and dust storms with catastrophic effects on human health and agricultural production (Micklin 1988). Levee construction around Colombia's Ciénaga Grande de Santa Marta cut off freshwater supplies and killed extensive areas of mangrove forest (Perdomo et al. 1998). Diversions along China's Yellow River caused the river to dry up approximately 600 km from the river's mouth, with no outflow for 226 days in 1997, causing seawater intrusion and wetland recession in the delta area (Cai and Rosegrant 2004).

Tools are available to anticipate environmental consequences of flow diversions, and our purpose here is to illustrate the application of hydrodynamic models to understand how different diversion types modify water source mixtures, flow paths, and rates. Each hydraulic effect has consequences for water quality, and we conclude with a discussion of how each might also drive changes in the capacity of the Delta ecosystem to sustain communities of native biota.

urce Mixtures

Water quality in the Sacramento-San Joaquin Delta has an unusually large spatial heterogeneity because its subregions contain different mixtures of water from multiple origins, each having distinct chemical composition. We used monitoring data and a hydrodynamic model to illustrate how patterns of spatial heterogeneity change in response to gate and export diversions, using salinity as a tracer of river water from different sources. This approach can be expanded to learn how diversions alter the concentration fields of other chemical constituents such as land-derived pollutants. Selenium is a priority pollutant in San Francisco Bay, originating from mobilization of Se-enriched soils by irrigation in the San Joaquin River basin and accumulating in food webs downstream, leading to potentially toxic levels in consumers, including white sturgeon and Sacramento splittail (Stewart et al. 2004). Selenium concentrations are 8-85 times higher in the San Joaquin than the Sacramento River (Cutter and Cutter 2004), so the concentration of dissolved selenium across the Delta waterscape is expected to vary with the ratio of San Joaquin:Sacramento water. We can hypothesize that as diversions modify this ratio they alter selenium concentrations, just as they alter salinity distributions.

Processes that change concentration fields of pollutants are ecologically important because the toxicity and accumulation of pollutants in food webs are concentration dependent. The new pyrethroid pesticides are extremely toxic to invertebrates with sublethal effects at concentrations measured in parts per trillion (Oros and Werner 2005); the herbicide diuron inhibits phytoplankton photosynthesis in the Delta at concentrations > 2 $\mu g\ L^{-1}$ (Edmunds et al. 1999); phytoplankton accumulate methyl mercury at concentrations 10,000 times those in water (Davis et al. 2003); bioaccumulation of toxic metals (e.g. copper, cadmium, silver, chromium) in invertebrates and fish depends on concentrations of those elements in water and prey (Luoma and Rainbow 2005). We have learned empirically how individual diversions modify salt concentrations across the Delta, but we have not yet considered how they modify distributions of land-derived pollutants and their threats to wildlife or human health.

Transport Routes

The Delta is an exceedingly complex network of channels, sloughs, and shallow open waters connected to a tidal estuary and large rivers. We used flow measurements and hydrodynamic simulations to illustrate how diversions, as intended, modify the routing of water through this network to meet multiple objectives. Pumped exports deliver fresh water to agricultural and municipal consumers; the Delta Cross Channel moves low-salinity Sacramento water into the central Delta and improves water quality delivered to exports and municipal intakes; seasonal barriers alter the routing of San Joaquin River water to facilitate fish migrations and prevent anoxia. The consequences of these altered flow routings are known for salinity and DO, but the broader suite of ecological consequences has not been explored systematically. This knowledge gap constrains our capacity for designing effective strategies to sustain or rehabilitate native species and their supporting ecological functions.

Some diversions, such as the HORB and DCC, are operated to direct the seaward or landward migrations of salmonids. However, other biological and ecological

...ponses to diversion-induced flow routings are poorly known and most have not yet been considered. Pumped exports and within-Delta diversions cause entrainment loss and increased predation of endangered/threatened species of fish such as Delta smelt (Bennett and Moyle 1996). A key uncertainty of the Delta ecosystem is the extent to which diversion-induced mortality contributes to population declines of native biota. Recent analyses show that routing paths matter: entrainment (salvage) of juvenile and adult Delta smelt at the SWP and CVP are strongly correlated with combined flows in Old River and Middle River (Smith et al. 2006).

Flow routings have potentially large impacts on ecosystem functions, such as primary and secondary production in pelagic food webs that sustain native fish. Agricultural diversions and pumped exports remove phytoplankton biomass equivalent to 30% of annual within-Delta primary production (Jassby et al. 2002). This loss at the food web base reduces the Delta's carrying capacity for consumers in this low-productivity ecosystem where food limitation is pervasive across trophic levels (Lopez et al. 2006), and it significantly reduces the supply of algal-derived organic matter from the Delta to the San Francisco Estuary (Jassby et al. 2000). Diversion-induced alterations of hydraulic exchange across habitats (Figure 4c) may also alter production efficiency. Modeling analyses indicate that overall ecosystem primary and secondary production increase in proportion to the transport rate of algal food supplies from shallow donor habitats, such as Mildred Island to deep recipient channel habitats (Cloern 2007).

Flushing Time

We also used the hydrodynamic model to illustrate how diversions modify flushing time, an index of water replacement rate within individual habitats. The seasonal depletion of dissolved oxygen in the San Joaquin River at Stockton shows how water quality is influenced by the balance between rates of competing processes: microbial metabolism that removes oxygen and advective-dispersive replacement of oxygen-deficient water with oxygenated water. Model simulations show that DO depletion occurs in the Stockton Ship ...nnel when the flushing time is longer than several weeks, but not when the flushing time is less than one week (Figure 7). This result is consistent with BOD measurements indicating that the half life of oxygen-consuming constituents is about 12-15 days in the lower San Joaquin River (Volkmar and Dahlgren 2006). Flushing times longer than this characteristic time of oxygen consumption lead to local oxygen depletions. DO depletions are critical habitat degradations because they can be direct causes of mortality or impede migrations of salmonids (Jassby and Van Nieuwenhuyse 2005).

The DO example illustrates how the dynamics of reactive constituents are determined by time scales of both transport and biogeochemical reactions, and how these dynamics become dominated by biogeochemical transformations as transport time scales are lengthened by water diversions. Transport time scales are critical attributes of aquatic ecosystems (Monsen et al. 2002) and we expect that many other components of water quality respond when diversions alter transport rates. Massive algal blooms develop in the lower San Joaquin River under low-flow conditions of long flushing time (Jassby 2005). Detailed mapping across Mildred Island revealed significant spatial variability characterized by highest water temperatures and highest phytoplankton biomass within side embayments isolated from strong tides and having long residence time (Lucas et al. 2006). These retentive, high-biomass subhabitats are zones of enhanced algal and bacterial assimilation of dissolved selenium and transformation into particulate forms available to consumers (Baines et al. 2004). The Delta functions as a biogeochemical transformer of reactive substances as they are transported from land runoff to San Francisco Bay. For example, the Delta removes 60-80% of the river input of dissolved selenium, and this removal efficiency decreases as the water residence time decreases (Meseck and Cutter 2006). Therefore, hydraulic manipulations that lengthen (shorten) flushing time will amplify (diminish) the magnitude of biogeochemical transformations, and therefore modify the net downstream transport of contaminants and other reactive constituents to San Francisco Bay.

Toward a Vision of the Delta's Future

Ecosystem frameworks for water management consider the full suite of costs and benefits of flow manipulation, and these frameworks become more urgent as the world population and scale of water development continue to grow. Water withdrawals for food production are projected to increase 14% in the next 30 years, expanding irrigated land by 450,000 km^2 in 93 developing countries (World Water Assessment Programme 2003). Allocations of water for agriculture will also increasingly compete with municipal demands and water allotments for ecosystem sustainability in California, with particular focus in the Sacramento-San Joaquin Delta. Innovative resource managers are searching for means to implement Integrated Water Resources Management in which development of water, land, and related resources are coordinated to maximize economic and social welfare "without compromising the sustainability of vital ecosystems" (World Water Assessment Programme 2003). Our purpose here is to highlight the critical importance of understanding how flow manipulations alter hydraulics, water quality, habitat quality, and sustainability of the Delta ecosystem, and to illustrate how hydrodynamic models can be used as one tool set to assess the ecosystem-scale consequences of scenarios as we produce a vision for the twenty-first century Delta (Mount et al. 2006).

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Attachment 17

LETTER 21

TRACY FISH FACILITY STUDIES
CALIFORNIA

Volume 11

Empirical and Experimental Analyses of Secondary Louver Efficiency at the Tracy Fish Collection Facility: March 1996 to November 1997

by

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COVER

Fish photography by Rene Reyes, Tracy Fish Collection Facility, Tracy, California.
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LETTER 21

EXECUTIVE SUMMARY

The Tracy Fish Collection Facility (TFCF) was completed in 1954 to salvage primarily chinook salmon and striped bass. An assessment of TFCF secondary louver efficiency in the late 1950s (Bates et al., 1960) showed louver efficiency for chinook salmon was between 92 and 100 percent; louver efficiency for striped bass was between 86 and 95 percent. By the early 1990s (Karp et al., 1995), louver efficiency for both of these species had deteriorated. In this report, the current secondary louver efficiency is evaluated for chinook salmon, striped bass, and 31 other species of fish.

Secondary louver efficiency was determined by simultaneously obtaining louvered fish in the holding tank and catching fish slipping through the louvers with a sieve net deployed behind the secondary louvers. We found the secondary louver efficiency had not improved since the early 1990s: (1) efficiency for chinook salmon averaged 85.1 percent and (2) efficiency for striped bass averaged 61.6 percent. Multivariate statistical analysis found only one significant relationship between any of three independent variables (average channel velocity, time of day, and debris load) studied and secondary louver efficiency. Average channel velocity varied positively with secondary louver efficiency of chinook salmon. However the relationship was not a strong one; average channel velocity cannot predict chinook salmon secondary louver efficiency.

No independent variable influenced delta smelt average channel velocity in a statistically significant manner. However, careful observation indicated one factor that varied inversely with delta smelt louver efficiency. When average channel velocity was less than or equal to 1.09 feet per second (ft/s) delta smelt louver efficiency was 82.5 percent. When average channel velocity was between 1.09 and 3.1 ft/s, delta smelt louver efficiency was 64.0 percent. When average channel velocity was greater than or equal to 3.1 ft/s, delta smelt louver efficiency was 13.0 percent. Because of this result and others detailed in the report, it is recommended that the average velocity in the secondary channel be maintained at 1.09 ft/s year-round except when chinook salmon are present at the TFCF. When chinook salmon are present, it is recommended that average velocity in the secondary channel be maintained at 3.1 ft/s.

Experiments were conducted to evaluate the influence of debris load on splittail secondary louver efficiency. An extremely heavy debris load was

simulated with a special experimental net. With the net in place, splittail were inserted into the secondary channel. Splittail secondary louver efficiency was significantly lower when the net was present during the day, but there was no difference at night. This suggests that louver efficiency is decreased when splittail can see the debris during the day. The experimental approach was found to be effective in determining the influences on louver efficiency. It is suggested that future research at the TFCF use this experimental approach to supplement the classical empirical approach.

INTRODUCTION

California's Central Valley Project moves water from the Sacramento River watershed south to the San Joaquin Valley (figure 1) and more southern localities. At the Federal south-Delta diversion point, the U.S. Department of the Interior (Interior), Bureau of Reclamation (Reclamation) operates the Tracy Fish Collection Facility (TFCF). After tests of various fish screens (U.S. Department of the Interior, 1957), Reclamation selected a system in which fish salvage is performed (figure 2) by a system of louvers and bypasses as water passes through the TFCF and into the Delta-Mendota Intake Canal (DMC). The DMC transports water to the Tracy Pumping Plant (TPP), where the water is lifted and then travels by gravity south for agricultural and domestic uses.

The fish salvage at the TFCF is accomplished in two louver channels. The primary channel has a maximum depth of 6 meters (m) (20 feet [ft]) and is completely traversed by the primary louver array, which is 97.5 m (320 ft) long and 25.6 m (84 ft) wide (figure 2). The louver array is angled 15 degrees to the channel and has four bypasses. Each bypass is 15.3 centimeters (cm) (6 inches [in]) wide and leads to a primary bypass pipe 91.4 cm (36 in) in diameter. These four pipes deliver water to the secondary louver channel.

The secondary louver channel has a maximum depth of 4.9 m (16 ft) and contains two parallel louver arrays that span the channel's entire 2.4 m (8 ft) width. Similar to the primary louvers, both secondary louver arrays are angled 15 degrees to the flow. The anterior louver array in the secondary channel ends in a rectangular opening. This steel "bypass" is 15.3 cm (6 in) wide. However, this is not a bypass to a holding tank (figure 3); the steel ends 1.7 m (5.6 ft) in front of the posterior louver array's true bypass (width = 15.3 cm [6 in]). A fish could be "louvered" by the anterior secondary louver array and potentially swim through the posterior secondary louver array and be transported into the DMC.

Each louver array consists of a series of vertical slats spaced 2.3 cm (0.9 in) apart. The louver slats create a visual and turbulent barrier to fish. Most fish swim against the current but are eventually transported downstream. When a fish encounters the louver array it tends to swim laterally away from the turbulence into the more laminar flow. Thus, fish are "guided" toward the bypass.

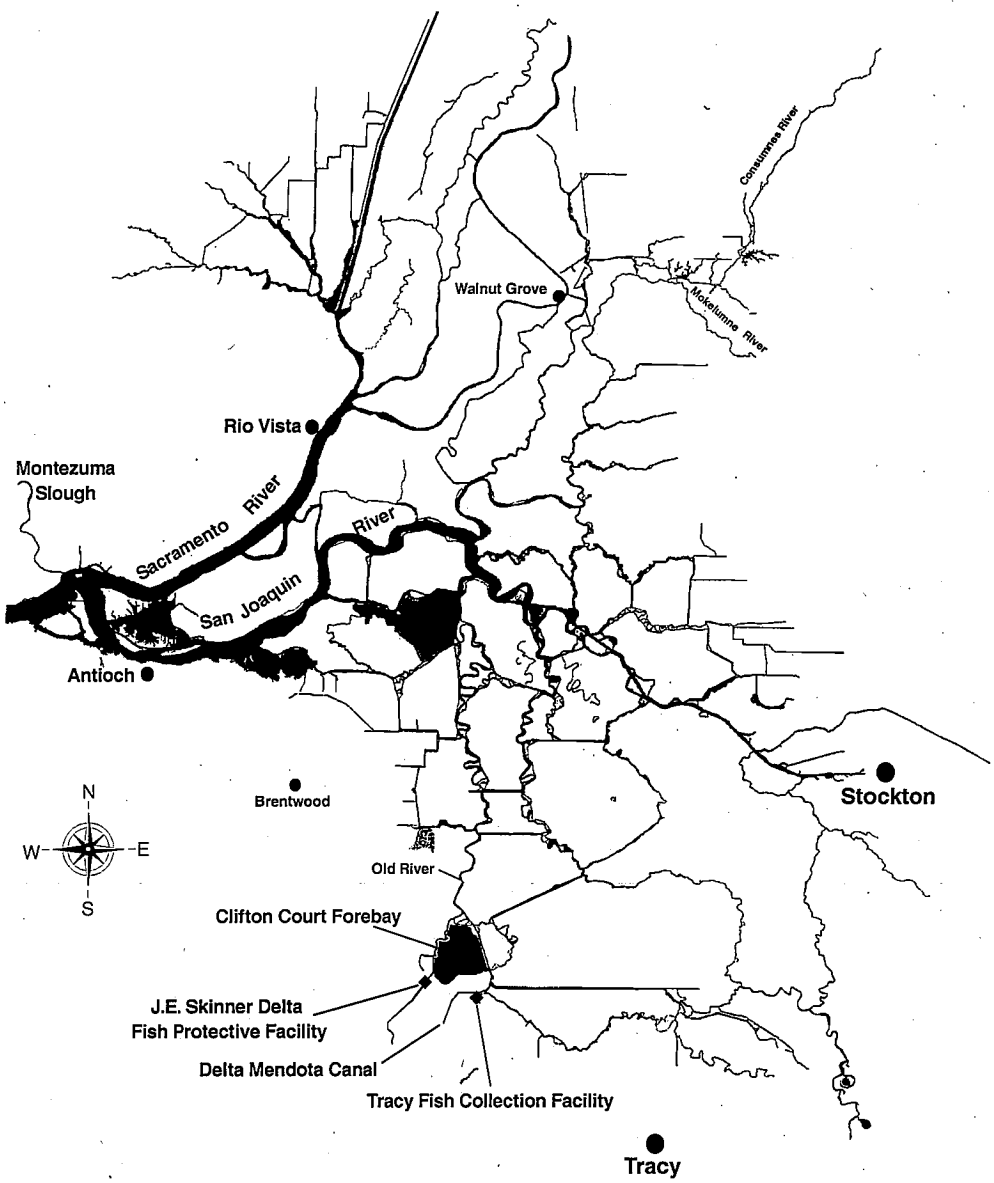


FIGURE 1.—The Sacramento-San Joaquin Delta with the location of the TFCF indicated.

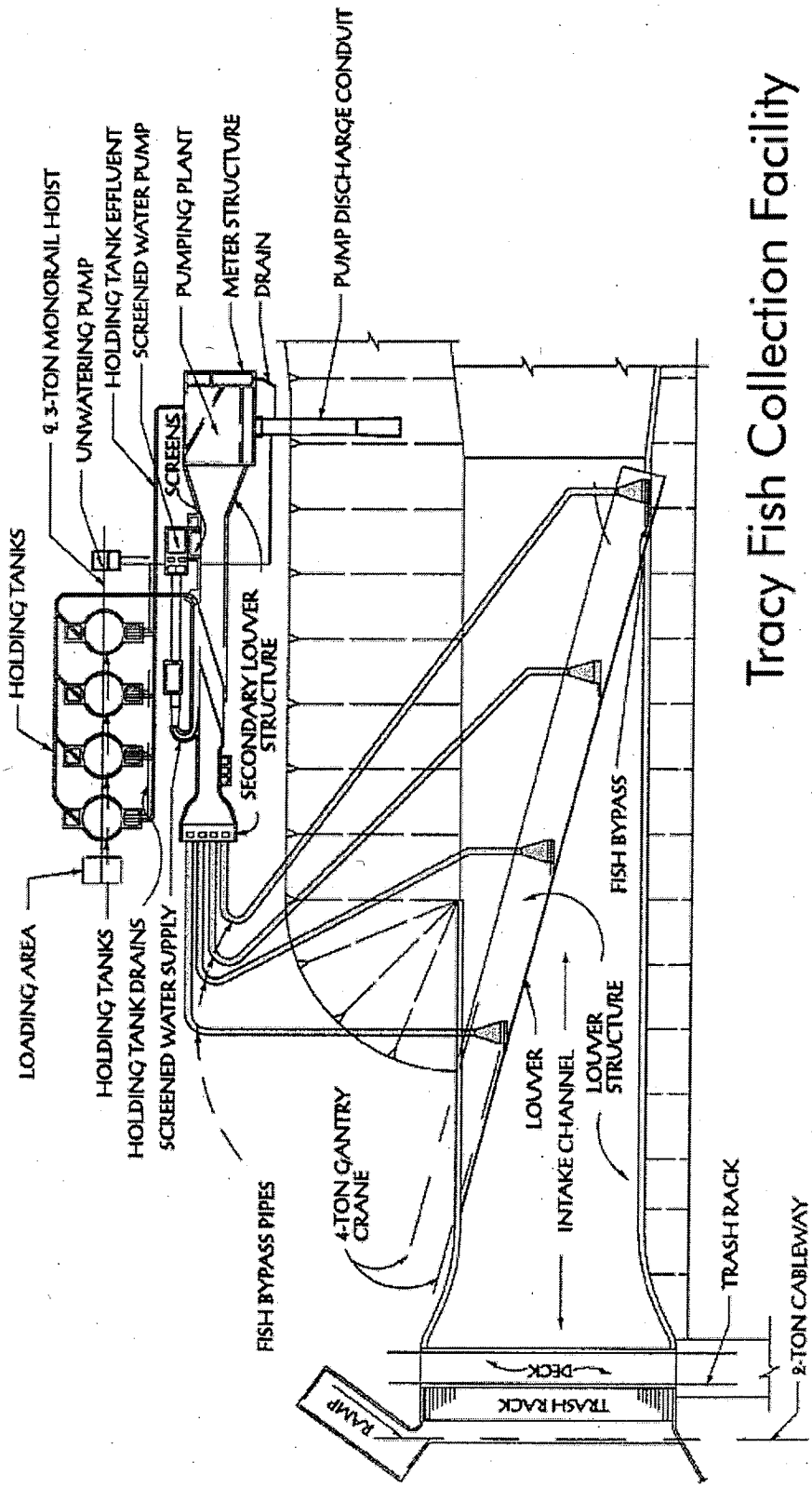


FIGURE 2.—Schematic of the TFCF.

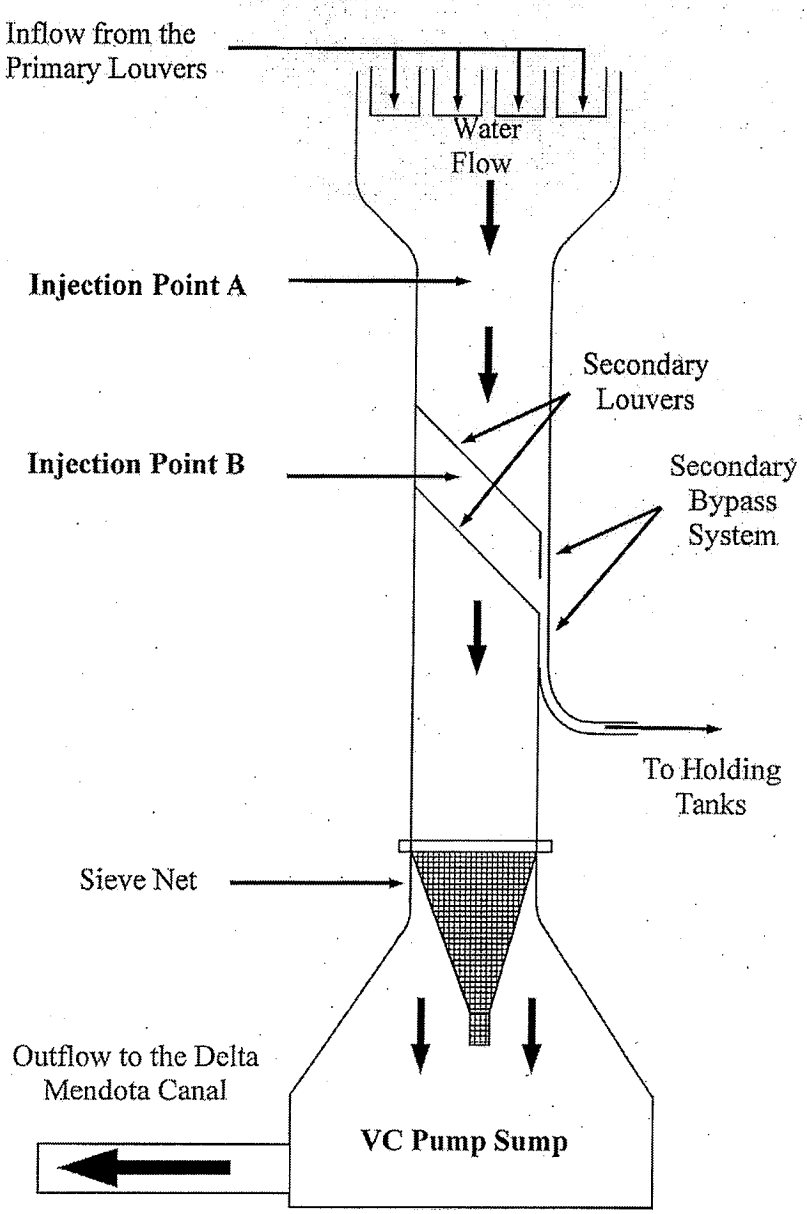


FIGURE 3.—The secondary channel at the TFCF. Sieve net and splittail injection locations are indicated.

Secondary Louver Efficiency

Since the completion of the TFCF, secondary louver efficiency has apparently decreased for the two target species for which the facility was primarily constructed: juvenile chinook salmon, *Oncorhynchus tshawytscha,* and juvenile striped bass, *Morone saxatilis* (table 1). We began this study to determine if this decrease was continuing and to investigate the influence of time of day, channel approach velocity, and louver debris load on secondary louver efficiency. After collecting many empirical observations of efficiency, we conducted experiments to evaluate the influence of time of day and louver debris load on splittail, *Pogonichthys macrolepidotus*, louver efficiency. Thus, we were able to compare empirical and experimental approaches to the study of secondary louver efficiency.

TABLE 1.—Range of secondary louver efficiencies observed at the TFCF, Tracy, California, from 1955 to present

	Chinook Salmon Efficiency, Lower Range Limit	Chinook Salmon Efficiency, Upper Range Limit
Bates et al., 1960	92	100
Karp et al., 1995	72	100
Bowen et al., 1998	83	85
	Striped Bass Efficiency, Lower Range Limit	Striped Bass Efficiency, Upper Range Limit
Bates et al., 1960	86	95
Karp et al., 1995	44	90
Bowen et al., 1998	61	86

METHODOLOGY

Secondary Louver Efficiency

We constructed a sieve net (2 millimeters [mm] [0.08 in] mesh) on a frame posterior to the two secondary louver arrays (figure 3). For 10 minutes (min), we simultaneously deployed the sieve net in the channel and directed flow from the bypass into a holding tank (effective mesh size 6 mm [0.25 in]). At the end of 10 min, we redirected flow into another holding tank and withdrew

the sieve net. Fish and debris were removed from the holding tank and sieve net.

The holding tank and sieve netted fish were then identified to species, and fork length (FL) was measured to the nearest mm (0.04 in). Species, lengths, and numbers of fish were recorded with operational and environmental parameters (table 2). For each 10-min observation, instantaneous secondary louver efficiency was calculated as:

$$E_i = H_i \quad (H_i + S_i)^{-1}$$

where,

E_i = Instantaneous secondary louver efficiency
H_i = Number of fish in the holding tank
S_i = Number of fish in the sieve net

TABLE 2.—Environmental and operational parameters recorded with simultaneous holding tank/sieve net observations at the TFCF

Operational	Environmental
Number of pumps operating at the TPP	Tide: out, in, slack
Primary channel discharge	Primary depth
Secondary channel discharge	Secondary depth
Primary channel velocity	Time of day
Secondary channel velocity	Debris load
Primary bypass ratio	Temperature
Secondary bypass ratio	Conductivity
Holding tank discharge	Salinity
VC pump combination	
Screen water (always off)	

We recognize that this instantaneous efficiency places more weight on fish that enter the secondary louver channel alone ($n = 1$) than on fish that enter in a group.

To account for this, grand secondary louver efficiency was calculated as:

$$E_g = H_g \quad (H_g + S_g)^{-1}$$

where,

E_g	=	Grand secondary louver efficiency
H_g	=	Number of fish in the holding tank for all 10-min samples combined
S_g	=	Number of fish in the sieve net for all 10-min samples combined

Splittail Injection Experiments

Two controls and one treatment were conducted. The first control was no net on the secondary louver array. The second control was a cotton net (mesh size of 25.6 mm [1 in]) weighted with rebar, 12.8 mm (0.5 in) in diameter, on the bottom of the net. The treatment was a cotton net, a duplicate of the control net, altered to simulate an extremely heavy debris load on the anterior secondary louver.

The treatment net was prepared with a cotton net, mesh size of 25.6 mm (1 in), on which was assembled plastic simulated vegetation and a plastic sheet. First, rebar 12.8 mm (0.5 in) in diameter was affixed to the bottom of the cotton net with cable ties to weight the bottom of the net. Second, 2,000 simulated vegetation clusters were affixed to the front of the cotton net with binder clips. Third, a plastic sheet was attached to the back of the net. From the plastic sheet, pieces were removed at random in three shapes: square, rectangular, and circular. The shapes were cut in three sizes: 0.09, 0.18, and 0.72 square meter (m^2) (1, 2, and 8 square feet [ft^2]). Pieces were removed until 17 percent of the plastic had been removed.

In a trial, no net, the control net, or the treatment net was affixed to the anterior secondary louver array. In addition, when the treatment net was in place, a perforated plate (3.7 m by 0.9 m (10 ft by 3 ft) with holes 2 mm (0.08 in) in diameter was situated on the last 0.9 m (3 ft) of the anterior secondary louver array. Thus, no fish could pass through the louver array in the 0.9 m (3 ft) closest to the bypass entrance. This perforated plate simulated the debris clogging that occurs near the bypass during heavy debris loading. We conducted a factorial design (table 3) with time of day

TABLE 3.—Factorial design executed in the splittail injection experiments. The number in each cell represents the number of replicates completed for each combination

Treatment	Day	Night
No net	3	3
Control net	4	2
Vegetation net	3	3

and the debris load treatments. All treatments began 1 hour (h) after high tide and each treatment was 3 h in duration. We also conducted three dimensional velocity profiles 91 cm (3 ft) along the front of the anterior louver with no net, the control net, and the experimental net in place.

In the spring of 1998, 1,440 splittail were retained from holding tank collections. For each experimental trial, 80 splittail (mean FL of 7 cm [3 in]) were prepared. Forty splittail were dyed with Bismarck brown for 3 h with 0.45 gram (g) of Bismarck brown in 220 liters (L) (100 gallons [gal]) of water. These 40 splittail then received a clip on the lower lobe of the caudal fin. Forty undyed splittail received a clip on the upper lobe of the caudal fin. One hour after high tide, the 40 dyed, clipped splittail were released by minnow bucket immediately downstream from the anterior secondary louver array. Hence, these fish were released between the two secondary louver arrays. The 40 undyed, clipped splittail were released 10 m (32.6 ft) upstream from the leading edge of the anterior louver array.

One hour after injection, and at the end of each hour during the trial, the sieve net was raised and all fish and debris were removed. Thus, the sieve net was out of the water for an average of 4 min every hour. This produced a slight overestimate of splittail secondary louver efficiency. We corrected for this effect by calculating the catch rate in the sieve net per minute. Then, we added the number of fish that would have been obtained in that 4 min. This discrepancy could not be avoided; when the sieve net was left in place for the entire 3-h duration of a trial, it was ripped by extensive accumulations of materials such as woody debris, plastics, and fish.

Delta Smelt Recommendation

Using logistic regression, we modeled delta smelt secondary louver efficiency as a function of approach velocity. Delta smelt louver efficiency was defined as instantaneous louver efficiency (see equation page 6) and can also be interpreted as the probability of a delta smelt being successfully louvered into a holding tank. Calculations were performed using PROC PROBIT in SAS/STAT Release 8.02 (SAS Institute Inc., 1999-2001). Using the logistic regression model, we estimated the approach velocity that is associated with a given secondary louver efficiency; this problem is one of inverse prediction, i.e., prediction of the independent variable (approach velocity) from the dependent variable (delta smelt secondary louver efficiency). Using the INVERSECL option, we obtained 95 percent inverse confidence limits for a value of velocity that yields a given louver efficiency. The inverse confidence limits indicate the precision in our estimate of that velocity. We graphed the lower inverse confidence limit for several efficiencies (figure 11) because the lower limit is a conservative estimate of the minimum velocity needed to achieve a given efficiency.

RESULTS

Between March 15, 1996, and November 9, 1997, we collected 26,539 fish representing 33 species of fish. These fish were obtained through 456 simultaneous 10-min holding tank/sieve net samples. Grand efficiency was calculated for each species (table 4).

Between March 1996 and November 1997, juvenile chinook salmon secondary louver efficiency was 85.1 percent; juvenile striped bass louver efficiency was 61.5 percent. The apparent reduction from the average 1960 (Bates et al., 1960) levels of louver efficiency noted in earlier studies (table 1) is still in effect for these two species.

Because of the bimodal distribution of empirical efficiency data (Bowen et al., 1998), we relied on logistic regression (Hosmer and Lemeshow, 1989) and Probit Analysis (SAS Institute Inc., 1999-2001) to evaluate the influence of channel approach velocity, time of day, and debris loading. With logistic regression, we found that juvenile chinook secondary salvage efficiency was positively influenced by channel approach velocity in the secondary channel (table 5: Probability of the Logistic Model Fit, $P = 0.7536$; Probability that Approach Velocity Explains No Variation, $P = 0.0009$). However, channel approach velocity was not a good predictor of secondary louver efficiency

TABLE. 4.— Grand secondary louver efficiency (see equation on page 6) of individuals successfully salvaged at the TFCF, Tracy, California, from March 1996 – November 1997. Order of fishes follows AFS (1991)

Common Name	Scientific Name	Percent Successfully Louvered	n
Lamprey Species	*Petromyzontidae*	72.7	11
River lamprey	*Lampetra ayersi*		
Pacific lamprey	*Lampetra tridentata*		
White sturgeon	*Acipenser transmontanus*	80.0	5
American shad	*Alosa sapidissima*	40.4	1,986
Threadfin shad	*Dorosoma petenense*	52.9	6,897
Red shiner	*Cyprinella lutrensis*	64.7	17
Common carp	*Cyprinus carpio*	32.8	58
Golden shiner	*Notemigonus crysoleucas*	75.0	28
Sacramento blackfish	*Orthodon microlepidotus*	88.2	17
Splittail	*Pogonichthys macrolepidotus*	71.2	765
Sacramento sucker	*Catostomus occidentalis*	32.2	839
White catfish	*Ameiurus catus*	86.5	2,516
Black bullhead	*Ameiurus melas*	80.0	5
Brown bullhead	*Ameiurus nebulosus*	92.3	26
Channel catfish	*Ictalurus punctatus*	73.4	576
Wakasagi	*Hypomesus nipponensis*	74.1	27
Delta smelt	*Hypomesus transpacificus*	65.0	1,112
Longfin smelt	*Spirinchus thaleichthys*	60.2	113
Steelhead	*Oncorhynchus mykiss*	100.0	22
Chinook salmon	*Oncorhynchus tshawytscha*	85.1	1,890
Western mosquitofish	*Gambusia affinis*	35.3	17
Inland silverside	*Menidia beryllina*	45.3	190
Prickly sculpin	*Cottus asper*	67.8	2,448
Striped bass	*Morone saxatilis*	61.5	4,017
Warmouth	*Lepomis gulosus*	76.8	56
Bluegill	*Lepomis macrochirus*	73.5	1,277
Redear sunfish	*Lepomis microlophus*	96.2	26
Largemouth bass	*Micropterus salmoides*	70.7	610
Black crappie	*Pomoxis nigromaculatus*	82.3	62
Bigscale logperch	*Percina macrolepida*	54.7	75
Yellowfin goby	*Acanthogobius flavimanus*	58.5	388
Shimofuri goby	*Tridentiger bifasciatus*	26.8	422
Starry flounder	*Platichthys stellatus*	90.5	21

TABLE 5.— Logistic regression analysis of the effects of three independent variables' on secondary louver efficiency at the TFCF, Tracy, California, from March 1996 – November 1997. Number of simultaneous 10-minute holding tank/sieve net samples were: splittail (n = 121), delta smelt (n = 149), chinook salmon (n = 196), and striped bass (n = 253)

Model	Splittail Probability of Model Fit	Splittail Probability of Significance	Delta Smelt Probability of Model Fit	Delta Smelt Probability of Significance	Chinook Salmon Probability of Model Fit	Chinook Salmon Probability of Significance	Striped Bass Probability of Model Fit	Striped Bass Probability of Significance
Approach Velocity	0.5375	0.5375	0.0028	0.0048	0.8639	0.8640	0.0420	0.0457
Time of Day	0.3312	0.3333	0.1414	0.1442	0.5137	0.5141	0.2570	0.2576
Debris	0.0379	0.0402	0.0025	0.0034	0.4523	0.4561	0.0007	0.0009
Ap. Veloc.+ Time of Day	0.5376	0.5856 0.3552	0.0034	0.0043 0.1235	0.7855	0.8127 0.5011	0.0358	0.0358 0.1901
Ap. Veloc.+ Debris	0.0830	0.4147 0.0343	0.0002	0.0061 0.0047	0.7536	0.0009 0.5279	0.0003	0.0380 0.0008
Time of Day+ Debris	0.0776	0.3728 0.0437	0.0081	0.4891 0.0078	0.5259	0.3967 0.3591	0.0024	0.4893 0.0014
Ap. Veloc.+ Time of Day+ Debris	0.1260	0.4351 0.3904 0.0368	0.0004	0.0060 0.4646 0.0118	0.7305	0.9239 0.3941 0.3721	0.0008	0.0326 0.3855 0.0013

(Somer's $D = 0.065$; = 0.090). For example, chinook salmon louver efficiency appears unrelated to channel approach velocity in some analyses (table 6). These conflicting results leave us without a consistent relationship between approach velocity and chinook salmon secondary louver efficiency.

For three other species of concern—splittail, threatened delta smelt, *Hypomesus transpacificus*, and striped bass—we analyzed statistically the influence of channel approach velocity, time of day, and debris loading on salvage efficiency. Only one (velocity) of these three independent variables influenced salvage efficiency for any species in a statistically significant manner (table 5). Yet, even when these factors were not statistically significant, we noted differences in salvage efficiency. Splittail louver efficiency was lower during crepuscular periods (table 7) and when debris load was light (table 8).

No statistically significant factor was isolated for delta smelt. However, on inspection of the empirical data, channel approach velocity appears inversely related to delta smelt louver efficiency (table 6). When channel approach velocity is less than 0.33 meter per second (m/s) (1.09 feet per second [ft/s]), delta smelt secondary louver efficiency is 82.5 percent. Secondary louver efficiency is 64.0 percent when channel approach velocities are between 0.33 and 0.95 m/s (1.09 and 3.1 f/s). Secondary louver efficiency is 13.0 percent when channel approach velocities exceed 0.95 m/s (3.1 ft/s).

Other factors also showed some relationship to delta smelt louver efficiency through inspections of the data. Delta smelt louver efficiency increased as debris in the 10-min counts increased (table 8). But delta smelt louver efficiency varied inversely with temperature (table 9).

Similarly to delta smelt, juvenile striped bass secondary louver efficiency was statistically not significantly influenced by approach velocity. However, table 6 shows that channel approach velocity appears inversely related to striped bass louver efficiency, and secondary louver efficiency is highest when channel approach velocity is less than 0.33 m/s (1.09 ft/s). Furthermore, striped bass efficiency increased with bypass ratio (table 10). But striped bass louver efficiency was independent of tidal state (table 11).

Secondary louver efficiency was low for some species of interest. Grand efficiency for American shad (*Alosa sapidissima*) was only 40.4 percent; in addition, efficiency was inversely proportional to temperature (table 9).

TABLE 6.—Secondary louver efficiency in three approach-velocity categories for fish collected at the TFCF, Tracy, California, from March 1996 – September 1997

Common Name	<0.33 m/s (<1.09 ft/s) Successfully Louvered (%)	<0.33m/s (1.09 ft/s) n	0.33-0.95 m/s (1.09-3.1 ft/s) Successfully Louvered (%)	0.33-0.95 m/s (1.09-3.1 ft/s) n	0.95 m/s (>3.1 ft/s) Successfully Louvered (%)	0.95 m/s (3.1 ft/s) n
American shad	—	0	39.4	1,614	44.9	372
Bigscale logperch	100.0	3	53.5	71	—	1
Black bullhead	—	0	80.0	5	—	0
Black crappie	100.0	1	81.5	54	85.7	7
Bluegill	47.7	44	74.6	949	73.9	284
Brown bullhead	100.0	1	95.8	24	—	1
Centrarchids	—	0	37.5	8	—	1
Channel catfish	66.7	3	71.1	523	94.0	50
Chinook salmon	85.7	14	84.8	1,686	87.4	190
Common carp	—	0	32.8	58	—	0
Delta smelt	82.5	103	64.0	986	13.0	23
Golder shiner	—	0	74.1	27	100.0	1
Goldfish	—	0	100.0	2	—	0
Green sturgeon	—	0	—	1	—	0
Green sunfish	—	0	100.0	1	—	0
Inland silverside	33.3	3	43.5	168	63.2	19
Lamprey Species	—	0	80.0	10	—	1
Largemouth bass	100.0	7	69.9	582	71.4	21
Longfin smelt	53.8	13	60.6	99	100.0	1
Prickly sculpin	91.2	171	66.8	2,136	53.2	141
Pumpkinseed	—	0	100.0	1	—	0
Red shiner	—	0	68.8	16	—	1
Redear sunfish	100.0	2	94.7	19	100.0	5
Sacramento blackfish	—	0	88.2	17	—	0
Sacramento sucker	—	4	30.7	807	53.6	28
Shimofuri goby	100.0	1	26.7	420	—	1
Splittail	—	0	71.1	751	64.3	14
Starry flounder	—	0	90.0	20	100.0	1
Steelhead	—	0	100.0	20	100.0	2
Striped bass	96.7	120	59.3	3,756	65.2	141
Threadfin shad	58.0	143	50.8	5,632	61.7	1122
Threespine stickleback	—	0	66.7	3	—	0
Tule perch	—	0	100.0	2	—	0
Wakasagi	—	0	73.1	26	100.0	1
Warmouth	100.0	1	81.0	42	61.5	13
Western mosquitofish	—	0	35.7	14	33.3	3
White catfish	98.1	53	86.3	2,155	83.1	308
White crappie	—	0	100.0	1	—	0
White sturgeon	—	0	80.0	5	—	0
Yellowfin goby	100.0	1	57.7	381	100.0	6

TABLE 7.— Secondary louver efficiency at three periods of day for fish collected at the TFCF, Tracy, California, from March 1996 – September 1997. Crepuscular period data combine dawn and dusk samples

Common Name	Day Successfully Louvered (%)	Day n	Crepuscular Successfully Louvered (%)	Crepuscular n	Night Successfully Louvered (%)	Night n
Lamprey Species	100.0	3	100.0	1	57.1	7
River lamprey						
Pacific lamprey						
White sturgeon	50.0	2	100.0	1	100.0	2
American shad	37.4	1,099	35.5	414	51.8	473
Threadfin shad	42.8	2,935	49.9	889	63.4	3,073
Red shiner	83.3	6	0.0	1	60.0	10
Common carp	17.4	23	34.8	23	58.3	12
Golden shiner	63.6	11	100.0	4	76.9	13
Sacramento blackfish	87.5	8	75.0	4	100.0	5
Splittail	74.6	319	59.9	172	74.5	274
Sacramento sucker	37.6	189	23.7	266	35.4	384
White catfish	87.9	495	86.9	444	86.0	1,577
Black bullhead	100.0	1	100.0	1	66.7	3
Brown bullhead	100.0	3	100.0	3	90.0	20
Channel catfish	61.0	182	84.8	66	78.0	328
Wakasagi	81.8	11	75.0	8	62.5	8
Delta smelt	65.7	720	60.6	188	66.7	204
Longfin smelt	62.1	66	52.9	34	69.2	13
Steelhead	100.0	8	100.0	7	100.0	7
Chinook salmon	82.9	346	84.3	408	86.0	1,136
Western mosquitofish	25.0	4	33.3	3	40.0	10
Inland silverside	36.5	96	66.7	9	52.9	85
Prickly sculpin	72.4	1,410	57.1	524	66.0	514
Striped bass	62.2	2,434	60.8	431	60.1	1,152
Warmouth	100.0	2	100.0	4	74.0	50
Bluegill	72.1	308	77.0	183	73.3	786
Redear sunfish	100.0	15	100.0	4	85.7	7
Largemouth bass	74.6	240	63.9	61	68.9	309
Black crappie	87.1	31	81.3	16	73.3	15
Bigscale logperch	56.8	44	42.9	14	58.8	17
Yellowfin goby	83.3	66	57.9	19	53.1	303
Shimofuri goby	21.8	335	41.7	12	46.7	75
Starry flounder	100.0	8	—	0	84.6	13

TABLE 8.— Secondary louver efficiency at three debris levels for fish collected at the TFCF, Tracy, California, from March 1996 – September 1997. Debris mass was obtained in the holding tank during a 10-min simultaneous holding tank/sieve net sample

Common Name	< 350 g (< 12.3 oz) Successfully Louvered (%)	< 350 g (< 12.3 oz) n	350 – 1000 g (12.3 – 35.3 oz) Successfully Louvered (%)	350 – 1000 g (12.3 – 35.3 oz) n	1000 g (35.3 oz) Successfully Louvered (%)	1000 g (35.3 oz) n
Lamprey Species	100.0	1	—	0	70.0	10
River lamprey						
Pacific lamprey						
White sturgeon	50.0	2	100.0	1	100.0	1
American shad	37.4	511	28.6	825	57.8	650
Threadfin shad	40.4	2,264	46.9	2,080	69.4	2,421
Red shiner	57.1	7	33.3	3	80.0	5
Common carp	16.3	43	100.0	7	100.0	3
Golden shiner	62.5	8	62.5	8	91.7	12
Sacramento blackfish	100.0	2	75.0	4	90.9	11
Splittail	57.3	248	78.7	235	83.7	257
Sacramento sucker	18.6	601	70.2	141	61.8	89
White catfish	76.0	434	84.8	580	90.4	1,442
Black bullhead	—	0	50.0	2	100.0	3
Brown bullhead	100.0	1	100.0	5	90.0	20
Channel catfish	53.8	221	82.2	107	87.6	242
Wakasagi	68.4	19	66.7	3	100.0	5
Delta smelt	55.2	717	85.2	305	91.5	71
Longfin smelt	51.6	91	92.3	13	100.0	9
Steelhead	100.0	4	100.0	5	100.0	11
Chinook salmon	77.8	334	79.5	347	89.0	1,125
Western mosquitofish	60.0	5	25.0	4	14.3	7
Inland silverside	37.5	56	30.2	53	62.8	78
Prickly sculpin	67.1	1,469	70.7	569	66.8	373
Striped bass	51.4	2,198	72.9	1,089	79.4	683
Warmouth	50.0	8	60.0	5	83.7	43
Bluegill	54.5	112	63.0	238	77.5	874
Redear sunfish	100.0	10	100.0	6	90.0	10
Largemouth bass	55.9	281	77.3	176	92.6	148
Black crappie	53.8	13	73.3	15	96.9	32
Bigscale logperch	47.8	46	66.7	21	62.5	8

TABLE 9.—Secondary louver efficiency at three temperature ranges for fish collected at the TFCF, Tracy, California, from March 1996 – September 1997

Common Name	< 14 °C (< 57.2 °F) Successfully Louvered (%)	< 14 °C (< 57.2 °F) n	14 – 20 °C (57.2 – 68 °F) Successfully Louvered (%)	14 – 20 °C (57.2 – 68 °F) n	20 °C (68 °F) Successfully Louvered (%)	20 °C (68 °F) n
Lamprey Species	75.0	4	71.4	7	—	0
Pacific lamprey						
River lamprey						
White sturgeon	100.0	1	75.0	4	—	0
American shad	45.5	237	40.7	970	38.5	779
Threadfin shad	59.4	957	59.2	2,832	45.1	3,108
Red shiner	25.0	4	75.0	8	80.0	5
Common carp	12.5	8	30.5	36	50.0	14
Golden shiner	75.0	4	92.8	14	50.0	10
Sacramento blackfish	100.0	2	90.0	10	80.0	5
Splittail	80.0	75	71.6	381	68.8	309
Sacramento sucker	41.3	29	31.1	751	40.6	59
White catfish	86.2	313	86.5	1,655	86.6	548
Black bullhead	100.0	1	66.6	3	100.0	1
Brown bullhead	100.0	6	86.6	15	100.0	5
Channel catfish	—	0	25.0	4	40.0	5
Wakasagi	0.0	1	82.3	17	66.6	9
Delta smelt	78.0	146	65.4	588	59.2	378
Longfin smelt	83.3	12	57.9	88	53.8	13
Steelhead	100.0	3	100.0	17	100.0	2
Chinook salmon	87.7	49	85.5	1,576	81.8	265
Western mosquitofish	66.6	3	20.0	5	33.3	9
Inland silverside	50.0	16	61.5	78	31.2	96
Prickly sculpin	78.9	176	65.7	1,889	72.5	383
Striped bass	63.9	441	67.6	726	59.5	2,850
Warmouth	70.0	30	100.0	18	50.0	8
Bluegill	69.3	323	74.4	806	77.7	148
Redear sunfish	100.0	2	92.3	13	100.0	11
Largemouth bass	72.1	61	80.3	102	68.2	447
Black crappie	100.0	3	86.6	45	64.2	14
Bigscale logperch	83.3	6	51.1	43	53.8	26
Yellowfin goby	55.0	69	64.2	98	57.0	221
Shimofuri goby	39.3	94	57.1	21	20.8	307
Starry flounder	90.0	10	100.0	1	90.0	10

TABLE 10.—Secondary louver efficiency in three bypass ratio categories for fish collected at the TFCF, Tracy, California, from March 1996 – September 1997

Common Name	< 1.2 Successfully Louvered (%)	< 1.2 n	1.2 – 1.6 Successfully Louvered (%)	1.2 – 1.6 n	1.6 Successfully Louvered (%)	1.6 n
Lamprey Species	75.0	800	50.0	200	—	0
River lamprey						
Pacific lamprey						
White sturgeon	50.0	2	100.0	200	—	0
American shad	40.8	867	41.3	673	43.7	183
Threadfin shad	54.1	2,813	52.4	2,342	42.6	514
Red shiner	60.0	5	83.3	6	50.0	2
Common carp	6.7	6	35.7	14	85.7	7
Golden shiner	69.2	13	70.0	10	100.0	3
Sacramento blackfish	100.0	4	100.0	6	50.0	2
Splittail	75.1	133	73.5	310	73.8	88
Sacramento sucker	62.2	45	32.3	229	58.3	48
White catfish	88.2	1,166	82.9	705	85.3	123
Brown bullhead	88.8	18	100.0	3	100.0	3
Channel catfish	83.5	184	65.7	286	60.0	33
Wakasagi	50.0	2	75.0	4	77.7	9
Delta smelt	70.7	263	58.0	205	71.3	381
Longfin smelt	47.0	34	61.1	18	75.0	44
Steelhead	100.0	11	100.0	3	—	0
Chinook salmon	85.2	987	88.5	453	84.6	117
Western mosquitofish	25.0	8	66.6	3	—	0
Inland silverside	45.0	71	55.5	54	25.0	24
Prickly sculpin	65.8	369	70.1	463	77.4	655
Striped bass	58.4	1,046	60.5	1,652	67.6	650
Warmouth	71.0	38	90.0	10	100.0	1
Bluegill	73.4	792	78.7	320	64.4	76
Redear sunfish	85.7	7	100.0	7	100.0	3
Largemouth bass	76.8	138	66.8	326	80.3	61
Black crappie	80.9	21	91.3	23	50.0	8
Bigscale logperch	28.5	7	65.5	29	75.0	12
Yellowfin goby	46.6	60	55.1	234	85.2	34
Shimofuri goby	13.3	127	33.9	206	5.7	52
Starry flounder	83.3	6	90.9	11	100.0	4

TABLE 11.—Secondary louver efficiency at three tidal states for fish collected at the TFCF, Tracy, California, from March 1996 – September 1997. Slack tide is the 6-h period between sequential tidal peaks

Common Name	Out Successfully Louvered (%)	Out n	Slack Successfully Louvered (%)	Slack n	In Successfully Louvered (%)	In n
Lamprey Species	33.3	3	100.0	1	85.7	7
River lamprey						
Pacific lamprey						
White sturgeon	100.0	2	—	0	66.7	3
American shad	41.7	770	37.0	608	42.3	608
Threadfin shad	54.1	2,465	46.2	1,947	57.0	2,485
Red shiner	72.7	11	—	1	60.0	5
Common carp	47.4	19	20.0	15	29.2	24
Golden shiner	80.0	5	71.4	7	75.0	16
Sacramento blackfish	66.7	6	100.0	5	100.0	6
Splittail	70.1	214	70.0	247	73.0	304
Sacramento sucker	34.5	278	33.9	224	29.1	337
White catfish	83.4	945	84.1	473	90.3	1,098
Black bullhead	66.7	3	—	0	100.0	2
Brown bullhead	85.7	7	100.0	7	91.7	12
Channel catfish	69.9	269	63.6	110	83.8	197
Wakasagi	70.0	10	100.0	1	75.0	16
Delta smelt	62.0	368	62.1	240	68.7	504
Longfin smelt	51.1	45	61.3	31	70.3	37
Steelhead	100.0	6	100.0	1	100.0	15
Chinook salmon	85.8	494	76.3	270	86.9	1126
Western mosquitofish	25.0	8	100.0	4	0.0	5
Inland silverside	37.8	74	25.9	27	57.3	89
Prickly sculpin	69.6	1,165	58.0	531	71.8	752
Striped bass	60.6	1,448	62.7	1,008	61.5	1,561
Warmouth	76.9	26	54.5	11	89.5	19
Bluegill	78.2	655	61.5	195	71.9	427
Redear sunfish	92.3	13	100.0	4	100.0	9
Largemouth bass	69.7	188	71.8	216	70.4	206
Black crappie	76.9	26	93.3	15	81.0	21
Bigscale logperch	57.1	28	45.0	20	59.3	27
Yellowfin goby	77.2	57	63.8	105	51.3	226
Shimofuri goby	26.9	186	24.7	93	28.0	143
Starry flounder	92.3	13	100.0	1	85.7	7

Furthermore, the efficiency for American shad is lower during daytime (table 7: 37.4 percent) and crepuscular (dawn and dusk combined) periods (35.5 percent) than at night (51.8 percent). Threadfin shad, *Dorosoma petenense*, showed a similar trend with the highest secondary efficiency observed at night (63.4 percent) and lower efficiencies observed during the day (42.8 percent) and crepuscular periods (49.9 percent).

As expected, for most species, secondary louver efficiency did not consistently vary with tidal state (table 11). The absolute number of fish entrained to the TFCF might vary with an incoming tide, but we did not expect this to vary the efficiency with which the louvers operate.

Similar to tidal state, we did not expect secondary efficiency to vary with the weight of debris obtained in a 10-min holding tank count (table 8). But 25 of the 32 species showed an increase in louver efficiency with an increasing debris load. We do not know if debris load was directly correlated with fouling of the louvers by debris. For example, when we measured extremely high debris loads (greater than 1,000 g in the 10-min holding tank count), the louvers could be dirty or clean depending on the time since they were last cleaned. It is possible that increased debris load in the 10-min sample is associated with higher debris fouling on the louvers; this fouling might reduce the area through which fish might pass from the secondary louvers, allowing an increase in efficiency. Splittail was 1 of 25 species that displayed this trend: higher debris loads provided higher secondary louver efficiency. Because debris load may not be related to fouling, we decided to further investigate the relationship between debris and louver efficiency using splittail as an example.

Secondary louver efficiency data for almost all species were not distributed normally (figures 4-8). Most commonly, these data were bimodal; no known transformation will provide normally distributed data from such distributions. Data for splittail were not distributed normally (figure 4d). We hypothesized this was due to the common occurrence of only one fish coming through the secondary channel at a time. Therefore, we decided to inject a number of splittail (n=40) to produce data distributed normally (figure 9) and allow us to employ parametric statistical techniques to elucidate the relationship between time of day, debris fouling, and splittail secondary louver efficiency.

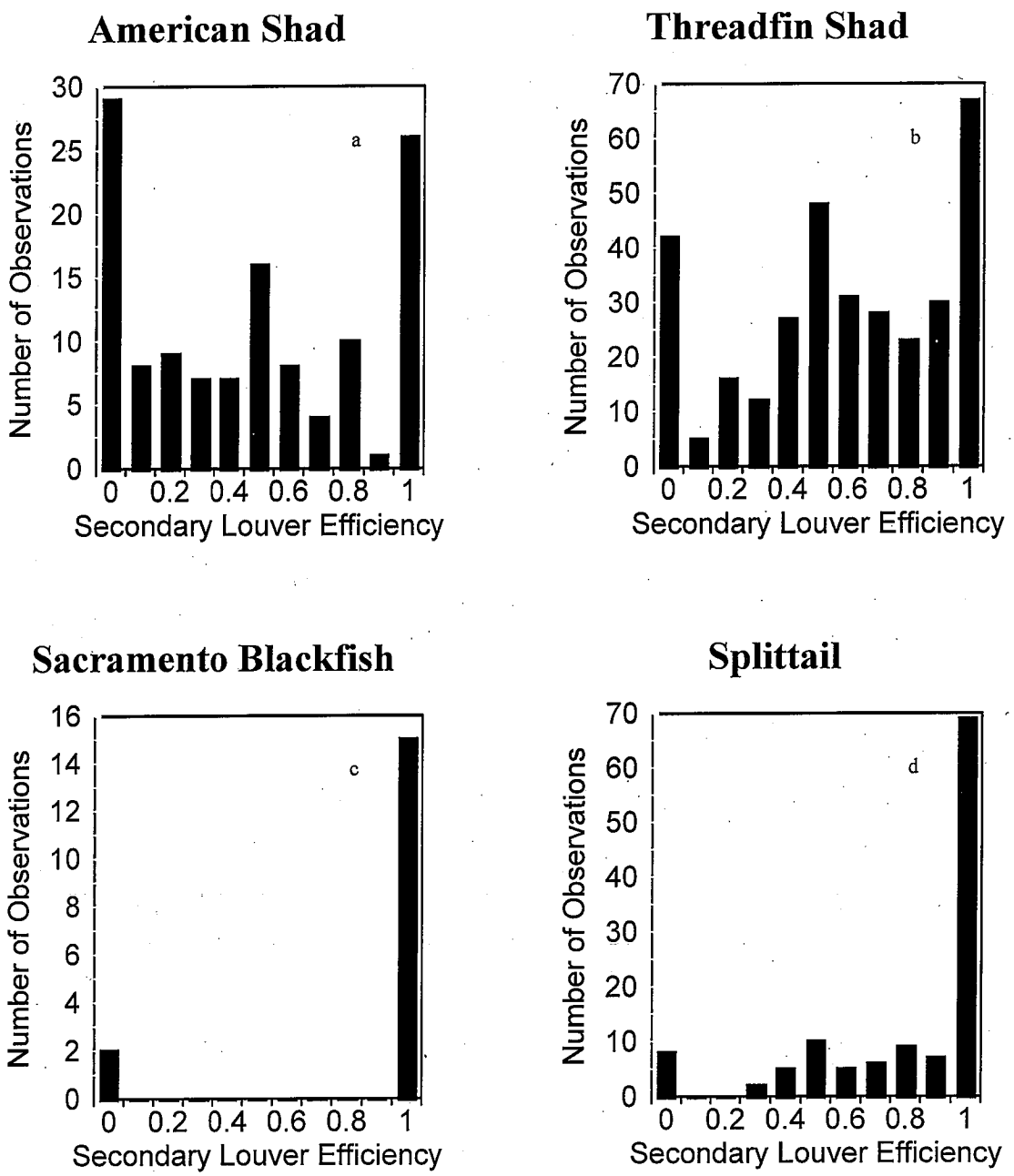


FIGURE 4.— Frequency distribution of secondary louver efficiency observations for (a) American shad, (b) threadfin shad, (c) Sacramento blackfish, and (d) splittail at the TFCF, March 1996 – November 1997.

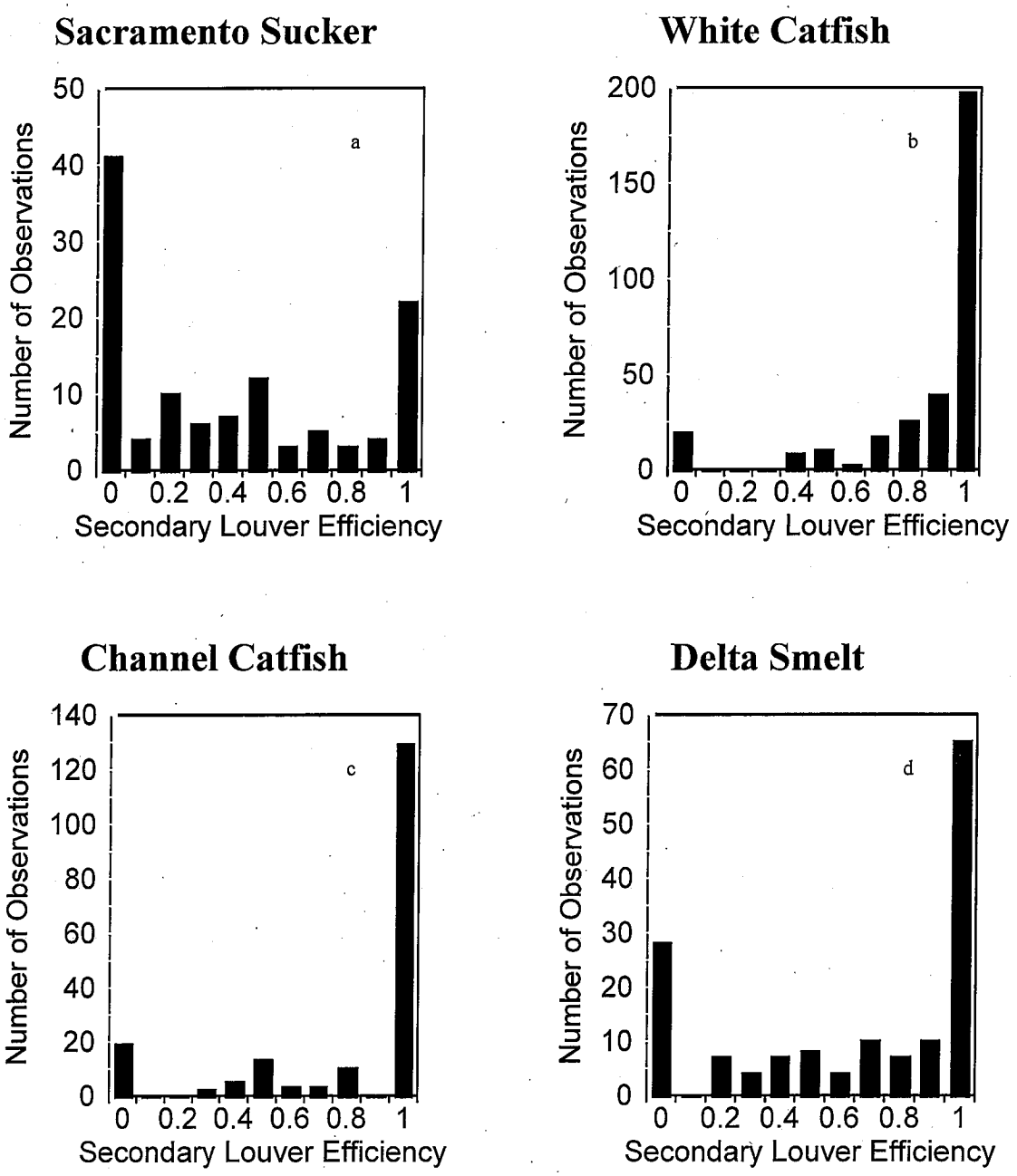


FIGURE 5.— Frequency distribution of secondary louver efficiency observations for (a) Sacramento sucker, (b) white catfish, (c) channel catfish, and (d) delta smelt at the TFCF, March 1996 – November 1997.

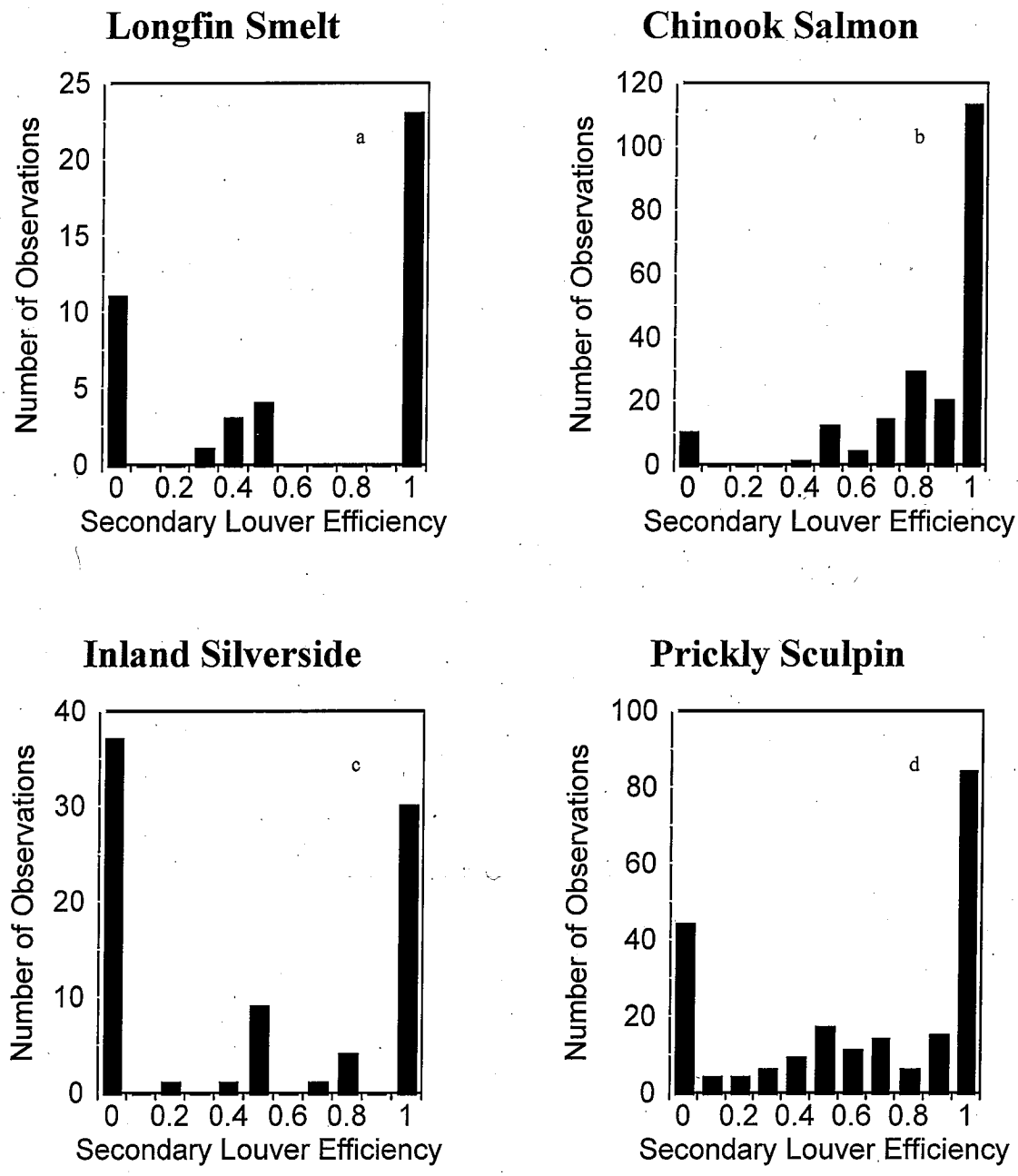


FIGURE 6.— Frequency distribution of secondary louver efficiency observations for (a) longfin smelt, (b) chinook salmon, (c) inland silverside, and (d) prickly sculpin at the TFCF, March 1996 – November 1997.

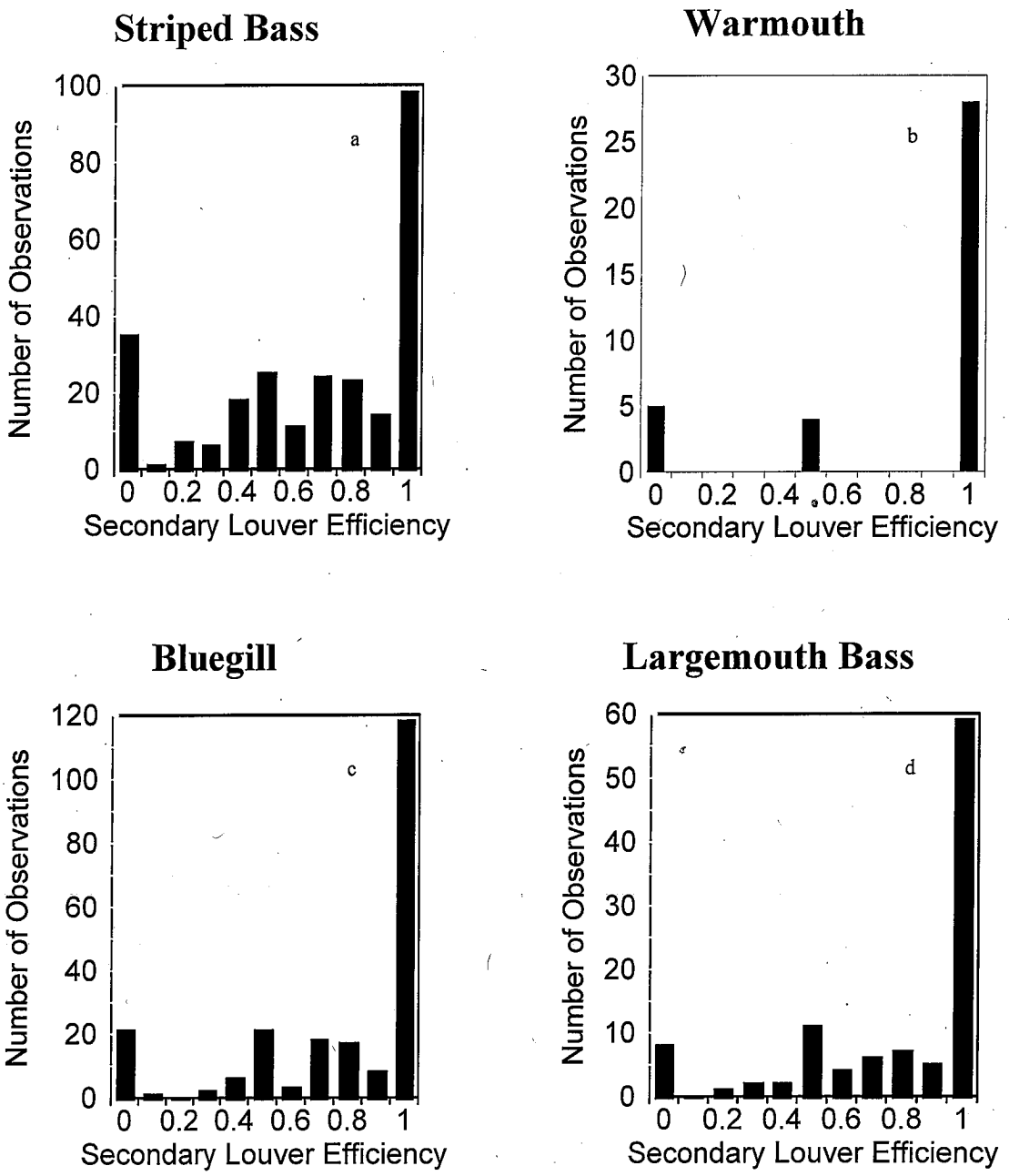


FIGURE 7.— Frequency distribution of secondary louver efficiency observations for (a) striped bass, (b) warmouth, (c) bluegill, and (d) largemouth bass at the TFCF, March 1996 – November 1997.

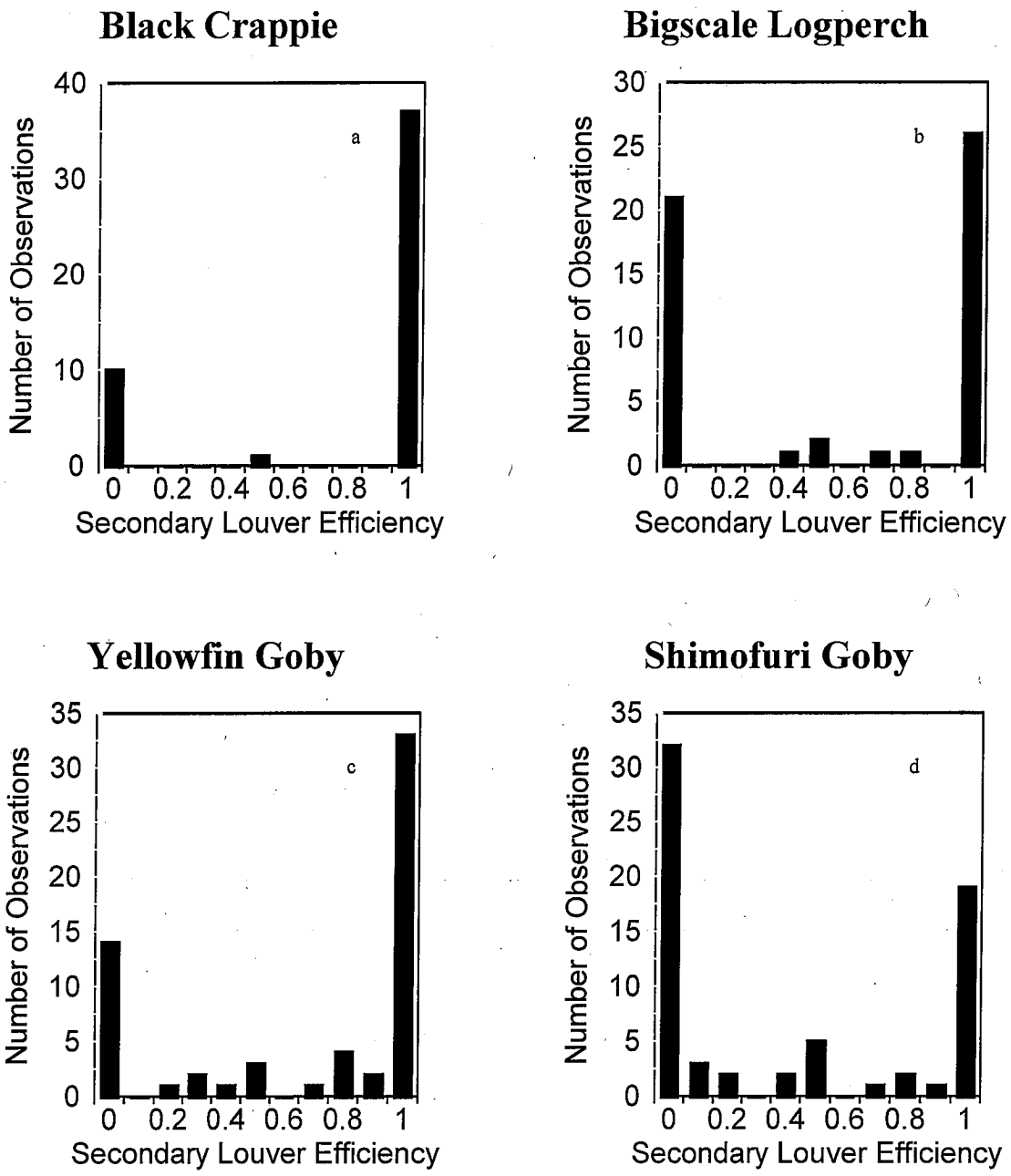


FIGURE 8.— Frequency distribution of secondary louver efficiency observations for (a) black crappie, (b) bigscale logperch, (c) yellowfin goby, and (d) shimofuri goby at the TFCF, March 1996 – November 1997.

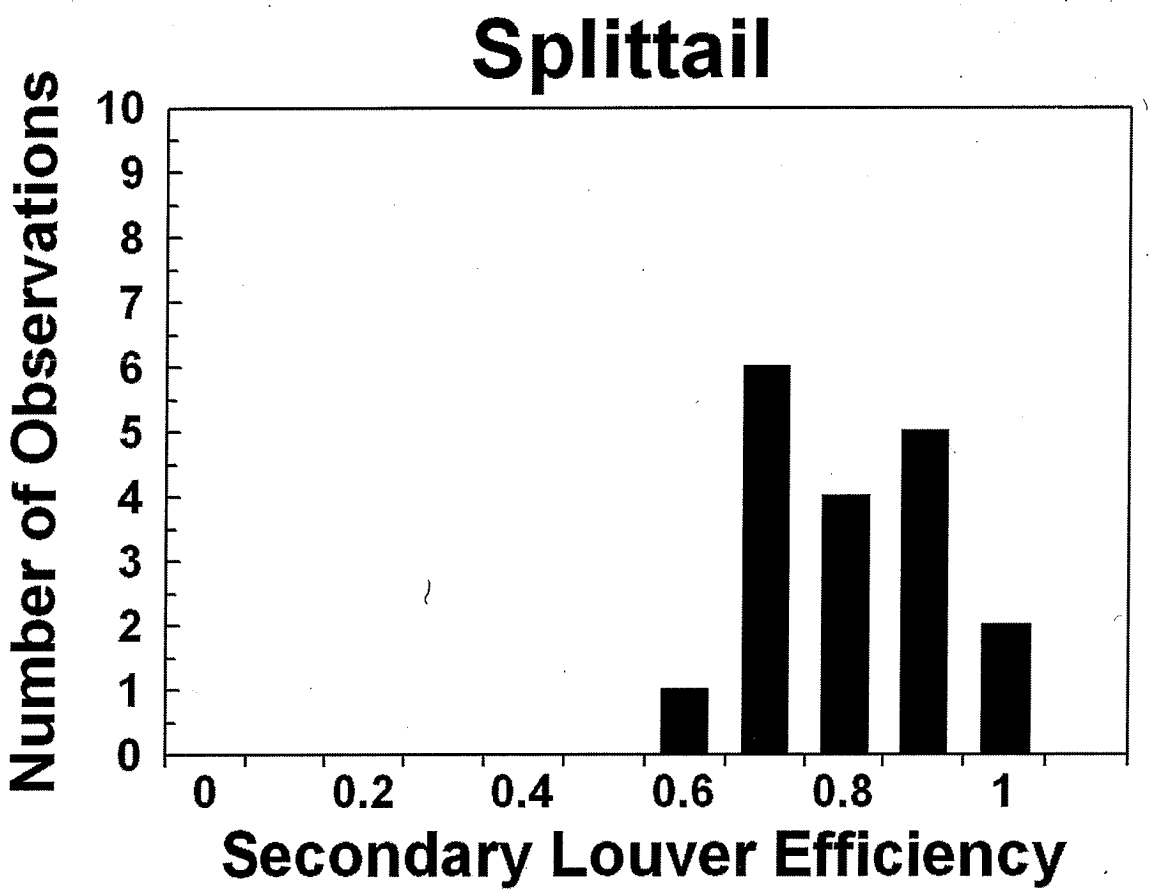


FIGURE 9.—Distribution of splittail secondary louver efficiency during injection experiments.

Splittail louver efficiency was also assessed through an experimental approach (table 12). Velocity profiles conducted without a net (figure 10a), with the control net (figure 10b), and with the experimental vegetation net (figure 10c) showed the experimental net was influencing the velocity profile in the secondary channel.

When isolated through experimentation, time of day exhibits a statistically significant impact on splittail salvage efficiency ($F = 9.92$; $P = 0.00071$). For the specific set of conditions under which the experiments were conducted, mean splittail louver efficiency during the day was 81.2 percent and at night it was 67.9 percent. Debris fouling simulated by the experimental net significantly reduced splittail secondary louver efficiency during the day (table 12).

TABLE 12.— Net experimental louver efficiency for splittail released in the secondary channel at the TFCF, March 1999 – May 1999. Superscripts indicate statistically significant difference via Two-Way, Model I ANOVA and planned comparison of means

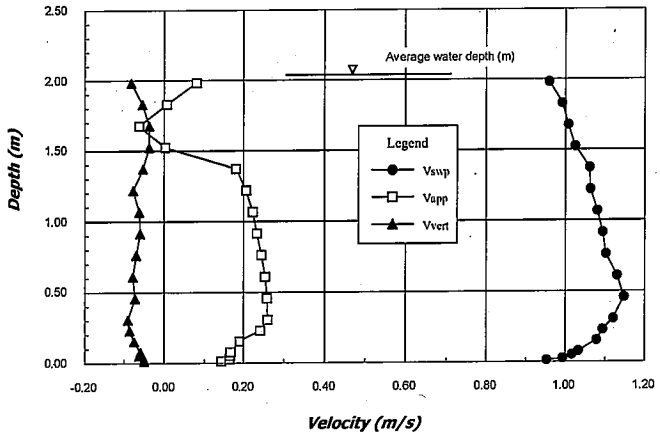
Treatment	Louver Efficiency, Day	sd	Louver Efficiency, Night	sd
Controls	86.5[a]	7.6	68.8[c]	8.4
Vegetation net	73.2[b]	9.2	66.5[c]	6

We estimated the amount of time spent collecting the empirical data to be 1,870 human-hours or 233 days. Next, we calculated the time spent obtaining the experimental observations concerning the influence of time of day and debris loading on splittail louver efficiency: 360 human-hours or 45 days. The empirical approach yielded one statistically significant relationship: channel approach velocity influences chinook salmon louver efficiency. The experimental approach yielded two statistically significant relationships: time of day and debris load influence splittail louver efficiency. Therefore, we suggest the experimental approach may be more efficient at demonstrating statistically significant influences on louver efficiency for particular species. However, the empirical approach allows the assessment of many factors (table 2) and their potential influence on louver efficiency for all fish species caught at the TFCF.

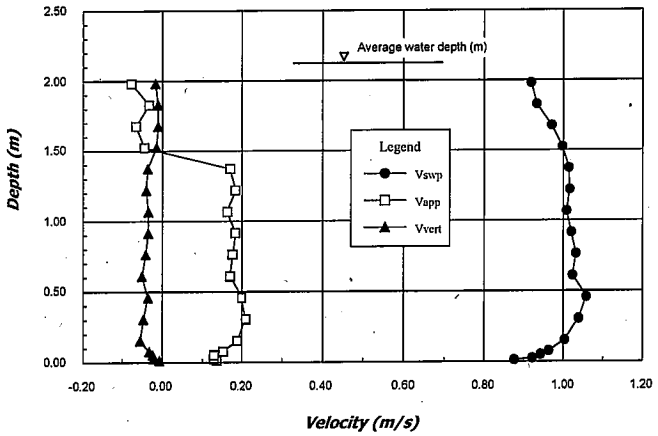
Delta Smelt Recommendation

After conducting the Probit analysis and inspecting the data, it seems possible to achieve better than 75 percent secondary louver efficiency for delta smelt.

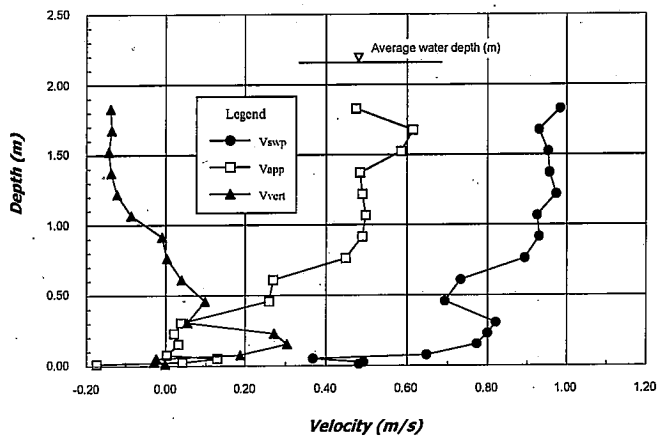
We plotted the predicted lower limit vs. louver efficiency (figure 11). With this graph in mind, we recommend using an average channel approach velocity of 0.33 m/s (1.09 ft/s) when the principal objective is to salvage delta smelt. The lower limit figure (figure 11) predicts that we should achieve approximately 80 percent secondary louver efficiency with this value. We would recommend an even lower channel velocity, but it seems unlikely to us that we can keep louver efficiency for other fish if approach velocity is



(a) No net



(b) Control net



(c) Experimental debris net

FIGURE 10.— Three dimensional velocity profile in front of the anterior louver array with (a) no net, (b) the control net, and (c) the experimental debris net in place. The velocity probe was placed 5.1 cm (2 in) from the louver array surface.

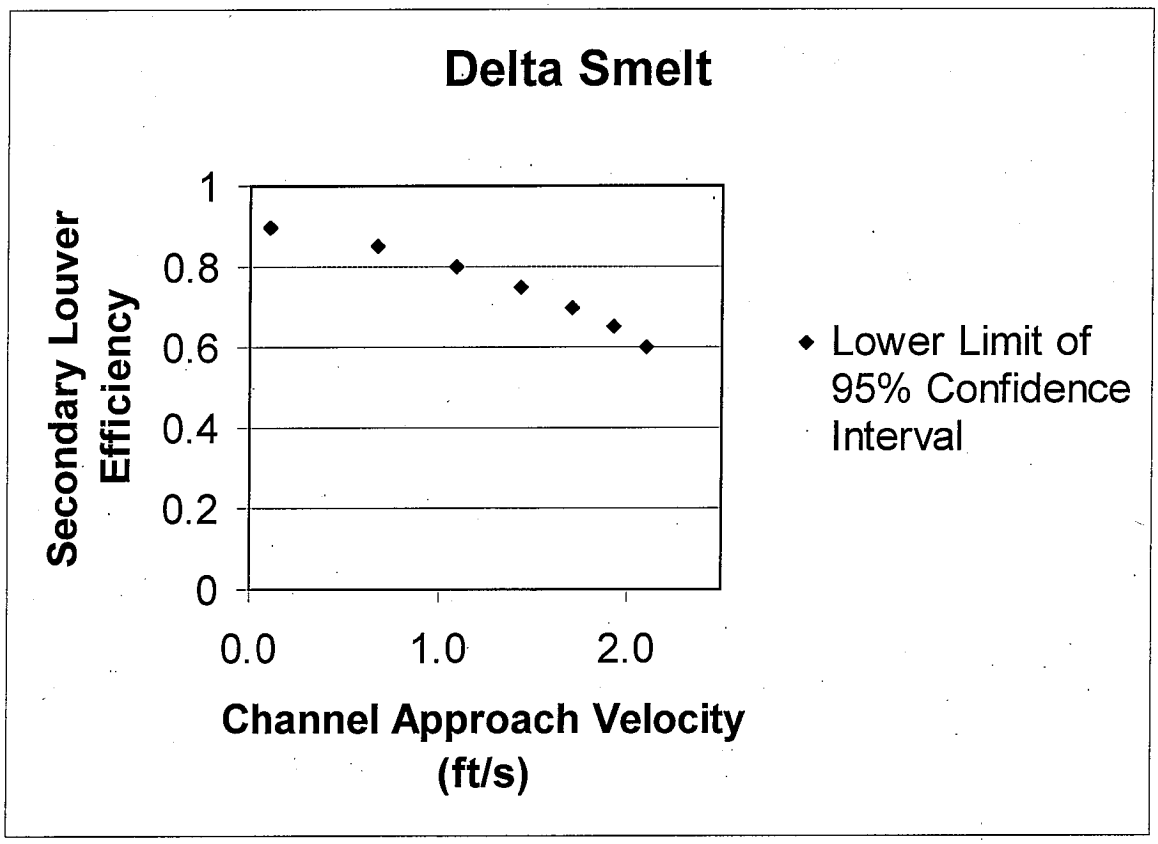


FIGURE 11.— Predicted secondary louver efficiency for delta smelt given channel approach velocity. These predictions were made using Probit analysis to generate the mean and confidence limits predicted at a particular channel velocity. (See page 9.)

lower than 0.33 m/s (1.09 ft/s). Thus, this recommendation may allow us to get above 75 percent for delta smelt and maintain louver efficiency for other species that do not exhibit the inverse relationship between approach velocity and louver efficiency (e.g., chinook salmon and steelhead).

DISCUSSION

Fish entrained to the TFCF often arrive individually and, thus, 0 and 1 are regular observations of the proportion of fish successfully salvaged. This result provides typically bimodal distributions in the secondary louver efficiency data (figures 4-8). In contrast, experimental injection of fish provided a normally distributed louver efficiency distribution (figure 9). Experimental analysis of factors influencing louver efficiency provided an effective approach for

establishing statistical significance of factors. However, for exploring a large number of potential influences on louver efficiency for 33 or more species of fish (table 4), the empirical approach is more efficient.

In the first experiments conducted, we found that the two sets of louvers in the secondary channel synergistically produce louver efficiencies up to 30 percent higher than one set of louvers alone (tables 13-1 and 13-2). Splittail released between the louver arrays had less time to orient themselves to the flow than those released in front of the more anterior louver array. Yet, the magnitude of louver efficiency increase with two louver arrays suggests the two sets of louver arrays are important in achieving satisfactory efficiencies. Thus, a series of barriers and screens may be more efficient than any one screen alone.

The size of fish appeared related to secondary louver efficiency for only one of the five target species we studied (table 14). American shad larger than 30-mm (1.2 in) FL were louvered less successfully than those smaller than 30-mm (1.2 in) FL. This relationship between size and louver efficiency lends itself to the experimental analysis of louver efficiency. Therefore, future research might use an experimental approach to determine if the observed variance in louver efficiencies with size are statistically significant.

This research also pointed out an unexpected result with respect to "take" of listed species at the TFCF. Currently, if Reclamation improves delta smelt louver efficiency at the TFCF, the official "take" is higher.

No consistent relationship between secondary channel approach velocity and splittail was evident. However, through inspection of the empirical data, relationships between secondary channel velocity did appear for delta smelt and striped bass. The highest delta smelt louver efficiency occurs at velocities lower than 0.33 m/s (1.09 ft/s).

TABLE 13-1.—Louver efficiency for those splittail released in front of both secondary louver arrays at the TFCF, March 1999 – May 1999

	Day	Night
No net	81.7	66.4
Control net	91.4	72.3
Vegetation net	73.2	66.5

TABLE 13-2.—Louver efficiency for those splittail released between the secondary louver arrays

	Day	Night
No net	51.1	47.8
Control net	57.2	55.0
Vegetation net	47.4	41.2

TABLE 14.—Percentage of two size ranges of target species successfully louvered at the TFCF March 1996 – November 1997

Species	Efficiency < 30 mm FL	n	Efficiency 30 mm FL	n
American shad	55.8	138	39.3	1848
Chinook salmon	—	0	85.0	1890
Delta smelt	64.2	1044	72.1	68
Striped bass	59.3	3184	65.7	833
Splittail	78.1	73	70.2	692

Similarly, striped bass show the highest louver efficiency at velocities below 0.33 m/s (1.09 ft/s), and the louver efficiency was positively related to bypass ratio (table 10). Secondary louver efficiency for chinook salmon was highest when channel velocity exceeded 0.94 m/s (3.1 ft/s). Logistic regression showed approach velocity was positively related to chinook salmon louver efficiency. We summarize these results into a suggested operations table for the secondary channel (table 15) with respect to channel velocity, bypass ratio, and time of year.

TABLE 15.— Proposed changes to operations for secondary louver channel at the TFCF. The recommended secondary channel approach velocity appears on the same line as the species for which the recommendation is intended. Justification for these recommended velocities appears in this section and the Results section

Season	Species Found in Salvage	Approach Velocity Recommended for Secondary Channel	Bypass Ratio Recommended for Secondary Channel
Spring	Delta smelt, Chinook salmon, Striped bass	< 0.33 m/s (1.09 ft/s)	
Summer and fall	Striped bass	< 0.33 m/s (1.09 ft/s)	1.6
Winter	Chinook salmon, Striped bass	> 0.94 m/s (3.1 ft/s)	

CONCLUSIONS

We suggest average approach velocity in the secondary channel be maintained below 0.33 m/s (1.09 ft/s) year-round, except when chinook salmon are present at the TFCF. When salmon are present, average velocity in the secondary channel should, if possible, equal or exceed 0.94 m/s (3.1 ft/s).

To understand louver efficiency at the TFCF, emphasis should be placed on experimental analysis of independent variables such as time of day, debris load, approach velocity, bypass ratio, and temperature. An experimental approach will require the use of the Tracy Aquaculture Facility (TAF); resources to maintain the TAF are an important part of this experimental approach.

When new agreements are prepared for the Tracy Fish Collection Facility, new "take" calculations could include "take" reductions for demonstrated improvements in louver efficiency. In addition, allowance should be made in the agreement for future research to improve "take" calculations.

ACKNOWLEDGMENTS

This study was funded by Reclamation's Mid-Pacific Region (Sacramento, California) and the Denver Technical Service Center. We thank Susan Durham and Cynthia Wilson for assistance with the data analysis. Jerry Morinaka, Kevan Urquahart, and staff from the California Department of Fish and Game were indispensable. Ron Silva and Gary Jordan and the staff in Tracy, California, provided logistical support. Ray Bark, Rafael Lopez, Louis Helfrich, and Johnson Wang provided valuable assistance with the field experiments. Catherine Patrick formatted this report and provided office support. Finally, we thank Charles Liston, Tracy Facilities Research Director; Ron Brockman, Mid-Pacific Region Fisheries Projects Coordinator; and Diana Weigmann, Fisheries Applications Research Group Manager, for program guidance.

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Attachment 18

5-YEAR REVIEW
March 31, 2004

Species under review: *Hypomesus transpacificus* (delta smelt)

FR Notice: Federal Register 68(148):45270-45271 on August 1, 2003

Lead Field Office: Sacramento Fish and Wildlife Office (916) 414-6700

Name of Reviewer(s): Ryan Olah and Michael Nepstad (916) 414-6625

Cooperating Field Office(s): Not Applicable

Lead Region: California/Nevada Operations Office, Diane Elam, 916/414-6464

BACKGROUND

1. Existing Recovery Priority Number:

The current U.S. Fish and Wildlife Service (Service) Recovery Plan (1996) for delta smelt assigned a recovery potential of 2C. A listed species is assigned a recovery priority number from 1 (highest) to 18 (lowest) according to the degree of threats, recovery potential and taxonomic distinctness. In addition, a species' rank may be elevated by adding a C designation to its numerical rank to indicate that there is some degree of conflict between the species' conservation efforts and economic development associated with its recovery. Recovery priority numbers are based on criteria published the Federal Register Notice (48 FR 43098; September 21, 1983). At the time of listing, Delta smelt was under a high degree of threat from the severe 1987-1992 California drought. The species persisted in small numbers and rebounded to pre-decline levels in 1993, suggesting that its recovery potential is fairly high. The subsequent decline in 1994, a critical water year, to a then all-time low annual abundance index of 102 (Fall Midwater Trawl Survey (FMWT)), however, illustrates the high degree of threat that neutralizes gains in abundance that result from good water years. More recent abundance indices have varied, but overall, the trend is still negative.

2. Most recent Species Status as reported to Congress in the Biennial Report:

The 2003 Species Status as reported to Congress in the Biennial Report (Service 2003a) contained the following information:

2003 Listing Status: T, CH
2003 Population Status: U
2003 Recovery Achieved: 2
2003 Recovery Priority: 2C
2003 Is Recovery Plan Under development: No (Final plan completed 1996)

2003 Active Approved Recovery Team: No
2003 Last Year of Population Survey: There presently is no survey which provides data which can be used for population estimates. All of the surveys described below provide limited data on seasonal distribution and abundance for a portion of the smelt life history.
2003 Controlled Propagation: Yes, for research program, objectives met
Species Comments: Not enough known as population information is based on abundance indices
Recovery Plan Comments: 5 year review ongoing, plan set recovery criteria which are now known to be incorrect, has not met delisting criteria. (See section 11 below and appendix A)

3. Listing History:

a. Original Listing:

The Service was petitioned to list the delta smelt as endangered on June 26, 1990. The Service proposed the species as threatened with critical habitat on September 27, 1991. The species was listed as threatened in Federal Register 58:12863 on March 5, 1993. Critical habitat was designated in Federal Register 59:65256 on December 19, 1994.

b. Revised Listing: Not Applicable

4. Associated Listings: Not Applicable

5. Review History: Not Applicable

6. Recovery Plan or Outline:

The Recovery Plan for the Sacramento-San Joaquin Delta Native Fishes was signed and approved on November 26, 1996. A recovery team assisted in the preparation of the plan; Dr. Peter Moyle of the University of California, Davis was the team leader. (See #11 and #12 below for a discussion of the Recovery Plan and Appendix A for recommendations concerning the Recovery Plan).

7. Reference Point Document:

The March 5, 1993 Final Rule (Service 1993) is the most recent comprehensive analysis of the species status and will be used as the reference point document.

The following is the five factor analysis as published in the 1993 Final Rule (Note that the citations in this section are located within Appendix C):

A. The Present or Threatened Destruction, Modification, or Curtailment of its Habitat or Range.

The delta smelt was one of the most common and abundant pelagic fish caught by California Department of Fish and Game trawl surveys in the Delta during the early 1970's (Stevens and Miller 1983, Moyle et al. 1989, Stevens et al. 1990). Its distribution once ranged from western Suisun Bay upstream to Sacramento on the Sacramento River and to Mossdale on the San Joaquin River (Radtke 1966, Moyle 1976, Moyle et al. 1992). Smelt populations fluctuated a great deal in the past, but after 1981 began a precipitous decline. Over the last 20 years, the population has experienced a ten-fold decline in numbers, and since 1982, has remained at extremely low levels. Recent population abundance indices confirm that the species has not shown any significant signs of recovery (Moyle and Herbold 1989, Moyle et al. 1989, Stevens et al. 1990, Moyle et al. 1992, Sweetnam 1992). This species' pelagic life history, dependence on pelagic microzooplankton, 1-year life span, and low fecundity are characteristics of a fish species that is affected greatly by perturbations to its reproductive habitat or larval nursery areas. Under existing levels of water development, the delta smelt is especially vulnerable during protracted drought periods. Deleterious effects of the present drought period would be exacerbated if additional alterations in hydrology caused by reductions of freshwater inflows to the Delta alter the timing and/or duration of water exports. A weak stock-recruitment relationship (i.e., little evidence of the effect of parent population size on subsequent recruitment) strongly suggests that environmental or habitat factors are severely limiting delta smelt abundance, even during those years when adults may be abundant (Moyle et al. 1992).

Moyle et al. (1989) reported multiple and synergistic causes of the delta smelt decline in the following order of importance: (1) Reduced river outflows, primarily in the Sacramento and San Joaquin Rivers, and their tributaries, (2) extremely high river outflows in years with unusually high rainfall, (3) entrainment mortality caused by water diversion, (4) human and natural perturbations to the smelt's food web, (5) presence of toxic substances in the aquatic habitat (e.g., agricultural and industrial chemicals, heavy metals, etc.), and (6) loss of genetic integrity because of a sharply curtailed delta smelt population. This small delta smelt population may become displaced by the wagasaki, or Japanese smelt (Hypomesus nipponensis), which was inadvertently introduced into reservoirs of the Sacramento River drainage by the California Department of Fish and Game (Moyle 1976).

Delta water diversions and exports presently total up to about nine million acre-feet per year. State and Federal projects presently export about six million acre-feet per year when there is sufficient water available, and in-Delta agricultural uses result in diversion of about three million additional acre-feet per year. Plans currently being prepared propose to greatly increase exports and diversions in the future. The Service is aware of 21 major Central Valley Project, State Water Project, or private organization proposals that will result in increased water exports from the Delta, reduce water inflow to the Delta, change the timing and volume of Delta inflow, or increase heavy metal contamination into the Delta. These proposed projects or actions include but are not limited to: Los Banos Grandes Reservoir, South Delta Water Management Program, South Delta Water Barriers Project, North Delta Water Management Project, West Delta Water Management Project, Coastal Aqueduct proposal, Delta Wetlands Corporation

Water Storage Project, Central Valley Project contract renewals, Los Vaqueros Reservoir, the Central Valley Project and State Water Project wheeling purchase agreement, reactivation of the San Luis Drain, Stanislaus-Calaveras River Basin Water Use Program, Kern Water Bank, Arvin Edison water storage and exchange proposal, and State Water Project Pump additions.

A significant change in in-Delta diversions is unlikely; if anything, a slight decrease in in-Delta agricultural use is probable. The Federal pumping plant has been operated at capacity for many years except for a very few drought years, so increased exports at this plant appear unlikely. The State Water Project pumping plant and the capacity of the State Aqueduct have considerable unused capacity, however. A table of past and projected State Water Project deliveries from Delta sources during the years of 1962 to 2035 are listed in California Department of Water Resources (1992). In the 1980's, deliveries ranged from 1.5 million acre-feet to 2.8 million acre-feet. By 1993, if enough water is available, deliveries could increase to as much as 3.8 million acre-feet. By 2010, deliveries of up to 4.2 million acre-feet are possible.

Since 1983, the proportion of water exported from the Delta during October through March has been higher than in earlier years (Moyle et al. 1992). The timing of these proportionally higher exports have coincided with the delta smelt's spawning season. Federal and State water diversion projects in the southern Delta export, by absolute volume, mostly Sacramento River water with some San Joaquin River water. During periods of high export pumping and low to moderate river outflows, however, reaches of the San Joaquin River reverse direction and flow to the pumping plants located in the southern Delta. The State-operated pumping plant presently exports water at rates up to 6,400 cubic feet per second (cfs). The State is considering proposals to export an additional 3,900 cfs. The Federal pumping plant can export water at rates up to 4,600 cfs. In addition, local private diverters export up to 5,000 cfs from about 1,800 diversions scattered throughout the Delta.

When total diversion rates are high relative to Delta outflow and the lower San Joaquin River and other channels have a net upstream (i.e., reverse or negative) flow, out-migrating larval and juvenile fish of many species become disoriented. Large mortalities occur as a result of entrainment and predation by striped bass at the various pumping plants and other water diversion sites. Net positive riverine flows and estuarine outflows of sufficient magnitude are required for delta smelt larvae to be carried downstream into the upper end of the mixing zone of the estuary rather than upstream to the pumping plants.

In recent years, the number of days of reversed San Joaquin River flow have increased, particularly during the February-June spawning months for delta smelt (Moyle et al. 1992). All size classes of delta smelt suffer near total loss when they are entrained by the pumping plants and diversions in the south Delta. Very few are effectively salvaged at the State and Federal pumping plant screens. The few delta smelt that are transported into water project reservoirs or canals fail to reproduce. This species' embryonic, larval, and postlarval mortality rates also will become higher as reduced western Delta flows

allow increases in the salinity level and relocation of the mixing zone.

The delta smelt is adapted for life in the mixing zone (brackish water/freshwater interface) of the Sacramento-San Joaquin estuary. The estuary is an ecosystem where the mixing zone and salinity levels are determined by the interaction of river outflow and tidal action. Moyle et al. (1992) reported that delta smelt were most abundant in shallow, low salinity water associated with the mixing zone, except when they spawned. Their analysis showed that smelt were collected from water with a mean salinity of 2 parts per thousand (ppt) with a mean temperature of 15 degrees Celsius (C), but were found in salinities ranging from 0-14 ppt at temperatures ranging from 6-23 degrees C. The larvae require the high microzooplankton densities produced by the mixing zone environment. The best survival and growth of smelt larvae occurs when the mixing zone occupies a large geographic area, including extensive shoal regions that provide suitable spawning substrates within the euphotic zone (depths less than 4 m). Sixty-two percent of delta smelt collected in Suisun Bay occurred at 3 sampling stations with depths less than 4 m; the remaining 38 percent were caught at 6 deeper stations.

During periods of drought and increased water diversions, the mixing zone and associated smelt populations are shifted farther upstream in the Delta. During years prior to 1984, the mixing zone was located in Suisun Bay during October through March (except in months with exceptionally high outflows or during years of extreme drought). From April through September, the mixing zone usually was found upstream in the channels of the rivers. Since 1984, with the exception of the record flood outflows of 1986, the mixing zone has been located primarily in the river channels during the entire year because of increased water exports and diversions. When located upstream, the mixing zone becomes confined to the deep river channels, becomes smaller in total surface area, contains very few shoal areas of suitable spawning substrates, may have swifter, more turbulent water currents, and lacks high zooplankton productivity. Delta smelt reproduction very likely is adversely affected now that the mixing zone is located in the main channels of the Delta, east of Suisun Bay (Moyle et al. 1992). In 1982, the decline of the delta smelt population in response to the shifted location of the mixing zone was significant. In all respects, the upstream river channels are much less favorable for the spawning and survival of the smelt. The decline of the delta smelt population since 1981 has been concurrent with an increasing amount and proportion of freshwater diversions that confine the mixing zone to the narrow, deep, and less productive channels in the lower rivers.

B. Overutilization for Commercial, Recreational, Scientific, or Educational Purposes

Not known to be applicable; however, the delta smelt may be harvested as a non-target by-catch in commercial bait fisheries for other baitfish species. Some scientific collecting is conducted for the delta smelt; however, these activities do not appear to be adversely affecting this species. Native Americans historically harvested delta smelt for food, but modern Native Americans are not known to be harvesting this fish. No recreational or educational uses of this animal are expected to affect the delta smelt population.

C. Disease or Predation

Not known to be applicable. However, the introduced striped bass may have caused an increase in predation on all size classes of the delta smelt. An effort by the California Department of Fish and Game is underway to compensate for striped bass population mortalities caused by water export projects. The 1991 striped bass stock was very low relative to the population in the 1960's. The striped bass compensation program annually releases 1-2 million juvenile hatchery reared striped bass in the estuary in an effort to rebuild the population. This year the Director of the California Department of Fish and Game decided not to release striped bass because of the potential harm they would cause to the federally threatened Sacramento River winter-run chinook salmon.

D. The Inadequacy of Existing Regulatory Mechanisms

NOTE: This paragraph from the original delta smelt listing is no longer correct. The delta smelt was subsequently listed as threatened under the California Endangered Species Act. *Regulatory mechanisms currently in effect do not provide adequate protection for the delta smelt or its habitat. This species is not listed by the State of California. The California Fish and Game Commission ruled on August 30, 1990, that a petition to the State to list the species was unwarranted, rejecting the California Department of Fish and Game's recommendation to list the delta smelt as a threatened species under State authority (Stevens et al. 1990). State listing would have provided some measure of protection to the species because State agencies would have been required to consult with the California Department to Fish and Game if any project they funded or carried out would adversely affect the delta smelt. However, even if the State of California had listed the delta smelt, the species would not have been protected from the adverse effects of Federal actions.*

Suisun Bay is the best known nursery habitat for this species' reproduction and larval survival, but the habitat has been deleteriously altered because of higher salinities in spring. These higher salinities are caused by the large number of freshwater diversions that allow brackish seawater to intrude farther upstream. At present, there are relatively few periods when freshwater outflow volumes through the Delta and Suisun Bay of any significance are mandated for wildlife or fisheries. Federal and State agencies had planned to increase 1991 and probably 1992 water supplies for out-of-stream uses at the expense of environmental protection of estuarine fish and wildlife resources in the fifth and potentially sixth years of drought (Morat 1991). Because of significantly higher than normal precipitation and subsequent higher instream flows during March, 1991, a State agency request for relaxation of Delta water quality standards was withdrawn. It is likely, should the severe California drought continue, that this water quality relaxation action will be requested again in the near future to favor out-of-stream water use over the need to protect aquatic habitats for fish and wildlife.

Present regulatory processes do not ensure that water inflows to Suisun Bay and the western Sacramento-San Joaquin estuary will be adequate to maintain the mixing zone near or in Suisun Bay to benefit delta smelt and other fish and wildlife. The California

State Water Resources Control Board (Board) has the authority to condition or require changes in the amount of water inflow and the amount of water exported or diverted from the Delta. At the Board's Water Quality/Water Rights Hearings in 1987, a Service biologist testified that the delta smelt had been recommended for addition to the Federal Animal Notice of Review as a category 1 candidate species (Lorentzen 1987). The Board has not taken regulatory or legal action to protect this animal or its habitat during the 4 years since the Service expressed its concern for several species native to Sacramento-San Joaquin estuary. On December 9, 1992, the Board released a copy of Water Rights Decision 1630 (D-1630), San Francisco Bay/Sacramento-San Joaquin Estuary (California State Water Resources Control Board 1992). A meeting to consider adoption of D-1630 is scheduled for January 25, 1993. In whatever form it is finally adopted by the Board, D-1630 will establish minimum levels of public trust uses of the delta for up to 5 years. Subsequently, long-term standards will be prepared and adopted.

Implementation of the draft decision as prepared would result in improved habitat conditions for the delta smelt. The Service is presently in the process of analyzing the draft terms and conditions to determine to what extent delta smelt will be benefited, if the decision is adopted and implemented. However, even assuming immediate adoption and implementation of these interim terms and conditions, their adequacy as a regulatory mechanism to protect the delta smelt remains in question. The Service is aware that the salinity standards currently in effect (D-1485) are inconsistently implemented and frequently violated due to operational constraints. Institutional guarantees of compliance have been lacking in the past and are needed in the future.

Similarly, the Service is currently analyzing the potential effects on the delta smelt and other fish and wildlife resources in California as a result of the recent enactment of the Central Valley Project Improvement Act (Pub. L. 102-575). Two of the stated purposes of this act are to: "protect, restore, and enhance fish, wildlife, and associated habitats in the Central Valley and Trinity River basins of California" and "to contribute to the State of California's interim and long-term efforts to protect the San Francisco Bay/Sacramento-San Joaquin Delta Estuary". Section 3406(b)(2) dedicates annually 800,000 acre-feet of Central Valley Project water for various purposes including the benefit of federally listed species. While the Service is reasonably certain that the delta smelt will realize some benefit from implementation of this Act, the magnitude and timeliness of these protections may be inadequate to prevent the endangerment of the delta smelt. For example, many analysts predict that provisions within the Act will take many years for the courts to resolve. Finally, neither adoption of the State Water Resources Control Board's Decision 1630 or the Central Valley Project Improvement Act protect the delta smelt per se, or provide mechanisms to ensure the continued existence of the species.

For the reasons stated above, the Service considers the existing regulatory mechanisms inadequate to assure the long-term existence of delta smelt in Suisun Bay and the Delta.

E. Other Natural or Manmade Factors Affecting its Continued Existence

The delta smelt is highly vulnerable to extinction because of its short life span, present small population size, and restricted distribution. The limited gene pool may result in depressed reproductive vigor and loss of genetic variation.

Poor water quality also may be a threat. All major rivers in this species' historic range are exposed to large volumes of agricultural and industrial chemicals that are applied in the California Central Valley watersheds (Nichols et al. 1986). Agricultural chemicals and their residues, and chemicals originating in urban runoff, find their way into the rivers and estuary. Toxicology studies of rice field irrigation drain water of the Colusa Basin Drainage Canal documented significant toxicity of drain water to striped bass embryos and larvae, medaka larvae, and the major food organism of the striped bass larvae and juveniles, the opposum shrimp (Neomysis mercedis). This drainage canal flows into the Sacramento River just north of the City of Sacramento. The majority of drain water samples collected during April and May 1990 were acutely toxic to striped bass larvae (96-hour exposures), the third consecutive year that the Colusa Basin rice irrigation drain water has been acutely toxic (Bailey et al. 1991). Delta smelt may be similarly affected by agricultural and industrial chemical run-off.

Some heavy metal contaminants have been released into the Delta from industrial and mining enterprises. Although the effects of these contaminating compounds on delta smelt larvae and their microzooplankton food resources are not well known, the compounds could potentially adversely affect delta smelt survival. In addition, increases in urban development in the Sacramento Valley will continue to result in concurrent increases in urban runoff. Finally, a proposal to reactivate the San Luis Drain would result in discharge of high levels of selenium from the San Joaquin Valley into the Delta. Selenium has been shown to cause developmental defects in and mortality of wildlife species.

In recent years, untreated discharges of ship ballast water introduced nonindigenous aquatic species to the Sacramento-San Joaquin estuary ecosystem (Carlton et al. 1990). Several introduced species adversely affect the delta smelt directly. An Asian clam (Potamocorbula amurensis), introduced as veliger larvae at the beginning of the present drought, was first discovered in Suisun Bay during October 1986. By June 1987, the Asian clam was nearly everywhere in Suisun, San Pablo, and San Francisco Bays irrespective of salinity, water depth, and sediment type at densities greater than 10,000 individuals per square meter. Asian clam densities declined to 4,000 individuals per square meter as the population aged during the year (Carlton et al. 1990). Persistently low river outflow and concomitant elevated salinity levels may have contributed to this species population explosion (Carlton et al. 1990). The Asian clam could potentially play an important role in affecting the phytoplankton dynamics in the estuary. It may have an effect on higher tropic levels by decreasing phytoplankton biomass and by directly consuming Eurytemora affinis copepod nauplii, the primary food of delta smelt.

Three non-native species of euryhaline copepods (Sinocalanus doerrii, Pseudodiaptomus forbesi, and Pseudodiaptomus marinus) became established in the Delta between 1978 and 1987 (Carlton et al. 1990), while Eurytemora affinis populations, the native

euryhaline copepod, have declined since 1980. It is not known if the introduced species have displaced E. affinis or whether changes in the estuarine ecosystem now favor S. doerrii and the two Pseudodiaptomus species (Moyle et al. 1989). These introduced copepod species are more efficient at avoiding the predation of larval delta smelt. The introduced copepods also exhibit a different swimming behavior that makes them less attractive to feeding delta smelt larvae. Because of reduced food availability or feeding efficiency causing decreased food ingestion rates, weakened delta smelt larvae are more vulnerable to starvation or predation.

The significantly altered microzooplankton food web now present in the Suisun Bay-Delta estuary may have decreased the gross growth efficiency of delta smelt larvae. Gross growth efficiency is the proportion of weight-specific food ingestion rate that goes to larval fish body growth. When food ingestion rates are low, gross growth efficiency is low. At low gross growth efficiencies, larval fish take much longer to metamorphose to juveniles. Long larval stage durations increase the likelihood that density-dependent mechanisms (e.g., predators, overgrazing of food resources, etc.) and density-dependent mechanisms (e.g., adverse salinities, temperature, absence of zooplankton, water diversion entrainment and impingement mortality, etc.) would develop to adversely affect survival and recruitment. In temperate latitudes, where spawning is temporally and spatially confined, as it is for the delta smelt, both mortality and growth rates tend to be low. Ingestion in temperate species is relatively low compared to tropical species, and larval stage duration is long and potentially highly variable. Under these circumstances, small changes in either mortality rates or growth rates can have significant adverse effects on recruitment potential (Shepherd and Cushing 1980, Houde 1989). Therefore, the timing of spawning and the availability of favorable spawning sites for adults are added critical elements in the recruitment success of the spawned cohort.

The Service has carefully assessed the best scientific and commercial information available regarding the past, present, and future threats faced by this species in this listing determination. The Service acknowledges that available data on the population dynamics of the delta smelt were collected incidental to other investigations and were not intended to provide a population estimate. The Service believes, however, that these data represent the best available information and support the listing of this species. The available data indicate a significant population decline over the last 20 years. Though the current population has remained relatively stable over the last 5 years, it has done so at very low levels. No apparent recovery is occurring. The delta smelt faces threats from a more frequent upstream shift of its aquatic estuarine habitat, and a reduction of available habitat due to drought, replenishment for groundwater overdraft, and water exports and diversions. The shift in location of the mixing zone, as well as the reduced area available to the smelt, is expected to continue in the future. These factors will continue to adversely affect all life stages of the delta smelt. Because the smelt population is at such low levels, this species' 1-year lifespan is also a factor that threatens the species. The failure of a single reproductive season could significantly affect the ability of this species to survive and recover. Based on the evaluation of all available information on population dynamics and threats to this species, the Service has determined that listing as threatened is appropriate at this time.

REVIEW

8. DPS Review - Application of the Distinct Population Segment (DPS) Policy:

The entire population of delta smelt is listed and nothing in the current science suggests that the delta smelt should be listed as a DPS.

Status Review

- **9. Information Review:** Is there new information available that is relevant to this review? Available information is considered to be all information 1) submitted, 2) available to Service employees, or 3) in Service files, during the review.

Yes __X__ (Go to 9. B.) No _____ (End of Review/Go to 14)

9. A. Is there any relevant new information regarding the listed population and/or the species throughout its range with respect to the appropriate application of the DPS policy?

Yes _____ No __X__

Not applicable, as the delta smelt was not listed as a DPS.

9. B. Is there relevant new information addressing the species' biology and status including, but not limited to, population trends, distribution, abundance, demographics, and genetics?

Yes __X__ No _____

Below is a discussion of available new and updated information which addresses delta smelt biology and status.

SURVEYS

The Service is aware of 14 surveys that collect data on delta smelt. See Appendix B for Abundance Indices Tables based on some of the below survey data. The following nine surveys began sampling before the listing in 1993:

(1) California Department of Fish and Game's (CDFG's) Fall Midwater Trawl (FMWT) (1967 to present) (CDFG 2003a). The Fall MWT was initiated by CDFG in 1967 to sample striped bass, a non-native sport fish. In addition to striped bass, CDFG has maintained records of other fish species captured in the samples in most years. This monitoring program currently samples 100 sites from San Pablo Bay in the west to Rio Vista on the lower Sacramento River and to Stockton on the San Joaquin River. Data are collected from September through December using a midwater trawl with a 3.7 square m (39.8 square ft) wide mouth. The FMWT covers the entire range of delta smelt distribution and provides one of the two best measures of delta smelt abundance (Sweetnam and Stevens 1993). The FMWT provides a better measure of abundance than

the Summer Townet Survey (described below) because it catches pre-spawning adult delta smelt (Service 1996). An index based on pre-spawning adults, rather than on juveniles which are vulnerable to high mortality, provides a better estimate of delta smelt stock and recruitment (Service 1996). Although the FMWT was not designed to catch delta smelt and is not as efficient at catching delta smelt compared with the Kodiak trawl (described below), it has been continuously done since 1967 and thus provides a solid base of historical data (Service 1996). Results from this trawl are used to calculate the Delta Smelt Recovery Index as described in the Recovery Plan.

(2) CDFG's San Francisco Bay Midwater Trawl (1980 to present). This trawl catches delta smelt throughout the year in the waters west of the delta seaward to south San Francisco Bay.

(3) CDFG's San Francisco Bay Otter Trawl (1980 to present). This trawl catches delta smelt throughout the year in the waters west of the delta seaward to south San Francisco Bay.

(4) University of California (UC) Davis' Suisun Marsh Otter Trawl (1979 to present). This trawl catches delta smelt in the Suisun Marsh waterways. The Suisun Marsh OT surveys began in 1979 and are conducted by the University of California (UC) Davis as part of a long-term study of the ecology of the entire fish community of the marsh. The survey is funded by California Department of Water Resources (CDWR) in part to determine if management actions in Suisun Marsh are affecting fish communities. The program samples 21 sites monthly in nine sloughs with an otter trawl that drags along the bottom and samples much of the water column in the shallow sloughs. In small sloughs, the trawl samples much of the cross sectional area; in large sloughs, the sampling fraction is smaller. A monthly abundance index is calculated as mean catch per trawl.

(5) Service's Chipps Island Trawl survey (1976 to present). The U.S. Fish and Wildlife Service conducts a sampling program for juvenile salmon in the deep water channel near Chipps Island at the western terminus of the Delta. This trawl also catches delta smelt. A midwater trawl is pulled at the surface for ten 20 minute hauls per day. Data are compiled to produce an index based on the catch per hour of trawling.

(6) Fish salvage at the CVP Tracy Fish Collection Facility (1979 to present) (CDFG 2003b and Service 2003b). This facility salvages smelt throughout the year. The CVP operates fish screening facility to divert fish away from the pump intakes into holding facilities where they are counted, measured, and released. Data collection takes place at two hour intervals when the pumps are operating. Reliable CVP data start in 1979. The pumps are not operated as sampling programs so the amount of "sampling" is related to the amount of water exported, which in turn is related to the amount of water available, water demand, and, in recent years, changes in pump operations to protect migratory salmon, splittail, and delta smelt and to maintain appropriate salinities in Suisun Bay and Marsh. The survival of fish salvaged at the facilities and released into the delta varies by species and environmental factors. At this time, delta smelt mortality from this process is estimated by the Service to be 100%. In addition, the number of smelt salvaged is used to

help determine if an Environmental Water Account (EWA) action needs to be taken. (See 9D below for a discussion of EWA)

(7) Fish salvage at the SWP Skinner Delta Fish Protective Facility in the south Delta (1979 to present) (CDFG 2003b and Service 2003b). This facility salvages smelt throughout the year. The SWP operates a fish screening facility to divert fish away from the pump intakes into holding facilities where they are counted, measured, and released. Data collection takes place at two hour intervals when the pumps are operating. Reliable SWP data start in 1979. The pumps are not operated as sampling programs so the amount of "sampling" is related to the amount of water exported, which in turn is related to the amount of water available, water demand, and, in recent years, changes in pump operations to protect migratory salmon, splittail, and delta smelt and to maintain appropriate salinities in Suisun Bay and Marsh. The survival of fish salvaged at the facilities and released into the delta varies by species and environmental factors. At this time, delta smelt mortality from this process is estimated by the Service to be 100%. In addition, the number of smelt salvaged is used to help determine if an EWA action needs to be taken.

(8) Service's Delta Beach Seine Survey (1976 to present). This survey can catch delta smelt throughout the year. The survey provides the broadest geographical coverage of all of the sampling programs but is focused on outmigrating juvenile salmonids.

(9) CDFG's Summer Townet Survey (1959 to present) (CDFG 2003c). This trawl is operated in the summer, catches juvenile and adult delta smelt, and provides one of the two best measures of delta smelt abundance (Sweetnam and Stevens 1993). The CDFG summer townet survey began in 1959 to provide an index of striped bass abundance. It samples YOY fish twice monthly at 30 sites using oblique tows in mid-channel. Starting and ending dates vary from year to year. Sample sites are located throughout the Delta, Suisun Bay, and San Pablo Bay. Data for species other than striped bass were not regularly recorded until after 1962, but were also not recorded in 1966, 1967, and 1968.

(10) CDFG's Striped bass egg and larval survey (1968 to 1995) (Interagency Ecological Program 1996). This survey sampled in the spring and caught larval delta smelt.

The following five surveys began sampling delta smelt since the listing:

(11) IEP's 20mm survey (1995 to present) (CDFG 2003d). This survey runs in the spring to catch larval and juvenile delta smelt. This survey's information is used to help determine smelt distributions in the delta and to helps determine if an EWA action needs to be taken.

(12) U.S. Army Corps of Engineers' (Corps) Napa River Survey (2001 to present) (Corps 2002 and 2003). This survey catches delta smelt in the Napa River. This survey exists in association with a flood control and ecosystem restoration project in the Napa River. It is performed by consultants under contract to the Corps, and involves a range of sampling techniques including beach seine, purse seine, otter trawl, fyke nets, and a 20 mm (0.8 in)

size class surveys. The Napa River Survey began sampling in March 2001 and has detected smelt (Corps 2002, 2003) but the data are too recent and of too short a term to be useful for an abundance index. The survey is scheduled to be completed in 2007 or 2008, after 7 years of data collection. In addition, the Napa River is less well understood in terms of relationships between outflow, smelt habitat, and smelt production, than are the Central Valley rivers and the Delta (see section 9.I. below).

(13) IEP's Spring Kodiak Trawl (2002 to present) (CDFG 2003e). This trawl, designed specifically to sample delta smelt, is pulled by two boats and samples the upper water column. This survey catches adult delta smelt and can help determine where adult smelt are distributed in the delta.

(14) North Bay Aqueduct Larval Fish Survey (1996 to present) (CDFG 2003f). This trawl samples north delta in the spring for larval delta smelt.

DENSITY DEPENDENCE

Attempts have been made to answer the questions of density dependence and population size for delta smelt, but to date there is no expert consensus on whether delta smelt populations display density dependence or density independence. Density dependence can be broadly defined as the case where more individuals of one life stage do not necessarily result in more adults and implies that there is a finite carrying capacity. There is considerable disagreement among experts over whether the data show that delta smelt exhibit density dependence during part or all of their life cycle (CALFED 2001, 2003a). This question is relatively controversial because of its ultimate potential implication for management of water diversions within the Delta. Bennett used traditional stock-recruitment analysis and calculations of mortality between life stages to conclude that density dependence has regulated delta smelt abundance over the period of record (CALFED 2001). However, Bennett (CALFED 2002a) stated that the available evidence suggests density dependence occurs infrequently and was most evident in the 1970's. Finally, Bennett (2003) stated that density dependant regulation may now be occurring at lower levels of abundance during late-summer than before the population decline.

A preliminary analysis by the California Department of Fish and Game (CDFG) (2003g) strongly suggests that the delta smelt population is largely regulated by density independent factors, particularly spring temperature conditions, the location of X2, and possibly the impact of export losses in dry years. CDFG (2003g) does not believe density dependant mortality currently plays a substantial role in determining annual delta smelt abundance for three fundamental reasons: 1) no credible mechanism for density dependent regulation has been presented; 2) smelt are currently not abundant relative to their past abundance or relative to the other species living in the delta, and; 3) the statistical evidence for density dependence is very weak.

ROLE OF TWO YEAR OLDS

Delta smelt typically live one year, but approximately 3-8% of individuals live two years

(Bennett 2003). Two year old fish have 3 to 5 times the fecundity of 1 year fish. These fish could be important for carrying the population over through years of poor year class strength (fewer individuals). However, there is no information at this time which describes their relative contribution to spawning during years following poor recruitment (CALFED 2003a, CDFG 2003g, and Bennett 2003).

9.C. Is there relevant new information addressing habitat conditions including, but not limited to, amount, distribution, and suitability?

Yes ___X___ (See Section 9D) No _____

9.D. Is there relevant new information addressing conservation measures that have been implemented that benefit the species?

Yes ___X___ No _____

FISH SCREENS

The CALFED Ecosystem Restoration Program has funded the construction of screens on several water diversions within the range of delta smelt, including an agricultural diversion on Hastings Slough, and the City of Sacramento's diversion on the Sacramento River (CALFED 2003b). These screens are designed to help prevent help prevent adult delta smelt from becoming entrained by the physical barrier of the screen as well as sweeping velocities that would carry delta smelt past the point of diversion (CALFED 2003b). While there remain over 1,800 diversions within the range of delta smelt, the Service recognizes that the actions of CALFED to date represent progress towards eliminating entrainment of delta smelt in unscreened diversions (CDWR 1995).

ECOSYSTEM RESTORATION

The CALFED Ecosystem Restoration Program has funded the restoration of multiple habitats at several locations within the range of delta smelt, including Canal ranch, Liberty Island, and McCormack-Williamson Tract (CALFED 2003b). The CALFED Ecosystem Restoration Program has also funded the restoration of shallow water tidal and marsh habitat at several locations within the range of delta smelt, including Fay Island, Franks Tract, Big Break, Lower Sherman Lake, and Prospect Island (CALFED 2003b). The Service recognizes that the actions of CALFED to date represent progress towards enhancing and/or restoring additional habitat for the delta smelt.

WATER MANAGEMENT

Since the listing of delta smelt, our body of knowledge of delta smelt life history and population dynamics has increased. Water and fishery management actions have become more focused on

addressing specific life history requirements rather than prescriptive limitations on exports. Both VAMP and the EWA, described below, are water management tools which are designed to address specific needs of delta smelt. As our scientific understanding of delta smelt increases, we expect that these or similar programs would adapt to our current state of knowledge.

VAMP

It has been postulated that the Vernalis Adaptive Management Program (VAMP) has changed water movement in the southern Delta during the early delta smelt life history (CALFED 2001). The assumptions and information leading to this hypothesis are as follows: 1) since the initiation of VAMP in 1996, modeling and field data demonstrate that April through May net flows in southern Delta channels are more positive than occurred pre-VAMP, with less water movement towards the pumps; 2) since VAMP started, the projects have exceeded the red light take level more often than they would have pre-VAMP; 3) the VAMP flows and pumping restrictions provide better spawning and rearing conditions in the south Delta than was formerly possible; 4) with better rearing conditions, the larvae in the south Delta that are not entrained grow to the size (greater than or equal to 20 mm) that is successfully salvaged and counted at the intakes; 5) taking this model to its logical conclusion, the projects are not removing more fish than they did historically, they are removing more older fish (i.e. in the past the larval fish did not reach the salvageable size and went down the aqueduct without being counted), and; 6) on balance, VAMP effects on delta smelt are likely to be or slightly positive since delaying higher levels of exports may allow more of the oldest fish to avoid entrainment.

ENVIRONMENTAL WATER ACCOUNT

CALFED has undertaken efforts to minimize the take of delta smelt at the SWP and CVP since 2001 water year using their Environmental Water Account (EWA). The EWA is designed to balance two conflicting objectives: (1) to protect federally listed fish and (2) avoid interruptions of water deliveries by the state and federal export facilities. The EWA is built on the premise that water can be obtained and banked until needed. When large numbers of delta smelt are being taken at the state and federal export facilities, pumping is reduced and water stored south of the delta pumps is delivered in place of water not pumped. The effectiveness of EWA is governed by two factors: its ability to acquire sufficient water and the surplus pumping capacity at the state and federal export facilities needed to bank the water (Service 2003c).

EWA is managed by an interagency team which has the responsibility of determining if and when EWA assets are used. The EWA is currently being resized to account for proposed increases in water exports at the state and federal export facilities. In addition, the EWA is currently being reviewed to determine if it was successful in its first 3 years of operation. The current EWA was established as a temporary program, lasting only four years with the ability to be extended in the future. It is expected that the EWA will continue, although it has not yet become a permanent program. EWA actions for smelt are taken to reduce pumping at the CVP and SWP when high numbers of smelt are in the south delta. However, at this time it is unclear what, if any, effect EWA actions have had on the delta smelt population. The last 3 years of survey data show declining numbers of delta smelt (see Appendix B) (CDFG 2003g). However, 3 years of operation are insufficient to determine EWA's impact on delta smelt, for even if abundance indices were to indicate increases, they represent too limited a timeframe to overcome natural variance (Service 2003c). The information currently available is inconclusive, and as a

result we are unable to accurately assess the effects of VAMP and EWA. What is clear is that to the extent flow management affects delta smelt viability, both programs contribute to delta smelt conservation.

9. E. Is there relevant new information addressing species' existing threats status and/or trends since the last review?

Yes __X__ No

New information relating to existing threats include water flow, water diversions, proposed modifications to the water system, and continuing inadequacy of existing regulatory mechanisms. Please refer to section #13 (5 factor analysis) for an in-depth discussion on each issue.

9. F. Is there relevant new information addressing new threats since the last review?

Yes __X__ No _____

New information relating to new threats include the South Delta Temporary Barriers, and possible disease, introduced species, predation, discharge of ballast water, food availability, genetics, and other environmental issues. Please refer to section #13 (5 factor analysis) for an in-depth discussion on each issue.

9. G. Is there relevant new information to suggest a change in species taxonomy?

Yes _____ No __X__

Stanley *et al.* (1995) confirmed that delta smelt is a genetically distinct species. This does not change our understanding of the species as cited in the reference point document.

9. H. Have any improved analytic methods resulted in relevant new information?

Yes __X__ No _____

POPULATION TREND

A number of surveys have been conducted both prior to and since the 1993 listing, as described in section 9B. The data gathered from these surveys provide abundance indices for delta smelt (see Appendix B). The two-year running average of the Delta Smelt Recovery Index for 2003, as determined from the FMWT, is the second lowest since the species was listed (Service 2003d). The Summer Tow Net Survey data show an almost complete disappearance of juvenile delta smelt in the south delta sampling stations by the mid-1970s (CDFG 2003g). Moyle (2003),

stated that the analysis of 22 years of monthly sampling data from Suisun Marsh shows that the delta smelt have still not recovered to their former abundance, although there has been a general increase in numbers since their low point during a long period of drought (Matern *et al.* 2002) (see Appendix B). From these indices, the Service has concluded that the delta smelt abundance has not recovered to its pre-decline (prior to 1982) levels.

In addition, the San Luis & Delta-Mendota Water Authority (2002) submitted an analysis of population trend on delta smelt adults. Based on four analyses (simple moving average, Lowess smoothing, linear splines smoothing, and polynomial trend smoothing) of Fall Midwater Trawl (FMWT) data, they asserted that delta smelt have exhibited an increasing population trend since the mid-1980's. USGS (2003) conducted a peer review of the San Luis & Delta-Mendota Water Authority (2002) submission. Overall, the peer reviewers (USGS 2003) concluded that the authors failed to demonstrate a positive trend in smelt abundance. Rather than demonstrating a positive trend, the USGS review (2003) indicated that large inter-annual variability is notable and that such variability is expected from a species with this life cycle.

In summary, we believe that there is little compelling information which would suggest that delta smelt populations are increasing over pre-decline levels. However, we recognize that the current available scientific information on delta smelt abundance is somewhat imprecise. We anticipate that research efforts will continue to focus on the development of more reliable population estimates for use in population trend analyses.

POPULATION SIZE

Many individuals and organizations have strongly suggested that abundance indices are inadequate to meet management needs and that population estimates should be made for delta smelt. A population estimate for delta smelt may permit more easily justified take limits, better assessments of population dynamics and extinction coefficients, better understanding of the trophic dynamics of the delta, and better public education efforts. However, there are many challenges associated with determining population size for delta smelt (Herbold 1996).

Surveys of abundance in one area can sometimes be generalized over an entire population. Most often in fisheries science, this involves counts of individuals at a point or points where the entire population must pass. For some species such as salmon, fish passage rates at fish ladders or carcass counts on spawning grounds can give reasonably adequate estimates of total population size (Herbold 1996). However, these methods are not possible for use on delta smelt.

Populations that spend at least part of their life cycle in a discrete area permit estimates of total population size. Fish which aggregate in large, monospecific, and concentrated schools can be adequately estimated through hydroacoustic surveys. The small, mixed species aggregations in the entrapment zone, combined with the delta smelt's frequent presence in shallow water habitats

where hydroacoustic gear is least effective; make such estimation procedures unsuitable for delta smelt (Herbold 1996).

Species that are regularly or randomly distributed within a well defined habitat permit counts in part of the habitat to be confidently expanded to the entire habitat. Species, like delta smelt, whose distributional patterns are unknown but which are likely to demonstrate different abundances and distributional patterns in different parts of their range are unlikely to be estimated with any useful degree of accuracy. For example, capture of two delta smelt in July in Suisun Marsh at a salinity of 10 parts per thousand (ppt), conditions under which they have never been abundant, would mean something quite different from a catch of 2 delta smelt at Chipps Island in October at a salinity of 2 ppt. However, our current understanding of delta smelt is insufficient to translate the difference into a population estimate (Herbold 1996).

The difficulties surrounding delta smelt population estimates are independent of the assumptions regarding gear effectiveness or choice of sampling sites. Thus, more effective sampling gear and wider distribution of surveys cannot wholly overcome the statistical difficulties attending the estimation of population size (Herbold 1996). We would anticipate an increase in confidence in delta smelt population estimates as our knowledge of smelt life history and population dynamics increases.

California Department of Water Resources (CDWR) noted that neither the FMWT nor the Summer Townet Survey provide statistically defensible population abundance estimates. Rosenfield (2003) stated that the Fall Midwater Trawl (FMWT) index is highly variable, at least in part because the sampling gear is not well-suited to detecting delta smelt, as it only briefly samples the surface waters where delta smelt are concentrated. According to Rosenfield (2003), the Kodiak Trawl appears to be a much more effective sampling instrument than the FMWT. The Kodiak Trawl collects fish from the top six feet of the water column (where delta smelt generally reside) while the FMWT collects samples by drawing the trawl diagonally through the water column from the bottom of the river to the top (San Luis & Delta-Mendota Water Authority 2003). The FMWT was not designed for sampling delta smelt and is used because it was implemented in 1967 and so can provide a historical context for relative delta smelt abundance. Unfortunately, the Kodiak Trawl has only been employed recently, and there is no historical context with which to interpret data collected with this gear (Rosenfield 2003).

Bennett (2003) believed that there is little confidence in the effectiveness of the sampling gear of the Fall Midwater Trawl (FMWT) and the Kodiak Trawl. For example, he notes, Kodiak Trawls appear to out-fish the traditional Fall Midwater Trawl in abundance per unit volume, but this knowledge is based on only 2 sampling days and 12 concurrent samples in September 1994. Moreover, there is little certainty of which size classes are missed by the various surveys. The lack of an appropriate abundance measure is currently a crucial factor limiting progress in our understanding of the delta smelt population.

The San Luis & Delta-Mendota Water Authority (2002) estimated the population size of sub-adult delta smelt in the late 1990's to be at least 1 million and as many as 12 million. The estimate was derived by using "side-by-side comparisons" of Fall Midwater Trawl (FMWT) and the Kodiak Trawl made in 1994 by the CDFG.

USGS (2003) and Rosenfield (2003) stated that the assumptions and procedures employed by the San Luis & Delta-Mendota Water Authority (2002) in reinterpreting the FMWT data are flawed. They state that the comparison of catches with different gear and scaling of density data to obtain population estimates is unsupportable as are the estimated correction factors used to offset trawl inefficiency. Also, the use of a correction factor for the Kodiak trawl is questionable. They stated that "scaling up of zero values is found unacceptable given the assumptions listed, life history of the fish, and limitations of the gear." After reviewing USGS (2003) and Rosenfield (2003), we have concluded that the population size estimates presented by San Luis & Delta-Mendota Water Authority (2002) are limited by uncertainties associated with the data set and assumptions. Despite any shortcomings in San Luis & Delta-Mendota Water Authority's (2002) approach, we would encourage continuation of future research efforts to develop reliable population estimates.

PROBABILITY OF EXTINCTION

The San Luis & Delta-Mendota Water Authority (2002) used the population estimates discussed above to estimate the probability of extinction of delta smelt. They estimated that if the sub-adult population is 12 million, then the probability of extinction of delta smelt by 2050 is less than one percent. The USGS (2003) peer reviewers indicated that the use of their population estimates conclusions as a basis for estimating extinction probability would result in a severe underestimate.

USGS reviewers (2003) also felt that risk could not be removed from the analysis as San Luis claims. USGS concluded that risks to the population from both the anthropogenic and climatic factors were major concerns in evaluating abundance indices, regardless of the analytical outcome.

In another analysis, Bennett (2003) investigated the likelihood of delta smelt populations falling below an "effective population size" for two consecutive years. He defines this term to be a Fall Midwater Trawl index of less than 100 for two straight years. This index value of 100 was chosen because it reflects an unprecedented low number of delta smelt. He determined that there was a 13% chance that the delta smelt's population size could fall below an effective population size within the next 10 years, and a 33% chance that the delta smelt's population size could fall below an effective population size by 2025.

9. I. Is there any other relevant new information, such as corrections in historic range, nomenclatural changes, or identification of erroneous information in the list?

Yes __X__ No _____

Delta smelt are now known to spawn in the Napa River (CDFG 2003d; Corps 2002 and 2003), although it is unclear if these delta smelt are self perpetuating or if frequent recolonization from the delta is necessary to maintain a population there. Several more years of study will be needed in order to determine the role that the Napa River plays in maintaining the species.

10. For population listings only, utilizing the updated species information, provide your assessment with respect to the appropriate application of the DPS policy. See attachment to 5-year review - Consideration of the DPS policy during the 5-year review.

Not applicable, as the delta smelt was not listed as a DPS.

11. Does the species have an up-to-date recovery plan with downlisting and/or delisting criteria (and in some cases uplisting criteria for threatened species) that address both the demographics and the threats to the species?

Yes _____ No __X__

Our Recovery Plan (Service 1996) stated that recovery of delta smelt should be assessed when the species satisfies abundance and distribution criteria. Distribution criteria were based on catches of smelt in various zones throughout the range of the species. Abundance criteria were that (1) smelt numbers or total catch must equal or exceed 239 (based on the Delta Smelt Recovery Index) for 2 out of 5 years and (2) not fall below 84 for more than two years in a row. If distribution and abundance criteria are met for a five-year period that includes two successive extreme outflow years, one of which is dry or critical, the species will be considered restored.

12. Does the relevant new information indicate that the recovery criteria for downlisting/delisting/uplisting have been met?

Yes __X__ No __X__

Our Recovery Plan (Service 1996) stated that delisting would be considered when (1) the five-year period includes two successive extreme outflow years with one year dry or critical and (2) legal mechanisms and interagency agreements are in place to manage the Central Valley Project (CVP), State Water Project (SWP), and other water users to meet these criteria.

During the period from 1998 through 2002 the Delta Smelt Recovery Index, as calculated from the Fall Midwater Trawl data, exceeded 239 in 2 out of 5 years, the 2 year running average never

fell below 84, and the distribution criteria were met (Service 2003d). Therefore, the delta smelt met the abundance and distribution criteria in 2002 based on the five year period from 1998 through 2002. However, threats to delta smelt still remain, and sufficient legal mechanisms and interagency agreements are not in place to assure removal of many of the threat (see section 13 below for a discussion of threats). Therefore, the delisting process has not been initiated. It should also be noted that for 2003, the Delta Smelt Recovery Index did not meet the abundance and distribution criteria outlined in the Recovery Plan.

13. 5-Factor Analysis - Threats Assessment

This section describes the current status of threats to delta smelt, using our 5-factor analysis.

(A) The present or threatened destruction, modification, or curtailment of its habitat or range.

WATER OUTFLOW

Our original listing document states that the delta smelt's decline and sustained low abundance is linked to changes in hydrology resulting from water resource development in and upstream of the Delta. Delta smelt continue to be affected by delta hydrology, which is governed by both climatological and anthropogenic factors.

For fishes and most other Delta organisms, moderately high spring outflows are important because they move fish downstream to shallow water areas in and around Suisun Bay, distant from south Delta diversions (Service 1996). This well mixed shallow water habitat encourages production of phytoplankton and zooplankton that are food for plankton-feeding fish such as delta smelt and their larvae (Service 1996). Low outflows maintain fish larvae and juveniles in the deep, narrow channels of the Delta and Sacramento River where productivity of phytoplankton is lower because much of the water is beyond the reach of sunlight (Service 1996). Presumably, if the food supply is inadequate, fish either starve to death or have increased mortality from secondary effects, as a result of poor nutrition (Service 1996).

Strong statistical relationships between outflow and abundances of American shad, Chinook salmon and longfin smelt (Stevens and Miller 1983), were demonstrated, but no such statistically significant relationship was found for delta smelt. Nevertheless, Kimmerer (2002) shows a change in delta smelt abundance as it relates to X2 (i.e., flow) historically, the further upstream X2 was the greater the abundance of delta smelt; and more recently, the further upstream X2 the poorer the abundance of delta smelt (see below for additional discussion of X2).

Years of major delta smelt decline have been characterized not only by unusually dry years with exceptionally low outflows (1987-1991) but also by unusually wet years with exceptionally high outflows (1982-83, 1986, 1998). High outflows are believed to flush delta smelt out of the system along with much of the zooplankton. This means that not only is potential spawning

stock of delta smelt reduced, but its food supply as well. Furthermore, depletion of established populations of invertebrates and fish may have made it easier for exotic species of copepods, clams, and fish to colonize the estuary, which may be detrimental to delta smelt (Service 1996).

Years of high delta smelt abundance were strongly correlated with the springtime location and duration of the 2 parts per thousand (ppt) bottom isohaline (X2) demarcation. There is some evidence that a large part of this relationship rests on the number of days in April when salinities of 2 ppt are between Middle Ground and Roe Island. The higher captures of delta smelt below 2 ppt and in shallow habitats (when waters of 2 ppt are near shallow habitats) suggest habitat selection by delta smelt. The tie between the amount of this habitat and fall abundance of delta smelt also suggests that availability of suitable habitat limits the abundance of this species. In the absence of a significant stock/recruitment relationship or tie to any other environmental variable, availability of nursery habitat may be a limiting factor to abundance of adult delta smelt (Service 1996). Future research efforts will hopefully draw more certain conclusions regarding the relationship between physical habitat and population status.

WATER DIVERSIONS

Water is pumped out of the Delta system mainly by the CVP and SWP to supply California's agriculture and municipal demands (Service 1996). Also, over 1,800 small diversions within the Delta supply water for Delta farms (CDWR 1995). Water is also pumped through power plants for cooling west of the Delta (Service 1996). Delta smelt are caught (entrained) in all these pumping facilities (Service 1996). The early stages of these fish are planktonic and weak swimmers making them susceptible to flow patterns (Service 1996). Large numbers of young delta smelt are entrained at CVP and SWP plants (Service 1996). Efforts are made to rescue a portion of the fish (greater or equal to 20 millimeters (mm) fork length being entrained at CVP and SWP plants by trapping them and trucking them back to the Delta (Service 1996). There are no efforts to rescue or quantify fish below 20 mm, these fish are the most susceptible to entrainment and loss (Service 1996). The effectiveness of the salvage activities have not been well evaluated, however, delta smelt are very fragile and the majority die as a result of the process (Bennett 2003).

During dry years, larvae are concentrated in the river channels making them more likely to be entrained in major and minor diversions. High export pumping in dry years changes the hydraulics of the Delta and small fish are shifted upstream to Delta channels rather than in Suisun Bay where they are relatively immune to entrainment. Studies are currently being conducted to quantify losses of delta smelt and other fishes to these delta diversions. Some delta smelt have been captured in agricultural diversions during the studies, but it appears that season, location and size of the diversion are major factors affecting entrainment of delta smelt. Other major diversions within the habitat of delta smelt are the power generation facilities west of the Delta, near Pittsburg and Antioch. These facilities are believed to entrain large numbers of delta smelt juveniles and larvae. Several million larval and juvenile delta smelt are estimated as lost in State, Federal, agricultural, and cooling diversions each year.

There is consensus among experts that power plants with flow through cooling can impose significant mortality if they are close to fish habitat (CALFED 2003a and Service 1996). In the San Francisco Estuary there are two such plants, one at Pittsburg and one at Antioch, both well within the region of maximum abundance of delta smelt for many months of each year (CALFED 2003a and Service 1996).

The California Department of Fish and Game (CDFG) (2003g) is concerned that entrainment at the CVP and SWP may be a major source of population impacts under certain conditions. The Summer Tow Net Survey data show an almost complete disappearance of juvenile delta smelt in the south delta sampling stations by the mid-1970s (CDFG 2003g). This disappearance followed a trend of increasing combined water exports from the south Delta (CDFG 2003g). They further state that they estimate the losses of delta smelt juveniles to SWP and CVP operations to range between 11 to 46% annually (Kimmerer, pers. comm. as cited in CDFG 2003g).

CDFG (2003g) states that in the pre-decline period, delta smelt were more abundant in the delta and less abundant in Suisun Marsh, and in the post-decline period the delta smelt are now less abundant in the delta and more abundant in Suisun Marsh. CDFG concludes that the water exports since the 1970s removed optimal smelt rearing conditions within the delta (CDFG 2003g).

Based upon years of entrainment data at the CVP and SWP facilities, it is clear that large numbers of delta smelt are subject to mortality each year. However, the net effect of this mortality on the delta smelt population structure is difficult to predict at this time.

The CDWR and the U.S. Bureau of Reclamation (Reclamation) are currently preparing a proposal to replace the temporary barriers with permanent barriers. The change from temporary fish and agricultural barriers to permanent barriers in the South Delta could result in additional effects to delta smelt. The temporary barriers are installed in April of each year and are removed in November, and serve the purpose of maintaining water levels for in-delta diverters. These barriers operate using tidal flap gates, meaning the barriers allow the flood tide flow upstream and then close when the tide ebbs to hold water behind the barriers. These barriers physically prevent smelt movement and can also change delta hydraulics (Service 2001). The proposed permanent barriers operations may include operating during additional periods and may include different operations that may affect delta smelt. Computer simulations by the California Department of Water Resources (2003) have shown that placement of the barriers changes south delta hydrodynamics, increasing central delta flows toward the state and federal export facilities. When delta smelt occur in areas influenced by the barriers, entrainment losses at the state and federal export facilities could increase. However, the operations and effects of the permanent barriers have not yet been fully analyzed.

PROPOSED MODIFICATIONS TO THE WATER SYSTEM

The demands on surface water resources in the Central Valley have increased. The proposed Freeport Regional Water Project would divert up to 185,000 acre-feet(af)/year of water from a point of diversion north of the delta at Freeport (Freeport Regional Water Authority 2003). The

proposed expansion of Los Vaqueros Reservoir would entail an additional 400,000 af of off-stream storage, diverted from the delta using existing facilities as well as new facilities located at Old River and/or Middle River (CALFED 2003c and Reclamation 2003a). Reclamation and CDWR have proposed to increase pumping capacity at the SWP Banks pumping plant from 6,680 cubic feet per second (cfs) to 8,500 cfs and eventually to 10,300 cfs (CALFED 2002b, 2003d). Reclamation and CDWR have also proposed construction of a 400 cfs intertie connecting their aqueducts, which would allow Reclamation to increase the pumping at their Tracy Pumping Plant from 4,200 cfs to 4,600 cfs. The CALFED Bay-Delta Program proposes to expand surface water storage capacity at existing reservoirs and strategically located off-stream sites by 3.5 million af (including the 400,000 af at Los Vaqueros) by: 1) north of the delta off stream storage; 2) Shasta enlargement; 3) Los Vaqueros Expansion; 4) in-delta storage; and 5) additional storage in the Upper San Joaquin (Friant) (CALFED 2002b and Reclamation 2003a). Finally, the City of Stockton proposes to construct a new intake at the southwestern tip of Empire Tract on the San Joaquin River with an ultimate diversion capacity of 371 cfs (Environmental Science Associates 2003). The diversions would likely result in lower delta outflows and increased entrainment.

In summary, the threats under this category as described in the original listing remain. Since the time of the listing, State and Federal agencies together with stakeholder groups have implemented the Delta's Water Quality Standards, VAMP, and EWA, which have helped to ameliorate these threats. It is unclear how effective these management tools will be over time based on available funding and future demands for water.

(B) Overutilization for commercial, recreational, scientific or educational purposes

Our final listing rule (Service 1993) did not identify any threats in this category, and there is no new information concerning threats of overutilization for commercial, recreational, scientific or educational purposes.

(C) Disease or predation

Our final listing rule (Service 1993) did not identify any threats in this category.

Antonio *et al.* (2000) examined infections associated with *Mycobacterium* ssp. in wild and captive delta smelt. *Mycobacterium* ssp. was not detected from any of the fish examined immediately after collection from the Sacramento-San Joaquin Estuary or during captivity of broodstock groups at water temperatures of 9-12°C. However, *Mycobacterium* ssp. was isolated from, and mycobacteriosis occurred in, broodstock held at 16°C during spawning season and in experimental groups maintained at 17°C. *Mycobacterium* ssp. and mycobacteriosis were more prevalent among groups frequently handled for physiological experiments. Broodstock groups that were less stressed exhibited a lower prevalence of the bacterium and the disease. Their findings suggest that *Mycobacterium* ssp. may be present in a latent state in the wild population of delta smelt and infections may progress from asymptomatic to clinical under intensive culture conditions. Swanson *et al.* 2002a concluded that while *Mycobacterium* ssp. may not play a significant role in the ecology of delta smelt (e.g. as the proximate cause of post-spawning

mortality), some aspect of the handling of the fish may have caused this disease to develop. The relevance of *Mycobacterium* ssp. to delta smelt in the wild is unknown at this time.

In the central Delta, recent studies by Grimaldo *et al.* (2000) of tidal wetland and marsh habitats show that introduced fishes dominate. The presence of the introduced water plant, *Egeria densa*, appears to be an important factor at sites in the central Delta. In areas where this plant is abundant, native fishes are extremely rare.

Although many species may prey on adult and juvenile delta smelt, much of the attention to date has focused on inland silversides (CALFED 2001). After their accidental introduction to the Delta in 1975, their population expanded rapidly through the 1990s (CALFED 2001). Estimates of abundance of delta smelt and silversides are negatively correlated, suggesting that inland silversides may be an important predator on larval delta smelt and competitor for copepod prey (CALFED 2001). Silversides often occur in dense schools near shorelines and their occurrence may detract from the value of shallow water habitat created to aid delta smelt restoration (CALFED 2001).

As noted by CDWR (2003), however, since the early 1980's there also have been increases in other potential larval fish predators such as coded-wire-tagged chinook salmon smolts released in the delta for survival experiments and non-native centrarchids. In addition, striped bass appear to have switched to piscivorous feeding habits at smaller sizes than they historically did following severe declines in the abundance of mysid shrimp (CDWR 2003). To address concerns regarding delta smelt, the California Department of Fish and Game completed a Habitat Conservation Plan for their striped bass management program, which includes measures designed to help conserve delta smelt.

Northern pike (*Esox lucius*) have been introduced into Lake Davis, and all attempts at eradication have failed (CDFG 2000). If these fish escape into the Sacramento River system and become established in the delta, the delta smelt population will almost certainly be affected (CDFG 2000).

In summary, the threats of disease and predation have still not been sufficiently studied to determine their effects on delta smelt.

(D) The inadequacy of existing regulatory mechanisms

The operation of the SWP and CVP has been conditioned by the Service's biological opinion (Service 1995). The BO has no provision for the protection of larval delta smelt (<20mm in size) at the facilities. The take is not quantified but assumed to be high in number given the smelt's poor swimming ability. At this time, we do not have information on any correlation or causality between larval delta smelt take and population index.

The discharge of any ballast water into the San Francisco Bay is not prohibited. The U.S. Coast Guard has jurisdiction over ships that discharge ballast water (Service 1996). The Coast Guard requires ships to discharge ballast water before entering U.S. ports, but compliance is voluntary

(Service 1996). A number of non-native species have already been introduced into the Bay-Estuary-Delta from ballast water and without strictly enforced prohibitions on ballast water discharge in the Bay, additional introductions of non-native species can be expected to continue (Service 1996 and Moyle 2003).

(E) Other natural or manmade factors affecting its continued existence

REDUCED PRODUCTIVITY AND FOOD

Jassby *et al.* (2003) found that phytoplankton biomass has declined over the past few decades, partly because of the Asiatic clam invasion. The phytoplankton decline may represent a reduction in the system's capacity to support higher levels of the food web. Lower phytoplankton levels have been linked to declines in key zooplankton populations in the delta, although the evidence for food limitation of fish populations is not as strong as for zooplankton and benthic invertebrates. However, Kimmerer (2002) pointed out that the decline in delta smelt abundance predates the step decline in the base food web.

Our Recovery Plan (Service 1996) stated that another complicating factor is the rise in abundance of the diatom *Melosira*, at some times to the point where it is the most abundant species of phytoplankton. This diatom grows in long chains and is very difficult for zooplankton to graze on; thus the change in composition and abundance of zooplankton may also be tied to the increased importance of this diatom. The causes of increase in *Melosira* are not known (Service 1996).

GENETICS

Genetic analyses have confirmed that delta smelt and wakasagi (*Hypomesus nipponensis*) are distinct species with delta smelt more closely related to surf smelt than wakasagi (Stanley et al. 1995; Trenham *et al.* 1998). While hybridization is possible between delta smelt and wakasagi the threat of introgression at the population level is believed to be low due to the sterility or lack of viability of offspring (Trenham *et al.* 1998). Interbreeding may cause the loss of valuable gametes of delta smelt and hinder the population from recovering (Moyle 2002, 2003). Swanson *et al.* (2000) studied the temperature, salinity, and flow tolerances of delta smelt and the non native wakasagi, and concluded that delta smelt may be at a physiological disadvantage to wakasagi, particularly in habitats with suboptimal environmental conditions. They also concluded that the low abundance of wakasagi in the delta recorded to date may indicate that factors other than temperature, salinity, and flow determine wakasagi distribution.

Trenham *et al.* 1998 determined that delta smelt exhibits very little population subdivision across its range, and that the delta smelt in the Napa River are not a distinct population.

ENVIRONMENTAL FACTORS

Delta smelt are relatively poor swimmers and show lower swimming ability than other sympatric fishes of the Delta (Swanson *et al.* 2000). Delta smelt are unable to swim against the current for any substantial distance, and therefore are more susceptible to impingement and entrainment at major water diversions than other similar sized fish species (Cech and Swanson 1998; Swanson *et al.* 1998, 2002b, and 2003; Young *et al.* 1998, and 2003; and White *et al.* 1998).

The threats of other natural or manmade factors affecting the delta smelt's continued existence as described in the original listing (Service 1993) remain and will increase. The available information indicates that hybridization with wakasagi is not a threat to delta smelt.

14. Outcome:

14.A. Regarding the species' demographic status, does the species now occupy a significant portion of its former range, and within its current range, is the species demographically stable or improving? If not, what is the outlook for expansion of the species into a significant portion of its former range?

The delta smelt currently occupies its historic range; although its abundance in the south delta is considerably lower (CDFG 2003g). Moyle (2002) stated that the pelagic life style, short life span, spawning habits, and relatively low fecundity indicate that a substantial population is necessary to keep delta smelt from becoming extinct.

The two-year running average of the Delta Smelt Recovery Index for 2003, as determined from the FMWT, is the second lowest since the species was listed (Service 2003d). The Summer Tow Net Survey data show an almost complete disappearance of juvenile delta smelt in the south delta sampling stations by the mid-1970s (CDFG 2003g). Moyle (2003), stated that the analysis of 22 years of monthly sampling data from Suisun Marsh shows that the delta smelt have still not recovered to their former abundance, although there has been a general increase in numbers since their low point during a long period of drought (Matern *et al.* 2002)(see appendix B). From these indices, the Service has concluded that the delta smelt abundance has not recovered to its pre-decline (prior to 1982) levels and that the overall trend is negative.

CDFG (2003g) is concerned that entrainment at the CVP and SWP remains be a major source of population impacts under certain conditions, and that the species will remain threatened in the foreseeable future due in part to water exports. Future increases in water exports could increase the population effects to delta smelt. Moyle (2003) states that the delta smelt will never be out of danger of extinction unless there are permanent and reliable changes made to the flow and temperature regimes that favor the smelt.

14.B. What individual threat(s), if any, could result in the extinction of the species within its currently occupied range? What has been done/is being done to abate these threats?

The threats of the destruction, modification, or curtailment of its habitat or range resulting from extreme outflow conditions (reduced outflow or high outflow) and/or the operations of the State and Federal water projects could result in the extinction of the delta smelt (CDFG 2003g and Moyle 2002, 2003). In addition, any one of the many stochastic factors that affect delta smelt, such as predation, invasive species, change in food organisms, toxic substances, disease, competition, and entrainment losses to water diversions can cause their numbers to move towards extinction (Moyle 2002, 2003).

The San Luis & Delta-Mendota Water Authority (2002) submitted to the Secretary of Interior their analysis of population size estimate, population trend and extinction probability for delta smelt. Their analysis was subjected to a peer review by the USGS (2003). The USGS (2003) determined that none of their analysis or assumptions was valid and that their white paper did not constitute new information. Others reviewing their white paper reached the same conclusions as the USGS. (See 9h above)

Moyle (2002) states that it is implicit that the recovery of delta smelt requires the recovery of natural processes in the Sacramento-San Francisco estuary, including outflow. Finding a way to protect the delta smelt without disrupting water supplies (i.e. CVP and SWP operations), was a major reason for the creation of CALFED. The CALFED process set in motion a number of efforts, described in #9D above, toward recovery of delta smelt, although the effectiveness of these measures remains to be seen.

14.C. What combined threats, if any, could result in the extinction of the species within its currently occupied range? What has been done/is being done to abate these threats?

See #14B above.

14.D. If no single threat or combination of threats threatens the species' existence at this time, what single threat or combination of threats could cause a decline toward endangerment?

See #14B above.

FINDING

__X__ The 5-year review does not indicate a change in classification is warranted.

_____ The 5-year review does indicate a change in classification is warranted.

In summary, the threats of the destruction, modification, or curtailment of its habitat or range resulting from extreme outflow conditions, the operations of the State and Federal water projects, and other water diversions as described in the original listing remain. The only new information concerning the delta smelt's population size and extinction probability indicates that the population is at risk of falling below an effective population size and therefore in danger of becoming extinct. Although VAMP and EWA have helped to ameliorate these threats, it is unclear how effective these will continue to be over time based on available funding and future demands for water. In addition, there are increased water demands outside the CVP and SWP which could also impact delta smelt. The increases in water demands are likely to result in less suitable rearing conditions for delta smelt in Suisun Marsh, increased vulnerability to entrainment, and less water available for maintaining the position of X2. The importance of exposure to toxic chemicals on the population of delta smelt is highly uncertain. Therefore, a recommendation to delist the delta smelt is inappropriate.

In addition, many potential threats have not been sufficiently studied to determine their effects, such as predation, disease, competition, and hybridization. Therefore, a recommendation of a change in classification to endangered is premature.

In his August 24, 2003, letter, the foremost delta smelt expert, Dr. Peter B. Moyle, stated that the delta smelt should continue to be listed as a threatened species (Moyle 2003). In addition, in their January 23, 2004, letter, the CDFG fully supported that the delta smelt should retain its threatened status under the Act (CDFG 2004).

15. If the outcome to #14 above indicated that a change is warranted, recommend the appropriate classification.

Not Applicable.

16. List all information and data sources used in this review, and file locations if they will not be filed with the review: All listed documents are filed within the Sacramento Fish and Wildlife Office.

A. Peer Reviewed Literature

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Kimmerer, W.J. 2002. Effects of freshwater flow on abundance of estuarine organisms: physical effects or trophic linkages? Marine Ecological Progress Series 243: 39-55.

Matern, Scott A., Peter B. Moyle, and Leslie C. Pierce. 2002. Native and Alien Fishes in a California Estuarine Marsh: Twenty-One Years of Changing Assemblages. Transactions of the American Fisheries Society 131: 797-816.

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17. List all knowledgeable experts and their affiliations used in this review:

The Service received comments from individuals and agencies during our comment period (see Appendix C for a list of commentors). In addition, the Service closely worked with CDFG to coordinate with their review on the status of delta smelt. In their January 23, 2004, letter, CDFG fully supported that the delta smelt should retain its threatened status under the Act.

U.S. FISH AND WILDLIFE SERVICE
5-YEAR REVIEW
SIGNATURE PAGE

Species: *Hypomesus transpacificus*

Recommendation: *No change in listing status.*

Lead Field Supervisor, U.S. Fish and Wildlife Service

Approve _____/Date 3/31/04

Do not Approve_____/Date

Lead Field Offices must ensure that all other Field Offices within the range of the species' have been provided an adequate opportunity to review and comment prior to the reviews' completion. For all species where a change in classification is recommended, written concurrence from other Field Offices is required.

Cooperating Field Supervisor, U.S. Fish and Wildlife Service

Concur N/A /Date

Not concur_____/Date

Lead Regional Director, U.S. Fish and Wildlife Service

Concur _____/Date 3/31/2004

Not concur_____/Date

The Regional Director must sign all 5-year reviews, unless the authority has been delegated by the Regional Director to the Field Supervisor.

Cooperating Regional Director, U.S. Fish and Wildlife Service

Concur _____/Date

Not concur_____/Date

The Lead Region must ensure that any other Regions within the range of the species' have been provided an adequate opportunity to review and comment prior to the reviews' completion. For all species where a change in classification is recommended, written concurrence from other Regional Directors is required.

APPENDIX A
to the 5-year review for
***Hypomesus transpacificus* (delta smelt)**

Based upon our review of the best available scientific data, we concluded that the delta smelt should retain threatened status. Many of the original threats to delta smelt identified in the 1993 listing continue to exist, and the population of delta smelt remains substantially below its historical levels. While some important improvements have been made, most threats which were discussed in the original listing remain. Therefore, it is not justified at this time to recommend delisting of the delta smelt.

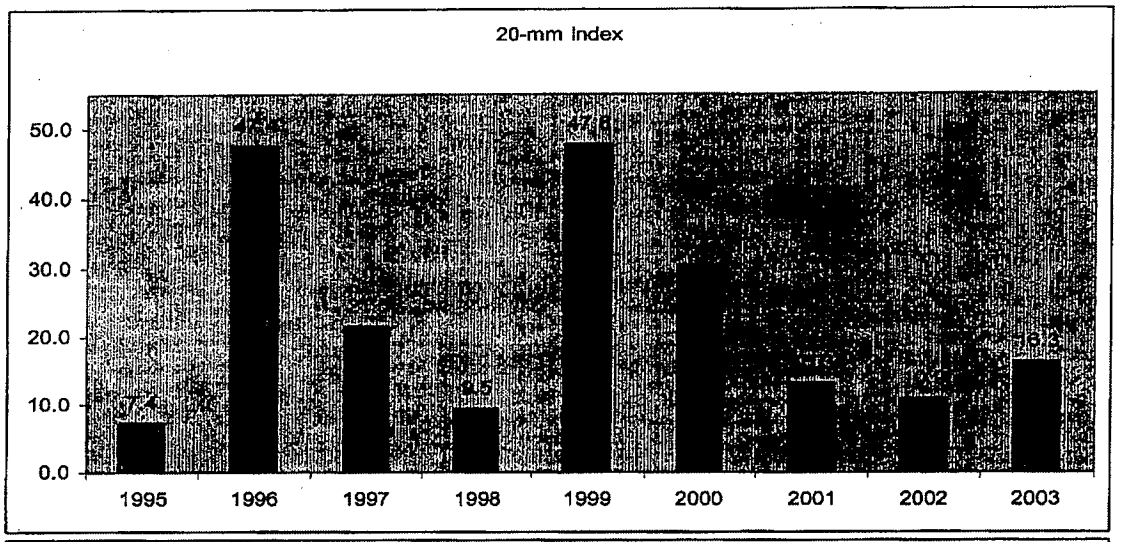
Having reached this conclusion, we nevertheless acknowledge that the San Luis & Delta-Mendota Water Authority's white paper made several important points with which we agree:

- Since 1996, significant new information has been collected, and therefore some of the original recovery criteria are outdated and in need of revision.
- Some of the data collection and analysis methods are not well suited for monitoring delta smelt abundance or population trends and should be improved.
- The Service should work more closely with you and other interested parties to incorporate updated scientific information into water management decisions.

There has been substantial information gathered since the time of listing concerning the life history and biology of delta smelt. Since the recovery plan was written in 1996 our understanding of how the delta smelt respond over time to changes in environmental conditions does not seem to have been born out. Dr. Peter Moyle (former Delta Native Fishes Recovery Team Leader) in his comments on the notice for this review (Moyle, 2003) suggested that the current numerical criteria for delta smelt are no longer appropriate based on our current understanding of delta smelt biology. Although the numeric criteria in the 1996 recovery plan have been met, it appears that the long-term trend of delta smelt abundance indices has not appreciably changed since the time of listing. There is numerous new data collection and analytical methods that have been explored in order to better understand delta smelt population dynamics these include the 20 mm survey and the spring townet survey. Also analytical methods to try and correlate different data sets for a more predictive estimate of future abundance have been investigated such as relationships between summer tow-net surveys and the fall mid-water trawl. The high degree of variability in the population both in time and space do not appear to be accurately reflected in the current numeric criteria. That is to say the current criteria only use one data set (fall mid-water trawl) and only a sub-set of the data set. There are geographic limitations to the data set in terms of establishing recovery over the known range of the species. The role of environmental variables such as the role of hydrology and climactic conditions in delta smelt population dynamics is not well understood and the temporal nature of the current recovery criteria should be reviewed. Based on the above reasoning and recommendations from experts in the field we recommend that a recovery team be reconvened to review the biology of delta smelt and revise the numeric criteria as appropriate.

APPENDIX B
to the 5-year review for
***Hypomesus transpacificus* (delta smelt)**
Date

Abundance Index Tables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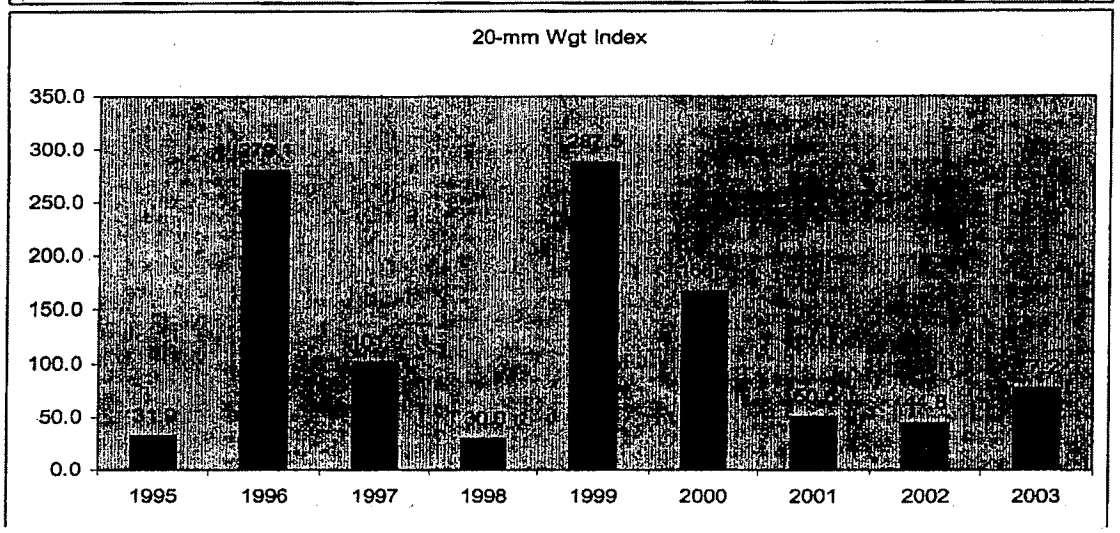
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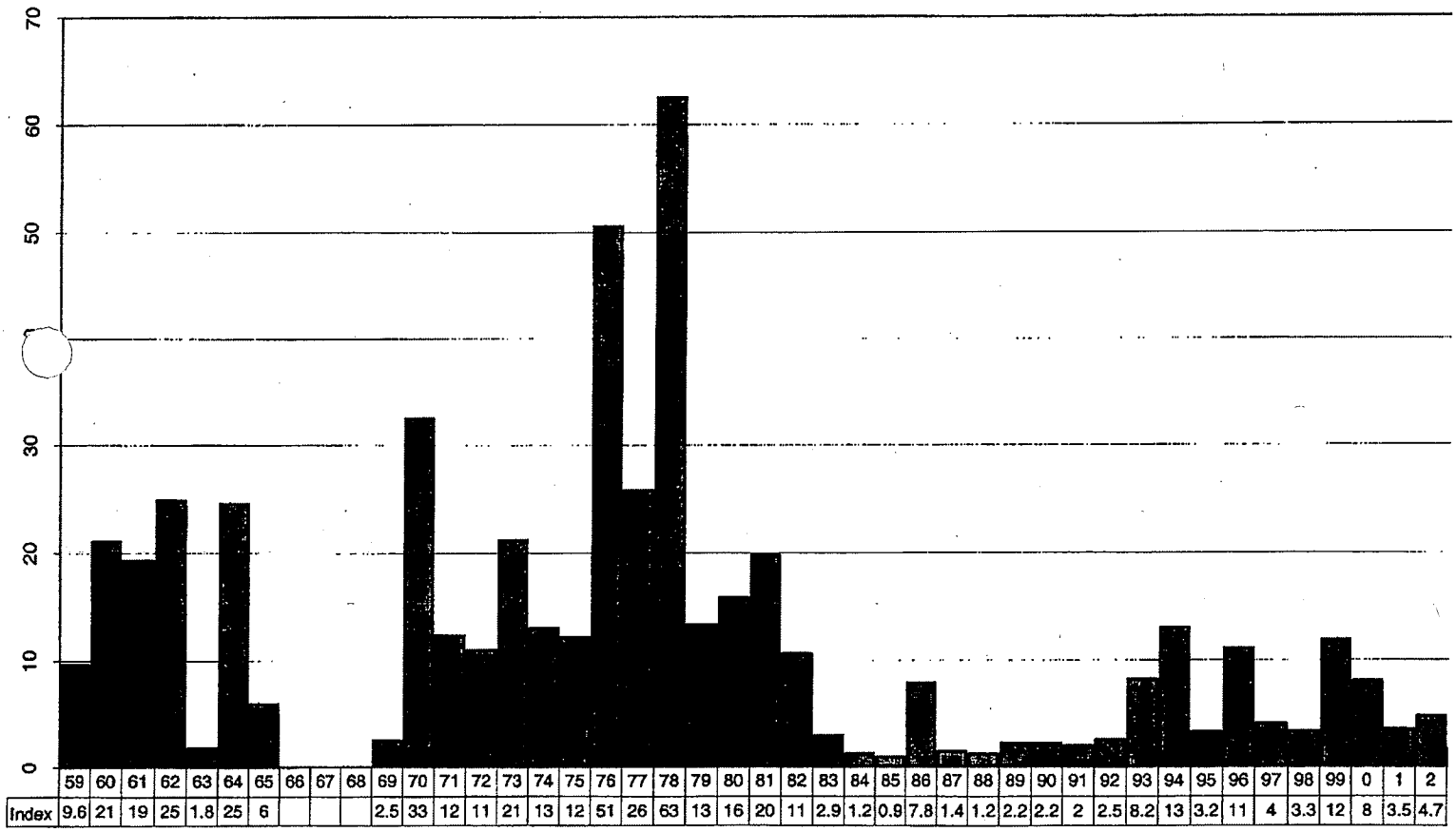
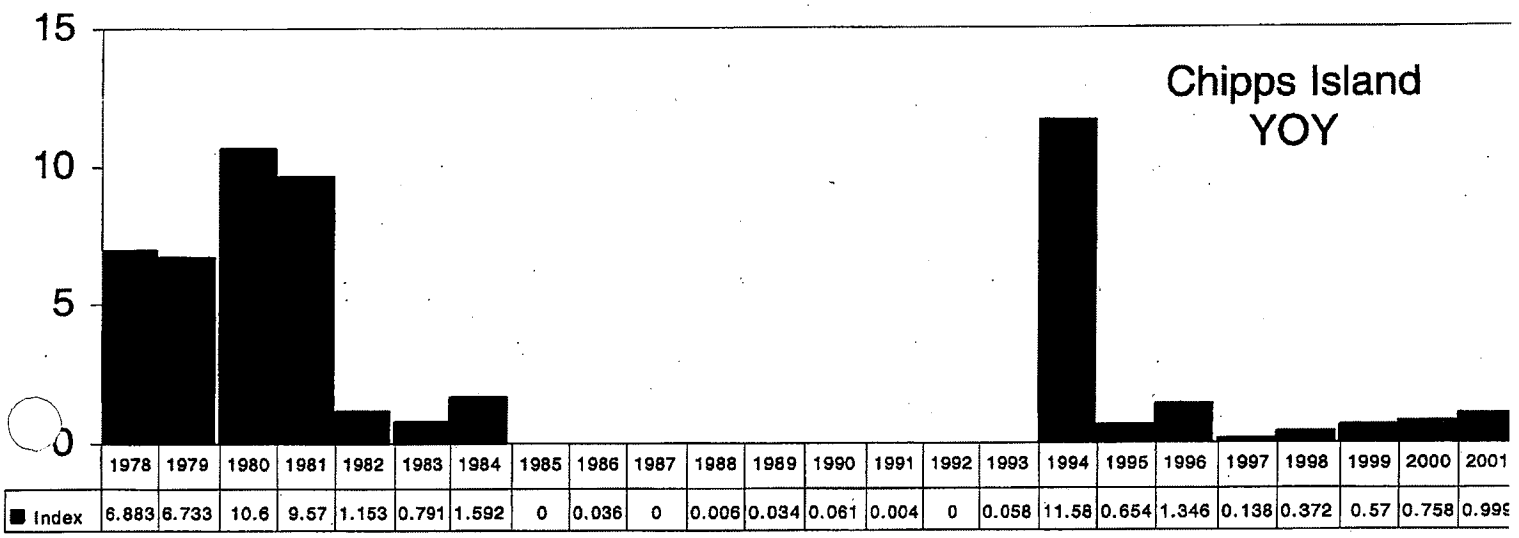
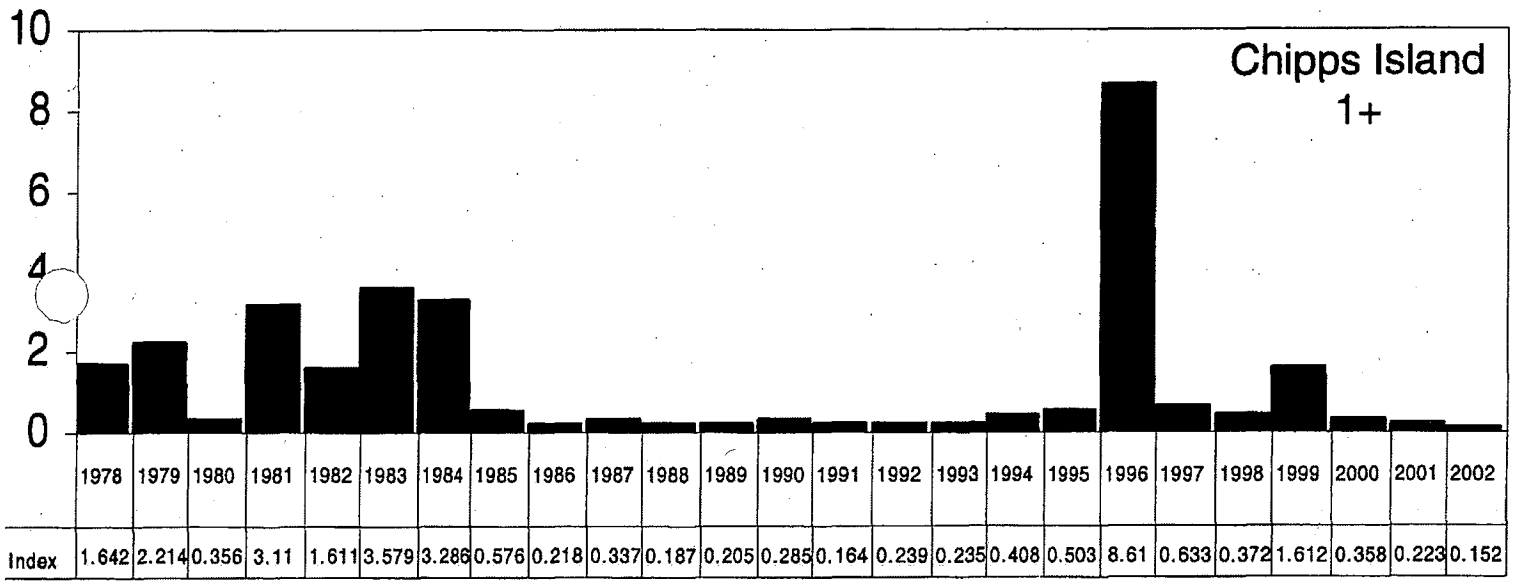
TNS Index



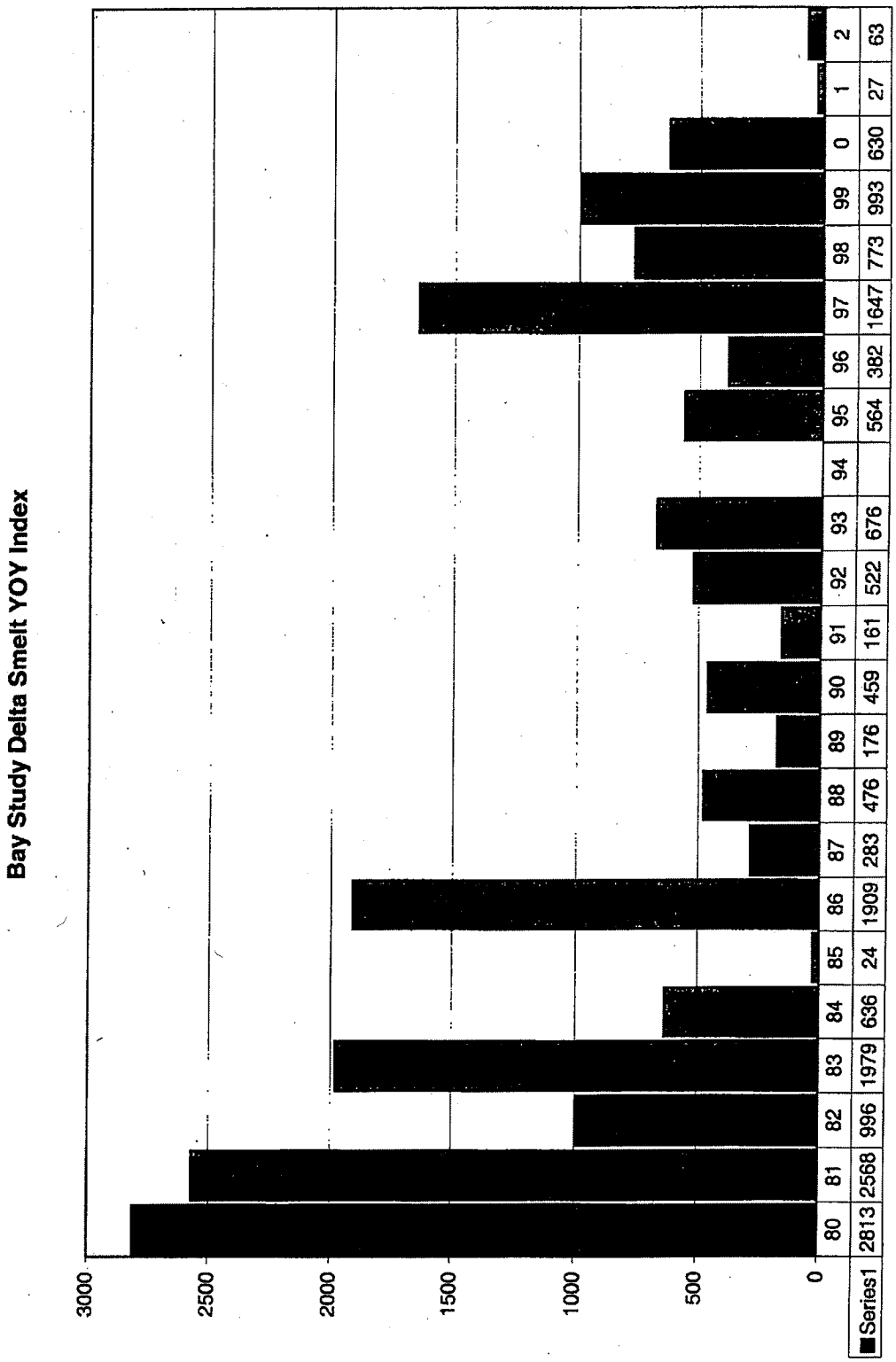
	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	0	1	2
Index	9.6	21	19	25	1.8	25	6				2.5	33	12	11	21	13	12	51	26	63	13	16	20	11	2.9	1.2	0.9	7.8	1.4	1.2	2.2	2.2	2	2.5	8.2	13	3.2	11	4	3.3	12	8	3.5	4.7



	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Index	6.883	6.733	10.6	9.57	1.153	0.791	1.592	0	0.036	0	0.006	0.034	0.061	0.004	0	0.058	11.58	0.654	1.346	0.138	0.372	0.57	0.758	0.99



	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Index	1.642	2.214	0.356	3.11	1.611	3.579	3.286	0.576	0.218	0.337	0.187	0.205	0.285	0.164	0.239	0.235	0.408	0.503	8.61	0.633	0.372	1.612	0.358	0.223	0.152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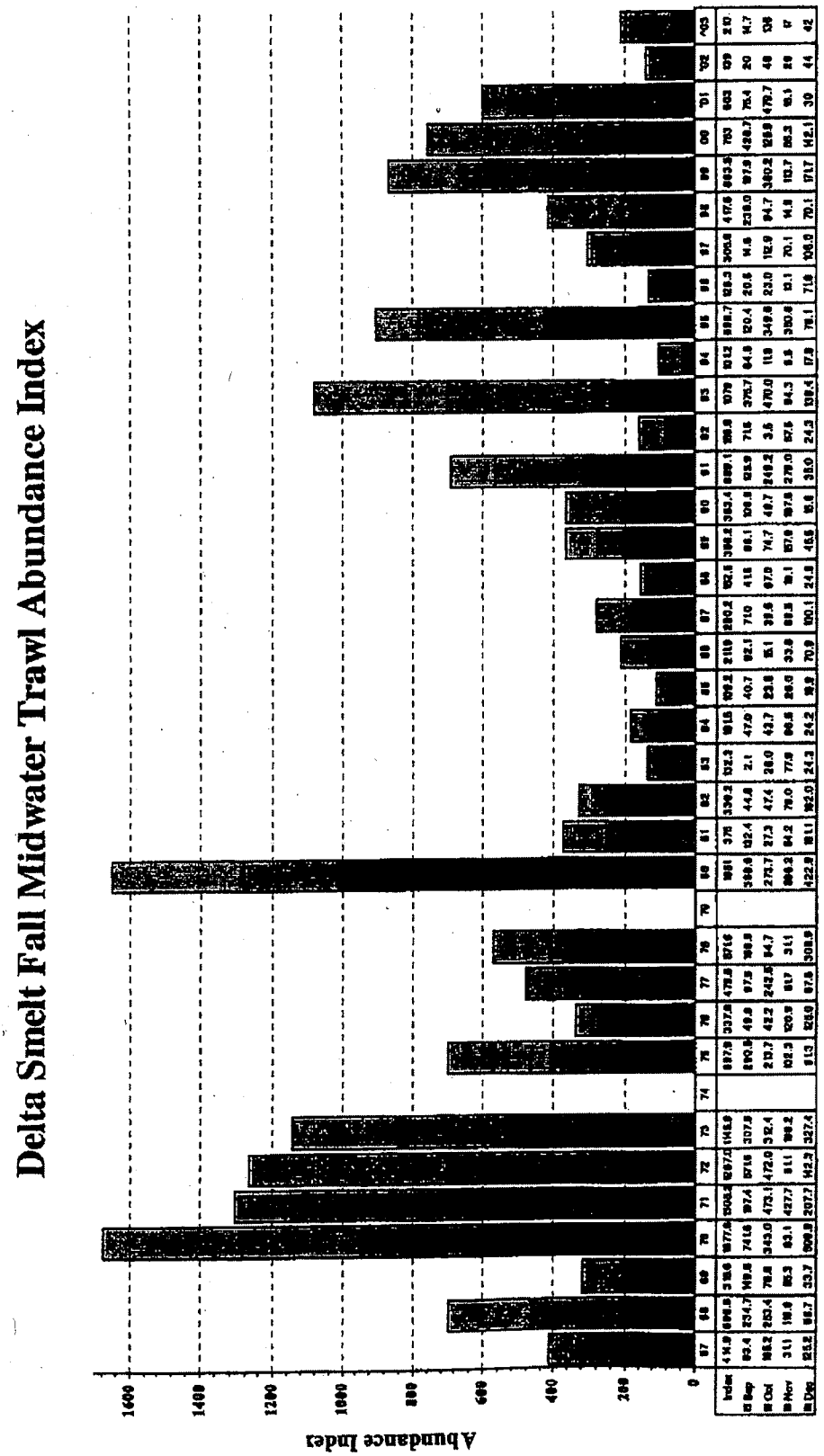
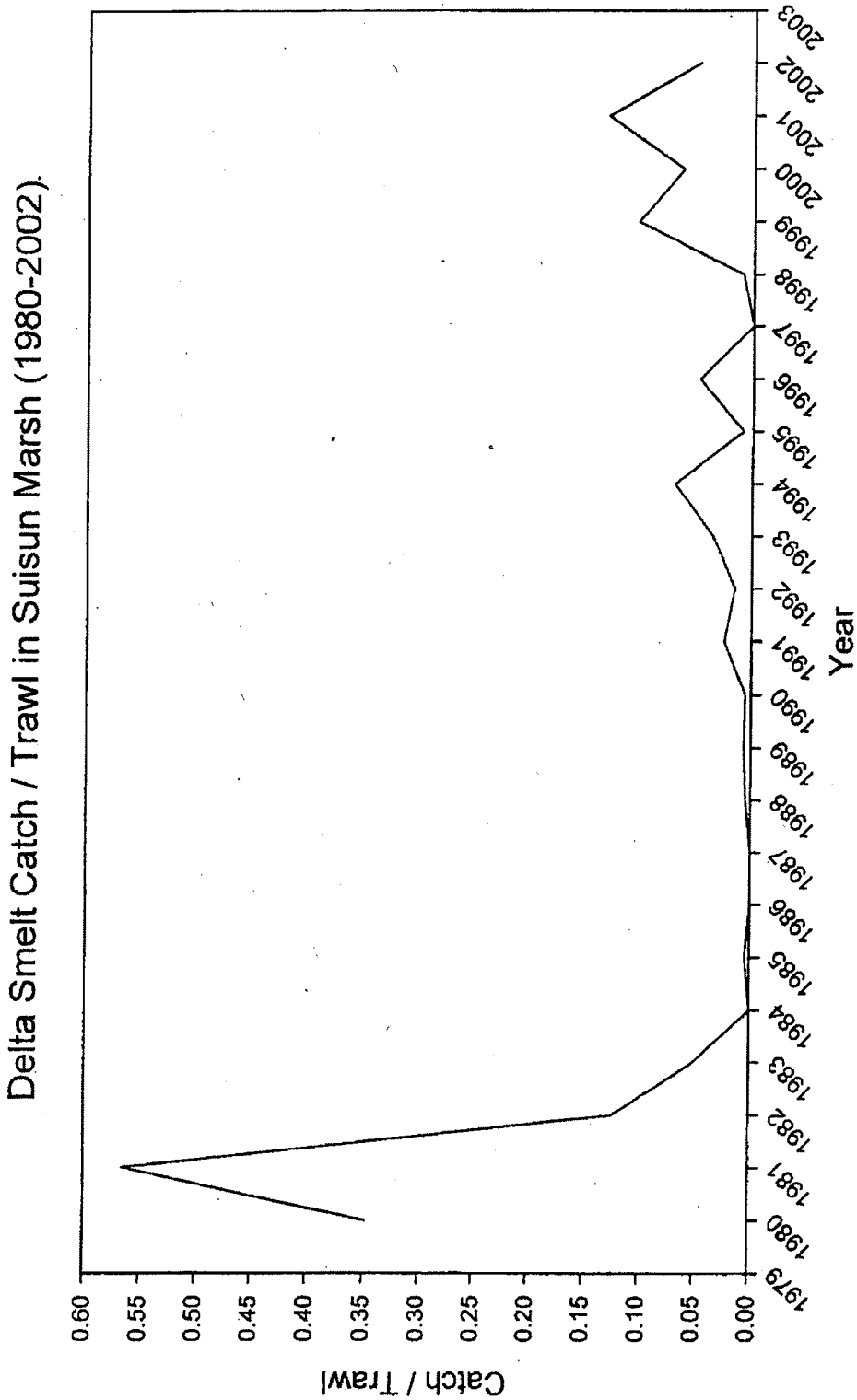
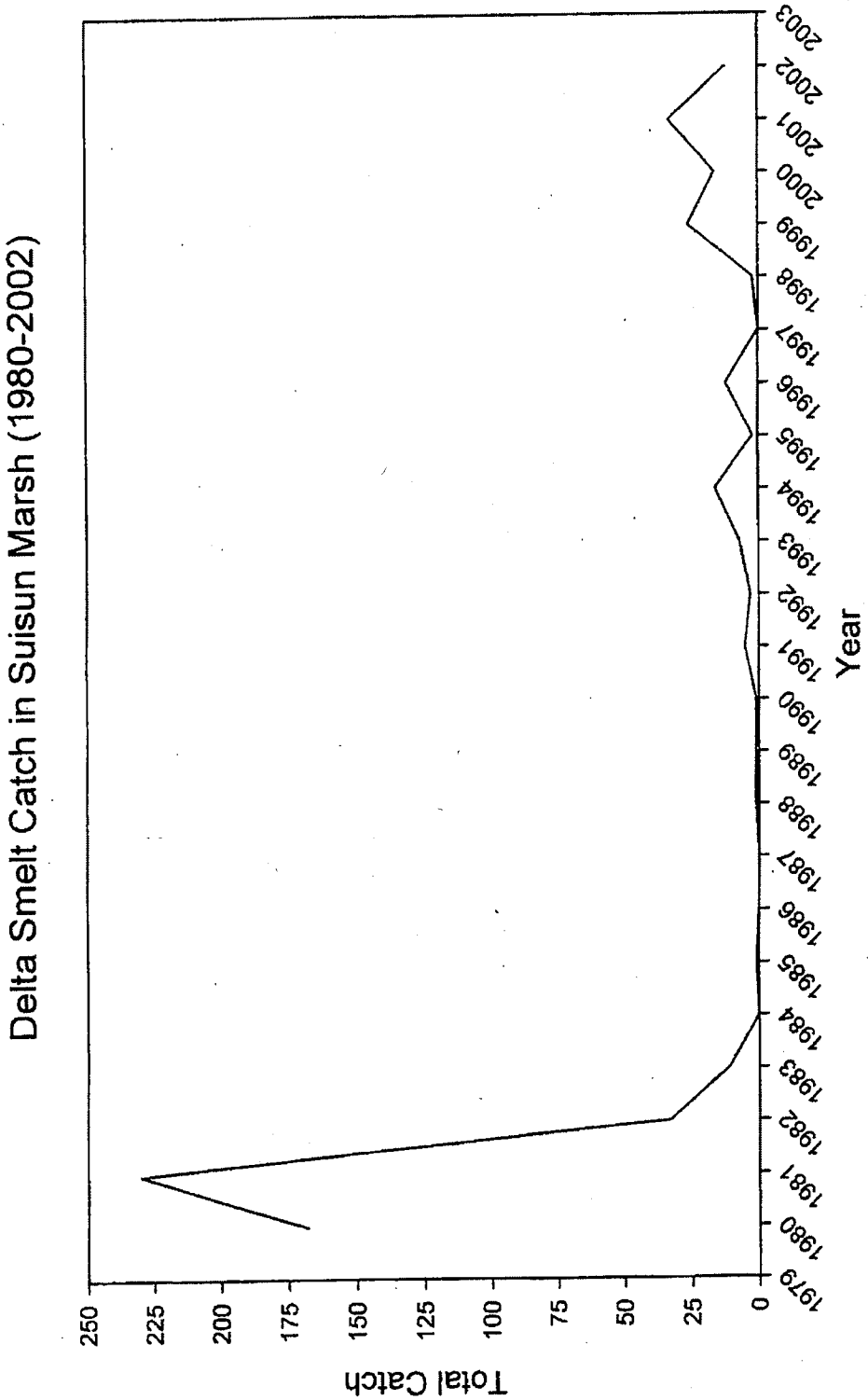
LETTER 21


Delta Smelt Fall Midwater Trawl Abundance Index
Abundance Index
Year



Data from Peter B. Moyle, Suisun Marsh study



Data from Peter B. Moyle, Suisun Marsh study

APPENDIX C
to the 5-year review for
***Hypomesus transpacificus* (delta smelt)**
Date

Commentors Index

Name	Address	Description
Dr. Peter B. Moyle, Ph.D., Professor	Department of Wildlife, Fish, and Conservation Biology University California at Davis 1 Shields Avenue Davis, CA 95616-8751	38pages includes letter, 3 journal articles co-authored by commenter, and 2 graphs; **"Moyle 2002" cited** [Inland Fishes of California]
Dr. Jonathan A. Rosenfield, Ph.D. Post-Graduate Researcher	Center for Integrated Watershed Science and Management 1 Shields Avenue University California at Davis Davis, CA 95616-8751	13 pages includes letter, journal article by commenter, and list of references
Mr. Perry L. Herrgesell, Chief	Central Valley-Bay Delta Branch California Department of Fish and Game 4001 N. Wilson Way Stockton, CA 94205-2486	6 pages includes letter, 2 cites, data, and graphs
Dr. Joe J. Cech, Jr. Professor	Department of Wildlife, Fish, and Conservation Biology University California at Davis 1 Shields Avenue Davis, CA 95616-8751	50 pages includes 7 abstracts & 4 journal articles
Mr. Stephen W. Verigin, Acting Chief Deputy Director	Division of Environmental Services California Department of Water Resources 3251 S Street Sacramento, CA 95816-7017	20 pages includes letter
Dr. Christina Swanson, Ph.D., Senior Scientist	The Bay Institute 500 Palm Drive, Suite 200 Novato, CA 94949-5006	4 pages
Ms. Florence LaRiviere, Chair	Citizens Committee to Complete the Refuge 453 Tennessee Lane Palo Alto, CA 94306-4149	4 pages 1 citation
Mr. Bill Pauli, President	Farm Bureau Federation 2300 River Plaza Drive Sacramento, CA 95833-3239	10 attachments = 1 1/8" 2 copies
Mr. Daniel J. O'Hanlon, Attorney At Law	Kronick, Moskovitz, Tiedemann, & Girard 400 Capitol Mall, 27th Floor	comments by water contractors 2 ½"

Attachment 19

FALL-RUN CHINOOK SALMON SPAWNER POPULATIONS

SACRAMENTO RIVER SYSTEM : Keswick Dam to Red Bluff Diversion Dam (RBDD)

YEAR	Sacramento River Mainstem: In-river	Sacramento River Mainstem: Transfer to CNFH 1/	Sacramento River Mainstem: TOTAL	Battle Creek: In-river: CNFH	Battle Creek: In-river: Dnst. CNFH	Battle Creek: In-river: Upst. CNFH 2/	Battle Creek: TOTAL	Clear Creek	Spring Gulch	China Gl.	Olney Cr.	Cotton-wood Cr.	Paynes Cr.	Cow Cr.	Bear Cr.	Ash Cr.	Still-water Cr.	Inks Cr.	Other 3/
1952	a/	7,000	7,000	11,000	4,000		15,000												
1953	a/	8,000	8,000	12,000	4,000		16,000	1,500				3,000		3,000	800				
1954	a/	6,000	6,000	8,000	4,000		12,000	3,000				1,000		4,500	500				
1955	a/	6,000	6,000	10,000	16,000		26,000	500				800		1,300	200				
1956	84,716	2,641	87,357	7,458	13,650		21,108	2,650	950	385		660		3,200	5				
1957	47,300	7,689	54,989	3,045	2,285		5,330	330				358		700	30	10	140		
1958	99,300	7,853	107,153	14,643	14,500	100	29,243	1,600		200	30	600		3,300	200				
1959	249,600	7,100	256,700	10,833	19,300	100	30,233	775	955			3,300		680	10				
1960	210,000	8,940	218,940	9,605	14,200		23,805	900				350		650	50	10			
1961	134,700	5,481	140,181	8,156	11,700		19,856					1,500							
1962	115,500	12,337	127,837	4,857	8,200		13,057	5,400				6,000		1,500					
1963	135,200	3,681	138,881	5,114	12,400		17,514	10,000				3,500							
1964	140,500	2,084	142,584	3,875	12,000		15,875	2,500				3,450		1,000	50				
1965	98,900	2,976	101,876	3,194	6,000		9,194	2,500				900	35	1,000	350				
1966	107,900	3,981	111,881	900	2,400		3,300	900				2,900	300	7,600	400				
1967	78,100	4,390	82,490	3,050	2,160		5,210	370				600		520	30				
1968	95,600	2,829	98,429	3,526	2,950		6,476	800				8,540		7,540	310				
1969	114,600	1,052	115,652	2,626	3,200		5,826	1,240				4,967	300	5,570	560	320	150	230	
1970	62,298	2,844	65,142	3,512	3,320		6,832												5,308
1971	52,247	1,641	53,888	2,004	3,285		5,289												
1972	33,559	399	33,958	2,822	2,030		4,852												
1973	40,424	705	41,129	3,835	4,300		8,135												
1974	45,590	1,429	47,019	1,607	2,294		3,901												
1975	52,248	881	53,129	2,431	2,426		4,857												
1976	43,604	2,149	45,753	2,297	3,147		5,444	1,013				2,427		726	167				
1977	15,784	392	16,176	5,244	5,604		10,848	1,362				1,512							
1978	32,235		32,235	1,882	1,770		3,652	60				1,120							
1979	47,758		47,758	8,729	4,430		13,159												
1980	21,961		21,961	9,503	4,940		14,443												
1981	26,261	2,951	29,212	10,272	6,933		17,205	3,133				3,356							
1982	17,731	235	17,966	19,525	7,270		26,795	785				700	30						
1983	26,226		26,226	8,756	5,227		13,983					1,000	100						
1984	36,898	67	36,965	21,581	8,312		29,893	4,000				500	90	250					
1985	52,120		52,120	16,320	12,792	10,696	39,808	700											
1986	68,593	228	68,821	12,481	11,508	7,263	31,252												
1987	76,562		76,562	16,256	5,868	2,125	24,249												
1988	63,998		63,998	13,615	51,923	1,937	67,475	4,453											
1989	48,968		48,968	11,986	18,829	233	31,048	2,153											
1990	32,109		32,109	14,635	6,453		21,088	1,011											
1991	20,523		20,523	10,683	6,558		17,241	2,026				676							
1992	23,914		23,914	7,275	5,433		12,708	600				1,585							
1993	33,471		33,471	7,587	11,029		18,616	1,246											
1994	44,729		44,729	18,991	24,274		43,265	2,546											
1995	53,385		53,385	26,677	56,515		83,192	9,298											
1996	71,725		71,725	21,178	52,409		73,587	5,922											
1997	98,765		98,765	50,670	50,744		101,414	8,569											
1998	5,718		5,718	44,351	53,957		98,308	4,259											
1999	133,365		133,365	26,970	92,929		119,899	8,003											
2000	87,793		87,793	21,659	53,447		75,106	6,687											
2001	57,792		57,792	25,082	100,604		125,686	10,865											
2002	45,523		45,523	66,147	397,149		463,296	16,071											
2003	66,476		66,476	88,281	64,764		153,045	9,475											
2004	34,050		34,050	68,232	23,861		92,093	6,365											
[2005]	44,950		44,950	142,283	20,520		162,803	14,824											
[2006]	46,568		46,568	58,017	19,493		77,510	8,422						4,130					

DATA FOR [YEARS IN BRACKETS] ARE PRELIMINARY.
BLANK ENTRY INDICATES THAT TRIBUTARY WAS NOT SURVEYED, OR THAT NO ESTIMATE WAS MADE.

1/ Salmon from the mainstem population that were trapped at Keswick Dam and transported to Coleman National Fish Hatchery (CNFH).
* fish trapped at both Keswick and Anderson-Cottonwood Irriration District dams.

2/ Salmon that entered CNFH and were released back into Battle Creek upstream of the hatchery.

3/ The data source did not provide a breakdown corresponding to this compilation.

LETTER 21

The spawner population was reported only for the entire mainstem from Keswick Dam to Princeton Ferry. Those numbers are Pag[illegible]2 in the Summary , page 5 of Fall Run.

LETTER 21

FALL-RUN CHINOOK SALMON SPAWNER POPULATIONS

SACRAMENTO RIVER SYSTEM : Red Bluff Diversion Dam to Princeton ferry

YEAR	Sacramento River Mainstem: In-river	Sacramento River Mainstem: Transfer to TCFF 1/	Sacramento River Mainstem: TOTAL	TCFF	Salt Cr.	Antelope Cr.	Craig Cr.	Dye Cr.	Mill Cr.	Toomes Cr.	Thomes Cr.	Deer Cr.	Coyote Cr.	Stoney Cr.	Singer Cr.	Big Chico Cr.	Other 2/
1952	a/								16,000			12,000					3,000
1953	a/					4,000			10,000			4,000					700
1954	a/					1,000			7,000			3,000					2,000
1955	a/					900			3,000								600
1956	5,800		5,800			327			896	5		120					1,500
1957	12,200		12,200			838		25	5,316		25	2,195				50	800
1958	20,600		20,600			400			4,340			1,300					2,200
1959	9,900		9,900						837			10					1,500
1960	14,000		14,000			250			940			800					
1961	9,400		9,400						1,689								
1962	8,500		8,500			800			4,384			2,000					
1963	6,800		6,800			300			1,286			1,249					
1964	5,500		5,500			50			450			100					
1965	1,500		1,500			60			150			200					
1966	3,100		3,100			200			500			100					
1967	9,200		9,200			60			500			60					
1968	11,800		11,800			80			750			270					
1969	17,600		17,600			180		20	1,700	40		750					
1970	5,860		5,860			400			690			500					
1971	22,920	4,741	27,661	295		205		100	980			248					
1972	15,350	1,671	17,021	110	30	275		50	631	25		304			15		
1973	16,599	2,491	19,090	886	43	200	90	153	420	40		676			90		
1974	27,127	2,234	29,361	843		440	140		944		60	640	100				
1975	34,200	1,973	36,173	1,994		90	270		1,208		170	328	160				
1976	36,100	1,882	37,982	1,430		60			245	20		315	160				
1977	44,074	3,146	47,220	1,669		660			318	120		220	200				
1978	45,921	2,085	48,006	2,052					300			90					
1979	64,932	53	64,985	2,456					810			780					
1980	28,413	175	28,588	1,865					320		151	210					
1981	40,340		40,340	2,384		407	100		1,020		167	820		393			
1982	22,578		22,578	1,225	20	162	90	25	1,290	15		480					
1983	30,751		30,751	1,267	15	60	60	20	200	15		370				500	
1984	17,960		17,960	1,206	30	260	60	50	5,800	50		680			20	200	
1985	42,028		42,028	4,752					3,840			900				25	
1986	38,544		38,544						574			256					
1987	31,120		31,120						282			64					
1988	18,262		18,262						1,487								
1989	10,101		10,101						1,565			358					
1990	16,175		16,175														
1991	10,108		10,108														
1992	8,315		8,315			0			999								
1993	12,760		12,760						1,975			72					
1994	13,817		13,817						1,081			307					
1995	10,549		10,549														
1996	12,361		12,361														
1997	20,531		20,531						478			1,203					
1998	600		600						546			270					
1999	27,827		27,827														
2000	8,895		8,895														
2001	17,360		17,360														
2002	20,167		20,167						2,611								
2003	22,753		22,753						2,426								
2004	9,554		9,554						1,192			300					
[2005]	12,063		12,063						2,426			963					
[2006]	8,900		8,900						1,403			1,905					

DATA FOR [YEARS IN BRACKETS] ARE PRELIMINARY.
BLANK ENTRY INDICATES THAT TRIBUTARY WAS NOT SURVEYED, OR THAT NO ESTIMATE WAS MADE.

1/ Salmon from the mainstem population that were trapped at Red Bluff Diversion Dam and transported to Tehama-Colusa Fish Facility (TCFF).

2/ Miscellaneous small tributaries; the data source did not provide a breakdown corresponding to this compilation. NOTE: The number of fish listed may include those for tributaries from Keswick Dam to RBDD.

LETTER 21

a/ The spawner population was reported only for the entire mainstem from Keswick Dam to Princeton Bridge. Those numbers are only included in the Summary , page 5 of Fall Run.

LETTER 21

FALL-RUN CHINOOK SALMON SPAWNER POPULATIONS

SACRAMENTO RIVER SYSTEM : Princeton Ferry to Sacramento

YEAR	Butte Cr.	Feather River			Yuba River	Bear River	Dry Cr.	American River			Natomas Drain.
		Feather R. Hatchery	In-river	TOTAL				Nimbus Hatchery	In-river	TOTAL	
1952									25,000	**25,000**	
1953			28,000	28,000	6,000				28,000	**28,000**	
1954			68,000	68,000	5,000				29,000	**29,000**	
1955			86,000	86,000	2,000			8,000	9,000	**17,000**	
1956			18,200	18,200	5,000			1,537	4,900	**6,437**	
1957			10,750	10,750	1,205			875	6,832	**7,707**	
1958			34,650	34,650	7,900			9,571	17,300	**26,871**	
1959			80,150	80,150	10,000			13,243	17,900	**31,143**	
1960			83,300	83,300	20,400			29,166	25,200	**54,366**	
1961			43,700	43,700	9,200			14,309	11,200	**25,509**	
1962			19,050	19,050	34,300			12,653	14,400	**27,053**	
1963			33,900	33,900	37,000			3,211	37,810	**41,021**	460
1964		5,952 a/	32,400	38,352	34,900			20,671	38,500	**59,171**	1,000
1965	0	3,635 a/	19,600	23,235	10,200			13,569	25,000	**38,569**	200
1966	0	1,850 a/	19,000	20,850	7,800			8,096	18,600	**26,696**	
1967		1,856	10,100	11,956	23,500			5,147	18,000	**23,147**	
1968		5,944	12,200	18,144	7,000			5,233	26,100	**31,333**	100
1969		4,378	56,200	60,578	5,230			3,065	44,200	**47,265**	
1970		3,355	58,170	61,525	13,830			8,629	28,680	**37,309**	
1971	615	3,541	43,500	47,041	5,650			10,110	41,680	**51,790**	
1972	450	3,635	43,200	46,835	9,258			7,042	17,459	**24,501**	
1973		8,477	65,100	73,577	24,119			12,535	82,242	**94,777**	
1974	200	5,248	60,518	65,766	17,809			8,200	53,596	**61,796**	
1975	1,000	5,265	37,735	43,000	5,641			7,412	32,132	**39,544**	
1976	640	5,198	56,802	62,000	3,779			5,215	23,159	**28,374**	
1977		8,784	37,668	46,452	8,722			6,868	41,605	**48,473**	
1978	20	4,759	33,000	37,759	7,416			8,162	12,929	**21,091**	
1979		4,090	28,415	32,505	12,430			10,351	37,315	**47,666**	
1980		3,690	31,605	35,295	12,406			15,543	34,259	**49,802**	
1981		8,282	44,738	53,020	14,025			20,593	43,462	**64,055**	
1982		7,563	47,956	55,519	39,367			10,898	33,000	**43,898**	
1983	1,000	7,699	22,823	30,522	13,756		500	8,900	26,400	**35,300**	
1984		9,288	41,769	51,057	9,665	300		12,249	27,447	**39,696**	
1985	100	5,811	50,191	56,002	13,042		25	9,093	56,120	**65,213**	
1986		8,628	46,843	55,471	19,328			5,695	49,372	**55,067**	
1987		10,108	67,738	77,846	18,518			6,258	39,885	**46,143**	
1988		6,480	42,556	49,036	9,000			8,625	24,889	**33,514**	
1989		7,578	40,541	48,119	7,622			9,741	19,183	**28,924**	
1990		6,126		**6,126**				4,850	5,389	**10,239**	
1991		10,717	31,345	42,062	14,008			7,128	18,083	**25,211**	
1992		16,440	24,105	40,545	6,362			6,456	4,811	**11,267**	
1993		11,991	30,923	42,914	6,703			10,656	28,754	**39,410**	
1994		15,202	38,382	53,584	10,890			8,567	31,520	**40,087**	
1995	445	12,149	59,912	72,061	14,237			6,498	80,330	**86,828**	
1996	500	8,107	57,170	65,277	27,900			7,651	74,745	**82,396**	
1997	800	15,128	50,547	65,675	25,948			5,650	52,195	**57,845**	
1998	500	18,889	--	18,889	31,090			11,788	54,792	**66,580**	
1999		12,927	--	12,927	24,230			9,760	55,339	**65,099**	
2000		18,146	114,717	132,863	14,995			11,160	99,059	**110,219**	
2001	4,430	24,870	178,645	203,515	23,392			11,750	135,384	**147,134**	
2002	4,550	20,507	105,163	125,670	24,051			9,817	124,252	**134,069**	
2003	3,310	14,976	89,946	104,922	28,316			14,887	163,742	**178,629**	
2004	2,516	21,297	54,171	75,468	15,269			26,400	99,230	**125,630**	
[2005]	4,255	22,201	49,160	71,361	15,048			22,349	62,679	**85,028**	
[2006]	1,920	11,581	81,700	93,281	8,127			8,728	21,000	**29,728**	

SAN JOAQUIN RIVER SYSTEM : Tributaries

YEAR	Cosumnes River	Mokelumne River			Stanislaus River	Tuolumne River	Merced River		
		MRFI 1/	In-river	TOTAL			MRFF 2/	In-river	TOTAL
1952			2,000	2,000	10,000	10,000			
1953	2,000		2,000	2,000	35,000	45,000			
1954	5,000		4,000	4,000	22,000	40,000		4,000	**4,000**
1955	2,000		2,000	2,000	7,000	20,000			
1956	1,200		474	474	5,000	5,500			
1957	142		2,400	2,400	4,090	8,170		380	**380**
1958	600		7,579	7,579	5,700	32,500		500	**500**
1959			2,106	2,106	4,300	45,900		400	**400**
1960	1,400		2,205	2,205	8,300	45,000		350	**350**
1961			137	137	1,900	500		50	**50**
1962	900		230	230	315	250		60	**60**
1963	1,500		481	481	200	100		20	**20**
1964	2,200	362	1,848	2,210	3,700	2,100		35	**35**
1965	800	173	1,127	1,300	2,231	3,200		90	**90**
1966	600	480	209	689	2,872	5,100		45	**45**
1967	500	250	2,750	3,000	11,885	6,800		600	**600**
1968	1,500	954	753	1,707	6,385	8,600		550	**550**
1969	4,400	615	2,070	2,685	12,327	32,200		600	**600**
1970	600	548	4,452	5,000	9,297	18,400	100	4,700	**4,800**
1971	500	925	4,275	5,200	13,621	21,885	200	3,451	**3,651**
1972	1,600	352	750	1,102	4,298	5,100	120	2,528	**2,648**
1973	900	407	2,193	2,600	1,234	1,989	375	797	**1,172**
1974	285	222	1,200	1,422	750	1,150	1,000	1,000	**2,000**
1975	725	399	1,501	1,900	1,200	1,600	700	1,700	**2,400**
1976		18	455	473	600	1,700	700	1,200	**1,900**
1977		0	250	250	0	450	661 a.	350	**1,011**
1978	100	486	600	1,086	50	1,300	100	525	**625**
1979	150	507	1,000	1,507	110	1,183	227	1,920	**2,147**
1980	200	639	2,592	3,231	100	559	157	2,849	**3,006**
1981			4,954	4,954	1,000	14,253	924	9,491	**10,415**
1982		2,677	6,695	9,372		7,126	189	3,074	**3,263**
1983	200	4,568	11,293	15,861	500	14,836	1,795	16,453	**18,248**
1984	1,000		8,298	8,298	11,439	13,689	2,109	27,640	**29,749**
1985	220	223	7,459	7,682	13,473	40,322	1,211	14,841	**16,052**
1986		1,913	5,254	7,167	6,497	7,404	650	6,789	**7,439**
1987	0	630	1,000	1,630	6,292	14,751	958	3,168	**4,126**
1988	100	128	400	528	10,212	5,779	457	4,135	**4,592**
1989		81	199	280	1,510	1,275	82	345	**427**
1990		68	429	497	480	96	46	36	**82**
1991		42	368	410	394	77	41	78	**119**
1992		710	935	1,645	255	132	368	618	**986**
1993		2,164	993	3,157	677	471	409	1,269	**1,678**
1994		1,919	1,238	3,157	1,031	506	943	2,646	**3,589**
1995		3,323	2,194	5,517	619	827	602	2,320	**2,922**
1996		3,883	4,038	7,921	168	4,362	1,141	3,291	**4,432**
1997		6,494	3,681	10,175	5,588	7,146	946	2,714	**3,660**
1998	300	3,091	4,122	7,213	3,087	8,910	799	3,292	**4,091**
1999		3,150	2,183	5,333	4,349	8,232	1,637	3,129	**4,766**
2000		5,450	1,973	7,423	8,498	17,873	1,946	11,130	**13,076**
2001		5,728	2,307	8,035	7,033	8,782	1,663	9,181	**10,844**
2002		7,913	2,840	10,753	7,787	7,173	1,840	8,866	**10,706**
2003		8,117	2,122	10,239	5,902	2,163	549	2,530	**3,079**
2004		10,356	1,588	11,944	4,015	1,984	3,270	1,050	**4,320**
[2005]		5,738	10,406	16,144	1,429	500	421	2,500	**2,921**
[2006]		4,116	1,723	5,839	3,022	500	150	2,000	**2,150**

DATA FOR [YEARS IN BRACKETS] ARE PRELIMINARY.
BLANK ENTRY INDICATES THAT TRIBUTARY WAS NOT SURVEYED, OR THAT NO ESTIMATE WAS MADE.

a/ Fish were transferred to upstream of Oroville dam.

1/ Mokelumne River Hatchery.

2/ Merced River Hatchery.

a/ Consists of fish that were trapped in the San Joaquin River mainstem. Only 389 of these were actually

transported to the hatchery spawning channel.

FALL-RUN CHINOOK SALMON SPAWNER POPULATIONS

SACRAMENTO RIVER SYSTEM : SUMMARY

	Keswick Dam to Red Bluff Diversion Dam				Red Bluff Diversion Dam to Princeton Ferry				Princeton Ferry to Sacramento		
		In-river				In-river				In-river	
YEAR	CNFF 1/	Mainstem	Tributaries	TOTAL	TCFF 2/	Mainstem	Tributaries	TOTAL	Hatcheries 3/	Tributaries	TOTAL
1952	11,000	7,000 a/	4,000	22,000		b/	31,000 c/	31,000		25,000	25,000
1953	12,000	8,000 a/	12,300	32,300		b/	18,700 c/	18,700		62,000	62,000
1954	8,000	6,000 a/	13,000	27,000		b/	13,000 c/	13,000		102,000	102,000
1955	10,000	6,000 a/	18,800	34,800		b/	4,500 c/	4,500	8,000	97,000	105,000
1956	7,458	87,357	21,500	116,315		5,800	2,848 c/	8,648	1,537	28,100	29,637
1957	3,045	54,989	3,853	61,887		12,200	9,249 c/	21,449	875	18,787	19,662
1958	14,643	107,153	20,530	142,326		20,600	8,240 c/	28,840	9,571	59,850	69,421
1959	10,833	256,700	25,120	292,653		9,900	2,347 c/	12,247	13,243	108,050	121,293
1960	9,605	218,940	16,160	244,705		14,000	1,990	15,990	29,166	128,900	158,066
1961	8,156	140,181	13,200	161,537		9,400	1,689	11,089	14,309	64,100	78,409
1962	4,857	127,837	21,100	153,794		8,500	7,184	15,684	12,653	67,750	80,403
1963	5,114	138,881	25,900	169,895		6,800	2,835	9,635	3,211	109,170	112,381
1964	3,875	142,584	19,000	165,459		5,500	600	6,100	26,623	106,800	133,423
1965	3,194	101,876	10,785	115,855		1,500	410	1,910	17,204	55,000	72,204
1966	900	111,881	14,500	127,281		3,100	800	3,900	9,946	45,400	55,346
1967	3,050	82,490	3,680	89,220		9,200	620	9,820	7,003	51,600	58,603
1968	3,526	98,429	20,140	122,095		11,800	1,100	12,900	11,177	45,400	56,577
1969	2,626	115,652	16,537	134,815		17,600	2,690	20,290	7,443	105,630	113,073
1970	3,512	65,142	8,628	77,282		5,860	1,590 c/	7,450	11,984	100,680	112,664
1971	2,004	53,888	3,285	59,177	295	27,661	1,828	29,784	13,651	91,445	105,096
1972	2,822	33,958	2,030	38,810	110	17,021	1,440	18,571	10,677	70,367	81,044
1973	3,835	41,129	4,300	49,264	886	19,090	2,598	22,574	21,012	171,461	192,473
1974	1,607	47,019	2,294	50,920	843	29,361	3,167	33,371	13,448	132,123	145,571
1975	2,431	53,129	2,426	57,986	1,994	36,173	4,220	42,387	12,677	76,508	89,185
1976	2,297	45,753	7,480	55,530	1,430	37,982	2,230	41,642	10,413	84,380	94,793
1977	5,244	16,176	8,478	29,898	1,669	47,220	3,187	52,076	15,652	87,995	103,647
1978	1,882	32,235	2,950	37,067	2,052	48,006	2,442	52,500	12,921	53,365	66,286
1979	8,729	47,758	4,430	60,917	2,456	64,985	4,046	71,487	14,441	78,160	92,601
1980	9,503	21,961	4,940	36,404	1,865	28,588	2,546	32,999	19,233	78,270	97,503
1981	10,272	29,212	13,422	52,906	2,384	40,340	5,291	48,015	28,875	102,225	131,100
1982	19,525	17,966	8,785	46,276	1,225	22,578	3,307	27,110	18,461	120,323	138,784
1983	8,756	26,226	6,327	41,309	1,267	30,751	2,507	34,525	16,599	64,479	81,078
1984	21,581	36,965	13,152	71,698	1,206	17,960	8,356	27,522	21,537	79,181	100,718
1985	16,320	52,120	24,188	92,628	4,752	42,028	9,517	56,297	14,904	119,478	134,382
1986	12,481	68,821	18,771	100,073		38,544	830	39,374	14,323	115,543	129,866
1987	16,256	76,562	7,993	100,811		31,120	346	31,466	16,366	126,141	142,507
1988	13,615	63,998	58,313	135,926		18,262	1,487	19,749	15,105	76,445	91,550
1989	11,986	48,968	21,215	82,169		10,101	1,923	12,024	17,319	67,346	84,665
1990	14,635	32,109	7,464	54,208		16,175		16,175	10,976	5,389	16,365
1991	10,683	20,523	9,260	40,466		10,108		10,108	17,845	63,436	81,281
1992	7,275	23,914	7,618	38,807		8,315	999	9,314	22,896	35,278	58,174
1993	7,587	33,471	12,275	53,333		12,760	2,047	14,807	22,647	66,380	89,027
1994	18,991	44,729	26,820	90,540		13,817	1,388	15,205	23,769	80,792	104,561
1995	26,677	53,385	65,813	145,875		10,549		10,549	18,647	154,924	173,571
1996	21,178	71,725	58,331	151,234		12,361		12,361	15,758	160,315	176,073
1997	50,670	98,765	59,313	208,748		20,531	1,681	22,212	20,778	129,490	150,268
1998	44,351	5,718	58,216	108,285		600	816	1,416	30,677	86,382	117,059
1999	26,970	133,365	100,932	261,267		27,827		27,827	22,687	79,569	102,256
2000	21,659	87,793	60,134	169,586		8,895		8,895	29,306	228,771	258,077
2001	25,082	57,792	111,469	194,343		17,360		17,360	36,620	341,851	378,471
2002	66,147	45,523	413,220	524,890		20,167	2,611	22,778	30,324	258,016	288,340
2003	88,281	66,476	74,239	228,996		22,753	2,426	25,179	29,863	285,314	315,177
2004	68,232	34,050	30,226	132,508		9,554	1,492	11,046	47,697	171,186	218,883
[2005]	142,283	44,950	35,344	222,577		12,063	3,389	15,452	44,550	131,142	175,692
[2006]	58,017	46,568	32,045	136,630		8,900	3,308	12,208	20,309	112,747	133,056

1/ Coleman National Fish Hatchery.

2/ Tehama-Colusa Fish Facility.

3/ Feather River and Nimbus Hatcheries.

a/ Salmon from the mainstem population that were trapped at Keswick Dam and transported to CNFF. For these years, the mainstem population was reported only for the entire reach from Keswick to Princeton.

b/ The spawner population was reported only for the entire mainstem from Keswick Dam to Princeton Ferry.

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c/ The number may include fish for tributaries from Keswick Dam to RBDD. Pa 2

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FALL-RUN CHINOOK SALMON SPAWNER POPULATIONS

CENTRAL VALLEY RIVER SYSTEMS : SUMMARY

YEAR	Sacramento River System				San Joaquin River System			Sacramento and San Joaquin River Systems			YEAR
	Hatcheries 1/	In-river Mainstem	In-river Tributaries	TOTAL	Hatcheries 2/	In-river Tributaries	TOTAL	Hatcheries	In-river	TOTAL	
1952	11,000	267,000	60,000	338,000		22,000	22,000	11,000	349,000	360,000	1952
1953	12,000	408,000	93,000	513,000		84,000	84,000	12,000	585,000	597,000	1953
1954	8,000	276,000	128,000	412,000		75,000	75,000	8,000	479,000	487,000	1954
1955	18,000	231,000	120,300	369,300		31,000	31,000	18,000	382,300	400,300	1955
1956	8,995	93,157	52,448	154,600		12,174	12,174	8,995	157,779	166,774	1956
1957	3,920	67,189	31,889	102,998		15,182	15,182	3,920	114,260	118,180	1957
1958	24,214	127,753	88,620	240,587		46,879	46,879	24,214	263,252	287,466	1958
1959	24,076	266,600	135,517	426,193		52,706	52,706	24,076	454,823	478,899	1959
1960	38,771	232,940	147,050	418,761		57,255	57,255	38,771	437,245	476,016	1960
1961	22,465	149,581	78,989	251,035		2,587	2,587	22,465	231,157	253,622	1961
1962	17,510	136,337	96,034	249,881		1,755	1,755	17,510	234,126	251,636	1962
1963	8,325	145,681	137,905	291,911		2,301	2,301	8,325	285,887	294,212	1963
1964	30,498	148,084	126,400	304,982	362	9,883	10,245	30,860	284,367	315,227	1964
1965	20,398	103,376	66,195	189,969	173	7,448	7,621	20,571	177,019	197,590	1965
1966	10,846	114,981	60,700	186,527	480	8,826	9,306	11,326	184,507	195,833	1966
1967	10,053	91,690	55,900	157,643	250	22,535	22,785	10,303	170,125	180,428	1967
1968	14,703	110,229	66,640	191,572	954	17,788	18,742	15,657	194,657	210,314	1968
1969	10,069	133,252	124,857	268,178	615	51,597	52,212	10,684	309,706	320,390	1969
1970	15,496	71,002	110,898	197,396	648	37,449	38,097	16,144	219,349	235,493	1970
1971	15,950	81,549	96,558	194,057	1,125	43,732	44,857	17,075	221,839	238,914	1971
1972	13,609	50,979	73,837	138,425	472	14,276	14,748	14,081	139,092	153,173	1972
1973	25,733	60,219	178,359	264,311	782	7,113	7,895	26,515	245,691	272,206	1973
1974	15,898	76,380	137,584	229,862	1,222	4,385	5,607	17,120	218,349	235,469	1974
1975	17,102	89,302	83,154	189,558	1,099	6,726	7,825	18,201	179,182	197,383	1975
1976	14,140	83,735	94,090	191,965	718	3,955	4,673	14,858	181,780	196,638	1976
1977	22,565	63,396	99,660	185,621	661	1,050	1,711	23,226	164,106	187,332	1977
1978	16,855	80,241	58,757	155,853	586	2,575	3,161	17,441	141,573	159,014	1978
1979	25,626	112,743	86,636	225,005	734	4,363	5,097	26,360	203,742	230,102	1979
1980	30,601	50,549	85,756	166,906	796	6,300	7,096	31,397	142,605	174,002	1980
1981	41,531	69,552	120,938	232,021	924	29,698	30,622	42,455	220,188	262,643	1981
1982	39,211	40,544	132,415	212,170	2,866	16,895	19,761	42,077	189,854	231,931	1982
1983	26,622	56,977	73,313	156,912	6,363	43,282	49,645	32,985	173,572	206,557	1983
1984	44,324	54,925	100,689	199,938	2,109	62,066	64,175	46,433	217,680	264,113	1984
1985	35,976	94,148	153,183	283,307	1,434	76,315	77,749	37,410	323,646	361,056	1985
1986	26,804	107,365	135,144	269,313	2,563	25,944	28,507	29,367	268,453	297,820	1986
1987	32,622	107,682	134,480	274,784	1,588	25,211	26,799	34,210	267,373	301,583	1987
1988	28,720	82,260	136,245	247,225	585	20,626	21,211	29,305	239,131	268,436	1988
1989	29,305	59,069	90,484	178,858	163	3,329	3,492	29,468	152,882	182,350	1989
1990	25,611	48,284	12,853	86,748	114	1,041	1,155	25,725	62,178	87,903	1990
1991	28,528	30,631	72,696	131,855	83	917	1,000	28,611	104,244	132,855	1991
1992	30,171	32,229	43,895	106,295	1,078	1,940	3,018	31,249	78,064	109,313	1992
1993	30,234	46,231	80,702	157,167	2,573	3,410	5,983	32,807	130,343	163,150	1993
1994	42,760	58,546	109,000	210,306	2,862	5,421	8,283	45,622	172,967	218,589	1994
1995	45,324	63,934	220,737	329,995	3,925	5,960	9,885	49,249	290,631	339,880	1995
1996	36,936	84,086	218,646	339,668	5,024	11,859	16,883	41,960	314,591	356,551	1996
1997	71,448	119,296	190,484	381,228	7,440	19,129	26,569	78,888	328,909	407,797	1997
1998	75,028	6,318	145,414	226,760	3,890	19,711	23,601	78,918	171,443	250,361	1998
1999	49,657	161,192	180,501	391,350	4,787	17,893	22,680	54,444	359,586	414,030	1999
2000	50,965	96,688	288,905	436,558	7,396	39,474	46,870	58,361	425,067	483,428	2000
2001	61,702	75,152	453,320	590,174	7,391	27,303	34,694	69,093	555,775	624,868	2001
2002	96,471	65,690	673,847	836,008	9,753	26,666	36,419	106,224	766,203	872,427	2002
2003	118,144	89,229	361,979	569,352	8,666	12,717	21,383	126,810	463,925	590,735	[2003
2004	115,929	43,604	202,904	362,437	13,626	8,637	22,263	129,555	255,145	384,700	2004
[2005]	186,833	57,013	169,875	413,721	6,159	14,835	20,994	192,992	241,723	434,715	[2005]
[2006]	78,326	55,468	148,100	281,894	4,266	7,245	11,511	82,592	210,813	293,405	[2006]

1/ Coleman National Fish Hatchery, Tehama-Clousa Fish Facility, and Feather River and Nimbus Hatcheries.

2/ Mokelumne River Fish Installation and Merced River Fish Facility.

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LATE-FALL-RUN CHINOOK SALMON POPULATIONS: Sacramento River System

YEAR	Sacramento River Mainstem						Battle Creek			Clear Creek	Cotton-wood Cr.	Salt Cr.	Craig Cr.	Feather River			TOTAL for RUN
	Upstream of RBDD 1/			Downstream of RBDD													
	In-river 2/	CNFF 3/	TOTAL	TCFF 4/	In-river	TOTAL	In-river	CNFH	TOTAL					In-river	Hatchery	TOTAL	
1971	16,741	–	16,741														16,741
1972	31,559	–	31,559														31,559
1973	21,781	–	21,781														21,781
1974	5,446	637	6,083														6,083
1975	18,324	937	19,261														19,261
1976	15,814	94	15,908														15,908
1977	8,678	532 *	9,210					914	914			245					10,369
1978	11,767	712	12,479														12,479
1979	9,572	712	10,284														10,284
1980	8,347	746	9,093														9,093
1981	6,423	148	6,571					147	147								6,718
1982	3,734	247	3,981					43	43	875				1,598	402	2,000	6,899
1983	14,437	547 **	14,984					105	105								15,089
1984	6,205	335 **	6,540		3,098	3,098				200	400		150				10,388
1985	7,929	207	8,136		1,863	1,863		181	181								10,180
1986	7,229	591	7,820		284	284		197	197								8,301
1987	15,768	454	16,222					349	349								16,571
1988	12,103	404	12,507		658	658		53	53								13,218
1989	11,990	817	12,807		0	0		65	65								12,872
1990	6,792	100	6,892		1,094	1,094		92	92								8,078
1991	6,493	118	6,611		1,491	1,491		161	161								8,263
1992	8,958	398	9,356		431	431		344	344								10,131
1993	339	400	739					528	528								1,267
1994	137	154	291					598	598								889
1995	–	166	166					323	323								489
1996	–	48	48					1,337	1,337								1,385
1997	–		–					4,578	4,578								4,578
1998	38,239 a/		38,239		1,101	1,101		3,079	3,079								42,419
1999	8,683 b/		8,683					7,075	7,075								15,758
2000	8,632 a/		8,632		119	119		4,194	4,194								12,945
2001	18,351 a/		18,351		925	925		3,327	3,327								22,603
2002	36,004 a/		36,004		0	0		2,669	2,669								38,673
2003	5,346 a/		5,346		148	148		2,797	2,797								8,291
2004	8,824 a/		8,824		0	0		5,040	5,040								13,864
[2005]	9,493	77	9,570		1,031	1,031		6,434	6,434								17,035
[2006]	14,168 a/		14,168		3,855	3,855		5,111	5,111								23,134

DATA FOR [YEARS IN BRACKETS] ARE PRELIMINARY.

BLANK ENTRY INDICATES THAT TRIBUTARY WAS NOT SURVEYED, OR THAT NO ESTIMATE WAS MADE.

1/ Red Bluff Diversion Dam.
2/ Includes numbers of fish for tributaries where estimates were not made.
3/ Transferred to Coleman National Fish Hatchery from Keswick Dam (unless otherwise noted).
* Fish transferred from RBDD.
** Total fish transferred from both Keswick Dam and RBDD.
4/ Transferred to Tehama-Colusa Fish Facility from RBDD.

a/ Mainstem in-river estimates based on carcass surveys, all others based on Red Bluff Diversion Dam counts.

b/ Est[illegible] only for the area covered in the carcass survey. Other estimates based on carcass [illegible]s were expanded using aerial redd counts.

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California Dept. of Fish & Game
Native Anadromous Fish & Watershed Branch

GrandTab
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WINTER-RUN CHINOOK SALMON: Sacramento-San Joaquin River System

SACRAMENTO RIVER SYSTEM

YEAR	Mainstem Sacramento River: In-river Spawners: Upstream of RBDD 2/	Mainstem Sacramento River: In-river Spawners: Downstream of RBDD 3/	Mainstem Sacramento River: In-river Spawners: Total In-river	Hatchery Transfers 1/: Coleman NFH	Hatchery Transfers 1/: Livingston Stone NFH	Battle Creek 4/	Total RUN for System 5/
1970	40,409		40,409				40,409
1971	53,089		53,089				53,089
1972	35,929		35,929				37,133
1973	22,651		22,651				24,079
1974	21,389		21,389				21,897
1975	22,579		22,579				23,430
1976	33,029		33,029				35,096
1977	16,470		16,470				17,214
1978	24,735		24,735				24,862
1979	2,339		2,339				2,364
1980	1,142		1,142				1,156
1981	19,795	2,756	22,551				22,797
1982	1,233	39	1,272				1,281
1983	1,827		1,827				1,831
1984	2,662		2,662				2,663
1985	3,686	1,445	5,131				5,407
1986	2,566		2,566				2,596
1987	2,068	97	2,165				2,185
1988	2,129	728	2,857				2,878
1989	635	14	649	42			696
1990	384	28	411	14			429
1991	177	0	177	33			211
1992	1,159	44	1,203	34			1,240
1993	369	9	378				387
1994	144	0	144	42			186
1995	1,159	7	1,166	43		88	1,297
1996	1,012	0	1,012			325	1,337
1997	836	0	836			44	880
1998	2,831	72	2,903		99		3,002
1999	3,264	0	3,264		24		3,288
2000	1,263	0	1,263		89		1,352
2001	8,085	35	8,120		104		8,224
2002	7,348	12	7,360		104		7,464
2003	8,105	28	8,133		85		8,218
2004	7,784	0	7,784		85		7,869
[2005]	15,730	0	15,730		109	0	15,839
[2006]	17,153	52	17,205	5	93	31	17,334

SAN JOAQUIN RIVER SYSTEM

YEAR	Calaveras River
1970	
1971	
1972	
1973	
1974	
1975	500
1976	500
1977	
1978	150
1979	
1980	
1981	
1982	
1983	
1984	100
1985	
1986	
1987	
1988	
1989	
1990	
1991	
1992	
1993	
1994	
1995	
1996	
1997	
1998	
1999	
2000	
2001	
2002	
2003	
2004	
[2005]	0
[2006]	0

TOTAL RUN FOR CENTRAL VALLEY

YEAR	TOTAL RUN FOR CENTRAL VALLEY
1970	40,409
1971	53,089
1972	37,133
1973	24,079
1974	21,897
1975	23,930
1976	35,596
1977	17,214
1978	25,012
1979	2,364
1980	1,156
1981	22,797
1982	1,281
1983	1,831
1984	2,763
1985	5,407
1986	2,596
1987	2,185
1988	2,878
1989	696
1990	429
1991	211
1992	1,240
1993	387
1994	186
1995	1,297
1996	1,337
1997	880
1998	3,002
1999	3,288
2000	1,352
2001	8,224
2002	7,464
2003	8,218
2004	7,869
[2005]	15,839
[2006]	17,334

SACR. RIVER MAINSTEM WINTER-RUN SALMON DATA 1/

YEAR	Number of Fish Passing RBDD 3/	Number of Fish Harvested 4/	Redd Distribution 2/: Upstream of RBDD	Redd Distribution 2/: Downstream of RBDD
1970	40,409			
1971	53,089			
1972	37,133	1,204		
1973	24,079	1,428		
1974	21,897	508		
1975	23,430	851		
1976	35,096	2,067		
1977	17,214	744		
1978	24,862	127		
1979	2,364	25		
1980	1,156	14		
1981	20,041	246	87.8%	12.2%
1982	1,242	9	97.0%	3.0%
1983	1,831	4		
1984	2,663	1		
1985	3,962	276	71.8%	28.2%
1986	2,596	30		
1987	2,088	20	95.5%	4.5%
1988	2,150	21	74.5%	25.5%
1989	682	5	97.9%	2.1%
1990	402	4	93.3%	6.7%
1991	211	1	100.0%	0.0%
1992	1,196	3	96.4%	3.6%
1993	378	9	97.7%	2.3%
1994	186	0	100.0%	0.0%
1995	1,290	0	99.4%	0.6%
1996	1,337	0	100.0%	0.0%
1997	880	0	100.0%	0.0%
1998	2,930	0	97.5%	2.5%
1999	3,288	0	100.0%	0.0%
2000	1,352	0	100.0%	0.0%
2001	5,499	0	99.6%	0.4%
2002	9,157	0	99.8%	0.2%
2003	9,724	0	99.7%	0.3%
2004	7,192	0	100.0%	0.0%
[2005]	5,299	0	100.0%	0.0%
[2006]	7,415	0	99.7%	0.3%

DATA FOR [YEARS IN BRACKETS] ARE PRELIMINARY.

BLANK ENTRY INDICATES THAT MONITORING WAS NOT CONDUCTED, OR THAT NO ESTIMATE WAS MADE.

1/ Numbers of fish transferred from Red Bluff Diversion Dam (RBDD) and Keswick Dam to hatcheries.

2/ Upstream mainstem in-river estimates prior to 2001 were based on RBDD counts, subsequent estimates based on carcass surveys. Those numbers using RBDD data are

3/ Downstream mainstem numbers based on upstream estimates and redd distribution.

4/ Fish which passed upstream of Coleman NFH weir.

5/ Consists of those fish for in-river mainstem and tributaries, at hatcheries, and harvested by the sport fishery.

1/ Data used (when appropriate) to determine estimates for mainstem in-river salmon.

2/ Based on aerial surveys of mainstem.

3/ Estimated from fish counts at Red Bluff Diversion Dam (RBDD).

4/ Estiamted fish caught in the sport fishery upstream of RBDD. After 1995, it was assumed that no fish were harvested due to an angling closure for winter-run salmon.

Ca[illegible]a Dept. of Fish & Game
Native Anadromous Fish & Watershed Branch

GrandTab
Updated: 20-Aug-2[illegible]

LETTER 21

SPRING-RUN CHINOOK SALMON POPULATIONS: Sacramento-San Joaquin River System

YEAR	Sacramento River Mainstem: Upstr. of RBDD 1/	Sacramento River Mainstem: Dnstr. of RBDD	Sacramento River Mainstem: TOTAL	Battle Creek	Clear Creek	Cotton-wood Cr.	Antelope Cr.	Mill Cr.	Thomes Cr.	Deer Cr.	Big Chico Cr.	Butte Cr.	Feather River: In-river	Feather River: Hatchery	Feather River: TOTAL	Yuba R.	Calaveras R.	TOTAL for RUN	YEAR
1960	a/							2,368				8,700		a/				11,068	1960
1961	a/							1,245				3,082						4,327	1961
1962	a/							1,692			200	1,750						3,642	1962
1963	a/				0			1,315		2,302	500	6,100	600		600			10,817	1963
1964	a/				0			1,539		2,874	100	600	2,908 b/		2,908			8,021	1964
1965	a/				0						50	1,000	738 b/		738			1,788	1965
1966	a/				0						50	80	297 b/		297			427	1966
1967	a/										150	180		146	146			476	1967
1968	a/				0						175	280		208	208			663	1968
1969	20,000		20,000		0						200	830		348	348			21,378	1969
1970	3,652		3,652					1,500		2,000		285		235	235			7,672	1970
1971	5,830		5,830					1,000		1,500	0	470		481	481			9,281	1971
1972	7,038		7,038					500		400		150		256	256		500	8,844	1972
1973	7,175		7,175					1,700		2,000	50	300		205	205			11,430	1973
1974	3,800		3,800			3		1,500		3,500	100	150		198	198			9,251	1974
1975	10,234		10,234			3		3,500		8,500		650		691	691			23,578	1975
1976	25,095		25,095									46		699	699			25,840	1976
1977	11,545		11,545					460		340	100	100		185	185			12,730	1977
1978	5,669		5,669					925		1,200		128	2	202	204			8,126	1978
1979	2,856		2,856									10		250	250			3,116	1979
1980	9,363	6 c/	9,369					500		1,500		226	400	269	669	200		12,464	1980
1981	20,655		20,655									250	531	469	1,000	200		22,105	1981
1982	23,156		23,156					700		1,500		534	90	1,910	2,000			27,890	1982
1983	3,854	1,793	5,647				59			500		50		1,702	1,702			7,958	1983
1984	7,823		7,823					191			0	23		1,562	1,562			9,599	1984
1985	10,200	2,713	12,913					121		301	0	254		1,632	1,632			15,221	1985
1986	15,948	6,110	22,058					291		543		1,371		1,433	1,433			25,696	1986
1987	10,911	1,460	12,371					90		200		14		1,213	1,213			13,888	1987
1988	9,601	266	9,867					572		371		1,290		6,833	6,833			18,933	1988
1989	5,131	0	5,131	7		0		563		84		1,300		5,078	5,078			12,163	1989
1990	3,896	302	4,198	2				844		496		250		1,893	1,893			7,683	1990
1991	766	59	825			1		319		479				4,303	4,303			5,927	1991
1992	371	0	371				0	237		209		730		1,497	1,497			3,044	1992
1993	391	0	391		1		3	61		259	38	650		4,672	4,672			6,075	1993
1994	862	0	862		0		0	723		485	2	474		3,641	3,641			6,187	1994
1995	349	77	426	66	2	8	7	320		1,295	200	7,500		5,414	5,414			15,238	1995
1996	378		378	34		6	1	253		614	2	1,413		6,381	6,381			9,082	1996
1997	126	2	128				0	202		466	2	635		3,653	3,653			5,086	1997
1998	1,115	0	1,115		47	477	154	424	1	1,879	369	20,259		6,746	6,746			31,471	1998
1999				70		102	40	560		1,591	27	3,679		3,731	3,731			9,800	1999
2000	71	0	71	40	19	122	9	544		637	27	4,118		3,657	3,657			9,244	2000
2001	711	25	736			245	8	1,100		1,622	39	9,605		4,135	4,135	108		17,598	2001
2002	273	0	273	144	66	125	46	1,594	2	2,185	0	8,785		4,189	4,189			17,409	2002
2003		0	0	94	25	73	46	1,426		2,759	81	4,398		8,662	8,662			17,564	2003
2004	394	0	394	66	98	17	3	998		804	0	7,390		4,212	4,212			13,982	2004
[2005]	0	30	30	80	69	47	82	1,150		2,239	37	10,625		1,771	1,771			16,130	[2005]
[2006]	0	0	0	177	70	55	102	1,002		2,432	299	4,579		1,952	1,952			10,668	[2006]

DATA FOR [YEARS IN BRACKETS] ARE PRELIMINARY.

BLANK ENTRY INDICATES THAT TRIBUTARY WAS NOT SURVEYED, OR THAT NO ESTIMATE WAS MADE.

1/ Red Bluff Diversion Dam.

a/ Estimated numbers are included with fall-run fish.
b/ Fish were transferred to upstream of Oroville Dam.
c/ Only fish taken into Tehama-Colusa Fish Facility.

Attachment 20

LETTER 21

SAN FRANCISCO Estuary & Watershed SCIENCE

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CENTRAL VALLEY SALMON

A Perspective on Chinook and Steelhead in the Central Valley of California

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CHAPTER 10

THE ESTUARY

We must remember that in the past 120 years, the Delta has changed from a vast tidal marsh to a series of 40 large flat-farmed islands. The old tidal creek channels have been dredged into some 900 miles of navigable waterways. ... Surprisingly enough, a significant wildlife resource remains. It is a far different resource, made up to a very great extent of introduced species dependent on an unnatural environment that man has been changing drastically for a hundred years.

Resources Agency of California (1964:1)

The most efficient and effective way to increase juvenile abundance would be to increase survival during outmigration to the ocean, particularly during passage through the Sacramento-San Joaquin Delta. ... Any improvements in delta survival would benefit natural production at a life stage when natural mortality is not density dependent and would result in a commensurate increase in adults if ocean survival is independent of freshwater survival. *SRFCRT 1994:1*

The notion of independent limiting factors to salmon production stems from a traditional agricultural approach to resource management. From this perspective, the estuary was viewed as a hazardous environment where numerous predators or competitors must be controlled to ensure efficient salmon production. This perspective provided little information about the estuarine habitats that salmon need or the processes that link freshwater, estuarine, and marine habitats. A fundamental impediment to salmon and estuary recovery, therefore, is the lack of an explicit conceptual framework to explain the evolutionary and ecological requirements of diverse salmon populations.

Bottom et al. 2005:iv

Many if not most salmon studies in the Central Valley in recent decades concern the passage of larger juveniles through the Delta, or the effects on salmon of the Delta pumps. Most of these studies reflect the view, expressed in the quotation above by the Sacramento River Fall Chinook Review Team, that for salmon the Delta is something to be got through. This view is widespread (Bottom et al. 2005), and in the Central Valley probably has been reinforced by the extensive modification of the Delta and the loss of tidal wetlands there. In contrast to the Delta, there has been little study of juvenile salmon in the bays until a recent effort by NOAA Fisheries that is still in progress, although results from the first year are described in MacFarlane and Norton (2002). This chapter reviews studies of the use of estuaries elsewhere by Chinook and steelhead, and then studies their occurrence of the Delta and of their survival passing through it. There is also information on the growth of juvenile Chinook in the estuary and the timing of their migrations through it in chapters 5 and 6.

The use of estuaries by Chinook and steelhead

The importance of estuaries for Chinook salmon has long been recognized. In the first major publication on salmon in the Central Valley, Rutter (1904; 71) observed that "The quinnat

[Chinook] salmon is found throughout the Pacific coast from Monterey Bay northward, but is less abundant north of Puget Sound. At spawning time it frequents the larger streams, especially those with estuaries." Rutter's associate, N. B. Scofield, monitored the movement of juvenile Chinook into the Delta at Georgiana Slough from January through May, 1899, as discussed in Ch. 6. Rutter knew that very young fry were sometimes found in brackish estuaries, and learned by experiments at the "Hopkins Seaside Laboratory" that even alevins tolerate brackish water: at six days post-hatch alevins can live in 25% seawater, and at 40 days in 50% seawater (Rutter 1904). Rich (1920:51) found from studies of scales of juvenile Chinook in the Columbia River that "The effect of migration into the brackish water of estuary is to decidedly stimulate the growth."

Estuaries are highly variable, as are Chinook life history patterns, so it is not surprising that the use of estuaries by Chinook is also highly variable, as found by Rich (1920) and subsequent workers. Generally, it appears that the importance of estuaries to Chinook varies inversely with the size of the fish reaching the estuary; stream-type Chinook that rear for a year in freshwater spend little time there, but ocean-type Chinook that migrate to the estuary directly after emergence depend on the estuary for rearing habitat, and may spend considerable time there (Healey 1991). For example, Healey (1980) estimated that fry migrants stay as long as 60 days in the Nanaimo River estuary, and tagged hatchery fry remained in the Delta for up to 64 days (Kjelson et al. 1982). Fry migrants initially tend to occupy shallow habitats, often moving far up into tidal wetlands with high tides, but move into deeper water as they grow; Chinook that rear in the river for several months before emigrating rapidly also occupy deeper water (Healey 1991). MacFarlane and Norton (2002) reported that juveniles sampled from April to mid-June took on average around 40 days to migrate through the bays, suggesting a total residence time in the estuary of up to 100 days.

As described in more detail in Ch. 5, most fall-run juveniles in the Central Valley begin migrating toward the lower rivers or the Estuary in January, February or March, shortly after they emerge from the gravel, when they are still less than 50 mm long; however, a considerable number rear near the spawning areas for one to three months before migrating, typically in April and May and at more than 60 mm. A few emigrate in the fall or winter, or in spring as yearlings. Most spring-run in the Central Valley follow a juvenile life-history pattern similar to that of fall-run, although some follow the typical stream-type life history pattern. The timing of migration among winter-run, late fall-run, and yearling spring-run is less clear, because the size-at-date method for distinguishing the runs is unreliable in the Delta (Hedgecock 2002), and they are otherwise distinguishable only by genetic analyses. Generally, however, there are larger (>~100 mm) juveniles moving into the Delta from fall through February or March. There is very little information on the extent to which these fish rear in the Delta, or on the extent to which doing so affects their survival.

Bottom et al. (2002) recently summarized the importance of estuaries for juvenile Chinook. There are enough differences between the Columbia estuary and the San Francisco Estuary that

various details do not apply, but there are enough similarities to make the summary and literature review quite relevant:

> More than just a simple corridor for salmon migration, the Columbia River estuary functions as an important transition environment, where individuals should have the opportunity to gradually adapt to salt water, and as a nursery ground, where many young salmon feed and grow to sizes that may increase their chances of surviving in the ocean (Reimers 1973; Simenstad et al. 1982; Thorpe 1994). Juvenile salmon are found in the estuary all months of the year, as different species, size classes, and life-history types continually move downstream and enter tidal waters from multiple upstream sources. The timing and duration of estuarine residence varies widely among salmon species and life-history types with species (Groot and Margolis 1991). Chinook salmon, (*O. tshawytscha*), which has the greatest diversity of juvenile life histories among all Pacific salmon (Healey 1991; Wissmar and Simenstad 1998), has the most varied patterns of estuarine use. Healey (1982) proposed that Chinook are the most estuarine dependent salmonid species since virtually all life-history types spend some time feeding and growing in estuaries, and (ocean-type) fry migrants may depend entirely on the estuary for nursery habitats. ...
>
> The movements of juvenile salmon and their patterns of habitat use within estuaries are size related. Chinook salmon and chum salmon subyearlings (fry) usually occupy shallow, nearshore habitats, including salt marshes, tidal creeks, and intertidal flats (Levy and Northcote 1982; Myers and Horton 1982; Simenstad et al. 1982; Levings et al. 1986). As subyearlings grow to fingerling and smolt stages, their distribution typically shifts toward deeper habitats farther from the shoreline(Healey 1982; 1991; Myers and Horton 1982). In the Columbia River estuary, McCabe et al. (1986) reported that subyearling Chinook salmon in shallow intertidal habitats were smaller than subyearlings captured in deeper pelagic areas. Large yearling migrants, on the other hand, may spend relatively little time in shallow-water habitat. A 1980-81 survey of the Columbia River estuary, for example, found most yearling Chinook salmon at deeper channel sites rather than at intertidal sites sampled near shore (Bottom et al. 1984). Thus, the occurrence of small subyearling salmon, including those life-history-history types that stay in the estuary for the longest periods, may be closely linked to the availability of certain shallow-water habitats.
>
> Emergent marshes, forested wetlands, and dendritic tidal channel networks may be particularly important to small salmon because they are (1) areas of high secondary production of insect and other invertebrate prey; (2) sources and sinks for detritus; and (3) places where complex structure provides refuge from predators (e.g., Levy and Northcote 1982; McIvor and Odum 1988; Gray et al. In press). ...

Although there has been extensive monitoring of the occurrence of juvenile salmon and steelhead in the Delta, and good evidence that Chinook fry rear there, there has been relatively little study of the actual use of the habitat by those fishes (Brown 2003). One exception is the BREACH studies (http://depts.washington.edu/calfed/breachii.htm). Generally, the results for Chinook are consistent with the studies of more northern estuaries reviewed above (L. Grimaldo, CDWR, pers.comm. 2003): small juveniles (< 60 mm) were collected from January to April,

with a peak in March. Most Chinook were collected in open water rather than among submerged aquatic vegetation, and their stomachs contained mainly larval and pupal chironomids (midges) and amphipods.

It appears that juvenile Chinook make less use of the marshes around the edges of Suisun and San Pablo bays than might be expected from the literature. In a review of the use of estuaries in Washington by Pacific salmon, Simenstad et al. (1982:352) noted that "Subyearlings and fry occur mainly in salt marshes where these habitats are available. However, mudflat, foreshore areas can be utilized for some time by larger subyearlings before they move into neritic habitats (Stober et al. 1973; Simenstad and Eggers 1981; Congleton et al. 1981)." Some of the Kjelson et al. (1982) West Delta sites were in brackish areas, and some juvenile Chinook were captured there, particularly in the wet year 1980, when juveniles were captured in San Pablo Bay and central San Francisco Bay as well. The IEP regularly captures juveniles at seine sampling stations around the edge of the bays, particularly in wet years, but the numbers are small (SSJEFRO 2003). Efforts to collect juvenile Chinook with beach seines for the work described in MacFarlane and Norton (2002) were largely unsuccessful (Bruce MacFarlane, NOAA Fisheries, pers.comm., 2003). However, Chinook fry (< 50 mm) are captured by the IEP trawl sampling at Chipps Island in wet years, and fry were found in near-shore habitats near Pittsburg in wet years during studies of the effects of the plume of warm cooling water from a large power plant (C. Hanson, Hanson Environmental, pers.comm.). As summarized by Kjelson et al. (1982:407): "In the Sacramento-San Joaquin system most estuarine rearing occurs in the freshwater Delta supplemented by fry rearing in the brackish bays during high runoff years."

The scant evidence of use of tidal wetlands and flats around the margins of the bays in drier years is something of an enigma, and may reflect a recent change in Chinook behavior. Considerable numbers of small (< 50 mm) Chinook were captured in a fyke trap at Martinez, in the strait between Suisun and San Pablo bays, in March and early April 1939, a dry year (Hatton 1940; Figure 6-29), and a 1966 report referred to "the proven heavy use of the mud flats of Suisun and Honker Bays by salmon and steelhead" (Delisle 1966:59).[57] Alternatively, the apparent low densities of juvenile Chinook around the bays may reflect the large area potentially available to them. The extent and circumstances under which juvenile Chinook make significant use of these brackish tidal areas has implications for the value for Chinook of wetland restoration around the bays, and deserves more attention. Repeating Hatton and Clark's trapping at Martinez would be an initial step.

Studies of the Delta

Erkkila et al. (1950) investigated the spatial distribution of juvenile Chinook within the Delta at 25 stations in April to July 1948 and in late February to July 1949, using a tow net with a 1.5 m (5 ft) circular opening, fished just below the surface (e.g., Figure 10-1). Although their

[57] Unfortunately, Delise (1966) did not provide a citation for his statement regarding heavy use of mud flats by Chinook and steelhead. However, he also stated that use of mud flats around the rest of the bay was unknown, so presumably he had some study in mind. Don Fry, a CDFG salmon biologist, helped with this report, and the statement about Suisun and Honker bays may reflect his knowledge.

catches seem too small to allow great confidence in the details of their results, they did show persuasively that Chinook from the Sacramento River were widely distributed through the Delta and remained there for some time. Catches peaked in February 1949, but remained fairly high until early June. Average size was steady through most of March, but increased rapidly in early April and again in late June, although the number of fish was very low by then (Figure 10-2). Juvenile Chinook from the San Joaquin River did not appear until early April in both 1948 and 1949, which Erkkila et al. (1950) attributed to the low flow in the river. They reported that movement of fish into the Delta was often but not always associated with pulses of flow, and that juveniles were gone from the Delta by the time the water warmed to about 24°C in both years.

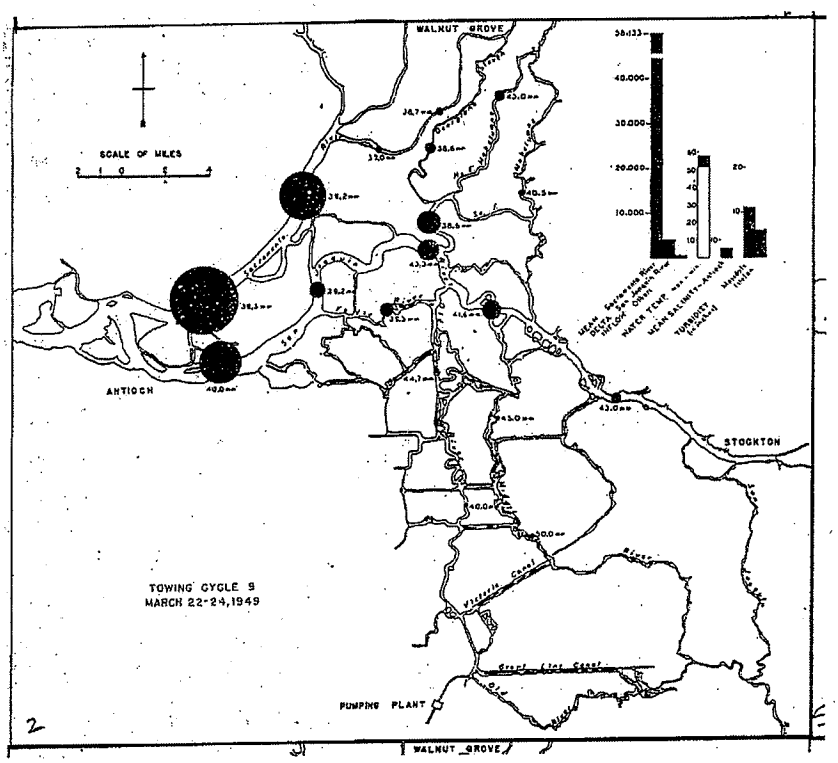

Figure 10-1. A panel from Figure 4 in Erkkila et al. (1950), depicting the estimated spatial distribution of juvenile Chinook in the Delta during the March 22-24, 1949 towing cycle. Areas of the circles are proportional to estimated abundance at the stations; the inset bar graphs show Delta inflow from the Sacramento, San Joaquin, and Mokelumne rivers, minimum and maximum water temperatures, mean salinity, and turbidity at Mossdale and Isleton.

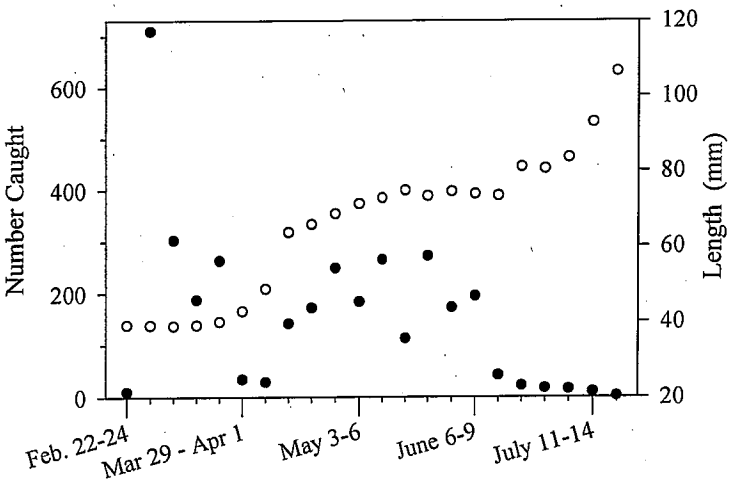

Figure 10-2. Size and abundance of juvenile Chinook in the Delta. Number (filled symbols) and mean fork length (open symbols) of juvenile Chinook captured in the Delta by Erkkila et al. (1950), in 1949, summed over 25 towing stations. Note that the mean length did not increase until late March.

Beach seines (15 x 1.2 m) were used in a subsequent study of the abundance and distribution of juvenile Chinook in the Delta (Kjelson et al. 1982; Figure 10-3); average catches peaked in February or March, and dropped off sharply in April. Monthly average lengths increased most rapidly from April to May, but the number of fish captured decreased sharply over the same period (Figure 10-4). Again, increased catches were associated with pulses of inflow. In diurnal sampling catches were higher during the day than at night, suggesting that the fish moved offshore then.

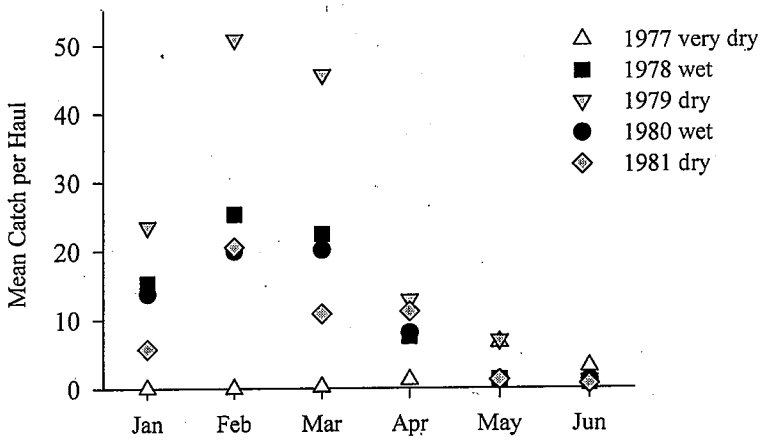

Figure 10-3. Mean monthly catch per haul of juvenile Chinook collected by beach seine in the Northern Delta in five years. Within months, catches were highly variable (average coefficient of variation 208%). Data from Kjelson et al. 1982.

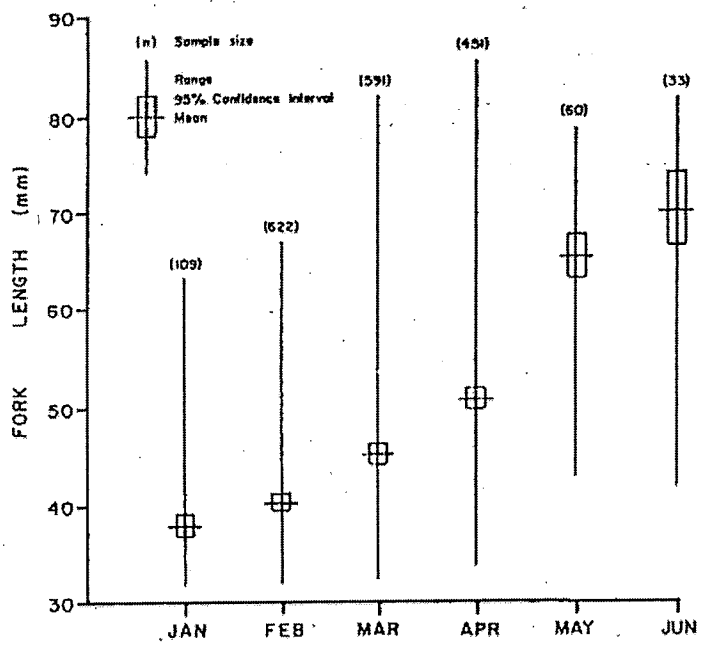

Figure 10-4. Mean size with 95% confidence intervals and range in sizes of 1,866 juvenile Chinook captured with beach seines in the northern Delta between 1978 and 1981. Copied from Kjelson et al. (1982).

Sampling with beach seines in the estuary has been continued by the IEP at ~ 40 stations from Sacramento and Stockton to San Francisco Bay. Summary data from this sampling from 1992-93 to 1998-99 have been reported in SSJEFRO (2003), with fish allocated to runs according to size at date criteria, except that spring and fall-run are reported together because they overlap in size.

Spring/fall-run are most abundant in the Delta in late winter and early spring, as fry, but are captured in significant numbers as larger juveniles in late spring as well, and in small numbers as larger juveniles in late summer and fall (Figure 10-5). The beach seines presumably are less effective for the larger juveniles that tend to occupy deeper water and are better able to escape the net, so the seasonal differences probably are somewhat less extreme than figures 10-3 and 10-5 suggest. Similarly, the nominal late fall-run captured in fall and winter are much larger than those captured in the spring, and probably are relatively more abundant than the seine data suggest.

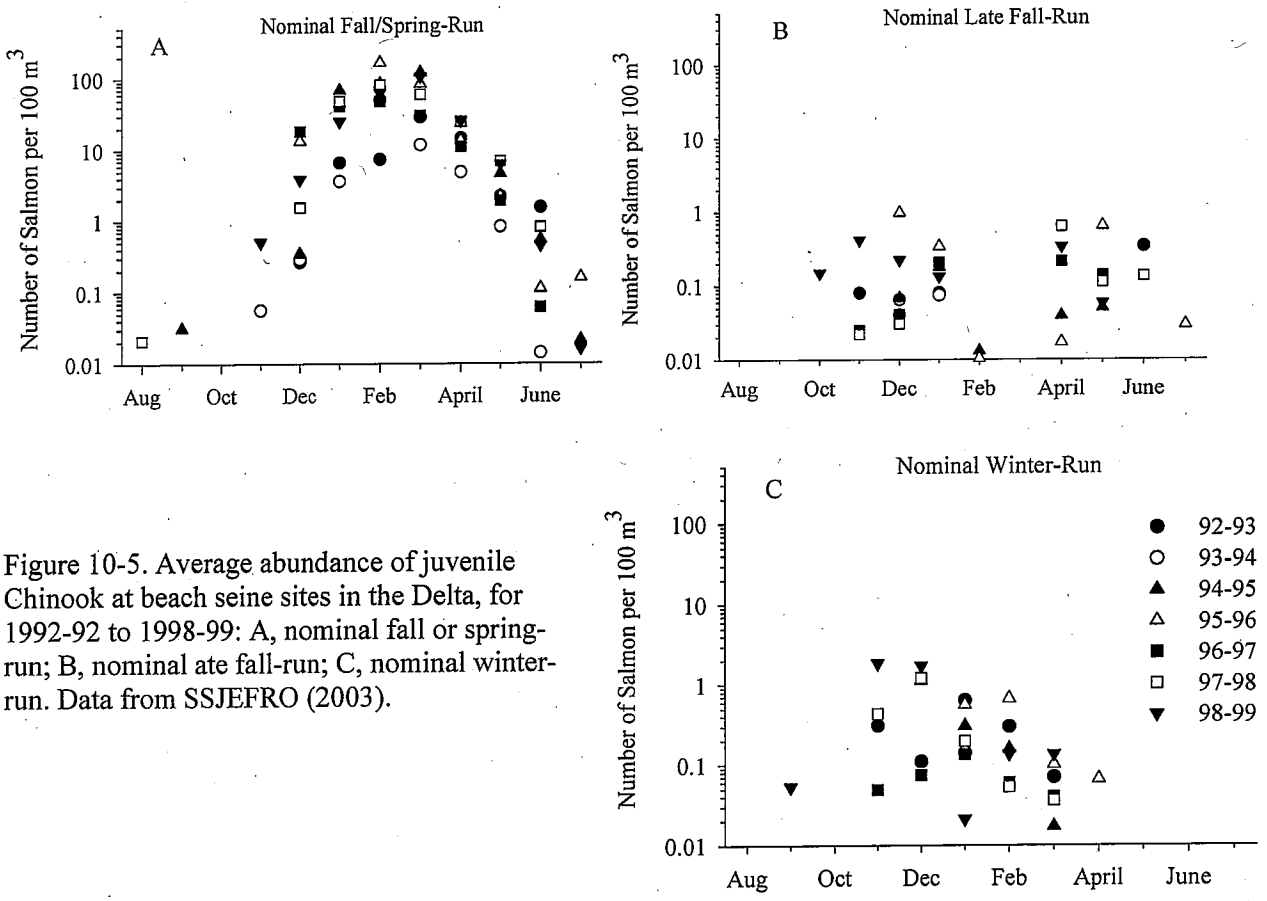

Figure 10-5. Average abundance of juvenile Chinook at beach seine sites in the Delta, for 1992-92 to 1998-99: A, nominal fall or spring-run; B, nominal ate fall-run; C, nominal winter-run. Data from SSJEFRO (2003).

Only one haul is taken at each station per sampling cycle, and the catches at individual sites are extremely variable (e.g., Figure 10-6), presumably because the fish occur largely in schools, so the data show only general patterns of temporal distribution. Similarly, it is not clear how well

the stations represent the areas in which they occur. For example, should we believe that there are few juvenile Chinook around the mouth of Steamboat Slough (Figure 10-7), or do the low catches reflect the particular site that is sampled? Nevertheless, the data do show, for example, that on an annual basis the January to March seine catch in the North Delta increases with the mean February flow in the Sacramento River ($r^2 = 0.69$; Brandes and McLain 2001).

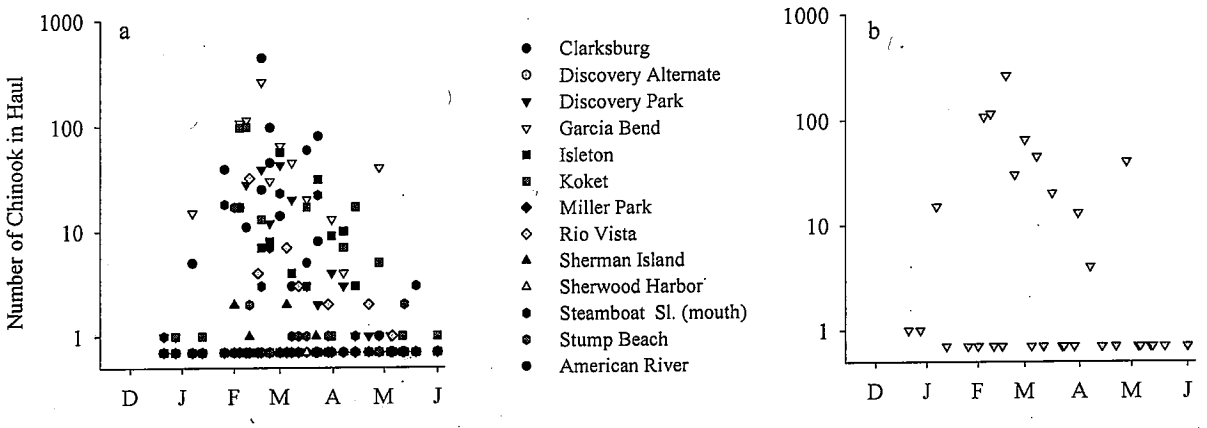

Figure 10-6. Catch per haul of juvenile Chinook in 1993-1994 at (a) 13 seine stations in the North Delta and at (b) one of the stations, Garcia Bend. Catches are extremely variable; note log scale (except that symbols at bottom show catches of zero).

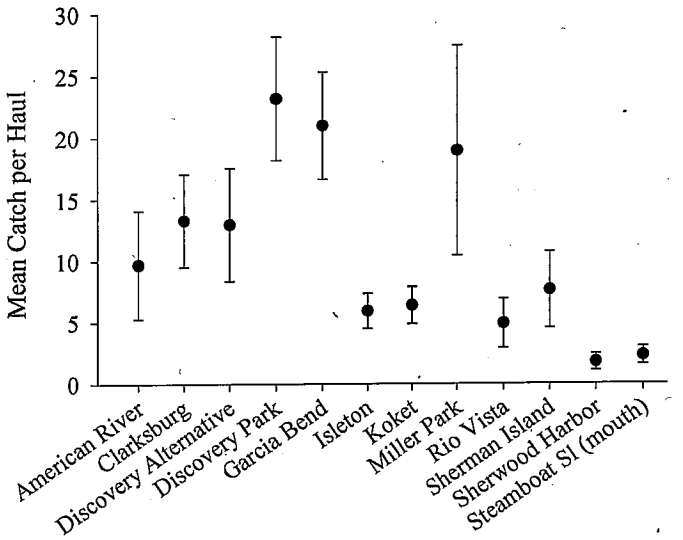

Figure 10-7. Mean catch per haul for 12 sampling stations in the North Delta, 1993-2002. Bars show 95% confidence intervals. Data from IEP.

Sampling also occurs at the CVP and SWP diversion facilities at the southern edge of the Delta, where fish are diverted by screens into holding tanks and trucked to the western Delta, and samples are counted and measured (Brown and Greene 1992). The fish sampled are neither a random nor a uniform sample of the fish that make their way to the diversions, since a smaller proportion is sampled when density is high, and the efficiency of the screens varies with factors such as the rate of diversion (Brown and Greene 1992; Hedgecock 2002). Moreover, many fish

may be consumed by predators as they approach the facilities. Nevertheless, it seems likely that the salvage data reasonably reflect major patterns regarding the time of year and conditions under which fish arrive or do not arrive at the diversions. Unfortunately, this source of information has not yet been fully exploited.

The general pattern of arrivals at the diversion facilities is fairly clear (Figure 10-8). Larger (>~ 80 mm) juvenile Chinook arrive from late summer to spring. Small juveniles begin to arrive in winter, and do so with little increase in size until sometime in March. Their average size then increases rapidly for about a month, from < 50 mm to > ~80 mm, and then levels off until July, when salvage of Chinook essentially ends.

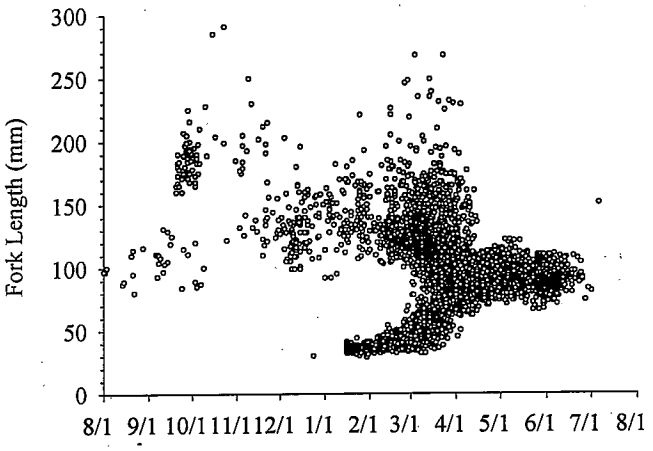

Figure 10-8. Juvenile Chinook at the Delta diversions; size at date of 6,752 juvenile Chinook sampled at the CVP and SWP diversion facilities in the Delta from August 1995 through July 2001. Data from Hedgecock (2002).

Flow apparently affects the timing with which juvenile fall and spring-run appear at the pumps. In a wet year (2000), young-of-the-year Chinook appeared at the pumps in mid-February, flowing a sharp increase in Delta inflow; however, in 2001, a dry year, few fish were sampled until late March (Figure 10-9).

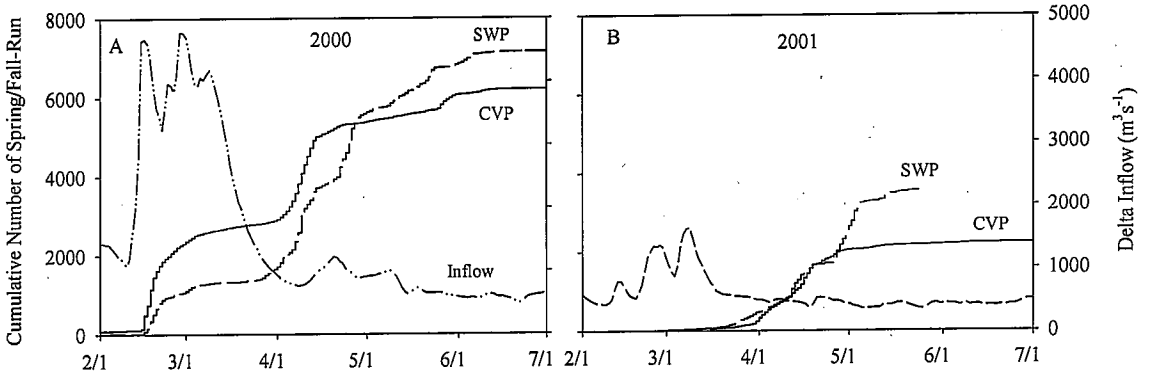

Figure 10-9. Unmarked juvenile spring or fall Chinook sampled at the CVP and SWP diversions in 2000 (A) and 2001 (B). Dashed lines show total inflow to the Delta. Fish appeared at the diversion facilities shortly after a rise in Delta inflow in February 2000. The numbers sampled are not expanded and do not represent the total numbers collected at the pumps (see text), but should reflect major patterns in the arrival of fish at the diversions. Data from the IEP database.

The rate at which juvenile Chinook appear in the samples is affected by the rate of pumping, but the relationship does not appear to be simple; for example, CVP pumping was steady though February and most of March, 2000, then dropped briefly in late March and resumed in early April (Figure 10-10). The peaks in sampling occurred in late February and early April.

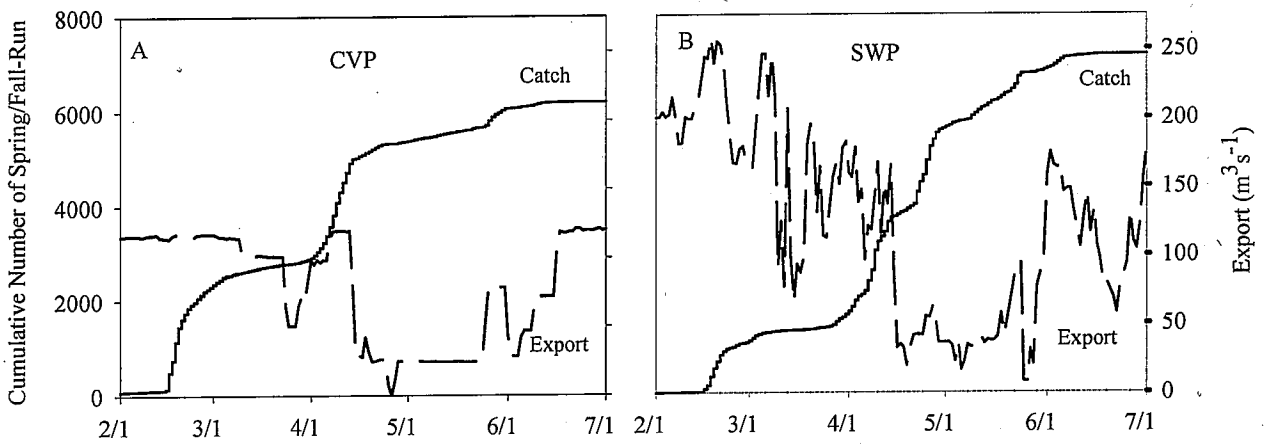

Figure 10-10. Cumulative number of unmarked juvenile spring and fall-run Chinook sampled at the CVP and SWP pumps in January through June of 2000 (solid lines), and exports for the same period (dashed lines). Data from the IEP database.

Besides arriving at the diversion facilities later in 2001 than in 2000, age 0 Chinook were also smaller by ~5 mm in late spring, and they were about~ 2 mm larger at the SWP diversion than at the CVP diversion in both years (Figure 10-11). Such year to year variation in size at date may provide a useful index of growth opportunity in fresh water. This should be explored. It would also be useful to look for relations between increases and decreases in the number of fish sampled at the diversions and environmental variables, such as increases in Delta inflow, and in the number of fish collected in other sampling efforts such as the Chipps Island trawl. The objective should be better understanding of the behavior of the fish, as well as better predictions of their arrival at the diversions.

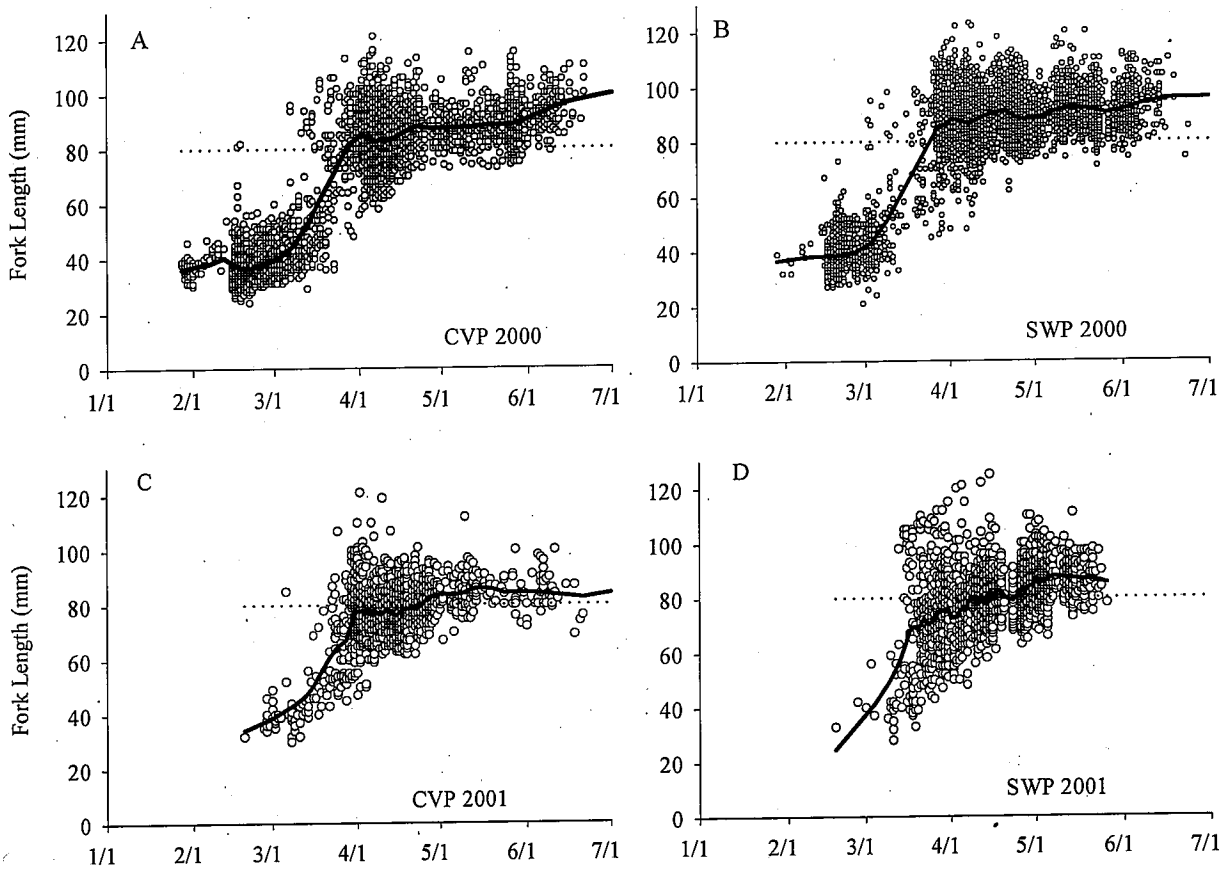

Figure 10-11. Lengths of unmarked fall and spring Chinook sampled at CVP and SWP diversion facilities in 2000, a wet year (A and B), and 2001, a dry year (C and D). Trend lines fit by LOWESS; almost all the change in length occurred March. Data from the IEP data bank.

Even when the numbers of fish sampled are expanded to account for the time intervals between samples (Figure 10-12), the total estimated numbers of juvenile Chinook collected at the diversion facilities do not seem large compared to the total number of juveniles that may arrive at the Delta. For example, if 50,000 Chinook females spawn an average of 5,000 eggs of which 7% survive to reach the Delta (which does not seem unreasonable given Bradford's (1995) estimate of 7% egg to smolt survival), then the few hundred thousand fish that are normally collected at the diversions would be a few percent of the 17.5 million arriving at the Delta. However, there is also indirect mortality associated with the diversions that is not well understood. Most efforts to study it have involved releases of hatchery fish marked with coded-wire tags, as discussed below.

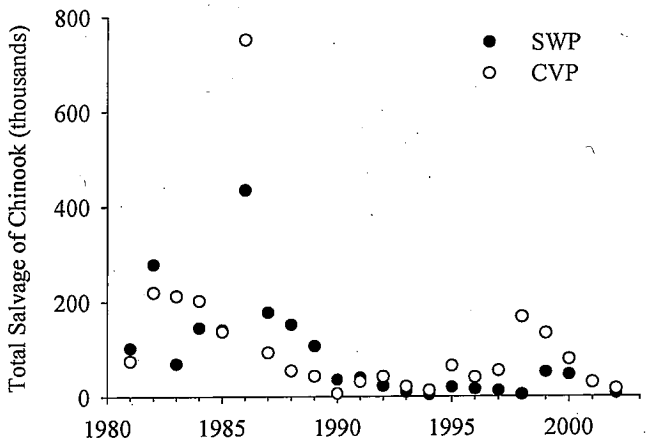

Figure 10-12. Estimated total number of juvenile marked and unmarked Chinook collected at diversion facilities operated by the SWP (solid circles) and CVP (open circles). The high values for 1986 may reflect the very high flows in February of that year. Data from USBR (2003).

False positive identification of winter-run:

Concern about direct and indirect losses of fish to Delta diversions varies inversely with the strengths of the populations involved, and is greatest for ESA-listed runs. All hatchery steelhead are now marked, so that identifying naturally spawned steelhead is straightforward. Chinook are assigned to runs by size at date criteria, as described in Ch. 6, and recent genetic analyses have demonstrated the problems with the size approach as applied to winter-run at the state and federal diversion facilities in the Delta (Hedgecock 2002). The initial objective of the genetic work was to use mixed stock analysis to determine the proportion of the salmon taken at the pumps that were winter run, from which the "take" of the listed winter-run might be estimated. This was abandoned, however, when it was realized that the sampling at the pumps did not allow for accurate estimates of allele frequencies in the impacted group of juvenile Chinook, since mixed-stock analysis depends on such estimates. As an alternative, individuals were assigned to runs. Although this did not allow a calculation of take, it did allow a test of the size criteria, with mixed results. Although 95% of the fish that were assigned to the winter-run by genetic analysis were within the winter-run size criteria, only half of the fish with assignable genotypes that met the size criteria were winter-run. In other words, as applied to winter-run at the pumps, the size criteria have a high rate of false positives (Figure 10-13). To complicate matters further, the rate of false positives has varied from 16.3% to 94.6% over the six years in which fish were sampled (1995/6 - 2000/1). This, together with the likely bias in samples selected from salvage, makes it hard to develop a useful estimate of take using the size criteria, and challenges the validity of analyses such as those summarized in Brown and Kimmerer (2001; 2002) that also depend on the size criteria.

When the Hedgecock (2002) work was performed it was possible to identity individuals as winter-run or non-winter-run with high accuracy by genetic analysis, but it was not yet possible to do this for runs that are more closely related, such as fall-run and late-fall run. Nevertheless, a mixed stock analysis by Vanessa Rashbrook of Hedgecock's laboratory showed that the large juveniles in September and October in the fall-run band in Figure 10-13 are indeed fall-run (D.

Hedgecock, pers.comm. April 2003). This result is clear enough that the sampling uncertainties described above do not matter. Additional genetic markers have since been developed, and it is now possible to distinguish individuals of all runs except Feather River spring-run (M. Banks, Oregon State U., pers.comm 2004).

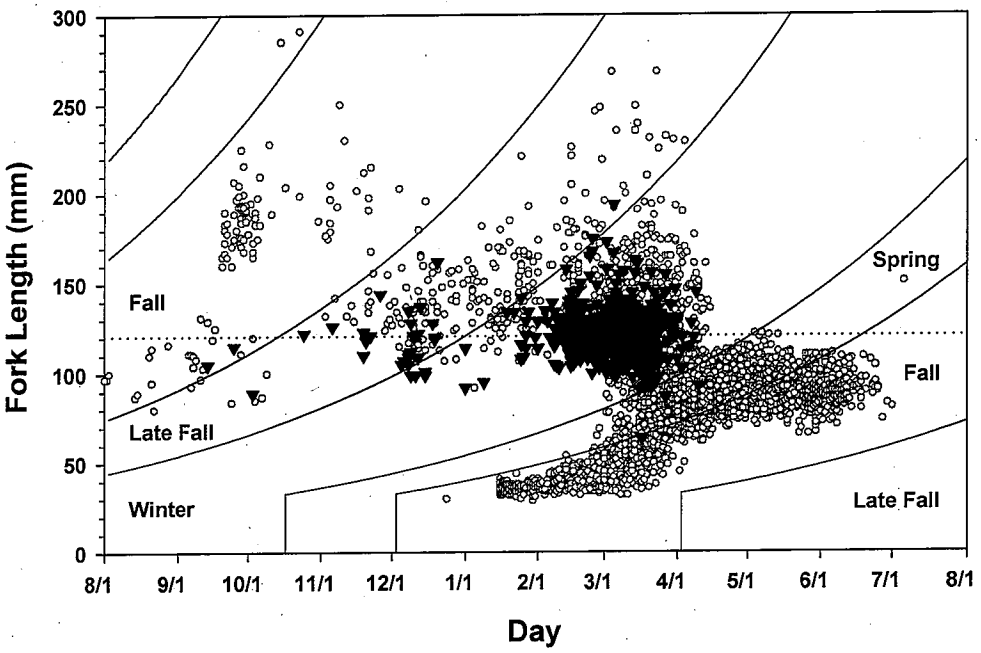

Figure 10-13. Distribution, by fork length and day of capture, of 6,752 juvenile chinook salmon with assignable genotypes over a six-year period, from August 1995 through July 2001. The 711 juveniles assigned to winter-run are shown by dark inverted triangles; fish assigned to other runs are shown by open circles. Note that each symbol may represent more than one fish, and that many non-winter-run are obscured by the tight cluster of winter-run. Mean fork length of winter run juveniles (121 mm) is shown by the dotted line. The figure and most of the caption are copied from Figure 1 in Hedgecock (2002).

Survival studies

Fry survival

Fry survival was studied using coded-wire tags (CWTs) from 1980 through 1987 (Brandes and McLain 2001). Tagged hatchery fry were released in February or March at various locations in the Delta; mean sizes for the groups ranged from 40 to 53 mm fork length, but most were 45-50 mm.[58] Fry released below Red Bluff Diversion Dam were recovered in the ocean fishery at a higher rate than fry released in the Sacramento River near the edge of the Delta, particularly in wet years, despite the greater distance that they had to travel. Based on the data in Brandes and McLain (2001), ocean recoveries of fry released in the Delta are roughly an order of magnitude lower than for smolts released there (Figure 10-14). Whether hatchery fry are reasonable

[58] 0.5 mm "half-tags" were used for these fish, because of their size.

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surrogates for naturally produced fry can be questioned, as discussed below. Whatever else happened to the tagged fry, few of them ended up at the pumps; only 46 of about two million were recovered there (Brandes and McLain 2001, App. A).

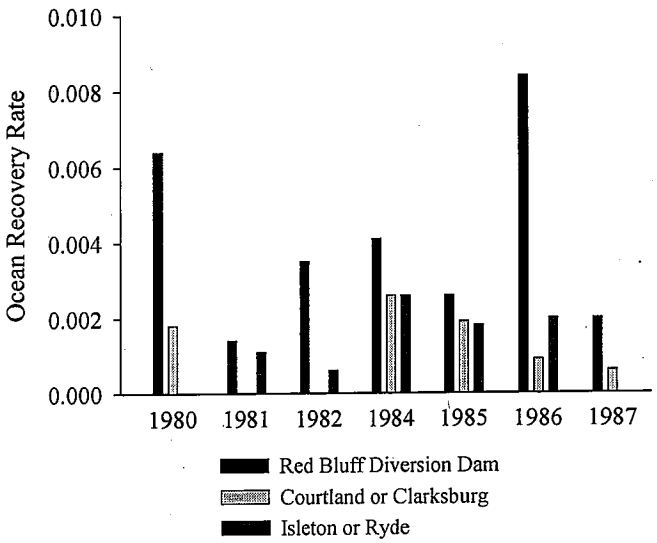

Figure 10-14. Recovery rates in the ocean harvest for ~50 mm chinook fry marked with CWTs and released near Red Bluff Diversion Dam and at locations on the lower Sacramento River. Data from Brandes and McLain (2001).

Smolt Survival

Most coded-wire tag studies have involved smolts. Analyses of the data have related survival as estimated by trawl and ocean fishery tag recoveries to covariates such as flow, water temperature, or exports, or whether the Delta cross-channel gates were open, for the relevant period. Early analyses of the CWT data (e.g., Kjelson et al. 1989) used multiple regression to estimate survival as a function of several covariates. This approach was criticized by various parties on a number of technical grounds, for example that linear regression is unsuitable for estimating survival rates that are constrained between 0 and 1, or on the selection of the covariates (Newman and Rice 2002). To move the situation beyond arguments, the California Urban Water Agencies and the U.S. Fish and Wildlife Service funded two independent statisticians, John Rice of the University of California Berkeley and Ken Newman of the University of Idaho, to apply more advanced methods to the data. A group of biologists and engineers representing various parties provided assistance in selecting and compiling covariates for 101 releases groups from 1979 to 1995 that were used in the analysis.[59]

The Newman-Rice study was essentially completed by 1998, although it was not published in the professional literature until 2002,[60] and to a considerable extent the preliminary reports defused the controversy. On the one hand, they generally supported the findings of the earlier

[59] Some of these covariates are complex and opaque; for example, the tide covariate is described as "a measure of the magnitude of the change in low-low and high-low tides and whether the delta was filling or draining." As far as I know no detailed description of the development of these covariates is available, which is unfortunate.

[60] The article was submitted in October 1998; apparently a very long lag time for publication is not unusual in statistics.

studies, but they also highlighted the limitations of the data and the need to apply the results cautiously. The technical level of the modeling is also beyond the ken of all but a few of the scientists involved with Central Valley salmon, which may have discouraged controversy. Newman continued with additional analyses, but this IEP-funded work has been largely free of the political tension that marked the early phases of the work with Rice. More recently, CUWA has sponsored another statistician, Bryan Manly, to participate in analyses of the cwt data.

One important difference between the Newman and Newman-Rice studies is that Newman and Rice (2002) estimated the effect of various environmental factors on recaptures of a larger number of groups of CWT fish that were released upstream and recovered at Chipps Island and in the ocean fishery. Newman (2003) focused on a subset of these groups for which groups released farther upstream could be paired with groups released just downstream from Chipps Island. Thus, Newman and Rice (2002) estimated the probability of survival times the probability that surviving fish are captured. By assuming equal probability of marine survival and capture for the paired releases, Newman (2003) estimated only probability of survival. Newman and Rice (2002) also used export/inflow ratio as a covariate, while Newman (2003) used exports.

The Newman and Rice analyses are described in more detail in Appendix B, but the main results can be summarized by a comparison of the original Newman and Rice (2002) study and the hierarchical model by Newman (2003). To facilitate comparison with the unpaired model of Newman and Rice (2002), Newman (2003) also reported results from the paired models using the export/inflow ratio rather than exports as a covariate (Figure 10-15); there are strong similarities but some important differences between the paired and unpaired analyses.

By the criterion that strong effects have coefficients more than two standard errors from zero, the temperature of the water into which fish were released (release temperature), whether the Delta Cross Channel gate was closed (gate position), and the export/inflow ratio had strong negative associations with survival for the hierarchical model, and fish size, salinity, turbidity, and the log of flow in the Sacramento River had strong positive associations. Of these, the export/inflow (E/I) ratio, fish size, turbidity, and log flow were not "strong" in the unpaired analysis (although fish size was very close), and only tide was a "strong" effect in the unpaired analysis but not in the hierarchical analysis. The greatest contrast concerns turbidity, which had little effect on predictions of the unpaired model. Newman (2003) speculated that this may result from turbidity increasing survival but also increasing the probability of capture in the trawl, and so having little effect in the unpaired model which estimates probability of survival times probability of capture, rather than probability of survival. Another important difference concerns Sacramento River flow, which has a much stronger association with survival than the hierarchical model.

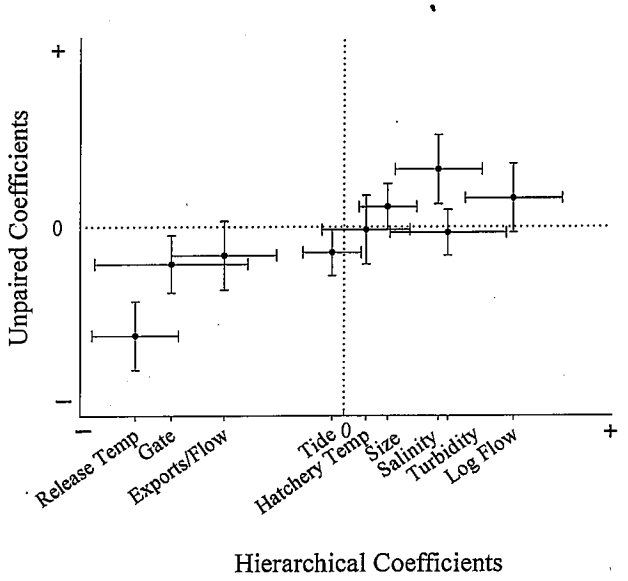

Figure 10-15. Comparison of estimated coefficients plus/minus two standard errors for the unpaired analysis of Newman and Rice (2002) and the hierarchical analysis of Newman (2003) with release-specific capture probabilities.

Release temperature has been strongly associated with survival in all analyses. An early application of modern statistics to the Central Valley coded-wire tag data, by Baker et al. (1995), focused on the effect of temperature, and estimated a 95% confidence interval for the temperature at which mortality of tagged fish reaches 50% as 23.01 ±1.08°C (73.4 ± 1.94°F).

Newman and Rice (2002) provided an example of the use of the unpaired model to compare the relative survival that might be expected from two options of management of the river that affects the covariates in the model, in this case the export/inflow ratio and the position of the cross-channel gate. They note, however, in a comment that also seems relevant to the paired-release models, that (p. 990):

> Comparisons such as this must be tempered with caution, however. Our model summarizes historical relationships and is relevant to prediction in such a passively observed system. But because a number of unmeasured variables may well be important, it is much less well suited to predicting what would happen if the system were directly manipulated (Box 1966). Thus it would be a mistake to take literally the numerical predictions of the model in the latter case; a more modest and realistic hope is that they point to beneficial management strategies.

Moreover, the models embody assumptions, such as the assumption of equal catchability in the unpaired model and of equal (or constant ratio) survival downstream from Chipps Island for the paired models, that are at best approximately valid. More fundamentally, the data are for hatchery fish, which may not be a reasonable surrogate for naturally produced fish, as discussed below.

It seems likely that Newman and Rice have wrung as much information regarding smolt survival in the Sacramento River and Delta from the historical CWT data as can be got by purely statistical analyses, and that focused studies such as the Delta Cross-Channel studies that can clarify the actual processes underlying the statistical associations are the next logical step. For example, flow and salinity are inversely related, so it seems curious that both should be positively related to survival. The data used for the statistical studies show that salinity was uniformly low when flow in the Sacramento River was above about 20,000 cfs, high when flow was less than about 7,500 cfs, and highly variable in-between (Figure 10-16). There is a group of about 11 data points with low flow (<10,000 cfs) and low salinity, which presumably had poor survival, and it seems worthwhile to investigate the particular circumstances at those times. Eight of these are from April or early May 1994. Investigating the circumstances in which salinity and discharge were both low might suggest testable hypotheses for the association identified by the statistical studies.

The CWT data also include information about ocean conditions, however, in the coefficients for the indicator variables for release year. The effects of ocean conditions on survival will be confounded by year-to-year variation in fishing effort and the variable ages of fish recovered in the ocean (2, 3 or 4 years), but these might be sorted out by state-space modeling (K. Newman, U. of St. Andrews, pers.comm, March 2003). Such an analysis might be most useful as a means to test hypotheses developed from other information about which ocean conditions are favorable or unfavorable for Central Valley Chinook.

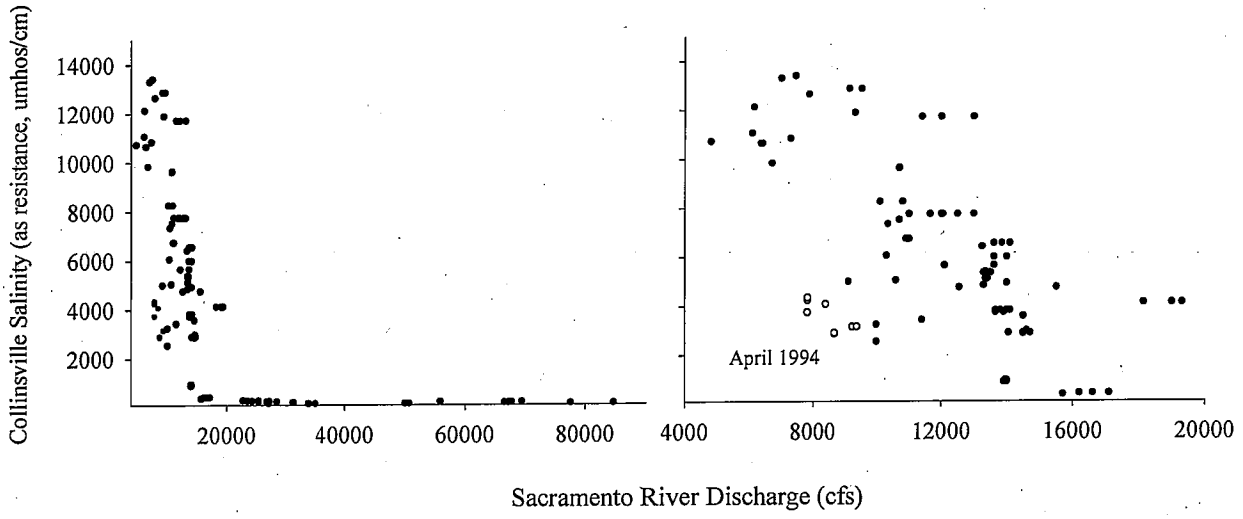

Figure 10-16. Values of salinity and Sacramento River Discharge used to characterize these conditions in the Newman and Rice (2002) analysis. A. all data; B. data for Q < 20,000 cfs, with eight data points (one is obscured) from April 1994 shown as open circles. Data from Alison Britton.

The paired analyses described above assume that the survival of fish released just downstream from Chipps Island is the same as the survival of the fish released at Sacramento or Courtland that pass Chipps Island. Newman (2003) describes several reasons to doubt this, and

the most biologically plausible reasons suggest that fish released downstream from Chipps Island should not survive as well. It seems likely that the hatchery fish used for the studies are not all equally likely to survive, but that there is a distribution of "survivability," so that fish with low survivability would already have been culled from the group released upstream by the time it reached Chipps Island. There is also good evidence that downstream migration is a self-reinforcing process (Høgåsen 1998; Ewing et al. 2001), so fish released upstream will be farther advanced in the smolting process and will be migrating more rapidly when they pass Chipps Island than will the group of fish released downstream from Chipps Island. There may also be an initial period of higher mortality following release, as fish adapt to life in the wild. Whatever the cause, the "shock effect" can be modeled by assuming that the mortality rate of the downstream group is some fixed multiple of the mortality rate of the upstream group. Newman (2003) found that doing this had relatively little effect on the estimated coefficients, although it decreased the estimates of survival and increased the estimates of the probability of capture. Estimates of the multiple or the shock effect were substantial, however, particularly for the hierarchical model.

There is independent evidence for a shock effect. For three experimental releases, hatchery Chinook trucked to the bays but allowed to acclimate in off-shore net pens before release survived ~2.5 times better than control fish released directly into the bays (Brown et al. 2004). Hatchery fish show a growth check in their scales or otoliths at the time of release (Rich 1920; Zhang et al. 1995). Newman (2003) noted that if shock also occurs with the upstream releases, which seems likely, then survival indices estimated from these releases would underestimate the survival of naturally-produced fish or of hatchery fish that are already acclimated to the river.

Coded-wire tags have also been used to estimate mortality in the Clifton Court Forebay to the SWP diversion facilities in the Delta, as described by Gringas (1997). Tagged salmon and striped bass have been released at the radial gates that separate the forebay from Old River and at the trash rack just upstream from the salvage facility, and recovered in the facility. Fish not recovered were assumed to have died. Estimated mortality for salmon in the forebay has ranged from 63 to 99%, with no obvious patterns in the data (Figure 10-17). The estimated forebay mortality is large and plays an important role in the calculation of the take of winter-run Chinook, so it seems that more effort should be made to characterize it well, as urged by the 2002 EWA Review Panel (2002). The estimates should also be reconciled with the observation by Kimmerer (2004) that similar numbers of fish are salvaged at the state and federal facilitates, although the federal facilities do not have a forebay. A strong shock effect, from high initial rates of predation on naïve hatchery fish, might help to explain this observation. This could be tested by checking whether water temperature affects the ratio between fish salvaged per volume of water exported at the two facilities, since the rate of predation should increase with water temperature. Such a shock effect could also explain the seemingly low survival rates (~15-20%) for juvenile Chinook in the lower San Joaquin River estimated by the VAMP experiments.

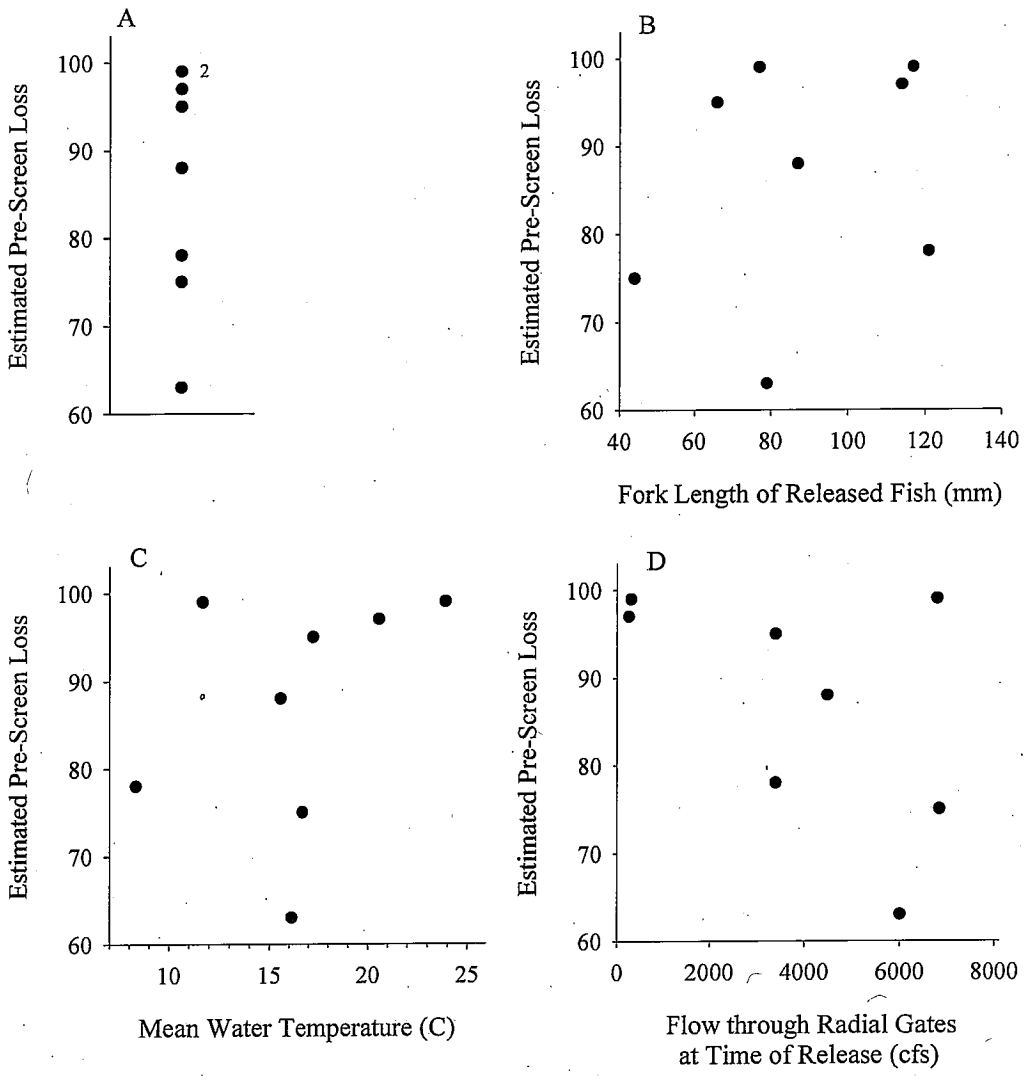

Figure 10-17. Estimated mortality of coded-wire tagged juvenile salmon in Clifton Court Forebay: A, overall distribution; B, as a function of, fork length; C, of water temperature, and D of flow through the radial gates; one point in A represents two estimates. Data from Table 1 in Gringas (1997).

In summary, the main result of the CWT studies seems to be that several factors influence the survival through the Delta of tagged hatchery fish, and of these, only water temperature stands out.

Are hatchery fish reasonable surrogates for naturally produced fish?

The utility of the CWT studies depends on the assumption that hatchery fish are reasonable surrogates for naturally produced fish. Although some studies have addressed questions specific to hatchery fish, such as the relative survival of fish released upstream or downstream of the Delta, most of the interest lies with naturally produced fish. There is good evidence for differences between hatchery and naturally produced fish, but it can be argued that the differences in the survival of hatchery fish with water temperature and other environmental variables also apply to naturally-produced fish, even though the absolute survival rates may

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differ. This matter was recently argued in an expert review of proposed methods for measuring smolt survival in the Tuolumne River (CWWR 1999), one of which involved CWTs. On the one hand, Anne Kapuscinski (University of Minnesota) asserted in her comments that:

> There are numerous behavioral and physiological differences between hatchery-propagated and wild-born fish, differences likely to affect downstream survival. These differences arise, in part, because hatchery fish develop physiologically and learn their behaviors under fundamentally different and often more homogenous environmental conditions than wild fish. If smolt survival assessments rely on hatchery fish, the effects of hatchery rearing on outmigration survival will be confounded with the effects of flow rates or habitat restoration. ... Because we don't understand the complex interactions among environmental and biological factors affecting seaward migration survival, monitoring of hatchery fish could even be misleading about the suite of in-river conditions needed to achieve an increase in naturally reproducing chinook salmon ..."

David Hankin (Humboldt State University) stated the alternative view, that useful inferences can be drawn from studies of hatchery fish.

> I find myself less concerned about use of hatchery-reared fish for survival studies than were some of the other peer reviewers. To me, the hatchery fish provide a nice "standardized" and available source of fish. If experiments using hatchery fish show that survival rates of these fish are very poor in the mining reach (as compared to the upper Tuolumne reach), then I am willing to conclude that survival rates of wild fish are probably also lower in the mining reach than in the upper Tuolumne. I would not be willing, however, to conclude that the absolute survival rates of wild and hatchery fish would be the same in the two areas. But I don't think knowledge of the actual survival rates is necessary to provide guidance for restoration or even evidence of improvements in survival rates after restoration activities.

As an example of the kind of difference that concerns Kapuscinski (although she did not cite it), Kerstetter and Keeler (1976) showed that the surge of activity of gill Na+K+ ATPase, an enzyme associated with smolting, occurred a month or more earlier in two strains of hatchery steelhead in the Trinity River than it did in wild fish, and there were also differences between the two hatchery strains (Figure 10-18). Since increased gill ATPAse activity is associated with migratory behavior (Zaugg and Wagner 1973, Ewing et al. 2001), and gill Na+K+ ATPase activity tends to cycle in hatchery chinook but not in wild Chinook (Ewing et al. 2001), it is easy to imagine that the relative survival of hatchery and wild fish could change over the season. However, definitive evidence on this point is lacking.

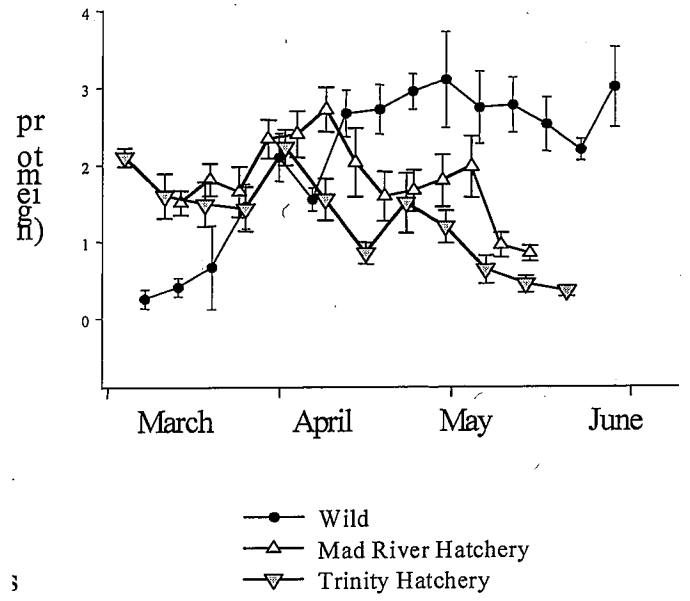

Figure 10-18. Difference in ATPase activity among wild and hatchery steelhead. Gill Na^+K^+ ATPase activity in wild Trinity River steelhead and two hatchery strains. Bars show standard errors; data from Kerstetter and Keeler (1976).

A related difficulty concerns populations of juvenile chinook in which some appear to be migrating actively (and have higher levels of gill Na+K+ ATPase activity) while others seem to migrating more passively and slowly. This is the situation with spring Chinook in the Rogue River which migrate in their first summer, reaching the estuary in September or October (Ewing et al. 2001). Fish captured in traps in the center of the channel were mainly from the more rapidly migrating part of the population, while those captured in beach seines were mainly not (fish were marked and recaptured at various places along the river so differences in migration rates could be determined). It would seem difficult for a homogenous group of hatchery fish to represent even the relative survival of both segments of the wild population.

Use of the bays by juvenile Chinook

Too little is known about the use of the bays by juvenile Chinook. MacFarlane and Norton (2002) reported one year of a ten-year field study of juvenile fall and perhaps spring-run in the bays (reviewed in Ch. 6), and analyses of the data from subsequent years is now underway (B. MacFarlane, NMFS, pers.comm. 2005), so much new information should be available soon. However, the sampling for these studies began in April, and collected fish with a trawl in relatively deep water. All that is known about fry migrants in the bays is that they are taken in small numbers in the IEP seine sampling, mainly in wet years.

Diet

Information is available on the diet of juvenile Chinook in other estuaries (Healey 1991; Bottom et al. 2005) as well as in the San Francisco Estuary (Rutter 1904; Scofield 1913; Ganssle 1966; Sasaki 1966; Heubach 1968; Fields 1976; Kjelson et al. 1982; MacFarlane and Norton 2002). Healey (1991:346) noted that "Diets vary considerably from estuary to estuary and from

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place to place within an estuary," and also that seasonal changes in diet are typical. The available information for the San Francisco Estuary seems consistent with these observations. From an analysis the stomach contents of 540 juvenile Chinook (< 70 mm) from the Delta and 189 from the bays, Kjelson et al. (1982:402) reported that:

> Crustáceans and insects dominated Chinook [< 70 mm] stomach contents, with an increase in crustacean ingestion downstream ... Cladocera and diptera were consumed frequently in the Delta, while in brackish San Pablo and San Francisco Bays, consumption of copepods, amphipods, and fish larvae increased. Similar food habits were reported for older fry and smolts in [earlier] Delta studies ...

MacFarlane and Norton (2002) examined the stomachs of 93 juvenile Chinook collected between Chipps Island and the Gulf of the Farallones from April 30 to July 15, 1997, and reported that fish leaving the Delta contained mainly amphipods, other crustaceans, and insects. In Suisun Bay insects, especially waterboatmen, and crustaceans were the main food items, along with some fish larvae. Crustaceans were the dominant food in San Pablo Bay, and fish larvae were dominant in Central San Francisco Bay.

Given that juvenile Chinook are opportunistic feeders in estuaries (Healey 1991), the more relevant question may not be what juvenile Chinook in the San Francisco Estuary eat, but what quality it is and whether they get enough of it. This seems questionable. MacFarlane and Norton (2002) found that juvenile Chinook moving through the bays grew slowly (0.18 mm d-1 on average) until they reached the Gulf of the Farallones. Kjelson et al. (1982) noted that the scales of fish from the Sacramento-San Joaquin system did not show the pattern of intermediate circuli spacing indicative of enhanced growth in brackish water, as reported by Rich (1920), Snyder (1931) and Reimers (1971; 1973) for the Columbia, Klamath, or Sixes rivers. MacFarlane and Norton (2002:225) concluded that "... juvenile Chinook salmon derive little benefit from their time in the [brackish water part of the] San Francisco Estuary." In contrast, Magnusson and Hilborn (2003) reported from a comparative study of rivers from northern California through Washington, the survival of tagged hatchery fall Chinook increased with the proportion of the estuary that was in natural condition.

Poor growth in the bays of the San Francisco Estuary may reflect changed conditions in the estuary, as noted by MacFarlane and Norton (2002). Scofield (1913:17), in a report of towing a live car filled with Chinook and steelhead fry from Sacramento to the Golden Gate, reported that there was "a plentiful supply of land insects" on the surface of Suisun and San Pablo bays in May, 1912, so that Chinook fry could continue "their habit of surface feeding until well out in salt water." Scofield also reported abundant "small crustaceans, especially young shrimp" at the surface of Suisun and San Pablo bays. He caught "quantities" of these with a gauze tow net, and the fry "devoured them greedily." Unfortunately, old collections of scales apparently have been lost, so the speculation that the estuary formerly offered better conditions for growth cannot be tested.

Although published data form the NMFS study on fish passing through the bays are available only for 1997, data on juveniles passing into the ocean are now available for 1998 and 1999. There is year to year variation in the size and condition of juvenile Chinook leaving the bay (Table 10-1), as might be expected from similar variation elsewhere in the rivers and the Delta. Fish at the Golden Gate were smaller and older in 1997 than in the other two years. The strongest variation is in energy stored as triacylglycerol, normalized to cholesterol (TAG/CHOL). Although growth of juvenile Chinook in the bay has been consistently low and condition (Fulton's K) has consistently declined in fish passing through the bay, TAG/CHOL has been variable from year to year (B. MacFarlane, NMFS, pers.comm. 2006). Why this should be so is not clear.

Table 10-1. Measures of condition of juvenile fall or Chinook captured near the Golden Gate. Data from MacFarlane and Norton (2002) and MacFarlane, et al. (2005).

Year	Length (mm)	Weight g	Age d	TAG/CHOL	Fulton's K
1997	**85.5±1.1 (64)**	**7.23±.3 (64)**	**176±3 (32)**	**9.5**[1]	**na**
1998	**87.6±0.5 (255)**	**7.1±0.1 (255)**	**160±1 (106)**	**4.1±0.4**	**1.04±??**
1999	**92.0±1.0 (124)**	**8.6±0.3 (124)**	**168±3 (60)**	**15.37±1.56**	**1.05±??**

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CHAPTER SIXTEEN

HYDROSYSTEM MANAGEMENT

At the present time, no salmon enter these streams [Feather, Yuba, American, Mokelumne, Tuolumne rivers]. It would be safe to estimate that one-half the streams in this State to which salmon formerly resorted for spawning have, for this purpose, been destroyed by mining. As mining is the more important industry, of course, for this evil there is no remedy, other than by artificial means to increase the supply in those tributaries that are still the resort of these fish.

Report of the Commissioners of Fisheries for 1876 and 1877

Although the plans to build a huge dam on the Sacramento River had been in print for at least seven years (citation), it was not until complete specifications for the Shasta Dam were published and the bids received for consideration that a study of the probable effects of this dam on the fishery resources of the river system was begun.

Hanson et al. (1940:1)

Development of the California Water Plan [i.e., the SWP] will create considerable environmental changes in the Sacramento-San Joaquin Delta. Major changes will occur in the amount and pattern of water flow, water quality and salinity incursion. A knowledge of the major factors affecting fish distribution and abundance is essential if we are to protect and enhance, if possible, the fishery resources of the Delta ...

J. L. Turner (1966:9)

There is a growing public recognition that one of the most important public uses of tidelands – a use encompassed within the tidelands trust – is the preservation of those lands in their natural state, so that they may serve as units for scientific study, as open space, and as environments which produce food and habitat for birds and marine life, and which favorably affect the scenery and climate of the area.

Marks v. Whitney (1971) 6 Cal.3d 251

The prosperity and habitability of much of this state requires the diversion of great quantities of water from its streams for purposes unconnected to any navigation, commerce, fishing, recreation, or ecological use relating to the source stream. The state must have the power to grant unvested usufructuary rights to appropriate water even if diversions harm public trust uses. Approval of such diversion without considering public trust values, however, may result in needless destruction of those values. Accordingly, we believe that before the courts and agencies approve water diversions they should consider the effect of such diversions upon interests protected by the public trust, and attempt, so far as feasible, to avoid or minimize any harm to those interests.

National Audubon v. Superior Court (1983) 33 Cal.3d 419

This chapter gives a brief review of water management in the Central Valley as it affects salmon, and is intended mainly as background for readers who are unfamiliar with the area. More detailed descriptions can be found in various documents, such as NOAA Fisheries (2004),

and the 2005 California Water Plan (http://www.waterplan.water.ca.gov). Management of harvest is discussed briefly in Chapter 14; legal issues related to instream flows, particularly regarding the Public Trust Doctrine as applied to water in California, are described in Appendix C.

All major Central Valley rivers are blocked by large dams with substantial reservoirs, as well as by various smaller dams (Ch. 3). Water stored in major reservoirs in the Sacramento Valley is mostly released into the rivers for diversion farther downstream, particularly in the Delta, so on annual average, flows in the rivers below the dams are not much reduced from natural levels. Shasta Dam on the Sacramento River and Folsom Dam on the American are part of the Central Valley Project (CVP), while Oroville Dam is part of the State Water Project (SWP). New Bullards Bar Dam on the North Fork Yuba River is owned by a local agency, and unlike the others, supplies mainly local demand. In the San Joaquin Valley, stored water is applied mainly to local uses, and major canals divert directly from the reservoirs, so that average flows in the downstream reaches available to salmon are much reduced from their natural level. In the extreme case of Friant Dam on the San Joaquin River, not enough water is released to satisfy downstream water rights, water from the Sacramento system is pumped south in the Delta-Mendota Canal to satisfy those water rights, and not enough water remains in parts of the river to allow fish migration. Friant Dam and Goodwin Dam on the Stanislaus River are part of the CVP, while New Don Pedro Dam on the Tuolumne River and New Exchequer Dam on the Merced River are owned by local agencies, as is Pardee Dam on the Mokelumne River, which drains directly to the Delta. This patchwork of ownership does not facilitate coordinated management.

For historical reasons including the importance of the mining industry, California recognizes both riparian and appropriative water rights (Littleworth and Garner 1995). The Mediterranean climate of the state, with an annual summer drought, makes extensive irrigation necessary, and large areas of the Central Valley were subject to frequent winter and spring flooding before the development of levees, flood bypasses, and multi-purpose dams. These and other developments had disastrous effects on Central Valley salmon (Ch. 3). Over time, however, more attention has been given to protection of fish and the environment. Fish protection was essentially an afterthought in the design of the CVP (Hanson et al. 1940), but major studies of the Delta were conducted during the design of the SWP (e.g., Fish Bulletins 133 and 136). This trend continued as the environmental movement developed as a political force, laws such as the Endangered Species Act and National Environmental Policy Act and their California counterparts were enacted, and the public trust doctrine was extended by the California Supreme Court to provide environmental protection to tidelands and to navigable waters or their tributaries in *Marks v. Whitney* (6 Cal.3d 251) in 1971 and *National Audubon Society v. Superior Court* (33 Cal.3d 419) in 1983. Thus, water management in the Central Valley is based on a complex web of rights and regulations that has evolved over time to accommodate new projects and changing legal and political environments.

The 1987-1992 drought created great tension between instream and consumptive needs for water, particularly because of the recent listing of winter Chinook under the Endangered Species Act. Political gridlock ensued, but was eased by the 1994 Delta Accord, which provided for interim protection for listed species, along with certain principles for managing the Delta and water diversions in the short term. The Delta Accord was implemented largely through Decision 1641 by the State Water Resources Control Board (SWRCB), in 1995.

The SWRCB deals with water quality as well as water rights, and because water quality in the Delta depends on inflows, water quality standards are in effect flow standards. In the abstract, the SWRCB has great authority in California water issues, but in practice has played a cautious and limited role in the Central Valley in recent decades. Instead, the lead role was taken by CALFED, a consortium of state and federal agencies which was transformed by the Delta Accord into a multi-agency effort to develop a comprehensive resolution to Central Valley water issues. This effort now has independent institutional existence as the California Bay-Delta Authority. CALFED has programs dealing with such matters as new water storage facilities, levee stability, and water transfers, but also with ecosystem restoration and science. Notably, the ecosystem restoration program emphasizes the importance of geomorphic processes in the creation and maintenance of habitats. Generally, money for restoration programs has been distributed through a process of competitive proposals. However, the organizational structure of CALFED has been sharply criticized (CLHC 2005), and CALFED is now going through a period of "re-focusing" and "re-invigoration" (CALFED 2005).

The Environmental Water Account (EWA) is a major CALFED program that is designed to reduce conflicts between exports from the Delta pumps and protection of ESA-listed fish. Water is acquired and moved south of the Delta when the diversions are thought to be less harmful, or is acquired south of the Delta, and banked. The banked water is used to replace water that is not pumped at times that are thought to be more harmful (CALFED 2005). Water is acquired in several ways, but mainly by purchasing water from willing sellers, by temporarily relaxing normal restrictions on Delta pumping, or by using water allocated to environmental uses under other programs. In another aspect of the program, hydropower producers can be compensated for foregone power generation, for example when cool water is released from outlets below the hydropower intakes, in order to reduce temperatures in the river downstream. Although the EWA has been successful in reducing conflicts, it is less clear that it has benefited listed Chinook or steelhead (NOAA Fisheries 2004).

The Central Valley Project Improvement Act (CVPIA), enacted in 1992, made fundamental changes in the CVP authorization, giving protection and restoration of fish and wildlife and associated habitats equal priority to municipal and irrigation uses of water, and enhancement equal priority with hydropower production. In particular, section 3406(b) called for implementation of a program "which makes all reasonable efforts to ensure that, by the year 2002, natural production of anadromous fish in Central Valley rivers and streams will be sustainable, on a long-term basis, at levels not less than twice the average levels attained during the period of 1967-1991." It also specified a number of measures intended to effect the new fish

and wildlife purposes, including dedication of 986.7 million m^3 [800,000 acre feet] of "CVP yield" to fish and wildlife purposes, and setting up a restoration fund to provide up to $50 million annually for fish and wildlife restoration. Section 3406(g) calls for development of "readily usable and broadly available models and supporting data to evaluate the ecologic and hydrologic effects of existing and alternative operations of public and private water facilitates and systems in the Sacramento, San Joaquin, and Trinity River watershed." These should provide improved scientific understanding of, among other things, "measures needed to restore anadromous fisheries ....", and "development and use of base flows and channel maintenance flows to protect and restore natural channel and riparian habitat values." The Secretary of the Interior was also charged with determining instream flow needs for all CVP controlled streams (3406(b)(1)(B)), based on recommendations of the USFWS after consultation with the CDFG.

Although some progress has been made, the CVPIA has made less difference than its proponents expected (McCarthy 1997). For one thing, litigation resulted in most of the 800,000 acre feet of CVP yield effectively being assigned to maintaining the status quo in the American River.[88] More fundamentally, implementation of the CVPIA revealed the limitations of current scientific knowledge and understanding, and the resulting difficulty in developing effective restoration programs. As a simple example, the estimate of natural production of Chinook salmon during the 1967-1991 base period is little more than an educated guess; estimates of harvest and estimates of varying quality of adult returns existed for most streams, but these were simply divided by two to estimate natural production (Mills and Fisher 1994).

All major Central Valley dams except Friant release water to provide habitat for fish below the dams, and as a result of current litigation, water presumably will soon be released from Friant, as well (Appendix C). Instream flow requirements are determined by the Federal Energy Regulatory Commission (FERC) for non-CVP projects with hydropower licenses,[89] and for other dams by the SWRCB, or alternatively, by a court, since the California courts also have jurisdiction over instream flow questions. From time to time instream flow requirements are reconsidered, for example when FERC licenses expire, and in most cases, instream flow requirements have been increased when permits were reviewed. For example, the license for Oroville Dam is currently under active review. For Shasta, a standard originally intended to protect navigation, 99 to 142 m^3s^{-1} (3,000 – 5,000cfs) depending on storage in Shasta, now effectively operates as a fish protection standard. Important legal developments affecting

[88] *San Luis and Delta Mendota Water Authority v. US* (U.S. District Court, E.D. Cal, CV-F-97-06140-OWW). As of 1992, the legally binding instream flow standards in the American River were set in the permit for Folsom Dam. These called for flows of 250 or 500 cfs (7.1 or 14.2 m^3s^{-1}), depending on the time of year. Subsequently, the SWRCB set higher standards, in a 1972 decision permitting the proposed Auburn Dam. These called for 1,500 cfs (42.5 m^3s^{-1}) unless CVP contractors were rationed, in which case somewhat lower flows applied. Since Auburn Dam was not built, the higher standards did not go into legal effect, although the Bureau of Reclamation operated Folsom as if they were. The CVPIA provided that the 800,000 acre-feet would go, among other things, to meet new legal obligations placed on the CVP following its enactment; thus, most of it has gone into the difference between the two sets of standards on the American River. Presumably, this was not the result intended by proponents of the CVPIA.

[89] Federal authority regulating hydropower production normally preempts state authority regarding instream flows (*California v. FERC*, 1990), but the Reclamation Act that provided authority for building the CVP explicitly required that state law be observed.

instream flows in the last few decades have mostly come from court decisions. In essence, these require that instream and consumptive uses of water be balanced, with considerable weight given to instream uses, and allow the balancing to be reconsidered in light of new information (Appendix C). To do such balancing in a straightforward way would require better information about the effects of water management on stream ecosystems than is generally available, which makes an adaptive (i.e., experimental) approach appropriate (Castleberry et al. 1996).

The major Central Valley reservoirs serve for both flood control and water storage. The reservoirs are drawn down in late fall to provide temporary storage for regulating runoff from winter storms, and then allowed to refill, mainly from snowmelt runoff, as the risk of major storms declines in the spring. During the winter, releases from the dams are increased during and after the storms, and then "ramped down" as the reservoir level drops back toward to the appropriate level. Maximum controlled releases are set at levels intended to prevent or at least minimize flood damage. Controls on the rate of change of the releases (ramping rates) to avoid stranding fish, or on decreases in flow after fish have spawned to avoid stranding redds, are other aspects of instream flow management. Generally these controls are specified in agreements, or are negotiated on a case by case basis by project operators and biologists for regulatory agencies, since the best course of action can depend strongly on the particular circumstances. Although there is no doubt that stranding does kill juvenile salmon, the importance of stranding mortality as a control of populations remains unclear (Ch. 8). Probably the stranding of fall-run redds below Keswick Dam is the most serious example.

During the summer a temperature gradient develops in reservoirs of much depth, with cooler and denser water lying below warmer water, so the temperature of releases from dams can be managed by adjusting the depth at which water is withdrawn and the amount of water discharged. Temperature management is simpler with reservoirs such as New Melones that are large relative to the annual flow in the river. Dams such as Shasta and Folsom were built without facilities for regulating the depth of withdrawals effectively, but these have been added recently, at considerable expense.

When cool water is released into a river during warm weather, its temperature rises toward an equilibrium temperature for the immediate environment at a rate that increases with the difference between the actual and equilibrium temperatures, and decreases with the mass of water involved (Deas and Lowney 2000). Thus, the temperature in the river at a given point downstream from the dam depends on the discharge, which affects both the amount of water to be warmed and the duration of the warming, since the velocity of the flow increases with discharge. Conversely, during cool weather in the fall-run spawning season, the rate of cooling may also decrease with discharge. Management of water temperature and management of instream flows are therefore linked, and temperature standards may act as flow standards.

Releasing cool water from dams can maintain habitat for salmonids for considerable distances. Even in the hot summer in the northern Central Valley, releases of cool water from Shasta Dam normally keep the Sacramento River cool enough for eggs of winter-run

Chinook to survive (<~14°C) for over 50 km (Deas et al. 1997). For the Sacramento River in the summer, the river usually approaches equilibrium temperature near the city of Sacramento. Managing water temperature is particularly challenging on the American River, where authorities try to maintain summer habitat for steelhead using a limited pool of cool water in Folsom Reservoir, and also to retain some cool water in reserve to accelerate cooling in the fall for spawning by fall-run Chinook. Management of water temperature on the Feather River is directed toward rice cultivation rather than fish; most of the water released from Oroville Dam passes through the shallow Thermalito Afterbay, where it warms enough that water diverted to irrigate rice will promote good growth, and cool water habitat in the river is restricted to the 13 km of channel upstream from the Thermalito Afterbay Outlet.

Since 1995, flows in the Delta have been managed largely in terms of an outflow-related salinity index called "X_2," as specified in Decision 1641 of the State Water Resources Control Board (SWRCB). X_2 is an ecologically-based index that is roughly the distance in kilometers up the axis of the Estuary from the Golden Gate to where the tidally-averaged, near-bottom salinity is 2 practical salinity units (psu) (Kimmerer 2004), and is determined by recent and current outflow from Delta.[90] The management requirements for "X_2 days" vary according to the flow in specified Central Valley rivers, with X_2 held farther down-Estuary in wetter years and vice versa. Besides X_2, SWRCB Decision 1641 imposes constraints or standards for diversions at the CVP and SWP pumps, specified in terms of an Export/Inflow (E/I) ratio and total export rates, minimum Delta outflow requirements, flow requirements in the lower San Joaquin and Sacramento rivers, and municipal and industrial (M&I) water quality standards at specific points in the Delta. Restrictions on the take of listed salmon and steelhead may also constrain pumping.

Three basic "knobs" are available for managing Delta water quality. First is regulating the rate of pumping itself; shifting diversions from one pump to the other allows for minor adjustments. Second is managing the routes of flow into the Delta, either by opening or closing the Delta Cross Channel, an artificial distributary that connects the Sacramento River with the interior Delta, or by closing the head of Old River, a distributary of the San Joaquin through which water flows to the pumps. Closing these channels causes water and associated fish to flow farther downstream in the mainstem rivers before moving toward the pumps, but closing the Delta Cross Channel causes more saline water to be entrained into the flow to the pumps, and blocking the head of Old River may cause more Delta smelt, another ESA listed species, to be so entrained. The third approach is to adjust Delta inflows, mainly by releases from CVP and SWP reservoirs. Thus, management of the Delta directly affects conditions in the rivers, and vice versa.

SWRCB Decision 1641 also established a major program to test the rationale for a controversial proposed standard for Delta inflow in the San Joaquin River to protect Chinook smolts. Although the data were clear that smolt survival was higher in wet years when spring discharge is high, a relation between flow and survival was not apparent at the lower range of

[90] See Kimmerer (2002) for a thorough discussion the history of and basis for X_2.

flows that usually occur. Following negotiations by parties involved, a 12 year Vernalis Adaptive Management Program (VAMP) was designed to investigate the influence of flow and exports on the survival of fall-run smolts moving into the Delta from the San Joaquin River. The VAMP uses hatchery fish marked with coded-wire tags, released above and below the reach most affected by the pumps: upstream releases at Durham Ferry (rkm 109) and Mossdale (rkm 90), and downstream releases at Jersey Point. Recoveries are at Antioch (rkm 9) and Chipps Island. The experimental design of the VAMP calls for targeting flow and export combinations for a 31 day period between April 15 and May 31 (Table 16-1), although as a practical matter flows in the San Joaquin vary around the selected target by around 10 m^3s^{-1}. Results to date are inconclusive (Figure 16-1). The estimated survivals through the lower river seem low, given that runs persist in San Joaquin tributaries.

Table 16-1. Combinations of exports and flow into the Delta from the San Joaquin River that are targeted by the Vernalis Adaptive Management Program (VAMP).

Flow (m^3s^{-1})	Exports (m^3s^{-1})		
	42.5	63.7	84.9
90.6	X		
127.4	X		
161.4		X	
198.2	X		X

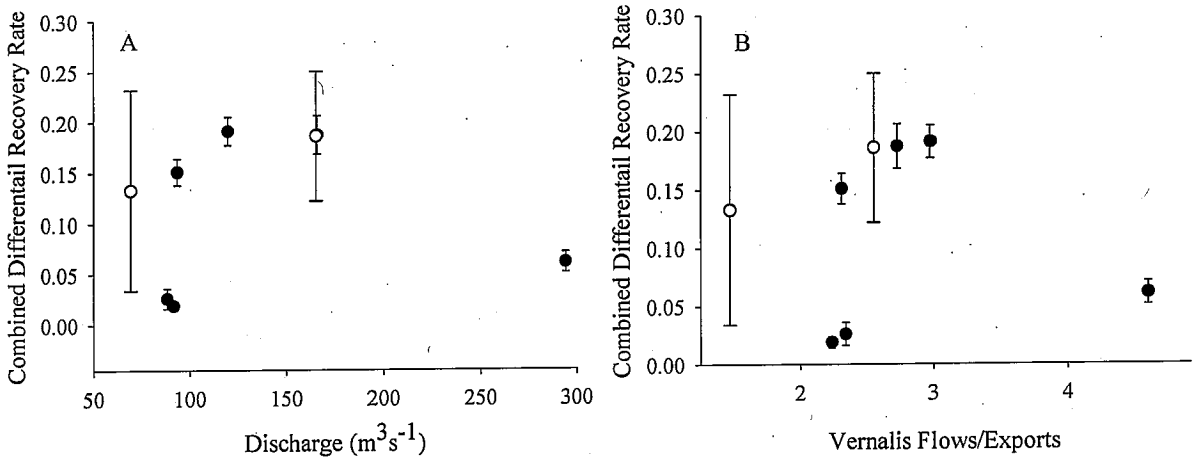

Figure 16-1. Combined differential recovery rate (a measure of survival) plotted (a) over discharge at Vernalis, and (b) the flow/export ratio, for the years of the VAMP experiment, 2000-2005 (filled circles) and two prior years, 1994 and 1997 (open circles). The two low survival years are 2003 and 2004. The combined differential recovery rate is the ratio of the recovery rates for the upstream and downstream release groups, which in turn are the ratios of the recoveries at both recovery sites to the number of fish released upstream. Bars show one standard error. Data from SJRGA (2004) and Lowell Ploss.

In general, the trend in management of the hydrosystem has been toward increased accommodation of environmental concerns, and the legal and institutional means for this trend to continue are in place. Whether the trend will continue is uncertain. The basic problem is that the increasing human population and climate change will place increasing stress on both the system and the web of legal and institutional arrangements by which it is managed. Warmer winters will mean that more precipitation will fall as rain, during individual storms as well as over the season, so to maintain the same level of flood control, dams may need to be drawn down farther in the winter, and there will be less snowmelt runoff to fill them in the spring. Like the Red Queen in Alice and Wonderland, hydrosystem management will need to run faster and faster just to stay in the same place.

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CHAPTER 17

SUMMARY AND RECOMMENDATIONS

The impression that it is sought to convey throughout this paper is that in order to conserve our fisheries, there are many problems to be solved, all of them important. Among them that of the adoption of statistical methods having for their object the ascertainment of the abundance, rather than the amount taken, easily comes first. But such a substitution cannot be made without a knowledge of biology to supplement and guide it. And the biological phases of fishery science are in themselves many and important, dealing as they do with the rate of growth and movements of the fish. Then, finally, there is almost no adequate knowledge concerning the methods of conservation, or the prevention of depletion. We are at the threshold of a period of exploitation of our fisheries and we must be sure to begin an era of scientific investigation of our fisheries in time to adequately guide and control the exploitation.

W. F. Thompson (1919:59)

This chapter provides a brief summary of the main points presented in earlier chapters, followed by a summary review of the current status and future prospects of the various runs of Chinook and of steelhead. Some recommendations relevant to each of the runs are given, followed by general recommendations regarding management of salmon and their habitats.

Summary

For thousands of years, since the post-Pleistocene rate of increase in sea level slowed and allowed the formation of vast tidal wetlands in the Delta, five species of Pacific salmon in the Central Valley adapted to conditions more or less like those existing when the gold rush began (Ch. 3). Occasionally, salmon in the Central Valley were subject to severe stresses, such as major episodes of drought around 1,000 and 700 years ago (Stine 1994), but evidently they survived. By the time of the first serious study of salmon at the end of the nineteenth century, however, Central Valley rivers had already been heavily modified by hydraulic mining, dams and diversions, levees, clearing and snagging, and logging. Pink, chum, and coho salmon were effectively extinct in the Central Valley, as were many of the pre-existing populations of Chinook and steelhead, and perhaps also summer-run Chinook in the San Joaquin River (Ch. 2). Statements about the life histories and habitat use of natural salmon populations in the Central Valley are therefore more or less speculative, as are statements about their abundance, although from the historical accounts there is no doubt that Chinook were abundant, and from the documentation of the natural landscape such as the Map of Public Surveys and inferences about the habitats that it offered, it is not hard to imagine why; the Central Valley was a good place to be a salmon (Ch. 3).

Modifications of Central Valley rivers continued through most of the twentieth century. Impassible dams were built on all major Central Valley rivers where the rivers emerge from the foothills, fundamentally changing the hydrologic conditions in the moderate to low gradient

reaches downstream from the dams where Chinook and steelhead are now mainly confined. The loss of upstream habitat and other changes such as loss of wetlands, increased diversions, bank stabilization and gravel extraction are detrimental to salmon, but not all modifications of the rivers were adverse. Particularly in the Sacramento system, water is released from dams into the channels rather than into canals for conveyance to users, and this creates habitat that to some degree substitutes for habitat above the dams that has been lost to salmon. For example, winter Chinook now reproduce in parts of the Sacramento River that formerly were far too warm during their summer spawning season, and for a time, until the Red Bluff Diversion Dam (RBDD) went into operation, this substitute habitat was highly productive. Problems associated with the RBDD have been reduced by keeping the dam gates open for much of the year, but the productivity of the habitat with current salmon populations remains uncertain, as explained below.

Based on analysis of functionally neutral genetic markers, five distinct groups of Chinook populations persist in the Central Valley: fall-run, late fall-run, winter-run, and two groups of spring-run. These are grouped into three Evolutionarily Significant Units (ESUs) for purposes of the federal Endangered Species Act (ESA): fall-run (including late fall-run), winter-run, and spring-run. Of these, winter-run are listed as endangered under the ESA, and spring-run are listed as threatened. The spring-run ESU includes a population in the Feather River that groups very close to fall-run in genetic analyses. The remaining steelhead are winter-run (sometimes called fall-run), although formerly there were also summer-run. However, existing Central Valley steelhead populations in the American and Mokelumne rivers are derived from a coastal population that was introduced into hatcheries on those rivers (Ch. 2). Central Valley steelhead are also listed as threatened under the ESA.

Naturally reproducing Central Valley salmon pass through a series of environments during their lives, beginning in the gravel-beds of streams, and continuing through the lower gradient reaches of the streams, the San Francisco Estuary, the Gulf of the Farallones, the ocean, and back again (Chapters 6-11). All of these habitats have been highly modified (Ch. 3).[91] Salmon have responded to these changes in various ways. Demographically, their numbers vary from year to year, depending both on natural variation in climate, ocean conditions, etc., and on variation in human activities such as harvest, hatchery production, and water management. Chinook populations have always varied substantially (Dettman et al. 1987), but, at least for fall Chinook in the Sacramento River and its tributaries, have done so particularly in the last two decades, from extreme lows around 1990 to much higher numbers around 2000 (Ch. 2).

Genetically, salmon have responded to the changed conditions in the Central Valley over tens of generations, enough time for considerable evolution to occur. As one example, age at maturity is genetically influenced, and the range of age at maturity in Chinook has decreased by about a year, presumably in response to selection by ocean harvest; 85 years ago there were many five year-olds and a few six year-olds, and now there are many four year-olds and a few

[91] From a salmon's point of view, ocean habitats have been highly modified in the last century by the appearance of a major new predator that also harvests small fish on which salmon feed.

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five year-olds. Size increases with age, so on average Central Valley Chinook are now smaller as well as younger (Ch. 13). Other changes have not been documented, but probably for lack of baseline data rather than absence of changes.

Developmentally, salmon may follow one or another life-history pattern, depending on both natural and anthropogenic conditions as well as on their genotypes. Currently, the great majority of naturally produced juvenile Chinook in the Sacramento River and its tributaries begins migrating downstream shortly after they emerge from the gravel, mainly in late winter or early spring, although some rear in the streams for a few months to a year before emigrating in late spring or in the following fall, winter, or spring (Ch. 2). The propensity to migrate at different times varies among runs and among populations, and among years. For example, in the San Joaquin tributaries, juvenile fall-run migrate mainly in winter in some years and in spring in others. Spring-run in several Sacramento River tributaries, the last wild salmon in the Central Valley, exhibit great diversity in life history patterns. Various cues, including the Earth's magnetic field, the angle and duration of sunlight, and the specific odors of different streams, are used to accomplish the required navigation and scheduling for these migrations, although just how it is accomplished remains unclear (Ch. 5). Similarly, although a good deal is known about the control of salmonid life history patterns (Ch. 1), just what determines the repertoire of behaviors used by Central Valley salmon to survive, grow and reproduce in these various habitats remains uncertain.

Whether or not "mitigation, protection, and restoration of fish and wildlife" have become co-equal with water supply as purposes of the Central Valley Project, as called for by the Central Valley Project Improvement Act (CVPIA), there is no doubt that in recent years salmon have been given much more consideration in the management of Central Valley rivers than was formerly the case (Ch. 16). Moreover, the conceptual foundation underlying salmon management is changing. The CALFED environmental restoration program, with an emphasis on restoring populations by restoring the natural processes that create habitat for the populations is one aspect of this change, which provides a basis for optimism regarding the future of salmon and steelhead in the Central Valley. Other aspects of salmon management, especially hatcheries and harvest, reflect an older, production-oriented approach based on an agricultural model (Ch. 1). Management actions based on these different points of view will be in conflict until a clear set of priorities is developed.

As one example, hatcheries now provide habitat for a large percentage of Central Valley Chinook and steelhead. In one sense the hatcheries have been successful, especially for fall Chinook, as evidenced by the very high returns in recent years. However, hatcheries have come under increasing criticism (Ch. 12). The National Resource Council (NRC 1996) identified demographic risks, genetic and evolutionary risks, behavior, fish health, physiology, and ecological problems as issues concerning the interaction of hatchery and naturally produced salmon. Genetic risks seem most serious, since genetic effects will persist even if hatchery production is ended. A group of distinguished scientists recently asserted that "Inevitably, hatchery brood stock show domestication effects, genetic adaptations to hatchery environments

that are generally maladaptive in the wild" Myers et al. (2004:1980), and there is evidence, discussed below and in Ch. 2, that hatchery fall Chinook have tended to replace naturally reproducing fish in the Central Valley, rather than supplement them. Thus, hatchery production tends to undercut the CALFED objective of promoting locally adapted, naturally reproducing populations of Chinook and steelhead.

As another example, there is little doubt that harvest is slowing the recovery of winter and spring Chinook. Almost a quarter of subadult winter-run were killed by the ocean fishery in 1998-2000, as were over a third of subadult spring-run in 1998 and 1999 (Feb. 2004 Interagency Workgroup Report to the PFMC, cited in CDFG 2004a and 2004b). Not all of these would have survived to spawn. Nevertheless, given the high mortality rate of small fish in the ocean, the ~1% of juvenile winter-run that are killed at the Delta pumps pales into insignificance by comparison.

Salmon monitoring in the Central Valley is conducted by a number of agencies or their consultants (Ch. 15). Coordination among the monitoring programs has improved in recent years, but the programs do not constitute a well integrated system, and primarily address questions based in the older production-based approach to salmon management.

The greatest threat facing Central Valley salmon is the projected warming of the regional climate (Ch. 3). The high mortality of adult spring-run in Butte Creek in two recent summers (Ch. 6) underscores this problem. Although the details remain uncertain, the world is getting warmer (Hansen et al. 2005; Barnett et al. 2005), and California increasingly will get less precipitation as snow (Mote et al. 2003; Hayhoe et al. 2004). Based on an analysis of an ensemble of climate models and emission scenarios and a reference temperature from 1951-1980, the most plausible projection for warming over Northern California is 2.5°C by 2050 and 5°C (9°F) by 2100, with a modest decrease in precipitation (Dettinger 2005). Climate change will complicate all the CALFED programs, but Chinook in the Central Valley are at the southern limit of their range, and it seems unlikely that any could survive a 5°C warming. These projections depend heavily on assumptions about future emissions of greenhouse gases, however, and because there are many other compelling reasons to reduce emissions, there may still be time to moderate warming enough to allow salmon to persist in the Central Valley.

The current status and future prospects of Chinook and steelhead in the Central Valley

Fall Chinook

The typical life history patterns of fall Chinook avoid freshwater during the summer, with juveniles migrating toward the Delta within a few days to a few months of emerging from the gravel. Much of the natural spawning habitat for fall-run is downstream from dams, habitat conditions on many streams seem good in many years, and large numbers of naturally spawned juveniles are produced in many years.

Fall-run returns have increased dramatically over the last decade, but much of the increase probably results from improved ocean conditions, together with stable hatchery production and

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sharply reduced harvest. Few hatchery fall-run are marked, so the proportion of hatchery fish among returning adults is unknown, but presumably it is large (Ch. 12). The NOAA Fisheries status review concluded regarding fall Chinook that "...high hatchery production combined with infrequent monitoring of natural production make assessing the sustainability of natural production problematic, resulting in substantial uncertainty regarding this ESU" (Myers et al. 1998). This uncertainty remains.

There is good reason to believe that salmon populations that breed both in hatcheries and in streams can lose fitness for breeding in streams (Ch. 12; Hey et al. 2005), and that hatchery salmon may tend to replace rather than supplement naturally producing fish in consequence of this and of density-dependent mortality (Cooney and Brodeur 1998; Hilborn and Eggers 2000; Sweeting et al. 2003). Such replacement has been demonstrated for a Chinook population in New Zealand (Unwin and Glova 1997), and there is evidence from the Sacramento River system that it is happening in the Central Valley. Enough marked fall-run have been found recently in Mill and Deer creeks to indicate that these populations are largely hatchery strays (Ch. 2). A century ago, Mill Creek was known for its large run of fall Chinook, and its watershed is still largely undeveloped, so the heavy presence of hatchery fish there is an ominous sign. Recent trends in returns to Battle Creek and to the mainstem river also suggest replacement (Figure 2-5). Assuming that the number of Coleman Hatchery fish that stray to the mainstem Sacramento River roughly balances the number of naturally produced fish returning to Battle Creek, so that the mainstem and Battle Creek returns approximate the naturally produced and hatchery fractions of the population, it appears that the hatchery fraction is now dominant. If the early estimates of returns reasonably reflect the actual returns, the total numbers of fall Chinook upstream from Red Bluff were about the same in the years around 1960 as they have been in recent years, but most fall-run now return to Battle Creek.

Some problems with hatcheries have been recognized and are in various stages of correction in the Central Valley; for example moving fish from one stream to another has largely been stopped, although CDFG policy still permits it. Some problems, such trucking fish around the Delta, which increases straying, could be stopped but have not been. Other problems, such as the lack of natural mate selection and the different selective regimes in hatchery and natural environments, probably cannot be avoided.

For fall-run, probably the greatest near-term need is to revise hatchery and harvest policies and practices to be more consistent with restoration objectives. Recommendations in this regard are given in Chapters 12 and 13, and below. Climate change is the greatest long term hazard, as it is with other runs. At the least, warming will shorten the period in which the low elevation habitats used by naturally producing fall-run are thermally acceptable. This should particularly affect fish that emigrate as fingerlings, mainly in May and June, and especially those in the San Joaquin River and its tributaries.

Late fall Chinook

Late fall Chinook spawn in winter, and the juveniles pass a summer in freshwater before emigrating in the fall. Less is known about late fall-run than about other runs of Chinook, for several reasons. First, they spawn when field work in the rivers is much more difficult than in other seasons, and since the RBDD gates have been raised seasonally the estimates of adult returns of late fall-run have been less reliable than for other runs. Second, until recently, it was not possible to distinguish individual late fall-run fish from fall-run fish using genetic markers, so confirming ideas about late fall-run has been very difficult. Third, because late-fall are included in the unlisted Central Valley fall-run ESU (Myers et al. 1998), there is less motivation to study them. There were good returns of late fall Chinook in 1998 and 2002, but they have not increased as strongly in recent years as other runs. Returns to the Colman National Fish Hatchery have increased in recent years relative to returns of naturally produced fish, and although the percentage of hatchery fish among natural spawners is still low, it seems to be increasing (Ch. 2).

More needs to be learned about late fall-run. A good first step would be regular genetic typing of subsamples of juvenile Chinook captured in monitoring programs. Initial questions that could be addressed include an assessment of which streams support late fall-run on a regular basis, whether populations in smaller streams are strongly influenced by hatchery strays, and whether there are differences in the life history patterns of naturally produced and hatchery fish. It is also important to learn whether juvenile late fall-run from the hatchery are reasonable surrogates for naturally produced Chinook from other runs, as assumed in some survival studies.

Winter Chinook

Winter Chinook have increased sufficiently over the last decade to ease concerns about their near-term prospects (Ch. 2). If the population continues to increase, the biological significance of reversible sources of mortality such as losses of juveniles at diversions will become increasingly questionable. The population is already large enough to raise questions about the desirability of hatchery supplementation, and to justify loosening restrictions on mortality in monitoring programs, especially those producing information that will be useful for managing winter-run or other listed runs or species. Besides ocean conditions and reduced harvest, changes in the management of freshwater habitat, especially raising the RBDD gates, probably account for most of the recent increase in numbers of winter-run, although probably hatchery supplementation has also helped. The long-term prospects for winter-run are still poor, however. For winter-run, the embryonic and larval life stages that are most vulnerable to high temperatures occur during the summer, so winter-run are particularly at risk from climate warming. Currently there is only a single population. Removal of dams on Battle Creek should allow for re-establishment of a second population there, but whether the Battle Creek habitat will remain cool enough to be suitable as the climate warms seems doubtful.

Now that the temperature of releases from Shasta can be better managed, the RBDD is operated seasonally, and passage over the ACID Dam has been improved, the actions that seem most likely to help winter-run in the short term are extending the "gates out" period at RBDD to include the beginning of juvenile migration period, further reductions in harvest, and

improvements to the habitat used by juveniles during their slow migration down the Sacramento River. Implementation of the "meanderbelt" concept between Red Bluff and Colusa (SRCAF 2003) through continued acquisition of riparian land or easements to allow more natural processes of channel behavior and habitat creation may be particularly important; most of the bank protection works in this reach were constructed from the 1960s to the 1980s (Greco 1999), when the winter-run population was declining. More needs to be learned about the way that juvenile winter-run use this habitat, but studying small fish in large rivers is difficult, and new approaches probably are needed. Collecting samples with seines by itself will be of limited value, absent well-defined questions that the sampling can reasonably be expected to answer.

Installing an operable gate with a fish ladder at the Fremont Weir, so that some water could be diverted into the Yolo Bypass in all years, should also be helpful. This would allow adults that are attracted into the bypass to continue their upstream migration, and make the toe drain a regular distributary of the Sacramento River, with better prospects for a more natural connection to a floodplain than are available for the main channel. Passage down the bypass also keeps migrating juveniles away from the central Delta and the pumps.

As far downstream as the RBDD, juvenile winter Chinook can be reasonably well identified using length at date criteria, but this will change if spring Chinook populations increase in upper Sacramento mainstem or tributaries. Below the confluences of Mill and Deer creeks the utility of these criteria deteriorates, because of overlap with spring-run, and fish or subsamples of fish should be assigned to runs by genetic analyses. Making genetic analyses a routine part of monitoring for juvenile Chinook will allow better understanding of the actual spatial and temporal distribution of juveniles of all runs. The existing data from the RBDD screw traps seem like a rich vein for exploratory data analyses. For example, the length and number of emigrating winter-run appear to be inversely related, suggesting a density-dependent effect (Figure 8-5). As patterns are identified they should be fit with models that can be tested with future data.

It is probably time to begin modeling the effects of different scenarios for climate change on water temperature in the Sacramento River, to allow assessment of their consequences for all runs.

Spring Chinook

Spring Chinook have made a spectacular recovery in Butte Creek in recent years and have increased in other streams as well, although the population in the mainstem Sacramento River apparently has dwindled to very low numbers (Ch. 2). Favorable ocean conditions, including reduced harvest, doubtless has contributed to the increases in the tributaries. Why spring-run declined in the mainstem Sacramento River is less clear, but interbreeding with fall-run seems the most plausible explanation. Why spring-run have increased more in Butte Creek than in Mill and Deer creeks is also unclear. Substantial efforts have been made to improve adult passage in Butte Creek, and this may have released the potential of inherently more productive habitat in Butte Creek, but the question remains why the habitat is more productive, if it is. The low elevation habitat in lower Butte Creek and the Sutter Bypass may be responsible, and the use of

this habitat by juvenile spring-run deserves continued study. In any event, the population in Butte Creek has been high enough in some recent years that strong density-dependent mortality seems inevitable, and further large increases should not be expected.

Despite recent increases in several populations, the prospects for spring-run are dampened by global warming. Spring-run in Butte Creek are limited to low elevation habitat that is thermally marginal now, as demonstrated by high summer mortality of adults in 2002 and 2003, and will become intolerable within decades if the climate warms as expected. The same is true for other streams such as Beegum Creek, a tributary of Cottonwood Creek, where modest numbers of spring-run have been observed in recent years. However, suitable conditions should persist longer in Mill and Deer creeks, where fish can reach higher altitudes. Some existing or potential habitat should also remain for some time below various dams that currently release cool water through the summer. More habitat could be opened up in Battle Creek if the proposed restoration plan for that stream is implemented; although it seems doubtful that the habitat will remain cool enough in the summer for the eggs of winter-run to survive if the predicted warming occurs, it may remain cool enough to provide holding habitat for adult spring-run, which are considerably more tolerant of warm water. Opening the Yuba River to spring-run is also under study. Temperature criteria developed from Butte Creek data should be used to evaluate the thermal suitability of habitats there, since temperature criteria developed from the literature are likely to be too conservative. On the other hand, the investigations should consider future as well as current temperatures.

Spring-run are restricted to low elevations in Butte Creek by natural barriers as well as PG&E dams. The Butte Creek canyon is so steep that opening access to higher elevation habitat would be difficult, but the possibility of doing so should be reassessed in light of global warming. In the meantime, consideration should be given to trucking a few adults around the PG&E dams to avoid losses of complete year classes, as may have happened in 2002, although the trucking would work only if the PG&E diversions were screened.

Chinook return to the Feather River in spring, but genetic analyses show that these are very closely related to fall-run (Figure 2-2). These fish hold over through the summer in the river, and until recently attempts at the hatchery to isolate them reproductively from fall-run have not been fully effective. Fish also appear in the Yuba River in spring, and it seems likely that these are similar. Whether or not these fish belong in the spring-run ESU, they do contribute to the phenotypic diversity of Central Valley Chinook, and so deserve attention, especially given the possibility that appropriate habitat for spring-run will become available in the Yuba River. In the meantime, a portion of the low-flow channel in the Feather River might be fenced off in early summer to keep these early fish spatially isolated from fall-run. The hatchery production target for Feather River spring-run has recently been reduced, from five to two million smolts. The appropriate level of hatchery production should be considered carefully, using analytical approaches such as those reported in Lynch and O'Hely (2001) or Goodman (2005).

Opening new habitat for reproduction raises the question whether fish from other streams should be introduced to seed the new habitat, or whether fish should be allowed to colonize it on their own. There is not an obvious answer to this question. Past transfers of fish from one stream to another are now commonly regarded as mistakes, and this history cautions against deliberate transfers. That is, we may think that we now understand enough to avoid past mistakes, but probably biologists in the past also thought that they understood enough to make wise choices. However, opening habitat that may not be colonized for decades does not seem feasible politically, even if it were desirable biologically. Where some fish are using the habitat, as in Clear Creek, it seems appropriate to give them a chance to colonize it. On the other hand, it seems far less likely that fish would spontaneously recolonize the San Joaquin River in any reasonable time, assuming that adequate instream flows are restored, so deliberate transfers seem appropriate.

Steelhead

The current status of naturally-produced anadromous steelhead in the Central Valley is poor; abundance data are scant, but based on the ratio of marked and unmarked smolts captured in the Chipps Island trawl, it appears that the anadromous populations total only a few thousand adults, and an unknown percentage of these are progeny of hatchery fish, some from an out-of-basin stock. On the other hand, if the non-anadromous component of the population is taken into account, the status of *O. mykiss* in the Central Valley is much less dire. Like spring Chinook, steelhead have been cut off from most of their natural spawning habitat on most Central Valley rivers by dams. Some of these dams, for example Shasta and New Melones, release enough cool water through the summer to provide good habitat for non-anadromous *O. mykiss*, and it appears that many fish are taking advantage of it. It is also possible that *O. mykiss* in Sacramento River tributaries such as Clear Creek have become potadromous rather than anadromous; that is, they may migrate downstream to the river, but not continue to the ocean.

Steelhead are heavily influenced by hatchery production in several rivers, with unknown consequences for the fitness of naturally spawning fish. This is particularly a problem on the American River, where the naturally spawning population is included in the Central Valley steelhead ESU although the hatchery population is not, but naturally spawning fish are mainly hatchery fish from a coastal stock (Hannon et al. 2002; 2003; Nielsen et al. 2005). If fish that really belong in the Central Valley ESU actually occur in the American River, then hatchery production is a major threat for them, and should at least be sharply curtailed. It seems more sensible to recognize that the steelhead in the American River are the legacy of a past mistake,[92] and to manage the river for fall Chinook instead. A similar situation exists in the Mokelumne River.

[92] When Nimbus Hatchery began operations it was unsuccessful at propagating the existing population of steelhead in the American River, and eggs from the northern California coast were introduced to found the existing population.

General recommendations for management

1. Take climate change into account.

Regional climate models are improving (Hayhoe et al. 2004), and before long may provide more specific forecasts that are usefully reliable for guiding management, but the reality of warming is certain enough that it should be factored into planning for restoration activities. As a practical matter, this means that restoration activities that will benefit multiple species or ecosystems should be preferred over those that are specific to salmon, especially along streams where water temperatures are less likely to remain tolerable for salmon. Restoration activities in lowland areas such as tidal marsh restoration should also take account of projected increases in sea level. Change in the amount and distribution of precipitation should also be expected, so designing restoration projects to match historical hydrology is problematic. This seems particularly so for restoration plans that aim to reconstruct floodplains to match miniaturized but more naturally variable hydrology downstream from dams; whether such plans are robust to plausible changes in climate should be considered before large amounts of money are committed to them.

Managers should resist the temptation to allow uncertainty regarding precisely how climate will change to be used to justify not taking future climate change into account in restoration planning. One reason for this is that uncertainty about the extent of global warming results mainly from uncertainty about future emissions of greenhouse gases (Hayhoe et al. 2004); ignoring climate change will likely make it worse.

2. Recognize the limitations of concepts, and use multiple approaches to evaluate problems and policies.

It is well known that the concepts of waves and particles can both be usefully applied to light, but that neither concept allows a complete description of its behavior. In a similar way, various conceptual models or analytical approaches can be usefully applied to salmon or habitats or ecosystems, but none allows complete or even generally sufficient descriptions of them. For example, concepts from population, behavioral, and physiological ecology might all be usefully applied to different aspects of some problem regarding salmon management. The saying that "all models are wrong, but some are useful" applies to conceptual models as well as other kinds, and different concepts or approaches will be more or less useful depending on the particular aspect of an issue that is under consideration. Which concepts or points of view are useful often depends on the spatial and temporal time scales involved, so problems and policies should be considered in terms of various spatial and temporal scales.

3. Take evolutionary considerations into account.

Evolution can occur rapidly in salmon populations. For example, a stream-type life-history pattern has developed in Chinook populations in New Zealand that were founded from ocean-type, fall-run fish about 100 years ago, as have other differences in life history patterns among Chinook in different New Zealand Rivers (Quinn et al. 2000; Quinn et al. 2001). In a statement supported by citations to studies of salmon as well as other organisms, Stearns and Hendry (2004:15) observed that "A major shift in evolutionary biology in the last quarter century is due

to the insight that evolution can be very rapid when large populations containing ample genetic variation encounter strong selection (citations omitted)." Management can impose strong selection, and managers should consider the consequences.

4. Take populations and their habitats as the unit for management.

The different runs of salmonids in the Central Valley, and the different life history patterns expressed by the runs, historically were associated with and presumably represented adaptations to particular habitats. If the runs and diversity in life history patterns are to be maintained, access to these habitats or their equivalents must be preserved or restored (Healey and Prince 1995). As a consequence, highest priority should be given to restoration actions that match fish with appropriate environments; for example, restoring access for steelhead to the South and Middle Yuba should have higher priority than managing temperature in the lower American River for steelhead, where the habitat is more appropriate for fall Chinook (and the existing steelhead population is derived from an out-of-basin stock). Maximizing access for winter-run and spring Chinook and steelhead to appropriate habitat in Battle Creek, and providing seasonal access for juvenile salmon to flooded overbank habitat, e.g., in the Yolo Bypass, should also have high priority.

Lichatowich (1998) noted that stocks have been the traditional unit of management, but, building on Healey and Prince (1995), argued that the management units need to be stocks and their habitats. Booke (1999) similarly argued that acceptable stock concepts must be based on inherited markers that define a specific group of fish plus its habitat. In practice, however, management convenience has sometimes resulted in the development of multi-population stocks such as Sacramento River Fall Chinook. Restoration, on the other hand, typically deals with habitats that are occupied by particular populations, and these habitats and populations should be the basic units of management.

5. Take account of the evolutionary and ecological effects of hatcheries and harvest, as well as the demographic effects.

In a recommendation that seems well directed to CALFED, NRC (1996:321) advised that "The approach to hatchery operations should be changed in accordance with the goal of rehabilitation and the ecological and genetic ideas that inform that goal." This is a major undertaking. To this end, CALFED should sponsor a major review of Central Valley hatcheries in which all options are up for consideration; these include sharply reducing hatchery production, consolidating hatchery production to one or two streams, moving Chinook hatcheries to coastal streams without natural populations, and abandoning hatchery production altogether (Ch. 12). In the meantime, all hatchery fish should be marked, as recommended by NRC (1996) and as legally required for salmon intended for harvest that are produced by federally funded hatcheries.[93]

[93] Public Law 108-7, enacted in Feb. 2003, contains the following language in sec. 138: "The U.S. Fish and Wildlife Service shall, in carrying out its responsibilities to protect threatened and endangered species of salmon, implement a system of mass marking of salmonid stocks, intended for harvest, that are released from Federally

The ocean troll fishery inherently selects against more slowly maturing fish, because it targets subadult as well as maturing fish (Clark 1929; Ricker 1980). The available evidence indicates that ocean harvest of sub-adults has narrowed the range of age at maturity for Central Valley Chinook by about a year. A shift to a terminal fishery, for example using gill nets in the bays, may be necessary to avoid continued selection against late-maturing fish, and continued decrease in average age at maturity. In the past, the California Fish and Game Commission favored a terminal fishery over the troll fishery for such reasons (Scofield 1929). Commercial harvesting in a terminal fishery would also allow a much tighter focus on unlisted runs, although the early season recreational fishery has the greatest impact on winter-run (CDFG 2004a). At the least, a shift to a terminal fishery deserves serious study.

PFMC objectives for adult returns should be harmonized with CALFED objectives. Goals for adult returns should be revised and put on a scientifically supportable basis. In particular, separate goals for adult returns should be set for naturally produced fall Chinook in major streams, including the San Joaquin River tributaries. Goals should be set in terms of the expected number of progeny, which would give more weight to larger females.

6. Treat management as experimental, and try to learn from it.

The California Department of Fish and Game recently suspended stocking trout in a sample of alpine lakes in the Sierra Nevada, and studied whether the existing populations were able to maintain themselves by natural reproduction (Armstrong and Knapp 2004); by and large they were, and comparisons of otoliths from fish in stocked and unstocked lakes indicated that density-dependent reductions in growth rates occurred in the stocked lakes. CALFED has properly emphasized the importance of such active adaptive management, in which actions are taken deliberately to perturb the system being managed, in order to learn from its response. For example, hatchery production of Chinook might be sharply reduced for some number of years to test whether there are density-dependent interactions between hatchery and naturally produced fish, such that increased productivity of the naturally produced fish would compensate for part or all of the foregone hatchery production. Unfortunately, the scarcity of good examples of active adaptive management demonstrates how difficult such management experiments are to arrange, and particularly in the short term, the political feasibility of active adaptive management does not seem likely to increase.

Deliberate management experiments are necessary where there is otherwise little variation in some variable that is central to the problem at hand, such as the hatchery production of juvenile salmon and steelhead. For many problems, however, there is substantial variation in the important variables because of natural variability in climate, and this makes a more passive approach to adaptive management viable. The critical element for success in such passive adaptive management is a state of mind: looking always for opportunities to learn. This leads to

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operated or Federally financed hatcheries including but not limited to fish releases of coho, chinook, and steelhead species."

thinking of management actions as experiments, formulating hypotheses, and trying to conduct monitoring that is adequate to get the experimental results and test the hypotheses. Monitoring should be approached from this point of view.

7. Simulate major restoration actions and monitoring programs.

Restoration actions are expensive experiments. CALFED has properly stressed the importance of articulating the conceptual model or hypotheses upon which proposed actions are based. For actions of any magnitude, it should be worthwhile to develop a numerical formulation of the conceptual model so that likely outcomes of the action can be evaluated quantitatively, and the sensitivity of the outcomes to various parameters in the model can be assessed. This process can help identify key uncertainties and avoid expensive mistakes. The Clear Creek Decision Analysis and Adaptive Management Model (Alexander et al. 2003) that has been developed with CALFED funding is an example of this approach; unfortunately, as that example demonstrates, such modeling can be very difficult. The Water Use Planning (WUP) process in British Columbia, more or less a Canadian equivalent of the FERC relicensing process, provides more successful examples (e.g., McDaniels and Gregory 2004).

In many cases, the monitoring that is proposed to accompany the action should also be simulated, with appropriate random noise added to simulate measurement uncertainty, to determine how strong a signal the restoration action must generate to be detected with reasonable probability. Monitoring programs not associated with specific restoration actions should also be simulated. Ludwig and Walters (1985) urged that "all estimation schemes should be tested with simulated data where the parameter values are known in advance, since accuracy and consistency cannot in principle be determined from 'real data' where parameter values are unknown." Williams (1999) used such simulations to show the limitations of the salmon monitoring proposed by the Comprehensive Monitoring and Assessment Program (CAMP). This should be standard practice, especially for major efforts such as the VAMP.

Developing a larger group of modelers and statisticians to work on Central Valley salmon issues would be a major step forward. Ideally, this group should be large enough to raise the general standard of numeracy among Central Valley salmon biologists, but small enough that it remains focused on issues of importance to other biologists and managers, rather than on modeling itself. It is also important that training opportunities be offered to biologists who are less well versed in statistics and data analysis, so that good communication is possible.

8. Take account of developments in other areas of biology that may help address questions regarding salmon biology and management.

The development of genetic markers for the various runs of Chinook has substantially improved understanding of questions concerning take of listed Chinook at the Delta pumps, and should allow better understanding of the migratory behavior of the various runs as genetic typing is incorporated into existing monitoring programs. With a few exceptions, however, the markers are not associated with traits conferring fitness. The development of a "gene chip" for salmon (Rise et al. 2004) may provide a means to address other genetic questions that do involve fitness.

For example, it may be possible to determine whether domestication has occurred in hatchery fish by examining whether patterns of gene expression in the face of low oxygen levels or other stresses are the same in wild fish and in fish with long histories of hatchery culture. Appropriate advantage should be taken of this and other technological advances.

9. Put the effects of the pumps on Chinook and steelhead into proper perspective.

It seems clear that the Delta pumps are a problem for Central Valley Chinook, especially for San Joaquin River Chinook, and presumably the problem will increase as pumping increases. Nevertheless, it does not appear that the pumps *per se* are **the** problem. Probably because of the assumption that juvenile salmon would passively follow the water (e.g., Erkkila et al. 1950), the pumps have received more attention as a factor in the decline of salmon and other fishes than seems justified by the available evidence. That said, it seems artificial to consider the pumps separately from truncated habitat, reduced spring flows, freshening of the Delta, and other changes in Central Valley salmon habitats that result from the entire system for water management, of which the pumps are an important part. The critical point is that Central Valley salmon would benefit from a more rational allocation of management attention over problems.

10. Put human intervention into proper perspective.

Restorationists have properly emphasized the desirability of maintaining or re-creating conditions such that natural processes maintain habitat in which wildlife can go about its business without human intervention. Thus, for example, CALFED has emphasized the importance of allowing high flows to power natural fluvial processes that sort bed sediments in streams and create spawning habitat. This is the best approach for protecting Chinook and steelhead in the Central Valley, as with the meanderbelt concept, mentioned above. However, the prevalence of dams on Central Valley rivers and human intervention in global climate limit the practicable scope for this approach, and alternatives should be entertained where it is not feasible. For example, on heavily regulated rivers where it is not feasible to provide "flushing flows," mechanical cleaning of spawning gravels should be considered, if gravel quality is a problem. Similarly, where dams prevent natural spatial segregation between runs, artificial separation is necessary if the distinct runs are to be maintained. For example, fall-run are now restricted to the valley reach of Clear Creek, to protect spring-run that spawn farther upstream in the canyon reach. Potentially, this approach could be followed on the Sacramento and Feather rivers, as well, if the fish ladder on the ACID Dam were closed say from the end of July to when the dam is removed in October, or if fall-run were blocked from part of the low-flow channel of the Feather River. In other words, the desirability of restoring ecological functions does not justify an ideological opposition to direct human intervention in the affairs of Chinook and steelhead when there is no good alternative. However, it should be a last resort.

11. *Allocate streams to different treatment groups.*

Central Valley streams vary in the extent to which they have been modified or degraded, and have different prospects for restoration, so it makes sense to treat them differently. Although this variation probably is more continuous than discrete, it seems useful to consider three basic treatment groups to which different restoration approaches or objectives should be applied.

Restore selected streams to a semblance of natural conditions. For several streams, restoration to an approximation of natural conditions seems feasible, and should be pursued. An approximation of natural conditions does not mean pristine, and this objective does not require curtailing all diversions or ending human occupancy and use of the land along the streams, but it does mean trying to maintain or restore the main features and functions of natural stream ecosystems. Mill Creek and Deer Creek are the obvious candidates; the significant problems with these streams are concentrated at their lower ends and seem tractable, and a major restoration program is planned for Battle Creek. This objective also seems feasible for Butte Creek and for the Cosumnes River. In a sense, the conceptual foundation for this treatment is "If it's natural, it's right," although biological, practical, and legal considerations will require that this be relaxed more or less frequently. Management should still be adaptive, with explicit hypotheses and monitoring for restoration work, but rehabilitation of natural conditions and processes would be the default objective.

Restoration actions appropriate for this set of streams include acquiring land or easements along the streams from willing sellers; providing substitute sources of water for diversions, especially during critical periods; removing or modifying dams that block or impede migration; removing inappropriate bank stabilization works, setting back or removing levees, and rebuilding bridges with longer spans to allow passage of tree trunks.[94]

Select other streams for intensive restoration or active adaptive management of instream flows. Focusing active adaptive management efforts in some streams should make it easier to do things on a large enough scale to get clear responses. Streams should be selected primarily in terms of opportunity for large-scale restoration, or suitability for experimental management. The Yuba River, for example, apparently offers the best opportunity for restoration of holding and spawning habitat for spring-run salmon and access to tributary habitat for steelhead, although a recent court decision may result in the reintroduction of spring-run to the San Joaquin River below Friant Dam (Appendix C). The "low flow" channel of the Feather River, between Oroville Dam and the return from the Thermalito Afterbay, seems well suited for instream flow experiments. The river is large enough to be a reasonable model for other Central Valley streams, but it is small enough to allow populations to be monitored with reasonable accuracy, and flows are normally well controlled. Some streams may be suitable for an active adaptive approach to certain questions, but not to others, so this grouping should be flexible. For example, the installation of a temperature control device has made the water temperature in the lower American River controllable to a useful degree, so that stream is well suited for temperature-related experiments in the summer and fall, but it is less suited for flow-related experiments.

Apply passive adaptive management or more "status quo" management to the remaining streams, at least for the time being. Passive adaptive management can be effective when there is

[94] It is also important to stop cutting fallen trees into smaller pieces, as was done recently along Butte Creek (Williams et al. 2002).

substantial variation in the factor of interest. For example, flow in most Central Valley rivers varies more from year to year variation in the weather than it would from any plausible experimental variation, so passive adaptive management seems appropriate for flow-related questions, and is much easier and less expensive to implement than active adaptive management. Passive adaptive management nevertheless requires clear hypotheses and good monitoring to be effective, so in subtle but important ways it is quite different from traditional or status quo management. Good monitoring is difficult and expensive, however, and within this group of streams it should be concentrated where it is most likely to be effective. This means that some streams may be left with status quo management and minimal monitoring. Restoration will be difficult enough in the best of circumstances. Adding a requirement of geographical "fairness" to the program will make it that much more difficult.

12. Develop a unified and consistent conceptual foundation for salmon management.

Salmon management in the Central Valley, as in most other areas, suffers from a kind of schizophrenia. Much of it, especially hatchery and fisheries management, is still based on a production perspective, but much of it is now often based on a population perspective.[95] This schizophrenia is well reflected in the CVPIA, which mandated efforts to increase the populations of naturally-produced anadromous fishes by a program that gives "first priority to measures which protect and restore natural channel and riparian habitat values," but at the same time provided for rehabilitation and expansion of the Coleman National Fish Hatchery. Similarly, CALFED is undertaking an ecosystem-based restoration program, in part to restore depleted and listed stocks of Central Valley Chinook, while state and federal agencies maintain industrial-scale hatcheries that support mixed-stock fisheries.

The very high returns of fall Chinook in recent years that resulted in high rates of prespawning mortality in streams with hatcheries (e.g., Table 12-3) provides a clear example of objectives in conflict. The ocean fishing season has been sharply cut back in order to reduce harvest of winter-run and spring-run, and of Chinook from the Klamath River. However, hatchery production has been maintained at the same level, either to support high catch rates during periods when fishing was allowed, or from management inertia. The result has been so many hatchery fish spawning in the rivers that the spawning success of naturally produced fish has been compromised. Given the evidence that hatchery fish are genetically less well adapted to natural conditions (Ch. 12), there is a conflict between the objectives of trying to support the coastal fishing industry, and trying to allow recovery of the genetic integrity of Central Valley fall-run. This conflict may have a partial physical solution, in moving hatcheries to coastal streams that do not support wild Chinook, but ocean harvest of sub-adults will continue to select against more slowly maturing fish. Hatchery release practices provide another example of conflicting objectives. On the one hand, trucking smolts around the Delta results in more sub-adults in the ocean and more adult returns than releasing smolts at the hatcheries. However, the resulting increased straying rate will tend to obliterate any local differentiation and adaptation that may still exist, or to prevent them from redeveloping.

[95] Population and production perspectives are described in Ch. 1.

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Because management actions based on these differing perspectives can be at cross-purposes, it is important that managers be given clear guidance on priorities. This can best be done by developing a unified and consistent conceptual foundation for the management of Central Valley rivers and the salmon that inhabit them. This review has advocated a population perspective, and clearly I hope that such a point of view will be adopted, but in fairness to the people who are expected to implement our policies, the temptation to finesse conflicts among management objectives should be resisted.

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Attachment 21

LETTER 21

NRDC
THE EARTH'S BEST DEFENSE

ENERGY DOWN THE DRAIN

The Hidden Costs of California's Water Supply

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NATURAL RESOURCES DEFENSE COUNCIL
PACIFIC INSTITUTE, OAKLAND, CALIFORNIA
August 2004

LETTER 21

NRDC

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The Natural Resources Defense Council is a national nonprofit environmental organization with more than 1 million members and online activists. Since 1970, our lawyers, scientists, and other environmental specialists have worked to protect the world's natural resources, public health, and the environment. NRDC has offices in New York City, Washington, D.C., Los Angeles, and San Francisco. Visit us at www.nrdc.org.

ABOUT PACIFIC INSTITUTE

The Pacific Institute is dedicated to protecting our natural world, encouraging sustainable development and improving global security. Founded in 1987 and based in Oakland, California, we provide independent research and policy analysis on issues at the intersection of development, environment, and security. Our aim is to find real-world solutions to problems like water shortages, habitat destruction, global warming, and environmental terrorism.

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LETTER 21

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EXECUTIVE SUMMARY

California has been through its share of scorching droughts and energy shortages, but many residents of the western United States may not realize the close connections between water and power resources. Water utilities use large amounts of energy to treat and deliver water. Even after utilities deliver water, consumers burn more energy to heat, cool, and use the water.

▸ The California State Water Project is the largest single user of energy in California. In the process of delivering water from the San Francisco Bay-Delta to Southern California, the project uses 2 to 3 percent of all electricity consumed in the state.

▸ The State Water Project burns energy pumping water 2,000 feet over the Tehachapi Mountains—the highest lift of any water system in the world. The amount of energy used to deliver that water to residential customers in Southern California is equivalent to approximately one-third of the total average household electric use in the region.

▸ Ninety percent of all electricity used on farms is devoted to pumping groundwater for irrigation.

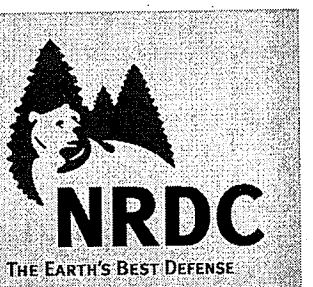
Despite these connections, water planners at the federal, state, and local levels have largely failed to consider the energy implications of their decisions. Water agencies select water sources without assessing the energy costs of transporting the water over great distances to its users. Likewise, they fail to consider the energy savings of using less water. This kind of disregard for the energy implications of water leads to high costs for consumers and wasteful water-supply decisions.

A proper understanding of water and energy, however, can save both money and resources. Our report presents a model for how policymakers can calculate the amount of energy consumed in water use. We applied this model to three case studies in the western United States, and our analysis shows that integrating energy use into water planning can save money, reduce waste, protect our environment, and strengthen our economy. Water planners can use this model in their own regions to find similar solutions that will benefit consumers and the environment alike.

KEY FINDINGS

We quantitatively evaluated the connections between energy and water in three case studies. We used San Diego County's search for future water supply options to highlight energy use in urban water systems. Our examinations of the Westlands Water District and the Columbia River Basin illustrate energy use in agricultural settings. Our research found the following.

Water conservation lowers energy use and energy bills. The San Diego case study revealed that end use of water—especially energy intensive uses like washing clothes and taking showers—consumes more energy that any other part of the urban water conveyance and treatment cycle. This is a rather striking finding since conveyance is a much more obvious energy consumer, particularly in Southern California. Therefore, reducing water use can save significant amounts of energy. For instance, if



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San Diego relied on conservation instead of additional water from Northern California to provide the next 100,000 acre-feet of water, it would save enough energy to provide electricity for 25 percent of all of the households in San Diego.

Water recycling is a highly energy efficient water source. In both urban and agricultural settings, reusing water is far less energy intensive than any physical source of water other than local surface water. For example, Orange County is constructing a water recycling system that will use only half the amount of energy required to import the same amount of water from Northern California. Even groundwater pumping is more energy intensive in San Diego and the Westlands Water District than water recycling from urban wastewater; and the depth to groundwater in these locations is not atypical for western settings.

Orange County is constructing a water recycling system that will use only half the amount of energy required to import the same amount of water from Northern California.

Retiring agricultural land may increase energy use if the water is transferred to other agricultural or urban uses. Transferring water from retired, drainage-impaired Westlands land to urban settings would dramatically increase energy use because urban water use is typically more energy intensive. For example, we estimate that transferring the conserved water to San Diego would require an additional 1.3 billion kWh/yr compared to leaving that water in the delta. Allowing water to remain in Westlands would likely result in an increase in permanent crops and a significant increase in embedded energy ranging from 16 percent to 48 percent depending on assumptions.

Retiring agricultural land can save energy if the water is dedicated to the environment. Using data from the Westlands Water District—one of the largest agricultural users of water in the West—we concluded that ending irrigation to retired farmlands could generate large energy savings if the water remains instream. Retiring 100,000 acres of drainage-impaired farmland in Westlands, with corresponding reductions in Central Valley Project deliveries, could save at least 71 million kWh from reduced Central Valley Project pumping. This is enough to meet the residential energy needs for the city of Modesto for two months. Retiring this land could also save an additional 50 million equivalent kilowatt-hours used for cultivation and harvest.

Diverting water above dams costs power and money. Our Columbia case study demonstrates that when water is diverted for irrigation before it reaches a dam, an enormous amount of energy—the foregone energy production—is lost. For example, the foregone energy production in the Columbia Basin Project is the equivalent of 30 percent of the total energy use for the city of Seattle. This loss may be large enough, in dry years, to make it possible to pay farmers more than they could earn growing low-value crops and still have enough money to purchase environmental flows when they are most valuable.

RECOMMENDATIONS

All three of our case studies demonstrate that including energy considerations in water management decisions can lead to significant energy—and money—savings.

The case study analysis supports two primary recommendations for how policy makers can begin to achieve these savings.

Decision makers should better integrate energy issues into water policy decision making. Looking at energy use and water use simultaneously generates valuable insights that do not arise from separate policy analyses of water and energy issues. We therefore recommend:

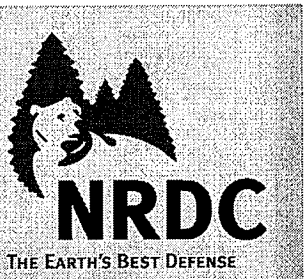
- Modifying state planning tools, such as the Urban Water Management Planning Act and Bulletin 160, among others, to require inclusion of energy use and costs;
- Improving coordination among resource management agencies to better identify and address the energy implications of water policy decisions;
- Conducting an energy intensity analysis of the United States Bureau of Reclamation's distribution systems and identifying regions and districts where large amounts of power are required to deliver water;
- Exploring the retirement of drainage-impaired lands in the Central Valley in order to reduce energy use and generate water to help restore the delta;
- Developing partnerships designed to produce energy, economic, and environmental benefits through voluntary water transfers in the Columbia River Basin and elsewhere, with a focus on dry-year transfers where large water diversions reduce downstream flows and hydropower generation.

Both water and energy policymakers should give water conservation higher priority. Surprisingly, policy actions that affect end uses of water may have much larger energy implications than policy actions that affect the mix of physical water sources. We conclude that conservation has much greater potential, and stronger energy-related economic and environmental benefits, than has been recognized to date. In addition, the energy benefits of conservation can generate air quality and climate change benefits. Given this strong finding, we recommend:

- Prioritizing conservation funding;
- Enforcing existing conservation requirements;
- Requiring water measurement;
- Promoting conservation through conservation pricing;
- Offering conservation incentives;
- Implementing measures to ensure conservation savings.

CHAPTER 1

THE HIGH COST OF ENERGY USE IN WESTERN WATER SYSTEMS



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Water use and energy use are closely linked. Providing and using water consume large amounts of energy. Energy production frequently uses or pollutes water.[1] Most electricity production also contributes to global climate change, which is likely to have tremendous impacts on water availability and management. Yet energy and water issues are rarely considered together. This is as true at the policy level as it is at the personal level. Most consumers certainly do not realize that saving water is an excellent way to save energy and, indirectly, to reduce air pollution.

The California Water Code notes that wasting water is an unreasonable use of energy.[2] Yet none of the existing resource planning efforts meaningfully addresses the interplay between the two issues, let alone their relationship with climate change. Even the California Energy Commission (CEC) has noted this failure. A CEC report to the state legislature noted: "The State appears to not be consciously managing its rapidly evolving water and energy policies in a coherent manner."[3] Integration of energy considerations into water policy and planning is long overdue.

This report explores the energy implications of water use and presents a methodology for incorporating energy impacts into water resource decisions. It relies heavily on data and examples from California but includes a case study from the Northwest.

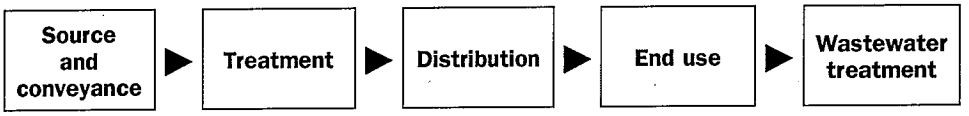
THE LINKS IN THE WATER-ENERGY CHAIN

The more than 60,000 water systems and 15,000 wastewater systems in the United States are among the country's largest energy consumers, using about 75 billion kWh/yr nationally—3 percent of annual U.S. electricity consumption.[4] This demand is equivalent to the entire residential demand for the state of California and does not even include energy for what is called end use: the energy required to further treat, circulate, heat, or cool water at the consumer level.[5] Even if all of this power came from relatively clean modern natural-gas-fired power plants, producing the energy used

by water systems would release approximately 30 million tons of carbon dioxide—the equivalent of more than 4 million cars.[6]

Many of the peak demands for water and the energy required to treat and transport that water coincide with the peak seasonal energy demands experienced by the electrical utilities, particularly in areas with hot summers like Southern California.[7] Thus, reducing the energy required to move, use, and treat water could help avoid power outages and avoid or delay the need for new power facilities.

This report divides the water supply-use-disposal chain into five stages.[8]



▶ *Source and conveyance:* Significant amounts of energy may be required to create a usable source of water and bring it to where it will be treated or consumed. Most water used in the United States is diverted from surface sources such as rivers and streams or pumped from groundwater aquifers. Smaller amounts of freshwater are produced from salt water, brackish water, or wastewater using desalination or water-recycling technologies. Desalination requires energy to remove salts from water using reverse osmosis or other processes. Water recycling requires energy to remove pollutants from wastewater.

Water is either used near its source or transported for storage and use elsewhere. Conveying water often requires pumping the water over hills and mountains or into storage facilities—a process that can require large amounts of energy. Such systems

FROM SOURCE TO TAP: THE HIGH ENERGY COST OF MOVING WATER

Moving large quantities of water over long distances and significant elevations is a highly energy intensive task. For this reason, water systems in the West are particularly energy intensive. According to the Association of California Water Agencies, water agencies account for 7 percent of California's energy consumption and 5 percent of the summer peak demand.

The State Water Project (SWP) is the largest single user of energy in California. It consumes an average of 5 billion kWh/yr, more than 25 percent of the total electricity consumption for the entire state of New Mexico. The California Energy Commission reports that SWP energy use accounts for 2 to 3 percent of all electricity consumed in California.

The SWP consumes so much energy because of where it sends its water. To convey water to Southern California from the Sacramento–San Joaquin Delta, the SWP must pump it 2,000 feet over the Tehachapi Mountains, the highest lift of any water system in the world. Pumping one acre-foot of SWP water to the region requires approximately 3,000 kWh. Southern California's other major source of imported water is also energy intensive: pumping one acre-foot of Colorado River Aqueduct water to Southern California requires about 2,000 kWh.

In fact, according to an estimate from the Metropolitan Water District of Southern California, the amount of electricity used to deliver water to residential customers in Southern California is equal to one-third of the total average household electric use in Southern California.

usually also have hydroelectric generators that recover some of this energy as the water falls down the other side of those hills and mountains.

▸ *Water treatment:* Water treatment facilities use energy to pump and process water. The amount of energy required for treatment depends on source-water quality. High-quality groundwater may require little treatment; surface water taken from rivers that have upstream discharges of wastewater may require significant treatment. The energy required for water treatment is expected to increase over the next decade as treatment capacity expands, new water quality standards are put in place, and new treatments are developed to improve drinking water taste and color.[9] Agricultural water generally is not treated before use.

▸ *Local water distribution:* Energy is typically required for local pumping and pressurization, but gravity pressurization and distribution are also possible when reservoirs are sufficiently higher than residences and businesses.

▸ *End uses:* Water users consume energy by further treating water (e.g. with softeners or filters), circulating and pressurizing it (e.g. with building circulation pumps or irrigation systems), and heating and cooling it.

▸ *Wastewater collection and treatment:* Treating wastewater consumes energy in pumping, aeration, and other processes. In 1995, wastewater treatment in California used approximately 1.6 billion kWh of electricity.[10]

ENERGY AND WATER USE: A CYCLE OF ENVIRONMENTAL DAMAGE

The development of the American West was facilitated by the construction of large water projects to convey water for municipal and agricultural uses. These water projects have brought important benefits, but they have also had well-documented and devastating impacts on rivers and landscapes throughout the West. Many once abundant species are now threatened or endangered due in part to these projects. When you include the massive energy production needed to operate these water projects, their environmental impacts are even greater. As one of the largest consumers of energy in the state, California's water system significantly contributes to the state's energy-related pollution.

Energy production has a wide range of damaging environmental and health effects, depending on how and where that energy is produced. Electric power plants, for instance, release dangerous levels of soot and smog, causing thousands of premature deaths, hundreds of thousands of asthma attacks, and other illnesses each year. In addition to the frequently noted air quality impacts of electric power plants, many power plants have once-through cooling systems that can significantly harm ocean and river environments. According to the Hudson Riverkeeper, a typical power plant using once-through cooling technology can kill billions of fish each year by trapping fish against intake screens or drawing fish into the facility.[11] Hydroelectric power production has far less impact on air quality, but far more negative effects on rivers and the aquatic species they support.[12]

THE WATER-ENERGY-CLIMATE-CHANGE FEEDBACK LOOP

Energy production also leads to climate change. Power plants emit 40 percent of U.S. carbon dioxide pollution, the primary cause of climate change. Unless emissions are reduced, average U.S. temperatures could be 5 to 10 degrees Fahrenheit higher by the end of the century. Climate change has the potential to greatly affect water supply and water management. In California, climate change is likely to lead to greater risk of drought or water shortages in the summer months. At the same time, winter runoff may increase and cause a greater risk of flooding. [13]

All of these changes could have serious consequences for hydroelectric power generation. Changes in runoff have a direct impact on the amount of hydropower generated both because hydropower production decreases with lower flows and because higher flows often must be spilled past dams without producing any power. During droughts, there are two types of hydroelectric losses: less water runs through the turbines in powerhouses, and the lower reservoir level reduces the "head," thereby reducing the power produced by a given amount of water. In the Colorado River's lower basin, a 10 percent decrease in runoff reduces hydropower production by 36 percent.[14] As hydropower generation decreases, energy users are likely to turn toward fossil fuels, thereby increasing emissions that contribute to climate change. During the first five years of the 1987 to 1992 California drought, hydropower losses cost California ratepayers $3 billion and led to an increase in greenhouse gas emissions of 25 percent over normal levels.[15]

ENERGY AND WATER SUBSIDIES: THE DRIVING FORCE BEHIND INEFFICIENCY

Despite the significant environmental and health concerns caused by energy intensive water use, many current policies actually encourage this wasteful practice. Energy and water subsidies in particular help drive the cycle of inefficient and energy intensive water use by hiding the true resource costs.[16] Water subsidies increase demand for water (thereby increasing energy use) and discourage conservation. Energy subsidies encourage transporting water over distances and pumping groundwater from depths that would not be economically feasible if the water users had to pay all the costs of energy and water. Policies aimed at reducing the energy used in water supply should address these inappropriate financial signals.

Subsidies exist when prices charged do not cover the government's cost or when the price does not equal comparable market price. A 1992 report from the Department of Energy's Energy Information Administration calculated the estimated subsidy value from these two different perspectives on federal hydropower sales nationwide. The report concluded that the annual subsidy at historic cost with full cost recovery was $1.232 billion for the Bonneville Power Administration (BPA) and $505 million for the Western Area Power Administration (WAPA) in 1990. The subsidy at estimated market price of electricity was $213 million for the BPA and $1.2 billion for the WAPA.[17]

Federal power remains close to the cheapest power in any region of the country.[18] Users of federally supplied irrigation water with access to this cheap power are getting

POWER ARBITRAGE: MAKING A PROFIT OFF SUBSIDIES

The schemes enabled by subsidized power rates can be seen in the Bureau of Reclamation's Columbia Basin Project. The project sells power to irrigators for less than 4 percent of the market rate. To take advantage of this cheap power, some water districts in the CBP have added low-head hydropower generators to their water canals. The cheap energy used to pump water into the canals is then used to help generate hydropower that the irrigators sell at a substantial profit on the open market. According to a report by the Committee on Natural Resources, this practice reduces water conservation incentives even further because every drop of water added to the canals provides more hydropower profits for the district. By allowing what is essentially a power arbitrage scheme, the Bureau of Reclamation has created an incentive for intensive pumping, leading to excess water and energy use and unnecessary environmental impacts, all at the taxpayers' expense.

a double subsidy and are receiving a distorted price signal about the value of that energy. For the Central Valley Project, energy charges vary widely from contractor to contractor. A charge of 1 cent per kWh—which a Central Valley Project representative estimated was the average for the project—is equivalent to $10 per MWh.[19] In comparison to market rate, California has long-term energy contracts for $86 per MWh.

It is difficult to calculate the full value of the subsidies given to users of federally supplied irrigation water. This difficulty helps keep the energy costs of water systems buried. Many California farmers still pay the government $2 to $20 per acre-foot for water, which represents as little as 10 percent of the "full cost" of the water, although some farmers are paying more as contracts are revised (e.g., $35 per acre-foot).[20] For new projects built or proposed by the Bureau of Reclamation, water costs are between $250 and $500 per acre-foot.[21] These water and power subsidies can have perverse results, as illustrated in the box on power arbitrage.

Including energy considerations might eliminate some of the water supply projects currently being considered in California and would more accurately show the benefits of conservation as an alternative.

MISSED OPPORTUNITIES: WATER POLICY OVERLOOKS ENERGY USE

Resource management could improve if water planning and policy reflected the critical link between water and energy. Despite a few recent efforts, however, water planning at the federal, state, and local levels has largely failed to consider energy implications. CALFED, California's Bulletin 160 series, the California Urban Water Management Planning Act, and the Memorandum of Understanding Concerning Urban Water Conservation in California (MOU) all give inadequate attention to the connections between water and energy use and policy. Although CALFED and other agencies have completed many studies that compare the costs of different water supply options, few of these studies have taken into account the energy benefits and costs of different water supply options. This is unfortunate because energy cost is a critical factor in the cost of various water management alternatives. Including energy considerations might eliminate some of the water supply projects currently being considered in California and would more accurately show the benefits of conservation as an alternative.

Water planners at the state level also have done a very limited job of addressing energy considerations. The California Water Plan, known as Bulletin 160, updates information about current and future water supplies and water uses for all regions of the state, including an evaluation of possible options for meeting California's future water needs. The California Water Code requires that the Department of Water Resources update Bulletin 160 every five years. As recently as 1998, Bulletin 160 did not include energy considerations.

A draft of the 2003 California Water Plan was released in November 2003. For the first time, the water plan included a discussion of the impacts of global climate change on California water resources and policy. It also qualitatively considered energy prices as a factor that could affect future water use, supply, or management. Significant quantitative evaluation of energy issues was not included in the 2003 draft. Phases 2 and 3 of the update (scheduled for 2004 and 2005, respectively) might address energy issues in more detail, with quantification or modeling possible in Phase 3 (2005).

Water planning at the local level generally fails to integrate energy considerations. Under California's Urban Water Management Planning Act, every supplier of urban water to more than 3,000 customers or in quantities greater than 3,000 af/yr must adopt an Urban Water Management Plan and must update it at least every five years. The law requires that the plans contain fairly specific projections of supply, demand, and potential water conservation measures across a 20-year planning horizon. Completed plans are filed with the Department of Water Resources. The Urban Water Management Planning Act does not require water suppliers to consider the energy implications of their water management options or to factor in related energy costs and benefits when considering water conservation measures.

Most major urban water suppliers in California have committed to implementing a series of water conservation practices outlined in an MOU. The cost-benefit analysis required in the MOU does not require consideration of energy, so water suppliers may fail to implement conservation practices that are clearly cost-effective when energy is included (see Table 5 in Chapter 2 for some residential examples of this problem).

Finally, the California Environmental Quality Act requires suppliers to evaluate the potential environmental impacts of all projects, including water transfers such as the recent arrangement between the Imperial Irrigation District and the San Diego County Water Authority. But the energy implications of water decisions are so far below the radar of decision makers that the significant energy impacts of the transfer are not mentioned in the environmental impact report for the project.[22]

CHAPTER 2

THE CONNECTIONS BETWEEN WATER AND ENERGY

NRDC
THE EARTH'S BEST DEFENSE

ENERGY DOWN THE DRAIN

The Hidden Costs of California's Water Supply

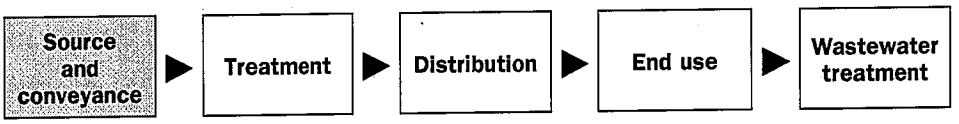
August 2004

As water works its way from source to tap, it typically requires many infusions of energy. We need energy to move it from its source, treat it, pipe it into businesses, consume it in our homes, and treat it before disposal. While one step in this process might not require a lot of energy—using a low-flow toilet in Los Angeles, for instance—another step may consume a great deal of energy—transporting water 2,000 feet over the Tehachapi Mountains to Southern California.[23] It is only when we look at the energy consumed in the entire water cycle that we get a clear sense of how much energy is really at stake.

This kind of whole-system calculation is called energy intensity. Energy intensity is defined as the total amount of energy required to use a specific amount of water in a specific location.[24] Energy intensity takes into account each site-specific step in the water supply-use-disposal cycle: source and conveyance, treatment, distribution, end use, and wastewater treatment.

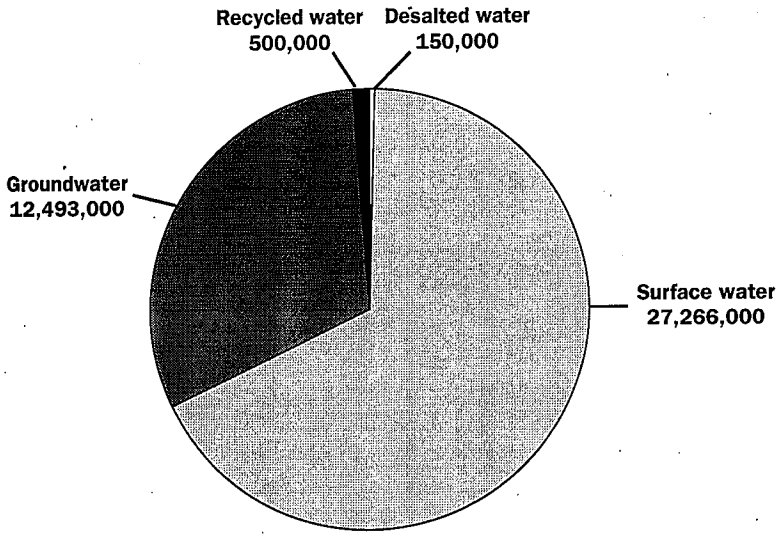
Looking at energy intensity reveals that not all water use requires the same amount of energy. For example, since it often takes more energy to convey a gallon of water from outside the region to Southern California than it does to Northern California, saving water in Southern California can achieve greater energy savings. This in turn means that water supply options appropriate for one region of California may not be appropriate for another. To determine appropriate strategies, water planners need to understand and quantify the five components of energy intensity presented below.

SOURCE AND CONVEYANCE



California gets its water from a great variety of sources and locations, and each one relies upon a different method of transport and a different amount of energy use. California's water supply mix is illustrated in Figure 1.[25] At present, surface water and groundwater provide the primary sources of water supply in California. Use of

FIGURE 1
Primary Sources of Water in California in Acre-Feet per Year



desalination and water recycling is expanding and could impact the energy used for water supply in some regions.

Surface Water

Surface water makes up about 70 percent, or about 27.3 million acre-feet per year, of water use in California. The majority of precipitation falls in the northern part of the state, while the majority of the population and the majority of water use is in the southern part of the state. Table 1 lists the major projects that transport water from one region to another in California.

These water delivery systems also generate hydroelectric power as water flows through power-generating turbines. Major water conveyance systems are either net energy producers (e.g., Central Valley Project, San Francisco, and Los Angeles aqueducts) or net energy consumers (e.g., State Water Project, Colorado River Aqueduct).

TABLE 1
Major Water Projects and Water Deliveries in California

Project	Average Annual Deliveries (million acre-feet)
Central Valley Project	7
All American and Coachella Canals	3
State Water Project	2.3
Colorado River Aqueduct	1.2
Mokolumne Aqueduct	0.36
Hetch Hetchy Aqueduct	0.33
Los Angeles Aqueduct	0.2
Potter Valley Project	0.154

Source: Association of California Water Agencies and Potter Valley Project Overview

The State Water Project and the Central Valley Project

The State Water Project (SWP) and the Central Valley Project (CVP) are two of the largest water projects in California and convey water the longest distances. The single largest user of energy in California, the SWP consumes an average of 5 billion kWh/yr, accounting for 2 to 3 percent of all electricity consumed in California.[26] On average, pumping one acre-foot of SWP water to Southern California requires approximately 3,000 kWh (this is an average net energy use figure; actual energy use varies for different Southern California communities).[27]

State and federal operations staff for the SWP and the CVP are well aware of the energy used to move water and have long worked to minimize it. The large energy requirements of the SWP were recognized even prior to its construction. Early SWP plans called for a dedicated nuclear power plant to provide electricity for the lift over the Tehachapi Mountains. Since then, some activities, including operational changes at the Oroville Dam and the Thermalito Afterbay, have been designed to reduce power use.

Both the SWP and the CVP have large financial incentives to reduce energy use. For example, the average SWP annual operating budget is about $900 million, of which at least a third is related to power costs.[28] Efficiency measures implemented by facility operators include:

- *Early water projections and energy purchases:* Each water year, the SWP makes projections for its water deliveries and develops its energy portfolios to ensure it has enough power to make these projected deliveries. Buying the power early in the water year is critical: the SWP makes advance purchases (days, weeks, or months ahead) on the power market because they are much more economical than buying on the spot market.

- *Optimizing pump scheduling:* The energy costs for water systems depend heavily on whether energy is consumed during on-peak or off-peak periods. On-peak energy is significantly more expensive than off-peak energy. Within system constraints, the SWP and the CVP try to take advantage of the price difference by pumping off-peak and generating on-peak.

- *Engineering, repairs, and maintenance:* CVP and SWP representatives say that their projects are constantly refurbishing the system to maximize power generation and minimize power use. This includes evaluating the efficiency of pumps and generators and upgrading technology.[29]

Despite these efforts at energy savings, the CVP and the SWP may become even bigger energy consumers, since both are now considering building new and expanded dams. Our analysis indicates that these new or expanded facilities are likely to be net energy consumers (see the "Can Building New Hydroelectric Dams Consume Energy?" box on page 10 for further discussion of this issue).

Conveyance and Evaporative Water Loss

Water is lost throughout the storage and conveyance process, often through evaporation and seepage as it sits in reservoirs and then travels through canals to water users.

CAN BUILDING NEW HYDROELECTRIC DAMS CONSUME ENERGY?

The Department of Water Resources and the Bureau of Reclamation are currently investigating five proposed new and expanded surface storage facilities to determine if they are feasible water supply projects. Proponents have cited hydropower production as an additional benefit for some of these projects. Careful analysis, however, reveals that these proposed dams might in fact be net consumers of energy.

Planning agencies often overlook two important energy-related issues regarding new and expanded dam projects: the first is off-stream location. Several of the facilities under consideration (Sites, Los Vaqueros, and some of the proposed sites on the Upper San Joaquin River) are off-stream facilities—constructed not on major streams, but in side canyons. These projects would require pumping water uphill into the reservoir. Energy would be generated when water is released from storage, but each of these facilities would be a net consumer of energy. Another of these proposed projects, the Delta Wetlands project, would be constructed on subsided delta islands. In this case, gravity would fill the reservoir, but energy would be required to pump water back into delta channels and deliver it to the SWP or other users. This facility would also be a net energy consumer.

The second often-overlooked issue is the amount of energy required to deliver the water generated by these new storage facilities. The water generated by new surface storage facilities could go to many water users. The closest potential user, Central Valley agriculture, however, will not be able to afford water from these facilities unless it is highly subsidized.

The other biggest market opportunity for the water is Southern California. But SWP water delivered to Southern California is very energy intensive, with a weighted average requirement for delivery of 2,947 kWh/af.[30] This energy requirement is so great that the energy required to convey this water would exceed the energy generated at the new dam. For example, one of the proposed expansions includes raising Shasta Dam. This is the best-case scenario since it would generate more new energy per acre-foot of additional storage than any other surface storage facility under consideration, both because Shasta is an on-stream reservoir that does not require pumping to fill the reservoir and because raising an existing reservoir generates more hydraulic head than a similarly sized new reservoir. Nevertheless, our analysis suggests that if the yield were delivered to Southern California, this project would result in a net consumption of 380 kWh/af.* In summary, all of the surface storage facilities under consideration by CALFED would be net consumers of energy if the water they generate were delivered to Southern California.

* See Larry Dale, et. al., *The Impact of Electricity Prices on the Cost of Five Options to Increase Southern California's Urban Water Supplies*, prepared for NRDC, 2003.

These losses increase the effective amount of energy required per usable gallon of water. Reservoir losses are not critical from an energy perspective when the reservoir is filled by gravity. But they may be critical if pumping takes place upstream of the reservoir (e.g., the Eastside Reservoir in Southern California) or if pumping is required to fill the reservoir, as in many of the current proposals for off-stream storage in California.

Reducing losses from reservoirs and conveyance systems could add to the available water supply and could generate additional hydroelectric energy. Reducing these losses would also lower the energy intensity of water supplies because it would

decrease the amount of energy used to transport water that is eventually lost (carriage water). The SWP has not done an analysis of conveyance losses but estimates these losses to be 5 percent.

The CVP has not done an analysis of its evaporative losses either. Instead, its models use assumed conveyance losses for evaporation and seepage south of the delta. CVP operations assume a loss of 150,000 acre-feet out of 3 million acre-feet delivered, or approximately 5 percent.

When comparing imported water to other sources, such as recycling or desalination, a full energy accounting would include the energy required to move water to the point where it evaporates or seeps out of the conveyance system. This energy would be added to the energy required to transport the water actually delivered.

Groundwater

Groundwater represents about 30 percent of the water used in California, or approximately 12.5 million af/yr. This is 1.5 million acre-feet more than is naturally replenished, a pattern referred to as overdraft. Agriculture uses 85 percent of the withdrawn groundwater, and municipal areas use 15 percent. Most is used locally in the area overlying the aquifer.

California does not measure or regulate groundwater withdrawals, so groundwater data are incomplete. Therefore, it is not possible to calculate exactly how much energy is used in pumping groundwater. The California Department of Water Resources has estimated groundwater use and well depths in three areas that represent two-thirds of the groundwater used in the state. In the Tulare Lake Basin, with an average well depth of 120 feet, groundwater pumping requires 175 kWh/af. In parts of the San Joaquin River Basin and the Central Coast region where groundwater depth is closer to 200 feet, pumping requires approximately 292 kWh/af. Based on these estimates, electricity used for pumping groundwater in these areas would average 2.25 billion kWh/yr at a 70 percent pumping efficiency.[31] If this represents two-thirds of the state's groundwater use—and if all groundwater were pumped with electricity—then statewide electrical energy use for groundwater pumping would be approximately 3.4 billion kWh/yr.

In some areas, greater depth to groundwater requires even greater energy use. For example, pumping in Los Angeles requires 580 kWh/af.[32] Staff of the Sweetwater Authority and the Yuima Muncipal Water District in San Diego County report 467 and 661 kWh/af, respectively, are used on average to pump groundwater in their service areas (see Chapter 3). Staff of the Westlands Water District report that groundwater pumping in the district requires an average of 740 kWh/af (see Chapter 4).

Groundwater overdraft is a growing issue in some agricultural areas, like the Central Valley. As groundwater levels decline, an increasing amount of energy is needed to lift that groundwater to the surface. Jointly managing surface and groundwater resources, known as conjunctive use, holds promise as an approach to increasing water supplies in the West. Any analysis of conjunctive use projects must recognize and include the energy costs of retrieving the stored water from groundwater basins. However, if conjunctive use helps to recharge overdrafted

groundwater basins, it could decrease the average use of energy for pumping groundwater. The California Energy Commission has expressed serious concerns about the CALFED conjunctive use proposals and CALFED's inattention to their energy implications.[33]

Desalination

Ninety-seven percent of the earth's water is too salty to drink or grow crops. However, salt water can be converted to freshwater through a process called desalination. Desalination has been limited in the United States because of its high cost: less than 1 percent of California's current water supply comes from desalination. However, it is a topic of growing interest as technological advances are reducing desalination costs.

The economics of desalination are directly tied to the cost of energy: energy constitutes approximately 40 percent of total costs. There are various methods of desalination, each requiring different amounts of energy. Energy use can vary within methods as well, depending on source water quality and design details.

The most common choice for new desalination plants today is reverse osmosis, in which salty water is filtered under high pressure through a semipermeable membrane. This method accounts for 90 percent of California's current desalination capacity. In 1999, desalination capacity in California was estimated at approximately 150,000 af/yr in more than 150 plants, the majority of which are small industrial plants. The 30 plants that are used for municipal purposes total about 80,000 af/yr.[34]

There are currently about two dozen desalination facilities proposed for along the California coast, with a total output of about 220,000 acre-feet.[35] The California Energy Commission is compiling data to determine how the energy demands of these proposed facilities could affect the state's power grid.

Current energy requirements and total costs for desalination vary widely depending on project specifics. For a seawater desalination plant under investigation by the Municipal Water District of Orange County, energy requirements are estimated at 5,500 kWh/af. The Carslbad seawater desalination project in San Diego County is estimated to use 5,400 kWh/af (see Chapter 3). Even lower energy use may be possible. Staff of Ionics Corporation report the new Trinidad seawater desalting plant will use about 4,800 kWh/af.[36] A proposed seawater desalting plant serving the Inland Empire Utilities Agency would use approximately 4,400 kWh/af.[37]

One of the models for lowering energy costs for desalination is colocating facilities with coastal power plants. Many of these power plants have destructive once-through cooling systems, however, and desalination should not be used to justify extending the life of these harmful facilities. In order for desalination projects—including colocated facilities—to gain acceptance, they will need to demonstrate a net reduction of environmental impacts.

Another opportunity for reducing energy requirements is to use desalination to treat brackish groundwater, which can produce water at a lower total cost and a lower energy cost than ocean desalination. Brackish groundwater treatment has enormously varying energy requirements depending on source water quality. Desalting brackish groundwater at the Chino Desalter Facility requires 1,700 kWh/af, while

CAN DESALINATION REDUCE ENERGY USE?

While desalination is very energy intensive on a per-unit basis, in some cases the flexibility it allows may result in lower total energy use.

The Marin Municipal Water District faces such an opportunity. The district is considering a desalination facility that would replace part of its contract with the Sonoma County Water Agency. The agency contract requires the district to purchase Russian River water at times of the year in which the water is not needed, in a classic "use it or lose it" arrangement. While the pumping needed to import Russian River water consumes less energy than desalination on a per-unit basis, the district would be forced to buy much more of it than it would need to produce with desalination.

With desalination, the district could shift more to its domestic reservoir supply—the least energy intensive source—in most year types, with desalination available as a dry-year supplement. The district's use of desalination to address peak demands could reduce its overall energy use.

In a dramatically different approach, private companies can also cover the cost of building and operating desalination plants in return for long-term contracts that require water agencies to purchase large volumes of desalinated water. Many Southern California projects are taking this approach. This could require desalination plants to operate at maximum capacity in order to drive down the unit cost, which could increase energy and air quality impacts.

the Reynolds water treatment plant in San Diego County reports only 405 kWh/af for treating brackish groundwater (see Chapter 3).[38] The same technology can be used to clean up groundwater impaired by other contaminants.

While the process of desalination remains expensive as a water supply option, it can have a variety of potential benefits relative to other sources of supply, including:

- *Local supply:* Desalination is typically done close to the place of use, so energy requirements for conveyance are likely to be lower than they would be for imported water supplies.

- *Reliability:* Desalination makes water available in all water years, while surface water and groundwater supplies may be limited in dry years. This reliability is extremely valuable to urban water users.[39]

- *Operational flexibility:* If the water is not needed, a desalination facility can be turned off. This is in contrast to the take-or-pay provisions of some water contracts. For the advantages and potential pitfalls of this approach, see the box on desalination above.

- *Water quality:* Desalination can produce very high-quality water, required by some water districts for blending with some of their lower-quality water supplies.

- *Potential ecosystem benefits:* Leaving surface water supplies instream and using desalinated water as a partial replacement can generate substantial ecosystem benefits.

Desalination may be a reasonable part of a water supply plan in areas where the energy costs of importing more supplies are high and where alternative water

Desalination makes water available in all water years, while surface water and groundwater supplies may be limited in dry years. This reliability is extremely valuable to urban water users.

sources could be environmentally damaging. This is particularly true when full life-cycle energy costs are considered along with the benefits of desalination, such as reliability, ecosystem restoration, and water quality.

However, before moving forward with desalination on a large scale, districts must recognize that very little is known about its impact on marine and coastal environments. Few, if any, studies have been conducted on marine resource impacts from the large-scale desalination facilities in the Middle East and Caribbean. The range of potential adverse environmental impacts that may arise from desalination facilities include siting and construction, waste discharge, energy consumption, coastal development, and injury and death of aquatic life from water intakes.[40] These must all be explored and adequately addressed before development of desalination facilities begins. In most cases, conservation or water recycling may offer better, cheaper, and less environmentally damaging alternatives.

In most cases, conservation or water recycling may offer a better, cheaper, and less environmentally damaging alternative to desalination.

Water Recycling

The California Water Code defines recycled water as "water which, as a result of treatment of waste, is suitable for a direct beneficial use or controlled use that would not otherwise occur."[41] By 2020 more than 3 million acre-feet of wastewater will be generated annually by California's urban coastal areas; much of this could be recycled.

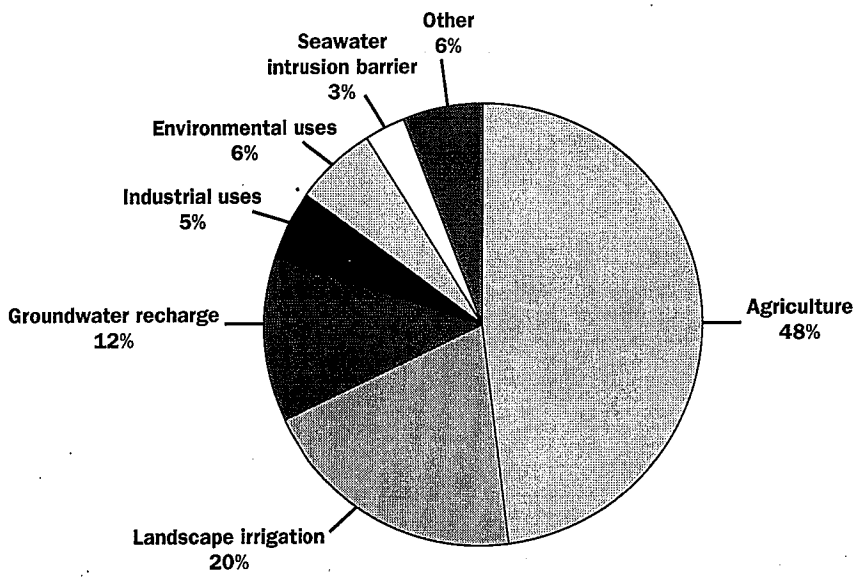
Recycled water is most commonly used for groundwater recharge or for landscape or irrigation purposes. While there have been some proposals for direct potable reuse of recycled water, these projects have not been implemented in the United States. Figure 2 shows municipal recycled water use in California in 2000.[42] Recycled water use is currently estimated to be within a range of 450,000 to 580,000 af/yr.[43] In addition to this officially recycled water, hundreds of thousands of acre-feet of treated wastewater are released into rivers and become part of the downstream water supply.

The energy costs for water recycling are the incremental treatment costs required to treat wastewater to the standard necessary for its intended use, and any energy required to convey the water to its place of use. Costs vary depending on the type of project being developed, the degree of treatment required, and the proximity of the water treatment plant to the location where the recycled water will be used.

In 2001, California legislation created a recycled water task force within the Department of Water Resources. The task force was assigned the responsibility of identifying impediments to using more recycled water in California, along with possible solutions. The task force's report was completed in June 2003 and asserts that California could recycle 1.5 million af/yr by 2030, with an investment of nearly $11 billion for additional infrastructure.[44]

Recycled water is already serving as an important element of water supply for many communities. As with desalination, water recycling offers reliability benefits, since it is available even in drought years. The energy costs for recycled water are likely to be lower than the costs for most other supply-side options, including desalination.

FIGURE 2
Recycled Water Use in California in 2000



The energy costs for recycled water are likely to be lower than the costs for most other supply-side options, including desalination.

The Orange County Water District is constructing a groundwater replenishment system—a water-recycling system that will replace an existing Orange County water recycling facility and will provide a new water supply for the area. Water from the system will be used as a seawater intrusion barrier as well as to augment groundwater supplies. Water costs for that component of the district's supply will be reduced by nearly half, since it will be less expensive to treat as well as produce the water locally than to import water.[45] In particular, producing the recycled water will require only half the energy it takes to bring water to Orange County from Northern California.[46] The system is expected to begin delivering water in 2007.

A few other examples of the many water recycling projects in California include:

- A joint project of the Dublin San Ramon Services District and the East Bay Municipal Utility District, in which 2,800 acre-feet of recycled wastewater are used to recharge the aquifer annually;

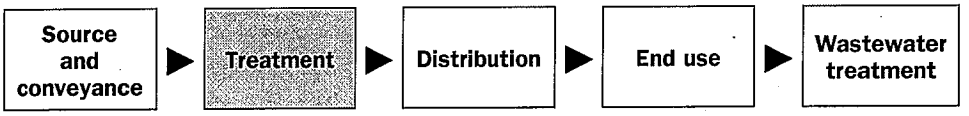
- South Bay and Long Beach, where recycled water is injected into formations that are part of the basin's aquifers to prevent seawater intrusion;

- Los Angeles County, where the Central Basin Recycled Water Project delivers approximately 4,000 acre-feet annually to more than 150 industrial, commercial, and landscape irrigation sites;

- South Bay Water Recycling in San Jose, which delivers around 16,000 af/yr to landscape irrigation customers;

- Monterey County Water recycling projects that provide recycled water for agricultural irrigation.

TREATMENT



Treatment is the second stage in the water use cycle, and generally applies only to urban water. The average direct electricity requirement for surface-water treatment plants is 450 kWh/af, with the bulk of that energy going to pump treated water.[47] Since pumping costs are directly related to the volume of water that must be pumped, reductions in demand for treated water will directly reduce this energy use. Energy efficient pumping systems can also make a significant difference in power bills and can reduce demand on energy infrastructure. Opportunities include installing premium efficiency motors and adjustable speed drives, selecting efficient pumps, using effective instrumentation and controls, and managing pumping operations by the efficient use of available storage and highly efficient pumping units.[48]

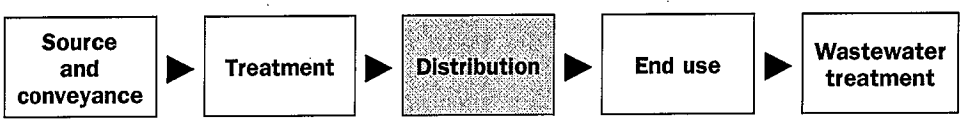
Data from the San Diego case study (see Chapter 3) confirm that energy for treatment is quite small. The Perdue Water Treatment plant reports using only 41 kWh/af; the Escondido-Vista plant reports 48 kWh/af; and the Levy Water Treatment Plant reports 68 kWh/af.

By reducing peak demand, water conservation can eliminate or delay the need for expanding treatment facilities or decrease the size of the expansion needed.

Most surface water sources require treatment, usually consisting of chemical additions, coagulation and settling, filtration, and disinfection. Urban water suppliers are moving in the direction of more energy intensive treatment methods of disinfection such as ozonation and ultraviolet radiation for health and safety reasons.[49] In many groundwater systems, disinfection is the only treatment required. Physical-chemical processes are used only in those cases where excessive concentrations of specific constituents have to be reduced.

Water treatment facilities are sized to meet peak demands. The lowest demand for water occurs in winter months when the requirements for outside water use are greatly reduced. Peak demand occurs in the summer when consumers irrigate for crops and landscaping. As mentioned in Chapter 1, many of the peak demands for water coincide with the peak seasonal demands experienced by the electrical utilities.[50] By reducing peak demand, water conservation can eliminate or delay the need for expanding treatment facilities or decrease the size of the expansion needed. By decreasing peak demands on the electrical utilities, water conservation can also help avoid power shortages.

LOCAL DISTRIBUTION



Water systems must transport water from the intake source to treatment facilities, then to local storage facilities, and finally to the customer. Most of the energy

involved in municipal water systems is used for pumping. For a city of 50,000 people, approximately 2 million kWh/yr are required for all plant operations, with more than 1.6 million kWh of that amount needed for the pumping alone.[51] Assuming 2.6 persons per household and 0.5 acre-foot per household per year of water consumption, this pumping-only estimate converts to about 170 kWh/af delivered to customers.

These are average figures. In many cases, energy for pumping is much higher. According to members of the San Diego County Water Authority staff, there is enormous variation in the energy used to distribute water from their treatment plants to customers. Limited data from the San Diego case study support this belief. The Levy-Helix Water District, for example, reports an average of 215 kWh/af to deliver water to its customers; however, half the distribution grid is pressurized by gravity since some treatment plants are significantly elevated above end use locations. The electrically pressurized portion of their distribution system reportedly uses about 430 kWh/af. The distribution system for the North City (San Diego) water recycling facility reportedly uses about 940 kWh/af.

Many urban water distribution systems were placed underground more than 50 years ago, and leaks caused by corrosion of pipe material or other problems can lead to the loss of significant amounts of potable water. Distribution system losses increase the energy intensity of water supply by requiring utilities to treat and convey water that will be lost. Losses vary significantly among urban suppliers: typically from 6 to 15 percent, but as high as 30 percent.[52] Approximately 2 percent of this lost water goes to unmetered use for firefighting, construction, and flushing drains and hydrants.

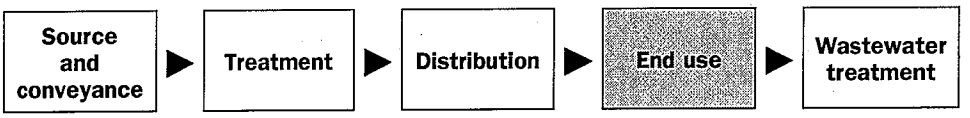
One approach to improving management of local distribution and reducing energy costs involves using a supervisory control and data acquisition (SCADA) system. The SCADA system consists of a central computer that integrates the operation of water-system control points, such as pumps, reservoirs, and metering stations, even when located far away from one another.

Fresno installed a SCADA system in 1988. The SCADA system saves Fresno $725,000 per year in energy and water costs by doing the following:[53]

- Continuously monitoring the pumping energy required for each gallon of water that every well produces;
- Turning on the pumps at the most cost-effective wells first;
- Selecting wells according to optimum time-of-day electrical rates;
- Providing better control of water-line pressure, which reduces leakage.

With the SCADA system continuously monitoring and managing the pumps, Fresno saves energy and money both by reducing the energy consumed by the pumps and by saving water that previously was lost to leakage. While many urban districts use SCADA systems, not all systems are being operated to reduce energy use. Some agricultural districts are also installing SCADA systems and variable frequency motor drives that are more efficient under partial loads, allowing them to save both water and energy.[54]

THE END USE OF WATER



Once a customer receives water, additional energy may be needed to heat, cool, purify, or pump that water in preparation for its intended use. Changes in the amount or quality of water needed for some of these uses can further increase the amount of energy consumed in the process. The literature on water use contains little information on energy use integral to water end use beyond domestic fixtures and appliances. The San Diego case study (Chapter 3) and to lesser extent the Westlands and Columbia case studies (Chapters 4 and 5) evaluate this issue to the extent possible given the resources available for this report. This is an area of great significance for future research and energy and water policy.

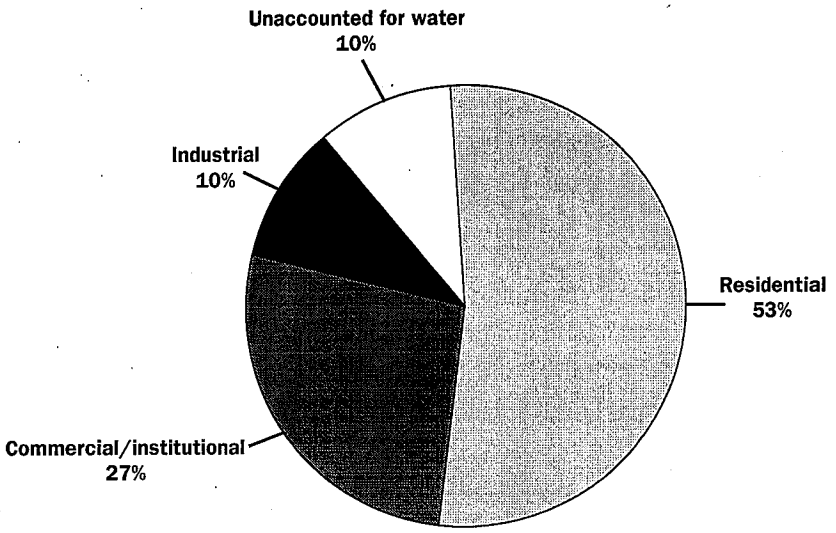
While there are efficiency improvements that can reduce the energy inputs required at each stage of the water use cycle, the greatest energy and water savings come from reducing water consumed by various end uses. Conservation at the end use stage eliminates all of the "upstream" energy required to bring the water to the point of end use, as well as all of the "downstream" energy that would otherwise be spent to treat and dispose of this water.

Conservation at the end use stage eliminates all of the "upstream" energy required to bring the water to the point of end use.

Urban Water Use

California urban water use in 2000 was approximately 7 million acre-feet.[55] Urban use is typically divided into residential and nonresidential use, with nonresidential use further divided into commercial, industrial, and institutional uses (CII). The breakdown of urban water use in California is illustrated in Figure 3.

FIGURE 3
Urban Water Use in California



Residential Water Use

California's residential sector uses almost 4 million af/yr. A new study found that approximately 1.4 million acre-feet of this use could be saved with existing cost-effective technologies.[56] These water savings would also provide substantial energy savings from avoided conveyance, treatment, distribution, end use, and wastewater treatment.

Hot Water Use

A study of 1,200 homes in 14 cities looking at residential water use found that the top four indoor uses were:[57]

- Toilet (26.7 percent);
- Clothes washer (21.7 percent);
- Shower (16.8 percent);
- Faucet (15.7 percent).

Energy use and savings from the latter three items on this list, which all use hot water, are presented in Tables 2 through 4.[58] Savings from toilets are discussed separately below.

Conserving water from some hot-water-using devices may not be cost-effective when water savings are considered alone. But as Table 5 demonstrates, the measures are very cost-effective when energy savings are included.[59] Where the table indicates

TABLE 2
Estimated Energy Use by Showerheads

	Rated Flow (gallons per minute)	Actual Flow (gallons per minute)	Estimated Energy Use per Household* (kWh/yr)	Estimated Savings per Household with a 2.5 gpm showerhead (kWh/yr)
1994–present	2.5	1.7	1,128	
1980–1994	3.0	2.0	1,328	200
1980–1994	4.0	2.7	1,793	665
Pre-1980	5.0–8.0	4.3	2,855	1,727

*Assumes 5.3 minutes per person per day; 2.64 persons per household; 0.13 kWh of electricity per gallon of water at 106 degrees.

TABLE 3
Estimated Energy Use by Faucets

	Rated Flow (gallons per minute)	Actual Flow (gallons per minute)	Estimated Energy Use per Household* (kWh/yr)	Estimated Savings per Household with a 1.5 gpm Faucet or Aerator (kWh/yr)
1994–present	1.5	1.0	445	N/A
1994–present	2.5	1.7	756	311
1980–1994	3.0	2.0	890	445
Pre-1980	3.0–7.0	3.3	1,468	1,023

*Assumes 8.1 minutes per person per day; 2.64 persons per household; 0.057 kWh per gallon of water at 80 degrees.

TABLE 4
Estimated Energy Use by Clothes Washers

	Water Use (gallons per minute)	Energy Use (kWh per load)	Estimated Energy Use per Household* (kWh/yr)	Estimated Savings per Household with a 27 gpm Clothes Washer (kWh/yr)
1998–present	27	1.6	632	N/A
1990–present	39	3.0	1,185	553
1980–1990	51	3.9	1,540	908

*Assumes 0.41 loads per person per day; 2.64 persons per household. Applies only to households with clothes washers.

TABLE 5
Accounting for Energy Benefits from Indoor Residential Water Conservation

	COST OF CONSERVED WATER (DOLLARS PER ACRE-FOOT CONSERVED)	
Device Installed (natural replacement)	Without Energy Benefit	With Energy Benefit
2.5 gallon-per-minute showerhead	$324	–$736
Average high-efficiency clothes washer (includes vertical and horizontal axis machines)	$865	–$177
Average high-efficiency dishwasher	$862	–$102

negative costs of conserved water, energy savings alone more than pay for the conservation investment.

Federal and state programs to promote market transformation, along with state and local rebate programs, can accelerate the adoption of these technologies.[60]

Cold Water Savings

Toilets and landscaping account for the two largest residential uses of water. Both use cold water and do not require significant end use energy. However, conservation of cold water can still save upstream and downstream energy inputs. Pacific Gas & Electric estimates that conveyance, treatment, distribution, and disposal energy requirements average 1,788 kWh/af statewide.[61] These requirements are much higher in Southern California, where conveyance alone averages close to 3,000 kWh/af.

Toilet flushing represents the largest single use of water inside the home. While older toilets use as much as 6 gallons per flush, federal and state water-efficiency laws now standardize flush volumes at a maximum of 1.6 gallons per foot for all new toilets. Many water utilities in California have conserved significant quantities of water by installing ultra low-flow toilets. Statewide, however, there are significant additional savings still available from ultra low-flow toilet retrofits.[62] Ultra low-flow toilets do not save end use energy because toilets don't use hot water, but they can save conveyance, distribution, and treatment energy.

Landscape water use represents approximately 40 percent of residential use in California. A recent study estimates that California residents could save from

25 to 40 percent of their landscape water use by improving management practices and applying already existing technology, such as rainwater cisterns and gray-water systems that reuse household wastewater for irrigation. These savings could be achieved relatively quickly and would reduce water use by 360,000 to 580,000 per year.[63]

One potentially effective way to target landscape water use is through rates. More than 2 million California residents are charged a fixed rate for water usage. This system fails to reward those who conserve and punish those who waste. Fixed rates are usually used when meters have not been installed. Lack of meters in turn allows leaks to go undetected. Data show that per-capita water use is about one-third less in areas where water users are billed based on volumetric rates rather than fixed rates. Metering is one of the most basic and effective water conservation tools. Recent legislation requires some unmetered cities in California to install water meters and bill water users on the basis of water use, and proposed legislation (AB 2572, Kehoe) would address the remaining unmetered cities.

Commercial/Industrial/Institutional Water Use

California's commercial, industrial, and institutional (CII) sector accounts for more than 30 percent of urban water demand, or around 2.5 million acre-feet.[64] More than 50 percent of the total CII water use is for cooling and heating, which requires energy inputs.[65] Recent studies estimate that cost-effective conservation could reduce CII water use by 15 to 50 percent.[66] In California, a recent study estimates that the CII sector could save 39 percent of the water it uses, which would correspond to statewide savings of 1 million acre-feet.[67]

Data show that per-capita water use is about one-third less in areas where water users are billed based on volumetric rates rather than fixed rates.

Commercial customers often have the same water needs as residential users, e.g., toilets, sinks, laundries, kitchens, and landscaping. The most frequently used commercial conservation measures include plumbing fixtures and appliance retrofits or replacement and more efficient landscaping. Institutional customers, such as schools and universities, hospitals, government buildings, prisons, and military installations, primarily use water for heating and cooling, domestic uses, and landscape irrigation.

Industrial water use primarily falls into five categories:

- Cooling and heating
- Industrial processing
- Washing
- Adding as a direct ingredient
- Landscaping

Data on water-related energy use in industry are scant. The Department of Energy asks manufacturers to report energy information on many end uses, but water treatment (e.g., heating, cooling, treating water) is not one of the end uses. Instead it gets embedded into broader end use categories. This makes it difficult to estimate industrial water-related energy use.

The most common conservation measures used in the industrial sector include site-specific engineering modifications of water-using equipment and processes.[68] Despite the potential for large savings in the CII sector, a study done for the American

DISHWASHERS AND WASHING MACHINES: HOW AN INCREASE IN ENERGY INTENSITY CAN STILL LEAD TO OVERALL ENERGY SAVINGS

Energy intensity measures the amount of energy used per unit of water. Some water sources are more energy intensive than others; for instance, desalination requires more energy than wastewater recycling. Water conservation technology may either increase or decrease energy intensity.

Yet when water planners make decisions, they should look not just at energy intensity, but also at the total energy used from source to tap. In the case of water conservation, some programs may consume a lot of energy at one stage in the energy-water-use cycle, but still decrease the amount of energy used overall. The following three examples illustrate the interplay between energy intensity and total energy use.

Water conservation may increase energy intensity and increase total energy use. A particular irrigation technology could reduce water use by 5 percent, but require so much energy to operate that it increases the energy intensity per acre-foot of water by 10 percent. This could increase total energy use by 4.5 percent.

Water conservation may increase energy intensity and decrease total energy use. The average high-efficiency dishwasher increases the energy intensity of dishwashing by 30 percent, but it reduces water use by 34 percent. As a result of using less water—and therefore less energy to convey water from the source to the dishwater—the net total energy needed to wash dishes would decline by 14 percent.

Water conservation may decrease energy intensity and decrease total energy use. The average high-efficiency clothes washer reduces water use by 29 percent, as compared with average low-efficiency machines, and simultaneously lowers energy intensity by 27 percent. Energy intensity declines because mechanical aspects of the machines (agitators, etc.) are also improved. By reducing total water use and energy intensity, total energy use is reduced by 48 percent.

Water Works Association Research Foundation found that certain types of large water-using facilities such as correctional facilities, military bases, and utility systems have been ignored by many audit programs and have thus not received recommendations for conservation measures. The study further noted: "improved coordination and cooperation among water, wastewater, and energy utilities are needed to realize the water efficiency potential in the CII sector."[69]

Landscape water use represents the single greatest use in the CII sector. In 2000, 38 percent of CII water use in California was used for landscape irrigation.[70] A recent study estimates that it is possible to reduce this water use by 50 percent.[71] One important tool for achieving these savings is better management of landscape water use. Frequently, the same meter is used to measure a property's indoor and outdoor water use. In these complex mixed-use situations, it may be difficult to even know how much water is being applied to the landscape. Proposed legislation (AB 2298, Plescia) would require a dedicated landscape meter for new construction with more than 10,000 square feet of irrigated acreage and for existing properties with more than one acre of irrigated landscape. This would enable water agencies to establish water budgets for these large landscapes and to target landscape water waste with appro-

priate rate structures. Dedicated landscape meters would also enable landscape managers to better ensure the efficiency and proper functioning of irrigation systems.

Urban Conservation

Since end use appears to consume the most energy in the water-supply-use chain, water conservation programs hold enormous energy conservation potential. Much of the urban water conservation occurring in California is driven by national and state efficiency standards for certain water appliances and by the Memorandum of Understanding Regarding Urban Water Conservation in California (MOU)—an agreement signed by most of the large urban water suppliers in California outlining a series of water conservation best management practices. The MOU and the California Urban Water Conservation Council (composed of signatories to the MOU) deserve much credit for advancing urban water conservation in California.

Nevertheless, significant conservation potential remains beyond what the MOU requires.

▸ The MOU does not require agencies to implement all cost-effective conservation strategies, but rather specifies levels of implementation (i.e., percentage of customers to be audited or number of toilets to be replaced).

▸ The Urban MOU has minimal requirements for CII water use, demanding only that utilities survey and offer incentives to 10 percent of their CII customers, and to achieve 3 percent CII water savings through implementation of a CII ultra low-flow toilet program by 2004.

▸ Because the Urban MOU targets a limited number of customers for landscape audits, even full implementation of the MOU will probably generate only a small portion of these total potential landscape water savings.

▸ The MOU pays scant attention to energy. For example, MOU signatories are not required to include energy savings when determining if a best management practice is cost-effective.

The neglect is mirrored by the energy utilities, which pay little attention to saving water. The only water-saving elements typically included in energy conservation programs are those that save hot water. This is unfortunate because, as noted throughout this report, saving even cold water can save significant amounts of energy, depending on the source of that water.

Some energy utilities have noted the link between water and energy use and have targeted their public messages accordingly. Public education materials from the Sacramento Municipal Utility District note: "a tremendous amount of electricity is used to run the pumps that obtain, purify, and bring water to your house and then transport wastes to your regional wastewater utility. To help reduce this energy use, the Sacramento Municipal Utility District and the Sacramento Area Water Works Association ask that you avoid using large amounts of water during the peak energy demand hours of 11 A.M. to 7 P.M."[72] Unfortunately, this approach is still the exception.

In sum, while energy savings are possible at all stages of the water supply cycle, water conservation programs may be the most cost-effective way of reducing the total energy involved in urban water use. In particular, programs aimed at reducing water use in areas with energy intensive supplies may yield the most cost-effective water and energy savings.

Agricultural Water Use

Agriculture uses approximately 80 percent of the developed water supply in California. In 1995, this amounted to almost 34 million acre-feet.[73] In 1995, California agriculture used approximately 4.4 billion kWh of electricity for groundwater pumping and irrigation purposes, and more than 11 billion kWh for all purposes.[74] Ninety percent of all electricity used on farms is used for groundwater pumping.[75]

For agriculture south of the delta, significant energy may be required for conveying surface water supplies, and reducing water use can translate into energy savings. For agriculture in some other regions of California, such as the Sacramento Valley, surface supplies are gravity fed and reducing surface water use will not translate into saving conveyance energy. Yet even in these areas, improving water use efficiency may save energy by decreasing groundwater pumping and reducing energy required for local distribution. However, in some cases, energy savings from reduced surface water deliveries or reduced groundwater pumping may be partially or fully offset by increased energy requirements of some water-efficiency technology.

Given the proper price signals—especially elimination of subsidies—farmers may shift to lower-water-use/higher-value crops.

Improving the efficiency of irrigation systems through better water measurement and irrigation scheduling, installation of micro-irrigation systems, tailwater recovery systems, and other measures can reduce agricultural water use on farms. [76] In addition to improving irrigation efficiency, farmers can also reduce water use by shifting to lower-water-use crops. While crop choice is made based on a wide variety of factors, resource costs play a significant role. Given the proper price signals—especially elimination of subsidies—farmers may shift to lower-water-use/higher-value crops. For example, a 1992 California Energy Commission report to the state legislature found that agriculture's response to the seven-year drought and changes in energy rates "was to shift production from low-value to high-value crops (e.g., from alfalfa to tomatoes). Even with higher costs, the agricultural economy was robust and these high-value crops were able to absorb those costs."[77]

Dry years present a particular challenge for both water and energy systems: demands are greater while supplies are reduced. In dry years, water systems generate less power. Not only does less water run through the turbines in powerhouses, but also the lower reservoir levels reduce the water pressure and thus reduce the power produced by a given amount of water. Unfortunately, dry years tend to result in increased power demand. During dry years, water systems will need to pump more water—and therefore consume more energy—because irrigators (and other consumers) are getting less water from rainfall. Also, in low water years, farmers are more likely to rely on groundwater pumping, which increases the demand for power.

A voluntary program of compensated dry-year fallowing of agricultural lands could generate a substantial dry-year water supply. However, depending on the source and

disposition of the transferred water, these programs may not save energy. Quantified examples of the potential energy and water benefits or costs of permanent or dry-year land-retirement programs are provided in the Westlands Water District (Chapter 4) and Columbia Basin (Chapter 5) case studies. As discussed in the Columbia River Basin case study, such programs can provide significant benefits to the agricultural economy.

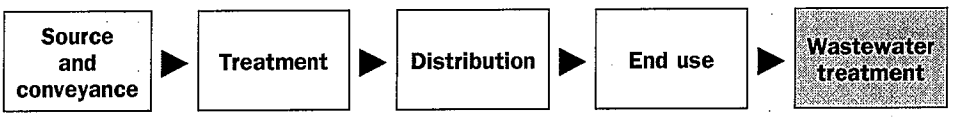
Agricultural Water Conservation

California currently lacks a comprehensive program for agricultural water use efficiency. Agricultural water users established the Agricultural Water Management Council, which developed a list of best management practices, but environmental groups have been critical of the council's process because it fails to adequately address water measurement, and it relies on a purely voluntary approach. Only four water management plans were submitted to the council last year.

CALFED's efforts to develop an agricultural water-use efficiency program have also been a disappointment. CALFED staff worked with environmental and agricultural stakeholders and agency representatives to identify specific benefits related to water flow, timing, and quality that can be achieved through agricultural water use efficiency, and to establish quantifiable objectives for the portion those benefits for which agriculture should be responsible. This program could allow for inclusion of energy costs and benefits, although inclusion of energy costs is not currently required in the cost-benefit analysis that must be submitted with project proposals.

Unfortunately, the task of implementing the CALFED Agricultural Water-Use Efficiency Program has been passed on to the Department of Water Resources, where it languishes. Updating quantifiable objectives is supposed to be an ongoing process, yet no additional objectives have been developed or refined since the program was given to the department. There is no process in place for evaluating progress toward meeting quantifiable objectives. CALFED has not even initiated its required three-year evaluation of progress toward meeting quantifiable objectives. The program never adopted any enforcement mechanisms or consequences for not meeting the program objectives.

WASTEWATER TREATMENT



Wastewater systems generally include three components: collection systems (sewers and pumping stations), treatment facilities, and effluent disposal or reuse. Collection and disposal or reuse require energy for pumping, while treatment requires energy for pumping, running treatment operations, and processing solids. In 1995, wastewater treatment in California used approximately 1.6 billion kWh of electricity.[78] Given California's continued growth, current energy use for wastewater treatment is likely to be significantly higher.

TABLE 6
Energy Use in Wastewater Treatment

Treatment	1-mgd facility (kWh/af)	100-mgd facility (kWh/af)	100-mgd facility with energy recovery (kWh/af)
Trickling filter	580	225	130
Activated sludge treatment	750	340	225
Advanced treatment	865	400	280
Advanced treatment with nitrification	980	520	400

Estimates of the energy used in water treatment depend on facility size, type of processing, and efficiency. Some facilities (typically larger facilities) recover energy from biogas combustion, which reduces their net consumption. Average energy use is illustrated in Table 6.[79]

Frank Burton conducted a study computing a weighted average over the range of facility sizes and estimates the following net energy requirements: 440 kWh/af for activated sludge, 501 kWh/af for advanced wastewater treatment without nitrification, and 640 kWh/af for advanced wastewater treatment with nitrification. The study estimated that by 2008, 50 percent of U.S. wastewater treatment capacity would include nitrification.

Energy used for wastewater plants in the San Diego case study (see Chapter 3) ranged from 816 kWh/af for the Santee Basin plant to 1,272 kWh/af for the North City (San Diego) plant. Variation may be wider than these numbers suggest since all water from the Santee Basin plant is reused either in recreational lakes or for irrigation after treatment to tertiary standards.

Water conservation can reduce the energy required for treating wastewater and can eliminate the need for new or expanded facilities. The 1996 Clean Water Needs Survey submitted to Congress by the Environmental Protection Agency identified more than $139 billion in capital costs for water quality projects and other related work eligible for funding through state revolving funds established under the Clean Water Act. Close to $100 billion of this amount is flow-related and could be delayed or reduced through water conservation.

Water conservation can also reduce wastewater treatment operating costs. In Orange County, California, conservation-induced reductions in wastewater flows generated energy savings in collection systems pumping, influent pumping, aeration, and outfall pumping. Taken together, these energy savings amounted to $11,047 per year for each million gallons per day of reduced flow. These savings are equivalent to about $10 per acre-foot of reduced flow. Capital costs savings were estimated to be worth more than 10 times this amount for the Orange County system.[80]

ADDITIONAL ENERGY IMPLICATIONS OF WATER POLICY

This chapter has focused on the energy embedded in water use—the energy directly applied during the five stages of the water use cycle through activities such as

pumping, heating, and cooling. However, the energy implications of water policy extend far beyond the energy embedded in water. For example, if a water allocation decision results in a factory closure, the factory would save both the energy embedded in water use and any other energy required for operating the facilities, such as heating, lighting, and industrial processing. The implications of a water policy decision may include changes in embedded energy use, as well as changes in other types of energy use.

In agriculture, water policy decisions may affect the amount of water applied to a field, and the energy required to obtain and apply that water. Savings from these changes represent the embedded energy component. In addition, water policy decisions that result in altered crop patterns may affect the amount of energy required for harvest, cultivation, and processing. These changes represent additional energy implications of the policy.

Where water for irrigation is diverted upstream of hydropower generation facilities, deciding to irrigate means deciding to forego hydropower generation.

In situations where water for irrigation is diverted upstream of hydropower generation facilities, deciding to irrigate means deciding to forego hydropower generation. This lost hydropower generation is not included when calculating the amount of energy embedded in water, yet these hydropower opportunity costs are also energy implications of water resource decisions. (Chapter 5 explores these additional energy implications in the Columbia River setting.)

This report has focused so far on energy embedded in water. But additional energy implications can be quite significant. While a complete analysis of the full energy implications of water policy decisions is beyond the scope of this report, for illustration purposes, we do analyze some of the additional energy implications of the specific water policy decisions discussed in the case studies.

NRDC

THE EARTH'S BEST DEFENSE

ENERGY DOWN THE DRAIN

The Hidden Costs of California's Water Supply

August 2004

CHAPTER 3

SAN DIEGO COUNTY—ENERGY AND URBAN WATER

Like many California water agencies, the San Diego County Water Authority (SDCWA) is attempting to find additional water sources to meet its current and projected water demands. SDCWA staff estimate that at least an additional 100,000 af/yr of end use water will be required in 2020. Efforts to develop these supplies are well under way. However, analysis of supply alternatives historically has neglected consideration of energy implications. This chapter illustrates the type of results SDCWA would obtain if they analyzed supply choices from an energy perspective.

The preliminary results of our San Diego analysis indicate that:

- End use constitutes the largest component of energy embedded in the urban water-use cycle.
- Conservation and recycling appear to be the most energy efficient sources of water if local surface supplies are not available.
- Water supply decisions can significantly affect energy use. These energy implications warrant inclusion in water supply planning and other water management policy decisions.

A MODEL FOR QUANTIFYING ENERGY IN WATER USE

This chapter introduces a spreadsheet model systematically quantifying the energy use implications of water management decisions in an urban setting. This tool can help policymakers throughout the western United States to better understand the energy implications of their water demand management and water supply decisions. Chapters 4 and 5 apply the model in two agricultural settings: the Westlands Water District in California's Central Valley and Washington's Columbia Basin Project.

The model tracks the energy inputs for the five stages of the water use cycle.[81] This allows planners and policymakers to manipulate these inputs and predict the energy impacts of different water policy choices, such as constructing a desalination facility or implementing a water conservation program. A discussion of the methodological

issues involved in constructing this model is presented in the box below. The full model is presented in Appendix A.

The case studies include enough specific data to reach some policy conclusions. They also help to identify areas where future research would be most worthwhile. Readers are cautioned that the case studies are illustrations of our methods, not full implementations of them. The methods require more location-specific information than could be assembled with the resources available during preparation of this report.

The San Diego case study illustrates how one can evaluate the energy implications of water policy decisions in an urban setting. The data sources, and assumptions used

METHODOLOGICAL ISSUES

As in all modeling efforts, there is a boundary question about which energy inputs should be included or excluded from the energy intensity estimates. We include energy used directly in managing water, e.g., pumping, heating, cooling, pressurization, and treatment. The method in this report is not a life-cycle analysis that accounts for indirect energy use such as the energy needed to manufacture and install a water pipeline.

For simplicity, the analysis only lists energy inputs that would change across water policy decisions. For example, the method does not quantify hydroelectric production in the State Water Project or Central Valley Project facilities prior to water intakes in the San Joaquin Delta, and it does not quantify gasoline or diesel fuel used to service these facilities. The policy decisions analyzed in this report would have little impact on these energy uses, so they are excluded.

The method uses water delivered to customers as the denominator of our energy intensity ratios. A qualitative definition of energy intensity is the amount of energy used per unit of water. Because water losses occur in the supply-use-disposal chain, however, there is more than one way to quantitatively define energy intensity. An acre-foot of water diverted by the State Water Project might yield only 0.95 acre-feet of water delivered to a water treatment plant because water evaporates and leaks from aqueducts and canals. If moving that amount of water were to take 100 kWh of energy, one could say that the energy intensity is either 100 kWh/af or 105.3 kWh/af (100/0.95). This same logic applies throughout the supply-use-disposal chain. One must choose water quantities at some point in the chain to use as the denominator in all of the energy intensity calculations in the chain in order to have consistent and meaningful results.

The method treats energy use as linear in the quantity of water transported or used. This is clearly not true at the scale of individual pumps because pumps are more efficient when operating near full capacity. They will use more energy per acre-foot lifted if they are running at half capacity. The linear assumption is often accurate, however, at larger scales because one of several pumps in a bank of pumps can be turned off or on in order to pump less or more water.

Not all energy used to pump or transport water is electric energy. For example, diesel fuel is increasingly used to pump water on farms, and natural gas is typically used to heat water in urban settings. The energy measure in this report is equivalent kilowatt-hours, which is the sum of actual kilowatt-hours and fossil-fuel use converted to kilowatt-hours. The conversion assumes that the fuels were used in thermal power plants to produce electricity.

in the San Diego case study, are listed in Appendix B. The data, however, may not be representative enough of the entire SDCWA service area to support final policy decisions on some issues.

THE SAN DIEGO CONTEXT

We chose San Diego County for our urban-water-supply case study because it involves a wide range of actual and potential water sources and conservation opportunities. The SDCWA is a regional water wholesaler that has been operating since 1944. It purchases water from the Metropolitan Water District of Southern California to sell to 23 member agencies located within the western third of San Diego County (920,000 acres; 1,437.5 square miles) and serves nearly 3 million residents. The water needs of the member agencies and their retail customers are diverse since the agencies consist of six cities, four water districts, eight municipal water districts, three irrigation districts, a public utility district, and a federal military reservation.

The average annual raw water supply in the SDCWA service area for 1996 through 2000 was approximately 685,000 acre-feet. Average annual raw water supplied by the SDCWA in 2020 is predicted to increase to about 810,000 acre-feet. Because water is lost in conveyance, treatment, and distribution, water currently delivered to customers is around 610,000 af/yr, while projected deliveries in 2020 are about 710,000 af/yr.

Key Water Supply Facts

▸ The Metropolitan Water District obtains water for the SDCWA from the Colorado River Aqueduct (about 470,000 af/yr) and the State Water Project (about 83,000 af/yr) and delivers it to the SDCWA at the boundary of Riverside and San Diego counties.

▸ Water is delivered from the SDCWA to its member agencies through two gravity-fed aqueducts containing five large-diameter pipelines (274 miles total).

▸ Water is delivered from the member agencies to retail customers via approximately 7,800 miles of pipeline.

▸ The local groundwater provides about 30,000 af/yr. One groundwater source is brackish and is treated to potable standards.

▸ Wastewater recycling provides about 18,000 af/yr.

▸ Surface water reservoirs are primarily used as terminal storage for imported water.

▸ The local surface water supply is about 86,000 af/yr.

Water in three of the five principal SDCWA pipelines is treated outside the county at the Metropolitan Water District's Skinner Water Treatment Plant in Riverside County. The SDCWA member agencies also operate 10 raw water treatment plants. Most water delivered by member agencies is treated potable water. The exceptions are recycled wastewater and untreated—raw—water provided for agricultural

purposes. Member agencies operate 14 wastewater treatment plants and 24 water recycling facilities.

The SDCWA has encouraged water conservation and investments in end use efficiency, both directly and through membership in the California Urban Water Conservation Council—the implementing agency for the Memorandum of Understanding for Urban Water Conservation in California. The SDCWA also recognized that energy and water savings can occur together and began a successful partnership with San Diego Gas and Electric, the regional energy supplier, over 10 years ago. Since the collaboration began, more than 550,000 low-flow showerheads have been installed. Over five years ago, SDCWA partnered with San Diego Gas & Electric to offer financial incentives for installing horizontal-axis clothes washers.

THE SEARCH FOR ADDITIONAL WATER SOURCES

To supplement its current water supplies and plan for the future, the SDCWA has been working for years to arrange a 75-year water transfer agreement with the Imperial Irrigation District, located in southeastern California. The final transfer agreement, signed on October 16, 2003, calls for the SDCWA to receive up to 200,000 af/yr of water. Deliveries will ramp upward during the term of the agreement, providing an average of about 143,000 af/yr over the life of the agreement. The SDCWA will provide the Imperial Irrigation District with up-front payments of $20 million and payments for the transferred water starting at $258 per acre-foot and increasing each year, according to a set price schedule. Additional costs will be incurred to "wheel" this water to San Diego.

The SDCWA also recognized that energy and water savings can occur together and began a successful partnership with San Diego Gas and Electric, the regional energy supplier, over 10 years ago.

In its Regional Water Facilities Master Plan of 2000, the SDCWA identified reducing its dependence on imported water in general and its dependence on water imported from the Colorado River in particular as critical to making its water supplies more stable and reliable. Toward this end, the SDCWA has attempted to diversify and expand its local sources of water, specifically targeting seawater desalination as the preferred alternative.

The SDCWA has considered developing a seawater desalination facility at Encina, which would be constructed adjacent to the Encina Power Station. This project would be the largest seawater desalination plant in the Western Hemisphere, producing 50 million gallons per day (56,000 acre-feet annually) of fresh water. The project is similar to other reverse-osmosis facilities being constructed around the world, including new operating plants in Florida and Trinidad. This new water source would supply up to 8 percent of the region's water needs.

In addition to developing the Encina facility, the SDCWA is evaluating other coastal locations that may be suitable for a regional seawater desalination facility. For example, the SDCWA is currently evaluating the feasibility of a desalination plant adjacent to the South Bay Power Plant in Chula Vista. Other coastal sites being evaluated include the San Onofre Nuclear Generating Station at the north end of San Diego County and sites as far south as the Mexican border.

SDCWA is not investigating or supporting any project to import water via ocean-going water bags towed by tug from Northern California or other points north. Nonetheless, the analysis includes an evaluation of water-bag supply to San Diego County as an interesting point of comparison with long-distance transport in canals and pipes. Readers should not construe inclusion of an alternative in this report as an endorsement by the authors or as a comment on the feasibility or appropriateness of any alternative.

RESULTS OF THE CASE STUDY

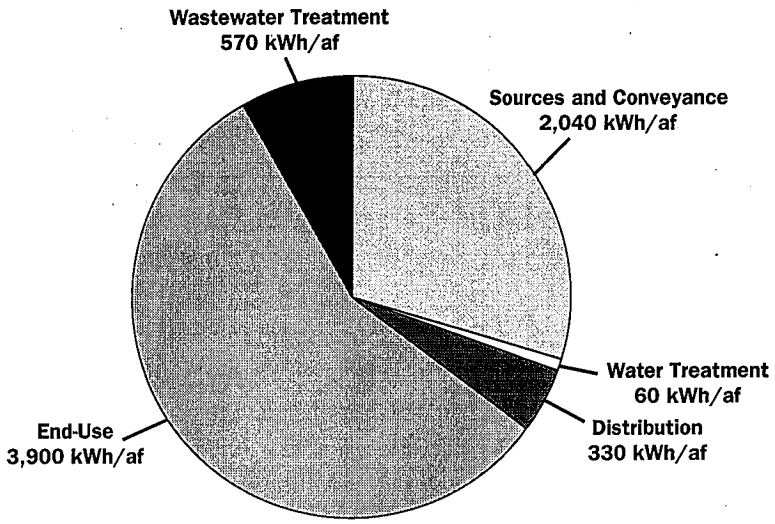
The SDCWA was able to provide some data for all five steps in the water-supply-use-disposal chain. Data from other locations were then used to supplement the analysis when San Diego data were not available. Consequently, the results of the case study analysis should be interpreted cautiously. Remember that the case studies demonstrate the methods and the importance of applying them, but they are based on limited data. Care should be taken in relying on this case study for final decision making until the data sources and assumptions are verified or modified appropriately.

End Use Energy Dominates the Water Use Cycle

Our research revealed that the end use of San Diego's water—heating it for showers, for instance, or pressurizing it for car washes—consumes by far the most energy in the whole water delivery chain. This is a rather striking result given that San Diego County imports most of its water from long distances, requiring large amounts of energy for conveyance.

Figure 4 describes the distribution of estimated total energy use per acre-foot (6,900 kWh) among the five components of the supply-use-disposal chain. Energy use that is integral to end use of water dominates the total.

FIGURE 4
Estimated Energy Intensity Components of Water in San Diego County



The relatively large amount of energy associated with end use is composed of three types. First, water is sometimes heated for use—for example, for taking showers in homes, for washing dishes in restaurants, or for manufacturing in some industrial facilities. Second, water is sometimes recirculated, pressurized, or lifted in use. Examples include cooling towers, recirculating hot water loops in newer residences, additional pressurization in high-rise buildings, and irrigation pipe pressurization or lifts from canals on farms. Finally, some energy use comes in close conjunction with water use, and may increase or decrease when water is conserved, but is not directly embedded in water. For example, energy is used to run air conditioning compressors that are water-cooled.

The summary number for estimated energy use integral to water end use shown in Figure 4 is presented in more detail in Table 7.[82] The energy intensity estimates are based on the data and assumptions listed in the table notes and are more fully described in Appendix B. Zeros are used when energy use is implausible. "Not Estimated" means data were inadequate to support a credible estimate. The numbers in the table are not significant to the digits shown, but are presented this way to facilitate comparison with other tables and figures.

The estimates in Table 8 probably understate energy use integral to water use because data on water-related energy use in the commercial, industrial, and

TABLE 7
Estimated Energy Use Integral to Water End Use in San Diego County

Water Use Category	Estimated Percent of Total Use in 2010 (8)	Estimated Energy Intensity (kWh/af) (8)
Residential	**58%**	
Toilets and leaks	14%	0
Dishwashers	1%	27,200
Clothes washers	8%	11,650
Showers, faucets, and bathtubs (1)	12%	6,700
Landscape irrigation	23%	0
Commercial, industrial, and institutional	**32%**	
Kitchen dishwashers	0.5%	27,200
Prerinse nozzles	0.2%	6,700
Other kitchen use	1.2%	Not Estimated
Laundries	0.6%	11,650
On-site wastewater treatment (2)	5.8%	800
Water-cooled chillers (3)	2.4%	67,700
Single pass cooling (3)	2.4%	0
Landscape irrigation	12.1%	0
Other heated water (4)	0.3%	6,700
Other unheated water (5)	6.5%	Not Estimated
Agricultural (6)	**10%**	**Not Estimated**
Totals and weighted average (7)	**100%**	**3,900**

Notes: (1) Showers and tubs heated to 105 degrees; faucet water conservatively assumed to be cold. (2) Estimate shown is for on-site wastewater treatment. (3) Assumes 50 percent of cooling water is single pass since the SDCWA provides financial incentives for water-efficient cooling investments. (4) CII water heating estimate from Sezgen and Koomey (1995), less other CII water heating estimated separately. (5) May use energy for recirculation or pressurization. (6) Data not available for San Diego County. (7) May differ from figures shown due to rounding. (8) Numbers are not significant to digits shown, but presented this way to facilitate comparison with other tables and figures.

TABLE 8
Energy Intensity of Sources of Water in San Diego County

	Energy Intensity (equivalent kWh/af)	Notes
Current Source Weighted Average:	**2,040**	
San Francisco Bay Delta (SWP)	3,240	Wilkinson (2000)
Colorado River (CRA)	2,000	Wilkinson (2000)
Local surface water	80	Raw water lift to treatment plants
Local groundwater	570	
Recycling	400	Includes one brackish groundwater treatment facility at 405 kWh/af
Potential Sources:		
Imperial Irrigation District	2,110	CRA (2000) plus hydroelectricity not generated in the All American Canal (110)
Seawater desalination	4,200	SDCWA seawater desalination facility at Encina
Water bags	1,180	900 mile tow

Our analysis shows that satisfying all growth in water demand via conservation would reduce the overall energy intensity of the SDCWA water supply by 13 percent.

institutional (CII) and agricultural sectors are incomplete, and the analysis conservatively omits some uses of energy for which credible estimates could not be made at present (e.g., CII process water heating or recirculation, and water lift or pressurization for agricultural irrigation).

Conservation and Water Recycling are the Least Energy Intensive Sources of Potential Supply

Our analysis shows that satisfying all growth in water demand via conservation would reduce the overall energy intensity of the SDCWA water supply by 13 percent. In comparison, satisfying all growth in water demand via recycling would reduce overall energy intensity by only 4 percent, while using seawater desalination to satisfy growth would increase overall energy intensity by 5 percent.

Table 8 presents the energy intensity of actual and potential sources of water in San Diego County. The first line in the table shows the weighted average energy use for the current mix of water sources.

The results presented above can be taken a step further by assessing the energy intensity implications of various "sources" of additional water (Table 9). An additional 100,000 af/yr implies an additional 108,000 af/yr of water from desalination or recycling facilities because 7 percent of water is estimated to be lost in distribution (i.e., 100,000/0.93 = 108,000). It implies an additional 113,000 af/yr of water delivered to San Diego County via the State Water Project, the Colorado River Aqueduct (presumably Imperial Irrigation District water rerouted to San Diego), or water bags because an estimated 5 percent more is lost in treatment. Or it implies no additional water, but conservation of about 16 percent of the estimated 610,000 af/yr of water actually delivered to customers today after losses in conveyance, treatment, and distribution.

As in the rest of this report, the total energy use is divided by the quantity of water delivered to the end user to calculate the average energy intensity. That

TABLE 9
The Energy Intensity for Satisfying 100,000 af/yr of Additional Demand

	Source and Conveyance Energy (kWh/af)	Water Treatment (kWh/af) (1)	Distribution (kWh/af) (2)	End Use (kWh/af) (3)	Wastewater Treatment (kWh/af) (4)	Total (kWh/af)
Status quo	2,040	60	330	3,900	570	6,900
Status quo plus scenario:						
Conservation	1,780	50	290	3,400	500	6,020
Recycling	1,830	50	330	3,900	500	6,610
Water bag transfer	1,950	60	330	3,900	570	6,810
Imperial Irrigation District transfer	2,080	60	330	3,900	570	6,940
Additional State Water Project	2,240	60	330	3,900	570	7,100
Seawater desalination	2,400	50	330	3,900	570	7,250

Notes: (1) The conservation, recycling, and desalination scenarios assume the additional 100,000 acre-feet of water do not require treatment, reducing the average energy intensity of treatment from 60 to 50 kWh/af delivered to customers. (2) Conserved water does not need to be distributed, reducing the energy intensity of distribution from 330 to 290 kWh/af delivered. (3) Conservation assumes no energy is conserved when water is conserved, but no energy is expended to conserve water either. (4) Wastewater is not generated by conservation or by recycling if recycled water is used for landscape irrigation, reducing energy intensity from 570 to 500 kWh/af delivered.

quantity is 710,000 af/yr in all but the conservation scenario. In order to make a fair comparison, however, the conservation scenario also uses a denominator of 710,000 af/yr, although only 610,000 af/yr would actually be delivered to customers. This is an appropriate adjustment because this level of conservation would meet the same need as 710,000 acre-feet would if San Diego were to choose to obtain additional water from the State Water Project or the other sources included in this analysis.

The table shows that water conservation is the far superior water "source" from an energy perspective. Of course, other considerations are relevant to the choice among "source" alternatives. For example, seawater desalination and recycling probably offer greater reliability benefits than the other alternatives.

Energy Implications of Water Supply Decisions Are Large and Warrant Inclusion in Water Supply Planning

Our analysis shows that not only are conservation and recycling the most energy efficient sources of new water supply, but also that shifting to conservation and recycling would generate large energy savings. Total energy savings from relying on conservation instead of additional State Water Project water to provide the next 100,000 acre-feet of water could be approximately 767 million kWh, or enough to provide the annual electricity for 118,000 households—25 percent of all of the households in the city of San Diego.[83] The scale of these potential energy benefits can also be illustrated by another comparison. The amount of energy that this conservation option would save is equal to 150 percent of the maximum annual output of the proposed—but now inactive—62.4 MW Chula Vista II power plant.[84] Relying on recycling rather than additional State Water Project water would save 348 million kWh, or enough to provide for the annual electricity needs of 53,500 households. Total energy use of the alternatives for adding 100,000 acre-feet to the status-quo water supply are presented in Table 10.

This case study demonstrates that water policy choices can save significant amounts of energy. The magnitude of these potential savings has important implications for decision-makers. An integrated approach to assessing San Diego's water supply options could save water and energy, and reduce emissions that contribute to climate change and other air pollution problems. Future planning efforts should capitalize on these opportunities. The type of analysis presented in this case study can easily be incorporated into local and regional water supply planning. Consultation between water agencies, state energy agencies, and local energy utilities can help California better manage our precious water and energy resources.

TABLE 10
Total Energy Use and Savings from San Diego Water Supply Options

Status quo plus scenario	Average Energy Intensity (equivalent kWh/af)	Total Energy Required for Water Supply (million kWh/yr)	Savings from Conservation Rather than an Additional 100,000 af/yr of Physical Supply (million kWh/yr)
Conservation	6,020	4,274	Not Applicable
Recycling	6,610	4,963	689
Water bag transfer	6,810	4,835	561
Imperial Irrigation District transfer	6,940	4,927	653
Additional State Water Project	7,100	5,041	767
Seawater desalination	7,250	5,148	874

CHAPTER 4

WESTLANDS WATER DISTRICT—ENERGY AND AGRICULTURAL WATER

ENERGY DOWN THE DRAIN

The Hidden Costs of California's Water Supply

August 2004

The Westlands Water District is one of the largest agricultural water users in California and the western United States. The district faces long-standing problems associated with soil quality and poor water drainage and is now negotiating with the Department of the Interior to retire—permanently fallow—a large portion of its agricultural lands.[85] In fact, the district has already started the fallowing process by retiring 33,000 acres. Retiring land presents significant implications for California's water use, since it raises the question of where water formerly used for crops will go instead. Our report asks and answers the question: how much energy will be required to use the water in a different way?

This report provides a case study of land retirement in Westlands because the results will be timely and could inform a real policy decision process. The study also illustrates more generally the energy-related issues and data that are necessary for evaluating energy impacts of agricultural water management decisions. Energy impacts have not previously been accounted for in analyses of land-retirement proposals.

This case study evaluates three alternatives for the disposition of the water formerly used to irrigate retired lands in the Westlands Water District: the water could be used to enhance environmental flows in the delta; it could be used on other land within the district; or it could be transferred to other agricultural or urban uses.

As with the San Diego example, care should be taken in making final policy decisions based on this case study without more detailed analysis. In particular, we present some information in the case study that is relevant to land-retirement decisions generally, but is not specific to the land currently proposed for retirement. This information is presented, rather, as an exploration of a new methodology that could be applied in other settings.

Our Westlands analysis indicates that:

▸ Significant amounts of energy can be embedded in agricultural water use. Agricultural water allocation decisions can have large energy impacts that warrant inclusion in analyses of water policy alternatives.

▸ The total energy implications of agricultural water policy decisions extend far beyond the energy embedded in water. To the extent possible, analyses of energy impacts should include harvest, cultivation, and other energy inputs.

▸ Retiring land south of the Sacramento–San Joaquin Delta and transferring water to environmental flows could save significant amounts of energy—the equivalent of powering more than 18,000 households for one year.

▸ Retiring land south of the delta and transferring water to urban users could dramatically increase energy use. For example, if water were transferred to San Diego County, energy use would increase by more than a factor of 8—that is, by more than 1.2 billion kWh/yr.

▸ Retiring land and allowing water to remain in the district for agricultural use would likely result in an increase in permanent crops, such as orchards, which under plausible assumptions would increase electricity use by 48 percent and total energy use by 16 percent.

Retiring land south of the Sacramento–San Joaquin Delta and transferring water to environmental flows could save significant amounts of energy—the equivalent of powering more than 18,000 households for one year.

The model used for the San Diego case study (Appendix A) was modified and simplified for the Westlands case study because many aspects of the urban water cycle (e.g., treatment before use) are usually not present in the agricultural sector. These modifications are described in Appendix C.

THE WESTLANDS CONTEXT

The Westlands Water District in California is one of the largest agricultural users of water in the West. It has a service contract with the United States Bureau of Reclamation for up to 1,150,000 acre-feet of water per year from the Central Valley Project (CVP). As a junior user in the overcommitted CVP system, Westlands currently receives on average about 65 to 70 percent annually of this amount.

Westlands' total water supply in 2001 was about 1,050,000 acre-feet. Of this total, about 200,000 came from groundwater. A 1980 study by the Bureau of Reclamation, the United States Geological Survey, and Westlands estimated that the sustainable yield of the deep confined aquifer under Westlands is in the range of 100,000 to 135,000 acre-feet. More recent district analysis of monitoring data suggests that the annual average sustainable yield might be as high as 200,000 acre-feet. Table 11 presents the district's

TABLE 11
Westlands Water District Estimates of Water Sources in 2002

Source of Water	Estimates for 2002
CVP deliveries	775,194 acre-feet
Groundwater	200,000 acre-feet
Private transfers	72,000 acre-feet
Additional district supplies	60,000 acre-feet
Total	**1,107,194 acre-feet**

estimates of its water sources in 2002. These figures were used in the analysis in this report.

Local groundwater has lower quality than CVP water. Depth to groundwater below the surface varied in 2001 from about 100 feet to 500 feet.[86] Energy consumption per acre-foot of groundwater pumped by the district is about 740 kWh.[87]

Westlands currently includes about 600,000 acres, 95 percent historically irrigable.[88] Approximately 470,000 acres were actually irrigated in 2002. Irrigation water is supplied by the San Luis Unit of the CVP and groundwater wells. Water provided to Westlands by the CVP is diverted from the Sacramento–San Joaquin Delta by the Tracy Pump Station and transferred south via the Delta-Mendota Canal. It is lifted several hundred feet, allowed to flow by gravity for about 150 miles, and is sometimes lifted another several hundred feet into the San Luis Reservoir. Some electricity is generated when water is released from the reservoir, but this offsets only about 70 percent of the energy used to fill the reservoir.[89]

Water is conveyed from the vicinity of the San Luis Reservoir to Westlands via the San Luis and Coalinga Canals. Westlands operates and maintains the 12-mile concrete-lined Coalinga Canal and the Pleasant Valley Pumping Plant, as well as other re-lift stations. Westlands' permanent distribution system consists of closed, buried pipes that convey water from the San Luis Canal, the Coalinga Canal, and a 7.4-mile unlined canal from the Mendota Pool. Approximately 88 percent of the irrigable land in the district is served by the system.

Technology for water distribution has become more efficient over the years. In 1996, about 36 percent of irrigated land was watered by gravity distribution alone, about 21 percent by pressurized distribution alone, and the remaining 43 percent by a combination. By comparison, acreage irrigated only by gravity distribution was 63 percent in 1985 and 43 percent in 1990.

Water provided to Westlands by the CVP is lifted several hundred feet, allowed to flow by gravity for about 150 miles, and is sometimes lifted another several hundred feet into the San Luis Reservoir.

CASE STUDY RESULTS

Substantial Energy Is Embedded in Westlands' Water Use

Sources and conveyance appear to represent the largest portion of energy embedded in Westland's water use. Our analysis indicates that substantial amounts of energy

TABLE 12
Energy Intensity of Surface Water Transport to the Westlands Water District

Location of Energy Use	Energy Intensity (kWh/af)
Tracy Pump Station (1)	238
Lift from O'Neal Forebay (1)	59
Lift to San Luis Reservoir	300
Hydroelectric generation from releases from the San Luis Reservoir (2)	–210
Dos Amigos Pump Station	138
Total CVP to the San Luis Canal	**435–525**
Pleasant Valley Pump Station	238
Total CVP to the Coalinga Canal	**673–763**

Notes: (1) The State Water Project Banks Pump Station is a parallel path for water en route to the San Luis Reservoir and eventually Westlands. Its energy use is nearly identical to the CVP pumps. (2) A negative number represents energy recovery, not use.

TABLE 13
Electrical Energy Requirements to Lift or Pressurize Sprinkler Systems

Activity	Approximate kWh/af
Flood irrigation without on-farm lift	0
Lifting water 10 feet for flood irrigation	30
Low-pressure sprinklers	100
Permanent set sprinklers	205

are required to deliver water to Westlands' fields, whether surface or groundwater. Energy required for water pumping in the CVP is presented in Table 12.[90] Totals in the table are approximate and lower than actual consumption per acre-foot because water losses between pumping locations are not accounted for. Ranges represent uncertainty about whether water to Westlands should be charged 90 kWh/af for lift into or release from the San Luis.[91]

Our analysis indicates that substantial amounts of energy are required to deliver water to Westlands' fields, whether surface or groundwater.

The amount of energy required to deliver water to a field in Westlands can vary widely depending on the location of that field within the district. Net electric energy consumption by the CVP to deliver water to canals in the Westlands Water District varies from about 435 to 763 kWh/af.[92] In addition, staff members report that district lift from the canals consumes about 245 kWh/af.[93] This implies that water available to farmers at the boundaries of their properties requires between 435 and 1,008 kWh/af.

Once water has been delivered to the field, additional energy may be required to lift and pressurize that water. Table 13 summarizes some average on-farm energy requirements for these irrigation purposes. It assumes a 10-foot lift and pressurization for the sprinklers. The figures are estimated from unit prices for electricity and expenditures per acre for water pumping and pressurization provided by the California Energy Commission in 2001 for grapes and almonds. The figures in the table are not specific to Westlands. The energy required for permanent set sprinklers is 20 to 47 percent of the energy required to deliver water to farms within Westlands (435 to 1,008 kWh/af). This demonstrates that energy used in on-farm water delivery systems can be significant in agricultural settings, depending on the types of crops grown and the choice of irrigation system.

Hydroelectric power issues are relatively insignificant for the Westlands analysis. Hydroelectric power production from the CVP is substantial (more than 4.5 billion kWh/yr), but nearly all irrigation water supply—such as that to Westlands—occurs downstream of CVP hydroelectric facilities. Therefore, there is no direct trade-off between irrigation and power generation as there is in the Columbia Basin study that follows. In addition, none of the scenarios analyzed in this case study would result in a dramatic change to hydroelectric operations upstream of the delta.

Energy Implications of Land Retirement Extend Beyond Water Delivery and Use

As discussed in Chapter 2, the full energy implications of a water policy decision may extend beyond the energy embedded in the water. In this case, permanent land

TABLE 14
Energy Intensity of Liquid Fuels Used to Cultivate and Harvest Crops

Crop	Energy Intensity (kWh equivalent per acre)
Alfalfa—California	145
Alfalfa—Ohio	205
Almonds	341
Almonds	373
Cotton—Alcala	472
Cotton—Pima	545
Tomatoes, processing	1,255
Tomatoes, fresh	710
Tomatoes, "typical" California	1,389
Wheat	247

Notes: Gasoline and diesel fuel converted to BTUs at 150,000 per gallon; BTUs converted to equivalent kWh at 10,239 per equivalent kWh.[94]

retirement would affect energy use in ways that are not captured by looking only at energy embedded in irrigation. In addition to irrigation, farms consume energy by operating farm machinery preparing soil, applying fertilizers and pesticides, and harvesting crops.

Permanent land retirement would affect energy use in ways that are not captured by looking only at energy embedded in irrigation.

This nonirrigation energy use varies enormously across crops.[95] Table 14 presents some sample calculations of gasoline and diesel energy used in agriculture. Again, these are not specific to Westlands but illustrate the type of analysis that is required to understand the energy implications of agricultural water use decisions. Energy used for irrigation is not included in the gasoline and diesel-fuel energy consumption estimates unless a power takeoff from farm machinery is used to drive a water pump.

To determine the nonirrigation energy savings from a land-retirement program, it is necessary to determine which crops will be phased out. Table 15 presents projected 2020 cropping patterns for Westlands without significant land retirement.[96] Crops projected for lands with shallow groundwater represent drainage-impaired lands that are candidates for retirement. The projection is extremely uncertain because it is based on estimated future market prices for crops obtained by extrapolation from historical trends and expert opinion. These trends and opinions may be altered by changes in other parts of the western United States and international agricultural regions that have not been evaluated. Nonetheless, Table 15 is the best available data on the types of crops that might not be grown in drainage-affected areas if significant retirement programs are implemented.

Cotton takes up more than a third of the acreage likely to be grown on land with shallow groundwater. Cotton also represents a midpoint in its nonirrigation energy use listed in Table 16, roughly 500 equivalent kWh/acre. Therefore, a rough estimate of the nonirrigation energy savings associated with retiring 100,000 acres of land is approximately 50 million equivalent kWh. Note that these are nonelectric savings that have been converted to kWh. Although these potential savings are not available to other customers as electricity, they are important additional implications of land

TABLE 15
Forecast Demand for Westlands Crops in 2020

Crop	Shallow Groundwater (thousands of acres)	Remainder (thousands of acres)
Alfalfa hay	8.04	0.96
Cotton	73.72	83.76
Field crops	5.57	14.80
Irrigated grain	9.19	1.72
Grapes	1.40	8.02
Irrigated pasture	0.23	0.8
Orchards	2.75	55.03
Row crops	31.22	109.83
Sugar beets	0.98	0.96
Subtropicals	3.55	1.03
Tomatoes	17.45	97.56
Dry-land grain	14.00	0.00
Fallow and nonbearing trees and vines	22.39	11.99
Total: (577,000 acres)	**190.49**	**386.46**

Our analysis indicates that dedicating water from retired lands to environmental flows in the delta would have the greatest energy benefits.

retirement because of the potential for air quality and global warming benefits that are beyond the scope of this analysis.

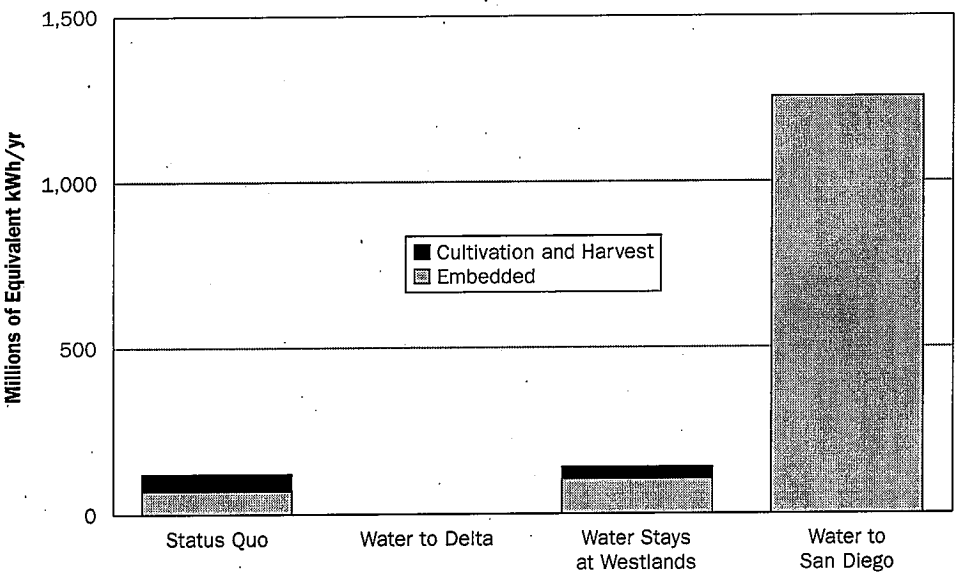
Dedicating Water to Environmental Flows Could Save Significant Energy

Long-standing problems associated with inadequate drainage, low quality of existing drainage water, and responsibility for management and disposal of drainage flows have led to recent proposals to retire—permanently fallow—200,000 acres within the district.[97] Under a Westlands proposal, farmers would receive federal payment for a significant part of the cost of land retirement, and the Westlands Water District would obtain or keep title to the land and all water associated with the land.

In concept, there is broad support for the retirement of drainage-impaired land on the west side of the San Joaquin Valley. However, current proposals are controversial for a variety of reasons not discussed in this report, including disposition of conserved water and the claim that the public cost of the retirement is higher than the public benefits that will be obtained. This case study considers three alternatives for the disposition of the water formerly used to irrigate the retired lands: dedicating the water to enhance environmental flows, transferring the water to other water users, and retaining the water for irrigation on other Westlands land. Summary statistics for the three alternatives are presented in Figure 5.

Our analysis indicates that dedicating water from retired lands to environmental flows in the delta would have the greatest energy benefits. The land targeted for retirement is predominantly downslope of the San Luis Canal and therefore receives water by gravity. On-farm pressurization is reported by Westlands staff to be minimal for these lands. Consequently, a conservative estimate of energy saved by reducing CVP water deliveries to Westlands, with that water left in the

FIGURE 5
Annual Energy Use by Water Disposition Scenario



San Francisco Bay-Delta for environmental purposes, is approximately 435 kWh/af. While average applied water in the district is 2.34 af/acre (1.1 million acre-feet divided by 470,000 cropped acres in 2002), not all of this is CVP water that could be dedicated to environmental flows. Since CVP water represented 70 percent of the district's 2002 supplies, we assume that 70 percent of the average applied water is CVP supply. Therefore, a 100,000-acre land-retirement program could save approximately 71 million kWh of electricity, or enough to power 11,000 households for a year.[98]

The full energy implications of land retirement extend beyond the energy embedded in water. Retiring 100,000 acres in Westlands and dedicating the conserved CVP water to environmental flows in the delta could have total energy implications of 121 million equivalent kWh (71 million kWh of embedded energy plus 50 million equivalent kWh used for cultivation and harvest).

It is important to note, however, that reduced groundwater pumping within the district would save even more electricity. Pumping groundwater alone uses about 740 kWh/af.[99] Electricity savings would be around 120 million kWh/yr if CVP deliveries were maintained and the district decreased groundwater pumping in the equivalent amount. Any pattern of reduction in total water use in the district implies significantly less electric and total energy use. However, given the lack of groundwater regulation in California at the moment, a retirement agreement would need to include special legal and enforcement provisions in order to ensure any reduction in groundwater pumping.

This analysis has implications for the Environmental Water Account, included in the CALFED Bay-Delta Program Record of Decision, signed in August 2000. The Environmental Water Account was created to provide water to compensate water

users for delta pumping reductions needed to protect endangered species, and, if enough water remains, to restore the bay-delta ecosystem. From an operational perspective, this complex arrangement can be identical to dedicating existing water consumed by irrigation to delta protection. The Environmental Water Account water can come from a number of sources, including the purchase of surface and groundwater and purchases north or south of the delta. The extraction of groundwater for the Environmental Water Account requires greater energy than purchases from existing gravity-fed surface water facilities. Water purchases from agriculture north of the delta would result in changes in agricultural operations with relatively small conveyance energy benefits. The Environmental Water Account water purchased from CVP contractors south of the delta, such as Westlands, would generate greater conveyance energy benefits than water purchased north of the delta. The greatest conveyance energy benefits from Environmental Water Account purchases in the Central Valley would be achieved from purchases of surface water from the Central Valley location with the greatest lift for imported delta irrigation supplies—Kern County.

Transferring the Water to Urban Users Would Dramatically Increase Energy Use

Transferring water from Westlands to urban locations would significantly increase energy use. Table 16 presents the conveyance energy that would be required to transfer the water to urban users.[100] As documented in the San Diego case study, other parts of the water cycle—water treatment, distribution, end use, and wastewater treatment—also use energy. Figure 5 uses data from the San Diego case study and Table 16 to estimate the energy use that would result if water conserved by retiring 100,000 acres in Westlands were transferred to San Diego. Total energy use—all electricity in this scenario—would increase by more than eight times the energy use in the status quo: more than 1.2 billion kWh/yr.

Water from land retirement at Westlands could also be transferred to other agricultural users. Transfers to locations that use less energy for conveyance (e.g., north of Westlands, such as the Sacramento Valley area) would have net energy benefits unless the types of crops and irrigation systems at the new location were sufficiently more energy intensive than those on retired lands at Westlands. In contrast, transfers to locations that use more energy for conveyance (e.g., south of Westlands, such as Kern County) would have net energy costs unless the types of

TABLE 16
Energy Used to Deliver Water to Various Users

Representative Points of Delivery	Energy Intensity (kWh/af)
Environmental flows in the Sacramento–San Joaquin Delta	0
Westlands Water District	435–1008
San Jose area	1,165
Santa Barbara area	2,826
Northern Los Angeles Basin	2,580
Southern Los Angeles Basin	3,236

crops and irrigation systems at the new location were sufficiently less energy intensive than those on retired lands in the district.

Retaining Water at Westlands Could Increase Energy Use

Westlands proposes to keep water formerly used to irrigate retired lands and reallocate this water to remaining agricultural lands within the district. Determining the energy implications of this policy requires forecasting the impact of water supply changes on cropping patterns. For example, land retirement without reduction in CVP deliveries creates greater reliability and availability of water per acre of land still farmed. One recent study estimates that a 39 percent increase in permanent crops, such as orchards, would result from increased reliability of water supply.[101] These reliability benefits are one reason Westlands has been pursuing its own land-retirement program.

District staff report that this level of increased tree planting would consume about an additional 170,000 af/yr.[102] Assuming for illustration purposes that permanent set sprinklers are used to deliver this amount of water previously delivered by gravity to retired lands, electricity use would increase by about 200 kWh/af. This would amount to about 35 million kWh/yr, as shown in Figure 5. In addition, irrigating orchard lands might require an additional 245 kWh/af for district lift from the canals, increasing electricity use even more than is presented in Figure 5.

The impact on other energy use on farms, however, might be positive. Tree crops tend to use less energy for cultivation and harvest than row crops. Figure 5 shows a reduction in energy used in cultivation and harvest that reflects 150 equivalent kWh per acre saved by switching from cotton to almonds. This type of change might amount to 15 million equivalent kWh/yr less energy use.

Overall, allowing Westlands to continue using water now applied to the retired lands would increase total energy use by approximately 19 million equivalent kWh/yr under the assumptions used. These assumptions illustrate the type of analysis that is important to perform when evaluating land-retirement proposals, such as the one for Westlands, but are only approximately accurate and should not be relied upon in making final decisions about land retirement in Westlands.

The analysis in this case study demonstrates three points that are relevant to agricultural water management decisions and worthy of further research:

- The importance of accounting for end use energy in agriculture;
- The importance of understanding the changes in land use or cropping patterns that are likely to result from a land-retirement decision;
- The importance of clearly defining, in an enforceable manner, the ultimate disposition of water no longer required to irrigate land that is retired.

Unfortunately, these concerns could not be quantified in further detail within the resources available for this report. But our analysis demonstrates that these concerns are quantitatively significant relative to energy use in agricultural water conveyance and distribution—a point that had not been established prior to this report.

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August 2004

CHAPTER 5

THE COLUMBIA RIVER BASIN—ENERGY AND HYDROPOWER

The Columbia River supports powerful farming, hydropower, and environmental interests, and their competing concerns reveal just how complex the relationship between energy and water can be.

Thanks to its unique plumbing, the Columbia River has numerous hydroelectric dams located downstream of major irrigation diversions. As a result, energy and water policy discussions have been more integrated here than elsewhere in the West. Despite this initial progress, however, water and energy planners in the region have a long way to go toward fully integrating energy and water policy. This shortcoming was brought into sharp focus by the drought and energy crisis of 2001, when energy production demands caused farmers, industry, and the environment to suffer severely.

In this chapter, we examine the energy implications of diverting irrigation water upstream of hydroelectric facilities. Our analysis leads to several key findings:

- A substantial amount of energy is embedded in the water consumed by agricultural users where substantial pumping is required to deliver water.

- When accounting for the energy costs of irrigation along rivers that have hydroelectric dams downstream of major irrigation diversions, policymakers must examine both the energy used to deliver the water to the field and the energy foregone, or not produced, as a result of taking water out of the river before a dam.

- In future droughts, cost-effective water transfers may make it possible to improve conditions for salmon, power generation, and agriculture.

The model used in the Westlands Water District chapter was abbreviated for this case study to focus on the diversion of water for agricultural purposes upstream of hydroelectric facilities. Nonetheless, the Columbia analysis shares the methodology used in the other case studies, and is described in Appendices A and C.

While the Westlands and San Diego case studies focused on the energy embedded in agricultural and urban water use, this case study takes the analysis a step further by examining another important energy implication of water use: energy production that is lost or foregone as a result of water policy decisions. This

opportunity cost must be included in any calculation of how much energy is embedded in water use.

This case study also includes a discussion of the energy required to plant, cultivate, and harvest crops—additional energy use associated with water used by agriculture. By more fully analyzing the energy implications of water used in agriculture, this methodology allows for the more accurate calculation of the potential energy savings of dry-year fallowing agreements. Water marketing arrangements are increasingly common throughout the West. This methodology allows us to demonstrate the potential energy benefits of some of these transfers.

THE COLUMBIA RIVER CONTEXT

The Columbia River travels over 1,200 miles from its headwaters to the Pacific Ocean, draining a watershed of 259,000 square miles and discharging an annual average of 160 million acre-feet (Figure 6). The Columbia and Snake Rivers are, respectively, the

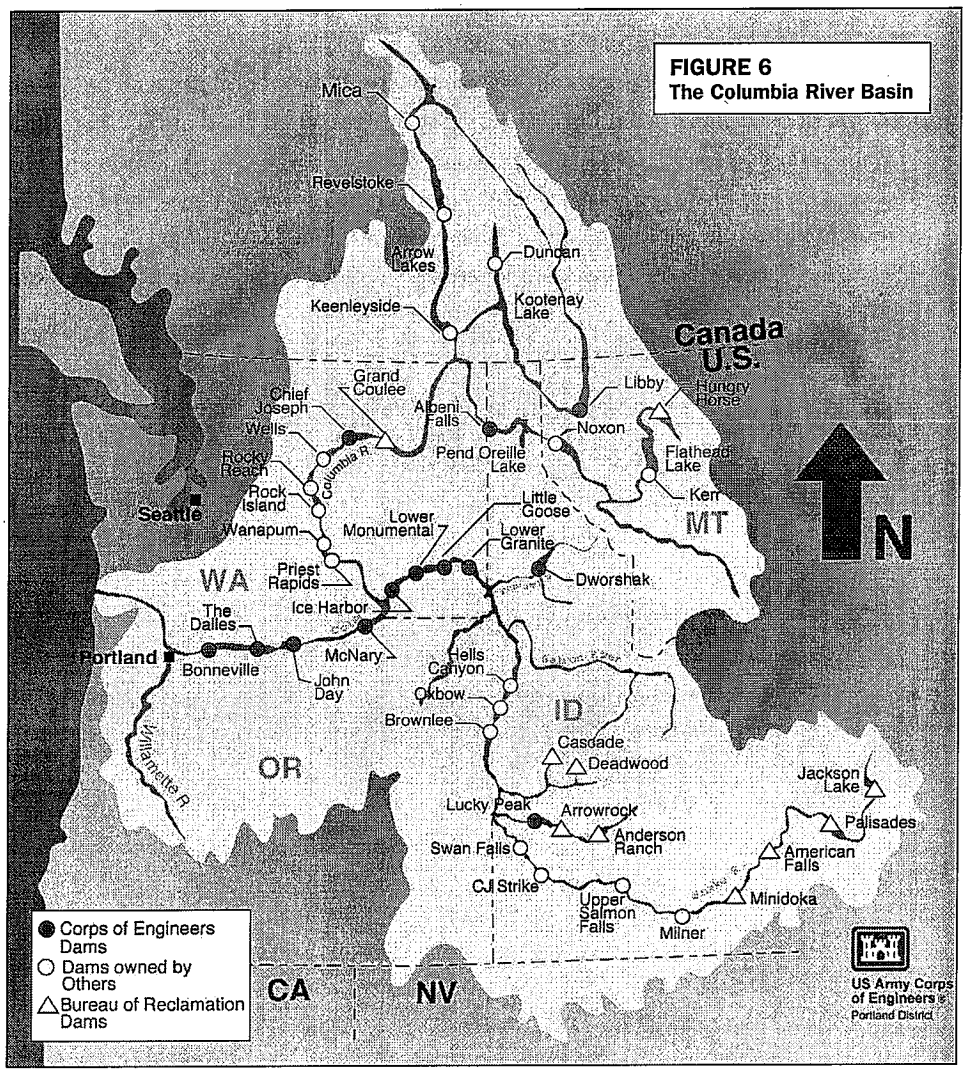


FIGURE 6
The Columbia River Basin

12th and 13th longest rivers in the nation. This river system is an international and interstate resource that provides the basis for the region's charm, history, environment, recreational opportunities, and agricultural and industrial successes.

The Decline of the Columbia River Ecosystem

Human activities have taken a heavy toll on the Columbia River and its fisheries. The Columbia once supported more than 11 million salmon and steelhead annually, but by the 1990s, the river supported only about one million anadromous fish.[103] This remaining population consists of a majority of unsustainable hatchery fish and a very small population of wild spawning fish. Table 17 presents the 12 evolutionarily significant units of anadromous fish now listed under the Endangered Species Act as endangered or threatened in the basin. A variety of causes are responsible for this decline; however, diversions and dams have played a primary role.

Unfortunately, an effective response to restore Columbia fisheries has not yet emerged. Fishery management is particularly complicated due to perceived conflicts among energy, irrigation, and the environment.

Hydropower on the Columbia River

Dams in the Columbia River system represent 95 percent of the region's hydroelectric supply and produce 60 percent of its electricity.[104] The 31 dams owned by the Bureau of Reclamation and the Army Corps of Engineers make up the Federal Columbia River Power System (FCRPS). In 2000, the National Marine Fisheries Service issued a Biological Opinion (BiOp) regarding the impacts of the FCRPS on anadromous fish. The BiOp recommended 199 actions to enable listed fish populations to survive rather than continue to decline.[105]

The actions regarding hydropower call for augmenting flows and spilling water through spillways or bypasses. The 2000 BiOp also recommends specific quantities of water for flow augmentation and spill at the federal hydroelectric dams. If insufficient progress is made toward restoring fisheries, stronger measures, such as breaching four Lower Snake River dams, may need to be pursued.

TABLE 17
ESA Listed Fish of the Columbia Basin

	Endangered	Threatened
Resident Fish	Kootenai River white sturgeon	Bull Trout
Anadromous Fish	Snake River sockeye Upper Columbia River spring Chinook Upper Columbia River steelhead	Snake River spring/summer Chinook Snake River fall Chinook Snake River steelhead Middle Columbia River steelhead Lower Columbia River Chinook Lower Columbia River steelhead Columbia River chum salmon Upper Willamette River Chinook Upper Willamette River steelhead

Source: U.S. Bureau of Reclamation, Finding and Commitments. Implementing December 2000 Biological Opinions for the Federal Columbia River Basin System and Other Related Actions, 2001.

Agriculture in the Columbia Basin

The diversion of millions of acre-feet of water from the Columbia Basin has enabled farmers to grow crops in the arid climate of the interior Northwest. While the economy has diversified in the last 20 years, agriculture remains a major industry. Major crops in the Columbia Basin include potatoes, alfalfa, sugar beets, wheat, and onions. The potential crops in much of this region are limited by the relatively short growing season for high-altitude farmland.

About 6 percent of the Columbia's flows are diverted for agricultural purposes.[106] While this seems like a low number, the National Marine Fisheries Service says that "Water withdrawals for irrigation throughout the Columbia River Basin have an enormous effect on the flow of the Snake and Columbia rivers, especially during dry years when river volumes are low."[107]

THE DROUGHT OF 2001

The drought of 2001 in the Pacific Northwest was one of the worst on record, comparable to the drought of 1977. By the summer of 2001, instream flows were naturally low and were further exacerbated by water diversions. The pumps for some of these diversions consumed significant amounts of energy. Low rainfall affected farms and reduced hydropower generation. Spot market power was prohibitively expensive because of the California electricity crisis. Salmon advocates, irrigators, and generators feared the worst. Decisions made during 2001 imposed major hardships on the environment, particularly salmon. With naturally producing salmon populations already at disastrously low levels, management of the Columbia River pushed many species closer to extinction.

Other load-reduction programs simply purchased the hydropower used to pump irrigation water, leading farmers to substitute diesel generation to run their pumps.

Hydropower Impacts from the Drought

Understandably, Northwest utilities were concerned about avoiding blackouts during the summer of 2001. Bonneville Power Administration (BPA) responded by declaring an emergency situation, thereby avoiding carrying out some of the BiOp actions designed to help salmon recover, including much of the scheduled spill over the dams for fish passage. Utilities also launched several energy load-reduction programs and encouraged conservation.

The two largest agriculture load-reduction programs were run by the Idaho Power Company in Idaho and the BPA in the Columbia Basin Project. Some programs paid farmers not to pump irrigation water, freeing up for other uses the energy typically used for pumping and leaving water in the river for downstream generation. Most of this water was sent through the generating plants rather than spilled. Other non-BPA load-reduction programs simply purchased the hydropower used to pump irrigation water, leading farmers to substitute diesel generation to run their pumps, worsening air pollution and generating no in-river benefits.

The drought response included industrial load-reduction programs as well. One major focus of this effort was the energy intensive aluminum smelting industry. Creative BPA load-reduction programs cut power use during 2001 while ensuring continued compensation for plant workers.[108] The load-reduction programs during

2001 allowed the BPA to continue exporting significant amounts of power to assist California during its power crisis. This demand for energy exports increased the challenges facing those managing the Columbia River system.

Although the drought required major efforts in the energy arena, the overall response to the drought was considered a success for the utilities. No blackouts made the headlines during the drought of 2001 in the Northwest.

Agriculture Impacts of the Drought

In the agricultural community, there was little that could be termed a success. Higher energy prices increased costs. The drought caused yields to fall. Low commodity prices worsened conditions. Because of overproduction, farmers were earning only $1.50 per 100 pounds of potatoes, although it takes $4 to $5 to grow a hundred pounds, leading the United States Farm Services Agency to institute a program to buy potatoes and raise prices.[109]

The irrigation buyback programs offered by utilities provided a lifeline for some of the unfortunate farmers facing low commodity prices and high energy cost. However, despite the financial appeal of the buyback programs, for a variety of reasons, it remained far more difficult to obtain water in the Upper Snake River than in other regions. By way of contrast, the Washington State Department of Ecology spent more than $300,000 to secure in-stream flows from farmers through 21 leases during this same drought.[110]

During 2001, buyback programs helped some farmers to survive during difficult farming conditions. According to one media report, "Some Idaho farmers reported that kilowatt hours were their best crop [in 2001]."[111] Implementing the recommendations discussed in Chapter 6 would allow farmers to use their water rights to provide a cushion against the challenging conditions facing them in the agricultural market.

Environmental Impacts of the Drought

For Columbia Basin fish, things were even bleaker. Already struggling to migrate past numerous dams, anadromous fish faced even lower flows because of the drought. In the Hanford Reach, 1.6 million young Chinook were stranded. In 2001, the drought prevented the agencies from meeting any of the BiOp objectives. Relying on the drought emergency, federal agencies reduced spills over the summer to only 10 percent of BiOp recommendations. The Fish Passage Center and the National Marine Fisheries Service both found that "the lowest survivals and slowest travel times for smolts resulted from the lowest flow and spill that has occurred in recent years."[112] In harsher terms, Save Our Wild Salmon characterized the hydropower operations as a "massacre."[113]

According to the Fish Passage Center, "the suspension of Biological Opinion measures resulted in very poor in-river migration conditions in 2001."[114] For endangered fisheries, 2001 represented another disturbing step toward extinction rather than recovery.

Lessons from the 2001 Drought

Was there any way to meet expected electricity needs without sacrificing the salmon? Some groups believed so. In a letter addressed to Congress on March 19, 2001,

environmental groups, scientists, and Native American tribes proposed that water be obtained from a point higher in the Columbia Basin, so that instream flows could be maintained while hydropower generators met their needs.

Clearly, hydropower generation was given the highest priority for Columbia water resources in 2001. Agricultural, industrial, and fishery interests all suffered, but there were no blackouts in the Northwest that year. Many farmers and industrial interests were compensated for reduced power—and water—use. Fish and fishery interests, including fishermen and Native Americans, however, had no choice and bore major hardships. In short, during 2001, several key factors came together:

- The drought worsened conditions for hydropower production.
- Exacerbated by diversions and power operations, the drought threatened the environment, particularly salmon.
- Spills over hydroelectric dams were inadequate.
- River flows were inadequate.
- Power prices peaked, due to the electricity crisis in California.
- Commodity prices were low.

These factors and the priorities given to the various uses of water in the Columbia River system led to a particularly unfortunate outcome—Idaho farmers lost money and plowed under unwanted, but water intensive, potatoes, while fish and hydropower production suffered from a lack of water. It is important for us to learn from this experience. It may be possible to address all of these problems during dry years by capturing some of the energy opportunity cost embedded in irrigation water in this region.

Idaho farmers lost money and plowed under unwanted, but water intensive, potatoes, while fish and hydropower production suffered from a lack of water.

CASE STUDY RESULTS

The Columbia case study examines energy implications of water use in one large federal project, the Columbia Basin Project (CBP). This project is located near Grand Coulee Dam, upstream of many of the Federal Columbia River Power System hydroelectric generating facilities. To simplify this effort, this analysis focused on the implications of only one crop, potatoes. Potatoes are one of the major crops in the Columbia Basin. Just as salmon are an iconic wildlife species for the Pacific Northwest, potatoes are agriculture's signature crop in parts of the region.

Significant Amounts of Energy Are Embedded in Agricultural Water Use

In the Columbia Basin Project, delivering water requires a significant amount of energy: 340 kWh per acre-foot. Our analysis of embedded energy use is shown as source and conveyance energy in Figure 7. This figure also shows the energy required to plant, cultivate and harvest this crop—385 kWh per acre-foot. Cultivation and harvest energy use, however, comes primarily in the form of diesel fuel consumption. Saving this energy is not, therefore, translatable directly into electricity. Nevertheless, it is also an important energy implication of water use by agriculture.

TABLE 18
Downstream Generation Gain from Reduced Diversion

Site	Net Energy Gain (kWh/af)
Columbia Basin Project	745
Upper Salmon	250
Walla Walla	140
Deschutes	36
Upper Snake	806

Energy Generation Opportunity Costs Must Be Added to Embedded Energy Costs

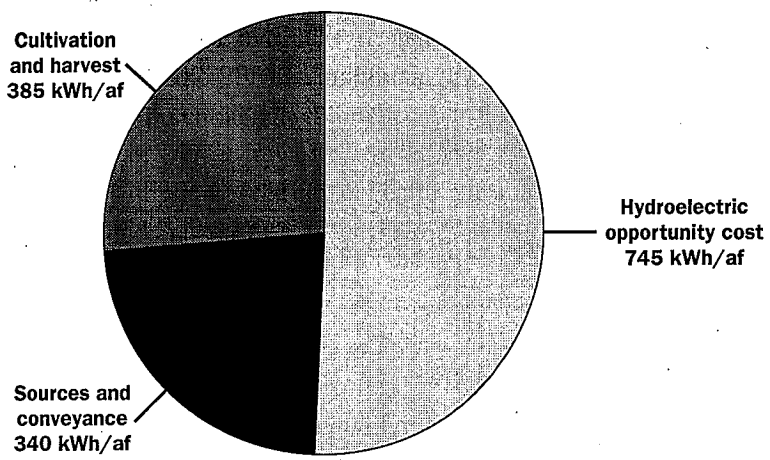
Because diversions from the CBP are upstream of major hydroelectric generation facilities, these diversions reduce the amount of water passing through those downstream facilities. Thus, one result of CBP diversions is a significant reduction in potential energy production. Figure 7 shows that this opportunity cost is 745 kWh/af. This hydroelectric opportunity cost was taken from Table 18, which summarizes the per-acre-foot energy potential of water at five points in the river system. Predictably, the energy opportunity costs in upper watersheds, above major hydroelectric dams, are extremely significant. In the case of the CBP, the energy opportunity cost is actually greater than the energy used to deliver water and to cultivate and harvest crops (725 kWh/af combined). Clearly, in regions like the Columbia River Basin, a full understanding of the energy implications of water use must include energy opportunity costs.

The total electricity implications of water used by the Columbia Basin Project can be estimated by multiplying the total electricity embedded in each acre-foot of water (to pump water from the Columbia River to the users) and potential downstream generation benefits from water released below the CBP (1,085 kWh/af—including both conveyance and downstream hydroelectric generation) times the annual average amount of water diverted by the CBP (2.4 million af/yr).[115] This exercise reveals that the embedded energy and potential generation benefits of the Columbia Basin Project alone amount to more than 2,600 gigawatt-hours per year, or nearly 25 percent of total annual energy consumption of the city of Seattle. An analysis of other diversions in the upper Columbia and Snake River systems would reveal similarly significant energy implications.

Water Transfers Could Benefit All Parties in Future Droughts

By combining embedded energy and opportunity costs, Figure 7 reveals the potential energy benefits of dry-year water transfers involving the Columbia Basin Project in

FIGURE 7
Energy Intensity of Water of Potatoes from Reduced Diversions



the future. Of the 1,470 equivalent kWh/af total energy implications of CBP water use, 1,085 consist of electricity used to pump water plus electricity not produced because water was diverted upstream of hydroelectric facilities.

This analysis demonstrates that if all water diversions to the Columbia Basin Project were to cease and if all of this water were instead run through downstream hydroelectric facilities, the additional energy produced would be more than 2,600 gigawatt-hours per year. We do not mean to suggest that this would be an appropriate reallocation. However, this analysis reveals the significant potential energy benefits that could accrue from realizing some of this potential under some circumstances. The BPA has conducted an analysis looking at different hydrological conditions that has reinforced this conclusion.[116]

During dry years, and especially when power costs are high and agricultural commodity prices are low, the value of this energy potential may be large enough for voluntary fallowing programs to pay farmers more than they could earn growing low-value crops and still have enough money left to purchase environmental flows. Such an arrangement would pay farmers to forego farming on some of their land, leaving more water in the river. Some of the conserved water could be used to generate additional energy, and some used to generate environmental benefits. Such hybrid energy and environmental transfers could improve low-flow conditions in places such as in the Hanford Reach, which suffered the large fish kill discussed previously. They could also help provide the spills from hydroelectric facilities required by the 2000 BiOp. During the disastrous conditions seen in 2001, voluntary fallowing arrangements could also have been beneficial to many farmers who lost money as a result of high production and low crop prices. In short, the opportunity for farmers, ratepayers, and the environment to mutually benefit from dry-year land fallowing in the Columbia Basin is significant.

The embedded energy and potential generation benefits of the Columbia Basin Project alone amount to nearly 25 percent of total annual energy consumption of the city of Seattle.

Experience in other states suggests that the greatest concerns regarding the type of marketing arrangements that this document recommends are likely to emerge from rural agricultural communities. We take these concerns seriously and will explore them further in a forthcoming report.

CONCLUSION

There are a few things upon which everyone associated with the management of the Columbia River would agree. The region will face droughts in the future. In fact, by reducing snowpacks, global warming may increase the frequency and severity of drought conditions in the future. These droughts will reduce the reliability of energy supplies that are essential to the region's economic vitality. Salmon populations are already at dangerously low levels and could be seriously imperiled in future droughts. And farmers in much of the basin are struggling to survive due to low crop prices and high costs. Any strategy that offers the potential to provide benefits in each of these interconnected areas deserves thoughtful evaluation. Voluntary dry-year marketing arrangements offer the potential to improve conditions for salmon, increase energy production, and provide badly needed income for farmers. The

Some of the conserved water could be used to generate additional energy, and some used to generate environmental benefits.

potential impacts of such arrangements on local communities should be carefully evaluated. However, if designed properly, such arrangements could significantly strengthen the region's economy and protect many thousands of jobs from potentially disruptive energy shortages.

On the Columbia River and on other river systems, a better understanding of the energy implications of water use can help managers design strategies in the future that will better meet the needs of our economy and environment. In these cases, the careful, regulated use of market principles offers the potential to produce broad benefits reflecting modern environmental values.

CHAPTER 6

RECOMMENDATIONS FOR WATER POLICY

The case studies in this report support water policy conclusions that are widely applicable in the western United States. Overall, our analysis indicates that energy implications of water policy decisions are large and warrant inclusion in water and energy policy decisions. All three case studies demonstrate that inclusion of energy considerations can improve resource management decisions and avoid potentially significant unintended energy consequences.

ENERGY IN URBAN WATER USE

The most striking conclusion is that the amount of energy required for end uses of water is the largest component of energy use in the urban water supply cycle. Therefore, urban conservation, particularly for energy intensive uses such as clothes washers and commercial cooling towers, is important regardless of the source of the water or location of its use. San Francisco, as well as Los Angeles, should be aggressively pursuing water conservation.

This finding implies that policy actions that affect water use may have much larger energy implications than policy actions that affect the mix of physical water sources. This is true in San Diego, at the most energy intensive "ends" of the State Water Project and Colorado River Aqueduct, but it is even more valid in other locales.

However, our analysis also reiterates that conveying water can be highly energy intensive. Since conservation saves all of the "upstream" energy inputs as well as end use inputs, conservation in areas with energy intensive water supplies will save substantially more energy than conservation in other areas.

Another conclusion from the urban case study—as well as the agricultural analysis—is that water reuse is far less energy intensive than any physical source of water other than local surface water. The San Diego case study explicitly supports this point, and tailwater recovery uses far less energy than urban water recycling since it usually requires no more than lifting tailwater from low points to high points on each farm. Even groundwater pumping is more energy intensive in San Diego and the Westlands Water District than water recycling from urban wastewater; and the depth to groundwater in these locations is not atypical for western settings.

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ENERGY IN AGRICULTURAL WATER USE

In agricultural settings, energy use varies widely and it is not possible to generalize about which stage of water use dominates. Source and conveyance and end use of water appear to demand the largest portions of energy in water use, but their respective energy use will vary by water source, district location, topography, and irrigation technology, among other factors.

The energy impacts of agricultural water policy decisions may also extend beyond the energy embedded in water use. For example, in some cases, water policy decisions may affect the amount of energy used for harvest and cultivation, which can be quite large. The Westlands Water District case study shows that the energy implications of land fallowing are complicated and worthy of further study, not just in Westlands but in other settings where fallowing (permanent, dry-year, or rotational) is being considered.

Our analysis indicates that the energy impacts of fallowing farmland depend largely on where the water formerly used to irrigate that land is sent instead. From an energy perspective, a combination of conservation and water recycling may be the best path for meeting growing urban needs, while water freed up in agriculture due to efficiency improvements and fallowing might be the best source to satisfy environmental flow needs.

From an energy perspective, a combination of conservation and water recycling may be the best path for meeting growing urban water needs.

Finally, the Columbia case study demonstrates that foregone hydroelectric production (energy opportunity cost) can be very significant when irrigation water is diverted above power production facilities. For example, the foregone energy production in the Columbia Basin Project is the equivalent of 25 percent of the total energy use for the city of Seattle. In some cases, particularly during times of high energy prices, it may be possible to purchase water from farmers for environmental flows and finance those purchases through the additional hydropower revenues. Our analysis strongly suggests that environmental flows and quality can be enhanced in the Columbia Basin without permanent land retirement or reduction in power production, at least in some dry years.

IMPLICATIONS OF THE CASE STUDIES

The analysis in this report supports two primary recommendations:

Decision makers should better integrate energy issues into water policy decision making. The background information in Chapters 1 and 2 and the case studies in Chapters 3, 4, and 5 demonstrate that looking at energy use and water use simultaneously generates valuable insights that do not arise from separate policy analyses of water and energy issues. The specific policy and planning recommendations that flow from this primary recommendation are presented below. Many of these recommendations are potentially relevant—with appropriate modification to account for differences in the policy context—outside California and the Columbia Basin.

Water conservation should be given higher priority by policy planners in both water and energy sectors. Although many planners in the water sector support conservation,

conservation program implementation has been slow. We conclude that conservation has much stronger economic and environmental benefits than has been recognized to date. Given this strong finding, a policy agenda for promoting water conservation is presented below.

RECOMMENDATIONS FOR WATER RESOURCE PLANNING

Water resource planning must incorporate energy considerations. Given the close relationship between water use and energy use, water and energy policies should be managed comprehensively. State energy and environmental policies must provide consistent encouragement for cities and agriculture to invest in cost-effective energy and water demand-side strategies.

Federal Level

► **Perform Energy Intensity Analysis.** The Bureau of Reclamation should perform an energy intensity analysis of its distribution system and identify regions and districts where large amounts of power are required to deliver water. State agencies and the Bureau of Reclamation should fully implement water-use efficiency programs in those regions and should include calculation of energy benefits in determining the cost-effectiveness of water conservation measures in those areas.

► **Produce a Power Balance.** The Bureau of Reclamation and the Power Marketing Authorities should produce a power balance that reconciles power generation and purchases with power consumption. There are many discrepancies between the Power Marketing Authorities and the Bureau of Reclamation data sources, which make it difficult to construct a full picture of energy generation and use. For example, given the available data, it's not possible to balance total energy resources (generation and purchases) with energy disposition (sales, consumption, and transmission losses.)

► **Change Energy Use Reporting Requirements.** The Department of Energy should ask manufacturers to report energy information on water heating, recirculation, pressurization, and other functions in separate categories rather than embedding that use in broader categories.

► **Include Energy in NEPA Evaluations.** The National Environmental Policy Act analyses for water supply issues should take particular care to address energy and related air quality impacts.

State Level

► **Revise the Urban Water Management Planning Act.** The legislature should revise the Urban Water Management Planning Act to require water suppliers to consider the energy implications of their water management options, and to factor in related energy costs and benefits when considering water conservation measures or water supply projects.

The legislature should revise the Urban Water Management Planning Act to require water suppliers to consider the energy implications of their water management options.

► **Include Energy Intensity in Bulletin 160.** The Department of Water Resources should include a regional energy intensity analysis in Bulletin 160 and should identify ways to reduce the energy intensity of water use on a regional basis.

► **Integrate Energy Costs into Economic Analysis of Water Management Alternatives.** CALFED should modify this analysis to include energy costs and benefits from the various CALFED alternatives and to evaluate the economic cost of various alternatives under a variety of energy price scenarios. CALFED should carefully evaluate claims that new water storage facilities will increase net energy production.

► **Coordinate Among Resource Management Agencies.** The Department of Water Resources should consult with the California Energy Commission and the Public Utilities Commission on the potential energy impacts of proposed water policies. For example, the Department of Water Resources should work with the California Energy Commission to evaluate how the proposed increase in delta pumping capacity would affect total energy consumption as well as load shape.

Regional/Local Level

► **Modify the MOU.** The California Urban Water Conservation Council should modify the MOU to require coordination with energy utilities and include energy costs and benefits in the cost-effectiveness methodology.

► **Investigate Energy Implications of Dry-Year Strategies.** The Metropolitan Water District of Southern California, the Department of Water Resources, and the California Energy Commission should investigate the different energy implications of dry-year strategies for Southern California, taking into consideration the premium value of energy during dry years and focusing on regional self-reliance.

► **Include Energy in Integrated Resource Planning.** Water agencies should include energy in their integrated resources plans. These plans should quantify the energy benefits of conservation and water recycling projects.

► **Reduce Energy and Environmental Impacts of Desalination.** Desalination proponents should minimize the energy and environmental impacts of desalination by: 1) looking for opportunities to use this technology on brackish and contaminated groundwater, 2) exploring desalination for use as peak or drought supply rather than base supply, and 3) seeking opportunities to reduce freshwater diversions.

Land Fallowing and Water Transfers in California, the Columbia Basin, and Beyond

Land fallowing and water transfer policies under consideration in California and throughout the West should specifically address the following points:

► **Include Energy in Environmental Analyses.** Environmental analyses for water transfer proposals should explicitly review the energy and subsequent air quality implications of the transfer proposal. The environmental impact report for the Imperial Irrigation District–San Diego transfer did not evaluate these impacts.

► **Plan for Energy Costs in Environmental Water Purchases.** Purchasers for CALFED's environmental water account should include in their purchase plans the conveyance energy benefits of purchasing account water from sources south of the delta. The retirement of drainage-impaired land in the Westlands Water District presents an opportunity to save energy and provide water for environmental restoration.

► **Build a Consensus for Dry-Year Contingency Plans on the Columbia River.** The Bureau of Reclamation should initiate a discussion with the Power Marketing Authorities, salmon advocates, regulatory agencies, and farmers in the Northwest regarding the development of a mutually beneficial dry-year contingency plan, designed to provide benefits for agriculture, energy, and the environment along the lines of the scenario presented in Chapter 5.

► **Focus on Rivers with Diversions Upstream of Hydropower Plants.** Policy makers around the West should investigate the potential for dry-year partnerships on river systems where there are large water diversions upstream of hydropower facilities and degraded rivers.

RECOMMENDATIONS FOR ADVANCING WATER CONSERVATION

Our analysis shows that the most effective way to reduce energy related to water use is to consume less water. In addition to reducing the energy required for end use, conservation eliminates all of the upstream energy required to bring the water to the point of use, as well as all of the downstream energy that would otherwise be consumed to treat and dispose of this water. In many cases, conservation provides the most cost-effective water supply option, particularly once energy costs are included. The federal, state, and local governments, as well as water and energy utilities, should prioritize conservation. To increase conservation, decision makers should:

In many cases, conservation provides the most cost-effective water supply option, particularly once energy costs are included.

Conservation Funding

► **Prioritize Conservation Funding.** State, federal, and local budget problems will limit the availability of public funding for many programs. Nonetheless, investment in conservation may forestall or avoid larger public investments for drinking water, clean water infrastructure, or power generation facilities, and it will help stretch available funds.

Conservation Requirements

► **Implement Existing Requirements.** The Bureau of Reclamation should implement the water conservation planning requirements of the Central Valley Project Improvement Act and Reclamation Reform Act.

► **Ensure Compliance with the MOU.** The Department of Water Resources should require anyone receiving water from the State Water Project, directly or indirectly, to fully implement the terms of the Memorandum of Understanding Concerning Urban Water Conservation in California.

Water Measurement and Pricing

▶ **Enact Universal Measurement Legislation.** All water use in the state, including surface and groundwater, should be measured, and water users should be charged for each unit of water they use. This is a precondition for efficient water use. The CALFED Authority should meet its commitment to develop legislation requiring appropriate measurement of water use for all water users in California.[117] This legislation should require:

▷ Measurement and volumetric billing of all urban and agricultural water use;

▷ Dedicated meters for large landscapes;

▷ Submetering of multi-family housing.

▶ **Conduct Groundwater Monitoring.** The CALFED Authority should develop and the legislature should adopt groundwater monitoring legislation to improve management of this unregulated resource.[118]

The CALFED Bay-Delta Authority should require full implementation of conservation measures, including water measurement and volumetric pricing, as a prerequisite for receiving any program benefits.

▶ **Eliminate Subsidies.** The federal government should phase out irrigation, energy, and crop subsidies, which encourage wasteful use of water and energy, as well as cultivation of low-value crops and cultivation of marginal lands where irrigation contributes to water quality problems.

▶ **Establish Wastewater Volumetric Pricing.** The legislature should pass legislation requiring wastewater agencies to bill their customers volumetrically. Flat rates for wastewater fail to deliver a price signal to customers to reduce their indoor water use. Volumetric billing of wastewater is already endorsed by Best Management Practice 11 in the Urban MOU. This measure has strong precedent in other states: in Texas and Florida, more than 97 percent of sewer rates are volumetric and in Arizona 68 percent are volumetric. In California, only 13 percent of the state's wastewater treatment providers bill by volume.

▶ **Require Dedicated Meters for Large Landscapes.** The legislature should pass AB 2298 (Plescia), requiring dedicated meters to measure landscape water use. This complements Best Management Practice #5 in the Urban MOU, and would provide a valuable conservation tool for water agencies and landscape managers.

▶ **Establish Rates for Outdoor Water Use.** Water agencies should establish seasonal or tiered water rates to target outdoor water use. The Urban MOU has not yet successfully addressed outdoor water use. Rate structures are an effective tool for targeting outdoor water use.

Conservation Incentives

▶ **Tie CALFED Benefits to Conservation.** The CALFED Bay-Delta Authority should require full implementation of conservation measures, including water measurement and volumetric pricing, as a prerequisite for receiving any program benefits.

▶ **Broaden Energy Conservation Programs.** Energy utilities should broaden their water conservation efforts to include all water use, not just the conservation of heated water.

► **Pursue Conservation above the MOU.** The CALFED Bay-Delta Authority and its member agencies should develop programs targeted at obtaining water conservation savings beyond the levels specified in the MOU. The MOU does not require implementation of all cost-effective conservation. Indeed, while much of the focus in CALFED and elsewhere tends to be on implementation of the best management practices, there remain significant cost-effective conservation savings beyond those practices.

► **Link Loans to Conservation Achievements.** The State Board and Department of Health Services should tie clean-water and drinking-water revolving-fund loans to conservation achievements. The state operates two federally authorized revolving funds that provide loans to local agencies for certain drinking water and wastewater infrastructure investments. California's total estimated needs for these expenditures is approximately $30 billion. A large percentage of these needs are flow-related and could be delayed or reduced if projected flows or volumes were reduced through conservation. As a condition to granting revolving-fund support, the State Board and Department of Health Services should require applicants to demonstrate that all projects for which funding is being sought have been sized and timed to account for full implementation of conservation programs.

Conservation Assurances

► **Adopt Best-Management-Practice Certification.** The CALFED Authority should adopt a best-management-practice certification process for urban conservation with consequences for noncompliance.[119]

► **Establish Agricultural Water-Use Efficiency Objectives.** The Department of Water Resources should finalize the remaining quantitative objectives for agricultural water use efficiency and an assurances package that includes consequences for failing to meet those objectives. The Department of Water Resources should conduct the overdue evaluation of progress toward meeting the quantitative objectives.

► **Verify Water Savings.** The Department of Water Resources must include a monitoring component in all water conservation grants to verify conservation savings and track disposition of conserved water. Expediting distribution of funds should not take precedence over good science.

► **Revise the Cost-Benefit Analysis.** The Department of Water Resources should revise the cost-benefit methodology required as part of the water-use efficiency grant process to require inclusion of energy costs and benefits.

► **Pass a Retrofit-Upon-Resale Law.** The state legislature should adopt a retrofit-upon-resale law requiring replacement of inefficient toilets with ultra low-flow toilets upon sale of a home. Such ordinances are in effect in Los Angeles, Santa Monica, San Diego, and other cities. The Urban MOU requires signatories to adopt programs that are at least as effective as a retrofit-upon-resale ordinance, but to date, few programs have achieved that level of implementation. The California real estate

market remains incredibly strong, and a retrofit-upon-resale requirement would have little impact on this market.

► **Improve the Model Landscape Ordinance.** The existing model landscape ordinance, developed in response to AB 325, is deficient in several respects. The California legislature should pass legislation to revise and improve the model ordinance.

AREAS FOR ADDITIONAL RESEARCH

Our research highlighted several areas where additional data could improve energy intensity analysis and facilitate the integration of energy considerations in water policy. Some of these are listed below:

► **Investigate Evaporative and Conveyance Losses.** The California State Water Project, the Central Valley Project, and water districts, agencies, and companies should conduct analyses of evaporative and conveyance losses throughout their systems, not just in large canals, aqueducts, and distribution piping.

► **Go Beyond Appliances.** The Department of Energy or another party should analyze energy use integral to end use of water beyond domestic fixtures and appliances.

► **Fund Research in Water Use Efficiency.** The Department of Water Resources should fund research to address remaining areas of uncertainty in water use efficiency, including the relationship between evaporation and transpiration and the potential for reducing irrecoverable losses through reductions in evaporation.

► **Study the Link Between Water Policy and Emissions.** The Department of Water Resources or another party should extend the models presented in this report to estimate changes in air emissions resulting from water policy decisions. Demonstrating the linkage all the way through to air quality would greatly strengthen the policy recommendation that water management decisions should account for the energy dimension.

► **Examine the Climate Change Implications for Water Policy.** The Department of Water Resources and the California Energy Commission should evaluate the climate change implications of water policy.

URBAN MODEL DESCRIPTION

We have modified and expanded the methodology of Wilkinson into a user-friendly spreadsheet to determine the energy embedded in water use from source to disposal.[120] Filling out the spreadsheets completely would require full information about actual and potential water and water-related energy use in San Diego County. Full information is never available in practice, but the information gaps that will exist are not known in advance, so this type of spreadsheet is the best analytical starting point. Note that the spreadsheets include water sources that are being considered for San Diego but are not actual (e.g., seawater desalination, transfer from the Imperial Irrigation District, and water bags towed by sea from Northern California).

The eight Excel spreadsheets we used are organized in three layers (see Figure A-1):

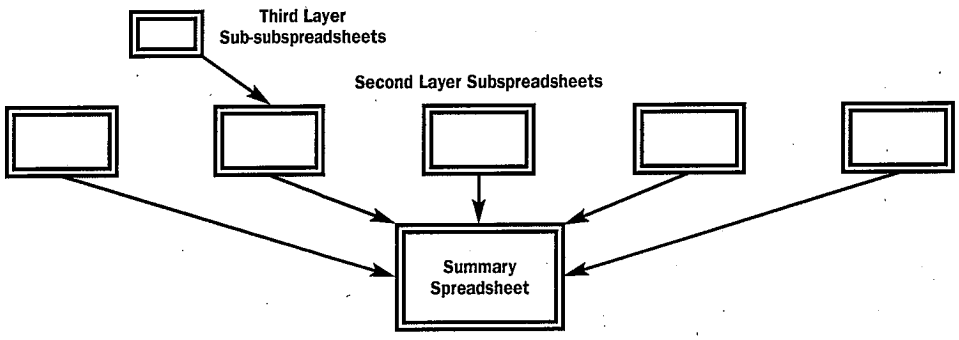
1. One summary spreadsheet.

2. Five subspreadsheets, one each for sources, water treatment, water distribution, end use, and wastewater treatment. Water recycling projects are considered to be sources of water. Their energy use consists of the energy required to upgrade water from discharge-suitable quality into reuse-suitable quality.

3. Two sub-subspreadsheets, one each for groundwater sources and water recycling sources.

Copies of the spreadsheets are available from Pacific Institute.

FIGURE A-1
Diagram of the Flow Between Spreadsheets



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The summary spreadsheet does not allow for data input, while the other seven spreadsheets require data input. All eight spreadsheets perform calculations. The five steps in the water-supply-use-disposal chain fix the number of spreadsheets in the second layer. The number of the third-layer spreadsheets depends on the circumstances. Each third-layer spreadsheet allows the user to assemble disaggregated data about one aggregate item in a second-layer spreadsheet. For example, the groundwater spreadsheet contains data on various groundwater sources that are aggregated into a single column in the sources and conveyance spreadsheet.

SUMMARY SHEET (TOP LAYER)

The summary spreadsheet does not allow inputs, and incorporates data directly from the penultimate spreadsheets (and indirectly from the subpenultimate spreadsheets). Here, the user can gain an overview of the energy embedded in water use as a function of the five principal energy components of urban water cycles. The effect of new water sources or conservation measures on energy use can be analyzed in the summary spreadsheet through changes in the data inputs of the other spreadsheets.

Row 5 summarizes the volume of water that enters each of the five principal energy components. Decreases in volume that occur between the first (sources and conveyance) and last (wastewater collection and treatment) of these components reflects water loss (both consumptive and nonconsumptive) that occurs during the water cycle. Row 6 summarizes the average annual energy use for each of the five steps in the supply-use-disposal chain, with total energy use summed across the five components presented in column K. Because these are total energy use figures for each component, their sum is an accurate number—it reflects total energy use in the chain based on the mix of supplies, the level of conservation, and so forth, input to the other spreadsheets.

Row 7 calculates the energy factor, a ratio of energy consumed (kWh/yr) to water consumed for end uses (af/yr), thus normalizing energy consumption per unit across the five principal energy components. The total of the energy factors for row 7 is in column K. Row 8 reports the energy factors as percentages and contains the data used to create "The Percent Energy Use in the Five Components of Urban Water Systems" graph. This graph visually depicts the percentage energy use by the urban water system component and helps to show where energy is being consumed under the assumptions that have been input. Although the first summary spreadsheet that a user of the model creates should reflect actual conditions, one can examine counterfactual scenarios by changing the inputs in the penultimate and subpenultimate spreadsheets.

SUBSPREADSHEETS (SECOND LAYER)

We have organized this layer of spreadsheets according to the five steps described previously: 1) sources and conveyances, 2) water treatment, 3) distribution, 4) end use, and 5) wastewater collection and treatment. Each subspreadsheet has a similar

format and requires three types of data: 1) average annual volume (in af/yr) of water "in," 2) average annual energy use (in kWh/yr), and 3) percentage of water loss. Several spreadsheets require additional data and are noted as such in the following descriptions.

Sources and Conveyances

This category represents the energy required for the extraction of raw water from its source and the conveyance of water to the site of treatment, either via pumping or water transport (e.g. water bags). For example, it requires more than 3,200 kWh/yr of energy to pump water from intakes in the delta through the State Water Project to San Diego (row 8, column C). For water recycling and desalination, this category includes the energy required to extract usable water from wastewater, brackish water, or salt water. San Diego potentially obtains water from the seven sources and conveyances listed as columns in this spreadsheet.

For each source and conveyance, the following inputs are required and calculations are performed. The average annual water supplied (in acre-feet) from each source and conveyance is input and is summed across to obtain a total average annual water supply (row 5, column K). Using the data from row 5, row 6 calculates the percentage of water supplied by each source and conveyance. The cells in row 6 are locked, meaning the user cannot change the percentage of water supplied by each source and conveyance. Users may investigate how changing the water supply and conveyance portfolio (i.e. percentage of water supplied by each source and conveyance) affects energy use by changing the water supply data in row 5. Users may also change the total average annual water supply (but keep the water supply and conveyance portfolio constant) to investigate how absolute rather than relative changes affect energy use.

The percentage of water loss that occurs after removal from a source and/or during conveyance may be input into row 7. This is useful information if available, but is not necessary for the calculations leading to the summary spreadsheet. If water "in" is input for all cells in all the spreadsheets, percent loss is the difference between water "in" to one step of the chain and water "in" to the next step of the chain. The input for percentage of water loss here provides an alternative method for estimating the amount of water into the next step in the chain if the user is unable to obtain "in" data for the next step (in this case, water treatment).

The average annual energy use (in kilowatt-hours) required for each source and conveyance is input in row 8 and is summed across sources and conveyances to obtain total average annual energy use (row 8, column K). Row 9 allows for the user to enter comments regarding the quality of the water supply should there be any unusual aspects of a water source and conveyance. The quality of raw water will often affect energy used to treat it, with more than average energy used if raw water is brackish and less than average energy used if raw water is from a desalting facility or very high-quality natural source.

The groundwater sources and water reuse columns are calculated from sub-penultimate spreadsheets described below. These subspreadsheets keep the sources

and conveyance spreadsheet manageable. We recommend using a subspreadsheet when more than two facilities exist for a column in a penultimate spreadsheet.

Water Treatment

This category represents the energy required for the processes that occur within a water treatment facility to obtain treated water that meets potable water health standards. Often, filtration or flocculation and sedimentation, followed by disinfection, are adequate. There are 10 water treatment facilities that process water treated in San Diego County. In addition, the Metropolitan Water District delivers treated water from the Skinner treatment plant in Riverside County. For simplicity, the model structure assumes that the location of the treatment facility (e.g., in the county or out of the county) does not affect the energy used to convey and distribute water to customers.[121]

The inputs required and calculations performed for the water treatment spreadsheet are the same as those for the sources and conveyances spreadsheet. As in the sources and conveyances spreadsheet, the user can enter information regarding water quality, highlighting the variation in energy factors across plants.

Distribution

This category represents the energy required for any pressurization or pumping that occurs as treated water leaves the water treatment facility and for the transport of treated water through the distribution blocks. There are many distribution zones within San Diego County. Note that the spreadsheet is constructed as if each distribution zone conveys water from one or more treatment plants to end users. If water were to pass through two distribution zones between treatment plant and end users, the spreadsheet would need to be modified to account for energy use "in series" rather than "in parallel."

The distribution spreadsheet does not allow for the user to enter notes regarding water quality. The assumption is that all water is of the same quality (i.e., treated to potable standards). Otherwise, the inputs required and calculations performed are the same as those for the sources and conveyances spreadsheet.

End Use

This category represents the energy required for all end uses; i.e., those that are measured via metered water consumption. Urban water users are primarily those in the municipal and industrial sector. For the general spreadsheet, we divide water use into the two large categories typical of urban water supply planning: 1) residential and 2) commercial, industrial, and institutional (CII). We further subdivide residential use into categories that apply throughout the western United States: clothes washers; dishwashers; showers, tubs, and faucets; toilets; turf landscape; and non-turf landscape. We do not subdivide CII uses at this time.

The inputs required and calculations performed for the end use spreadsheet are the same as those for the sources and conveyances spreadsheet, with the exception that average annual energy use includes kilowatt-hours actually used plus thermal energy converted to kilowatt-hours at a heat rate of 10,239 British thermal units

per kilowatt-hour. This conversion represents the electrical energy that could be produced at average thermal power plant efficiency if thermal energy were in fact converted to electricity prior to use. This is necessary to report total energy intensity numbers (equivalent kilowatt-hours), but should not be misinterpreted as actual kilowatt-hours used in any category.

Energy use during end use is in addition to the energy used to pressurize water in distribution systems. Some end uses do not use additional energy. For example, flush toilets with gravity sewers do not use additional energy, so the cell for energy use by toilets contains a zero value. Similarly, irrigation systems that operate solely from distribution pressure do not use additional energy unless they have electrically operated valves or control systems. In contrast, any use of hot water involves additional energy, as do appliances that include motors, pumps, automatic valves, timers, and so forth (e.g., clothes washers or recirculating pumps at car washes).

In this sense, end use energy is no different than source and conveyance, treatment, distribution, and disposal energy. It is one of five parts of a chain of energy uses that must be added to obtain total energy use associated with each acre-foot of water used by customers.

However, end use represents a unique step among the five parts of the supply-use-disposal chain. It is the only step where conservation saves energy in the other four steps. Reducing water losses in conveyance will reduce the amount of energy associated with each acre-foot delivered. But it will not reduce total energy consumed in other steps if water delivered to customers is held constant. Reductions in distribution losses (the biggest part of "unaccounted-for water") are similar. But reductions in water consumption will affect total energy use in all five parts of the chain, even though it may not reduce the amount of energy associated with each acre-foot of use.

Stated another way, total energy use depends on the average energy factor of a system (average kWh/af delivered to customers) and the total water consumption of the system (acre-feet). Conservation doesn't necessarily affect the average energy factor, although it may, but it will always affect total energy use. Many water conservation technologies also reduce energy use, so conservation will often save energy in total and pull down the average energy factor of the system. However, some water conservation measures use more energy than pre-conservation practices, driving up the average energy factor of the system. But even if the average energy factor is driven up because energy is being substituted for water, speaking in the jargon of economics, total energy use can still decline because the increased energy in end use may be smaller than the energy savings from reducing the customer's need for water.

The linked spreadsheets account for these possibilities. First, one inputs average energy use associated with water use in each category (e.g., CII) or subcategory (e.g., clothes washers). Then, when considering implementation of water conservation measures, one both reduces total end use of water by the amount of conservation and adjusts the energy use in each end use category and subcategory to reflect energy use after implementation of that amount of conservation. The adjusted energy use inputs may be higher or lower than before conservation. If lower, the

average system energy factor and total system energy consumption will decline. If higher, the average system energy factor will increase but total system energy consumption may increase or decrease.

Wastewater Collection and Treatment

This category represents the energy required for the transport of wastewater to the wastewater treatment facility—lift requirements are significant in many places and all wastewater treatment processes, which usually consist of a series of physical processes (e.g., pumping, screening, and filtration), chemical processes (e.g., chlorine addition), and biological processes (e.g., microbial removal of contaminants) to prepare wastewater and waste solids for release back into the environment. San Diego County has 14 wastewater treatment facilities.

The wastewater collection and treatment spreadsheet is similar to the other spreadsheets with respect to data input and calculations; any unusual wastewater treatment requirements can be noted in the bottom row.

SUB-SUBSPREADSHEETS (THIRD LAYER)

The sub-subspreadsheets perform calculations, the results of which feed into the subspreadsheets. Thus, the subspreadsheets remain streamlined with a consistent format while background calculations are conducted in the sub-subspreadsheets. Based on our evaluation of San Diego County, we believe that two spreadsheets in the third layer are adequate to model any water system. Another spreadsheet for local reservoirs might be necessary if energy use or production from those reservoirs were significant. In San Diego County, however, energy used to charge the reservoirs with imported water is included in the import columns of the source and conveyance spreadsheet, and energy production from the reservoirs is reported to be very small. This is typical for relatively small terminal reservoirs in a system that depends heavily on imported water.

Groundwater Sources

The objective of this spreadsheet is to determine the average annual volume of water that comes from each of the groundwater sources (row 5) and the average annual energy use associated with each groundwater source (row 7). Energy requirements are due primarily to pumping and conveyance of groundwater. Groundwater pumps are either electric or gas; if they use gas, energy use in therms is converted into kilowatt-hours (row 6). Row 8 allows the user to input information regarding the quality (e.g. brackish water, seawater) of the groundwater source if it is unusual. The weighted averages from the groundwater sources spreadsheet are linked to the groundwater column in the sources and conveyances spreadsheet.

Water Reuse Projects

The objective of this spreadsheet is to determine the average annual volume of water (row 5) that comes from each of the water recycling projects and the average annual

energy use associated with water recycling (row 7). Energy requirements are due primarily to pumping and conveying recycled water. Row 8 allows the user to input data regarding the water quality associated with each water reuse project. The results from the water reuse projects spreadsheet are linked to the water reuse column in the sources and conveyances spreadsheet.

San Diego has 24 water reuse projects; the water from these projects is primarily used for agriculture, landscaping, and irrigation purposes. Note that this is the energy used to upgrade water from a quality level adequate for legal discharge to the quality level required for reuse. Energy used to treat wastewater to discharge quality is included in the wastewater collection and treatment subspreadsheet.

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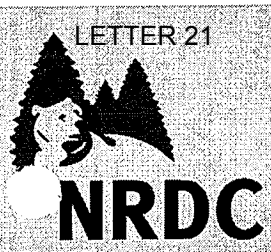

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APPENDIX B

SAN DIEGO CASE STUDY DATA SOURCES AND ASSUMPTIONS

▸ The State Water Project (SWP) pumping energy is from Wilkinson.[122] Flow from Devil's Canyon to the San Diego County Water Authority (SDCWA) is assumed to be by gravity via Lake Perris, the Diamond Valley Lake, or Lake Skinner. Energy intensity is assumed to be for water delivered to Devil's Canyon. That is, water losses in the SWP are already accounted for in this energy intensity figure.

▸ The Colorado River Aqueduct (CRA) pumping energy is from Wilkinson.[123] Flow to the SDCWA is assumed to be by gravity via Lake Mathews, the Diamond Valley Lake, or Lake Skinner. Energy intensity is assumed to be for water delivered to Lake Mathews, or equivalent.[124] That is, water losses in the CRA are already accounted for in this energy intensity figure.

▸ Water-bag towing expenditures are for diesel fuel energy from Spragg for a 400-mile round-trip from the Mad River to Monterey, adjusted for a 900-mile round-trip from the Mad River to San Diego.[125] Energy expenditures were converted to kilowatt-hours equivalent using $1.50 per gallon, 150,000 BTU per gallon, and 10,239 BTU required to produce each kilowatt-hour.

▸ Hydroelectricity is not produced in the Colorado River between the intake of the CRA and the intake of the All American Canal.[126]

▸ Hydroelectric power not produced in the All American Canal if water were transferred to San Diego is based on an average of 2.85 million af/yr of flow in the canal and an average of 3 million kWh/yr of hydroelectricity produced from that flow.[127] Adjusting for an assumed 5 percent loss of water in the CRA, these figures yield 110 kWh lost per acre-foot delivered to San Diego County.

▸ Energy use per acre-foot for the SDCWA Seawater Desalination Facility at Encina is from SDCWA staff.[128]

▸ Raw water lift to treatment plants is from SDCWA. Staff provided data for the Levy and Perdue water treatment plants.[129] It is assumed to be representative of other plants in the county and the Skinner treatment plant operated by the Western Municipal Water District in Riverside County.

► Groundwater lift data are from SDCWA. Staff provided data for the Yuima Municipal Water District and the Sweetwater Authority.[130]

► Energy use in water recycling is from SDCWA. Staff provided data for supplemental treatment at San Elijo and Santee Basin and brackish groundwater treatment at Reynolds.[131]

► Energy use in water treatment is from SDCWA. Staff provided data for Vista (Escondido), Levy, and Perdue water treatment plants.[132]

► Water loss in water treatment was assumed to be 5 percent based on calculations at the Perdue (Sweetwater) treatment plant.[133]

► Energy use in water distribution is from the Helix Water District's distribution system from the Levy treatment plant and the North City recycled water system.[134] Note that about half the distribution system flow from Levy is pressurized by gravity, so pump pressurization requirements are higher per acre-feet than the figures used. Our analysis uses the weighted average figure because, according to SDCWA staff, significant portions of the distribution system in San Diego County are pressurized by gravity.[135]

► Distribution loss (unaccounted-for water) is assumed to be 7 percent based on one estimate of the sum of losses in regional distribution and local distribution provided by SDCWA staff.[136]

► Water use in the SDCWA service area in 2010 is projected to be 32 percent CII (commercial, industrial, and institutional uses); 58 percent residential (41 percent single-family, 17 percent multi-family); and 10 percent agricultural, according to SDCWA staff.[137] Our analysis assumed these figures are also roughly representative of current use.

► Residential water use is assumed to be 60 percent indoor, 40 percent outdoor.[138]

► Indoor use is further disaggregated according to the Awwa Research Foundation: toilets, 26.1 percent; clothes washers, 22.7 percent; showers, 17.8 percent; faucets, 15.4 percent; leaks, 12.7 percent; baths, 1.8 percent; dishwashers, 1.4 percent; other, 2.1 percent.

► CII use was disaggregated as in Gleick et al: 38 percent landscaping, 6 percent kitchen (composed of 24 percent dishwashers, 14 percent pre-rinse nozzles, 62 percent other kitchen), 15 percent cooling, 14 percent restroom, 18 percent process, 2 percent laundry, and 7 percent other.[139]

► Energy use in clothes-washers and dishwashers are averages from the Department of Energy's Energy Star website.[140] Energy use in showers and baths assumes heating from 60 to 105 degrees Fahrenheit; faucet water is conservatively assumed to be unheated.

► All dishwasher energy savings are assumed to be from reduced consumption of hot water; three-quarters of clothes-washer savings are assumed to be from reduced consumption of hot water.[141]

▸ Water-cooled chiller energy consumption of 0.5 kWh/ton from the Federal Energy Management Program website.[142]

▸ Evaporative water consumption and the ratio of evaporative consumption to blowdown in water-cooled chillers from city of San Jose.[143]

▸ CII energy use for water heating from Sezgen and Koomey.[144]

▸ Energy use in industrial wastewater treatment in the United States is from Amarnath,[145] conservatively assuming the reported $2.5 billion of annual fuel and energy expenditures for treatment were for diesel fuel or gasoline at $1.50 per gallon, with heat content of 150,000 BTUs per gallon.[146]

▸ Industrial water use for the United States also from Amarnath, but cross-checked against United States Geological Survey Circular 1081.[147]

▸ Energy use in wastewater treatment is from SDCWA. Staff provided data for the North City and Santee Basin facilities.[148] Note that energy intensity per acre-foot treated is significantly higher than the energy intensity presented in Figure 4 because the latter is energy intensity per acre-foot of end use. Only 46 percent of countywide water use is estimated to enter the wastewater system because landscape and agricultural water use, pipe leaks, and some CII processing and cooling water are not tributary to wastewater treatment plants.

AGRICULTURAL MODEL DESCRIPTION

The agricultural model structure is parallel to the urban model presented in Appendix A. However, a number of modifications were required to account for differences between urban and agricultural settings. Some of the differences include:

- Sources other than surface and groundwater, recycled water, and conservation are rarely used for agriculture. For example, desalination for agricultural use is unheard of. The economic value of agricultural products is not high enough to justify the more expensive sources of water used in urban settings.
- Water for agriculture is rarely treated unless it is reclaimed from a wastewater source.
- Hydroelectric production opportunities and trade-offs are often more complicated for agricultural water than urban water.
- Agricultural water is often distributed to end use (the plants in the fields) by gravity in open channels, although pressurized distribution via sprinklers or drip irrigation systems is also common. Often, water is lifted a short height—such as 10 feet—from the distribution canal to the field.
- On-farm redistribution from irrigation-tailwater-return ponds is growing in popularity as a way of conserving water and reducing discharge of pollutants. The urban analogy is on-site water reuse by industry. However, industrial water reuse usually involves treatment, while on-site agricultural reuse usually does not.
- The water quality standards for recycled wastewater intended for agricultural reuse are lower than for urban reuse, which implies less energy consumption per unit of water recycled. Recycling wastewater for agricultural purposes is common in the western United States, especially in landlocked areas where discharge to receiving waters is restricted either during the dry season or year-round.

There is no treatment spreadsheet since agricultural water is not treated between source/conveyance and distribution. As in the urban model, distribution is separated into generic blocks. End uses are defined as crop type/irrigation system combinations. For example, one could grow almonds with flood irrigation or with permanent sprinklers. Energy for pressurizing the sprinklers or lifting water from edge-of-farm canals is included in end use energy, not in distribution energy. In

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concept, a spreadsheet for drainage management would replace the wastewater treatment spreadsheet in the urban model. In the Westlands Water District, however, drainage management other than tailwater-return ponds does not use energy. Tailwater-return energy use is accounted for in the third-layer water-reuse spreadsheet that feeds the sources and conveyances spreadsheet. The groundwater spreadsheet is conceptually identical to the urban model.

ENDNOTES

1 The use of water in producing energy is an important subject but is beyond the scope of this report. For information on this issue see, for example Ellen Baum, et al., *The Last Straw: Water Use by Power Plants in the Arid West*, (Boston: The Clean Air Task Force and the Land and Water Fund of the Rockies, 2003).

2 California Water Code, Section 522.

3 California Energy Commission, *Agricultural Rates in California* (Sacramento, California: California Energy Commission, 2001), p. 9.

4 Electric Power Research Institute, *Energy Audit Manual for Water/Wastewater Facilities*, (Palo Alto: 1999), Executive Summary.

5 There are 11.5 million households in California (U.S. Census). Each of these households consumes an average of 6,500 kWh/yr. "California Energy Consumption by Sector," available at http://energy.ca.gov/electricity/consumption_by_sector.html.

6 Nathanael Greene and Roel Hammerschlag, "Small and Clean Is Beautiful: Exploring the Emissions of Distributed Generation and Pollution Prevention Policies," in *The Electricity Journal*, June 2000, pp. 50–60.

7 Frank Burton, *Water and Wastewater Industries: Characteristics and Energy Management Opportunities* (Palo Alto, CA: Electric Power Research Institute, 1996), pp. 3–9.

8 Robert C. Wilkinson combines treatment and distribution; i.e., he divides the water chain into four stages in *Methodology for Analysis of the Energy Intensity of California's Water Systems, and an Assessment of Multiple Potential Benefits Through Integrated Water-Energy Efficiency Measures* (Santa Barbara, CA: University of California, Santa Barbara, Environmental Studies Program, 2000).

9 Electric Power Research Institute, Executive Summary.

10 Carrie Anderson, *Energy Use in the Supply, Use, and Disposal of Water in California*, (Sacramento: California Energy Commission, 1999), p.9.

11 "Power Plants Kill Billions of Fish," available at: www.riverkeeper.org/campaign.php/fishkills/the_facts/178. For additional information on the impacts of power plants on aquatic resources, see, for example, Peter Raimondi's testimony before the Central Coast Regional Water Quality Control Board, July 10, 2003, entitled "Cooling Water System: Findings Regarding Clean Water Act Section 316(b), Diablo Canyon Power Plant." This testimony is available at: www.swrcb.ca.gov/rwqcb3/Facilities/Diablo/Diablo.htm.

12 For more information on these impacts see, for example, Bruce Driver and Gregg Eisenberg, *Western Hydropower: Changing Values/New Visions, Independent Report to the Western Water Policy Review Advisory Commission* (Boulder, CO: 1997); and Phillip Williams, "The Flood Next Time: Restoring Living Rivers," in *World Rivers Review*, February 2000, p. 6.

13 For further discussion of global climate change and its impacts on water supply, see Peter H. Gleick and D. Briane Adams, *Water: The Potential Consequences of Climate Variability and Change for the Water Resources of the United States, the Report of the Water Sector Assessment Team for the U.S. Global Change Research Program* (Oakland, CA: Pacific Institute, 2000); Victor S. Kennedy, et al., *Coastal and Marine Ecosystems and Global Climate Change: Potential Effects on U.S. Resources* (Arlington, VA: Pew Center on Global Climate Change, 2002); Jay R. Lund, et al., *Climate Warming and California's Water Future* (Davis, CA: Department of Civil and Environmental Engineering, University of California, 2003), Kirkman O'Neal, *Effects of Global Warming on Trout and Salmon in U.S. Streams* (Washington, DC: Defenders of Wildlife, 2002); N. Leroy Poff and Mark Brinson, *Aquatic Ecosystems and Global Climate Change: Potential Impacts on Inland Freshwater and Coastal Wetland Ecosystems in the United States* (Arlington, VA: Pew Center on Global Climate Change, 2002); and *Confronting Climate Change in California: Ecological Impacts on the Golden State* (Cambridge, MA: Union of Concerned Scientists, 1999).

14 *Climate Changes the Water Rules: How Water Managers Can Cope With Today's Climate Variability and Tomorrow's Climate Change* (Delft, The Netherlands: The Dialogue on Water and Climate, 2003). This collaborative report is available at: www.waterandclimate.org/report.htm.

15 Peter H. Gleick and Linda L. Nash, *The Societal and Environmental Costs of the Continuing California Drought* (Oakland, CA: Pacific Institute, 1991).

16 A full discussion of water and power subsidies is beyond the scope of this report. For more information on the magnitude of these extensive subsidies, see, for example, Norman Myers and Jennifer Kent, *Perverse Subsidies: How Misused Tax Dollars Harm the Environment and the Economy* (Washington, DC: Island Press, 1998); Committee on Natural Resources, *Taking from the Taxpayer: Public Subsidies for Natural Resource Development* (Washington: U.S. Government Printing Office, 1994); B. Delworth Gardner, *Plowing Ground in Washington: The Political Economy of U.S. Agriculture* (San Francisco: Pacific Research Institute for Public Policy, 1995); Ronald Bailey, ed., *The True State of the Planet* (New York: Competitive Enterprise Institute, 1995); and Dr. E. Phillip LeVeen and Laura B. King, *Turning Off the Tap on Federal Water Subsidies* (New York: NRDC, 1985).

17 Committee on Natural Resources, p. 64.

18 Committee on Natural Resources, p. 66.

19 The Central Valley Project no longer charges a power rate for its water deliveries. In part, this seems to be because it does not want to be subject to oversight by FERC or other agencies. Instead, the Central Valley Project includes a per-acre-foot power charge for water deliveries. The per-acre-foot energy rates vary widely from contractor to contractor, ranging from one penny to $4.96 per acre-foot. Jesus Reynoso, Water Rate-Setting Section, United States Bureau of Reclamation Finance Office, personal communication, April 2003.

20 *Mid-Pacific Region 1999 Irrigation Water Rates, Central Valley Project* (Sacramento, CA: U.S. Bureau of Reclamation, Mid-Pacific Region, 1999).

21 B. Delworth Gardner, *Plowing Ground in Washington: The Political Economy of U.S. Agriculture* (Pacific Research Institute for Public Policy), p. 296.

22 Our San Diego case study shows that about 2,100 kWh/af will be required to support the transfer. About 5 percent of this amount (100 kWh/af) is hydroelectricity not produced in the All American Canal; the other 2,000 kWh/af are used as electricity to pump the transferred water through the Colorado River Aqueduct. Each 100,000 af/yr of water transferred to San Diego, therefore, may increase electricity demand by 210 million kWh/yr. This is certainly not negligible, and should have been discussed in the environmental impact review.

23 S. Joshua Newcom, "Dealing with the Shock: Shedding Light on the Link Between Water and Power in California," in *Western Water*, September/October 2001, p. 7.

24 Wilkinson, p. 6.

25 Surface and groundwater figures come from Department of Water Resources, *Bulletin 160-98*; recycled water figure comes from Department of Water Resources, *Water Recycling 2030: Recommendations of California's Recycled Water Task Force*, 2003; desalination figure comes from Department of Water Resources, *Bulletin 160-03*, 2003 stakeholder draft.

26 Carrie Anderson, *Energy Use in the Supply, Use, and Disposal of Water in California* (Sacramento: California Energy Commission, 1999) p. 1.

27 Wilkinson, p.7.

28 Steve Kashiwada, State Water Project, personal communication, June 2002.

29 Barry Mortimer, Central Valley Project, May 2002, and Steve Kashiwada, State Water Project, personal communication, June 2002.

30 Larry Dale, et al., *The Impact of Electricity Prices on the Cost of Five Options to Increase Southern California's Urban Water Supplies* (prepared for NRDC, 2003), p. 4.

31 Anderson, p.4.

32 Larry Dale, et. al., 2003.

33 California Energy Commission, p. 16.

34 Department of Water Resources, *California Water Plan Update 2003–Stakeholder Draft*, (Sacramento, CA: 2003).

35 *Seawater Desalination and the California Coastal Act (DRAFT)* (Sacramento, CA: California Coastal Commission, 2003).

36 John Kiernan, personal communication, March 2003.

37 Wilkinson.

38 Ibid.

39 Barakat & Chamberlin, Inc., *The Value of Water Supply Reliability: Results of a Contingent Valuation Survey of Residential Customers* (Sacramento, CA: California Urban Water Agencies, 1994).

40 The Ocean Conservancy, *Desalination: An Overview*, prepared for May 5, 2003, Environmental Roundtable Meeting in San Francisco.

41 California Water Code Section 13050 (n).

42 Department of Water Resources, Recycled Water Task Force, *Water Recycling 2030: Recommendations of California's Recycled Water Task Force*, (Sacramento: June 2003), p.7.

43 Ibid., p.5.

44 Ibid., p.5.

45 Newcom, p.12.

46 "Water Pipeline Project Underway in Orange County," Orange County Water District Press Release, February 19, 2004, available at: http://www.gwrsystem.com/news/releases/040219.html.

47 Burton, pp.3–30. In addition to direct energy costs for water treatment, substantial energy is also required to produce the chemicals used for water treatment. Those costs, while beyond the scope of this report, are part of the life-cycle energy costs of water.

48 Burton, p. ES–5.

49 Burton, p. ES–4.

50 Burton, pp. 3–9.

51 Burton, pp. 3–27.

52 *Draft WUE Program Plan* (Sacramento, CA: CALFED Bay-Delta Program, 1999), pp.5–21.

53 National Renewable Energy Laboratory, "Cities Cut Water System Energy Costs," 1994.

54 Irrigation Training and Research Center, *Variable Frequency Drives and SCADA—Are They Worthwhile Investments?* ITRC Report 02-006 (San Luis Obispo, CA: California Polytechnic State University, 2002).

55 Gleick, et al., p.3.

56 Gleick, et. al., p.2.

57 Peter W. Mayer, et al., *Residential End Uses of Water* (Denver, CO: American Water Works Association Research Foundation, 1999).

58 Tables 3 through 5 modified from Amy Vickers' *Handbook of Water Use and Conservation: Homes, Landscapes, Business, Industries, Farms* (Amherst, MA: WaterPlow Press, 2001).

59 Gary H. Wolff and Peter H. Gleick, "The Soft Path for Water," in *The World's Water: The Biennial Report on Freshwater Resources* (Washington, DC: Island Press, 2002).

60 For a complete discussion of residential conservation measures, see Vickers, and Gleick, et.al., 2003.

61 *Codes and Standards Enhancement Initiative For FY2003: Title 20 Standards Development, Comments of PG&E Regarding Proposed Residential Clothes Washer Water Factor Standards* (Docket No. 03-AAER-01) (RCW) November 11, 2003, p. 11. Comments were prepared for PG&E by Energy Solutions.

62 Gleick, et al.

63 Gleick et al., p. 63.

64 Gleick, et al., p.2.

65 Vickers, p.232.

66 Benedykt Dziegielewski, et al., *Commercial and Insitutional End Uses of Water* (Denver, CO: American Water Works Association Research Foundation, 2000).

67 Gleick, et al., p.2.

68 For additional descriptions of CII water conservation measures, see Vickers; Gleick, et.al.; and Miriam Pye, *Making Business Sense of Energy Efficiency and Pollution Prevention* (Washington, DC: American Council for an Energy Efficient Economy, 1998).

69 Vickers, p.235.

70 Gleick, et.al., p.83.

71 Ibid. p.91.

72 "Conservation Tips," Sacramento Municipal Utility District, available at: www.smud.org/residential/saving/conservation.html.

73 Department of Water Resources, *California Water Plan Update: Bulletin 160-98*.

74 Anderson, p.6. This latter figure includes energy used in food processing such as water sterilization, pumping, reclamation for washing, and other purposes.

75 California Energy Commission, p.1.

76 The Department of Water Resources does not have a good estimate of agricultural water use efficiency. While the CALFED water use efficiency program plan estimates average statewide water use efficiency as 73 percent, there is good reason to doubt this estimate. The estimate is based on data from the Westlands Water District during a limited number of irrigation seasons—a very limited and nonrepresentative sample. For additional discussion of agricultural water conservation, see Vickers; Ronnie Cohen and Jennifer Curtis, *Agricultural Solutions: Improving Water Quality in California Through Water Conservation and Pesticide Reduction* (New York: NRDC, 1998); Elise Fulstone, *The Role of Improved Irrigation Technologies in Helping Farmers Meet Environmental and Economic Challenges* (Washington, DC: Environmental and Energy Study Institute, 1997); and Department of Water Resources, *Agricultural Efficient Water Management Practices that Stretch California's Water Supply* (Sacramento, CA: 1995).

77 California Energy Commission, p. 5.

78 Anderson, p. 9.

79 Table 8 is modified from Burton.

80 Edward R. Osann and John E. Young, *Saving Water, Saving Dollars: Efficient Plumbing Products and the Protection of America's Waters* (Washington, DC: Potomac Resources, 1998), p. 10. Capital cost savings from reductions in wastewater flows will vary tremendously by location, particularly for older systems designed for certain flows. For new systems, however, water conservation and reduced wastewater flows should translate more reliably into reduction in wastewater capital costs.

81 To create this spreadsheet, we modified and expanded the methodology of Wilkinson (2000) to determine the energy embedded in water use from source to disposal.

82 The residential, commercial/industrial/institutional (CII), and agricultural percentages of total use in the table are from San Diego County Water Authority staff for the year 2010. They were disaggregated using data from the Awwa Research Foundation (1999) and Gleick (2003).

83 U.S. Census Bureau, Census 2000 figures available at: www.census.gov.

84 California Energy Commission, "Chula Vista Power Project, Chula Vista, Emergency Peaker Project," Energy Commission Docket Number: 01-EP-3. Available at: www.energy.ca.gov/sitingcases/peakers/chulavista/.

85 For more information about the environmental implications of drainage water and conflicts over responsibility for management and disposal of drainage flows, see, for example, *Management Plan for Agricultural Subsurface Drainage and Related Problems on the Westside San Joaquin Valley*, (Sacramento, CA: U.S. Department of Interior and California Resources Agency, 1990).

86 The district is within the Tulare Lake groundwater basin, and Westside and Pleasant Valley subbasins. Historic groundwater depth maps are available from the Westlands Water District at: www.westlandswater.org/maps/dgwmapsel.htm and the Department of Water Resources online database, available at: http://wdl.water.ca.gov.

87 Russ Freeman, Resources Division, the Westlands Water District, personal communication, June 2003.

88 The original district included approximately 376,000 acres. It is currently referred to as Priority Area I (PAI). Most of PAI is east of the San Luis Canal and has gravity water service. Small recirculating pumps are used to pressurize supply laterals serving land adjacent to the San Luis Canal that is too high to be served through gravity laterals. The Westplains Water Storage District merged with Westlands in 1965, adding 210,00 acres. These lands are referred to as Priority Area II (PAII). Much of it is west and upslope of the San Luis Canal. It is served by pumping from the San Luis Canal and gravity supply from the Coalinga Canal. About one-third of the land between the San Luis Canal and the Coalinga Canal is served by pumping from the San Luis Canal. About 18,000 acres were added to the district subsequent to the Westplains merger. These lands are referred to as Priority Area III (PAIII). Unlike

PAI and PAII, PAIII does not have a water service contract. It receives surplus Central Valley Project water or hardship water when available from the bureau during drought periods to preserve trees and vines.

89 Barry Mortimeyer, chief, Central Valley Operations, U.S. Bureau of Reclamation, personal communication, June 2003.

90 The unit factors are for water moved at the point of energy use. Due to system losses, actual energy used per acre-foot of water delivered is higher, as discussed in Chapter 2. In this case study, conveyance losses were not included due to data limitations.

91 Barry Mortimeyer, chief, Central Valley Operations, U.S. Bureau of Reclamation, personal communication, May 2003.

92 Since water in the canals cannot be differentiated by recipient, just as electrons in power lines cannot be labeled "for customer A," it is unclear how the 90 kWh/af net consumption of storing water in San Luis should be allocated. Westlands Water District staff claim it should not be allocated to them (Russ Freeman, Resources Division, The Westlands Water District, personal communication, July 2003) because priority is given to deliveries to exchange contractors and wildlife refuges. But it is not clear how these priorities affect timing of deliveries or that it is appropriate to differentiate this energy by recipient. An equally valid approach would be to charge a percentage of 90 kWh/af to all recipients, where the percentage reflects the percentage of water passing the San Luis Reservoir outlet that is pumped into and then recovered from San Luis Reservoir.

93 The 245 kWh/af figure does not apply to every acre-foot of Central Valley Project water delivered in the district since the district lifted only about 400,000 af/yr, or about 50 percent of Central Valley Project deliveries, in 2002.

94 Pimental and cost and return studies prepared by the University of California Cooperative Extension, which are available at www.agecon.ucdavis.edu/outreach/crop/cost.htm.

95 We have not, for example, estimated the energy embedded in the materials used on farm. Pimental and Pimental provide such data for around a dozen examples, including some relatively old data on tomato production in California. In that example, gasoline and diesel fuel account for a little more than half of the embedded energy inputs. See D. Pimental, and M. Pimental, editors, *Food, Energy, and Society* (Niwot, Colorado: University of Colorado Press, 1996).

96 W. Illingworth, D. Mitchell, L. Dale, A. Fargeix, R. T. Mott, and S. Msangi, *Analysis of Economic Impacts of Proposed Land Retirement in Westlands Water District, Final Report* (Westlands Water District, May 2003).

97 Permanent retirement of up to 200,000 acres of land within the Westlands Water District has been proposed by the district itself. According to Illingworth, et.al., the Westlands Water District is developing plans to purchase and retire up to 100,000 acres of land within the district. The district would retain ownership of these lands and would redirect the water from these lands to non-drainage impaired land within the district. An additional 100,000 acres of land retirement may take place if an agreement is reached with the Department of the Interior.

98 100,000 acres times 2.34 acre-feet of water-use-per-acre times 435 kWh per acre-foot times 70 percent = 71 million kWh.

99 Russ Freeman, Resources Division, the Westlands Water District, personal communication, June 2003.

100 Wilkinson (2000) and Table 12 of this report.

101 W. Illingworth, D. et.al., May 2003.

102 Russ Freeman, Resources Division, the Westlands Water District, personal communication, August 2003.

103 *Pocket Guide: The Northwest Power Planning Council's Fast Facts about the Columbia River Basin*, (Portland, Oregon: Northwest Power and Conservation Council, 1992), p. 9.

104 Ibid.

105 The National Marine Fisheries Service's RPAs are "expected to cost $1 billion a year, significantly more than the $800 million estimated one-time cost of breaching the four dams," (*Chicago Tribune*, March 5, 2001).

106 Foundation for Water and Energy Education, "What Makes the Columbia River Basin Unique and How We Benefit," available at: www.fwee.org/c-basin.html.

107 The National Marine Fisheries Service Press Release NOAA 97-R136, "Federal Fishery Agency Calls for a No-Net-Loss Approach to New Irrigation Pumping in Columbia Basin," May 16, 1997. Available at: www.publicaffairs.noaa.gov/pr97/may97/noaa97-r136.html.

108 Bonneville Power Administration, "Aluminum Companies Chip In," *Journal of the Bonneville Power Administration*, February 2001, p.2.

109 Linda Mapes, "Abundant Idaho Water Tied Up Tight," *Seattle Times*, April 29, 2001.

110 Washington State Department of Ecology, *2001 Drought Response Report to the Legislature*, (Olympia, WA: 2001), p. 18.

111 Joel R. Hamilton and R. Garth Taylor, "The Idaho Power Irrigation Electricity Buyout," *Idaho Economics*, November 2001.

112 Michele DeHart, manager, Fish Passage Center, in a letter to Rich Zabel, National Marine Fisheries Service, commenting on the National Marine Fisheries Service draft report on survival estimates for spring-migrating juvenile salmonids through Snake and Columbia River dams and reservoirs during 2001, February 27, 2002.

113 "The [Federal Salmon Plan]'s flow and spill provisions were not met on even a single day during 2001," Save Our Wild Salmon, *Failing Salmon, Failing People*, (Seattle, 2001), Executive Summary.

114 Fish Passage Center *Annual Report* (Portland, OR: 2001), p. xix.

115 This estimate assumes that energy used to grow potatoes is an average for the project area. The assumption needs verifying, but it is useful for illustration purposes and is plausible based on cultivation and harvest energy estimates per acre-feet of water use developed in the Westlands case study.

116 Bonneville Power Administration, "Follow Up Questions for Power Net Revenue Improvements," *Sounding Board*, March 2004, p. 2.

117 The CALFED Bay-Delta Program Record of Decision indicates that the program will produce a "definition of appropriate measurement by the end of 2001," and that it will work "to develop legislation for introduction and enactment in the 2003 legislative session requiring the appropriate measurement of all water uses in the state of California," (record of decision, p. 63). CALFED has missed both of these dates.

118 The record of decision was adopted in August 2000 by state and federal water management agencies. The plan states that "CALFED agencies will support legislation that encourages groundwater management at the sub-basin level," (record of decision, p.47). We are not aware of progress toward the enactment of this legislation.

119 The record of decision states that "(By) the end of 2002, CALFED Agencies will implement a process for certification of water suppliers' compliance with the terms of the urban MOU, including implementation of best management practices for urban water conservations," (record of decision, p. 62). CALFED has missed this target.

120 Wilkinson.

121 This assumption is worthy of further research in some settings. Since both treated and untreated water are delivered to San Diego County in pipelines rather than canals, the assumption is probably valid in our case study. But it may not be valid in all settings since friction losses in pipelines often exceed those in open channels.

122 Robert C. Wilkinson, *Methodology for Analysis of the Energy Intensity of California's Water Systems, and an Assessment of Multiple Potential Benefits Through Integrated Water-Energy Efficiency Measures* (Santa Barbara, CA: University of California, Santa Barbara, Environmental Studies Program, 2000).

123 Wilkinson.

124 Robert Wilkinson, Professor, University of California Santa Barbara, personal communication, September 2003.

125 Terry Spragg, "Response to the Administrative Law Judge's Ruling Requiring Supplemental Information Granting Motion to Intervene" (Spragg & Associates, June 11, 1999).

126 William L. Kahrl, *California Water Atlas* (The State of California, 1979).

127 CH2Mhill, Final Environmental Impact Report/Environmental Impact Statement, Water Conservation and Transfer Project, Imperial Irrigation District, June 2002; Henrik Olstowski, superintendent of general power generation, Imperial Irrigation District, personal communication June 2003.

128 Jeff Stephenson, water resources specialist, San Diego County Water Authority, personal communication, June 2003.

129 Ibid.

130 Ibid.

131 Ibid.

132 Ibid.

133 Ibid.

134 Ibid.

135 Ibid.

136 Ibid.

137 Ibid.

138 Peter H. Gleick, D. Haasz, C. Henges-Jeck, V. Srinivasan, G. Wolff, and A. Mann, *Waste Not Want Not: The Potential for Urban Water Conservation in California* (Oakland: Pacific Institute, 2003).

139 Ibid.

140 "Energy Star Qualified Clotheswashers" list and "Energy Star Qualified Dishwashers" list, available at: www.energystar.gov/ia/products/prod_lists/clotheswash_prod_list.pdf and www.energystar.gov/ia/products/prod_lists/dishwash_prod_list.pdf, respectively.

141 Amy Vickers' *Handbook of Water Use and Conservation: Homes, Landscapes, Business, Industries, Farms* (Amherst, MA: WaterPlow Press, 2001).

142 United States Department of Energy, "How to Buy an Energy Efficient Water-Cooled Chiller," available at: www.eere.energy.gov/femp/procurement/wc_chillers.html.

143 City of San Jose Environmental Services Department, *Water Conservation Guide for Office Buildings and Commercial Establishments* (San Jose, California: City of San Jose, 1992).

144 Osman Sezgen and Jonathan G. Koomey, *Technology Data Characterizing Water Heating in Commercial Buildings: Application to End-Use Forecasting* (Berkeley, California: University of California Berkeley, Lawrence Berkeley National Laboratory, 1995).

145 A. Amarnath, *Maximizing Wastewater Reduction for Process Industries*, TR-1114205 (Palo Alto: Electric Power Research Institute, 1999).

146 Ibid.

147 U.S. Geological Survey, "Estimated Use of Water in the United States, 1990," in *USGS National Circular* 1081, available at: http://water.usgs.gov/watuse/wucircular2.html.

148 Jeff Stephenson, Water Resources Specialist, San Diego County Water Authority, personal communication, June, 2003.

Attachment 22

Welcome to the California Energy Commission

WWW.ENERGY.CA.GOV / ELECTRICITY / US PER CAPITA ELECTRICITY 2005

U.S. Per Capita Electricity Use By State In 2005

Ranking Highest	State	Population (thousands)	kWh (millions)	kWh per capita
1	Wyoming	509	14,138	27,787
2	Kentucky	4,173	89,351	21,414
3	District of Columbia	582	11,816	20,301
4	Alabama	4,548	89,202	19,612
5	South Carolina	4,247	81,254	19,132
6	Tennessee	5,956	103,905	17,446
7	Louisiana	4,507	77,389	17,170
8	North Dakota	635	10,840	17,081
9	Indiana	6,266	106,549	17,004
10	Arkansas	2,776	46,165	16,632
11	West Virginia	1,814	30,152	16,621
12	Mississippi	2,908	45,901	15,782
13	Nebraska	1,758	26,976	15,343
14	Idaho	1,429	21,853	15,288
15	Oklahoma	3,543	53,707	15,157
16	North Carolina	8,672	128,335	14,798
17	Texas	22,929	334,258	14,578
18	Georgia	9,133	132,265	14,483
19	Montana	935	13,479	14,420
20	Delaware	842	12,137	14,419
21	Iowa	2,966	42,757	14,418
22	Virginia	7,564	108,850	14,390
23	Kansas	2,748	39,024	14,200
24	Ohio	11,471	160,176	13,964
25	Missouri	5,798	80,940	13,961
26	Nevada	2,412	32,501	13,473
27	Washington	6,292	83,425	13,259
28	Minnesota	5,127	66,019	12,877
29	Oregon	3,639	46,419	12,756
30	Wisconsin	5,528	70,336	12,724
31	Florida	17,768	224,977	12,662
32	South Dakota	775	9,811	12,661
	United States	296,507	3,660,969	12,347

33	Maryland	5,590	68,365	12,231
34	Pennsylvania	12,405	148,273	11,952
35	Arizona	5,953	69,391	11,656
36	Illinois	12,765	144,986	11,358
37	Michigan	10,101	110,445	10,934
38	New Mexico	1,926	20,639	10,716
39	Colorado	4,663	48,353	10,369
40	Utah	2,490	25,000	10,039
41	Connecticut	3,501	33,095	9,454
42	Vermont	622	5,883	9,452
43	New Jersey	8,703	81,897	9,410
44	Maine	1,318	12,363	9,378
45	Alaska	663	5,913	8,915
46	Massachusetts	6,433	57,228	8,895
47	New Hampshire	1,307	11,245	8,605
48	Hawaii	1,273	10,539	8,277
49	New York	19,316	150,148	7,773
50	Rhode Island	1,074	8,049	7,497
51	California	36,154	254,250	7,032

Sources:
Population -
http://www.census.gov/popest/states/tables/NST-EST2006-01.xls
Kilowatt-hour -
http://www.eia.doe.gov/cneaf/electricity/epa/sales_state.xls

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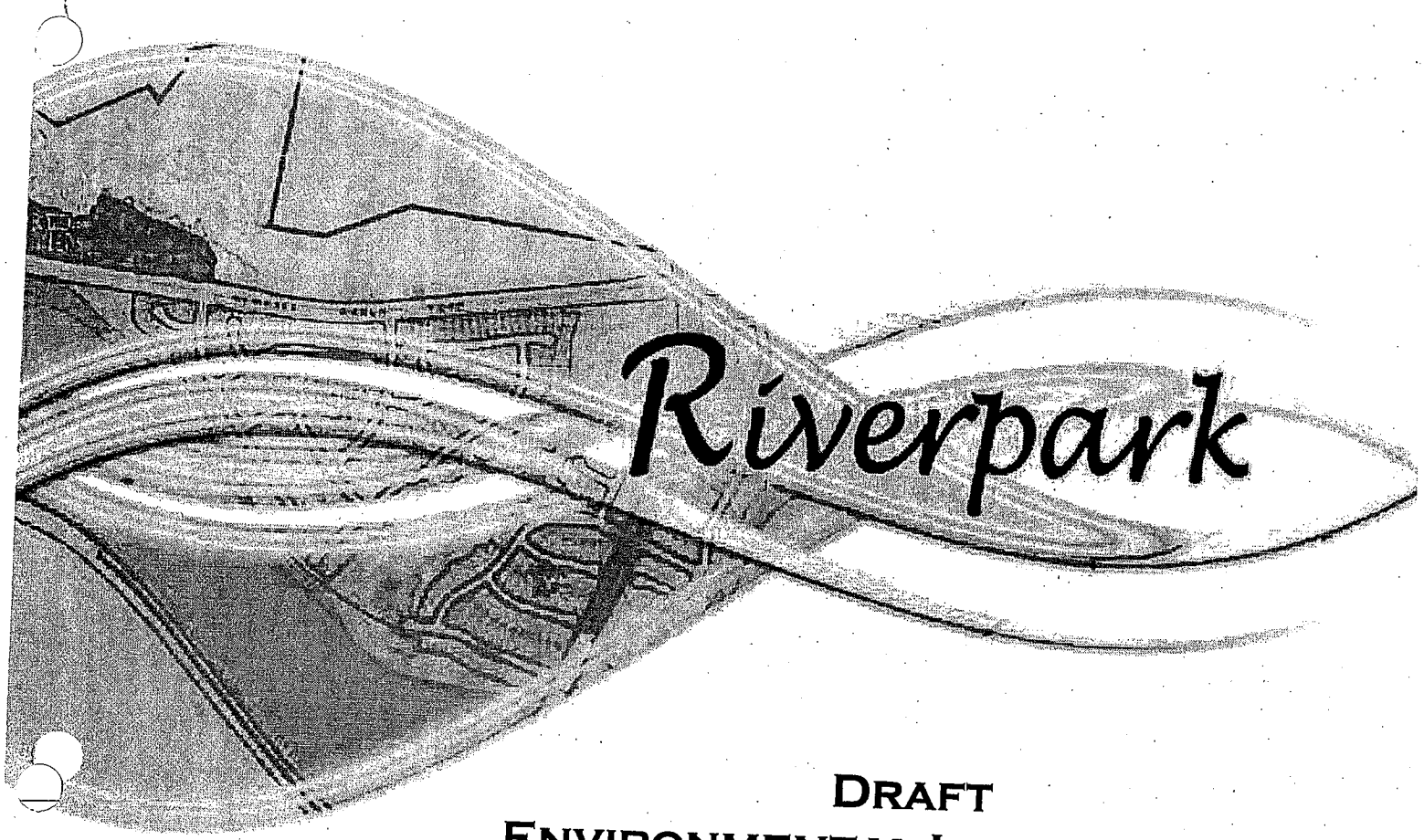
Attachment 23-A

LETTER 21



DRAFT
ENVIRONMENTAL IMPACT REPORT

SCH No. 2002091081

VOLUME I

Prepared for:

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March 2004

Pages omitted.

Visit http://www.santa-clarita.com/cityhall/cd/planning/eir/completed.asp for complete document.

Table ES-1
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts		Recommended Mitigation Measures	Residual Impact
4.1 GEOTECHNICAL RESOURCES			
Much of the elevated portion of the project site is underlain by accumulations of ancient river channel deposits that were deposited on a series of successively lower benches cut in the underlying Saugus Formation bedrock by the ancestral Santa Clara River. These depositional Terrace Deposits exhibit crude horizontal stratification. Quaternary Alluvium covers the valley floors.	**a.**	**General**	
	4.1-1	All project site development shall be performed according to the recommendations identified in Geologic and Geotechnical Report; Review of Tentative Tract Map, (Dated February 25, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated April 4, 2003, and in Geologic and Geotechnical Report – Addendum No. 1 Revised Tentative Tract Map (Revised June 11, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated June 30, 2003.	Not Significant
	4.1-2	Mitigation measures for geotechnical resources shall be implemented so as not to conflict with mitigation measures as section forth in **Section 4.6, Biological Resources**, of this EIR.	
	b.	**Earth Materials**	
	4.1-3	All grading shall be accomplished under the observation and testing of the Project Soils Engineer, Engineering Geologist and/or their authorized representatives in accordance with the recommendations contained herein, the current Unified Building Code requirements and "Recommended Earthwork Specifications" as presented in Appendix E of Geologic and Geotechnical Report; Review of Tentative Tract Map, (Dated February 25, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated April 4, 2003.	
	4.1-4	During site preparation, the site shall be cleared and stripped of organics (vegetation), topsoil, roots, undocumented artificial fill, rubble, construction debris and other unsuitable materials, as applicable, and the site shall be graded to provide a firm base for compacted fill. All organics shall be removed from the site for proper disposal. The Geotechnical Engineer and/or his representatives shall observe the excavated areas prior to placing compacted fill.	
	4.1-5	In order to provide a uniform firm bottom prior to placing fill, all unconsolidated Alluvium, slopewash, colluvial soils and severely weathered Terrace Deposits and bedrock shall be removed from areas to receive fill. The estimated depths of removals (excluding landslides) are 5 to 23 feet as shown on **Figure 4.1-1**. The exact depth and extent of necessary removals will be determined in the field during the grading operations when observations and more location-specific evaluations can be performed.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.1 GEOTECHNICAL RESOURCES (continued)		
	4.1-6 All existing artificial fill (af) shall be removed and replaced with compacted fill. Removals at the locations of exploratory trenches shall be extended to the bottom of the trench backfill if the adjacent removal depths are shallower than the trench.	
	4.1-7 In areas to receive compacted fill where the surface gradient is steeper than 5:1 (h:v), the soil mantle, colluvium and unsuitable material shall be removed and such areas benched horizontally into competent material prior to or in conjunction with fill placement (See Appendix E, Fill Over Natural Slope, Figure E2 of Geologic and Geotechnical Report; Review of Tentative Tract Map, (Dated February 25, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated April 4, 2003).	
	4.1-8 After the ground surface to receive fill has been exposed, it shall be ripped to a minimum depth of 6 inches, brought to optimum moisture content or above, thoroughly mixed to obtain a near uniform moisture condition and uniform blend of materials, and then compacted to the required relative compaction per the latest ASTM D 1557 laboratory maximum density.	
	4.1-9 Where recommended removals encounter ground water, water levels shall be controlled by providing an adequate excavation bottom slope and sumps for pumping water out as the excavation proceeds, or ground water may be lowered by installing shallow dewatering well points prior to grading. Partial removals of soils above the water table and soil improvement below the water table (e.g., shallow compaction grouting) may be another option. The determination as to which measures are to be used shall be made by the project Civil Engineer. Dewatering may be needed depending on the season when the removals are performed. All discharges from dewatering operations, if any, shall comply with the National Pollutant Discharge Elimination System permit requirements of project construction.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.1 GEOTECHNICAL RESOURCES (continued)		
	4.1-10 A minimum 5-foot thick over-excavation shall be performed on all cut-lots, transitional lots (transitions between bedrock, fill, Terrace Deposits and Alluvium), and streets. This over-excavation will provide attenuation of potential differential settlements or differential material response to seismic events and provide a uniform base for structural support of buildings. If the maximum depth of fill exceeds 15 feet on a cut/fill transition lot, then the thickness of the fill cap shall be one-third of the deepest fill thickness below any proposed structure (See Appendix E, Cut Lot and Cut Fill Lot (Transitional), Figure E3, of Geologic and Geotechnical Report; Review of Tentative Tract Map, (Dated February 25, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated April 4, 2003). If excavation of the native soils (i.e., bedrock) exposes expansive materials, then the lot over-excavation shall be deepened to 8 feet.	
	4.1-11 On-site soils that are free of debris, over-size rocks, topsoil, and organic matter may be used as sources for compacted fills. Rock or similar irreducible material with a maximum dimension greater than 8 inches may not be placed in the fill. Rocks or hard fragments larger than 4 inches shall not compose more than 25 percent of the fill and/or lift. Any large rock fragments over 8 inches in size, may be incorporated into the fill as rockfill in windrows after being reduced to the specific maximum rock fill size (See Figure E4, Rock Disposal, in Appendix E of Geologic and Geotechnical Report; Review of Tentative Tract Map, (Dated February 25, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated April 4, 2003). Where fill depths are too shallow to allow large rock disposal, special handling, or removal may be required depending upon on-site field decisions made during grading operations by the project Geologist/Geotechnical Consultant (See "Recommended Earthwork Specifications," Appendix E of the Seward report.)	
	4.1-12 All fill material shall be placed in uniform lifts not exceeding 8 inches in its loose state and compacted to a minimum of 90 percent relative compaction as determined based on the latest ASTM Test Designation D-1557. Additional field compaction requirements are presented in Appendix E, "Recommended Earthwork Specifications" of Geologic and Geotechnical Report; Review of Tentative Tract Map, (Dated February 25, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated April 4, 2003. Appendix E also includes recommended specifications for placement of trench backfill.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.1 GEOTECHNICAL RESOURCES (continued)		
	4.1-13 For fills deeper than 40 feet, the portion of fill below 40 feet depth shall be compacted to a minimum of 93 percent relative compaction. These areas shall be delineated at the Grading Plan stage.	
	4.1-14 Fill slope inclination shall not be steeper than 2:1 (h:v). The fill material within approximately one equipment width (typically 15 feet) of the slope face shall be constructed with cohesive material obtained from on-site soils. The finished fill-slope face shall be constructed by over-building the slope and cutting back to the compacted fill material. Stability Fills are recommended where cut-slope faces will expose fill-over bedrock, Alluvium-over-bedrock or Quaternary Terrace Deposits over bedrock conditions. These fills shall be constructed with a keyway at the toe of the fill slope with a minimum equipment width, but not less than 15 feet, and a minimum depth of 3 feet into the firm undisturbed earth. Following completion of the keyway excavations, the Project Engineering Geologist shall observe and approve the keyway bottom prior to backfilling with certified engineered fill.	
	4.1-15 Where fill slopes are constructed above natural ground with a gradient of 5:1 (h:v) or steeper, all topsoil, colluvium, and unsuitable material shall be removed and a keyway shall be constructed at the toe of the fill slope with a minimum width of 15 feet, and a minimum depth of 3 feet into firm undisturbed earth (See Appendix E, Fill Slope Over Natural Slope diagram, Figure E5 of Geologic and Geotechnical Report; Review of Tentative Tract Map, (Dated February 25, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated April 4, 2003). Following completion of the keyway excavations, the project Engineering Geologist/Geotechnical Engineer or designated representative shall observe and approve the keyway bottom prior to backfilling with compacted fill.	
	4.1-16 Where fill slopes toe out on relatively level natural ground, the removals shall be performed to a minimum 1:1 projection from the toe of slope to the recommended removal depth, (See Appendix E, Fill Slope Toeing Out on Flat Alluviated Canyon, Figure E6 of Geologic and Geotechnical Report; Review of Tentative Tract Map, (Dated February 25, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated April 4, 2003).	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.1 GEOTECHNICAL RESOURCES (continued)		
	4.1-17 Where sliver fill-slopes are proposed, the slope shall be constructed with a minimum 15-foot width Stability Fill throughout, which is keyed in at the toe of slope (See Appendix E, Stability/Buttress Fill and Backdrains Detail, Figure E7 of Geologic and Geotechnical Report; Review of Tentative Tract Map, (Dated February 25, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated April 4, 2003).	
	4.1-18 Fourteen landslides are located within or in the vicinity of the proposed development area of the project. These landslides shall be mitigated as recommended in Table 1 of Geologic and Geotechnical Report – Addendum No. 1 Revised Tentative Tract Map (Revised June 11, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated June 30, 2003.	
	4.1-19 Nineteen proposed cut-slopes that would be 25± feet or higher have been identified on the subject site and are designated them as CS-1 through CS-19. Recommended mitigation, if necessary, for each slope as presented in Cut-Slope Summary (Table 2 of Geologic and Geotechnical Report – Addendum No. 1 Revised Tentative Tract Map (Revised June 11, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated June 30, 2003 shall be followed. This determination shall be made by the Geologist/Geotechnical Consultant prior to grading activities. It has been conservatively assumed for the purposes of stability analysis that weak bedding planes may occur anywhere in the proposed cut-slopes. If any of the smaller proposed cut-slopes (less than 25± feet in height) have adverse geologic grading configurations (fill over cut), they shall be mitigated, if necessary, with a standard 15- to 20-foot wide key (depending on the proposed cut-slope height) and benching similar to a Stability Fill. A "Typical Fill above Cut-Slope" detail is shown on Figure E8 within Appendix E of the Seward report. This determination shall be made by the project Geologist/Geotechnical Consultant prior to grading activities.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.1 GEOTECHNICAL RESOURCES (continued)		
	4.1-20 All permanent cut-slopes shall be constructed at a slope ratio not steeper than 2:1 (horizontal to vertical). All permanent cut-slopes exposing Terrace Deposits or Alluvium shall be constructed as a stability fill. Temporary cut slopes in competent rock may be constructed as steep as 1.5:1 (h:v). Potential unstable subsurface conditions exposed during construction, such as adverse bedding, joint planes, zones of weakness or exposed seepage, may require either flatter slopes than specified above or construction of benches. An Engineering Geologist shall observe all backcuts during the grading operations and provide appropriate recommendations, if necessary.	
	4.1-21 For the south and southwest facing natural ridge slope located above Planned Area D in the vicinity of Lot No. 526, groundwater levels shall be permanently limited to those found to be necessary for stability of the affected slopes through surface water control as specified in **Mitigation Measures 4.1-27** through **4.1-30**. No piped water shall be allowed above elevation 1,250 feet above msl on the existing natural ridge north and northeast of Lot No. 526, and the area of the existing natural ridge above elevation 1,250 feet above msl shall be recorded as a Restricted Use Area (RUA) on the Final Map. The RUA does not allow for structures and is intended to provide gross stability above the development in order to satisfy the City of Santa Clarita slope stability requirements. This recommended RUA is hatch marked on **Figure 4.1-1**. See the slope stability analysis in Appendix F of Geologic and Geotechnical Report; Review of Tentative Tract Map, (Dated February 25, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated April 4, 2003 for details.	
	4.1-22 Proposed cut-slope CS-10 shall be constructed as a stability fill due to Quaternary Terrace Deposits anticipated to be exposed within the proposed slope face. A 20-foot building setback shall be constructed from the top of proposed cut-slope CS-10 for Lot Nos. 386 through 391 due to the steep gradient of the natural slope located below the proposed cut slope. This setback is based on geologic/geotechnical judgment and shall be designated on the Final Map as a Restricted Use Area; the setback line is hatch marked on **Figure 4.1-1**. The RUA does not allow for structures and is intended to provide gross stability above the development in order to satisfy the City of Santa Clarita slope stability requirements.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.1 GEOTECHNICAL RESOURCES (continued)		
	4.1-23 The recommended building setback from the top of proposed cut-slope CS-10 at the rear of Lot Nos. 386 through 391 located on **Figure 4.1-1** shall be delineated on the Final Map as a Restricted Use Area. The RUA does not allow for structures and is intended to provide gross stability above the development in order to satisfy the City of Santa Clarita slope stability requirements. The RUA determination is made by the Geologist/Geotechnical Consultant and is made prior to recordation of the Final Map. The standard setbacks from ascending and descending slopes provided in the California Code/Unified Building Code shall be followed, unless superseded by specific geologic and/or soils engineering evaluations.	
	4.1-24 All of the exploratory trenches and borings previously excavated for this project shall be over-excavated and backfilled with compacted fill in accordance with the earthworks recommendations of Geologic and Geotechnical Report; Review of Tentative Tract Map, (Dated February 25, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated April 4, 2003.	
	c. Drainage Control	
	4.1-25 Whenever groundwater seepage is observed, the condition shall be evaluated by the Engineering Geologist and Geotechnical Engineer prior to covering with fill material.	
	4.1-26 Surface drainage control design shall include provisions for positive surface gradients to ensure that surface runoff is not permitted to pond, particularly above slopes or adjacent to building foundations or slabs. Surface runoff shall be directed away from slopes and foundations and collected in lined ditches or drainage swales via non-erodible drainage devices, which shall discharge to paved roadways or existing watercourses. If these facilities discharge onto natural ground, means shall be provided, as directed by the project Civil Engineer, to control erosion and to create sheet flow.	
	4.1-27 Site grading shall be inspected, particularly after heavy, prolonged rainfall, by the City of Santa Clarita to identify erosion areas at an early stage. Maintenance work shall be done as soon as practical to repair these areas and prevent their enlargement.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.1 GEOTECHNICAL RESOURCES (continued)		
	4.1-28 Planting and irrigation standards within the City of Santa Clarita Grading Code shall be adhered to in order to prevent soil erosion.	
	4.1-29 Fill slopes and stability fills, as applicable, shall be provided with subsurface drainage as necessary for stability as determined by the project Geologist/Geotechnical Consultant. A typical backdrain detail is shown on Figure E7, Appendix E of Geologic and Geotechnical Report; Review of Tentative Tract Map, (Dated February 25, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated April 4, 2003. Also, subdrains along the bottom of canyon fills shall be constructed. A typical canyon subdrain detail is presented on Figure E9 of the Seward report. The existing subdrains constructed during the grading for the Rio Vista water treatment facility shall be extended to daylight out of the future planned grading or connected to the future storm drains.	
	4.1-30 All final grades shall be sloped away from the building foundations to allow rapid removal of surface water runoff. No ponding of water shall be allowed adjacent to the foundations. Plants and other landscaped vegetation requiring excessive watering shall be avoided adjacent to the building foundations. Should landscaping be constructed, an effective water-tight barrier shall be provided to prevent water from affecting the building foundations.	
	d. Shrinkage, Bulking, and Subsidence	
	4.1-31 The Project Engineer shall design pad grades with sufficient flexibility to accommodate a possible shortage of fill of up to 10 percent of the total yardage graded due to potential shrinkage of fill and potential subsidence due to dewatering.	
	e. Foundation and Settlement Considerations	
	4.1-32 The structural design shall include seismic geotechnical parameters in accordance with UBC requirements for Seismic Zone 4. These parameters will be provided at the Grading Plan stage.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.1 GEOTECHNICAL RESOURCES (continued)		
	4.1-33 Shallow spread footings for foundation support of residential structures can adequately be placed on compacted engineered fill as stated in **Mitigation Measures 4.1-12** and **4.1-13**. Support for heavier structures, if applicable, shall be addressed at the Grading Plan stage. Minimum specifications for continuous (wall) foundation dimensions are 12 inches wide and 12 inches deep below lowest adjacent grade for single-story residential structures. Tentatively, an allowable bearing capacity of 1,800 pounds per square-foot can be used for (minimum-sized) shallow foundations constructed in certified compacted fill. This tentative allowable bearing value shall be confirmed by further field and laboratory testing by the Project Geologist of the site soils before use in design plans. Lateral resistance of footing walls shall be provided at the Grading Plan stage.	
	4.1-34 If, during grading operations, the resulting cut-fill transition is steep, as determined by the project Geologist/Geotechnical Consultant, at depth below the building area, the geometry of the transition shall be reviewed during grading operations by the Soils Engineer on a site specific basis to evaluate the need for additional over excavation removals and/or additional foundation reinforcement. As a general guideline, steep cut/fill transitions would include slope gradients steeper than 4:1 (h:v) and overall variations in fill thickness of greater than 15 feet that occur within 20 feet of final pad grade. The determination of need for over excavation of materials shall be guided by Figure E3 (Appendix E), "Cut Lot (Transitional)" and "Cut-Fill Lot (Transitional") of Geologic and Geotechnical Report; Review of Tentative Tract Map, (Dated February 25, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated April 4, 2003, which provides a foundation grading detail for locations where foundations will straddle transition zones between cut and fill materials.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.1 GEOTECHNICAL RESOURCES (continued)		
	4.1-35 To minimize significant settlements, the upper soils in areas to receive fills shall be removed and replaced with compacted fill. Some minor settlements will be expected due to loads from high fills (e.g., higher than 30 feet). Currently, locations of proposed high fills are: CPT-6, CPT-7, CPT-8, CPT-10, CPT-11, CPT-12, CPT-14, CPT-17, CPT-19, CPT-32 and CPT-33. Most of the settlements due to the load of added fill will occur during and shortly after rough grading is complete. However, since lenses of relatively compressible clayey soils exist below recommended removal depths, some of the fill settlements will not occur until the ground water table is lowered below the compressible clay lenses. Ground water table lowering is usually the result of pumping from water wells. (Note: the project would not directly withdraw groundwater.) Alternatively, the site may be temporarily surcharged with earth fill sufficient to simulate the load increase on the compressible clay lenses due to lowering of the ground water table, as determined by the project Geologist/Geotechnical Consultant.	
	4.1-36 At other alluvial removal areas, potential settlements in Alluvium shall be minimized by the removals and recompaction recommended in Geologic and Geotechnical Report; Review of Tentative Tract Map, (Dated February 25, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated April 4, 2003. Also, potential effects from localized seismically-induced settlements will be attenuated by the recompacted upper layers and proposed additional fills (See of Geologic and Geotechnical Report; Review of Tentative Tract Map, (Dated February 25, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated April 4, 2003).	
	f. Excavations, Shoring and Backfill Recommendations	
	4.1-37 Excavations deeper than 3 feet shall conform to safety requirements for excavations as set forth in the State Construction Safety Orders enforced by the State Division of Industrial Safety, CAL OSHA. Temporary excavations 12 feet or lower shall be no steeper than 1:1 (h:v). For excavations to 20 feet in height, the bottom 3.5 feet may be vertical and the upper portion between 3.5 and 20 feet shall be no steeper than 1.5:1 (h:v). Excavations not complying with these requirements shall be shored. The project Geologist/Geotechnical Consultant shall determine at the time of field inspection if excavation walls in sands and dry soils shall be kept moist, but not saturated at all times.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.1 GEOTECHNICAL RESOURCES (continued)		
	4.1-38 Parameters for design of cantilever and braced shoring shall be provided at the Grading Plan stage.	
	4.1-39 The bases of excavations or trenches shall be firm and unyielding prior to foundations or utility construction. On-site materials other than topsoil or soils with roots or deleterious materials may be used for backfilling excavations. Densification (compaction) by jetting may be used for on site clean sands or imported equivalent of coarser sand provided they have a Sand Equivalent greater than or equal to 30 as determined by ASTM D2419 test method. Specifications for placement of trench backfill shall be adhered to and are presented in Appendix E of Geologic and Geotechnical Report; Review of Tentative Tract Map, (Dated February 25, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated April 4, 2003.	
	g. Expansive Soils Considerations	
	4.1-40 The measures presented in Table E1, Minimum Foundation and Slab Recommendations for Expansive Soils, in Appendix E of Geologic and Geotechnical Report; Review of Tentative Tract Map, (Dated February 25, 2003), prepared by Allan E. Seward Engineering Geology, Inc., and dated April 4, 2003, shall be implemented to minimize the effects of soil expansion potential. It is anticipated that compacted fill from the on-site materials will have a very low to medium expansion potential. The expansion potential of the site soils exposed at rough grade shall be tested again after site grading is complete and the final foundation design shall be based on those expansion test results.	
	h. Corrosivity and Chemical Attack Considerations	
	4.1-41 On-site soils classify as severely corrosive to corrosive to buried metals per County of Los Angeles classification. Pending additional testing, either Type I or II cement may be considered for use in concrete placed in contact with the ground. Mitigating measures for soil corrosivity shall be finalized by the Project Engineer based on additional confirmatory tests that shall be performed at the Grading Plan stage. Final recommendations for concrete shall be in accordance with the latest UBC requirements, and a corrosion specialist shall provide mitigating recommendations for potential corrosion of metals in contact with on-site soils prior to issuance of a Grading Permit.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts		Recommended Mitigation Measures	Residual Impact
4.2 FLOOD			
The project site is located within an unnamed approximately 835-acre tributary watershed of the 1,624 square mile Santa Clara River basin. The Santa Clara River traverses the southern portion of the site. Site clearing and grading operations have the potential to discharge sediment downstream during storm events. Temporary erosion control measures in disturbed areas of the site during the construction phase of the project are proposed to reduce this potential impact to less than significant. Once developed consistently with the proposed Drainage Concept, the Riverpark project would reduce post-development storm water flows from the approximately 835-acre tributary watershed compared to existing conditions during a 50-year Capital Storm event. Specifically, the amount of burned and bulked runoff from the watershed would decrease from 2,225 cubic feet per second (cfs) to 2,1121 cfs, while the amount of debris volume would be reduced from 31,770 cubic yards (cy) to 15,558 cy. This 51 percent reduction in debris volume would be due to upstream debris basins proposed within the site and to the reduction in erosive areas on the site that contribute sediment and debris to the runoff. Implementation of the proposed Drainage Concept would meet the flood control requirements of the City of Santa Clarita and the Flood Control and Watershed Management Divisions of the Los Angeles County Department of Public Works and would reduce impacts to less than significant. There would be no appreciable increases in eroded areas of the riverbed due to buildout of the study area during the 2- 5- and 10-year storm events, and there would be a decrease in eroded areas during the 20-year and greater storm events. Therefore no significant stream erosion and debris deposition impacts are anticipated due to the project.	**a.**	**Mitigation Measures Already Incorporated into the Project** 4.2-1 The on-site storm drains (pipes and reinforced concrete boxes) and open channels shall be designed and constructed for either the 25-year or 50-year Capital Storm. 4.2-2 Debris basins shall be constructed pursuant to Los Angeles County Department of Public Works requirements to intercept flows from undeveloped areas entering into the developed portions of the site. 4.2-3 Energy dissipaters consisting of either rip-rap or larger standard impact type energy dissipaters shall be installed as required by LACDPW at outlet locations to reduce velocities of runoff into the channel where necessary to prevent erosion. 4.2-4 Approximately 6,000 linear feet of buried bank stabilization shall be constructed along the Santa Clara River for residential, park and commercial project development (not including approximately 1,500 feet of toe protection [e.g. A-Jacks™, soil cement or equivalent]), and approximately 3,000 linear feet to allow for the construction of Newhall Ranch Road. Additionally, bridge abutments and piers shall be constructed for the Newhall Ranch Road/Golden Valley Road Bridge.	Not Significant

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.2 FLOOD (continued)		
	4.2-5 The project shall comply with applicable mitigation measures of the Natural River Management Plan.	
	4.2-6 The project is required to comply with the RWQCBLAR Municipal Permit (General MS4 Permit) Order No. 01-182, NPDES No. CAS004001 (adopted December 13, 2001), and with the State's General Construction Activity Storm Water Permit, California State Water Resources Control Board Order No. 99-08-DWQ, National Pollutant Discharge Elimination System (NPDES) No. CAS000002, reissued on April 17, 1997, as amended.	
	b. Mitigation for Construction Impacts	
	4.2-7 All on- and off-site flood control improvements necessary to serve the project are to be constructed to the satisfaction of the City of Santa Clarita and/or County of Los Angeles Department of Public Works Flood Control Division.	
	4.2-8 Prior to start of soil-disturbing activities at the site, a Notice of Intent (NOI) and Storm Water Pollution Prevention Plan (SWPPP) shall be prepared in accordance with and in order to partially fulfill the California State Water Resources Control Board Order No. 99-08-DWQ, NPDES General Permit No. CAS000002 (General Construction Permit). The SWPPP shall meet the applicable provisions of Sections 301 and 402 of the CWA by requiring controls of pollutant discharges that utilize best available technology economically achievable (BAT) and best conventional pollutant control technology (BCT) to reduce pollutants. The SWPPP shall be certified the City of Santa Clarita in accordance with the signatory requirements of the General Construction Permit and implemented concurrently with commencement of the soil-disturbing activity.	
	4.2-9 Per the April 26, 2001 modification to the General Construction Permit, a contingency "Sampling and Analysis Plan" shall be developed in the event that the BMPs implemented at the construction site fail to prevent non-visible pollutants from discharging from the site. BMPs shall be inspected prior to storm events, every 24 hours during extended events, and after the storm events to ensure proper function of the BMPs and to identify necessary repairs in a timely manner. A record of the inspections and repairs shall be documented in the SWPPP.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.2 FLOOD (continued)		
	4.2-10 Following the completion of the construction project and when the site has been stabilized, a Notice of Termination shall be filed with the RWQCBLAR.	
	4.2-11 During all construction phases, temporary erosion control to retain soil and sediment on the site shall be implemented, including: • re-vegetating exposed areas as quickly as possible; • minimizing disturbed areas; • diverting runoff from downstream drainages with earth dikes, temporary drains, slope drains, etc.; • velocity reduction through outlet protection, check dams, and slope roughening/terracing; • dust control measures, such as sand fences, watering, etc.; • stabilizing all disturbed areas with blankets, reinforced channel liners, soil cement, fiber matrices, geotextiles, and/or other erosion resistant soil coverings or treatments; • stabilizing the construction entrance/exist with aggregate underdrain with filter cloth or other comparable method; • placing sediment control BMPs at appropriate locations along the site perimeter and at all operational internal inlets to the storm drain system at all times during the rainy season (sediment control BMPs may include filtration devices and barriers, such as fiber rolls, silt fence, straw bale barriers, and gravel inlet filters, and/or with settling devices, such as sediment traps or basins; and/or • eliminating or reducing, to the extent feasible, non-storm water discharges (e.g., pipe flushing, and fire hydrant flushing, over-watering during dust control, vehicle and equipment wash down) from the construction site through the use of appropriate sediment control BMPs.	
	4.2-12 All necessary permits, agreements, letters of exemption, or a Verification Request Letter from the ACOE and/or the CDFG for project-related development are to be obtained prior to issuance of grading permits.	
	4.2-13 By October 1st of each year, a separate erosion control plan for construction activities shall be submitted to the local municipality describing the erosion control measures that will be implemented during the rainy season (October 1 through April 15).	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.2 FLOOD (continued)		
	c. Mitigation Measures for Operational Impacts	
	4.2-14 A final developed condition hydrology analysis shall be prepared in conjunction with final project design when precise engineering occurs. This final analysis will be done to confirm that the final project design is consistent with this analysis. Those final calculations shall establish design features for the project that satisfy the criterion that post-development peak storm water runoff discharge rates, velocities, and duration in natural drainage systems mimic pre-development conditions. All elements of the storm drain system shall conform to the policies and standards of the Los Angeles County Department of Public Works, Flood Control Division, as applicable.	
	4.2-15 Ultimate project hydrology and debris production calculations shall be prepared by a project engineer to verify the requirements for debris basins and/or desilting inlets.	
	4.2-16 To reduce debris being discharged from the site, debris basins shall be designed and constructed pursuant to LACDPW Flood Control to intercept flows from undeveloped areas entering into the developed portions of the site.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts		Recommended Mitigation Measures	Residual Impact
4.3 TRAFFIC/ACCESS			
At buildout, the proposed project development would generate 13,300 average daily trips. The Riverpark project is located within the Bouquet Canyon Bridge and Thoroughfare District (Bouquet B&T District). This district is considered a full-mitigation district, that is, traffic improvements identified in the district mitigate traffic impacts created by planned growth within the district. In summary, the District has been designed to accommodate the needs of future development anticipated by the City and County General Plans. Mitigation in the form of securing right-of-way for roadways improvements is proposed for four intersections and are considered currently infeasible: Pre-Interim Year (Occupancy of up to 500 units, without Newhall Ranch Road/Golden Valley Road Bridge) • Valencia Boulevard/Magic Mountain Parkway Interim Year (Full-Buildout of Project) • Valencia Boulevard/Magic Mountain Parkway • Bouquet Canyon Road/Soledad Canyon Road • Seco Canyon Road/Bouquet Canyon Road • Whites Canyon Road/Soledad Canyon Road	**a.**	**On-Site Mitigation Measures**	
	4.3-1	The project applicant shall construct all on-site local roadways and intersections to City of Santa Clarita standards.	Significant
	4.3-2	Two future major arterial roadways pass through the project site (Newhall Ranch Road and Santa Clarita Parkway) and are identified as traffic improvements in the Bouquet Bridge and Thoroughfare District. The project shall construct the portions of these arterials that are located within the site boundary to accommodate the project generated traffic; that is a total of two vehicular lanes (one in each direction) on both Newhall Ranch Road and Santa Clarita Parkway. Santa Clarita Parkway shall be extended from its intersection with Newhall Ranch Road, south approximately 1,500 linear feet. The applicant can occupy up to 500 units with the construction of an extension of Newhall Ranch Road easterly to the furthest access point needed for the 500 units. This extension of Newhall Ranch Road for the occupancy of 500 units shall include a total of two vehicular lanes (one in each direction). Prior to occupancy of the 501st unit, Newhall Ranch Road from Bouquet Canyon Road to the Soledad Canyon Road "flyover," including the Newhall Ranch Road/Golden Valley Bridge, shall be constructed and operational with a total of two vehicular lanes (one in each direction).	
	b.	**Off-Site Mitigation Measures** **Pre-Interim Year**	
	4.3-3	Valencia Boulevard & Magic Mountain Parkway: Add 3rd Eastbound Through Lane (requires right-of-way on south side of Valencia Boulevard, presently infeasible).	
	4.3-4	Bouquet Canyon Road & Soledad Canyon Road: Temporary configuration to consist of 3 Southbound Left-Turn Lanes and 2 Southbound Through Lanes. Would revert to 2 Southbound Left-Turn Lanes and 3 Southbound Through Lanes (existing configuration) when Cross-Valley Connector is completed.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.3 TRAFFIC/ACCESS (continued)		
	4.3-5 Seco Canyon Road & Bouquet Canyon Road: Convert 1st Southbound Right-Turn Lane to a shared Left-Turn/Right-Turn Lane (for 1 Left-Turn Lane, 1 shared Left-Turn/Right-Turn Lane, 1 Right-Turn Lane). The improvements at the Bouquet Canyon Road/Soledad Canyon Road intersection consist of reconfiguring the southbound approach to include three left-turn lanes and two through lanes.	
	4.3-6 Bouquet Canyon Road/Newhall Ranch Road: Add 2nd Southbound Left-Turn Lane; Temporary configuration to consist of 3 Northbound Left-Turn Lanes, 3 Northbound Through Lanes and 2 Westbound Right-Turn Lanes. Will revert to 2 Northbound Left-Turn Lanes, 4 Northbound Through Lanes, and 1 Westbound Right-Turn Lane (existing configuration) when Cross-Valley Connector is completed.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts		Recommended Mitigation Measures	Residual Impact
4.3 TRAFFIC/ACCESS (continued)			
Mitigation that will reduce the project's impact to a level of insignificance is presently infeasible at the above-identified four intersections for the following reasons. First, the identified mitigation requires the acquisition of additional property for right-of-way, property not controlled by the applicant. Eminent domain may reasonably be seen as necessary to make the necessary acquisitions. Second, the mitigation would require relocation of on-site improvements on properties at the affected intersections. Finally, the mitigation could force the relocation of existing businesses at the affected intersections. Affected intersections are illustrated with photographs depicting right-of-way encroachment in **Appendix 4.3, Traffic/Access.** The City has determined that the affected intersections are built-out and generally recognizes the infeasibility of additional improvements at such intersection, with the exception of the Bouquet Canyon Road/Soledad Canyon Road intersection. The Bouquet Canyon Road/Soledad Canyon Road intersection improvements are expected to occur in Spring 2004. Upon completion of these improvements, this intersection will be considered built out. The City of Santa Clarita General Plan Circulation Element states, "Existing street improvements are, in some cases, not able to be modified to accommodate additional traffic or circulation movements due to right-of-way limitations and existing development."		**Interim Year**	
	4.3-7	McBean Parkway & Newhall Ranch Road: Add 4th Eastbound Through Lane. Add 4th Westbound Through lane.	Significant
	4.3-8	Valencia Boulevard & Magic Mountain Parkway: Add 3rd Eastbound Through Lane (requires right-of-way on south side of Valencia Boulevard, presently infeasible).	
	4.3-9	Seco Canyon Road & Bouquet Canyon Road: Add 1st Westbound Right-Turn Lane (requires right-of-way, presently infeasible). Convert 1st Southbound Right-Turn Lane to a shared Left-Turn/Right-Turn Lane (for 1 Left-Turn Lane, 1 shared Left-Turn Lane/Right-Turn Lane, 1 Right-Turn Lane).	
	4.3-10	Bouquet Canyon Road & Soledad Canyon Road: Add 4th Northbound Through Lane. (Requires right-of-way on Southeast Corner of Intersection along Bouquet Canyon Road, presently infeasible.)	
	4.3-11	Bouquet Canyon Road & Newhall Ranch Road: Add 4th Eastbound Through Lane and Add 4th Westbound Through Lane.	
	4.3-12	Whites Canyon & Soledad Canyon Road: Add 2nd dedicated Northbound Left-Turn Lane & convert shared Northbound Left-Turn/Through Lane to 3rd dedicated Through Lane (requires right-of-way on southeast side of intersection along Whites Canyon Road, presently infeasible) or Add 1st Eastbound Right-Turn Lane (requires right-of-way on southwest corner of intersection along Soledad Canyon Road, presently infeasible).	
		Alternative Interim Year (Not a Part of the Proposed Project)	
	4.3-13	McBean Parkway & Newhall Ranch Road: Add 4th Eastbound Through Lane. Add 4th Westbound Through Lane.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.3 TRAFFIC/ACCESS		
This language in the adopted General Plan acknowledges that the benefits of improvements at such intersections are not outweighed by a combination of the potential time and cost of actions that may necessary to acquire the property, the physical and economic costs to businesses at the affected intersections, and the social costs that could occur if businesses were forced to relocate in order to continue to operate. Consequently, these improvements will not be able to be made and impacts would be unavoidable and significant and a statement of overriding considerations would be necessary.	4.3-14 Valencia Boulevard & Magic Mountain Parkway: Add 3rd Eastbound Through Lane (requires right-of-way on south side of Valencia Boulevard, presently infeasible). 4.3-15 Seco Canyon Road & Bouquet Canyon Road: Convert 1st Southbound Right-Turn Lane to a shared Left-Turn/Right-Turn Lane (for 1 Left-Turn Lane, 1 shared Left-Turn Lane/Right-Turn Lane, 1 Right-Turn Lane). 4.3-16 Bouquet Canyon Road & Soledad Canyon Road: Add 4th Northbound Through lane (requires right-of-way on Southeast Corner of Intersection along Bouquet Canyon Road, presently infeasible). 4.3-17 Bouquet Canyon Road and Newhall Ranch Road: Add 4th Eastbound Through Lane Add 4th Westbound Through Lane. **c. Other Mitigation** 4.3-18 Applicable transit mitigation fees will be paid at the time of final map recordation. 4.3-19 If additional fixed route service will be needed near the project site in the future, as determined by the City of Santa Clarita, the project developer(s) shall coordinate with the transit provider to identify appropriate bus stop/turnout locations. **d. Cumulative Mitigation** 4.3-20 The project shall fund its calculated fair share of improvements to augment the capacities of affected roadways.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.4 AIR QUALITY		
Construction-related emissions would be generated by on-site stationary sources, on- and off-road heavy-duty construction vehicles, and construction worker vehicles. Operation-related emissions would be generated by on-site and off-site stationary sources and by mobile sources. During the 51-month construction phase, emissions of carbon monoxide (CO), volatile organic compounds (VOC), oxides of nitrogen (NO_x) and particulate matter (10 micron) (PM_{10}) would exceed thresholds of significance recommended by the South Coast Air Quality Management District (SCAQMD) for approximately 13, 36, 26, and 12 months, respectively. At project buildout, operational emissions of CO, VOC, NO_x, and PM_{10} would exceed SCAQMD thresholds, primarily due to mobile source emissions in the summertime and, in the wintertime, to mobile source and fireplace/wood-burning stove emissions. Feasible mitigation measures would be implemented that would reduce construction-related and operational-related emissions to the maximum extent feasible. However, no feasible mitigation exists which would reduce the project's construction-related emissions of VOC, NO_x, or PM_{10} to below the SCAQMD's recommended thresholds of significance. No feasible mitigation exists to reduce the project's operational emissions of CO, VOC, or NO_x to less than significant. Therefore, the project's construction-related and operation-related emissions would be considered unavoidably significant.	The SCAQMD has also prepared a list of measures that could be implemented by new projects to reduce the impacts of operation-related emissions. Measures already incorporated in the project include retail services in close proximity to a residential subdivision; constructing off-site bicycle trails linking the project to designated bicycle routes; providing through paseos a safe, pedestrian-friendly environment; bus stops and providing shade trees to reduce building heating/cooling needs. **a. Mitigation for Construction Impacts** The SCAQMD has prepared a list of measures to reduce the impacts of construction-related emissions to the greatest extent possible. Those that could be feasibly implemented during the development of the project are as follows: 4.1-1 To the maximum extent feasible, develop and implement a construction management plan, as approved by the City, which includes the following measures recommended by the SCAQMD, or equivalently effective measures approved by the SCAQMD: a. Configure construction parking to minimize traffic interference. b. Provide temporary traffic controls during all phases of construction activities to maintain traffic flow (e.g., flag person). c. Schedule construction activities that affect traffic flow on the arterial system to off-peak hours. d. Re-route construction trucks away from congested streets.	Significant

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts		Recommended Mitigation Measures	Residual Impact
4.4 AIR QUALITY (continued)			
		e. Consolidate truck deliveries when possible. f. Provide dedicated turn lanes for movement of construction trucks and equipment on- and off-site. g. Maintain equipment and vehicle engines in good condition and in proper tune as per manufacturers' specifications and per SCAQMD rules, to minimize exhaust emissions. h. Suspend use of all construction equipment operations during second stage smog alerts. Contact the SCAQMD at 800/242-4022 for daily forecasts. i. Use electricity from power poles rather than temporary diesel- or gasoline-powered generators. j. Use methanol- or natural gas-powered mobile equipment and pile drivers instead of diesel if readily available at competitive prices. k. Use propane- or butane-powered on-site mobile equipment instead of gasoline if readily available at competitive prices.	
The SCAQMD's criteria of annual emission reductions of one percent for CO, VOC, NO_x, PM_{10}, and oxides of sulfur (SO_x), were used to assess cumulative air quality impacts. Through site planning, proposed design features, and with implementation of the mitigation measures recommended in this section, the project would reduce wintertime emissions for CO, VOC, NO_x, and PM_{10} by 75.3, 91.8, 29.5, and 85.3 percent, respectively. During the summer, these emissions would be reduced by 4.6, 17.7, 9.3, and 4.2 percent, respectively. Therefore, cumulative air quality impacts would not be significant given the cumulative project thresholds of significance of the SCAQMD's CEQA Air Quality Guidelines, and the fact that the project's population forecast is consistent with the SCAQMD's 2003 Air Quality Management Plan. However, because the project's operational-related CO, VOC, NO_x, and PM_{10} emissions would exceed the SCAQMD's project-specific thresholds of significance, even with all feasible mitigation, project implementation will result in a cumulatively significant and unavoidable air quality impact. This is considered a conservative and "worst-case" approach for estimating the project's cumulative air quality impacts.		4.4-2 To the maximum extent feasible, develop and implement a dust control plan, as approved by the City, which includes the following measures recommended by the SCAQMD, or equivalently effective measures approved by the SCAQMD: a. Apply approved non-toxic chemical soil stabilizers according to manufacturer's specification to all inactive construction areas (previously graded areas inactive for four days or more). b. Replace ground cover in disturbed areas as quickly as possible. c. Enclose, cover, water twice daily, or apply approved soil binders to exposed piles (i.e., gravel, sand, dirt) according to manufacturers' specifications. d. Water active grading sites at least twice daily. e. Suspend all excavating and grading operations when wind speeds (as instantaneous gusts) exceed 25 mph. f. Provide temporary wind fencing consisting of 3- to 5-foot barriers with 50 percent or less porosity along the perimeter of sites that have been cleared or are being graded. g. All trucks hauling dirt, sand, soil, or other loose materials are to be covered or should maintain at least two feet of freeboard (i.e., minimum vertical distance between top of the load and the top of the trailer), in accordance with Section 23114 of the California Vehicle Code.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.4 AIR QUALITY (continued)	h. Sweep streets at the end of the day if visible soil material is carried over to adjacent roads (recommend water sweepers using reclaimed water if readily available). i. Install wheel washers where vehicles enter and exit unpaved roads onto paved roads, or wash off trucks and any equipment leaving the site each trip. j. Apply water three times daily or chemical soil stabilizers according to manufacturers' specifications to all unpaved parking or staging areas or unpaved road surfaces. k. Enforce traffic speed limits of 15 mph or less on all unpaved roads. l. Pave construction roads when the specific roadway path would be utilized for 120 days or more. 4.4-3 Comply with Title 24 of the UBC energy conservation requirements. 4.4-4 Restaurants with an under-fired charbroiler shall obtain a permit from the SCAQMD prior to an issuance of an occupancy permit. 4.4-5 Gas stations shall obtain a permit from the SCAQMD prior to issuance of an occupancy permit. 4.4-6 Any dry cleaners proposing to locate on site shall conduct cleaning operations at an off-site previously SCAQMD permitted location. No on-site dry cleaning operations will be permitted to occupy space in the commercial area. 4.4-7 Applicable transit mitigation fees shall be paid at the time of final map recordation. 4.4-8 All on- and off-road construction equipment shall to the extent feasible, as determined by the City of Santa Clarita use aqueous fuel. Aqueous fuel is a stable emulsion of up to 55 percent water and petroleum-based naphtha (a petroleum product from the earliest stages of the refinery process), with trace amounts of bonding and winterizing agents. It can be used to run both gasoline and diesel engines. Aqueous fuel is clean-burning and, based on information provided in the URBEMIS2002 model for its use in construction equipment, it can reduce NO_x emissions by 14 percent and PM_{10} emissions by 63 percent.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.4 AIR QUALITY (continued)		
	4.4-9 All on- and off-road construction equipment shall, to the extent feasible as determined by the City of Santa Clarita, employ cooled exhaust gas recirculation technology. Cooled exhaust gas recirculation (EGR) reduces CO, VOC, NO_x, and PM_{10} emissions as follows: Oxygen is required for fuel to be burnt in a combustion engine. The high temperatures found within combustion engines cause nitrogen in the surrounding air to react with any unused oxygen from the combustion process to form NO_x. EGR technology directs some of the exhaust gases that have already been used by the engine and no longer contain much oxygen back into the intake of the engine. By mixing the exhaust gases with fresh air, the amount of oxygen entering the engine is reduced. Since there is less oxygen to react with, fewer nitrogen oxides are formed, the amount of nitrogen oxides that a vehicle releases into the atmosphere is decreased. Based on information provided in the URBEMIS2002 model for its use in construction equipment, cooled exhaust gas recirculation technology can reduce CO and VOC emissions by 90 percent, NO_x emissions by 40 percent and PM_{10} emissions by 85 percent. Because **Mitigation Measures 4.4-8** and **4.4-9** are based on technology unproven on a large scale, these mitigation measures may be infeasible. **b. Mitigation for Operation Impacts** **Stationary Sources** The following are additional SCAQMD measures and others that may be feasibly implemented by the project. Other potential measures listed in the CEQA Air Quality Handbook were not applicable to the project due to the type or size of proposed development and were considered infeasible. These measures are identified in the Estimated Emissions Reductions Efficiencies spreadsheet in **Appendix 4.4** along with explanations of why they are infeasible and not applicable to the project. 4.4-10 Utilize low emission water heaters in residential and commercial uses to reduce natural gas consumption and emissions. 4.4-11 Residential uses are to utilize built-in energy-efficient appliances (e.g., stoves, ovens, refrigerators) to reduce energy consumption and emissions.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.4 AIR QUALITY (continued)		
	4.4-12 Residential uses are to utilize energy-efficient and automated controls for air conditioners to reduce energy consumption and emissions.	
	4.4-13 Wood-burning fireplaces and stoves shall be prohibited in all residential units. Use of wood in fireplaces and wood-burning stoves shall be prohibited through project CC&Rs. Permits shall not be issued by the City of Santa Clarita for wood-burning stoves.	
	4.4-14 Install special sunlight-filtering window coatings or double-paned windows in residential uses to reduce thermal gain or loss.	
	4.4-15 Utilize automatic lighting on/off controls and energy-efficient lighting in new residential common area construction (including parking areas) to reduce electricity consumption and associated emissions.	
	4.4-16 To the extent feasible, orient living spaces in residential structures so they face to the north.	
	4.4-17 Use light-colored roofing materials in new residential construction as opposed to dark roofing materials. These materials would reflect, rather than absorb, sunlight and minimize heat gains in buildings. This measure would lessen the overall demand for mechanical air conditioning systems.	
	4.4-18 Multi-family and commercial uses shall use central water heating systems.	
	Mobile Sources	
	4.4-19 If Santa Clarita Transit determines that additional fixed route service will be needed near the project site in the future, the project developer(s) shall coordinate with the transit provider to identify and provide for appropriate bus stop/turnout locations.	
	4.4-20 Synchronize traffic lights on streets impacted by project development.	
	4.4-21 The project applicant shall construct bicycle facility improvements, such as bike lanes in roadways and wider-than-required sidewalks with bike paths within and adjacent to residential subdivisions at the time the roads are constructed.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.4 AIR QUALITY (continued)		
	4.4-22 Kiosks with local transit and Metrolink information shall be constructed by the project applicant adjacent to selected future bus stops prior to initiation of bus service to the site.	
	4.4-23 The sellers of new residential units shall distribute brochures and other relevant information published by the SCAQMD or similar organization to new homeowners regarding the importance of reducing vehicle miles traveled, energy saving appliances, and related air quality impacts, as well as information on local opportunities for public transit and ridesharing.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts		Recommended Mitigation Measures	Residual Impact
4.5 NOISE			
Mitigation measures recommended to reduce construction-related noise impacts would reduce the magnitude of those impacts; however, the potential for construction-related noise levels to exceed normally acceptable noise levels in the Noise Element Guidelines would remain. Therefore, construction-related noise impacts are considered unavoidably significant. Even with construction of the sound walls as proposed and with implementation of the mitigation measures recommended in this section, the project would result in unavoidably significant long-term mobile source noise impacts both on and off the project site. In addition, should they occur, on-site noise levels in excess of 55 dB(A) CNEL from activities at Saugus Speedway would be unavoidably significant under Section 11.44.040 of the Noise Ordinance. Because noise levels at many sensitive receptors in the project study area already exceed normally acceptable levels under the Noise Element's Noise and Land Use Compatibility Guidelines, any noise increases as a result of cumulative projects would result in significant and unavoidable noise impacts at sensitive receptors along the following roadway segments: • Bouquet Canyon Road n/o Newhall Ranch Road, • Bouquet Canyon Road e/o Seco Canyon Road, • Bouquet Canyon Road e/o Santa Clarita Parkway, • Bouquet Canyon Road s/o Soledad Canyon Road, • Golden Valley Road w/o SR-14, • Magic Mountain Parkway w/o San Fernando Road, • Newhall Ranch Road w/o Hillsborough Way, • Newhall Ranch Road w/o Bouquet Canyon Road, • Rainbow Glen Drive s/o Soledad Canyon Road, • Seco Canyon Road n/o Bouquet Canyon Road, • Soledad Canyon Road e/o Santa Clarita Parkway, • Soledad Canyon Road e/o Rainbow Glen Drive, • Soledad Canyon Road w/o Whites Canyon, • Valencia Boulevard s/o Magic Mountain Parkway, • Via Princessa e/o Rainbow Glen Drive, • Via Princessa w/o Whites Canyon Road, and • Whites Canyon Road n/o Soledad Canyon Road.	a.	**Mitigation Measures Already Incorporated into the Project**	Significant
	4.5-1	Lots 1 and 2 (Area A1): A 6-foot high continuous solid masonry wall along the rear yard lot lines of Lots 1 and 2 and wrapping around Lot 1 to "C" Street.	
	4.5-2	Lots 56, 57, and 60 to 72 (Area A1): A 7-foot high masonry wall and 3-foot high continuous berm along the rear yards of Lots 56, 57, and 60 to 72, wrapping around the rear yard of Lot 56 as it backs on to "A" Street.	
	4.5-3	Lots 158 to 176 (Area A1): A 7-foot high masonry wall and 3-foot high continuous berm along Newhall Ranch Road and the western lot line of Lot 176.	
	4.5-4	Lot 132 (Area A1): A 6-foot high continuous solid masonry wall along Newhall Ranch Road extending approximately 200 feet easterly from the 10-foot wall/berm at the northeastern corner of Lot 158.	
	4.5-5	Lots 251 to 260 (Area A2): A 7-foot high masonry wall and 3-foot high continuous berm along the western edge of Santa Clarita Parkway from a point across from "Q" Street to the southeastern corner of Lot 251, wrapping continuously around the southern lot line of Lot 251.	
	4.5-6	Lots 294, 295, 313, 314, 337, and 338 (Area A2): A 6-foot high continuous solid masonry wall along the property lines of Lots 294, 295, 313, 314, 337, and 338 along Santa Clarita Parkway at the proposed pad elevations for each lot.	
	4.5-7	Lots 368, 375 to 378 (Area B): A 6-foot high continuous solid masonry wall along the side and rear of Lot 368, and the rear lot lines of Lots 375 to 378.	
	4.5-8	Lot 457 (Area B): A 6-foot high continuous solid wall along the southern rear yard of Lot 457 that backs onto "R" Street.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.5 NOISE (continued)		
	4.5-9 Lots 441, 442, 448, 449, 456, and 457 (Area B): A 7-foot high masonry wall and 3-foot high continuous berm along Santa Clarita Parkway along Lots 441, 442, 448, 449, 456, and 457. The berm/masonry wall also "wraps around" the northern boundary of Lot 441 as it backs onto "Q" Street.	
	4.5-10 Lot 434 (Area B): A 6-foot high continuous solid masonry wall along the southern boundary of Lot 4334 as it backs onto "Q" Street.	
	4.5-11 Lots 421 to 434 (Area B): A 7-foot high masonry wall and 3-foot high continuous berm along the rear lot lines of Lots 421 to 434 that back onto Santa Clarita Parkway and Newhall Ranch Road.	
	4.5-12 Area B: A 7-foot high masonry wall and 3-foot high continuous berm along Newhall Ranch Road from the northeastern corner of Lot 421 to the northwestern corner of Lot 513.	
	4.5-13 Lot 521 (Area C): A 6-foot high continuous solid masonry wall at the top of slope along the frontage of Lot 521 with Newhall Ranch Road and "wrapping around" the driveway entrance for a distance of approximately 150 feet.	
	4.5-14 Lot 519 (Area C): A 6-foot high continuous solid masonry wall at the top of slope along the frontage of Lot 519 with Newhall Ranch Road and Future Golden Valley Road, and "wrapping around" the driveway entrance for a distance of approximately 150 feet.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.5 NOISE (continued)		
	b. Construction Noise Mitigation	
	4.5-15 Pursuant to Section 11.44.080 of the City's Noise Ordinance, no construction work shall occur within 300 feet of occupied residences except between the hours of 7:00 AM and 7:00 PM Monday through Friday, and between 8:00 AM and 6:00 PM on Saturday. No construction work shall occur on Sundays, New Year's Day, Independence Day, Thanksgiving Day, Christmas Day, Memorial Day, and Labor Day.	
	4.5-16 When construction operations occur within 300 feet of on- or off-site occupied residences, and when it is determined by City staff during routine construction site inspections that the construction equipment could generate a noise level at those residences that would be in excess of normally acceptable noise levels of the City's Noise and Land Use Compatibility Guidelines, implement appropriate additional noise reduction measures. These measures shall include among other things changing the location of stationary construction equipment, shutting off idling equipment, notifying residents in advance of construction work, and installing temporary acoustic barriers around stationary construction noise sources.	
	4.5-17 Locate construction staging areas on site to maximize the distance between staging areas and occupied on- and off-site residences, including those within the adjacent mobile home park and the Emblem tract.	
	c. Operational Noise Mitigation	
	In addition to the traffic mitigation measures included in **Section 4.3, Traffic/Access**, the following measures are recommended to ensure that operational noise levels, experienced at buildout with future traffic volumes, do not exceed the normally acceptable noise levels set forth in the Noise Element Guidelines.	
	4.5-18 Lot 60 (Area A1): A 6-foot high continuous masonry wall shall be constructed along the western side yard of Lot 60.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.5 NOISE (continued)		
	4.5-19 Balconies are considered exterior living areas and must also meet the exterior noise standard. Therefore, balconies shall either be discouraged on residential units where they would be exposed to exterior noise levels greater than the 60 dB(A) CNEL standard for single family residences or the 65 dB(A) CNEL standard for multi-family residences through architectural or site design, or balconies in such areas shall be enclosed by solid noise barriers, such as 3/8-inch glass or 5/8-inch Plexiglas to a height specified by a qualified noise consultant.	
	4.5-20 Interior noise environments of all residential units within the project shall not exceed 45 dB(A).	
	4.5-21 Prior to issuance of building permits, a detailed acoustic analysis shall be performed for all residence in areas subject to noise levels in excess of normally acceptable noise levels for that use. The analysis shall be based upon final site grades, building orientation, and noise exposure, and shall specify all practical noise insulation features necessary to ensure interior residential noise environments do not exceed 45 dB(A). These noise insulation features may include, but are not limited to, the following: a. All windows, both fixed and operable, shall consist of either double-strength glass or double-paned glass. All windows facing sound waves generated from the mobile source noise shall be manufactured and installed to specifications that prevent any sound from window vibration caused by the noise source. b. Doors shall solid core and shall be acoustically designed with gasketed stops and integral drop seals. c. If necessitated by the architectural design of a structure, special insulation or design features shall be installed to meet the required interior ambient noise level. d. The exterior walls of living areas shall be of a special type construction and/or include special insulation, depending on the maximum ambient noise levels generated at any time in a particular area.	
	4.5-22 Air conditioning units shall be installed to serve all living areas of all residences with direct lines of sight to Newhall Ranch Road, Santa Clarita Parkway, Golden Valley Parkway, or Soledad Canyon Road.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.5 NOISE		
	4.5-23 Delivery Truck Noise Impacts on Lot 525 (Area D): A minimum 6-foot high solid masonry wall with a 2-foot berm shall be constructed along the western edge of Lot 525 (multi-family, Area D) between the off-site commercial use to the west and the apartment units.	
	4.5-24 Prior to final map approval, another noise impact analysis on the tract shall be performed by a qualified acoustical consultant to ensure noise levels within the project are consistent with this analysis and the City's Noise Element Guidelines.	
	4.5-25 Prior to sale of any single-family residential lot within Riverpark, future homeowners shall be informed via language in the disclosure documents the presence of the Saugus Speedway facility, the types of events that can potentially occur at the speedway, the expected frequency of their occurrence, and that noise from events at the speedway may be intermittently audible at their properties during daytime, evening, and late night hours.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts		Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES			
All impacts that are associated with the implementation of this proposed project can be mitigated to a level less than significant except the following: • The total net loss of 280 acres of wildlife habitat/natural open space as a result of conversion of undeveloped property to developed. Though over 400 acres of the site will remain as open space and some of the habitat can be restored and enhanced within remaining open space areas of the site, and measures exist to replace the loss of some habitat, there will still be a net loss of habitat for wildlife and open space that cannot be replaced. This net loss represents a significant unavoidable impact. • Impacts to riverine habitat (as identified by the resource line) and associated riverbed. While riparian vegetation can be planted and enhanced along preserved portions of the river, there will still be a net loss of 25.5 acres of riparian and riverbed habitat that ultimately cannot be replaced. This net loss represents a significant unavoidable impact. • Impacts to adjacent upland habitat within 100 feet of the riparian resource line. While the 100-foot setback threshold will be upheld in several areas along the river, this threshold will not be met along substantial portions of the project. Those portions of the project site that provide less than 100 feet of preserve upland habitat adjacent to the resource line represent a significant unavoidable impact.	a.	**Mitigation Measures Incorporated into the Project**	
	4.6-1	To minimize significant impacts of the project on biological resources, the applicant has incorporated the following measures from the NRMP into this Draft EIR: a. Construction activities in the riverbed shall be restricted to the following areas of temporary disturbance: (1) an 85-foot-wide zone that extends into the river from the base of the rip-rap gunite or soil cement bank protection from where it intercepts the river bottom; (2) 100 feet on either side of the outer edge of a new bridge or bridge to be modified; (3) 50-foot-wide corridor for all utility lines; and (4) 20-foot-wide temporary access ramps and roads to reach construction sites. The locations of these temporary construction sites and the routes of all access roads shall be shown on maps submitted with the Verification Request Letter submitted to the ACOE and CDFG for individual project approval. The construction plans should indicate what type of vegetation, if any, would be temporarily disturbed and the post-construction activities to facilitate natural revegetation of the temporarily disturbed areas. b. All native riparian trees in temporary construction areas with a 4-inch dbh or greater shall be replaced at a 3:1 ratio using 1 to 5 gallon container plants in the temporary construction areas in the winter following the construction disturbance. The growth and survival of the replacement trees shall meet the performance standards specified in later mitigation measures. In addition, the growth and survival of the planted trees shall be monitored for five years in accordance with the methods and reporting procedures specified in a later mitigation measure.	Significant

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact

4.6 BIOLOGICAL RESOURCES (continued)

Indirect impacts associated with this cumulative project are not quantifiable but are reasonably foreseeable. Such impacts would come primarily through an increase in vehicular traffic across the bridge route itself and the increase light and glare cause by its use. Stormwater runoff from the bridge and roadway would also occur. Various pollutants related to vehicular traffic (e.g., rubber from tires, hydrocarbons from engine exhaust, etc.) would be expected to wash off the road surface into the river and degrade habitat if left unmitigated. Construction activities themselves would also be expected to temporarily and permanently impact habitat along the river corridor. As with the proposed project alone, impacts cause by this cumulative project would, in combination with the proposed project, result in significant indirect biological impacts. A total of 2.8 acres of habitat within Santa Clara River SEA will be disturbed or converted to urban use as a result of Santa Clarita Parkway Bridge construction. Approximately 0.5 acre will be temporarily disturbed as a result of proposed bank stabilization activities and will be replaced upon completion of the bank stabilization to protect the bridge structure. Within the SEA boundaries, a total of 1.5 acres of riverwash, 0.2 acre of southern riparian scrub, and 0.5 acres of disked field representing a total of 2.2 acres of SEA habitat will be permanently lost as a result of this cumulative project. The locations of these impacts are generally along the northern and southern bank of the Santa Clara in the central portion of the project site.

Because of the relatively small amount of each habitat type within the SEA to be removed, like with the proposed project, the permanent loss of an additional 2.2 acres of habitat within the SEA boundaries is not expected to detract from the overall integrity and value of the SEA, in and of itself. In particular, this loss of area will not adversely affect the unarmored three-spine stickleback, the state and federally listed Endangered fish species for which the SEA was originally designed to protect. However, because of the overall sensitivity of SEAs, and because any permanent loss of habitat within a SEA will effectively reduce the overall size of the SEA, any net loss of land within a SEA is considered a significant impact. Therefore, the permanent loss of an additional 2.2 acres of SEA habitat is considered a significant cumulative impact.

c. Native vegetation within temporary construction areas shall be mulched and spread over the temporary impact areas once construction is completed in order to facilitate revegetation. Areas temporarily disturbed by construction activities shall also be weeded annually, as needed, for up to five years following construction. These areas shall be annually monitored for five years after construction to document colonization by weeds and native plants. Weeds shall be removed by hand, an approved herbicide application, and/or by equipment. In the event that native plant cover does not reach 50 percent of the pre-construction native plant cover within three years, the applicant shall revegetate the temporary construction area in accordance with the methods specified in later mitigation measures. Annual monitoring reports on the status of the natural recovery of temporarily disturbed areas shall be submitted to the ACOE and CDFG as part of the Annual Mitigation Status Report and Mitigation Accounting Form to be submitted to the ACOE and CDFG by April 1st of each year.

d. Permanent removal of riparian habitats shall be replaced by creating riparian habitats of similar functions and values in the project area. Wetland restoration shall be in-kind and at a 1:1 replacement ratio (except as indicated in **Item f.**, below, for new habitat installed two years in advance of the removal of habitat at the construction site. If replacement habitat cannot be installed two years in advance of the project, the ratios listed below will apply. As described in **Item c.**, lower replacement ratios may be appropriate if an ACOE-approved hydrogeomorphic method (HGM) of assessing replacement ratios indicates lower ratios would ensure replacement of habitat values and functions.

Timing Mitigation	Value of Habitat of Affected	Proposed Ratio Required for Revegetation
Habitat installation completed 2 years or more prior to construction impact	N/A	1:1
Habitat installation completed less than 2 years in advance of impact	Low	1:1
	Medium	2:1
	High	3:1

* High (NRMP EIS/EIR mapping units 1, 2, 3, 6), Medium (NRMP EIS/EIR mapping units 4, 7), Low (NRMP EIS/EIR mapping units 5, 8)

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued) Potentially significant cumulative impacts could occur to various environmental biological resources due to the combined impacts of the proposed project and following nearby projects: Santa Clarita Parkway extension, Tesoro del Valle, Newhall Ranch Specific Plan, West Creek, North Valencia II Specific Plan, Valencia Commerce Center, and Curtis Sand and Gravel Mine Expansion. These resources include upland habitats such as coastal sage scrub, oak trees, riparian habitat associated with Santa Clara River, wildlife movement corridors, special-status species (including unarmored three-spine stickleback and arroyo toad), resources within SEA 23, and increased use of sensitive riparian resources by human and domestic animals. Potentially significant cumulative impacts include loss of riparian habitat, disturbance of riparian wildlife habitat due to nearby urban development, and effects on habitat for the unarmored three-spine stickleback, least Bell's vireo, and the arroyo toad, when present. While most of these projects include the implementation of measures that will mitigate specific biological impacts, most will still result in a net loss of biological resources, particularly natural habitat areas. Because of the high biological value of riparian and wetland habitats and because of the continued loss of these habitats throughout the region, the proposed Riverpark project's contribution to this loss, although relatively small, is considered a significant cumulative impact, both to the vegetation community itself, as well as to its value to the riparian ecosystem. Because of the time it takes for oak trees to reach maturity and contribute biological values equal to that currently occurring on the site, and due to continued loss of these trees in the region, the project's contribution to this loss is considered a significant cumulative impact. Continued development in the area also cumulatively contributes to the increase of humans and domestic animals. Because of the substantial amount of disturbance to sensitive resource areas posed by this increase, the project's contribution to this increase is also considered cumulatively significant. Although the proposed project minimizes impacts to the biological resources within the SEA, the net loss of habitat within the SEA, combined with net losses of SEA habitats from other projects, effectively reduces the overall size of the SEA and is considered a significant cumulative impact.	e. Creation of new riparian habitats shall occur at suitable sites in or adjacent to the watercourses included in the NRMP. Habitat restoration sites in the riverbed shall only be located in areas where the predominant habitats present are dry open floodplain, weedy herbaceous, or their functional equivalent. The highest priority habitat restoration sites should be new riverbed areas created during the excavation of uplands for bank protection. Restoration sites may also occur at locations outside the riverbed where there is appropriate hydrologic conditions to create a self-sustaining riparian habitat and where upland and riparian habitat values are absent or very low. All sites shall contain suitable hydrological conditions and surrounding land uses to ensure a self-sustaining functioning riparian habitat. Candidate restoration sites shall be selected by the applicant described in the Annual Mitigation Status Report that will be submitted to the ACOE by April 1st of each year. Sites will be approved when restoration plans are submitted to the ACOE and CDFG as part of the Verification Request Letters submitted for individual projects, or as part of the Annual Mitigation Status Report and Mitigation Accounting Form.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued) When the potential cumulative effects of the above mentioned projects are viewed from a regional wildlife movement perspective, the major movement corridors between the Santa Clara River Valley and the Santa Susana Mountains and Los Padres/Angeles National Forest lands would still be preserved. Therefore, no significant cumulative impacts would occur with respect to regional wildlife movement.	f. Replacement habitat shall be designed to replace the functions and values of the habitats being removed. At this time, the replacement habitat shall be restored in accordance with the acreage replacement ratios described in **Item a**. The replacement habitats shall have similar dominant trees and understory shrubs and herbs as the affected habitats. In addition, the replacement habitats shall be designed to replicate the density and structure of the affected habitats once the replacement habitats have reached mature status. Replacement ratios that are lower than those listed in **Item a.** may be used if an ACOE-approved hydrogeomorphic method (HGM) is applied in which habitat functions and values of both the affected habitat and the replacement habitat are quantified. g. Average plant spacing shall be determined based on an analysis of habitats to be replaced. Typical plant spacing is presented below for use in developing willow-cottonwood woodland habitat as an example only. The applicant shall develop similar tree spacing specifications for habitats to be restored. Plant spacing specifications shall be reviewed and approved by the ACOE and CDFG when restoration plans are submitted to the ACOE as part of the Verification Request Letters submitted to the ACOE and CDFG for individual projects or as part of the Annual Mitigation Status Report and Mitigation Accounting Form.	

Species	Average Plant Spacing (feet)	Height (feet) After 3 years	Height (feet) After 5 years
Arroyo willow	8	10	15
Black willow	8-10	12	18
Sandbar willow	8	4	6
Red willow	8	9	15
Cottonwood	20	7	12

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	h. Each tree and shrub species used in restoration shall have a minimum of 80 percent survival after three years and 70 percent survivorship after five years. Key indicator tree species to be used in the riparian restoration program shall achieve a minimum growth at the end of three years and five years, as described above in **Item e**. Performance standards for cover shall be developed for each individual habitat type being created, based on the observed natural cover in undisturbed habitats in the project area. These standards shall be approved by the ACOE and CDFG after they have reviewed the Annual Mitigation Status Report and Mitigation Accounting Form Minimum growth, survivorship, and cover performance at the mitigation sites shall be measured based on random samples taken during years three and five at each individual mitigation site, or at other sampling intervals if the ACOE' hydrogeomorphic methodology is used by the applicant. i. If the minimum growth, survivorship, and/or cover are not achieved at the time of the three and five year evaluations, then the applicant shall be responsible for taking the appropriate corrective measures as to achieve the specified growth, survivorship, and/or cover criteria. The applicant shall be responsible for any costs incurred during the revegetation or in subsequent corrective measures. If acts of God (flood, fires, or drought) occur after the vegetation has met the three-year criteria for growth, survival, and cover, the applicant will not be responsible for replanting damaged areas. If these events occur prior to the plants meeting the three-year criteria, the applicant shall be responsible for replanting the area one time only. j. The applicant shall be responsible for weeding all restoration sites to prevent an infestation of non-native weeds for a period of five years after the initial habitat restoration, regardless of the success of the planted species. The cover of non-native plant species at the mitigation sites shall not exceed 10 percent at any time, within this five-year period.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	k. Temporary irrigation shall be installed, as necessary, for plant establishment. Irrigation shall continue as needed to meet the three and five-year performance criteria regarding survivorship and growth. Irrigation shall be terminated in the winter to provide the least stress to plants. Removal of the irrigation system shall occur in conjunction with an appropriate "weaning" procedures to minimize plant stress. Irrigation shall be terminated at the earliest opportunity after achieving the five-year criteria. l. As an alternative to the restoration of habitats to compensate for permanent removal of riparian habitats, the applicant (at the discretion of the ACOE and CDFG) may remove exotic plant species from the project area in locations: (1) where there is an infestation of exotics such as *Arundo donax* such that the natural habitat functions and values are substantially degraded and at risk, and where the cover of exotics is equal to or exceeds 25 percent of the ground; or (2) other areas where exotic removal would be strategic in a watershed approach to weed management, as determined by the ACOE and CDFG. The weed removal sites shall be selected in logical manner to ensure that the eradication of weeds from specific sites will contribute to the overall control of exotics in the NRMP watercourses. Removal areas shall be kept free of exotic plant species for five years after initial treatment. In addition, native riparian vegetation must become established through natural colonization and meet the revegetation plant cover goals established by the ACOE and CDFG under **Item f.** after five years. m. The removal program shall utilize methods and procedures approved by the ACOE and CDFG to remove exotics, including but not limited to, mechanical equipment in specific areas, handcutting, and the application of herbicides to stumps. Exotic plant species removal credit will be given as shown below (except when weed removal is used to mitigate for loss of habitat for sensitive riparian bird species where the ACOE and CDFG may require higher ratios). Weed eradication plans shall be submitted to the ACOE and CDFG for approval as part of the Verification Request Letters submitted to the ACOE and CDFG. The plans shall describe the proposed methods and the conditions of the site to be treated. A monitoring program shall be implemented to document the effectiveness of the removal and the natural establishment of native vegetation in the weeded area.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact

4.6 BIOLOGICAL RESOURCES (continued)

Value of Riparian Habitat to be Removed	Mitigation Ratios for Exotic Removal 2 Years in Advance	Mitigation Ratios for Exotic Removal <2 Years in Advance
High (NRMP EIS/EIR mapping units 1, 2, 3, 6)	3:1	4:1
Medium (NRMP EIS/EIR mapping units 4, 7)	2:1	3:1
Low (NRMP EIS/EIR mapping units 5, 8)	1:1	2:1

n. Prior to initiating construction for the installation of bridges, storm drain outlets, utility lines, and/or bank protection, all construction sites and access roads within the riverbed, as well as all riverbed areas within 300 feet of the construction site and access road, shall be inspected by a qualified biologist for the presence of arroyo toads, unarmored three-spine stickleback and arroyo chub. The ACOE and the CDFG shall be notified of the inspection and shall have the option of attending. If either agency is not represented, the biologist shall file a written report of the inspection with the agency not in attendance within 14 days of the survey and no sooner than 30 days prior to any construction work in the riverbed.

o. Construction work areas and access roads shall be cleared of the species listed above immediately before the prescribed work is to be carried out, immediately before any equipment is moved into or through the stream or habitat areas, and immediately before diverting any stream water. The removal of such species shall be conducted by a qualified biologist using procedures approved by the ACOE and CDFG, and with the appropriate collection and handling permits. Species shall be relocated to nearby suitable habitat areas. A plan to relocate these species shall be submitted to the ACOE and CDFG for review and approval no later than 30 days prior to construction. Under no circumstances shall the unarmored three-spine stickleback be collected or relocated, unless USFWS personnel or their agents implement this measure.

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	p. All stream flows traversing a construction site or temporary access road shall be diverted around the site and under access roads (using a temporary culverts or crossings that allow fish passage). A temporary diversion channel shall be constructed using the least damaging method possible, such as blading a narrow pilot channel through an open sandy river bottom. The removal of wetland and riparian vegetation to construct the channel shall be avoided to the greatest extent feasible. The temporary channel shall be connected to a natural channel downstream of the construction site prior to diverting the stream. The integrity of the channel and diversion shall be maintained throughout the construction period. The original stream channel alignment shall be restored after construction, provided suitable conditions are present at the work site after construction. A temporary stream diversion plan shall be included in the Verification Request Letters submitted to the ACOE and CDFG. This procedure can only be implemented if: (1) there are assurances by the applicant that the fully protected unarmored three-spine stickleback will not be taken or possessed; or (2) USFWS personnel or their agents implement this measure. q. A qualified biologist shall be present when any stream diversion takes place, and shall patrol the areas both within, upstream, and downstream of the work area to rescue any species stranded by the diversion of the stream water. Species that are collected shall be relocated to suitable downstream of the work area. Under no circumstances shall the unarmored three-spine stickleback be collected or relocated, unless USFWS personnel or their agents implement this measure.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	r. The removal of any riparian habitat suitable for breeding, nesting, foraging, and temporary usage during migration by special-status species from the project footprint (i.e., boundaries of temporary and permanent impacts) shall be mitigated through the creation or enhancement of similar riparian habitat at an approved mitigation site, or by the removal of exotic species from an area of existing similar habitat. The requirement for replacing suitable habitat by either creating new habitat or removing exotic species from existing habitat shall follow the replacement ratios and timing requirements in later mitigation measures. Habitat to be created to mitigate for the loss of riparian habitat shall be designed specifically to replicate the appropriate species mixture and vegetative structure for these species. Existing habitat to be weeded as mitigation for the loss of riparian habitat must be located adjacent to similar habitat that is to be replaced and infested with invasive weeds. The first priority for habitat mitigation for sensitive bird species will be the creation or restoration of habitat rather than weed removal. The final habitat replacement or exotic removal plans for impacts to these types of habitats shall be reviewed by the ACOE and CDFG. s. Beginning 30 or more days prior to the removal of any suitable riparian habitat that will occur during the riparian bird breeding and nesting season of March 15th through September 1st, the applicant shall arrange for weekly bird surveys to detect the above riparian bird species in the habitats to be removed, and any other such habitat within 300 feet of the construction work areas. The surveys shall be conducted by a qualified biologist using CDFG and/or USFWS survey protocols. The surveys shall continue on a weekly basis, with the last survey being conducted no more than 7 days prior to the initiation of construction work.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	t. In the event that a special-status species is observed in the habitats to be removed or in other habitats within 300 feet of the construction work areas, the applicant has the option of delaying all construction work in the suitable habitat or within 300 feet of the suitable habitat until after September 1st, or continuing the surveys in order to locate any nests. If an active nest is found, clearing and construction within 300 feet of the nest shall be postponed until the nest is vacated and juveniles have fledged, and when there is no evidence of a second attempt at nesting. Limits of construction to avoid a nest site shall be established in the field with flagging and stakes or construction fencing. Construction personnel shall be instructed on the ecological sensitivity of the area. u. Locating and determining the status of a nest shall be performed in accordance with approved procedures by the USSFWS and CDFG. The ACOE and CDFG shall be notified at least 14 days prior to the first scheduled survey and shall have the option of attending. Results of the surveys, including surveys to locate nests, shall be provided to the ACOE and CDFG no later than 5 days prior to construction. The results shall include a description of any nests located and measures to be implemented to avoid nest sites. No surveys will be necessary if the work is completed outside of the riparian bird breeding and nesting season, i.e., from September 1st through March 15th. v. Thirty days prior to construction activities in areas of the "upland impact zone" associated with individual NRMP projects, a qualified biologist shall conduct a survey to capture and relocate individual San Diego and California horned lizard, silvery legless lizard, coastal western whiptail, pallid bat, San Diego black-tailed jackrabbit, and San Diego desert woodrat in order to avoid or minimize take of these sensitive species. Individuals shall be relocated to nearby undisturbed areas with suitable habitat. Pre-construction surveys shall only be conducted in areas dominated by Riversidian coastal sage scrub or coastal sage – chaparral scrub or if construction will occur within 300 feet of native upland habitat. Results of the surveys and relocation efforts shall be provided to CDFG in the Annual Mitigation Status Report. Collection and relocation of animals shall only occur with the proper scientific collection and handling permits.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	w. Construction activities shall be limited to the following areas of temporary disturbance: (1) an 85-foot-wide zone that extends into the river from the base of the rip-rap or gunite bank protection where it intercepts the river bottom; (2) 60 feet on either side of the outer edge of a new bridge or bridge to be modified; (3) 50-foot-wide corridor for all utility lines; and (4) 20-foot-wide temporary access ramps and roads to reach construction sites. The locations of these temporary construction sites and the routes of all access roads shall be shown on maps submitted with the Verification Request Letters for individual projects that are submitted to the CDFG and ACOE. Any variation from these limits shall be noted, with a justification for a variation. The construction plans should indicate what type of vegetation, if any, would be temporarily disturbed, and the post-construction activities to facilitate natural revegetation of the temporarily disturbed areas. The boundaries of the construction site and any temporary access roads within the riverbed shall be marked in the field with stakes and flagging. No construction activities, vehicular access, equipment storage, stockpiling, or significant human intrusion shall occur outside the work area and access roads.	
	x. Equipment shall not be operated in areas of ponded or flowing water unless there are no practicable alternative methods to accomplish the construction work, and only after prior approval by the CDFG and the ACOE. Approval shall be acquired by submitting a request to CDFG and ACOE no later than 30 days prior to construction. The request must contain a biological evaluation demonstrating that no sensitive fish, amphibians, and/or reptiles are currently present, or likely to be present during construction, at the construction site or along access roads.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	y. Temporary sediment retention ponds shall be constructed downstream of construction sites that are located in the riverbed under the following circumstances: (1) the construction site contains flowing or ponded water that drains off site into the undisturbed streamflow or ponds, as allowed for certain areas under **Item a.**, above; or (2) streamflow is diverted around the construction site, but the work is occurring in the period November 1st through April 15th when storm flows could inundate the construction site. The sediment ponds shall be constructed of riverbed material and shall prevent sediment-laden water from reaching undisturbed ponds or streamflows. To the extent feasible, ponds shall be located in barren or sandy river bottom areas devoid of existing riparian scrub, riparian woodland, or aquatic habitat. The ponds shall be maintained and repaired after flooding events, and shall be restored to pre-construction grades and substrate conditions within 30 days after construction has ended at that particular site. The location and design of sediment retention ponds shall be included in the Storm Water Pollution Prevention Plan (SWPPP) prepared by the applicant for all construction activities that require a NPDES General Construction Activity Storm Water Permit.	
	z. Installation of bridges, culverts, or other structures shall not impair movement of fish and aquatic life. Bottoms of temporary culverts shall be placed at or below channel grade. Bottoms of permanent culverts shall be placed below channel grade.	
	aa. Water containing mud, silt, or other pollutants from construction activities shall not be allowed to enter a flowing stream or be placed in locations that may be subject to normal storm flows during periods when storm flows can reasonably be expected to occur.	
	bb. Vehicles shall not be driven or equipment operated in areas of ponded or flowing water, or where wetland vegetation, riparian vegetation, or aquatic organisms may be destroyed, except as otherwise provided for in the 404 Permit or 1603 Agreement.	
	cc. Silt settling basins, installed during the construction process, shall be located away from areas of ponded or flowing water to prevent discolored, silt-bearing water from reaching areas of ponded or flowing water during normal flow regimes.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	dd. If a stream channel has been altered during the construction and/or maintenance operations, its low flow channel shall be returned as nearly as practical to pre-project topographic conditions without creating a possible future bank erosion problem, or a flat wide channel or sluice like area. The gradient of the streambed shall be returned to pre-project grade, to the extent practical, unless it is represents a wetland restoration area. ee. Temporary structures and associated materials not designed to withstand high seasonal flows shall be removed to areas above the high water mark before such flows occur. ff. Staging/storage areas for construction equipment and materials shall be located outside of the ordinary high water mark. gg. Any equipment or vehicles driven and/or operated within or adjacent to the stream shall be checked and maintained daily, to prevent leaks of materials that if introduced to water could be deleterious to aquatic life. hh. Stationary equipment such as motors, pumps, generators, and welders which may be located within the riverbed construction zone shall be positioned over drip pans. No fuel storage tanks shall be allowed in the riverbed. ii. The applicant shall use best efforts to ensure that no debris, bark, slash sawdust, rubbish, cement or concrete or washing thereof, oil, petroleum products, or other organic material from any construction, or associated activity of whatever nature, shall be allowed to enter into, or be placed where it may be washed by rainfall or runoff into, watercourses included in the permit When construction operations are completed, any excess materials or debris shall be removed from the work area. jj. No equipment maintenance shall be done within or near any stream where petroleum products or other pollutants from the equipment may enter these areas with stream flow.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	kk. If water diversions are required to perform work within the Santa Clara River, the applicant shall utilize provisions for the protection of arroyo toad, unarmored three-spine stickleback, arroyo chub, Santa Ana sucker, southwestern pond turtle and two-striped garter snake, including securing appropriate Endangered species permits. Those provisions are as follows: • Prior to initiating construction, the site shall be inspected by a qualified biologist for the presence of the species listed above. The ACOE and the CDFG will be notified of the inspection and will have the option of attending. If either agency is not represented, the biologist will file a written report of the inspection with the agency not in attendance within ten days of completion of the survey. If any of the species listed above are present, the following conditions will apply: – The site shall be surveyed and cleared of the species listed above immediately before the work is to be carried out, immediately before any equipment is moved into or through the stream, and immediately before diverting any stream water. Any species found shall be moved out of the construction area and replaced in the stream in a manner or place to assure their survival. – Blocking nets, or fences with 1/4 inch square mesh, 18 inches high and buried 6 inches, shall be placed upstream and downstream of the work area to assure that none of the species move into the area. ll. A qualified biologist will be present at the moment any stream diversion takes place and will patrol the areas, both within and downstream of the work area, to rescue any species stranded by diversion of stream water. If the possibility exists that additional downstream sections of the stream will be dewatered, additional biologists will be available for downstream patrol. This rescue patrol will continue until all dewatered portions of the stream are determined to be cleared. mm Once the construction site or a portion of the site and work area boundary has been determined to contain none of the species listed above, the site shall be fenced with construction fencing along the riverside and construction personnel and equipment will not enter the river beyond the fence.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	nn. A water control system will be installed to intercept stream flow upstream of the site and carry it around the site. The system will be completed before turning water into it. The process of turning water into the bypass system shall be done so as to minimize sediment movement. • The Operator will use best efforts to insure that no debris, bark, slash, sawdust, rubbish, cement, concrete, or washings thereof, oil or petroleum products, or other organic material from construction or associated activity will be allowed to enter into or be placed where it may be washed by rainfall or runoff into the river. Sediment management best management practices shall be used during construction. • Impacts to Endangered species may require appropriate Endangered species permits. oo. Pilot channels constructed to divert flows around work areas shall be sized to maintain existing water velocities, with wide, shallow channels being utilized. The channel should be kept as small as possible, extending no more than 25 feet upstream and downstream of the work area. Construction of pilot channels should start downstream. Once water is diverted into the new channel, the original channel should be visually inspected and any stranded fish shall be removed and returned to the water downstream of the diversion. Once the diversion is no longer needed, the area shall be restored as closely as practical to its original configuration. pp. The use of a pump to divert flows around a work site is also acceptable. The pump must have at least a 1/4-inch screen. Water should be discharged downstream, within 25 feet of the work area. Any dams installed across flowing water for the diversion shall be removed upon completion of construction and the area shall be restored as closely as practical to its original configuration.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	qq. The Operator shall utilize a Maintenance Notification and Emergency Maintenance Notification forms (Exhibits 1 and 2 of the NRMP) to alert the ACOE and the CDFG of work to be performed. In non-emergency situations, the form should be filled out and faxed or mailed to the ACOE and the CDFG at least two weeks in advance of the work. If the work may adversely impact Endangered species, the ACOE, the CDFG and LACDPW shall meet in the field to resolve the issue. LACDPW may contact the ACOE and the CDFG to identify areas of potential Endangered species habitat. If the ACOE and the CDFG believe the work may adversely impact Endangered species or its habitat resources or the LACDPW wishes to consult with the ACOE and the CDFG, a field meeting will be scheduled. At the field meeting, the ACOE and the CDFG will provide information regarding Endangered or Threatened species that could be impacted by the project. If take of an Endangered species will occur, the appropriate Endangered species permits will be required. To the extent that a USFWS Section 7 and a CDFG Section 2081 Memorandum of Agreement have been completed for the species present, the mitigation measures shall be implemented and construction may proceed as outlined in these documents. rr. The notification is provided to demonstrate consistency with the policies of the NRMP. In non-emergency situations, the ACOE and the CDFG must respond to the notification within 20 working days if they believe that the work is inconsistent with the NRMP, at which time a field meeting will be scheduled to review the site and determine how the work may proceed. If the ACOE and the CDFG do not respond within 20 working days, the work shall proceed as described in the notification. However, appropriate Endangered species permits will be required for impacts to Endangered species.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	b. **Mitigation Measures Recommended by this EIR**	Not Significant
	Resource Management and Monitoring Plan	
	4.6-2 Prior to issuance of a Grading Permit for the project, the applicant shall obtain the services of a qualified biologist who must, at a minimum, have a degree in botany, biology, wildlife biology or ornithology and experience in developing management plans for the flora and fauna, plant community and wildlife habitats found in the Southern California area, to develop a RMMP to serve as a guideline for managing and monitoring mitigation areas for specific species, plant communities, jurisdictional resource areas, and habitats. The RMMP shall be submitted to the City of Santa Clarita Planning & Building Services at least 30 days prior to issuance of a grading permit for the project, and shall include the following: a. A **Planting Plan**, at a minimum, that lists all appropriate native plants to be included in all revegetation mitigation areas. The planting plan shall be developed by a qualified biologist as approved by the City. b. **Procedures** regarding the removal of non-native vegetation, planting of native vegetation, translocation of trees, planting of container stock, irrigation, and equipment use. c. **Maps** that illustrate the specific location of mitigation areas. d. **Procedures outlining monitoring and maintenance activities** including frequency and timing of monitoring visits, plant maintenance, and irrigation maintenance. e. **Specific criteria** that will specify what goals must be accomplished at each mitigation area before the mitigation is deemed a success. f. **Adaptive Management and Contingency actions** that will specify what actions will be taken in the event success criteria are not met. g. **The source of funding** that will be required to successfully carry out all procedures outlined in the RMMP.	
	4.6-3 Unless directed otherwise by a lead agency, responsible agency, or regulatory agency, the monitoring of results will be maintained for a period of five years. The frequency of monitoring visits may vary by task category, but generally quarterly visits are conducted for the first three years followed by two subsequent annual visits. An annual report shall be produced by the biologist conducting the monitoring activities and will be provided to the lead agency and appropriate regulatory agencies.	

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Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	ACOE Waters of the U.S. and CDFG Streambeds	Not Significant
	4.6-4 Newhall shall prepare an amendment or variance to the NRMP and mitigate in accordance with the above requirements.	
	Special-Status Plant Species	Not Significant
	Parry's larkspur, Slender and Plummer's mariposa lilies	
	4.6-5 To minimize direct loss of Parry's larkspur, slender and Plummer's mariposa lilies in areas subject to disturbance, additional field surveys to determine amount of area covered by these species and approximate densities shall be conducted during the appropriate blooming period for these species prior to site preparation and/or grading activities in areas potentially supporting this species. Locations of individual plants or plant populations shall be appropriately flagged and (1) seeds from a representative mix of individual plants shall be collected and sown in appropriate habitats, or on cut slopes, and (2) the bulbs shall be harvested and transplanted to areas of appropriate habitat which are not subject to further disturbance. The goal will be to produce replacement populations of in-kind plants reaching maturity, at a ratio of 1:1 with respect to the number and density of plants (estimated) to be lost. The areas to be preserved and maintained as open space within the Riverpark project site contain habitat suitable to support these species. All seed collecting, planting, and transplanting procedures shall be identified in the RMMP and appropriate management, monitoring, success criteria, and adaptive management guidelines for the mitigation of impacts to these species shall also be identified.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	Oak Trees	
4.6-6	While the majority of oak trees on the site will be retained in place, three live trees will be removed and 12 will be relocated. Appropriate approvals shall be obtained prior to oak trees being removed, subject to the Oak Tree Preservation Ordinance (Ordinance 89-1) and the City of Santa Clarita Oak Tree Preservation and Maintenance Guidelines. Prior to grading, oak trees near construction/grading areas that will not be removed will be protected during the grading and construction phases of the project by appropriate fencing that extends five feet beyond the tree canopy's dripline, or 15 feet from the trunk, whichever is greater.	Not Significant
4.6-7	Additional specific mitigation measures are described in detail in the Oak Tree Report produced by Tree Life Concern, Inc. (**Appendix 4.6**) and listed below. The mitigation measures described in this report are supported by the City's Oak Tree Specialist and exceed the requirements of the City of Santa Clarita Tree Ordinance. • Equipment damage to the limbs, trunks and roots must be avoided. Even slight trunk injuries can result in long-term, life threatening pathogenic maladies. No storage of equipment or debris within the Protective Zone (dripline plus 5') will be allowed. No dumping of construction wastewater i.e., paint, stucco, concrete, clean-up, etc. within Protective Zones, Generally, fencing shall be placed at the Protective Zone of any oak or groups of oaks within 50' of proposed construction activity. Protective Fencing must remain in place during construction projects and shall not be moved or removed without prior written approval from the Department of Community Development under the direct supervision of the Project Consulting Arborist. • Protective Fencing shall be at least 4' in height with a visible sign attached at 50' intervals that reads: "WARNING - THIS FENCE IS FOR THE PROTECTION OF THIS TREE AND SHALL NOT BE REMOVED OR RELOCATED WITHOUT WRITTEN AUTHORIZATION FROM THE CITY OF SANTA CLARITA COMMUNITY DEVELOPMENT DEPARTMENT".	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	• If possible, complete pruning of the larger California Live or Valley oaks, is recommended for health and weight reduction (inspect for occupied woodpecker nests prior to removal of larger dead snags). Any cuts over 2' diameter would require a Pruning Permit from the City. After pruning, the installation of support cables to prevent future main crotch failures is recommended (refer to the Summary of Field Inspection for specific tree and cable numbers). All cables should be a minimum of 5/16" diameter EHS (Extra High Strength) and attached with 5/8" diameter, galvanized thru-bolts. Heavy-duty 3/8" thimbles are to be utilized at each attachment point. These recommendations are presented for consideration by the City, current and/or future property owners. • Care should be taken to avoid placing any sprinklers within watering distance to the trunk of an oak tree. Generally, sprinklers should not reach within 15' of a mature oak trunk. Grass or ground covers must never be planted next to the trunks. Too much moisture near the base of an oak is generally believed to be their leading cause of death in residential settings. Oak Root Fungus is the result of over-watering. Oak trees survive and thrive on annual rainfall alone and generally do not need supplemental irrigation except during periods of drought. Watering should take place at or near the dripline. Landscape plans should leave the area within the dripline of an oak tree in a native or natural setting. • Care must be taken to limit grade changes near the trunk areas. The grade should not be lowered or raised around the trunks of trees. This can lead to plant stress from oxygen deprivation or Oak Root Fungus at the root collar. • Mitigation for the tree removals/relocations includes the dedication of a 24-acre property with oak tree habitat. This property is directly adjacent to the 4.25-acre active neighborhood park and contains a majority of the oak trees on the project site. The proposed mitigation (dedication of 24 acres of oak habitat open space and the transplanting of oak trees on-site including the costs associated with the corresponding five-year maintenance plan of said trees) for oak tree impacts is consistent with the provisions of the City's Oak Tree Preservation Ordinance.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	• Protective fencing shall be installed around all oaks not listed for removal. Place protective fencing at the PZ as shown on the TLM. The fencing can be re-positioned as needed to allow for grading near the oaks listed as "impacted". The project arborist must be present during the fence placement. Final fencing locations shall be inspected by the City prior to the commencement of development activities. Regular inspections of this fencing shall occur during site development. • An Oak Tree Information Packet including the City of Santa Clarita Oak Tree Protection and Preservation Guidelines must be available on-site during construction. The property owner and contractor should be familiar with the contents of these documents. • Vehicle travel along dirt roadways to and from the site may create a heavy coating of dust on the foliage of nearby oaks. These oaks should be hosed off periodically during construction activities. • All work performed within the Protective Zone (dripline plus 5') of any oak shall be accomplished by utilizing hand tools only and must be 'monitored' by the project's Oak Tree Consultant. • All roots over 1.5" diameter will be clean cut at a 45 degree angle and treated by the Consulting Arborist. • No oaks outside the property line are to be impacted by this construction project. • The leaf-litter build-up under the canopies of the oaks on this site is ideal for healthy tree growth and root development. Do not alter or remove if possible. A 3-inch layer of mulch may be advisable in settings where leaf-litter has been lost. • Do not remove the aluminum tags numbering each oak on this site • No construction materials are to be stored or discarded within the PZ of any oak. Rinse water, concrete residue, liquid contaminates (paint, thinners, gasoline, oils, etc.) of any type shall not be deposited in any form at the base of an oak. • No vehicles shall be parked within the PZ of an oak. No construction vehicles are to be parked under the shade (within the PZ) of an oak.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	Oak Transplantation The oak trees listed for transplanting shall be professionally "boxed" and relocated on-site to the designated "storage area" (see TLM). A qualified transplant company shall perform the relocations (it is anticipated that Valley Crest Tree Company will be performing the relocations). To enhance the success of each tree for long-term survival the relocations will be monitored by the Project Arborist. The size of box for each tree will be determined by the Arborist and Valley Crest representative (see chart below). Consideration will be given to the buttress spread, as well as the trunk diameter. Generally, the larger the box the greater the probability of success. In every case where a decision is to be made between a smaller size box and a larger box, i.e., I go" or 192" box, the box of choice will be the 192" box. Under the direction of the Project Arborist, side-boxing/root-pruning operations shall take place during the months of November through January. These trees will then be maintained in situ for a 90-day period prior to bottom-board installation and relocation to the "storage site". A "storage site" has been designated (see TLM) with a permanent water supply, which will be accessible to each boxed tree. The Project Arborist (in conjunction with the relocation company) will determine if and when fungicides, fertilizer or soil amendments are needed. Each tree will be monitored for any condition that may require a specific treatment to enhance survivability before, during and after relocation. Prior to side-boxing and root pruning the soil moisture content must be sufficient to maintain the rootball intact during this process. Each oak should be lightly pruned at this point to remove deadwood, stubs, broken limbs, crossing limbs or for clearance purposes. The pruning will be monitored. The excavation process will first begin with a back-hoe. As roots are encountered the back-hoe will be removed and roots 2" or larger will be hand excavated and clean-cut with a handsaw. The exposed cuts will be treated with a Bordeaux linseed oil solution to help prevent desiccation. All roots shall be clean cut with pruning shears or by handsaw. Root balls that are exposed to full sun will be tarped until the side-box wall is installed.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	After side-boxing/root-pruning operations the trees will remain in place for approximately 90 days before the bottom boards are installed. The boxed trees will be hoisted by the box itself (not by the trunk) and carried to the storage area. The orientation of each oak (north, south, east, west) will be carefully maintained during the storage process. The project arborist will mark each box for proper direction while in storage. This is important to prevent damage from sunburn. Valley Crest shall guy-wire each tree as needed into the box and/or into the ground as needed. The storage area is notoriously windy and extra attention will be paid to securing the trees until planting. The guy-wires will be placed through hose-sections where they are in contact with the tree. When planting the oaks, the planter-hole (pit) location will be partially filled with loosened native soil. The size of the hole will be 2' larger than the box size. If drainage is determined to be a concern, PVC drain tubes will be installed in a rectangular fashion with breather ports attached at four locations. The bottom of the pit will be filled with 8" of gravel and a layer of permeable soil-cloth will be placed over the gravel. An 8" layer of native soil will then be placed over the cloth and the tree install backfilled. This will allow for monitoring any possible water pooling at the base of each tree. Unamended native soil will be utilized for the backfill unless a soil analysis indicates that amendments will be required. A soil analysis will be performed at the planting site 30 days prior to relocation. The backfill soil will be compacted to normal (native-soil compaction). The height of the root ball is critically important in the long-term survival of a transplanted oak. Each rootball will be placed at least 6" above existing grade. This will allow for settling and ensure that water does pool at the root collar. Soil watering-basins will be constructed to properly irrigate the entire rootball of each tree. The trees will be monitored by relocation company and the Project Arborist on a weekly basis to determine current condition and maintenance requirements.	

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Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	4.6-8 All revegetation, restoration, and enhancement measures within mixed oak woodlands shall be documented in the Resource Management and Monitoring Plan and shall include, at a minimum, the following: (1) the location of the planting/revegetation areas (to be coordinated with the City; (2) the species of oaks and other plant species to be planted within the protected zone of the oaks; (3) planting procedures; (4) a schedule and action plan to maintain the plantings; and (5) a list of criteria by which to measure success of the plantings, as well as contingency measures if the plantings are not successful.	
Mitigation measures to avoid take of state- and federally-listed Threatened and/or Endangered species have been identified in the NRMP EIS/EIR and in the Section 1603 Streambed Alteration Agreement issued by CDFG for the NRMP. A detailed program of mitigation measures is set forth in the NRMP Section 1603 Streambed Alteration Agreement and a blanket Section 7 Endangered species permit has been issued in conjunction with the NRMP. In addition, compliance with the California Endangered Species Act will occur, as applicable.	**Special-Status Wildlife** Mitigation measures included in the NRMP EIS/EIR and Section 1603 authorization include the following: • Surveys and site inspections for the least Bell's vireo (vireo) and unarmored three-spine stickleback (UTS) by qualified biologists; • Installation of blocking nets as specified by FWS for the UTS; • Specific stream diversion practices utilizing qualified biologists for the UTS; and • Limitations on construction activities during the nesting season near occupied habitat for the vireo.	Not Significant
	Increased Human and Domestic Animal Presence	
	4.6-9 Pets and other domestic animals shall be prohibited with fencing and signage from the open space areas and in any revegetation areas on the project site unless restrained by leash and only in designated areas.	Not Significant
	4.6-10 Fencing of sufficient height and design (i.e., ranch-rail) shall be constructed between the edge of the fuel modification zone and the river corridor to deter humans and domestic animals from entering open space habitat areas.	
	4.6-11 Native shrubs such as laurel sumac, California coffeeberry, toyon, and coast prickly-pear shall be planted along the fence to further deter access. Final fence design shall be approved by and the City Planning and Building Services Department.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	4.6-12 Human access into the open space areas shall only occur in designated locations (i.e., existing and future trails). All motorized vehicles are prohibited from entering the preserved natural open space areas with the exception of emergency or maintenance vehicles. Applicant shall post signage reflecting the above requirement.	
	4.6-13 Prohibitions against human, domestic animal, and motorized vehicle use in preserved natural open space areas shall be established by the covenants conditions and restrictions (CC&Rs) recorded with the City Planning and Building Services Department.	
	4.6-14 Interpretative signs shall be constructed and placed in appropriate areas, as determined by the City Planning and Building Services Department that explain the sensitivity of natural habitats and the need to minimize impacts on these natural areas. The signs will state that they are entering a protected natural area and that all pedestrians must remain on designated trails, all pets are to be restrained on a leash, and that it is illegal to harm, remove, and/or collect native plants and animals. The project applicant shall be responsible for installation of interpretive signs and fencing.	
	Lighting and Glare	
	4.6-15 All street, residential, and parking lot lighting shall be downcast luminaries or directional lighting with light patterns directed away from natural areas. Covenants, Codes and Restrictions (CC&Rs) shall require the exterior lighting within the residential area be limited to low voltage.	Not Significant

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	Construction-Related Activities	
	The following measures shall be implemented to minimize impacts on remaining biological resources on the site as a result of construction and grading activities and to ensure that potential impacts on these resources will remain less than significant.	Not Significant
	4.6-16 A qualified biologist, as determined by the City of Santa Clarita, shall be retained as a construction monitor to ensure that incidental construction impacts on biological resources are avoided, or minimized, and to conduct pre-grading field surveys for special-status plant and wildlife species that may be destroyed as a result of construction and/or site preparation activities. Responsibilities of the construction monitor include the following: • The construction monitor shall attend pre-grade meetings to ensure that timing/location of construction activities do not conflict with mitigation requirements (e.g., seasonal surveys for plants and wildlife). • Mark/flag the construction area in the field with the contractor in accordance with the final approved grading plan. Haul roads and access roads shall only be sited within the grading areas analyzed in the project EIR. • Supervise cordoning of preserved natural areas that lie outside grading areas identified in the project EIR (e.g., with temporary fence posts and colored rope). • Conduct a field review of the staking (to be set by the surveyor) designating the limits of all construction activity. Any construction activity areas immediately adjacent to riparian areas or other special-status resources should be flagged or temporarily fenced by the monitor, at his/her discretion. • Conduct meetings with the contractor and other key construction personnel describing the importance of restricting work to designated areas. The monitor should also discuss procedures for minimizing harm/harassment of wildlife encountered during construction. • Periodically visit the site during construction to coordinate and monitor compliance with the above provisions.	
	4.6-17 Construction personnel shall be prohibited from entry into areas outside the designated construction area, except for necessary construction related activities, such as surveying. All such construction activities shall be coordinated with the construction monitor.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.6 BIOLOGICAL RESOURCES (continued)		
	4.6-18 Standard dust control measures shall be implemented to reduce impacts on nearby plants and wildlife. This includes replacing ground cover in disturbed areas as quickly as possible; water active sites at least twice daily; suspend all excavating and grading operations when wind speeds (as instantaneous gusts) exceed 25 mph; and restricting traffic speeds on all unpaved roads to 15 mph or less in areas within 200 feet of vegetation. 4.6-19 Upon completion of construction, the contractor shall be held responsible to restore any haul roads and access roads that are outside of approved grading limits. This restoration shall be done in consultation with the construction monitor. In addition, impacts to biological resources as a result of construction and grading activities will be mitigated by implementation of NRMP **Mitigation Measures 4.6-1w.** through **uu.**, above.	
4.7 LAND USE		
The project applicant is requesting a General Plan Amendment and Zone Change to designate the 695.4-acre site as 692.4 acres of RM (PD) and 3.0 acres of CC (PD). The project applicant is requesting 439 single-family and 744 multi-family residential lots adjacent to and in close proximity to Newhall Ranch Road and Santa Clarita Parkway. Two ridgelines classified by the City as secondary traverse a portion of the project site. The project applicant is providing an innovative application to the Planning Commission/City Council for approval of uses on portions of these secondary ridgelines. It can be concluded that the project satisfies the intent of both the ridgeline protection and hillside development standards and will not result in a significant land use impact.	The proposed project is consistent with the applicable goals and policies of the General Plan, consequently there would be no impacts and no mitigation is required.	Not Significant

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Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.8 WATER SERVICES		
Using water demand factors provided by SCWD, the proposed project would consume approximately 697 AFY. Existing water demand in the Santa Clarita Valley is approximately 77,998 AFY in average years (this figure accounts for a dry year increase in water demand in 2002 of approximately 10 percent). Of this demand, approximately 68,023 acre feet is related to urban or developed areas and approximately 15,278 acre feet is related to other uses in the Santa Clarita Valley, including agricultural uses. When combined with the Riverpark water demand of 697 AFY, the total water demand in the Santa Clarita Valley would be approximately 77,998 acre feet if Riverpark were completely built out today. Existing supplies exceed the project demand, in conjunction with existing demand in the Santa Clarita Valley. Existing water supplies exceed demand by 2,283 to 10,553 AFY in dry years and by 25,775 AFY in an average/normal year after adding the proposed project to existing demands; therefore, no significant near-term water supply impacts are anticipated.	No mitigation is required as there are no significant impacts.	Not Significant

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts		Recommended Mitigation Measures	Residual Impact
4.8.1 WATER QUALITY			
The project is expected to have a less than significant impact on surface water quality, as discussed above, and accordingly, no water quality mitigation measures are required under CEQA. Nonetheless, the project proponent proposes to include the following measures to improve further the quality of storm water runoff from the project site. The project would generate pollutants typical of urban residential and small commercial areas both during construction, and after the site is built out and occupied. In addition, the existing condition of the Santa Clara River, and the current water quality standards applicable to it give rise to water quality concerns. Primary pollutants of concern include minerals/salts, total suspended solids, nutrients, trace metals, pathogens, hydrocarbons, pesticides, and other toxics. Constituents for which sufficient data was available were analyzed quantitatively using a water quality model created to address the project's features. Taking into account the project's non-structural and structural (treatment) best management practices (BMPs) design features, and evaluating the identified pollutants of concern, the following analysis concludes that project water quality impacts would be less than significant. The project would meet all applicable regional and local water quality requirements of the State Water Resources Control Board, the Regional Water Quality Control Board, Los Angeles Region, the National Pollutant Discharge Elimination System, the County of Los Angeles and the City of Santa Clarita during both construction and operation of the project.	a.	**Mitigation Measures Already Incorporated Into the Project** 4.8.1-1 To reduce pollution from impacts from the "first flush" runoff, a series of pipes and outlets would be constructed pursuant to Los Angeles County Department of Public Works requirements to intercept first flush runoff from paved developed areas and channel it to above ground and/or subsurface water quality control basins. 4.8.1-2 The project is required to comply with the RWQCBLAR Municipal Permit (General MS4 Permit) Order No. 01-182, NPDES No. CAS004001 (adopted December 13, 2001) to reduce the discharge of pollutants to the maximum extent practicable. 4.8.1-3 To treat storm water, two water quality detention basins, a grassy swale, and hydrodynamic separator systems would be constructed. 4.8.1-4 Post-construction structural or treatment control BMPs to minimize or prevent storm water pollutants from discharging into the Santa Clara River shall, at minimum, include: • water quality detention basins; • a grassy swale; and • hydrodynamic separator systems, such as Continuous Deflective Separator (CDS) units. Additional equivalent BMPs that could alternatively be implemented at the project site include: • catch basin inserts; • storm water filters; and • storm water clarifiers. The project is expected to have a less than significant impact on surface water quality, as discussed above, and accordingly, no water quality mitigation measures are required under CEQA. Nonetheless, the project proponent proposes to include the following measures to improve further the quality of storm water runoff from the project site.	Not Significant

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.8.1 WATER QUALITY (continued)	**b. Mitigation Measures Proposed By This EIR**	
	Construction Impacts	
	4.8.1-5 All necessary permits, agreements or letters of exemption from the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, California Department of Fish and Game, and/or the Regional Water Quality Control Board for project-related development are to be obtained prior to start of soil-disturbing activities.	
	4.8.1-6 Prior to start of soil-disturbing activities at the site, a Notice of Intent (NOI) and Storm Water Pollution Prevention Plan (SWPPP) shall be prepared in accordance with and in order to partially fulfill the California State Water Resources Control Board Order No. 99-08-DWQ, National Pollutant Discharge Elimination System (NPDES) General Permit No. CAS000002 (General Construction Permit). The SWPPP shall meet the applicable provisions of Sections 301 and 402 of the CWA by requiring controls of pollutant discharges that utilize best available technology economically achievable (BAT) and best conventional pollutant control technology (BCT) to reduce pollutants. The SWPPP shall be certified the City of Santa Clarita in accordance with the signatory requirements of the General Construction Permit and implemented concurrently with commencement of the soil-disturbing activity.	
	4.8.1-7 Per the April 26, 2001 modification to the General Construction Permit, a contingency "Sampling and Analysis Plan" shall be developed in the event that the BMPs implemented at the construction site fail to prevent non-visible pollutants from discharging from the site. BMPs shall be inspected prior to storm events, every 24 hours during extended events, and after the storm events to ensure proper function of the BMPs and to identify necessary repairs in a timely manner. A record of the inspections and repairs shall be documented in the SWPPP.	
	4.8.1-8 Following the completion of the construction project and when the site has been stabilized, a Notice of Termination shall be filed with the RWQCBLAR.	
	4.8.1-9 During construction, delineate and flag the smallest site disturbance area possible to minimize soil compaction and restricting temporary storage of construction equipment in these areas, as appropriate.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.8.1 WATER QUALITY (continued)		
	Operational Impacts	
	4.8.1-10 For treatment efficiency, the biofiltration swale shall maximize length and minimize depths. Slopes of the swale shall also be kept to between 2 and 5 percent to prevent scouring.	
	4.8.1-11 The homeowners' association or the City of Santa Clarita shall be responsible for the operation and maintenance of any detention basins on the site, which include: • Dispersion of alluvial sediment deposition at inlet structures, thus limiting the extended localized ponding of water. • Periodic sediment removal to ensure adequate storage and treatment volume. • Monitoring of the basin to ensure it is completely and properly drained. • Outlet riser cleaning. • Vegetation management to prevent marsh vegetation from taking hold, and to limit the growth of habitat for disease-carrying fauna. • Removal of graffiti, litter, vegetative and other debris. • Preventative maintenance on monitoring equipment. • Vegetative stabilization of eroding banks.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.8.1 WATER QUALITY (continued)		
	4.8.1-12 The homeowners' association or the City of Santa Clarita shall be responsible for the maintenance and monitoring of any biofiltration swales on the site, which include: • Vegetation management to maintain adequate hydraulic functioning and to limit habitat for disease-carrying animals. • Animal and vector control. • Periodic sediment removal to optimize performance. • Trash, debris, grass trimmings, tree prunings, and leaf collection and removal to prevent obstruction. • Removal of standing water, which may contribute to the development of aquatic plant communities or mosquito breeding areas. • Erosion and structural maintenance to prevent the loss of soil and maintain the performance of the swale. Although maintenance requirements vary greatly depending on the particular model and manufacturer, biofiltration swales shall be maintained quarterly to yearly for clean-outs. Cleaning after a storm event shall be required. Inspection will be required to make certain that the unit is operating correctly and to make any repairs.	
	4.8.1-13 The homeowners' association or the City of Santa Clarita shall be responsible for the operation and maintenance of any storm water filters on the site, to include: • Providing adequate access for inspection and maintenance. • Removal of accumulated trash, paper and debris. • Corrective maintenance including removal and replacement of top layers of media. • Complete replacement of filter media every 3 to 5 years. • Periodic removal of vegetative growth.	
	4.8.1-14 The homeowners' association or the City of Santa Clarita shall be responsible for the operation and maintenance of any storm water clarifiers on the site, which include: • Inspection prior to the beginning of the storm season. • Regular inspection following storm events. • Removal of accumulated sediment, trash and debris.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.8.1 WATER QUALITY (continued)		
	4.8.1-15 Monthly street sweeping shall occur in high traffic areas and annual or semi-annual street sweeping shall occur in areas with low rates of traffic and little pedestrian use. The homeowners' association or private property owner shall be responsible for sweeping the private streets.	
	4.8.1-16 "Low-impact" vegetation shall be planted in common areas. This vegetation requires minimal irrigation, fertilizing and pest control, and could include native and/or non-invasive plants.	
	4.8.1-17 An education program shall be developed and implemented for the residents and landscape contractors regarding activities and practices that could affect water quality, such as carpet and other cleaners that are not properly disposed of, residential car washing, and animal waste management, such as the importance of cleaning up after pets and not feeding wild animals, such as pigeons, seagulls, ducks and geese. Community car washes shall only take place in areas that are drained to the sanitary sewer system. Pet bags would be provided along trails.	
	4.8.1-18 On-site features that attract wild animals shall be kept to a minimum in order to minimize pathogens in the storm system.	
	4.8.1-19 Pesticide applications shall be managed through educational and other source control efforts, including the installation of efficient landscape irrigation systems in common areas and the development of guidance on applying these types of chemicals for contractors maintaining landscape areas. Examples of material which may be used for education may include educational pamphlets currently available through the City of Santa Clarita, LA County and/or other sources (i.e., http://www.americanoceans.org/runoff/epa-bro.htm). Because of the concerns regarding indicators of human pathogens, education programs shall emphasize animal waste management, such as the importance of cleaning up after pets and not feeding wild animals, such as pigeons, seagulls, ducks and geese. The project applicant shall create and distribute these pamphlets to landscape contractors prior to on-site planting.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.8.1 WATER QUALITY (continued)		
	4.8.1-20 The project applicant shall prepare an herbicide/pesticide program to be utilized by landscaping contractors on commonly owned landscaped areas. This program shall include requirements to minimize the use of herbicides and pesticides in these landscaped areas and shall be prepared and in place prior on-site planting.	
4.9 SOLID WASTE		
Upon project buildout and assuming no solid wastes from the proposed project would be recycled (a worst-case scenario), the project would generate a total of 10,203 pounds of solid waste per day. This is equivalent to approximately 1,862 tons per year. Although the project would generate approximately 1,862 tons of waste per year, it can be assumed that the project will meet the current recycling goals of the community and, therefore, generate 931 tons per year. This is based on the current City diversion rate of 50 percent of waste disposal. The project may also generate household-type hazardous wastes.	**a. Mitigation Measures Already Incorporated into the Project**	
	4.9-1 Solid waste collection/recycling areas are to be compatible with nearby structures, secure, protected against adverse environmental conditions, clearly marked, adequate in capacity, number and distribution, and contain a sufficient number of bins, to serve the recycling needs of the development. (Model Ordinance)	Significant
	4.9-2 Design and construct collection/recycling areas to accommodate front-loader packing trucks, including maneuvering room. (Model Ordinance)	
	4.9-3 Design and construct driveways and/or travel aisles with adequate width and maneuverability space for unobstructed garbage collection, trash container storage and vehicle access and clearance. (Model Ordinance)	
	4.9-4 Post signs at all access points of the recycling areas that clearly identify all recycling and solid waste collection and loading areas and the materials accepted therein. (Model Ordinance)	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.9 SOLID WASTE (continued)		
The project's 1,862 tons per year (without recycling) would represent 0.47 percent of this Valley-wide total. Land suitable for landfill development or expansion is quantitatively finite and limited due to numerous environmental, regulatory and political constraints. This is not to say, though, that alternative solid waste disposal technologies that could substantially reduce landfill disposal will not be developed and legislatively approved in the future; given the market forces that drive the solid waste industry, it seems reasonable to assume they will. However, until other disposal alternatives that will be adequate to serve existing and future uses for the foreseeable future are found and because landfill space is a finite resource project, the potential project and cumulative solid and hazardous waste impacts are considered unavoidably significant.	**b. Mitigation Measures proposed by This EIR** **General Provisions** 4.9-5 Locate recycling/separation areas in close proximity to dumpsters for non-recyclables, elevators, loading docks, and primary internal and external access points. 4.9-6 Locate recycling/separation areas to not be in conflict with any applicable Federal, State or local laws relating to fire, building, access, transportation, circulation, or safety. 4.9-7 Locate recycling/separation areas so they are convenient for those persons who deposit, collect, and load the recyclable materials. 4.9-8 Place recycling containers/bins so that they do not block access to each other. 4.9-9 Reduce yard waste on the project site through the use of xeriscape techniques and the use of drought-tolerant and native vegetation in common area landscaping wherever possible. 4.9-10 For commercial developments and residential buildings having five or more living units, no refuse collection or recycling areas are to be located between a street and the front of a building. 4.9-11 Install on-site trash compactors for non-recyclables in all restaurants/food services areas. 4.9-12 If possible, kitchen, garage or garden design shall accommodate trash and recyclable components to assist in the City's recycling efforts. This includes a design to accommodate a minimum of three 90-gallon containers in locations allowable under the CC&Rs. 4.9-13 First-time buyers shall receive educational material on the City's waste management efforts. Educational material shall be passed to consecutive buyers using the CC&Rs. 4.9-14 The applicant shall comply with all applicable state and Los Angeles County regulations and procedures for the use, collection and disposal of solid and hazardous wastes.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.9 SOLID WASTE (continued)		
	Construction Impacts	
	4.9-15 Place recycling bins for glass, metals, paper, wood, plastic, greenwastes, and cardboard on construction sites to ensure their use by construction workers to then be trucked to recycling/processing facilities.	
	4.9-16 In construction specification and bid packages, require building materials made of recycled materials, to the extent possible.	
4.10 EDUCATION		
It is estimated that the project would generate 288 new elementary students, 71 new junior high students and 115 new high school students in the Saugus and Hart districts at buildout. The Saugus District is operating within its total capacity. Student enrollment in the Hart District exceeds available capacity even with the use of portable classrooms. Project applicant compliance with the School Facilities Funding Agreement Between the Saugus Union School District and the Newhall Land and Farming Company (February 1997) and the School Facilities Funding Agreement Between the William S. Hart Union High School District and the Newhall Land and Farming Company (October 1998) was designed to mitigate all project impacts to these districts to less than significant levels. Because the school districts agree that compliance with the school district agreement will mitigate all project impacts on school facilities, the Riverpark project would result in no significant impact on these districts, and no additional project mitigation is required. Cumulative student generation under the DMS Build-Out Scenario and under the Santa Clarita Valley Build-Out Scenario cannot be accommodated by existing or planned facilities within the school facilities that serve the Valley and cumulative impacts on the districts would be significant. Compliance, as appropriate, with existing School Facilities Funding Agreements and/or other mechanisms (e.g., SB 50, the Valley-Wide Joint Fee Resolution, and/or new school facilities funding agreements) would reduce cumulative development impacts on the school districts to below a level of significance and no unavoidable significant cumulative impacts to educational services are anticipated.	No mitigation required as agreements with school districts has already been reached.	Not Significant

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts		Recommended Mitigation Measures	Residual Impact
4.11 LIBRARY SERVICES			
Library services for the proposed project and the Santa Clarita Valley area are provided by the County of Los Angeles Public Library system. The City of Santa Clarita contracts with the County of Los Angeles for public library services. The Santa Clarita Valley area is served by three County libraries (Valencia, Newhall, and Canyon Country Jo Anne Darcy) and a mobile library service. Existing library space in the Santa Clarita Valley does not meet the County Public Libraries library planning standards. Development of the proposed project would result in increased demands on library facilities and would, according to County Library planning standards, create a demand for 1,789 gross square feet of library space and 7,152 items (books, periodicals, audio cassettes, videos, etc.). Recommended payment of the City adopted library impact fee, $640.00 per new residential dwelling unit as of November 2002, for new library construction and book purchases would reduce this impact to a less than significant level. In addition, revenues collected by the City of Santa Clarita over the course of buildout of the project would fund library service in the Santa Clarita Valley and also reduce impacts.	a.	**Mitigation Measures Already Incorporated into the Project**	
	4.11-1	The applicant shall pay the current library fee ($640.00 per residential unit as of November 2002) to the City of Santa Clarita to offset the demand for library items and building square footage generated by the proposed project or whatever fee is established by either the City or County at the time of building permit issuance, whichever is higher. The library mitigation payment shall be made on a building permit by building permit basis. This current per unit mitigation fee of $640.00 would generate at least a total of $757,120.00 in library facility fees if all units proposed were built, and would fund new library space and materials which would be needed to serve the project.	Not Significant

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.12 PARKS AND RECREATION		
The project incorporates a 29-acre active/passive park, which will have direct access to the City's Santa Clara River River Trail, a portion of which is proposed for construction as a part of this project. Except for intrusion by the future Santa Clarita Parkway Bridge, the alignment of Newhall Ranch Road (including the Newhall Ranch Road/Golden Valley Road Bridge) and a water quality basin, the entire 300 acres of river area within the project boundaries (defined by a 404/1603 jurisdictional delineation per the already approved Natural River Management Plan) will remain in a natural state (except for bank stabilization). Measured under the identified significance threshold, the Riverpark project is in compliance with Quimby Act parkland standards and would not result in significant unavoidable impacts to local parks and recreation facilities.	**a. Mitigation Measures Already Incorporated into the Project**	Not Significant
	4.12-1 Development of the Riverpark project will provide the following parks and open areas: • a 29-acre active/passive park including 4.5 acres of improved park area, which will be dedicated to the City; • three private recreation lots totaling 1.3 acres; and • 440-acres of dedicated open space, 330.8 acres of which include the Santa Clara River Area.	
	4.12-2 The applicant will meet City parkland requirements by providing either the dedication of land, payment of in-lieu fees, or construction of park amenities, or a combination of the three as approved by the Director of Parks, Recreation and Community Services, prior to issuance of building permits.	
Implementation of cumulative projects would incrementally increase demand for local active park facilities in an area where such facilities are already below locally adopted standards. However, the proposed project will meet and exceed the City and Quimby Act local parkland standards with a combination of a public park and private recreational facilities. Furthermore, future development projects would also be subject to the City and Quimby Act requirements, which would mitigate the demands associated with each future project. Given this, no significant cumulative parkland impacts are expected to occur.	**b. Mitigation Measures Recommended by the EIR** The provision of parks and open areas for credit pursuant to the City Standards and the Quimby Act will occur as individual subdivision maps are processed in accordance with standard City practice.	
	4.12-3 Developer shall construct all trails and shall be in accordance with the City of Santa Clarita Department of Parks and Recreation trail system standards.	
	4.12-4 The City of Santa Clarita shall receive ownership and/or easements of existing maintenance roads/trails and open space prior to easements provided to the Los Angeles County Flood Control District or others.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.13 FIRE SERVICES		
Project implementation would result in an increase in calls for fire protection services received by the County of Los Angeles Fire Station 111. As proposed, the project would have an impact on the current level of local fire protection services; however, proposed mitigation measures would reduce impacts to a level of insignificance.	**a. Mitigation Measures Already Incorporated into the Project**	
	4.13-1 All proposed development on the site must comply with applicable state, City and County code and ordinance requirements.	Not Significant
	b. Mitigation Measures Recommended by This EIR	
	4.13-2 Concurrent with the issuance of building permits, the applicant shall either participate in the Developer Fee Program or make an in-lieu donation to the satisfaction of the County of Los Angeles Fire Department.	
	4.13-3 The project shall prepare a Fuel Modification Plan, landscape plan and irrigation plan as required for projects located with a Very High Fire Hazard Severity Zone. The Fuel Modification Plan shall be submitted and approved by the County Fire Department prior to final map clearance. The Fuel Modification Plan shall depict a fuel modification zone in conformance with the Fuel Modification Ordinance in effect at the time of subdivision. The fuel modification plan shall not conflict with the revegetation plan as directed in **Section 4.6, Biological Resources.**	
	4.13-4 The project shall provide water mains, fire hydrants and fire flows as required by the County of Los Angeles Fire Department, for all land shown on the map that shall be recorded.	
	4.13-5 Brush clearance shall be conducted prior to initiation of construction activities in accordance with Fire Department requirements.	
	4.13-6 Additional access requirements may be needed during the building construction process.	
	4.13-7 Adequate water availability shall be provided to service construction activities.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.13 FIRE SERVICES (continued)		
	4.13-8 Installation of 79 public and 24 private on-street fire hydrants is required. The required fire flow for 20 public fire hydrants located on Newhall Ranch Road, adjacent to Area C and Area D, is 5,000 gpm at 20 psi for five hours with three fire hydrants flowing. 59 public fire hydrants are required to be installed on all other streets, including Newhall Ranch Road, as indicated on the Tract Map. The required fire flow is 1,250 gpm at 20 psi for two hours with one fire hydrant flowing. 24 on-site fire hydrants are required within Area C and Area D. The required fire flow is 2,500 gpm at 20 psi for two hours with two fire hydrants flowing simultaneously.	
	4.13-9 Vehicular access must be provided and maintained serviceable throughout construction to all required fire hydrants. All required fire hydrants shall be installed, tested and accepted or bonded prior to construction. All hydrants shall measure 6 inches by 4 inches x 2 1/2 inches brass or bronze, conforming to current AWWA standard C503 or approved equal. All on-site hydrants shall be installed a minimum of 25 feet from a structure or protected by a two-hour rated firewall. These hydrants shall be located as per the Vesting Tentative Tract Map on file with the Fire Department.	
	4.13-10 Fire Department access shall be extended to within 150 feet distance of any exterior portion of all structures.	
	4.13-11 Access shall comply with Section 902 of the Fire Code, which requires all weather access. All weather access may require paving.	
	4.13-12 All private gates shall comply with Regulation 5 of the Fire Code. Prior to approval of the Tentative Tract Map, the applicant shall receive approval of the gates from the Los Angeles County Fire Department.	
	4.13-13 All fire lanes must not be less than 26 feet paved width (clear to sky and unobstructed) and posted and red curbed "NO PARKING - FIRE LANE".	
	4.13-14 The trail system shall provide adequate access for emergency vehicles.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.13 FIRE SERVICES (continued)		
	4.13-15 Where driveways extend further than 300 feet and are of single access design, turnarounds suitable for fire protection equipment use shall be provided and shown on the final map. Turnarounds shall be designed, constructed, and maintained to insure their integrity for Fire Department use. Where topography dictates, turnarounds shall be provided for driveways that extend over 150 feet in length.	
	4.13-16 Private driveways shall be indicated on the final map as "Private Driveway and Fire Lane" with the widths clearly depicted and shall be maintained in accordance with the Fire Code.	
	4.13-17 Provide Fire Department or City approved street signs and building access numbers prior to occupancy.	
	4.13-18 Additional access requirements include: • A second means of access is required prior to the construction of the 501st dwelling unit. The number of dwelling units includes all single-family homes, and all units within the apartments and townhomes. • Temporary turnarounds are required for the end of Newhall Ranch Road and the end of Santa Clarita Parkway. The turnarounds shall be either a cul-de-sac bulb with a 32-foot centerline or a hammer-head design, which would be posted and red curbed "NO PARKING - FIRE LANE". These temporary turn-arounds are required to stay in place until the bridges have been completed and are opened to an existing street. • All streets with center medians shall have a minimum paved width of 20 feet on each side of the median, with street posted and red curbed "NO PARKING - FIRE LANE".	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.13 FIRE SERVICES (continued)		
	• Street widths for this project shall conform to the widths indicated on the cross-section on this Vesting Tentative Tract Map. All street widths shall be measured from the curb flow line to curb flow line. • The traffic circle at the end of "N" Street is approved. The area surrounding the traffic circle shall be posted and red curbed "NO PARKING - FIRE LANE". • Due to "N" Street extending greater than 700 feet in length, "N" Street shall have a minimum street width of 36 feet, curb-flow-line to curb-flow-line, not 34 feet as indicated on the map. Provide four revised copies of this page only of the Tract Map indicating this correction. This is required to be submitted to the Land Development Unity prior to any approvals of this Tract Map. • For on-site access in Area C and Area D, provide a minimum unobstructed driveway width of 28 feet, clear-to-sky posted and red curbed "NO PARKING - FIRE LANE". Each turning radius shall be 42 feet from the centerline.	
4.14 SHERIFF SERVICES		
Project implementation would impact the current level of Sheriff's Department protection services through a project-generated increase in service calls. Implementation of mitigation measures would reduce project impacts of Sheriff's protection services to less than significant levels.	**a. Mitigation Measures Already Incorporated into the Project**	
	4.14-1 During construction, private security patrols shall be utilized to protect the project site.	Not Significant
	b. Mitigation Measures Proposed by This EIR	
	4.14-2 As final building plans are submitted to the City for approval in the future, Sheriff's Department design requirements which reduce demands for service and ensure adequate public safety (such as those pertaining to site access, site security lighting, shall be incorporated into building designs.	
	4.14-3 Project design shall landscape the project site with low-growing groundcover and shade trees, rather than a predominance of shrubs which could conceal potential criminal activity around buildings and parking areas.	
	4.14-4 Project design shall provide lighting, to the satisfaction of the Sheriff's Department, around and throughout the development to enhance crime prevention and enforcement efforts.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.14 SHERIFF SERVICES (continued)		
	4.14-5 Project design shall provide clearly visible (during the day and night) address signs and/or building numbers for easy identification during emergencies.	
	4.14-6 Project design shall provide visibility of doors and windows from the street and between buildings.	
	4.14-7 Project site design shall include adequate parking spaces in the parking lots to accommodate shoppers, employees and residents.	
4.15 HUMAN MADE HAZARDS		
The proposed Riverpark project is not expected to include any uniquely hazardous land uses. Both residential and commercial proposed uses are expected to use and store chemicals and/or substances that are typically found in similar settings. There are several abandoned oil wells within the project site that were used for crude oil production. Based on the extremely limited productivity of these wells, they were ultimately abandoned. As crude oil is not considered to be a hazardous material, residential and non-residential development in areas previously occupied by the oil production facilities would not result in environmental safety hazards to future residents, employees, and/or visitors. Electrical transmission lines are located to the east of the project site.	There are no human made hazards located on the project site; therefore no mitigation measures are required.	Not Significant

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.16 VISUAL RESOURCES		
Views of the existing open space areas from each of the view corridors would be altered due to development of proposed residential and commercial uses. The images of the project's residential and commercial development, bank stabilization, roadways, and other human activity along the Santa Clara River would, overall, be a significant change from the existing characteristics of the project site.	4.16-1 Taller growing trees and/or shrubs shall be planted along Newhall Ranch Road, the river trail and Santa Clarita Parkway borders of the project site in order to screen the project and minimize the potential for light and glare impacts. Shade trees shall be planted at the commercial site to provide visual relief and help to reduce ambient temperatures.	Significant
	4.16-2 All parking lot pole lights and streetlights shall be fully hooded and back shielded to reduce the light "spillage" and glare.	
	4.16-3 The project applicant shall consult with the City Department of Transportation and Engineering Services and Southern California Edison to develop a street lighting program that will allow for reduced streetlight to reduce lighting spillover into the Santa Clara River.	
	4.16-4 All trail and community park lighting shall provide optimum safety while at the same time reducing light "spillage" and glare.	
The project would result in grading of ridgelines classified by the City as secondary ridgelines (see discussion in **Section 4.7, Land Use**), bank stabilization and conversion of the site from vacant land to a man-made urban environment. The proposed project would be most visible from Bouquet Canyon Road, Soledad Canyon Road, the extension of Newhall Ranch Road, the proposed and future extension of Santa Clarita Parkway and the existing residential, commercial, and business parkland uses to the west, south and southeast of the project site. Incorporation of recommended mitigation measures would reduce project-level and cumulative visual impacts caused by converting the project site from an undeveloped to a developed urban area, but not to a level less than significant.	4.16-5 The colors of exposed bank stabilization structures shall be earth tones, which blend with the surrounding natural environment. Wall surfaces shall be variously textured to diffuse lighting and minimize reflectivity.	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.17 POPULATION/HOUSING/EMPLOYMENT		
The 1,183 residential units proposed for the project would house approximately 3,615 persons. Relative to the year 2010 City and Santa Clarita Valley population projections, population generated by the project is considered negligible (2.0 and 1.3 percent of the 2010 projections, respectively). The project would also create 94 jobs at the commercial retail use. Although the existing City's General Plan designations for the site are proposed to be changed, the proposed General Plan Amendment would reduce on-site density or intensity of residential use compared to that allowed under the existing General Plan, and it would generate less population than allowed on the site. Project population, housing, and employment would also be within growth projections for the City and the Santa Clarita Valley. Therefore, the proposed project would not exceed City or regional population, housing, and employment projections and would not result in a significant impact relative to population and housing.	No mitigation is required.	Not Significant

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts		Recommended Mitigation Measures	Residual Impact
4.18 CULTURAL RESOURCES			
Phase I and II archaeological surveys of cultural resources in the proposed project area were undertaken. These surveys have resulted in the discovery and recording of three prehistoric and one historic archaeological sites. Phase II archaeological studies were conducted at two of the prehistoric archaeological sites. The second site contains a subsurface archeological deposit and intact prehistoric artifacts that can contribute to the scientific reconstruction of prehistoric lifeways in the Santa Clara River Valley. This site is culturally significant and the applicant has designed the project so as to preserve it in situ in perpetuity within the open space areas. Inadvertent direct and/or indirect disturbance during construction of the proposed project to any sensitive cultural resource found on the site would be considered a significant impact. Mitigation measures are proposed that reduce the magnitude of potential impacts to cultural resources to less than significant levels.	**a.**	**Mitigation Measures Incorporated into the Project**	
	4.18-1	CA-LAN-351 contains a subsurface archaeological deposit and intact prehistoric artifacts that can contribute to the scientific reconstruction of prehistoric lifeways in the Santa Clara River Valley. This site shall be preserved in its current state in perpetuity as is demonstrated on VTTM 53425.	Not Significant
	b.	**Mitigation Proposed by the EIR**	
	4.18-2	Archaeological site CA-LAN-3043 contains an intact subsurface deposit and artifacts that hold the potential for contributing to our understanding of the prehistory of this portion of California. A Phase III data recovery (salvage excavation) program shall be conducted for CA-LAN-3043 prior to grading activities.	
	4.18-3	Although no other significant cultural resources were observed or recorded during the surface field survey, all grading activities and surface modifications must be confined to only those areas of absolute necessity to reduce any form of impact on unrecorded (buried) cultural resources that may exist within the confines of the project area. In the event that resources are found during construction, activity shall stop and a qualified archaeologist shall be contacted to evaluate the resources. If the find is determined to be a historical or unique archaeological resource, contingency funding and a time allotment sufficient to allow for implementation of avoidance measures or appropriate mitigation should be available. Construction on other parts of the project will be subject to Public Resources Code §21083.2(i).	

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.19 AGRICULTURAL RESOURCES		
The proposed project would convert 73 acres of prime agricultural land to urban uses. The conversion of prime agricultural land is irreversible, and is considered an unavoidable significant impact. However, in light of the continuing trend by the County to convert cultivated lands to urban uses to accommodate growth, and the fact that the site is surrounded by development, the project site is impaired (i.e., relatively difficult and less economical to farm). Although the site is generally of lower value than larger and better-situated parcels found to the west and the loss of agricultural productivity on prime agricultural land under such circumstances is t considered a significant and unavoidable project and cumulative impact. The conversion of prime agricultural land is irreversible and is, therefore, considered an unavoidable significant impact.	There is no feasible mitigation for the loss of agricultural land.	Significant
4.20 FLOODPLAIN MODIFICATION		
The proposed project would modify the floodplain by placing bank stabilization and erosion protection along selected portions of the river, developing the floodplain areas behind the bank stabilization, and installing a bridge across the river. These actions would alter flows in the river; however, the effects would only be observed during infrequent flood events that reach the buried banks (e.g., 50-year and 100-year flood events). The proposed project would cause an increase in flows and changes in water velocities and water depth; and changes in the flooded areas. However, these hydraulic effects would be localized and minor in magnitude and extent, would be limited to the project footprint, and would be insufficient to alter the amount, location, and nature of aquatic and riparian habitats in the project area and downstream. Under the project, the river would still retain sufficient width to allow natural fluvial processes to continue. Hence, the mosaic of habitats in the river that support various sensitive species would be maintained, and the populations of the species within and adjacent to the river corridor would not be significantly affected.	No mitigation measures are required.	Not Significant

Table ES-1 (continued)
Summary of Project Impacts and Recommended Mitigation Measures

Project Impacts	Recommended Mitigation Measures	Residual Impact
4.21 WASTEWATER DISPOSAL		
The proposed project, located entirely within the service boundaries of the Saugus Water Reclamation Plant (District 26), would generate approximately 0.26 million gallons of wastewater on a daily basis. This effluent would be treated at both the Saugus Water Reclamation Plant (District 26) as well as the Valencia Water Reclamation Plant (County Sanitation District 32), which together, form the Santa Clarita Valley Joint Sewerage System. These two facilities have a combined permitted treatment capacity of 19.1 mgd with an average treatment volume of 17.3 mgd. Based on the impact analysis prepared for the proposed project, neither project nor cumulative wastewater impacts would be significant.	The proposed project would not result in any significant impacts. However, as is standard operating procedure for development projects in the City of Santa Clarita, the following measures are required to be incorporated into a project's approval process and design.	
	4.10-1 Applicant shall obtain will-serve letter from County Sanitation Districts of Los Angeles County prior to issuance of building permits in order to verify that there is sufficient capacity in the receiving trunk lines and the reclamation plant to serve the project.	Not Significant
	4.10-2 All local wastewater lines within the project boundaries are to be constructed by the applicant and dedicated to the City of Santa Clarita Transportation and Engineering Services Department.	
	4.10-3 Prior to issuance of building permits, the applicant shall pay wastewater connection fees.	

Pages omitted.

Visit http://www.santa-clarita.com/cityhall/cd/planning/eir/completed.asp for complete document.

4.8 WATER SERVICE

1. EXISTING CONDTIONS

a. Preface

This section describes the existing water purveyors in the Santa Clarita Valley and their service areas, and summarizes important characteristics applicable to the water service area in the Santa Clarita Valley, which includes the project site. The data found in the section provides an important backdrop to understanding water supplies and demand in the Santa Clarita Valley generally, as well as understanding the Riverpark project's water demand and supplies. Please see **Figure 4.8-1** for an illustration of the existing water reclamation plants and sanitation districts.

b. Existing Water Service Area Characteristics

To understand water supplies and demand in the Santa Clarita Valley, it is important to highlight some of the important local conditions or characteristics of the area. These local conditions affect water demand and supplies in the Santa Clarita Valley and surrounding areas. The section describes local climatic conditions, regional demographics, existing topography and regional area geology and surface water flows in the Santa Clarita Valley and downstream.

In addition, the section briefly summarizes the effects of statewide drought conditions on the Santa Clarita Valley. As explained below, in general, there was minimal impact on the Santa Clarita Valley prior to the 1990-1991 statewide drought conditions. The 1990-1991 statewide drought impacted water supplies in the Santa Clarita Valley; however, on balance, the Santa Clarita Valley responded well to those drought conditions. Since the 1990-1991 drought, the Castaic Lake Water Agency (CLWA) and the other retail water purveyors have continued to work cooperatively to ensure that water demands are met in response to varying hydrologic conditions and increasing demand from existing and planned growth. This effort includes the decision by the Santa Clarita Valley's water agencies[1] to jointly prepare the Urban Water Management Plan (UWMP). The UWMP describes current and future implementation of water conservation measures (called Water Demand Management Measures) within the CLWA service area (shown on **Figure 4.8-8** below), and it updates the Santa Clarita Valley's Water Shortage Contingency Plan.

1 Los Angeles County Waterworks District 36 is not required to prepare a UWMP because it has less than 3,000 connections and, consequently, did not participate in this effort.

LETTER 21

(1) Climate

The climate in the Santa Clarita Valley is generally characterized as semi-arid and warm. Summer months are dry with temperatures that can reach as high as 110° F. Winter months are somewhat cool with temperatures that can drop as low as 20° F. Typically, "dry" years (less than 10 inches of rainfall per year) are followed by "wet" years (greater than 20 inches of rainfall per year) in a cyclical pattern. Average rainfall is approximately 19 inches per year in the flat areas and approximately 27 inches per year in the mountains. The region, including the Santa Clarita Valley, is subject to wide variations in annual precipitation.[2] **Figure 4.8-2** illustrates the annual rainfall in the Santa Clarita Valley and graphically depicts the time periods with low rainfall.

(2) Regional Demographics

The purveyors provide water service to residential, commercial, and industrial customers within CLWA's service area, including Santa Clarita Valley. Water service is also provided for other uses, such as fire service and utility line cleaning.

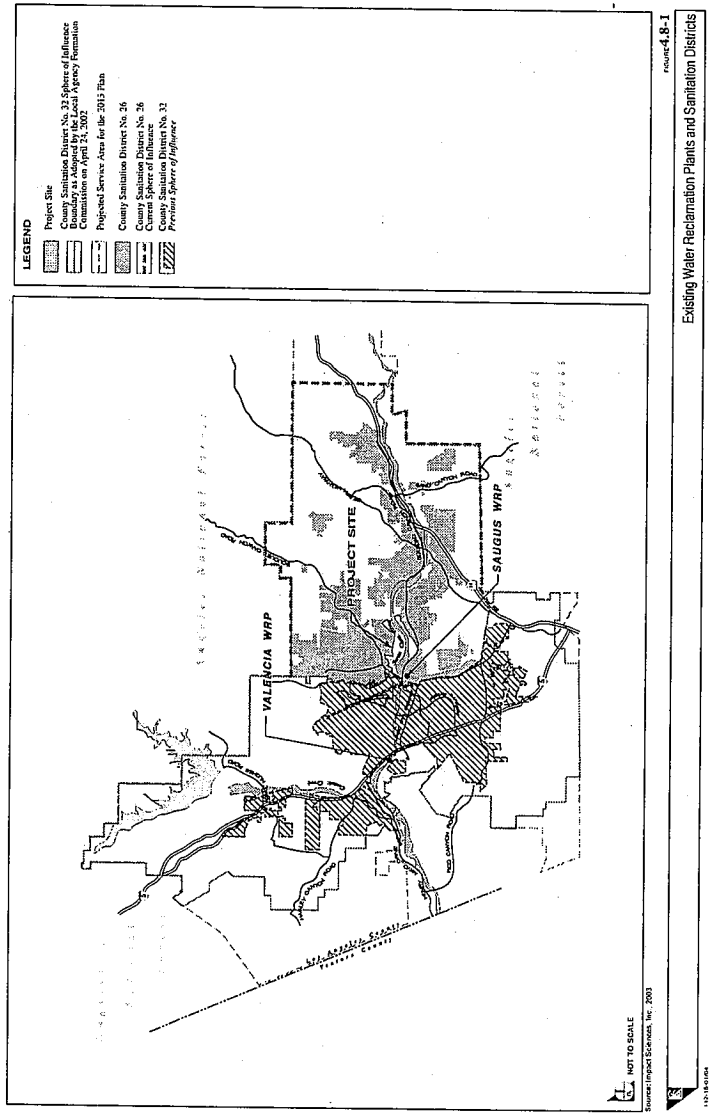
CLWA reports that the number of new service connections in its service area increased from 39,299 in 1990 to 58,221 in 2003 (See, **Table 4.8-1**). As shown on **Table 4.8-1**, the increase in the number of new service connections was slightly more than 500 connections per year in 1991, to a maximum of 4,200 connections in 2001, representing an average annual increase of 1,456 new service connections.

Table 4.8-1
Historical Number of Service Connections

Service Connections	1990	1992	1994	1996	1998	2000	2002
Valencia Water Co.	14,272	14,854	15,703	17,420	19,863	22,000	25,286
Newhall County	5,854	6,144	6,294	6,477	6,585	7,200	7,700
Santa Clarita Water Division of CLWA	18,550	19,000	19,400	19,650	20,300	22,000	24,175
LA County #36	623	736	752	768	774	700	1,060
Total	39,299	40,734	42,149	44,315	47,522	51,900	58,221

Source: CLWA 2000; Santa Clarita Valley Water Report 2000 and 2002.

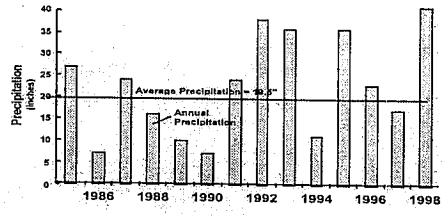
2 See, Newhall Ranch ASR Impact Evaluation, prepared by CH2MHill, February 2001, Section 4.



Existing Water Reclamation Plants and Sanitation Districts

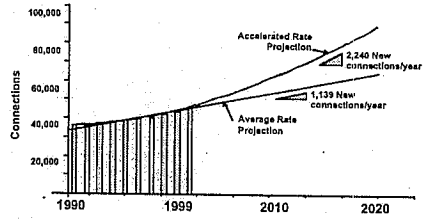
Figure 4.8-1

Figure 4.8-2
Rainfall in the Santa Clarita Valley



To determine the future number of service connections in the CLWA service area, CLWA used two different projection techniques. Using an "average rate" regression technique, the number of connections is projected to be about 70,000 in the year 2020. Under the second technique (accelerated rate projection), CLWA projects the connections to be about 96,000 by the year 2020. **Figure 4.8-3** depicts the historical and projected number of service connections in the CLWA service area.

Figure 4.8-3
Historical and Projected Number of Service Connections



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(3) Topography

The CLWA service area encompasses the relatively flat-lying Santa Clarita Valley, the eastern portion of the Santa Clara River Valley and portions of the surrounding hills and mountains. The mountains include the Santa Susana and San Gabriel Mountains to the south and the Sierra Pelona and Leibre-Sawmill Mountains to the north. Elevations range from about 800 feet on the valley floor to about 6,500 feet in the San Gabriel Mountains. The headwaters of the Santa Clara River are at an elevation of about 3,200 feet at the divide separating this hydrologic area (i.e., the Upper Santa Clara River Hydrologic Area) from the Mojave Desert.

The Riverpark project is located within the Santa Clara River Valley Groundwater Basin, East Subbasin (Basin No. 4-4.07).[3] This area is upstream of the other groundwater basins in the Santa Clara River Valley drainage. The western end of the East Subbasin extends to roughly the Los Angeles County/Ventura County boundary line. The Piru groundwater basin is located to the west in Ventura County. The two groundwater basins are connected through relatively thin alluvial deposits (in the Alluvial Aquifer) that overlie relatively impermeable Pico Formation bedrock deposits at this location. Groundwater in the Santa Clarita Valley also discharges to the Santa Clara River, which flows into Ventura County.

(4) Regional Geology

The geology within and adjacent to the CLWA service area consists of relatively thin alluvial deposits (Alluvium) overlying a deeper, relatively thick Saugus Formation in certain areas. Figure 4.8-4 delineates the location of the Alluvium and the Saugus Formation. As discussed in further detail below, both the Alluvium and Saugus Formation contain water-bearing sediments capable of becoming saturated so as to provide water to wells. These water-bearing sediments constitute the local "groundwater reservoir" for the Santa Clarita Valley.[4]

The upper basin, called the Alluvium or Alluvial Aquifer, generally underlies the Santa Clarita Valley and side canyons. The main river valley consists of medium-grained sand on the west to cobbly sand in the east. Due to the unconsolidated to poorly consolidated condition of the Alluvium, and its lack of cementation, the Alluvium has relatively high permeability and porosity. The maximum thickness of the Alluvium varies along the Santa Clarita Valley, but is generally considered to be 200 feet.

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3 California Department of Water Resources Bulletin 118.

4 This section is based on information from the Newhall Ranch ASR Impact Evaluation, prepared by CH2MHill, February 2001, Sections 3 and 4, and Hydrogeologic Conditions in the Saugus Formation, Santa Clarita Valley, California, prepared by Richard C. Slade & Associates, LLC, January 2001. This report is located in **Appendix 4.8.**

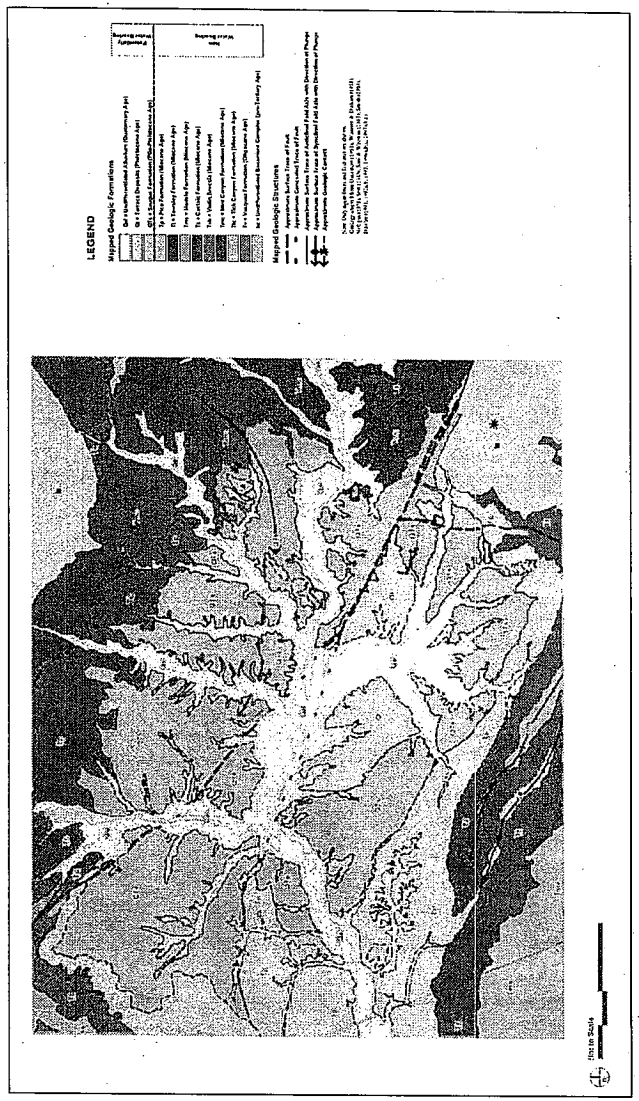

Figure 4.8-4
Location of the Alluvial and Saugus Formation

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The groundwater is pumped from wells up to 200 feet in depth. The Alluvium is estimated to store over 240,000 acre-feet of water. It has supplied approximately 30,000 to 40,000 acre feet per year (AFY) in average/normal years, and 30,000 to 35,000 AFY in dry years. The annual average groundwater production from the Alluvial Aquifer during the 1990s was approximately 33,500 AFY.

Underlying the Alluvium deposits in the main portion of the Santa Clarita Valley is the Saugus Formation. The Saugus Formation consists of unconsolidated to semi-consolidated sandstone and conglomerate materials. Two faults, the active San Gabriel Fault, and the potentially-active Holser Fault, traverse the Santa Clarita Valley. Although maximum thickness of the Saugus Formation is reported to be 8,500 feet, the estimated water-bearing thickness of the formation ranges from 5,500 feet between the San Gabriel Fault and the Holser Fault to 1,500 feet northeast of the San Gabriel Fault. It is estimated that the amount of groundwater in storage in the Saugus Formation is about 1.65 million acre feet. Of the 1.65 million acre feet, the area north of the San Gabriel Fault is estimated to contain approximately 130,500 acre feet, the area between the Holser and San Gabriel Faults is estimated to contain approximately 641,000 acre feet and the area south of the Holser Fault is estimated to contain approximately 641,000 acre feet. The Saugus Formation is pumped by wells extending to about 2,000 feet in depth. It has supplied approximately 7,500 to 15,000 AFY in average/normal years, and 11,000 to 15,000 AFY in dry years.

(5) Hydrology of the Santa Clarita Valley

Most of the CLWA service area is within the Santa Clarita Valley Groundwater Basin, East Subbasin. The primary drainage course in the service area is the Santa Clara River.[5] **Figure 4.8-5** depicts the geology and hydrologic cycle in Santa Clarita Valley. **Figure 4.8-6** shows the Santa Clara River, East Subbasin, with respect to other groundwater basins downstream of the Specific Plan area. **Figure 4.8-7** shows the locations of production wells in the Alluvial Aquifer and Saugus Formation.

The Santa Clara River and its tributaries flow generally westward from the Santa Clarita Valley to the Pacific Ocean. The principal tributaries to the Santa Clara River include Mint Canyon, Bouquet Canyon, San Francisquito Canyon and Castaic Creek. Water flow in the canyon areas is ephemeral, and diminishes rapidly after most rainfall events. The local surface water bodies include the Santa Clara River, Bouquet Reservoir and Castaic Lake. Various reaches of the Santa Clara River were listed by EPA in 1999 as impaired due to high concentrations of chloride, nitrogen, nitrates and nitrites, high coliform count and dissolved oxygen.

5 The information contained in this section is from Newhall Ranch ASR Impact Evaluation, prepared by CH_2MHill, February 2001, and an updated technical memorandum prepared by CH_2MHill.

The sources of surface water in the Santa Clarita Valley include precipitation, irrigation return flows, groundwater discharge, stormwater releases from Castaic Lake and Bouquet Reservoir, and treatment plant discharges to the Santa Clara River from the two existing water reclamation plants (WRPs). Another significant source of surface flow comes from the increased importing of State Water Project (SWP) water supplies by CLWA to its service area.

Since 1980, CLWA has been importing SWP water as a supplemental water source to the retail water purveyors in its service area. The total amount of SWP water delivered to the service area from 1980 through 2002 was 405,062 acre feet.

In order to evaluate historical and projected surface flow to downstream from imported SWP water in Santa Clarita Valley, an updated technical memorandum was prepared by CH_2MHill (February 2001). The objective of the updated technical memorandum was to estimate the historical and projected flow to downstream due to the importation of SWP water by CLWA and the use of that water in the Santa Clarita Valley.

Based on the updated technical memorandum, imported SWP water is used to meet both residential and non-residential interior and exterior water demands. A portion of the imported SWP water finds its way into the Santa Clara River watersheds where it recharges local aquifers and flows downstream to Ventura County. Stream gage data collected at the County line (USGS Gage No. 11108500) from 1953 to 1996 demonstrates a 60 percent increase in average annual flow since the importation of SWP water, even during dry years (the annual flow of 17,596 cubic feet per second (cfs) in 1991, a drought year, exceeds the annual average flow prior to importation of 16,479 cfs). The source of this additional flow in the Santa Clara River watershed includes imported SWP water.

The SWP water used to meet residential and non-residential interior water demands ultimately reaches the local existing WRPs in the Santa Clarita Valley. Historically, the treated water has been discharged to the Santa Clara River, where it contributes significantly to the natural surface water and groundwater flows reaching Ventura County. As discussed below, although a significant portion of the imported water used for irrigation is lost through evapotranspiration to the atmosphere, SWP water has significantly increased the flow of surface water and groundwater flows in the Santa Clara River watershed.

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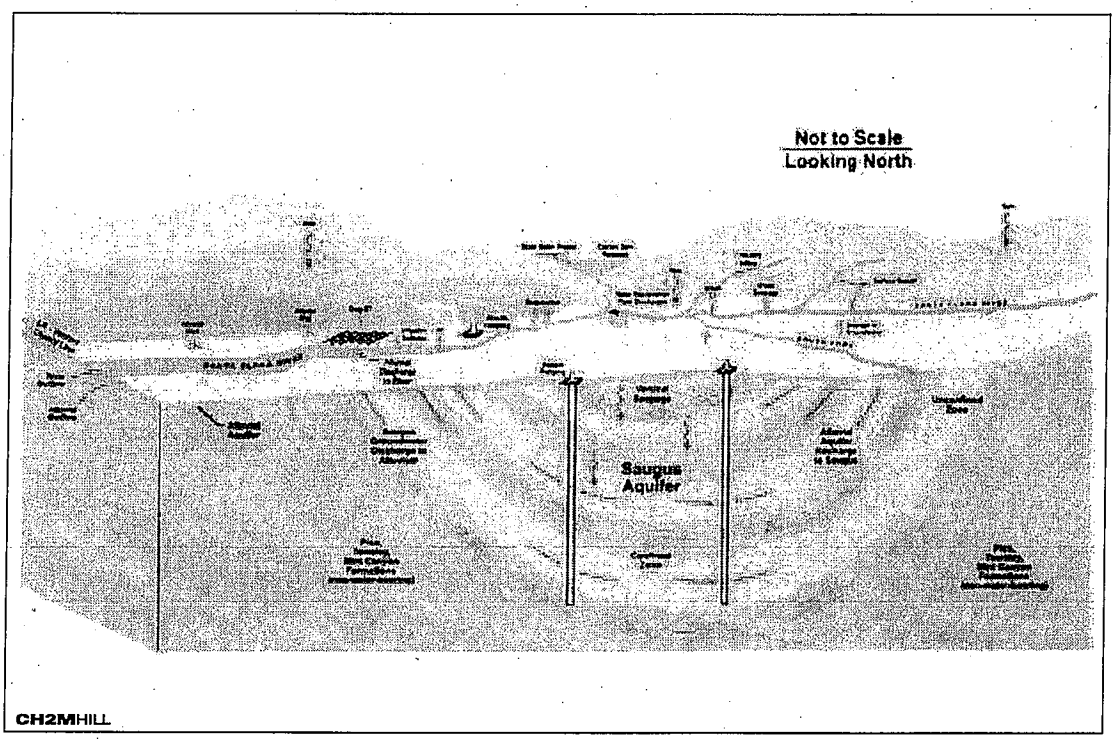

FIGURE 4.8-5

Geology And Hydrologic Cycle–Santa Clarita Valley

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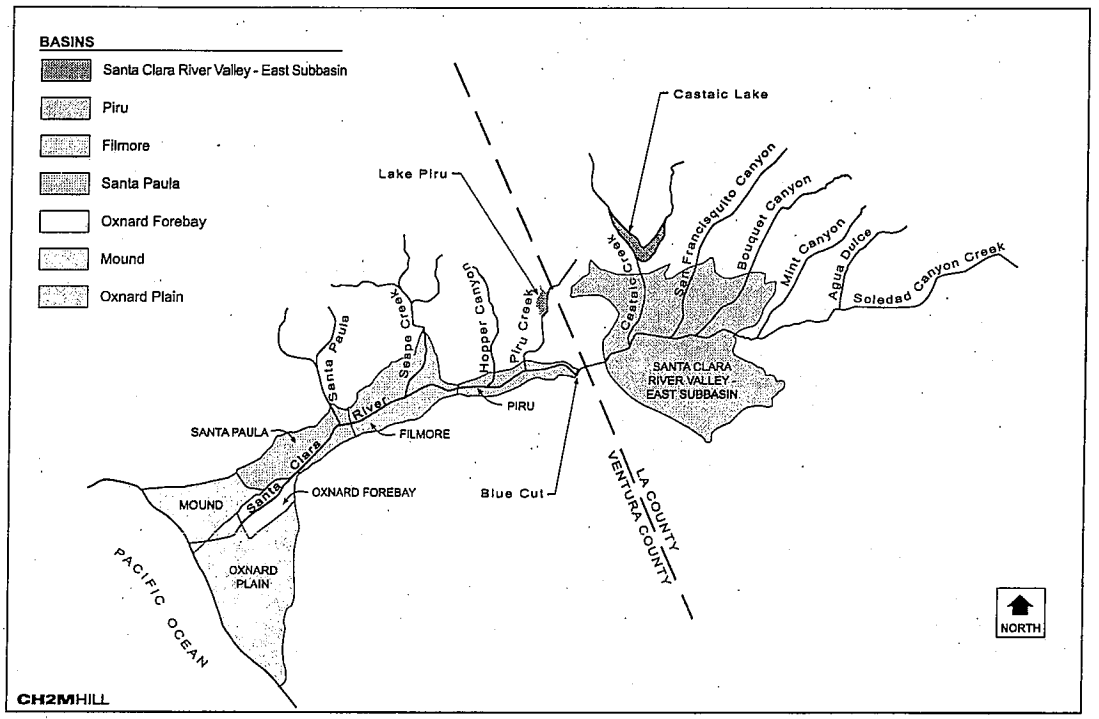

FIGURE 4.8-6

Groundwater Basins in the Santa Clara River Drainage

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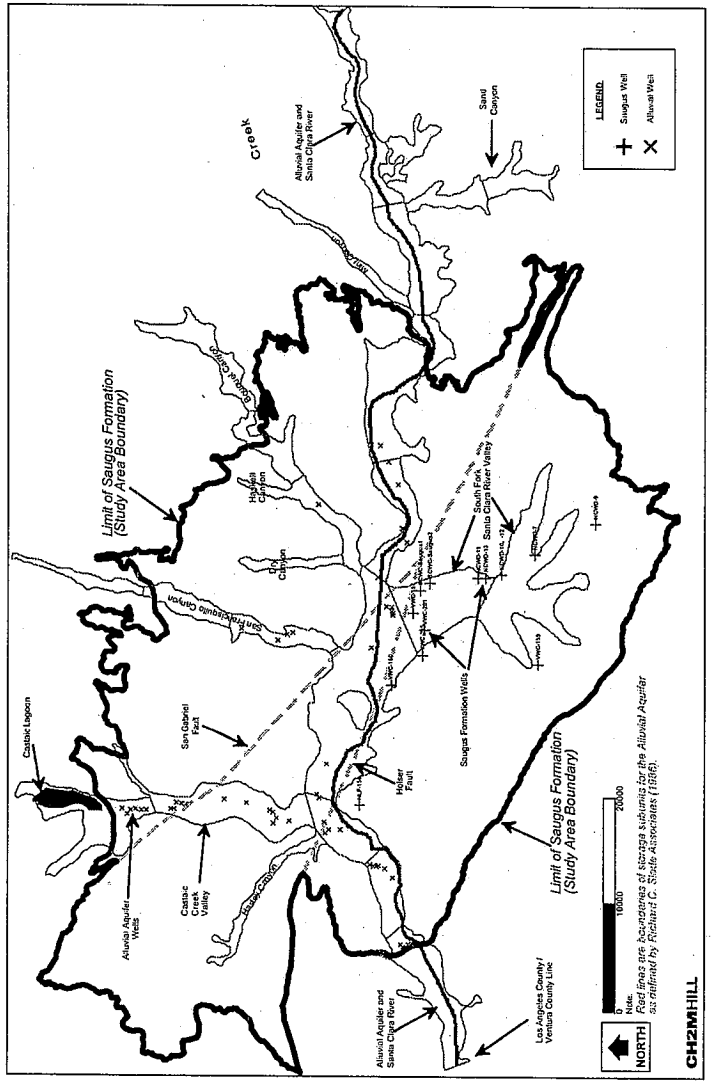

FIGURE 4.8-7
Groundwater Production Well Locations–Santa Clarita Valley

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Again, the total amount of SWP water delivered to the service area from 1980 through 2002 was 405,062 acre feet. Based on the updated technical memorandum, it is estimated that approximately 136,544 acre feet of imported SWP water has been added to the Santa Clara River through return flow and discharges from existing water treatment plants in Santa Clarita Valley. It is estimated that approximately 18,000 AFY enhanced the watershed and flowed downstream to Ventura County in 1999.

In the future, when CLWA takes its full 95,200 AFY allocation of SWP water, CH_2MHill estimates that approximately 22,160 AFY will enhance the watershed and flow to Ventura County (CH_2MHill, 2001). Consequently, similar to other watersheds where water importation has occurred (e.g., Santa Ana River), the flow in the Santa Clara River watershed is, and will continue to be, significantly enhanced by importing SWP water to the watershed. The importing of SWP water, and the use of that water in the CLWA service area, will continue to result in a net benefit in the amount of surface flow into Ventura County.

(6) Effects Of Drought

Drought cycles will affect the project in two ways. First, local droughts in the Santa Clarita Valley historically have resulted in short-term increased water demand, short-term increased groundwater pumping, and short-term decreased recharge to the local groundwater system. Second, a statewide drought affects water availability in the SWP system and ultimately deliveries from the SWP system. Droughts have occurred locally in 1947-1950, 1958-1960 and 1990-1991. Recent statewide droughts have occurred in 1976-1977 and 1987-1992.[6] Since the area's water supplies are dependent upon rainfall conditions both locally and statewide, it is important to note that wet and dry year conditions do not occur at the same time in Northern and Southern California. As a result, the water purveyors in Santa Clarita Valley are able to adjust the mix of available water resources on a year-to-year basis in response to local and statewide hydrologic conditions.

Prior to 1990-1991, drought conditions statewide had a minimal impact upon the Santa Clarita Valley other than requiring additional water supply to compensate for the lack of spring rainfall for irrigation (e.g., crops, lawns and gardens). In 1990-1991, however, for the first time, statewide drought conditions caused cutbacks in imported SWP supplies in the Santa Clarita Valley. Water production also declined in

6 The 1987-1992 drought was notable for its six-year duration. Statewide reservoir storage was about 40 percent of average by the third year of the drought. The State Water Project met contractors' delivery requests during the first four years of the drought, but then was forced by declining reservoir storage to reduce deliveries substantially. The SWP terminated deliveries to agricultural contractors and provided about 30 percent of requested urban deliveries in 1991, the single-driest year of the drought. A 1991 Governor's executive order resulted in implementation of a State drought water bank. (Critical Water Shortage Contingency Plan, Governor's Advisory Drought Planning Panel, December 29, 2000.)

some wells operating in the shallow, outlying reaches of the Alluvial Aquifer. However, because Santa Clarita Water Division's alluvial wells are located in the major water bearing reaches of the aquifer, none of SCWD's alluvial wells experienced loss of production during 1990-1991 (CLWA acquired the Santa Clarita Water Company, an investor-owned retail water company serving the eastern part of the Santa Clarita Valley. The former Santa Clarita Water Company was incorporated into CLWA's Santa Clarita Water Division, which continues to serve the same area with Santa Clarita Water Company's facilities. Additional details regarding the Santa Clarita Water Division of CLWA is provided below). In addition to the alluvial groundwater supplies, the water purveyors in Santa Clarita Valley pumped more water from the Saugus Formation in 1990-1991, and requested that their customers voluntarily conserve water by 10 percent. Actual water use in the valley decreased more than 10 percent as a direct result of water conservation efforts.

Due to the steps taken by the local purveyors, water demands in the Santa Clarita Valley were met for the duration of the 1990-1991 drought. CLWA also elected not to participate in the state's Drought Water Bank because alternate local supplies were available to meet water demands in the Santa Clarita Valley. In addition, members of the Santa Clarita Valley Water Purveyors signed a Drought Emergency Water Sharing Agreement, agreeing to share water from all sources, and to facilitate beneficial water transfers, exchanges and wheeling arrangements. The purveyors also worked with the City of Santa Clarita and the County of Los Angeles to implement water use ordinances for Santa Clarita Valley residences, review water consumption and supply data and recommend measures to encourage conservation.

Since the 1990-1991 drought, CLWA and the other retail water purveyors have continued to work cooperatively to ensure customer demands are met under varying hydrologic conditions and with overall increasing demands from planned growth. These efforts have included water resource planning activities, acquisition of new water supplies and construction of transmission and treatment facilities, as discussed in further detail below. These efforts include the decision by most of the Santa Clarita Valley's water agencies to jointly prepare the UWMP. The UWMP describes current and future implementation of water conservation measures (called Water Demand Management Measures) within the CLWA service area. These conservation measures are described in Chapter 5.0 of the UWMP. The UWMP also includes an update to the Santa Clarita Valley's Critical Water Shortage Contingency Plan. The updated plan is based on the water agencies' actual experience in addressing water shortages in the Santa Clarita Valley in 1991 (due to the continuation of the 1990-1991 statewide drought) and in 1994 (due to the 1994 Northridge earthquake). The updated plan is described in Chapter 6.0 of the UWMP.

At the state level, significant changes have also occurred in California's water management framework since the last statewide drought of 1987-1992. For further information regarding these statewide changes,

please refer to the heading, **Imported SWP Water Supplies; SWP Reliability** and Critical Water Shortage Contingency Plan, Governor's Advisory Drought Planning Panel, December 29, 2000 (Chapter 2).

(7) Effects Of Urbanization on Aquifer Recharge in the Santa Clarita Valley

In a groundwater basin, the effect of urbanization on recharge to underlying groundwater is dependent on land uses, water uses, vegetative cover, and geologic conditions. Groundwater recharge from undeveloped lands occurs from precipitation alone, whereas areas that are developed for agricultural or urban land uses receive both precipitation and irrigation of vegetative cover. In an urban area, groundwater recharge occurs directly beneath irrigated lands and in drainages whose bottoms are not paved or cemented. A memorandum prepared by CH_2MHill entitled Effect of Urbanization on Aquifer Recharge in the Santa Clarita Valley (February 22, 2004; see **Appendix 4.8**) discusses the general effects of urbanization on groundwater recharge and the specific effects in the Santa Clarita Valley. The findings of that memorandum is presented below.

In the Santa Clarita Valley, stormwater runoff finds its way to the Santa Clara River and its tributaries, whose channels are predominantly natural and consist of vegetation and coarse-grained sediments (rather than concrete). The stormwater that flows across paved lands in the Santa Clarita Valley is routed to stormwater detention basins and to the river channels, where the porous nature of the sands and gravels forming the streambeds allow for significant infiltration to occur to the underlying groundwater.

Increased urbanization in the Valley has resulted in the irrigation of previously undeveloped lands. The effect of irrigation is to maintain higher soil moisture levels during the summer than would exist if no irrigation were occurring. Consequently, a greater percentage of the fall/winter precipitation recharges groundwater beneath irrigated land parcels than beneath undeveloped land parcels. In addition, urbanization in the Santa Clarita Valley has occurred in part because of the importation of State Water Project (SWP) water, which began in 1980. SWP water use has increased steadily, reaching nearly 44,500 acre-feet (AF) in 2003. Two-thirds of this water is used outdoors, and a portion of this water eventually infiltrates to groundwater. The other one-third is used indoors and is subsequently routed to local water reclamation plants (WRPs) and then to the Santa Clara River (after treatment). A portion of this water flows downstream out of the basin, and a portion infiltrates to groundwater.

Records show that groundwater levels and the amount of groundwater in storage were similar in both the late 1990s and the early 1980s, despite a significant increase in the urbanized area during these two decades. This long-term stability of groundwater levels is attributed in part to the significant volume of natural recharge that occurs in the streambeds, which do not contain paved, urban land areas. On a long-

term historical basis, groundwater pumping volumes have not increased due to urbanization, compared with pumping volumes during the 1950s and 1960s when water was used primarily for agriculture. Also, the importation of SWP water is another process that contributes to recharge in the Valley. In summary, urbanization has been accompanied by long-term stability in pumping and groundwater levels, plus the addition of imported SWP water to the Valley, which together have not reduced recharge to groundwater, nor depleted the amount of groundwater that is in storage within the Valley.

c. Water Purveyors in Santa Clarita Valley and Their Service Areas

(1) Castaic Lake Water Agency

For most residents within the Santa Clarita Valley, domestic water service is provided by four retail water purveyors: Los Angeles County Waterworks District 36, Newhall County Water District, Santa Clarita Water Division of CLWA and Valencia Water Company. However, these four retail water purveyors actually obtain all or a portion of their water supplies from the Castaic Lake Water Agency.

CLWA was formed in 1962 as a wholesale water agency for the purpose of contracting with the California Department of Water Resources (DWR) to provide a supplemental supply of imported water from the State Water Project (SWP) to serve retail water purveyors in the Santa Clarita Valley.[7] CLWA is one of 29 agencies with long-term water supply contracts with DWR for SWP water.[8] CLWA obtains SWP water from the upper reservoir at Castaic Lake, a storage reservoir of the SWP. CLWA serves the City of Santa Clarita, the unincorporated Santa Clarita Valley in Los Angeles County and portions of Ventura County. CLWA's service area covers approximately 195 square miles. **Figure 4.8-8** depicts CLWA's service area.

CLWA's physical water delivery system is comprised of facilities needed to treat and convey SWP supplies to the retail water purveyors. The funding for CLWA's expansion, modification, and addition to its current facilities and programs is through its Capital Improvement Plan (CIP). As part of CLWA's annual budget process, the CIP is reviewed and updated as necessary. An integral part of CLWA's CIP is its capital facilities fee, or development impact fee, which is a source of revenue to fund additional facilities and programs required to accommodate growth within the service area. As part of CLWA's CIP, funding has been established to provide for the purchase of additional imported supplies, implementation of reclaimed water (also referred to as "recycled water") programs and enhancement of groundwater, as well as groundwater banking/conjunctive-use programs both inside and outside the

7 See, California Water Code Appendix Sections 103-1, 103-15.

8 CLWA also provides retail water service through a contract with the Santa Clarita Water Division of CLWA since September 1999.

CLWA service area. According to CLWA, implemented over time, these measures will provide assurance that there will be sufficient supplies to meet water demands. Seawater and local brackish water desalination coupled with other contractual water exchanges could also provide the additional water supplies to meet anticipated community needs. It should be noted that desalination water would not likely be delivered to the Santa Clarita Valley. Desalination water would be exchanged for non-desalination water owned by another water agency located nearer to the desalination source. According to CLWA, the priority for implementation of some of these supply approaches will be driven in part by the relative cost. CLWA has also recently prepared a draft document entitled, Draft Report, Water Supply Reliability Plan, dated September 2003. A copy of this document can be found in Appendix 4.8 of this EIR. As indicated in the Draft Report, Water Supply Reliability Plan (also referred to as the Draft Water Supply Reliability Plan), SWP supply is variable due to its dependence on hydrology (i.e., precipitation and snowpack of the present and past years) and, therefore, deliveries can be curtailed. When sufficient SWP water is not available, the balance of the Valley's demand is met with local groundwater provided by the Santa Clarita Valley Water Purveyors. In recognition of the need to evaluate the technical, environmental, and economic issues associated with potential water supply reliability projects, CLWA has developed the long-term Draft Water Supply Reliability Plan. Because available groundwater is limited, it is anticipated that water demands will increasingly rely on SWP supplies. As CLWA's water requirements utilize increased proportions of its SWP Table A Amount, water banking opportunities, together with water transfers, water conservation, recycled water, and local Aquifer Storage and Recovery, become important elements of CLWA's long-term water supply strategy and are included in its Capital Improvement Program. In particular, water banking programs are essential to optimizing the use of CLWA's SWP Table A Amount.

The primary objectives of the Draft Water Supply Reliability Plan are to develop a protocol to identify current opportunities, evaluate opportunities using uniform economic criteria, and recommend a water supply reliability plan that focuses CLWA's efforts on the cost effective and beneficial opportunities.

The Draft Water Supply Reliability Plan includes the following primary elements:

- Near-term acquisition of water banking capacity to allow banking of excess SWP water until the selected long-term banks have been developed.
- Acquisition of water banking capacity south of the Tehachapi Mountains to provide reliability for potential SWP conveyance disruptions.
- Acquisition of water banking capacity north of the Tehachapi Mountains to meet the additional identified water banking requirements not provided south of the Tehachapi Mountains.

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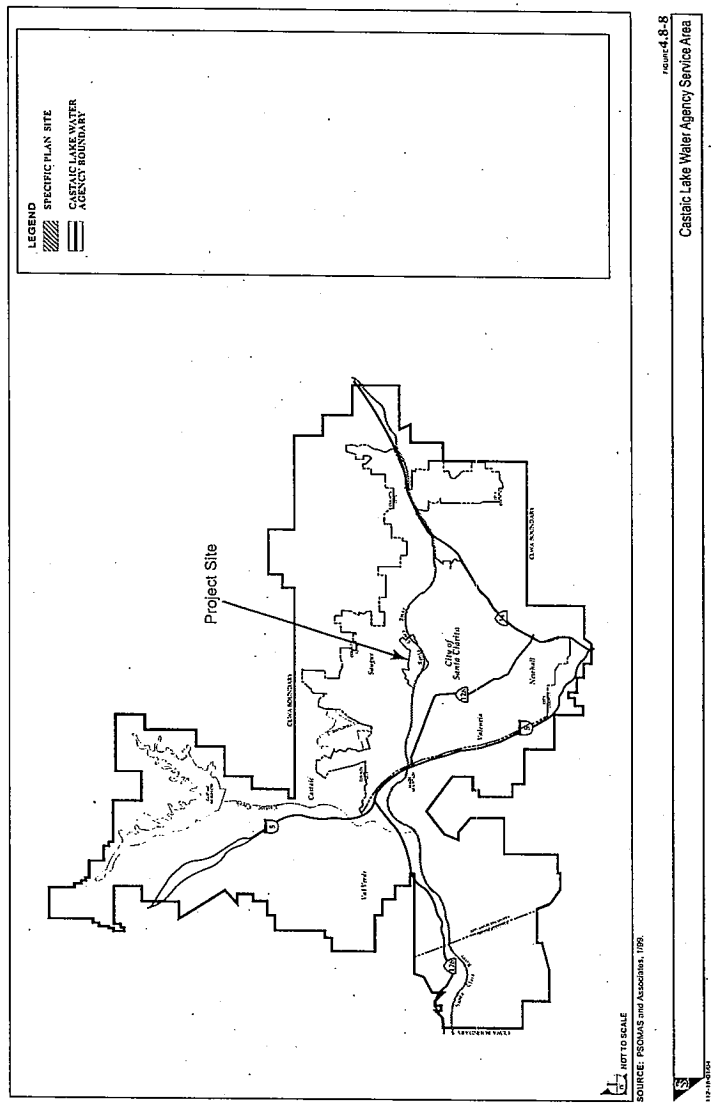
The Draft Water Supply Reliability Plan also includes a discussion of key implementation issues and a recommended implementation plan. The plan recommends that CLWA provide a minimum storage capacity of 50,000 acre feet by 2005, rising to 183,000 acre feet by 2050. Recent experience illustrating that CLWA is already participating in such programs comes from the Semitropic Water Storage District (Semitropic) in Kern County. Semitropic is expanding its existing groundwater banking program to include the Stored Water Recovery Unit (SWRU). The SWRU will provide 650,000 AF of additional groundwater storage capacity. CLWA has contracted with Semitropic to participate in this phase of the program. As part of this program, up to 50,000 AF of guaranteed annual recovery capacity could be made available to CLWA immediately. In 2002, CLWA fulfilled the following accomplishments in order to enhance, preserve, and strengthen the quality and reliability of existing and future supplies.

- Stored 24,000 AF of SWP water in the Semitropic Water Storage District's Groundwater Bank.
- Completed preliminary design for expansion of Earl Schmidt Filtration Plant from 25 mgd to 55 mgd.
- Obtained permission from California Department of Health Services to increase filter flow rate at ESFP.
- Negotiated with DWR, in conjunction with other State Water Contractors, an extended carry-over program for 2002 SWP allocations.
- Constructed Phase 2 of the Magic Mountain pipeline.
- Initiated construction of Lost Canyon Turnout for Newhall County Water District.
- Continued implementation of programs recommended in the UWMP adopted in December 2000.
- Continued implementation of the water conservation Best Management Practices, as recommended in the 2000 UWMP.
- Worked with other State Water Contractors to establish claim to 16,000 acre feet of SWP Table A subject to conditioned release by the Kern County Water Agency and DWR, following appropriate environmental review.
- Purchased site for location of Pumping Station for the Sand Canyon Pipeline and Reservoir project.
- Continued litigation against Whittaker et al., relative to the perchlorate contamination of groundwater supply, which impacts operation of 5 wells that can supply 8,700 gpm of pumping capacity.
- Continued cooperative effort with the U.S. Army Corps of Engineers for characterization studies of the Whittaker site.
- Participated in a task force effort with the City of Santa Clarita, area elected officials and state agencies to affect the cleanup and remediation of all aspects of the Whittaker site, including the perchlorate groundwater contamination.
- Began construction of the first phase of the recycled water transmission system.

For additional related information, please see the plan in Appendix 4.8.



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CLWA's existing water delivery system is presented in Figure 4.8-9. As shown in that figure, CLWA owns and operates two water filtration plants, the Earl Schmidt Filtration Plant, with a current water capacity of 33 million gallons per day (mgd), and the Rio Vista Water Treatment Plant, with a water capacity of 30 mgd. The two plants have a current capacity to treat a total of 63 mgd. These plants were designed to accommodate expansion as required. CLWA has completed the design of the Earl Schmidt plant expansion to increase the plant's treatment capacity to a total of approximately 56 mgd. Construction of the treatment plant began in August 2003 and is scheduled to be on-line by mid-2005. CLWA also owns and operates an intake pump station at the Earl Schmidt plant, a pump station at the Rio Vista plant, major water transmission lines, and storage tanks and reservoirs. CLWA has also begun the design and environmental review process for expanding the capacity of the Rio Vista Water Treatment Plant from 30 mgd to 60 mgd.

CLWA treats the SWP water at its two water filtration plants and then distributes the water to the local retail water purveyors in the Santa Clarita Valley. From CLWA's two existing plants, the treated SWP water is delivered by gravity to the retail water purveyors through CLWA's distribution network of pipelines and turnouts. Local water retailers, such as CLWA's Santa Clarita Water Division, combine SWP water with groundwater from their own municipal-supply wells in the Alluvial Aquifer and Saugus Formation to meet water demand within their respective service areas. The actual mix between SWP and groundwater distributed by the water retailers to their respective service areas is variable over time and is based upon availability and operational and cost considerations.

CLWA's current total maximum contracted water allocation of SWP water is 95,200 AFY.[9] Of that amount, CLWA obtained 41,000 AFY from KCWA, through its member district Wheeler Ridge-Maricopa Water Storage District (Wheeler Ridge), pursuant to a March 1999 water transfer agreement. CLWA analyzed the potential environmental impacts of the water transfer in a Final EIR entitled, Supplemental Water Project Environmental Impact Report, dated February 1999 (SCH No. 98041127) (the CLWA EIR). A project opponent filed a petition for Writ of Mandate in April 1999, challenging the adequacy of the CLWA EIR under CEQA. The trial court rejected the petition, finding that the CLWA EIR complied with CEQA, and the petitioner appealed.

In a decision issued in January 2002, the appellate court reversed the trial court's judgment but not on any of the specific grounds urged by the petitioner. Rather, the appellate court found that, since the appeal had been filed, another EIR, which studied the environmental effects of the Monterey Agreement (the

9 An acre-foot represents 43,560 cubic feet, or 325,850 gallons, of water. An acre-foot of water has been generally defined as "an irrigation-based measurement equaling the quantity of water required to cover an acre of land to a depth of one foot." See, *Bryden v. East Bay Mun. Utility Dist.* (1994) 24 Cal.App.4th 178, 182, fn. 1.

Monterey Agreement EIR), had been ordered decertified (detailed information regarding the Monterey Agreement is provided in the heading below entitled **Imported SWP Water Supplies**. Because it found that the CLWA EIR had "tiered" on the now-decertified Monterey Agreement EIR, the appellate court held that the CLWA EIR also must be decertified. Notably, the appellate court found that, were it not for the intervening decertification of the Monterey Agreement EIR, it "...would have affirmed [the trial court's] judgment." See, *Friends of the Santa Clara River v. Castaic Lake Water Agency* (2002) 95 Cal.App.4th 1373, 1387.

Importantly, although the appellate court ordered the CLWA EIR decertified, it did *not* order CLWA to void its approval of the water transfer agreement itself. Instead, the appellate court remanded the matter to the trial court for further proceedings concerning the remedy, stating that the trial court was in a "better position" than the appellate court to make the factual determinations necessary to devise an appropriate remedy. Id. at 1388.

The trial court held a hearing on September 24, 2002, to hear argument on whether the water transfer agreement should be allowed to remain intact while CLWA completes a new EIR. As directed by the appellate court, the trial court ordered CLWA to vacate its certification of the CLWA EIR. However, the trial court did not order CLWA to vacate its approval of the water transfer agreement itself. Rather, the court ruled that CLWA may utilize and rely on the 41,000 AFY. The trial court allowed that the petitioner may renew its application for a prohibition on CLWA's use of the 41,000 AFY if the petitioner could provide evidence that CLWA is actually using the additional entitlement for purposes the petitioner considers improper. A copy of the trial court's judgment and Writ, along with a transcript of the September 24, 2002 hearing, is provided in **Appendix 4.8** to this report.

CLWA is currently in the process of preparing a new EIR for the water transfer agreement, consistent with CEQA and the appellate court opinion. CLWA has hired an environmental consultant and the work on the new EIR is well underway.

(2) Retail Water Purveyor Service Areas

CLWA and the four retail water purveyors provide water to most residents of the Santa Clarita Valley. A description of the service areas of the local retail purveyors is provided on the following pages.

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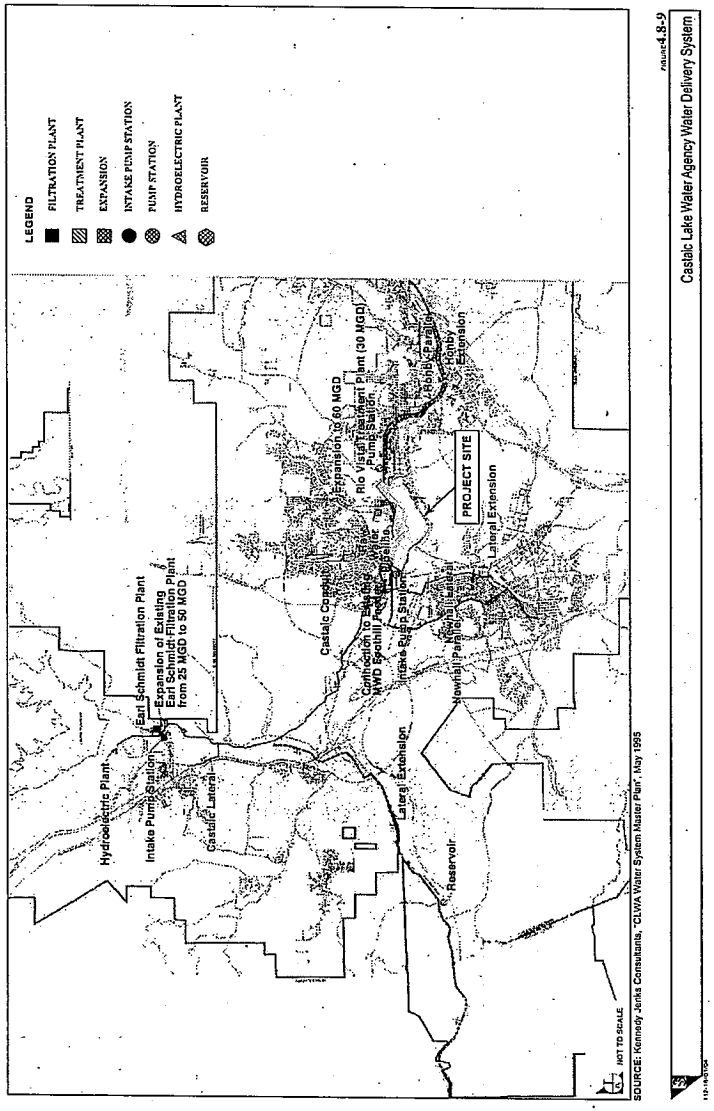

Figure 4.8-9 Castaic Lake Water Agency Water Delivery System

The Los Angeles County Waterworks District 36 service area encompasses approximately 7,635 acres in the Hasley Canyon area and the unincorporated community of Val Verde. The District obtains its full water supply from CLWA turnouts. The District presently has no operating groundwater extraction facilities.

The Newhall County Water District service area lies within four distinct geographical areas of the Santa Clarita Valley: Newhall, Pinetree, Tesoro Del Valle, and Castaic. The district's service connections are located over a 34 square-mile area. The District's water supplies are obtained from groundwater wells and SWP water from CLWA turnouts.

CLWA's Santa Clarita Water Division (SCWD) service area includes portions of the City of Santa Clarita, including the proposed project site, and unincorporated portions of Los Angeles County in the communities of Saugus, Canyon Country and Newhall. SCWD is expected to be the retail water purveyor for the project.

In September 1999, CLWA acquired the Santa Clarita Water Company, an investor-owned retail water company serving the eastern part of the Santa Clarita Valley.[10] The former Santa Clarita Water Company was incorporated into CLWA's Santa Clarita Water Division, which continues to serve the same area with Santa Clarita Water Company's facilities. Figure 4.8-10 illustrates the service area of the Santa Clarita Water Division (SCWD).

As buildout of the project proceeds over time, the tentative subdivision map would require preliminary and final water plans for review and approval by the SCWD. The plans would indicate anticipated water demand, required water storage facilities, booster pump stations, and on-site and off-site piping needed for adequate domestic and fire water flow pressure to the site. The company's water supplies are obtained from groundwater wells and SWP water from CLWA turnouts.

The Valencia Water Company service area serves a portion of the City of Santa Clarita and the unincorporated communities of Castaic, Newhall, Saugus, Stevenson Ranch and Valencia in Los Angeles County. Valencia's service area is approximately 25 square miles. Valencia's water supplies are obtained

10 CLWA acquired 100 percent of the capital stock in Santa Clarita Water Company by way of a judgment in eminent domain in Los Angeles County Superior Court case number BC 215065, entered on September 2, 1999. Subsequently, CLWA's authority to own the Santa Clarita Water Company and to provide retail water service through the former assets of the Company has been challenged in *Klajic v. Castaic Lake Water Agency* (California Court of Appeal, 2nd Dist, case number B161069). In addition, the public agency borrowing undertaken by CLWA to finance the acquisition of the Santa Clarita Water Company has been challenged in *Plambeck v. Stone and Youngberg* (LASC case no. BC249168). The cases are currently pending, but neither case seeks relief affecting the availability of water to Santa Clarita Water Company, SCWD or CLWA.

from groundwater wells and SWP water from CLWA turnouts. Figure 4.8-11 illustrates the respective service areas of CLWA and the four retail water purveyors in the Santa Clarita Valley.

As of 2002, the four retail water purveyors service over 58,000 connections in the Santa Clarita Valley. The specific breakdown by purveyor is provided in Table 4.8-2.

Table 4.8-2
Santa Clarita Valley Retail Water Purveyors

Purveyor	Connections
Los Angeles County Waterworks District 36	1,060
Newhall County Water District	7,700
Santa Clarita Water Division of CLWA	24,175
Valencia Water Company	25,286
Total	58,221

Source: Santa Clarita Valley Water Report, 2002.

(4) CLWA's Allocation of Imported Water Supplies

CLWA's fixed-percentage allocation to retail purveyors is based on a "first-come, first-served" allocation method. CLWA distributes imported water supplies among "water service areas" established by CLWA on a basis that allows imported water to be delivered to these areas where it is needed. CLWA's current allocation system, defined by Section 103-29.5 of CLWA's governing act as interpreted by CLWA, is based on the collection of developer impact fees paid by new development and other contributions collected within each "water service area." Under CLWA's allocation method, water supplies available to CLWA are allocated among the CLWA-defined "water service areas" based on the payment of developer impact fees, property taxes, and other contributions that fund CLWA's Capital Program. Historically, however, CLWA has not been required to allocate imported water supplies to the retail water purveyors, because the available supply of imported water has been sufficient to meet all purveyor requests. Even in the extreme drought year, 1991, no allocation was necessary, because the four retail purveyors entered into a water sharing agreement by which the purveyors shared all available water supplies and, with the help of significant conservation, were able to meet all water demand in the Santa Clarita Valley. Accordingly, absent the need for an allocation during times of limited supply under CLWA's method, CLWA supplies are delivered to retail water purveyors on a first-come, first-served basis. However, should CLWA need to allocate water resources, SCWD's allocation would likely increase due to the increased amount of connection fees paid to CLWA.

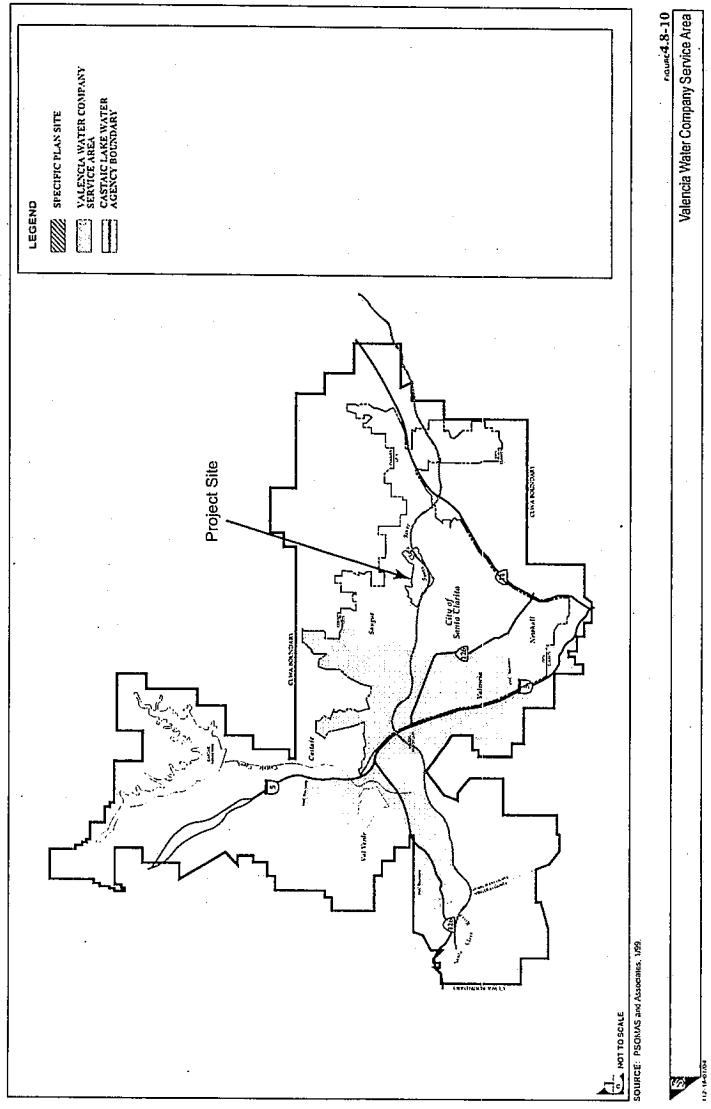

Figure 4.8-10
Valencia Water Company Service Area

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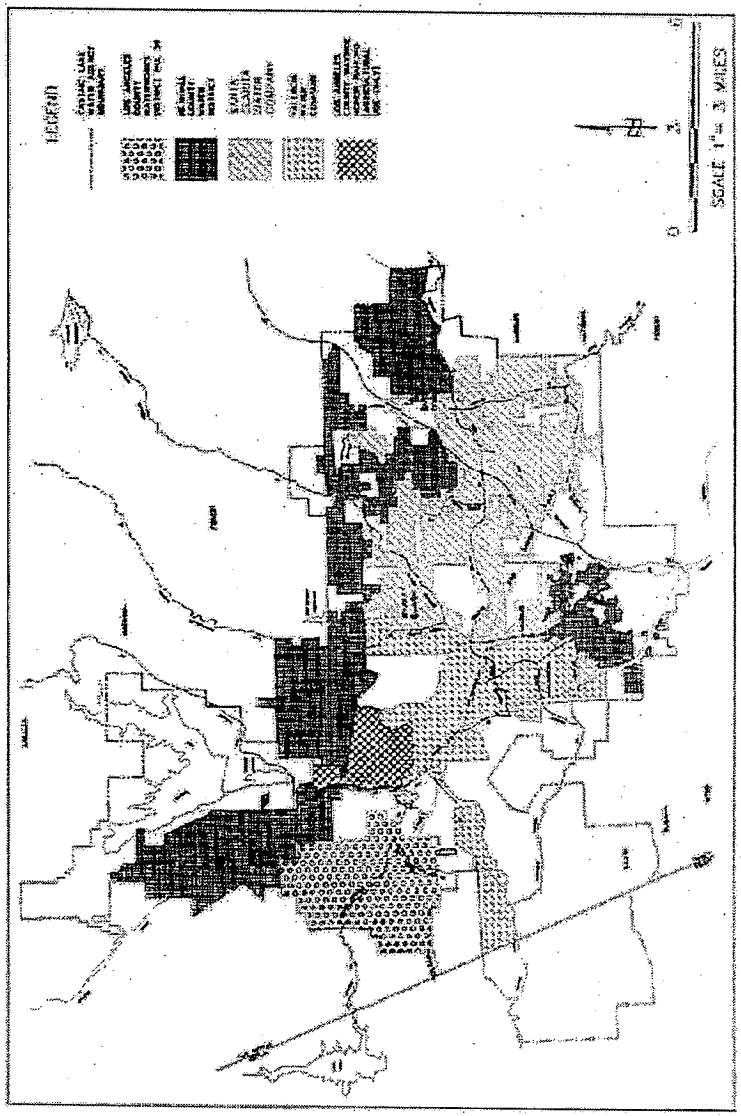

FIGURE 4.8-11 Groundwater Basins in the Santa Clara River Drainage

112-16-11R3

In light of CLWA's allocation method, SCWD expects that its share of water supplies from CLWA is expected to increase for the following reasons: (a) SCWD's "water service area" includes significant amounts of existing and planned development; (b) water supplies are now allocated among CLWA-defined "water service areas," and SCWD's "water service area" significantly contributes to the funding of the CIP; and (c) water supplies are delivered by CLWA to the purveyors, including the SCWD, on a first-come, first-served basis. Accordingly, SWP water supplies in the Santa Clarita Valley are evaluated on a valley-wide basis, rather than on individual percentage allocations to retail purveyors.

(5) Santa Clarita Valley Water Purveyors

The wholesale and retail water purveyors in Santa Clarita Valley meet regularly as a technical group to coordinate the water resources of the Valley. The group has been commonly known as the Santa Clarita Valley Water Purveyors (purveyors). One of the highest priorities of this group is to provide an adequate water supply for the CLWA service area, safeguard existing water resources and develop both short-term and long-range plans for the efficient use of water in the Santa Clarita Valley.

Over the years, the purveyors have documented the availability of water resources in the region, assessed the condition of the local groundwater aquifers and their hydrogeologic character and reviewed aquifer storage capacity and the perennial yield and recharge rate of the aquifers. The purveyors have also studied the potential for conjunctive use of both groundwater and imported water resources. In addition, the purveyors continue to monitor water quality, including plans for the treatment of water to maintain good quality water for use in the Santa Clarita Valley.

Other cooperative efforts of the purveyors have included development of drought contingency plans, evaluation of landfill impacts on the groundwater basin, coordination of emergency response procedures and implementation of valley-wide conservation programs. In 1985, the purveyors prepared the area's first UWMP. In 1998, the purveyors participated with CLWA in the preparation of a Draft Integrated Water Resources Plan (IWRP), which assessed the existing and long-term water supply and demand of the Santa Clarita Valley. In addition to identifying the range of water demands and supplies, the IWRP addressed opportunities to improve water supply reliability for the Santa Clarita Valley. The plan suggested a phased approach toward development of the supplies needed to meet projected demands. This approach combined additional acquisition of imported water, water conservation, surface and groundwater storage, water transfers and exchanges and water reclamation in an integrated strategy designed to meet increasing water demands while assuring a reasonable degree of supply reliability.

In years 1998 through 2003, the purveyors prepared Annual Water Reports (also referred to as "water reports") providing information about the local water supplies and water demands in Santa Clarita Valley. The information presented in the water reports is intended to supplement information already required by the County's Development Monitoring System (DMS). The DMS is used by both the County and the City of Santa Clarita to track development activity in the Santa Clarita Valley, and it requires that adequate water supplies be in place prior to development taking place. The information presented in the water reports is used by the County and City of Santa Clarita in connection with future land use decisions in the Santa Clarita Valley in general.

In addition, in December 2000, the Santa Clarita Valley's water agencies jointly sponsored preparation of the 2000 UWMP. The UWMP covers the CLWA service area, which includes the service areas of the four retail water purveyors. The UWMP presents information about the water supply, water demand, water reclamation (also referred to as "water recycling"), water conservation and reliability planning in the CLWA service area over a 20-year time frame. Consultants with expertise in water resource management were retained to assist CLWA and retail water purveyors in preparing the UWMP.

In April 2001, opponents of the UWMP filed a lawsuit against CLWA and the retail water purveyors challenging the adequacy of the UWMP under the Urban Water Management Planning Act and the Public Trust doctrine. CLWA and the purveyors successfully demurred to the Public Trust doctrine claim and the trial court ordered the claim dismissed. The trial court also ruled that the UWMP is adequate. A copy of the court's decision is attached to this report as **Appendix 4.8**. Petitioners have appealed this ruling.

The Santa Clarita Valley Water Purveyors have adopted resolutions approving the UWMP. The State Department of Water Resources (DWR) has also accepted the UWMP for filing. In addition, DWR indicated in its review that the Santa Clarita Valley Water Purveyors had addressed virtually all of the requirements of the Urban Water Management Planning Act, including all of the more significant provisions relating to water supply, demand, and reliability. Accordingly, the UWMP is considered by CLWA and the SCWD to be in compliance with the Urban Water Management Planning Act. Whatever the outcome of the UWMP litigation, however, it is not expected to have any impact on the validity of this water resources analysis. The bulk of the UWMP data utilized in this report relates to aspects of the plan not challenged in the current litigation. Moreover, all of the data cited in this report is provided for informational purposes only and has been independently reviewed and considered by the City of Santa Clarita prior to use in this analysis. State law requires that UWMPs be updated every five years.

(6) Water Reclamation Plants in the Santa Clarita Valley

Most existing wastewater generated in the Santa Clarita Valley is treated at two WRPs. The two plants are operated by the County Sanitation Districts of Los Angeles County (CSDLAC).

The Saugus WRP, a tertiary treatment plant, is located southeast of the intersection of Soledad Canyon Road and Bouquet Canyon Road. The Valencia WRP, also a tertiary treatment plant, is located on The Old Road, north of Magic Mountain Parkway. The two facilities are illustrated in **Figure 4.8-12**. The Saugus WRP, located in District No. 26, has a permitted capacity of 6.5 mgd.

The Valencia WRP, in District No. 32, is presently undergoing expansion of an additional 9 mgd, which will be completed in 2003. Once constructed, the permitted capacity of the Valencia WRP is anticipated to be 21.6 mgd.

These two WRPs have been interconnected to form a regional treatment system known as the Santa Clarita Valley Joint Sewerage System (SCVJSS). The relationship between the two districts was established through a joint powers agreement that created the regional treatment system and permits the Valencia WRP to accept flows that exceed the capacity of the Saugus WRP.

Due to site space constraints, the Saugus WRP, completed in 1962, will not be expanded beyond its current permitted capacity of 6.5 mgd. In 2002, the Saugus WRP had an average monthly effluent flow of 5.60 mgd (6,294 AFY), which is approximately 86 percent of its permitted capacity. Effluent from the Saugus WRP contains about 723 milligrams per liter TDS (total dissolved solids) and is discharged to the Santa Clara River west of Bouquet Canyon Road.

The Valencia WRP, completed in 1967, has a current permitted capacity of 12.6 mgd. The ultimate planned capacity for the Valencia WRP is 27.6 mgd. In 2002, the average monthly effluent flow for the Valencia WRP was 12.11 mgd, which is approximately 96 percent of its current permitted capacity. Effluent from the Valencia WRP is discharged to the Santa Clara River west of The Old Road.

It should be noted that the Newhall Ranch Specific Plan proposes a new 6.9 mgd WRP on the Newhall Ranch site to exclusively serve the Specific Plan. The proposed Newhall Ranch WRP would be located near the western edge of the Specific Plan site along the south side of State Route 126 (SR-126). Effluent from the proposed Newhall Ranch WRP would be used to partially meet non-potable water demands within the Specific Plan site.

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For further information regarding use of reclaimed water from the existing WRPs and the proposed Newhall Ranch WRP, please refer to the section below.

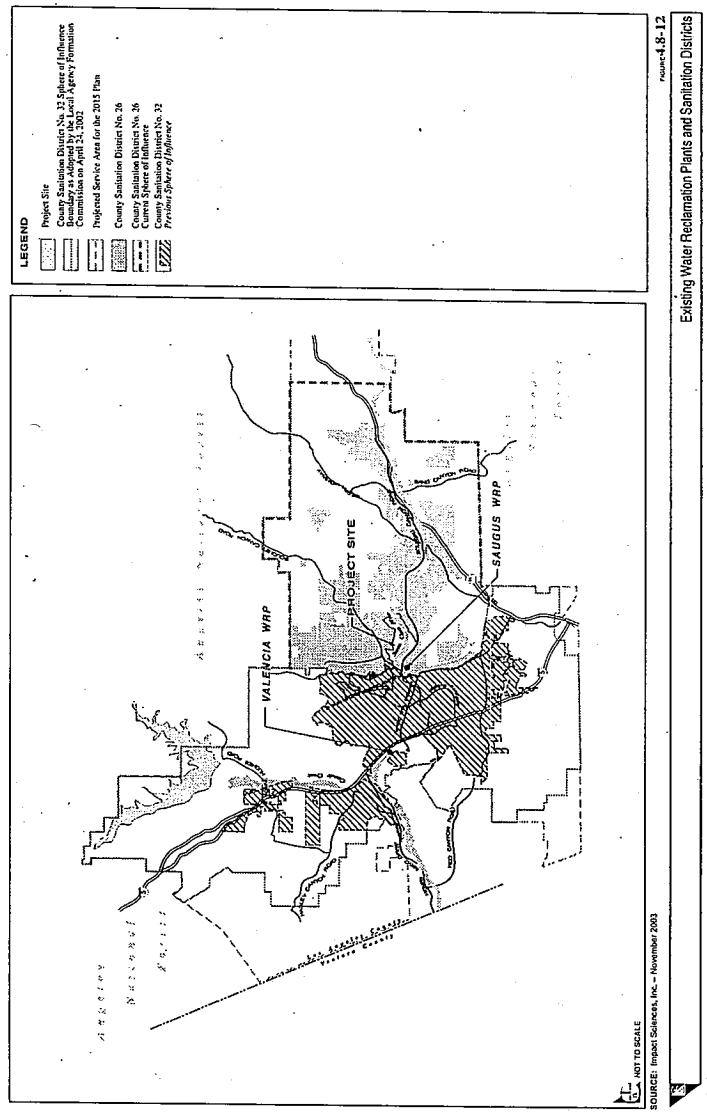

FIGURE 4.8-12
Existing Water Reclamation Plants and Sanitation Districts

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2. WATER SUPPLIES AND DEMAND IN THE SANTA CLARITA VALLEY

a. Preface

This section provides important regional information regarding available water sources for the Santa Clarita Valley, including the project site. The section summarizes two important aspects of the water picture, which provide context to the water supply and demand analysis of the project. First, the section summarizes the existing and planned future water supplies for the Castaic Lake Water Agency (CLWA) service area, including the project site. Second, the section summarizes the historic, existing and projected water demands within the CLWA service area.

Historically, local groundwater extracted from the Alluvial Aquifer and Saugus Formation has been the primary source of water in the Santa Clarita Valley. However, since 1980, local groundwater supplies have been supplemented with imported water from the SWP. These current water supplies are described in this section.

This section also briefly describes the groundwater resources of the Santa Clarita Valley and SWP water supplies, including reclaimed water, groundwater banking supplies, water transfers and desalted water. In addition, in recent years, water conservation has become an increasingly important factor in water supply planning. In a dry year (i.e., a year of below average rainfall) following a year of average or normal rainfall, experience in the Santa Clarita Valley indicates that the demand for water typically increases by approximately 10 percent. For example, in a dry year a homeowner may notice that his or her lawn is drying out during the winter months, a time of year when people normally decrease lawn sprinkler use to take advantage of winter rains. In response, the homeowner increases sprinkler use in the winter to compensate for reduced rainfall. This type of action causes water demand to increase in a dry year when compared with years of average or above average rainfall. Conservation planning is a required component of the UWMP prepared by the water purveyors in the Santa Clarita Valley. Water purveyors expect that during a critical dry year, or during a prolonged drought, water demand can be reduced by up to 20 percent below the single dry year demand. This is due to the fact that during such critically dry periods, purveyors are able to enact voluntary and mandatory water conservation programs (however, this analysis conservatively assumes that critical dry year demand would decrease by 10 percent below dry year demand). This section describes the UWMP's current drought contingency planning for the Santa Clarita Valley.

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b. Local Groundwater Supplies

Prior to 1980, local groundwater extracted from the Alluvial Aquifer and the Saugus Formation was the primary water source for the Santa Clarita Valley. The current capacities and future potential of these Aquifers are discussed below, including the reliance on these sources during drought periods. The groundwater information presented below is based on: (a) a report prepared by Slade entitled, 2001 Update Report Hydrogeologic Conditions in the Alluvial and Saugus Formation Aquifer Systems, dated July 2002; (b) a 2-volume report prepared by Richard C. Slade & Associates (Slade) entitled, Hydrogeologic Investigation of the Perennial Yield and Artificial Recharge Potential of the Alluvial Sediments in the Santa Clarita Valley of Los Angeles County, California, dated December 1986; (c) a 2-volume report prepared by Slade entitled, Hydrogeologic Assessment of the Saugus Formation in the Santa Clarita Valley of Los Angeles County, California, dated February 1988; (d) a technical memorandum prepared by Slade, dated November 16, 2000; (e) a letter from Joseph C. Scalmanini, Luhdorff and Scalmanini Consulting Engineers, dated December 15, 2000, regarding review of the groundwater components of the UWMP; (f) a report prepared by Slade entitled, Assessment of the Hydrogeologic Feasibility of Injection and Recovery of Water in the Saugus Formation, Santa Clarita Valley, California, dated February 2001, including the Technical Appendix by Slade entitled, Hydrogeologic Conditions in the Saugus Formation, Santa Clarita Valley, California, February 2001; (g) a report prepared by CH_2MHill entitled, Newhall Ranch ASR Impact Evaluation, dated February 2001; and (h) a report prepared by CH_2MHill entitled, Newhall Ranch Updated Water Resources Impact Evaluation, dated September 2002.

As stated above, the groundwater basin underlying the CLWA service area consists of two aquifers comprised of the Alluvial Aquifer and the deeper underlying Saugus Formation (See previous, Figure 4.8-4). The two aquifers occupy approximately 84 square miles in the central portion of CLWA's service area.

The geologic sediments in the Alluvial Aquifer and the underlying Saugus Formation have been assessed according to their relative water-bearing characteristics. The term "water-bearing characteristics" means the relative ability of the geologic materials to contain, transmit and yield groundwater to wells. As such, two geologic divisions are recognized in the Santa Clarita Valley: a water-bearing sediment group and a nonwater-bearing rock group. Depending upon water levels, the water-bearing sediments are capable of becoming saturated, which allow the sediments to provide water that can be extracted by pumping through wells. As such, the sediments in these aquifers constitute the "groundwater reservoir" in the Santa Clarita Valley.

The water-bearing sediments have been penetrated to various depths by numerous water wells in the region and historically have provided virtually all of the groundwater extracted in the Santa Clarita Valley. Underlying the water-bearing sediments is the relatively impermeable, nonwater-bearing bedrock.

Figure 4.8-4 illustrates the water-bearing sediments in the Alluvium (shown as map symbol, Qal), in the terrace deposits (shown as Qt) and in the geologically older sediments known as the Saugus Formation (shown as QTs). For the most part, the water-bearing sediments are geologically younger, more permeable, less consolidated and less structurally deformed than the underlying relatively impermeable, nonwater-bearing bedrock.

(1) Alluvial Aquifer

The water-bearing sediments in the Santa Clarita Valley consist of the alluvial or valley fill deposits that underlie the Santa Clara River and its tributaries. Typically, the Alluvial Aquifer tends to be the deepest along the central portion of the river, and thins or pinches-out as the flanks of the adjoining hills are approached. The maximum thickness of the Alluvial Aquifer varies in the Santa Clarita Valley, but is generally considered to be approximately 200 feet. (Slade 2002) The Alluvium is able to produce good quality water where saturated.

Groundwater present in the alluvial deposits in the Santa Clarita Valley is unconfined. Natural sources of recharge to the Alluvium include deep percolation of direct precipitation; infiltration of stream runoff flowing into the valley along the Santa Clara River and its tributaries; subsurface inflow from the adjoining (upgradient) portions of the Alluvial Aquifer to the north and east of the Santa Clarita Valley; and discharge of groundwater from the Saugus Formation to the Alluvial Aquifer on the west side of the Santa Clarita Valley.

Man-made sources of recharge to the Alluvial Aquifer include deep percolation of irrigation seepage; percolation of stormwater runoff from urban areas; percolation of surface flow and underflow from Castaic Dam in the Castaic Creek area; percolation of water released by the Los Angeles Department of Water and Power from its reservoir facilities in Dry Canyon and upper Bouquet Canyon; and percolation of discharges to the Santa Clara River from the existing WRPs.

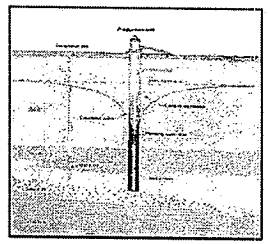
Outflow or discharge from the Alluvial Aquifer occurs by water well extractions. Additional discharge occurs by subsurface outflow through the Alluvial Aquifer to the downstream Piru groundwater basin to the west, and by seepage to underlying permeable portions of the Saugus Formation, particularly in the

eastern portion of the basin. Discharge also occurs by evapotranspiration in areas where deep-rooted riparian vegetation grows along the main Santa Clara River channel, particularly along the western reach of the river.

Available aquifer test data from alluvial wells indicate that the Alluvial Aquifer is unconfined (i.e., Aquifer is under water table conditions). Transmissivity values range from 35,000 to over 400,000 gallons per day per foot and specific yield values range from about 0.09 to 0.16. (Slade 1986)

As to the municipal-supply water well extraction from the Alluvial Aquifer, the Newhall County Water District (NCWD), the Santa Clarita Water Division of CLWA (SCWD) (formerly the Santa Clarita Water Company), Valencia Water Company (VWC) and the Wayside Honor Rancho (WHR) own and operate municipal-supply wells and extract water from this Aquifer. The Newhall Land and Farming Company also owns and operates private agricultural-supply wells and extracts water from this Aquifer.[11] Figure 4.8-13 illustrates a typical well configuration.

Figure 4.8-13
Typical Well Configuration



Groundwater levels in the Alluvial Aquifer have varied over the period of available record, reflecting changes in pumping and variations in the amount of recharge and discharge.[12] Because of the generally high permeability of the Alluvium and the hydraulic interrelationship between the Alluvial Aquifer and

11 The wells identified above do not include pumping of water from this aquifer by other privately-owned industrial, agricultural, ranch or domestic-supply wells. Production of water from these other wells is estimated to be 500 AFY.

12 Available records generally extend back to the 1950s, with some data available from about 1930 to 1947.

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the Santa Clara River and its tributaries, groundwater levels may rapidly fluctuate over the course of a year, and, to a large degree, in response to precipitation, runoff and groundwater pumping.

The amount of groundwater in storage in the Alluvium can vary considerably because of the effects of recharge and discharge from the Aquifer. Slade (2000) has estimated the historic quantity of water stored in the Alluvial Aquifer at 240,000 acre-feet following periods of high rainfall. The historical annual production of the Alluvial Aquifer is estimated to be between 30,000 to 40,000 AFY in normal/average rainfall years (Slade 2000; Scalmanini 2000). During dry years, the Alluvial Aquifer production should be reduced to the range of 30,000 to 35,000 AFY. (Slade 2000)

Based on the results of Slade (1986, 2000), and the operating experience of the Santa Clarita Valley water purveyors, Scalmanini (2000) addressed the sustainable yield of the Alluvial Aquifer and found that the range of pumping from the Alluvial Aquifer (30,000 to 40,000 AFY in normal/average years, and 30,000 to 35,000 AFY in dry years) is consistent with studies of the Aquifer and the successful operating experience of the Aquifer over the last 50 years:

> *"[T]he Alluvium has been managed within its perennial yield,[13] while pumping in the broad range of nearly 20,000 AFY to more than 42,000 AFY. Although there have been seasonal and longer term intermittent lowering of ground-water levels in response to both variations in pumping and variations in precipitation (and associated recharge), the long-term trend in Alluvial ground-water levels has been stable, with no persistent trend toward lower water levels and associated depletion of ground-water storage. While the cited ranges for Alluvial pumpage in various year-types suggest that, overall, the average extraction will be greater than the perennial yield reported by Slade in 1986, recent high Alluvial pumping and sustained high ground-water levels suggest that an updated perennial yield analysis would result in a higher value of perennial yield than that reported by Slade nearly 15 years ago. Ultimately, however, the exact number is not as important as operating in a range of production that does not cause undesirable results such as chronic ground-water level decline; [and] the ranges cited in the UWMP would certainly fit that criterion. In any case, in light of the range of historical pumping from the Alluvium and the lack of any chronic ground-water level depression as a result of that pumping, it appears sound to plan on long-term ground-water supplies from the Alluvium in the general ranges of pumping included in the UWMP, which are consistent with what has been successfully practiced over the last 50 years." (Emphasis added) (Scalmanini 2000)*

This information indicates that use of the Alluvium has occurred without adverse affects such as long-term water level decline or degradation of groundwater quality. The current management practice of the Santa Clarita Valley water purveyors is to prioritize the use of the Alluvial Aquifer because of the Aquifer's ability to rapidly recharge, store and produce good quality water on an annual basis. Like most

[13] Perennial yield is defined as the maximum quantity of water that can be withdrawn annually from a groundwater resource under a given set of conditions without causing an undesirable result. The phase "undesirable result" is understood to refer to a gradual lowering of the groundwater levels resulting eventually in depletion of the supply, subsidence, increased energy costs, desiccated wetland or degraded water quality. Source: California Groundwater Management, Groundwater Resources Association of California, Steve Bachman, Carl Hauge, Kevin Neese, Anthony Saracino.

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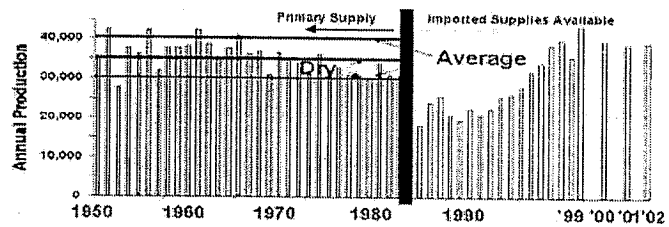
groundwater basins, it is possible to intermittently stress the Alluvial Aquifer (i.e., pump in excess of the perennial yield value for one or more years without long-term adverse effects). Short-term withdrawal in excess of the perennial yield may temporarily lower groundwater levels, however, subsequent decreases in pumping and natural recharge results in a rapid return of groundwater levels and associated refilling of groundwater storage with no harm to the resource. Historical groundwater data collected from the Alluvial Aquifer over many hydrologic cycles demonstrate that groundwater elevations return to normal in average or wet years following periods of abnormally low rainfall.

(a) Historical and Current Conditions of the Alluvial Aquifer

Over the last 50 years, groundwater production from the Alluvial Aquifer has ranged from 20,000 AFY to more than 40,000 AFY. Since the introduction of SWP supplies to the CLWA service area, total pumpage from the Alluvial Aquifer has ranged from a low of about 20,000 AFY (in 1983) to a high of 43,000 AFY (in 1999); average pumpage from the Alluvium over that period has been 28,500 AFY. Agricultural pumpage of the Aquifer throughout the 1950s was consistently in the range of 33,000 AFY to 41,000 AFY. (2002 Santa Clarita Valley Water Report, p. 15)

Figure 4.8-14 depicts historical Alluvial Aquifer groundwater production from 1950 to 2002. The historical data and all technical information indicate that the Alluvial Aquifer is in good operating condition. The data and related information show that the Alluvial Aquifer has produced annually up to 43,000 AFY without any undesirable results (such as long-term water level declines or degradation of the water quality).

Figure 4.8-14
Historical Groundwater Production – Alluvial Aquifer



(b) Groundwater Levels in the Alluvial Aquifer

Based on available data, the groundwater levels over the last 20 years are generally higher than over the preceding 30 years. In some locations of the Alluvial Aquifer, there are intermittent dry-period declines (and an associated use of some groundwater from storage) followed by wet-year recoveries (and associated refilling of storage space). On a long-term basis, whether over the last 23 years since importation of supplemental SWP water, or over the last 40 to 50 years (since the 1950s–60s), the Alluvial Aquifer shows no trend toward decreasing water levels or storage decline (i.e., overdraft). Based on the available data, pumpage from the Alluvial Aquifer has been and continues to be within the operational yield of the aquifer. (2002 Santa Clarita Valley Water Report, pgs. 16 and 17)

(c) Groundwater Flows in the Alluvial Aquifer

In general, groundwater movement in the Alluvium beneath the side canyons is toward the east-west trending Santa Clarita Valley and then westward in the Alluvium toward the Los Angeles County/Ventura County line. This general pattern of groundwater flow in a westerly direction remains unchanged whether groundwater levels are high or intermittently depressed. This finding is based on an examination of Aquifer extent and historical groundwater levels. Long-term stream flow data gauged near the County line shows notably higher flows from the Santa Clarita Valley into the uppermost downstream basin, the Piru Basin, over the last 30 to 35 years. (2002 Santa Clarita Valley Water Report, page 29 and Figure III-6)

(d) Water Quality in the Alluvial Aquifer

Total Dissolved Solids: The principal water quality concern in waters from the Alluvial Aquifer is total dissolved solids (TDS). TDS concentrations in the Alluvial Aquifer typically range from 400 to 700 milligrams per liter (mg/l), and the water is considered moderately hard to hard. Groundwater quality variations also inversely correlate with precipitation and stream flow: Wet periods have produced substantial recharge of higher quality water (low TDS) and dry periods have resulted in an increase in TDS (and individual component constituents) in the deeper parts of the aquifer.

Ammonium Perchlorate: The water purveyors have tested municipal-supply water wells in the Alluvial Aquifer in response to claims that groundwater supplies in the Alluvium are contaminated from ammonium perchlorate. Perchlorate is used in the manufacture of rocket propellants, munitions and fireworks. The alleged source of perchlorate is a facility in the Santa Clarita Valley known as the Whittaker-Bermite site. Each local water purveyor regularly collects groundwater samples from the

numerous municipal-supply wells in the Alluvial Aquifer. In 2002, as part of ongoing monitoring of wells for perchlorate contamination, perchlorate was detected in one Alluvial well located near the former Whittaker-Bermite facility that has been the primary focus of potential perchlorate contamination that has impacted four Saugus wells since 1997. The detected concentration at the Alluvial well (up to 5.9 ug/l) slightly exceeded the Action Level for perchlorate (4 ug/l) and the well has been inactivated for municipal water supply. All other Alluvial wells operated by the Purveyors continue to be used for municipal water supply service (2002 Santa Clarita Valley Water Report, p. 17). The wells will continue to be sampled, tested and monitored for possible detection of perchlorate, and any other contaminants. The sampling, testing and monitoring of the numerous municipal-supply wells in the Alluvial Aquifer actually serve as an early warning device for the possible detection (and ultimate treatment) of perchlorate and other contaminants. For further information regarding perchlorate and other contaminants in the Santa Clarita Valley's other Aquifer, Saugus Formation, please refer to the section below.

(2) Saugus Formation

Underlying the Alluvial Aquifer in the main portion of the Santa Clarita Valley and extending to the surrounding foothills is the Saugus Formation. The Saugus Formation contains lenticular[14] and interfingered[15] beds of poorly- to well-consolidated sandstone, conglomerate, and siltstone that are at least 5,000 feet thick in the deepest part of the basin. The degree to which these beds are laterally continuous is unknown. However, interpretations of geophysical electric log data by Slade (2000) indicates that some more permeable sand zones may be laterally continuous from one end of the basin to the other. The deepest and oldest portion of the Saugus Formation was deposited in a marine environment (the Sunshine Ranch member) and consists of siltstone, shale, and fine-grained sandstone of low permeability.

Faulting and folding of the rocks in the region have caused the sedimentary rocks, including the Saugus Formation, to form a bowl-shaped structure. The Saugus Formation and the underlying bedrock dip generally toward the center of the "bowl" from all locations along the bottom (basal) contact of the Saugus Formation.

14 Lenticular: Shaped approximately like a double convex lens. When a mass of rock thins out from the center to a thin edge all around, it is said to be lenticular in form.

15 Interfinger: To grade or pass from one material into another through a series of interlocking or overlapping wedge-shaped layers.

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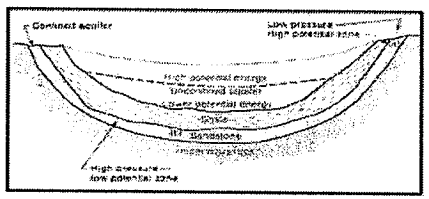
Dominating the geologic structure in the project area is the northwesterly-trending San Gabriel Fault. A spur from this fault, referred to as the Holser Fault, trends west through the project area. South of the Faults, the Saugus Formation is thickest and this is the area where the majority of Saugus municipal water wells are located. North of the San Gabriel Fault, the Saugus Formation is older, thinner and finer grained than south of the Fault. Little groundwater development has occurred north of the San Gabriel Fault.

The Saugus Formation is recharged by two principal sources: (1) deep percolation of precipitation in the exposed portions of the Saugus Formation in the highlands surrounding the valley, and (2) seepage from the Alluvial Aquifer along the Santa Clara River and its tributaries, particularly on the eastern end of the Santa Clarita Valley. Minor recharge may also occur in limited areas through irrigation seepage where the land overlying the Saugus is cultivated. In the eastern part of the Santa Clarita Valley, the Saugus Formation is underlain by older, relatively impermeable rocks of the Castaic Formation and Mint Canyon Formation, which form the bottom and sides of the "bowl-shaped" Saugus structure. Little, if any, groundwater exchange occurs between these formations and the Saugus Formation (see **Figure 4.8-15**).

Figure 4.8-15 Cross Section of Groundwater Basin



The amount of water-bearing sediments in the Saugus Formation is substantial. Slade (2002) estimated that the amount of water stored in the Saugus Formation is approximately 1.65 million acre-feet. A determination of the perennial yield of the Saugus Formation has not been made because information on the Aquifer characteristics is limited. However, for planning purposes, the annual production of the Saugus Formation is estimated to be between 7,500 to 15,000 AFY in normal/average years and 21,000 to 35,000 AFY in dry years. (Slade 2000)

Discharge from the Saugus Formation occurs in part through groundwater extraction from wells as deep as 2,000 feet. Discharge from the Saugus Formation also occurs at the west end of the valley (west of the I-5 bridge) where Saugus groundwater is known to discharge to the Alluvial Aquifer. This discharge of

groundwater from the Saugus Formation into the Alluvial Aquifer is promoted in this area by the presence of older and relatively impermeable rocks of the Pico Formation that underlie and form the western boundary of the Saugus Formation (where they are exposed at the ground surface). These older rocks of the Pico Formation form a barrier to groundwater flow and force Saugus groundwater to discharge upwards into the Alluvial Aquifer approximately 2.5 miles upstream of the county line (refer to the previously presented **Figure 4.8-6**).

As a result of the folding of the Saugus, Pico, and Mint Canyon Formations in the Santa Clarita Valley, permeable sand layers in places within the Saugus Formation are oriented so that they are in direct connection with the overlying Alluvial Aquifer. Consequently, recharge to the Saugus may be greatest in these areas, particularly on the east side of the Santa Clarita Valley. Also, discharge to the Alluvium is enhanced where permeable sand layers of the Saugus are contacting the Alluvial Aquifer on the western end of the Santa Clarita Valley where the Saugus discharges.

Available Aquifer test data from Saugus wells located near the center of the Santa Clarita Valley where the Saugus is thickest indicate that the Saugus is semi-confined (under pressure). Transmissivity values range from 80,000 to 160,000 gallons per day per foot and storativity values are on the order of 10^{-3} to 10^{-4}. In areas where the Saugus crops out, the uppermost-saturated zones are partially unconfined because the permeable beds are folded upwards. In the highlands, the Saugus beds are exposed at the ground surface, and in the valley the Saugus beds are in contact with the Alluvial Aquifer.

Based on the results of Slade (1988, 2000), and the operating experience of the water purveyors, Scalmanini (2000) undertook an independent review of the information regarding the Saugus Formation, and concluded that:

> *"The Saugus Formation is the more difficult of the two aquifers in the area to assess, both in terms of dry period water supply and long-time dependability, primarily because there is no historical operating experience in the range of dry-year Saugus pumping cited in the UWMP. The memorandum in Appendix C [Slade 2000] includes a brief discussion of historical pumpage (up to a maximum of nearly 15,000 AFY, and an average of slightly more than 7,000 AFY over the last 20 years), limited historical water levels (no long-term change or other evidence of overdraft, with current levels comparable to pre-development levels), and ground-water storage (on the order of one million AF in storage in the depth zone of 500 to 2,500 feet). Based on these conditions and a couple of other considerations (large areal extent and substantial vertical depth of the Saugus, and typically deep well completions with sufficient available drawdown in wells), it is concluded that it is hydrogeologically feasible to increase pumpage from the Saugus for short-term periods in a ramped manner from 15,000 to 25,000 to 40,000 AFY. The memorandum is not specific with regard to pumping outside the "short-term" periods when pumpage might be increased; however, it implies that increased pumpage would occur only during dry periods, and that pumpage would decline to lower values in wet and normal period such that the long-term stability in water levels and storage discussed in the memorandum would be maintained." (Emphasis added) (Scalmanini 2000)*

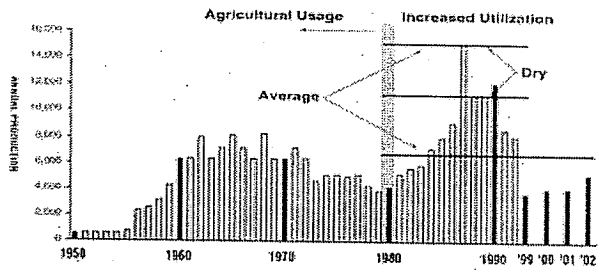
Focusing on the projected groundwater supplies depicted in the UWMP and whether those supplies were "realistic" under average and dry year conditions, Scalmanini (2000) concluded that:

> *"[B]oth the Alluvium and the Saugus are reasonable and sustainable sources at the yields represented in the Plan. As such, those yields are not overstated and will not deplete or "dry up" the ground-water basin; and there is no need to 'reduce' them for purposes of planning within the context of an Urban Water Management Plan." (Scalmanini 2000)*

(a) Historical and Current Conditions of the Saugus Aquifer

From 1980 through 2002, total pumpage from the Saugus Formation has ranged from a low of about 3,850 AFY in 1983 to a high of nearly 15,000 AFY in 1991. Average pumpage over that period has been nearly 6,800 AFY (2002 Santa Clarita Valley Water Report). Slade has estimated that the historical annual production of this Formation is 7,500 AFY to 15,000 AFY. (Slade 2000) Figure 4.8-16 depicts the historical groundwater production from the Saugus Formation from 1947 to 2002.

Figure 4.8-16
Historical Groundwater Production from the Saugus Formation from 1947 to 2002



Wells drilled into the Saugus Aquifer south of the San Gabriel Fault are anticipated to produce 1,500 to 2,000 gallons per minute, from a depth of 1,500 to 2,500 feet.

(b) Groundwater Levels of the Saugus Aquifer

Although there have been seasonable water level changes, in response to groundwater pumping, the long-term trend in the Saugus Aquifer (over the last 35 to 40 years) shows relatively stable groundwater levels (2002 Santa Clarita Valley Water Report [Figure III-3]). There is no trend toward a sustained decline in Saugus water levels or storage, which would be indicative of overdraft conditions. On that basis, and with recognition that historical (pre-1980) pumpage was quite small, and that average pumpage over the last two decades has been less than the reported range of potential recharge to the Saugus Aquifer, pumpage from the Saugus Aquifer has been and continues to result in the long-term stability of water levels and storage capacity.

Scalmanini (2000) has concluded that it is feasible to increase pumping from the Saugus for short-term periods in a ramped manner from 15,000 AFY to 25,000 AFY to 40,000 AFY based on: (a) historical pumping data; (b) the amount of groundwater in storage (on the order of 1.4 million acre-feet in the depth zone of 500 to 2,500 feet); (c) the areal extent and substantial vertical depth of the Saugus; and (d) typically deep-well completions with sufficient available drawdown in the wells. The increased pumping from the Saugus would occur in dry periods, and the pumping would decline to lower values in wet and normal/average periods, to allow for recharge, such that the long-term stability in groundwater levels and storage would be maintained.

Based on work from Slade (2000) and Scalmanini (2000), the Purveyors estimate (2002 Santa Clarita Valley Water Report) that water supplies from the Saugus Formation can be withdrawn up to approximately 21,000 to 35,000 AFY in dry years, without any adverse effects, for short-term periods. It is also projected that the drilling of additional wells in the Saugus would be required to obtain these production levels for future water supplies (2002 Santa Clarita Valley Water Report).

(c) Groundwater Flows of the Saugus Aquifer

Groundwater movement in the Saugus Aquifer is toward the center of the valley from the highlands and then toward the western end of the Santa Clarita Valley where it discharges naturally into the Alluvial Aquifer.

(d) Water Quality Of The Saugus Aquifer (Including Perchlorate)

TDS/Ammonium Perchlorate. The primary water quality concerns in waters from the Saugus Aquifer are TDS and perchlorate detection.

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TDS. The total dissolved solids (TDS) concentration of Saugus Formation groundwater typically ranges from 500 to 900 mg/l. The California Secondary Maximum Contaminant Level (SMCL) is expressed as a range with the midpoint or (upper) level for TDS being 1000 mg/l. No fixed consumer acceptance contaminant level has been established for TDS.

On behalf of Valencia Water Company, Richard C. Slade & Associates re-examined all available TDS data from Saugus Formation water wells in the Santa Clarita River Valley, as part of a May 2000 presentation to the California Public Utilities Commission (PUC). The PUC conducted a full evidentiary hearing on this and other issues relating to the Water Management Plan prepared by the Valencia Water Company. The original laboratory data were used to recalculate TDS using a more standard, additive method described in a United States Geological Survey report by Hem (1992). These data were then compared to historic pumping and water level records to look for any discernible trends in TDS concentrations over time, and to examine if these trends were related to changes in groundwater production.

The results of that evaluation revealed that although there has been a slight increase in TDS levels in most Saugus Formation wells in the past 40 years, this increase could not be correlated with increased groundwater production. In fact, there is some evidence that TDS concentrations actually dropped during the period of greatest Saugus Formation groundwater production.

Ammonium Perchlorate. As stated above, perchlorate is used in the manufacture of solid rocket propellants, missiles and fireworks. Sources of drinking water have been contaminated by perchlorate in areas in which such manufacturing has occurred. The primary human health concern related to perchlorate is that it can interfere with the thyroid gland's ability to utilize iodine to produce thyroid hormones, which are required for normal body metabolism, as well as growth and development. Perchlorate in very high doses has been used in medicine in the treatment of Graves' disease, a condition in which excessive amounts of thyroid hormone are produced.

Because perchlorate historically has not been considered a common drinking water contaminant, there are currently no federal or state drinking water standards regulating perchlorate. However, in September 2002, Senate Bill (SB) 1822 was passed. The law required the State Office of Environmental Health Hazard Assessment to perform a perchlorate risk assessment and adopt a perchlorate public health goal by January 1, 2003. SB 1822 also required the State Department of Health Services (DHS) to adopt a primary drinking water standard for perchlorate by January 1, 2004. However, the adoption of a public health goal has been delayed until later in 2004 so further research can be completed by the National Academy of Sciences.

DHS previously established an initial provisional "action level" for water utilities in the event that perchlorate is detected in an amount exceeding 18 parts per billion (ppb) or micrograms per liter (ug/l). Data from DHS showed that perchlorate concentrations lower than 18 ppb were not considered to pose a health concern for the public. In January 2002, based on draft health risk evaluations released by the U.S Environmental Protection Agency (EPA), DHS reduced the perchlorate action level to 4 ppb.

In January 1999, DHS adopted a regulation identifying perchlorate as an unregulated chemical for which monitoring is required.[16]

The alleged source of perchlorate detected in the Saugus Aquifer is a facility in the Santa Clarita Valley known as the former Whittaker-Bermite facility.[17] Perchlorate has been detected in four wells in the eastern part of the Saugus Aquifer, near the former Whittaker-Bermite facility. It has been suggested by a local environmental group that the detection of perchlorate in the Saugus Aquifer dramatically limits or precludes its usefulness as a local water supply source and that reports prepared by the water purveyors "overestimate" groundwater supplies by not properly accounting for perchlorate detected in certain wells in the Saugus Aquifer. As discussed below, the water purveyors in Santa Clarita Valley have reported the existence of perchlorate in the Saugus Aquifer for several years, and, based on the information provided below, the Saugus Aquifer remains an important and viable groundwater resource for the Santa Clarita Valley. Due to the high value of this local water resource, the purveyors have placed a high priority on replacing the impacted groundwater extraction capacity by installing wellhead treatment and the construction of new wells.

The CLWA Draft Integrated Water Resources Plan (IWRP), dated February 1998, the 1998, 1999, 2000, 2001, and 2002 Santa Clarita Valley Water Reports and the UWMP 2000 have disclosed that perchlorate was detected in certain specified wells in the Saugus Aquifer. Since 1997, groundwater samples have been collected from at least 12 municipal-supply water wells in the Saugus Aquifer for purposes of conducting laboratory testing for perchlorate. Based on laboratory test results, and additional information obtained by the water purveyors, four Saugus Formation municipal-supply wells (and one Alluvial well) located near the Whittaker-Bermite facility have been voluntarily placed on inactive status due to perchlorate detection. The location of the active and inactive wells is illustrated in **Figure 4.8-17**. The eight other Saugus wells in the area are active and available for use.

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16 "Unregulated" refers to the absence of a drinking water standard, or maximum contaminant level (MCL). DHS has advised water utilities about required and recommended actions to be taken if the "action level" is exceeded, including notices to local agencies and water utility customers. For further information regarding DHS action related to perchlorate, please refer to DHS's internet website located at http://www.dhs.cahwnet.gov/, and, specifically, http://www.dhs.cahwnet.gov/ps/ddwem/chemicals/perchl/actionlevel.htm.

17 Please refer to Plate 1 in the report prepared by Richard C. Slade & Associates entitled, Hydrogeologic Conditions in the Saugus Formation, Santa Clarita Valley, California, February 2001. The report may be found in Appendix 4.8 of this report.

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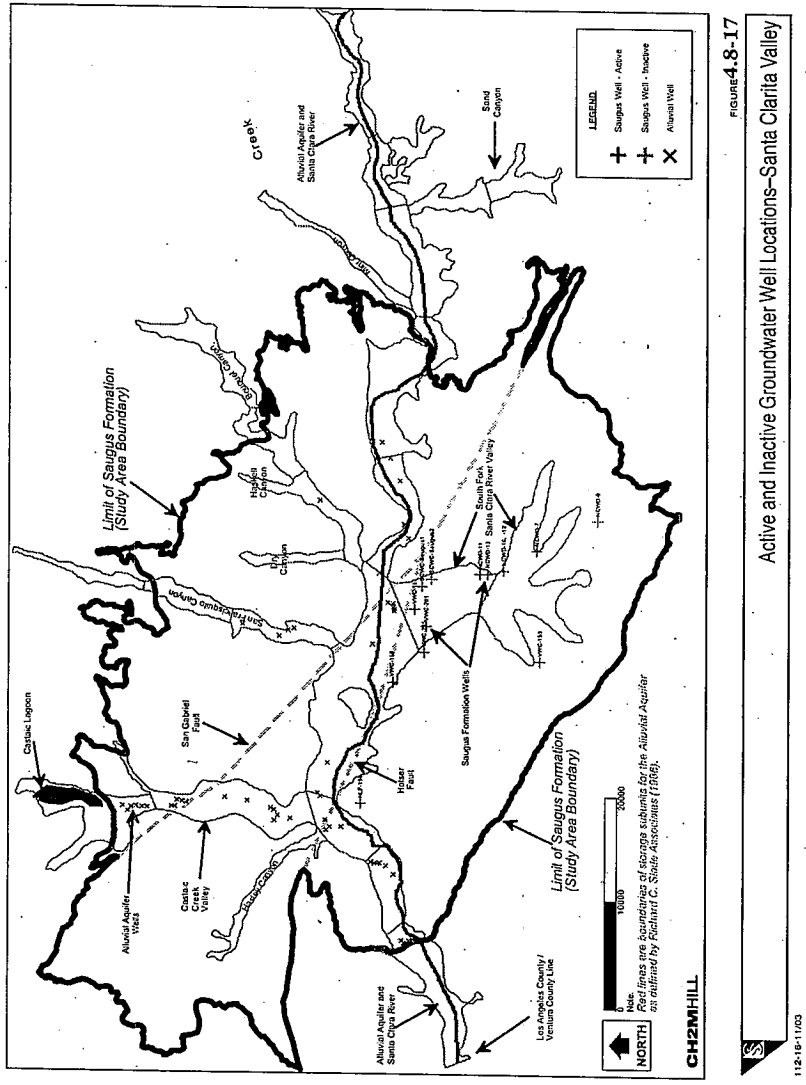

FIGURE 4.8-17
Active and Inactive Groundwater Well Locations–Santa Clarita Valley

112-16-11/03

The testing of the impacted municipal-supply wells has occurred over time. For example, testing of Newhall County Water District (NCWD) Well No. 11 showed perchlorate concentrations ranging between 9.9 and 23 ppb between May 1997 and October 2000. This well is currently on inactive operational status, and NCWD has voluntarily refrained from using the well since 1998. The testing of Valencia Water Company (VWC) Well No. 157 between 1997 and 2000 also showed perchlorate concentrations ranging from not-detected to 14 ppb. This well is also currently on inactive operational status, and VWC has voluntarily refrained from using the well since 1997. Finally, the testing of Santa Clarita Water Division of CLWA's (SCWD) Saugus-1 and Saugus-2 wells in 1997 and 1998 revealed perchlorate concentrations ranging from 16 and 42 ppb in Well Nos. 1, and 12 and 45 ppb in Well No. 2. Neither of these two wells is currently being pumped.

Results of ongoing laboratory testing of all other active Saugus Formation municipal-supply wells have shown non-detect concentrations of perchlorate. VWC Well Nos. 201, 205 and 160 were sampled and analyzed for perchlorate in June 2003, with all samples returning not-detected results. In addition, VWC sampled all of its Alluvial Aquifer municipal-supply wells in June 2003, and all samples had non-detect results. NCWD's active Saugus Formation water wells were all tested for perchlorate in October 2000 and in October 2002, with all samples returning not-detected results. Slade has reported that the Saugus Aquifer is and will continue to be a viable source of water supply for the water purveyors in the Santa Clarita Valley as long as efforts remain in place to treat impacted wells on an interim basis to contain the plume.

As to groundwater production, the voluntary closure of 4 of the 12 Saugus municipal-supply wells is due, in part, to caution related to perchlorate; however, the water purveyors have limited their use of the Saugus Aquifer for other significant reasons as well. For example, the water purveyors are pumping water from wells in the shallower Alluvial Aquifer because the water is readily available, and because it costs less to pump water from the Alluvial wells when compared to pumping from the deeper Saugus Aquifer. In addition, SWP water has been available to local purveyors since 1980, making this imported water supply more readily available than in years prior to that time. SWP water is also less expensive than pumping from the Saugus Aquifer, making SWP water a more desirable source when available. The local water purveyors also have developed an overall strategy of maintaining the Saugus Aquifer as a firming supply for drought years in the event SWP supplies are curtailed.

In addition to the water purveyors' strategy regarding groundwater production from the Saugus Aquifer, in November 2000, CLWA, NCWD, SCWD and VWC filed suit against the current and prior owners of the former Whittaker-Bermite facility. The lawsuit requests that the current and prior owners pay all necessary costs of response, removal of the perchlorate contaminant, remediation action costs and other

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damages associated with the contamination. Under federal and state law, the current and prior owners of that facility have the responsibility for the clean-up activities and costs.

In 2002, CLWA and the U.S Army Corps of Engineers also entered into an agreement to assess groundwater conditions in the Saugus Aquifer within the Eastern Santa Clara Basin. Funded by a $7 million appropriation from the Federal Government, $4 million of which has been earmarked for groundwater investigations related to perchlorate contamination in the Santa Clarita Valley, with matching funds from CLWA, the purpose of the study is to sufficiently characterize the condition of the Whittaker-Bermite site and evaluate long-term and interim solutions for clean-up of the contaminated soil and groundwater. The groundwater study will be implemented pursuant to Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and related federal regulations.[18]

Other studies regarding the nature and extent of the perchlorate in the Alluvial and Saugus Aquifers have already commenced. In addition, the local water purveyors continue routine sampling of the existing wells. CLWA's board of directors also approved a project to perform pre-design services for treatment of groundwater to contain the perchlorate plume.

The current studies are still in their initial stages; however, based on the study results to date, there is no indication that perchlorate has impacted more than the original four Saugus and one Alluvial water supply wells. Concentrations of perchlorate have been detected in Alluvial monitoring wells near the Whittaker-Bermite site boundary and in shallow groundwater under the Saugus Metrolink site, but there is no evidence that these impacts have the potential to impact Alluvial and Saugus water supply wells.

The first phase of the remedial investigation of the Whittaker-Bermite site has been completed by the U.S. Army Corps of Engineers. The scope of work of the remedial investigation includes an evaluation of the nature and extent of impacted groundwater in the study area. As part of this effort, five monitoring wells were drilled on the site at varying depths. In a May 7, 2003 memorandum entitled, Remedial Investigation Technical Memorandum No. 1, Eastern Santa Clara Subbasin Groundwater Study, Santa Clarita, California was produced. The purpose of the memorandum is to convey relevant data and information to stakeholders to facilitate decision-making for subsequent phases of the investigation. It is not intended to be a comprehensive reporting of results obtained to date. A full report will be prepared upon completion of additional field activities and full data evaluation. During the Phase I effort,

18 CERCLA is found at Title 42 USC Section 9601 at sec. Related federal regulations are also found at 40 CFR Part 300.

perchlorate levels on the Whittaker-Bermite site itself have been found to range from 3 ug/l to as high as 58,200 ug/l. This Memorandum is herein incorporated by reference.

In addition, CLWA and the other retail water purveyors in the Santa Clarita Valley plan to perform clean-up activities at the impacted well sites using treatment technologies that have been approved by the Department of Health Services. As discussed below, in the past few years, much progress has been made in developing treatment methods capable of removing perchlorate from groundwater supplies.

Perchlorate Treatment Technology. Effective technologies presently exist to treat perchlorate in water in order to meet drinking water standards. In a publication from the U.S. Environmental Protection Agency (EPA), Region 9 Perchlorate Update, June 1999,[19] the EPA discussed the current state of perchlorate treatment technology, and the current and planned treatment development efforts being carried out as part of U.S. EPA Superfund program studies, U.S. Air Force research, water utility-funded studies, and the Federally funded research effort underway by the East Valley Water District, California and the American Water Works Association Research Foundation (AWWARF). The EPA also summarized two of the technologies that are in use today, which are capable of removing perchlorate from groundwater supplies. Each technology is discussed below, along with a brief summary of the specific application of each method used to remove perchlorate from groundwater supplies in the San Gabriel Valley.

Ion Exchange Method. The first of the two perchlorate-removal technologies receiving the most attention is ion exchange, in which the perchlorate ion is replaced by chloride, a chemically similar but nontoxic ion. Ion exchange processes have been used in homes and businesses for water softening for decades. Bench- and pilot-scale studies have demonstrated that ion exchange systems can reliably reduce perchlorate concentrations in San Gabriel Valley groundwater from approximately 75 ppb to below detectable levels. The studies have also provided valuable information on resin selection and regeneration, brine production, and cost that will guide the design and operation of full-scale systems.

The ion exchange treatment method has been approved by DHS for use in the San Gabriel Basin. In February 2001, DHS approved La Puente Valley County Water District's (LPVCWD) application to amend its domestic water supply permit. After considering a detailed engineering report, and overseeing a pilot program, DHS granted LPVCWD's application to amend its domestic water supply permit, and to operate two existing domestic water supply wells in the San Gabriel Basin for purposes of treating

19 See, EPA Internet website, Perchlorate, and Region 9 Perchlorate Update, found at http://www.epa.gov/ogwdw/ccl/perchlor/perchlo.html.

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perchlorate-contaminated water from the wells and providing the treated water to its customers for drinking and other domestic uses.[20]

LPVCWD's water treatment facility consists of pumping and treating perchlorate contaminated groundwater from two of its domestic-use wells. An ion separation (ISEP) unit will be used to remove the perchlorate. The ISEP process involves an ion exchange resin that is used to remove the perchlorate from the groundwater. The resulting perchlorate brine from the District's wellhead will be discharged from an existing line to either a new pipeline or the sanitary sewer system after obtaining appropriate permits from local agencies. The treatment has been demonstrated to produce final treated water to non-detect contaminate levels.

Biological Treatment Methods. To date, considerable effort has been directed at developing biological treatment methods for removing perchlorate from groundwater. In the biological treatment process, microbes destroy perchlorate by converting the perchlorate ion to oxygen and chloride. In most cases, nutrients must be added to sustain the microbes. Microbes have been used for decades in the treatment of drinking water supplies as part of a process known as slow sand filtration.

A six-month pilot-scale study of a biological process has been completed for the San Gabriel Basin, demonstrating the reduction of perchlorate from approximately 75 ppb to below detectable levels. The same process is being used in a recently constructed full-scale system at the Aerojet site in Northern California, where perchlorate concentrations exceed 1,000 ppb. A biological process also has been used to treat perchlorate-contaminated wastewaters resulting from the manufacture and maintenance of rocket motors, where perchlorate concentrations may exceed 500,000 ppb.

Biological treatment methods are believed to be capable of producing potable water, but additional testing must be completed to determine whether a biological process can reliably and cost-effectively produce drinking water-quality water. The necessary tests are planned for later this year, when a biological treatment system designed to produce potable water for use in the San Gabriel Valley will be in operation.

The San Gabriel Valley project involves the installation of not only the ion exchange technology to remove perchlorate, but also a second groundwater treatment system utilizing a biological process to remove perchlorate. The biological treatment train system will be constructed at LPVCWD's well site and

20 A copy of LPVCWD's Water Permit Amendment (No. 04-16-01 PA-000), dated February 15, 2001, along with the engineering report and other information are provided in Appendix 4.8 of this report.

will initially be used to demonstrate the ability to biologically reduce perchlorate concentrations using microbes. The biological treatment system will consist of a bioreactor to remove perchlorate, followed by a standard multi-media filter, followed by UV/hydrogen peroxide (oxidation) to lower contaminant concentrations to comply with DHS drinking water standards. The treated water will flow through Granular Activated Carbon (GAC) pressure vessels to "polish" the treated water to ensure that all contaminants are removed. The fully-treated water will then be disinfected.

During the demonstration, all water treated by the biological treatment system will be discharged in compliance with an NPDES permit, which will be obtained from the Regional Water Quality Control Board. After the demonstration phase, a permit will be requested from DHS to provide the full-treated water to LPVCWD's customers. Following receipt of the DHS permit, the biological treatment train system will continue to operate and provide fully-treated water to LPVCWD customers. As part of the biological treatment system, ethanol will be stored on site and used to foster microbial growth. A permit will be obtained from the local agency to store the ethanol on site.

Biological treatment methods are new to many water utilities. However, biologically-active filters have been used in drinking water treatment for decades to help remove particles and biodegradable organic matter. As stated above, the San Gabriel Valley project will rely on biological treatment for primary perchlorate removal, and is expected to include GAC as a backup process capable of limited perchlorate removal.

Other Treatment Methods. Other technologies have also been demonstrated as capable of removing perchlorate, but probably at higher cost. Reverse osmosis and nanofiltration were tested by researchers at the Metropolitan Water District of Southern California and shown to be effective in removing perchlorate, but they are likely to be much more expensive to operate than ion exchange processes. Liquid phase GAC also removes perchlorate, but only for a limited period of time before regeneration or replacement of the carbon is required. Frequent carbon replacement would make relying solely on GAC for perchlorate removal very expensive. Perchlorate cannot be removed from water by conventional filtration, sedimentation or air stripping technologies.

In addition to the proven treatment methods, a U.S. patent was recently granted for a new treatment device that reportedly renders perchlorate harmless. The device is a hollow-fiber membrane biofilm reactor, which, through a natural biochemical process of electron transfer, turns perchlorate into innocuous chloride. Perchlorate contaminated water is run through the biofilm reactor, which contains a bundle of thousands of hollow fiber membranes into which hydrogen gas is fed. The hydrogen gas diffuses through the membrane walls into the water as it flows past the fibers. Bacteria attach to the

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surface of the membrane because they gain energy from the process of transferring electrons and act as catalysts for the transfer of electrons from hydrogen gas to the oxidized contaminant, such as perchlorate. The contaminants are reduced to harmless end products while the hydrogen gas is oxidized to water.

The advantage of the biofilm reactor method over existing methods is that it destroys the contaminant without creating brine or other waste products, which must then be disposed of. The creators of the biofilm reactor device have embarked on a pilot study of the treatment method in La Puente, California, treating groundwater that is highly contaminated with perchlorate. Results of the study have shown that the biofilm reactor can effectively treat 0.3 gallons of water per minute. The current research is supported by a grant from the U.S. Environmental Protection Agency and administered by AWWARF.

In the coming year, the results of perchlorate treatment research funded by a $2 million federal appropriation to the AWWARF will be available. AWWARF is funding studies into biological treatment methods, ion exchange, reverse osmosis, nanofiltration and other processes. The result of the AWWARF research should allow more efficient design and operation of the ion exchange and biological treatment processes, and may identify other technologies capable of cost-effectively removing perchlorate from water.

Summary. Due to the high value of this local water resource, the purveyors have placed a high priority on replacing the impacted groundwater extraction capacity by installing wellhead treatment and the construction of new wells. The "best" technology for removal of perchlorate will probably vary from site to site. At this time, however, ion exchange and biological treatment systems have been approved for construction and operation in the San Gabriel Valley. The San Gabriel Valley project will continue to provide cost and performance data over the years that will be available to other water utilities for other sites. The results from recent and ongoing studies will also be of use to water utilities in need of reliable, easy-to-operate treatment methods that can reduce perchlorate concentrations to low or non-detectable levels.

Other Water Contaminants. Water quality regulations are constantly changing as contaminants that are not typically found in drinking water are being analyzed by DHS and U.S. EPA. In addition, existing water quality standards are becoming more stringent in terms of allowable levels in drinking water.

Hexavalent Chromium. Over the past year, hexavalent chromium (chromium 6) has become an important new water quality concern in Southern California. In a letter dated March 27, 2001, DHS asked the California Environmental Protection Agency to establish a specific public health goal (PHG) for chromium 6. The PHG would formally identify a level of chromium 6 in drinking water that does not

pose a significant human health risk. DHS has adopted regulations adding chromium 6 to the list of unregulated chemicals requiring monitoring, effective January 3, 2001. The regulations require drinking water systems to monitor for unregulated chemicals for which drinking water standards have not been established. The objective of the regulations is to collect data throughout the state to determine the occurrence of these chemicals to help DHS make regulatory decisions that will adequately protect public health.

DHS currently regulates chromium in drinking water as total chromium. DHS's drinking water standard for total chromium is 50 parts per billion (ppb). Total chromium is comprised of chromium 3 and chromium 6. Both are naturally occurring and are found in groundwater. Chromium 3 is an important dietary supplement necessary for public health. While chromium 6 is a known occupational carcinogen through inhalation, scientists differ over the potential health effects posed when consumed in water. Due to the level of public concern about chromium 6, the DHS regulations were adopted on an emergency basis to expedite monitoring for this chemical. All drinking water systems with sources determined by DHS to be vulnerable to chromium 6 must monitor to enable DHS to determine both its occurrence and the proportion of chromium 6 in the "total chromium" level.

The retail water purveyors in the Santa Clarita Valley have implemented a monitoring schedule in compliance with these regulations. Preliminary scanning samples taken throughout the Santa Clarita Valley have shown trace levels (<1 ppb) of chromium 6. These levels are likely attributed to naturally occurring chromium in the rocks and soil. For further information, please refer to the following DHS website, http://www.dhs.ca.gov/ps/ddwem/chemicals/Chromium6/Cr+6index.htm.

MTBE. Additional water quality regulations have been promulgated and/or revised over the past several years. For example, MTBE (methyl-tertiary-butyl ether) has been a concern for the past few years, and on May 17, 2000, DHS adopted a primary maximum contaminant level (MCL) for MTBE of 0.013 mg/L. CLWA and the local water purveyors have been testing for MTBE since 1997, and, to date, have not detected it in any of the production wells or in the treated SWP water supplies.

(3) Summary of Local Groundwater Supplies

In summary, **Table 4.8-3**, shows the existing and projected groundwater supplies from the Alluvial and Saugus Aquifers. The groundwater projections are from the UWMP and the updated analysis by Slade (UWMP 2000, Appendix 4.8).

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Table 4.8-3
Existing and Planned Groundwater Supplies[1]
(acre-feet per year)

Source	Average/Normal Year	Dry-Year
Alluvial Basin	35,000	35,000
Saugus Formation	11,000	13,000
Saugus Formation (new wells)[2]		20,000
Total Supply	46,000	68,000

Source: SB 610 Water Supply Assessment of the Riverpark Project, Santa Clarita Water Division, 2003.
[1] Studies by Richard Slade & Associates in October 2000, and the Santa Clarita Valley Water Report 2002, April 2003.
[2] Planned program for future implementation. Prior to implementing increases in production from groundwater supplies, CLWA will analyze the feasibility, cost and potential water quality and environmental effects of such a program. However, preliminary analyses and recent studies (Slade 2000) have concluded that additional pumping can be carried out.

c. Reclaimed Water Supplies

Water reclamation (or recycling) is defined as the treatment and disinfection of municipal wastewater to provide a water supply suitable for non-potable reuse (e.g., landscape irrigation). Under specified conditions, the state now requires the use of reclaimed water when available. (See SB 2095 [Johnston] and Government Code Section 65602 relating to water recycling.) Section 65602 states in part:

> *"(a) The waters of the state are of limited supply and are subject to ever-increasing demands.*
>
> *(b) The continuation of California's economic prosperity is dependent on adequate supplies of water being available for future uses.*
>
> *(c) It is the policy of the state to promote the efficient use of water through the development of water recycling facilities.*
>
> *(d) Landscape design, installation, and maintenance can and should be water efficient.*
>
> *(e) The use of potable domestic water for landscaped areas is considered a waste or unreasonable use of water within the meaning of Section 2 of Article X of the California Constitution if recycled water is available that meets conditions described in Section 13550 of the Water Code."*

Section 65605(b) also requires that a local agency adopt a recycled (or reclaimed) water ordinance that will:

> *"[S]tate that it is the policy of the local agency that recycled water determined to be available pursuant to Section 13550 of the Water Code shall be used for non-potable uses within the designated recycled water use area set forth by the local agency when the local agency determines that there is not an alternative higher or better use for the recycled water, its use is economically justified, and its use is financially and technically feasible for projects under consideration by the local agency."*

Reclaimed water is available for use in the Santa Clarita Valley from two existing WRPs operated by the County Sanitation Districts of Los Angeles County, the Saugus WRP, located in District 26 and the Valencia WRP, in District 32.

CLWA is currently in the process of updating its Reclaimed Water System Master Plan (Master Plan). The purpose of the Master Plan is to evaluate and plan for the use of reclaimed water as a reliable water source to meet a portion of the non-potable water demand in the Santa Clarita Valley. The prior version of the Master Plan (Kennedy Jenks Consultants, 1993) outlined a multi-phase program to deliver reclaimed water to the valley totaling 10,000 acre-feet. CLWA's reclaimed water supply is approximately 1,700 AFY. Projections by CLWA show a total reclaimed water supply of 17,000 acre-feet by the year 2020. This amount is in addition to the reclaimed water originating at the proposed Newhall Ranch WRP.[21]

Reclaimed Water Demand. The Master Plan identified potential reclaimed water users with existing and future demands totaling 10,361 AFY. Of the total demand, 1,215 AFY of demand is outside the CLWA service area.

Since reclaimed water is used for non-potable purposes such as landscape irrigation, demand for reclaimed water follows a highly seasonal pattern. Reclaimed water demand is generally low during wet winter months and increases dramatically during hot, dry summer months to meet greater irrigation requirements. For the annual demand of 10,361 AFY identified in the Master Plan, the total peak monthly demand is 1,922 acre-feet and the total peak daily demand is 20.5 mgd (1 acre-foot of water is equivalent to 325,850 gallons).

In addition to the reclaimed water demand identified in the Master Plan, when the proposed Newhall Ranch Specific Plan is constructed, the non-potable water demand in the CLWA service area could increase by 9,035 AFY (Newhall Ranch non-potable demand). The peak monthly non-potable demand for Newhall Ranch has been estimated to be 1,275 acre-feet (approximately 13.8 mgd). Assuming construction of the Newhall Ranch Specific Plan, the total non-potable water demand within the CLWA's service area is expected to reach approximately 19,396 AFY. This demand will be highly seasonal, with peak demands during summer months when the weather is hot and dry and irrigation needs are greatest.

21 See, CLWA's SB 610 Water Supply Assessment for the Riverpark Project, which is attached to this analysis as Appendix 4.8. See also, CLWA's draft Reclaimed Water System Master Plan (Kennedy Jenks Consultants, 1993), which is incorporated by reference and available for public review at the City of Santa Clarita Planning Department.

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Table 4.8-4, below, summarizes the reclaimed water demands.

Table 4.8-4
Reclaimed Water Demand

Item	Annual Demand (acre-feet per year)	Peak Monthly Demand (acre-feet)	Peak Demand (acre-feet)	Daily mgd
Within CLWA Service Area[a]	9,146	1,690	55.6	18.00
Outside CLWA Service Area[a]	1,215	233	7.5	2.45
Newhall Ranch[b]	9,035	1,275	42.5	13.81
Total	19,396	3,198	105.6	34.26

[a] *From CLWA Reclaimed Water Master Plan, September 1993.*
[b] *From CLWA Integrated Water Resources Plan, Water Demand and Supply Evaluation, February 1998; Technical Memorandum, Update to: Addendum to Water Resources and Wastewater Management for the Newhall Ranch Project, January 18, 1999, CH2MHILL.*

Reclaimed Water Supplies. The two existing WRPs in the Santa Clarita Valley that can potentially supply reclaimed water to meet the identified non-potable water demands in the CLWA service area are the Valencia WRP and the Saugus WRP. A third plant has been proposed as part of the Newhall Ranch Specific Plan.

Due to site space constraints, the Saugus WRP, completed in 1962, will not be expanded beyond its current permitted capacity of 6.5 mgd. In 2002, the Saugus WRP had an average monthly effluent flow of 5.60 mgd (6,294 AFY), which is approximately 86 percent of its permitted capacity. Effluent from the Saugus WRP contains about 723 milligrams per liter TDS (total dissolved solids) and is discharged to the Santa Clara River west of Bouquet Canyon Road.

The Valencia WRP, completed in 1967, has a current permitted capacity of 12.6 mgd. The ultimate planned capacity for the Valencia WRP is 27.6 mgd. In 2002, the average monthly effluent flow for the Valencia WRP was 12.11 mgd, which is approximately 96 percent of its current permitted capacity. Effluent from the Valencia WRP contains approximately 753 milligrams per liter TDS (total dissolved solids) and is discharged to the Santa Clara River west of The Old Road.

The Newhall Ranch Specific Plan proposes a 6.9 mgd WRP on the Newhall Ranch site to exclusively serve the Specific Plan. The proposed Newhall Ranch WRP would be located near the western edge of the Specific Plan site along the south side of SR-126. Effluent from the proposed Newhall Ranch WRP would be used to partially meet non-potable water demands within the Specific Plan site. According to the Newhall Ranch Final EIR, the proposed WRP is projected to produce on average approximately 5,630

AFY. Of this amount, 5,344 AFY would be used for irrigation, with the remaining 286 AFY discharged to the Santa Clara River during winter months when demands are low. This supply is projected to meet approximately 59 percent of the 9,035 AFY of potential non-potable water demands for the Specific Plan. The remainder of the non-potable demand is expected to be met by reclaimed water from CLWA, consistent with its updated Reclaimed Water System Master Plan.

Table 4.8-5 summarizes CLWA's reclaimed water supplies:

Table 4.8-5
Reclaimed Water Supplies

	Current Capacity (mgd)	Ultimate Capacity (mgd)	Flow (1999) mgd	Flow (1999) acre-feet	TDS (mg/l)
Saugus WRP	6.5	6.5	5.60	6,271	723
Valencia WRP	12.6	27.6	12.11	12,856	753
Total	19.1	34.1	16.06	19,127	--

Source: County Sanitation Districts of Los Angeles County, Letter Dated January 13, 2003.

d. Imported SWP Water Supplies

(1) SWP Overview

In 1951, the California Legislature authorized construction of a large state water storage and delivery system.[22] Eight years later, in 1959, the Legislature authorized the submission for voter approval of a $1.75 billion general obligation bond issue to build the State Water Project (SWP) system. The voters approved the measure, which enabled DWR to commence construction of the SWP.[23]

The DWR operates and manages the SWP facilities.[24] The SWP is the largest state-built, multi-purpose water project in the country. The SWP was designed and built to deliver water, control floods, generate power, provide recreational opportunities and enhance fish and wildlife habitats. SWP water supplies are used for both urban and agricultural uses throughout California. The SWP facilities consist of a complex system of dams, reservoirs, power plants, pumping plants, canals and aqueducts to deliver water.[25]

22 DWR, Bulletin No. 132-95 (Nov. 1996) p. xxiii; DWR Bulletin No. 132-98 (Nov. 1999) p. xxvii-xxxv.
23 Wat. Code §12930 et seq.; DWR, Bulletin No. 132-93 (Sept. 1994) p. 15.
24 DWR, Bulletin No. 132-93, (Sept. 1994) p. 15.
25 DWR, Bulletin No. 132-98 (Nov. 1999) p. xxvii.

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At the inception of the SWP, DWR entered into individual water supply contracts with agricultural and urban water suppliers (SWP contractors) throughout California. The contracts were the method used to fund construction and operation of the SWP facilities for the delivery of water to the SWP contractors. Each such contract sets forth a maximum annual allocation of SWP water, which is stated in Table A to the contract (Table A Amount, or allocation).

There are currently 29 SWP contractors with water supply contracts with DWR. A SWP contractor may annually request that DWR deliver water in the following year in any amount up to the SWP contractor's Table A Amount. The SWP contracts provide that in a year when DWR is unable to deliver the full amount of contractor requests, deliveries to contractors will be reduced so that total deliveries equal total available supply for that year. Some SWP contractors, including CLWA, historically have never requested delivery of their full annual amount because lower growth, other water supplies and water conservation efforts have held their demand below projections. Other SWP contractors historically have ordered their full Table A Amount nearly every year.

Existing long-term SWP water supply contracts called for the annual delivery of 4,103,651 acre-feet of Table A water by 1997 through SWP facilities, gradually increasing to a maximum of 4,172,686 acre-feet by 2020. Actual demand, however, has also not developed as projected, owing to circumstances, which have changed since the long-term contracts were signed in the 1960s. The changes include slower population growth, changes in local land use, local water conservation programs and conjunctive-use programs. The most SWP Table A water delivered to date (2003) in any year was about 3.5 million acre-feet in 2000.[26] The demands for SWP water are expected to increase as the population of California continues to increase.[27]

(2) Monterey Agreement

By 1994, disputes arose among the many agricultural and urban SWP contractors and DWR regarding the availability and distribution of water through SWP facilities. To avoid potential litigation, DWR and agricultural and urban SWP contractors met in Monterey, California to attempt to resolve the ongoing disputes. After negotiations, DWR and the agricultural and urban SWP contractors agreed to a statement of principles, which became known as the "Monterey Agreement."

The Monterey Agreement, signed by DWR and many of the agricultural and urban SWP contractors in 1994, established principles to be incorporated in contract amendments (the Monterrey Amendments) to be offered to the SWP contractors. To date, all but two SWP contractors (Plumas County Flood Control

26 See, The State Water Project Delivery Reliability Report, 2003, Final, Department of Water Resources, Bay Delta Office.

27 See, DWR, Bulletin 132-98 (Nov. 1999), p. xxvii.

and Water Conservation District and Empire West Side Irrigation District) have accepted the amendments. The amendments have three primary objectives: (i) to increase the reliability of all SWP contractors' water supplies; (ii) to stabilize the rate structure in order to improve the financial viability of the SWP; and (iii) to increase water management flexibility for all SWP contractors.

The Monterey Agreement provided a number of water management tools that have allowed local agencies to maximize their use of available supplies, thus meeting increased demand without construction of new SWP facilities. Most of these tools are environmentally beneficial or neutral. They include:

(a) **Water Transfers.** SWP contractors can transfer unneeded Table A water to other contractors on a permanent basis. This provides financial relief from SWP charges for the seller and additional water supplies for the buyer.

(b) **Turnback Pool.** SWP contractors with unneeded supplies on a short-term basis can turn their water back into a pool for purchase by other contractors.

(c) **Storage Outside Service Area.** SWP contractors are permitted to store water outside their service area (for example, in a groundwater banking project) for later use within their service areas.

(d) **Terminal Reservoirs.** SWP contractors are permitted to utilize flexible storage in Castaic Lake and Lake Perris to enhance their water supply reliability.

(e) **SWP Allocation.** Allocation of available SWP supply is made based on the proportion of each contractors' maximum contractual Table A water, rather than historical use with agricultural SWP contractors being cut first as in the past. This provides additional reliability to agricultural contractors earlier in the year, which improves their planning capability.

(f) **Interruptible Water.** Interruptible water (available surplus water) is distributed on an equal basis among SWP contractors rather than to agricultural SWP contractors first.

(g) **Flexibility.** Additional flexibility is granted to SWP contractors wishing to increase or decrease the Table A Amounts in their contracts.

(h) **Banking.** The Kern Water Bank was transferred to SWP agricultural users for development and use. This transfer has provided agricultural users as well as other local agencies with additional flexibility and water supply reliability.

(i) **Non-Project Water.** Use of project facilities for conveyance of non-project water is permitted to assist SWP contractors, which are able to locate additional sources of water.

As stated above, the Monterey Agreement has facilitated water transfers among SWP contractors. These water transfer provisions have resulted in 130,000 acre-feet of agricultural SWP contractors' Table A Amount being available for sale to urban SWP contractors. Agreements already have been executed among contractors to purchase the additional Table A water from the agricultural SWP contractors. Agreements for the additional Table A Amount of SWP water are effective upon execution (DWR Bulletin No. 132-96, August 1997, Ch. 1, p. 5), and, therefore, are considered permanent water reallocations of SWP Table A water. These permanent transfers of SWP Table A Amounts have allowed urban SWP contractors to obtain additional SWP Table A Amounts, thereby increasing their overall deliveries, even

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in times of drought. The permanent transfers of SWP Table A Amounts have also allowed SWP urban contractors to increase the reliability of their deliveries by having more Table A Amounts available overall.

The DWR now has approximately eight years of experience in implementing the Monterey Agreement and the associated water management tools identified above. The SWP contractors have come to rely on the Monterey Agreement water management tools and other provisions in their planning activities. Some of the results to date include:

(a) Up to 200,000 acre-feet transferred annually in the Turnback pool program;

(b) Nearly 114,000 acre-feet transferred in permanent Table A water transfers;

(c) Nearly 1,000,000 acre-feet stored outside SWP contractors' service areas;

(d) Utilization of terminal reservoirs' flexible storage; and

(e) Delivery of up to 200,000 acre-feet annually in Interruptible water (available surplus water).

(3) Monterey Agreement Environmental Review and Litigation

The Monterey Agreement gave rise to potentially significant environmental effects requiring analysis under the California Environmental Quality Act. Therefore, a Program EIR was prepared to address the potentially significant environmental effects of implementing the Monterey Agreement. The Final Program EIR was certified in October 1995. The adequacy of the Final EIR was challenged in litigation arising under the California Environmental Quality Act. The Sacramento Superior Court upheld the adequacy of the EIR. Before and after the trial court's decision, DWR and the agricultural and urban SWP contractors who had executed the Monterey Agreement began implementing various amendment provisions, including the completion of permanent transfers of Table A Amounts among agricultural and urban SWP contractors. The trial court's decision was subsequently appealed. On appeal, the petitioners sought a writ to prevent further implementation of the Monterey Agreement during the appeal. However, the appellate court denied the requested writ (DWR Bulletin 132-98, November 1999, Ch. 6, p. 2).

The appellate court reversed the trial court's decision. The appellate court held that the Program EIR for the Monterey Agreement was improperly prepared by the Central Coast Water Agency, as "Lead Agency" under CEQA, rather than by DWR, which should have been the "Lead Agency." The appellate court also found that the EIR did not sufficiently discuss implementation of a "no project" alternative.

The court then concluded that a new EIR must be prepared and certified. Finally, the court held that the trial court improperly dismissed the plaintiffs' challenge to DWR's transfer of title to the Kern Water Bank from DWR to Kern County Water Agency.

The appellate court then remanded the case to the trial court and directed that the trial court issue a writ of mandate vacating certification of the EIR and retaining jurisdiction until DWR certifies an EIR in accordance with CEQA. The appellate court further directed that the trial court consider whether the Monterey Agreement may continue to be implemented while the new EIR is being prepared. (*Planning & Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892.)

The appellate court decision invalidated certification of the EIR, but did not set aside, invalidate or otherwise vacate the Monterey Agreement. In addition, no court orders have been issued to "stay" further implementation of the Monterey Agreement.

In October 2000, DWR filed a petition asking the California Supreme Court to review the appellate court decision. The California Supreme Court denied the petition for review and the matter was remanded to the trial court for further proceedings, consistent with the appellate court's decision. The trial court has not issued a final ruling in the action.

In March 2001, the parties to the Monterey Agreement litigation commenced confidential mediation discussions in San Francisco. In a "Joint Statement on the Monterey Amendments Litigation," dated July 18, 2002, the parties to the litigation stated that they "have reached a joint agreement on the principles for settling the lawsuit[.]" The parties also stated that DWR had commenced preparing a new EIR for the Monterey Agreement. In May 2003, the Department of Water Resources, Central Coast Water Authority, Kern Water Bank Authority and certain State Water Project Contractors entered into a Settlement Agreement (Settlement) with the Planning and Conservation League, Plumas County Flood Control and Water Conservation District, and Citizens Planning Association of Santa Barbara County, Inc. Pursuant to the Settlement, the Department agreed to public negotiation of certain amendments to the long term water supply contracts, including contract amendments to transfer Table A Amounts between existing SWP contractors. The settlement also contains an "Acknowledgment and Agreement Regarding Kern-Castaic Transfer" (i.e., the 41,000 acre-foot CLWA/WRMWSD water transfer described in section (4) below). The settlement states: "...nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in [the] litigation [on the 41,000 acre-foot transfer]." Consequently, the decisions reached in that litigation stand. The full text of the Settlement and further information regarding the Monterey Agreement and Monterey Amendment, including future opportunities for public involvement are available on the worldwide web at

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http://www.montereyamendments.water.ca.gov/. A copy of the settlement is also included in Appendix 4.8 to this report.

(4) Santa Clarita Valley SWP Supplies

CLWA SWP Table A Amount. Imported water from the SWP has been a supplemental source of supply to the Santa Clarita Valley since 1980. The SWP is contracted (and designed) to deliver approximately 4.2 million acre-feet of water per year to 29 contracting agencies. However, because the SWP has not been completed, it cannot yet deliver the entire 4.2 million acre-feet. CLWA is a contracting agency with a current maximum annual SWP Table A Amount of 95,200 AFY, or about 2.3 percent of the total (The CLWA/WRMWSD water transfer of 41,000 AFY has been completed, CLWA has paid approximately $47 million for the additional Table A Amount, the monies have been delivered, the sales price has been financed through CLWA by tax-exempt bonds, and DWR has increased CLWA's SWP maximum Table A Amount to 95,200 AFY because it was a permanent transfer/reallocation of SWP Table A entitlement between SWP contractors).

Prior to completion of the CLWA/WRMWSD water transfer, the proposed transfer was the subject of environmental review by the water agencies. The agencies selling the 41,000 acre-feet of SWP Table A Amount to CLWA assessed the environmental consequences of the proposed transfer within their service area in a Final EIR, dated June 1998. This EIR was certified in 1998 and has never been the subject of judicial review. As a result, the EIR is conclusively presumed to be valid. (Pub. Res. Code §21167.2)

CLWA also prepared a supplemental Final EIR, which assessed the environmental effects of CLWA's acquisition of the 41,000 acre-feet within its service area. The Board of Directors of CLWA certified the Supplemental Final EIR in March 1999. Thereafter, in April 1999, a lawsuit was brought challenging the adequacy of the EIR under CEQA (*Friends of the Santa Clara River, et al. v. Castaic Lake Water Agency, et al.*, Case No. BS 056954). The trial court ruled in favor of CLWA and upheld the adequacy of the EIR under CEQA.

In October 2000, the plaintiffs filed an appeal. The appellate court reversed the trial court's judgment and ordered CLWA's EIR decertified. However, the appellate court did not order CLWA to void its approval of the water transfer. Instead, the appellate court remanded the matter to the trial court for further proceedings. After a hearing on September 24, 2002, the trial court concluded that CLWA could utilize the 41,000 AFY to which it is entitled.

Status of CLWA's Acquisition Under the Monterey Agreement. The CLWA/WRMWSD transfer of SWP Table A Amount was the type of water transfer that fell within the provisions of the Monterey Agreement. As stated above, under the Monterey Agreement, certain SWP agricultural contractors agreed that 130,000 acre-feet of their Table A Amount could be transferred to urban contractors. The CLWA 41,000 acre-feet acquisition was a part of the 130,000 acre-feet of SWP Table A Amount, which has been transferred under the Monterey Agreement.

In effect, the Monterey Agreement provided a blanket pre-approval for those transfers by the participating SWP contractors, thus facilitating transfers of Table A Amounts from agricultural to urban SWP contractors. As stated above, the environmental documentation for the Monterey Agreement has been decertified. However, the pending legal proceedings have not invalidated the Monterey Agreement or enjoined either the Monterey Agreement or further implementation of the Monterey Agreement.

Even in the absence of the Monterey Agreement, CLWA's permanent acquisition of an additional 41,000 acre-feet of SWP Table A Amount could occur under existing SWP water supply contract provisions, subject to appropriate environmental review.

Nothing in the existing SWP water supply contracts, or applicable law, prohibit such water transfers with or without the Monterey Agreement. The Monterey Agreement simply provides a specific vehicle for accomplishing transfers of SWP Table A Amounts from agricultural to urban SWP contractors; the amendments under the Monterey Agreement are not the exclusive means by which that Amount may be transferred. In support of that fact, in 1981 (almost 15 years before the Monterey Agreement), the entire SWP Table A Amount of the Hacienda Water District was permanently transferred to the Tulare Lake Basin Water Storage District, pursuant to an agreement approved by DWR.

The acquisition of the 41,000 acre-feet could proceed as a water transfer under existing law. See, e.g., Water Code §§382, 383 (authority for transferring surplus water) and Water Code §1745, et seq. (authority for transferring non-surplus water). The Kern County Water Agency has reaffirmed its willingness to allow transfers of up to 130,000 acre-feet of SWP Table A Amounts under pre-Monterey Agreement conditions even if the Monterey Agreement is ultimately invalidated.

If it were not for existing SWP water supply contract provisions which allow such transfers (without the need for the Monterey Agreement), and existing law which enables CLWA to enter into contracts outside the context of the Monterey Agreement, an adverse final judgment invalidating the Monterey Agreement could affect CLWA's completed acquisition of the 41,000 acre-feet, which could in turn impair CLWA's supply of SWP water through its contracts with DWR and other SWP contractors. However, CLWA

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believes that an adverse outcome in the Monterey Agreement litigation is not likely to adversely affect CLWA's water supplies over the long term because CLWA believes that such a result is unlikely to "unwind" executed and completed agreements with respect to the permanent transfer of SWP Water Amounts.

(5) CLWA SWP Deliveries

With limited exception, as shown below, DWR's allocation to CLWA has been 100 percent of CLWA's actual request for SWP water supplies. Based on annual water supply information provided by DWR, there have been only two years on record since 1980 (1991 and 1992) when DWR's delivery to CLWA was not 100 percent of CLWA's requested need. Despite the reduced DWR allocation in those two years, the amount of SWP water delivered to CLWA was sufficient to meet all local water supply needs in the Santa Clarita Valley. Table 4.8-6, below, summarizes the DWR's annual SWP supply to CLWA from 1990 to 2003.

Table 4.8-6 includes several important features regarding CLWA's annual water supply since 1990. The features of this table, are discussed below.

The "Maximum Table A Amount" column represents CLWA's possible maximum total annual allocation of SWP Table A water. From 1990 until 1999, CLWA's full (maximum) annual SWP Table A Amount was 54,200 AFY. The full annual SWP Table A Amount of 95,200 AFY, shown in the "Maximum Table A Amount" column in the years 2000, 2001, 2002, and 2003 reflects the permanent acquisition of an additional 41,000 AFY of SWP Table A Amount in 1999 from the Kern County Water Agency.

The "DWR Allocation" column represents the amount (%) of the Table A water allocated to CLWA by DWR. Note that it has often been the case (e.g., 1995–2003) that CLWA received from DWR an allotment of Table A water far in excess of its actual need. Consequently, CLWA turned back (returned) significant amounts of water into the turnback pool.

Table 4.8-6
Castaic Lake Water Agency
Annual SWP Water Supply Information
from Department of Water Resources

Year	CLWA Maximum Table A Amount (AF) [1]	DWR Allocation (%) [2]	Table A Amount Allocated (AF)	Imported Water Delivered/ Need (AF)	Percent of Table A Amount Delivered (%)
1990	54,200	100%	54,200	21,613	40%
1991	54,200	30%	16,260	7,968	49%
1992	54,200	45%	24,390	13,911	57%
1993	54,200	100%	54,200	13,393	25%
1994	54,200	50%	27,100	14,389	53%
1995	54,200	100%	54,200	16,996	31%
1996	54,200	100%	54,200	18,093	33%
1997	54,200	100%	54,200	22,148	41%
1998	54,200	100%	54,200	20,254	37%
1999	54,200	100%	54,200	27,282	50%
2000	95,200	90%	85680	32,579	38%
2001	95,200	39%	37,128	35,369	95%
2002	95,200	70%	66,640	41,768 [4]	62%
2003(est)	95,200	90%	85,680	42,000 [5]	49%

[1] *CLWA Maximum Table A Amount: Represents CLWA's contract rights to SWP water since 1990. There are 29 contracting agencies with a maximum SWP Table A Amount totaling 4,172,786 acre-feet. In 1992, CLWA acquired the water supply of the Devil's Den Water District (i.e., its 12,700 AFY Table A Amount). By Year 2000, CLWA had acquired 41,000 AFY of Table A amount from the Kern County Water Agency and the Wheeler Ridge-Maricopa Water Storage District.*

[2] *DWR Allocation: Represents the Table A Amount allocated to CLWA by DWR. Note that it has often been the case (e.g., 1995-2003) that CLWA received from DWR an allotment of their Table A Amount far in excess of its actual need. Consequently, CLWA turned back (returned) significant amounts of water into the turn-back pool.*

[3] *Actual imported water delivered by CLWA in 1991 was 3,846 AF and 11,890 AF in 1992. The difference between these deliveries and the Imported Water Delivered/Need column is the amount of groundwater pumped into CLWA's system during 1991 and 1992.*

[4] *CLWA also delivered to the Semitropic Water Storage District a total of 24,000 AF in 2002 and 35,000 AF in 2003 to be stored for CLWA's future use.*

Other observations: *In 1994, CLWA deliveries were disrupted by the Northridge Earthquake. The Table does not account for Devil's Den deliveries, carryover provisions of the SWP contract, Article 21 water deliveries, turn-back water pool purchases, flexible storage account balance and deliveries, transfers to Westlands Water, Flood Flow deliveries, groundwater pumped during the 1991 drought into CLWA's system, etc.*

The "Table A Amount Allocated" column is the amount of CLWA's Table A Amount available for delivery to CLWA in a given year by DWR. Many factors can affect the amount of water delivered by DWR, including environment conditions and weather. The "Imported Water Delivered/Need" column is the actual amount of SWP water required by CLWA to meet local water demand. Since 1990, this amount is typically far less than the amounts available to CLWA. These deliveries include not only the Table A water, but also local groundwater, "Carry-Over," "Interruptible" and "Local Flood Flow Water" supplied by DWR over the years. Had CLWA participated in any "Drought Water Bank" programs, DWR deliveries under such programs would have been reflected in this column as well; however, CLWA has not needed to participate in any of the statewide drought programs due to available local supplies and voluntary conservation programs.

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DWR's annual Turnback Pool program has been in place since execution of the Monterey Amendments. The program is an internal SWP mechanism that provides for pooling potentially unused SWP supplies early in the year for purchase by other SWP contractors at a set price. The program is intended as an incentive to return unneeded water early in the year for reallocation among SWP contractors on willing-buyer/seller basis. See, Critical Water Shortage Contingency Plan, Governor's Advisory Drought Planning Panel, December 29, 2000, p. 3-11.

Through this program, any SWP water that CLWA deems is not needed in a given year is returned to DWR. This unused water is then made available to the SWP and other SWP contractors. CLWA participated as a "seller" in this program from 1996 through 2000, with over 127,000 acre-feet in sales of unused water. Several other SWP contractors have also returned unused SWP water to DWR, with a 5-year total return of over 1 million acre-feet. Under this program, CLWA could participate as a "buyer," rather than a "seller," in the event additional SWP supplies were needed for storage, water banking projects or other conjunctive use programs.

DWR also conducts a "Dry Year Program" to allow water users such as CLWA to obtain supplemental supplies during dry years. The program provides "options" purchases as well as direct purchases of water. Under the Program, DWR attempts to negotiate water purchases from farmers in the Sacramento Valley. Participating farmers will receive funds that will enable them to fallow, pump groundwater, or shift to an alternative (lower water use) crop. The water sold by the farmers will then be placed into a pool of water that will be allocated among water users who wish to participate in the Dry Year Program. This pool will be allocated based on the total number of participants and the relative amounts of water they request. The program is open to all water users in California. In 2001, CLWA submitted an initial request to purchase up to 12,000 acre-feet through the program. While CLWA did not participate in the Dry Year Program for 2001 and 2002 because CLWA ultimately received a large enough SWP allocation from DWR, the program was available to the agency showing the considerable flexibility of DWR, SWP contractors, and the retail purveyors to adapt to changing water supply forecasts and reliability levels. Documents demonstrating CLWA's ability to participate in the Dry Year Program is provided in Appendix 4.8.

(6) SWP Facilities

As discussed above, the SWP is a large water supply, storage, and distribution system authorized by the California Legislature in 1959. In 1960, California voters approved the $1.75 billion bond issue to begin building SWP facilities. The SWP currently includes 32 storage facilities, reservoirs and lakes, 17

pumping plants, three pumping-generating plants, five hydroelectric power plants, and about 660 miles of aqueducts and pipelines. Principal SWP facilities are shown in Figure 4.8-18.

The primary purpose of the SWP is to distribute water to 29 urban and agricultural water contractors in Northern California, the San Francisco Bay Area, the San Joaquin Valley and Southern California. The 29 SWP contractor service areas are shown in Figure 4.8-19.

The primary water source for the SWP is within the drainage of the Feather River, a tributary of the Sacramento River. Runoff is stored behind Oroville Dam in Butte County, which is the project's largest storage facility. The water is then released down natural channels to the Sacramento-San Joaquin Delta.

In the southern Delta, water is pumped by the Harvey O. Banks Delta Pumping Plant into the 444 mile-long California Aqueduct. The South Bay Aqueduct, located just south of the Banks Pumping Plant, conveys water to Alameda and Santa Clara counties. Water in the California Aqueduct travels along the west side of the San Joaquin Valley. Some SWP water is stored in the San Luis Reservoir, which is jointly operated by the DWR and the U.S. Bureau of Reclamation. From the San Luis Reservoir, waters in the SWP continue southward.

SWP water then flows south to the Tehachapi Mountains, where the A.D. Edmonston Pumping Plant lifts the water 1,926 feet to enter 10 miles of tunnels and siphons that traverse the Tehachapi Mountains. After crossing the Tehachapis, the aqueduct divides into two branches. The West Branch Aqueduct delivers water to Pyramid and Castaic reservoirs to serve CLWA and other SWP contractors in Southern California. The East Branch Aqueduct flows through the Antelope Valley and delivers water to Silverwood Lake. The water is then transported to San Bernardino and Riverside Counties, and stored in the Lake Perris reservoir.

Many other reservoirs add to the storage capacities of the SWP. Table 4.8-7, lists the major storage facilities of the SWP and their storage capacity. In addition to the water storage facilities included in the SWP system, additional storage is available within the SWP contractors' service area (e.g., 800,000 acre-feet of storage in the Diamond Valley Reservoir and 300,000 acre-feet in the Las Posas Basin within the service area of the Metropolitan Water District of Southern California).

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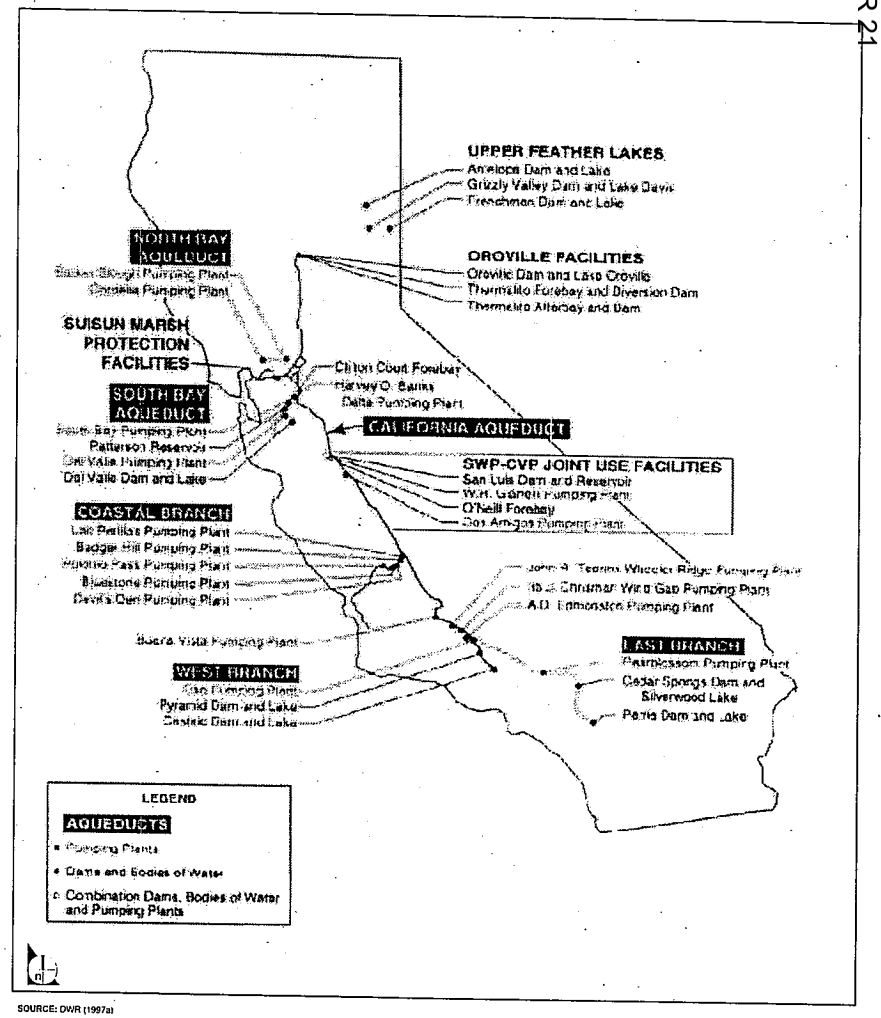
Table 4.8-7
Major SWP Reservoirs

SWP Division (Location)	Reservoir	Total Storage (AF)
Oroville Field Division		3,762,670
	Frenchman Lake	55,480
	Antelope Lake	22,570
	Davis Lake	64,370
	Oroville Reservoir	3,537,580
	Thermalito Diversion Pool	13,350
	Thermalito Forebay	11,700
	Thermalito Afterbay	57,040
	Small Storage Facilities	580
	Aqueduct Pools	0
Delta Field Division		130,909
	Clifton Court Forebay	31,260
	Bethany Reservoir	5,070
	Lake Del Valle	77,110
	Small Storage Facilities	142
	Aqueduct Pools	17,327
San Luis Field Division (Joint Use)		1,148,967
	O'Neill Forebay (Total Storage = 56,430)	29,500
	San Luis Reservoir (Total Storage = 2,027,840)	1,062,183
	Los Banos Reservoir	34,560
	Little Panoche Reservoir	5,580
	Small Storage Facilities	0
	Aqueduct Pools	17,144
San Joaquin Division		27,541
	Small Storage Facilities	16
	Aqueduct Pools	27,525
Southern Division		979,182
	Silverwood Reservoir	74,970
	Lake Perris	131,450
	Quail Lake	7,580
	Pyramid Reservoir	171,200
	Elderberry Forebay	32,480
	Castaic Lake	323,700
	Castaic Lagoon	5,560
	Small Storage Facilities	1,580
	Aqueduct Pools	230,662
SWP Total		6,049,269
	Reservoirs & Small Storage Facilities	5,756,611
	Aqueduct Pools	292,658

Source: Data Handbook, State Water Project, 1997.



SOURCE: DWR (1997a)

FIGURE 4.8-18
Principal State Water Program Facilities

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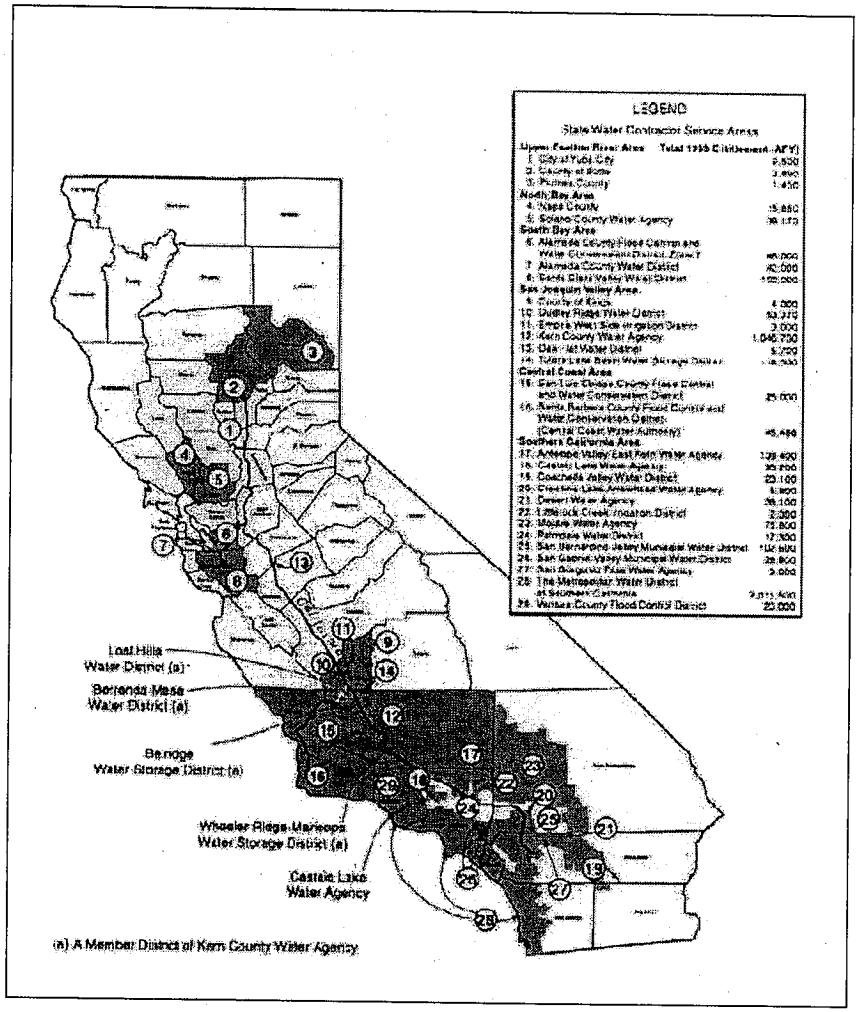

FIGURE 4.8-19

State Water Program Contractor Service Areas

112-16-1

(7) SWP Water Deliveries

SWP Deliveries. In the early 1960s, DWR entered into individual water supply contracts with various agricultural and urban water suppliers or contractors. Each contractor (shown previously in Figure 4.8-19) was provided with a contract amount (Table A Amount) and capacity rights to the SWP aqueduct and storage system in return for payments intended to cover operation and maintenance, bondholder obligations and repayment of moneys loaned from the California Water Fund.

DWR water supply contracts require the SWP to deliver 4.2 million AFY to 29 SWP contractors. Although the SWP is not fully constructed and cannot yet deliver the full 4.2 million AFY, since the end of the six-year drought in 1992, the SWP has fully met SWP contractors' water needs every year, except the dry years of 1994 and 2001. Of SWP water deliveries, about 70 percent is delivered to SWP urban contractors and about 30 percent is delivered to SWP agricultural contractors. In 2003, DWR indicated that it can deliver 90 percent (or 3.71 million acre-feet) of SWP Table A Amount to its contractors. Ninety percent of CLWA's SWP maximum Table A Amount of 95,200 AFY equates to 85,680 acre-feet of water.[28] However, as discussed more fully below, the maximum Table A Amount contractually allocated does not necessarily result in equivalent deliveries of SWP water in any given year.

From statewide perspective, the maximum capacity of the overall SWP transportation system is generally limited by the capacity of the system pumps. Therefore, the capacity of the California Aqueduct is 10,300 cubic feet per second (cfs) at its northern end and 4,480 cfs below the Edmonston pumping plant. (1,000 cfs is approximately 82.6 acre-feet per hour, 1,980 acre-feet per day and 725,000 AFY.) If these transportation rates were maintained for a full year, they would result in the transport of approximately 7.2 million acre-feet near the Delta and 3.2 million acre-feet to users in Southern California. Examples of the capacity of the canals and tunnels in the SWP transportation system are shown in Table 4.8-8.

28 DWR NEWS, State Water Project Plans 100 Percent Deliveries, March 14, 2000, (http://wwwdwr.water.ca.gov/dir-dwr...00R2/Mar.14,00-SWP_Full_Deliv.html). The DWR annually issues a series of allocation estimates, starting with conservative estimates in early winter months. Estimates are subject to change during the winter and spring months as more rainfall and snowpack data becomes available. DWR conducts five monthly snow surveys each winter and spring to assess snow conditions and make estimates about snowmelt runoff and future water supply. During the last six years, watersheds feeding the SWP have experienced heavy precipitation, which resulted in high volumes of water delivery through the SWP. Deliveries in wet years typically range around 3 million acre-feet. The current delivery projection is higher than prior years. For example, DWR estimates that the SWP can deliver about 3.71 million acre-feet during calendar year 2003. This current delivery allocation projection, although subject to change, is approximately 90 percent of the maximum Table A Amount requested by SWP contractors. See, Department of Water Resources, State Water Project Delivery Update, Water Deliveries, 2003 State Water Project Allocation Increase, May 16, 2003, http://www.dwr.water.ca.gov/water.html.

Table 4.8-8
Examples of SWP Transportation System Capacity

Location	Facility or Structure	Design Capacity (cfs)
Delta Intake	Clifton Court Forebay Channel	10,300
Near Kings/Kern County Line	SWP Aqueduct Canal	7,300
Grapevine	SWP Aqueduct Canal	4,400
South of the Tehachapis and before the East Branch/West Branch Split	SWP Aqueduct Canal	5,360
West Branch to Castaic Lake	Lower Quail Lake Canal	1,564

Source: Compiled by Impact Sciences, Inc.

The local supplies received by CLWA from the SWP are treated, filtered and disinfected at the two existing filtration plants in Santa Clarita Valley. The plants have a current capacity to treat a total of 58 mgd. From the existing plants, the treated water is delivered by gravity throughout the CLWA service area through a distribution network of pipelines and turnouts. One of the existing plants, the Earl Schmidt Filtration Plant, has a current design capacity of 33 mgd. CLWA is currently expanding the plant's treatment capacity to a total of 56 mgd. In addition, the process performance of the plant is being evaluated and will be improved to assure continuous compliance with state and federal water quality regulations. The expanded plant is scheduled to be on-line by mid-2005. CLWA has also begun the design and environmental review process for the expansion of the Rio Vista Water Treatment Plant from 30 to 60 mgd. Ultimate plant design planning by CLWA indicates that the combined treatment capacity of the treatment plants would be approximately 180 mgd.

(8) SWP Reliability

The maximum contractual amount of SWP Table A Amounts do not necessarily result in equivalent deliveries of SWP water in any given year. The demands of SWP contractors vary from year-to-year depending on many factors, including the amount of winter rains, agricultural markets, the availability (and cost) of other water resources, municipal and industrial demands and environmental requirements associated with the Sacramento-San Joaquin Delta (Delta), where the water supplied by the SWP originates. To account for these variable supplies and demands, DWR and the SWP contractors have developed a system that annually allows for the identification of the anticipated demands of each SWP contractor (a request of supply) and the system supplies (a DWR allocation of those supplies). Other water resources (Turnback Pool and Interruptible Water) are available from time-to-time to SWP contractors whose needs are not met by the annual allocation of Table A Amounts. The total planned

annual delivery capability of the SWP (approximately 4.2 million acre-feet) is distributed by contract among the 29 SWP contractors, based on their respective contractual Table A Amount. As a result of various factors, the SWP annual deliveries of both Table A Amount water and non-Table A Amount water have ranged from approximately 550,000 acre-feet to 3.52 million acre-feet (DWR 2003). In 1999, the SWP delivered approximately 3.1 million AFY of both Table A Amount and non-Table A Amount water. The SWP delivered approximately 3.5 million acre-feet of Table A Amount and non-Table A Amount water in 2000.[29] In 2003, DWR indicates that it can deliver 90 percent (or 3.71 million acre-feet) of the maximum contractual SWP Table A Amount to its contractors. Ninety percent of CLWA's maximum SWP Table A Amount of 95,200 AFY equates to 85,680 acre-feet of water.

CLWA's current maximum SWP Table A Amount of 95,200 AFY is affected by, and can be reduced due to, a number of factors, including hydrologic conditions, the status of SWP facilities' construction, environmental requirements and evolving policies for the Delta. Because of these factors, SWP supplies are subject to reduction, particularly during drought periods. The programs listed below have the potential to improve the reliability of SWP water.

Monterey Agreement/Amendments. As discussed above, the Monterey Agreement between DWR and the agricultural and urban contractors provides substantial opportunities for SWP contractors, including CLWA, to increase water management flexibility by providing more tools to maximize the use of existing facilities and, in doing so, increase water supply reliability. The Monterey Agreement changed SWP water allocation rules by specifying that, during drought years, project supplies are to be allocated proportionately based on the maximum contractual Table A Amount. Water is allocated to urban and agricultural purposes on a proportional basis, deleting a previous initial supply reduction to agricultural contractors. The agreement further defines and permits permanent sales of SWP Table A Amounts and provides for transfer of up to 130,000 acre-feet of annual Table A Amounts from agricultural use to municipal use, of which CLWA has purchased 41,000 acre-feet. The Agreement also allows SWP contractors to store water in another agency's reservoir or groundwater basin, facilitates the implementation of water transfers and provides a mechanism for using SWP facilities to transport non-project water for SWP water contractors. The Agreement provides greater flexibility for SWP contractors to use their share of storage in SWP reservoirs. CLWA currently has access to about 4,700 acre-feet of storage in Castaic Lake.

CALFED Bay Delta Program. The CALFED Bay Delta program is a cooperative state-federal process with the goal of developing a long-term solution to the many competing water needs of the Sacramento-

[29] The State Water Project Delivery Reliability Report, 2003, Final, found at http://swpdelivery.water.ca.gov.

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San Joaquin Bay-Delta. The program is a 30-year, three-phased effort addressing a number of issues including ecosystem quality, water quality, water system reliability and system vulnerability. Implementation of the CALFED improvements over time can significantly improve CLWA's ability to maintain delivery of high quality water and provide needed water supplies during dry years.

Interim Delta Improvements. Potential supply development for the SWP includes interim Delta improvements that involve: (1) south Delta channel enlargements and construction of four barriers to improve south Delta flow circulation; and (2) installation of acoustic fish barriers on the Sacramento River. The interim improvements would enable the use of additional pumps at Banks Pumping Plant when flow conditions are sufficient, and permit the relaxation of certain current operational constraints. It is also anticipated that these improvements would change the Delta fisheries on a positive basis. Therefore, the expected supply yield would improve. Although this solution is considered viable and cost-effective, it does not constitute a permanent solution to the Delta.

Full Delta Fix. As the overall demand for water increases and the need for low-salinity imported water intensifies, a long-term solution to the Delta becomes critical. It is expected that a Delta transfer facility would provide a long-term solution to Delta problems, increase supply reliability, reduce habitat impacts and improve the water quality of Delta diversions. Goals would be to minimize the effects of the SWP export pumps on Delta fisheries and greatly improve the quality of the exported water.

South of Delta Storage. The potential exists for additional storage south of the Delta. This storage could include both reservoir projects and groundwater banking/conjunctive-use storage. The reliability of the SWP supply would increase significantly, especially during dry years, with the development of south of Delta storage. However, the benefits of the storage would be maximized if a full Delta fix were implemented. As part of the CALFED analysis, approximately 3 million acre-feet of total storage capacity could be implemented south of the Delta.

Figure 4.8-20 and Table 4.8-9, below, summarize the variability in SWP supplies available to CLWA by the year 2020 under the following different CALFED improvement scenarios:

(a) **Under Existing Conditions,** based on the DWRSIM model and historical hydrologic conditions, CLWA would receive approximately 37,900 acre-feet about 10 percent of the time (which is considered to be in a dry period) and approximately 56,800 acre-feet about 50 percent of the time (which is considered to be in average/normal rainfall periods).

(b) **Under Interim Delta Improvements,** CLWA would receive approximately 40,200 acre-feet about 10 percent of the time and approximately 73,700 acre-feet about 50 percent of the time.

(c) **Under a Full Delta Fix,** CLWA would receive approximately 63,900 acre-feet about 10 percent of the time and approximately 95,200 acre-feet about 50 percent of the time.

(d) **Under a South of Delta Storage,** CLWA would receive its full Table A Amount about 50 percent of the time.

Figure 4.8-20
Projected State Water Deliveries

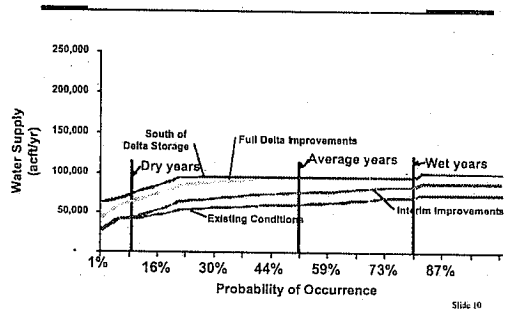

Table 4.8-9
Projected State Water Project Supplies
(acre-feet per year)

	Wet-Year	Average/Normal Year (50% Occurrence)	Dry-Year (10% Occurrence)
Existing Conditions	66,300	56,800	37,900
Interim Delta Fix	82,900	73,700	40,200
Full Delta Fix	95,200	95,200	63,900
South of Delta Storage & Full Delta Fix	95,200	95,200	75,800

Based on DWRSIM modeling (assuming full requests for all contractors).

DWRSIM and CALSIM II - Modeling Results. As stated above, the amount of water available to CLWA was calculated through the use of computer models, commonly known as the DWRSIM model and the CALSIM II model. The DWRSIM model, developed by DWR, was used to forecast CLWA water supply under various meteorological and land use changes as well as regulatory constraints. The reliability analysis derived from the DWRSIM model generally provides a conservative projection of SWP operations. For example, SWP delivery projections are usually based on *advance* requests reported by

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SWP contractors. These requests generally overstate the *actual* need for SWP deliveries. Therefore, there is additional SWP water available for actual distribution despite the DWRSIM modeling results shown above. In addition, as a mathematical model, DWRSIM is limited to the amount of water actually requested and does not include water available in excess of requests. Therefore, as noted below, the modeling results should be supplemented with information based on historic availability of additional SWP water supplies.

DWR has prepared a new computer model, known as CALSIM II. CALSIM II simulates the operation of the SWP on a monthly basis over a 73-year historical record of rainfall and runoff (1922 – 1994). When compared with DWRSIM, CALSIM II forecasts that more water will be available in average/normal years (i.e., 59.7 percent under DWRSIM versus 75 percent under CALSIM) and less water will be available in single critical dry years (i.e., 39.8 percent under DWRSIM versus 20 percent under CALSIM). The analysis presented in this document utilizes a worst-case combination of the DWRSIM and CALSIM II models. (See, DWR's The State Water Project Delivery Reliability Report, Final, dated May 2003, attached to this analysis in Appendix 4.8 for a complete description of the CALSIM II model.)

Historically, the SWP has delivered water in excess of SWP contractors' requests. From 1962 to 1999, the SWP delivered water in excess of the SWP contractors' requests in all but four years.

Drought Water Bank. Another program with the potential to improve the reliability of SWP water in drought periods is the state's Drought Water Bank. The Drought Water Bank is implemented as needed by an Executive Order by the Governor, or a finding by the DWR's director that water deliveries will be curtailed. The purpose of the Bank is to help California's urban, agricultural and environmental interests meet their water supply needs during dry years. The procedure was used successfully in 1991, 1992 and 1994 when DWR purchased water from willing sellers and sold the water to willing buyers under a set of allocation guidelines. However, in future dry years, the use of the state's Drought Water Bank would have to take into consideration local groundwater management ordinances, which restrict or control groundwater export. The proliferation of these local ordinances makes it less likely that the state's Drought Water Bank would rely on water transfers involving groundwater export in future dry years.

Drought Planning. In addition to the Drought Water Bank, the CALFED Record of Decision (August 28, 2000) called for the Governor to convene a panel, chaired by the DWR director, to develop a contingency plan for reducing the impacts of critical water shortages primarily for agricultural and urban water users. The contingency plan, known as the Governor's Advisory Drought Planning Panel, Critical Water Shortage Contingency Plan, December 29, 2000, building upon experience gained from implementing the Drought Water Bank, identifies available water resources (e.g., water transfers, water exchanges,

groundwater programs) and funding mechanisms to minimize the impacts created by drought conditions. The plan has been completed, circulated for public comment and finalized.

The contingency plan provides a brief background on California's water supplies and the hydrologic conditions potentially associated with critical water shortages. Chapter 2 describes changed water management conditions since the most recent statewide drought of 1987-1992. Chapter 3 describes the challenges in dealing with critical water shortages given these changed conditions. The challenges include constraints on availability and capacity of conveyance and storage facilities, regulatory restrictions and uncertainties, competition for limited water supplies among existing water purchasing programs and other identified issues. Chapter 4 presents the panel's recommendations for actions to be undertaken to address critical water shortages.

In the plan, the panel focused on the significant water management changes that have occurred since the statewide drought in 1987–1992. These developments include changes in water demand due to population growth, changes in institutional conditions affecting use of surface water and groundwater, construction of new water supply facilities, legislative changes and pending implementation of CALFED actions.

Since the last statewide drought of 1987–1992, two of the beneficial changes that have occurred in California are the construction of new water supply facilities and an expansion in groundwater recharge/storage capacity. Table 4.8-10, below, shows the major water conveyance facilities constructed or under construction since the last statewide drought.

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Table 4.8-10
Large-Scale Conveyance Facilities Constructed Since the Last Drought

Facility	Agency	Length (miles)	Maximum Capacity (cfs)
Coastal Branch Aqueduct	Department of Water Resources	100	100
Eastside Reservoir Pipeline	Metropolitan Water District of Southern California	8	1,000
East Branch Enlargement	Department of Water Resources	100	2,100
	(this phase increased existing capacity by approximately 750 cfs)		
Mojave River Pipeline	Mojave Water Agency	70	94
Old River Pipeline (Los Vaqueros Project)	Contra Costa Water District	20	400
East Branch Extension (under construction)	Department of Water Resources	14	104
Inland Feeder Project (under construction)	Metropolitan Water District of Southern California	44	1,000
Morongo Basin Pipeline	Mojave Water Agency	71	100
New Melones Water Conveyance Project (Farmington Canal)	Stockton East Water District and Central San Joaquin Water Conservation District	21	500

Source: Critical Water Shortage Contingency Plan, Governor's Advisory Drought Planning Panel, December 29, 2000.

In addition, there has been an expansion in groundwater recharge/storage capacity since the last statewide drought. **Table 4.8-11**, below, describes some of the larger groundwater recharge/storage projects currently operating in California. The projects that are now operational since the last drought are those operated by the Semitropic Water Storage District, the Arvin-Edison Water Storage District, the Kern Water Bank Authority, the Mojave Water Agency and the Calleguas Municipal Water District. These groundwater recharge/storage projects rely either wholly or in part on recharge supplies from the SWP. Therefore, the project's operations are subject to SWP restrictions in drought periods, as well as the availability of conveyance capacity. If water transfers provide a component of recharge supplies, availability of SWP conveyance capacity becomes a limiting factor (Contingency Plan, November 2000). As discussed above, the maximum capacity of SWP storage and conveyance facilities is extensive (4.2 million acre-feet); however, those facilities have not been completed. This capacity has been enhanced by the aforementioned groundwater recharge/storage facilities since the statewide drought of 1987–1992.

Table 4.8-11
Examples of Groundwater Storage Projects

Agency and Project Location	Comments
Alameda County Water District Niles Cone, Alameda County	Seawater intrusion management and conjunctive use, District recharges local runoff and imported surface supplies from its SWP 42 taf annual contractual Table A Amount. Average annual recharge of 25 taf.
Arvin Edison Water Storage District Kern County	A 350 taf banking program is being developed with MWD. Estimated extraction capability is 40 to 75 taf/year.
Calleguas Municipal Water District Las Posas Basin, Ventura County	Uses injection wells to recharge its imported MWD supplies. Maximum storage capacity of 300 taf. At full implementation, maximum annual extraction rate estimated to be 72 taf. Providing local emergency storage is a major project purpose.
City of Bakersfield Kern River Fan Area, Kern County	Initial operation of 2,800-acre recharge facility began in 1978. City has rights to Kern River water, and long-term contracts with three water agencies that store and extract water in coordination with the city.
Coachella Valley Water District Upper Coachella Valley, Whitewater River Channel Area	Recharge from local Whitewater River supplies and from MWD's imported Colorado River Aqueduct water exchanged for SWP contractual Table A Amounts of CVWD and Desert Water Agency.
Kern Water Bank Authority Kern River Fan Area, Kern County	6,800 acres of recharge basins. The Authority is a joint powers agency that operates the project on behalf of local water agencies. Recharge supplies may be local surface water or imported supplies.
The County of Los Angeles Department of Public Works, Los Angeles River and San Gabriel River watersheds, Los Angeles County	Extensive recharge facilities employing about 2,400 acres of spreading areas, and injection wells at three seawater intrusion barriers (Alamitos, Dominguez Gap, and West Coast). County operates the river systems for the dual purpose of flood control and groundwater recharge, and also recharges imported and reclaimed water provided by others.
Monterey County Water Resources Agency Salinas River Valley, Monterey County	Releases from MCWRA's Nacimiento and San Antonio Reservoirs are managed to provide recharge for upper valley. MCWRA distributes reclaimed water produced by the Monterrey Regional Water Pollution Control Agency for in-lieu recharge in the lower valley, to help reduce seawater intrusion. MCWRA's 45-mile distribution system can convey 19.5 taf of reclaimed water.
Mojave Water Agency Mojave River Basin, San Bernardino County	Basin has been adjudicated by court. The ephemeral Mojave River is the only local surface supply. To reduce overdraft, MWA's two new 71-mile pipelines import SWP supplies for recharge in spreading areas in the river channel. MWA's initial SWP contractual Table A Amount of 50.8 taf annually was augmented by the 1997 purchase of an additional 25 taf of annual Table A Amount.
Pioneer Project, Kern County Water Agency, Kern County	Recharge project with 1,200 acres of ponds capable of recharging 146 taf per year. Annual recovery capacity of 98 taf. Estimated storage of 400 taf. Project began operation in 1995.
Orange County Water District Santa River Watershed, Orange and Riverside Counties	Recharges Santa Ana River water regulated at Prado Dam, also recharges reclaimed water. Operates series of recharge basins along lower river and two seawater intrusion barriers. One barrier is jointly operated with the County of Los Angeles. Typically recharges about 300 taf annually.
Santa Clara Valley Water District Santa Clara County	District formed in 1929 to combat declining groundwater levels and associated land subsidence. Has 20 recharge basins covering about 390 acres, and also recharges in stream channels. District typically recharges over 100 taf annually, with a combination of local and imported supplies. Estimated operational storage is 350 taf.
Semitropic Water Storage District Kern County	Banking (in-lieu recharge) program with one maf storage capacity. Banking partners include MWD (350 taf), Santa Clara Valley WD (350 taf), Alameda County WD (50 taf), Zone 7 Water Agency (65 taf), Vidler Water Company (185 taf), The Newhall Land and Farming Company and the Castaic Lake Water Agency.
United Water Conservation District Santa Clara River Watershed, Ventura County	Operates Lake Piru on Piru Creek and Freeman Diversion Dam on the Santa Clara River in conjunction with spreading areas at Saticoy, El Rio and Piru.
Zone 7 of Alameda County Water Conservation and Flood Control District Alameda County	Recharges imported SWP water (46 taf annual contractual Table A Amount) in local stream channels.

Source: Critical Water Shortage Contingency Plan, Governor's Advisory Drought Planning Panel, December 29, 2000.

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(9) SWP - Other Water Deliveries

In addition to delivering Table A Amounts to the SWP contractors, the SWP conveys water to and stores water for contractors and other public agencies through other contracts and programs. (DWR Bulletin 132-98, November 1999, Ch. 9) These contracts and programs include, for example, the following:

Turnback Water Pool Program. Under Article 56(d) of the Monterey Amendments, the Turnback Water Pool Program was initiated through Notice to the SWP Contractors No. 97-3, dated February 5, 1997 (DWR Bulletin 132-98, November 1999, Ch. 9) All SWP contractors who signed Monterey Amendments are permitted to participate in the program. The program allows SWP contractors to offer a portion of their approved Table A Amounts for sale in a turnback pool for use outside their service area. Other contractors interested in purchasing this water can then request a portion or all of it. Based on supply and demand, the turnback water is then allocated between the selling and purchasing contractors. This program allows "excess" water to be made available to SWP contractors throughout the State of California.

Interruptible Water Program. The Interruptible Water Program allows an SWP contractor to take delivery of water over the approved and scheduled allocations for the current year. Interruptible water is available for delivery on a short-term basis as determined by the DWR, when scheduled project demands are being delivered and operational requirements for project water deliveries, water quality and other requirements are being met. (DWR Bulletin 132-98, November 1999, Ch. 9) CLWA is one of the SWP contractors that can participate in this program based upon its proportionate maximum Table A Amount.

Surplus Water Provisions. Pursuant to the Monterey Amendments, the Surplus Water Provisions allow certain SWP contractors to take delivery of "surplus" water; that is, water in excess of that required to meet all demands for Table A water. CLWA is one of the SWP contractors that can avail itself of surplus water as needed based upon its proportionate Table A Amount.

Carryover Water. For several years, DWR has offered SWP contractors the opportunity to carryover a portion of their undelivered Table A Amounts from one year for delivery during the next year. The carryover program was designed to encourage the most effective and beneficial use of water and to avoid obligating the contractors to use or lose the water by December 31 of each year. The SWP contractors' long-term water supply contracts and amendments state the criteria of carrying over Table A Amounts from one year to the next. CLWA is one of the SWP contractors that can avail itself of carryover water. In 1997, 263,759 acre-feet of carryover water was approved by DWR for future delivery to SWP contractors. (DWR Bulletin 132-98, November 1999, Ch. 9)

Both CLWA's SWP Table A Amount and SWP water from the foregoing programs are water supply sources that could be used in groundwater banking programs. These water supply sources are available during average/normal years for injection or "banking" in groundwater basins. The stored water can then be pumped when SWP supplies are reduced in dry years. In particular, these water supply sources could be available from CLWA for use in the Semitropic Groundwater Banking Project, which is discussed in further detail below.

e. Groundwater Banking and Conjunctive-Use Projects

With recent developments in conjunctive-use and groundwater banking programs, there are significant opportunities currently exist to improve the reliability of local and imported water supplies in Santa Clarita Valley. The term "conjunctive-use" generally means the coordinated operation of multiple water supplies to achieve improved supply reliability. Most conjunctive-use concepts are based on storing water supplies in times of surplus for use in times of drought. A typical program involves importation of additional surface supplies from the SWP during wet periods, recharging the water in a local groundwater basin and pumping out the stored water from wells when SWP supplies are reduced during a drought.

Groundwater banking programs generally involve storing available SWP supplies during wet years in groundwater basins (e.g., the San Joaquin Valley and the Saugus Formation). The water would be stored either directly by surface spreading or injection/extraction wells, or indirectly by supplying surplus SWP water to farmers in-lieu of groundwater pumping for agricultural uses. During dry periods, the stored water could be pumped out and exported to the Aqueduct, or used by farmers in exchange for their surface water allocations and delivered to CLWA through SWP facilities. Several potential conjunctive use and groundwater banking opportunities are available for use in the Santa Clarita Valley. Upon implementation, such programs can provide the following significant benefits in terms of water management and planning:

(a) A location to store available supplies in wet years, thus maximizing the efficient use of water resources;

(b) A dry-year supply that augments existing supplies reduced by drought or other shortages; and

(c) A storage "reservoir" that can be drawn upon when supplies are insufficient during unforeseen emergencies.

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These benefits allow such programs to "firm up" and enhance the reliability of both existing and future water supplies. **Table 4.8-12** below summarizes the projected water supply benefits for each of the identified groundwater banking and conjunctive use projects projected by CLWA.

Table 4.8-12
Projected Groundwater Banking and Conjunctive-Use Supplies – CLWA (2020)[1]
(acre-feet per year)

Source	Dry Year
Kern Water Bank	25,000
Semitropic Water Bank	30,000
Kern Delta Water Bank	40,000
North Las Posas Water Bank	10,000
Total	105,000

[1] *Assumes Groundwater Banking Programs would only be called on in dry-years. All groundwater banking programs are available in wet and average/normal years. In 2010, the amount of supply expected from groundwater banking and conjunctive use projects is approximately 50,000 AFY.*

Ongoing groundwater banking programs include the Kern Water Bank, the Semitropic Water Storage District, the Kern Delta Water District and the North Las Posas Water Bank. Each program is discussed in further detail below.

Kern Water Bank. The Kern Water Bank was established by DWR in 1988 as a statewide conjunctive-use program to increase the yield and enhance the reliability of the SWP. Eight elements were identified, seven sponsored by local agencies with the eighth being DWR's Kern Fan Element. The Kern Fan Element (later transferred to Kern Water Bank Authority) included the purchase of 19,900 acres of land and construction of recharge basins, extraction wells and related facilities. The original plan was to store SWP water underground in years of abundant supply and extract the banked water in dry years for use by SWP contractors. This original plan was divided into elements, such as Kern Fan, Semitropic and Cawelo. Initial studies indicated that the Kern Fan Element could store as much as 1,000,000 acre-feet of water and provide up to 140,000 acre-feet of water to the SWP in dry years. The other seven elements vary significantly in size. The Semitropic Local Element is the largest of these with more than 1,000,000 acre-feet of storage, while Cawelo Water District is the smallest with a storage capacity of about 110,000 acre-feet. The Semitropic element is discussed further below.

In 1994, the Kern Water Bank Authority (KWBA) was established to develop and operate the Kern Water Bank. The KWBA is a joint powers authority consisting of six water agencies. The KWBA constructed recharge basins and began recharging water in 1995. KWBA is now constructing additional basins, extraction wells and water conveyance facilities.

In October 1997, the KWBA, in conjunction with state and federal fish and wildlife agencies, established a Habitat Conservation Plan and Natural Community Conservation Plan that is preserving wildlife in the area while ensuring an adequate water supply for the future. When the KWBA's new water recharge facilities are completed, they will provide Kern County farming interests with the capability of storing more than 1,000,000 acre-feet of water on a permanent basis. Currently, more than 760,000 acre-feet is in storage.

Semitropic Water Storage District. The Semitropic Water Storage District (also referred to as "Semitropic" or "District") provides SWP for irrigation. The District is located in the San Joaquin Valley in the northerly part of Kern County immediately east of the California Aqueduct. Using the immense groundwater storage capacity available to Semitropic (one million acre-feet), the District has developed a groundwater-banking program. The District operates the program by taking additional SWP supplies in wet years and returning the water in dry years. As part of this dry-year return, Semitropic can leave its Table A Amount in the Aqueduct and increase its groundwater production. Semitropic has also constructed facilities so that groundwater can be pumped into their canal and, through reverse pumping plants, actually delivered to the California Aqueduct. Semitropic currently has six banking partners: the Metropolitan Water District, Santa Clara Valley Water District, Alameda County Water District, Alameda County Zone 7, Vidler Water Company and The Newhall Land and Farming Company. The total amount of storage under contract is approximately 1,000,000 acre-feet. The stored water may be extracted in annual amounts of up to 90,000 acre-feet for all banking partners except Newhall; Newhall can extract up to 4,950 AF annually from the bank. In 2002, CLWA entered into an agreement with DWR and the Kern County Water Agency for the interim banking of water in Semitropic.

In addition, Semitropic has recently completed environmental documentation to construct new storage and return facilities. These new facilities will provide Semitropic with the additional capability to extract and pump-back to the California Aqueduct approximately 200,000 acre-feet annually. The total return capability of Semitropic in dry years is expected to be approximately 290,000 acre-feet.

Kern Delta Water District. Kern Delta Water District is in the process of developing a banking agreement with the Metropolitan Water District. Kern Delta is in the San Joaquin Valley southwest of Bakersfield and obtains imported supplies from the Kern River, 180,000 acre-feet of pre-1914 rights, and the SWP under contract through Kern County Water Agency for a maximum annual Table A Amount of 25,000 acre-feet. Under the proposed Kern Delta banking program, in wet years, additional water would be supplied to Kern Delta where it would augment groundwater supplies through either direct groundwater recharge by spreading or by in-lieu replenishment. In dry years, previously stored supplies would be returned to the Metropolitan Water District, either by direct groundwater pumpback or

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through exchange of other supplies available to Kern Delta. Total return capability in dry years would be 40,000 acre-feet, with a total storage capacity of 200,000 to 240,000 acre-feet.

North Las Posas Water Bank. The North Las Posas Groundwater Basin is about 18 miles long and 4.5 miles wide, and is located in Southern California near Los Angeles. Water to this area is supplied by the Calleguas Municipal Water District, which imports all of its water from the Metropolitan Water District.

Investigations have shown that the North Las Posas Groundwater Basin has available storage capacity of about 300,000 acre-feet, primarily as a result of historic groundwater production. It is projected that the North Las Posas Water Bank could be used to return up to 10,000 acre-feet of previously stored water when needed.

f. Water Transfers

Another opportunity available to CLWA for increasing water supplies and enhancing reliability is to participate in voluntary water transfer programs (UWMP, Ch. 2.0). Since the statewide drought of 1987-1992, water transfers have developed into a viable supplemental source to improve supply reliability. The initial concept for water transfers was codified into law in 1986 when the California Legislature adopted the "Katz" Law (California Water Code Sections 1810-1814) and the Costa-Isenberg Water Transfer Law of 1986 (California Water Code Sections 470, 475, 480-483). These laws help to define the parameters for water transfers and establish a variety of approaches through which water or water rights can be transferred among individuals or agencies.

A water transfer can involve water sales, water ranching/farming and water sharing, and usually occurs as a form of spot, option and core transfers agreements. The cost of water transfer varies depending on the type, term and location of the transfer. Up to 27 million acre-feet of water are delivered for agricultural use every year. Over half of this water is in the Central Valley, and much of it is delivered by, or adjacent to, SWP and Central Valley Project conveyance facilities. This allows for the voluntary transfer of water to many urban areas through SWP facilities, including the CLWA service area.

One of the most important aspects of any resource planning process is flexibility. A flexible strategy minimizes unnecessary or redundant investments (or stranded costs). The voluntary purchase of water between willing sellers and buyers can be an effective means of achieving flexibility. However, not all water transfers have the same effectiveness for ensuring flexibility. Within the resource planning process and through ultimate implementation, several different types of water transfers have been undertaken:

Core Transfers. Agreements to purchase a defined quantity of water every year, whether needed or not. These transfers have the benefit of more certainty in costs and supply, but tend to offset surplus imported water (available in most years) that is already paid for.

Spot Market Transfers. Water that is purchased only during the time of need (usually a drought). Payment for these transfers occurs only when water is needed, but there is usually greater uncertainty in terms of costs and availability of supply. An example of such a transfer was the state's Drought Water Bank. An additional risk of spot market transfers is that the purchase may be subject to institutional limits or restricted access (e.g., requiring the purchasing agency to institute rationing before it is eligible to participate in the program).

Option Contracts. Agreements that specify the amount of water needed and the frequency or probability that the supply will be called upon (an option). These transfers have the best characteristics of both core and spot transfers. With option contracts, the potential for redundant capacity is minimized, as are the risks associated with cost and supply availability.

The most viable types of water transfers are core and option transfers and, as such, represent the CLWA's long-term strategy. (UWMP, Ch. 2.0) The costs for these types of transfers have been estimated to be about $60 to $160 per acre-foot for core transfers (compared to the initial cost of $1,100 to $2,000 per acre-foot for SWP Table A water), and $250 per acre foot for option transfers. Although the option transfer costs might seem high, the equivalent average annual cost is much less, about $65 to $112 per acre foot. The reason the average annual option transfer costs are much lower is due to the variable likelihood that the transfers will be needed.

g. Water Exchanges: Brackish and Seawater Desalting

Water exchanges represent the use of water that belongs to another entity either by trading water for water or by paying the cost of the water development and transmission. One opportunity for future exchange is through brackish and seawater desalting. (UWMP, Ch. 2.0)

Large-scale seawater desalination processes usually occur by one of two means: membrane processes and thermal processes. Membrane processes such as reverse osmosis (RO) use pressure to push seawater through semi-permeable membranes. The membrane acts as a filter allowing water to pass but not dissolved solids and impurities. Thermal processes utilize heat to separate the water from the salt and other impurities in the seawater. Thermal facilities tend to be more common but are often located in

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areas where fuel is inexpensive. Therefore, as membrane technology closes the cost gap, RO will become a less costly and more energy efficient desalination technology.

Desalination of seawater is technically feasible, but has historically been an expensive procedure. However, recent seawater desalination projects seem to indicate that the cost of seawater desalination, in some site-specific situations, has decreased in recent years. The competitive proposal process for the design, construction, and operation of the 25 mgd Tampa, Florida, seawater desalination plant gained worldwide attention. The best and final offer had a first year water cost of $560.00/acre-feet and a 30-year nominal cost of water of $680.00/acre-feet. This compares favorably to past desalination costs reported to be in the range of $1,300.00 to over $2,000.00 per acre-feet. The Tampa project includes a number of favorable factors that contribute to the low water price.

In Trinidad, a 23-year contract was awarded to build, own, and operate a 28.8 mgd seawater desalination facility. The plant will supply water at a first-year price of $865.00/acre-feet (1999).

A third example is the Long Beach Desalination Project, currently in the planning stages. Poseidon Resources, the Long Beach Water Department and Southern California Edison are key participants in this project. The project includes a 20-40 mgd desalination plant and appurtenant facilities. The $90 to $180 million private investment will present no financial risk to the public partners, while at the same time providing substantial water supplies.

Current projects would seem to indicate that the cost of seawater desalting is at a point where it could become a viable resource option. As discussed above, 20,000 to 40,000 AFY will be available as part of the proposed Long Beach project. CLWA has assumed that between 2,000 and 5,000 AFY of desalted water could be purchased for use in the CLWA service area.

h. Water Conservation and Water Supply Planning

In recent years, water conservation has become an increasingly important factor in water supply planning (UWMP, Ch. 5.0, 7.0). Although not considered a "supply" source, water conservation measures have the same effect by reducing overall water demand, making more water available for use at the local and state level. In the Santa Clarita Valley, CLWA and the four retail water purveyors have actively implemented water conservation programs for many years, and additional programs are planned for the future. (UWMP, Ch. 5) CLWA is now a signatory to the Urban Water Conservation Council Memorandum of Understanding regarding the use of best management practices.

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In summary, CLWA and the purveyors have developed extensive water conservation efforts, and the CLWA service area has achieved significant reductions in actual water usage through these programs. During the early 1990s (hot/dry period), the overall water requirements, due to the effects of weather, were projected to increase by approximately 10 percent. As a result of the conservation efforts, the overall water requirement actually decreased by 20 percent.

CLWA has adopted the water conservation goal of an overall 10 percent reduction in normal demand. Residential and commercial water usage can be expected to decrease through the implementation of existing and future programs. CLWA and the purveyors assume that water conservation can decrease water usage in normal years by approximately 10 percent (which is considered a conservative estimate).

Water Demand Measures and Best Management Practices. The Urban Water Management Act lists 14 Demand Management Measures that correspond to the 14 urban Best Management Practices ("BMPs"), or water use efficiency measures, promulgated by the California Urban Water Conservation Council. Adoption of the BMPs is presently voluntary; about 250 water agencies throughout the state have committed to implement them.

The recent CALFED Bay-Delta Program required mandatory adoption of the BMPs by December 2002. The water agencies of the Santa Clarita Valley have committed to implement the BMPs.

Implementation of Best Management Practices. The Demand Management Measures/Best Management Practices that are currently being implemented by the Santa Clarita Valley water agencies, or planned for implementation, are listed below.

- **Water Survey Programs for Single and Multi-Family Residential Customers.** The programs target and market the identified residential customers. The water agencies in Santa Clarita Valley will continue to implement these surveys and later implement the BMP.
- **Residential Plumbing Retrofit.** The program identifies residences constructed since 1992 and develops distribution strategy for water saving devices. The water agencies in Santa Clarita Valley will continue to implement this program and later implement the BMP.
- **System Water Audits, Leak Detection and Repair.** This programs involves leak detection and repair. The water agencies in Santa Clarita Valley will continue to implement this activity.
- **Metering with Commodity Rates for New Connections and Retrofit of Existing Connections.** The metering of all new connections and retrofitting is already done by agencies in Santa Clarita Valley.
- **Large Landscape Conservation Programs and Incentives.** These programs offer water use surveys to non-residential customers with large landscape areas. The water agencies in Santa Clarita Valley are partially complying with this activity, and will later implement the BMP.

- **High Efficiency Washing Machine Rebate Program.** This program offers rebates for purchase of horizontal-axis washing machines. The water agencies in Santa Clarita Valley do not offer rebates (nor do local energy providers or wastewater agencies). Local agencies are exempt from implementation.

- **Public Information Program.** This program implements an appropriate public information program on water efficiency. The water agencies in Santa Clarita Valley offer a very extensive and effective, award-winning program.

- **School Education.** This program provides water efficiency classes and information to schools. The water agencies in Santa Clarita Valley offer an extensive and effective award-winning program.

- **Conservation Programs for Commercial, Industrial, and Institutional (CII) Customers.** These programs identify such accounts, rank them according to water use and offer water use surveys and incentives. The water agencies in the Santa Clarita Valley not yet implementing the programs will implement the BMP at a later date.

- **Wholesale Agency Programs.** CLWA provides financial incentives or equivalent to retailers, along with technical support and information. Local water agencies will continue to implement this activity.

- **Conservation Pricing.** The water agencies in the Santa Clarita Valley institute conservation pricing. Local agencies will continue to implement a variety of pricing structures that meet the terms of this requirement.

- **Water Conservation Coordinator.** The water agencies in the Santa Clarita Valley designate staff to oversee water conservation program implementation. Local agencies will continue to implement.

- **Water Waste Prohibition.** CLWA enforces measures prohibiting water waste; however, CLWA does not possess police powers.

- **Residential Ultra-Low-Flow Toilet (ULFT) Replacement Program.** The programs determine number of service connections constructed before 1992 and offer toilet replacements. Local agencies will implement this BMP at a later date.

In September 2003, CLWA developed a long-term Draft Report, Water Supply Reliability Plan. A copy of this document can be found in Appendix 4.8 of this EIR. The primary objectives of the draft Water Supply Reliability Plan are to develop a protocol to identify current opportunities, evaluate opportunities using uniform economic criteria, and recommend a water supply reliability plan that focuses CLWA's efforts on the cost effective and beneficial opportunities. The recommended draft Water Supply Reliability Plan includes the following primary elements:

- Near-term acquisition of water banking capacity to allow banking of excess SWP water until the selected long-term banks have been developed.
- Acquisition of water banking capacity south of the Tehachapi Mountains to provide reliability for potential SWP conveyance disruptions.

- Acquisition of water banking capacity north of the Tehachapi Mountains to meet the additional identified water banking requirements not provided south of the Tehachapi Mountains.

The draft Water Supply Reliability Plan also includes a discussion of key implementation issues and a recommended implementation plan. The Plan recommends that CLWA provide a minimum storage capacity of 50,000 acre-feet by 2005, rising to 183,000 acre-feet by 2050. For additional information regarding these topics, please see the plan in Appendix 4.8.

i. Local Water Contingency Planning

In addition to the conservation programs, during the 1991 drought year, the local water agencies in the Santa Clarita Valley prepared and implemented a Water Shortage Contingency Plan. It was again implemented in 1994 due to the Northridge earthquake. In both instances, the Contingency Plan worked effectively. The summary provided below describes various aspects of the updated Water Shortage Contingency Plan for the Santa Clarita Valley. (UWMP, Ch. 6.0)

Drought Committees. In past droughts, two committees were formed to address drought conditions: the Upper Santa Clara Valley Water Committee, consisting of the local water agencies in the Santa Clarita Valley, and the City of Santa Clarita Drought Committee. Each reviewed information on water production and demand. The Water Committee agreed to cooperate in sharing water resources regardless of contractual or water rights during the emergency. The City committee made recommendations to the City Council and the water purveyors.

Drought Conditions. In the event of a continued drought, it is assumed that the SWP Table A deliveries to CLWA would be curtailed, and that a State Drought Water Bank would be formed. In addition, a combination of supplies would be available such as short-term water exchanges, participation in DWR's dry-year water program, deliveries from CLWA's flexible water account in Castaic Lake Reservoir, and local groundwater pumping in accordance with groundwater studies. Reclaimed water availability is also assumed to be available.

Earthquake or Other Natural Catastrophes. If a major earthquake were to occur, or if other catastrophic natural events were to occur elsewhere in the state, it could affect the Santa Clarita Valley. Local storage in reservoirs, combined with requests to the public to reduce consumption, would provide an adequate supply for about seven days. Experts agree that at least 72 hours may elapse before outside help is received; during this period and beyond, the pumping capacity of the retail agencies should provide sufficient water.

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Contamination. No extended problems with water contamination are anticipated, since the quality of local supplies is good, and steps can be readily taken to isolate a contamination problem. As discussed above, the presence of perchlorate found in one area of the Saugus Formation is currently being addressed through the development of a cleanup plan for this Aquifer.

Stages of Action. The agencies have agreed on a four-stage rationing plan, when needed. The trigger points for these stages have been established, priorities set and consumption limits established. A public hearing must be called to implement the rationing plan, and various monitoring procedures have been adopted.

Taken together, an updated Water Shortage Contingency Plan for the Santa Clarita Valley is in place, and has been successfully implemented. (UWMP, Ch. 6.0)

j. Summary Of Water Supplies For Santa Clarita Valley

The reliability of water supplies available to the CLWA service area does not depend on the "Full Delta Fix" and other water supply improvements recommended by the CALFED Program. CLWA and the retail water purveyors in the Santa Clarita Valley continue to pursue and fund their own local water supply programs. Recently, local water reliability enhancement programs have been undertaken to ensure that the water needs of the service area can be met into the future. As part of this endeavor, numerous programs are being undertaken simultaneously to safeguard against the onset of the next dry year.

As an example, CLWA's long-term Capital Improvement Plan ("CIP") is currently funding the purchase of additional SWP supplies, groundwater storage programs both inside and outside CLWA's service area, surface water storage programs, water conservation and recycling programs, short-term pumping from the Saugus Formation and short-term exchanges from other agencies on an as-needed basis. In 2001 and 2002, CLWA took several specific actions to enhance, preserve and strengthen the quality and reliability of existing and future water supplies in the Santa Clarita Valley. Those actions included, among others, completing the preliminary design for expansion of the Earl Schmidt Filtration Plant from 25 mgd to 56 mgd; obtaining permission from DHS to increase filter flow at the Filtration Plant; negotiating a transfer of 8,786 AFY of 2001 Castaic Creek Flood Flows to CLWA for treatment and use; negotiating with DWR an extended carry-over program for 2001 SWP allocations; signing the Memorandum of Understanding Regarding Urban Water Conservation in California; working to complete acquisition of an additional 16,000 AFY of SWP Table A Amount, following appropriate environmental review, which is underway; and entering into an agreement to bank water in the Semitropic Water Storage District on an interim

basis. These measures implemented over time provide the assurance that alternative supplies will be available in the CLWA service area to meet local water demands well into the future. For long-term planning purposes, water supplies and facilities are added on an incremental basis and in advance of need.

At the same time, however, CLWA, the four local retail water purveyors and other purveyors in the state readily acknowledge that it would be economically imprudent now, or in the short-term, to acquire all of the water supplies and facilities needed for the next twenty-five to thirty years. This type of an approach would represent an unfair shift of costs from future customers in new developments to existing customers in existing developments. In fact, water agencies in California are generally prohibited by law from imposing fees and charges for water supplies and facilities unless those fees and charges are reasonably related to actual services provided.

(1) Availability of Local Supplies

As shown in Table 4.8-13, projected total future supplies from local groundwater and reclaimed water sources range from 85, 000 AFY in a dry year to 63,000 AFY in an average/normal year.

Table 4.8-13
Planned Local Supplies
(acre-feet per year)

Source	Average/Normal Year	Dry-Year
Groundwater		
Alluvial Aquifer	35,000	35,000
Saugus Formation	11,000	13,000
Saugus Formation (new wells)*	--	20,000
Reclaimed Water	17,000	17,000
Total Local Supplies	63,000	85,000

Source: Santa Clarita Valley Water Report 2002, April 2003 and SB 610 Water Supply Assessment for the Riverpark Project, which are attached to this analysis in Appendix 4.8.

* *Planned program for future implementation. According to the CLWA, prior to implementing increases in production from groundwater supplies, CLWA will analyze the feasibility, cost and potential water quality and environmental effects of such a program. However, preliminary analyses and recent studies have concluded that additional pumping can be carried out.*

(2) Availability of Imported Supplies

As shown below in Table 4.8-14, projected supplies from the SWP, water banking/conjunctive-use projects, and water transfers range from 61,273 AFY in average/normal years to 122,540 to 141,390 AFY in dry years.

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Table 4.8-14
Planned Imported Supplies
(acre-feet per year)

Source	Average/Normal Year	Dry Years
SWP Supplies *	56,073	19,040 - 37,890
Banking/Conjunctive Use**	--	100,000
Water Transfers	5,200	3,500
Total Imported Supplies	61,273	122,540-141,390

Source: The State Water Project Delivery Reliability Report, May 2003 and SB 610 Water Supply Assessment for the Riverpark Project, which are attached to this analysis in Appendix 4.8.
** 56,800 acre-feet = 59.7 percent of maximum Table A Amount; 19,040 acre-feet = 20 percent of maximum Table A Amount; and 37,890 acre-feet = 39.8 percent of maximum Table A Amount.*
*** Planned programs for future implementation pursuant to UWMP 2000, Table 2-5 and SB 610 Water Supply Assessment for the Riverpark Project.*

(3) Total Water Supply Availability

As shown below in Table 4.8-15, for long-term planning purposes, total water supplies available to the CLWA service area range from 182,240 to 241,790 AFY in dry years, and from 103,200 to 157,100 AFY in average/normal years. For critical dry years, when the reliability of the SWP can be reduced to 20 percent of SWP maximum Table A Amount, CLWA would utilize dry year supplies available from the Saugus Aquifer, and water banking and conjunctive use projects as indicated in Table 4.8-15.

Table 4.8-15
Total Supplies
(acre-feet per year)

Source	Average/Normal Year	Dry Year
Local Supplies Groundwater		
Alluvial Aquifer	35,000	35,000
Saugus Formation	11,000	13,000
Saugus Formation (new wells)*	--	20,000
Reclaimed Water*	17,000	17,000
Imported Supplies		
SWP Supplies	56,073	19,040 -37,890
Water Banking/Conjunctive Use*	--	100,000
Water Transfers*	5,200	3,500
Total Supplies	124,273	207,540 to 226,390

Source: The State Water Project Delivery Reliability Report, May 2003 and SB 610 Water Supply Assessment for the Riverpark Project, which are attached to this analysis in Appendix 4.8.
** Planned programs for future implementation pursuant to the UWMP 2000, Table 2-6 and SB 610 Water Supply Assessment for the Riverpark Project.*

The remaining portion of this section summarizes "water demand" in the Santa Clarita Valley.

k. Water Demand In The Santa Clarita Valley

This section describes the historic, existing and projected water use (demand) within the CLWA service area.

CLWA provided historic and existing water usage in the Santa Clarita Valley and the methodology used to forecast future water demand for the valley. Water usage consists of residential, commercial, industrial, recreational, agriculture and other uses. Existing land-use data, new housing construction information and population data were also compiled for the Santa Clarita Valley. The information was then compared to historic trends in water service connections and customer water usage to determine the reasonableness of the projected information. In addition, the CLWA considered the effects of weather and conservation on historic water usage.

This section summarizes the historical and existing water demand in the Santa Clarita Valley and forecasts the water demand in the Valley through 2020.

(1) Historical And Existing Water Demand In Santa Clarita Valley

The historical and existing water usage was based upon service connections from the four retail water purveyors in the CLWA service area. As shown in Table 4.8-16, the total number of new service connections has increased from 39,299 in 1990 to 58,221 in 2002. This increase in the number of service connections represents slightly more than 500 per year in 1991, to a maximum of 4,200 in 2001, representing an average annual increase of 1,456 new service connections per year.

Table 4.8-16
Historical Number of Service Connections

Service Connections	1990	1992	1994	1996	1998	2000	2002
Valencia Water Co.	14,272	14,854	15,703	17,420	19,863	22,000	25,286
Newhall	5,854	6,144	6,294	6,477	6,585	7,200	7,700
Santa Clarita Water Division of CLWA	18,550	19,000	19,400	19,650	20,300	22,000	24,175
LA County #36	623	736	752	768	774	700	1,060
Total	39,299	40,734	42,149	44,315	47,522	51,900	58,221

Source: CLWA 2000; Santa Clarita Valley Water Report 2000 and 2002.

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(2) Projected DMS Water Demand In Santa Clarita Valley (2015)

The DMS is an important regulatory component of the County's General Plan. The DMS acts as an early warning system to County decision-makers by providing information about the existing capacity of certain infrastructure, facilities and public services at the time a new development is considered in the four major "urban expansion areas" of the County's General Plan, including the Santa Clarita Valley. The goal of DMS is to identify the new infrastructure, facilities and public services that will be required for new development, and to ensure that the appropriate costs of expanding such infrastructure, facilities and services will be paid for by new development and not assumed by taxpayers in existing developments.

In accomplishing the goals stated above, the DMS determines the availability of certain infrastructure, facilities and services, including water services, on an individual and cumulative basis. The DMS utilizes a computer database that incorporates information supplied by service providers and determines capital facility capacity and demand placed on the system by existing, pending, approved and recorded projects for which land divisions have been filed within the four major "urban expansion areas" of the County's General Plan, including Santa Clarita Valley. The DMS is used to quantitatively determine project and cumulative impacts on certain essential infrastructure, facilities and services, including water service. In EIRs prepared for the County, whenever a proposed project would result in an exceedance of applicable infrastructure, facilities or services, a significant impact is identified and recommended mitigation measures are provided.

The "DMS Build-Out Scenario" entails buildout of subdivision projects listed in the County's Development Monitoring System (DMS), plus the Riverpark project. A DMS analysis is required by the County's General Plan for the cumulative analysis of certain utilities and services, including water service.

The County's DMS database includes all pending, recorded and approved projects for which land divisions have been filed within County unincorporated lands and within the City of Santa Clarita. The City plus County unincorporated area together constitute the County's Santa Clarita Valley Planning Area. A list of the future DMS development activity in the Santa Clarita Valley Planning Area is presented below in **Table 4.8-17**. The listing presented in **Table 4.8-17** does not include General Plan Amendment requests such as the Newhall Ranch Specific Plan. (General Plan Amendment requests are considered in the Santa Clarita Valley Cumulative Build-Out Scenario, which is considered more comprehensive than the DMS Build-Out Scenario. The Santa Clarita Valley Cumulative Build-Out Scenario is discussed in the section below).

Table 4.8-17
Cumulative Development Activity - DMS Build-Out Scenario -
Santa Clarita Valley Planning Area

Land Use Types	Pending Projects[a]	Approved Projects[b]	Recorded Projects[c]	Total
Single-Family Units (detached)	7,142 du	8,109 du	8,385 du	23,636 du
Multi-Family Units	1,965 du	8,371 du	2,868 du	13,204 du
Mobile Homes	650 du			650 du
Commercial	305 ac	107 ac	60 ac	472 ac
Industrial	195 ac	188 ac	200 ac	583 ac

Source: The County of Los Angeles Service Provider Report, Santa Clarita Valley Water Service Purveyors, April 23, 2003.
[a] Pending Projects: The County of Los Angeles and City of Santa Clarita subdivisions filed with the County of Los Angeles Department of Regional Planning, which are not yet recorded or expired.
[b] Approved: subdivisions approved by the County, which are not yet recorded or expired.
[c] Recorded: subdivisions recorded, but not yet built.
du = dwelling units
ac = acres

Table 4.8-18 illustrates cumulative water demand for the Santa Clarita Valley service area under the DMS Build-Out Scenario.

Table 4.8-18
Scenario 1: DMS Build-Out Scenario Demand for the Santa Clarita Valley - 2015 (acre-feet per year)

	Average Year	Dry Year[a]
Santa Clarita Valley DMS Demand		
- Existing Plus DMS Demand	97,862	107,648
Existing Demand	61,403	61,403
Pending Demand	7,045	7,045
Approved Demand	9,372	9,372
Recorded Demand	5,984	5,984
Other Demand (including Agriculture)[b]	7,100	7,100
Newhall Ranch Specific Plan[c]	6,958	6,958
Dry Year 10% Increase in Demand	0	9,786
- Riverpark Demand	697	697
Dry Year 10% Increase in Demand	0	70
- Less Conservation	(9,856)	(10,842)
Total[d]	88,703	97,573

[a] Demand is increased by approximately 10 percent in dry years.
[b] This demand figure reflects a reduction in agricultural demand that would occur as the projects shown in the County's DMS are built. According to the Valencia Water Company (DiPrinzio, Personal Communication, 2003) water demand in a critical dry year can be expected to decrease by approximately 20 percent through implementation of future water conservation practices in the CLWA service area. This analysis conservatively assumes a 10 percent reduction in critical dry year demand below dry year demand.
[c] The Newhall Ranch Specific Plan would only be partially built-out by 2015. It is assumed that development on the Specific Plan site would start to be occupied in 2005 and would be fully built out by 2030. This figure represents 10 years worth of development on the Specific Plan site.

Without the Riverpark project, future DMS water demand plus existing urban and other demand (including reduced agricultural demand) would be in the total amount of approximately 97,862 AFY (including partial buildout of the Newhall Ranch Specific Plan by 2015 which has been added to the

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demands shown in the DMS for the purpose of this analysis). With the water demand of the Riverpark project added (697 AFY in an average year and 767 AFY in a single dry year) and taking into consideration expected water conservation (9,856 AFY in an average year and 10,842 AFY in a dry year), total cumulative demand under the DMS Build-Out Scenario would be approximately 88,703 and 97,573 acre-feet of water per year in an average and dry year, respectively. While no one can precisely predict the year buildout of all projects listed in the DMS would occur, this analysis estimates that DMS buildout would likely occur over the next 10 to 11 years. This analysis assumes that all projects on the DMS buildout in 2015.

(3) Projected Water Demand In Santa Clarita Valley Up To 2025

In order to forecast future water demand through 2025, CLWA utilized both the extrapolation method (based on service connections) and the econometric method (based on land-use analysis) as the most accurate means of forecasting water demand through 2025. This combined forecast took the projected growth in new service connections, accounted for the effects of housing trends, land-use changes, development trends, weather and conservation effects to create an estimated increase in water demand through 2025.

Normal/Average Year Water Demand: Table 4.8-19 depicts the projected average/normal year water demand for the Santa Clarita Valley through 2020.

Table 4.8-19
Projected Normal/Average Year Water Demand
(acre-feet per year)

	2005	2010	2015	2020
Urban Uses	66,600	77,700	90,900	106,000
Agricultural Uses[1]	15,100	12,400	9,800	7,100
Total Projected Demand[2]	81,700	90,100	100,700	113,100

Source: Water Supply Assessment for the Riverpark Project, Santa Clarita Water Division of the Castaic Lake Water Agency, August 7, 2003.

1 *Agricultural water usage is expected to decrease from 17,800 AFY in 1999 to about 7,100 AFY by 2020 due to increased development in the Santa Clarita Valley. This decrease in agricultural demand includes the approximately 7,038 AFY of Newhall Land and Farming Company agricultural water that would be used to partially meet the potable water demands of the Newhall Ranch Specific Plan as Newhall Land and Farming Company's agricultural lands in Los Angeles County are converted to urban uses.*

2 *Does not include expected long-term water conservation savings of 10 percent.*

Using a straight-line projection, water demand is expected to increase to 123,570 AFY by 2025.

Single Dry Year Water Demand: CLWA evaluated the estimated dry-year demands and projected supplies for the year 2010 for the purpose of assessing a single dry year. This year was selected in order to show the results of local and imported water supply development over the next 10 years. In May 2003 DWR finalized its State Water Project Delivery Reliability Report. For the worst-case scenario single critical dry year (1977, with a one in 73 year probability of occurrence), DWR estimates that SWP deliveries to contractors would be approximately 20 percent of contract Table A Amounts. Single dry year demand in 2010 is estimated at 81,810 AFY (i.e., 90,900 acre-feet less 9,090 acre-feet (10 percent) to account for expected voluntary conservation).

Multiple Dry Year Water Assessment: CLWA estimated the minimum water supply available during each of the three water years, 2001, 2002, and 2003.[30] The surface and groundwater supplies included in this analysis are reflective of supplies available during the 1987-92 drought years, and in particular, 1990, 1991, and 1992. The supplies available from recycling projects are assumed to experience no reduction in a dry year but are also assumed not to be fully on-line at this early stage of the 20-year projection. Demand reductions of 10 percent based on short-term water conservation programs are assumed for these dry-year scenarios (this level of conservation was achieved during the 1987-1992 drought). If projected imported and local supplies are developed as indicated, no shortages are anticipated within the Agency's service area in the dry-year scenarios analyzed.[31] Years 1, 2 and 3 in Table 4.8-20 represent demand projections for 2003 through 2005. The single and multiple dry year water supply and demand assessments from the UWMP are summarized in the following table.[32]

Table 4.8-20
Projected Dry Year and Multi-Dry Year Demand
acre-feet per year

	Single Dry Year	Multiple Dry Years		
		Year 1	Year 2	Year 3
Total Estimated Demand	90,900	82,000	83,300	84,600
Voluntary 10% Conservation	9,090	8,200	8,330	8,460
Total Net Demand	81,810	73,800	74,970	76,140

Information concerning "Future Planned Water Supply Programs" as listed below, from the UWMP and other sources was included to indicate examples of how CLWA would add reliability and flexibility to its

30 UWMP p. 4-3. Hot, dry weather may generate a 10 percent increase above normal in both urban and agricultural water usage. This percentage was used to generate the dry-year demands in Table 2.2.

31 UWMP p. 4-4.

32 Excerpted from Table 4-2 of the UWMP.

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water supply portfolio. Programs such as these will be analyzed by CLWA and contracts entered into as need and cost-effectiveness are determined through time. Future Water Supply Assessments will reflect these contractual agreements.

Long-Term (2025) Dry Year Demand: To determine the projected water demand in dry years, CLWA relied on studies showing that hot-dry weather may generate a single-year 10 percent increase in both urban and agricultural water usage above and beyond the average/normal year water demand. Therefore, this percentage was used to generate the dry-year demands shown in Table 4.8-21. No conservation savings are reflected in the water demand projections shown in Table 4.8-21. Table 4.8-21 also provides the overall projected water demand for the Santa Clarita Valley through 2020 in average/normal years and dry years.

Table 4.8-21
Projected Dry-Year Water Demand
(acre-feet per year)

	2005	2010	2015	2020
Total Projected Normal/Average Year Demand	81,700	90,100	100,700	113,100
Plus 10% Increase in Usage in Dry-Years	8,170	9,010	10,070	11,310
Total Projected Dry-Year Demand	89,870	99,110	110,770	124,410

Source: CLWA's *SB 610 Water Supply Assessment for the Riverpark Project* and *UWMP 2000, Table 3-5 and Table 4-2.*

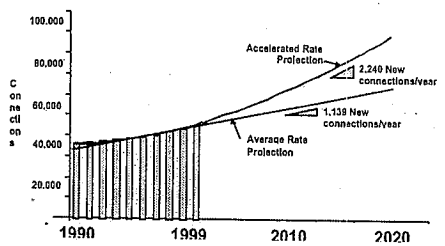
Water demand in dry years would increase to 135,927 acre-feet per year by 2025. In considering the future number of service connections needed within the CLWA service area, CLWA utilized the methodology, referred to as the extrapolation method. This method evaluates projected water usage based on the extrapolation of service connections throughout the CLWA service area. Using this method, service connections are exponentially projected for the CLWA service area through 2025. Under this method (exponential projection), the number of new service connections is projected to increase from 49,550 in 1999 to about 96,000 in 2020 and 107,200 in 2025, representing an annual average increase of about 2,240 new connections per year. Recent service connection data is generally consistent with this projected average. Connection data compiled and maintained by CLWA since 2000 shows 2,249 new connections in 2000, 2,822 new connections in 2001, and 2,080 new connections in 2002.[33]

Figure 4.8-21, below, depicts the historical and projected number of service connections in the CLWA service area by the year 2020. The figure shows about 96,000 new connections in 2020, with an average

[33] See, CLWA's SB 610 Water Supply Assessment for the Riverpark Project, which is attached to this analysis as **Appendix 4.8.**

annual increase of 2,240 connections per year from 2000 to 2020, using the accelerated rate projection); and it shows about 70,000 new connections in 2020, with an average annual increase of 1,139 connections per year from 2000 to 2020, using an average rate projection).

Figure 4.8-21
Historical and Projected Number of Service Connections



3. RIVERPARK WATER DEMAND AND SUPPLIES

As indicated in the SB 610 Water Supply Assessment for the Riverpark Project an adequate supply of water is available to meet the demands of the Riverpark project without creating significant environmental impacts.

a. Preface

This section is the "heart" of the Water Services section. This section demonstrates that adequate water sources will be available for buildout of the project by showing that the water purveyor serving the project site has a sufficient supply of water for its customers including those ultimately on the project site.

b. Water Demand and Delivery

(1) Riverpark Water Demand and Delivery

This section presents the water demand for the Riverpark project. In this discussion, the project's water demand is assessed in conjunction with the existing water demand in the Santa Clarita Valley, as well as the future cumulative water demand in the Santa Clarita Valley under near-term and long-term conditions.

The Riverpark project is a proposed residential development consisting of single- and multi-family housing on a 695.4-acre site in the City of Santa Clarita. It includes 439 single-family dwellings, 744 apartments, 40,000 square feet of commercial building area, and a 29-acre passive park, of which a maximum of 8 acres would be landscaped and irrigated. The project site is located at the terminus of Newhall Ranch Road, east of Bouquet Canyon Road between CLWA property and the Santa Clara River, north of Soledad Canyon Road. Home construction is anticipated to begin in 2006 and will continue until buildout in 2009.

Using water demand factors provided by SCWD, the proposed project would consume approximately 697 AFY. The anticipated project demand for water is summarized in Table 4.8-22, Estimated Water Demand, below.

Table 4.8-22
Estimated Water Demand

Land Use Category	Amount	Water Duty Factor	Water Demand (AFY)
Single-Family Units	439 units	0.55 af/unit	241.45
Apartments	744 units	0.19 af/unit	141.36
Park	8 acres	3 af per acre	24.0
Other Misc. Landscaping (irrigated common landscaping, pocket parks, etc.)	93 acres	3 af per acre	279.0
Commercial (40,000 sq. ft.)	3 acres	0.0289 af/100 sq. ft.	11.56
TOTAL			697.37

Proposed On-Site Potable Water System: The proposed project will be served by a series of existing and proposed water lines and water tanks. The proposed project's water delivery system would consist of 16-inch water mains that generally follow the major roadways on and off the project site (i.e., Santa Clarita Parkway and Newhall Ranch Road). Additionally, a system of 8- and 12-inch water lines are proposed to follow the internal roadways of the project. The proposed 16-inch water main in Newhall Ranch Road, to be owned and operated by Santa Clarita Water Company (SCWC), is anticipated to connect to an existing 14-inch SCWC line in Bouquet Canyon Road. This existing line is a Zone A line (Bouquet Zone) (See, **Figure 4.8-22, Proposed On-Site Potable Water System for the location of proposed water zones**). The water storage tank serving the Bouquet Zone is owned and operated by SCWC and is located just north of the project site and is situated at an elevation of 1,450 feet above mean sea level. From this point of connection at Bouquet Canyon Road, the Newhall Ranch Road main will continue east to proposed extension of Valley Center Drive. The main will then follow the alignment of Valley Center Drive to connect to an existing 10-inch line in Soledad Canyon Road (See, **Figure 4.8-22, Proposed On-Site Potable Water System**). This line is within Zone E (Honby Zone) and is fed from a tank three miles east of the project site (also owned and operated by SCWC). This water tank is situated at an elevation of 1,510 feet above mean sea level. A 16-inch water main is also proposed to be located in Santa Clarita Parkway with a connection at Newhall Ranch Road. This line is not proposed to be extended beyond the limits of development by this project. It is currently anticipated that both water production and storage will be accomplished off site at existing SCWC facilities, though the project includes a potential water tank, at one of two possible locations, if needed in the future to serve the project.

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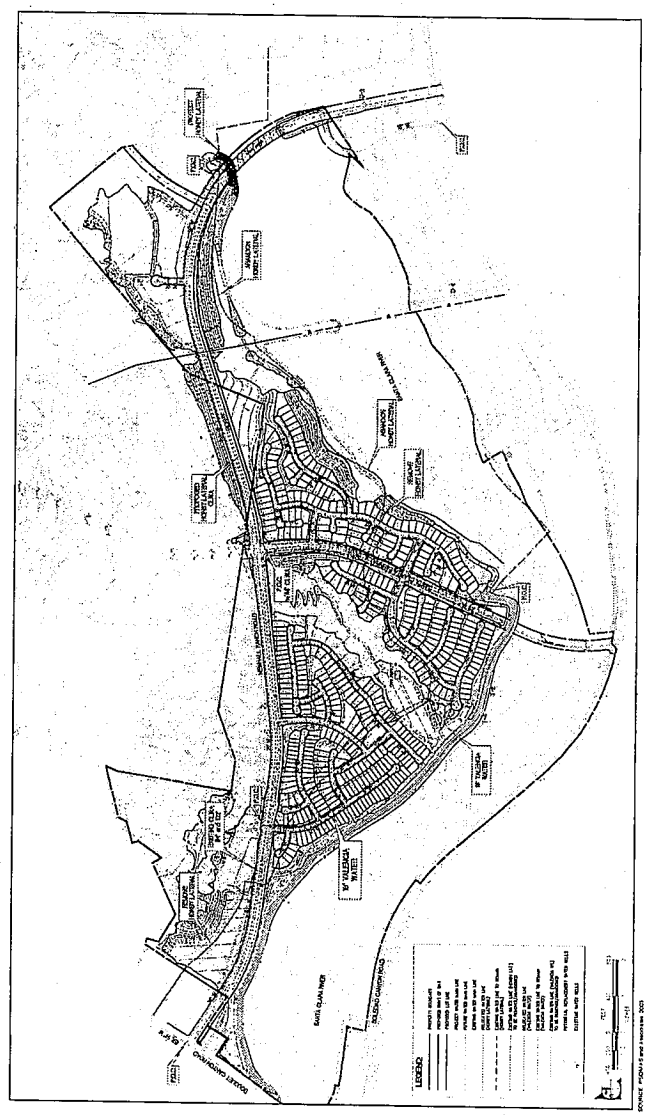

FIGURE 4.8-22
Proposed On-Site Potable Water System

Existing On-Site Water Infrastructure: Several existing water lines, belonging to Castaic Lake Water Agency (CLWA) and Valencia Water Company (VWC), currently traverse the project site. CLWA's Honby Lateral enters the project site at the eastern boundary. This 33-inch steel pipe continues west across the project site to a point of connection with an 84-inch CLWA water transmission line that exists in the future alignment of Newhall Ranch Road.

Additionally, CLWA is proposing to relocate and upgrade the Honby Lateral within the project site. This realignment and upgrade is part of CLWA's Capital Improvement Program, which was analyzed in a program EIR certified in 1998. CLWA will be preparing a separate project-level environmental document for the relocation and upgrade covering this portion of the Honby Lateral. The Honby Lateral does not provide water service to the Riverpark project.

In addition to the Honby Lateral, CLWA has two existing transmission lines that originate at the agency's water treatment plan north of the Riverpark site. These 84-inch and 102-inch lines travel downhill from the water treatment plant and continue, for the most part, along the currently graded future right-of-way for Newhall Ranch Road to a point of connection with Bouquet Canyon Road. The project proposes no change to these water lines.

VWC operates two water wells on the project site (T-2 and T-4), as well as two wells just off site (U-3 and U-4). There is an existing 12-inch water line that connects well U-4 to T-2. This line then becomes a 16-inch line at well T-2. This 16-inch line traverses the project site in a northwesterly direction until it reaches the currently graded alignment of Newhall Ranch Road. This line continues west and follows the graded roadway alignment. As this line exits the site at the northwestern boundary it ties into 12-inch and 14-inch lines. Valencia Water Company, in conjunction with project development, intends to relocate this line to behind the proposed bank stabilization and within "A" Street to a point of reconnection with the existing VWC line in Newhall Ranch Road. Additionally, VWC will replace the two existing on-site water wells in alternative locations on the project site. Valencia Water Company does not provide water service to the Riverpark project.

Project Fire Flows: The Los Angeles County Fire Department requires sufficient capacity for fire flows of 1,250 gallons per minute (gpm) at 20 pounds per square inch (psi) for a two hour duration for single family uses, and up to 5,000 gpm at 20 psi for a duration of up to five hours for multi-family and commercial uses with a first floor area of 35,000 square feet or greater (actual fire flow requirements would be confirmed for each use by the Los Angeles County Fire Department prior to Final Tract Map approval). Based on the experience of the project engineer, PSOMAS, the proposed water system would be able to meet both domestic and fire flow requirements of the project.

(2) Existing Conditions Plus Project Water Demand

This section describes the existing development in the Santa Clarita Valley, as well as the project water demand. **Table 4.8-23, Existing Plus Project Demand for the Santa Clarita Valley**, illustrates the project demand, in conjunction with existing demand in the Santa Clarita Valley.

Table 4.8-23
Existing Plus Project Demand for the Santa Clarita Valley
(acre-feet per year)

	Average Year	Dry Year[b]	Critical Dry Year[c]
Existing Demand[a]	62,023	68,225	68,225
Other Demand (Agricultural)[a]	15,278	16,806	16,806
Riverpark Demand	697	767	767
Critical Dry Year 10% Demand Decrease (Conservation)			(8,580)
Total Demand	77,998	85,798	77,218

[a] *Source: Santa Clarita Valley Water Report 2002. Prepared by the Castaic Lake Water Agency, Los Angeles County Waterworks District #36, Newhall County Water District, Valencia Water Company, April 2003.*
[b] *Demand is increased by approximately 10% in dry years. 2002, the year from which this demand was derived, was a dry year and already reflects the 10% increase in demand over a normal or average year. A dry year is a year when below average rainfall occurs after a normal or wet year.*
[c] *Demand in a critical dry year is expected to decrease by as much as 20% due to voluntary and mandatory planned purveyor conservation programs. This analysis assumes a critical dry year 10% reduction in demand from the dry year demand. A critical dry year is a year when rainfall is at a critically low level (i.e., a year that occurs once every 73 years). Such a demand reduction occurred in the last critical dry year experienced in the Santa Clarita Valley (1991).*

As shown, existing water demand in the Santa Clarita Valley is approximately 77,301 AFY in average years (this figure accounts for a dry year increase in water demand in 2002 of approximately 10 percent). Of this demand, approximately 62,023 acre-feet is related to urban or developed areas and approximately 15,278 acre-feet is related to other uses in the Santa Clarita Valley, including agricultural uses. When combined with the Riverpark water demand of 697 AFY, the total water demand in the Santa Clarita Valley would be approximately 77,998 acre-feet if Riverpark were completely built out today. The land use-related water demand would increase by approximately 10 percent in dry years, such as occurred in 2002, resulting in a water demand of approximately 85,798 AFY. In a critical dry year, such as occurred in 1991, demand could decrease by up to 20 percent due to conservation measures that would be enacted by the local water purveyors and CLWA. However, this analysis conservatively assumes that critical dry-year demand would decrease by 10 percent from the dry-year demand. During such extreme conditions, water demand in the Santa Clarita Valley with the Riverpark project would be approximately 77,218 acre-feet.

(3) Cumulative Water Demand

In order to analyze the cumulative water impacts of Riverpark in combination with other expected future growth, the amount and location of growth expected to occur in addition to that of the project must be predicted. Section 15130(b) of the CEQA Guidelines allows two methods of prediction. The two methods are described as follows: "(a) a list of past, present, and reasonably anticipated future projects producing related or cumulative impacts, including those projects outside the control of the agency; or (b) a summary of projections contained in an adopted general plan or related planning document which is designed to evaluate regional or area-wide conditions." In response to the CEQA requirements, three separate cumulative development scenarios are analyzed for this water analysis in order to meet CEQA requirements as well as the requirements set forth in SB 610 and the County's Development Monitoring System (DMS). The three cumulative scenarios analyzed are referred to below as the "SB 610 Water Supply Assessment Scenario," the "DMS Build-Out Scenario," and the "Santa Clarita Valley Cumulative Build-Out Scenario."

The list of cumulative projects used in this water analysis to assess cumulative impacts is not static. From time to time, the list of cumulative projects is increased or decreased as specific development proposals are applied for, withdrawn, approved, or denied by lead agencies. As part of this analysis, an attempt has been made to be as current as possible; however, it is possible that the list of projects maintained by the City of Santa Clarita or other surrounding jurisdictions will change while this analysis is a subject of public review.

(a) SB 610 Water Supply Assessment Scenario - Demands

As indicated previously, a water supply assessment was prepared for the Riverpark project by the Santa Clarita Water Division pursuant to SB 610. The conclusion of the water supply assessment is summarize below and a complete copy of the water supply assessment is attached to this analysis in Appendix 4.8.

Water demands were estimated under three scenarios for the SB 610 Water Supply Assessment. They include the average/normal water year, the single dry year, and multiple dry years. Under the average/normal conditions, water demand in the Santa Clarita Valley would be 81,700 acre-feet in year 2005, 90,100 acre-feet in year 2010, 100,700 acre-feet in year 2015 and 113,100 acre-feet in year 2020.

For the critical dry year (2010), which occurs once every 73 years, water demand in the Santa Clarita Valley would be 90,900 acre-feet less 9,090 acre-feet due to voluntary conservation of 10 percent for a net demand of 81,810 acre-feet (While in the last critical dry year, 1991, a conservation level of 20 percent was

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achieved, this portion of the analysis is using a 10 percent reduction in demand is assumed in order to be conservative).

Under the multiple dry-year scenarios and after conservation of 10 percent, Year 1, 2 and 3 demands would be 73,800 acre-feet, 74,970 acre-feet, and 76,140 acre-feet, respectively.

(b) DMS Build-Out Scenario - Demands

The County's DMS database includes all pending, recorded, and approved projects for which land divisions have been filed within County unincorporated lands and within the City of Santa Clarita. The City plus County unincorporated area together constitute the County's Santa Clarita Valley Planning Area. Table 4.8-24 illustrates cumulative water demand for the Santa Clarita Valley service area under the DMS Build-Out Scenario. It should be noted that this scenario also includes a portion of the Newhall Ranch Specific Plan. The Newhall Ranch Specific Plan would only be partially built out by 2015, and it is assumed that development on the Specific Plan site would start to be occupied in 2005 and would be fully built out by 2030. The water demand of Newhall Ranch shown in Table 4.8-24 represents 10 years worth of development on the Specific Plan site.

Table 4.8-24
Scenario 1: DMS Build-Out Scenario Demand for the Santa Clarita Valley - 2015 (acre-feet per year)

	Average Years	Dry Years[a]
Santa Clarita Valley DMS Demand		
- Existing Plus DMS Demand	97,862	107,648
Existing Demand	61,403	61,403
Pending Demand	7,045	7,045
Approved Demand	9,372	9,372
Recorded Demand	5,984	5,984
Other Demand (including Agriculture)[b]	7,100	7,100
Newhall Ranch Specific Plan[c]	6,958	6,958
Dry Year 10% Increase in Demand	0	9,786
- Riverpark Demand	697	697
Dry Year 10% Increase in Demand	0	70
- Less Conservation	(9,856)	(10,842)
Total[a]	88,703	97,573

[a] *Demand is increased by approximately 10 percent in dry years.*
[b] *This demand figure reflects a reduction in agricultural demand that would occur as the projects shown in the County's DMS are built. According to the Valencia Water Company (DiPrimio, Personal Communication, 2003) water demand in a critical dry year can be expected to decrease by up to 20 percent through implementation of future water conservation practices in the CLWA service area.*
[c] *The Newhall Ranch Specific Plan would only be partially built out by 2015. It is assumed that development on the Specific Plan site would start to be occupied in 2005 and would be fully built out by 2030. This figure represents 10 years worth of development on the Specific Plan site.*

With the water demand of the Riverpark project (697 AFY in an average year and 767 AFY in a single dry year) and taking into consideration expected water conservation (9,856 AFY in an average year and 10,842 AFY in a dry year), total cumulative demand under the DMS Build-Out Scenario would be approximately 88,703 to 97,573 acre-feet of water per year in an average and dry year, respectively.

(c) Santa Clarita Valley 2025 Build-Out Scenario - Demand

CLWA and other retail water purveyors in the Santa Clarita Valley prepared the UWMP, December 2000. CLWA estimated of future water demand for the CLWA service area to the year 2020. The CLWA service area includes the Santa Clarita Valley and a portion of Ventura County. In all, the service area is approximately 192 square miles in size. CLWA and the local retail water purveyors undertook a comprehensive effort to project future water demands and supplies.

CLWA indicates that an extrapolation service connection analysis method produces the most accurate predictions of near-term demand (i.e., 10 to 20 years), but does not account well for economic changes over the long-term (i.e., 50 years). However, the Santa Clarita Valley is not expected to reach buildout by the year 2020. Therefore, another method is needed to estimate the water demand for the Santa Clarita Valley by the year 2025. The year 2025 water demand is included because SB 610 calls for an analysis 20 years into the future. Given that this project would begin construction in approximately 2005 if approved, 2025 was selected for the 20-year analysis.

In order to obtain the most accurate forecast of long-term water demand, CLWA combined the extrapolation/service connection analysis with the econometric/land-use analysis to project the estimated increase in water demand through 2020. Table 4.8-25, below, presents the predicted water demand of the Santa Clarita Valley, including Riverpark and the portion of Newhall Ranch constructed, in the year 2020.

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Table 4.8-25
Scenario 3: Santa Clarita Valley 2025 Build-Out Scenario Water Demand
(acre-feet per year)

	Partial Buildout (year 2020)		Full Buildout (year 2025)	
	Average	Dry	Average	Dry
Build-Out Demand				
- DMS Demand	88,709	88,709	88,709	88,709
Dry Year 10% Increase in Demand	0	8,871	0	8,871
- Newhall Ranch Specific Plan [a]	10,437	11,481	13,972	15,369
- Riverpark Demand	697	697	697	697
- Additional Urban Demand	13,257	13,186	19,798	19,663
Dry Year 10% Increase in Demand	0	1,465	0	2,184
Total	113,100[c]	124,410[b]	123,176[d]	135,494[b]

[a] *Newhall Ranch buildout is assumed to occur from 2005 to 2030 at a rate of 864 dwelling units per year, with average water demands of 707 AFY.*
[b] *Demand is increased by approximately 10% in dry years (113,100 x 1.10 = 124,410 and 123,176 x 1.10 = 135,494). Water demand in a critical dry year can be expected to decrease by up to 20% through implementation of water conservation practices in the CLWA service area.*
[c] *Source: UWMP, December 2000, Table 3-5.*
[d] *Source: UWMP, December 2000, Table 3-5, using a straight-line projection from 2020 to 2025.*
Note: It is expected that the existing plus DMS demand would reach its peak in approximately 2015. The Newhall Ranch Specific Plan demand would begin in approximately 2005 and would reach its peak in approximately 2030. The additional urban demand would begin in approximately 2015, after DMS demand peaks.

As shown in Table 4.8-25, partial buildout of the Valley by the year 2020 would create an average year water demand of approximately 113,100 AFY. This water demand figure includes the water demand generated by the project and the portion of the Newhall Ranch Specific Plan that would be expected to build out by that time (i.e., a land use water demand of approximately 10,437 AFY). It also includes the water demand of additional urban development that would occur after the buildout of all projects listed in the County's DMS (i.e., approximately 13,257 AFY). In dry years, total demand would increase to approximately 124,410 AFY.

As shown in Table 4.8-25, again using this combined projection method and extrapolating out to 2025, the total water demand in the Santa Clarita Valley by the year 2025, including the project and other development over and above DMS, would be approximately 123,176 AFY in average years and approximately 135,494 AFY in dry years.

c. Riverpark Water Supplies

This section identifies the water sources that will be available to meet the water demand generated by buildout of the Riverpark project. This section also discusses Riverpark water supplies in conjunction

with existing near-term development and future cumulative long-term development in the Santa Clarita Valley.

As discussed in the above section, the projected total water demand for the Riverpark project is 697 AFY in years with average rainfall (an "average year"). Project water demand increases by approximately 10 percent in years with lower than average rainfall (a single "dry year") to a total of 767 AFY. To meet this demand, water would be provided to the project by the Santa Clarita Water Division (SCWD). The project site is located completely within the SCWD service area. Water sources expected to be used by SCWD include a combination of SWP water delivered through CLWA and local groundwater resources in the Alluvial and Saugus Aquifers. The amount delivered from each source varies year to year due to hydrologic and atmospheric conditions in the state.

(1) Existing Conditions Plus Project Water Demand and Supply

This section describes the existing development demand in the Santa Clarita Valley as well as the project water demand, measured against existing supplies. **Table 4.8-26, Existing Plus Project Demand and Supply for the Santa Clarita Valley**, illustrates that existing supplies exceed the project demand, in conjunction with existing demand in the Santa Clarita Valley. Existing water supplies exceed demand by 2,283 to 10,553 AFY in dry years and by 25,775 AFY in an average/normal year after adding the proposed project to existing demands. It should be noted that dry year supplies available above demand reflect water supplies that would be available to purveyors in dry years. Purveyors would typically secure water from these supplies only in amounts necessary to meet demand.

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Table 4.8-26
Existing Plus Project Demand and Supply for the Santa Clarita Valley
(acre-feet per year)

	Average Year	Dry Year[b]	Critical Dry Year[c]
Existing Demand[a]	62,023	68,225	68,225
Other Demand (agricultural)[a]	15,278	16,806	16,806
Riverpark Demand	697	767	767
Critical Dry Year 10% Demand Decrease (Conservation)			(8,580)
Total Demand	77,998	85,798	77,218
Existing Water Supply Programs Available:			
Local Supplies			
Alluvial Aquifer	35,000	35,000	35,000
Saugus Formation	11,000	13,000	15,000
Recycled Water	1,700	1,700	1,700
Imported Supplies[b]			
SWP Table A Amount	56,073	37,890	19,040
Semitropic Bank Account		7,200	7,200
Flexible Storage Account		1,561	1,561
Total Existing Supplies	103,773	96,351	79,501
Surplus/(Deficit)	25,775	10,553	2,283

[a] *Source: Santa Clarita Valley Water Report 2002, Prepared by the Castaic Lake Water Agency, Los Angeles County Waterworks District #36, Newhall County Water District, Valencia Water Company, April 2003.*
[b] *Demand is increased by approximately 10% in dry years. 2002, the year from which this demand was derived, was a dry year and already reflects the 10% increase in demand over a normal or average year. A dry year is a year when below average rainfall occurs after a normal or wet year.*
[c] *Demand in a critical dry year is expected to decrease by as much as 20% due to voluntary and mandatory planned purveyor conservation programs. This analysis assumes a critical dry year 10% reduction in demand from the dry year demand. A critical dry year is a year when rainfall is at a critically low level (i.e., a year that occurs once every 73 years). Such a demand reduction occurred in the last critical dry year experienced in the Santa Clarita Valley (1991).*

d. Cumulative Water Supply Analysis

The following discussion focuses on the cumulative impacts to water availability for the Santa Clarita Valley. The analysis evaluates cumulative impacts under the following three future water demand and supply scenarios:

- **Scenario 1:** Existing development within the CLWA service area, plus near-term projections, plus the project (referred to as the "SB 610 Water Supply Scenario"); and
- **Scenario 2:** Existing development within the CLWA service area, plus Development Monitoring System ("DMS") projections, plus the project (referred to as the "DMS Build-Out Scenario"); and
- **Scenario 3:** Buildout within the CLWA service area by 2025, plus active pending General Plan Amendment requests, plus the project (referred to as the "Santa Clarita Valley 2025 Build-Out Scenario").

(1) SB 610 Water Supply Scenario

As indicated previously, a water supply assessment was prepared for the Riverpark project by the Santa Clarita Water Division (SCWD) pursuant to SB 610. A complete copy of the water supply assessment is attached to this analysis in **Appendix 4.8**. In the assessment, SCWD concludes there will be a sufficient water supply available at the time the Riverpark project is ready for occupancy to meet the needs of the project in addition to existing and other planned future uses.

CLWA has existing water allocation rights and contracts to meet future demand as needed over time, and has committed sufficient capital resources and planned investments in various water programs and facilities to serve all of its existing and planned customers, including SCWD's customers. SCWD water rights and contracts for local supplies, in addition to imported supplies provided by CLWA, are sufficient to serve all of its existing and planned customers. SCWD has also identified an operational strategy combined with a prudent and flexible management approach to ensure water reliability.

SCWD's current service area-wide demand is approximately 27,000 AFY.[34] As mentioned previously, the Riverpark project will require 697 AFY at buildout. The conclusions of the SCWD as stated in the 2000 UWMP related to the requirements of the SB 610 for Riverpark are as follows:

Average/Normal Year Water Assessment. The UWMP indicates that no shortages are anticipated within the agency's service area in an average/normal water year through 2020 if projected imported and local supplies are developed as estimated.[35] Total projected water demands for the CLWA through the year 2020 are compared with the supplies projected to be available to meet demands in this analysis. The following table, **Table 4.8-27**, summarizes the data from the UWMP.

"Future Planned Water Supply Programs", as listed in Table 4.8-27, are included in the UWMP to indicate examples of how CLWA would add reliability and flexibility to its water supply portfolio. Programs such as these will be analyzed by CLWA and contracts entered into as need and cost-effectiveness are determined through time. Future water supply assessments will reflect these contractual agreements.

34 This represents average year demand. Dry year demand is approximately 10 percent higher.
35 Castaic Lake Water Agency, 2000 Urban Water Management Plan (December 2000) p.4-2.

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Table 4.8-27
Average/Normal Water Year
Supply and Demand Assessment[a]
(acre-feet per year)

	Year 2005	Year 2010	Year 2015	Year 2020
Existing Water Supply Programs:				
Local Supplies				
Alluvial Aquifer	35,000	35,000	35,000	35,000
Saugus Formation	11,000	11,000	11,000	11,000
Recycled Water	1,700	1,700	1,700	1,700
Imported Supplies[b]				
SWP Table A Amount	56,073	56,073	56,073	56,073
Total Existing Supplies:	103,773	103,773	103,773	103,773
Total Estimated Demand	81,700	90,100	100,700	113,100
Difference - Surplus/(Deficit)	22,073	13,673	3,073	(9,327)
Future Planned Water Supply Programs:				
Local Supplies				
Recycled Water		9,000	14,000	17,000
Imported Supplies				
Water Transfers	5,200	5,200	5,200	5,200
Total Planned Supplies:	5,200	14,200	19,200	22,200
Net Water Surplus/(Deficit)	27,273	27,873	22,273	12,873

[a] *Excerpted from Table 4-1 of the UWMP.*
[b] *56,800 af represents approximately 59% of CLWA's contractual Table A Amount. Normal year supply based on assumptions from the UWMP. The DWR SWP Delivery Reliability Report 2003 indicates greater reliability of Table A deliveries (72 to 76%) than was assumed for the 2000 UWMP.*

Single Dry-Year Water Assessment. The UWMP evaluated the estimated dry-year demands and projected supplies for the year 2010 for the purpose of assessing a single critical dry year. This year was selected in order to show the results of local and imported water supply development over the next 10 years. In May 2003, DWR finalized its State Water Project Delivery Reliability Report. For the worst-case scenario single dry year (1977, with a one in 73 year probability of occurrence), DWR estimates that SWP deliveries to contractors would be approximately 20 percent of contract amounts. If projected imported and local supplies are developed as indicated, no shortages are anticipated within the agency's service area for the extreme-case single dry-year scenario analyzed.[36] In fact, as shown in **Table 4.8-27** water supplies exceed demand by 814 acre-feet without considering future planned water supply programs and supplies exceed demand by 81,614 acre-feet with the future programs in the single critical dry year (2010). It should be noted that dry-year supplies available above demand reflect water supplies that would be

[36] UWMP p. 4-3. Hot, dry weather may generate a 10 percent increase above normal in both urban and agricultural water usage. This percentage was used to generate the dry-year demands.

available to purveyors in dry years. Purveyors would typically secure water from these available supplies only in amounts necessary to meet demand.

Multiple Dry-Year Water Assessment. The UWMP estimated the minimum water supply available during each of the three water years, 2001, 2002, and 2003. The surface and groundwater supplies included in this analysis are reflective of supplies available during the 1987-92 drought years, and in particular, 1990, 1991, and 1992. The supplies available from recycling projects are assumed to experience no reduction in a dry year but are also assumed not to be fully on-line at this early stage of the 20-year projection. Demand reductions of 10 percent based on short-term water conservation programs are assumed for these dry-year scenarios (this level of conservation was achieved during the 1987–1992 drought). If projected imported and local supplies are developed as indicated, no shortages are anticipated within the agency's service area in the dry-year scenarios analyzed.[37] Years 1, 2 and 3 in **Table 4.8-28** represent demand projections for 2003 through 2005. The multiple dry-year water supply and demand assessments from the UWMP are summarized in the following table.[38]

Information concerning "Future Planned Water Supply Programs" as listed below from the UWMP and other sources was included to indicate examples of how CLWA would add reliability and flexibility to its water supply portfolio. Programs such as these will be analyzed by CLWA and contracts entered into as need and cost-effectiveness are determined through time. Future Water Supply Assessments will reflect these contractual agreements. As shown, water supplies exceed demand by 9,251 to 11,851 acre-feet without considering future planned water supply programs and supplies exceed demand by 90,051 to 92,651 acre-feet with the future programs in multiple dry years. Again, it should be noted that dry-year supplies available above demand reflect water supplies that would be available to purveyors in dry years. Purveyors would typically secure water from these available supplies only in amounts necessary to meet demand.

[37] UWMP, p. 4-4.
[38] Excerpted from Table 4-2 of the UWMP.

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Table 4.8-28
Dry-Year and Multi-Dry-Year Water Supply and Demand Assessment
(acre-feet per year)

	Single Dry Year	Multiple Dry Years		
		Year 1	Year 2	Year 3
Existing Water Supply Programs				
Local Supplies				
Alluvial Aquifer	35,000	32,500	32,500	32,500
Saugus Formation	13,000	13,000	13,000	13,000
Recycled Water	1,700	1,700	1,700	1,700
Imported Supplies[a]				
SWP Table A Amount	19,040	37,890	37,890	37,890
Semitropic Bank Account	7,200	7,200	7,200	7,200
Flexible Storage Account	4,684	1,561	1,561	1,561
TOTAL EXISTING SUPPLIES	82,624	93,851	93,851	93,851
TOTAL ESTIMATED DEMANDS	90,900	82,000	83,300	84,600
Voluntary 10% Conservation	(9,090)	(8,200)	(8,330)	(8,460)
Difference - Surplus/(Deficit)	814	11,851	10,551	9,251
Future Planned Water Supply Programs	(2010)[b]			
Local Supplies				
Recycled Water		7,300		
Saugus (New Wells)		20,000		
Imported Supplies				
Water Transfers		3,500		
Water Banking/Conjunctive Use		50,000		
TOTAL FUTURE PLANNED SUPPLIES		80,800		

[a] *19,040 represents 20% of CLWA's contractual Table A Amount. 37,890 represents 39.8% of CLWA's contractual Table A Amount. Dry-year supply based on assumptions from the UWMP. The DWR SWP Delivery Reliability Report 2003 indicates greater reliability of Table A deliveries than was assumed for the 2000 UWMP.*

[b] *The UWMP assumed a total of approximately 100,000 af in available future supplies by 2020. Therefore 50,800 af shown herein is assumed to be available by 2010.*

(2) DMS Build-Out Scenario (2015)

The DMS Build-Out Scenario entails existing development, buildout of the near-term subdivision projects listed in the County's DMS, plus a portion of the Newhall Ranch Specific Plan, plus the project. The analysis of this cumulative development scenario is required by the City for the cumulative analysis of water service. The County's DMS lists all pending, recorded and approved projects for which land divisions have been filed within County unincorporated lands and within the City of Santa Clarita. The City plus County unincorporated areas together constitute the County's Santa Clarita Valley Planning area.

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Table 4.8-29, below, illustrates both the cumulative water demand (existing plus DMS) and supply for the Santa Clarita Valley. This cumulative water demand is compared to the near-term projected Santa Clarita Valley water supplies and the additional Newhall Ranch Specific Plan water supplies. As shown, there is an adequate supply of water expected in both average years and dry years and no cumulative water supply impacts would occur. In fact, the table shows that water supplies exceed demand for the DMS Development Scenario by 11,435 to 38,972 acre-feet in average years and by 7,120 to 78,657 acre-feet in a single dry year. However, it should be noted that dry-year supplies available above demand reflect water supplies that would be available to purveyors in dry years. Purveyors would typically secure water from these supplies only in amounts necessary to meet demand.

(a) DMS General Plan Consistency

The purpose of this subsection is to assess the Riverpark project's consistency with the County's General Plan DMS policies as they relate to water supply. As indicated previously in this section, the County's General Plan includes provisions known as the DMS to give decision makers information about the existing capacity of available public services at the time a new development proposal is considered in the four major Urban Expansion Areas of the County of Los Angeles General Plan (Antelope Valley, Santa Clarita Valley, Malibu/Santa Monica Mountains, and East San Gabriel Valley).[39] The goal of DMS is to identify what new public facilities will be required for the new development, and to ensure that the appropriate cost of any expansion of facilities will be paid for by that new development, and not assumed by the taxpayers.

In accomplishing the goal stated above, the DMS determines the availability of school, fire, sewerage, library, water and road services and facilities on an individual and cumulative basis. The DMS data used for this analysis includes:

(a) Inventory information reports for water, sewer and library services in the Santa Clarita Valley;

(b) Service Provider Reports for the water wholesaler (Castaic Lake Water Agency) and water retailers in Santa Clarita Valley and County Sanitation Districts Nos. 26 and 32; and

(c) A list of all pending, approved and recorded projects where land divisions have been filed within both the unincorporated area of the County and the City of Santa Clarita.

The DMS also works toward ensuring that the expansion costs of new development are paid for by that development.

[39] Resolution of the County of Los Angeles Board of Supervisors, Plan Amendment Case No. S.P. 86-173.

To ensure new development is located in close proximity to services and existing development, DMS states that in no event is the proposed development to be located beyond one mile of an existing development or service. Also, DMS states that new development is to be located within, generally, five miles of commercial services and job opportunities.

Table 4.8-29
Scenario 1: DMS Build-Out Scenario Demand and Supply for the Santa Clarita Valley
(acre-feet per year)

	Average Years		Dry Years	
Santa Clarita Valley Demand				
- Existing Plus DMS Demand [a]	97,862		107,648	
- Riverpark Demand	697		767	
- Less Conservation	(9,856)		(10,842)	
Total	88,703		97,573	
Santa Clarita Valley Supply [b]				
- Local Supply				
a. Groundwater				
Alluvial Aquifer	30,000 to 40,000		30,000 to 35,000	
Less Newhall Ranch Agricultural Water	(3,402)		(4,534)	
Saugus Aquifer	7,500 to 15,000		11,000 to 15,000	
Saugus Aquifer (new)	0	0	10,000 to 20,000	
Newhall Ranch Agricultural Water	3,402		4,534	
b. Reclaimed Water	1,700	10,737	1,700	10,737
Less CLWA Reclaimed Water Supply for Newhall Ranch	(1,017)		(1,017)	
Newhall Ranch WRP Supply	2,103		2,103	
CLWA Newhall Ranch Supply	1,017		1,017	
- Imported Supplies				
a. SWP Supplies [c]	56,800		37,900	
b. Water Banking/Conjunctive Use			10,000 to 52,500	
c. Desalination	2,000 to 3,000		2,000 to 3,000	
Total Supplies	100,138 to 127,675		104,693 to 176,230	
Total Supplies above Demand	**11,435 to 38,972** [d]		7,120 to 78,657 [e]	

[a] *Complete buildout of DMS land uses is estimated to occur in 2015.*
[b] *Source: UWMP, December 2000, Tables 2-6 and 4-1, and the Water Supply Assessment for the Riverpark Project, August 2003, SCWD of CLWA.*
[c] *Consistent with the DWRSIM model, the figures show SWP allocation reduced in average years to approximately 59.7 percent of maximum allocation and in multiple dry years to approximately 39 percent of maximum allocation. The CALSIM II model projects that reliability in average years rises to approximately 75 percent and decreases to 20 percent in a single dry year. In any given year, the actual amount of SWP water deliveries could be above or below these model projections. Deliveries of water associated with the agency's SWP maximum allocation of 95,200 AFY are affected by a number of factors, including hydrologic conditions, the status of SWP facilities' construction, environmental requirements and evolving policies for the Bay-Delta. Programs are in place that have the potential to improve the reliability of imported water. As these programs are needed in dry years, they could be used up to the amounts indicated (as needed).*
[d] *The surplus shown above is the net water available for injection into banking programs (e.g., Semitropic Groundwater Banking Project, other groundwater banking projects, etc.).*
[e] *Dry-year supplies available above demand reflect water supplies that would be available to purveyors in dry years. Purveyors would typically secure water from these available supplies only in amounts necessary to meet demand.*

The DMS includes a computerized database that incorporates information supplied by service providers and determines capital facility capacity and demand placed on the system by existing, pending, approved

and recorded projects for which land divisions have been filed within the four major Urban Expansion Areas. The DMS is used to quantitatively determine project and cumulative impacts on many County and other public services. In EIRs, wherever a proposed development project would result in an exceedance of applicable County infrastructure or facilities (such as water supply), a significant impact is identified and mitigation is recommended as appropriate. The General Plan DMS requirements apply to "subdivisions" proposed within the Santa Clarita Valley.

This analysis addresses water supply requirements resulting from buildout of all pending, recorded, and approved projects listed in the County's DMS, plus the Riverpark project and a portion of the Newhall Ranch Specific Plan. As indicated in **Table 4.8-29, Scenario 1: DMS Build-Out Scenario Demand and Supply for the Santa Clarita Valley**, under the DMS analysis there is sufficient water supply for the entire demand of the Riverpark project and all pending approved and recorded projects in DMS. In fact, available water supplies would exceed demand by 11,435 to 38,972 AFY in an average year and supplies would exceed demand by 7,120 to 78,657 AFY in a dry year (dry-year supplies available above demand reflect water supplies that would be available to purveyors in dry years. Purveyors would typically secure water from these supplies only in amounts necessary to meet demand). Therefore, the Riverpark project is not expected to create any significant cumulative water availability impacts.

In addition to ensuring that an adequate supply of water is available for a project, DMS requirements also indicate that the project in question must be located within one mile of an existing development or service and that the development be located within generally five miles of commercial services and job opportunities. The Riverpark site is located immediately adjacent to existing development and is within the retail water service area of the Santa Clarita Water Division of CLWA. It is also within the wholesale service area of the Castaic Lake Water Agency.

Based on the information provided in this analysis, the Riverpark project is consistent with the General Plan DMS policies as they relate to water supplies.

(3) Santa Clarita Valley 2025 Build-Out Scenario

The Santa Clarita Valley 2025 Build-Out Scenario entails buildout of lands under the current land-use designations indicated in the County's Area Plan and the City of Santa Clarita's General Plan by the year 2025, plus the proposed Riverpark project, plus all known active pending General Plan Amendment requests for additional urban development in the County unincorporated area and the City of Santa Clarita.

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Table 4.8-30, Scenario 2: Santa Clarita Valley 2025 Build-Out Scenario Water Supplies, and Table 4.8-31, Scenario 2: Santa Clarita Valley 2025 Build-Out Scenario Water Demand and Supply, summarize the cumulative water demand and supply for this build-out scenario. As shown, at partial buildout by the year 2020, there are adequate water supplies for the project. As a result, the Riverpark project is not expected to create any significant cumulative water availability impacts in either average/normal or dry years. In addition, as shown, at buildout by the year 2025, there are adequate water supplies for the project, with no significant cumulative water supply impacts occurring in either average/normal or dry years. In fact, the two tables show that water supplies exceed demand under this scenario in average and dry years in both 2020 and 2025.

Dry-year supplies available above demand reflect water supplies that would be available to purveyors in dry years. Purveyors would typically secure water from these supplies only in amounts necessary to meet demand. For a critical dry year, when reliability of the SWP could be reduced, CLWA would utilize both dry-year supplies available from the Saugus Aquifer, and water banking and conjunctive use projects as indicated in Table 4.8-30, which follows.

As depicted in Table 4.8-30, purveyors have access to an amount of water supplies that exceed demand during dry conditions. Therefore, no cumulatively significant water availability impacts would occur due to buildout of the Riverpark project.

(4) Conclusion – Cumulative Impacts

Because cumulative water supplies exceed demand, cumulative development (including the proposed Riverpark project) would not result in unavoidable significant cumulative impacts on Santa Clarita Valley water resources. This includes potential impacts to groundwater resources related to recharge potential. Based on the memorandum prepared by CH2Mhill entitled Effect of Urbanization on Aquifer Recharge in the Santa Clarita Valley (February 22, 2004; see **Appendix 4.8**), development of the proposed project site and other sites proposed for development in the Santa Clarita Valley, no significant project-specific or cumulative impacts would occur to the groundwater basin with respect to aquifer recharge. This is due to the fact that urbanization in the Santa Clarita Valley has been accompanied by long-term stability in pumping and groundwater levels, plus the addition of imported SWP water to the Valley, which together have not reduced recharge to groundwater, nor depleted the amount of groundwater that is in storage within the Valley. Therefore, cumulative mitigation measures are not required with respect to water resources.

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Table 4.8-30
Scenario 2: Santa Clarita Valley 2025 Build-Out Scenario Water Supplies
(acre-feet per year)

	Buildout (year 2020)		Buildout (year 2025)	
Santa Clarita Valley Water Supplies [a]	Average Years	Dry Years	Average Years	Dry Years
Local Supply				
a. Groundwater				
Alluvial Aquifer	35,000	32,500	35,000	32,500
Saugus Aquifer	11,000	13,000	11,000	13,000
Saugus Aquifer (new wells)	0	20,000	0	20,000
b. Reclaimed Water	17,000	17,000	17,000	17,000
Newhall Ranch WRP Supply	3,155	3,155	5,258	5,258
Imported Supplies				
a. CLWA SWP Table A Water [b]	56,073	37,890	56,073	37,890
Newhall Nickel Water			1,468	1,607
Newhall Semitropic Groundwater Storage				712
b. Water Banking/Conjunctive Use	0	100,000	0	100,000
Water Transfers	5,200	3,500	5,200	3,500
Total Supply	127,428	227,045	131,199	219,767

[a] *Source: UWMP, December 2000, Tables 2-2, 2-6 and 4-1.*
[b] *SWP maximum allocation reduced in average years to approximately 59.7% of maximum allocation and in dry years to approximately 39.8% of maximum allocation. In any given year, the actual amount of SWP water deliveries could be above or below these model projections.*

Table 4.8-31
Scenario 2: Santa Clarita Valley 2025 Build-Out Scenario Water Demand and Supply
(acre-feet per year)

	Buildout (year 2020)		Buildout (year 2025)	
	Average Years	Dry Years	Average Years	Dry Years
Total Build-Out Demand [b]	113,100[c]	124,410	123,176[c]	135,494
Santa Clarita Valley Water Supplies [d]	127,428	227,045	131,199	219,767
Total Surplus [e]	14,328	102,635	7,823	84,273

[a] *Source: 2000 UWMP, December 2000, Table 3-5 and the SB 610 Water Supply Assessment for the Riverpark Project.*
[b] *Demand is increased by approximately 10% in dry years.*
[c] *Source: UWMP, December 2000, Table 3-5, using a straight-line projection from 2020 to 2025.*
[d] *Source: UWMP, December 2000, Tables 2-2, 2-6 and 4-1.*
[e] *Dry-year supplies available above demand reflect water supplies that would be available to purveyors in dry years. Purveyors would typically secure water from these available supplies only in amounts necessary to meet demand.*

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Pages omitted.

Visit http://www.santa-clarita.com/cityhall/cd/planning/eir/completed.asp for complete document.

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Attachment 23-B

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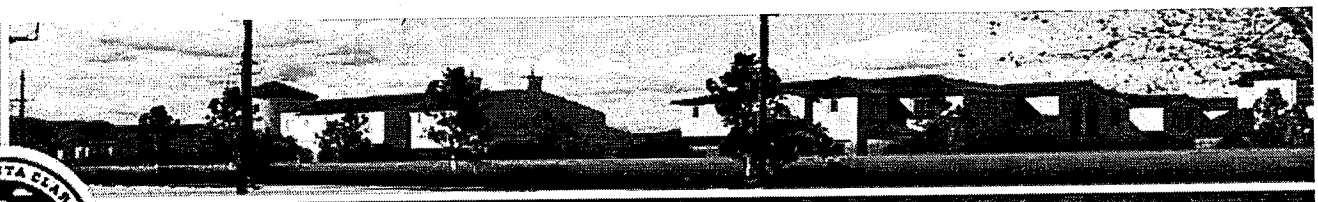
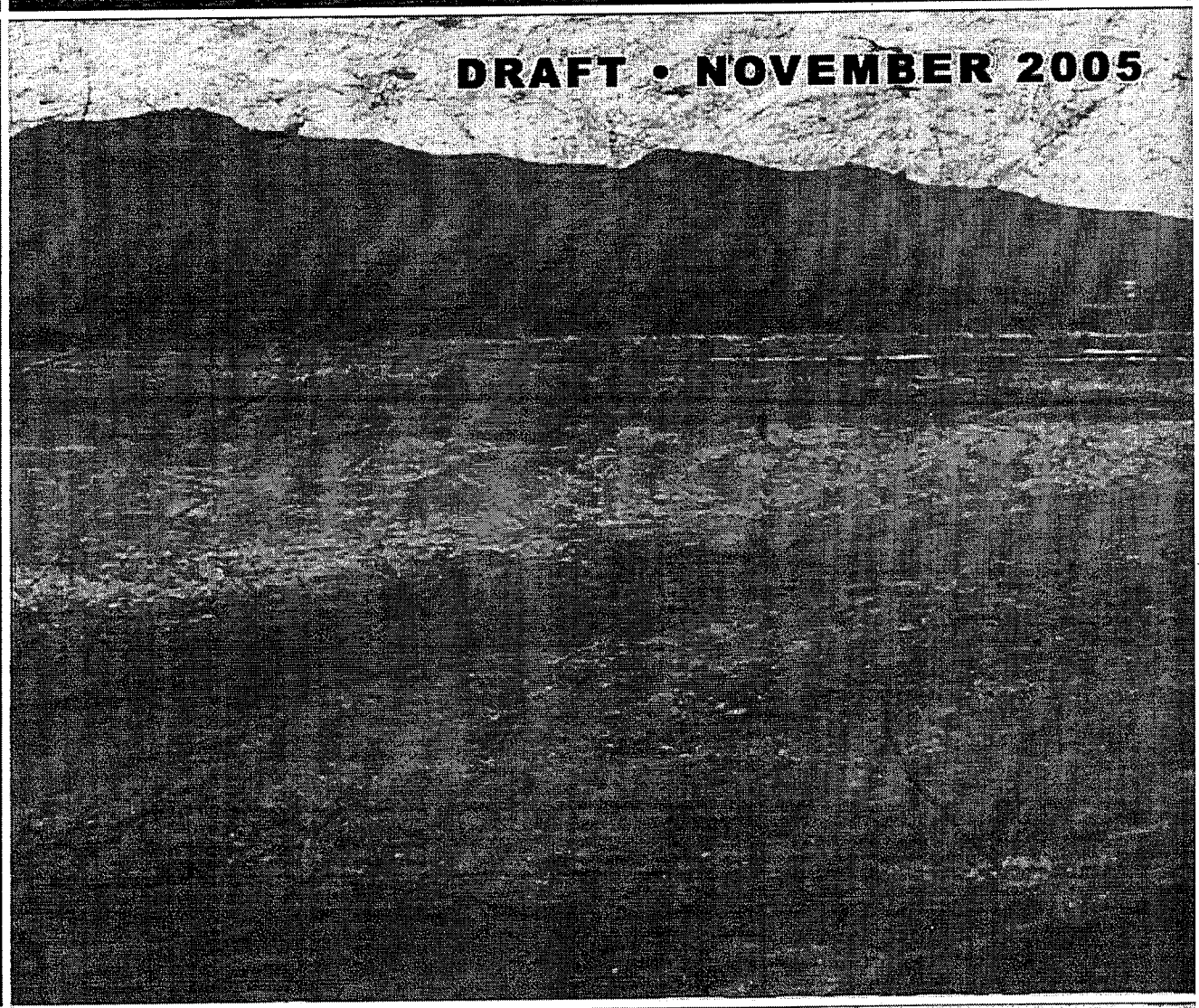


Soledad Village Environmental Impact Report

SCH NO. 2005041100

DRAFT • NOVEMBER 2005



RBF CONSULTING

Pages omitted.

Visit http://www.santa-clarita.com/cityhall/cd/planning/eir/completed.asp for complete document.

Section 2.0
EXECUTIVE SUMMARY

2.0 EXECUTIVE SUMMARY

2.1 PROJECT LOCATION

The City of Santa Clarita (City) is located 35 miles northwest of downtown Los Angeles between the Interstate 5 (I-5) and State Route 14 (SR-14) freeways, has an area of 47 square miles and a population of 165,000. The City encompasses the communities of Canyon Country, Newhall, Saugus and Valencia. Surrounding the City are various unincorporated areas of Los Angeles County and the Angeles National Forest.

The approximately 30-acre project site is centrally located within the City, along the north side of Soledad Canyon Road adjacent to the Santa Clara River, between Bouquet Canyon Road and Golden Valley Road. The site is triangular shaped with approximately 2,600 feet of frontage along Soledad Canyon Road. A 1,400-foot long by 10-foot wide drainage easement extends along portions of the front of the property parallel to Soledad Canyon Road.

2.2 PROJECT OBJECTIVES

The *California Environmental Quality Act* (CEQA) *Guidelines* requires that an environmental impact report (EIR) include a statement of the objectives sought by a project applicant (Section 15123(b) of the *CEQA Guidelines*). The following are the applicant's stated objectives:

LAND USE PLANNING

- Create a new community that allows for residential, commercial, and recreational development.
- Provide new housing units to accommodate projected regional growth in a location, which is adjacent to existing and planned infrastructure, urban services, public transit, transportation corridors, and major employment areas.
- Provide development that is compatible with surrounding communities and land uses.
- Provide for the long-term maintenance of public infrastructure and recreational facilities including parks, trails, landscaping, storm drains, etc., that serve the project site.
- To create a small, safe, human scale, residential development enclave, by incorporating traffic calming measures and avoiding the use of long through streets, to foster closer-knit resident interaction, and to reduce and downplay the dominance of the automobile.

ECONOMIC

- Develop the site to include housing of varying types, accommodating a range of incomes, and commercial opportunities for the residents of the project as well as the local area.
- Provide neighborhood commercial element that would provide retail and services for local residents and area workers.
- Create an economically feasible project.

MOBILITY

- Provide a safe, efficient, and aesthetically attractive street system, which includes pedestrian walkways (sidewalks) with connection to adjoining regional transportation routes.
- Provide an efficient street circulation system that minimizes impacts on residential neighborhoods and environmentally sensitive areas.
- Takes advantage of the adjacent Metrolink commuter rail station and other transit services.

PARKS AND RECREATION

- Provide a range of active recreational opportunities, including a recreation center, tot lots, and access to the Santa Clara River Trail and the Soledad Canyon multi-purpose trail.
- Provide passive recreational opportunities such as pocket park areas and private patios.

RESOURCE CONSERVATION OBJECTIVES

- To provide a sensitive and protective interface with the Santa Clara River by utilizing appropriate landscape, bank stabilization, and water quality treatments.
- To foster the design and integration of a mutually beneficial relationship between the natural and built environments, sensitive land use transition treatments, attractive street scenes, and indigenous architectural and landscape design guidelines.

2.3 PROJECT SUMMARY

The proposed project will develop with residential, commercial, and recreational uses (common and private open space areas) and on-site private roads on approximately 30 acres. The proposed project will require an Amendment to the *City of Santa Clarita General Plan* (*General Plan*) and zone change from Commercial Office (CO) to Residential Medium High (RMH) and Commercial Neighborhood (CN). The proposed project will maintain the Planned Development (PD) zone and Valley Center Concept (VCC Overlay). A Conditional Use Permit (CUP) will also be required, which will implement the Planned Development and allow for an increase of architectural treatment projections from 35 feet, up to 50 feet. Approval of the Tentative Tract Map (TTM No. 62322) is also required to subdivide the Project site for condominium uses, and the applicant is requesting to vacate Finch Court and portions of Gladding Way.

RESIDENTIAL

A total of 437 residential units will be developed including 275 attached townhomes and 162 triplexes. Two-story triplex units will be developed, with three different floor plans ranging from 1,303 square feet to 1,892 square feet. Two-story townhome units will be developed with four different floor plans ranging from 1,263 square feet to 1,513 square feet. The architectural style will incorporate elements of the California ranch style homes and the Santa Fe and Mediterranean-style houses that are characteristic of the neighboring residential communities. Approximately five percent of the housing will be designated for workforce housing, offering units at approximately 10 percent below market rates.

COMMERCIAL

An 8,000 square foot retail building will be located at the northeast corner of Gladding Way and Soledad Canyon Road. This will allow for a variety of smaller retail, eatery and service tenants, which is consistent with the CN zone. The architectural elements of the retail building will be consistent with the proposed design of the residential structures. As previously discussed a CUP will need to be approved by the Planning Commission to permit structures over 35 feet in height and up to 50 feet in height. The specific site plan, building elevations, number of parking spaces, landscaping and other improvements for the commercial site will be reviewed separately under the City's Development Review process.

RECREATIONAL/OPEN SPACE/PEDESTRIAN CIRCULATION

Active Recreational Facilities. A private recreational center will be located north of the commercial building. The facilities will include an approximately 1,200 square foot recreation building (including a community room, restrooms, and a pool equipment room), swimming pool, wading pool, spa, shade structures and a cabana. A private tot lot will also be provided for Soledad Village residents within the eastern portion of the project site. In addition, public pedestrian trails will extend along Soledad Canyon Road, and along the western and southern boundary of the project site along the Santa Clara River. Primary and secondary trails will also be provided throughout the project site. A pedestrian bridge will

also be developed west of the project site. The pedestrian bridge will connect from a trail along the Santa Clara River, cross Soledad Canyon Road to the Metrolink Commuter Rail station.

Passive Recreational Facilities. A total of approximately 2.5 acres of open space will be provided, allowing for passive recreational areas throughout the project site. The project will be buffered from Soledad Canyon Road by a minimum 15-foot wide landscaped setback area. In addition, a sound wall will be constructed along the residential components of the project.

CIRCULATION/PARKING

Main access to the project site and commercial pad will be provided via Gladding Way off of Soledad Canyon Road. This intersection is already improved with a traffic signal. When entering the project site, Gladding Way will be a four lane divided roadway, which will merge into a two-lane roadway with smaller roadways and driveways extending east and west. Secondary access will be provided via QQ Street, also off of Soledad Canyon Road. Both entrances will include approximately 300-foot right turning pockets (deceleration lanes). A total of 1,094 parking spaces will be provided with 874 covered parking spaces and 220 on-street guest parking spaces. Additional parking spaces will be provided for the commercial site, based on the type of use.

2.4 SUMMARY OF PROJECT ALTERNATIVES

In accordance with *CEQA Guidelines* Section 15126.6, Section 6.0, Alternatives, describes a range of reasonable alternatives to the proposed project that could feasibly attain the basic objectives of the proposed project, while evaluating the comparative merits of each alternative. The analysis focuses on alternatives capable of eliminating significant adverse environmental effects or reducing them to less than significant levels, even if these alternatives would impede, to some degree, the attainment of the project objectives. Potential environmental impacts are compared to impacts from the proposed project. The following is a description of each of the alternatives evaluated in Section 6.0, Alternatives.

NO PROJECT/NO DEVELOPMENT ALTERNATIVE

The No Project/No Development Alternative assumes the Soledad Village Project would not be implemented and land uses and other improvements would not be constructed. The existing project site would remain unaltered and in its current condition. All infrastructure improvements including water, wastewater, drainage, and circulation facilities identified on the Soledad Village Tentative Tract Map would not be constructed, and the project site's *General Plan* and zoning designations would not be changed. No additional entitlements would be required under this Alternative.

REDUCED DENSITY ALTERNATIVE

The Reduced Density Alternative would be similar to the proposed project in terms of land use types, but would provide multi-family residential units at a lower density. This

Alternative would still require approval of the entitlements required under the proposed project, including the following: Tentative Tract Map, *General Plan* Amendment, zone change, and CUP. The Reduced Density Alternative would retain the 8,000 square feet of commercial retail uses included in the proposed project, but would provide a similar proportion of triplex and townhome dwelling units, but the residential portion of the site would be zoned RM-PD. The RM-PD zone allows for multi-family residential uses at a maximum density of 11 dwelling units per acre (du/acre). Given that the Reduced Density Alternative would still include 8,000 square feet of commercial, a minimum lot size of approximately 1-acre is required for the commercial uses and associated roadways and setbacks under the CN-PD zone, which provides for a maximum floor-area ratio (FAR) of 0.375:1. Per the *Unified Development Code* (*UDC*), a CUP is required for all development within a Planned Development overlay, as well as for architectural elements above the 35-foot maximum building height within the RM and CN zones. As such, the remainder of the project site, approximately 29 acres, would be zoned RM-PD, allowing a density of 319 multi-family dwelling units. As previously indicated, the proportion of housing types in the residential portion of the project under this Alternative is anticipated to be comparable to that of the proposed project, yielding 201 townhome units and 118 triplex units. All other proposed facilities, infrastructure, and amenities would also be provided, to the extent required by the City or other affected agencies.

EXISTING GENERAL PLAN ALTERNATIVE

The Existing *General Plan* Alternative would eliminate all of the residential uses and dramatically increase the amount of commercial uses on site relative to the proposed project. Under the Existing *General Plan* Alternative, the entire 30-acre project site would remain designated and zoned CO-PD with the VCC overlay. This Alternative would still require approval of a Tentative Tract Map and a CUP, the latter of which is required for all development within a Planned Development overlay. Under this Alternative, no residential units would be constructed on-site, but instead the site would be developed with a mix of office and retail uses. The commercial development would be comprised of approximately 60 percent office uses (980,100 square feet) and 40 percent retail uses (653,400 square feet), totaling 1,633,500 square feet, the maximum allowable density under the CO zone, which limits the FAR to 1.25:1. All other, facilities, parking, landscaping, and infrastructure would also be provided, as required for the CO zone per the UDC.

WORK-LIVE UNIT ALTERNATIVE

Under the Work-Live Unit Alternative, the proposed project would be modified to provide 22 work-live units in the central portion of the development. These work-live units would be townhome units, which would be intended to provide a convenient, innovative form of workforce housing by allowing homeowners to live and work at home, thereby also reducing vehicle trips. All other aspects of the project under the Work-Live Unit Alternative would be similar to the proposed project, with 412 total residential units (including 222 townhomes, 168 triplex units, and 22 work-live units). In addition, the size of the commercial component will be increased to include 8,000 square feet of first-floor retail uses, and 8,000 square feet of second-floor office.

This Alternative would still require approval of the entitlements required under the proposed project, including the following: Tentative Tract Map, General Plan Amendment, zone change and CUP. The boundaries of the zone change would be modified, as a larger portion of the project site would be zoned CN-PD to allow for the inclusion of work-live units on-site. In addition, the scope of the CUP would be expanded to include the construction of three-story buildings up to 50 feet in height and to include the inclusion of work-live units on-site. In addition, this Alternative would require the approval of a Parking Adjustment, to reduce the parking requirements for the commercial component by 20 percent.

All other proposed facilities, infrastructure, and amenities, including landscaping open space, pathways/trail connections, recreational facilities and pedestrian bridge over Soledad Canyon Road, would still be provided to the extent required by the City or other affected agencies.

2.5 SUMMARY OF ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The summary includes impact statements, level of significance before mitigation, mitigation measures, and level of significance after mitigation.

IMPACTS	LEVEL OF SIGNIFICANCE PRIOR TO MITIGATION	MITIGATION MEASURES	LEVEL OF SIGNIFICANCE AFTER MITIGATION
LAND USE			
Santa Clarita General Plan			
The proposed project would be consistent with the applicable goals and policies of the City of Santa Clarita *General Plan.*	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
Unified Development Code			
The proposed project would not conflict with the standards and requirement of the City of Santa Clarita *Unified Development Code.*	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
SCAG Regional Comprehensive Plan and Guide			
The proposed project would not conflict with applicable policies of the Southern California Association of Governments' *Regional Comprehensive Plan and Guide.*	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.

IMPACTS	LEVEL OF SIGNIFICANCE PRIOR TO MITIGATION	MITIGATION MEASURES	LEVEL OF SIGNIFICANCE AFTER MITIGATION
SCAG Southern California Compass Growth Visioning Program			
The proposed project would be consistent with the principles and strategies of the Southern California Association of Governments' Southern California *Compass Growth Visioning Program.*	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
Cumulative Impacts and Mitigation Measures			
Development associated with the proposed project and other related cumulative projects would not result in cumulatively considerable land use and planning impacts.	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
POPULATION, EMPLOYMENT, AND HOUSING			
Housing			
Project implementation includes the development of a maximum of 437 residential units.	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
Employment			
Project implementation would include development of a maximum of 8,000 square feet of commercial uses.	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
Population			
Project implementation could induce population growth in the City of Santa Clarita.	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
Cumulative Impacts and Mitigation Measures			
Implementation of the proposed project, in conjunction with related projects in the City of Santa Clarita, would not result in significant cumulative population, employment, and housing impacts.	Less than Significant Impact.	No mitigation measures are required.	Not applicable.

IMPACTS	LEVEL OF SIGNIFICANCE PRIOR TO MITIGATION	MITIGATION MEASURES	LEVEL OF SIGNIFICANCE AFTER MITIGATION
AESTHETICS			
Short-Term Construction Aesthetic, Light, and Glare Impacts			
Development of the proposed project would result in grading and construction activities that would temporarily alter the existing visual character of the project site and the surrounding area and introduce new sources of light and glare.	Potentially Significant Impact.	AES1 Construction equipment staging areas shall be located a minimum of 200 feet from existing residential uses and appropriate screening (i.e., temporary fencing with opaque material), shall be used to buffer views of construction equipment and material, when feasible. Staging location shall be indicated on project Final Development Plans and Grading Plans. AES2 All construction-related lighting shall be located and aimed away from adjacent residential areas and consist of the minimal wattage necessary to provide safety at the construction site. A construction safety lighting plan shall be submitted to the City for review concurrent with Grading Permit application.	Less Than Significant Impact.
Long-Term Aesthetic Impacts			
Development of the proposed project would alter the existing visual character and viewshed from surrounding locations.	Potentially Significant Impact.	AES3 The site plan, building elevations, number of parking spaces, landscaping and other improvements for the commercial site shall be reviewed in accordance with the City's Development Review process.	Less Than Significant Impact.
Long-Term Light and Glare Impacts			
Development of the proposed project would introduce new sources of light and glare into the project area.	Potentially Significant Impact.	AES4 Prior to plan approval, the City of Santa Clarita Planning Division shall ensure that the following elements are included in the project plans, as appropriate: ◆ A photometric study shall be completed indicating compliance with all lighting standards contained the City's *Unified Development Code* (*UDC*), including, but not limited to Chapter 17.15, *Property Development Standards*, and Chapter 17.19, *Sign Regulations (Private Property)*;	Less Than Significant Impact.

IMPACTS	LEVEL OF SIGNIFICANCE PRIOR TO MITIGATION	MITIGATION MEASURES	LEVEL OF SIGNIFICANCE AFTER MITIGATION
		◆ All exterior lighting shall be designed and located as to avoid intrusive effects on adjacent residential properties and undeveloped areas adjacent to the project site. Low-intensity street lighting and low-intensity exterior lighting shall be used throughout the development to the extent feasible. Lighting fixtures shall use shielding, if necessary to prevent spill lighting on adjacent off-site uses; ◆ Design and placement of site lighting shall minimize glare affecting adjacent properties, buildings, and roadways; ◆ Fixtures and standards shall conform to state and local safety and illumination requirements; ◆ Development projects shall use minimally reflective glass and all other materials used on exterior building and structures shall be selected with attention to minimizing reflective glare; and ◆ Automatic timers on lighting shall be designed to maximize personal safety during nighttime use while saving energy.	
Cumulative Impacts and Mitigation Measures			
Implementation of the proposed project, in conjunction with related cumulative projects in the City of Santa Clarita, could result in significant cumulative aesthetic, light, and glare impacts.	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.

IMPACTS	LEVEL OF SIGNIFICANCE PRIOR TO MITIGATION	MITIGATION MEASURES	LEVEL OF SIGNIFICANCE AFTER MITIGATION
TRAFFIC AND CIRCULATION			
Project Impacts Phase I			
Development associated with Phase I of the proposed project could result in adverse impacts to the function of intersections in the project area for short-range traffic conditions.	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
Project Impacts - Buildout			
Development associated with the buildout of the proposed project could result in adverse impacts to the function of intersections in the project area for the interim year (2015) traffic conditions.	Potentially Significant Impact.	TR1 At Project Driveway No. 2 and Soledad Canyon Road, construct a new project intersection with limited access (left-in and right-in, right-out only). TR2 Minimum 300-foot deceleration lanes shall be constructed at both westbound entrances off of Soledad Canyon Road.	Significant and Unavoidable Impact.
Cumulative Impacts and Mitigation Measures			
Development associated with the buildout of the proposed project and other related cumulative projects could result in adverse impacts to the function of intersections in the project area for the interim year (2015) traffic conditions.	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
AIR QUALITY			
Construction Impacts			
Construction activities associated with the proposed project could result in significant air pollutant emissions impacts.	Potentially Significant Impact.	Although construction-related air quality impacts cannot be reduced to less than significant, the following standard air pollution control mitigation measures would serve to reduce impacts to the maximum extent feasible:	Significant and Unavoidable Impact.

IMPACTS	LEVEL OF SIGNIFICANCE PRIOR TO MITIGATION	MITIGATION MEASURES	LEVEL OF SIGNIFICANCE AFTER MITIGATION
		AQ1 During construction, the construction contractor shall be responsible for ensuring that all measures listed below in Table 5.5-8, Standard Measures for Construction-Related Emissions, are implemented. To achieve the particulate control efficiencies shown, it is assumed that finished surfaces would be stabilized with water and/or dust palliatives and isolated from traffic flows to prevent emissions of fugitive dust from these areas. In addition, the following water application rates are assumed: ◆ Roads traveled by autos, rock trucks, water trucks, fuel trucks, and maintenance trucks: up to twice per hour; ◆ Roads traveled by scrapers and loaders in active excavation areas: up to three times per hour; ◆ Finish grading areas: up to once every two hours. AQ2 All construction equipment shall be maintained in good operating condition so as to reduce operational emissions. The construction contractor shall ensure that all construction equipment is properly serviced and maintained. AQ3 The construction contractor shall utilize, as much as possible, precoated/natural colored building materials, water-based or low-VOC coating, and coating transfer or spray equipment with high transfer efficiency, such as HVLP spray method, or manual coatings application such as a paintbrush, hand roller, trowel, spatula, dauber, rag, or sponge.	

IMPACTS	LEVEL OF SIGNIFICANCE PRIOR TO MITIGATION	MITIGATION MEASURES	LEVEL OF SIGNIFICANCE AFTER MITIGATION
Long-Term Operational Impacts			
Development associated with the proposed project could result in significant air pollutant emissions impacts.	Potentially Significant Impact.	Although no mitigation measures are required to reduce stationary source impacts to less than significant, the following standard measures are recommended for project design to minimize air quality impacts: AQ4 Project design shall incorporate energy-saving features throughout the project, including low-emission water heaters, central water heating systems, and built-in energy efficient appliances. AQ5 Parking areas shall be planted with trees to insure shading and prevent heat buildup.	Significant and Unavoidable Impact.
Air Quality Management Plan Consistency			
Development associated the proposed project would result in conflicts with the SCAQMD's adopted air quality management plan.	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
Cumulative Impacts and Mitigation Measures			
Development associated with the proposed project and other related projects could result in cumulatively considerable air quality impacts.	Potentially Significant Impact.	No mitigation measures are required.	Significant and Unavoidable Impact.
NOISE			
Construction-Related Noise			
Project-related grading and construction activities could result in temporary noise impacts on nearby noise-sensitive receptors.	Potentially Significant Impact.	N1 Construction shall be limited to the hours of 7:00 AM to 7:00 PM, Monday through Friday, and 8:00 AM to 6:00 PM on Saturday, in accordance with the City of Santa Clarita's Noise Control Ordinance. No construction activities shall be permitted outside of these hours or on Sundays and Federal holidays.	Less Than Significant Impact.

IMPACTS	LEVEL OF SIGNIFICANCE PRIOR TO MITIGATION	MITIGATION MEASURES	LEVEL OF SIGNIFICANCE AFTER MITIGATION
		N2 During all site excavation and grading, the project contractor(s) shall equip all construction equipment, fixed or mobile, with properly operating and maintained mufflers consistent with manufacturers' standards. N3 The project contractor(s) shall place all stationary construction equipment a minimum of 200 feet from any residential unit, so that emitted noise is directed away from sensitive receptors nearest the project site. N4 The project contractor(s) shall locate equipment staging a minimum of 200 feet from any residential unit during all project construction.	
Short-Range Operational Traffic Noise			
Development associated with Phase I of the proposed project could permanently increase traffic-related noise in the project area.	Potentially Significant Impact.	Outdoor Active Use Areas The following mitigation measures would be required for outdoor active use areas associated with residential uses: N5 A sound barrier with a minimum wall height of six feet shall be required for ground-floor front-line outdoor active use areas associated with the all dwelling units located directly adjacent to Soledad Canyon Road. N6 Balconies or decks, if proposed for front-line dwelling units located directly adjacent to Soledad Canyon Road, shall require a noise barrier with a minimum height of five feet along the perimeter of balconies or decks (balconies or decks on the side of the building facing away from the street or outside of the 65-dBA CNEL impact zone shall not require sound wall protection).	Less Than Significant Impact.

IMPACTS	LEVEL OF SIGNIFICANCE PRIOR TO MITIGATION	MITIGATION MEASURES	LEVEL OF SIGNIFICANCE AFTER MITIGATION
		Interior Noise Sound Wall To meet the City's 45-dBA CNEL interior noise standard, the following mitigation measures would be required: N7 Mechanical ventilation, such as an air-conditioning system, shall be required for all dwelling units along the project's southern boundary adjacent to Soledad Canyon Road to ensure that windows can remain closed for prolonged periods of time. N8 Windows with STC-30 or higher shall be required for bedrooms of the dwelling units located adjacent to Soledad Canyon Road west of Gladding Way where no retaining walls are proposed between residential structures and the Soledad Canyon Road right-of-way. N9 Windows with STC-32 or higher shall be required for bedrooms of dwelling units adjacent to Soledad Canyon Road east of Gladding Way. N10 Mechanical ventilation, such as an air-conditioning system, shall be required for the commercial uses proposed on the project site.	
Interim Year (2015) Operational Traffic Noise			
Development associated with buildout of the proposed project could permanently increase traffic-related noise in the project area.	Potentially Significant Impact.	Refer to Mitigation Measures N1 through N10. No additional mitigation would be required.	Less Than Significant Impact.

IMPACTS	LEVEL OF SIGNIFICANCE PRIOR TO MITIGATION	MITIGATION MEASURES	LEVEL OF SIGNIFICANCE AFTER MITIGATION
Stationary Source Noise			
Development associated with the proposed project could permanently increase stationary-source noise in the project area.	Potentially Significant Impact.	N11 Prior to sale of any residential units, future homeowners shall be informed via language in the disclosure documents of the presence of the Saugus Speedway facility, the types of events that can potentially occur at the speedway, the expected frequency of their occurrence, and that noise from events at the speedway may be intermittently audible at their properties during daytime, evening, and late night hours.	Significant and Unavoidable Impact.
Metrolink And Freight Train-Related Noise			
Railroad-related noise could result in adverse noise impacts on sensitive receptors in the project area.	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
Cumulative Impacts and Mitigation Measures			
Development associated with the proposed project and other related cumulative projects could result in cumulatively considerable noise impacts.	Potentially Significant Impact.	Refer to Mitigation Measures N5 through N11. No additional mitigation measures are required.	Less Than Significant Impact.
HYDROLOGY AND WATER QUALITY			
Hydromodification Impacts			
Development associated with the proposed project could result in adverse hydrology and drainage impacts.	Potentially Significant Impact.	*Tables 5.7-4* and *5.7-5* identify the proposed project's SUSMP requirements and corresponding Project Design Features, and treatment control BMPs that would fully mitigate project impacts. No additional mitigation measures are required.	Less Than Significant Impact.
Groundwater Recharge Impacts			
Development associated with the proposed project could result in adverse groundwater recharge impacts.	Potentially Significant Impact.	*Table 5.7-4* identifies the proposed project's SUSMP requirements and corresponding Project Design Features that would fully mitigate project impacts. No additional mitigation measures are required.	Less Than Significant Impact.

IMPACTS	LEVEL OF SIGNIFICANCE PRIOR TO MITIGATION	MITIGATION MEASURES	LEVEL OF SIGNIFICANCE AFTER MITIGATION
Operational Surface Water Quality Impacts			
Operation of development associated with the proposed project could result in adverse surface water quality impacts.	Potentially Significant Impact.	*Tables 5.7-4* and *5.7-5* identify the proposed project's SUSMP requirements and corresponding Project Design Features, and treatment control BMPs that would fully mitigate project impacts. No additional mitigation measures are required.	Less Than Significant Impact.
Construction-Related Surface Water Quality Impacts			
Construction activities associated with implementation of the proposed project could result in adverse impacts to surface water quality.	Potentially Significant Impact.	*Tables 5.7-4* and *5.7-5* identify the proposed project's SUSMP requirements and corresponding Project Design Features, and treatment control BMPs that would fully mitigate project impacts. No additional mitigation measures are required.	Less Than Significant Impact.
Groundwater Quality Impacts			
Development associated with the proposed project could result in adverse groundwater quality impacts.	Potentially Significant Impact.	*Tables 5.7-4* and *5.7-5* identify the proposed project's SUSMP requirements and corresponding Project Design Features, and treatment control BMPs that would fully mitigate project impacts. No additional mitigation measures are required.	Less Than Significant Impact.
Cumulative Impacts and Mitigation Measures			
Development associated with the proposed project and other related cumulative projects would contribute to cumulative hydrology and water quality impacts.	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
WATER SUPPLY			
Water Demand and Supply			
Development of the Soledad Village project could create demand for water that exceeds available supplies.	Potentially Significant Impact.	WS5 Prior to the issuance of building permits that allow construction, the applicant of the proposed project shall finance the expansion costs of water service extension to the subdivision through the payment of connection fees to the appropriate water agency(ies).	Less Than Significant Impact.
Cumulative Impacts and Mitigation			
Development associated with the proposed project and other related projects would increase demand for water supplies.	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.

IMPACTS	LEVEL OF SIGNIFICANCE PRIOR TO MITIGATION	MITIGATION MEASURES	LEVEL OF SIGNIFICANCE AFTER MITIGATION
SCHOOLS/EDUCATION			
Saugus Union School District			
Development associated with the proposed project would increase student enrollment within the Saugus Union School District.	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
Hart District			
Development associated with the proposed project would increase student enrollment within the Hart District.	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
County Development Monitoring System (DMS) Buildout Scenario			
Development associated with the proposed project and other related cumulative projects would increase the demand for school facilities within the Saugus and Hart school districts.	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
Cumulative Buildout Scenario			
Development associated with the proposed project and other related cumulative projects would increase the demand for school facilities within the Saugus and Hart School Districts.	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
PARKS AND RECREATION			
Neighborhood and Community Parks			
Development of the proposed project would increase usage of neighborhood and community parks.	Potentially Significant Impact.	PR1 The project shall comply with the City Ordinance and Quimby Act in providing a minimum of 4.0 acres of parkland either through the dedication of park area, and/or payment of fees in-lieu of the dedicated parkland.	Less than Significant Impact.
Regional Parks			
Development of the proposed project would increase usage of regional parks.	Less Than Significant Impact.	No mitigation measures are required.	No applicable.

IMPACTS	LEVEL OF SIGNIFICANCE PRIOR TO MITIGATION	MITIGATION MEASURES	LEVEL OF SIGNIFICANCE AFTER MITIGATION
State and Federal Recreation/Forests			
Development of the proposed project would increase usage of State and Federal recreation/forests.	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
Trails			
Development of the proposed project would increase usage of local trails.	Less Than Significant Impact.	No mitigation measures are required.	Beneficial Impact.
Cumulative Impacts and Mitigation Measures			
Development associated with the proposed project and related cumulative projects would increase demands for parks and recreational facilities in the Santa Clarita Valley.	Less Than Significant Impact.	No mitigation measures are required.	Not applicable.
SOLID WASTE			
Construction-Related Impacts			
Construction of the proposed project would generate solid waste, which would incrementally decrease the capacity and lifespan of landfills.	Potentially Significant Impact.	SW1 The project applicant/individual project applications shall adhere to all source reduction programs for the disposal of construction materials and solid waste, as required by the City of Santa Clarita. Prior to issuance of building permits, a source reduction program shall be prepared and submitted to the Director of Field Services for the project to achieve a minimum 50 percent reduction in waste disposal rates, including green waste and construction debris.	Significant and Unavoidable Impact.
Operation-Related Impacts			
Operation of the proposed project would generate solid waste which would incrementally decrease the capacity and lifespan of landfills.	Potentially Significant Impact.	**General** SW2 The location of recycling/ separation areas shall be in close proximity to dumpsters for non-recyclables, elevators, loading docks, and primary internal and external access points.	Significant and Unavoidable Impact.

IMPACTS	LEVEL OF SIGNIFICANCE PRIOR TO MITIGATION	MITIGATION MEASURES	LEVEL OF SIGNIFICANCE AFTER MITIGATION
		SW3 The location of recycling/ separation areas shall not be in conflict with any applicable federal, state or local laws relating to fire, building, access, transportation, circulation, or safety. SW4 The location of recycling/ separation areas shall be convenient for those persons who deposit, collect, and load the recyclable materials. SW5 Recycling containers/bins shall be located so that they do not block access to each other. SW6 Yard waste shall be reduced through the use of drought-tolerant and native vegetation in common area landscaping wherever possible. **Commercial** SW7 For commercial developments and residential buildings having five or more living units, no refuse collection or recycling areas shall be located between a street and the front of a building. SW8 On-site trash compactors shall be installed for non-recyclables in all restaurants/food services areas. **Residential** SW9 If possible, kitchen, garage or garden design shall accommodate trash and recyclable components to assist in the City's recycling efforts. SW10 Property buyers shall receive educational material on the City's waste management efforts.	

IMPACTS	LEVEL OF SIGNIFICANCE PRIOR TO MITIGATION	MITIGATION MEASURES	LEVEL OF SIGNIFICANCE AFTER MITIGATION
		SW11 The applicant shall comply with all applicable state and Los Angeles County regulations and procedures for the use, collection and disposal of solid and hazardous wastes.	
Cumulative Impacts and Mitigation Measures			
Development associated with the proposed project and related cumulative projects would increase the demand for landfill disposal capacity.	Potentially Significant Impact.	Refer to Mitigation Measures SW1 through SW11. No additional mitigation measures are required.	Significant and Unavoidable Impact.

Pages omitted.

Visit http://www.santa-clarita.com/cityhall/cd/planning/eir/completed.asp for complete document.

LETTER 21

Section 5.8
WATER

5.8 WATER SUPPLY

This section describes the existing water purveyors in the Santa Clarita Valley and their service areas, and summarizes important characteristics applicable to the water service area in the Santa Clarita Valley, which includes the project site. The data found in the section provides an important backdrop to understanding water supplies and demand in the Santa Clarita Valley generally, as well as understanding the Soledad Village project's water demand and supplies. The following list identifies all of the documentation that has been relied upon in the preparation of the Soledad Village Water Study (WSA), prepared by Impact Sciences (October 2005); refer to Appendix H, Water Study.[1]

- *2000 Urban Water Management Plan, 2005 Groundwater Perchlorate Contamination Amendment and Other Amendments*, prepared by Castaic Lake Water Agency (CLWA), January;
- *Impact and Response to Perchlorate Contamination*, prepared by Luhdorff & Scalmanini Consulting Engineers, April 2005;
- *Santa Clarita Valley Water Report 2004*, prepared by Luhdorff and Scalmanini, Consulting Engineers, for CLWA, Los Angeles County Waterworks District #36, Newhall County Water District (NCWD), and VWC, May 2005;
- *Santa Clarita Valley Water Report 2003*, prepared by Luhdorff and Scalmanini, Consulting Engineers, for CLWA, Los Angeles County Waterworks District #36, Santa Clarita Water Division of CLWA, and VWC, May 2004;
- *Santa Clarita Valley Water Report 2002*, prepared by Luhdorff and Scalmanini, Consulting Engineers, for CLWA, Los Angeles County Waterworks District #36, NCWD, and VWC, April 2003;
- *2001 Update Report, Hydrogeologic Conditions in the Alluvial and Saugus Formation Aquifer Systems*, prepared by Richard C. Slade & Associates LLC, July 2002;
- *Capital Improvement Program*, prepared by CLWA, Kennedy-Jenks Consultants, 2003;
- *The Final State Water Project Delivery Reliability Report*, prepared by California Department of Water Resources, 2002;
- *Water Supply Contract Between the DWR and the CLWA*, (plus amendments, including the "Monterey Amendment," 1995, and Amendment No. 18, 1999, the transfer of 41,000 AF of entitlement from Kern County Water Agency [KCWA] to CLWA), 1963;

[1] All the reference materials are located at the City of Santa Clarita Planning and Economic Development Department, located at 23920 Valencia Boulevard, Suite 300, Santa Clarita, California, 91355.

- *2002 Semitropic Groundwater Storage Program and Point of Delivery Agreement Among the DWR, CLWA and KCWA*;
- *2003 Semitropic Groundwater Storage Program*;
- *Water Management Program*, prepared by Valencia Water Company (VWC), 2001;
- *Hydrogeologic Investigation of the Perennial Yield and Artificial Recharge Potential of the Alluvial Sediments in the Santa Clarita Valley of Los Angeles County, California*, prepared by Richard C. Slade & Associates, December 1986;
- *Hydrogeologic Assessment of the Saugus Formation in the Santa Clarita Valley of Los Angeles County, California*, prepared by Richard C. Slade & Associates, February 1988;
- A technical memorandum prepared by Richard C. Slade & Associates, November 16, 2000;
- A letter from Joseph C. Scalmanini, Luhdorff and Scalmanini Consulting Engineers, dated December 15, 2000, regarding review of the groundwater components of the *UWMP*;
- *Assessment of the Hydrogeologic Feasibility of Injection and Recovery of Water in the Saugus Formation, Santa Clarita Valley, California*, prepared by Richard C. Slade & Associates, February 2001, including the Technical Appendix *Hydrogeologic Conditions in the Saugus Formation, Santa Clarita Valley, California*, February 2001;
- *Newhall Ranch ASR Impact Evaluation*, prepared by CH2MHILL, February 2001;
- *Newhall Ranch Updated Water Resources Impact Evaluation*, prepared by CH2MHILL, September 2002; and
- *Well Q2 Report*, prepared by VWC, April 2005.

5.8.1 ENVIRONMENTAL SETTING

WATER SERVICE

Castaic Lake Water Agency

Castaic Lake Water Agency (CLWA) is a public agency that serves an area of 195 square miles in Los Angeles and Ventura counties. CLWA is a water wholesaler that provides approximately one-half of the water for Santa Clarita households and businesses. CLWA operates two potable water treatment plants, storage facilities, and over 17 miles of transmission pipelines. CLWA supplements local groundwater supplies with State Water Project (SWP) water from northern California. This water is treated and delivered to the local water retailers. The four retail purveyors served by CLWA are the Valencia Water

Company (VWC), Los Angeles County Water District #36, Newhall County Water District (NCWD) and the Santa Clarita Division of CLWA (SCWD).

CLWA also delivers highly treated recycled water from one of the two water reclamation plants in the Santa Clarita Valley owned by the Sanitation Districts of Los Angeles County, in order to meet non-potable water demands (golf courses and landscape irrigation, etc.).
In 2001, CLWA signed the *Memorandum of Understanding Regarding Urban Water Conservation in California* (MOU) on behalf of the CLWA service area, as recommended in the *Amended 2000 UWMP*. By signing the MOU, CLWA became a member of the California Urban Water Conservation Council (CUWCC) and pledged to implement all cost-effective Best Management Practices (BMPs) for water conservation. CLWA has implemented 13 of the 14 BMPs recommended by CUWCC (one BMP is currently under revision by CUWCC). CLWA has estimated that conservation measures within the service area can reduce total water demands by approximately ten percent.

WATER SUPPLY

The current water supply for the Santa Clarita Valley is derived from five primary sources:

- Groundwater from the Alluvial Aquifer;
- Groundwater from the Saugus Formation;
- Imported SWP Water;
- Dry Year Groundwater Banking Programs; and
- Recycled Water.

The sources of water supply within CLWA's service area can be characterized as: (1) local supplies consisting of groundwater and recycled water; and (2) imported supplies that are transported via the SWP and consisting of SWP contract amounts and dry year supplies delivered from groundwater banking programs.

Potential future water sources include acquisition of additional imported water supplies, recycled water, desalination, storm water runoff, increased dry year Saugus pumping, and additional SWP reliability projects. Demand side management programs (conservation) is also considered a component of water supply resulting from efforts by CLWA and other retailers to reduce water demands on a long term basis.

Local Water Supplies

Groundwater

Groundwater is drawn from two aquifer systems within the Santa Clara River Valley East Sub-basin (Basin), one of the several sub-basins identified along the Santa Clara River in Los Angeles and Ventura counties. The Basin is approximately 22 miles long east to west and 13 miles wide. The shallow aquifer system is designated the Alluvial Aquifer and the deeper aquifer is designated the Saugus Formation.

It is estimated that approximately 200,000 acre-feet (AF) of water is in storage in the Alluvial Aquifer and approximately 1.65 million AF of potentially usable groundwater is present from depths of 500 to 2,500 feet in the Saugus Formation. Neither aquifer system is in overdraft at the present time. The Basin has not been adjudicated and has not been identified as overdrafted or projected to be overdrafted by the Department of Water Resources.

Total pumpage from the Alluvial Aquifer in 2004 was approximately 33,800 AF, an increase of approximately 200 AF from 2003. Of the total Alluvial Aquifer pumpage in 2004, 56 percent (approximately 19,000 AF) was for municipal water supply, and the remaining 44 percent was utilized for agricultural and other miscellaneous. Over the previous 20 years, total pumpage from the Alluvial Aquifer has ranged from a low of approximately 20,000 AFY in 1983 to slightly more than 43,000 AFY in 1999. The Allluvial Aquifer has a sustainable yield ranging from 30,000 to 40,000 AFY. The total annual groundwater production from the Alluvial Aquifer (urban and agricultural production) over the last 10 years has averaged approximately 35,000 AFY, approximately 10 percent higher than earlier estimates of the practical or perennial yield. However, there is no evidence of undesirable conditions that might be an indication of aquifer overdraft.

Total pumpage from the Saugus Formation in 2004 was 6,500 AF, an increase of approximately 2,300 AF from 2003. Of the total Saugus Formation pumpage in 2004, most (5,700 AF) was for municipal water supply, and the remainder (800 AF) was for agricultural and other miscellaneous uses. Groundwater pumpage from the Saugus Formation peaked in the early 1990s and the declined steadily; pumpage remained stable, at an average of approximately 4,800 AFY, since 1998. On a long-term average basis since the importation of SWP water, total pumpage from the Saugus Formation has ranged from a low of approximately 3,700 AFY in 1999 to a high of nearly 15,000 AFY in 1991; average pumpage from 1980 to present has been approximately 7,000 AFY. It is estimated that the Saugus Formation has a sustainable operational yield of 7,500 to 15,000 AFY, and that extraction can be increased on an infrequent basis to range from 15,000 to 35,000 AFY, without creating undesirable conditions (overdraft). However, the increase to 35,000 AFY would be temporary and would need to return to, or be reduced below, the historical range of 7,500 to 15,000 AFY once rainfall patterns returned to normal in order to avoid long-term adverse affects to the aquifer.

Recycled Water

Wastewater that has been highly treated and disinfected can be reused for landscape irrigation and other purposes. It is not suitable for use as potable water. In 1993, CLWA completed a *Reclaimed Water System Master Plan* (*Master Plan*), to use recycled water as a reliable water source to meet some non-potable demand within Santa Clarita Valley. The *Master Plan* is being updated, and the amount of recycled water expected to be produced is approximately 17,000 AFY in 2020. CLWA is currently under contract for 1,700 AFY that became available in 2003.

Imported Supplies

SWP Overview

In 1951, the California legislature authorized construction of a large state water storage and delivery system. Eight years later, in 1959, the legislature authorized the submission for voter approval of a $1.75 billion general obligation bond issue to build the SWP system. The voters approved the measure, which enabled DWR to commence construction of the SWP.

The DWR operates and manages the SWP facilities. The SWP is the largest state-built, multi-purpose water project in the country. The SWP was designed and built to deliver water, control floods, generate power, provide recreational opportunities and enhance fish and wildlife habitats. SWP water supplies are used for both urban and agricultural uses throughout California. The SWP facilities consist of a complex system of dams, reservoirs, power plants, pumping plants, canals and aqueducts to deliver water.

At the inception of the SWP, DWR entered into individual water supply contracts with agricultural and urban water suppliers (SWP contractors) throughout California. The contracts were the method used to fund construction and operation of the SWP facilities for the delivery of water to the SWP contractors. Each such contract sets forth a maximum annual allocation of SWP water, which is stated in Table A to the contract (Table A Amount, or allocation).

There are currently 29 SWP contractors with water supply contracts with DWR. A SWP contractor may annually request that DWR deliver water in the following year in any amount up to the SWP contractor's Table A Amount. The SWP contracts provide that in a year when DWR is unable to deliver the full amount of contractor requests, deliveries to contractors will be reduced so that total deliveries equal total available supply for that year. Some SWP contractors, including CLWA, historically have never requested delivery of their full annual amount because lower growth, other water supplies and water conservation efforts have held their demand below projections. Other SWP contractors historically have ordered their full Table A Amount nearly every year.

Existing long-term SWP water supply contracts called for the annual delivery of 4,103,651 acre-feet of Table A water by 1997 through SWP facilities, gradually increasing to a maximum of 4,172,686 acre-feet by 2020. Actual demand, however, has also not developed as projected, owing to circumstances, which have changed since the long-term contracts were signed in the 1960s. The changes include slower population growth, changes in local land use, local water conservation programs and conjunctive-use programs. The most SWP Table A water delivered to date (2003) in any year was about 3.5 million acre-feet in 2000. The demands for SWP water are expected to increase as the population of California continues to increase.

Monterey Agreement

By 1994, disputes arose among the many agricultural and urban SWP contractors and DWR regarding the availability and distribution of water through SWP facilities. To avoid potential litigation, DWR and agricultural and urban SWP contractors met in Monterey, California to attempt to resolve the ongoing disputes. After negotiations, DWR and the agricultural and urban SWP contractors agreed to a statement of principles, which became known as the "Monterey Agreement."

The Monterey Agreement, signed by DWR and many of the agricultural and urban SWP contractors in 1994, established principles to be incorporated in contract amendments (the Monterrey Amendments) to be offered to the SWP contractors. To date, all but two SWP contractors (Plumas County Flood Control and Water Conservation District and Empire West Side Irrigation District) have accepted the amendments. The amendments have three primary objectives: (i) to increase the reliability of all SWP contractors' water supplies; (ii) to stabilize the rate structure in order to improve the financial viability of the SWP; and (iii) to increase water management flexibility for all SWP contractors.

The Monterey Agreement provided a number of water management tools that have allowed local agencies to maximize their use of available supplies, thus meeting increased demand without construction of new SWP facilities. Most of these tools are environmentally beneficial or neutral. They include the following:

- Water Transfers: SWP contractors can transfer unneeded Table A water to other contractors on a permanent basis. This provides financial relief from SWP charges for the seller and additional water supplies for the buyer.
- Turnback Pool: SWP contractors with unneeded supplies on a short-term basis can turn their water back into a pool for purchase by other contractors.
- Storage Outside Service Area: SWP contractors are permitted to store water outside their service area (for example, in a groundwater banking project) for later use within their service areas.
- Terminal Reservoirs: SWP contractors are permitted to utilize flexible storage in Castaic Lake and Lake Perris to enhance their water supply reliability.
- SWP Allocation: Allocation of available SWP supply is made based on the proportion of each contractors' maximum contractual Table A water, rather than historical use with agricultural SWP contractors being cut first as in the past. This provides additional reliability to agricultural contractors earlier in the year, which improves their planning capability.
- Interruptible Water: Interruptible water (available surplus water) is distributed on an equal basis among SWP contractors rather than to agricultural SWP contractors first.
- Flexibility: Additional flexibility is granted to SWP contractors wishing to increase or decrease the Table A Amounts in their contracts.

- Banking: The Kern Water Bank was transferred to SWP agricultural users for development and use. This transfer has provided agricultural users as well as other local agencies with additional flexibility and water supply reliability.

- Non-Project Water: Use of project facilities for conveyance of non-project water is permitted to assist SWP contractors, which are able to locate additional sources of water.

As stated above, the Monterey Agreement has facilitated water transfers among SWP contractors. These water transfer provisions have resulted in 130,000 acre-feet of agricultural SWP contractors' Table A Amount being available for sale to urban SWP contractors. Agreements already have been executed among contractors to purchase the additional Table A water from the agricultural SWP contractors. Agreements for the additional Table A Amount of SWP water are effective upon execution (DWR Bulletin No. 132-96, August 1997, Ch. 1, p. 5), and, therefore, are considered permanent water reallocations of SWP Table A water. These permanent transfers of SWP Table A Amounts have allowed urban SWP contractors to obtain additional SWP Table A Amounts, thereby increasing their overall deliveries, even in times of drought. The permanent transfers of SWP Table A Amounts have also allowed SWP urban contractors to increase the reliability of their deliveries by having more Table A Amounts available overall.

The DWR now has approximately eight years of experience in implementing the Monterey Agreement and the associated water management tools identified above. The SWP contractors have come to rely on the Monterey Agreement water management tools and other provisions in their planning activities. Some of the results to date include the following:

- Up to 200,000 acre-feet transferred annually in the Turnback Pool program;

- Nearly 114,000 acre-feet transferred in permanent Table A water transfers;

- Nearly 1,000,000 acre-feet stored outside SWP contractors' service areas;

- Utilization of terminal reservoirs' flexible storage; and

- Delivery of up to 200,000 acre-feet annually in Interruptible water (available surplus water).

Monterey Agreement Environmental Review and Litigation

The Monterey Agreement gave rise to potentially significant environmental effects requiring analysis under CEQA. Therefore, a Program EIR was prepared to address the potentially significant environmental effects of implementing the Monterey Agreement. The Final Program EIR was certified in October 1995. The adequacy of the Final EIR was challenged in litigation arising under CEQA. The Sacramento Superior Court upheld the adequacy of the EIR. Before and after the trial court's decision, DWR and the agricultural and urban

SWP contractors who had executed the Monterey Agreement began implementing various amendment provisions, including the completion of permanent transfers of Table A Amounts among agricultural and urban SWP contractors. The trial court's decision was subsequently appealed. On appeal, the petitioners sought a writ to prevent further implementation of the Monterey Agreement during the appeal. However, the appellate court denied the requested writ (DWR Bulletin 132-98, November 1999, Ch. 6, p. 2).

The appellate court reversed the trial court's decision. The appellate court held that the Program EIR for the Monterey Agreement was improperly prepared by the Central Coast Water Agency, as "Lead Agency" under CEQA, rather than by DWR, which should have been the "Lead Agency." The appellate court also found that the EIR did not sufficiently discuss implementation of a "no project" alternative.

The court then concluded that a new EIR must be prepared and certified. Finally, the court held that the trial court improperly dismissed the plaintiffs' challenge to DWR's transfer of title to the Kern Water Bank from DWR to KCWA.

The appellate court then remanded the case to the trial court and directed that the trial court issue a writ of mandate vacating certification of the EIR and retaining jurisdiction until DWR certifies an EIR in accordance with CEQA. The appellate court further directed that the trial court consider whether the Monterey Agreement may continue to be implemented while the new EIR is being prepared. (Planning & Conservation League v. Department of Water Resources (2000) 83 Cal.App.4th 892.)

The appellate court decision invalidated certification of the EIR, but did not set aside, invalidate or otherwise vacate the Monterey Agreement. In addition, no court orders have been issued to "stay" further implementation of the Monterey Agreement.

In March 2001, the parties to the Monterey Agreement litigation commenced confidential mediation discussions in San Francisco. In a "Joint Statement on the Monterey Amendments Litigation," dated July 18, 2002, the parties to the litigation stated that they "have reached a joint agreement on the principles for settling the lawsuit...." The parties also stated that DWR had commenced preparing a new EIR for the Monterey Agreement. In May 2003, the DWR, Central Coast Water Authority, Kern Water Bank Authority and certain SWP contractors entered into a Settlement Agreement (Settlement) with the Planning and Conservation League, Plumas County Flood Control and Water Conservation District, and Citizens Planning Association of Santa Barbara County, Inc. Pursuant to the Settlement, the department agreed to public negotiation of certain amendments to the long term water supply contracts, including contract amendments to transfer Table A Amounts between existing SWP contractors. The settlement also contains an "Acknowledgment and Agreement Regarding Kern-Castaic Transfer" (i.e., the 41,000 acre-foot CLWA/WRMWSD water transfer described under the heading Santa Clarita Valley SWP Supplies, below). The settlement states: "nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in [the] litigation [on the 41,000 acre-foot transfer]." Consequently, the decisions reached in that litigation stand. Refer to Appendix H for the full text of the Settlement and further information regarding the Monterey Agreement and Monterey Amendment.

Santa Clarita Valley SWP Supplies

CLWA SWP Table A Amount

Imported water from the SWP has been a supplemental source of supply to the Santa Clarita Valley since 1980. The SWP is contracted (and designed) to deliver approximately 4.2 million acre-feet of water per year to 29 contracting agencies. However, because the SWP has not been fully constructed and cannot, on a regular basis, deliver the entire 4.2 million acre-feet. CLWA is a contracting agency with a current maximum annual SWP Table A Amount of 95,200 AFY, or about 2.3 percent of the total (The CLWA/WRMWSD water transfer of 41,000 AFY has been completed, CLWA has paid approximately $47 million for the additional Table A Amount, the monies have been delivered, the sales price has been financed through CLWA by tax-exempt bonds, and DWR has increased CLWA's SWP maximum Table A Amount to 95,200 AFY because it was a permanent transfer/reallocation of SWP Table A Entitlement between SWP contractors).

Prior to completion of the CLWA/WRMWSD water transfer, the proposed transfer was the subject of environmental review by the water agencies. The agencies selling the 41,000 acre-feet of SWP Table A Amount to CLWA assessed the environmental consequences of the proposed transfer within their service area in a Final EIR, dated June 1998. This EIR was certified in 1998 and has never been the subject of judicial review. As a result, the EIR is conclusively presumed to be valid. (Pub. Res. Code §21167.2)

CLWA also prepared a supplemental Final EIR, which assessed the environmental effects of CLWA's acquisition of the 41,000 acre-feet within its service area. The Board of Directors of CLWA certified the Supplemental Final EIR in March 1999. Thereafter, in April 1999, a lawsuit was brought challenging the adequacy of the EIR under CEQA (Friends of the Santa Clara River, et al. v. Castaic Lake Water Agency, et al., Case No. BS 056954). The trial court ruled in favor of CLWA and upheld the adequacy of the EIR under CEQA.

In October 2000, the plaintiffs filed an appeal. The appellate court reversed the trial court's judgment and ordered CLWA's EIR decertified. However, the appellate court did not order CLWA to void its approval of the water transfer. Instead, the appellate court remanded the matter to the trial court for further proceedings. After a hearing on September 24, 2002, the trial court concluded that CLWA could utilize the 41,000 AFY to which it is entitled. In December 2004, CLWA certified a new EIR addressing the impacts of the water transfer agreement. That document is now the subject of legal challenge.

Status of CLWA's Acquisition Under the Monterey Agreement

The CLWA/WRMWSD transfer of SWP Table A Amount was the type of water transfer that fell within the provisions of the Monterey Agreement. As stated above, under the Monterey Agreement, certain SWP agricultural contractors agreed that 130,000 acre-feet of their Table A Amount could be transferred to urban contractors. The CLWA 41,000 acre-feet acquisition was a part of the 130,000 acre-feet of SWP Table A Amount, which has been transferred under the Monterey Agreement.

The Monterey Agreement provides for those transfers by the participating SWP contractors, thus facilitating transfers of Table A Amounts from agricultural to urban SWP contractors. As stated above, the environmental documentation for the Monterey Agreement has been decertified. However, the legal proceedings (Planning and Conservation League v. Department of Water Resources [2000] 83 Ca.App.4th 892 [PCL litigation]) have not invalidated the Monterey Agreement or enjoined either the Monterey Agreement or further implementation of the Monterey Agreement. In addition, the subsequent settlement agreement in the PCL litigation did not invalidate or otherwise enjoin the Monterey Agreement.

Even in the absence of the Monterey Agreement, CLWA's permanent acquisition of an additional 41,000 acre-feet of SWP Table A Amount could occur under existing SWP water supply contract provisions, subject to appropriate environmental review.

Nothing in the existing SWP water supply contracts, or applicable law, prohibit such water transfers with or without the Monterey Agreement. The Monterey Agreement simply provides a specific vehicle for accomplishing transfers of SWP Table A Amounts from agricultural to urban SWP contractors; the amendments under the Monterey Agreement are not the exclusive means by which that amount may be transferred. In support of that fact, in 1981 (almost 15 years before the Monterey Agreement), the entire SWP Table A Amount of the Hacienda Water District was permanently transferred to the Tulare Lake Basin Water Storage District, pursuant to an agreement approved by DWR.

The acquisition of the 41,000 acre-feet could proceed as a water transfer under existing law. See, e.g., Water Code §§382, 383 (authority for transferring surplus water) and Water Code §1745, et seq. (authority for transferring non-surplus water). The KCWA has reaffirmed its willingness to allow transfers of up to 130,000 acre-feet of SWP Table A Amounts under pre-Monterey Agreement conditions even if the Monterey Agreement is ultimately invalidated.

If it were not for existing SWP water supply contract provisions which allow such transfers (without the need for the Monterey Agreement), and existing law which enables CLWA to enter into contracts outside the context of the Monterey Agreement, an adverse final judgment invalidating the Monterey Agreement could affect CLWA's completed acquisition of the 41,000 acre-feet, which could in turn impair CLWA's supply of SWP water through its contracts with DWR and other SWP contractors. However, CLWA believes that an adverse outcome in the Monterey Agreement litigation is not likely to adversely affect CLWA's water supplies over the long term because CLWA believes that such a result is unlikely to "unwind" executed and completed agreements with respect to the permanent transfer of SWP Water Amounts.

In May 2003, the California Department of Water Resources (DWR) completed its *State Water Project Deliver Reliability Report*. This report provides current information on the ability of the SWP to deliver water under existing and future levels of development, assuming historical levels of precipitation. On average, the SWP will be able to deliver between 72 to 76 percent of the maximum total contract amount of 4.1 million AF at both current and projected (2020) levels of demand. Assuming SWP reliability of 76 percent, CLWA's average/normal water year deliveries would be approximately 72,350 AFY. The single critical

dry year deliveries, according to the DWR are forecasted to be approximately 18,088 AFY and the multiple dry year deliveries could be approximately 35,244 AFY.

Average/Normal Year, Single Dry Year and Multiple Dry Year Water Supply

The amount of water supply available from the various sources is summarized in *Table 5.8-1, Existing Water Supplies (Acre-Feet)*. *Table 5.8-1* is not intended to be an operational plan for how supplies would be used in a particular year, but rather identifies the complete range of water supplies available under a range of hydrologic conditions. Diversity of supply allows SCWD and the purveyors the option of drawing on multiple sources of supply in response to changing conditions such as varying climatic conditions (average/normal years, single dry years, multiple dry years), natural disasters and contamination with substances such as perchlorate.

Table 5.8-1
Existing Water Supplies (Acre-Feet)

	Available During		Available During Single Dry Year	Available During Each of Three Consecutive Dry Years
	Average Year	Wet Year		
Local Supplies				
Alluvial Aquifer	35,000	40,000	32,500	32,500
Saugus Formation	11,000	11,000	15,000	24,000
Recycled Water	1,700	1,700	1,700	1,700
Imported Supplies				
SWP Amount[1]	56,800	95,200	37,900	37,900
Draw From Short-term Semitropic Bank Account	0	0	50,870	16,950
Draw From Flexible Storage Account	0	0	4,684	1,561
Existing Supplies (2004)	**104,500**	**147,900**	**142,654**	**114,611**

1. Since the *2000 UWMP* was adopted, DWR released its SWP Delivery Reliability Report (May 2003), which analyzes the reliability of SWP supplies. During infrequent dry periods, deliveries are projected to be less than 50 percent, and possibly as low as 19 percent during an unusual single dry year condition that occurs about once every 70 years. During very wet years, full deliveries can be expected. Thus, the amount of water available to CLWA in the worst-case single dry year would be 19 percent of 95,200 AF (18,088 AF). In a worst-case multiple dry-year period, the amount of water available to CLWA in each of those dry years would be 37 percent of 95,200 AF (35,244 AF). The May 2003 DWR report also assumes average year SWP deliveries of 76 percent. This would result in 72,352 AF of CLWA's entitlement amount. The *2005 UWMP* will reflect this new information.

For the *2000 UWMP*, water supplies reflected in this table are based on SWP reliability as of 2000. Use of the 2003 SWP reliability figures would reduce the existing Single Dry Year and Consecutive Dry Year Amounts to 18,088 AF and 35,244 AF, respectively. The corresponding total existing supplies would be reduced to 122,842 AF and 112,955 AF, respectively. Total existing and planned supplies in Single Dry and Consecutive Dry Years would be reduced to 147,272 AF and 134,305 AF, respectively. Assuming 76 percent reliability in the average year, total existing supplies would be 120,052 AF, and total existing and planned supplies would be 135,352 AF.

Source: *Amended 2000 UWMP.*

In April 2005, VWC confirmed the detection of perchlorate in its Well Q2, an Alluvial well, in connection with its regular monitoring of active municipal-supply wells near the former Whittaker-Bermite site. In response, VWC removed the well from active service, and requested Luhdorff & Scalmanini, Consulting Engineers to prepare a report assessing the impact of, and response to, the perchlorate contamination in VWC's Well Q2 (*Q2 Report*).

The *Q2 Report* documents that the perchlorate detected in Well Q2 does not significantly impact the water supplies used to meet demand in the Santa Clarita Valley. VWC's response plan for Well Q2 is to pursue permitting and installation of wellhead treatment by the fall of 2005, which will return the well to water supply service.

2000 URBAN WATER MANAGEMENT PLAN AND 2005 AMENDMENT

The final version of the Santa Clarita Valley's Urban Water Management Plan (2000 UWMP) was adopted by the CLWA Board of Directors on December 20, 2000. In the County of Ventura v. Castaic Lake Water Agency case, (Kern County Superior court case no. 245365-RJO), the validity and sufficiency of the regional 2000 UWMP prepared by VWC, CLWA and NCWD were challenged. The Court of Appeal issued a decision that focused on the 2000 UWMP's discussion regarding perchlorate contamination as it related to groundwater supplies and concluded that the 2000 UWMP must have a discussion as to the time needed to implement the method for treating the affected groundwater as well as a discussion as to the reliability of groundwater during the treatment period. The decision also required the trial court to vacate the approval of the 2000 UWMP. However, SCWD and the other affected water agencies have prepared and adopted an amendment to the 2000 UWMP, the Water Management Plan, (Amendment 2000 UWMP) to address the insufficiencies identified by the Court of appeal regarding perchlorate contamination. The CLWA and other retailers are currently preparing the 2005 Water Management Plan, with approval anticipated by the end of 2005. Some supply and demand factors may be modified but the overall conclusions (there is sufficient water for existing and planned growth) are expected to remain the same.

The *Amended 2000 UWMP* uses *Table 5.8-1* as a basis for developing the mix of supplies for the two operational scenarios needed to meet the demand. The near-term and long-term operating scenarios have been conservatively developed to match available supplies necessary to meet existing and projected demands over the next three years and through the year 2020. Because of the diverse nature of these supplies, there are multiple combinations of supplies that can be utilized in any year to meet demands, and the scenarios presented in the *Amended 2000 UWMP* represent reasonable assumptions about the availability of each water supply based upon the most up to date information at this time.

The *Amended 2000 UWMP* concluded the following findings in regards to groundwater supply:

- Both the Allluvial Aquifer and the Saugus Formation are reasonable and sustainable sources at the yields represented in the *Amended 2000 UWMP*;
- The yields are not overstated and will not deplete or "dry up" the groundwater basin; and
- There is no need to reduce the yields for purposes of planning in the context of the *Amended 2000 UWMP*.

Based on the findings in the *Q2 Report* and the *Amended 2000 UWMP*, CLWA, SCWD, and other retail purveyors believe that sufficient water supplies continue to be available to meet the current and projected water demands in the Santa Clarita Valley over the next 20-year horizon, even after taking into account groundwater supply impacted by perchlorate contamination.

5.8.2 SIGNIFICANCE THRESHOLD CRITERIA

Appendix G of the *CEQA Guidelines* contains the Initial Study Environmental Checklist form used during preparation of the project Initial Study, which is contained in Appendix A of this EIR. The Initial Study includes questions relating to water. The issues presented in the Initial Study Checklist have been utilized as thresholds of significance in this section. Accordingly, a project may create a significant environmental impact if one or more of the following occurs:

- Have sufficient water supplies available to serve the project from existing entitlements and resources, or require new or expanded entitlements; and
- Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects.

5.8.3 IMPACTS AND MITIGATION MEASURES

WATER DEMAND AND SUPPLY

◆ ***DEVELOPMENT OF THE SOLEDAD VILLAGE PROJECT COULD CREATE DEMAND FOR WATER THAT EXCEEDS AVAILABLE SUPPLIES.***

Level of Significance Prior to Mitigation: Potentially Significant Impact.

Impact Analysis: The Soledad Village project is a proposed residential development consisting of multi-family housing on a 30-acre site in the City of Santa Clarita. It would include 437 townhomes, 8,000 square feet of commercial building area, and a recreation center.

Using water demand factors provided by Santa Clarita Water Division, the proposed project would consume approximately 154 AFY. The anticipated project demand for water is summarized in *Table 5.8-2, Estimated Water Demand*.

Table 5.8-2
Estimated Water Demand

Land Use Category	Amount	Water Duty Factor	Water Demand (AFY)
Townhomes	437 units	0.24 AFY per unit	104.9
Recreation Area	0.75	3 AFY per acre	2.2
Landscaping	15 acres	3 AFY per acre	45.0
Commercial (8,000 square feet)	1 acre	0.0289 AFY per 100 square feet	2.3
Total			**154.4**

Existing Conditions Plus Project Water Demand

Table 5.8-3, Existing Plus Project Demand for the Santa Clarita Valley, illustrates the project demand, in conjunction with existing demand in the Santa Clarita Valley. As shown in *Table 5.8-3*, existing water demand in the Santa Clarita Valley is approximately 82,364 AFY in average years (this figure accounts for a dry year increase in water demand in 2004 of approximately 10 percent). Of this demand, approximately 66,364 AFY is related to urban or developed areas and approximately 16,000 AFY is related to other uses in the Santa Clarita Valley, including agricultural uses. When combined with the Soledad Village project, water demand of 154 AFY, the total water demand in the Santa Clarita Valley would be approximately 82,518 AFY if Soledad Village were completely built out today. The land use-related water demand would increase by approximately 10 percent in dry years, resulting in a water demand of approximately 89,169 AFY. In a critical dry year, demand could decrease by up to 20 percent due to conservation measures that would be enacted by the local water purveyors and CLWA. However, this analysis conservatively assumes that critical dry-year demand would decrease by 10 percent from the dry-year demand. During such extreme conditions, water demand in the Santa Clarita Valley with the Soledad Village project would be approximately 80,252 AF.

Table 5.8-4, Existing Plus Project Demand and Supply for the Santa Clarita Valley, illustrates that existing supplies exceed the project demand, in conjunction with existing demand in the Santa Clarita Valley. Existing water supplies exceed demand by 42,590 to 62,485 AFY in dry years and by 21,982 AFY in an average/normal year after adding the proposed project to existing demands. It should be noted that dry year supplies available above demand reflect water supplies that would be available to purveyors in dry years. Purveyors would typically secure water from these supplies only in amounts necessary to meet demand.

Table 5.8-3
Existing Plus Project Demand for the Santa Clarita Valley

	Average Year	Dry Year[1]	Critical Dry Year[2]
Existing Demand	66,364	73,000	73,000
Other Demand (Agricultural)	16,000	16,000	16,000
Soledad Village Demand	154	169	169
Critical Dry Year 10% Demand Decrease			(8,917)
Total Demand	**82,518**	**89,169**	**80,252**

Notes:
1. Demand is increased by approximately 10 percent in dry years. 2004, the year from which this demand was derived, was a dry year and already reflects the 10 percent increase in demand over a normal or average year. A dry year is a year when below average rainfall occurs after a normal or wet year.
2. Demand in a critical dry year is expected to decrease by as much as 20 percent due to voluntary and mandatory planned purveyor conservation programs. This analysis assumes a critical dry year 10 percent reduction in demand from the dry year demand. A critical dry year is a year when rainfall is at a critically low level (i.e., a year that occurs once every 73 years). Such a demand reduction occurred in the last critical dry year experienced in the Santa Clarita Valley (1991).

Source: *Santa Clarita Valley Water Report 2004*, prepared by the CLWA, Los Angeles County Waterworks District #36, Newhall County Water District, VWC, May 2005.

Table 5.8-4
Existing Plus Project Demand and Supply for the Santa Clarita Valley

	Average Year	Dry Year[1]	Critical Dry Year[2]
Existing Demand	66,364	73,000	73,000
Other Demand (agricultural)	16,000	16,000	16,000
Soledad Village Demand	154	169	169
Critical Dry Year 10% Demand Decrease			(8,917)
Total Demand	**82,518**	**89,169**	**80,252**
Existing Water Supply Programs Available:			
Local Supplies			
Alluvial Aquifer	35,000	32,500	32,500
Saugus Formation	11,000	24,000	15,000
Recycled Water	1,700	1,700	1,700
Imported Supplies[1]			
SWP Table A Amount	56,800	37,900	18,088
Semitropic Bank Account		50,870	50,870
Flexible Storage Account		4,684	4,684
Total Existing Supplies	**104,500**	**151,654**	**122,842**
Surplus/(Deficit)	**21,982**	**62,485**	**42,590**

Notes:
1. Demand is increased by approximately 10 percent in dry years. 2004, the year from which this demand was derived, was a dry year and already reflects the 10 percent increase in demand over a normal or average year. A dry year is a year when below average rainfall occurs after a normal or wet year.
2. Demand in a critical dry year is expected to decrease by as much as 20 percent due to voluntary and mandatory planned purveyor conservation programs. This analysis assumes a critical dry year 10 percent reduction in demand from the dry year demand. A critical dry year is a year when rainfall is at a critically low level (i.e., a year that occurs once every 73 years). Such a demand reduction occurred in the last critical dry year experienced in the Santa Clarita Valley (1991).

Source: *Santa Clarita Valley Water Report 2004*, prepared by the CLWA, Los Angeles County Waterworks District#36, Newhall County Water District, VWC, May 2005.

Table 5.8-5, Example Near-Term Operation Scenario Average/Normal Water Year Water Supply and Demand Assessment, and *Table 5.8-6, Example Near-Term Operation Scenario Single Dry Year and Multiple Dry Year Water Supply and Demand Assessment*, delineate the mixes of water supplies expected to be used to meet demands in the next three years (2005-2007) under average/normal water supply conditions (refer to *Table 5.8-5*) and under dry water supply conditions (refer to *Table 5.8-6*). This three-year period was selected to specifically respond to concerns over the reliability of supply during the implementation phase of the perchlorate contamination treatment project to restore currently impacted groundwater supplies. This scenario takes into account the impact of perchlorate on the reliability of groundwater supplies from the Alluvial aquifer and Saugus Formation under an average/normal year, single dry year, and three consecutive dry years. It also includes delivery of dry year "firming" supplies that were planned but not yet available when the *2000 UWMP* was adopted. The mix of water supplies from available groundwater not impacted by perchlorate contamination in combination with other available supplies is sufficient to meet customer demands with a high degree of reliability over the next three years, which includes the transition to full restoration of groundwater production currently impacted by perchlorate contamination.

Table 5.8-5
Example Near-Term Operation Scenario
Average/Normal Water Year Water Supply
and Demand Assessment

Existing Water Supply	2005	2006	2007
Local Supplies			
Alluvial Aquifer	35,000	35,000	35,000
Saugus Formation	5,000	5,000	9,000
Recycled Water	700	1,000	1,300
Imported Supplies			
SWP Table A Amount	41,000	42,380	39,760
Draw From Short-Term Semitropic Bank Acct	0	0	0
Draw From Flexible Storage Account	0	0	0
Existing Supply	**81,700**	**83,380**	**85,060**
Existing Demand	**81,700**	**83,380**	**85,060**

Source: *Groundwater Perchlorate Contamination Amendment and Other Amendments, 2000 Urban Water Management Plan*, CLWA, CLWA Santa Clarita Water Division, Newhall County Water District, Valencia Water Company, January 2005.

WATER DISTRIBUTION SYSTEM

The entire project site is located within Santa Clarita Water Division Pressure Zone E. The project would be served by a proposed looping system of water lines connecting to an existing 10-inch water main located on the north side of Soledad Canyon Road at the east end and to a 14-inch main installed along the remaining project frontage in the south side of Soledad Canyon Road. The proposed project's water delivery system would consist of 12- to 16-inch water mains that generally follow the roadway system within the project site. Additionally, a series of fire hydrants would be located along Soledad Canyon Road.

Table 5.8-6
Example Near-Term Operation Scenario
Single Dry Year and Multiple Dry Year Water Supply
and Demand Assessment

Existing Water Supply	Single Dry Year	Multiple Dry Years		
	2005	2005	2006	2007
Local Supplies				
Alluvial Aquifer	32,500	32,500	32,500	32,500
Saugus Formation	5,000	5,000	5,000	11,000
Recycled Water	700	700	1,000	1,300
Imported Supplies				
SWP Table A Amount	37,900	37,900	37,900	37,900
Draw From Short-Term Semitropic Bank Acct	916	4,039	5,419	2,360
Draw From Flexible Storage Account	4,684	1,561	1,561	0
Existing Supply	**81,700**	**81,700**	**83,380**	**85,060**

Source: *Groundwater Perchlorate Contamination Amendment and Other Amendments, 2000 Urban Water Management Plan,* CLWA, CLWA Santa Clarita Water Division, Newhall County Water District, Valencia Water Company, January 2005.

The Los Angeles County Fire Department requires sufficient capacity for fire flows of 5,000 gallons per minute (gpm) at 20 pounds per square inch (psi) for a five-hour duration for multi-family and commercial uses with a first floor area of 35,000 square feet or greater (actual fire flow requirements would be confirmed for each use by the Los Angeles County Fire Department prior to final tract map approval). According to the project engineer, the proposed water system would be able to meet both domestic and fire flow requirements of the project.

In summary, there would be sufficient water supply to meet the project's water demand under an average/normal water year, single dry year, or multiple dry years. In addition, the proposed project would include development of a distribution system that would provide sufficient capacity for domestic and fire flow requirements. Regardless, mitigation measures are recommended in order to ensure impacts to water supply and distribution remain below a level of significance.

Mitigation Measures:

WS1 Landscape concept plans shall include a palette rich in drought-tolerant and native plants.

WS2 Major manufactured slopes shall be landscaped with materials that will eventually naturalize, requiring minimal irrigation.

WS3 Water conservation measures as required by the State of California shall be incorporated into all irrigation systems.

WS4 Prior to commencement of use, all uses of recycled water shall be reviewed and approved by the State of California Health and Welfare Agency, Department of Health Services.

WS5 Prior to the issuance of building permits that allow construction, the applicant of the proposed project shall finance the expansion costs of water service extension to the subdivision through the payment of connection fees to the appropriate water agency(ies).

Level of Significance After Mitigation: Less Than Significant Impact.

5.8.4 CUMULATIVE IMPACTS AND MITIGATION MEASURES

◆ ***DEVELOPMENT ASSOCIATED WITH THE PROPOSED PROJECT AND OTHER RELATED PROJECTS WOULD INCREASE DEMAND FOR WATER SUPPLIES.***

Level of Significance Prior to Mitigation: Less Than Significant Impact.

Impact Analysis: The following discussion focuses on the cumulative impacts to water availability for the Santa Clarita Valley. The analysis evaluates cumulative impacts under the following three future water demand and supply scenarios:

Scenario 1: Existing development within the CLWA service area, plus near-term projections, plus the project (referred to as the "SB 610 Water Supply Scenario");

Scenario 2: Existing development within the CLWA service area, plus Development Monitoring System ("DMS") projections, plus the project (referred to as the "DMS Build-Out Scenario"); and

Scenario 3: Buildout within the CLWA service area by 2025, plus active pending General Plan Amendment requests, plus the project (referred to as the "Santa Clarita Valley 2025 Build-Out Scenario").

SB 610 Water Supply Scenario

As indicated previously, a WSA is not required for the Soledad Village project. However, for information purposes, an SB 610 scenario was prepared. As indicated below, there will be a sufficient water supply available at the time the Soledad Village project is ready for occupancy to meet the needs of the project in addition to existing and other planned future uses.

CLWA has existing water allocation rights and contracts to meet future demand as needed over time, and has committed sufficient capital resources and planned investments in various water programs and facilities to serve all of its existing and planned customers, including Santa Clarita Valley Water Division's customers. Santa Clarita Valley Water Division's water rights and contracts for local supplies, in addition to imported supplies provided by CLWA, are sufficient to serve all of its existing and planned customers. Santa Clarita Valley Water District has also identified an operational strategy combined with a prudent and flexible management approach to ensure water reliability.

Santa Clarita Valley Water District's current service area-wide demand is approximately 29,191 AFY. As mentioned previously, the Soledad Village project will require 154 AFY at buildout. The conclusions as stated in the *2000 UWMP* related to the requirements of the SB 610 for Soledad Village are as follows:

Average/Normal Year Water Assessment: The *UWMP* indicates that no shortages are anticipated within the agency's service area in an average water year through 2020 if planned water supply programs are developed as estimated. Without such programs, a deficit is possible in 2020. Total projected water demands for the CLWA through the year 2020 are compared with the supplies projected to be available to meet demands in this analysis. The following table, *Table 5.8-7, Long-Term Projection Average/Normal Water Year Water Supply and Demand Assessment*, summarizes the data from the *2000 UWMP*.

Table 5.8-7
Long-Term Projection Average/Normal Water Year
Water Supply and Demand Assessment

	2005	2010	2015	2020
EXISTING WATER SUPPLY				
Local Supplies				
Alluvial Aquifer	35,000	35,000	35,000	35,000
Saugus Formation	5,000	11,000	11,000	11,000
Recycled Water	700	1,700	1,700	1,700
Imported Supplies				
SWP Table A Amount	41,000	56,800	56,800	56,800
Draw From Short-Term Semitropic Bank Account	0	0	0	0
Draw From Flexible Storage Account	0	0	0	0
Total Existing Supply	**81,700**	**104,500**	**104,500**	**104,500**
PLANNED WATER SUPPLY				
Local Supplies				
Recycled Water	0	7,300	12,300	15,300
Imported Supplies				
Draw From Long-Term Water Banking Programs	0	0	0	0
Total Planned Supply	0	7,300	12,300	15,300
Total Supply (Existing Plus Planned)	**81,700**	**111,800**	**116,800**	**119,800**
Estimated Demand (without conservation)	**81,700**	**90,100**	**100,700**	**113,100**

Source: *Amended 2000 UWMP.*

Single Dry Year Water Assessment: The *2000 UWMP* evaluated the estimated dry-year demands and projected supplies for the year 2010 for the purpose of assessing a single critical dry year. This year was selected in order to show the results of local and imported water supply development over the next 10 years. For the worst-case scenario single dry year (1977, with a one in 73 year probability of occurrence), DWR estimates that SWP deliveries to contractors would be approximately 20 percent of contract amounts. If projected imported and local supplies are developed as indicated, no shortages are anticipated within the agency's service area for the extreme-case single dry-year scenario analyzed.[2] In fact, as

[2] *UWMP* p. 4-3. Hot, dry weather may generate a 10 percent increase above normal in both urban and agricultural water usage. This percentage was used to generate the dry year demands.

shown in *Table 5.8-8, Long-Term Projection Single Dry Year and Multiple Dry Year Water Supply and Demand Assessment*, water supplies exceed demand by 56,484 AF in the single, critical-dry year (2010). It should be noted that dry year supplies available above demand reflect water supplies that would be called upon by purveyors in dry years. Purveyors would typically secure water from these supplies only in amounts necessary to meet demand.

Table 5.8-8
Long-Term Projection Single Dry Year and Multiple Dry Year Water Supply and Demand Assessment

	Single Dry Year 2010	Multiple Dry Years		
		Year 1 2018	Year 2 2019	Year 3 2020
Existing Water Supply				
Local Supplies				
Alluvial Aquifer	32,500	32,500	32,500	32,500
Saugus Formation	15,000	15,000	15,000	15,000
Recycled Water	1,700	1,700	1,700	1,700
Imported Supplies				
SWP Table A Amount[1]	37,900	37,900	37,900	37,900
Draw From Short-Term Semitropic Bank Account (through 2013)	17,500	0	0	0
Draw From Flexible Storage Account	4,684	1,561	1,561	1,561
Total Existing Supply	**109,284**	**88,661**	**88,661**	**88,661**
Planned Water Supply				
Local Supplies				
Restored Contaminated Wells	10,000	10,000	10,000	10,000
New Saugus Wells	0	0	0	10,000
Recycled Water	7,300	12,300	12,300	15,300
Imported Supplies				
Draw From Long-Term Water Banking Programs	20,000	13,000	13,000	13,000
Total Planned Supply	**37,300**	**35,300**	**35,300**	**48,300**
Total Supply (Existing plus Planned Future)	**146,584**	**123,961**	**123,961**	**136,961**
Estimated Demand (without conservation)	**90,100**	**108,140**	**110,620**	**113,100**

Source: *Amended 2000 UWMP*. Since the *2000 UWMP* was adopted, DWR released its SWP Delivery Reliability Report (May 2003), which analyzes the reliability of SWP supplies. During infrequent dry periods, deliveries are projected to be less than 50 percent, and possible as low as 19 percent during an unusual single dry year condition that occurs about once every 70 years. During very wet years, full deliveries can be expected. Thus, the amount of water available to CLWA in the worst-case single dry year would be 19% of 95,200 AF, or 35,244 AF. The *2005 UWMP* will reflect this new information.

For the *2000 UWMP*, water supplies reflected in this table are based on SWP reliability as of 2000. Use of the 2003 SWP reliability figures would reduce the existing single dry year and consecutive dry year Table A Amounts to 18,088 AF and 35,244 AF, respectively. The corresponding total existing supplies would be reduced to 89,472 AF and 86,005 AF, respectively. Total existing plus planned supplies in single dry, consecutive dry years 1–2 and consecutive dry year 3 would be reduced to 126,772 AF, 121,305 AF and 134,305 AF, respectively.

Multiple Dry Year Water Assessment: The *2000 UWMP* estimated the minimum water supply available during each of the three water years, 2018, 2019, and 2020; refer to *Table 5.8-8*. The surface and groundwater supplies included in this analysis are reflective of supplies available during the 1987 to 1992 drought years, and in particular, 1990, 1991, and 1992. The supplies available from recycling projects are assumed to experience no reduction

in a dry year but are also assumed not to be fully on-line at this early stage of the 20-year projection. Demand reductions of 10 percent based on short-term water conservation programs are assumed for these dry-year scenarios (this level of conservation was achieved during the 1987–1992 drought). If projected imported and local supplies are developed as indicated, no shortages are anticipated within the agency's service area in the dry-year scenarios analyzed.[3] As shown in *Table 5.8-8*, water supplies exceed demand by 13,341 to 23,861 AF in multiple dry years. Again, it should be noted that dry year supplies available above demand reflect water supplies that would be called upon by purveyors in dry years. Purveyors would typically secure water from these supplies only in amounts necessary to meet demand.

DMS Build-Out Scenario (2015)

The County's General Plan includes provisions known as the DMS to give decision makers information about the existing capacity of available public services at the time a new development proposal is considered in the four major Urban Expansion Areas of the County of Los Angeles General Plan (Antelope Valley, Santa Clarita Valley, Malibu/Santa Monica Mountains, and East San Gabriel Valley).[4] The goal of DMS is to identify what new public facilities will be required for the new development, and to ensure that the appropriate cost of any expansion of facilities will be paid for by that new development, and not assumed by the taxpayers. To ensure new development is located in proximity to services and existing development, DMS states that in no event is the proposed development to be located beyond one mile of an existing development or service. Also, DMS states that new development is to be located within, generally, five miles of commercial services and job opportunities. The DMS also works toward ensuring that the expansion costs of new development are paid for by that development.

This analysis addresses water supply requirements resulting from buildout of all pending, recorded, and approved projects listed in the County's DMS, plus the Soledad Village project and a portion of the Newhall Ranch Specific Plan. As indicated in *Table 5.8-9, Scenario 1: DMS Build-Out Scenario Demand and Supply for the Santa Clarita Valley*, under the DMS analysis there is sufficient water supply for the entire demand of the Soledad Village project and all pending, approved, and recorded projects in the DMS. In fact, available water supplies would exceed demand by 15,876 to 24,913 AF in average years and by 45,145 to 82,994 AF in a dry year (dry year supplies available above demand reflect water supplies that would be available to purveyors in dry years. Purveyors would typically secure water from these supplies only in amounts necessary to meet demand). Therefore, the Soledad Village project is not expected to create any significant cumulative water availability impacts.

In addition to ensuring that an adequate supply of water is available for a project, DMS requirements also indicate that the project in question must be located within one mile of an existing development or service and that the development be located within generally five miles of commercial services and job opportunities. The Soledad Village site is located immediately adjacent to existing development and is within the retail water service area of

[3] UWMP p. 4-4.

[4] Resolution of the County of Los Angeles Board of Supervisors, Plan Amendment Case No. S.P. 86-173.

the Santa Clarita Water Division of CLWA. It is also within the wholesale service area of the CLWA.

Table 5.8-9
Scenario 1: DMS Build-Out Scenario Demand and Supply for the Santa Clarita Valley

	Average Years	Dry Years
Santa Clarita Valley Demand		
Existing Plus DMS Demand[1]	100,654	110,720
Soledad Village Demand	154	169
Less Conservation	(10,081)	(11,089)
Total	**90,727**	**99,800**
Santa Clarita Valley Supply[2]		
Local Supply		
Groundwater		
Alluvial Aquifer	35,000	32,500
Less Newhall Ranch Agricultural Water	(3,402)	(4,534)
Saugus Formation	11,000	15,000–24,000
Restored Impacted Wells	0	10,000
Saugus Formation (new)	0	10,000
Newhall Ranch Agricultural Water	3,402	4,534
Reclaimed Water	1,700 - 10,737	1,700 - 10,737
Less CLWA Reclaimed Water Supply for Newhall Ranch	(1,017)	(1,017)
Newhall Ranch WRP Supply	2,103	2,103
CLWA Newhall Ranch Supply	1,017	1,017
Imported Supplies		
SWP Supplies[3]	56,800	18,088–37,900
Water Banking/Conjunctive Use	0	50,870
Flexible Storage Account	0	4,684
Total Supplies	**106,603–115,640**	**144,945–182,794**
Total Supplies Above Demand	**15,876–24,913[4]**	**45,145–82,994[5]**

1. Complete buildout of DMS land uses is estimated to occur in 2015.
2. Source: *2000 UWMP*, December 2000, Tables 2-6 and 4-1, and the Santa Clarita Valley Water Report 2004, May 2005.
3. Consistent with the DWRSIM model, the figures show SWP allocation reduced in average years to approximately 59.7 percent of maximum allocation and in multiple dry years to approximately 39 percent of maximum allocation. The CALSIM II model projects that reliability in average years raises to approximately 75 percent and decreases to 20 percent in a single dry year. In any given year, the actual amount of SWP water deliveries could be above or below these model projections. Deliveries of water associated with the agency's SWP maximum allocation of 95,200 AFY are affected by a number of factors, including hydrologic conditions, the status of SWP facilities' construction, environmental requirements and evolving policies for the Bay-Delta. Programs are in place that has the potential to improve the reliability of imported water. As these programs are needed in dry years, they could be used up to the amounts indicated (as needed).
4. The surplus shown above is the net water available for injection into banking programs (e.g., Semitropic Groundwater Banking Project, other groundwater banking projects, etc.).
5. Dry year supplies available above demand reflect water supplies that would be available to purveyors in dry years. Purveyors would typically secure water from these available supplies only in amounts necessary to meet demand.

The DMS Build-Out Scenario entails existing development, buildout of the near-term subdivision projects listed in the County's DMS, plus a portion of the Newhall Ranch Specific Plan, plus the project. The County's DMS lists all pending, recorded, and approved projects for which land divisions have been filed within County unincorporated lands and within the City of Santa Clarita. The City plus County unincorporated areas together constitute the County's Santa Clarita Valley Planning area.

Table 5.8-9 illustrates both the cumulative water demand (existing plus DMS) and supply for the Santa Clarita Valley. This cumulative water demand is compared to the near-term projected Santa Clarita Valley water supplies and the additional Newhall Ranch Specific Plan water supplies. As shown, there is an adequate supply of water expected in both average years and dry years and no cumulative water supply impacts would occur. In fact, *Table 5.8-9* shows that water supplies exceed demand for the DMS Development Scenario by 15,876 to 24,913 AF in average years and by 45,145 to 82,994 AF in a single dry year. However, it should be noted that dry year supplies available above demand reflect water supplies that would be available to purveyors in dry years. Purveyors would typically secure water from these supplies only in amounts necessary to meet demand. Based on the information provided in this analysis, the Soledad Village project is consistent with the General Plan DMS policies as they relate to water supplies.

Santa Clarita Valley 2025 Buildout Scenario

The Santa Clarita Valley 2025 Buildout Scenario entails buildout of lands under the current land-use designations indicated in the *County's Area Plan* and the *City of Santa Clarita's General Plan* by the year 2025, plus the proposed Soledad Village project, plus all known active pending General Plan Amendment requests for additional urban development in the County unincorporated area and the City of Santa Clarita.

Table 5.8-10, Scenario 2: Santa Clarita Valley 2025 Buildout Scenario Water Supplies, and *Table 5.8-11, Scenario 2: Santa Clarita Valley 2025 Buildout Scenario Water Demand and Supply*, summarize the cumulative water demand and supply for this build-out scenario. As shown, at partial buildout by the year 2020, there are adequate water supplies for the project. As a result, the Soledad Village project is not expected to create any significant cumulative water availability impacts in either average/normal or dry years. In addition, as shown, at buildout by the year 2025, there are adequate water supplies for the project, with no significant cumulative water supply impacts occurring in either average/normal or dry years. In fact, the two tables show that water supplies exceed demand under this scenario in average and dry years in both 2020 and 2025.

Dry year supplies available above demand reflect water supplies that would be available to purveyors in dry years. Purveyors would typically secure water from these supplies only in amounts necessary to meet demand. For a critical dry year, when reliability of the SWP could be reduced, CLWA would utilize both dry-year supplies available from the Saugus Formation, and water banking and conjunctive use projects as indicated in *Table 5.8-10*.

Table 5.8-10
Scenario 2: Santa Clarita Valley 2025 Buildout Scenario
Water Supplies

	Buildout (Year 2020)		Buildout (Year 2025)	
	Average Years	Dry Years	Average Years	Dry Years
Local Supply				
Groundwater				
Alluvial Aquifer	35,000	32,500	35,000	32,500
Saugus Formation	11,000	15,000–24,000	11,000	15,000–24,000
Restored Impacted Wells	0	10,000	0	10,000
Saugus Formation (new wells)	0	10,000	0	10,000
Reclaimed Water	17,000	17,000	17,000	17,000
Newhall Ranch WRP Supply	3,155	3,155	5,258	5,258
Imported Supplies				
CLWA SWP Table A Water[1]	56,800	18,088–37,900	56,800	18,088–37,900
Newhall Nickel Water	0	0	1,468	1,607
Newhall Semitropic Groundwater Bank Storage	0	0	0	712
Water Banking/Conjunctive Use, etc.	0	90,870	0	90,870
Flexible Storage Account	0	4,684	0	4,684
Total Supply	**122,955**	**201,297–230,109**	**126,526**	**205,719–234,531**

Note:
1. SWP maximum allocation reduced in average years to approximately 59.7% of maximum allocation and in dry years to approximately 39.8% of maximum allocation. In any given year, the actual amount of SWP water deliveries could be above or below these model projections.

Source: *2000 UWMP*, December 2000, Tables 2-2, 2-6 and 4-1.

Table 5.8-11
Scenario 2: Santa Clarita Valley 2025 Buildout Scenario
Water Demand and Supply

	Buildout (Year 2020)		Buildout (Year 2025)	
	Average Years	Dry Years[5]	Average Years	Dry Years[5]
Total Build-Out Demand[2]	113,100[1]	124,410	123,176[3]	135,494
Santa Clarita Valley Water Supplies[4]	122,955	201,297–230,109	126,526	205,719–234,531
Total	**9,855**	**76,887–105,699**	**3,350**	**70,225–99,037**

Notes:
1. Source: *2000 UWMP*, December 2000, Table 3-5 and the SB 610 Water Supply Assessment for the Soledad Village Project.
2. Demand is increased by approximately 10 percent in dry years.
3. Source: *2000 UWMP*, December 2000, Table 3-5, using a straight-line projection from 2020–2025.
4. Source: *2000 UWMP*, December 2000, Tables 2-2, 2-6 and 4-1.
5. Dry year supplies available above demand reflect water supplies that would be called upon by purveyors in dry years. Purveyors would typically secure water from these supplies only in amounts necessary to meet demand.

As depicted in *Table 5.8-10*, purveyors have access to an amount of water supplies that exceed demand during dry conditions. Therefore, no cumulatively significant water availability impacts would occur due to buildout of the Soledad Village project.

CONCLUSION

Because cumulative water supplies exceed demand, cumulative development (including the proposed Soledad Village project) would not result in unavoidable significant cumulative impacts on Santa Clarita Valley water resources. This includes potential impacts to groundwater resources related to recharge potential. Development of the proposed project site and other sites proposed for development in the Santa Clarita Valley, no significant project-specific or cumulative impacts would occur to the groundwater basin with respect to aquifer recharge. This is due to the fact that urbanization in the Santa Clarita Valley has been accompanied by long-term stability in pumping and groundwater levels, plus the addition of imported SWP water to the valley, which together have not reduced recharge to groundwater, nor depleted the amount of groundwater that is in storage within the valley. Therefore, cumulative mitigation measures are not required with respect to water resources.

Mitigation Measures: No mitigation measures are required.

Level of Significance After Mitigation: Not applicable.

5.8.5 UNAVOIDABLE SIGNIFICANT IMPACTS

Implementation of the proposed Soledad Village Project would not result in significant and unavoidable impacts to water supply and distribution facilities.

Pages omitted.

Visit http://www.santa-clarita.com/cityhall/cd/planning/eir/completed.asp for complete document.

Attachment 23-C

LETTER 21

City of Santa Clarita

Gate-King Industrial Park

Final Environmental Impact Report

State Clearinghouse Number 2001021121

June 2003

Pages omitted.

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EXECUTIVE SUMMARY

This section summarizes the characteristics of the proposed project, the environmental impacts associated with the project, and measures recommended to mitigate identified significant impacts.

PROJECT SYNOPSIS

Project Applicant

The project applicant is Gate King Properties, LLC.

Project Description

The applicant is proposing to subdivide the 584-acre project site into 60 lots and is requesting General Plan amendments to change the land use designations in several areas of the site. The proposal involves amending the land use designation on about 223 acres, or about 38% of the site. The proposed changes would eliminate the residential (RE) and commercial (CC) designations from the site, and would increase the area designated IC from 337.5 acres to about 344 acres. The area designated OS would increase from 93.2 acres to about 240 acres.

Lots 1-41, which encompass about 35% of the site, are proposed to be industrial/business park lots. Lots 42-44, which comprise about 1.8 acres, would accommodate two water tanks to serve site development. Lots 45-54, which comprise about 16% of the site, consist of landscaped slopes and trails. Lots 55-59, which comprise about 38% of the site, would be designated as permanent open space. The remainder of the site would consist of rights-of-way, including public streets (29.2 acres) and the MTA (14 acres) and SCE (19.3 acres) rights-of-way.

Full buildout of the site under the applicant's proposal would involve the development of about 170.1 acres (29.1% of the site) with industrial/commercial uses. This acreage would accommodate up to about 4.45 million square feet of industrial/commercial development. An additional 64.3 acres (11% of the site) would be rights-of-way (SCE, MTA, roads) and water wells. The remaining 349.6 acres (59.9% of the site) would include a combination of slopes, trails, areas within industrial/commercial lots that would not be developed due to the presence of large oak groves, and natural open space.

ALTERNATIVES

As required by CEQA, the EIR examines a range of alternatives to the proposed project. Studied alternatives include:

- **No Project (Alternative 1)** – This option assumes that the project is not constructed, and that the site remains in its current condition.
- **Buildout Under Los Angeles County General Plan and Zoning (Alternative 2)** – This alternative considers the impact of buildout of the project site in accordance with the land uses prescribed in the Santa Clarita General Plan. About 31 residences and 4.9

million square feet of commercial and industrial development could be built under this alternative.

- **Ridgeline Preservation (Alternative 3)** – This alternative entails a reconfiguration of the project primarily to reduce grading of the Primary ridgeline onsite. Lots 17-22, 24-29, and 31-38 would be designated as open space and therefore would not be developed with industrial commercial uses as proposed. Also, 'C' Street, 'B' Street, and the segments of 'A' Street between lots 29 and 16 would be eliminated. This alternative would involve about 2.04 million square feet of commercial/ industrial development on about 67 buildable acres.
- **Oak Tree Preservation (Alternative 4)** – This option considers designation of development lots 9, 14, 15, 23, and 26- 38 as permanent open space to avoid impacts to several large clusters of oak trees. Landscape lots 50-53 would also be left as undeveloped open space. In addition, neither 'B' Street nor 'C' Street would be constructed and the extension of 'E' Street to connect to Pine Street would be eliminated. Buildout under this alternative would involve about 2.26 million square feet of industrial commercial development on about 71.3 acres.
- **Reconfigured 'C' Street (Alternative 5)** – This alternative, suggested by the project applicant, would eliminate all but about the 900 northernmost feet of 'C' Street and would eliminate most of the planned development along 'C' Street. Specifically, proposed industrial commercial lots 24-27 and the adjacent 8.8-acre landscape slope area would be left as permanent open space. One new industrial commercial lot would be added at the end of the reconfigured 'C' Street. This alternative would include about 4.2 million square feet of industrial commercial development on about 159.8 acres.

Each of the alternatives would be environmentally superior to the proposed project in at least one issue area. The No Project Alternative shows up as environmentally superior for each issue area as it would have no impact. However, that alternative would not fulfill the basic objective of the project. In addition, the No Project alternative would not preclude the site from eventual development in accordance with the existing General Plan designation for the site.

Of the development scenarios, only Alternative 2 (General Plan buildout) would involve more overall development than the proposed project and would have generally greater environmental impacts. Alternatives 3, 4, and 5 involve less overall development than the proposed project and would therefore reduce overall demands upon local services and infrastructure. Alternative 3 would involve the least overall development and would have the greatest benefits as compared to the proposed project with respect to ridgeline grading. Alternative 4 would reduce impacts to oak trees and associated habitat to the greatest degree. Either of these could be considered the environmentally superior alternative overall.

SUMMARY OF IMPACTS AND MITIGATION MEASURES

Table ES-1 includes a brief description of the environmental issues relative to the proposed project, the identified environmental impacts, proposed mitigation measures, and impacts after mitigation. Impacts are categorized by class. Class I impacts are defined as significant, unavoidable adverse impacts which require a statement of overriding considerations to be issued per Section 15093 of the *State CEQA Guidelines* if the project is approved. Class II impacts are significant adverse impacts that can be feasibly mitigated to less than significant levels and which require findings to be made under Section 15091 of the *State CEQA Guidelines*. Class III are considered less than significant impacts.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
LAND USE AND PLANNING		
Impact LU-1 The proposed development generally would not create compatibility conflicts with residential, commercial and industrial uses in the project vicinity. This impact is considered Class III, *less than significant.*	Mitigation measures recommended in Sections 4.7, *Noise,* and 4.11, *Aesthetics,* would minimize compatibility conflicts with surrounding land uses.	Less than significant.
Impact LU-2 The proposed project would add an estimated 6,527 jobs within the City. Because this increase in employment is within citywide projections, this impact is considered Class III, *less than significant.*	None required.	Less than significant.
Impact LU-3 The proposed project is considered generally consistent with City Land Use Element goals and policies, but is potentially inconsistent with City policies pertaining to preservation/ protection of significant ridgelines and oak trees.	Mitigation measures contained in Sections 4.6, *Biology*, 4.11, *Aesthetics,* 4.9, *Public Services,* 4.10, *Utilities,* and 4.12, *Cultural Resources,* would attain consistency with City General Plan goals and policies to the degree feasible. The following findings would need to be adopted for the proposed project. Various findings with respect to General Plan and Unified Development Code Consistency would need to be made to approve the project. A complete listing of these findings can be found in Section 4.1 *Land Use and Planning.*	The Planning Commission would need to make a finding that the project complies with the Ridgeline Preservation and Hillside Development Ordinance and Guidelines if it were to approve the project.
Impact LU-4 The proposed project appears to fully or partially implement most relevant policies of the Regional Comprehensive Plan and Guide.	Mitigation measures included in Sections 4.2, *Geology*, 4.3, *Hydrology and Water Quality*, 4.4, *Air Quality*, and 4.6, *Biological Resources*, would achieve compliance with SCAG policies to the degree feasible.	The project appears to fully or partially implement most relevant SCAG policies.
GEOLOGY		
Impact GEO-1 The project site's potential to experience ground rupture is considered low. Nevertheless, impacts relating to ground rupture are considered Class II, *significant but*	The following measure is recommended to address potential concerns about the Beacon Fault. **GEO-1** The significance of the Beacon Fault shall be verified at the Grading Plan stage.	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
mitigable, due to the presence of the Beacon Fault onsite.	During site grading, the final at-grade fault location shall be determined, and, as required by the City Engineer, the location and width of the setback shall be adjusted accordingly.	
Impact GEO-2 The project site would experience substantial groundshaking in the event of an earthquake on any of several faults. However, compliance with UBC requirements would reduce such impacts to a Class III, *less than significant* level.	The project site would experience substantial groundshaking in the event of an earthquake on any of several faults. However, compliance with UBC requirements would reduce such impacts to a Class III, *less than significant* level.	Less than significant.
Impact GEO-3 The project site has a low potential for ground failure. Impacts relating to ground failure are considered Class III, *less than significant.*	None required.	Less than significant.
Impact GEO-4 The project involves grading and development in steeply sloped areas with high landslide potential. Potential impacts relating to landsliding are considered Class II, *significant but mitigable.*	**GEO-4(a)** A definitive determination of potential debris flow hazard shall be completed as a part of a review of 1 inch = 40 feet scale grading plans. Specific mitigation measures for debris flow hazard may consist of avoidance, debris walls or debris basins designed to contain the anticipated volume of debris, building setbacks from the potential debris flow hazard area, or removal of the material susceptible to debris flow. **GEO-4(b)** A more detailed analysis of cut slopes shall be performed at the grading plan stage once 1"=40' scale plans are available. Cut-slopes that will expose bedrock disrupted by the Beacon Fault may also require stability fills to mitigate the potential for surficial instability, and should be evaluated at the Grading Plan stage. The stability of bedding planes below the proposed buttresses shall also be analyzed and presented at the grading plan stage utilizing piezometric surfaces where applicable. A declaratory statement needs to be made in the slope stability section of the report that justifies the use or omission of groundwater (piezomertric surfaces) in the slope stability analyses. Per RTF&A the temporary stability of the backcuts for the recommended stability fills and buttresses will also need to be demonstrated at the grading plan stage along with any backcuts required for the removal of landslides, alluvium or artificial fill. Future anticipated loads from water tanks, buildings or other significant structures should also be incorporated into the stability calculations at the grading plan stage.	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
	GEO-4(c) The future anticipated load(s) from the proposed water tank(s) shall be incorporated into the stability calculations at the Grading Plan stage along with any anticipated future groundwater. **GEO-4(d)** The areas of deep (>40 feet thick) proposed fills shall be evaluated further at the grading plan stage. Any additional requirements of the City Engineer shall be fully implemented. **GEO-4(e)** Recommended removal depths shown on RTF&A's Figure 2.1 (report 10/22/01) range from 3 to 70 feet. The deep removals shall be analyzed in detail at the grading plan stage relative to groundwater conditions and backcut stability. Per RTF&A (2001), uncertified existing fills will be removed prior to the placement of compacted fill. Any unsuitable materials underlying the fills shall also be removed. **GEO-4(f)** In order to reduce the potential for erosion, all cut and fill slopes should be seeded or planted with proper ground cover as soon as possible following grading. The ground cover should consist of drought-resistant, deep-rooting vegetation. A landscaping expert should be consulted for ground cover recommendations. **GEO-4(g)** Implement canyon subdrains in the main drainage areas to receive fill, and backdrains for buttress fills to help protect the proposed fills from groundwater infiltration. **GEO-4(h)** Per standard grading practices, water shall not be allowed to stand or pond on the future graded building pads nor should it be allowed to flow over natural or constructed slopes, but should be directed to the natural slope drainage devices.	
Impact GEO-5 Some onsite soils are potentially expansive. This is considered a Class II, *significant but mitigable impact.*	**GEO-5** If potentially expansive units are encountered in the final pad or street grades, they shall be evaluated by the Project Geotechnical Engineer. Special foundation designs and reinforcement can be utilized to mitigate expansive material. Optionally, the expansive material can be removed to a specified depth determined by the Project Geotechnical Engineer and replaced with compacted fill with very low to non-expansive characteristics, or the expansive soil may be treated with additives to lower the expansion index.	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
HYDROLOGY AND WATER QUALITY		
Impact H-1 During project construction, the soil surface would be subject to erosion and the downstream watershed would be subject to pollution. However, compliance with the requirements of the NPDES permit would reduce these impacts to a less than significant level (Class III).	Implementation of BMPs to be developed as part of the SWPPP for the site would be required (see above). Additional mitigation is not required.	Less than significant.
Impact H-2 The proposed project would increase impervious surface and runoff to Newhall Creek, which could increase the potential for downstream flooding and stream channel erosion. This is considered a Class II, *significant, but mitigable impact.*	**H-2(a)** The drainage plan for the project shall include post-development designs for detention basins and on-site infiltration to reduce Q_{50B} peak discharge to the pre-development level for Newhall Creek. The Los Angeles Flood Control District and the City of Santa Clarita Engineer shall review all hydrology and drainage plans for the site to determine if the drainage plans adequately reduce peak flows to predevelopment levels. **H-2(b)** The RCB under Sierra Highway shall be improved to have adequate capacity to accommodate the Capital Flood. Additionally, the natural channel approaching the RCB shall be improved to prevent flooding of the Highway. Alternatively, a retention basin with adequate capacity to eliminate the need for improvement of the RCB can be provided at the Hondo Oil and Gas site. **H-2(c)** Onsite drainage facilities for the developed areas shall be designed for the 25-year Urban Design Storm. The 50-year Capital Flood storm shall be used for all open channels, closed conduits under major and secondary road, and detention facilities. **H-2(d)** Slope protection along Railroad Canyon and Newhall Creek shall be designed to meet LACPWD standards. Rock riprap slope protection side slopes shall not be greater than 2:1 and gunite side slopes shall be no greater than 1.5:1.	Less than significant.
Impact H-3 Portions of the site are within the 100-year flood zone and may therefore be subject to flooding. This is considered a Class II, *significant, but mitigable impact.*	**H-3(a)** The finished floor elevation of the buildings within the A and AO zones shall be a minimum of 1 foot above the existing adjacent grade. **H-3(b)** The applicant shall obtain a revision to the Flood Insurance Rate Map. This process will first entail a conditional letter of map revision (CLOMR). Then, after the project is built, a letter of map revision	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
	(LOMR) showing the actual "as built" plans shall be submitted. FEMA will require that the CLOMR and LOMR indicate, with supporting technical data, how the sites will be protected from erosive forces. This can be accomplished in a variety of ways, including demonstrating non-erosive velocities or placement of rock rip rap along the channel.	
Impact H-4 With the proposed project, runoff to Newhall Creek could be adversely affected with pollutants such as oil, pesticides, and herbicides. This is considered a Class II, significant but mitigable impact.	**H-4** A Storm Water Management Plan that incorporates Best Management Practices (BMPs) for the long-term operation of the site shall be developed and implemented by the applicant to minimize the amount of pollutants that are washed from the site. The plan shall be developed in accordance with the requirements of the City of Santa Clarita. Examples of BMPs that apply to both initial development of the lots and to long-term operation of the project are listed below. *Education* • Stencil all storm drains inlets and post signs along channels to discourage dumping by informing the public that water flows to the Santa Clara River • Provide educational flyers to each new building unit regarding toxic chemicals and alternatives for fertilizers, pesticides, cleaning solutions and automotive and paint products. • Provide educational flyers to each new building unit regarding proper disposal of hazardous waste and automotive waste. *Source Reduction/ Recycling* • Development of an integrated pest management program for landscaped areas of the project. These areas would include slope-stabilization landscaping, and commercial area landscaping. Integrated pest management emphasizes the use of biological, physical, and cultural controls rather than chemical controls. Examples include use of insect resistant cultivars, manual weed control, use of established thresholds for pesticide and herbicide application, use of chemical controls that begin preferentially with dehydrating dusts, insecticidal soaps, boric acid powder, horticultural oils, and pyrethrinbased insecticides. *Cleaning/ Maintenance*	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
	• Routine cleaning of streets, parking lots and storm drains. Regular maintenance and cleaning of catch basins, debris basins, and siltation basins; maintenance logs shall be regularly submitted to the appropriate agencies. *Structural Treatment Methods* • Catch basin inserts or storm drain devices such as storm cepters shall be installed with the initial development. The use of vegetated swales and strips, infiltration basins of oil separators as needed to manage stormwater pollution from each developed lot shall be provided at the time the buildings are constructed. • Trash storage areas and storage areas for materials that may contribute pollutants to storm water shall be covered by a roof and protected from surface runoff.	
AIR QUALITY		
Impact AQ-1 Construction activity associated with the proposed project would result in the emission of air pollutants, including fugitive dust. Because emissions would exceed SCAQMD significance thresholds, construction impacts are considered Class I, *unavoidably significant.*	**AQ-1(a)** Water trucks shall be used during construction to keep all areas of vehicle movement damp enough to prevent dust from leaving the site. Increased watering is required whenever wind speed exceeds 15 mph. Grading shall be suspended if wind gusts exceed 25 mph. **AQ-1(b)** The amount of disturbed area shall be minimized and on-site vehicle speeds shall be kept to 15 mph or less. **AQ-1(c)** Soil with 5% or greater silt content that is stockpiled for more than two days shall be covered, kept moist, or treated with soil binders to prevent dust generation. Trucks transporting material shall be tarped from the point of origin or shall maintain at least two feet of freeboard. **AQ-1(d) Fugitive Dust Control Measures** • All material excavated or graded shall be sufficiently watered to prevent excessive amounts of dust. Watering should occur at least twice daily with complete coverage, preferably in the late morning and after work is done for the day. • All clearing, grading, earth moving, or excavation activities shall cease during periods of high winds (i.e., greater than 20 mph averaged over one hour) so as	Unavoidably significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
	to prevent excessive amounts of dust. • All material transported off-site shall be either sufficiently watered or securely covered to prevent excessive amounts of dust. • The area disturbed by clearing, grading, earth moving, or excavation operations shall be minimized so as to prevent excessive amounts of dust. • All inactive portions of the construction site shall be seeded and watered until grass cover is grown; or, a sealer is placed over these portions of the site. • All active portions of the construction site shall be sufficiently watered to prevent excessive amounts of dust. **AQ-1(e) General Dust Controls** • All areas with vehicle traffic should be watered periodically, at a minimum, this will require twice daily applications (once in late morning and once at end of workday). • Streets adjacent to the project site shall be swept as needed to remove silt that may have accumulated from construction activities so as to prevent excessive amounts of dust. **AQ-1(f) Ozone Precursor Control Measures:** • Equipment engines shall be maintained in good condition and in proper tune as per manufacturer's specifications. • New technologies to control ozone precursor emissions shall be used as they become available in the future. • The applicant shall use low-VOC architectural coatings in construction whenever feasible and shall coordinate with the SCAQMD to determine which coatings would reduce VOC emissions to the maximum degree feasible.	
Impact AQ-2 Operational emissions associated primarily with projec-generated traffic would exceed SCAQMD significance thresholds for ROC and NO_x. This is considered a Class I, *unavoidably significant* impact.	The proposed project includes a number of features designed to provide transportation alternatives that minimize air emissions. These include the provision of sidewalks and ample landscaping along all project site roads, and a network of hiking/ equestrian trails through the portions of the site that would remain undeveloped. To further reduce emissions associated with the proposed project, the following measures are recommended: **AQ-2(a)** On-site industrial structures shall be	Unavoidably significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
	fitted with photovoltaic roof tiles or other technologies that allow the use of solar energy for heating and lighting to the maximum degree feasible. **AQ-2(b)** Energy-efficient windows shall be installed in all buildings. **AQ-2(c)** On-site parking areas shall be designed to accommodate electric vehicle charging stations.	
Impact AQ-3 Project traffic, together with other cumulative traffic increases in the area, would increase carbon monoxide concentrations at some area intersections. However, because concentrations would remain below state and federal standards, this impact is considered Class III, *less than significant.*	None required.	Less than significant.
TRANSPORTATION AND CIRCULATION		
Impact TC-1 The proposed project would generate significant traffic impacts under City criteria at 13 of 19 study area intersections under existing + project conditions. These impacts are considered Class II, *significant but mitigable.*	Table 4.5-7 summarizes mitigation measures in the form of intersection improvements that effectively mitigate the project's direct impacts.	Less than significant.
Impact TC-2 The proposed project would generate significant traffic impacts under City criteria at 10 of 19 study area intersections under interim year + project conditions. These impacts are considered Class II, *significant but mitigable*	Intersection and roadway improvements will be required in order to maintain acceptable levels of service in the future. Table 4.5-9 in Section 4.5 summarizes these improvements and lists the proposed project's percent share of the improvement. Also included in the table are the ICU values that result from applying the recommended mitigation. For locations where "with-project" conditions are LOS B or better, mitigation consists of payment of Bridge and Thoroughfare District Fees in lieu of specific improvements for that location.	Less than significant.
Impact TC-3 Installation of traffic signals is warranted at each of the new intersections created by the project as well as at the existing Pine Street/San Fernando Road and SR-14 Southbound ramps/San Fernando Road intersection. These impacts are considered Class II, *significant but mitigable.*	In conjunction with project development, traffic signals shall be added at the following intersections: 141. SR-14 SB Ramp & San Fernando Road 215. Pine Street & San Fernando Road 216. 'A' Street & San Fernando Road 217. Sierra Highway & 'A' Street	Less than significant.
Impact TC-4 The proposed project	The following mitigation measures are	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
would not create any significant impacts under Los Angeles County CMP criteria. Impacts relating to CMP criteria are considered Class III, *less than significant.*	recommended to meet Santa Clarita Transit bus stop requirements: **TC-4(a)** Bus stop improvements shall be installed at the following locations: • Southbound 'A' Street, near side of "E" Street • Southbound 'A' Street, at lot line of lots 18 and 19 • Southbound 'A' Street, far side of 'C' Street • North bound 'A' Street, far side of 'C' Street • Northbound 'A' Street, opposite lot line of lots 18 and 19, adjacent to water tank access road • Northbound 'A' Street, far side of "E" Street • Northbound Sierra Highway, far side of 'A' Street • Westbound San Fernando Road, far side of 'A' Street • Eastbound San Fernando Road, near side of 'A' Street **TC-4(b)** All bus stop locations shall be equipped with 10 foot by 20 foot concrete pads placed behind the sidewalk. Concrete pads may require the dedication of additional right-of-way. In a bus stop location, the sidewalk shall touch the street for a length of no less than 80 feet. **TC-4(c)** With respect to the bus stops at the locations of westbound San Fernando Road, far side of 'A' Street, and eastbound San Fernando Road, near side of 'A' Street, the following requirements shall apply: • The stops shall be equipped with bus turnouts and permanent stylized bus shelters. • The shelter shall include a bench and trash receptacle. • Architecture of the shelter shall be approved by City staff. • The shelter shall be hard wired for lighting. • Bus turnouts shall require an additional 12 feet of right-of-way to accommodate their width. **TC-4(d)** At all intersections where there are bus stops, there shall be a safe, traffic-controlled way to cross the street. This may be	

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
	accomplished by either traffic signals, stop signs, or pedestrian overcrossings. At intersections where there are traffic signals or stop signs, crosswalks shall be provided on all four sides of the intersection. **TC-4(e)** The project applicant shall provide a park-and-ride lot at the intersection of San Fernando Road and 'A' Street, or funds in lieu of the lot as provided by the Development Agreement. **TC-4(f)** Although transit impact fees do not apply to the project at this time, the applicant shall pay any fees that may be in place at the time of building permit issuance.	
Impact TC-5 The proposed development would need to provide an estimated 8,891 overall parking spaces to serve the project. Assuming that each individual development onsite complies with its Code requirements for parking, impacts to parking would be Class III, *less than significant.*	None required beyond compliance with the parking requirements outlined in the City's Unified Development Code.	Assuming compliance with applicable parking requirements, no significant impacts are anticipated.
BIOLOGICAL RESOURCES		
Impact BIO-1 Project development would result in the direct permanent loss, and indirect degradation and fragmentation of several "common" habitat types onsite, including Mixed Chaparral, Riversidean Sage Scrub, and Annual Grassland habitats. This is considered a *significant but mitigable* impact (Class II).	**BIO-1(a)** Landscaping within fire clearance zones shall include native species indigenous to the region. Modification of fire hazard fuels shall be limited to hand thinning of individual shrubs, clearing dead fuel, replanting with fire-resistant plants indigenous to the area, or other methods to attain fire safety while producing a viable natural and native vegetation community. No species identified as invasive on the CNPS, Channel Islands Chapter *Invasive Plants List* (1997) shall be utilized in the landscape plans and all landscaping plans shall be prepared by the City and approved by the City and the County Fire Department. **BIO-1(b)** Revegetation and landscaping plans for the graded road areas onsite shall be prepared and approved by the City before each phase of the proposed project. Plant species, seed mixes, weed suppression, and planting methodology, and irrigation schedule shall be approved by a qualified biologist or landscape architect and shall utilize native species from onsite habitats. No species identified as invasive on the CNPS, Channel Islands Chapter *Invasive Plants List* (1997) shall be utilized in the landscape plans and all landscaping plans shall prepared by the City and approved by the City and Fire Department.	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
Impact BIO-2 The proposed project may cause the direct loss of special-status plants identified as List 1B or 4 species by the California Native plant Society (CNPS). This is a Class II, *significant but mitigable,* impact.	**BIO-2** Prior to grading of each development phase, focused surveys shall be conducted during the prior flowering season for the slender and Plummer's mariposa lilies to determine the presence or absence of those special-status plants. If no specimens are found within the development footprint or fire clearance zone, then no additional mitigation is required. In the event either slender or Plummer's mariposa lilies are identified within the development or fire clearance areas, the applicant shall submit a special-status plant restoration plan for review and approval by a City of Santa Clarita Planning Department approved biologist. Target sites for mitigation shall be sampled for soil type and habitat criteria sufficient for the establishment and growth of the affected special-status species. The plan shall additionally include, but not be limited to, the following components: 1) Performance criteria (i.e., what is an acceptable success level of revegetation to mitigate past impacts); 2) Monitoring effort (who is to check on the success of the revegetation plan, and how frequently); 3) Contingency planning (if the effort fails to reach the performance criteria, identify the remediation steps need to be taken); and 4) Irrigation method/schedule (how much water is needed, where, and for how long).	Less than significant.
Impact BIO-3 Development of the proposed project could potentially affect the San Fernando Valley spineflower (SFVS), if present onsite. Potential impacts to this species would be considered Class II, *significant but mitigable.*	Due to the extreme rarity of the SFVS and its known presence at only two locations, the following mitigation measures are required. **BIO-3(a)** In the April-June prior to onsite grading and development of each phase, a survey for the SFVS shall be conducted by a qualified biologist in all Mixed Chapparal, Riversidean Sage Scrub, Annual Grassland, and Disturbed areas where ground disturbance is anticipated. If no SFVS are found, no further mitigation is required. In the event the SFVS is discovered onsite, mitigation measures B-3 (b-d) shall be required. **BIO-3(b)** In the event the SFVS is discovered onsite, the current and anticipated	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
	future distribution of the species shall be mapped by a qualified biologist. The CDFG and City of Santa Clarita shall be formally notified and consulted regarding the presence of this species onsite. If the SFVS becomes federally listed prior to grading of the site, the USFWS shall also be notified. A preservation and management plan shall be prepared for the SFVS by a qualified biologist and shall include, but not be limited to, the following: • Project development shall be located no closer than 200-feet to any SFVS that may be found onsite. This buffer zone shall be designated with appropriate fencing to exclude construction vehicles and public access, but not wildlife access; • Stormwater runoff, irrigation runoff, and other drainage from developed areas shall not pass through areas populated by the SFVS; • Spineflower areas shall not be artificially shaded by structures or landscaping within the adjacent development areas; • Pesticide use shall not be permitted within SFVS areas; • The agency responsible for monitoring the SFVS area during construction and after project completion shall be identified and the frequency and extent of monitoring shall be determined. **BIO-3(c)** In the event it is determined that project development could potentially affect the SFVS, the CDFG shall be contacted to determine the need for a "take permit" under the California Endangered Species Act. If the SFVS is federally listed prior to site grading, the USFWS shall be contacted to determine the need for a take permit under the federal Endangered Species Act. Appropriate mitigation required to minimize or mitigate impacts to the SFVS shall be implemented and may include the following: the creation of a spineflower preserve, establishment of vegetated buffers or other setbacks, drainage modification of the adjacent areas, SFVS revegetation, and monitoring to ensure success of the mitigation.	
Impact BIO-4 The proposed project would directly remove up to 1,100 healthy oak trees and 709 dead or fire damaged oaks, and could indirectly	**BIO-4(a)** All direct impacts to oak trees on site shall be avoided wherever feasible. For oak trees that are affected, an oak tree mitigation program shall be developed pursuant to the	Unavoidably significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
disturb an estimated 551 individual oak trees. An estimated 69 acres, or approximately 34%, of the oak woodland/ forest habitat onsite would be affected. Impacts to oak woodland/forest habitat are considered Class I, *unavoidably significant.*	City's oak tree preservation ordinance. This mitigation program shall include, but not be limited to: • Identifying specific protective measures for protecting and maintaining all oaks within potential encroachment areas; • Mature oak trees and shrubs shall not be removed during preparation of fire clearance zones; • Replacement tree planting, maintenance, and monitoring specifications, which shall at the minimum include the following: 1) Performance and success criteria to ensure that at least 80% of the 500 planted coast live oak trees survive for at least five years; 2) Monitoring effort (who is to check on the success of the revegetation plan, and how frequently); 3) Contingency planning (if the effort fails to reach the performance criteria, identify the remediation steps needed to be taken); 4) Irrigation method/schedule (how much water is needed, where, and for how long); and 5) A final map, corresponding spreadsheet, and impact summary table indicating all oaks to be removed and that reflects impacts resulting from the final approved project. 6) All native California oak trees removed as a result of project implementation shall be replaced with in-kind native California oak tree specimens obtained from regional (i.e., Santa Clarita Valley) stock. **BIO-4(b)** The proposed open space wilderness area and any other wildlife/corridor easement areas and/or fee transfers per previous City agreements shall be deeded and/or secured with the City at the time of final tract map approval.	
Impact BIO-5 The proposed development would cause direct and indirect impacts to CDFG and Corps jurisdictional drainages onsite. This is a Class II, *significant but mitigable* impact.	Compliance with the requirements of the appropriate Corps, CDFG, and RWQCB permits, and implementation of any mitigation measures contained therein, would offset the loss of waters of the U.S. and waters of the state. As discussed in Section 4.3, Hydrology and Water Quality, a National Pollution Discharge Elimination System (NPDES) permit is required for development of the	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
	proposed project. As a result Best Management Practices (BMPs) would be required to minimize impacts to water quality and quantity both onsite and offsite during construction. No additional mitigation is required beyond that specified in Section 4.3, Hydrology. Although the Corps and CDFG will require specific mitigation as part of their permitting processes, the following measures provide minimum requirements for the project. **BIO-5(a)** Impacts to jurisdictional waters shall be mitigated at a minimum ratio of 2:1. **BIO-5(b)** The project applicant shall provide a buffer between development and I riparian habitat associated with drainage FF, which is located directly south of the Eternal Valley Cemetery, as required by CDFG.	
Impact BIO-6 The proposed development would disrupt wildlife movement corridors through the project area, and between the open space areas associated with the San Gabriel and Santa Susana Mountains. This impact is considered *unavoidably significant* (Class I).	**BIO-6(a)** The open space area in lot 55 shall be maintained for continued wildlife access. Dense native vegetation reflecting species currently present onsite shall be planted along the borders of these areas as necessary to provide appropriate cover and resources for wildlife. A pathway for animal movement shall be located between the vegetated buffers. **BIO-6(b)** Solid barrier fencing onsite shall be prohibited around areas that border open spaces or routes of animal movement. Fencing in these areas shall consist of "ranch style" post fencing or barb-wire style fencing. Fencing shall allow at least one-foot of clearance above ground to permit wildlife movement. **BIO-6(c)** Wildlife guzzlers (2) shall be constructed in open space areas along wildlife movement corridors in locations to be determined by a qualified biologist. **BIO-6(d)** The following low-light design features shall be implemented adjacent to open space and wildlife corridor areas: • Low sodium lights shall be used on all roadways to reduce glare and direct it away from wildlife corridor and open space areas; • Streetlight poles shall be of an appropriate height to reduce the glare and pooling of light into open space and corridor areas;	Unavoidably significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
	and • Street light elements shall be recessed or hoods shall be used to reduce glare impacts on open space and corridor areas.	
Impact BIO-7 The proposed development may cause the direct loss of special-status wildlife through conversion of onsite habitats to developed areas. Indirect impacts on special-status wildlife species could occur through the habitat fragmentation and degradation because of the introduction of non-native plants. This impact is considered *significant but mitigable* (Class II).	**BIO-7(a)** Two weeks prior to removal of trees during the raptor nesting season (February through October), a survey for raptor nests shall be made by a qualified biologist. If active nests are located, then all construction work must be conducted at least 500 feet from the nest until the adults and young are no longer dependent upon the nest site. **BIO-7(b)** Not more than two weeks prior to ground disturbing construction within Mixed Chaparral, Riversidean Sage Scrub, and Annual Grassland habitats, a preconstruction survey for the coast horned lizard, coastal western whiptail, coast patch-nosed snake, rosy boa, California horned lark, the Southern California rufous–crowned sparrow and any other special-status species shall be conducted by a qualified biologist. As all potential special-status species that may occur in these habitats are Species of Concern and not formally listed, any individuals found shall be captured, when possible, and transferred to adjacent appropriate habitat within the open space/wilderness preserve onsite.	Less than significant.
NOISE		
Impact N-1 Construction activity would temporarily generate high noise levels on-site. Because noise could exceed thresholds in the City Noise Ordinance, impacts are considered Class II, *significant but mitigable.*	**N-1(a)** All diesel equipment shall be operated with closed engine doors and shall be equipped with factory-recommended mufflers. **N-1(b)** Whenever feasible, electrical power shall be used to run air compressors and similar power tools. **N-1(c)** For all construction activity on the project site, noise attenuation techniques shall be employed as needed to ensure that noise remains below 80 dBA in commercial/industrial areas and below 65 dBA at residences. Such techniques include, but are not limited to, the use of sound blankets on noise generating equipment and construction of temporary barriers between construction sites and affected uses.	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
Impact N-2 Daytime operations are not expected to violate the City Noise Ordinance, but noise levels could exceed Noise Ordinance standards for nearby residential uses if on-site truck activity occurs at night. Impacts relating to project operation are therefore considered Class II, *significant but mitigable.*	The following measures are recommended to minimize the potential for noise disturbance. **N-2(a)** Loading dock operations on Lots 2-4, 7- 9, 14, and 15 shall be oriented away from residential areas. **N-2(b)** Onsite trash pickup services, street and parking lot sweeping, and truck deliveries shall be restricted to between the hours of 7:00 AM and 6:00 PM.	Less than significant.
Impact N-3 Project-generated traffic would incrementally increase traffic noise levels along major roadways in the site vicinity. However, the increases would be less than the significance thresholds; therefore, project-related traffic noise impacts are considered Class III, *less than significant.*	Significant impacts are not anticipated; therefore, mitigation is not required.	Less than significant.
HUMAN HEALTH AND SAFETY		
Impact HHS-1 Several areas on-site potentially have soil and/or groundwater contamination that could pose a risk to human health and safety. This is considered a Class II, *significant but mitigable* impact.	**HHS-1(a)** The sampling program outlined below shall be implemented prior to issuance of grading permits for areas suspected of being contaminated: • Collect soil samples in the vicinity of the former or existing underground storage tanks on the Turner and Stevens property. Complete a geophysical survey to determine if the tanks are still present on the property. • Collect soil samples from beneath the leach lines of the septic tank located on the Turner & Stevens property, formerly utilized by the Elmore Pipe Jacking Facility. • Collect soil samples in the vicinity of any oil wells not previously sampled and any wells not scheduled for abandonment. Also, collect soil samples from directly beneath the former tank farm locations, formerly located on various areas of the property. • Collect soil samples from near the current (SCE and ARCO) and former (Mobil) oil and gas pipeline easements located on the project site. • Collect soil samples from near the railroad tracks located on the western portion of the property. • Collect sediment samples from Newhall creek and its tributary located on the project site.	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
	• Collect soil and groundwater samples on the project site adjacent to the border of the Newhall County Water District property. • Collect groundwater samples from the project site adjacent to the former Newhall Refinery (across Sierra Highway). • Collect soil and groundwater samples from the project site adjacent to the Historic Pioneer Refinery. • Collect soil samples from beneath the three 5-gallon buckets of hydraulic oil observed on the Arklin property. If contamination exceeding regulatory action levels is found in any of the above locations, appropriate remediation shall be undertaken prior to issuance of grading permits for the contaminated areas. Any remedial activity shall be conducted to the satisfaction of the appropriate regulatory oversight agency (for example, the County Health Department, Department of Conservation, Regional Water Quality Control Board, Department of Toxic Substances Control). **HHS-1(b)** The debris and trash, including tires, electrical appliances, mattresses, abandoned automobile and trailer home and miscellaneous empty drums located on various portions of the property, including within Newhall Creek, shall be removed and properly disposed of offsite prior to issuance of grading permits.	
Impact HHS-2 Disturbance of oil and gas lines on-site during site grading could potentially result in hazardous conditions for site workers. Implementation of appropriate safety precautions would reduce such impacts to a Class II, *significant but mitigable* level.	The following measures are recommended for all grading activity in the vicinity of onsite oil or gas pipelines. **HHS-2(a)** Pipeline operators shall be notified in advance of any grading activity in the vicinity of an oil or gas pipeline. Any specific requirements of the operator to avoid disturbance that could create a safety hazard shall be fully implemented. Possible methods to protect underground utilities inlcude dielectric coating, cathodic protection, mortar coating or encase in cement-slurry or concrete. **HHS-2(b)** Prior to grading in the vicinity of oil or gas pipelines, the locations of the pipelines shall be marked. Underground Service Alert shall be notified 48 hours in advance of grading and shall clear the	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
	pipeline locations prior to grading activity.	
Impact HHS-3 Project development would expose site workers to electromagnetic radiation from the high voltage overhead transmission line onsite. However, such hazards are considered Class III, *less than significant.*	None required.	Less than significant.
Impact HHS-4 The project would introduce new industrial park development in the vicinity of the rail line along Pine Street. Although this would incrementally increase the potential for safety conflicts with rail activity, compliance with standard safety requirements would reduce such impacts to a Class III, *less than significant* level.	None required.	Less than significant.
PUBLIC SERVICES		
Impact PS-1 The proposed project would increase demand for fire protection service. However, provision of funding for additional fire protection equipment and facilities, and adherence to guidelines regarding access to all property would reduce the impact to fire protection service to a Class II, *significant but mitigable*, level.	**PS-1(a)** The applicant will provide a fire station site and a helo-pad site as provided in a separate agreement with the County Fire Department. **PS-1(b)** Coordination with the Los Angeles County Fire Department is required in order to determine the need for a fire station within the development and its inclusion in the tract map. If the Fire Department requests an on-site station, a fire station site shall be provided on-site in a location satisfactory to the Department as provided in a separate agreement between the applicant and the County Fire Department. **PS-1(c)** All applicable building codes and ordinance requirements for construction, access, water mains, fire hydrants, fire flows, brush clearance and fuel modification plans must be met. The Los Angeles County Fire Department has set forth specific guidelines regarding access issues. These guidelines are as follows: • The roadway to every building shall be accessible by an all weather surface that is not less than the prescribed width, unobstructed and clear to sky and be extended to within 150' of all portions of the exterior walls. • When a bridge is required as part of a fire access road, it shall be designed for a live load of a minimum of 75,000 pounds.	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
	• The maximum allowable grade shall not exceed 15% except where the topography makes it impractical to keep within such a grade, and then an absolute maximum of 20% will be allowed for up to 150 feet in distance. The average maximum allowed grade, including topography difficulties, shall be no more than 17%. Grade breaks shall not exceed 10% in 10 feet. • No portion of lot frontage shall be more that 200' via vehicular access from a public fire hydrant, and no portion of a building shall exceed 400 feet via vehicular access from a properly spaced public fire hydrant. • A cul-de-sac shall not be more that 500' in length and shall have a turning radius of at least 42'; when extending beyond 200' a hydrant shall be required at the corner and mid-block • On-site driveways shall provide a minimum unobstructed width of 26' clear to sky and are to be within 150 ' of all portions of the exterior walls of the first story of any building. Driveway widths are required to be greater than 26' depending on the height of the building and the amount of parking allowed on the access road. • Limited access devises (gates etc.) shall be 26' wide if used for both directions of travel and 20' if used for one direction of travel. They shall be positioned 50' from a public right-of-way and shall have a turnaround with a minimum of a 32' radius. If an intercom system is used, the 50' shall be measured from the right-of-way to the intercom control device. • Any proposals for traffic calming measures (speed bumps, traffic circles etc.) shall be submitted to the Fire Department for review prior to implementation.	
Impact PS-2 The proposed project would be located in a Very High Fire Severity Zone as designated by the Los Angeles County Fire Department. Impacts relating to wildfire hazards are considered Class II, *significant but mitigable.*	**PS-2(a)** The applicant shall develop a Fuel Modification Plan for all development areas adjacent to or potentially exposed to wildfire hazard areas. The plan shall be subject to review and approval by the Los Angeles County Fire Department Fuel Modification Unit. **PS-2(b)** The landscape palette for the project shall prohibit the use of highly flammable	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
	species near areas of open space. **PS-2(c)** Landscaping of manufactured slopes shall use plant species appropriate for use in fuel modification zones. Use of native plants shall maintain the natural landscape of the project area and will reduce the use of exotic and possibly invasive non-native species.	
Impact PS-3 The project would generate a modest increase in demand for police services. Provision of funding for additional police protection personnel and equipment and adherence to the crime prevention guidelines suggested by the Los Angeles County Sheriff's Department would reduce the impacts to a *significant but mitigable* (Class II) level.	**PS-3** The project shall incorporate the following crime prevention measures: • Adequate lighting in open areas and parking lots • Visibility of doors and windows from public streets and between buildings • Adequate parking spaces in all parking lots • Well lit building address numbers that are large enough to be readily apparent from the street • A four-lane roadway as the major street access through the site (note: this is consistent with the applicant's proposal)	Less than significant.
Impact PS-4 The proposed project would not directly generate additional students at local public schools. Any indirect increase in school enrollment associated with on-site job generation would be mitigated through implementation of applicable developer school impact fees. Impacts to schools are considered Class III, *less than significant.*	The City is strictly limited in the mitigation measures it may impose against developers of residential projects to address school crowding issues. The presumption of State law is that the developer's payment of school impact fees to the local school district, in an amount established by the school districts, would address school capacity impacts.	Less than significant.
Impact PS-5 The proposed project would not directly generate demand for library services. Impacts to libraries would be Class III, *less than significant.*	None required other than payment of standard library fees by future residential developers.	Less than significant.
PUBLIC UTILITIES		
Impact PU-1 Development of the project would generate demand for an estimated 386 acre-feet of water per year. Although the Newhall County Water District would be able to supply the projected demand, impacts to water supply are considered Class II, *significant but mitigable* because of ongoing concerns about regional water supplies.	**PU-1(a)** Interior water conservation measures, as required by the State of California, shall be incorporated into the project. These include, but are not limited to: • Installation of low flow toilets and urinals in all new construction. • Installation of a water heating system and pipe insulation in all new construction to reduce water used before water reaches equipment or fixtures • Installation of self-closing faucets in all lavatories	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
	PU-1(b) Exterior water conservation features as recommended by the State Department of Water Resources, shall be incorporated into the project. These include, but are not limited to: • Landscaping of common areas with low water-using plants • Minimizing the use of turf by limiting it to lawn dependent uses • Wherever turf is used, installing warm season grasses **PU-1(c)** The project shall, to the extent feasible, use reclaimed water for irrigation of landscaping. **PU-1(d)** Landscaped areas shall use vegetation that will eventually naturalize and require minimal irrigation.	
Impact PU-2 Project implementation could potentially affect the existing MWD Foothill Feeder Newhall Tunnel pipeline, which traverses the central portion of the site. Conflicts with MWD right-of-way that could result in an interruption of MWD service or facilities would be considered a Class II, *significant but mitigable,* impact.	**PU-2** During project construction and throughout project operations, the applicant and future occupants shall comply with all requirements of the MWD's "Guidelines for Developments in the Area of Facilities, Fee Properties, and/or Easements of the Metropolitan Water District of Southern California." Per these guidelines, the applicant shall identify on-site MWD facilities on all applicable project maps and plans. The project applicant and/or future occupants shall obtain approval from MWD for all landscaping, structures, or other facilities within the MWD pipeline easement.	Less than significant.
Impact PU-3 Buildout of the proposed project would generate an estimated 0.276 million gallons of wastewater per day. Because the wastewater treatment plants serving the site have adequate capacity to accommodate this amount of wastewater, this impact is considered Class III, *less than significant.*	No mitigation is required. The project site would need to be annexed into District No. 32 so that the LACSD may provide sewage treatment services to the proposed project. In addition, the District's Sphere of Influence would need to be amended to include the project site, and the project applicant would be required to pay the applicable fee for this amendment.	Less than significant.
Impact PU-4 The local wastewater conveyance system is anticipated to be adequate to accommodate project-generated wastewater. Therefore, the impact to the wastewater conveyance system is considered Class III, *less than significant.*	No mitigation is required. The project applicant would be required to pay wastewater conveyance connection fees to the County Sanitation Districts. The connection fee is required so that necessary expansions to the sewage collection system can accommodate new development. In addition, the plans for the necessary pumping station and sewer collection infrastructure will need to be reviewed by Los Angeles County Public Works and approved by the Sanitation Districts and the City of Santa Clarita.	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
Impact PU-5 The proposed project would consume an estimated 107 million kilowatt-hours per year. SCE indicates that it anticipates being able to serve the proposed development; therefore, impacts are considered Class III, *less than significant.*	No mitigation measures are required. The proposed project would be required to comply with energy efficiency standards of California Administrative Code Title 24. To comply with these requirements, the proposed project may include energy conservation measures such as incorporating specialized glass to reduce heating/cooling loads, installing insulation, or using ventilation devices to reduce the demand on heating/cooling systems.	Less than significant.
Impact PU-6 The proposed project would consume an estimated 292 million cubic feet of natural gas per year. Southern California Gas Company could provide service to the project site; therefore, impacts are considered Class III, less than significant.	No mitigation measures are required. Per state and local energy guideline requirements, the proposed project will be required to meet the Energy Building Regulations adopted by the California Energy Commission (Title 24). Meeting these standards would conserve non-renewable natural resources to levels acceptable to the State of California.	Less than significant.
Impact PU-7 The proposed project would generate about 29.1 tons of solid waste per day. Participation in Citywide and Countywide waste reduction efforts would reduce waste sent to area landfills to just under 15 tons per day. Because existing landfills serving the City have adequate capacity to accommodate project-generated waste, impacts related to solid waste are considered Class III, *less than significant.*	**PU-7(a)** Construction contractors shall provide recycling bins for glass, metals, paper, wood, plastic, green wastes, and cardboard during construction. **PU-7(b)** Building materials shall be made of recycled materials, to the greatest extent possible. **PU-7(c)** Reduce yard waste on the project site through the use of xeriscape techniques and the use of drought-tolerant and native vegetation in common area landscaping wherever possible. **PU-7(d)** Business park tenants shall receive educational material on the City's waste management efforts.	Less than significant.
AESTHETICS		
Impact AES-1 The proposed project would alter scenic views from public viewing locations and alter City-designated Primary and Secondary ridgelines. This is considered a Class I, *unavoidably significant* impact.	**AES-1** The proposed water tanks shall be fully screened from public view with landscape material.	Unavoidably significant.
Impact AES-2 The proposed project would produce new sources of light and glare that would extend the area of daytime glare and night light across the currently vacant property, which would alter the nighttime sky. Light and glare impacts are considered Class II, *significant but mitigable.*	**AES-2(a)** Prior to development, proposed lighting shall be indicated on site plans that demonstrate that spill-over of lighting would not affect surrounding areas. The lighting plan shall incorporate lighting that directs light pools downward or otherwise shield adjacent areas from glare. Light fixtures that shield excessive brightness at night shall be included in the	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
	lighting plan. Non-glare lighting shall be used. **AES-2(b)** All lighting of the landscaped areas shall be of an accent nature. Any security lighting shall be screened such that lighting globes are not visible from a distance of more than 20 feet. **AES-2(c)** All on-site street lighting shall use cutoff luminaires. This would avoid creating high levels of glare and light pollution for motorists. **AES-2(d)** Project design and architectural treatments shall incorporate additional techniques to reduce light and glare, such as use of low reflectivity glass, subdued colors for building materials in high visibility areas, and the use of plant material along the perimeter of the structures to soften views.	
Impact AES-3 Project development may include structures and facilities that could be found to be inconsistent with the goals and policies of the City General Plan Community Design Element.	**AES-3** Specific designs of future all on-site development shall adhere to all applicable standards and guidelines of the *Ridgeline Preservation and Hillside Development Ordinance* and the Community Design Element of the General Plan to the satisfaction of the Director of Planning and Building Services.	Compliance with City-adopted standards, guidelines, goals, and policies would ensure that proposed landscaping and structures result in a high quality aesthetic environment that is generally compatible with the surrounding area.
Impact AES-4 Some of the topographic modifications could be considered in conflict with the City's *Ridgeline Preservation and Hillside Development Ordinance*. A determination that the project is consistent with the requirements of the Ordinance would be required for project approval.	Measures BIO-4(a) and BIO-4(b) in Section 4.6, *Biological Resources*, would mitigate oak tree impacts to the degree feasible through development and implementation of an oak tree replacement program that As discussed in Section 4.1, *Land Use*, in order for the project to be approved, the City Planning Commission would need to make the following findings relative to the City's Ridgeline Preservation and Hillside Development Ordinance and Guidelines: • The proposed use is proper in relation to adjacent uses, the development of the community and the various goals and policies of the General Plan. • The use or development will not be materially detrimental to the visual character of the neighborhood or community, nor will it endanger the public health, safety or general welfare. • The appearance of the use or development will not be different than the appearance of adjoining ridgeline	The City Planning Commission would need to make the findings discussed above in order to approve the project as proposed.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
	areas so as to cause depreciation of the ridgeline appearance in the vicinity. • The establishment of the proposed use or development will not impede the normal and orderly development and improvement of surrounding property, nor encourage inappropriate encroachments to the ridgeline area. • It has been demonstrated that the proposed use or development will not violate the visual integrity of the significant ridgeline area through precise illustration and depiction.	
CULTURAL RESOURCES		
Impact CR-1 The proposed project would not disturb any known archaeological resources; however, site development has the potential to disturb as-yet undetected areas of prehistoric archaeological significance. This is considered a Class II, *significant but mitigable*, impact.	**CR-1(a)** Should unanticipated cultural resource remains be encountered during construction or land modification activities, the applicable procedures established by the Advisory Council on Historic Preservation concerning protection and preservation of Historic and Cultural Properties (36 CFR 8700) should be followed. In this event, work shall cease until the nature, extent, and possible significance of any cultural remains can be assessed and, if necessary, remediated. If remediation is needed, possible techniques include removal, documentation, or avoidance of the resource, depending upon the nature of the find. **CR-1(b)** In the event that human remains are discovered during construction or land modification activities, the procedures in Section 7050.5 of the California Health and Safety Code shall be followed. These procedures require notification of the coroner and the Native American Heritage Commissions if the coroner determines the remains to be of Native American ancestry.	Less than significant.
Impact CR-2 The proposed project would not directly affect any identified significant historic resources. However, possible indirect impacts to the Pioneer Oil Refinery are considered Class II, *significant but mitigable.*	**CR-2(a)** As provided in the Development Agreement, the applicant shall make a payment to the City which the City, at its discretion, may apply towards the construction of a new fence that will be effective in preventing unauthorized individuals from entering the Pioneer Oil Refinery site. **CR-2(b)** Construction contractors shall take precautions to either avoid using heavy equipment in the vicinity of the acid tank on the Refinery property or stabilize the acid tank to prevent its collapse and potential destruction. **CR-2(c)** The drainage system for the areas surrounding the Refinery shall be designed to	Less than significant.

Table ES-1 Summary of Environmental Impacts, Mitigation Measures, and Residual Impacts

Impact	Mitigation Measures	Significance After Mitigation
	prevent any further deposition of materials onto the Refinery site.	
RECREATION		
Impact REC-1 The project would remove existing informal trails on portions of the project site. However, these trails and recreational use of the project site are on private property and do not constitute public recreational resources. Therefore, this impact is considered Class III, *less than significant.*	None required.	Less than significant.
Impact REC-2 The proposed industrial park may create demand for daytime recreational facilities. However, it would not directly generate additional resident population and therefore would not conflict with City park standards. In addition, the project would provide additional recreational amenities on-site. The impact relating to demand for recreation is considered Class III, *less than significant.*	None required.	Less than significant.
Impact REC-3 The proposed project would provide a trail system that appears to generally meet City standards. This is considered a Class III, *less than significant* impact.	Although the proposed trail system appears to generally meet the intent of City policies relating to provision of trails, the following measures are recommended to maximize the utility of the system and minimize the potential for safety conflicts. **REC-3(a)** The on-site trail system should provide a direct connection to William S. Hart Park. The applicant shall coordinate with the County of Los Angeles to determine the most appropriate location for such a connection. **REC-3(b)** All trail crossings of internal roadways shall be appropriately signed and/or striped to alert drivers to the presence of a crossing. **REC-3(c)** Trail easements for areas going through or across manufactured slopes or outside of road rights-of-way shall be included in the trail plan. **REC-3(d)** A water meter for City use shall be included onsite. **REC-3(e)** Onsite trails shall include safety fencing as required by the City Parks Department.	Less than significant.

Attachment 23-D

TOPICAL RESPONSE 1: CLWA'S 41,000 AFY WATER TRANSFER

California Water Impact Network (C-WIN) and Friends of the Santa Clara River (Friends) have submitted comments on the Draft Additional Analysis for the Gate-King Industrial Park project, claiming that the Additional Analysis should not include or rely on the transfer in 1999 to Castaic Lake Water Agency (CLWA) of 41,000 acre-feet per year (afy) of State Water Project (SWP) Table A water supplies (hereafter referred to as "41,000 afy water transfer"). They assert that the Additional Analysis should not include or rely on CLWA's 41,000 afy water transfer because it is the subject of litigation and on that basis they claim it is not "final."

In addition, C-WIN states that the 41,000 afy water transfer is "further compromised" by recent court decisions concerning regional water supplies. It is asserted that these litigation challenges create uncertainty regarding the availability and reliability of water supplies for the Santa Clarita Valley. Please refer to **Topical Response 2: Litigation Concerning Water Supplies**, which discloses various litigation matters concerning water supplies, summarizes the status of such litigation, and explains why the City of Santa Clarita (City) concurs with conclusions reached by the expert water agencies, CLWA, Newhall County Water District (NCWD), Valencia Water Company, and Santa Clarita Water, a Division of CLWA (SCWD), that it is appropriate to include the 41,000 afy water transfer as part of CLWA's available SWP water supplies for planning purposes.

For the reasons discussed below, the City has determined that it is appropriate for the Gate-King Industrial Park Additional Analysis to rely on CLWA's SWP water supplies, including the 41,000 afy water transfer.

1. SWP OVERVIEW

As stated in the Gate-King Industrial Park Additional Analysis, from 1951 through 1959, the California Legislature authorized and funded construction of the SWP facilities, which are managed and operated by the California Department of Water Resources (DWR). SWP water supplies are used for both urban and agricultural uses throughout California.[1] The SWP facilities consist of a complex system of dams, reservoirs, power plants, pumping plants, canals, and aqueducts to deliver water throughout California.

At the inception of the SWP, DWR entered into individual water supply contracts with agricultural and urban water suppliers (SWP contractors). The contracts were the method used to fund construction and operation of the SWP facilities for the delivery of water to the SWP contractors. Each such contract sets forth the annual amount of water to which a SWP contractor is contractually entitled, which is stated in

1 Urban water uses also are referred to as "municipal and industrial," or "M&I," uses.

"Table A" to the contract (Table A Amount or allocation). However, the amount of SWP water actually available for delivery in any year may be an amount less than the contractor's maximum Table A amount due to hydrology, operational constraints, environmental constraints, and a number of other factors. The Table A Amount was previously referred to as "SWP entitlement."[2]

There are currently 29 SWP contractors that have entered into water supply contracts with DWR. A SWP contractor may annually request that DWR deliver water in the following year in any amount up to the SWP contractor's Table A Amount. The SWP contracts provide that in a year when DWR is unable to deliver the full amount of contractor requests, deliveries to contractors are reduced so that total deliveries equal total available supply for that year. CLWA's annual contractual Table A Amount is 95,200 afy. In the fall of each year, CLWA, along with all the other SWP contractors, submits a request to DWR for an allocation for the following year. DWR utilizes the factors noted above to "allocate" water among all contractors who have made requests, so that each contractor receives a percentage of its Table A Amount.

For example, if the SWP allocation is 40 percent of the Table A Amounts, each contractor receives 40 percent of its Table A Amount. If the allocation is 100 percent (as in 2006), each SWP contractor could receive the entire contractual Table A Amount. Therefore, CLWA's annual allocation is based on its total contractual Amount. **Table 1** indicates the actual Table A allocations made through the SWP since 1978.

The 41,000 afy water transfer amount is not kept "separate" as some have suggested. Since 2000, DWR has been including the 41,000 afy in the Table A Amount that is allocated in all allocations made to CLWA (based on its total annual allocation of 95,200 acre-feet). DWR has been *delivering* and the CLWA service area *receiving* water supply, including a percentage of the 41,000 afy, since calendar year 2000. While SWP contractors that receive water from the Delta currently hold Table A Amounts totaling approximately 4.13 million afy, the amount of Table A water actually delivered by the SWP may be less in some years due to hydrology, and operational and environmental constraints. Given existing SWP facilities, hydrology, operational and environmental conditions, and SWP contractor demands, the SWP is available to meet 100 percent of the SWP contractors' Table A requests this year (2006).[3] This 100

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2 As stated by the Court of Appeal in *Santa Clarita Organization for Planning the Environment v. County of Los Angeles* (2003) 106 Cal.App.4th 715, SWP Table A "entitlements" *are not equivalent to actual deliveries of water* because the amount of SWP water actually available for delivery in any given year may be an amount less than the Table A Amount. For example, the amount of SWP water actually available for delivery in any given year may be *reduced* due to several factors, including drought periods, increased SWP operational constraints, environmental water requirements/constraints (e.g., the listing of several fish species as endangered or threatened), water quality concerns, and other factors.

3 See, DWR *"News for Immediate Release,"* dated April 18, 2006, which is found in **Appendix J** of the Final Additional Analysis.

percent allocation of the Table A Amount to SWP contractors would add up to 4.13 million afy, distributed among the SWP contractors.[4]

Table 1
Actual SWP Annual Allocations

Year	Percent Allocation	
	To Agricultural Contractors	To Urban (M&I) Contractors
1978 to 1989	100	100
1990	50	100
1991	0	30
1992	45	45
1993	100	100
1994	50	50
1995	100	100
1996	100	100
1997	100	100
1998	100	100
1999	100	100
2000	90	90
2001	39	39
2002	70	70
2003	90	90
2004	65	65
2005	90	90
2006	100	100

Source: California Department of Water Resources, State Water Project Analysis Office, 2006.

This available supply varies from year to year. For example, in 2003, DWR approved deliveries of Table A Amount allocations, totaling 3.71 million acre-feet (or 90 percent of the 4.13 million acre-foot Table A Amount).[5] In 2002, DWR approved deliveries of Table A Amounts, totaling 2.89 million acre-feet (70 percent).[6] In 2001, DWR approved deliveries of Table A Amounts, totaling 1.61 million acre-feet (39 percent),[7] and in 2000, DWR approved deliveries of Table A Amounts, totaling 3.42 million acre-feet (90 percent).[8]

4 The original long-term water supply contracts between DWR and the SWP contractors assumed maximum annual Table A water deliveries of 4.23 million afy, assuming full development of the SWP. Currently, the maximum Table A Amounts for the SWP contractors that receive their supply from the Delta total approximately 4.13 million afy. (See, Final Additional Analysis, **Appendix AQ** [*SWP Delivery Reliability Report*, Public Review Draft, November 16, 2005, p. 7].)

5 See, DWR Bulletin 132-04, *Management of the California State Water Project*, September 2005, excerpts of which are provided in **Appendix O** of the Final Additional Analysis.

6 See, DWR Bulletin 132-03, December 2004 (**Appendix N** of the Final Additional Analysis).

7 See, DWR Bulletin 132-02, January 2004 (**Appendix M** of the Final Additional Analysis).

8 See, DWR Bulletin 132-01, December 2002 (**Appendix L** of the Final Additional Analysis).

The original plan for the SWP included constructing additional water storage and conveyance facilities as SWP contractor demands increased; however, very little new construction of SWP storage facilities has occurred since the SWP facilities were initially completed, and those facilities were never fully completed as contemplated in the 1950s. Although future construction or other actions could improve the quantity and reliability of SWP supplies, those actions would entail their own environmental reviews, potential litigation delays, and multi-year constructions periods.

2. CLWA'S 41,000 AFY WATER TRANSFER ACQUISITION

In 1999, CLWA purchased 41,000 afy of SWP Table A Amount from Kern County Water Agency (KCWA), acting on behalf of its member district, Wheeler Ridge-Maricopa Water Storage District. This purchase brought CLWA's total annual SWP Table A Amount to 95,200 afy; that purchase is generally referred to as the 41,000 afy water transfer.

The 41,000 afy water transfer was memorialized in a DWR/CLWA water supply contract amendment (Amendment No. 18), which reflects the *increase* in CLWA's annual allocation of SWP Table A Amounts from 54,200 afy to 95,200 afy. This increase reflects the permanent allocation of the 41,000 afy to CLWA (95,200 - 54,200 = 41,000).[9] As reported in the Gate-King Industrial Park Additional Analysis, the 41,000 afy water transfer has been completed, CLWA paid approximately $47 million for the additional Table A Amount, the monies have been delivered, the sales price has been financed through CLWA by tax-exempt bonds, and DWR increased CLWA's SWP Table A allocation, starting in calendar year 2000, because it was a permanent transfer/reallocation of SWP Table A water between SWP contractors.

Some comments have suggested that CLWA's 41,000 afy water transfer has not been approved by DWR. This is not correct. The 41,000 afy water transfer was approved by DWR on March 31, 1999, in the fully-executed amendment to CLWA's water supply contract (Amendment No. 18). Other comments have asserted that the 41,000 afy water transfer was not a "permanent" transfer of SWP Table A water. This also is incorrect. As stated by DWR in Bulletin 132-00, dated December 2001, at page 94, Amendment No. 18 "provided for the *permanent* transfer of 41,000 afy of SWP agricultural entitlement by CLWA from KCWA, . . . The transfer is consistent with implementation of the Monterey Amendment, which provides for the *permanent* transfer of up to 130,000 afy of agricultural entitlement to urban agencies." (Emphasis

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9 A copy of "Amendment No. 18 to the Water Supply Contract between the State of California, Department of Water Resources and Castaic Lake Water Agency," dated March 31, 1999, is presented in **Appendix A** of the Final Additional Analysis.

added.) Importantly, since 2000, DWR has included the 41,000 afy in all allocations made to CLWA, based on CLWA's total annual Table A allocation of 95,200 acre-feet.[10]

To further support the fact that CLWA's 41,000 afy water transfer was a "permanent" transfer/ reallocation of SWP Table A Amount from one SWP contractor to another, in Bulletin 132-04 (September 2005), at page 120, DWR identified all eight Table A transfers, including the 41,000 afy water transfer, as "permanent" transfers under the Monterey Amendments. Furthermore, DWR has confirmed that the parties to the Monterey Settlement Agreement "recognize that the Kern-Castaic Lake Water Agency 41,000 afy Table A transfer is subject to pending litigation and agree that jurisdiction with respect to that litigation remain[s] in the Los Angeles County Superior Court and that nothing in the [Monterey Settlement Agreement] is intended to predispose the remedies or other actions that may occur in the pending litigation." In that same Bulletin, at page 120, DWR has also pointed out that the potential environmental effects of all eight "permanent Table A transfers" under the Monterey Amendments, including the 41,000 afy water transfer, will be analyzed in DWR's new Monterey EIR.[11] (The Monterey Amendments and related Monterey Settlement Agreement are discussed in further detail below). Thus, there is no basis to distinguish the 41,000 afy transfer and the other permanent Table A transfer, except for the California Environmental Quality Act (CEQA) litigation discussed in **Section 6.**

3. MONTEREY AMENDMENTS

In 1994, disputes arose between DWR and many agricultural and urban SWP contractors regarding the availability and distribution of water through SWP facilities. To avoid potential litigation, those parties met in Monterey, California, to attempt to resolve their ongoing disputes and, after negotiations, they agreed to a statement of principles, which became known as the "Monterey Agreement." The Monterey Agreement, signed by DWR and many of the agricultural and urban SWP contractors, established principles to be incorporated into contract amendments (the "Monterey Amendments"), which were primarily intended to increase the reliability of all SWP water supplies, stabilize SWP's rate structure, and increase water management flexibility for all SWP contractors. To date, all but two SWP contractors have accepted the Monterey Amendments. The Monterey Amendments included, among other benefits, water transfers among SWP contractors. Specifically, under the Monterey Amendments, SWP contractors may transfer unneeded Table A water to other contractors on a permanent basis, which provides financial relief from SWP charges for the seller and additional water supplies for the buyer. The Monterey

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10 Please see **Appendix R** through **X** of the Final Additional Analysis for DWR's "Notices to State Water Project Contractors," informing them of increases or decreases in approved Table A Amounts from 2000 to 2006. In the 2006 Notice, CLWA's Table A allocation is shown as 95,200 afy, and in all of the prior Notices, CLWA's Table A allocation is shown in two places, once under the "San Joaquin Valley" heading, which shows the allocation at 12,700 afy, and again under the "Southern California" heading, which shows the allocation at 82,500 afy, totaling 95,200 afy.

11 See, DWR Bulletin 132-04 (September 2005), p. 120 (**Appendix O** of the Final Additional Analysis).

Amendments have facilitated the transfer of 130,000 afy of SWP Table A Amounts from agricultural to urban SWP contractors.[12] Many such transfers were implemented soon after the Monterey Amendments became effective. CLWA's 41,000 afy water transfer was one of the water transfers effected by the Monterey Amendments.

4. ENVIRONMENTAL REVIEW OF MONTEREY AMENDMENTS AND SUBSEQUENT LITIGATION

A Program EIR was prepared and certified to analyze the environmental effects of implementing the Monterey Agreement/Monterey Amendments. The adequacy of the Program EIR was challenged in litigation filed in 1995 in the Sacramento County Superior Court, and the Superior Court upheld the adequacy of the Program EIR. Before and after the Sacramento County trial court's decision, DWR and the agricultural and urban SWP contractors who had executed the Monterey Agreement began implementing various amendment provisions, including the completion of permanent transfers of Table A Amounts among agricultural and urban SWP contractors. Again, CLWA's 41,000 afy water transfer was one of eight water transfers effectuated by the Monterey Amendments. The trial court's decision was subsequently appealed. On appeal, the petitioners sought an injunction to prevent further implementation of the Monterey Agreement during the appeal. However, the appellate court denied the requested injunction.

The appellate court ultimately reversed the trial court's decision. The appellate court held that the Program EIR was improperly prepared by the Central Coast Water Agency, as "Lead Agency" under CEQA, rather than by DWR, which should have been the "Lead Agency." The appellate court also found that the EIR did not sufficiently discuss implementation of a "no project" alternative, and concluded that a new EIR must be prepared and certified.

The appellate court then remanded the case to the Sacramento County trial court and directed that the trial court issue a writ of mandate vacating certification of the EIR and retaining jurisdiction until DWR, as lead agency, prepared and certified an EIR in accordance with CEQA. The appellate court further directed that the trial court consider whether the Monterey Amendments may continue to be

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12 Neither the Monterey Agreement nor the Monterey Amendments created a new right to carry out permanent transfers of SWP Table A Amounts. That right had existed since the early 1960s through Article 41 of the SWP contracts. The Monterey Amendments simply provided a vehicle through which the SWP agricultural contractors promised that they would support such Article 41 transfers up to 130,000 acre feet. The Monterey Amendments also did not limit the SWP contractors' rights to implement permanent transfers under existing law other than those described in the Monterey Amendments. (See, e.g., Water Code §§382, 383.)

implemented while the new EIR is being prepared. (*Planning & Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892.)[13]

The appellate court decision invalidated certification of the Program EIR, but did not set aside, invalidate or otherwise vacate the Monterey Amendments or enjoin the water transfers effected thereunder. Instead, the appellate court directed the trial court to consider under CEQA whether the Monterey Amendments should remain in place pending DWR's preparation of a new EIR, and to retain jurisdiction pending certification of that EIR. In addition, no court orders have ever been issued to "stay" further implementation of the Monterey Amendments.

5. THE MONTEREY SETTLEMENT AGREEMENT

In March 2001, before the Sacramento County trial court had acted on remand, the parties to the *PCL* litigation entered into settlement negotiations. In May 2003, DWR, Central Coast Water Authority, Planning and Conservation League, certain SWP contractors (including CLWA) and other entities entered into a final settlement of the *PCL* litigation (the "Monterey Settlement Agreement").[14] Under the Monterey Settlement Agreement, the parties expressly agreed that the SWP would continue to be administered and operated in accordance with both the Monterey Amendments and terms of the Monterey Settlement Agreement:

> *"Pending the Superior Court's issuance of an order discharging the writ of mandate in the underlying litigation, the Parties will jointly request that the Superior Court enter an order approving this Settlement Agreement, and an order, pursuant to California Public Resources Code Section 21168.9, authorizing on an interim basis the administration and operation of the SWP . . . in accordance with the Monterey Amendments, [and] the terms of this Settlement Agreement. ..." (Final Additional Analysis,* ***Appendix AF*** *[Monterey Settlement Agreement, p. 9].)*

The Monterey Settlement Agreement did not set aside, invalidate, or otherwise vacate the Monterey Amendments, or any of the water transfers effectuated under the Monterey Amendments. On June 6, 2003, the Sacramento County Superior Court issued the requested order, pursuant to CEQA (Pub.Res.Code Section 21168.9), approving both the Monterey Settlement Agreement and the administration and operation of the SWP pursuant to the Monterey Amendments and the terms of the approved agreement.[15]

Section III(C)(4) of the Monterey Settlement Agreement required DWR to carry-out an "[a]nalysis of the potential environmental effects relating to" eight water transfers under the Monterey Amendments,

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13 The decision, *Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892, hereafter referred to as "*PCL*," is presented in **Appendix AI** of the Final Additional Analysis.

14 The Monterey Settlement Agreement is presented in **Appendix AF** of the Final Additional Analysis.

15 The Sacramento County trial court's Order is presented in **Appendix AR** of the Final Additional Analysis.

seven so-called "Attachment E Transfers" and the 41,000 afy water transfer, also referred to in the agreement as the "Kern-Castaic Transfer." Further, the Monterey Settlement Agreement obligated DWR to evaluate all eight of the water transfers in the same manner, even though seven of them, defined in the agreement as the "Attachment E Transfers," were no longer subject to legal challenge. (See, Final Additional Analysis, **Appendix AF** [Monterey Settlement Agreement, Sections III(C)(4), III(D), III(E), pp. 11-12].) The point of the DWR review of the eight transfers was not to determine whether to continue the transfers, because seven of them beyond CEQA challenge, and the eighth, the 41,000 afy transfer, was also a permanent transfer, but it was still subject to litigation. Rather, the point of the DWR review of all eight transfers was to examine the environmental effects of such transfers in light of the Monterey Agreement as a whole.

In fact, Section III(D) of the Monterey Settlement Agreement affirmed that none of the parties could challenge the effectiveness or validity of the Attachment E Transfers, which had been litigated in other forums or had become final without challenge by the expiration of applicable statutes of limitations. According to CLWA and other signatories to the Agreement, this is why Section III(D) referred to the Attachment E Transfers as "final." (See, Final Additional Analysis, **Appendix AF** [Monterey Settlement Agreement, Section III(D), p. 12].) The 41,000 afy water transfer was not included among the Attachment E transfers, only because the 41,000 afy water transfer was then under the jurisdiction of the Los Angeles County Superior Court and that litigation was ongoing.[16]

Section III(E) protects the jurisdiction of the Los Angeles County Superior Court in connection with the then-pending CEQA litigation challenging the validity of CLWA's EIR on the 41,000 afy water transfer. Section III(E) states, in part: "nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation." As set forth below, Section III(E) provides:

> *"Acknowledgement and Agreement Regarding Kern-Castaic Transfer [the 41,000 afy water transfer]. With respect to Section III(C)(4)(b) regarding the Kern-Castaic Transfer, the Parties* recognize that such water transfer is subject to pending litigation in the Los Angeles County Superior Court *following remand from the Second District Court of Appeal. (See* Friends of the Santa Clara River v. Castaic Lake Water Agency, *95 Cal.App.4th 1373, 116 Cal.Rptr.2d 54 (2002);* review denied *April 17, 2002.) The Parties agree that* jurisdiction *with respect to that litigation should* remain *in that court and that* nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation." (Emphasis added.) *(Final Additional Analysis, **Appendix AF** [Monterey Settlement Agreement, Section III(E), p. 12].)*

16 In Section VII(I), the parties further agreed that, should the certification of DWR's new EIR be challenged, the challenging parties must stipulate to the continued administration and operation of the SWP during the pendency of that challenge, and, should that challenge be successful, during any future challenges to future DWR EIR's. In turn, Section VII(I), subdivision (1), limits the grounds on which DWR's return to the writ of mandate can be legally challenged, and Section VII(J) prohibits any future litigation challenging the validity of any Monterey Amendments (or any portions thereof). Finally, Sections VII(L) and IX provide that all disputes regarding the Monterey Settlement Agreement must be mediated.

The Monterey Settlement Agreement does not preclude CLWA, a signatory to that agreement, from using the 41,000 afy water transfer as part of its overall SWP Table A supplies for planning purposes. First, the language of the Monterey Settlement Agreement, quoted above, does not state that CLWA may not rely on the 41,000 afy water transfer (also referred to as the Kern-Castaic transfer). Second, nothing in the Monterey Settlement Agreement precludes a project EIR from referencing and using all of CLWA's SWP Table A supplies in analyzing available water supplies for the Santa Clarita Valley. Given that the 41,000 afy water transfer was specifically covered by the Monterey Settlement Agreement, if the parties to that agreement had intended to preclude reliance on the 41,000 afy water transfer, they surely could and would have spelled out that prohibition. Rather than prohibiting CLWA or others from relying on the 41,000 afy water transfer, the Monterey Settlement Agreement simply clarified that the transfer was (and remains today) under the jurisdiction of the Los Angeles County Superior Court.

In addition, the Monterey Settlement Agreement allows implementation of the Monterey Amendments and validates the water transfers that already had taken place by the time that agreement took effect. The only reason the 41,000 afy water transfer was not included on the list of "final" transfers in Attachment E for purpose of that agreement was that it was the subject of ongoing litigation. The 41,000 afy water transfer was both a permanent and final reallocation of SWP Table A Amounts from one SWP contractor to another (CLWA), just as were the other seven transfers; the pending 41,000 afy water transfer litigation did not convert that transfer from permanent to temporary.

Importantly, DWR, itself, includes the 41,000 afy to CLWA in its published "Notices to State Water Project Contractors." For example, on April 18, 2006, DWR sent its notice to SWP contractors stating that DWR was increasing its allocation of 2006 SWP water to its contractors. The table attached to that Notice listed all such contractors' Table A Amounts, and their approved allocations. CLWA's Table A Amount is listed under the Southern California heading in the amount of 95,200 afy, which includes CLWA's 41,000 afy. If DWR, the agency that administers the SWP, did not consider CLWA's 41,000 afy water transfer to be both a permanent and final reallocation of SWP Table A Amounts, it would not publish CLWA's total Table A allocation at 95,200 afy.[17]

Contrary to comments received from C-WIN and Friends, which attempt to place a cloud over CLWA's reliance upon the 41,000 afy water transfer, the terms of the Monterey Settlement Agreement make clear that the agreement was intended to protect the Los Angeles County Superior Court's jurisdiction in the pending 41,000 afy water transfer litigation. Nothing in that agreement characterized the 41,000 afy water transfer as not final. And, nothing in that agreement prohibited any party, agency, or other entity from relying on the 41,000 afy water transfer for planning purposes.

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17 DWR's April 18, 2006, "Notice to State Water Project Contractors" is presented in **Appendix S** of the Final Additional Analysis.

6. CLWA ENVIRONMENTAL REVIEW OF 41,000 AFY WATER TRANSFER AND LITIGATION

Prior to completion of the 41,000 afy water transfer, the proposed transfer was the subject of environmental review by CLWA and KCWA and its member district. The agencies selling the 41,000 afy of SWP Table A Amount to CLWA assessed the environmental consequences of the proposed transfer within their service area in a Final EIR, dated June 1998. That EIR was certified in 1998 and was not challenged in court. As a result, that EIR is conclusively presumed to be valid (Pub. Res. Code §21167.2).

CLWA also prepared a supplemental Final EIR, which assessed the environmental effects of CLWA's acquisition of the 41,000 afy within its service area. The Board of Directors of CLWA certified the Supplemental Final EIR in March 1999. Thereafter, in April 1999, a lawsuit was brought in the Los Angeles County Superior Court challenging the adequacy of the EIR under CEQA (*Friends of the Santa Clara River, et al. v. Castaic Lake Water Agency, et al.*, Case No. BS 056954, also referred to as "*Friends*"). The Los Angeles County trial court in the *Friends* litigation ruled in favor of CLWA and upheld the adequacy of the EIR under CEQA.

In October 2000, the *Friends* petitioners filed an appeal. During the pendency of the *Friends* appeal, the Third District Court of Appeal issued the *PCL* decision, which found the Monterey EIR inadequate and ordered it decertified.[18] On appeal in *Friends*, the Second District Court of Appeal considered the *Friends* petitioners' multiple arguments, and concluded that CLWA's EIR on the 41,000 afy water transfer must be decertified, not because the EIR was substantially inadequate or failed to support the analysis of the transfer's approval, but only because it had been "tiered" from the Monterey EIR, recently found to be inadequate:

> *"We have examined all of appellant's other contentions and find them to be* without merit. *If the* PCL/*tiering problem had not arisen,* we would have affirmed the judgment."[19] (Emphasis added.)

Nonetheless, like the Third District Court of Appeal in the *PCL* decision, the Second District Court of Appeal in *Friends* refused to issue any ruling affecting CLWA's ability to continue to rely on the 41,000

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18 Please refer to **Appendix AI** of the Final Additional Analysis for the *PCL* decision.

19 The January 2002 *Friends* decision entitled, *Friends of the Santa Clara River v. Castaic Lake Water Agency* (2002) 95 Cal.App.4th 1373, is found in **Appendix AA** of the Final Additional Analysis. The *Friends* decision provides useful factual background information concerning the Monterey Amendments, the Monterey Amendments EIR, water transfers authorized by the Monterey Amendments, the local agency environmental review of the 41,000 afy water transfer, CLWA's acquisition of the 41,000 afy, and the relationship between the *PCL* decision and the *Friends* decision. See, Final Additional Analysis, **Appendix AA** [*Friends* decision, pp. 1376-1384].

afy water transfer, leaving it to the trial court's discretion whether or not to enjoin CLWA's use of the water pending its completion of a new EIR.[20]

In December 2002, on remand to the Los Angeles County Superior Court, the *Friends* petitioners sought to enjoin CLWA's use of, and reliance upon, the 41,000 afy water transfer under CEQA, but the trial court rejected that request. Specifically, the trial court maintained its jurisdiction over the matter and authorized CLWA to utilize any of the 41,000 afy subject to the following order:

> *"Respondent [CLWA] will not be prohibited from using the water to which it is entitled, but Petitioner may renew its application for such prohibition based upon evidence of the actual use of such additional water for purposes it considers improper."*[21]

The *Friends* petitioners never pursued the trial court's suggestion for them to "renew" their request to prohibit the use of the 41,000 afy water transfer "based upon evidence of the actual use of such additional water for purposes it considers improper." Instead, the *Friends* petitioners appealed the trial court's judgment and, again, requested that the use of the 41,000 afy water transfer be prohibited.

However, on December 1, 2003, in an unpublished decision, the Second District Court of Appeal affirmed the trial court's ruling allowing CLWA to utilize and rely on the 41,000 afy water transfer pending completion of its new EIR.[22] Significantly, petitioners and others in the *Friends II* decision argued that the trial court's determination of whether to enjoin CLWA's use of the 41,000 afy water transfer should be based on the status of the *PCL* litigation and DWR's new EIR for the Monterey Amendments the same argument they advance here. In making that argument, they relied on language in the original *Friends* decision in which the Court of Appeal suggested that *as one option* CLWA "may be able to cure the *PCL* problem by awaiting action by the DWR complying with the *PCL* decision, then issuing a subsequent EIR, supplement to EIR, or addendum to EIR . . . tiering upon a newly certified Monterey Agreement EIR."[23] The Court of Appeal in *Friends II*, however, rejected this argument, explaining:

> *"Amici misapprehend our directions to the trial court. As explained above, those directions are found in the dispositional language of our opinion. That language directed the trial court,* inter alia, *to "consider such orders it deems appropriate under [Pub.Res.Code] section 21168.9." [Citation.] That section grants the trial court broad powers to fashion equitable relief. [Note.]* Amici's argument that the exercise of said discretion was to be based upon the status of either the PCL litigation or the new EIR for the Monterey Agreement is at odds with the clear dispositional language we employed. *The two paragraphs in our opinion upon which* amici *rely were merely suggestions as to how respondent could proceed and a statement that, in exercising its discretion whether to grant equitable relief pending completion of a new EIR for this project, the trial court could ascertain, and if it so chose, rely upon the status of the PCL litigation*

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20 See, Final Additional Analysis, **Appendix AA** [*Friends* decision, p. 1388].

21 For the trial court's decision, please refer to **Appendix AA**, p. 2 ¶6, of the Final Additional Analysis.

22 For the Court of Appeal's unpublished opinion, please refer to **Appendix Y** of the Final Additional Analysis [*Friends of the Santa Clara River v. Castaic Lake Water Agency*, 2003 WL 22839353 (*Friends II*)].

23 Please see **Appendix Y** of the Final Additional Analysis (*Friends II*, p. 16).

and new Monterey Agreement EIR." (Emphasis added; *Final Additional Analysis, **Appendix Y** [Friends II, p. 17].)*

The Court of Appeal not only refused to enjoin the 41,000 afy water transfer, but also made it clear that CLWA's use of that water is not legally bound to either the *PCL* litigation or to DWR's new EIR for the Monterey Amendments.

Accordingly, neither the *PCL* litigation, the Monterey Settlement Agreement, nor the *Friends* or *Friends II* litigation has changed the status of the 41,000 afy water transfer from a permanent, final allocation of SWP Table A water to a "temporary or non-final" water transfer. To the contrary, the Monterey Settlement Agreement specifically provides that the SWP will continue to be administered and operated in accordance with both the Monterey Amendments and the terms of the Settlement Agreement, and the *Friends* trial court issued its Judgment permitting CLWA to continue to use the 41,000 afy, a decision that the Second District Court of Appeal affirmed. Thus, the two courts charged with responsibility over the 41,000 afy water transfer have determined that CLWA may continue to use the water to which it is entitled pending preparation of CLWA's new EIR.

Furthermore, CLWA completed and, on December 22, 2004, certified its new EIR on the 41,000 afy water transfer.[24] The CLWA 2004 EIR fully analyzed the environmental implications of the 41,000 afy water transfer without tiering from the Monterey EIR.[25] On December 30, 2004, CLWA lodged the certified Final EIR with the Los Angeles County Superior Court, as part of its "return" to the trial court's writ of mandate issued by the trial court as directed in the *Friends I* decision. There was no opposition filed to CLWA's return, which challenged the adequacy of CLWA's 1999 EIR on the 41,000 afy water transfer. On February 1, 2005, petitioner, Friends of the Santa Clara River, filed a request for entry of a dismissal with prejudice of the *Friends I* action, which was subsequently entered by the Los Angeles County Superior Court, terminating the *Friends I* action.

CLWA's 2004 EIR is currently the subject of two other legal challenges brought by C-WIN and Planning and Conservation League in January 2005. Despite the pending litigation, however, an EIR is presumed adequate under CEQA, and the plaintiff in a CEQA action has the burden of proving otherwise.[26] Because the CLWA 2004 EIR was overturned solely because it tiered from a later-decertified Monterey EIR and would otherwise have been affirmed, and because CLWA has now completed and certified the 2004 EIR approving the 41,000 afy water transfer without tiering from a Monterey EIR, the City has

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24 For a copy of CLWA Resolution No. 2354 certifying the Final EIR on the 41,000 afy transfer, and approving that project, please refer to **Appendix I** of the Final Additional Analysis.

25 CLWA's Draft and Final EIR (SCH No. 1998041127) for the 41,000 afy water transfer are incorporated by reference and available for public review and inspection at the City of Santa Clarita, 23920 Valencia Boulevard, Santa Clarita, California, Contact: Mr. Jason Mikaelian, AICP, (661) 255-4330.

26 See, e.g., Pub.Res.Code §21167.3(b), CEQA Guidelines §15231; *Barthelemy v. Chino Basin Water Dist.* (1995) 38 Cal.App.4th 1609, 1617.

determined, based on substantial evidence in the record as a whole, that it remains appropriate for the Gate-King Industrial Park Additional Analysis to include those water supplies in its water supply and demand analysis, while acknowledging and disclosing the potential uncertainty created by the pending litigation.

On a related matter, the City has noted that DWR submitted a comment letter on CLWA's 2004 EIR for the 41,000 afy water transfer project. In that letter, DWR stated that CLWA's 2004 EIR "adequately and thoroughly discusses the proposed project and its impacts."[27] DWR's letter specifically addressed DWR's new Monterey EIR and the relationship between that EIR and the CLWA 2004 EIR, stating:

> *"The DEIR provides a good discussion of the relationship between the 41,000 acre-feet Table A transfer and the current Monterey Plus [the new Monterey EIR] process. DWR will analyze the effects of all Table A transfers that were part of the Monterey Amendment to the SWP contracts [e.g., both the 41,000 afy and the Attachment E transfers] in the Monterey Plus EIR."* Id.

DWR's comment letter contains no statement or suggestion that the 41,000 afy water transfer is contingent on DWR's approval, or on DWR's new Monterey EIR, or is in any other way not permanent.

7. UNCERTAINTIES CONCERNING CLWA'S 41,000 AFY WATER TRANSFER

The comment letters argue that the pending litigation challenges to CLWA's 2004 EIR for the 41,000 afy transfer, and DWR's preparation of a new Monterey Agreement EIR, introduce an element of potential uncertainty regarding the 41,000 afy water transfer. The City has acknowledged and considered these potential uncertainties, and concluded that, based on a review of all the surrounding circumstances, these events do not significantly affect the reliability of the transfer amount. Therefore, the City has concluded that it is still appropriate to rely on the transfer amount as part of CLWA's 95,200 afy Table A Amount, for the reasons discussed below.

- First, the 41,000 afy water transfer was memorialized in 1999 in a DWR/CLWA water supply contract amendment, and DWR has allocated and annually delivered the water in accordance with the completed transfer since 2000. At the same time, DWR and KCWA executed Amendment No. 28 to the water supply contract between these parties, which also provided for the permanent transfer of the 41,000 afy by KCWA, acting on behalf of its member district, to CLWA, which DWR also stated was consistent with the implementation of the Monterey Amendments. Neither of these contract amendments was ever legally challenged, and both are considered permanent and in full force and effect. In connection with that transfer, CLWA paid approximately $47 million for the additional 41,000 afy Table A supply, the monies have been delivered, the sale price has been financed through the sale of CLWA tax-exempt bonds, and DWR has approved and amended CLWA's long-term water supply contract to reflect the increase in CLWA's SWP Table A Amount, and the permanent transfer and reallocation of SWP Table A supply between SWP contractors.
- Second, DWR has from its inception treated the 41,000 afy water transfer as a "permanent" Table A transfer from one SWP contractor to another, and has stated that the transfer is consistent with

27 For a copy of the DWR letter, dated July 30, 2004, commenting on CLWA's EIR for the 41,000 afy water transfer, please refer to **Appendix P** of the Final Additional Analysis.

implementation of the Monterey Amendments, which provide for the "permanent" transfer of up to 130,000 afy of agricultural Table A Amounts to urban SWP contractors.

- Third, the Court of Appeal held that the only defect in the 1999 CLWA EIR was that it tiered from the Monterey EIR, which was later decertified. This defect has now been remedied by CLWA's preparation in 2004 of a new EIR that did not tier from the Monterey EIR. CLWA's 2004 EIR is presumed adequate pending resolution of the latest legal challenges to that EIR.

- Fourth, the Monterey Settlement Agreement expressly authorized the operation of the SWP in accordance with the Monterey Amendments and the terms of the settlement agreement. The Monterey Amendments, which are still in effect, authorized SWP contractors to transfer unneeded SWP supply amounts to other contractors on a permanent basis. Specifically, the Monterey Agreement provisions authorized 130,000 afy of agricultural SWP contractors' entitlements to be available for sale to urban SWP contractors. CLWA's 41,000 afy acquisition was a part of the 130,000 afy of SWP Table A supply that was transferred, consistent with the Monterey Amendments. The 41,000 afy transfer was not listed on Attachment E to the Monterey Settlement Agreement with the other permanent transfers because it was the only permanent transfer that was subject to then pending litigation (i.e., the *Friends I* litigation). The Monterey Settlement Agreement otherwise treated all eight of the permanent transfers the same, and provided that DWR's new EIR would do so, as well, as DWR has affirmed in a letter commenting on the CLWA 2004 EIR for the 41,000 afy water transfer. No other transfers that were part of the 130,000 afy were the subject of litigation.

- Fifth, as to the new Monterey EIR, the Court of Appeal in the 41,000 afy litigation has stated that CLWA's use of the 41,000 afy is not legally bound to the *PCL* litigation, or to DWR's new Monterey EIR. In addition, DWR did not oppose CLWA's completion and certification of the EIR for the 41,000 afy water transfer, independent of DWR's new Monterey EIR. Thus, the pending legal challenges to the CLWA EIR, and DWR's preparation of a new Monterey EIR, should have no impact on the amount of SWP water available to CLWA as a result of the completed 41,000 afy water transfer.

- Sixth, two courts have refused to enjoin the 41,000 afy water transfer, pending CLWA's preparation of a new EIR, and this EIR is now completed and certified by CLWA as adequate and complete under CEQA. CLWA also filed the 2004 EIR on the 41,000 afy transfer with the Los Angeles County Superior Court as part of its "return" to the trial court's writ of mandate as directed in the *Friends I* decision. Thereafter, the petitioner voluntarily dismissed that action, resulting in its termination. As a result, both the CLWA 2004 EIR and the 41,000 afy water transfer are no longer subject to challenge in the *Friends I* action. This litigation finality brings further certainty to the permanent 41,000 afy water transfer.

- Seventh, as stated above, CLWA's amended water supply contract documenting the 41,000 afy water transfer remains in full force and effect, and no court has ever questioned the validity of the contract or enjoined the use of this portion of CLWA's SWP Table A Amount.

Other comments have stated that the Monterey Settlement Agreement requires that DWR's new Monterey EIR analyze, among others, the 41,000 afy water transfer; and, therefore, water from that transfer should not be relied upon until DWR completes its new EIR. The City does not concur with these comments.

First, nothing in either the Monterey Settlement Agreement or the related court orders preclude CLWA from using or relying upon the 41,000 afy water transfer, which remains intact pending completion of the DWR EIR. Second, nothing in the terms of the Monterey Settlement Agreement precludes CLWA from proceeding with its 2004 EIR to address the environmental implications of the 41,000 afy water transfer.

Again, if the Monterey Settlement Agreement had intended such a result, then it is reasonable to assume that provisions would have been included in that agreement making it clear that CLWA could not proceed with its own EIR on the 41,000 afy water transfer. In fact, no such provisions were included in the Monterey Settlement Agreement, because such provisions would have interfered with the jurisdiction of another court in the separately pending 41,000 afy water transfer litigation. Finally, although the Monterey Settlement Agreement requires the new Monterey EIR to analyze the potential environmental effects relating to CLWA's 41,000 afy water transfer as well as the other permanent transfers, it does not, and cannot, preclude CLWA from conducting its own environmental review of that transfer. Indeed, CLWA *was required* by court order to prepare a new EIR to address the environmental implications of the 41,000 afy water transfer.[28] In the meantime, however, there are no court orders precluding CLWA from using or relying on that water supply. And, as discussed below, CLWA already has completed and certified the 2004 EIR, which has addressed the environmental impacts of the 41,000 afy water transfer, without tiering or relying on the decertified 1995 Monterey EIR.

In short, CLWA's 2004 EIR provides the environmental analysis for the 41,000 afy water transfer, which is required by CEQA and the orders and opinions issued in the 41,000 afy water transfer litigation. Nothing in CEQA or any law, regulation, or agreement constrains or limits CLWA's discretion to proceed with its own EIR on the 41,000 afy water transfer.

For all these reasons, The City of Santa Clarita has determined that it remains appropriate to rely on the 41,000 afy water transfer as part of CLWA's SWP Table A water supplies. Furthermore, based on the above, the City has determined that it is reasonable to conclude that even if a court finds the CLWA 2004 EIR legally deficient, that court, like all others before it, will again refuse to enjoin the permanent 41,000 afy water transfer, and instead require further revisions to that EIR. Therefore, the pending legal challenges to the 41,000 afy water transfer should have no impact on the amount of SWP water available to CLWA as a result of the completed 41,000 afy water transfer.

8. OTHER LITIGATION CONCERNING THE 41,000 AFY TRANSFER

The CLWA 41,000 afy water transfer also has been the subject of two recent court decisions. The first court case involved a published appellate court decision in *California Oak Foundation v. City of Santa Clarita* (2005) 133 Cal.App.4th 1219. In the *California Oak Foundation* decision (the decision setting aside the first EIR for this project), the Court of Appeal invalidated an EIR under CEQA for the Gate-King project

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28 In the Judgment granting the writ of mandate setting aside CLWA's certification of the 41,000 afy EIR, the trial court specifically retained "jurisdiction until respondent Castaic Lake Water Agency certifies an Environmental Impact Report that complies with the California Environmental Quality Act and is consistent with the views expressed by the Court of Appeal Opinion, filed January 10, 2002, Case No. B145283." (Final Additional Analysis, **Appendix AC** [Judgment Granting Peremptory Writ of Mandate, dated October 25, 2002, p. 2, ¶3].)

located in the City of Santa Clarita, because the EIR did not explain how demand for water would be met if the 41,000 afy water transfer were set aside, or, alternatively, why it is appropriate to rely on the 41,000 afy transfer in any event. The above analysis explains in detail why it is appropriate to rely on the 41,000 afy water transfer as part of CLWA's SWP water supplies. None of this information or analysis was contained in the Gate-King EIR. In short, the Gate-King Industrial Park Additional Analysis supplies the information supporting the decision to rely on the 41,000 afy transfer, which the *California Oaks* court indicated was needed. A copy of the *California Oak Foundation* decision is provided in Appendix 3.0-21 of the Draft Additional Analysis.

The second court case involved a separate legal challenge under CEQA to an EIR for the West Creek project, located in Los Angeles County. This separate legal challenge was brought in Santa Barbara County Superior Court in *Santa Clarita Organization for Planning the Environment v. County of Los Angeles*, Case No. 1043805 (*West Creek* litigation). After a hearing, the Santa Barbara County Superior Court issued an Order determining that the EIR prepared for the West Creek project contained substantial evidence in the record to support Los Angeles County's decision to rely on the 41,000 afy water transfer for planning purposes. The Order noted that substantial evidence appeared in the record to support the County's decision to rely on the 41,000 afy water transfer, while acknowledging and disclosing the potential uncertainties involving the 41,000 afy water transfer created by pending litigation. The Order summarized the evidence, including the fact that: (a) DWR continues to allocate and deliver the water in accordance with the amended water supply contract authorizing the 41,000 afy transfer; (b) neither the *PCL* litigation, nor the Monterey Settlement Agreement set aside any of the water transfers made under the Monterey Amendments, including the 41,000 afy water transfer; (c) the courts have not enjoined CLWA's use of the 41,000 afy water transfer; and (d) CLWA has prepared and certified a new EIR on the 41,000 afy water transfer and that EIR is presumed adequate despite pending legal challenges. A copy of the trial court Order in the *West Creek* litigation is provided in **Appendix AU** of this Additional Analysis. The *West Creek* decision is currently on appeal.

In conclusion, one of the primary purposes of this Additional Analysis topical response is to respond to public comments and to inform decision makers and the public of pending and related litigation concerning CLWA's 41,000 afy water transfer, so that the information can be taken into account in determining whether there is adequate water supply for the Gate-King Industrial Park project, in addition to existing and planned future uses in the Santa Clarita Valley. In making that informed decision, the law does not require a showing of freedom from all legal challenges for a source of water to be included in overall SWP water supplies. Based on the above information, the City has determined that CLWA's 41,000 afy water transfer is sufficiently certain, so that it is not only permissible, but also reasonable, to include the 41,000 afy in CLWA's water supply sources for the Santa Clarita Valley.

TOPICAL RESPONSE 1: CLWA'S 41,000 AFY WATER TRANSFER

California Water Impact Network (C-WIN) and Friends of the Santa Clara River (Friends) have submitted comments on the Draft Additional Analysis for the Gate-King Industrial Park project, claiming that the Additional Analysis should not include or rely on the transfer in 1999 to Castaic Lake Water Agency (CLWA) of 41,000 acre-feet per year (afy) of State Water Project (SWP) Table A water supplies (hereafter referred to as "41,000 afy water transfer"). They assert that the Additional Analysis should not include or rely on CLWA's 41,000 afy water transfer because it is the subject of litigation and on that basis they claim it is not "final."

In addition, C-WIN states that the 41,000 afy water transfer is "further compromised" by recent court decisions concerning regional water supplies. It is asserted that these litigation challenges create uncertainty regarding the availability and reliability of water supplies for the Santa Clarita Valley. Please refer to **Topical Response 2: Litigation Concerning Water Supplies**, which discloses various litigation matters concerning water supplies, summarizes the status of such litigation, and explains why the City of Santa Clarita (City) concurs with conclusions reached by the expert water agencies, CLWA, Newhall County Water District (NCWD), Valencia Water Company, and Santa Clarita Water, a Division of CLWA (SCWD), that it is appropriate to include the 41,000 afy water transfer as part of CLWA's available SWP water supplies for planning purposes.

For the reasons discussed below, the City has determined that it is appropriate for the Gate-King Industrial Park Additional Analysis to rely on CLWA's SWP water supplies, including the 41,000 afy water transfer.

1. SWP OVERVIEW

As stated in the Gate-King Industrial Park Additional Analysis, from 1951 through 1959, the California Legislature authorized and funded construction of the SWP facilities, which are managed and operated by the California Department of Water Resources (DWR). SWP water supplies are used for both urban and agricultural uses throughout California.[1] The SWP facilities consist of a complex system of dams, reservoirs, power plants, pumping plants, canals, and aqueducts to deliver water throughout California.

At the inception of the SWP, DWR entered into individual water supply contracts with agricultural and urban water suppliers (SWP contractors). The contracts were the method used to fund construction and operation of the SWP facilities for the delivery of water to the SWP contractors. Each such contract sets forth the annual amount of water to which a SWP contractor is contractually entitled, which is stated in

1 Urban water uses also are referred to as "municipal and industrial," or "M&I," uses.

"Table A" to the contract (Table A Amount or allocation). However, the amount of SWP water actually available for delivery in any year may be an amount less than the contractor's maximum Table A amount due to hydrology, operational constraints, environmental constraints, and a number of other factors. The Table A Amount was previously referred to as "SWP entitlement."[2]

There are currently 29 SWP contractors that have entered into water supply contracts with DWR. A SWP contractor may annually request that DWR deliver water in the following year in any amount up to the SWP contractor's Table A Amount. The SWP contracts provide that in a year when DWR is unable to deliver the full amount of contractor requests, deliveries to contractors are reduced so that total deliveries equal total available supply for that year. CLWA's annual contractual Table A Amount is 95,200 afy. In the fall of each year, CLWA, along with all the other SWP contractors, submits a request to DWR for an allocation for the following year. DWR utilizes the factors noted above to "allocate" water among all contractors who have made requests, so that each contractor receives a percentage of its Table A Amount.

For example, if the SWP allocation is 40 percent of the Table A Amounts, each contractor receives 40 percent of its Table A Amount. If the allocation is 100 percent (as in 2006), each SWP contractor could receive the entire contractual Table A Amount. Therefore, CLWA's annual allocation is based on its total contractual Amount. **Table 1** indicates the actual Table A allocations made through the SWP since 1978.

The 41,000 afy water transfer amount is not kept "separate" as some have suggested. Since 2000, DWR has been including the 41,000 afy in the Table A Amount that is allocated in all allocations made to CLWA (based on its total annual allocation of 95,200 acre-feet). DWR has been *delivering* and the CLWA service area *receiving* water supply, including a percentage of the 41,000 afy, since calendar year 2000. While SWP contractors that receive water from the Delta currently hold Table A Amounts totaling approximately 4.13 million afy, the amount of Table A water actually delivered by the SWP may be less in some years due to hydrology, and operational and environmental constraints. Given existing SWP facilities, hydrology, operational and environmental conditions, and SWP contractor demands, the SWP is available to meet 100 percent of the SWP contractors' Table A requests this year (2006).[3] This 100

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2 As stated by the Court of Appeal in *Santa Clarita Organization for Planning the Environment v. County of Los Angeles* (2003) 106 Cal.App.4th 715, SWP Table A "entitlements" *are not equivalent to actual deliveries of water* because the amount of SWP water actually available for delivery in any given year may be an amount less than the Table A Amount. For example, the amount of SWP water actually available for delivery in any given year may be *reduced* due to several factors, including drought periods, increased SWP operational constraints, environmental water requirements/constraints (e.g., the listing of several fish species as endangered or threatened), water quality concerns, and other factors.

3 See, DWR *"News for Immediate Release,"* dated April 18, 2006, which is found in **Appendix J** of the Final Additional Analysis.

percent allocation of the Table A Amount to SWP contractors would add up to 4.13 million afy, distributed among the SWP contractors.[4]

Table 1
Actual SWP Annual Allocations

Year	Percent Allocation	
	To Agricultural Contractors	To Urban (M&I) Contractors
1978 to 1989	100	100
1990	50	100
1991	0	30
1992	45	45
1993	100	100
1994	50	50
1995	100	100
1996	100	100
1997	100	100
1998	100	100
1999	100	100
2000	90	90
2001	39	39
2002	70	70
2003	90	90
2004	65	65
2005	90	90
2006	100	100

Source: California Department of Water Resources, State Water Project Analysis Office, 2006.

This available supply varies from year to year. For example, in 2003, DWR approved deliveries of Table A Amount allocations, totaling 3.71 million acre-feet (or 90 percent of the 4.13 million acre-foot Table A Amount).[5] In 2002, DWR approved deliveries of Table A Amounts, totaling 2.89 million acre-feet (70 percent).[6] In 2001, DWR approved deliveries of Table A Amounts, totaling 1.61 million acre-feet (39 percent),[7] and in 2000, DWR approved deliveries of Table A Amounts, totaling 3.42 million acre-feet (90 percent).[8]

4 The original long-term water supply contracts between DWR and the SWP contractors assumed maximum annual Table A water deliveries of 4.23 million afy, assuming full development of the SWP. Currently, the maximum Table A Amounts for the SWP contractors that receive their supply from the Delta total approximately 4.13 million afy. (See, Final Additional Analysis, **Appendix AQ** [*SWP Delivery Reliability Report*, Public Review Draft, November 16, 2005, p. 7].)

5 See, DWR Bulletin 132-04, *Management of the California State Water Project*, September 2005, excerpts of which are provided in **Appendix O** of the Final Additional Analysis.

6 See, DWR Bulletin 132-03, December 2004 (**Appendix N** of the Final Additional Analysis).

7 See, DWR Bulletin 132-02, January 2004 (**Appendix M** of the Final Additional Analysis).

8 See, DWR Bulletin 132-01, December 2002 (**Appendix L** of the Final Additional Analysis).

The original plan for the SWP included constructing additional water storage and conveyance facilities as SWP contractor demands increased; however, very little new construction of SWP storage facilities has occurred since the SWP facilities were initially completed, and those facilities were never fully completed as contemplated in the 1950s. Although future construction or other actions could improve the quantity and reliability of SWP supplies, those actions would entail their own environmental reviews, potential litigation delays, and multi-year constructions periods.

2. CLWA'S 41,000 AFY WATER TRANSFER ACQUISITION

In 1999, CLWA purchased 41,000 afy of SWP Table A Amount from Kern County Water Agency (KCWA), acting on behalf of its member district, Wheeler Ridge-Maricopa Water Storage District. This purchase brought CLWA's total annual SWP Table A Amount to 95,200 afy; that purchase is generally referred to as the 41,000 afy water transfer.

The 41,000 afy water transfer was memorialized in a DWR/CLWA water supply contract amendment (Amendment No. 18), which reflects the *increase* in CLWA's annual allocation of SWP Table A Amounts from 54,200 afy to 95,200 afy. This increase reflects the permanent allocation of the 41,000 afy to CLWA (95,200 - 54,200 = 41,000).[9] As reported in the Gate-King Industrial Park Additional Analysis, the 41,000 afy water transfer has been completed, CLWA paid approximately $47 million for the additional Table A Amount, the monies have been delivered, the sales price has been financed through CLWA by tax-exempt bonds, and DWR increased CLWA's SWP Table A allocation, starting in calendar year 2000, because it was a permanent transfer/reallocation of SWP Table A water between SWP contractors.

Some comments have suggested that CLWA's 41,000 afy water transfer has not been approved by DWR. This is not correct. The 41,000 afy water transfer was approved by DWR on March 31, 1999, in the fully-executed amendment to CLWA's water supply contract (Amendment No. 18). Other comments have asserted that the 41,000 afy water transfer was not a "permanent" transfer of SWP Table A water. This also is incorrect. As stated by DWR in Bulletin 132-00, dated December 2001, at page 94, Amendment No. 18 "provided for the *permanent* transfer of 41,000 afy of SWP agricultural entitlement by CLWA from KCWA, . . . The transfer is consistent with implementation of the Monterey Amendment, which provides for the *permanent* transfer of up to 130,000 afy of agricultural entitlement to urban agencies." (Emphasis

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9 A copy of "Amendment No. 18 to the Water Supply Contract between the State of California, Department of Water Resources and Castaic Lake Water Agency," dated March 31, 1999, is presented in **Appendix A** of the Final Additional Analysis.

added.) Importantly, since 2000, DWR has included the 41,000 afy in all allocations made to CLWA, based on CLWA's total annual Table A allocation of 95,200 acre-feet.[10]

To further support the fact that CLWA's 41,000 afy water transfer was a "permanent" transfer/ reallocation of SWP Table A Amount from one SWP contractor to another, in Bulletin 132-04 (September 2005), at page 120, DWR identified all eight Table A transfers, including the 41,000 afy water transfer, as "permanent" transfers under the Monterey Amendments. Furthermore, DWR has confirmed that the parties to the Monterey Settlement Agreement "recognize that the Kern-Castaic Lake Water Agency 41,000 afy Table A transfer is subject to pending litigation and agree that jurisdiction with respect to that litigation remain[s] in the Los Angeles County Superior Court and that nothing in the [Monterey Settlement Agreement] is intended to predispose the remedies or other actions that may occur in the pending litigation." In that same Bulletin, at page 120, DWR has also pointed out that the potential environmental effects of all eight "permanent Table A transfers" under the Monterey Amendments, including the 41,000 afy water transfer, will be analyzed in DWR's new Monterey EIR.[11] (The Monterey Amendments and related Monterey Settlement Agreement are discussed in further detail below). Thus, there is no basis to distinguish the 41,000 afy transfer and the other permanent Table A transfer, except for the California Environmental Quality Act (CEQA) litigation discussed in **Section 6**.

3. MONTEREY AMENDMENTS

In 1994, disputes arose between DWR and many agricultural and urban SWP contractors regarding the availability and distribution of water through SWP facilities. To avoid potential litigation, those parties met in Monterey, California, to attempt to resolve their ongoing disputes and, after negotiations, they agreed to a statement of principles, which became known as the "Monterey Agreement." The Monterey Agreement, signed by DWR and many of the agricultural and urban SWP contractors, established principles to be incorporated into contract amendments (the "Monterey Amendments"), which were primarily intended to increase the reliability of all SWP water supplies, stabilize SWP's rate structure, and increase water management flexibility for all SWP contractors. To date, all but two SWP contractors have accepted the Monterey Amendments. The Monterey Amendments included, among other benefits, water transfers among SWP contractors. Specifically, under the Monterey Amendments, SWP contractors may transfer unneeded Table A water to other contractors on a permanent basis, which provides financial relief from SWP charges for the seller and additional water supplies for the buyer. The Monterey

10 Please see **Appendix R** through **X** of the Final Additional Analysis for DWR's "Notices to State Water Project Contractors," informing them of increases or decreases in approved Table A Amounts from 2000 to 2006. In the 2006 Notice, CLWA's Table A allocation is shown as 95,200 afy, and in all of the prior Notices, CLWA's Table A allocation is shown in two places, once under the "San Joaquin Valley" heading, which shows the allocation at 12,700 afy, and again under the "Southern California" heading, which shows the allocation at 82,500 afy, totaling 95,200 afy.

11 See, DWR Bulletin 132-04 (September 2005), p. 120 (**Appendix O** of the Final Additional Analysis).

Amendments have facilitated the transfer of 130,000 afy of SWP Table A Amounts from agricultural to urban SWP contractors.[12] Many such transfers were implemented soon after the Monterey Amendments became effective. CLWA's 41,000 afy water transfer was one of the water transfers effected by the Monterey Amendments.

4. ENVIRONMENTAL REVIEW OF MONTEREY AMENDMENTS AND SUBSEQUENT LITIGATION

A Program EIR was prepared and certified to analyze the environmental effects of implementing the Monterey Agreement/Monterey Amendments. The adequacy of the Program EIR was challenged in litigation filed in 1995 in the Sacramento County Superior Court, and the Superior Court upheld the adequacy of the Program EIR. Before and after the Sacramento County trial court's decision, DWR and the agricultural and urban SWP contractors who had executed the Monterey Agreement began implementing various amendment provisions, including the completion of permanent transfers of Table A Amounts among agricultural and urban SWP contractors. Again, CLWA's 41,000 afy water transfer was one of eight water transfers effectuated by the Monterey Amendments. The trial court's decision was subsequently appealed. On appeal, the petitioners sought an injunction to prevent further implementation of the Monterey Agreement during the appeal. However, the appellate court denied the requested injunction.

The appellate court ultimately reversed the trial court's decision. The appellate court held that the Program EIR was improperly prepared by the Central Coast Water Agency, as "Lead Agency" under CEQA, rather than by DWR, which should have been the "Lead Agency." The appellate court also found that the EIR did not sufficiently discuss implementation of a "no project" alternative, and concluded that a new EIR must be prepared and certified.

The appellate court then remanded the case to the Sacramento County trial court and directed that the trial court issue a writ of mandate vacating certification of the EIR and retaining jurisdiction until DWR, as lead agency, prepared and certified an EIR in accordance with CEQA. The appellate court further directed that the trial court consider whether the Monterey Amendments may continue to be

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12 Neither the Monterey Agreement nor the Monterey Amendments created a new right to carry out permanent transfers of SWP Table A Amounts. That right had existed since the early 1960s through Article 41 of the SWP contracts. The Monterey Amendments simply provided a vehicle through which the SWP agricultural contractors promised that they would support such Article 41 transfers up to 130,000 acre feet. The Monterey Amendments also did not limit the SWP contractors' rights to implement permanent transfers under existing law other than those described in the Monterey Amendments. (See, e.g., Water Code §§382, 383.)

implemented while the new EIR is being prepared. (*Planning & Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892.)[13]

The appellate court decision invalidated certification of the Program EIR, but did not set aside, invalidate or otherwise vacate the Monterey Amendments or enjoin the water transfers effected thereunder. Instead, the appellate court directed the trial court to consider under CEQA whether the Monterey Amendments should remain in place pending DWR's preparation of a new EIR, and to retain jurisdiction pending certification of that EIR. In addition, no court orders have ever been issued to "stay" further implementation of the Monterey Amendments.

5. THE MONTEREY SETTLEMENT AGREEMENT

In March 2001, before the Sacramento County trial court had acted on remand, the parties to the *PCL* litigation entered into settlement negotiations. In May 2003, DWR, Central Coast Water Authority, Planning and Conservation League, certain SWP contractors (including CLWA) and other entities entered into a final settlement of the *PCL* litigation (the "Monterey Settlement Agreement").[14] Under the Monterey Settlement Agreement, the parties expressly agreed that the SWP would continue to be administered and operated in accordance with both the Monterey Amendments and terms of the Monterey Settlement Agreement:

> *"Pending the Superior Court's issuance of an order discharging the writ of mandate in the underlying litigation, the Parties will jointly request that the Superior Court enter an order approving this Settlement Agreement, and an order, pursuant to California Public Resources Code Section 21168.9, authorizing on an interim basis the administration and operation of the SWP . . . in accordance with the Monterey Amendments, [and] the terms of this Settlement Agreement. ..." (Final Additional Analysis,* ***Appendix AF*** *[Monterey Settlement Agreement, p. 9].)*

The Monterey Settlement Agreement did not set aside, invalidate, or otherwise vacate the Monterey Amendments, or any of the water transfers effectuated under the Monterey Amendments. On June 6, 2003, the Sacramento County Superior Court issued the requested order, pursuant to CEQA (Pub.Res.Code Section 21168.9), approving both the Monterey Settlement Agreement and the administration and operation of the SWP pursuant to the Monterey Amendments and the terms of the approved agreement.[15]

Section III(C)(4) of the Monterey Settlement Agreement required DWR to carry-out an "[a]nalysis of the potential environmental effects relating to" eight water transfers under the Monterey Amendments,

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13 The decision, *Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892, hereafter referred to as "*PCL*," is presented in **Appendix AI** of the Final Additional Analysis.

14 The Monterey Settlement Agreement is presented in **Appendix AF** of the Final Additional Analysis.

15 The Sacramento County trial court's Order is presented in **Appendix AR** of the Final Additional Analysis.

seven so-called "Attachment E Transfers" and the 41,000 afy water transfer, also referred to in the agreement as the "Kern-Castaic Transfer." Further, the Monterey Settlement Agreement obligated DWR to evaluate all eight of the water transfers in the same manner, even though seven of them, defined in the agreement as the "Attachment E Transfers," were no longer subject to legal challenge. (See, Final Additional Analysis, **Appendix AF** [Monterey Settlement Agreement, Sections III(C)(4), III(D), III(E), pp. 11-12].) The point of the DWR review of the eight transfers was not to determine whether to continue the transfers, because seven of them beyond CEQA challenge, and the eighth, the 41,000 afy transfer, was also a permanent transfer, but it was still subject to litigation. Rather, the point of the DWR review of all eight transfers was to examine the environmental effects of such transfers in light of the Monterey Agreement as a whole.

In fact, Section III(D) of the Monterey Settlement Agreement affirmed that none of the parties could challenge the effectiveness or validity of the Attachment E Transfers, which had been litigated in other forums or had become final without challenge by the expiration of applicable statutes of limitations. According to CLWA and other signatories to the Agreement, this is why Section III(D) referred to the Attachment E Transfers as "final." (See, Final Additional Analysis, **Appendix AF** [Monterey Settlement Agreement, Section III(D), p. 12].) The 41,000 afy water transfer was not included among the Attachment E transfers, only because the 41,000 afy water transfer was then under the jurisdiction of the Los Angeles County Superior Court and that litigation was ongoing.[16]

Section III(E) protects the jurisdiction of the Los Angeles County Superior Court in connection with the then-pending CEQA litigation challenging the validity of CLWA's EIR on the 41,000 afy water transfer. Section III(E) states, in part: "nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation." As set forth below, Section III(E) provides:

> *"Acknowledgement and Agreement Regarding Kern-Castaic Transfer [the 41,000 afy water transfer]. With respect to Section III(C)(4)(b) regarding the Kern-Castaic Transfer, the Parties* recognize that such water transfer is subject to pending litigation in the Los Angeles County Superior Court *following remand from the Second District Court of Appeal. (See* Friends of the Santa Clara River v. Castaic Lake Water Agency, *95 Cal.App.4th 1373, 116 Cal.Rptr.2d 54 (2002);* review denied *April 17, 2002.) The Parties agree that* jurisdiction *with respect to that litigation should* remain *in that court and that* nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation." (Emphasis added.) *(Final Additional Analysis, **Appendix AF** [Monterey Settlement Agreement, Section III(E), p. 12].)*

16 In Section VII(I), the parties further agreed that, should the certification of DWR's new EIR be challenged, the challenging parties must stipulate to the continued administration and operation of the SWP during the pendency of that challenge, and, should that challenge be successful, during any future challenges to future DWR EIR's. In turn, Section VII(I), subdivision (1), limits the grounds on which DWR's return to the writ of mandate can be legally challenged, and Section VII(J) prohibits any future litigation challenging the validity of any Monterey Amendments (or any portions thereof). Finally, Sections VII(L) and IX provide that all disputes regarding the Monterey Settlement Agreement must be mediated.

The Monterey Settlement Agreement does not preclude CLWA, a signatory to that agreement, from using the 41,000 afy water transfer as part of its overall SWP Table A supplies for planning purposes. First, the language of the Monterey Settlement Agreement, quoted above, does not state that CLWA may not rely on the 41,000 afy water transfer (also referred to as the Kern-Castaic transfer). Second, nothing in the Monterey Settlement Agreement precludes a project EIR from referencing and using all of CLWA's SWP Table A supplies in analyzing available water supplies for the Santa Clarita Valley. Given that the 41,000 afy water transfer was specifically covered by the Monterey Settlement Agreement, if the parties to that agreement had intended to preclude reliance on the 41,000 afy water transfer, they surely could and would have spelled out that prohibition. Rather than prohibiting CLWA or others from relying on the 41,000 afy water transfer, the Monterey Settlement Agreement simply clarified that the transfer was (and remains today) under the jurisdiction of the Los Angeles County Superior Court.

In addition, the Monterey Settlement Agreement allows implementation of the Monterey Amendments and validates the water transfers that already had taken place by the time that agreement took effect. The only reason the 41,000 afy water transfer was not included on the list of "final" transfers in Attachment E for purpose of that agreement was that it was the subject of ongoing litigation. The 41,000 afy water transfer was both a permanent and final reallocation of SWP Table A Amounts from one SWP contractor to another (CLWA), just as were the other seven transfers; the pending 41,000 afy water transfer litigation did not convert that transfer from permanent to temporary.

Importantly, DWR, itself, includes the 41,000 afy to CLWA in its published "Notices to State Water Project Contractors." For example, on April 18, 2006, DWR sent its notice to SWP contractors stating that DWR was increasing its allocation of 2006 SWP water to its contractors. The table attached to that Notice listed all such contractors' Table A Amounts, and their approved allocations. CLWA's Table A Amount is listed under the Southern California heading in the amount of 95,200 afy, which includes CLWA's 41,000 afy. If DWR, the agency that administers the SWP, did not consider CLWA's 41,000 afy water transfer to be both a permanent and final reallocation of SWP Table A Amounts, it would not publish CLWA's total Table A allocation at 95,200 afy.[17]

Contrary to comments received from C-WIN and Friends, which attempt to place a cloud over CLWA's reliance upon the 41,000 afy water transfer, the terms of the Monterey Settlement Agreement make clear that the agreement was intended to protect the Los Angeles County Superior Court's jurisdiction in the pending 41,000 afy water transfer litigation. Nothing in that agreement characterized the 41,000 afy water transfer as not final. And, nothing in that agreement prohibited any party, agency, or other entity from relying on the 41,000 afy water transfer for planning purposes.

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17 DWR's April 18, 2006, "Notice to State Water Project Contractors" is presented in **Appendix S** of the Final Additional Analysis.

6. CLWA ENVIRONMENTAL REVIEW OF 41,000 AFY WATER TRANSFER AND LITIGATION

Prior to completion of the 41,000 afy water transfer, the proposed transfer was the subject of environmental review by CLWA and KCWA and its member district. The agencies selling the 41,000 afy of SWP Table A Amount to CLWA assessed the environmental consequences of the proposed transfer within their service area in a Final EIR, dated June 1998. That EIR was certified in 1998 and was not challenged in court. As a result, that EIR is conclusively presumed to be valid (Pub. Res. Code §21167.2).

CLWA also prepared a supplemental Final EIR, which assessed the environmental effects of CLWA's acquisition of the 41,000 afy within its service area. The Board of Directors of CLWA certified the Supplemental Final EIR in March 1999. Thereafter, in April 1999, a lawsuit was brought in the Los Angeles County Superior Court challenging the adequacy of the EIR under CEQA (*Friends of the Santa Clara River, et al. v. Castaic Lake Water Agency, et al.*, Case No. BS 056954, also referred to as "*Friends*"). The Los Angeles County trial court in the *Friends* litigation ruled in favor of CLWA and upheld the adequacy of the EIR under CEQA.

In October 2000, the *Friends* petitioners filed an appeal. During the pendency of the *Friends* appeal, the Third District Court of Appeal issued the *PCL* decision, which found the Monterey EIR inadequate and ordered it decertified.[18] On appeal in *Friends*, the Second District Court of Appeal considered the *Friends* petitioners' multiple arguments, and concluded that CLWA's EIR on the 41,000 afy water transfer must be decertified, not because the EIR was substantially inadequate or failed to support the analysis of the transfer's approval, but only because it had been "tiered" from the Monterey EIR, recently found to be inadequate:

> *"We have examined all of appellant's other contentions and find them to be* without merit. *If the* PCL/*tiering problem had not arisen,* we would have affirmed the judgment."[19] (Emphasis added.)

Nonetheless, like the Third District Court of Appeal in the *PCL* decision, the Second District Court of Appeal in *Friends* refused to issue any ruling affecting CLWA's ability to continue to rely on the 41,000

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18 Please refer to **Appendix AI** of the Final Additional Analysis for the *PCL* decision.

19 The January 2002 *Friends* decision entitled, *Friends of the Santa Clara River v. Castaic Lake Water Agency* (2002) 95 Cal.App.4th 1373, is found in **Appendix AA** of the Final Additional Analysis. The *Friends* decision provides useful factual background information concerning the Monterey Amendments, the Monterey Amendments EIR, water transfers authorized by the Monterey Amendments, the local agency environmental review of the 41,000 afy water transfer, CLWA's acquisition of the 41,000 afy, and the relationship between the *PCL* decision and the *Friends* decision. See, Final Additional Analysis, **Appendix AA** [*Friends* decision, pp. 1376-1384].

afy water transfer, leaving it to the trial court's discretion whether or not to enjoin CLWA's use of the water pending its completion of a new EIR.[20]

In December 2002, on remand to the Los Angeles County Superior Court, the *Friends* petitioners sought to enjoin CLWA's use of, and reliance upon, the 41,000 afy water transfer under CEQA, but the trial court rejected that request. Specifically, the trial court maintained its jurisdiction over the matter and authorized CLWA to utilize any of the 41,000 afy subject to the following order:

> *"Respondent [CLWA] will not be prohibited from using the water to which it is entitled, but Petitioner may renew its application for such prohibition based upon evidence of the actual use of such additional water for purposes it considers improper."*[21]

The *Friends* petitioners never pursued the trial court's suggestion for them to "renew" their request to prohibit the use of the 41,000 afy water transfer "based upon evidence of the actual use of such additional water for purposes it considers improper." Instead, the *Friends* petitioners appealed the trial court's judgment and, again, requested that the use of the 41,000 afy water transfer be prohibited.

However, on December 1, 2003, in an unpublished decision, the Second District Court of Appeal affirmed the trial court's ruling allowing CLWA to utilize and rely on the 41,000 afy water transfer pending completion of its new EIR.[22] Significantly, petitioners and others in the *Friends II* decision argued that the trial court's determination of whether to enjoin CLWA's use of the 41,000 afy water transfer should be based on the status of the *PCL* litigation and DWR's new EIR for the Monterey Amendments the same argument they advance here. In making that argument, they relied on language in the original *Friends* decision in which the Court of Appeal suggested that *as one option* CLWA "may be able to cure the *PCL* problem by awaiting action by the DWR complying with the *PCL* decision, then issuing a subsequent EIR, supplement to EIR, or addendum to EIR . . . tiering upon a newly certified Monterey Agreement EIR."[23] The Court of Appeal in *Friends II*, however, rejected this argument, explaining:

> *"Amici misapprehend our directions to the trial court. As explained above, those directions are found in the dispositional language of our opinion. That language directed the trial court,* inter alia, *to "consider such orders it deems appropriate under [Pub.Res.Code] section 21168.9." [Citation.] That section grants the trial court broad powers to fashion equitable relief. [Note.]* Amici's argument that the exercise of said discretion was to be based upon the status of either the PCL litigation or the new EIR for the Monterey Agreement is at odds with the clear dispositional language we employed. *The two paragraphs in our opinion upon which* amici *rely were merely suggestions as to how respondent could proceed and a statement that, in exercising its discretion whether to grant equitable relief pending completion of a new EIR for this project, the trial court could ascertain, and if it so chose, rely upon the status of the PCL litigation*

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20 See, Final Additional Analysis, **Appendix AA** [*Friends* decision, p. 1388].

21 For the trial court's decision, please refer to **Appendix AA**, p. 2 ¶6, of the Final Additional Analysis.

22 For the Court of Appeal's unpublished opinion, please refer to **Appendix Y** of the Final Additional Analysis [*Friends of the Santa Clara River v. Castaic Lake Water Agency*, 2003 WL 22839353 (*Friends II*)].

23 Please see **Appendix Y** of the Final Additional Analysis (*Friends II*, p. 16).

and new Monterey Agreement EIR." (Emphasis added; *Final Additional Analysis, **Appendix Y** [Friends II, p. 17].)*

The Court of Appeal not only refused to enjoin the 41,000 afy water transfer, but also made it clear that CLWA's use of that water is not legally bound to either the *PCL* litigation or to DWR's new EIR for the Monterey Amendments.

Accordingly, neither the *PCL* litigation, the Monterey Settlement Agreement, nor the *Friends* or *Friends II* litigation has changed the status of the 41,000 afy water transfer from a permanent, final allocation of SWP Table A water to a "temporary or non-final" water transfer. To the contrary, the Monterey Settlement Agreement specifically provides that the SWP will continue to be administered and operated in accordance with both the Monterey Amendments and the terms of the Settlement Agreement, and the *Friends* trial court issued its Judgment permitting CLWA to continue to use the 41,000 afy, a decision that the Second District Court of Appeal affirmed. Thus, the two courts charged with responsibility over the 41,000 afy water transfer have determined that CLWA may continue to use the water to which it is entitled pending preparation of CLWA's new EIR.

Furthermore, CLWA completed and, on December 22, 2004, certified its new EIR on the 41,000 afy water transfer.[24] The CLWA 2004 EIR fully analyzed the environmental implications of the 41,000 afy water transfer without tiering from the Monterey EIR.[25] On December 30, 2004, CLWA lodged the certified Final EIR with the Los Angeles County Superior Court, as part of its "return" to the trial court's writ of mandate issued by the trial court as directed in the *Friends I* decision. There was no opposition filed to CLWA's return, which challenged the adequacy of CLWA's 1999 EIR on the 41,000 afy water transfer. On February 1, 2005, petitioner, Friends of the Santa Clara River, filed a request for entry of a dismissal with prejudice of the *Friends I* action, which was subsequently entered by the Los Angeles County Superior Court, terminating the *Friends I* action.

CLWA's 2004 EIR is currently the subject of two other legal challenges brought by C-WIN and Planning and Conservation League in January 2005. Despite the pending litigation, however, an EIR is presumed adequate under CEQA, and the plaintiff in a CEQA action has the burden of proving otherwise.[26] Because the CLWA 2004 EIR was overturned solely because it tiered from a later-decertified Monterey EIR and would otherwise have been affirmed, and because CLWA has now completed and certified the 2004 EIR approving the 41,000 afy water transfer without tiering from a Monterey EIR, the City has

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24 For a copy of CLWA Resolution No. 2354 certifying the Final EIR on the 41,000 afy transfer, and approving that project, please refer to **Appendix I** of the Final Additional Analysis.

25 CLWA's Draft and Final EIR (SCH No. 1998041127) for the 41,000 afy water transfer are incorporated by reference and available for public review and inspection at the City of Santa Clarita, 23920 Valencia Boulevard, Santa Clarita, California, Contact: Mr. Jason Mikaelian, AICP, (661) 255-4330.

26 See, e.g., Pub.Res.Code §21167.3(b), CEQA Guidelines §15231; *Barthelemy v. Chino Basin Water Dist.* (1995) 38 Cal.App.4th 1609, 1617.

determined, based on substantial evidence in the record as a whole, that it remains appropriate for the Gate-King Industrial Park Additional Analysis to include those water supplies in its water supply and demand analysis, while acknowledging and disclosing the potential uncertainty created by the pending litigation.

On a related matter, the City has noted that DWR submitted a comment letter on CLWA's 2004 EIR for the 41,000 afy water transfer project. In that letter, DWR stated that CLWA's 2004 EIR "adequately and thoroughly discusses the proposed project and its impacts."[27] DWR's letter specifically addressed DWR's new Monterey EIR and the relationship between that EIR and the CLWA 2004 EIR, stating:

> *"The DEIR provides a good discussion of the relationship between the 41,000 acre-feet Table A transfer and the current Monterey Plus [the new Monterey EIR] process. DWR will analyze the effects of all Table A transfers that were part of the Monterey Amendment to the SWP contracts [e.g., both the 41,000 afy and the Attachment E transfers] in the Monterey Plus EIR."* Id.

DWR's comment letter contains no statement or suggestion that the 41,000 afy water transfer is contingent on DWR's approval, or on DWR's new Monterey EIR, or is in any other way not permanent.

7. UNCERTAINTIES CONCERNING CLWA'S 41,000 AFY WATER TRANSFER

The comment letters argue that the pending litigation challenges to CLWA's 2004 EIR for the 41,000 afy transfer, and DWR's preparation of a new Monterey Agreement EIR, introduce an element of potential uncertainty regarding the 41,000 afy water transfer. The City has acknowledged and considered these potential uncertainties, and concluded that, based on a review of all the surrounding circumstances, these events do not significantly affect the reliability of the transfer amount. Therefore, the City has concluded that it is still appropriate to rely on the transfer amount as part of CLWA's 95,200 afy Table A Amount, for the reasons discussed below.

- First, the 41,000 afy water transfer was memorialized in 1999 in a DWR/CLWA water supply contract amendment, and DWR has allocated and annually delivered the water in accordance with the completed transfer since 2000. At the same time, DWR and KCWA executed Amendment No. 28 to the water supply contract between these parties, which also provided for the permanent transfer of the 41,000 afy by KCWA, acting on behalf of its member district, to CLWA, which DWR also stated was consistent with the implementation of the Monterey Amendments. Neither of these contract amendments was ever legally challenged, and both are considered permanent and in full force and effect. In connection with that transfer, CLWA paid approximately $47 million for the additional 41,000 afy Table A supply, the monies have been delivered, the sale price has been financed through the sale of CLWA tax-exempt bonds, and DWR has approved and amended CLWA's long-term water supply contract to reflect the increase in CLWA's SWP Table A Amount, and the permanent transfer and reallocation of SWP Table A supply between SWP contractors.

- Second, DWR has from its inception treated the 41,000 afy water transfer as a "permanent" Table A transfer from one SWP contractor to another, and has stated that the transfer is consistent with

27 For a copy of the DWR letter, dated July 30, 2004, commenting on CLWA's EIR for the 41,000 afy water transfer, please refer to **Appendix P** of the Final Additional Analysis.

implementation of the Monterey Amendments, which provide for the "permanent" transfer of up to 130,000 afy of agricultural Table A Amounts to urban SWP contractors.

- Third, the Court of Appeal held that the only defect in the 1999 CLWA EIR was that it tiered from the Monterey EIR, which was later decertified. This defect has now been remedied by CLWA's preparation in 2004 of a new EIR that did not tier from the Monterey EIR. CLWA's 2004 EIR is presumed adequate pending resolution of the latest legal challenges to that EIR.

- Fourth, the Monterey Settlement Agreement expressly authorized the operation of the SWP in accordance with the Monterey Amendments and the terms of the settlement agreement. The Monterey Amendments, which are still in effect, authorized SWP contractors to transfer unneeded SWP supply amounts to other contractors on a permanent basis. Specifically, the Monterey Agreement provisions authorized 130,000 afy of agricultural SWP contractors' entitlements to be available for sale to urban SWP contractors. CLWA's 41,000 afy acquisition was a part of the 130,000 afy of SWP Table A supply that was transferred, consistent with the Monterey Amendments. The 41,000 afy transfer was not listed on Attachment E to the Monterey Settlement Agreement with the other permanent transfers because it was the only permanent transfer that was subject to then pending litigation (i.e., the *Friends I* litigation). The Monterey Settlement Agreement otherwise treated all eight of the permanent transfers the same, and provided that DWR's new EIR would do so, as well, as DWR has affirmed in a letter commenting on the CLWA 2004 EIR for the 41,000 afy water transfer. No other transfers that were part of the 130,000 afy were the subject of litigation.

- Fifth, as to the new Monterey EIR, the Court of Appeal in the 41,000 afy litigation has stated that CLWA's use of the 41,000 afy is not legally bound to the *PCL* litigation, or to DWR's new Monterey EIR. In addition, DWR did not oppose CLWA's completion and certification of the EIR for the 41,000 afy water transfer, independent of DWR's new Monterey EIR. Thus, the pending legal challenges to the CLWA EIR, and DWR's preparation of a new Monterey EIR, should have no impact on the amount of SWP water available to CLWA as a result of the completed 41,000 afy water transfer.

- Sixth, two courts have refused to enjoin the 41,000 afy water transfer, pending CLWA's preparation of a new EIR, and this EIR is now completed and certified by CLWA as adequate and complete under CEQA. CLWA also filed the 2004 EIR on the 41,000 afy transfer with the Los Angeles County Superior Court as part of its "return" to the trial court's writ of mandate as directed in the *Friends I* decision. Thereafter, the petitioner voluntarily dismissed that action, resulting in its termination. As a result, both the CLWA 2004 EIR and the 41,000 afy water transfer are no longer subject to challenge in the *Friends I* action. This litigation finality brings further certainty to the permanent 41,000 afy water transfer.

- Seventh, as stated above, CLWA's amended water supply contract documenting the 41,000 afy water transfer remains in full force and effect, and no court has ever questioned the validity of the contract or enjoined the use of this portion of CLWA's SWP Table A Amount.

Other comments have stated that the Monterey Settlement Agreement requires that DWR's new Monterey EIR analyze, among others, the 41,000 afy water transfer; and, therefore, water from that transfer should not be relied upon until DWR completes its new EIR. The City does not concur with these comments.

First, nothing in either the Monterey Settlement Agreement or the related court orders preclude CLWA from using or relying upon the 41,000 afy water transfer, which remains intact pending completion of the DWR EIR. Second, nothing in the terms of the Monterey Settlement Agreement precludes CLWA from proceeding with its 2004 EIR to address the environmental implications of the 41,000 afy water transfer.

Again, if the Monterey Settlement Agreement had intended such a result, then it is reasonable to assume that provisions would have been included in that agreement making it clear that CLWA could not proceed with its own EIR on the 41,000 afy water transfer. In fact, no such provisions were included in the Monterey Settlement Agreement, because such provisions would have interfered with the jurisdiction of another court in the separately pending 41,000 afy water transfer litigation. Finally, although the Monterey Settlement Agreement requires the new Monterey EIR to analyze the potential environmental effects relating to CLWA's 41,000 afy water transfer as well as the other permanent transfers, it does not, and cannot, preclude CLWA from conducting its own environmental review of that transfer. Indeed, CLWA *was required* by court order to prepare a new EIR to address the environmental implications of the 41,000 afy water transfer.[28] In the meantime, however, there are no court orders precluding CLWA from using or relying on that water supply. And, as discussed below, CLWA already has completed and certified the 2004 EIR, which has addressed the environmental impacts of the 41,000 afy water transfer, without tiering or relying on the decertified 1995 Monterey EIR.

In short, CLWA's 2004 EIR provides the environmental analysis for the 41,000 afy water transfer, which is required by CEQA and the orders and opinions issued in the 41,000 afy water transfer litigation. Nothing in CEQA or any law, regulation, or agreement constrains or limits CLWA's discretion to proceed with its own EIR on the 41,000 afy water transfer.

For all these reasons, The City of Santa Clarita has determined that it remains appropriate to rely on the 41,000 afy water transfer as part of CLWA's SWP Table A water supplies. Furthermore, based on the above, the City has determined that it is reasonable to conclude that even if a court finds the CLWA 2004 EIR legally deficient, that court, like all others before it, will again refuse to enjoin the permanent 41,000 afy water transfer, and instead require further revisions to that EIR. Therefore, the pending legal challenges to the 41,000 afy water transfer should have no impact on the amount of SWP water available to CLWA as a result of the completed 41,000 afy water transfer.

8. OTHER LITIGATION CONCERNING THE 41,000 AFY TRANSFER

The CLWA 41,000 afy water transfer also has been the subject of two recent court decisions. The first court case involved a published appellate court decision in *California Oak Foundation v. City of Santa Clarita* (2005) 133 Cal.App.4th 1219. In the *California Oak Foundation* decision (the decision setting aside the first EIR for this project), the Court of Appeal invalidated an EIR under CEQA for the Gate-King project

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28 In the Judgment granting the writ of mandate setting aside CLWA's certification of the 41,000 afy EIR, the trial court specifically retained "jurisdiction until respondent Castaic Lake Water Agency certifies an Environmental Impact Report that complies with the California Environmental Quality Act and is consistent with the views expressed by the Court of Appeal Opinion, filed January 10, 2002, Case No. B145283." (Final Additional Analysis, **Appendix AC** [Judgment Granting Peremptory Writ of Mandate, dated October 25, 2002, p. 2, ¶3].)

located in the City of Santa Clarita, because the EIR did not explain how demand for water would be met if the 41,000 afy water transfer were set aside, or, alternatively, why it is appropriate to rely on the 41,000 afy transfer in any event. The above analysis explains in detail why it is appropriate to rely on the 41,000 afy water transfer as part of CLWA's SWP water supplies. None of this information or analysis was contained in the Gate-King EIR. In short, the Gate-King Industrial Park Additional Analysis supplies the information supporting the decision to rely on the 41,000 afy transfer, which the *California Oaks* court indicated was needed. A copy of the *California Oak Foundation* decision is provided in Appendix 3.0-21 of the Draft Additional Analysis.

The second court case involved a separate legal challenge under CEQA to an EIR for the West Creek project, located in Los Angeles County. This separate legal challenge was brought in Santa Barbara County Superior Court in *Santa Clarita Organization for Planning the Environment v. County of Los Angeles,* Case No. 1043805 (*West Creek* litigation). After a hearing, the Santa Barbara County Superior Court issued an Order determining that the EIR prepared for the West Creek project contained substantial evidence in the record to support Los Angeles County's decision to rely on the 41,000 afy water transfer for planning purposes. The Order noted that substantial evidence appeared in the record to support the County's decision to rely on the 41,000 afy water transfer, while acknowledging and disclosing the potential uncertainties involving the 41,000 afy water transfer created by pending litigation. The Order summarized the evidence, including the fact that: (a) DWR continues to allocate and deliver the water in accordance with the amended water supply contract authorizing the 41,000 afy transfer; (b) neither the *PCL* litigation, nor the Monterey Settlement Agreement set aside any of the water transfers made under the Monterey Amendments, including the 41,000 afy water transfer; (c) the courts have not enjoined CLWA's use of the 41,000 afy water transfer; and (d) CLWA has prepared and certified a new EIR on the 41,000 afy water transfer and that EIR is presumed adequate despite pending legal challenges. A copy of the trial court Order in the *West Creek* litigation is provided in **Appendix AU** of this Additional Analysis. The *West Creek* decision is currently on appeal.

In conclusion, one of the primary purposes of this Additional Analysis topical response is to respond to public comments and to inform decision makers and the public of pending and related litigation concerning CLWA's 41,000 afy water transfer, so that the information can be taken into account in determining whether there is adequate water supply for the Gate-King Industrial Park project, in addition to existing and planned future uses in the Santa Clarita Valley. In making that informed decision, the law does not require a showing of freedom from all legal challenges for a source of water to be included in overall SWP water supplies. Based on the above information, the City has determined that CLWA's 41,000 afy water transfer is sufficiently certain, so that it is not only permissible, but also reasonable, to include the 41,000 afy in CLWA's water supply sources for the Santa Clarita Valley.

Attachment 23-E

LETTER 21

DRAFT ENVIRONMENTAL IMPACT REPORT

The Keystone Project

THE KEYSTONE

Prepared for:
City of Santa Clarita

Prepared By:
CHRISTOPHER A. JOSEPH & ASSOCIATES
Environmental Planning and Research

July 2005

Pages omitted.

Visit http://www.santa-clarita.com/cityhall/cd/planning/eir/completed.asp for complete document.

LETTER 21

Table II.1
Summary of Significant Environmental Impacts and Mitigation Measures

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
AESTHETICS		
Scenic Vistas The Proposed Project would introduce a residential development project with a junior high school site and YMCA site into the scenic vistas of the Santa Clarita Valley. The Proposed Project would provide an innovative and effective strategy for reducing the visual effects of the development. The strategy includes re-created ridgelines include manufactured berms that have the appearance of natural ridgelines with elevation peaks higher than the development pad areas. Manufactured (or super) slopes would be provided on the project site as previously described. These slopes create the sides to the development pads that include various gradients and curvature, emulating the existing topography. These slopes include peak elevations similar in height to the existing ridgelines, provide the base or side to the development pads, and include berms to camouflage portions of the development. As discussed above, the project site is not visible from the north or west and, therefore, would have no visual impact with respect to land uses in those directions. As shown in the view simulations, the site design and grading techniques would be effective in reducing the project's visual impact as seen from locations south of the project site and would minimize the effects of grading to insure that the natural character of ridgelines are preserved.	None required.	Less Than Significant

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
In balance, given the effectiveness with which the project minimizes its visual impacts to the larger community of the Santa Clarita Valley, it is concluded the project would not have a substantial adverse effect on a scenic vista. Therefore, the Proposed Project's impacts on scenic vistas would be less than significant.		
Scenic Resources The major scenic resources on the project site are the Primary and two Secondary Ridgelines and the open space. There are no outstanding scenic trees, rock outcroppings or historic building on the project site. The project would not affect the Primary Ridgeline and although portions of the secondary ridgelines would be altered, they would be recreated in essentially the same locations, would retain their basic forms and elevations, and would be contour graded to blend back into the natural adjoining hillsides. Large areas of open space would be retained by the Proposed Project, natural areas would be incorporated into the development areas, and much of the proposed development areas would be screened from view by constructed perimeter ridgelines. Project impacts with respect to scenic resources would be less than significant.	None required.	Less Than Significant
Visual Character The project site is not visible from Bouquet and Plum Canyons and, therefore, would have no visual impact to those areas. The Proposed Project would be visible from adjacent residential development to the east and the west, as well as from the existing development located south of the Santa Clara River. From these	None feasible.	Significant and Unavoidable

LETTER 21

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
areas, the project would be sent to convert undeveloped hillsides into a developed environment of housing, landscaping and institutional uses. Views of existing topography and native vegetation would be reduced or eliminated. For the Alta Knoll Drive community located to the northwest, the most visually prominent change would be the construction of an adjacent single-family residential community. Although the project's land uses would be consistent with the type and character of development for the Alta Knoll Drive community, the loss of their visual open space would be an adverse significant impact. The introduction of adjacent multiple-family housing would constitute a substantial change in the existing visual character of the project site for residents on the edge of the adjacent residential community on the east, the Ermine Street community. Even though the multiple-family housing would be situated at a substantially lower elevation than the existing homes and there would be substantial setbacks and landscaping to soften their visual effect, the site would be transformed largely from vacant mostly undeveloped property to a more urban environment. Implementation of the Proposed Project would constitute an adverse significant visual impact for these homes as it would substantially degrade the existing visual character or the quality of the site and its surroundings.		

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
Light and Glare New lighting associated with the Proposed Project would not be directly visible from either Plum Canyon or Bouquet Canyon, although an increase in sky "glow" may be detectible from these areas, particularly on cloudy nights. The new lighting could be perceptible from residential areas to the south; however, there is substantial distance (approximately one mile or more) between the project site and the more light sensitive residential areas in the hillsides south of the Santa Clara River wash. The mitigating effect of this distance would be expected to render this lighting impact less than significant. The existing residential communities adjacent to the east and west sides of the project site would experience the greatest night lighting impact: the conversion of dark nighttime hillsides into an illuminated community. For residents in these areas, the Proposed Project would create new sources of substantial light. Therefore, this impact would be considered potentially significant and mitigation is required. Glare is typically a daytime problem associated with commercial buildings constructed with highly reflective building materials. As a hillside residential development buffered by berms and substantial landscaping, the Proposed Project would not be expected to generate substantial glare. Therefore, glare impacts are expected to be less than significant.	B-1 The Project Applicant shall prepare and implement a Lighting Mitigation Plan. The Plan shall be submitted to the City of Santa Clarita Department of Planning and Economic Development for reviewed and approval prior to issuance of grading permits. B-2 Project street lighting shall be the lowest intensity necessary for security and safety purposes, while still adhering to the recommended levels of the Illuminating Engineering Society of North America. B-3 In order to minimize illumination wash onto adjacent areas, street lighting shall utilize non-glare fixtures directed downward onto the project site and aimed away from the off-site viewers. B-4 Atmospheric light pollution shall be minimized by utilizing street lighting fixtures that cut-off light directed to the sky. B-5 The project developer shall distribute information to prospective home buyers recommending the use of motion detectors for private security, rather than continuous lighting systems. B-6 Project CC&Rs shall include the following restrictions on outdoor lighting for private residences: • The use of exterior up lighting fixtures for building facades and trees shall be prohibited. • Only down lighting for exterior-building mounted fixtures shall be permitted. • Use of "glowing" fixtures that would be visible from existing communities or public	Less Than Significant

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
	roads shall be prohibited. A glowing fixture is a lantern style fixture, or any fixture that allows light through its vertical components.	
Cumulative Impacts: The Proposed Project represents infill development in an established urban area. There are existing residential communities to the northwest and east of the project site and residential communities under construction to the north (SunCal development) Related Project No. 4. Riverpark, combined with the Proposed Project would have the most significant visual changes to the immediate area with respect to scenic vistas, scenic resources and visual character due to proximity to the Proposed Project. The other related projects may not be as prominent visually when considered with the Proposed Project due to intervening topography. Both projects would alter, to varying degrees, Secondary Ridgelines, however, both incorporate site design and grading techniques that would minimize the disruption of the existing view corridors and scenic vistas. However, the change in visual character of the sites combined would represent a material change from an undeveloped to a developed environment that would result in a significant cumulative impact the other 11 Related Projects, significant cumulative impacts would also occur as all of these properties would involve conversion of vacant land to suburban uses. There would be a cumulative loss of vacant land as viewed from public roadways and the amount of natural vegetation and landforms would decrease overall. Therefore, an overall change in visual character with all 12 Related Project sites	None feasible for Visual Character For Light and Glare, project mitigation would reduce project's contribution to light and glare and the increase would not be considerable and thus less than significant.	Significant and Unavoidable for Visual Character Les than Significant for Scenic Vistas, Scenic Resources and Light and Glare

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
and the Related Project site would occur and is considered cumulatively significant. The Proposed Project's incremental contribution to the significant impact with respect to change in visual character would be cumulatively considerable and significant. With respect to light and glare, mitigation measures proposed would result in less than significant impacts.		

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
AIR QUALITY		
AQMP Consistency Projects that are consistent with the projections of employment and population forecasts identified in the Growth Management Chapter of the RCPG are considered consistent with the AQMP growth projections, since the Growth Management Chapter forms the basis of the land use and transportation control portions of the AQMP. As discussed in Section V.L. Population and Housing, implementation of the Proposed Project would not directly or indirectly induce substantial population or employment growth beyond current growth projections established by SCAG and would be consistent with the AQMP employment forecasts for the City of Santa Clarita and the Santa Clarita Valley. Therefore it would not jeopardize attainment of State and national ambient air quality standards in Los Angeles County and impacts would be less than significant.	None required.	Less than Significant
Construction Emissions Construction related daily emissions would exceed SCAQMD significance thresholds for NOx and PM_{10} during the site grading phase, VOC and NOx during the peak construction phase when the school, YMCA, and first two residential phases are constructed, and NOx during the third residential development phase. Therefore, this impact would be significant regarding a substantial contribution to an existing or projected air quality violation.	C-1 The Applicant shall implement measures to reduce the emissions of pollutants generated by heavy-duty diesel-powered equipment operating at the project site throughout the project construction phases. The Applicant shall include in construction contracts the control measures required and recommended by the SCAQMD at the time of development. Examples of the types of measures currently required and recommended include the following: • Keep all construction equipment in proper tune in	Significant and Unavoidable

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
	accordance with manufacturer's specifications; • Use late model heavy-duty diesel-powered equipment at the project site to the extent that it is readily available in the South Coast Air Basin; • Use diesel-powered equipment that has been retrofitted with after-treatment products (e.g., engine catalysts or cooled exhaust gas recirculation technology) to the extent that it is readily available in the South Coast Air Basin; • Use low-emission diesel fuel for all heavy-duty diesel-powered equipment operating and refueling at the project site to the extent that it is readily available and cost effective in the South Coast Air Basin (this does not apply to diesel-powered trucks traveling to and from the site); • Utilize alternative fuel construction equipment (i.e., compressed natural gas, liquid petroleum gas, and unleaded gasoline) to the extent that the equipment is readily available and cost effective in the South Coast Air Basin; • Limit truck and equipment idling time to five minutes or less; • Rely on the electricity infrastructure surrounding the construction sites rather than electrical generators powered by internal combustion engines to the extent feasible. • The following measures are recommended to reduce the potential emissions associated with	

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
	operational activities to the maximum extent feasible.	

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
Daily Operational Emissions The Proposed Project would generate daily emissions that exceed the thresholds of significance for VOC, NOx, and CO recommended by the SCAQMD during both the summertime smog season and wintertime non-smog season. This is a significant impact regarding a substantial contribution to an existing or projected air quality violation.	C-2 The Applicant shall include in construction contracts the following requirements or measures shown to be equally effective: • Use solar or low-emission water heaters in the residential, school, and YMCA buildings. • Provide energy-efficient heating, cooling, and other appliances, such as cooking equipment, refrigerators, and dishwashers. • Provide energy-efficient and automated controls for air conditioning units. • Install ozone destruction catalyst on air conditioning systems, in consultation with the SCAQMD. • Use light colored roof materials to reflect heat. • Install only gas-burning fireplaces in the residential units. Wood-burning fireplaces shall not be constructed. • Require that commercial landscapers providing services at the project site use electric or battery-powered equipment, or other internal combustion equipment that is either certified by the California Air Resources Board or is three years old or less at the time of use, to the extent that such equipment is reasonably available and competitively priced in Los Angeles County.	Significant and Unavoidable
Localized CO Concentrations Future CO concentrations near the studied intersections would not	None required.	Less than Significant

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
exceed the national and State ambient air quality standards for CO. Therefore, implementation of the Proposed Project and cumulative development would not expose any sensitive receptors located in close proximity to these intersections to substantial pollutant concentrations. This would be a less-than-significant impact regarding the exposure sensitive receptors to substantial pollutant concentrations.		

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
Toxic Air Contaminants Toxic or carcinogenic air pollutants are not expected to occur in any meaningful amounts in conjunction with operation of the proposed land uses at the project site. Only small quantities of common forms of hazardous or toxic substances, such as cleaning agents, which are typically used or stored in conjunction with residential and educational uses, would be present. Most uses of such substances would occur indoors. Based on the common uses expected on the site, any emission would be minor. Impacts would be a less-than-significant impact regarding the exposure sensitive receptors to substantial pollutant concentrations.	None required.	Less than Significant
Airborne Odors Potential operational airborne odors could result from cooking activities associated with the new residential units and school. These odors would be similar to existing residential uses in the local vicinity and would be confined to the immediate vicinity of the new buildings. Therefore, implementation of the Proposed Project is not expected to create objectionable odors affecting a substantial number of people. This is a less-than-significant impact.	None required.	No Impact

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
Cumulative Impacts As long as growth in the Basin is within the projections for growth identified in the Growth Management Chapter of the RCPG, implementation of the 2003 AQMP will not be obstructed by such growth. As growth in the City of Santa Clarita and Santa Clarita Valley has not exceeded these projections, this impact would not be significant. Because the Basin is currently in nonattainment for ozone, CO, and PM_{10}, related projects could exceed an air quality standard or contribute a substantial increase to an existing or projected air quality exceedance. Construction related daily emissions associated with project development would exceed SCAQMD significance thresholds for NOx and PM_{10} during the site grading phase, VOC and NOx during the peak construction phase when the school, YMCA, and first two residential phases are constructed, and NOx during the third residential development phase. Therefore, the emissions generated by project construction would be cumulatively considerable regarding a substantial contribution to an existing or projected air quality violation. Operation of the Proposed Project would also generate operational emissions of VOC, NOx, and CO that exceed the SCAQMD's recommended thresholds. These emissions would, therefore, also be cumulatively considerable and significant. Cumulative development would not have a significant impact in terms of exposure of sensitive receptors to substantial toxic pollutant concentrations or the creation of objectionable odors	None feasible.	Significant and Unavoidable

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
affecting a substantial number of people. Projects projected to be built in the vicinity of the Proposed Project site include residential and commercial developments. The odors would be similar to existing residential uses in the vicinity and would be confined to the immediate vicinity of the new buildings. As analyzed above in this section, the project's contribution to odor impacts would not be cumulatively considerable.		
BIOLOGICAL RESOURCES		
Native Plant Communities Coastal Sage Scrub The Proposed Project site includes a total of approximately 100.07 acres of Coastal Sage Scrub (CSS). Grading for the Proposed Project would permanently impact 86.00 acres of CSS, which includes 0.70 acres of fuel modification impacts. The remaining 14.07 acres will be retained within Natural Open Space. The total loss represents about 86 percent of this habitat type on the site and would be considered a significant impact prior to mitigation. In addition, The Keystone site is within an area designated as critical habitat for the federally listed threatened coastal California gnatcatcher and CSS is considered to be a Primary Constituent Element (PCE) that could provide for breeding, foraging and dispersal for this species. The loss of CSS, because it is within designated critical habitat and would be considered to be a PCE, and the loss would be a significant impact	D-1 The project will impact 85.3 acres of coastal sage scrub, a special-status vegetation community and which is also within a designated critical habitat unit for the coastal California gnatcatcher. The loss of 85.3 acres of coastal sage scrub is considered a significant impact before mitigation. Mitigation would consist of restoration or purchase of 85.3 acres to replace the lost habitat or mitigation as determined by USFWS in conjunction with Mitigation Measure D-10.	Less than Significant
Chaparral	D-2 The project will impact 53.13 acres of chaparral, which is	Less than Significant

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The Proposed Project site includes a total of approximately 85.18 acres of Chaparral. Grading for the Proposed Project would permanently impact 57.85 acres of chaparral, which includes approximately 4.72 acres of fuel modification impacts. The remaining 27.33 acres will be retained within Natural Open Space. The total loss represents about 67.9 percent of this habitat type on the site. While chaparral is widespread and common and has no designation in the California Natural Diversity Database as a special-status habitat. The project site is within an areas designated as critical habitat for the federally listed threatened California Gnatcatcher and chaparral is considered to be a Primary Constituent Element (PCE) that could provide for breeding, foraging and dispersal for this species. The loss of chaparral because its within the designated critical habitat and would be considered to be a PCE, would be considered a significant impact.	also within a designated critical habitat unit for the coastal California gnatcatcher. The loss of 53.13 acres of chaparral is considered a significant impact before mitigation. Mitigation would consist of restoration or purchase of 53.13 acres to replace the lost functions of the Critical Habitat or mitigation as determined by USFWS in conjunction with Mitigation Measure D-10.	
Non-Native Grassland The Proposed Project site totals approximately 18.42 acres of non-native grassland (NNG). Grading for the Proposed Project would permanently impact 10.81 acres of NNG, which includes approximately 1.03 acres for fuel modification. The remaining 7.61 acres will be retained within Natural Open Space. The total loss represents about 58.6 percent of this habitat type on the site. NNG is not considered a PCE of the gnatcatcher Critical Habitat and the loss of NNG would not be considered a significant impact.	None Required.	Less than Significant

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
Southern Cottonwood-Willow Riparian Habitat The Proposed Project site totals approximately 3.09 acres of southern cottonwood-willow riparian forest. Grading for the Proposed Project would permanently impact 2.44 acres of riparian forest. The remaining 0.65 acres will be retained within Natural Open Space. The loss represents about 78.9 percent of this habitat on the site and would be a significant impact.	D-3 The project will impact 2.44 acres of Southern Cottonwood-Willow Riparian Habitat, a habitat designated as sensitive in the CNDDB and that is also regulated by CDFG. The impact is therefore considered significant. The applicant shall develop a mitigation and monitoring plan to be prepared in accordance with the most Corps recent guidelines and shall receive approval of the plan by CDFG prior to impacts to jurisdictional waters on the site. A five-year monitoring plan shall be implemented as set forth in the mitigation and monitoring plan prepared for the project.	Less than Significant
Residential/Urban/Exotic Non-Habitat Vegetation Association The Proposed Project site totals approximately 34.11 acres of residential/urban/exotic/non-habitat vegetation association. Grading for the Proposed Project would permanently impact 26.64 acres of exotic vegetation, which includes approximately 0.03 acres of fuel modification impacts. The remaining 7.47 acres will be retained within Natural Open Space. The loss represents about 78.1 percent of this habitat type on the site. Residential/Urban/Exotic vegetation is not considered a PCE of the gnatcatcher Critical Habitat and the loss of this type of land cover would not be considered significant.	None required.	Not Significant.
Actively Scoured Santa Clara River Bottom There are no impacts to Santa Clara River wash resulting from development. This entire area will be preserved as Natural Open	None required.	Not Significant

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
Space.		
Common Wildlife Construction activity and grading operations, associated with development of the Proposed Project would temporarily disturb common wildlife species on that occupy the site. Many mobile species (e.g., avifauna) would be expected to relocate to other areas of similar habitat within the vicinity of the site. Because of the relatively common character and widespread distribution of many or most of the wildlife species that would be displaced or lost as a result of construction activities, such impacts are not considered significant. It should be noted that in the absence of mitigation, a number of bird species could be adversely affected as a result of implementation of the Proposed Project. The Proposed Project includes removal of mature trees and shrubs from the property. Construction-related activities could result in the direct loss of active nests or the abandonment of active nests by adult birds during the nesting season. The Migratory Bird Treaty and the California Fish and Game Code prohibit the take — defined as destroy, harm, harass, etc.— bird nest with eggs or young.	(See Measures D-5 and D-6)	Less than Significant
Special Status Plant and Wildlife Resources Special-Status Plant Species Oak Trees Of the eight oak trees found within the project study area, five oaks are located within the project site boundaries, east of the LA DWP	D-4 While the majority of oak trees on the site will be retained in place, three oak trees (designated O-1, O-2, and O-8 in the TLC report) would be removed during grading: one (O-8) would be removed due to project construction and two would be removed due to construction of the Golden	Less than Significant

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
right-of-way. Oak tree number 0-8, within the project site boundaries, would be removed during grading of a slope in Lot 115. The remaining four oak trees (O-3, O-4, O-5 and O-7) that are clustered together immediately adjacent to the right-of-way would be preserved in situ in an open space area not proposed for development. The remaining three oak trees are situated outside the project site boundaries. Two of these trees (O-2 and O-6) are located in close proximity to the future alignment of the Golden Valley Road extension to Newhall Ranch Road. The project applicant would construct the road as its necessary to provide project site access. One of these trees (O-1) would be preserved in situ as it would not be within the roadway right-of-way. Three oak trees (O-2, O-6 and O-8) would be removed by construction of the Proposed Project and the Golden Valley Road extension.	Valley Road extension from the project site boundary to Newhall Ranch Road. Appropriate approvals shall be obtained prior to oak trees being removed, subject to the Oak Tree Preservation Ordinance (Ordinance 89-1) and the City of Santa Clarita Oak Tree Preservation and maintenance Guidelines. The applicant shall develop a detailed mitigation program for approval by the City in accordance with the Ordinance. In addition, and prior to grading, oak trees near construction/grading area that will not be removed and will be protected during the grading and construction phases of the project by appropriate fencing that extends 5 feet beyond the tree canopy's dripline, or 15 feet from the trunk, whichever is greater. Equipment damage to the limbs, trunks and roots must be avoided. Even slight trunk injuries can result in long-term, life threatening pathogenic maladies. No storage of equipment or debris within the Protective Zone (drip line plus 5 feet) will be allowed. No dumping of construction wastewater i.e., paint, stucco, concrete, clean-up, etc. Within Protective Zones, Generally, fencing shall be placed at the Protective Zone of any oak or groups of oaks within 50 feet of proposed construction activity. Protective Fencing must remain in place during construction projects and shall not be moved or removed without prior written approval from the Department of Planning and Economic Development under the direct supervision of the Project Consulting Arborist.	

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	Protective Fencing shall be a least 4 feet in height with a visible sign attached a 50 feet intervals which reads: (WARNING- THIS FENCE IS FOR THE PROTECTION OF THIS TREE AND SHALL NOT BE REMOVED OR RELOCATED WITHOUT WRITTEN AUTHORIZATION FROM THE CITY OF SANTA CLARITA PLANNING AND ECONOMIC DEVELOPMENT DEPARTMENT) Care should be taken to avoid placing any sprinklers within watering distance to the trunk of an oak tree. Generally, sprinklers should not reach within 15 feet of a mature oak trunk. Grass or ground covers must never be planted next to the trunks. Too much moisture near the base of an oak is generally believed to be their leading cause of death in residential settings. Oak Root Fungus is the result of over-watering. Oak trees survive and thrive on annual rainfall alone and generally do not need supplemental irrigation except during periods of drought. Watering should take place at or near the drip line. Landscape plans should leave the area within the drip line of an oak tree in a native or natural setting. Care must be taken to limit grade changes near the trunk areas. The grade should not be lowered or raised around the trunks of trees. This can lead to plant stress from oxygen deprivation or Oak Root Fungus at the root collar.	

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
	Protective fencing shall be installed around all oaks not listed for removal. Place protective fencing at the Protected Zone (PZ) as shown on the TLM. The fencing can be repositioned as needed to allow for grading near the oaks listed as "impacted". The project arborist must be present during the fence placement. Final fencing locations shall be inspected by the City prior to the commencement of development activities. Regular inspections of this fencing shall occur during site development. An Oak Tree Information Packet including the City of Santa Clarita Oak Tree Protection and Preservation Guidelines must be available on site during construction. The property owner and contractor should be familiar with the contents of these documents. Vehicle travel along dirt roadways to and from the site may create a heavy coating of dust on the foliage of nearby oaks. These oaks should be hosed off periodically during construction activities. All work performed within the Protective Zone (drip line plus 5 feet) of any oak shall be accomplished by utilizing hand tools only and must be 'monitored' by the projects Oak Tree Consultant.	

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	All roots over 1.5-inch diameter will be clean cut at a 45-degree angle and treated by the Consulting Arborist. No oaks outside the property line (except for two oaks to be removed for construction of Golden Valley Road) are to be impacted by this construction project. The leaf-litter build-up under the canopies of the oaks on this site is ideal for healthy tree growth and root development. Do not alter or remove if possible. A 3-inch layer of mulch may be advisable in settings where leaf-little has been lost. Do not remove the aluminum tags numbering each oak on this site. No construction materials are to be stored or discarded within the PZ of any oak. Rinse water, concrete residue, liquid contaminates (paint, thinners, gasoline, oils, etc.) of any type shall not be deposited in any form at the base of an oak. No vehicles shall be parked within the PZ of an oak. No construction vehicles are to be parked under the shade (within the PZ) of an oak.	

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
Special-Status Wildlife Species Observed in the Site The Western spadefoot toad is a California Species of Special Concern and Federal Species of Concern and a single individual was observed on the project site during the 2003-focused survey. The area where the single individual was detected is located in an area proposed for development. However, because only a single individual was detected, the potential loss would not be considered a significant impact. The Cooper's hawk is California Species of Special Concern that was occasionally observed foraging or flying over the site. No nesting was detected and potential breeding areas on the site are very limited. Development of the site would not result in significant impacts to the Cooper's hawk. Bell's sage sparrow is a Federal Species of Concern and is still common throughout the region. One location for this species was observed during a number of survey visits. Breeding was not detected. Because this species is still common and only one occurrence would be affected by the project, the potential impact would not be considered significant. The yellow warbler is a California Species of Special Concern that was observed on the site on two occasions. This species is still widespread and common in the region. No breeding was detected. Development of the site would not result in significant impacts to the	None required.	Less than Significant

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yellow warbler. The yellow-breasted chat is a California Species of Special Concern that was observed on the site on six occasions. This species is still widespread and common in the region. No breeding was detected. Development of the site would not result in significant impacts to the yellow-breasted chat. The loggerhead shrike is California Species of Special Concern and Federal Species of Concern that was observed onsite on multiple occasions and constitutes a single occurrence. This species is still widespread and common in the region. No breeding was detected. Development of the site would not result in significant impacts to the loggerhead shrike.		
Migratory Bird Treaty Act Compliance Pursuant to the federal Migratory Bird Treaty Act, it is unlawful to "take" (i.e., capture, kill, pursue, or possess) migratory birds or their nests. Removal of vegetation associated with project implementation should not take place during the nesting season for most birds (January 31 to August 1) and for migratory birds (March 15 – August 15). The loss of an active nest of a migratory bird would be significant. With implementation of the recommended mitigation, this potential impact would be reduced to less-than-significant.	D-5 If grubbing or clearing of vegetation is scheduled to occur during the nesting season (January 31 to August 1), then prior to issuance of grading permits the project applicant shall have a qualified biologist survey the project site for the presence of any occupied raptor nests. If such a nest is found, then no construction work shall occur within a 300-foot radius from the nest until the nestlings have fledged, or as directed by the biological monitor to ensure compliance with Section 3503.5 of the California Fish and Game Code. D-6 If grubbing or clearing of vegetation is scheduled to take place during the nesting season for migratory birds (March	Less than Significant

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
	15-August 15), then three days prior to issuance of grading permits, the Project Applicant shall have a qualified biologist survey impact areas for the presence of occupied migratory bird nests. If active nests of migratory birds are located, then no construction work shall occur within a 300-foot radius from the nest until the nestlings have fledged, or as directed by the biological monitor.	
Jurisdictional Resources Impacts to Corps Jurisdiction Grading of the project would result in impacts to 1.22 acres of Waters of the United States which less than 0.01 acre consists of jurisdictional wetlands. The loss of 1.22 acres of Waters of the United States is considered a significant impact.	D-7 The applicant shall obtain a Section 404 Permit from the Corps prior to discharging fill into waters of the United States. The loss of 1.22 acres of waters of the United States shall be mitigated at a minimum replacement of 1:1 on the project site or in the vicinity of the site in the Santa Clara River watershed as determined through processing of the Section 404 Permit. The applicant shall develop a mitigation and monitoring plan prepared in accordance with the most recent guidelines prepared by the Corps and shall receive approval of the plan prior to impacts to jurisdictional waters on the site. A five-year monitoring plan shall be implemented as set forth in the mitigation and monitoring plan prepared for the project.	Less than Significant
Impacts to CDFG Jurisdiction Grading for the project would result in impacts to 4.26 acres of CDFG jurisdictional streambeds is considered a significant impact.	D-8 The applicant shall obtain a Section 1602 Streambed Alteration Agreement from CDFG prior to impacting waters of the State. The loss of 4.26 acres of CDFG jurisdictional streambeds shall be mitigated at a minimum	Less than Significant

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
	replacement of 1:1 on the project site or in the vicinity of the site in the Santa Clara River watershed or as determined in the Streambed Alteration Agreement. The applicant shall development a mitigation and monitoring plan prepared in accordance with the most recent guidelines prepared by the Corps and shall receive approval of the plan by CDFG prior to impacts to jurisdictional waters on the site. A five-year monitoring plan shall be implemented as set forth in the mitigation and monitoring plan prepared for the project.	
Impacts on Habitat Adjacent to Santa Clara River Riparian Area Upland habitat within 100 feet from riparian wildlife species is necessary to maintain species diversity within the riparian ecosystem and adequately buffer this ecosystem from adjacent incompatible land uses. Temporary grading would be allowed in the 100-foot buffer if the area is revegetated with native habitats following completion of grading. With incorporation of native habitat into the 100-foot buffer area, any impacts to the Santa Clara River would be reduced to less than significant.	D-9 Temporary project grading shall be allowed within a 100 foot buffer area adjacent to the Santa Clara River Riparian Area. Upon completion of grading, the project applicant shall re-vegetate the 100-foot buffer area with native habitat. The applicant shall delineate the 100-foot buffer prior to issuance of grading permits. A palette of site-appropriate native plant species shall be submitted to the Director of Planning & Economic Development for approval prior to issuance of grading permits.	Less than Significant
Significant Ecological Areas No habitat within Santa Clara River SEA will be disturbed or converted to urban uses as result of project implementation resulting in permanent impact. Grading will be occurring in	None required	Less than Significant

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
adjacent buffer areas; however, these areas will be planted with native species and will function as buffer areas upon completion of the project.		
Coastal California Gnatcatcher Critical Habitat Unit 13 Essentially, the entire Keystone site is located within Critical Habitat Unit 13 for the federally listed threatened coastal California gnatcatcher, which was not identified on the site during focused protocol surveys. Nevertheless, the 85.3 acres of CSS and 53.13 acres of chaparral on the site, totaling approximately 138.43 acres, are considered to comprise Primary Constituent Elements (PCEs) that could potentially provide for breeding, foraging and dispersal for this species. As noted under plant communities above, the loss of CSS and chaparral, totaling 138.43 acres combined within Critical Habitat Unit 13 would be a significant impact.	D-10 The project shall require federal permits (i.e., a Section 404 Permit from the Corps) that would further require that impacts to designated critical habitat be addressed through a Section 7 Consultation with USFWS. Specific mitigation to compensate for impacts to designated gnatcatcher critical habitat will be addressed and developed in consultation with USFWS during the Section 7 Consultation.	Less than Significant
	Additional Construction-Related Mitigation Measures D-11 The following measures shall be implemented to minimize impacts on remaining biological resources on the site as a result of construction and grading activities and to ensure that potential impacts on these resources will remain less than significant. A qualified biologist shall be retained, as determined by the City of Santa Clarita, as a construction monitor to ensure that incidental construction impacts on biological resources are avoided, or minimized, and to conduct pre-	

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	grading field surveys for special-status plant and wildlife species that may be destroyed as a result of construction and/or site preparation activities. Responsibilities of the construction monitor include the following: a) The construction monitor shall attend pre-grade meetings to ensure that timing/location of construction activities do not conflict with mitigation requirements (e.g. seasonal surveys for plants and wildlife). b) Mark/flag the construction area in the field with contractor in accordance with the final approved grading plan. Haul roads and access roads shall only be sited within the grading areas analyzed in the project EIR. c) Supervise cordoning of preserved natural areas that lie outside grading areas identified in the project EIR (e.g., with temporary fence posts and colored rope). d) Conduct a field review of the staking (to be set by the surveyor) designating the limits of all construction activity. Any construction activity areas immediately adjacent to riparian areas or other special-status resources should be flagged or temporarily fenced by the monitor, at his/ her discretion. e) Conduct meetings with the contractor and other key construction personnel describing the importance of restricting work to designated areas. The monitor should also discuss procedures for minimizing harm/ harassment of wildlife encountered during	

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	construction. f) Periodically visit the site during construction to coordinate and monitor compliance with the above provisions. g) Construction personnel shall be prohibited from entry into areas outside the designated construction area, except for necessary construction related activities, such as surveying. All such construction activities shall be coordinated with the construction monitor. h) Standard dust control measures shall be implemented to reduce impacts on nearby plants and wildlife. This includes replacing ground cover in disturbed areas as quickly as possible; water active sites at least twice daily; suspend all excavating and grading operations when wind speeds (as instantaneous gusts) exceed 25 mph; and restricting traffic speeds on all unpaved roads to 15 mph or less in areas within 200 feet of vegetation. i) Upon completion of construction, the contractor shall be held responsible to restore any haul roads and access roads that are outside of approved grading limits. This restoration shall be done in consultation with the construction monitor.	
Operational Impacts Increased Human and Domestic Animal Presence Implementation of the Proposed Project would increase human and	D-12 Pets and other domestic animals shall be prohibited with fencing and signage from the open space areas and in any revegetation areas on the project site unless restrained by	Less than Significant

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domestic animal presence in the area. The River already receives a certain amount of equestrian and off-road vehicle use, as well as domestic animal use. an increase in these uses as a result of project implementation, taken together, could substantially effect the quality of these areas as wildlife habitat, would potentially interfere with movement of wildlife, and would potentially reduce the population of wildlife species, including special-status bird and fish species. Therefore, the increased use of the river areas by humans and domestic animals is considered a significant impact.	leash and only in designated areas. D-13 Fencing of sufficient height and design (i.e., ranch-rail) shall be constructed between the edge of the fuel modification zone and the river corridor to deter humans and domestic animals from entering open space habitat areas. D-14 Native shrubs such as laurel sumac, California coffeeberry, toyon, and coast prickly-pear shall be planted along the fence to further deter access. Final fence design shall be approved by and the City Planning and Building Services Department. D-15 Human access into the open space areas shall only occur in designated locations (i.e., existing and future trails). All motorized vehicles are prohibited from entering the preserved natural open space areas with the exception of emergency or maintenance vehicles. Applicant shall post signage reflecting the above requirement. D-16 Prohibitions against human, domestic animal, and motorized vehicle use in preserved natural open space areas shall be established by the covenants conditions and restrictions (CC & Rs) recorded with the City Planning and Building Services Department. D-17 Interpretative signs shall be constructed and placed in	

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	appropriate areas, as determined by the City Planning and Building Services Department that explain the sensitivity of natural habitats and the need to minimize impacts on these natural areas. The signs will state that they are entering a protected natural area and that all pedestrians must remain on designated trails, all pets are to be restrained on leash, and that it is illegal to harm, remove, and/or collect native plants and animals. The project applicant shall be responsible for installation of interpretive signs and fencing.	
Lighting and Glare The development of a residential community and YMCA and junior high school would increase the number of nighttime light and glare sources on the site over current levels, which are relatively low. Because of the potential disruption to breeding and foraging behavior of wildlife species remaining on, and adjacent to, and in proximity to the project site, increased nighttime lighting and glare is considered a potentially significant impact.	D-18 All street, residential, and parking lot lighting shall be downcast luminaries or directional lighting with light patterns directed away from natural areas. Covenants, Codes and restrictions (CC&Rs) shall require the exterior lighting within the residential area be limited to low voltage unless such lights are shielded and pointed downward.	Less than Significant
Increase in Population of Non-Native Species Non-native plant and wildlife species are typically attracted to developed and urban environments and potentially displace native species because of their ability to complete more effectively for resources. However, because various levels of development essentially surround the project site, non-native and urban-adapted	D-19 The only potential impacts associated with an increase in non-native are along the interface of the Santa Clara River. Implementation of Mitigation Measures D-9 and D-17 above, would mitigate these potential impacts to a level that is less than significant.	Less than Significant

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plant species already occur on the project site and surrounding area. Consequently, the project is not exposed. Therefore, impacts on the remaining natural areas as result of potential increases in non-native plants and wildlife resulting from project implementation are not expected to be significant. However, incorporation of native planting into buffer areas along the Santa Clara River would ensure that impacts to the river are less than significant. **Cumulative Impacts** Because of the overall low value of the biological resources on the site, the proposed Keystone project's contribution to the regional loss would not be substantial. However, significant impacts to Coastal Sage Scrub, Chaparral, Southern Cottonwood-Willow Riparian Forest and individual oak trees have been determined and the loss of these habitats with project and related project implementation would add to the cumulative loss in the regions. With implementation of the mitigation for direct habitat loss would be fully compensated and the cumulative impacts would also be reduced to a less-than significant level as set forth mitigation measures D-1, D-2, D-3, and D-5. Cumulative impacts to Gnatcatcher Critical Habitat Unit 13 would be mitigated to a less than significant level as set forth in mitigation measure D-1, D-2, and D-4. The cumulative loss of aquatic resources subject to the jurisdiction of the Corps and CDFG would be mitigated with the project mitigation measure D-8. All potential	None required	Less than Significant

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cumulative impacts to biological resources would be mitigated to a less-than-significant level with implementation of the mitigation measures set forth above.		
CULTURAL RESOURCES		
Historical: According to the Phase I that was prepared for the project, although no evidence of historical resources was found on the project site, the project site is moderately sensitive for historical resources and unknown resources could be uncovered during project construction. If proper care is not taken during grading and excavation activities, these unknown resources could be damaged or destroyed. Therefore, project impacts on unknown historical resources would be significant.	E.1-1 Prior to excavation and construction on the Proposed Project site, the prime construction contractor and any subcontractor(s) shall be cautioned on the legal and/or regulatory implications of knowingly destroying cultural resources or removing artifacts, human remains, bottles, and other cultural materials from the project site. E.1-2 If during any phase of project construction, any cultural materials are encountered, construction activities within a fifty-meter radius shall be halted immediately, and the project applicant shall notify the City. A qualified historic archaeologist (as approved by the City) shall be retained by the project applicant and shall be allowed to conduct a more detailed inspection and examination of the exposed cultural materials. During this time, excavation and construction would not be allowed in the immediate vicinity of the find. However, those activities could continue in other areas of the project site.	Less than Significant

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	E.1-3 If any find were determined to be significant by the qualified historic archaeologist, the City, and the qualified historic archaeologist would meet to determine the appropriate course of action. E.1-4 All cultural materials recovered from the site would be subject to scientific analysis, professional museum curation, and a report prepared according to current professional standards.	

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Prehistoric Archaeological Resources One prehistoric archaeological site (CA-LAN-0295) and two prehistoric isolates have been recorded within a one mile radius of the project site. According to the Phase I that was prepared for the project, the site appears to be clear of any known, potentially significant resources and not likely to yield buried deposits. Given the archaeological-sensitivity of the area, it is possible that during the project's construction phase, unknown prehistoric archaeological resources could be encountered. Without proper care during grading and excavation, unknown resources could be damaged or destroyed. Therefore, project impacts on unknown prehistoric archaeological resources would be significant.	Mitigation measures E.1-1 through E.1-4, listed under Cultural Resources, Historical Resources above, for the impacts to unknown resources would also be applicable to unknown prehistoric archaeological historic archaeological resources.	Less than Significant
Human Remains No evidence has been uncovered that the project would disturb any human remains. Contact with the Native American Heritage Commission resulted in no written comments and no specific concerns with respect to potential resources on the site. However, it is possible during the project's construction phase that human remains could be uncovered. Therefore, project impacts on unknown human remains would be significant.	E.2-1 If human remains are discovered at the project site during construction, work at the specific construction site at which the remains have been uncovered shall be suspended, and the City of Santa Clarita Department of Planning and Economic Development and County coroner shall be immediately notified. If the remains are determined by the County coroner to be Native American, the Native American Heritage Commission (NAHC) shall be notified within 24 hours, and the guidelines of the NAHC shall be adhered to in the treatment and disposition of the remains.	Less than Significant
Paleontological resources: Although earth-moving activities would be relatively short term, some fossil remains, unrecorded fossil sites, associated specimen	E.3-1 Prior to construction, the project applicant shall retain the services of a qualified vertebrate paleontologist approved by the City of Santa Clarita and the Los Angeles County	Less than Significant

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data, and corresponding geologic and geographic site data, and the fossil-bearing strata could be lost. The potential loss of these paleontological resources would be significant. Therefore, project impacts on paleontological resources would be significant.	Vertebrate Paleontology Department (LACMVP) to implement the mitigation program during earth-moving activities in the parcel. E.3-2 The paleontologist shall develop a formal agreement with a recognized museum repository, such as the LACMVP, regarding final disposition and permanent storage and maintenance of any fossil remains and associated specimen data and corresponding geologic and geographic site data that might be recovered as a result of the mitigation program, and the level of treatment (preparation, identification, curation, cataloguing) of the remains that would be required before the entire mitigation program fossil collection would be accepted by the repository for storage. E.3-3 Prior to the start of any earth-moving activity associated with development of the parcel, the paleontologist and/or monitor shall conduct an intensive survey of the parcel, including those areas that would be buried but not otherwise disturbed by these activities. The survey, particularly with regard to areas of the parcel underlain by the Saugus Formation, shall allow for the discovery of any unrecorded fossil site and the recovery the fossil remains, the recording of associated specimen data and corresponding geologic and geographic site data, and the recognition of fine-grained strata suitable for containing smaller vertebrate fossil remains. The recovery of fossil	

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	remains during the survey might reduce the potential for a delay in earth-moving activities. E.3-4 The paleontologist or monitor shall coordinate with the appropriate grading contractor personnel to provide information regarding lead agency requirements for the protection of paleontological resources. Contractor personnel also shall be briefed on procedures to be followed in the event that a fossil site or remains are encountered by earth-moving activities, particularly when the monitor is not on site. The briefing shall be presented to new contractor personnel as necessary. Names and telephone numbers of the monitor and other appropriate mitigation program personnel shall be provided to the appropriate contractor personnel. E.3-5 Earth-moving activities shall be monitored by the monitor only in those areas of the parcel where these activities would disturb previously undisturbed strata. Monitoring shall be conducted on a full-time basis in areas underlain by Saugus Formation, half time where underlain by the low terrace remnants, and quarter time where underlain by the high terrace deposits, younger alluvium, and stream channel deposits (monitoring would not be conducted in areas underlain by younger alluvium or stream channel deposits, unless and until these activities have reached a depth at least 5 feet below grade, or in areas where exposed strata would be buried,	

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	but not otherwise disturbed). If fossil remains are encountered by these activities, monitoring shall be increased to full or half time, as appropriate, at least in the vicinity of the fossil site where the area is underlain by the fossil-bearing rock unit. With City of Santa Clarita approval, if no fossil remains are found once 50 percent of earth-moving activities have been completed in an area underlain by a particular rock unit, monitoring may be reduced or suspended in that area. Monitoring shall consist of visually inspecting debris piles and freshly exposed strata for larger fossil remains, and periodically dry test screening sediment, rock, and debris for smaller fossil remains. As soon as practicable, the monitor shall recover all vertebrate fossil specimens, a representative sample of invertebrate or plant fossils, or any fossiliferous rock sample that can be recovered easily. If recovery of a large or unusually productive fossil occurrence is warranted, earth-moving activities shall be diverted temporarily around the fossil site and a recovery crew shall be mobilized as necessary to remove the occurrence as quickly as possible. If not on site when a fossil occurrence is uncovered by these activities, the activities shall be diverted temporarily around the fossil site and the monitor called to the site to evaluate and, if warranted, remove the occurrence. If the fossil site is determined too unproductive or the fossil remains not worthy of recovery, no further action shall be taken to preserve the fossil site or remains, and earth-moving	

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	activities would be allowed to proceed through the site immediately. The location and proper geologic context of any fossil occurrence shall be documented, as appropriate. Any recovered rock sample shall be processed to allow for the recovery of smaller fossil remains. Rock samples shall be processed to allow for the recovery of smaller fossil remains that normally are too small to be observed by the monitor. No more than 6,000 pounds (12,000 pounds total) of rock shall be processed from either the Saugus Formation or the low terrace remnants. E.3-6 All fossil specimens recovered from the parcel as a result of the mitigation program, including those recovered as the result of processing fossiliferous rock samples, shall be treated (prepared, identified, curated, catalogued) in accordance with designated museum repository requirements. Rock samples from the Saugus Formation and older alluvium shall be submitted to commercial laboratories for microfossil, pollen, or radiometric dating analysis. E.3-7 The monitor shall maintain daily monitoring logs that include the particular tasks accomplished, the earth-moving activity monitored, the location where monitoring was conducted, the rock unit encountered, fossil specimens recovered, and associated specimen data	

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	and corresponding geologic and geographic site data. A final technical report of results and findings shall be prepared by the paleontologist in accordance with any City of Santa Clarita requirement.	
Cumulative Impacts: There are no historical resources located on the project site. One prehistoric archaeological site (CA-LAN-0295), two prehistoric isolates, and seven historical archaeological sites (CA-LAN-2105, CA-LAN-2132, and CA-LAN-2040 through -2044) have been recorded within one mile of the project area and there is further potential that one or more of the related projects might encounter archaeological resources during the course of development. It is anticipated that historic, archeological or paleontological resources that are potentially affected would be subject to the requirements of CEQA. It is further anticipated that the effects of cumulative development on such resources would be mitigated to the extent feasible in accordance with CEQA and other applicable legal requirements. Consequently, cumulative impacts are expected to be less than significant and thus, when considered in conjunction with the Proposed Project would not be cumulatively considerable.	None required.	Less than Significant

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GEOLOGY AND SOILS		
Earthquakes, Landslides, Mudslides, Ground Failure, or Similar Hazards The Geologic and Geotechnical Report prepared for the project site determined that impacts exposing people or property to geologic hazards related to earthquakes, landslides/mudslides, ground failure associated with liquefaction, transition lots, groundwater and soil corrosivity would be less than significant with incorporation of the required mitigation measures.	The Proposed Project may result in potential impacts associated with geotechnical resources prior to mitigation. Therefore, the Project Applicant has committed to implementing the following mitigation measures for the Proposed Project to ensure that future development of the project site is safe from geotechnical hazards (earthquakes, landslides, mudslides, ground failure or similar hazards), wind or water erosion of soils, unstable earth conditions in geologic substructure and that it would not adversely affect adjacent properties. General F-1 All project site development shall be performed according to the recommendations identified in the referenced report, (Allan E. Seward Engineering Geology, 2004). F-2 Mitigation measures for geotechnical resources shall be implemented so as not to conflict with mitigation measures as section set forth in Section V.D, Biological Resources, of this EIR.	Less than Significant
Wind or Water Erosion of Soils Wind and water erosion of the project site would increase during construction activities unless mitigated, and this would result in a significant construction-related impact. With proposed mitigation, impacts would be less than significant. Once developed, site erosion and sedimentation would decrease	***Drainage Control*** F-25 Wherever groundwater seepage is observed, the condition shall be evaluated by the Engineering Geologist and Geotechnical Engineer prior to covering with fill material. F-26 Surface drainage control design shall include provisions for positive surface gradients to ensure that surface runoff	Less than Significant

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substantially compared to existing conditions because the project site would be covered with non-erosive surfaces, including pavement, structures, and permanent vegetation, all which would reduce the amount of exposed soil subject to wind and water erosion. Also, implementation of the existing provisions in the City's grading requirements for planting and irrigation of constructed slopes in conjunction with drainage recommendations would provide sufficient mitigation against potential erosion within the project site. As a result, long-term project impacts would be less than significant.	is not permitted to pond, particularly above slopes or adjacent to building foundations or slabs. Surface runoff shall be directed away from slopes and foundations and collected in lined ditches or drainage swales via non-erodible drainage devices, which shall discharge to paved roadways or existing watercourses. If these facilities discharge onto natural ground, means shall be provided, as directed by the project Civil Engineer, to control erosion and to create sheet flow. F-27 It should be expected that, even with the construction of carefully planned and designed erosion control measures, some erosion may occur during the first few wet seasons after the project is completed. Site grading should be inspected, particularly after heavy, prolonged rainfall, to identify erosion areas at an early stage. Maintenance work shall be done as soon as practical to repair these areas and prevent their enlargement. F-28 Planting and irrigation standards within the City of Santa Clarita Grading Code shall be adhered to in order to prevent soil erosion. F-29 Fill slopes and stability fills, as applicable, shall be provided with subsurface drainage as necessary for stability as determined by the project Geologist/Geotechnical Consultant. A typical backdrain detail is shown on Figure E7, Appendix E of the	

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	referenced report (Allan E. Seward Engineering Geology, Inc, 2004). Also, subdrains along the bottom of canyon fills shall be constructed. A typical canyon subdrain detail is presented on Figure E9 of the referenced report. F-30 All final grades shall be sloped away from the building foundations to allow rapid removal of surface water runoff. No ponding of water shall be allowed adjacent to the foundations. Plants and other landscaped vegetation requiring excessive watering shall be avoided adjacent to the building foundations. Should landscaping be constructed, an effective water-tight barrier shall be provided to prevent water from affecting the building foundations. **Corrosivity and Chemical Attack Considerations** F-41 On-site soils classify as severely corrosive to corrosive to buried metals per County of Los Angeles classification. Sulfate concentrations are negligible per UBC (1997) classification, and pH was near-neutral (reported as 7.2 in the referenced report, Allan E. Seward Engineering Geology, Inc., 2004). Pending additional testing, either Type I or II cement may be considered for use in concrete placed in contact with the ground. Mitigating measures for soil corrosivity shall be finalized by the Project Engineer based on additional confirmatory tests that shall be performed at the Grading Plan stage. Final recommendations for concrete shall be in accordance with	

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	the latest UBC requirements, and a corrosion specialist shall provide mitigating recommendations for potential corrosion of metals in contact with on-site soils prior to issuance of a Grading Permit.	
Unstable Earth Condition or Changes in Geologic Substructure Development over the existing undocumented fill would result in a significant geotechnical impact unless mitigated. With proposed mitigation, impacts would be less than significant.	***Landslides*** F-18 Three landslides are located within or in the vicinity of the proposed development area of the project. These landslides shall be mitigated as recommended in Table 1 of Geologic and Geotechnical Report – Addendum No. 1 Revised Tentative Tract Map of the referenced report, (Allan E. Seward Engineering Geology, 2004). F-19 Landslides Qls-1, Qls-2 and Qls-3 shown in figure 4.1-1 should be included on the Final Map as Restricted Use Areas. ***Proposed Cut-Slopes*** F-20 Eighteen proposed cut-slopes ranging in height from 25 feet to 120 feet are proposed on the project site and are designated as CS-1 through CS-18. Recommended mitigation, if necessary, for each slope as presented in Cut-Slope Summary (Table 2.1 of the referenced report, Allan E. Seward Engineering Geology, Inc., 2004), shall be followed. This determination shall be made by the Geologist/Geotechnical Consultant prior to grading activities. It has been conservatively assumed for the purposes of stability analysis that weak bedding planes	Less than Significant

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	may occur anywhere in the proposed cut-slopes. If any of the smaller proposed cut-slopes (less than 25± feet in height) have adverse geologic grading configurations (fill over cut), they shall be mitigated, if necessary, with a standard 15- to 20-foot wide key (depending on the proposed cut-slope height) and benching similar to a Stability Fill. A "Typical Fill above Cut-Slope" detail is shown on Figure E8 within Appendix E of the referenced report, (Allan E. Seward Engineering Geology, 2004). This determination shall be made by the project Geologist/Geotechnical Consultant prior to grading activities. F-21 All permanent cut-slopes shall be constructed at a slope ratio not steeper than 2:1 (h:v). All permanent cut-slopes exposing Terrace Deposits or Alluvium shall be constructed as a stability fill. Temporary cut slopes in competent rock may be constructed as steep as 1.5:1 (h:v). Potential unstable subsurface conditions exposed during construction, such as adverse bedding, joint planes, zones of weakness or exposed seepage, may require either flatter slopes than specified above or construction of benches. An Engineering Geologist shall observe all backcuts during the grading operations and provide appropriate recommendations, if necessary. ***Natural Slopes***	

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	F-22 Natural slopes within the proposed Tentative Tract 60258 have gradients ranging from 5:1 (h:v) to 1.1:1 (h:v). A 75-foot high approximately 1:1 (h:v) gradient slope located westerly of Lot 99 within the DWP easement was identified by the referenced report, (Allan E. Seward Engineering Geology, 2004) as the most critical slope. The referenced report illustrates the geologic conditions of this slope on Section 13 - 13' and provides slope stability analysis indicating that this natural slope satisfies the City of Santa Clarita factor of Safety requirements. All natural slopes that are relatively steep and have accumulations of soil and slopewash are prone to debris flow hazard. F-23 A fill over natural condition is proposed along the southern edge of the proposed school site (Lot 102) above the Santa Clara River. The natural slope is approximately 90-feet in height with gradients up to 1.1:1 (h:v). A fill slope up to 40 feet in height is proposed to ascend above the natural slope. The referenced report, (Allan E. Seward Engineering Geology, Inc., 2004). recommends a twenty foot horizontal bench to set back the fill slope from the descending natural slope. The horizontal bench is recommended to extend laterally a distance of approximately 450 feet. The recommended bench is color coded yellow on the Geologic/Geotechnical Map as well as on Cross Section 3-3' Plate II within the referenced report, (Allan E. Seward Engineering Geology, Inc., 2004).	

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	Exploratory Trench and Boring Backfill F-24 All of the exploratory trenches and borings previously excavated for this project shall be overexcavated and backfilled with compacted fill in accordance with the earthworks recommendations of the referenced report, (Allan E. Seward Engineering Geology, Inc., 2004).	
	Earthwork F-3 All grading shall be accomplished under the observation and testing of the Project Soils Engineer, Engineering Geologist and/or their authorized representatives in accordance with the recommendations contained herein, the current Uniform Building Code requirements and "Recommended Earthwork Specifications" as presented in Appendix E of the referenced report. (Allan E. Seward Engineering Geology, 2004). ***Site Preparation*** F-4 During site preparation, the site shall be cleared and stripped of organics (vegetation), topsoil, roots, undocumented artificial fill, rubble, construction debris and other unsuitable materials, as applicable, and the site shall be graded to provide a firm base for compacted fill. All organics shall be removed from the site for proper disposal. The Geotechnical Engineer and/or his representatives shall observe the excavated areas prior to placing compacted fill.	

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	Removal and Benching F-5 In order to provide a uniform firm bottom prior to placing fill, all unconsolidated alluvium, slopewash, colluvial soils and severely weathered terrace deposits and bedrock shall be removed from areas to receive fill. The estimated depths of removals (excluding landslides) range from 3 to 36 feet as shown on Figure V.F-1. The exact depth and extent of necessary removals will be determined in the field during the grading operations when observations and more location specific evaluations can be performed. F-6 All existing artificial fill (af) shall be removed and replaced with compacted fill. Removals at the locations of exploratory trenches shall be extended to the bottom of the trench backfill if the adjacent removal depths are shallower than the trench. F-7 In areas to receive compacted fill where the surface gradient is steeper than 5:1 (h:v), the soil mantle, colluvium and unsuitable material shall be removed and such areas benched horizontally into competent material prior to or in conjunction with fill placement (see Appendix E, Fill Over Natural Slope, Figure E2 of the referenced report, Allan E. Seward Engineering Geology, 2004). ***Preparation of Bottom Areas*** F-8 After the ground surface to receive fill has been exposed.	

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	it shall be ripped to a minimum depth of 6 inches, brought to optimum moisture content or above, thoroughly mixed to obtain a near uniform moisture condition and uniform blend of materials, and then compacted to the required relative compaction per the ASTM D 1557 laboratory maximum density. ***Dewatering During Removals*** F-9 Where recommended removals encounter groundwater, water levels shall be controlled by providing an adequate excavation bottom slope and sumps for pumping water out as the excavation proceeds, or groundwater may be lowered by installing shallow dewatering well points prior to grading. Partial removals of soils above the water table and soil improvement below the water table (e.g., shallow compaction grouting) may be another option. The determination as to which measures are to be used shall be made by the project Civil Engineer. Dewatering may be needed depending on the season when the removals are performed. All discharges from dewatering operations, if any, shall comply with the National Pollutant Discharge Elimination System Permit (NPDES) requirements of project construction. ***Over-Excavation*** F-10 A minimum five-foot thick over-excavation shall be performed on all cut-lots, transitional lots (transitions between bedrock, fill, terrace deposits and alluvium), and	

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	streets. This overexcavation will result in reduction of potential differential settlements or differential material response to seismic events and provide a uniform base for structural support of buildings. If the maximum depth of fill exceeds 15 feet on a cut/fill transition lot, then the thickness of the fill cap shall be one-third of the deepest fill thickness below any proposed structure (see Appendix E, Cut Lot and Cut Fill Lot (Transitional), Figure E3, of the referenced report, Allan E. Seward Engineering Geology, 2004). If excavation of the native soils (i.e., bedrock) exposes expansive materials, then the lot over-excavation shall be deepened to at least eight feet. ***Fill Materials*** F-11 On-site soils that are free of debris, over-size rocks, topsoil and organic matter may be used as sources for compacted fills. Rock or similar irreducible material with a maximum dimension greater than eight inches may not be placed in the fill. Rocks or hard fragments larger than four inches shall not compose more than 25 percent of the fill and/or lift. Any large rock fragments over eight inches in size, may be incorporated into the fill as rockfill in windrows after being reduced to the specific maximum rock fill size, see Figure E4, Rock Disposal, in Appendix E of the referenced report, (Allan E. Seward Engineering Geology, 2004). Where fill depths are too shallow to allow large rock disposal, special handling or removal may be required depending upon on-site field decisions	

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	made during grading operations by the project Geologist/Geotechnical Consultant see "Recommended Earthwork Specifications" in Appendix E of the referenced report, (Allan E. Seward Engineering Geology, 2004). ***Fill Compaction*** F-12 All fill material shall be placed in uniform lifts not exceeding eight inches in its loose state and compacted to a minimum of 90 percent relative compaction as determined based on the latest ASTM Test Designation D-1557. Additional field compaction requirements are presented in Appendix E, "Recommended Earthwork Specifications" of the referenced report (Allan E. Seward Engineering Geology, 2004). Appendix E also includes recommended specifications for placement of trench backfill. F-13 For fills deeper than 40 feet, the portion of fill below 40 feet depth shall be compacted to a minimum of 93 percent relative compaction. These areas shall be delineated at the Grading Plan stage. ***Proposed Fill Slopes*** F-14 Fill slope inclinations shall not be steeper than 2:1 (h:v). The fill material within approximately one equipment width (typically 15 feet) of the slope face shall be constructed with cohesive material obtained from on-site	

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	soils. The finished fill-slope face shall be constructed by over-building the slope and cutting back to the compacted fill material. Stability fills are recommended where cut-slope faces will expose fill-over bedrock, alluvium over bedrock or Quaternary terrace deposits over bedrock conditions. These fills shall be constructed with a keyway at the toe of the fill slope with a minimum equipment width, but not less than 15 feet, and a minimum depth of 3 feet into the firm undisturbed earth. Following completion of the keyway excavations, the Project Engineering Geologist shall observe and approve the keyway bottom prior to backfilling with certified engineered fill. F-15 Where fill slopes are constructed above natural ground with a gradient of 5:1 (h:v) or steeper, all topsoil, colluvium, and unsuitable material shall be removed and a keyway shall be constructed at the toe of the fill slope with a minimum width of 15 feet, and a minimum depth of 3 feet into firm undisturbed earth (see Appendix E, Fill Slope Over Natural Slope diagram, Figure E5 of the referenced report, Allan E. Seward Engineering Geology, 2004). Following completion of the keyway excavations, the project Engineering Geologist/Geotechnical Engineer or designated representative shall observe and approve the keyway bottom prior to backfilling with compacted fill. F-16 Where fill slopes toe out on relatively level natural ground, the removals shall be performed to a minimum	

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	1:1 (h:v) projection from the toe of slope to the recommended removal depth, (see Appendix E, Fill Slope Toeing Out on Flat Alluviated Canyon, Figure E6 of the referenced report. Allan E. Seward Engineering Geology, 2004). F-17 Where sliver fill-slopes are proposed, the slope shall be constructed with a minimum 15-foot width Stability Fill throughout, which is keyed in at the toe of slope (see Appendix E, Stability/Buttress Fill and Backdrains Detail, Figure E7 the referenced report, Allan E. Seward Engineering Geology, 2004). ***Proposed Cut-Slopes*** F-20 Eighteen proposed cut-slopes ranging in height from 25 feet to 120 feet are proposed on the project site and are designated as CS-1 through CS-18. Recommended mitigation, if necessary, for each slope as presented in Cut-Slope Summary (Table 2.1 of the referenced report, Allan E. Seward Engineering Geology, Inc., 2004), shall be followed. This determination shall be made by the Geologist/Geotechnical Consultant prior to grading activities. It has been conservatively assumed for the purposes of stability analysis that weak bedding planes may occur anywhere in the proposed cut-slopes. If any of the smaller proposed cut-slopes (less than 25± feet in height) have adverse geologic grading configurations (fill over cut), they shall be mitigated, if necessary, with a	

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	standard 15- to 20-foot wide key (depending on the proposed cut-slope height) and benching similar to a Stability Fill. A "Typical Fill above Cut-Slope" detail is shown on Figure E8 within Appendix E of the referenced report, (Allan E. Seward Engineering Geology, 2004). This determination shall be made by the project Geologist/Geotechnical Consultant prior to grading activities. F-21 All permanent cut-slopes shall be constructed at a slope ratio not steeper than 2:1 (h:v). All permanent cut-slopes exposing Terrace Deposits or Alluvium shall be constructed as a stability fill. Temporary cut slopes in competent rock may be constructed as steep as 1.5:1 (h:v). Potential unstable subsurface conditions exposed during construction, such as adverse bedding, joint planes, zones of weakness or exposed seepage, may require either flatter slopes than specified above or construction of benches. An Engineering Geologist shall observe all backcuts during the grading operations and provide appropriate recommendations, if necessary. *Natural Slopes* F-22 Natural slopes within the proposed Tentative Tract 60258 have gradients ranging from 5:1 (h:v) to 1.1:1 (h:v). A 75-foot high approximately 1:1 (h:v) gradient slope	

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	located westerly of Lot 99 within the DWP easement was identified by the referenced report, (Allan E. Seward Engineering Geology, 2004) as the most critical slope. The referenced report illustrates the geologic conditions of this slope on Section 13 - 13' and provides slope stability analysis indicating that this natural slope satisfies the City of Santa Clarita factor of Safety requirements. All natural slopes that are relatively steep and have accumulations of soil and slopewash are prone to debris flow hazard. F-23 A fill over natural condition is proposed along the southern edge of the proposed school site (Lot 102) above the Santa Clara River. The natural slope is approximately 90-feet in height with gradients up to 1.1:1 (h:v). A fill slope up to 40 feet in height is proposed to ascend above the natural slope. The referenced report, (Allan E. Seward Engineering Geology, Inc., 2004), recommends a twenty foot horizontal bench to set back the fill slope from the descending natural slope. The horizontal bench is recommended to extend laterally a distance of approximately 450 feet. The recommended bench is color coded yellow on the Geologic/Geotechnical Map as well as on Cross Section 3-3' Plate II within the referenced report, (Allan E. Seward Engineering Geology, Inc., 2004). ***Exploratory Trench and Boring Backfill*** F-24 All of the exploratory trenches and borings previously excavated for this project shall be overexcavated and backfilled with compacted fill in accordance with the	

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	earthworks recommendations of the referenced report. (Allan E. Seward Engineering Geology, Inc., 2004). ***Shrinkage, Bulking and Subsidence*** F-31 The Project Engineer shall design pad grades with sufficient flexibility to accommodate a possible shortage of fill of up to 10 percent of the total yardage graded due to potential shrinkage of fill and potential subsidence due to dewatering. ***Foundation Settlement Consideration*** F-32 The structural design shall include seismic geotechnical parameters in accordance with UBC requirements for Seismic Zone 4. These parameters will be provided at the Grading Plan stage. F-33 Shallow spread footings for foundation support of residential structures can adequately be placed on compacted engineered fill as stated in Mitigation Measures V.F-13 and V.F-14. Support for heavier structures, if applicable, shall be addressed at the Grading Plan stage. Minimum specifications for continuous (wall) foundation dimensions are 12 inches wide and 12 inches deep below lowest adjacent grade for single-story residential structures. Tentatively, an allowable bearing capacity of 1,500 pounds per square-foot can be used for (minimum-sized) shallow foundations constructed in certified compacted fill. This tentative allowable bearing value	

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	shall be confirmed by further field and laboratory testing by the Project Geologist of the site soils before use in design plans. Lateral resistance of footing walls shall be provided at the Grading Plan stage. F-34 If, during grading operations, the resulting cut-fill transition is steep, as determined by the project Geologist/Geotechnical Consultant, at depth below the building area, the geometry of the transition shall be reviewed during grading operations by the Soils Engineer on a site-specific basis to evaluate the need for additional over excavation removals and/or additional foundation reinforcement. As a general guideline, steep cut/fill transitions would include slope gradients steeper than 4:1 (h:v) and overall variations in fill thickness of greater than 15 feet, which occur within 20 feet of final pad grade. The determination of need for over excavation of materials shall be guided by Figure E3 (Appendix E), "Cut Lot (Transitional)" and "Cut-Fill Lot (Transitional") of the referenced report, (Allan E. Seward Engineering Geology, Inc., 2004), which provides a foundation grading detail for locations where foundations will straddle transition zones between cut and fill materials. F-35 To minimize significant settlements, the upper soils in areas to receive fills shall be removed and replaced with compacted fill. Some minor settlements will be expected due to loads from high fills (e.g., thicker than 30 feet).	

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	Currently, locations of proposed high fills are in the vicinity of Lots 10-21, 30-34, 38, 39, 42-56, 77, 97, 99, 102, and 102A. Most of the settlements due to the load of added fill will occur during and shortly after rough grading is complete. However, since lenses of relatively compressible clayey soils exist below recommended removal depths, some of the fill settlements will not occur until the ground water table is lowered below the compressible clay lenses. Ground water table lowering is usually the result of pumping from water wells. (Note: the Proposed Project would not directly withdraw groundwater.) Alternatively, the project site may be temporarily surcharged with earth fill sufficient to simulate the load increase on the compressible clay lenses due to lowering of the ground water table, as determined by the project Geologist/Geotechnical Consultant.	
	F-36 At other alluvial removal areas, potential settlements in Alluvium shall be minimized by the removals and recompaction recommended in the referenced report, (Allan E. Seward Engineering Geology, Inc., 2004). Also, potential effects from localized seismically induced settlements will be attenuated by the recompacted upper layers and proposed additional fills, see Appendix C in the referenced report, (Allan E. Seward Engineering Geology, 2004).	
	Excavation, Shoring and Backfill Recommendations	

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	F-37 Excavations deeper than 3.5 feet shall conform to safety requirements for excavations as set forth in the State Construction Safety Orders enforced by the State Division of Industrial Safety, CAL OSHA. Temporary excavations 12 feet or lower shall be no steeper than 3/4:1 (h:v). For excavations to 20 feet in height, the bottom 3.5 feet may be vertical and the upper portion between 3.5 and 20 feet shall be no steeper than 1.5:1 (h:v). Excavations not complying with these requirements shall be shored. Excavation walls in sands and dry soils shall be kept moist, but not saturated at all times.	
	F-38 Parameters for design of cantilever and braced shoring shall be provided at the Grading Plan stage.	
	F-39 The bases of excavations or trenches shall be firm and unyielding prior to foundations or utility construction. On-site materials other than topsoil or soils with roots or deleterious materials may be used for backfilling excavations. Densification (compaction) by jetting may be used for on-site clean sands or imported equivalent of coarser sand provided they have a Sand Equivalent greater than or equal to 30 as determined by ASTM D2419 test method. Specifications for placement of trench backfill shall be adhered to and are presented in Appendix E of the referenced report, (Allan E. Seward Engineering Geology, 2004).	

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	Expansive Soils Considerations F-40 The measures presented in Table E1, Minimum Foundation and Slab Recommendations for Expansive Soils, in Appendix E of the referenced report, (Allan E. Seward Engineering Geology, 2004), shall be implemented to minimize the effects of soil expansion potential. It is anticipated that compacted fill from the on-site materials will have a very low to medium expansion potential. The expansion potential of the site soils exposed at rough grade shall be tested again after site grading is complete and the final foundation design shall be based on those expansion test results.	
Cumulative Impacts : Geotechnical impacts are site specific in nature and each development site is subject to, at minimum, uniform site development and construction standards relative to seismic and other geologic conditions that are prevalent within the locality and/or region. Therefore, impacts of cumulative development would be less than significant given known geologic considerations of the cumulative projects.	None required.	Less than Significant
HAZARDS		
Routine Transport, Use or Disposal of Hazardous Materials/Risk of Upset *Construction* The services of properly trained and qualified hazardous waste	G-1 The services of properly trained and qualified hazardous waste handlers shall be used to perform hazardous waste cleanup or abatement, transportation and disposal prior to construction and appropriate protocol shall be followed to	Less than Significant

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handlers shall be used to perform hazardous waste cleanup or abatement, transportation and disposal prior to construction and appropriate protocol will be followed to ensure that construction workers are not exposed to toxic substances. Therefore, hazardous materials impacts relative to exposure to hazardous substances during disposal would be less than significant with mitigation. Oil Production Operations The site assessment report indicated that the former oil well and drill site had been abandoned in 1964 in accordance with applicable regulations. However, the Phase 1 Environmental Site Assessment report did not map the exact location of the oil well and referred to the area as the "southwest" portion of the site. It is recommended as mitigation that additional environmental assessment be provided documenting the exact location of the oil well. Since the oil well was abandoned in 1964 it is recommended that the well be re-abandoned to current standards. With this mitigation, impacts would be less than significant with regards to the oil well. Previous Agricultural Operations Based on aerial photography review, farming activity occurred in the late 1920s and continued sometime between the 1950s and 1960s on the southern plateau area east of the LADWP easement. Mining activities for aggregate resources also occurred on the same southern plateau during the 1960s. Approximate cuts appear to have been in excess of 30 feet, but less than 50 feet. There are some fill soils remaining from the mining activities in the southern	ensure that construction workers are not exposed to toxic substances. G-2 Prior to recordation of the Final Tract Map, initiation of rough grading or issuance of any subsequent permits, the applicant shall prepare a subsequent environmental assessment to document the exact location of the oil well. Re-abandonment of the oil well shall be performed to meet the current requirements of the State of California, Department of Conservation, Division of Oil, Gas & Geothermal Resources (DOGGR). Once re-abandoned, the oil well will not provide a significant impact to the Proposed Project.	

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portion of the southern plateau. Based upon exploration performed by AES, artificial fill up to 14 feet was encountered. No traces of pesticides were identified in the Phase 1 Environmental Site Assessments for the project site. Therefore, impacts would be less than significant. *Operation* The Proposed Project is not anticipated to result in an accidental release of hazardous materials into the environment. The proposed YMCA building, the junior high school and the residential dwelling units would utilize limited quantities of common cleaning and maintenance materials, which would be shipped, stored, used and disposed of in accordance with applicable statutes. Based on the amount expected to be stored, nature of packaging, materials involved, and the Proposed Project's required compliance with applicable regulations, the risk from use of these materials is considered to be low and impacts would be less than significant.		
Hazardous Materials Sites The Phase I Environmental Site Assessments prepared for the Proposed Project reviewed a database of government-regulated properties having known and/or recognized environmental conditions that have potential environmental concerns in the vicinity of the project. There is a low probability that listed off-site properties in the search vicinity have impacted or are currently impacting the project site. As a result of the low probability of these properties impacting the project site, development of the Proposed Project would result in impacts less than significant.	None required.	Less than Significant

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Exposure of People to Potential Health HazardsTransmission Line Exposure Typical maximum EMF levels at the edge of a 200-foot right-of-way for 230 kV transmission lines would be approximately 1.8-3.6 mG. This level is less than the background levels of 0.5 mG to 4.0 mG, which are typically found in the average home. Because there is no established threshold of significance for exposure to EMFs, there would be no significant impact associated with development of the Proposed Project adjacent to SCE transmission easements. The Proposed Project would not expose people, animal, or plant life populations to known health hazards from SCE transmission lines. No significant impacts from EMFs would occur.	None required.	Less than Significant
Other Past Usage: A Phase I Site Assessment revealed that a water well was found on the project site, in the area east of the LA DWP easement in the southwestern portion of that area. The presence of the well does not represent a recognized environmental hazardous condition. However, an uncapped or un-abandoned well can serve as a conduit for contaminants to groundwater. The Phase 1 Environmental Site Assessment recommends that the well be plugged and abandoned in accordance with applicable regulatory requirements. With implementation of this mitigation measure, impacts would be less than significant.	G-3 Prior to recordation of the Final Tract Map, initiation of rough grading or issuance of any subsequent permits, the applicant shall prepare a subsequent environmental assessment to document the exact location of the water well. Abandonment of the of the water well shall be performed to meet the current requirements regulatory requirements.	Less than Significant
Cumulative Impacts: Development of the 12 related projects, in conjunction with the Proposed Project, would increase the potential for the transport or	None required.	Less than Significant

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accidental release of hazardous materials. The one industrial related project, No. 5, is located south of the project site on Soledad Canyon Road. The residential projects are unlikely to use, store, or transport hazardous materials in any material quantities and most likely would be using household cleaning fluids and materials. Hence, there is a very low probability that one or more of the related projects might release hazardous materials into the environment that, in turn, might combine with a release of hazardous materials from the project site to cause cumulative impacts. Therefore, the Proposed Project in combination with the 12 Related Projects would not be expected to result in significant cumulative impacts associated with hazardous materials.		
HYDROLOGY AND WATER QUALITY		
Water Quality Standards/Waste Discharge The Proposed Project includes a mix of uses all having the potential to directly and indirectly impact water quality through point and nonpoint sources given their proximity to the Santa Clara River. In addition, short-term construction activities also have the potential to cause a variety of water quality impacts. Therefore, project impacts are considered potentially significant and mitigation is required.	H-1 The Proposed Project shall comply with the RWQCB Municipal Permit (General MS4 Permit) Order No. 01-182, NPDES No. CAS004001 (adopted December 13, 2001) to reduce the discharge of pollutants to the maximum extent practicable. H-2 The project applicant shall obtain authorization through the Regional Water Quality Control Board (RWQCB) for a National Pollution Discharge Elimination System (NPDES) permit for general construction activity. The applicant shall avoid and minimize potential temporary water quality impacts by including provisions in the final engineering plans and specifications of each project	Less than Significant

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	component together with associated instructions to the contractors, assuring compliance with applicable RWQCB and City of Santa Clarita requirements. The project engineer shall file a notice of intent to discharge stormwater, and an application for the NPDES stormwater permit for general construction activity with the RWQCB before starting construction. All construction activities shall be subject to this requirement. H-3 The project's Drainage Concept Study and Hydrologic Analysis shall be reviewed and approved by the Los Angeles County Public Works Department prior to the issuance of any building permits. This analysis shall demonstrate that site drainage can adequately be collected and conveyed via the proposed drainage facilities without significantly impacting downstream hydrology, wetland functions, and/or water quality.	
Groundwater Supplies and Groundwater Recharge The Proposed Project would not be supplied with water drawn from either regional or local groundwater sources. Thus, the Proposed Project would not substantially deplete groundwater supplies such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level. As a result, impacts to groundwater supplies would be	None required	Less than Significant

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less than significant. According to the Basin Plan, the project site is not located directly over a regional groundwater basin. Thus, the Proposed Project would not interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level. As a result, impacts to groundwater recharge would be less than significant.		
Alteration of Existing Drainage and Erosion: Two detention basins will be provided on site to offset increases in two year storm flows as a result of project implementation. A reduction in sedimentation and debris production (15,948 cubic yards to 8,401 cubic yards) is a result of reduced erosion of the site due to coverage of much of the development area with pavement, roofs, vegetation, and other non-erosive surfaces. It is also a result of the proposed debris basins that would capture sediment and debris in upstream runoff. With these improvements in place, the project would reduce post-construction impacts on- and off-site erosion, downstream sedimentation, and debris production and transport and, therefore, a less than significant impact.	H-4 The project applicant shall prepare an Erosion and Sediment Control Plan to address construction impacts and long-term operational effects on downstream environments and watersheds. This plan shall be prepared by a qualified Civil Engineer. Proposed management efforts may include (but not be limited to) provisions for the use of vegetative filtering, preparation of detailed erosion control plans, appropriate use of	Less than Significant

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	temporary debris basins, silt fences, sediment traps and other erosion control practices. The proposed plan shall also address all relevant NPDES requirements and recommendations for the use of best available technology. The erosion control plan shall be reviewed and approved by the City Engineer prior to issuance of grading permits. H-15 By October 1st of each year, a separate erosion control plan for construction activities shall be submitted to the local municipality describing the erosion control measures that will be implemented during the rainy season (October 1 through April 15). H-17 Ultimate project hydrology and debris production calculations shall be prepared by a project engineer to verify the requirements for debris basins and/or desilting debris. H-18 To reduce debris being discharged from the site, debris basins shall be designed and constructed pursuant to LACDPW Flood Control to intercept flows from undeveloped areas entering into the developed portions of the site.	
Alteration of Existing Drainage and Flooding The Proposed Project would make alterations to the existing drainage pattern on the project Site by placing fill in canyons and		

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directing surface runoff into storm drainage facilities. However, all site runoff would continue to flow in approximately the same location as it does currently and would be discharged to the Santa Clara River. Compared to existing site conditions during a 50-year storm, both burned and burned and bulked volumes would be reduced by approximately 14 percent. Therefore, the Proposed Project would not substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite.	H-5 The project applicant shall submit a final drainage report including an evaluation of adequacy of all on-site drainage improvements. The final drainage report shall be based on final project plans and shall provide engineering detail on all proposed drainage improvements demonstrating that such improvements meet all County of Los Angeles requirements and design standards for stormwater infrastructure. The final drainage report shall be submitted to the City of Santa Clarita and County of Los Angeles Public Works Department for review and approval prior to issuance of any project permits.	Less than Significant
Project Runoff Water and Stormwater Drainage Systems/Additional Sources of Polluted Runoff The Proposed Project would increase the amount of runoff from those areas of the site that would be covered by roads, buildings, paved parking areas, and other relatively impermeable or impervious features. Burned and bulked flows would be reduced as a result of the proposed upstream debris basins that would capture upstream bulk flows and allow debris to settle out from the runoff before it enters the storm system through the developed portion of the site. As a result, there would be a net decrease in runoff and the project would not result in downstream flooding. Since storm flows from upstream areas would be channeled through	H-7 The on-site storm drain (pipes and reinforced concrete boxes) and open channels shall be designed and constructed for either the 25-year of 50-year capital storm. H-8 Debris basins shall be constructed pursuant to Los Angeles County Department of Public Works requirements to intercept flows from undeveloped areas entering into the developed portions of the site.	Less than Significant

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the site in facilities designed for the 50-year capital storm, and since on-site runoff would be accommodated in facilities designed for the 25-year Urban Design Storm pursuant to LACDPW requirements, no-site or upstream flooding inadequately designed storm drainage facilities would occur. Also, the inclusion of BMPs in the project design can be expected to prevent substantial additional sources of polluted runoff. Therefore, impacts associated would be less than significant.	H-9 Energy dissipaters consisting of either rip-rap or larger standard impact type energy dissipaters shall be installed as required by LACDPW at outlet locations to reduce velocities of runoff into the channel where necessary to prevent erosion. H-10 All on- and off-site flood control improvements necessary to serve the project are to be constructed to the satisfaction of the City of Santa Clarita and/or County of Los Angeles Department of Public Works Flood Control Division.	
Project Degradation of Water Quality Other than those issues already discussed above, the Proposed Project also has the potential to degrade water quality as a result of onsite sewage generation. The Proposed Project would connect to public sewers and its sewage would be treated by the Santa Clarita Valley Joint Sewerage System. There would be no onsite sewage disposal and the Proposed Project is not expected to otherwise substantially degrade water quality.	H-6 All Best Management Practices (BMPs) proposed in the project's Storm Water Pollution Prevention Plan (SWPPP) shall be implemented prior to and during construction activities. The project contractor shall implement all Best Management Practices as described in the SWPPP to reduce potential water quality impacts. Final review and approval of this plan shall be completed by the City of Santa Clarita prior to issuance of grading permits. At a minimum, the BMPs shall address soil stabilization, sediment control, wind erosion control, tracking control, non-stormwater control, waste management and materials pollution control practices,	Less than Significant

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	and emergency spill control and response measures. Typical BMPs that shall be considered for inclusion in the SWPPP include: • temporary sediment control: silt fencing, sandbagging, strawbale ground-covering, fiber roll barriers, and desilting basins; • temporary soil stabilization: hydroseed straw or mulch, seeding, soil binders, erosion control mats or blankets; • preservation of existing vegetation outside construction areas; • construction scheduling outside of the rainy season; • stockpile management: size restriction, runoff control, covers; • sediment tracking control: street sweeping, cover hauling trailers; and • waste management: spill prevention, concrete wash management, material delivery and storage, vehicle fueling and cleaning.	
	H-11 Per the April 26, 2001 modification to the General Construction Permit, a contingency "Sampling and Analysis Plan" shall be developed in the event that the BMPs implemented at the construction site fail to prevent non-visible pollutants from discharging from the site. BMPs shall be inspected prior to storm events, every 24 hours during extended events, and after the storm events	

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	to ensure proper function of the BMPs and to identify necessary repairs in a timely manner. A record of the inspections and repairs shall be documented in the SWPPP. H-12 Following the completion of the construction project and when the site has been stabilized, a Notice of Termination shall be filed with the RWCQB. H-13 During all construction phases, temporary erosion control retain soil and sediment on the site shall be implemented, including: • re-vegetating exposed areas as quickly as possible; • minimizing disturbed areas; • diverting runoff from downstream drainages with earth dikes, temporary drains, slope drains, etc.; • velocity reduction through outlet protection, check dams, and slope roughening/terracing; • dust control measures, such as sand fences, watering, etc.; • stabilizing all disturbed areas with blankets, reinforced channel liners, soil cement, fiber matrices, geotextiles, and/or other erosion resistant soil coverings or treatments; • stabilizing the construction entrance/exist with aggregate underdrain with filter cloth or other comparable method; • placing sediment control BMPs at appropriate locations along the site perimeter and all operational internal inlets to the storm drain system at all times during the rainy season (sediment control BMPs may include filtration	

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	devices and barriers, such as fiber rolls, silt fence, straw bale barriers, and gravel inlet filters, and/or with setting devices, such as sediment traps or basins; and/or • eliminating or reducing, to the extent feasible, non-storm water discharges (e.g., pipe flushing, and fire hydrant flushing, over-watering during dust control, vehicle and equipment wash down) from the construction site through the use of appropriate sediment control BMPS. See also Mitigation Measures H-1 and H-2.	
Housing Within a 100-year Flood Hazard Area The project encroaches upon the existing FEMA flood hazard area, but the area that encroaches include only open space areas with no proposed housing.	None required.	Less than Significant
Structures Within a 100-year Flood Hazard Area Impeding or Redirecting Flood Flows The project encroaches upon the existing FEMA flood hazard area, but the area that encroaches include only open space areas with no proposed housing.	None required.	Less than Significant
Exposure of People or Structures to a Significant Risk of Loss, Injury or Death Involving Flooding		

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The project site is located inland from the Pacific Ocean and not in proximity to any large, continuously filled bodies of surface water; therefore, it is not subject to seiche or tsunamis. The site is subject to some debris flows; however, adequate building setbacks from natural slopes and debris control facilities proposed in upstream areas of the site would protect the project development from mudflow hazard. Therefore, project impacts relating to exposure of people or structures to a significant risk of loss, injury, or death involving flooding would be less than significant.	None required.	Less than Significant
Exposure of People or Structures to a Risk of Levee or Dam Failure As discussed above, the project site is not in the potential inundation area of an upstream levee or dam. Therefore, the Proposed Project would not expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam.	H-14 All necessary permits, agreements, letters of exemption or a Verification Request Letter from the Army Corps of Engineers and/or the California Department of Fish and Game for Project related development are to be obtained prior to issuance of grading permits. H-16 A final developed condition hydrology analysis shall be prepared in conjunction with final project design when precise engineering occurs. This final analysis will be done to confirm that the final project design is consistent with the analysis. Those final calculations shall establish design features for the project that satisfy the criterion that post development peak storm water runoff discharge rates, velocities, and duration in natural drainage systems mimic	

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	pre-development conditions. All elements of the storm drain system shall conform to the policies and standards of the Los Angeles County Department of Public Works, Flood Control Division, as applicable.	
Cumulative Impacts: The Proposed Project and any future projects in the Santa Clara River watershed must include project PDFs (site design, source control, and treatment control BMPs) in compliance with the requirements of the Los Angeles County NPDES Permit (Order No. 01-182) and the Los Angeles County SUSMP. In addition, the Proposed Project, as well as any future projects in the watershed must comply with the Construction General Permit and General Waste Discharge Requirements. Each of these regulatory requirements is intended to be protective of water quality and beneficial uses in the project receiving waters. Therefore, compliance of the Project with the MS4 Permit, the LA County SUSMP, and the Construction General Permit and General Waste Discharge Requirements constitutes compliance with regulatory requirements that address cumulative water quality impacts and to assure mitigation of those impacts to a less-than-significant level.	None required.	Less than Significant
LAND USE		
Community Division: The project site is currently undeveloped and bounded to the north by a residential development currently under construction and to	None required.	Less than Significant

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the northwest by an existing residential neighborhood. The City has recently approved a residential and commercial development project to the west. Further, the land to the east is currently developed with single-family homes. Therefore, the Proposed Project would not physically divide any established community or uses and impacts would be less than significant.		
Conflict with any Applicable Conservation Plan or Natural Community Conservation Plan: The project site boundary includes portions of the Santa Clara River (Lot 123) which is designated as a Significant Ecological Area (SEA)(No. 23). The project applicant does not proposed development within the SEA. Further, there are no habitat conservation plans or natural community conservation plans that are applicable to the Proposed Project. Therefore, the Proposed Project would not conflict with any habitat conservation plan or community conservation plan and impacts would be less than significant.	None required.	Less than Significant
Consistency with Land Use Plans: *City of Santa Clarita – General Plan* The proposed Keystone project may be consistent with the RS, RMH and IC development standards pertaining to these land use designations subject to approval of the General Plan Amendment (GPA) by City Council	None required	Less than Significant
Consistency with City of Santa Clarita General Plan Element Goals and Polices	None required.	Less than Significant

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The City of Santa Clarita General Plan contains goals and numerous policies to guide development and uses planned within the City. Existence of an inconsistency between a Proposed Project and an applicable general plan is a legal determination, vested in the City Council and subject to court review if challenged. Inconsistency is not an impact under CEQA – plan inconsistencies in and of themselves are not significant impacts on the environment under CEQA. The City of Santa Clarita General Plan Element Goals and Policies and their applicability to the Proposed Project are discussed in Table V.I-4, which is found in Section V.I, Land Use.		
Consistency with the Unified Development Code The proposed Keystone project may be consistent with the RS and RMH zones that correspond to the City's General Plan land use designations and the proposed uses are permitted under these districts subject to approval of the Zone Change by City Council. The project would be subject to the general requirements for development and grading under the UDC.	None required.	Less than Significant
Cumulative Impacts: Cumulative land use impacts could occur if other related projects in the vicinity of the project site would result in land use impacts in conjunction with the Proposed Project. Twelve proposed or approved projects were identified that could potentially contribute to the cumulative effects of the Proposed Project (see Figure III-X	None required.	Less than Significant

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
in Section III (Related Projects)). Development of the Proposed Project in conjunction with the related projects would result in an intensification of existing prevailing land uses in the project vicinity. The Proposed Project would not physically divide an established community and subject to approval by City Council of the GPA and Zone Change would conflict with any applicable land use plan, regulation, habitat conservation plan or natural community conservation plan. Therefore, the Proposed Project's incremental increase is not considerable and impacts are less than significant.		
MINERAL RESOURCES		
Loss of Availability of a Known Mineral Resource that would be of Value to the Region: A small portion of the project site adjacent to the southern site margin is contained within a Mineral Resources Zone-2 (MRZ-2) classification, which includes a project designated approximately 15-acre open space lot and a 0.55-acre industrial lot. Neither lot is proposed for development. Given that no development is proposed within the project site land classified as MRZ-2, implementation of the project would not preclude or impede mineral resource extraction from MRZ-2 classified land. Thus, there would be no impact to the availability of known mineral resources. Conversion of the majority of the project site to urban uses would not result in a loss of availability of a known mineral resource that would be of value to the region and the residents of the state.	None required.	Less than Significant

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
Thus, impacts would be less than significant.		
Impacts Related to the Loss of Availability of a Locally-Important Mineral Resource Recovery Site Delineated on a Local General Plan, Specific Plan, or Other Land Use Plan: Though a small portion of the site (approximately 15.5-acres) is within a mineral resource classification of MRZ-2, the City's General Plan does not envision the site suitable as conservation for resource recovery. Therefore, project implementation would not result in the loss of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan; thus, no impact would occur.	None required.	Less than Significant
Cumulative Impacts: Cumulative mineral resource impacts could occur if other related projects in the vicinity of the project site in conjunction with the Proposed Project would result in the loss of recoverable mineral resources. Twelve proposed or approved projects were identified that could potentially contribute to the cumulative effects of the Proposed Project within a two mile radius of the project site. Related Project Nos. 3, 4, 5 and 6 are within MRZ-3 mineral resource category and border MRZ-2. Related Project Nos. 1, 7, 8, 9 and 10 are within MRZ-3 while Related Projects Nos. 11 and 12 are also within MRZ-3 but border MRZ-1. Development of the Proposed Project in conjunction with the related projects would result in urbanization of existing undeveloped land in the project vicinity.	None required.	Less than Significant

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
The Proposed Project and related projects have proposed development on land classified as MRZ-3. The closest related project that has land on the Santa Clara River (which is classified as MRZ-2) is Related Project No. 4, Riverpark. Like the Proposed Project, Riverpark does not propose development within the Santa Clara River which is an SEA. Though mineral and aggregate resource extraction could occur, it would not be likely as the Santa Clara River in the project site vicinity does not have a MOCA overlay which would permit such activity. Therefore, no development would occur in MRZ-2 and impacts would not be cumulatively considerable.		

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
NOISE		
Construction-Related Noise: Project development would require the use of heavy equipment for ground clearing, site grading, roadway construction, and building construction. Construction activities would primarily affect the existing residences located immediately east and west of the Proposed Project site. Assuming that average daytime noise levels average around 45 dBA L_{eq} at these homes (based on the noise levels monitored at the project site), noise levels associated with project implementation would represent a substantial periodic increase in ambient noise levels in the project vicinity above levels existing without the project. These daytime noise levels would exceed City standards for residential uses and would continue to constitute a substantial increase in ambient noise levels in the project vicinity above levels existing without the project. This is a significant noise impact.	K-1 The Applicant should implement measures to reduce the noise levels generated by construction equipment operating at the project site during project grading and construction phases. The Applicant should include in construction contracts the following requirements or measures shown to be equally effective: • All construction equipment shall be equipped with improved noise muffling, and have the manufacturers' recommended noise abatement measures, such as mufflers, engine covers, and engine isolators in good working condition. • Stationary construction equipment that generates noise levels in excess of 65 dBA L_{eq} shall be located as far away from existing residential areas as possible. If required to minimize potential noise conflicts, the equipment shall be shielded from noise sensitive receptors by using temporary walls, sound curtains, or other similar devices. • Heavy-duty vehicle storage and start-up areas shall be located a minimum of 150 feet from occupied residences where feasible. • All equipment shall be turned off if not in use for more than five minutes. • An information sign shall be posted at the entrance to each construction site that identifies the permitted construction hours and provides a	Significant and Unavoidable

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
	telephone number to call and receive information about the construction project or to report complaints regarding excessive noise levels.	
Construction-Related Groundborne Vibration: Groundborne vibrations levels would not approach the 80 VdB threshold at residences near the project site. This would be a less-than-significant impact regarding the exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels.	None required.	Less than Significant
Operational Noise Levels - On-site: Future exterior noise levels at most of the proposed land use locations, as well as interior noise levels throughout the project area would not exceed City standards. However, the future exterior noise levels at several of the buildings proposed along Golden valley Road could exceed City standards. Heating, ventilation, and air conditioning (HVAC) systems would be installed for the new buildings within the Proposed Project site. Residential HVAC systems result in noise levels that average between 40 and 50 dBA L_{eq} at 50 feet from the equipment. These noise levels would not exceed the City's exterior noise standards. Future residents of the project site could be exposed to exterior noise levels that exceed City standards. This would be a potentially significant noise impact.	K-2 Lot 97: Prior to the issuance of building permits for the multi family units of Lot 97 located along Golden valley Road (only those units that front Golden valley Road), the project developer shall submit environmental noise analyses that demonstrate that future exterior noise levels at ground floor porches and upper floor balconies will not exceed 65 dBA CNEL. Buildings that could be exposed to future exterior noise levels above 65 dBA CNEL shall either (1) have increased setbacks from Golden Valley Road (estimated to be approximately 145 feet from the centerline of Golden Valley Road) or (2) barriers shall be designed and constructed between the buildings and roadway (estimated to have a height of one foot above the roadway grade). The barriers could be in the form of earthen berms or solid masonry walls. K-2 Lot 97: Prior to the issuance of building permits for the multi family units of Lot 97 located along Golden Valley	Less than Significant

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
	Road (only those units that front Golden Valley Road), the project developer shall submit environmental noise analyses that demonstrate that future exterior noise levels at ground floor porches and upper floor balconies will not exceed 65 dBA CNEL. Buildings that could be exposed to future exterior noise levels above 65 dBA CNEL shall either (1) have increased setbacks of the exterior porches or balconies from Golden Valley Road (estimated to be approximately 145 feet from the centerline of Golden Valley Road) or (2) barriers shall be designed and constructed between the buildings and roadway (estimated to have a height of one foot above the roadway grade). The barriers could be in the form of earthen berms or solid masonry walls. K-3 Lot 98: Prior to the issuance of building permits for the multi family units of Lot 98 located along Golden Valley Road (only those units that front Golden Valley Road), the project developer shall submit environmental noise analyses that demonstrate that future exterior noise levels at ground floor porches and upper floor balconies will not exceed 65 dBA CNEL. Buildings that could be exposed to future exterior noise levels above 65 dBA CNEL shall either (1) have increased setbacks of the exterior porches or balconies from Golden Valley Road (estimated to be approximately 145 feet from the centerline of Golden Valley Road); (2) have barriers designed and constructed around the balconies; or (3) not provide balconies that face Golden Valley Road in the affected residential units. The	

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
	barriers could be in the form of 3/8inch glass or 5/8-inch plexiglass to a height of six feet above the floor elevation. It is not expected that earthen berms or solid masonry wall built to a standard height of six feet along the edge of the property could reduce noise levels at the second and third floor balconies. K-4 Lot 100: Prior to the issuance of building permits for the multi family units of Lot 100 located along Golden Valley Road (only those units that front Golden Valley Road), the project developer shall submit environmental noise analyses that demonstrate that future exterior noise levels at ground floor porches and upper floor balconies will not exceed 65 dBA CNEL. Buildings that could be exposed to future exterior noise levels above 65 dBA CNEL shall either (1) have increased setbacks of the exterior porches or balconies from Golden Valley Road (estimated to be approximately 150 feet from the centerline of Golden Valley Road); (2) have barriers designed and constructed around the balconies; or (3) not provide balconies that face Golden Valley Road in the affected residential units. The barriers could be in the form of 3/8inch glass or 5/8-inch plexiglass to a height of six feet above the floor elevation. It is not expected that earthen berms or solid masonry wall built to a standard height of six feet along the edge of the property could reduce noise levels at the second and third floor balconies.	

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
Operational Noise Levels –Locations Off Site: Locations in the vicinity of the Proposed Project site could experience slight changes in noise levels as a result of an increase in the on-site population and resulting increase in motor vehicle trips. The Proposed Project would increase local noise levels by a maximum of 0.2 dBA CNEL, which is inaudible/imperceptible to most people and would not exceed the identified thresholds of significance.	None required.	Less than Significant
Operational Groundborne Vibration: When the Proposed Project is completed and operational, background vibration levels would be expected to average around 50 VdB, which is substantially less than the 80 VdB threshold for residential buildings. Impacts would be less than significant.	None required.	Less than Significant
Cumulative Impacts: With the proposed extension of Ermine Street to Golden Valley Road, residents of the residential area east of the Proposed Project site are expected to use Ermine street as an alternate route for traveling to the western area of Santa Clarita. The combined noise levels of Ermine Street and Golden Valley Road would result in average noise levels of approximately 54.0 dBA CNEL at the homes located at the western end of Ermine Street. Approximately 52.3 dBA CNEL is associated with the increased traffic along Ermine Street. Although the resulting noise levels at these homes would be well below the City's 65.0 dBA CNEL standard for residential uses, the existing noise levels in this area is estimated to be approximately 45.0 dBA CNEL. The increase of approximately		Cumulatively considerable.

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
9.0 dBA CNEL above the existing noise level at this location would be considered substantial and, therefore, a significant cumulative impact. Although few of the residents of the Proposed Project are expected to use this roadway to travel east of the project site, the roadway extension would not occur without the Proposed Project. Therefore, the contribution of the Proposed Project to the cumulative impact would be considerable.		
POPULATION AND HOUSING		
Population and Housing: As the project site is currently undeveloped, the increase in residential population represents a 100% population and housing increase on the project site. This population growth and the addition of dwelling units to the City's housing inventory are not anticipated to be substantial compared to citywide growth projections. The increase in population is considered minimal, as it would represent 1.6% of the City's projected 2010 (the year closest to project build-out) population of 187,795, and 7.9% of the City's in-migration for the period between 2000 and 2010 (32,707 new residents). The Proposed Project would add 96 single-family and 883 multi-family residences to the City's housing inventory. This increase represents 1.6% of projected housing units within the City for 2010 (61,101 units) and 9.6% of the new housing units projected to be added for the period between 2000 and 2010 (10,214 new units). Further, the addition of 979 dwelling units to the City's housing inventory would not exceed the projected growth rates for the City. Impacts relating to population and housing	None required.	Less than Significant

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
would be less than significant.		
Employment: *Construction Impacts* Construction of the Proposed Project would result in increased employment opportunities during the project's construction period. However, construction workers would likely be drawn from the construction employment labor force already resident in the surrounding communities and it is not likely that construction workers would relocate their place of residence as a consequence of working on the Proposed Project. *Long-Term Operation Impacts* The Junior High School is expected to have an enrollment of approximately 1,200 students and would be expected to generate 132 net new jobs (though the Hart District anticipates approximately 70 faculty). The YMCA Community / Fitness Center will be housed in an approximately 30,476 square foot facility and would be expected to generate 72 net new jobs. Thus the Proposed Project would generate a total of 204 new jobs. This increase represents 0.36% of projected jobs with in the City for 2010 (57,248 jobs) and 2.67% of the new jobs projected to be added for the period between 2000 and 2010 (7,636 new jobs). Because the Proposed Project would represent only a 0.36% increase in employment opportunities within the City, this increase is not considered to be substantial in terms of employment growth.	None required.	Less than Significant
Indirect Growth:		

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
The proposed roadways and other infrastructure associated with the project would not induce growth because they would only serve project residents and would not extend into previously undeveloped areas that would then be made available for future development. As a result, development of the Proposed Project would not indirectly induce substantial population growth and impacts relating to population and housing would be less than significant.	None required.	Less than Significant
Housing or Population Displacement: The Proposed Project site is currently undeveloped and does not contain any housing or people. Therefore, implementation of the Proposed Project would not displace substantial numbers of existing housing or substantial numbers of people necessitating the construction of replacement housing or replacement of affordable housing. No significant impacts would occur.	None required.	Less than Significant
Cumulative Impacts: The dwelling units that would be developed with implementation of the Proposed Project in combination with the related projects would concurrently increase the resident population in the area. The 5,273 dwelling units that would be developed with the related projects in combination with the Proposed Project's 979 dwelling units would yield a total of approximately 19,106 new residents. The total number of employees generated by the Proposed Project and related projects would be approximately 878. The residential population would increase by approximately 2,683 people and 878 households. This would result in a cumulative population increase	None required.	Less than Significant

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of 21,789 people. The addition of 21,789 new people would be within the City of Santa Clarita's forecasted increase of 36,707 people between 2000 and 2010. The Proposed Project in combination with the related projects would not result in a significant impact on population or housing because the number of people and homes that would be generated by the Proposed Project in combination with the related projects is within current Santa Clarita Valley population and housing forecasts; roadways and other infrastructure are not anticipated to be extended into previously undeveloped areas that would be available for future development; and the Proposed Project would not result in or contribute to the displacement of housing or people. Therefore, cumulative impacts on population and housing would be less than significant. Thus, the project's incremental increase is not considerable and impacts would be less than significant.		

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
PUBLIC SERVICES		
Police Protection: *Short-Term Construction Impacts* During the construction phase, additional LASD's services would be required in the project area, as the project site would increase the number of people on-site from existing demand. This increase in daytime population would vary depending on the type of construction activity (i.e. site grading, construction of structures, infrastructure improvements, etc.). Therefore, during the construction phase, private security patrols would be utilized to protect the project site; thereby, reducing potential demands on the existing LASD's resources. In addition, temporary fencing would also be installed around the construction site to keep out the curious. With implementation of the mitigation measures, no significant short-term construction impacts are anticipated. *Long-term Operational Related Impacts* Assuming a residential density of 3.056 persons per dwelling unit, the Proposed Project would generate a population increase of 2,992 persons. Recreational uses would provide a trail system linking to the Santa Clara River Trail and a YMCA facility and a proposed junior high school would provide additional educational facilities for the existing and proposed residential development. Consequently, an increase in the number of requests for assistance calls for the police services from new homes would be expected. The LASD's resources are already strained by a chronic shortage of uniformed officers, a situation that may not improve in the	M.1-1 During construction, private security patrols shall be utilized to protect the project site and temporary fencing would also be installed around the construction site to keep out the curious. M.1-2 As final building plans are submitted to the City for approval in the future, Sheriff's Department design requirements which reduce demands for service and ensure adequate public safety (such as those pertaining to site access, site security lighting), shall be incorporated into building designs. M.1-3 Project design shall provide lighting, to the satisfaction of the Sheriff's Department, around and throughout the development to enhance crime prevention and enforcement efforts. M.1-4 Project design shall provide clearly visible (during the day and night) address signs and/or building numbers for easy identification during emergencies. M.1-5 Project design shall provide visibility of doors and windows from the street and between buildings. M.1-6 Project site design shall include adequate parking spaces in the parking lots to accommodate residents,	Less than Significant

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
foreseeable future. The Proposed Project would include significant crime prevention design features and as the project is developed, tax revenues from property and sales taxes would be generated and deposited in the City of Santa Clarita General Fund. A portion of these revenues would then be allocated, in accordance with the City of Santa Clarita and County of Los Angeles contractual service agreement, to maintain staffing and equipment levels for the Santa Clarita Valley Sheriff's Substation in response to related demands. Although the project would increase demands for Sheriff's services, these service demands can be met through the allocation of revenues collected from the project using existing sources. Though the Proposed Project could increase staffing levels at the Sheriff's substation, the increase in staff and equipment would not result in the need to physically alter the physical plant (Santa Clarita Sheriff's Substation), construction of which could cause significant environmental impacts in order to maintain service ratios and response time. Consequently, impacts on the Santa Clarita Valley Sheriff's Substation would be less than significant.	per the Unified Development Code.	

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
City Emergency Response/Evacuation Plans: The primary vehicle access to the project site would be via a major arterial, Golden Valley Road, which would run north-south axis through the site. The roadway will be eventually constructed with a flyover Soledad Canyon Road to connect with Newhall Ranch Road. The project would also include approximately 19 acres of other public streets, including the access roadway to the multi-family lots and the access roadway to the single-family neighborhood including cul-de-sacs. These roadways would provide alternative evacuation routes for the site. thus it is not anticipated that the design of the project would preclude implementation of an evacuation plan, which would provide for the safe movement of future residents. Consequently, no significant impacts are expected to occur.	None required	Less than Significant
Fire Protection: *Short-Term Construction Impacts* Construction of the Proposed Project would increase the potential for accidental wildfires from such sources as the operation of mechanical equipment in close proximity to fire-prone vegetation, use of flammable construction materials, and from carelessly discarded cigarettes. In most cases, the implementation of "good housekeeping" procedures by the construction contractors and the work crews would minimize these hazards. Nonetheless, as the Proposed Project's construction-related activities would increase the potential for starting a wildfire, and since LACFD has determined that the development of the Proposed Project would require additional manpower, equipment and facilities, without	M.2-1 The project developer shall contribute funds to the Los Angeles County Fire Department Developer Fee Program. The exact contribution shall be determined by the Los Angeles County Fire Department before a building permit is issued. M.2-2 The project shall prepare a Fuel Modification Plan, landscape plan and irrigation plan as required for projects located with a Very High Fire Hazard Severity Zone. The Fuel Modification Plan shall be submitted and approved by the County Fire Department prior to final map recordation. The Fuel Modification Plan shall depict a fuel modification	Less than Significant

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
proper mitigation measures a potentially significant impact would occur. *Long-term Operational Related Impacts* The intensification of land uses combined with the increase in human activity on the project site and due to the location of the project site in an area designated as VHFHSZ would result in an increase in fire hazards and other associated needs for fire protection services. As such, the Proposed Project would meet all applicable County and City fire codes, including those related to commercial, institutional, and residential uses per the LACFD with respect to street width, turning radius and access for emergency vehicles and location and number of fire hydrants. Specifically, the Proposed Project would implement a fuel modification plan. The Fire Department has stated that no fire station is required for development mitigation for this specific project. Nonetheless, based on a preliminary review of the Proposed Project, the LACFD has determined that additional manpower, equipment, and facilities would be needed to serve the Proposed Project in order to maintain adequate staffing and response times. Therefore, without appropriate mitigation measures a potentially significant impact would occur.	zone in conformance with the Fuel Modification Ordinance in effect at the time of subdivision. The fuel modification plan shall not conflict with any revegetation plans as discussed in Section V.D (Biological Resources). M.2-3 The project shall provide water mains, fire hydrants and fire flows as required by the County of Los Angeles Fire Code. M.2-4 Fire Department access shall be extended to within 150 feet distance of any exterior portion of all structures. M.2-5 Access shall comply with Section 902 of the Fire Code, which requires all weather access. All weather access may require paving. M.2-6 Access roads shall be maintained with a minimum of ten feet of brush clearance on each side. Fire access roads shall have an unobstructed vertical clearance clear-to-sky. M.2-7 All fire lanes must not be less than 26 feet paved width (clear to sky and unobstructed) and posted and red curbed "NO PARKING - FIRE LANE". Any proposed reduction in fire lane shall be subject to written acceptance by the County Fire Department.	

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
	M.2-8 All private gates shall comply with Regulation 5 of the Fire Code. Prior to the approval of the Tentative Tract Map, the applicant shall receive approval of the gates from the Los Angeles County Fire Department.	
Schools: The development of the Proposed Project would bring new students into the Saugus Unified School District (SUSD) and the William S. Hart School District (HUSD), as 979 new dwelling units would be built. As such, 334 additional students associated with the Proposed Project would be generated as a result of project implementation. The schools in the SUSD, which would serve the project site are currently operating under capacity and could accept additional students generated by the Proposed Project without exceeding capacity. Consequently, the project would not require additional facilities, such as additional classrooms, to accommodate its students. Therefore, implementation of the project would not result in adverse physical impacts associated with the provision of new or physically altered school facilities, the construction of which could cause significant environmental impacts. No project impacts to the SUSD would occur. The junior and high school students, which could possibly be introduced to the HUSD by the Proposed Project would attend schools which are currently over capacity. The School Funding Agreement between the applicant and HUSD would provide a 'Fair Share' mitigation fee to the HUSD that would ensure adequate	M.3-1 Compliance with the provisions of SB 50 is deemed to be complete and adequate mitigation of Proposed Project impacts to school facilities. In addition, project participation in School Facilities Funding Agreements with the SUSD and HUSD would further mitigate project specific impacts on these districts. These agreements would provide for a 'Fair Share' fee to be paid to the SUSD and the HUSD in order to house the additional students generated by the project. No further mitigation is required.	Less than Significant

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school capacity to serve this project. In addition, the Proposed Project proposes to sell a portion of the project site to HUSD for the construction of a junior high school. As a result, no project impacts to the William S. Hart School District would occur. The potential environmental impacts of construction of a junior high school on the Proposed Project's school site are analyzed in this environmental impact report.		
Libraries: The Proposed Project would increase the local permanent residential population by 2,992. Using the County Library's planning guidelines of 0.50 square feet of library facilities and 2.75 collection items per capita, the Proposed Project would generate a need for an additional 1,496 square feet of library facilities and 8,228 additional collection items. As discussed above, the Santa Clarita Valley is currently under-served with regard to Library services and development of the Proposed Project would thereby increase the existing need for additional library facilities. If the project generated demand for 1,496 square feet of additional space were translated into new construction of permanent space, this would be the approximate equivalent of three rooms measuring 20' x 20'. The construction of new, permanent space could be considered an adverse impact under the CEQA Guideline threshold. However, CEQA Guidelines, Section 15301, states that construction on an existing use that totals either 2,500 square feet or 50 percent of the floor area of the structure before the addition would have a negligible impact on the environment. Therefore, the additional construction of approximately 1,496 square feet on the	None required.	Less than Significant

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
Jo Anne Darcy Library would have a physically insignificant effect on the environment. For these reasons, the project's impacts on County Library facilities would be less than significant. Based on the current library mitigation fee of $677.00 per dwelling unit, the Proposed Project would be required to pay a fee of $662,783.00 ($677.00 x 979 dwelling units = $662,783.00) toward the construction of expanded or new library facilities and the acquisition of additional collection materials. Payment of the library mitigation fee is a requirement of the project by Los Angeles County and the City of Santa Clarita to offset the demand recreated by the project for additional square footage and library collection materials. Impacts would be less than significant.		
Parks: Future residents of the project site would increase the demand for recreational facilities and opportunities in the project area. The Keystone project includes active recreational facilities for public use, including ball fields and courts located at the junior high, and trails and open space uses. In addition, each multi-family community would contain active recreation area including swimming pools, children's play areas, etc. However, the project is required to pay Quimby fees that would satisfy the need for any new or physically altered parks or recreational facilities in order to maintain current service ratios. Therefore, project impacts on parks and recreational facilities would be less than significant.	M.5-1 Developer shall construct all trails (within the Proposed Project site and off-site to the west) and shall be in accordance with the City of Santa Clarita Department of Parks, Recreation and Community Services trail system standards.	Less than Significant

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Cumulative Impacts: Police Protection The Sheriff's substation serving the City of Santa Clarita operates at an adequate level of service. This service is expected to be maintained as cumulative development projects would contribute to the City of Santa Clarita's General fund through taxes and fees which in turn would provide funds to mitigate any cumulative impacts to Sheriff's services to a level of non-significance as long as the City of Santa Clarita and the County of Los Angeles maintain service and funding agreements. Therefore, the Proposed Project and related projects impacts cumulatively would not be considerable and impacts to Sheriff's services would not be significant.	None required.	Less than Significant
Fire Protection The project and related projects cumulatively could result in an increase in the average response time for fire protection. However, project specific mitigation measures are required and therefore the impacts resulting from new development would be reduced to less-than-significant by compliance with state, City, and County fire codes, standards and guidelines and the incorporation of project-specific mitigation measures. Moreover, developer fees as determined by the Los Angeles County Fire Department and increased taxes paid by new development would provide revenues to increase staff and purchase new equipment. Therefore,	None required	Less than significant

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
cumulative project and related project impacts on fire protection services would not be cumulatively considerable and impacts would be less-than-significant.		
Schools Cumulative development would generate 1,853 elementary school students, 656 junior high school students and 992 senior high school students that would need to be accommodated by the SUSD and the HUSD, respectively. Capacity for these students has yet to be fully planned in the subject school districts and unless these additional students can be accommodated, build-out under this scenario could result in a significant impact to schools and educational services. However, compliance as appropriate, with existing School Facilities Funding Agreements and/or other funding mechanisms (e.g., SB 50, the Valley-Wide Joint Fee Resolution, and/or new school facilities funding agreements) would reduce cumulative development impacts on the school districts and project and related project impacts would not be cumulatively considerable and impacts would be less-than-significant level.	None required	Less than Significant
Library Payment of the library mitigation fee is a requirement of the project by Los Angeles County and the City of Santa Clarita to offset the	None required	Less than Significant

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
demand recreated by the project for additional square footage and library collection materials. Therefore, funding would be provided to offset these demands and provide the County Library system the ability to provide library services and facilities. For these reasons, the project and related project cumulative impacts on to the County Library system under the DMS scenario would not be cumulatively considerable and impacts would be less than significant.		
Parks In accordance with CEQA Guidelines Section 13130(a)(3), the Proposed Project's contribution to the cumulative impacts on parks and recreational facilities would not be cumulatively considerable because the project developer would (1) provide onsite recreational facilities and preserved open space and (2) to the extent that such facilities and open space are insufficient to satisfy fully the project developer's Quimby Act obligations, pay Quimby fees. The satisfaction of the Quimby Act requirements would constitute the project's fair share of mitigation designed to alleviate the cumulative impact on parks and recreational facilities. Therefore, cumulative impacts of the Proposed Project in combination with the related projects would not be cumulatively considerable and impacts would be less than significant.	None required	Less than Significant
UTILITIES AND SERVICE SYSTEMS		
Water: Water Supply Assessment		

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
The Water Supply Assessment for the Proposed Project concluded that "there will be sufficient water supply available when The Keystone project is ready for occupancy, in addition to existing and other planned future uses." Therefore, it is anticipated that the future water supplies will meet the demand of the Proposed Project in addition to the existing demand and the associated impact would be less than significant. Nonetheless, mitigation measures are recommended to further reduce the Proposed Project's less-than-significant impact on water supplies and to support the water conservation efforts of the CLWA. Water Facilities The number of water connections that would be added to the existing water supply system in the Santa Clarita Valley is within the growth projections in the 2000 UWMP, as amended. As discussed in the Water Supply Assessment for the Proposed Project, the 2000 UWMP assumed an average growth rate of 2,240 connections per year based on the average growth rate that occurred during the 1990s. The Proposed Project would add approximately 331 residential connections, which is less than the annual average anticipated by the 2000 UWMP and is, therefore, considered to be accounted for in the 2000 UWMP, as amended.	N.1-1 The project developer shall ensure that the landscape irrigation system be designed, installed and tested to provide uniform irrigation coverage. Sprinkler head patterns shall be adjusted to minimize over spray onto walkways and streets. N.1-2 The project developer shall install either a "smart sprinkler" system to provide irrigation for the landscaped areas or, at a minimum, set automatic irrigation timers to water landscaping during early morning or late evening hours to reduce water losses from evaporation. Irrigation run times for all zones shall be adjusted seasonally, reducing water times and frequency in the cooler months (fall, winter, spring). Sprinkler timer run times shall be adjusted to avoid water runoff, especially when irrigating sloped property. N.1-3 The project developer shall select and use drought-tolerant, low-water consuming plant varieties to reduce irrigation water consumption. N.1-4 The project developer shall install ultra-low flush water toilets and water-saving showerheads in new construction. Low-flow faucet aerators should be installed on all sink faucets.	Less than Significant
Sewer:	N.2-1 Applicant shall obtain a will-serve letter from the County	Less than Significant

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
The amount of construction-related wastewater that would be generated would not have a significant impact on local disposal or treatment facilities due to the expected low volume of waste. Upon completion, the Proposed Project would generate approximately 235,431 gallons of sewage per day. The existing Soledad Canyon trunk line in the project vicinity has a design capacity of 3.9 mgd and currently conveys a peak flow of 2.4 mgd, leaving 1.5 mgd of remaining capacity. Since the Proposed Project would be anticipated to generate 0.24 mgd, the trunk sewer is considered adequate to accommodate flow projections. It is therefore concluded that the project would not have a significant adverse impact on the District's trunk sewer.	Sanitation Districts of Los Angeles County prior to issuance of building permits in order to verify that there is sufficient capacity in the receiving trunk lines and the reclamation plant to serve the project. N.2-2 All local wastewater lines within the project boundaries are to be constructed by the applicant and dedicated to the City of Santa Clarita Transportation and Engineering Services Department. N.2-3 Prior to the issuance of building permits, the applicant shall pay wastewater connection fees.	
Solid Waste: *Short Term Construction Impacts* Construction of the Proposed Project would be expected to generate approximately 7,668 tons of waste over project build-out. Recycling of construction-related waste materials in compliance with AB 939, assuming a 50% diversion rate, means that approximately 3,438 tons of solid waste over project build-out would go to landfills. The total landfill capacity in Los Angeles County is limited, therefore any addition to the overall waste stream flowing to the County's landfills will hasten the day the County eventually runs out of landfill capacity. Therefore and any additional solid waste from any source may be considered adverse.	*Mitigation Measures Already Incorporated Into the Project* N.3-1 Solid waste collection/recycling areas are to be compatible with nearby structures, secure, protected against adverse environmental conditions, clearly marked, adequate in capacity, number and distribution, and contain a sufficient number of bins to serve the recycling and solid waste needs of the development. (Model Ordinance) N.3-2 Design and construct collection/recycling areas to accommodate front-loader packing trucks, including	Significant and Unavoidable

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
However, since the addition of the Proposed Project's construction related wastes to the local landfills (i.e. the Chiquita Canyon Landfill, the Antelope Valley Public Landfill I and II and The Lancaster Landfill and Recycling Center), estimated to be approximately 4.4 tons per work day[3], would not cause those landfills to exceed their permitted daily capacity of an aggregate 9,500 tons per day, this impact would be considered less than significant. Because an adequate amount of landfill space has not been ensured to accommodate long-term solid waste disposal at current generation rates, even with mitigation, the Proposed Project's construction-related solid waste impact would be considered significant.	maneuvering room. (Model Ordinance) N.3-3 Design and construct driveways and/or travel aisles with adequate width and maneuverability space of unobstructed garbage collection, trash container storage and vehicle access and clearance. (Model Ordinance) N.3-4 Post signs at all access points of the recycling areas that clearly identify all recycling and solid waste collection and loading areas and the materials accepted therein. (Model Ordinance) N.3-5 The applicant shall comply with all applicable state and Los Angeles County regulating and procedure for the use, collection and disposal of solid and hazardous wastes. *Project Mitigation Measures* Short-term Construction N.3-6 The construction contractor shall only contract for waste disposal services with a company that recycles construction related wastes.	

[3] 3,438 tons of solid waste over project build-out / 780 work days (approximately three years) = 4.4 tons per work day.

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
	N.3-7 To facilitate the on-site separation and recycling of construction related wastes, the construction contractor shall provide temporary waste separation bins, which shall be prominently placed on each construction site. N.3-8 All construction documents shall specify that building materials shall be made of recycled materials, or materials with the highest content possible of recycled materials, to the extent feasible.	
Long-term Operational Impacts Over the long term the project's 979 residences, Junior High School and YMCA Facility would generate approximately 10,839 pounds of solid waste per day, or 1,979 tons per year. Per AB 939 there is a requirement to reduce the solid waste stream by 50%, which means that approximately 5,419.5 pounds of the Proposed Project's total waste stream (798 tons per year) would be diverted elsewhere than to a landfill (e.g. recycled.) Therefore, the Proposed Project is anticipated to produce approximately 5,419.5pounds per day of solid waste (71 tons total landfill capacity in the County is limited and any addition to the overall waste stream would reduce the County's overall landfill capacity. The Chiquita Canyon Landfill, the Antelope Valley Public Landfill I and II and the Lancaster Landfill and Recycling Center have sufficient capacity for	*Long-term Operational* N.3-9 The Project Applicant shall locate recycling / separation areas in close proximity to dumpsters for non-recyclables, elevators, loading docks, and primary internal and external access points. N.3-10 The Project Applicant shall locate recycling / separation areas such that they are not in conflict with any applicable federal, state or local laws. N.3-11 The Project Applicant shall locate recycling / separation areas so they are convenient for those persons who deposit collect, and load the recyclable material.	Significant and Unavoidable

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
their currently projected solid waste intake and the Proposed Project's intake for the foreseeable short-term future. However, because local landfills will eventually reach capacity, the Proposed Project's long-term impact on solid waste facilities would be considered significant.	N.3-12 The Project Applicant shall place recycling containers / bins so that they do not block access to one another. N.3-13 The project shall employ the use of xeriscape techniques and plant drought tolerant and native vegetation in common landscaped areas, wherever possible, to reduce yard waste. N.3-14 For commercial and institutional developments and residential buildings having five or more dwelling units, no refuse collection or recycling areas are to be located between a street and the front of a building. N.3-15 The project shall install on-site trash compactors for non-recyclables in all commercial (YMCA and junior high school) food service areas. N.3-16 If possible, kitchen, garage and garden design shall accommodate trash and recyclable components to assist the City's recycling efforts. This includes a design to accommodate a minimum of three 90-gallon containers in locations allowable under the development's CC&Rs. N.3-17 First time buyers shall receive educational material on the City's waste management efforts, including information concerning curbside recycling, used motor oil recycling, and hazardous waste collection	

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
	programs. Education material shall be passed on to consecutive buyers using the development's CC&Rs	
Cumulative Impacts: **Water** The CLWA anticipates that its projected water supplies available during normal, single-dry, and multiple-dry water years, as included in its 2000 UWMP, as amended, would meet the projected water demand associated with the Proposed Project, in addition to the existing and other planned future uses in the CLWA's system. The Water Supply Assessment for the Proposed Project included the Proposed Project and "planned future uses", which includes probable future projects. The Water Supply Assessment clarifies "planned future uses" as within the projections included in the 2000 UWMP, as amended. Therefore, the Proposed Project's incremental increase would not be considerable and impacts on water supplies would be less than significant. The effect of the additional water connections due to the Proposed Project would not incrementally contribute a considerable amount to the cumulative total number of connections. As such, the associated cumulative impact would not be cumulatively	None required.	Less than Significant

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
considerable and impacts would be less than significant. The project's incremental increase would not be considerable and impacts would be less than significant.		
Sewer The design capacity of the Santa Clarita Valley Joint Sewage System (SCVJSS) is 28.10 mgd and the SCVJSS's current average wastewater flow is 18.4 mgd. Therefore, the SCVJSS has a remaining capacity of approximately 9.7 mgd. The cumulative sewage generation of 1.5 mgd would be well within the design capacity of the SCVJSS, representing about 15.5 percent of the remaining capacity. In addition, it should be noted that connection permits are not issued if there is not sufficient capacity in the system, and all new development projects are required to pay the District's connection fees to assure the continual expansion of district facilities. Therefore no project and related project impacts would be considerable and impacts to the sewerage system would be less than significant. The project's incremental increase is not considerable and impacts would be less than significant.	None required	Less than Significant
Solid Waste The Proposed Project, in combination with the related projects, would generate a cumulative total of approximately 71,739 pounds (35.9 tons) of solid waste per day. As discussed above, new landfill options and additional capacity may become available through the expansion of the Puente Hills Landfill, conversion of waste-to-energy and through waste-by-rail programs to landfills	None required	Significant and Unavoidable

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
outside of Los Angeles County (e.g., the proposed Eagle Mountain Landfill in Riverside County). Because solid waste (including hazardous waste) can could eventually be disposed of outside of Los Angeles County, and the disposal market is driven by the free enterprise system, it is reasonable to assume that as local options are exhausted solid waste generated by cumulative development would be disposed of outside of Los Angeles County and even possible possibly outside of the state. Given this assumption, the cumulative project area could encompass a geographic area outside the jurisdictional boundaries of the City of Santa Clarita, Los Angeles County and even possibly the state border. However it is beyond the scope of this EIR and too speculative to attempt to quantify the solid waste that could be generated by cumulative development that is proposed in greater Los Angeles County or the region beyond, or to assess the landfill options that might be available or, more importantly, other solid waste disposal options which could become available. It is reasonable to assume that the market forces that drive the waste disposal industry will put pressure on officials and governmental agencies to continually identify new, economically and politically feasible means of waste disposal in the future to accommodate growth. However, because new facilities are not currently available, cumulative project impacts would be considered significant. The project's incremental increase would be considerable and impacts would be significant.		

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
TRANSPORTATION		
The Proposed Project would generate approximately 11,005 total average daily trips (ADT). Approximately 1,468 and 1,009 trips would occur in the AM and PM peak hours, respectively.	*On-site Mitigation Measures* O-1 The project applicant shall construct all on-site roadways and intersections to City of Santa Clarita standards. O-2 The Proposed Project shall install a four-lane roadway on Golden Valley Road from the project's eastern boundary to the northern project boundary. O-3 The project applicant shall install traffic signals at the following project site intersections: • Golden Valley Road and "I" Street North (tee int.) • Golden Valley Road and "I" Street South (four-way int.) • Golden Valley Road and Ermine Street On Golden Valley Road, a four-way intersection with "I" Street is planned approximately 0.40 miles north of the future extension of Newhall Ranch Road. This intersection will serve both the project's residential development located west of Golden Valley Road and the YMCA and junior high school site located on the east. The second intersection with Golden Valley Road at Ermine Street will be configured as a "T" intersection and will be located approximately 0.50 miles north of the four-way intersection at "I" Street. The third intersection with Golden Valley Road (the second connection to "I" street) will be located approximately 0.10 miles	Less than Significant

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
	north of the Ermine Street intersection.	
The project would generate approximately 513 total daily transit trips and approximately 51 peak hour transit trips. The City of Santa Clarita does not have level of service standards for transit serve that are applicable to future development. Transit service is evaluated and fueled on an as-needed basis. IF additional fixed route service will be needed near the project site in the future, the project should coordinate with the transit provider to identify appropriate bus stop/turnout locations.	*Congestion Management Program (CMP) – Transit Service* O-4 The project applicant shall coordinate with the local transit provider to identify appropriate bus/stop turnout locations on the project site roadways (Golden Valley Road and/or "I" Street).	Less than Significant
Nine intersections experience a significant impact due to the project-generated traffic when compared to the no project scenario, and eight of those intersections forecast to exceed LOS "D". The following intersections are those significantly impacted: Existing Intersections • 57. Valencia Boulevard & Magic Mtn Parkway • 65. Bouquet Canyon Road & Soledad Canyon Road • 66. Bouquet Canyon Road & Newhall Ranch Road • 145. Sierra Highway & Placerita Canyon Road • 162. Sierra Highway & Golden Valley Road • 172. Whites Canyon Road & Soledad Canyon Road Future Intersections • 163. Golden Valley Road & Via Princessa • 166. Golden Valley Road & Newhall Ranch Road Freeway On/Off Ramp Intersection	*Off-Site Mitigation* Existing Intersections O-5 (57.) Valencia Boulevard & Magic Mountain Parkway. Add second WBL turn lane. Implementation of this measure would require restriping, median modification and widening of Valencia Boulevard. O-6 (65.) Bouquet Canyon Road and Soledad Canyon Road. Add fourth NBT lane. Implementation of this measure would require widening of Bouquet Canyon Road northbound approach. O-7 (66.) Bouquet Canyon Road & Newhall Ranch Road. - Add second SBL turn lane. Implementation of	Significant and Unavoidable (see Cross Valley Connector discussion below)

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
• 144. Sierra Highway & SR-14 SB Ramps	this measure would require restriping with potential median modification. - Add second SBR turn lane. Implementation of this measure would require widening of Bouquet Canyon Road southbound approach. - Add third EBT lane. Implementation of this measure would require restriping. O-8 (145.) Sierra Highway & Placerita Canyon Road. - Restripe one WBT lane to a WBR turn lane. Implementation of this measure would require restriping. - Restripe one WBT lane to a shared thru/right turn lane. Implementation of this measure would require restriping. O-9 (162.) Sierra Highway and Golden Valley Road. Add third WBT lane. Implementation of this measure would require widening of west leg (Golden Valley Road) to accommodate three lanes. O-10 (177.) Whites Canyon Road and Soledad Canyon Road. Restripe separate WBR turn lane to a shared thru/right lane. Implementation of this measure would require restriping. This mitigation measure is only necessary for the "With Golden Valley Road extension to Plum Canyon Road" scenario, with or without the Ermine Street connection to Golden Valley Road.	

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
	Future Intersections O-11 (163.) Golden Valley Road & Via Princessa. No requirements of the project applicant. Future intersection to be built out to achieve LOS D. O-12 (166.) Golden Valley Road & Newhall Ranch Road. - Install traffic signal. - Add second WBR turn lane or construct WBR as a free-flow turn lane. This mitigation measure is only necessary for the "With Golden Valley Road extension to Plum Canyon Road" scenario, with or without the Ermine Street connection to Golden Valley Road. Freeway On/Off Ramp Intersections O-13 (144.) Sierra Highway & SR-14 SB Ramps. - Add separate NBR turn lane. Implementation of this measure would require restriping. - Add second SBL turn lane. Implementation of this measure would require restriping with potential widening of Sierra Highway.	
Two scenarios have been analyzed in which the planned Cross	Project Mitigation is not sufficient for either scenario without the	Significant and Unavoidable

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
Valley Connector (CVC) roadway is either not built or is only partially built before the occupancy of the Proposed Project. One scenario examined only construction of the CVC east of Bouquet Canyon road to serve only the neighboring Riverpark project (recently approved by City Council). Keystone traffic would access the site via Golden Valley Road at Plum Canyon Road. The second scenario examined the construction of the CVC to the west of the site for project access (with access as well to Plum Canyon Road on the north) but the bridge over the Santa Clara River is not completed but the Golden Valley Road/Soledad Canyon Road flyover is operational. For both scenarios, the neighboring Riverpark project is built with only 500 residential units. Under the first scenario, eight intersection show significant impacts and under the second scenario four intersections would be significantly impacted. The following are the significantly impacted intersections: • 48. McBean Parkway & Newhall Ranch Road (Scenario 2) • 65. Bouquet Canyon Road & Soledad Canyon Road (Scenarios 1 & 2) • 66. Bouquet Canyon Road & Newhall Ranch Road (Scenarios 1 & 2) • 67. Seco Canyon Road & Bouquet Canyon Road (Scenario 1) • 160. Haskell Canyon Road & Bouquet Canyon Road	completed Cross Valley Connector roadway.	

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
(Scenario 1) • 172. Whites Canyon Road & Soledad Canyon Road (Scenario 1 & 2) • 173. Santa Catarina/GVR & Plum Canyon Road (Scenario 1) • 174. Bouquet Canyon Road & Plum Canyon Road (Scenario 1) • 198. Valley Center & Soledad Canyon Road (Scenario 1) Intersections of particular importance to the project for these scenarios are Bouquet Canyon Road at Plum Canyon Road and Bouquet Canyon Road at Newhall Ranch Road. Without the CVC, each of these intersections show deficiencies without project traffic added. Without the relief provided by the CVC, even a small amount of additional traffic added to these locations will result in a significant impact. Even a minimal amount of traffic from the project site results in significant impacts at the identified locations and that implementation of an early phase of The Keystone project is not feasible without the CVC.		
Cumulative Impacts The additional cumulative traffic, without the project, would worsen conditions at eight intersections during one or both of the peak-hour periods. With the addition of the project traffic, nine intersections experience a significant impact, and eight of those intersections forecast to exceed LOS "D". The cumulative significantly impacted intersections include:	Bouquet Canyon Bridge and Thoroughfare District O-14 The project and related projects shall fund its calculated fair share of improvements to the Bouquet Canyon Bridge and Thoroughfare District to augment future improvements that are planned for the SR-14 freeway.	Significant and Unavoidable

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
Freeway On/Off Ramp Intersection • 144. Sierra Highway & SR-14 SB Ramps (AM and PM) Existing Intersections • 57. Valencia Boulevard & Magic Mtn Parkway (AM and PM) • 65. Bouquet Canyon Road & Soledad Canyon Road (PM) • 66. Bouquet Canyon Road & Newhall Ranch Road • 145. Sierra Highway & Placerita Canyon Road (AM and PM) • 162. Sierra Highway & Golden Valley Road (AM and PM) • 172. Whites Canyon Road & Soledad Canyon Road Future Intersections • 163. Golden Valley Road & Via Princessa (AM and PM) • 166. Golden Valley Road & Newhall Ranch Road (PM) Therefore, traffic would worsen at these intersections and the Proposed Project would contribute considerably to the cumulative impact at locations shown to be deficient, therefore cumulative impacts are significant. Like the Proposed Project, the related projects would be dependent upon a completed Cross Valley Connector roadway for impacts to be less than significant.		

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
ENERGY CONSERVATION		
Electricity: Upon full build-out, the Proposed Project is anticipated to consume approximately 17,585 kilowatt hours (kwH) per day. In order to serve the Proposed Project's electricity needs, existing electrical lines in the project area would need to be extended. The SCE has determined that the electrical loads of the Proposed Project are within the parameters of projected load growth for the area and therefore there would be an adequate power supply to serve the Proposed Project. With modern energy efficient construction materials and compliance with Title 24 standards, the Proposed Project would be consistent with the State's energy conservation standards and therefore would not conflict with adopted energy conservation plans.	P.1-1 In the event of full or partial road closures, the project developer shall employ flagmen during the construction of the electrical disribution system to facilitate the flow of traffic. P.1-2 During the design process, the project developer shall consult with the Southern California Edison's, Energy Design Resources program or SCE's Savings by Design program, regarding additional possible energy efficiency measures. None required.	Less than Significant Less than Significant
Cumulative Impacts: Development of the Proposed Project in conjunction with the 12 related projects would increase the demand for electricity. The estimated electricity consumption by the related projects in combination with the Proposed Project would be approximately 111,915 kwH per day. However, cumulative impacts are not expected to be significant as the SCE has an obligation to serve the citizens of the City and projects would be required to comply with Title 24 of the California Code which establishes energy		

PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
conservation standards for new construction. Therefore, the combined effects of the Proposed Project and the related projects are expected not to be cumulatively considerable and impacts would be less-than-significant.		
Natural Gas: Upon full build-out, the Proposed Project is anticipated to consume approximately 153,943 cubic feet of natural gas per day. SCG has stated that it can accommodate the natural gas needs of the Proposed Project from existing medium pressure mains and current supply. Natural gas would likely be provided to the project site by providing service extensions from the four-inch medium pressure main in Ermine Street and an additional extension from either Newhall Ranch Road and/or Golden Valley Road. While the extension of natural gas service to the Proposed Project would include expansion of distribution infrastructure and capacity-enhancing alterations to existing facilities, these requirements are not expected to create significant impacts to the physical environment as there would be no disruption in service to existing customers; extension of natural gas mains would be within public right-of-ways and any required road closures would be for a short period of time; and the full cost of the proposed service extensions and the fair share costs of the expansion of the natural gas distribution systems would be borne by the project developer. In addition, the Proposed Project would comply with the standards in Title 24 as they relate to the conservation of natural gas and would use modern energy-efficient construction materials and	P.2-1 Prior to the start of construction, the Proposed Project's energy engineer shall consult with SCG for an energy analysis regarding efficiency and conservation measures. P.2-2 The project developer shall hire flagmen to facilitate traffic flow during installation of the natural gas main extensions.	Less than Significant

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PROJECT IMPACTS	MITIGATION MEASURES	LEVEL OF IMPACT AFTER MITIGATION
otherwise comply with the State's energy conservation standards. Therefore, the Proposed Project would not conflict with adopted energy conservation plans.		
Cumulative Impacts: Development of the Proposed Project in conjunction with the 12 related projects would increase the demand for natural gas. The estimated natural gas consumption by the related projects in combination with the Proposed Project would be approximately 1,161,805 cubic feet per day. However, cumulative impacts are not expected to be significant because SCG has stated that "[d]emand projections by the Gas Company have allowed for additional load/demand of this project, as well as, the cumulative impact of future proposals in this area." As SCG has indicated that natural gas is available for the Proposed Project in combination with the related projects, cumulative impacts to natural gas services would not be cumulatively considerable and impacts would be less than significant	None required	Less than Significant

Pages omitted.
Visit http://www.santa-clarita.com/cityhall/cdd/planning/eir/completed.asp for complete document.

V. ENVIRONMENTAL IMPACT ANALYSIS
N. UTILITIES
1. WATER

INTRODUCTION

This section addresses the potential environmental impacts associated with the provision of water to the Proposed Project. In accordance with Sections 10910-10915 of the State Water Code, a Water Supply Assessment was conducted for the Proposed Project. The Water Supply Assessment for the Proposed Project is discussed in detail below, and is attached as Appendix 10 to this Draft EIR.

ENVIRONMENTAL SETTING

Physical Conditions

Regional Climate

The climate in the Santa Clarita Valley is characterized as semi-arid and warm. Temperatures in the summer months can reach up to approximately 110 degrees Fahrenheit, and temperatures in the winter months can drop to approximately 20 degrees Fahrenheit. Average annual rainfall is approximately 18 inches in the flat-lying areas and approximately 27 inches in the mountainous areas. The region is subject to wide variations in precipitation.[1]

Regional Geology and Hydrology

The project site is located in the 103-square-mile Santa Clara River Valley Groundwater East Subbasin (see Figure V.N.1-1), which is bounded by the Piru Mountains to the north, the Modelo and Saugus Formations and alluvium to the west, the Santa Susana Mountains to the south, and the Gabriel Mountains to the southeast. The subbasin is drained by the Santa Clara River, Bouquet Creek, and Castaic Creek.[2]

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1 *Castaic Lake Water Agency, Urban Water Management Plan 2000, page 1-6.*

2 *California Department of Water Resources, California Groundwater Bulletin 118, Hydrologic Region South Coast, Santa Clara River Valley Groundwater Basin, February 27, 2004.*

In the Santa Clara River Valley, groundwater is found in alluvium, terrace deposits, and the Saugus Formation. Generally, groundwater in the subbasin is unconfined in the alluvium (i.e., Alluvial Aquifer), but may be confined, semi-confined, or unconfined in the Saugus Formation.[3]

Groundwater levels in the alluvium were relatively stable from 1970 through 2000, with varying depths to groundwater from approximately 13 to 100 feet depending on the location within the subbasin. Water levels tend to follow long-term precipitation patterns by dropping in period of low rainfall and recovering during periods of high rainfall. Groundwater levels in the Saugus Formation were also constant between 1970 and 2000. Groundwater flow in the subbasin is southward and westward, following the course of the Santa Clara River.[4]

Aquifer Recharge

The Alluvial Aquifer is recharged chiefly by infiltration of runoff in the Santa Clara River and its tributaries, with additional natural recharge from precipitation to the valley floor and subsurface flow. Recharge is also attributed to excess irrigation water that is used in urban landscaping and reclaimed water discharged into the Santa Clara River. From the sands and gravels beneath the Santa Clara River, water is pumped from relatively shallow wells (up to 200 feet in depth). The Alluvial Aquifer is estimated to store over 200,000 acre-feet of water.[5]

Beneath the Alluvial Aquifer, the Saugus Formation is a deeper layer of groundwater. Recharge to the Saugus Formation is from precipitation on the exposed formation and percolation of water from the alluvial aquifer. It is estimated that the Saugus Formation stores about one million acre-feet of water and is pumped by wells extending to about 2,000 feet in depth.[6] Water is discharged through pumping for municipal irrigation, consumption by vegetation, and outflow to the Santa Clara River.

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3 *Ibid.*

4 *Ibid.*

5 *Castaic Lake Water Agency, Urban Water Management Plan 2000, page 1-12*

6 *Ibid.*

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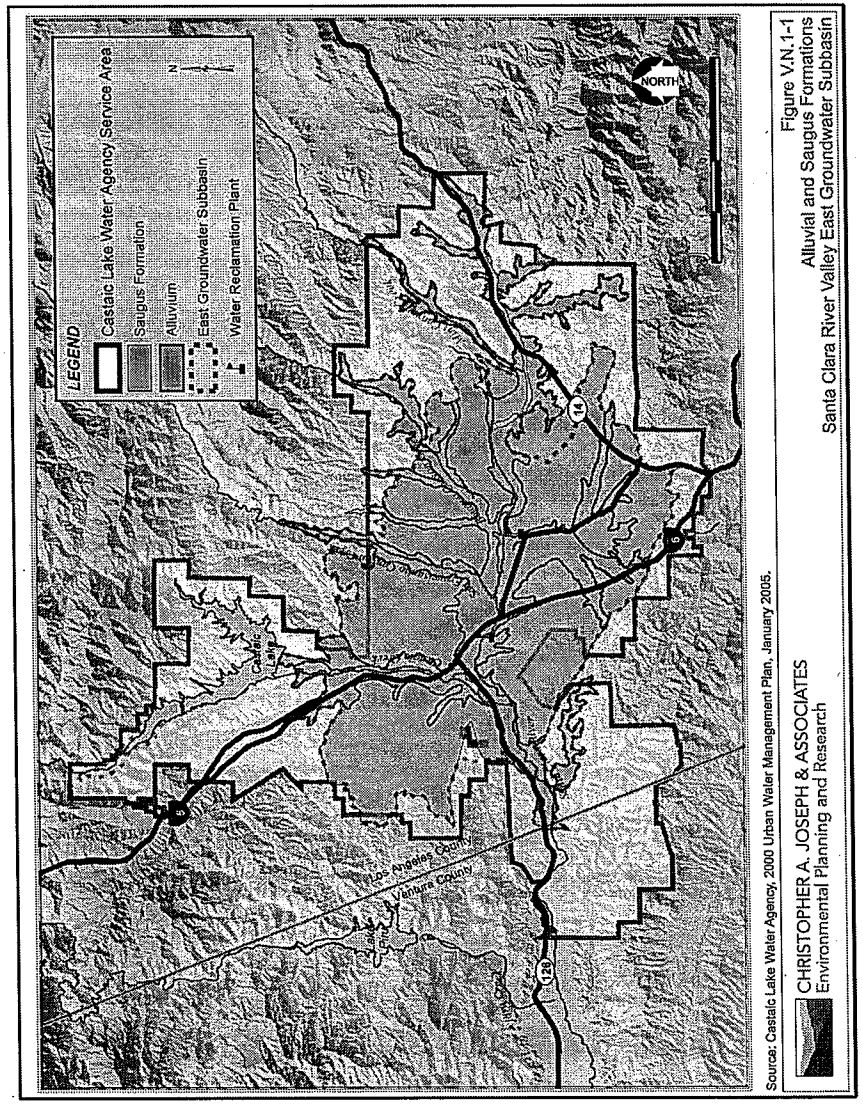

Local Geology and Hydrology

Groundwater beneath the project site is found in the recent alluvium (i.e., Alluvial Aquifer), and perched above the Saugus Formation and the Quaternary Terrace Deposits. Detailed information regarding the geology of the project site is presented in Section V.F, Geology and Soils, of this Draft EIR. Detailed information regarding the hydrology of the project site is presented in Section V.H, Hydrology and Water Quality, of this Draft EIR.

Cyclic Drought Conditions

Local droughts in the Santa Clarita Valley historically have resulted in short-term increased water demand, short-term increased groundwater pumping, and short-term decreased recharge to the local groundwater system.

Statewide drought affects water availability in the SWP system, and ultimately deliveries from the State Water Project (SWP) system. Droughts have occurred locally in 1947-1950, 1958-1960 and 1990-1991. Recent Statewide droughts have occurred in 1976-1977 and 1987-1992.[7] Since the area's water supplies are dependent on rainfall conditions both locally and Statewide, it is important to note that wet and dry year conditions do not occur at the same time in Northern and Southern California. As a result, the water purveyors in Santa Clarita Valley are able to adjust the mix of available water resources on a year-to-year basis in response to local and Statewide hydrologic conditions.

Prior to 1990-1991, Statewide drought conditions had a minimal impact upon the Santa Clarita Valley, other than requiring additional water supply to compensate for the lack of spring rainfall for irrigation (e.g., crops, lawns and gardens). In 1990-1991, however, for the first time, Statewide drought conditions caused cutbacks in imported SWP supplies in the Santa Clarita Valley. Water production also declined in some wells operating in the shallow, outlying reaches of the Alluvial Aquifer. However, because Santa Clarita Water Division's (SCWD) alluvial wells are located in the major water bearing reaches of the aquifer, none of SCWD's alluvial wells experienced loss of production during 1990-1991. In addition to the alluvial groundwater supplies, the water purveyors in Santa Clarita Valley pumped more water from the Saugus Formation in 1990-1991, and requested that their

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[7] *The 1987-1992 drought was notable for its six-year duration. Statewide reservoir storage was about 40 percent of average by the third year of the drought. The SWP met contractors' delivery requests during the first four years of the drought, but then was forced by declining reservoir storage to reduce deliveries substantially. The SWP terminated deliveries to agricultural contractors and provided about 30 percent of requested urban deliveries in 1991, the single driest year of the drought. A 1991 Governor's executive order resulted in implementation of a State drought water bank. (Critical Water Shortage Contingency Plan, Governor's Advisory Drought Planning Panel, December 29, 2000.)*

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customers voluntarily conserve water by 10 percent. Actual water use in the valley decreased more than 10 percent as a direct result of water conservation efforts.

Due to the steps taken by the local purveyors, water demands in the Santa Clarita Valley were met for the duration of the 1990-1991 drought. CLWA also elected not to participate in the State's Drought Water Bank because alternate local supplies were available to meet water demands in the Santa Clarita Valley. In addition, members of the Santa Clarita Valley Water Purveyors signed a Drought Emergency Water Sharing Agreement, agreeing to share water from all sources, and to facilitate beneficial water transfers, exchanges and wheeling arrangements. The purveyors also worked with the City of Santa Clarita and the County of Los Angeles to implement water use ordinances for Santa Clarita Valley residences, review water consumption and supply data and recommend measures to encourage conservation.

Since the 1990-1991 drought, CLWA and the other retail water purveyors have continued to work cooperatively to ensure customer demands are met under varying hydrologic conditions and with overall increasing demands from planned growth. These efforts have included water resource planning activities, acquisition of new water supplies and construction of transmission and treatment facilities. These efforts include the decision by most of the Santa Clarita Valley's water agencies to jointly prepare the Urban Water Management Plan (UWMP). The UWMP describes current and future implementation of water conservation measures (called "Water Demand Management Measures") within the CLWA service area. The UWMP also includes an update to the Santa Clarita Valley's Critical Water Shortage Contingency Plan. The updated plan is based on the water agencies' actual experience in addressing water shortages in the Santa Clarita Valley in 1991 (due to the continuation of the 1990-1991 Statewide drought) and in 1994 (due to the 1994 Northridge earthquake).

Water Use and Planning

Water Purveyors

Castaic Lake Water Agency

The Castaic Lake Water Agency (CLWA) was formed in 1962 as a wholesale water agency whose purpose it was to contract with the California Department of Water Resources (DWR) to provide supplemental water supply from the State Water Project (SWP) to retail water purveyors in the Santa Clarita Valley. CLWA obtains SWP water from the upper reservoir in Castaic Lake. CLWA serves the City of Santa Clarita, the unincorporated Santa Clarita Valley in Los Angeles County, and portions of unincorporated Ventura County. The CLWA service area encompasses approximately 195 square miles.

Retail Purveyors

The CLWA and the following four retail water purveyors provide water to most residents in the Santa Clarita Valley.

- **Los Angeles County Waterworks District 36.** The Los Angeles County Waterworks District 36 (the "District") service area encompasses approximately 7,635 acres in the Hasley Canyon area and the unincorporated community of Val Verde. The District obtains all of its water supply from the CLWA, and does not have any currently operating groundwater extraction facilities.

- **Newhall County Water District.** The Newhall County Water District (NCWD) service area includes Newhall, Pinetree, Tesoro Del Valle, and Castaic. The NCWD has service connections that extend over a 35-square-mile area. The NCWD obtains all of its water supply from groundwater wells and SWP water from the CLWA.

- **Santa Clarita Water Division.** The CLWA's Santa Clarita Water Division (SCWD) service area includes portions of the City of Santa Clarita and portions of the unincorporated communities of Saugus, Canyon Country, and Newhall. The SCWD obtains all of its water supply from the CLWA. The SCWD would be the water purveyor for the Proposed Project.

- **Valencia Water Company.** The Valencia Water Company (VWC) service area encompasses approximately 25 square miles and includes a portion of the City of Santa Clarita and portions of the unincorporated communities of Castaic, Stevenson Ranch, and Valencia. The VWC obtains all of its water supply from groundwater wells and SWP water from the CLWA.

The CLWA and the retail water purveyors' service areas are illustrated in Figure V.N.1-2.

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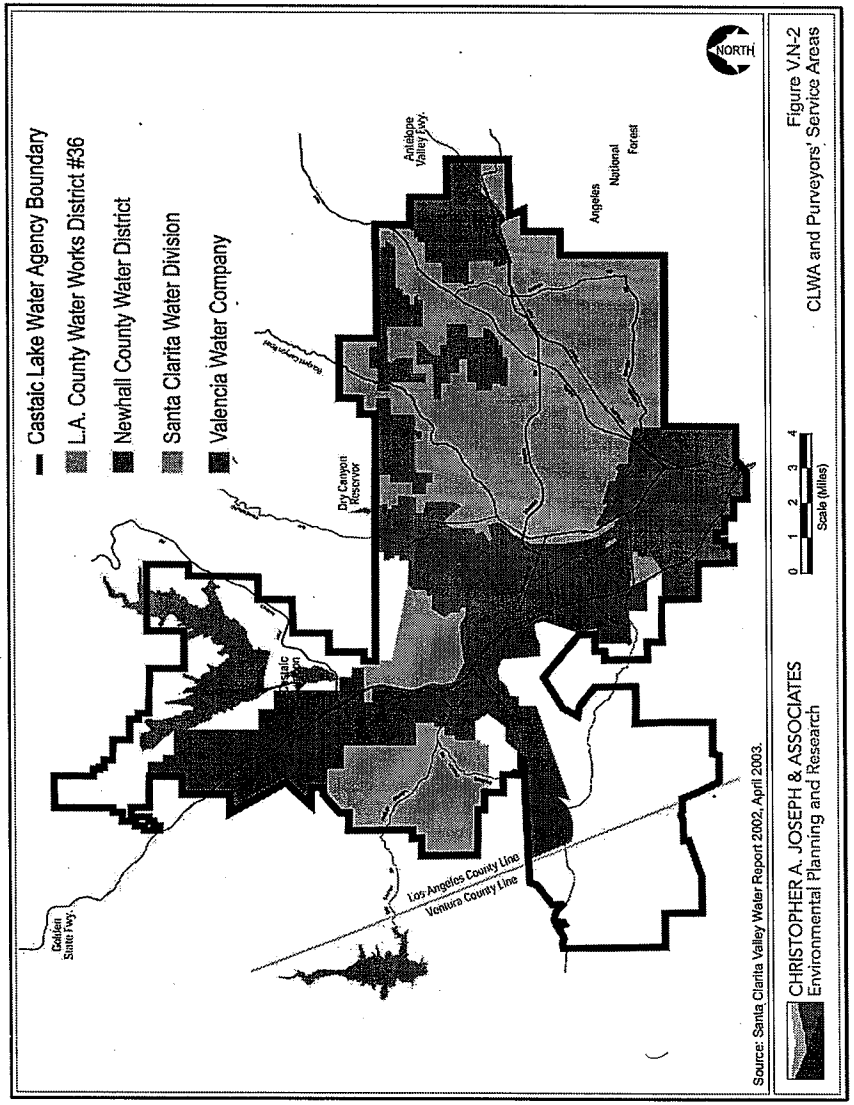

Water Supply Facilities and Water Treatment Facilities

CLWA's water treatment facilities include the Earl Schmidt Filtration Plant and the Rio Vista Water Treatment Plant. The Earl Schmidt Filtration Plant has a capacity of 33 million gallons per day (gpd) of water, and the Rio Vista Water Treatment Plant has a capacity of 30 million gpd of water. The Earl Schmidt Filtration Plant is currently being expanded to a capacity of approximately 56 million gpd by Spring-2005.[8]

From CLWA's two water treatment facilities, water is distributed by gravity to the retail water purveyors through a network of pipelines and turnouts. Local water retailers combine this water with groundwater from municipal supply wells in the Alluvial Aquifer and the Saugus Formation.

With respect to water supply facilities, the four retail water purveyors service nearly 62,000 connections in the Santa Clarita Valley in 2003. Table V.N.1-1 lists the connections by water purveyor.

Table V.N.1-1
Santa Clarita Valley Water Connections

Retail Water Purveyor	Connections
Santa Clarita Water Division of CLWA	25,175
Los Angeles County Waterworks District 36	1,280
Newhall County Water District	8,650
Valencia Water Company	26,810
Total	***61,915***

Source: Castaic Lake Water Agency, Groundwater Perchlorate Contamination Amendment and Other Amendments 2000 Urban Water Management Plan, January 2005.

Existing Water Supplies and Demand

CLWA is currently allocated 95,200 acre-feet (i.e., approximately 31,021 million gallons[9]) of water per year. In addition, the CLWA annually receives approximately 30,000 to 40,000 acre-feet of water from the Alluvial Aquifer and approximately 4,000 to 5,000 acre-feet of water from the Saugus Formation.[10] Although historical pumping from the Saugus Formation has ranged as high as 15,000

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[8] *Castaic Lake Water Agency, Castaic Lake Water Agency FY 2004/05 Budget, July 1, 2004, page 5.*

[9] *One acre-foot is 325,851 gallons.*

[10] *Castaic Lake Water Agency, Groundwater Perchlorate Contamination Amendment and Other Amendments, 2000 Urban Water Management Plan, January 2005, page 1-4.*

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acre-feet per year, the combination of recent perchlorate contamination (see Water Quality discussion below regarding perchlorate contamination) and planned use of this aquifer primarily for dry-year water supply has resulted in less pumping.

CLWA's allocation to the retail water purveyors is based on a "first come, first served" method. The CLWA distributes imported water supplies to the water service areas in a way that allows imported water to be delivered to the areas where it is needed. Developer impact fees and other types of contributions that fund CLWA's Capital Program are collected within each water service area and paid to the CLWA. However, historically, the CLWA has not been required to allocate water to the retail purveyors using this method because the available water supply has been more than sufficient to meet the purveyors' requests.

Water Quality

Although the overall quality of groundwater in the Santa Clarita Valley is considered to be good, ammonium perchlorate ("perchlorate") was discovered in 1997 in four groundwater wells in the Saugus Formation at a site formerly occupied by a local industry (i.e., the Whittaker-Bermite site). These four wells were immediately shut down. These four wells have a combined capacity of 9,000 gallons per minute, which represents approximately 14,500 acre-feet per year.[11] Subsequently, in November 2002, perchlorate was detected in a single Alluvial Aquifer well adjacent to the Whittaker-Bermite site (near the Saugus Speedway), which was immediately closed. In March 2005, perchlorate was detected in another Alluvial Aquifer well (known as "Q2") located immediately northwest of the confluence of Bouquet Creek and the Santa Clara River, which was immediately closed.[12]

Perchlorate is an inorganic chemical that is used in solid rocket propellants, fireworks, and explosives. Perchlorate can interfere with the ability of the thyroid gland to utilize iodine which produces thyroid hormones. Thyroid hormones are needed for normal prenatal and postnatal growth and development in children, and for normal metabolic function in adults.[13]

In the case of the Whittaker Bermite site, this 988.6-acre industrial site was used for approximately 80 years as a military flare and munitions manufacturing facility. As a result, the site was contaminated with various chemical compounds, including perchlorate which traveled downward into the

[11] *Ibid.*

[12] *Valencia Water Company, Impact and Response to Perchlorate Contamination Valencia Water Company Well Q2, prepared by Ludhorff & Scalmanini Consulting Engineers, April 2005.*

[13] *Castaic Lake Water Agency, Perchlorate Information, website: http://www.clwa.org/perchlorate_information.htm, December 21, 2004.*

groundwater and, thus, into the local drinking water supply.[14]

As perchlorate dissolves easily in water, it presents health concerns and the California Office of Environmental Health Hazard Assessment (OEHHA) has proposed a Public Health Goal for the amount of perchlorate in drinking water. OEHHA's suggests a range of two to six micrograms per liter. In addition, the California Department of Health Services (DHS) was required to adopt a Maximum Contaminant Level (MCL) for perchlorate by January 1, 2004. However, this date has been extended into 2005, and there is presently no drinking water standard, or MCL, for perchlorate. The current perchlorate advisory action level is six micrograms per liter, which is not an enforceable standard.[15]

In November 2002, the State Department of Toxic Substances Control (DTSC) issued an Order that required Whittaker to complete all site investigations and feasibility studies for all contaminants of concern expeditiously. In response to DTSC's Order, a substantial amount of cleanup work has occurred since December 2002. In summary, recent activities included:

- Additional remedial investigations, including soil samples, borings, exploratory trenching and groundwater monitoring wells;
- Feasibility reports, treatability studies and pilot tests; and
- Remedial action plans.

In addition, in September 2004, a State appellate court invalidated the Santa Clarita Valley UWMP because the plan did not "assess the reliability of the water supply obtained from two layers of an aquifer contaminated with perchlorate."[16] The court concluded that the UWMP's description of the contaminated groundwater was inadequate because it did not (1) address the time needed to treat the contaminated groundwater and (2) describe the reliability of the groundwater supply during the cleanup process. As a result, the CLWA prepared an amendment to their 2000 UWMP ("2000 UWMP Amendment") to address the concerns raised by the court.[17] However, the 2000 UWMP Amendment

[14] *City of Santa Clarita, Whittaker-Bermite Property Clean-Up Information Page, website: http://www.santa-clarita.com/cityhall/ped/planning/bermite.asp, December 28, 2004.*

[15] *Castaic Lake Water Agency, Groundwater Perchlorate Contamination Amendment and Other Amendments, 2000 Urban Water Management Plan, January 2005, page 2-24.*

[16] *Friends of the Santa Clara River et al. v. Castaic Lake Water Agency, filed September 22, 2004.*

[17] *Castaic Lake Water Agency, Groundwater Perchlorate Contamination Amendment and Other Amendments, 2000 Urban Water Management Plan, January 2005.*

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was prepared prior to the detention of perchlorate in Well Q2, as discussed above. To address the contamination of Well Q2, the VWC prepared "Impact and Response to Perchlorate Contamination Valencia Water Company Well Q2."[18] Furthermore, a 2005 UWMP is currently being prepared and is expected to be completed in mid-2005, which will update both the 2000 UWMP and the 2000 UWMP Amendment.

Re-estimated Water Supplies and Demand

2000 UWMP Amendment

The 2000 UWMP Amendment addresses the amount of water supply available while planning, design, and construction of treatment and other restoration activities are being implemented, as well as long-term water supply. As such, the 2000 UWMP Amendment presents the following two sets of operational scenarios: (1) near-term conditions (2005-2007) to include the transition of local groundwater supplies from impacted to restored and (2) long-term conditions (through 2020) through the end of the planning horizon. The estimated water supply and demand for the near-term and long-term operational scenarios during an average/normal water year is presented in Table V.N.1-2 and Table V.N.1-3, respectively, below. As shown in both tables, the combination of existing and planned water supplies will be able to meet projected water demand in an average/normal water year.

Table V.N.1-2
Water Supply and Demand -Near-Term Operational Scenario
Average/Normal Water Year (acre-feet)

Existing Water Supply	2005	2006	2007
Local Supplies			
Alluvial Aquifer	35,000	35,000	35,000
Saugus Formation	5,000	5,000	9,000
Recycled Water	700	1,000	1,300
Imported Supplies			
SWP Table A Amount	41,000	42,380	39,760
Draw From Short-Term Semitropic Bank Account	0	0	0
Draw From Flexible Storage Account	0	0	0
Total Existing Supply	***81,700***	***83,380***	***85,060***
Estimated Demand (without conservation)	***81,700***	***83,380***	***85,060***
Source: Castaic Lake Water Agency, 2000 Urban Water Management Plan, January 2005, Table 4-1.			

[18] *Valencia Water Company, Impact and Response to Perchlorate Contamination Valencia Water Company Well Q2, prepared by Ludhorff & Scalmanini Consulting Engineers, April 2005.*

Table V.N.1-3
Water Supply and Demand - Long-Term Operational Scenario
Average/Normal Water Year (acre-feet)

Existing Water Supply	2005	2010	2015	2020
Local Supplies				
Alluvial Aquifer	35,000	35,000	35,000	35,000
Saugus Formation	5,000	11,000	11,000	11,000
Recycled Water	700	1,700	1,700	1,700
Imported Supplies				
SWP Table A Amount	41,000	56,800	56,800	56,800
Draw From Short-Term Semitropic Bank Account	0	0	0	0
Draw From Flexible Storage Account	0	0	0	0
Total Existing Supply	***81,700***	***104,500***	***104,500***	***104,500***
Planned Water Supply	**2005**	**2010**	**2015**	**2020**
Local Supplies				
Recycled Water	0	7300	12,300	15,300
Imported Supplies				
Draw From Long-Term Water Banking Programs	0	0	0	0
Total Planned Supply	***0***	***7,300***	***12,300***	***15,300***
Total Supply (Existing plus Planned)	**81,700**	**111,800**	**116,800**	**119,800**
Estimated Demand (Without Conservation)	**81,700**	**90,100**	**100,700**	**113,100**
Source: Castaic Lake Water Agency, 2000 Urban Water Management Plan, January 2005, Table 4-3.				

With respect to a dry year and multiple-dry year, as shown in Table V.N.1-4 and Table V.N.1-5, the existing and planned supplies would meet projected demands in both near-term and long-term conditions. As shown in both tables, the combination of existing and planned water supplies will be able to meet projected water demand in a single-dry year and multiple-dry water years.

Table V.N.1-4
Water Supply and Demand - Near-Term Operational Scenario
Single Dry Year and Multiple-Dry Year (acre-feet)

	Single Dry Year	Multiple Dry Years		
Existing Water Supply	2005	2005	2006	2007
Local Supplies				
Alluvial Aquifer	32,500	32,500	32,500	32,500
Saugus Formation	5,000	5,000	5,000	11,000
Recycled Water	700	700	1,000	1,300
Imported Supplies				
SWP Table A Amount	37,940	37,900	37,900	37,900
Draw From Short-Term Semitropic Bank Account	916	4,039	5,419	2,360

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Table V.N.1-4
Water Supply and Demand - Near-Term Operational Scenario
Single Dry Year and Multiple-Dry Year (acre-feet)

Existing Water Supply	Single Dry Year	Multiple Dry Years		
	2005	2005	2006	2007
Draw From Flexible Storage Account	4,684	1,561	1,561	0
Total Existing Supply	***81,700***	***81,700***	***83,380***	***85,060***
Estimated Demand (without conservation)	***81,700***	***81,700***	***83,380***	***85,060***

Source: Castaic Lake Water Agency, 2000 Urban Water Management Plan, January 2005, Table 4-2.

Table V.N.1-5
Water Supply and Demand - Long-Term Operational Scenario
Single Dry Year and Multiple-Dry Year (acre-feet)

Existing Water Supply	Single Dry Year	Multiple Dry Years		
	2010	2018	2019	2020
Local Supplies				
Alluvial Aquifer	32,500	32,500	32,500	32,500
Saugus Formation	15,000	15,000	15,000	15,000
Recycled Water	1,700	1,700	1,700	1,700
Imported Supplies				
SWP Table A Amount	37,900	37,900	37,900	37,900
Draw From Short-Term Semitropic Bank Account (through 2013)	17,500	0	0	0
Draw From Flexible Storage Account	4,684	1,561	1,561	1,561
Total Existing Supply	***109,284***	***88,661***	***88,661***	***88,661***
Local Supplies				
Restored Contaminated Wells	10,000	10,000	10,000	10,000
New Saugus Wells	0	0	0	10,000
Recycled Water	7,300	12,300	12,300	15,300
Imported Supplies				
Draw From Long-Term Water Banking Programs	20,000	13,000	13,000	13,000
Total Planned Supply	***37,300***	***35,300***	***35,300***	***48,300***
Total Supply (Existing plus Planned)	**146,584**	**123,961**	**123,961**	**136,961**
Estimated Demand (Without Conservation)	**90,100**	**108,140**	**110,620**	**113,100**

Source: Castaic Lake Water Agency, 2000 Urban Water Management Plan, January 2005, Table 4-4.

Effect of Perchlorate Contamination in Well Q2 on Water Supply

As discussed above, perchlorate was detected in Well Q2 in March 2005. As a result of the detection of perchlorate in Well Q2, the VWC has removed it from active service and is pursuing rapid permitting and installation of wellhead treatment in order to return the well to water supply service. It is anticipated that the permitting and installation of wellhead treatment can be accomplished by mid-summer 2005, in advance of the peak water demand season. Nonetheless, the VWC assessed the effect of the removal of this well on its overall water supply until the proposed treatment is in place and the well is returned to service.[19]

The temporary closure of Well Q2 represents a reduction of 1,200 gallons per minute (gpm) of source capacity. With that closure, VWC would still operate 19 wells, including four wells in the Alluvial Aquifer and five wells in the Saugus Formation. The combined pumping capacity of the 14 wells in the Alluvial Aquifer is slightly greater than 20,000 gpm, and the combined pumping capacity of the five wells in the Saugus Formation is slightly greater than 10,000 gpm. Therefore, the combined source capacity of VWC's active wells, after the temporary closure of Well Q2, and its CLWA turnouts is approximately 57,000 gpm.[20]

With a total source capacity of approximately 57,000 gpm, with the temporary closure of Well Q2, the VWC has sufficient source capacity to meet its maximum day demand of 32,500 gpm with allowance for potential outage at one or more individual wells or treated surface water connections. Furthermore, the VWC has sufficient surplus source capacity to meet future increases in maximum day demand with existing sources, to be increased by returning Well Q2 to service after installation of treatment.[21] Therefore, considering that Well Q2 would be returned to service prior to the implementation of the Proposed Project, the temporary closure of Well Q2 would not alter the assessment of overall water supply presented in the 2000 UWMP Amendment or in the Water Supply Assessment, as described below. Furthermore, as discussed above, it is anticipated that the SCWD would be the water purveyor for the Proposed Project, not the VWC.

Reclaimed Water Supplies and Demand

Water reclamation is the process of treatment and cleaning of wastewater so that it can be reused for non-potable purposes (e.g., landscaping, industrial processes, and groundwater replenishment). Under

[19] *Ibid.*

[20] *Ibid.*

[21] *Ibid.*

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certain conditions, the State requires the use of reclaimed water when it is available. Section 65602 of the California Government Codes states the following:

> *(a) The waters of the state are of limited supply and are subject to ever-increasing demands.*
>
> *(b) The continuation of California's economic prosperity is dependent on adequate supplies of water being available for future uses.*
>
> *(c) It is the policy of the state to promote the efficient use of water through the development of water recycling facilities.*
>
> *(d) Landscape design, installation, and maintenance can and should be water efficient.*
>
> *(e) The use of potable domestic water for landscaped areas is considered a waste or unreasonable use of water within the meaning of Section 2 of Article X of the California Constitution if recycled water is available that meets the conditions described in Section 13550 of the Water Code.*

The Sanitation Districts of Los Angeles County operate two water reclamation plants that treat wastewater in the Santa Clarita Valley, the Saugus Water Reclamation Plant (SWRP) and the Valencia Water Reclamation Plant (VWRP). The SWRP provides primary, secondary, and tertiary treatment for seven million gallons of wastewater per day[22] (2,555 million gallons per year). In Fiscal Year 2001-02 (the most recent data available), the SWRP reclaimed approximately 6,162 acre-feet of water[23] (2,008 million gallons). In addition, the VWRP provides primary, secondary, and tertiary treatment for 11 million gallons of wastewater per day[24] (4,015 million gallons per year). In Fiscal Year 2001-02, the VWRP reclaimed approximately 13,186 acre-feet of water[25] (4,297 million gallons). As of 2003, it was

[22] *Sanitation Districts of Los Angeles County, Saugus Water Reclamation Plant, website: http://www.lacsd.org/waswater/wrp/saugus.htm, December 23, 2004.*

[23] *Sanitation Districts of Los Angeles County, Water Reuse Summary for Fiscal Year 2001-2002, website: http://www.lacsd.org/waswater/webreuse/refy0002.htm, December 23, 2004.*

[24] *Sanitation Districts of Los Angeles County, Valencia Water Reclamation Plant. website: http://www.lacsd.org/waswater/wrp/valencia.htm, December 23, 2004.*

[25] *Sanitation Districts of Los Angeles County, Water Reuse Summary for Fiscal Year 2001-2002, website: http://www.lacsd.org/waswater/webreuse/refy0002.htm. December 23, 2004.*

anticipated that the CLWA will deliver approximately 1,700 acre-feet (554 million gallons) of reclaimed water annually.[26]

ENVIRONMENTAL IMPACTS

Thresholds of Significance

In accordance with Appendix G to the State CEQA Guidelines, a project would have a significant impact if it would:

> b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects;
>
> d) Have insufficient supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed;

Project Impacts

The Proposed Project includes the development of 979 residential units, comprised of 96 single-family residences, 216 apartments, and 667 condominiums. A junior high school, a YMCA recreational facility, trails, and open space (debris basins, graded lots, and natural open space lots) are also included with the Proposed Project. A 41-foot high entry monument with a 16-foot high water feature is proposed at the entrance to the project site. Section IV, Project Description, of this Draft EIR provides a detailed discussion of the characteristics of the Proposed Project.

Water Supply Assessment

In 2001, the California State Legislature approved Senate Bill 610, which amended Sections 10910-10915 of the State Water Code to require:

> *...a city or county that determines a project is subject to the California Environmental Quality Act to identify any public water system that may supply water for the project and to request those public water systems to prepare a specified water supply assessment, except as otherwise specified. The bill would require the assessment to include, among other information, an identification of existing water supply entitlements, water rights, or water service contracts relevant to the identified water*

[26] *Castaic Lake Water Agency, Los Angeles County Waterworks District # 36, Newhall County Water District, and Valencia Water Company, Santa Clarita Valley Water Report 2002, April 2003, page 28.*

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supply for the Proposed Project and water received in prior years pursuant to those entitlements, rights, and contracts. The bill would require the city or county, if it is not able to identify any public water system that may supply water for the project, to prepare the water supply assessment after a prescribed consultation. The bill would revise the definition of "project," for the purposes of these provisions, and make related changes.[27]

Section 10912(a) of the State Water Code defines a "project" for purposes of determining whether a Water Supply Assessment would be required as:

(1) A proposed residential development of more than 500 dwelling units.

(2) A proposed shopping center or business establishment employing more than 1,000 persons or having more than 500,000 square feet of floor space.

(3) A proposed commercial office building employing more than 1,000 persons or having more than 250,000 square feet of floor space.

(4) A proposed hotel or motel, or both, having more than 500 rooms.

(5) A proposed industrial, manufacturing, or processing plant, or industrial park planned to house more than 1,000 persons, occupying more than 40 acres of land, or having more than 650,000 square feet of floor area.

(6) A mixed-use project that includes one or more of the projects specified in this subdivision.

(7) A project that would demand an amount of water equivalent to, or greater than, the amount of water required by a 500 dwelling unit project.

As the Proposed Project includes the development of 979 residential units, a Water Supply Assessment was sought from the CLWA. The Water Supply Assessment for the Proposed Project is included as Appendix 10 to this Draft EIR. In its Water Supply Assessment, the CLWA concluded that the water demand generated by the Proposed Project falls within the available and projected water supplies for normal, single-dry, and multiple-dry years through 2020 (see Table V.N.1-6), and within the 20-year water demand growth projected in CLWA's 2000 UWMP , as amended. As a result, the CLWA found that it would be able to meet the water demand of the Proposed Project, in addition to existing and planned future demands of the water system.

[27] *Senate Bill 610, Legislative Counsel's Digest.*

Table V.N.1-6
Existing and Planned Water Supplies Through 2020
(acre-feet)

	Available During Average Year	Available During Wet Year	Available During Single Dry Year	Available During Each of Three Consecutive Dry Years
Existing Water Supplies (2004)				
Local Supplies				
Alluvial Aquifer	35,000	40,000	32,500	32,500
Saugus Formation	11,000	11,000	15,000	24,000
Recycled Water	1,700	1,700	1,700	1,700
Imported Supplies				
SWP Table A Amount[a]	56,800	95,200	37,900	37,900
Draw From Short-Term Semitropic Bank Account (through 2013)	0	0	50,870	16,950
Draw From Flexible Storage Account	0	0	4,684	1,561
Total Existing Supplies	**104,500**	**147,900**	**142,654**	**114,611**
Planned Water Supplies (through 2020)				
Local Supplies				
Restored Impacted Wells	--	--	10,000	10,000
New Saugus Wells	0	0	10,000	--
Recycled Water	15,300	15,300	15,300	15,300
Imported Supplies				
Draw From Long-Term Water Banking Programs	0	0	40,000	13,000
Total Planned Supplies	**15,300**	**15,300**	**75,300**	**38,300**
Total Existing and Planning Supplies Through 2020 (not including Short-Term Semitropic Bank After 2013)	**119,800**	**163,200**	**167,084**	**135,961**

[a] *Since the 2000 UWMP was adopted, DWR released its SWP Delivery Reliability Report (May 2003), which analyzes the reliability of SWP supplies. During infrequent dry periods, deliveries are projected to be less than 50 percent, and possibly as low as 19 percent during an unusual single dry year condition that occurs about once every 70 years. During very wet years, full deliveries can be expected. Thus, the amount of water available to CLWA in the worst-case single dry year would be 19 percent of 95,200 af, or 18,088 af. In a worst-case multiple dry-year period, the amount of water available to CLWA in each of those dry years would be 37 percent of 95,200 af, or 35,244 af. The May 2003 DWR report also assumes average year SWP deliveries of 76 percent. This would result in 72,352 af of CLWA's Table A entitlement. The 2005 UWMP will reflect this new information.*

For the 2000 UWMP, water supplies reflected in this table are based on SWP reliability as of 2000. Use of the 2003 SWP reliability figures would reduce the existing Single Dry Year and Consecutive Dry Year Table A amounts to 18,088 af and 35,244 af, respectively. The corresponding total existing supplies would be reduced to 122,842 af and 111,955 af, respectively. Total existing and planned supplies in Single Dry and Consecutive Dry Years would be reduced to 147,272 af and 133,305 af, respectively. Assuming 76 percent reliability in the average year, total existing supplies would be 120,052 af and total existing and planned supplies would be 135,352 af.

Source: Castaic Lake Water Agency, Santa Clarita Water Division, SB 610 Water Supply Assessment for The Keystone Project, March 2005.

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Proposed Project Water Demand

The Proposed Project's estimated potable water demand is based on water demand factors that have been provided by the CLWA in the Water Supply Assessment. Table V.N.1-7 summarizes the water demand that would be generated with the Proposed Project.

Table V.N.1-7
Proposed Project Water Demand

Land Use	Size	Annual Rate	Water Demand (af per year)
Single-Family Residences	96 units	0.80 af / unit	77
Condominiums	667 units	0.24 af / unit	160
Apartments	216 units	0.23 af / unit	50
School	21 acres	3 af / acre	63
YMCA Facility[a]	4 acres	3 af / acre	12
Manufactured Slopes	86 acres	3 af / acre	258
Water Feature[b]	16 feet high	N/A	N/A
Total	--	--	***620***

Note:
af = acre-feet

[a] *The proposed YMCA Facility is categorized as "Parks" in Table 1 of the Water Supply Assessment.*

[b] *The water feature would be supplied with 2,500 gallons of water when it is first constructed. Then, the water would be re-circulated through a looped water system.*

Source: Castaic Lake Water Agency Santa Clarita Water Division, SB 610 Water Supply Assessment for The Keystone Project, March 2005, page 5; and Christopher A. Joseph & Associates, 2005.

As shown in Table V.N.1-7, the Proposed Project would generate a demand for approximately 620 acre-feet of water per year. This water would be delivered to the Proposed Project by a system of water lines that would be installed within the proposed roadways.

Existing Conditions Plus Project Water Demand

As shown in Tables V.N.1-2, V.N.1-3, and V.N.1-4, the existing water demand in the Santa Clarita Valley is approximately 81,700 acre-feet per year. When combined with the Proposed Project's demand of 620 acre-feet per year, the total water demand in the Santa Clarita Valley would be approximately 82,320 acre-feet per year.

According to the Water Supply Assessment for the Proposed Project, the project's estimated water demand (as indicated in Table V.N.1-7) was accounted for in the 2000 UWMP, as amended. The Water Supply Assessment states the following:[28]

> *The timing of the project places it within the timeframe for calculating 'planned future uses' within the 2020 water supply projection included in the 2000 UWMP.... The 2000 UWMP assumes an average growth rate of 2,240 connections per year based on the average growth rate that occurred during the 1990s. The Keystone project would add approximately 331 residential connections, which is less than the annual average anticipated by the 2000 UWMP and is, therefore, considered to be accounted for in this plan.*

The Water Supply Assessment for the Proposed Project concluded that "there will be sufficient water supply available when The Keystone project is ready for occupancy, in addition to existing and other planned future uses."[29] Therefore, it is anticipated that the future water supplies will meet the demand of the Proposed Project in addition to the existing demand and the associated impact would be less than significant. Nonetheless, mitigation measures are recommended below to further reduce the Proposed Project's less-than-significant impact on water supplies and to support the water conservation efforts of the CLWA.

Fire Flow

With respect to fire flow requirements, the County of Los Angeles Fire Department has indicated that the Proposed Project would require the following:[30]

- High Density Residential – up to 5,000 gallons per minute at 20 pounds per square inch residual pressure for up to five hours duration;
- Single-Family Detached Residential – 1,250 gallons per minute at 20 pounds per square inch residual pressure for a two-hour duration;

[28] *Castaic Lake Water Agency, Santa Clarita Water Division, SB 610 Water Supply Assessment for The Keystone Project, March 2005, page 3.*

[29] *Ibid., page 4.*

[30] *Written correspondence from David R. Leininger, Chief, Forestry Division Prevention Bureau, County of Los Angeles Fire Department, October 7, 2004 and December 17, 2004.*

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- Two-family dwelling units (duplexes) – 1,500 gallons per minute at 20 pounds per square inch residual pressure for a two-hour duration;
- Five or more units with a single driveway access – 1,500 gallons per minute at 20 pounds per square inch residual pressure for a two-hour duration; and
- Institutional – 8,000 gallons per minute at 20 pounds per square inch residual pressure for up to four hours duration.

The actual fire flow requirements would be confirmed for each proposed land use by the County of Los Angeles Fire Department prior to Final Tract Map approval. As further discussed in Section V.M.2, Fire Protection, the final fire flow requirements for the Proposed Project would be based on the size of the buildings, their relationship to other structures, property lines, and types of building materials used. The associated water infrastructure would also be required to meet commercial and residential fire flow requirements as determined by the SCWD and the County of Los Angeles Fire Department. Therefore, the impact of the Proposed Project on fire flows would be less than significant (see also Section V.M.2, Fire Protection).

Water Facilities

The Proposed Project would be connected to existing water lines in Ermine Street (12-inch line) to the east, Golden Valley Road (16-inch line) to the north (under construction), and Newhall Ranch Road to the south. As indicated by the SCWD, no major increases in existing water distribution infrastructure or capacity enhancing alterations would be required in the general vicinity of the Proposed Project.[31]

Furthermore, as discussed above, the number of water connections that would be added to the existing water supply system in the Santa Clarita Valley is within the growth projections in the 2000 UWMP, as amended. As discussed in the Water Supply Assessment for the Proposed Project, the 2000 UWMP assumed an average growth rate of 2,240 connections per year based on the average growth rate that occurred during the 1990s. The Proposed Project would add approximately 331 residential connections, which is less than the annual average anticipated by the 2000 UWMP and is, therefore, considered to be accounted for in the 2000 UWMP, as amended.

With respect to onsite water facilities and infrastructure, the Proposed Project would likely include an approximately 14-inch water main that would loop throughout the project site and connect to smaller water lines that range in size from approximately eight to 10 inches. These proposed onsite water lines are illustrated in Figure V.N.1-3.

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[31] *Written correspondence W.J. Manetta, Jr., Retail Manager, Santa Clarita Water District, November 2, 2004.*

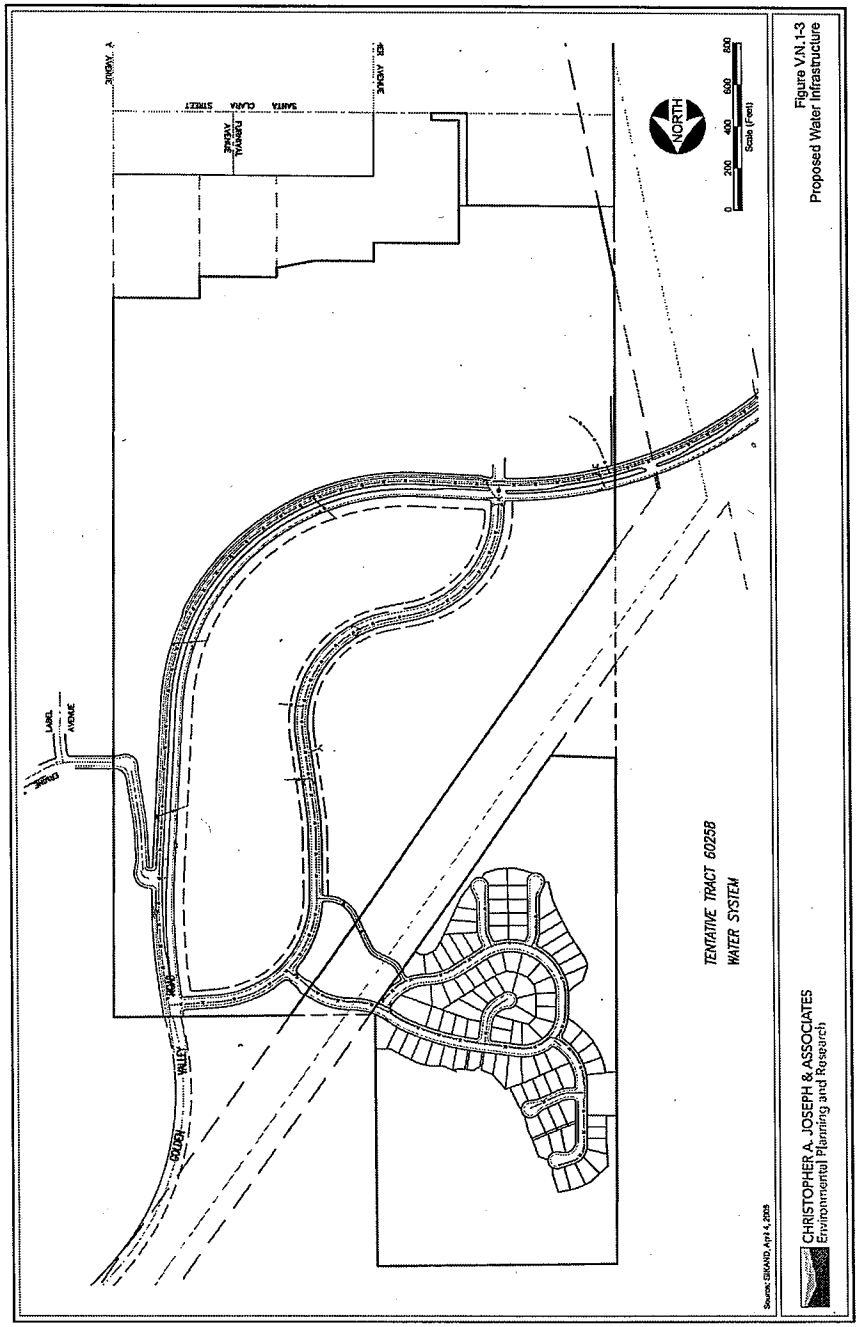

Figure V.N.1-3
Proposed Water Infrastructure

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With respect to water treatment facilities, it is anticipated that the expanded Earl Schmidt Filtration Plant, which will be completed prior to the development of the Proposed Project, and the Rio Vista Filtration Plant will be able to accommodate the water treatment demand of the Proposed Project. As discussed above and in the Water Supply Assessment for the Proposed Project, the water demand associated with the Proposed Project was anticipated in the 2000 UWMP, as amended. As such, the CLWA's water treatment requirements associated with the water supply projections in the 2000 UWMP, as amended, can be accommodated by the Earl Schmidt Filtration Plant and the Rio Vista Filtration Plant.

Overall, the impacts of the Proposed Project on water facilities and water treatment facilities are anticipated to be less than significant.

CUMULATIVE IMPACTS

To analyze cumulative impacts, a list of related projects was compiled by the City of Santa Clarita (Traffic and Engineering Department and Planning and Economic Development Department) consisting of all approved, proposed or potential projects located within the City of Santa Clarita within an approximate two-mile radius of the project site. A two-mile radius is used as a standard for areas that are urbanizing in which projects are located within a relevant geographical area in proximity to the Proposed Project site using similar infrastructure (e.g., roadways, utilities) and public services. The following list was presented in Section III. Environmental Setting of this Draft EIR and is provided here for reference:

List of Related Projects

Map No.	Project Name	Project Location	Description
1	HH Seco II LLC Master Case 01-317	Southwest corner of Seco Cyn Rd and Copper Hill Dr	Development for a new 40,000 square foot commercial shopping center
2	Rice Development Master Case 02-231	Southwest corner of Seco Cyn Rd and Copper Hill Dr	Development for an 84,000 square foot self-storage facility
3	TT 062322	North of Soledad Cyn Rd, south of Santa Clara River, approx. 1 mi. east of Bouquet Cyn Rd	420 townhomes
4	Riverpark	East of Bouquet Cyn Rd, north of Santa Clara River	432 single-family DU, 657 multi-family DU, 16,000 square feet commercial
5	Aspen Investment Company Master Case 02-273	North corner of Soledad Cyn Rd and Valley Center Dr	Development for 8 new industrial buildings totaling 109,000 square feet
6	Soledad Circle Estates	Soledad and Penlon Road	150 residential units on 19.5 acres
7	TT 46018 (S&S)	East and west of Plum Cyn Rd, north of Whites Cyn Rd	1,298 single-family DU, 1,202 condominium units, 150,000 square

List of Related Projects

Map No.	Project Name	Project Location	Description
			feet commercial
8	TR 52763 (S&S)	West of Plum Cyn Rd, north of Whites Cyn Rd	11 single-family DU
9	Plum Canyon TR 31803	North and south of Golden Valley Rd, west of Plum Cyn Rd	498 single-family DU
10	Rodgers Development Master Case 02-232	Northeast corner of Bouquet Cyn Rd and Plum Cyn Rd	Development for a new 34,000 square foot commercial shopping center
11	TT 98046	North of Copper Hill Dr at terminus of Benz Rd	91 single-family DU
12	TT 47760	Copper Hill Dr at Haskell Cyn Rd	480 single-family DU

The Water Supply Assessment for the Proposed Project included an analysis of the water demand of all planned future uses in combination with the Proposed Project. The conclusions of the Water Supply Assessment with respect to planned future uses are discussed below in addition to the list of 12 related projects (see Related Projects list above).

Water Supplies

Implementation of the Proposed Project in combination with the 12 related projects would generate a demand for approximately 2,307 af per year of water, further increasing the demand for water in the Santa Clarita Valley (see Table V.N.1-8). However, the CLWA anticipates that its projected water supplies available during normal, single-dry, and multiple-dry water years, as included in its 2000 UWMP, as amended, would meet the projected water demand associated with the Proposed Project, in addition to the existing and other planned future uses in the CLWA's system.

Furthermore, as discussed above, a Water Supply Assessment was prepared by the CLWA for the Proposed Project (see Appendix 10 to this Draft EIR). Pursuant to Section 10910(c)(4) of the State Water Code, the Water Supply Assessment included a discussion of whether the water supply projections can meet the water demand associated with the Proposed Project, in addition to existing and planned future uses, including agricultural and manufacturing uses. As discussed above, the Water Supply Assessment for the Proposed Project included the Proposed Project and "planned future uses", which includes probable future projects.[32] The Water Supply Assessment clarifies "planned future

[32] *Castaic Lake Water Agency, Santa Clarita Water Division, SB 610 Water Supply Assessment for The Keystone Project, March 2005.*

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uses" as within the projections included in the 2000 UWMP, as amended.[33] Therefore, the Proposed Project and related projects would not be cumulatively considerable, and impacts on water supplies would be less than significant.

Table V.N.1-8
Projected Water Consumption for Proposed and Related Projects

No.	Land Use	Size	Daily Consumption Rate[a] (gpd)	Daily Water Consumption (gpd)	Annual Water Consumption (af)
1	HH Seco II - Commercial Retail	40,000 sq.ft.	180 gpd/1,000 sq.ft.	7,200	8
2	Rice Dev – Self Storage	84, 000 sq.ft.	30 gpd/1,000 sq.ft.	2,520	3
3	TT 062322 -Townhomes	420 du	234 gpd/du	98,280	110
4	Riverpark – Single-Family	432 du	312 gpd/du	134,784	151
	Multi Family	657 du	234 gpd/du	153,738	172
	Commercial Retail	16,000 sq.ft.	180 gpd/1,000 sq.ft.	2,880	3
5	Aspen Investment - Industrial	109, 000 sq.ft.	30 gpd/1,000 sq.ft.	3,270	4
6	Soledad Circle – Single-Family	150 du	312 gpd/du	46,800	52
7	TT 46018 – Single-Family	1,298 du	312 gpd/du	404,976	454
	Multi Family	1,202 du	312 gpd/du	281,268	315
	Commercial Retail	150,000 sq.ft.	180 gpd/1,000 sq.ft.	27,000	30
8	TR 52763 – Single-Family	11 du	312 gpd/du	3,432	4
9	Plum Canyon – Single-Family	498 du	312 gpd/du	155,376	174
10	Rodgers Dev - Commercial Retail	34,000 sq.ft.	180 gpd/1,000 sq.ft.	6,120	7
11	TT 98046 – Single-Family	91 du	312 gpd/du	28,392	32
12	TT 47760 – Single-Family	480 du	312 gpd/du	149,760	168
			Related Projects Total		***1,687***
			Proposed Project Total		***620***
			Cumulative Total		***2,307***

[33] *Castaic Lake Water Agency, Groundwater Perchlorate Contamination Amendment and Other Amendments, 2000 Urban Water Management Plan, January 2005.*

Table V.N.1-8
Projected Water Consumption for Proposed and Related Projects

No.	Land Use	Size	Daily Consumption Rate[a] (gpd)	Daily Water Consumption (gpd)	Annual Water Consumption (af)

Notes: af = acre-feet; sq.ft. = square feet; gpd – gallons per day

[a] *Water Consumption rates are 120 percent of wastewater generation rates.*

Water Facilities

As discussed in the Water Supply Assessment for the Proposed Project, the 2000 UWMP assumed an average growth rate of 2,240 water connections per year based on the average growth rate that occurred during the 1990s. The Proposed Project would add approximately 331 residential connections, which is less than the annual average anticipated by the 2000 UWMP. Therefore, the effect of the additional water connections due to the Proposed Project would not incrementally contribute a considerable amount to the cumulative total number of connections. As such, the associated cumulative impact would not be cumulatively considerable and impacts would be less than significant.

With respect to water treatment facilities, it is anticipated that the expanded Earl Schmidt Filtration Plant and the Rio Vista Filtration Plant will be able to accommodate the water treatment demand of the Proposed Project and the related projects.

In addition, the potential need for the related projects to upgrade water lines to accommodate their water needs is site-specific and there is little, if any, cumulative relationship between the development of the Proposed Project and the related projects. Therefore, no cumulative water infrastructure impact or water treatment facilities impact are anticipated from the development of the Proposed Project and the related projects. Thus, the Proposed Project's incremental increase is not considerable and the impacts would be less than significant.

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MITIGATION MEASURES

Project Mitigation Measures

Although the Proposed Project would not have a significant impact on water supply the following mitigation measures are recommended to reduce further the Proposed Project's impacts associated with water supplies:

N.1-1 The project developer shall ensure that the landscape irrigation system be designed, installed and tested to provide uniform irrigation coverage. Sprinkler head patterns shall be adjusted to minimize over spray onto walkways and streets.

N.1-2 The project developer shall install either a "smart sprinkler" system to provide irrigation for the landscaped areas or, at a minimum, set automatic irrigation timers to water landscaping during early morning or late evening hours to reduce water losses from evaporation. Irrigation run times for all zones shall be adjusted seasonally, reducing water times and frequency in the cooler months (fall, winter, spring). Sprinkler timer run times shall be adjusted to avoid water runoff, especially when irrigating sloped property.

N.1-3 The project developer shall select and use drought-tolerant, low-water consuming plant varieties to reduce irrigation water consumption.

N.1-4 The project developer shall install ultra-low flush water toilets and water-saving showerheads in new construction. Low-flow faucet aerators should be installed on all sink faucets.

Cumulative Mitigation Measures

No cumulative mitigation measures are required.

LEVEL OF SIGNIFICANCE AFTER MITIGATION

Project

The Proposed Project's impacts on water supply would be less than significant without mitigation. However, the implementation of the recommended mitigation measures N.1-1 through N.1-4 provide measures to reduce wasteful consumption of water resources and, thus, would further reduce the Proposed Project's impacts.

Cumulative

The Water Supply Assessment for the Proposed Project included the Proposed Project and "planned future uses", which includes probable future projects. The Assessment clarified "planned future uses" as within the projections included in the 2000 UWMP. Therefore, no cumulative impacts to water supply is expected and impacts would be less than significant. No cumulative water infrastructure impact or water treatment facilities impact are anticipated from the development of the Proposed Project and the related projects and thus no mitigation is required and cumulative impacts would be less than significant.

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Pages omitted.

Visit http://www.santa-clarita.com/cityhall/cd/planning/eir/completed.asp for complete document.

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Attachment 23-F

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DRAFT

Environmental Impact Report

California State Clearinghouse No. 1998041127

Castaic Lake Water Agency

Supplemental Water Project Transfer of 41,000 Acre-Feet of State Water Project Table A Amount

CASTAIC LAKE WATER AGENCY

June 2004

Pages omitted.

PREFACE

This Environmental Impact Report (EIR) evaluates the potential environmental impacts of the transfer of an existing 41,000 acre-feet (AF) of State Water Project (SWP) Table A Amount[1] from a SWP contractor (the Kern County Water Agency [KCWA]) and its member unit in Kern County (the Wheeler Ridge-Maricopa Water Storage District [WRMWSD]), to the Castaic Lake Water Agency (CLWA), another SWP contractor located in Los Angeles and Ventura counties. This EIR also evaluates the use of SWP facilities from northern California to Los Angeles County for the delivery of SWP water to the CLWA service area, and use of this water within the CLWA service area. These actions are referred to as "the Project" in subsequent sections of this EIR.

The Project is intended to meet water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area. CLWA is not a land use agency and has no control over where and when growth will occur within its service area. To the extent that land use decision-makers utilize or rely on this EIR to predict future CLWA water supplies, they are cautioned that although CLWA will implement all feasible measures to firm up its water supplies (and CLWA's retail purveyors may implement conjunctive use programs using SWP and groundwater supplies to increase the reliability of deliveries to their customers), past water deliveries are not a guarantee of future delivery rates. Rather than repeat this advice to decision-makers in each section of the EIR, the reader is requested to keep this advice in mind when reading the information about the availability and reliability of water supplies wherever such information appears. Information regarding water supplies is presented throughout this document as it relates to the CLWA service area (section 1.3.1), the Project description (section 2.3), the environmental setting (section 3.0), and growth-inducing effects and growth-related impacts (Chapter 4). To facilitate your reading of this EIR, it is suggested that the reader refer to section 10.0, "List of Acronyms and Glossary of Terms." The acronyms used in this EIR are defined the first time they are used in the text.

The transfer of SWP Table A Amount that is the subject of the present EIR was contractually completed in 1999, and imported water supply associated with the transfer became available for use by CLWA starting in January 2000 (refer to the discussion under Related Environmental Documentation for additional detail).

CLWA is the lead agency for preparation of the EIR and thus will evaluate, and if appropriate, certify this EIR, make CEQA findings, and approve the Project. CLWA has the principal responsibility for carrying out and implementing the Project because 1) a substantial portion of

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1 "Table A" is a term used in SWP Water Supply Contracts. The "Table A Amount" is the annual maximum amount of water to which an SWP Contractor has a contract right to request delivery, and is specified in Table A of each Contractor's Water Supply Contract. (Prior to the Settlement Agreement arising out of a legal challenge to the Monterey Amendment to the State Water Project contracts, the Table A Amount was referred to as "entitlement.") The amount of water actually available for delivery in any year may be an amount less than the Contractor's Table A Amount due to a number of factors, including hydrologic conditions. The parallel term used in the member unit contract between KCWA and WRMWSD is "Contract Entitlement" (sometimes referred to as "Table 1 Entitlement"). For the sake of brevity, in this EIR the term "Table A Amount" refers to the Table A Amount in the SWP Water Supply Contracts, or "Annual Entitlement" prior to the Monterey Amendment; where the term is used in connection with WRMWSD, it refers to the Table 1 Entitlement under its member unit contract with KCWA.

the Project occurs within CLWA's jurisdiction and substantially affects CLWA; 2) CLWA has been the lead proponent of the Project and has assumed the primary task of effectuating the SWP water supply contract amendment; 3) CLWA has the expertise to implement the Project; and 4) the Project, although requiring the use of SWP facilities, would involve transfers only between three agencies (CLWA, KCWA, and WRMWSD) within a limited geographic area and does not implicate the entire statewide water rights or supply framework.

The California Department of Water Resources (DWR), KCWA, and WRMWSD are considered to be responsible agencies. Responsible agencies are public agencies other than the lead agency that have responsibility for carrying out or approving a project (CEQA Guidelines section 15381).

EXECUTIVE SUMMARY

PROJECT DESCRIPTION

Project Location

The Project would use existing SWP facilities located between the southern Delta facilities and Castaic Lake; these facilities include the SWP's southern Delta facilities (Clifton Court Forebay, the Banks Pumping Plant, and Bethany Reservoir); the San Luis Reservoir facilities (San Luis Reservoir, O'Neil Forebay, and the Gianelli Pumping-Generating Plant); and the California Aqueduct from the southern Delta to Castaic Lake, including pumping plants, a power plant, and storage facilities along the Aqueduct (Buena Vista, Teerink, Chrisman, Edmonston, and Oso pumping plants, Warne power plant, and Quail, Pyramid and Castaic lakes). These facilities are located in Alameda, Contra Costa, Fresno, Kern, Kings, Los Angeles, Merced, San Joaquin, and Stanislaus counties. The Project also could affect environmental resources located in the CLWA and WRMWSD service areas. The CLWA service area is located in northern Los Angeles and eastern Ventura counties. The WRMWSD is located in the southern extent of the San Joaquin Valley in Kern County.

Project Objectives

The portion of the CLWA service area that is located within the unincorporated and incorporated portions of Los Angeles County is experiencing substantial growth in population and urbanization. This trend is expected to continue based on development that already has been approved by the County of Los Angeles and the City of Santa Clarita and development that is projected in local adopted plans. (Considerably less growth is occurring in or is anticipated to occur in the portion of the service area that is in Ventura County since this area is designated for agricultural or open space uses in the general plan, and the Ventura County Save Open-Space and Agricultural Resources [SOAR] Initiative requires a vote of the people for most changes to the general plan policies and land use designations regarding open space, agricultural, and rural lands.) Pursuant to the provisions of its SWP Water Supply Contract, CLWA has over time acquired a right to delivery of SWP water at an amount necessary to reasonably supply the Agency's increasing demand. The Project is an action by CLWA to maintain the water supply needed to meet water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area.

Specific Project objectives are as follows:

- Augment CLWA's SWP Table A Amount to meet water demands of existing users and some future anticipated growth.
- Provide a means of delivery for the augmented water supplies.

Description of the Project

The Project is the transfer of an existing 41,000 AF of SWP Table A Amount from KCWA and its member unit in Kern County, WRMWSD, to CLWA. The Project also includes the use of SWP

facilities from northern California to Los Angeles County for the delivery of SWP water to the CLWA service area, and use of this water within the CLWA service area. The Project water is transported from certain points of origin in the SWP system to the CLWA intake south of Castaic Lake via existing SWP facilities. The points of origin and delivery are identified in the 41,000 AF Transfer Agreement and the Point of Delivery Agreement. These and other documents referenced in this EIR are available for public inspection at the CLWA offices at 27234 Bouquet Canyon Road, Santa Clarita, CA 91350, (661) 297-1600.

The Project currently is being implemented by an amendment to the SWP water supply contracts of CLWA and KCWA executed in 1999. The Project is to authorize CLWA to use water delivered from the 41,000 AF of SWP Table A Amount for water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area. As described in detail in section 3.15 and Appendix D, the annual allocations of SWP water made by DWR are based on that year's hydrologic conditions, the amount of water in storage in the SWP system, and Contractors' requests for SWP supplies. Thus, the actual amount of water available for delivery to CLWA as a result of the 41,000 AF transfer would vary from year to year. (Section 3-0 outlines the assumptions used in the environmental impact analysis regarding the amount of water that would be delivered for use by CLWA.) Water would be requested by CLWA as needed to meet the demands of its service area, and as discussed in section 1.3.1, the transfer of Table A Amount would be one of a number of projects implemented by CLWA (e.g., infrastructure improvements, groundwater banking programs, increased recycling and conservation, and expanded use of local groundwater sources) to increase water reliability. Those projects that are considered reasonably foreseeable and for which sufficient information is available are included in the cumulative impacts analysis contained in section 6.3.3.1 of this EIR.

The Project does not include the construction of any additional SWP facilities or new facilities in the CLWA, KCWA, or WRMWSD service areas.

Permits and Other Approvals to Implement the Project

The amendment to the SWP water supply contract was approved by CLWA and DWR in 1999. Associated amendments to water supply and delivery contracts have been approved by KCWA and WRMWSD. WRMWSD is the KCWA member unit providing this Table A Amount. No permits or other approvals would be required other than the certification of this EIR.

RELATED ENVIRONMENTAL DOCUMENTATION

Supplemental Water Project EIR

The transfer of 41,000 AF of SWP Table A Amount between CLWA, KCWA, and WRMWSD (41,000 AF Transfer Agreement) and the Point of Delivery Agreement between DWR, KCWA, and CLWA were evaluated previously in the Supplemental Water Project Final EIR (CLWA 1999).

The Second Appellate Court, Fourth Division and the Superior Court of Los Angeles ordered that this EIR be decertified in January 2002 (*Friends of the Santa Clara River v. Castaic Lake Water Agency* (2002) 95 Cal. App. 3d 1373 [*Friends*]) because it tiered from the Monterey Agreement Program EIR, which was itself decertified as a result of an appellate court decision issued while

Friends was on appeal. "All other contentions" concerning the legal adequacy of the Supplemental Water Project EIR were found to be "without merit." The Court of Appeal specifically ordered the Trial Court to "issue a writ of mandate vacating the certification of the EIR," and to "retain jurisdiction until [CLWA] certifies an EIR complying with CEQA," and "consider such orders it deems appropriate under section 21168.9 [of the Public Resources Code]." The CLWA Board of Directors decertified CLWA's Supplemental Water Project Final EIR on November 27, 2002.

In September 2002, the Trial Court was requested to prohibit CLWA from using the 41,000 AF in any manner. Trial Court refused to enjoin the performance of the 41,000 AF Transfer Agreement, maintained its jurisdiction over the matter, and authorized CLWA to utilize "any of the 41,000 AFY [acre-feet per year]," albeit, with certain limitations:

> Respondent [CLWA] will not be prohibited from using the water to which it is entitled, but petitioner may renew its application for such prohibition based upon evidence of the actual use of such additional water for purposes it considers improper.

The above Order was issued without prejudice to a renewed request by the Petitioner for an injunction on all portions of CLWA's project pending completion of the EIR[1]. The present EIR is being prepared in accordance with the decisions of the Second Appellate Court, Fourth Division and the Superior Court of Los Angeles (Superior Court Case No. BS05694).

KCWA, WRMWSD, CLWA, and DWR previously approved the various contract amendments on the basis of the 1999 Supplemental Water Project Final EIR and other environmental analyses and documentation.

Monterey Amendment Program EIR

During the 1990s, disagreements arose between DWR, Agricultural Contractors, and municipal and industrial (M&I) Contractors about how available SWP supplies should be allocated. The SWP Contractors and DWR agreed to negotiate a settlement of their differences and develop a new approach to managing SWP resources through a major overhaul of the Water Supply Contracts. After a series of exhaustive negotiating sessions, an agreement was reached in December 1994 in Monterey, California on a set of principles, known as the "Monterey Agreement." The Monterey Agreement principles were implemented through an amendment to the Water Supply Contracts between DWR and the SWP Contractors, which became known as the "Monterey Amendment." The term "Monterey Amendment" is used in subsequent sections of this EIR. The Monterey Amendment was approved in 1995 and went into effect in August 1996.

A Program EIR analyzing the environmental impacts of the Monterey Amendment (Monterey Agreement EIR) was prepared and certified by the Central Coast Water Authority (CCWA) in 1995. In late 1995, a lawsuit was filed by the Planning and Conservation League (PCL), Plumas County Water Conservation and Flood Control District (Plumas County), and Citizens

1 Petitioners appealed the Remand Order issued by the Superior Court in this case. The Court of Appeal affirmed the Trial Court's order (refusing the request for an injunction) on December 1, 2003.

Planning Association of Santa Barbara County (CPA) (collectively referred to as the "plaintiffs") challenging the EIR. The plaintiffs argued that the environmental impact analysis prepared was inadequate because CCWA was not a proper lead agency and the EIR analysis did not reflect the inability of the SWP to deliver full Contract amounts to Contractors, even though they held contractual "entitlements" to those supplies. In 2000, the California State Court of Appeal (Third District) found that a new EIR must be prepared. That litigation is referred to as the PCL Litigation in this EIR.[2]

Discussions to mediate a settlement began in 2001 and were finalized in May 2003.[3] All parties to the litigation have signed the Settlement Agreement. The Settlement Agreement calls for DWR to prepare a new EIR pursuant to CEQA (a Notice of Preparation [NOP] was issued by DWR on January 24, 2003),[4] while the Monterey Amendment's provisions remain in operation. Pursuant to the Settlement Agreement, the parties are now administering the preparation of a new EIR, which is expected to be completed in approximately two years. The new EIR will evaluate the potential environmental impacts of changes to SWP operations incorporated in the Monterey Amendment and the Settlement Agreement. The Settlement Agreement also calls for DWR to produce a biennial SWP Delivery Reliability Report. The SWP Delivery Reliability Report - 2002 was issued in May 2003 (DWR 2003b). The Settlement Agreement did not change the substance of the Monterey Amendment, but addressed the process by which the new Monterey Amendment EIR will be prepared.

It should be noted at this point that the Settlement Agreement concerning the PCL Litigation creates a specific exclusion for this Project from any prohibitions against transfers of State Water Project Table A Amounts by the Settlement Agreement. The exclusion states:

> With respect to Section III(c)(4)(b) regarding the Kern-Castaic Transfer, the Parties recognize that such water transfer is subject to pending litigation in the Los Angeles County Superior Court following remand from the Second District Court of Appeal (See Friends of the Santa Clara River v. Castaic Lake Water Agency 95 Cal.App.4th 1373, 116 Cal.Rptr.2d 54 (2002); review denied, April 17, 2002). The Parties agree that jurisdiction with respect to that litigation should remain in that court and that nothing in this Settlement Agreement is intended to predispose the remedies or other actions that may occur in that pending litigation.

The order on remand from the appellate court in the Friend case specifically ordered the Trial Court "to retain jurisdiction until [CLWA] certifies an EIR complying with CEQA" and "consider such orders it deems appropriate under section 21168.9 [of the Public Resources Code]." This EIR thus remains under the jurisdiction of the Superior Court until the EIR is certified by CLWA.

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2 *Planning and Conservation League, et al. v. Department of Water Resources* (2000) 83 Cal. App. 4th 892.

3 In May 2003, the settlement agreement among the plaintiffs, DWR, and the SWP Contractors (referred to herein as the "Settlement Agreement") was executed and approved by the State Attorney General's office. On May 20, 2003 the Settlement Agreement was approved by the Sacramento Superior Court.

4 The NOP is entitled Notice of Preparation of Environmental Impact Report for the Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Other Contract Amendments and Associated Actions as part of a Proposed Settlement Agreement in Planning and Conservation League v. Department of Water Resources.

Capital Program and Water Plan, including Acquisition of Supplemental Water and of a Proposed Second Plant Site, EIR

In 1988, CLWA completed the Capital Program and Water Plan, including Acquisition of Supplemental Water and of a Proposed Second Plant Site, Final EIR (Capital Program EIR) (CLWA 1988), which evaluated the potential environmental impacts of the proposed Capital Improvements Program, including the acquisition of supplemental water, and the construction of a new treatment plant and facilities improvements. The Capital Program EIR evaluated a proposal for CLWA to obtain additional SWP Table A Amount of up to 37,800 AF to supplement the 1988 SWP Table A Amount of 41,500 AF. This EIR assumed that deliveries from the new SWP Table A Amount would become 100 percent reliable before 2010. It also identified a total water demand of 120,000 AFY to support a population of 270,000 persons in the year 2010. The implementation of reasonable conservation measures and recycling was projected to reduce net demand to 106,300 AFY, an approximately 11 percent reduction. The Project evaluated in the present EIR was programmatically evaluated in the Capital Program EIR (CLWA 1988).

ENVIRONMENTAL SETTING

CEQA Guidelines section 15125 directs that an EIR must include a description of the physical environmental conditions in the vicinity of the Project as they exist at the time the NOP is published. This environmental setting will normally constitute the baseline physical conditions by which the lead agency determines whether an impact is significant. This Project was previously analyzed in the 1999 Supplemental Water Project Final EIR (CLWA 1999); the 41,000 AF Transfer Agreements were duly executed, and the Project was implemented. Solely relying on the description of physical conditions that existed at the time that the NOP for the present EIR was published (January 2003) would fail to capture any changes to the pre-Project conditions that may have resulted from the ongoing implementation of the 41,000 AF Transfer Agreement. Thus, this EIR's description of the Project's environmental setting includes information from the general timeframe when the January 2003 NOP was issued (referred to as current or present conditions), as well as information describing the environmental setting as it existed when the NOP for the 1999 Supplemental Water Project Final EIR was published (April 1998).

SUMMARY OF SIGNIFICANT IMPACTS AND MITIGATION MEASURES

Table ES-1 summarizes the direct and indirect impacts of the Project, mitigation measures for significant impacts, and the residual impacts that would occur after the implementation of mitigation measures. No significant direct impacts would occur in any of the three geographic areas evaluated. Very minor, less than significant impacts to aesthetic/visual resources, cultural resources, and geology and soils would occur at San Luis Reservoir due to the slight seasonal change in the timing of water delivered from the reservoir. Imperceptible or very minor, less than significant impacts to water quality in the Delta could result in some years due to a minor change in the timing of Delta diversions. However, these changes would fall well within the range of historical and future anticipated SWP diversions from the Delta. Other changes associated with the SWP are less than significant impacts from increased electrical power demand and air emissions from the generation of electrical power to move water from WRMWSD to the CLWA service area.

The only impact to WRMWSD is a less than significant impact to groundwater quality from the minor reduction of SWP Table A supply that has been replaced by other water management actions. Under some extreme conditions this could result in increased reliance on other water sources and groundwater. Increased use of other water and groundwater would result in higher TDS water used and recharged to local groundwater.

The additional water supply provided by the Project would remove an obstacle to growth, and significant, indirect, growth-related impacts to all environmental resources could result from Project implementation. Compliance with the adopted plans and policies of local jurisdictions would reduce all of these impacts to less than significant, with the possible exception of five resources: aesthetics, air quality, biological resources, transportation/traffic, and utilities/service systems (solid waste disposal). Specific mechanisms for implementing these policies would be determined in the course of project-specific environmental review, as required under CEQA.

CUMULATIVE IMPACTS

No significant cumulative impacts resulting from the Project were identified for the SWP and associated facilities or the WRMWSD. Significant cumulative Project impacts in the CLWA service area would be as described under indirect impacts, and the same mitigation measures would apply. Impacts to aesthetics, air quality, biological resources, transportation/traffic, and utilities/service systems (solid waste disposal) could be unavoidable.

ALTERNATIVES TO THE PROJECT

Five alternatives were carried forward for detailed analysis.

Alternative 1, No Project Alternative

Under the No Project Alternative, CLWA would not acquire the additional Table A Amount or acquire the associated contractual rights for delivery of water associated with the transfer. The demand for high quality surface water is expected to increase throughout all of southern California as a result of continued growth, and local planning agency documents project continuing growth in the CLWA service area. The contract right to the Table A Amount that is the subject of the Project could be acquired and transferred to other portions of urbanized California. The amount, timing, and location of such a transfer are highly speculative, however, and this scenario is not considered further. Two hypothetical scenarios have been carried forward for detailed analysis that are intended to define a reasonable range of possible actions that could occur under this alternative. Actions relating to future land development are not under the control of CLWA, however, and could vary depending upon the actions of agencies with land use planning and permitting authority.

Scenario 1 –Moratorium on New Development, Existing Users Subject to Delivery Cutbacks (Moratorium Scenario)

In the absence of the Project, under this scenario, a moratorium on new development would be implemented. This assumes that the local retail water purveyors[5] within the CLWA service area decide that there is insufficient water to issue "will serve" letters to supply development and that local land use agencies respond by imposing a moratorium on new development in the CLWA service area.

Under this scenario, development that had already been approved or recorded but not yet built in the Santa Clarita Valley would not be built, nor would pending (unapproved) development. (Approved projects are subdivisions that have been granted an approved tentative tract map that is not yet recorded or has expired; recorded projects are subdivisions that have recorded a final tract map but are not yet built.) The 1998 DMS included 15,973 housing units (8,588 approved, 2,292 recorded, and 5,093 pending). The 2002 DMS included 33,113 housing units (13,586 approved, 9,915 recorded, and 9,612 pending). Assuming 3.1 persons per household, this amount of development would result in a population of approximately 49,510 persons, using the 1998 DMS, and 102,640 persons, using the 2002 DMS. In comparison, the Project could support approximately 35,600 housing units given an average year water supply, which would house approximately 106,700 persons. Thus, the amount of development and associated population that could be allowed under this scenario would be less than could occur under the Project.

Some additional groundwater production wells might be required to serve existing demand that would have been met by the 41,000 AF transfer. Treatment at the wellhead likely would be needed, depending upon local groundwater characteristics. New underground distribution pipelines also may be required. Electric pumps would be used as needed.

Scenario 2 –Build-Out of Recorded and Approved Projects in DMS (Build-Out Scenario)

Under the Build-Out Scenario, approved and recorded projects listed in the DMS for the Santa Clarita Valley would be developed, notwithstanding the potential shortfall in reliable water supply. Based on the DMS from both 1998 and 2002, the number of housing units in approved and recorded DMS projects considered under this scenario (10,880 and 23,500 units, respectively) is less than the number of housing units that could be supported by the Project given an average year water supply of 34,400 AF (35,600 units). The population associated with the development identified in the 1998 DMS would be about 33,730 persons; the population associated with the 2002 DMS development would be about 72,850 persons. In comparison, the population that could be served by the Project would be about 106,700 persons. Thus, the amount of development and associated population that could be allowed under this scenario would be less than could occur under the Project.

Under this scenario, existing demand currently met by the 41,000 AF transfer and the increased water demand from new development would rely on existing water supplies (principally local groundwater resources) that are currently not used for urban purposes. Treatment at the

5 The CLWA Act refers to "retail water distributors," although the term "retail water purveyors" also is commonly used. For purposes of this report, the terms are synonymous.

wellhead likely would be needed, depending upon local groundwater characteristics. New underground distribution pipelines also may be required. Electric pumps would be used as needed.

Alternative 2, Increased Extractions from the Saugus Formation (Increased Groundwater Extractions)

Under this alternative, in lieu of the Project, up to 41,000 AFY would be extracted from the Saugus Formation and delivered to users in the CLWA service area. The extraction would be accomplished by increased use of existing wells and by the installation of 15 additional wells, pumps, and wellhead treatment facilities. Existing or new distribution facilities such as pipelines and pumping stations would be used to transport this water to existing and planned treated water distribution facilities. Pumps and treatment facilities would use electrical power. Wherever possible, distribution facilities would be placed in public rights-of-way, including streets, utility, and railroad corridors. Disturbed areas would be restored to their former appearance once construction was completed. It is estimated that approximately 40 acres would be disturbed by the new facilities, which would be constructed and operated either by CLWA, individual purveyors, or other parties. A detailed geohydrologic investigation would be necessary prior to drilling on a site-by-site basis.

Until contaminant remediation is completed, existing, localized perchlorate contamination in a small part of the Saugus Formation would limit potential well locations. Field studies and groundwater modeling activities are in progress to evaluate how best to hydraulically contain the portion of the aquifer system where production wells have been shut down, while simultaneously preventing perchlorate movement to currently unimpacted areas. The field studies have included the installation and sampling of monitoring wells at multiple depths and locations on and around the Whittaker-Bermite site, the most likely source of perchlorate; water level monitoring in these wells; aquifer testing of two unimpacted water supply wells; and groundwater velocity testing in alluvial monitoring wells located between the site and the Santa Clara River. These studies have helped the water purveyors and the Whittaker Corporation further refine the current understanding of groundwater flow patterns in specific areas on and near the site (such as along the Holser Fault). This information has been incorporated into a regional groundwater flow model that has been developed by the purveyors and whose calibration and construction was recently reviewed and approved by the California Department of Toxic Substances Control (DTSC). The model is being used to identify a pumping scheme that would meet the objectives of restoring the lost water supply from the impacted wells (with wellhead treatment) while simultaneously containing perchlorate and hydraulically limiting its movement downgradient to unimpacted wells and other portions of the aquifer system where new water supply wells might be constructed. The modeling analysis accounts not only for the pumping of impacted wells, but also (a) the 2000 Urban Water Management Plan's (UWMP) pumping plan for unimpacted wells throughout the Santa Clarita Valley and (b) the significant year-to-year variation in local hydrology (especially groundwater recharge) that occurs in the Valley (CH2MHill 2004). The modeling simulations will be used to guide selection of a final pumping plan for the impacted Alluvial Aquifer well and the impacted Saugus Formation wells. The selection of a final pumping plan will be made jointly by the purveyors and the Whittaker Corporation, with regulatory oversight and permitting performed by the California Department of Health Services (CA DHS) with technical support from the DTSC.

There are numerous wells in the Saugus Formation, other than the wells that were voluntarily shut down due to perchlorate contamination. Additionally, other Saugus wells are planned for construction, including those included in CLWA's Capital Improvements Program. If operated continuously during the year, the wells not subject to perchlorate contamination have the capability to produce approximately 21,000 AFY (personal communication, L. Takaichi 2004). However, a more realistic production capability is 15,000 AFY due to periodic shutdown for maintenance, monitoring, or storage limitations (personal communication, L. Takaichi 2004). The current groundwater production capability from the Saugus Formation is estimated to be 5,000 AFY during normal years but could reach 15,000 AFY during dry periods or other periods of need (personal communication, L. Takaichi 2004). These capabilities will increase as additional production wells in the Saugus Formation are completed and a response action to perchlorate contamination is implemented.

Alternative 3, Exchange Desalinated Water for SWP Water (Desalination/Exchange)

This alternative comprises two primary components in lieu of the Project: (1) CLWA would contribute a portion of the funds needed by another agency to develop a seawater desalination facility along the southern California coast; and (2) up to 41,000 AFY of desalinated water produced by this facility would be exchanged with CLWA for SWP water. A likely partner in such an arrangement would be The Metropolitan Water District of Southern California (Metropolitan). If both parties agreed, CLWA would enter into a contract with Metropolitan indicating that a portion of Metropolitan's annual SWP Table A Amount would be delivered to Castaic Lake for use by CLWA in exchange for CLWA's contribution to a desalination facility to be constructed by Metropolitan. CLWA would treat and distribute this SWP water in existing CLWA facilities, and Metropolitan would use water from the desalination facility in lieu of the SWP water exchanged with CLWA.

Assuming a 50 percent recovery rate, a plant capacity of approximately 73 mgd would be required to produce 41,000 AFY. Depending on the extent of ancillary facilities included at the site, a site of at least 2 acres could be required. In addition to the desalting plant, the coastal facility would likely include new electrical power conveyance and control equipment, ocean water intake and brine disposal structures, and a treated water pumping plant. Total site area could be up to 5 acres. Depending on site location, additional pipelines and related pumping facilities may be required to convey the desalinated water a short distance to the existing Metropolitan distribution facilities.

Alternative 4, Transfer of a Smaller Table A Amount (Smaller Table A Amount)

Under this alternative, CLWA would acquire a smaller amount of SWP Table A Amount than under the Project. A transfer of approximately 20,000 AF of SWP Table A Amount was analyzed since it is the approximate mid-point between the amount that would be transferred under the Project and the No Project Alternative. Existing facilities would be used, as described for the Project.

Since the demand for high quality surface water is expected to increase in southern California as a result of anticipated growth, the remaining SWP Table A Amount (21,000 AF) could be acquired and transferred to other (unidentified) portions of urbanized southern California. The Table A Amount not acquired by CLWA would likely be acquired by other agencies with

growing urban water demands. However, the timing, amount, and location of the transfer(s) as well as the associated impacts are speculative and are not evaluated under this alternative.

Alternative 5, Transfer of a Larger Table A Amount (Larger Table A Amount)

Under this alternative, CLWA would acquire a larger SWP Table A Amount than under the Project. Such an alternative would require the use of a larger proportion of the SWP facilities and capacities than described for the Project, and would attempt to reduce or avoid the effects of reductions in SWP supplies (during periods of drought) on local groundwater resources. In order to provide an analysis of impacts of a transfer greater than the Project (transfer of 41,000 AF of Table A Amount), a transfer of approximately 60,000 AF of SWP Table A Amount was established for this alternative. This Table A Amount is potentially available from other KCWA member units who have expressed interest in reducing their Table A Amount and have completed CEQA analysis of the sale of this contract right (e.g., Belridge Water Storage District, Berrenda Mesa Water District, and Lost Hills Water District [BWSD 1998; BMWD 1996]). Existing facilities would be used, as described for the Project.

Environmentally Superior Alternative

Scenarios 1 and 2 of Alternative 1, the No Project Alternative, would reduce or avoid the significant indirect (growth-related) impacts of the Project, but each would result in greater direct impacts since new groundwater wells, treatment facilities, and associated pipelines would be required. Additionally, each of these scenarios could result in significant unavoidable impacts to groundwater supply and groundwater quality. This alternative would not augment CLWA's water supply and therefore would not meet the Project objectives. Since the direct impacts of the No Project Alternative would be substantially greater than the Project and since it would not meet Project objectives, this alternative is not considered environmentally superior.

Alternative 2, the Increased Groundwater Extractions Alternative, would result in the same indirect impacts as the Project and thus would not reduce or avoid the Project's significant growth-related impacts. It would result in greater direct impacts to many environmental resources because new groundwater wells, treatment facilities, and pipelines would have to be constructed. It also would result in a significant, unavoidable impact to groundwater supply, whereas the Project would result in a beneficial impact to groundwater supply through recharge. This alternative would not augment CLWA's water supply and therefore would not meet the Project objectives. Because the direct impacts of the Increased Groundwater Extractions Alternative would be substantially greater than the Project and since it would not meet Project objectives, this alternative is not considered environmentally superior.

Alternative 3, the Desalination/Exchange Alternative, would result in the same indirect impacts as the Project and thus would not reduce or avoid the Project's significant growth-related impacts. It would result in greater direct impacts to many environmental resources from the construction and operation of a new desalination plant and pipeline. This alternative would augment CLWA's water supply since desalinated water would be exchanged with another water agency's SWP Table A Amount, which would be conveyed to existing CLWA facilities, and therefore would meet the Project objectives. Because the direct impacts of the

Desalination/Exchange Alternative would be substantially greater than the Project, however, this alternative is not considered environmentally superior.

Alternative 4, the Smaller Table A Amount Alternative, would reduce the potentially significant indirect impacts of the Project and would result in similar or lessened direct impacts, as well. This alternative would not meet one of the two Project objectives, however, which is to "Augment CLWA's SWP Table A Amount to meet water demands of existing users and a portion of future water demand from anticipated growth within the CLWA service area." Thus, while this alternative would result in lessened direct and indirect impacts, it does not meet an important basic Project objective[6] and is not considered the environmentally superior alternative.

Alternative 5, the Larger Table A Amount Alternative, would increase the significant indirect impacts of the Project and would result in similar or greater direct impacts, as well. It would meet the Project objectives but would result in greater environmental impacts than the Project and is not considered environmentally superior.

The Project is identified as the environmentally superior alternative that meets Project objectives.

AREAS OF KNOWN CONTROVERSY

The previous EIR on the Project was decertified because it tiered from the Monterey Agreement Program EIR, which was itself decertified as a result of an appellate court decision. The present EIR does not tier from this or any other EIR, and examines environmental impacts that would occur with and without the change in water allocation criteria implemented as part of the Monterey Amendment. Although the Monterey Amendment continues in operation under the Settlement Agreement, this EIR evaluates a reasonable worst-case scenario of SWP operations without the Monterey Amendment.

The potential for growth inducement as a result of the increased water supply to the CLWA service area is an area of known controversy.

The availability of local water supplies has been the subject of some controversy in the Santa Clarita Valley over the last few years. The water suppliers' consulting engineers recently calculated the availability of local groundwater at 50,000 AFY (Slade 2002) based on updated studies prepared using reasonable, accepted engineering and scientific practices (perchlorate remediation measures and recycled water use were considered in these studies). Some Santa Clarita Valley residents have questioned the conclusions of these studies and claim that only about 32,000 AFY of water is available based on conclusions in an earlier report published in 1986 (Slade 1986). They also claim that water from the Saugus Formation should not be calculated as available on a long-term basis until the perchlorate contamination in a small part of this formation is fully contained or remediated. CLWA, CLWA Santa Clarita Water Division, Newhall County Water District, and Valencia Water Company have received $8 million as reimbursement for litigation costs and studies to determine the cleanup plan for the

6 Under CEQA Guidelines 15126.6, an EIR must describe a range of reasonable alternatives that would feasibly attain most of the basic objectives of the proposed project but would avoid or substantially lessen significant impacts of the project.

perchlorate. CLWA and the retail purveyors are presently identifying the method of cleanup and the costs of cleanup to be paid by the insurance companies of Whitaker Bermite and related parties. It is anticipated the cleanup should be in place by 2006.

UNRESOLVED ISSUES

No unresolved environmental issues have been identified.

Table ES-1. Summary of the Project's Environmental Impacts and Mitigation Measures

(Page 1 of 8)

Environmental Resource	*Location*	*Direct Impacts*	*Indirect Impacts*	*Mitigation Measures*	*Residual Impacts*
Aesthetic/ Visual Resources	SWP	**Less than significant.** Slight decrease in water stored in San Luis Reservoir from December through June.	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: Less than significant. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential changes to the visual characteristics and resources from development of open space and further urbanization of hillside and natural areas. Potential increase in the amount of night lighting and unwanted glare in presently undeveloped areas. (Growth-related impact)	DIRECT: None required. INDIRECT: Reduced by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Significant unavoidable adverse impacts.
Agricultural Resources	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential conversion of agriculture lands to non-agricultural uses or for changes in agricultural zoning by local jurisdictions in order to allow a higher density or intensity of development. (Growth-related impact)	DIRECT: None required. INDIRECT: Reduced by local governments implementing the policies of the County of Los Angeles, County of Ventura, and the Piru general and area plan.	DIRECT: None. INDIRECT: Less than significant.
Air Quality	SWP	**Less than significant.** Increased air emissions from the generation of additional electrical power to move water from WRMWSD to CLWA.	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: Less than significant. INDIRECT: None.

Table ES-1. Summary of the Project's Environmental Impacts and Mitigation Measures
(Page 2 of 8)

Environmental Resource	*Location*	*Direct Impacts*	*Indirect Impacts*	*Mitigation Measures*	*Residual Impacts*
Air Quality (continued)	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential increase in air pollutant emissions from transportation and development. (Growth-related impact)	DIRECT: None required. INDIRECT: Reduced by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans. Additionally, reduced by compliance with SCAQMD plans.	DIRECT: None. INDIRECT: Significant unavoidable adverse impact.
Biological Resources	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Conversion and degradation of habitat; reduction/local extinction of local native plant and wildlife populations; including sensitive species; introduction of invasive non-native species; disruption of established wildlife corridors and native wildlife nursery sites; impacts on sensitive fish and amphibian populations due to wastewater discharge and polluted runoff; conflicts with local policies and ordinances protecting biological resources. (Growth-related impact)	DIRECT: None required. INDIRECT: Reduced by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans. State and federal regulatory agencies permit conditions may reduce significant impacts.	DIRECT: None. INDIRECT: Significant unavoidable impact.

Table ES-1. Summary of the Project's Environmental Impacts and Mitigation Measures
(Page 3 of 8)

Environmental Resource	*Location*	*Direct Impacts*	*Indirect Impacts*	*Mitigation Measures*	*Residual Impacts*
Cultural Resources	SWP	**Less than significant.** Potential exposure of submerged cultural resources in San Luis Reservoir from December through June.	**No impact.**	DIRECT None required. INDIRECT: None required.	DIRECT: Less than significant. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential disturbance of human remains, archaeological, historical, and paleontological resources by excavation and grading activities associated with future development. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Less than significant.
Geology and Soils	SWP	**Less than significant.** Slight increase in soil exposed to wind and water erosion at San Luis Reservoir from December through June.	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: Less than significant. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential from: geologic hazards, including fault rupture, seismically induced ground failure, and seiches, as well as causing permanent changes in topography, loss of topsoil, and removal of unique geologic features. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Less than significant.
Hazards and Hazardous Materials	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.

Table ES-1. Summary of the Project's Environmental Impacts and Mitigation Measures
(Page 4 of 8)

Environmental Resource	*Location*	*Direct Impacts*	*Indirect Impacts*	*Mitigation Measures*	*Residual Impacts*
Hazards and Hazardous Materials (continued)	CLWA	**Less than significant.** Incremental increase in use of hazardous materials to treat transferred water.	**Significant.** Previously contaminated sites may require the removal or remediation of soils before development. Potential increase in transport, use, and disposal of hazardous materials, along with increased risks of hazardous substance releases. Potential impairment of emergency response plans or emergency evacuation plans. Increased public exposure to wildland fires. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: Less than significant. INDIRECT: Less than significant.
Land Use and Planning	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential to division of a community or conflict with adopted land use plans. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Less than significant.
Noise	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential short-term increases from construction and grading activities, increase in traffic-related emissions and changes in land uses. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Less than significant.

Table ES-1. Summary of the Project's Environmental Impacts and Mitigation Measures
(Page 5 of 8)

Environmental Resource	*Location*	*Direct Impacts*	*Indirect Impacts*	*Mitigation Measures*	*Residual Impacts*
Population and Housing	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: Less than significant.
	CLWA	**No impact.**	**Significant.** Potential increase in population and housing. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Less than significant.
Public Services	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential increase in demand for public facilities and services. (police, fire, schools, and library services). (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Less than significant.
Recreation	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None, INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.

Table ES-1. Summary of the Project's Environmental Impacts and Mitigation Measures
(Page 6 of 8)

Environmental Resource	*Location*	*Direct Impacts*	*Indirect Impacts*	*Mitigation Measures*	*Residual Impacts*
Recreation (continued)	CLWA	**No impact.**	**Significant.** Potential increase in demand for recreational resources. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Less than significant.
Transportation/Traffic	SWP	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**No impact.**	**Significant.** Potential increase in traffic and the need for new or altered roads, highways, and transportation systems in the Santa Clarita Valley. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Significant unavoidable adverse impacts from increased vehicle trips due to growth in the Santa Clarita Valley.
Utilities and Service Systems	SWP	**Less than significant.** Additional electricity required to convey water to CLWA.	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: Less than significant. INDIRECT: None.
	WRMWSD	**No impact.**	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.

Table ES-1. Summary of the Project's Environmental Impacts and Mitigation Measures
(Page 7 of 8)

Environmental Resource	*Location*	*Direct Impacts*	*Indirect Impacts*	*Mitigation Measures*	*Residual Impacts*
Utilities and Service Systems (continued)	CLWA	**Less than significant.** Additional demand for water treatment and electrical power to treat and distribute the transferred water within the CLWA service area.	**Less than significant.** Potential increase wastewater generation and demand for wastewater treatment; potential need for new storm water drainage facilities or the expansion of existing facilities. (Growth-related impact) **Significant.** Potential increased demand for solid waste disposal services; potential increased need for potable water treatment facilities. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans. Impacts to solid waste disposal may not be avoidable unless additional landfill capacity is approved and constructed.	DIRECT: None. INDIRECT: Significant unavoidable adverse impact related to increased demand for solid waste disposal services.
Water Resources	SWP	**Less than significant.** Imperceptible or minor change in water quality in the Delta due to minor changes in timing of Delta diversions in some years. However, these changes would fall well within the range of historical and future anticipated SWP diversions from the Delta.	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.

Table ES-1. Summary of the Project's Environmental Impacts and Mitigation Measures

(Page 8 of 8)

Environmental Resource	*Location*	*Direct Impacts*	*Indirect Impacts*	*Mitigation Measures*	*Residual Impacts*
Water Resources (continued)	WRMWSD	**Less than significant.** Minor reduction of SWP Table A supply that has been replaced by other water management actions. Under some extreme conditions this could result in increased reliance on other water sources and groundwater. Increased use of other water and groundwater would result in higher TDS water used and recharged to local groundwater.	**No impact.**	DIRECT: None required. INDIRECT: None required.	DIRECT: None. INDIRECT: None.
	CLWA	**Beneficial impact.** Increased imported water supply to meet anticipated demands. Increased SWP supply would replace water that could have otherwise been pumped from groundwater.	**Significant.** Potential increased demand on local groundwater resources during periods of reduced SWP deliveries could result in substantial short-term stressing of groundwater supplies. Potential alteration of surface flows, reduction of aquifer recharge and increased amount and rate of stormwater runoff. Increased flooding and peak flow rates could result in substantial erosion or siltation on- or off-site. (Growth-related impact)	DIRECT: None required. INDIRECT: Mitigated by local governments implementing the policies of the County of Los Angeles, County of Ventura, and City of Santa Clarita general and area plans.	DIRECT: None. INDIRECT: Less than significant.

Pages omitted.

3.15 WATER RESOURCES

As discussed in section 3-0, this EIR's description of the Project's environmental setting includes information from the general timeframe when the January 2003 NOP was issued (referred to as current or present conditions), as well as information describing the environmental setting as it existed when the NOP for the 1999 Supplemental Water Project Final EIR was published (April 1998). Table 3.0-1 describes the key substantive changes in the environmental setting, if any, that occurred between 1998 and the present for each environmental resource analyzed in this EIR. The differences relevant to water resources are summarized below for the three geographic areas under consideration.

State Water Project

Total Table A deliveries fluctuated, ranging from a low of 1,546,740 AF in 2001 to a high of 3,714,230 AF in 2003. SWP Table A Amounts were transferred among SWP Contractors, including MWD to Coachella Valley Water Authority – 35,000 AF; Belridge Water Storage District to Zone 7 – 2,219 AF; and Tulare Lake Basin Water Storage District to Zone 7 – 400 AF. The PCL litigation challenging the Monterey Amendment was settled and essentially leaves these amendments in place (see sections 12.2 and 1.4.2 for a more complete description).

Wheeler Ridge-Maricopa Water Storage District

Water supplies are generally the same, although WRMWSD has increased participation in other, more cost effective, water management options. In 1998, such water management activities could have supplied WRMWSD with an additional 59,500 AFY, and 106,000 AFY in 2002. WRMWSD's contract with KCWA from SWP water was 197,088 AF in 2002. WRMWSD's contract with KCWA was 238,088 AF of "firm supply" in 1998.

Castaic Lake Water Agency

Water supply sources are generally the same, although CLWA's SWP Table A Amount was was increased by 41,000 AF due to the Project. In 1998, CLWA's average year SWP supply was estimated to be 46,500 AF based on available DWR model analysis. CLWA's average year SWP supply now is estimated to be 68,300 AF based on new DWR model results and Project implementation. In 1998, the total water demand in 2010 was projected to be approximately 106,300 AF. Future demand now is expected to be approximately 82,400 AF in 2010 and 102,500 AF by 2020.

3.15.1 Environmental Setting

3.15.1.1 State Water Project

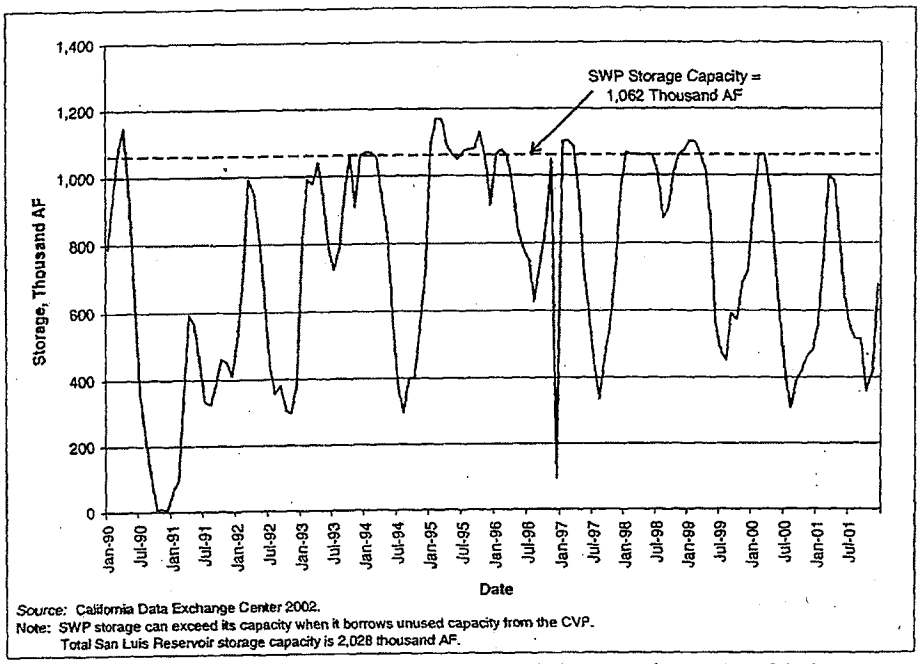
SWP Facilities

The SWP is a water supply, storage, and distribution system that includes 28 storage facilities, reservoirs, and lakes; 20 pumping plants; six pumping-generating plants and hydroelectric power plants; and about 660 miles of aqueducts and pipelines (DWR 2001a). Principal SWP facilities are shown on Figure 1.3-1.

The primary water source for the SWP is within the drainage of the Feather River, a tributary of the Sacramento River, where runoff is stored behind Oroville Dam. Water released from Oroville Dam flows down natural channels to the Delta. In the southern Delta, water is pumped into the 444-mile-long California Aqueduct at the Clifton Court Forebay by the Banks Pumping Plant (or by agreement with the U.S. Bureau of Reclamation [USBR], at the Central Valley Project's [CVP] Tracy Pumping Plant). SWP water exports for users south of the Banks and Tracy pumping plants are currently limited by a series of water quality and operational constraints, governed primarily by the SWRCB's Water Right Decision 1641, as amended. Decision 1641 was adopted by the SWRCB in 1999; prior to that time, SWP water exports from the Delta were limited by the SWRCB's Water Right Decision 1485 (adopted in 1978), Order Water Right (WR) 95-6 (adopted in 1995), and Order WR 98-09 (adopted in 1998).

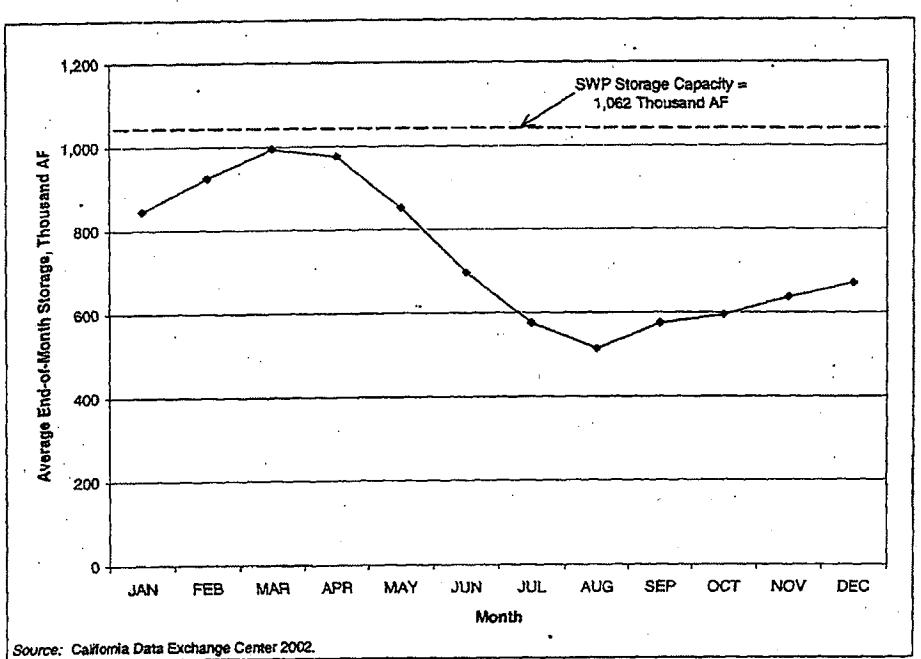
From the southern Delta facilities, water in the California Aqueduct travels along the west side of the San Joaquin Valley and is delivered directly to SWP Contractors or is stored in San Luis Reservoir, the SWP's main storage facility south of the Delta. San Luis Reservoir, located near Los Banos, is an off-stream storage reservoir with a total storage capacity of more than 2 million AF (of which approximately 1,062,000 AF are allocated to the SWP; the remainder is allocated to the CVP [DWR 2001a]).

In general, the SWP is operated to fill storage reservoirs during the high runoff months of the winter and early spring. Regulatory requirements for the Delta and associated operational constraints also affect the timing and ability to fill reservoirs south of the Delta. Under current operating conditions, including Decision 1641, SWP diversions from the Delta are substantially reduced as of April 15 of each year. As a result, the SWP is operated to store as much water as possible in San Luis Reservoir prior to April 15. The stored water is then released to meet Contractor demands during the high-demand summer and fall months to supplement the more limited pumping from the Delta during those months. Figure 3.15-1 shows the volume of SWP water stored in San Luis Reservoir for the period between 1990 and 2001. Figure 3.15-2 shows the average end-of-month SWP storage in San Luis Reservoir from 1990 to 2001. As is shown on these figures, San Luis Reservoir SWP storage levels vary considerably, both during the year and from year to year. From 1990 to 2001, SWP storage in the reservoir has ranged from approximately zero to more than 1.1 million AF.



Source: California Data Exchange Center 2002.
Note: SWP storage can exceed its capacity when it borrows unused capacity from the CVP.
Total San Luis Reservoir storage capacity is 2,028 thousand AF.

Figure 3.15-1. SWP Storage in San Luis Reservoir, 1990 to 2001



Source: California Data Exchange Center 2002.

Figure 3.15-2. SWP Storage in San Luis Reservoir, 1990 to 2001 Average End-of-Month Storage

Water is conveyed southward from San Luis Reservoir via the California Aqueduct to the primarily agricultural users in the San Joaquin Valley and the primarily urban regions of the Central Coast and southern California. Water is diverted from the Aqueduct and delivered directly to SWP Contractors, including KCWA, in the central and southern San Joaquin Valley at various locations along the Aqueduct. The Aqueduct traverses the west side of the San Joaquin Valley, and water is pumped through a series of four pumping plants (Dos Amigos, Buena Vista, Teerink, and Chrisman) before reaching the Edmonston Pumping Plant. The capacity in these reaches of the Aqueduct ranges from 10,000 cubic feet per second (cfs) at the northern end to approximately 4,400 cfs at the Edmonston Pumping Plant. The Edmonston Pumping Plant pumps water over the Tehachapi Mountain Range, and the California Aqueduct then divides into the East Branch and the West Branch. Water intended for use by CLWA is conveyed through the West Branch through Quail and Pyramid lakes and then to Castaic Lake, the terminus for the West Branch.

Quail and Pyramid lakes are located between the KCWA turnouts for deliveries to WRMWSD and the CLWA turnout on the West Branch of the California Aqueduct. Because of Quail Lake's limited storage capacity (approximately 7,800 AF) the lake is primarily used for the re-regulation of Aqueduct flows. Pyramid Lake, which has a storage capacity of approximately 171,200 AF, is used to provide an emergency water supply to the SWP Contractors that receive deliveries from the West Branch in the case of a major supply system outage, and is used in the operation of the Castaic Power Plant, located between Pyramid and Castaic lakes.

Castaic Lake has a storage capacity of approximately 323,700 AF. As shown on Figure 3.15-3, from 1990 to 2001, storage has ranged from a minimum of approximately 150,000 AF to a maximum of approximately 320,000 AF. The average end-of-month storage from 1990 to 2001 in Castaic Lake is shown on Figure 3.15-4. The reservoir is operated to provide regulatory storage to meet peak deliveries during the summer months for the three SWP Contractors that receive water from Castaic Lake (CLWA, The Metropolitan Water District of Southern California [MWD], and the Ventura County Flood Control District [VCFCD]), and to provide an emergency water supply in the case of a major supply system outage. As part of the Monterey Amendment, these three SWP Contractors have access to 160,000 AF of the storage from Castaic Lake as "flexible storage," which they may withdraw in addition to their allocated SWP supplies and which they must replace within five years of any withdrawal. Local runoff captured in Castaic Lake is managed in compliance with an agreement between DWR and the holders of prior water rights. From 1990 to 2000, SWP deliveries to CLWA from Castaic Lake averaged approximately 19,200 AF, or approximately 6 percent of the total annual SWP deliveries from the lake (see Table 3.15-1). From 1990 to 2000, the majority of the SWP water delivered from the lake (approximately 93 percent) was delivered to MWD due to its relatively larger Table A Amount and storage rights in Castaic Lake.

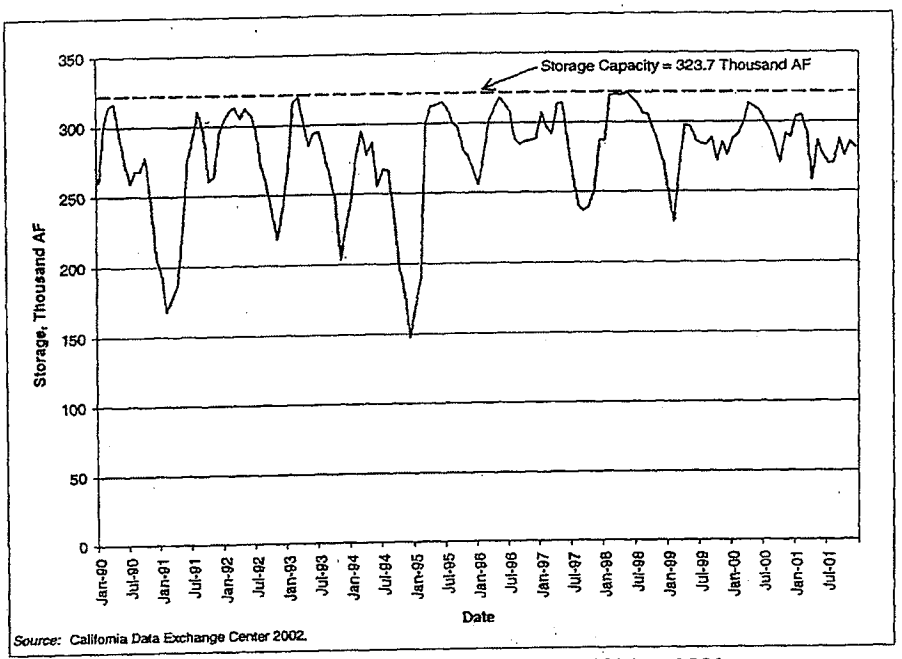


Figure 3.15-3. Castaic Lake Storage, 1990 to 2001

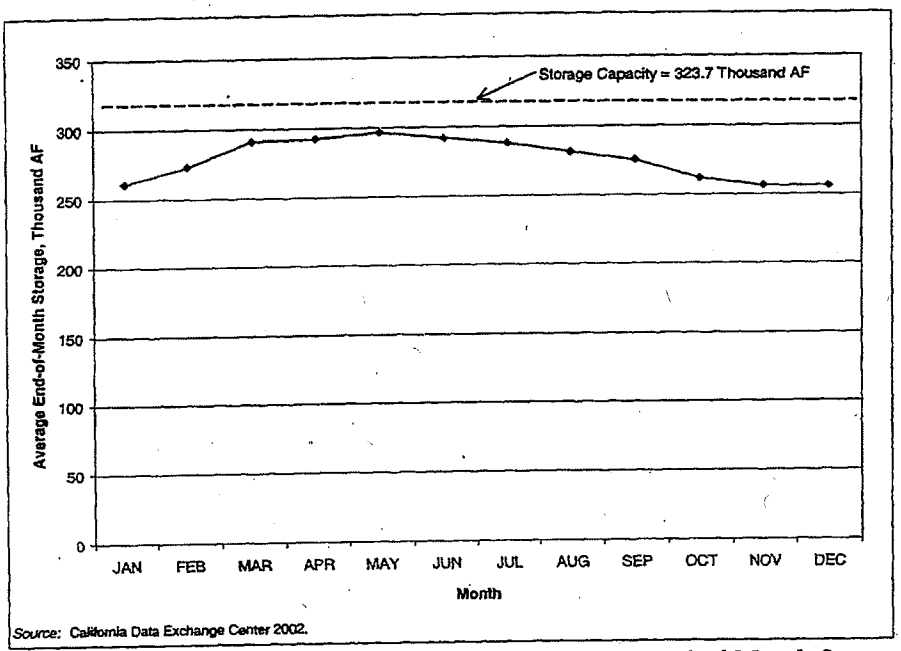


Figure 3.15-4. Castaic Lake Storage, 1990 to 2001 Average End-of-Month Storage

Table 3.15-1. Annual SWP Water Deliveries from Castaic Lake by Contractor, 1990 to 2000

	CLWA	MWD	VCFCD	Other[1]	Total	CLWA as a % of Total
1990	22,139	764,380	0	0	786,519	2.81
1991	3,846	257,835	0	1,240	262,921	1.46
1992	14,812	420,849	0	0	435,661	3.40
1993	13,787	437,470	0	0	451,257	3.06
1994	14,919	475,900	0	0	490,819	3.04
1995	17,747	139,882	0	0	157,629	11.26
1996	18,448	267,618	0	0	286,066	6.45
1997	22,842	271,379	1,850	27,130	323,201	7.07
1998	19,782	187,277	1,850	0	208,909	9.47
1999	28,813	327,001	1,850	0	357,664	8.06
2000	33,674	632,993	1,848	0	668,515	5.04
Average	19,164	380,235	673	2,579	402,651	5.56

Source: DWR 2002.
1. Includes deliveries from Castaic Lake via exchange. These deliveries were made by the Santa Barbara County Flood Control and Water Conservation District in 1991 via exchange with VCFCD, and by the Coachella Valley Water District and Desert Water Agency in 1997 via exchange with MWD.

Water Supply and Demands[1]

As described in section 1.4.2, in the early 1960s, DWR began entering into individual Water Supply Contracts with various urban and agricultural public water supply agencies, known as Contractors. The total planned annual delivery capability of the SWP and the sum of all Contractors' maximum Table A Amounts specified in the Water Supply Contracts were approximately 4.2 million AF. The initial SWP facilities were designed to meet Contractors' water demands in the early years of the project, with the construction of additional facilities planned as demands increased. Water deliveries to Contractors began as initial SWP facilities were completed in the late 1960s and early 1970s; essentially no additional SWP storage facilities have been constructed since that time.

As shown on Table 3.15-2, from 1990 to 2003, actual SWP annual deliveries of Table A supplies to Contractors have ranged from approximately 550,000 AF in 1991 to approximately 3.7 million AF in 2003. Many Contractors did not request delivery of their full Table A Amount during this period. Climatic conditions and other factors can significantly alter the availability of SWP water in any year. The annual allocations of water made by DWR are based on that year's hydrologic conditions, the amount of water in storage in the SWP system, and Contractors' requests for SWP supplies. Contractors' water needs vary from year to year, and many

1 Bulletin 132-01, *Management of the California State Water Project*, is the most recent published data by DWR for SWP operations, including SWP deliveries to Contractors. Because Bulletin 132-01 covers SWP activities through calendar year 2000, the baseline information presented in this EIR for SWP operations includes information through calendar year 2000.

Contractors did not request delivery of their full Table A Amount in a number of years during this 14-year period.

Table 3.15-2. SWP Annual Table A Deliveries, 1990 to 2003

	Agricultural Contract Holders		*M&I Contract Holders*		*Total Table A Deliveries (AF)*
	Table A Deliveries (AF)	*Allocation Percentage (%)*	*Table A Deliveries (AF)*	*Allocation Percentage (%)*	
1990	706,080	50	1,876,070	100	2,582,150
1991	12,440	0	536,670	30	549,110
1992	509,810	45	961,650	45	1,471,460
1993	1,250,370	100	1,064,870	100	2,315,240
1994	614,360	53	1,134,990	53	1,749,350
1995	1,165,520	100	801,570	100	1,967,090
1996	1,369,190	100	1,145,640	100	2,514,830
1997	1,067,320	100	1,258,460	100	2,325,780
1998	860,720	100	864,800	100	1,725,520
1999	1,333,590	100	1,405,300	100	2,738,890
2000	1,177,200	90	2,022,700	90	3,199,900
2001	383,840	39	1,162,900	39	1,546,740
2002	827,128	70	2,059,886	70	2,887,014
2003	1,064,267	90	2,649,966	90	3,714,230

Source: For 1990 to 2000, DWR 2002. For 2001, DWR 2004a. For 2002, DWR 2003c. For 2003, DWR 2004b.

Under conditions specified in the Water Supply Contracts, DWR can make water available to SWP Contractors above and beyond a Contractor's Table A supply. Table 3.15-3 provides an overview of the various types of SWP water supplies discussed throughout this EIR.

In 1998, DWR estimated that annual deliveries to SWP Contractors would average approximately 3.1 million AF (based on estimates of then-existing levels of Contractor demands and land and water use upstream of the Banks Pumping Plant[2], with existing facilities operated under the constraints of Order WR 95-6; DWR 1998). This estimate is generally consistent with DWR's recent SWP Delivery Reliability Report (DWR 2003b). In this report, DWR estimated that the SWP currently can be expected to deliver an average annual supply of approximately 2.96 million AF, based on a 2001 level of Contractor demand and upstream land and water use, with existing facilities operated under existing constraints (DWR 2003b).

2 Land and water use upstream of the Banks Pumping Plant affects the amount of water flowing into the Delta. In general, increases in the amount of water flowing into the Delta can increase SWP supplies, while decreases in the amount of water flowing into the Delta (due to increased water use upstream or a variety of other factors) can decrease SWP supplies.

1 **Table 3.15-3. SWP Surplus and Other Water Types**

Surplus Water	SWP water that can be made available to Contractors when water and capacity are available in excess of SWP storage needs and Table A supplies. See below for terminology for, and descriptions of, specific types of surplus water. Surplus water terminology changed with implementation of the Monterey Amendment.	
	Without Monterey Amendment (Including With Implementation of Article 18(b))	**With Monterey Amendment**
	Scheduled surplus water - Water that DWR determined to be available, in addition to Table A supplies, which was scheduled for delivery throughout the year (in the same manner as Table A supplies). This water was generally available only during the early years of the SWP (when Contractor demands were low).	Category deleted as part of the Monterey Amendment. Given increased Contractor demands, this water was physically no longer available.
	Unscheduled surplus water - Water that DWR made available when water and capacity were available in excess of SWP storage needs and Table A supplies. This water is only available for limited time periods, generally only in the winter or early spring when Contractors demands are low, and only under specific conditions that do not occur on an annual basis.	**Article 21 water** - Same as unscheduled surplus water. Article 21 water was defined under the Monterey Amendment as "interruptible water" but is more commonly referred to as "Article 21 water."
Carryover Water	SWP Table A water that is allocated to, and paid for by, a Contractor in one year, but is stored in SWP supply reservoirs (when storage is available) for use by that Contractor in a following year.	
DWR Dry Year Purchase	Water from DWR's Dry Year Water Purchase Program, through which water is purchased by DWR in shortage years from willing sellers in areas that have available supplies, and is then sold by DWR to Contractors willing to purchase those supplies.	
Flexible Storage (Added as part of the Monterey Amendment)	Storage available to Contractors that share in repayment of the costs of terminal reservoirs (Castaic and Perris lakes). These Contractors may withdraw water from their share of flexible storage, in addition to any other SWP supplies available to the Contractor. The Contractor must replace any water it withdraws from flexible storage within five years. Flexible storage was added to the Water Supply Contracts as part of the Monterey Amendment. CLWA may withdraw up to 4,684 AF of water from Castaic Lake as flexible storage.	
Turnback Pool Water (Added as part of the Monterey Amendment)	Water sold or purchased through the SWP Turnback Pool. The Turnback Pool is a program in which Contractors with allocated Table A supplies that are in excess of their needs in a given year may turn back that excess supply for purchase by other Contractors that need additional supplies that year. The Turnback Pool can make water available in all types of hydrologic years, although there is generally less excess water turned back in dry years. The Turnback Pool was created as part of the Monterey Amendment.	

2 *Water Quality*

3 Water quality in the California Aqueduct is primarily a reflection of the quality of water
4 diverted from the Delta. Wet hydrologic years have lower concentrations of total dissolved

solids (TDS[3]) and other constituents relative to drier hydrologic years due to higher Delta outflows pushing the Delta's seawater/fresh water interface further downstream. Water quality sampling data are available at various locations in the California Aqueduct from the California Data Exchange Center (CDEC) operated by DWR. Table 3.15-4 summarizes the water quality data at the Banks Pumping Plant, Check 29 on the California Aqueduct (the nearest upstream location to WRMWSD), and at Castaic Lake from 1990 to 2001.

Table 3.15-4. SWP Water Quality Summary based on Monthly Data for the Banks Pumping Plant, Check 29, and Castaic Lake, 1990 to 2001

Constituent[1]	*MCL*[1]	*Harvey Banks Delta Pumping Plant*		*Check 29*[2]		*Castaic Lake*[3]	
		AVERAGE	RANGE	AVERAGE	RANGE	AVERAGE	RANGE
Chloride[4] (mg/L)	250	82.27	12 to 162	85.05	3 to 170	77.64	41 to 119
Nitrate + Nitrite, (mg/L)	10	3.33	0.13 to 13	2.909	0.1 to 8.9	1.18	0.044 to 3.1
TDS[4] (mg/L)	500	276.12	85 to 466	330.55	66 to 687	386.59	239 to 429
Arsenic[5] (mg/L)	0.010	0.002	0.001 to 0.01	0.002	0.001 to 0.017	0.002	0.002 to 0.008
Selenium (mg/L)	0.05	0.001	0.001 to 0.002	0.005	0.001 to 0.1	0.001	0.001 to 0.001

Source: Personal communication, C. Erickson 2003.

1. An MCL (Maximum Contaminant Level) is the maximum permissible level of a contaminant in drinking water that is delivered to any user of a public water system.
2. Check 29 is located near Highway 119, north of the Buena Vista Pumping Plant and south of the Coastal Aqueduct.
3. Castaic Lake data were taken from MWD's inlet pipe and the outlet tower.
4. The chloride and TDS standards are secondary standards, which are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards but does not require compliance. States may choose to adopt them as enforceable standards, however.
5. On January 22, 2001, EPA adopted a new standard for arsenic in drinking water at 0.010 milligrams per liter (mg/L), replacing the previous standard of 0.050 mg/L. The rule became effective on February 22, 2002. Systems must comply with the new 0.010 mg/L standard is January 23, 2006 (EPA 2002).

The beneficial uses[4] designated by the Central Valley Regional Water Quality Control Board (CVRWQCB) for the California Aqueduct include municipal, agricultural, industrial, recreational (except for canoeing and rafting), and wildlife habitat uses (CVRWQCB 1998). The San Luis Reservoir has the same beneficial uses designated for the Aqueduct except that the reservoir does not have an industrial processing use. San Luis Reservoir is also designated as a

3 TDS is a measure of the total amount of minerals, organic matter, and nutrients that are dissolved in water. The dissolved solids concentration commonly is called the water's salinity and is classified as follows: fresh, 0-1,000 mg/L; slightly saline, 1,000-3,000 mg/L; moderately saline, 3,000-10,000 mg/L; very saline, 10,000-35,000 mg/L; and briny, more than 35,000 mg/L.

4 The Porter-Cologne Water Quality Control Act gave the SWRCB authority over water quality within California and established nine regional water quality control boards. The regional boards prepare water quality plans (called basin plans) for their region that identify the beneficial uses of water to be protected, establish water quality objectives (limits or levels of water constituents based on both state and federal laws), and define a program to implement water quality objectives.

warm freshwater fishery. The beneficial uses designated by the Los Angeles Regional Water Quality Control Board (LARWQCB) for Castaic and Pyramid lakes include municipal, agricultural, industrial, groundwater recharge, freshwater replenishment of surface waters to maintain quality or flow, power, recreational activities, warm and cold water fisheries, wildlife habitat and fish spawning, and rare species habitat (LARWQCB 1994).

3.15.1.2 *Wheeler Ridge-Maricopa Water Storage District*

Facilities and District Areas

WRMWSD receives SWP water through 16 separate turnouts along the California Aqueduct via KCWA's Water Supply Contract with DWR. The WRMWSD distribution system consists of a series of pipelines, pumping plants, canals, and related facilities to deliver surface water from the California Aqueduct to approximately 72,000 acres of contract lands within the district. Contract lands are those lands within the district where landowners have executed long-term contracts with WRMWSD for the delivery of surface water, including SWP water, by the WRMWSD distribution system. These contract lands rely mainly on surface water to meet water demands, although many of the landowners use groundwater to supplement supplies when adequate surface water supplies are not available. Non-contract lands, those lands that do not hold long-term contracts for surface water, rely mainly on groundwater supplies to meet water demands. Surface water, including SWP water when available, can be delivered to certain non-contract lands within the district (generally those lands that historically have held contracts) via the existing WRMWSD distribution system.

Owners of contract lands pay an annual fixed cost based on the amount of land specified in the contract and annual variable costs based on the amount of water received by a particular contract land holder. Contract holders are required to pay the annual fixed cost regardless of the amount of water delivered to their land. Because contract holders can use local groundwater to irrigate their lands, the decision by individual landowners to enter into a contract (or likewise reduce a contract amount or cancel a contract), or to order surface water from WRMWSD instead of using local groundwater is predominantly an economic decision.

WRMWSD delivers untreated surface water predominantly for agricultural uses. Water delivered by WRMWSD is not intended for municipal or potable use without additional treatment.

Water Supply

WRMWSD obtains its water supplies from the SWP, other surface water sources, and groundwater sources, and delivers water to agricultural and industrial users within the district. WRMWSD also participates in a variety of other water management activities, including groundwater banking programs outside of the district and other in-lieu and direct groundwater recharge programs within the district.

LOCAL SURFACE WATER

WRMWSD is located along Wheeler Ridge and east of the Tejon Hills in southern Kern County. Sandy, Bitterwater, Santiago, Pleitito, Pleito, Salt, Tecuya, Grapevine, Pastoria, Tunis, El Paso,

Liveoak, and Caparell creeks flow from the south into the district; and Tejon Creek flows from the east into the district. Most of these creeks are intermittent and do not provide substantial water for irrigation or conveyance for irrigation water. Floods occur along the creeks and in areas where sheetflow may occur during high intensity rainfall (KCWA 1998).

The water quality of most of the streams entering the district is generally suitable for irrigation. Because these streams are ephemeral, however, they cannot be used as a reliable source of irrigation water supply for large-scale irrigation (KCWA 1998).

GROUNDWATER

Deep groundwater wells in the district initially were drilled in the mid-1940s. Over the next 20 years, groundwater was the primary water supply in the southern Kern County area. As a result, the groundwater levels declined by 150 to 200 feet (Bookman-Edmonston Engineering, Inc. [BE] 1995). In the late 1960s, the annual groundwater overdraft was estimated to be about 112,000 AF (BE 1995). Use of SWP water has allowed groundwater levels to rise to levels equal to, or above, those observed prior to the availability of SWP water (BE 1995).

The San Joaquin Valley is underlain by a large aquifer system generally referred to as the San Joaquin Valley Groundwater Basin. DWR has divided the San Joaquin Valley Groundwater Basin into smaller groundwater basins based on hydrologic differences (such as water quality and rate of movement of water through the basin). The Kern County Groundwater Basin is the part of the San Joaquin Valley Groundwater Basin that underlies the district. The basin is bounded on the north by the Kern County line and the Tule Groundwater Basin, on the east and southeast by the granitic bedrock of the Sierra Nevada and Tehachapi Mountain ranges, and on the west and southwest by the marine sediments of the San Emigdio and Coast Mountain ranges (DWR 2003a). The surface area of the basin is approximately 1.945 million acres, or 3,040 square miles (DWR 2003a). Total water in storage within the basin is estimated to be 40 million AF, and the dewatered (available) aquifer storage is estimated to be 10 million AF (DWR 2003a). Recharge to the basin results from the seepage of surface water from local streams along the eastern extent of the basin and the Kern River, as well as seepage of surface water from agriculture-related land uses, which is the largest contributor to recharge (DWR 2003a).

The White Wolf Groundwater Basin, a sub-basin to the Kern County Groundwater Basin, underlies the eastern portion of the district. The White Wolf sub-basin is separated from the remainder of the Kern County Groundwater Basin to the north by the White Wolf Fault, and to the southwest by the Springs Fault. The White Wolf Fault historically has been considered a barrier to movement of groundwater from the White Wolf sub-basin to the rest of the Kern County basin (BE 1967; BE 1975). Recent studies have indicated that the White Wolf Fault may act as only a partial barrier to groundwater flow, and only when the aquifer is stressed by pumping (Hagan 2001). The surface area of the White Wolf basin is approximately 52,000 acres (BE 1975). The volume of groundwater in storage has been estimated to be 2.5 million AF (BE 1975). Recharge to the White Wolf basin results from seepage of surface water from local streams and seepage of surface water from agriculture-related land uses.

Imported Water

KCWA holds the Water Supply Contract through which WRMWSD receives SWP water. KCWA's SWP Table A Amount in 2003 was 1,000,949 AF, and was 1,087,730 AF in 1998. This reduction in Table A Amount was due to several Table A Amount transfers KCWA completed with SWP Contractors since early 1999 consistent with the terms of the Monterey Amendment, including the 41,000 AF transferred to CLWA that is the subject of this EIR. WRMWSD's contract with KCWA included 263,200 AF of SWP Table A Amount in 1971[5]. This quantity was reduced to 251,370 AF in 1988, to 238,088 AF in 1996, and to 197,088 AF in 2000, after the Project was implemented.

Table 3.15-5 summarizes SWP Table A deliveries from 1990 through 2001. From 1990 to 1999 (before the Project was implemented), the SWP deliveries by WRMWSD averaged about 137,360 AF, with a minimum of zero AF in 1991 to a maximum of about 198,100 AF in 1997.

Other Water Management Actions

WRMWSD participates in a variety of other water management actions, including groundwater banking both within and outside of the district. Through its groundwater banking program, WRMWSD stores water when available and draws on that water in dry years to reduce shortages. WRMWSD's other water management actions consist of the following: ongoing in-lieu groundwater recharge within the district through delivery of surface water, when available, to non-contract lands; groundwater wells available to WRMWSD starting in 1992 and additional wells developed or acquired by WRMWSD since 1992; participation in the Kern Water Bank beginning in 1995; participation in the Pioneer Groundwater Banking Project initiated in 1997; and participation in the Berrenda Mesa Project beginning in 1999. These water management actions provide water supplies above and beyond the additional supplies that may be obtained from purchases and exchanges. In 1998, these water management actions could have supplied WRMWSD with an additional 59,500 AF, and by 2001 the amount had increased to over 88,000 AF. In 2002, the amount available from these other water management actions was over 106,000 AF.

Table 3.15-5 summarizes deliveries of water from these other water management actions from 1990 to 2001.

Total Supply

Table 3.15-5 summarizes the annual amount of SWP supply and other water supplies (such as the User Input Program[6], other transfers and exchanges, and other water management actions) available to WRMWSD, and the amount of water delivered within the district from 1990 to 2001. As identified in this table, except for 1990 and 1991, both drought years, WRMWSD's

5 As discussed in Chapter 1, the term Table A Amount in connection to WRMWSD is used for brevity. The parallel term used in the KCWA—WRMWSD member unit contract is "Contract Entitlement," sometimes referred to as "Table 1 Entitlement."

6 The User Input Program allows water users within the district to deliver water into the WRMWSD distribution system. The water user is then credited with an equal amount of water, less any losses, to be delivered to the user by WRMWSD within the same calendar year.

Table 3.15-5. Summary of Annual SWP and Other Water Supply to WRMWSD and Delivered within the District, 1990 to 2001
(all values in AF except percentages)

Year	Water Supply					Water Delivered				Table A Water Delivered as a Percent of Table A Supply	Total Delivered as a Percent of Total Supply
	SWP Table A Amount (AF)	SWP Allocation Percent[1]	SWP Table A Water Supply [2] (a)	Other Water Supply [3] (b)	Total Supply (a + b)	SWP Table A Water Delivered (c)	Carryover Water Delivered (d)	Other Water Delivered [3] (e)	Total Delivered (c + d + e)		
1990	251,370	50%	126,535	60,888	187,423	126,544	40,884	20,004	187,432	100%	100%
1991	251,370	0%	0	66,656	66,656	0	0	66,656	66,656	N/A[4]	100%
1992	251,370	45%	113,117	18,431	131,548	107,504	1,382	17,048	125,934	95%	96%
1993	251,370	100%	251,370	22,774	274,144	133,600	10,370	2,555	146,525	53%	53%
1994	251,370	53%	133,226	50,544	183,770	132,316	0	28,248	160,564	99%	87%
1995	251,370	100%	251,370	49,614	300,984	161,024	0	1,114	162,138	64%	54%
1996	238,088	100%	238,088	60,244	298,332	191,279	11,319	425	203,023	80%	68%
1997	238,088	100%	238,088	59,740	297,828	198,065	0	240	198,305	83%	67%
1998	238,088	100%	238,088	63,111	301,199	145,605	949	2,738	149,292	61%	50%
1999	238,088	100%	238,088	66,162	304,250	177,702	0	4,868	182,570	75%	60%
2000	197,088	90%	177,379	77,013	254,392	165,090	2,579	16,260	183,929	93%	72%
2001	197,088	39%	76,864	114,025	190,889	73,247	3,441	61,640	138,508	96%	73%

1. SWP allocation (i.e., the percent of Table A Amount that each Contractor could have received based on that year's supply availability and Contractor requests), as determined by DWR for the year. Based on agricultural Table A allocations for years prior to implementation of the Monterey Amendment in 1996.
2. SWP Table A water available equals SWP Table A Amount multiplied by the SWP allocation percentage.
3. Other water includes the following: SWP surplus water (unscheduled surplus water/Article 21 water); SWP Carryover water (refer to Table 3.15-3); WRMWSD wells; Blanca Rosa Improvement District wells; User Input Program water; Kern Water Bank; Pioneer Groundwater Banking Project; Berrenda Mesa Project; and other miscellaneous water supplies such as water purchased from the Drought Water Bank, and other water transfers and purchases. Of these sources, Article 21 water, Carryover water, other miscellaneous water supplies, and to some extent User Input Program water is not available for use in future years.
4. SWP water (Table A or surplus) was not available to Agricultural Contractors in 1991; therefore, no SWP water was delivered in this year.

water supply (both SWP Table A supply and total supply) has been greater than the amount of water delivered within the district.

Water Demand

A variety of factors, including the cost and availability of different water sources, the anticipated crop market value, anticipated or existing crop subsidies, and other factors (such as labor cost, regulation of the use of certain chemicals, etc.) are considered by farmers in the determination to plant or fallow fields, and to plant certain crops. Therefore, water demands within the district can vary substantially from year to year depending on irrigated acreage and the types of crops grown. Refer to section 3.2, Agricultural Resources for further discussion of crop types and irrigated acres within the district. In addition, demands within the district can vary depending on local hydrologic and climatic conditions (e.g., amount and timing of rainfall and local temperatures).

WRMWSD has estimated that under favorable economic conditions, demands within the contract lands are approximately 180,000 to 190,000 AF (personal communication, W. Taube 2002). In only four years from 1990 to 1999 (prior to the Project), did WRMWSD deliver greater than 180,000 AF of SWP water, indicating that favorable economic conditions occurred approximately 40 percent of the time. Demands within the district vary from year to year depending on agricultural economic conditions and hydrologic conditions (amount and timing of local rainfall), but demands within the district are not anticipated to materially increase in the future because the suitable agricultural lands within the district are already in agricultural production, and because WRMWSD does not provide potable water.

Water Quality

WRMWSD is within the jurisdiction of the CVRWQCB, Region 5c. Within the district, there are no impaired water bodies or established Total Maximum Daily Load (TMDL) programs[7] (CVRWQCB 1995, SWRCB 1998). Local surface water is of generally good quality. Water quality of imported supplies is primarily dependent on the SWP water quality, which is discussed above.

Groundwater quality varies across the district, and there are portions of the district in which groundwater is not used due to poor quality. These areas are generally located in the most westerly portions of the district. Within the district, the Kern County Groundwater Basin has TDS concentrations that generally increase from east to west, with concentrations ranging from 300 to 2,600 milligrams per liter (mg/L) (BE 1995). TDS concentrations within the White Wolf

7 The federal Clean Water Act requires states to designate appropriate water uses to be protected and directs states to set water quality criteria based on these uses (United States Environmental Protection Agency [EPA] 2000a). Under section 303(d) of the Clean Water Act, states, territories, and authorized Indian tribes are required to submit lists to the EPA detailing water bodies for which existing pollution controls are insufficient to attain or maintain water quality standards. After submitting the list of "impaired waters" to the EPA, states must develop a TMDL plan to limit excess pollution. A TMDL is a number that represents the assimilative capacity of water for a particular pollutant, or the amount of a particular pollutant that the waterbody can receive without impacting its beneficial uses. TMDL plan implementation can be accomplished through revised permit requirements (for point source contaminants) and through implementation of Best Management Practices (EPA 1999).

Groundwater Basin range from 300 to 700 mg/L in the eastern two-thirds of the basin and 1,000 to 3,500 mg/L in the western one-third of the basin (BE 1995).

3.15.1.3 *Castaic Lake Water Agency*

CLWA is the wholesale water supplier for the Santa Clarita Valley. In addition, CLWA's Santa Clarita Water Division is one of four retail water purveyors within the Santa Clarita Valley. The other three retailers are Los Angeles County Waterworks District #36, Newhall County Water District and Valencia Water Company.

Facilities

CLWA receives SWP water through the terminus of the West Branch of the California Aqueduct at Castaic Lake. Surface water supplies (whether derived from local or imported water supplies) require treatment (filtration and disinfection) prior to distribution. SWP water from Castaic Lake is treated at the ESFP and RVWTP (both owned and operated by CLWA), and is distributed to the four water retailers through a system of pipelines.

The RVWTP is planned for future expansion from its current 30 mgd treatment capacity, to 60 mgd and eventually to 90 mgd as demands for treated water increase. This expansion was programmatically evaluated in CLWA's Capital Program Final EIR (CLWA 1988). In April 2003, CLWA approved an upgrade of treatment technology and a capacity expansion at the ESFP from 33.6 mgd to 56 mgd. The combined capacity of the two treatment plants currently is approximately 63.6 mgd. When the ESFP is expanded, the total treatment capacity will increase to about 86 mgd. Without the Project, CLWA's Water Supply Contract provides for a delivery maximum of 99 cfs for its 54,200 AF of Table A Amount. This delivery rate is approximately 65 mgd, or similar to the current treatment capacity, and would yield a maximum monthly delivery of approximately 6,000 AF. With the Project, CLWA's contractual delivery limit increases to 150 cfs (or approximately 98 mgd, yielding a maximum of approximately 9,000 AF per month) for the 95,200 AF of Table A Amount.

Water Supply

The current water supply for the Santa Clarita Valley is derived from both local and imported sources. The principal components of this supply are groundwater from the Alluvial Aquifer, groundwater from the Saugus Formation, and imported water from the SWP. A variety of future water sources (including local recycled[8] water, desalted ocean water, increased Saugus Formation production, conjunctive use of local or non-local groundwater basins, and other imported water sources) could be developed to supply future development planned for the CLWA service area.

CLWA completed an analysis of its water supply as part of the UWMP (CLWA 2000). Prior to that analysis, CLWA had determined that it could reliably depend on the SWP to deliver about half of its Table A Amount (about a 25,000 AF supply vs. 54,200 AF of Table A) in any year (CLWA 1996). The UWMP is scheduled to be updated in 2005.

8 Initial deliveries of recycled water commenced in 2003.

Table 3.15-6 summarizes water supplies available to meet demands in the CLWA service area in 1998, prior to the Project. SWP supplies identified in the table are based on results from DWR's SWP operations model, DWRSIM (discussed in section 3.15.2.2), with SWP water supplies allocated among Contractors under the Water Supply Contract provisions then in effect (i.e., based on the Monterey Amendment provisions). The table displays water supplies available under various hydrologic conditions.

Table 3.15-6. 1998 Water Supplies for the CLWA Service Area
(all values in AF)

Hydrologic Condition[1]	SWP Supplies		Existing Local Supplies		*Total*
	Table A[2]	*SWP Flexible Storage*[3]	*Alluvial Aquifer*	*Saugus Formation*	
Average Year	46,500	0	35,000	11,000	**92,500**
Single Dry Year	12,100	4,680	32,500	15,000	**64,280**
Multiple Dry Year Period	24,000	1,170	32,500	15,000	**72,670**

1. The average year supply is the average amount of water available based on DWRSIM model results over its entire period of hydrologic record. The single dry year supply is the supply available in the single year with the lowest total SWP deliveries based on DWRSIM model results (1977). Multiple dry year period supply is the average amount of water available over the four consecutive drought years of 1988 through 1991 based on DWRSIM model results. (See section 3.15.2.2).
2. Values based on CLWA's Table A Amount in 1998 (prior to the Project) of 54,200 AF, and percentages for Table A deliveries based on DWR's DWRSIM SWP operations model (discussed in section 3.15.2.2).
3. CLWA may withdraw up to about 4,680 AF of water from Castaic Lake as "flexible storage." It is assumed that CLWA would use this supply only in drier years, with the entire amount used in the one single dry year. For the multiple dry year, it is assumed that the entire amount would be used during the four-year period, or an annual average of 1,170 AF.

Table 3.15-7 summarizes existing (2002) water supplies available to meet demands in the CLWA service area, including the Project. SWP supplies are based on the data presented in DWR's SWP Delivery Reliability Report, with SWP water supplies allocated among Contractors under the Water Supply Contract provisions currently in effect (i.e., based on the Monterey Amendment provisions). The table displays water supplies available under various hydrologic conditions. In 2002, CLWA was able to store some of its allocated SWP Table A supply on a short-term basis (10 years or less) pursuant to a groundwater banking agreement with the Semitropic Water Storage District. CLWA may withdraw up to 21,600 AF within 10 years. Similar to 2002, in February 2004, CLWA was again able to store up to 35,000 AF of its allocated 2003 SWP Table A supply on a short-term basis (10 years or less) pursuant to a groundwater banking agreement with the Semitropic Water Storage District. CLWA may withdraw up to 31,500 AF within 10 years. In addition to the supplies identified in Tables 3.15-6 and 3.15-7, CLWA may obtain additional surface supplies on a limited basis when surplus water is available within the SWP system, along with various other SWP and non-SWP purchases and exchanges.

Local Surface Water

The primary drainage course in the CLWA service area is the Santa Clara River. Principal tributaries to the Santa Clara River include creeks flowing from Mint, Bouquet, San Francisquito, Castaic Creek, Oak Spring, Sand, and Potrero canyons. Water flow in the stream

Table 3.15-7. Existing Water Supplies for the CLWA Service Area

(all values in AF)

Hydrologic Condition[1]	SWP Supplies			Existing Local Supplies		*Total*
	Table A[2]	*SWP Flexible Storage*[3]	*Semitropic Storage*[4]	*Alluvial Aquifer*	*Saugus Formation*	
Average Year	68,300	0	0	35,000	11,000	114,300
Single Dry Year	18,600	4,680	7,200	32,500	15,000	77,980
Multiple Dry Year Period	34,300	1,170	5,400	32,500	15,000	88,370

1. The average year supply is the average amount of water available based on DWRSIM model results over its entire period of hydrologic record. The single dry year supply is the supply available in the single year with the lowest total SWP deliveries based on DWRSIM model results (1977). Multiple dry year period supply is the average amount of water available over the four consecutive drought years of 1988 through 1991 based on DWRSIM model results. (See section 3.15.2.2).
2. Values based on current Table A Amount of 95,200 AF (which includes the Project), and percentages for Table A deliveries from DWR's SWP Delivery Reliability Report (DWR 2003b).
3. CLWA may withdraw up to about 4,680 AF of water from Castaic Lake as "flexible storage." It is assumed that CLWA would use this supply only in drier years, with the entire amount used in the one single dry year. For the multiple dry year, it is assumed that the entire amount would be used during the four-year period, or an annual average of 1,170 AF.
4. In 2002, CLWA was able to store some if its allocated SWP Table A supply on a short-term basis (10 years or less) under a groundwater banking agreement with the Semitropic Water Storage District. Under this agreement, CLWA stored 24,000 AF of SWP water, and after consideration for losses, may withdraw up to 21,600 AF within 10 years. It is assumed that CLWA could expect to withdraw up to 1/3 of this amount in the single dry year, and the entire amount would be used during the four-year dry period. It is assumed that CLWA would only use this supply in drier years.

canyons and the upper Santa Clara River is ephemeral, and diminishes rapidly after most rainfall events. Surface water resources include the Santa Clara River and Castaic Lake.

Primary flood hazard areas occur in and along natural drainage channels, such as the Santa Clara River and its tributaries, and in areas where sheetflow may occur during high intensity rainfall (CLWA 1988, CLWA 1998a). CLWA does not utilize local surface water as a water supply, although landholders within the service area may use runoff from these natural drainages as a water supply.

Groundwater

The existing local water supply in the CLWA service area is groundwater extracted from the Alluvial Aquifer and from the underlying Saugus Formation. Historically, groundwater has been the primary source of water in the Santa Clarita Valley. Since 1980, local groundwater supplies have been supplemented with imported water from the SWP.

Although the Alluvial Aquifer is the smaller of the two-aquifer systems as measured by storage capacity, most water wells within the CLWA service area are drilled into this aquifer. In his original assessment of the Alluvial Aquifer, Slade (1986) estimated the practical perennial yield of the Alluvial Aquifer to be 31,600 AFY to 32,600 AFY. The total annual groundwater production from the Alluvial Aquifer over the last 10 years (urban and agricultural production) has averaged approximately 35,000 AFY, about 10 percent higher than the "practical perennial yield" without any evidence of undesirable conditions that might be an indication of aquifer

overdraft (Slade 2002). Slade (2002) suggested that the primary reason that the Alluvial Aquifer has been able to supply groundwater in volumes that are in excess of its previously estimated perennial yield is due to the increase in imports of SWP water by CLWA. For example, most of the historical period on which Slade's original work was based predated the importation of SWP water. Based on discharge records published by the LARWQCB (2002), approximately half of this additional water is returned to the Alluvial Aquifer in the form of discharge from the two wastewater reclamation plants located along the Santa Clara River. Additionally, percolation of SWP water from various municipal and industrial uses (such as landscape irrigation) also contributed to recharge of the Alluvial Aquifer.

In this recent updated report on the groundwater basin, Slade (2002) identified the operational yield of the Alluvial Aquifer to be about 30,000 to 40,000 AF in normal weather years, and 30,000 to 35,000 AF in dry years. In updating his original (1986) analysis of the yield of the Alluvium, Slade recognized that the analytical methodology employed in his original work was no longer applicable, primarily due to a combination of stable groundwater levels and storage, and the progressive changes in the hydrology of the basin as a result of the increasing importation of supplemental water (from the SWP). In his updated analysis, Slade proposed that the concept of operational yield of the basin was more applicable to current conditions in the basin since it allows fluctuations in year-to-year yield in response to fluctuating hydrologic conditions, yet protects the renewability of the groundwater by retaining longer-term pumping within the basin's perennial yield on an average basis. The normal and dry-year ranges of basin yield were based by Slade on that operational yield concept.

Recharge amounts are highly variable depending on annual precipitation, with documented annual water level recoveries of 70 feet or more during wet years that follow dry periods. Multi-year dry periods have in the past resulted in water level decreases of as much as 100 feet from the beginning to the end of the multi-year drought period, particularly in Soledad Canyon. However, groundwater levels have remained very stable over time (and near the ground surface) throughout the western part of the basin, generally west of Bouquet Canyon. This relative stability occurs because the regional discharge zone for the valley's groundwater resources is the alluvium west of Interstate 5. In this area, the Saugus Formation discharges to the alluvium, which in turn discharges to the Santa Clara River. The discharge zone is present in this area because of the east-west movement of groundwater and the bedrock materials that form the western margin of the basin aquifer systems at Blue Cut (just to the west of the Los Angeles County / Ventura County line). The shallow and stable nature of the groundwater levels in this area are further supported by a continual supply of recharge water from the treatment plant discharges described above.

From 1980 to 2002, groundwater extraction from the Alluvial Aquifer for urban uses ranged from approximately 8,700 to 27,200 AFY, while total extraction for all uses ranged between 20,300 and 43,400 AFY. Average extractions from the Alluvial Aquifer during this same period were approximately 17,500 AFY for urban uses and 30,400 AFY for all uses (SCVWP 2002). The latter remains well within all historical estimates of the yield of the Alluvial Aquifer. The use of one well in the Alluvial Aquifer has been suspended due to the detection of perchlorate. (Groundwater quality in the Alluvial Aquifer is discussed in more detail under the subheading Groundwater Quality.)

The Saugus Formation contains much greater quantities of groundwater than the Alluvial Aquifer. In his original assessment of the Saugus Formation, Slade (1988) estimated that approximately 1.41 million AF of potentially useable groundwater was present from depths of 500 to 2,500 feet in the Saugus Formation. More recent information on the thickness of the alluvium and the degree of potential drawdown interference between adjacent Saugus Formation and Alluvial Aquifer wells has supported a re-calculation of groundwater in storage in the Saugus Formation to approximately 1.65 million AF (Slade 2002).

The principal source of recharge to the Saugus Formation is precipitation on exposed outcrops and direct infiltration from the overlying alluvium. In his initial assessment of the Saugus Formation, Slade (1988) estimated the combined potential recharge to the Saugus Formation from these two sources to be from 20,000 to 22,000 AFY in wet periods, and from 11,00 to 13,000 AFY in dry periods. The Saugus Formation has supplied about 7,500 to 15,000 AF in normal weather years, and 11,000 to 15,000 AF in dry years (CLWA 2000). No long-term continuous or permanent decline in either water levels or the amount of groundwater in storage has occurred under this historical range of pumping (Slade, 2002). Based on the amount of water in storage and the historic aquifer performance, Slade (2002) identified that production from the Saugus Formation for dry period water supply could be increased from 15,000 to 20,000 AFY, and ultimately to 35,000 AFY if dry conditions continue. The increase to 35,000 AFY would be temporary and would need to return to, or be reduced below, the historical range of 7,500 to 15,000 AFY once rainfall patterns returned to normal in order to recharge, or replenish, storage and avoid long-term adverse effects to the aquifer.

From 1980 to 2002, groundwater extractions from the Saugus Formation for urban uses ranged between approximately 2,700 and 14,400 AFY, while total extraction for all uses ranged between about 3,700 and 14,900 AFY. Average extraction from the Saugus Formation during this same period has been approximately 6,200 AFY for urban uses and 6,800 AFY for all uses (SCVWP 2002); these values remain well within all historical estimates of the yield or recharge potential of the Saugus Formation. The use of four wells in the Saugus Formation has been suspended due to the detection of perchlorate. (Groundwater quality in the Saugus Formation is discussed in more detail under the subheading Groundwater Quality.)

There are numerous wells in the Saugus Formation, other than the wells that were voluntarily shut down due to perchlorate contamination. Additionally, other Saugus wells are planned for construction, including those included in CLWA's Capital Improvements Program. If operated continuously during the year, the wells not subject to perchlorate contamination have the capability to produce approximately 21,000 AFY (personal communication, L. Takaichi 2004). However, a more realistic production capability is 15,000 AFY due to periodic shutdown for maintenance, monitoring, or storage limitations (personal communication, L. Takaichi 2004). The current groundwater production capability from the Saugus Formation is estimated to be 5,000 AFY during normal years but could reach 15,000 AFY during dry periods or other periods of need (personal communication, L. Takaichi 2004). These capabilities will increase as additional production wells in the Saugus Formation are completed and a response action to perchlorate contamination is implemented.

With regard to the impacts of perchlorate on the water supply capacity of several wells as noted above, field studies and groundwater modeling activities are in progress to evaluate how best

to hydraulically contain the portion of the aquifer system where production wells have been shut down, while simultaneously preventing perchlorate movement to currently unimpacted areas. The field studies have included the installation and sampling of monitoring wells at multiple depths and locations on and around the Whittaker-Bermite site, the most likely source of perchlorate; water level monitoring in these wells; aquifer testing of two unimpacted water supply wells; and groundwater velocity testing in alluvial monitoring wells located between the site and the Santa Clara River. These studies have helped the Purveyors and the Whittaker Corporation further refine the current understanding of groundwater flow patterns in specific areas on and near the site (such as along the Holser Fault). This information has been incorporated into a regional groundwater flow model that has been developed by the Purveyors and whose calibration and construction was recently reviewed and approved by the DTSC. The model is being used to identify a pumping scheme that would meet the objectives of restoring the lost water supply from the impacted wells (with wellhead treatment) while simultaneously containing perchlorate and hydraulically limiting its movement downgradient to unimpacted wells and other portions of the aquifer system where new water supply wells might be constructed. The modeling analysis accounts not only for the pumping of impacted wells, but also (a) the UWMP's pumping plan for unimpacted wells throughout the Santa Clarita Valley and (b) the significant year-to-year variation in local hydrology (especially groundwater recharge) that occurs in the Valley (CH2MHill 2004). The modeling simulations will be used to guide selection of a final pumping plan for the impacted Alluvial Aquifer well and the impacted Saugus Formation wells. The selection of a final pumping plan will be made jointly by the Purveyors and the Whittaker Corporation, with regulatory oversight and permitting performed by CA DHS with technical support from DTSC. (Groundwater quality and perchlorate are discussed in more detail under the subheading Groundwater Quality.)

Imported Water

CLWA provides imported water supplies via the SWP to the CLWA service area. CLWA facilities and supplies of SWP water are described above.

SWP deliveries to CLWA from 1990 through 2002 are provided in Table 3.15-8. SWP supplies supplement local water sources and are used to meet the municipal and industrial demand of the region. From 1990 to 1999 (prior to implementation of the Project), CLWA's use of its SWP supply averaged approximately 18,000 AF. This low level of SWP delivery (relative to CLWA's Table A Amount) is a reflection of generally low demand in the CLWA service area for this water during this period and is not due to limited SWP supplies. With the exception of 1991, during 1990 to 1999 CLWA received adequate SWP supplies to meet its demands. As is shown on Table 3.15-8, SWP deliveries to CLWA generally have increased over the past decade because demands within the service area have risen during this time.

Total Supply

Table 3.15-8 shows total water deliveries in the CLWA service area from 1990 through 2002. These include deliveries by the four municipal water purveyors, along with groundwater pumped by agriculture and miscellaneous uses. Agriculture and miscellaneous uses include irrigated agriculture, landscape irrigation, golf course irrigation, and other miscellaneous uses within the service area.

Table 3.15-8. Summary of Annual SWP and Local Groundwater Use within the CLWA Service Area, 1990 to 2002

Year	*SWP Table A Amount (AF)*	*SWP Allocation[1] (Percent)*	*SWP Deliveries (AF)*	*Local Groundwater Deliveries[2] (AF)*	*Agriculture and Miscellaneous Uses[3] (AF)*	*Total (AF)*
1990	41,500	100	21,600	21,500	11,280	54,380
1991	54,200	30	7,970	31,800	10,280	50,050
1992	54,200	45	14,900	27,300	12,150	54,350
1993	54,200	100	13,840	30,000	11,220	55,060
1994	54,200	53	14,700	31,600	13,870	60,170
1995	54,200	100	17,000	28,700	14,350	60,050
1996	54,200	100	18,870	32,100	15,350	66,320
1997	54,200	100	23,220	32,000	16,390	71,610
1998	54,200	100	20,270	28,600	13,610	62,480
1999	54,200	100	27,300	30,000	17,140	74,440
2000	95,200	100	32,580	28,400	15,320	76,300
2001	95,200	39	35,370	25,320	16,090	76,780
2002	95,200	70	41,770	26,460	16,810	85,040

Source: SCVWP 2003.

1. SWP allocation (i.e. the percent of Table A Amount that each Contractor could have received based on that year's supply availability and Contractor requests), as determined by DWR for the year. The values shown are M&I Table A allocation percentages. In 1991, the Devil's Den Water District permanently transferred 12,700 AF of agricultural Table A Amount to CLWA. For years prior to implementation of the Monterey Amendment in 1996, agricultural Table A allocations were as follows: 0 percent in 1991; 45 percent in 1992; 100 percent in 1993; 53 percent in 1994; and 100 percent in 1995.
2. Groundwater deliveries by municipal water purveyors within the CLWA service area.
3. Includes groundwater pumped by, and SWP water delivered to, agricultural and miscellaneous uses within the CLWA service area. SWP deliveries to agricultural and miscellaneous uses within the CLWA service area occurred from 1992 to 2000, with a maximum of approximately 1,070 AF delivered in 1997.

Water Demand

In 1998, the total water demand within the CLWA service area in 2010 was projected to be approximately 106,300 AF. Table 3.15-9 provides CLWA's projected total future water demands in years of average local precipitation based on the UWMP, the most recent future water demand projections by CLWA. CLWA's demands vary from year-to-year depending on local hydrologic and meteorologic conditions, with demands generally increasing in years of below average local precipitation and decreasing in years of above average local precipitation. Based on various planning factors, CLWA's average year demand is expected to increase to approximately 75,100 AF in 2005 and 102,500 AF by 2020, or approximately 1,370 AFY (CLWA 2000). This is consistent with the annual average increase in CLWA's SWP deliveries from 1990 to 2001 of approximately 1,150 AFY (SCVWP 2002).

Table 3.15-9. CLWA's Projected Total Water Demand in Average Hydrologic Years
(AFY; reductions in parenthesis)

	2005	2010	2015	2020
M&I	66,600	77,700	90,900	106,000
Other Demand[1]	15,100	12,400	9,800	7,100
Subtotal	*81,700*	*90,100*	*100,700*	*113,100*
Projected Conservation	(6,600)	(7,700)	(9,100)	(10,600)
Total	**75,100**	**82,400**	**91,600**	**102,500**

Source: CLWA 2000.
1. Includes irrigated agriculture and miscellaneous uses.

Because growth has exceeded that projected when the UWMP was prepared in 2000, actual demand exceeds projected demand. The UWMP is scheduled to be updated in 2005. This EIR uses the best available data. New UWMP data is not available at this time.

In 2001, CLWA signed the Memorandum of Understanding Regarding Urban Water Conservation in California (MOU) on behalf of the CLWA service area, as recommended in the UWMP. By signing the MOU, CLWA became a member of the California Urban Water Conservation Council (CUWCC) and pledged to implement all cost-effective Best Management Practices (BMPs) for water conservation. CLWA has implemented 11 of the 14 BMPs recommended by CUWCC. CLWA has estimated that conservation measures within the service area can reduce total water demands by 6,600 AF in 2005 and up to 10,600 AF in 2020, or about 10 percent of demand.

Water Quality

With regard to water quality, the main regulatory driver for CLWA is the Safe Drinking Water Act[9], because CLWA, as a wholesale water purveyor, must deliver water that meets the applicable drinking water standards.

EXISTING WATER QUALITY

Existing water quality conditions for urban water uses in the CLWA service area are documented in the Santa Clarita Valley 2002 Water Quality Report (CLWA 2002). That report provides the cumulative results of thousands of water quality tests performed in the Santa Clarita Valley area on CLWA's and the local purveyors' water supplies. Table 3.15-10 provides basic water quality data for CLWA's drinking water supplies, which includes test results from both SWP water and groundwater.

9 The Safe Drinking Water Act is intended to protect public health by regulating the nation's public drinking water supply, and requires a variety of actions to protect drinking water and its sources. The Act authorizes the EPA to set national health-based standards for drinking water to protect against both naturally occurring and man-made contaminants that may be found in drinking water.

Table 3.15-10. CLWA Drinking Water Quality Summary

Constituent[1]	*MCL*[2]	*Typical Value*	*Range*
Turbidity, nephelometric turbidity Unit (NTU)	5	0.08	0.05-0.40
Chloride[3], mg/L	250	86	65-112
Nitrate (as NO3), mg/L	45	2-2.8	2.0-2.8
Fluoride, mg/L	2	0.15	0.12-0.18
Trihalomethanes (THMs)	100	86	65-112
Haloacetic Acids (HAA5)	60	34	16-81
Coliform, percent positive samples	5	0	0-2
Sulfates, mg/L	250	52	38-64
TDS, mg/L	500	314	--
pH	None	7.86	7.5-8.2

Source: CLWA 2002b.

1. Unless stated otherwise, all tests were run in 2001.
2. A MCL (Maximum Contaminant Level) is the maximum permissible level of a contaminant in drinking water that is delivered to any user of a public water system.
3. The chloride standard is a Secondary Standard. Secondary Standards are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water. EPA recommends secondary standards to water systems but does not require systems to comply. States may choose to adopt them as enforceable standards, however.

Local Surface Water Quality

In accordance with the Porter-Cologne Act and the Clean Water Act, the LARWQCB developed the Water Quality Control Plan for the Coastal Watersheds of Los Angeles and Ventura Counties (Basin Plan), as amended (LARWQCB 1994). The Basin Plan addresses five constituents of concern that are relevant for inland surface water and groundwater (TDS, sulfate, chloride, boron, and nitrogen) and considers local hydrology, land use, population, sensitive environmental resources, and established water quality objectives for each of the watersheds, including the Santa Clara River. New and proposed water quality objectives for the Santa Clara River watershed have either been established or are currently undergoing discussion for future approval and/or consideration. Within the Santa Clara River watershed, chlorides have been prioritized for further study, with higher priority given to nutrients. Other constituents are currently (2003) not prioritized.

On February 4, 2003, the SWRCB adopted the 2002 Clean Water Act Section 303(d) List of Water Quality Limited Segments for Surface Waters in California (referred to herein as "Section 303(d) List") (SWRCB 2003b). This list identifies water quality-limited water bodies and pollutants of concern for which a TMDL must be developed. Reach 3[10] of the Santa Clara River (Freeman Diversion to A Street) was listed as impaired for ammonia, chloride, and TDS. Reach 7 (Blue Cut near the Los Angeles/Ventura County line to West Pier Hwy 99 Bridge) was listed as

10 The Santa Clara River is divided into nine reaches for management purposes. Reach 1 begins at the Santa Clara River Estuary at the Pacific Ocean. Reach numbers increase upstream.

impaired for chloride, high coliform count, nitrite and nitrate, and delisted for ammonia. Reach 8 (West Pier Hwy 99 to Bouquet Canyon Road) was listed as impaired for chloride and for high coliform count. Lastly, Reach 9 (Bouquet Canyon Road to above Lang Gaging Station) was listed as impaired for high coliform count.

Chlorides – In recent years, high concentrations of chloride have been measured in waters of the Santa Clara River watershed. These concentrations are primarily due to various types of loading during beneficial water uses, including agricultural uses (irrigation and leaching); commercial uses; domestic uses; and water treatment (e.g., water softeners) (LACSD 2002a). In addition to loading from urban runoff, imported water in certain year types, and the discharge of treated wastewater, naturally occurring chloride concentrations contribute to excessive chloride concentrations in Santa Clarita Valley groundwater (LARWQCB 1999b). The identification of excessive chloride concentrations resulted in the addition of several reaches of the Santa Clara River in the Section 303(d) List, as identified above. Table 3.15-11 provides a timeline summary of the regulatory actions taken to regulate chloride loading within the Santa Clara River.

Table 3.15-11. Regulatory Timeline for Chloride

Time	*Action*
January 1997	LARWQCB adopts a Chloride Policy, which consists of Resolution No. 97-02: Amendment to the California Regional Water Quality Control Plan for the Los Angeles Region, to Incorporate a Policy for Addressing Levels of Chloride in Discharges of Wastewaters.
Fiscal Year 1997/1998	Santa Clara River Reaches 3, 7 and 8 are added to the Section 303(d) List for chloride impairment, and TMDL monitoring commences.
October 2002	LARWQCB amended the 1994 Basin Plan to incorporate a TMDL for chloride for the upper Santa Clara River, establishing the 100 mg/L surface water quality objective for Reaches 7 and 8 (SWRCB 2002).
February 2003	SWRCB remanded the chloride TMDL back to the LARWQCB to consider sequentially phasing TMDL implementation tasks, extending the interim limits, and reevaluation of the chloride objective itself (SWRCB 2003a).
March 2003	LACSD adopts an ordinance that prohibits the installation and use of new self-regenerating water softeners in the Santa Clarita Valley to help lessen the chloride loading in the region (LACSD 2002a).
May 2003	EPA is developing chloride TMDLs for Reaches 3, 7 and 8 of the Santa Clara River, in the event that the LARWQCB does not adopt it's chloride TMDL by June 2003 (EPA 2003).
July 2003	The LARWQCB adopted the chloride TMDL in light of the Remand Resolution, and revised the Basin Plan to incorporate the chloride TMDL.

In October 2002, the LARWQCB amended the 1994 Basin Plan to incorporate a TMDL for chloride for the upper Santa Clara River, establishing a 100 mg/L surface water quality objective for Reaches 7 and 8 to protect the agricultural beneficial use of the river (SWRCB 2002). The TMDL is intended to reduce the sources in the upper Santa Clara River by reducing the sources of chloride discharged from households and industries and, if necessary, by constructing a chloride removal system to treat water reclamation plant effluent before discharge to the Santa Clara River. On February 19, 2003, the SWRCB remanded the chloride TMDL back to the LARWQCB to consider sequentially phasing TMDL implementation tasks,

extending the interim limits, and reevaluation of the chloride objective itself (SWRCB 2003a). The LARWQCB adopted the 100 mg/L chloride TMDL, and incorporated it into the Basin Plan on July 10, 2003 (LARWQCB 2003a). Because the State was not able to complete adoption of a chloride TMDL for Reach 3 (80 mg/L) of the Santa Clara River by the June 22, 2003 deadline, EPA is establishing the TMDL for Reach 3 to fulfill its legal obligations (EPA 2003). The EPA is also establishing chloride TMDLs for Reaches 5 and 6[11] (100 mg/L) at this time, at the request of the LARWQCB.

The Los Angeles County Sanitation Districts (LACSD) have compiled the Santa Clarita Valley Joint Sewerage System Chloride Source Report, a detailed and comprehensive study of the sources of chloride loading in the Santa Clarita Valley (LACSD 2002a). That study identified that residential water use, primarily from self-regenerating water softeners, greatly contributes to the chloride loading. Based on the results of that study, the LACSD adopted an ordinance that prohibits the installation and use of new self-regenerating water softeners in the Santa Clarita Valley. This ordinance took effect in March 2003.

Nitrogen –The LARWQCB adopted a nutrient TMDL in late 2003 for the upper Santa Clara River that addresses the Section 303(d) List for nitrate plus nitrite impairment (LARWQCB 2003b). The TMDL limits nitrate (NO_3), nitrite (NO_2), ammonia (NH_3), and total nitrogen (N). Principal sources of nitrogen to a watershed typically include discharges from water reclamation plants and runoff from agricultural activities. Elevated nitrogen concentrations (ammonia, nitrate, and nitrite) can cause impairments in warm water fish and wildlife habitat, along with contributing to eutrophic effects such as algae growth and low dissolved oxygen.

Other Impairments – Reaches 7, 8, and 9 of the Santa Clara River are listed as impaired on the Section 303(d) List for fecal coliform. Sources of coliform can include discharges from water reclamation plants, urban stormwater runoff, and septic tanks. A coliform TMDL for the upper Santa Clara River is scheduled for completion in 2006.

Typical data ranges for the Santa Clara River and Basin Plan objectives are provided in Table 3.15-12. Water quality in the Santa Clara River is considered generally impaired due to high concentrations of chlorides (LARWQCB 1999b). Much of the water present in the Santa Clara River west of Bouquet Canyon Road is a result of discharges from current wastewater treatment and reclamation plants. Beneficial uses for Pyramid and Castaic lakes as designated by the LARWQCB were presented in the discussion of the SWP facilities.

Imported Water Quality

Raw water from Castaic Lake delivered to the ESFP and RVWTP is generally of high quality. CLWA produces water that meets drinking water standards set by the EPA and the California Department of Health Services (CA DHS) (SCVWP 2003). A summary of the water quality data for 1990 to 2001 for Castaic Lake can be found in Table 3.15-4, in the discussion of SWP water quality.

11 The 303 (d) list identifies the impaired Reaches as 3, 7, and 8. Reaches 7 and 8, however, correspond to those identified as Reaches 5 and 6 in the Basin Plan and in the chloride TMDL. EPA is using the designations of Reaches 5 and 6 in the TMDL to correspond to the Basin Plan (EPA 2003).

Table 3.15-12. Water Quality Summary for the Santa Clara River

Constituent	Applicable Objective/Criteria	Typical Data Ranges Resulting in Impairment	303(d) Listed Waters/ Santa Clara River Reaches
Ammonia[1]	0.53-2.7 mg/L	ND-4.9 mg/L (mean of 1.4 ± 1.3)	Reaches 3, 7, and 8
Chloride	80-100 mg/L	10-138 mg/L (mean of 105 ± 21)	Reaches 3, 7, 8, and 9
Nitrate + Nitrite	≤ 10 mg/L	0.3-15.4 mg/L (mean of 5.7 ± 2.4)	Reach 8
Organic enrichment/low Dissolved Oxygen	5.0-7.0 mg/L[2]	0.8-11.0 mg/L (mean of 7.7 ± 2.5)	Reaches 8 and 9
Coliform	100-400 MPN/100ml[3]	20-24000 MPN/100ml	Estuary and Reach 8
Sulfate	150 mg/L	ND	Reach 9

Source: LARWQCB 2001.

Abbreviations: mg/L = milligrams per liter; MPN = most probable number; ND = none detected; ml = milliliter.

1. Basin Plan numeric objective varies depending on pH and temperature. The general range is 0.53-2.7 mg/L of total ammonia (at average pH and temp.) in waters designated as warm to protect against chronic toxicity and 2.3-28.0 mg/L to protect against acute toxicity.
2. Annual Basin Plan numeric objective mean greater than 7.0 mg/L and no single sample less than 5.0 mg/L.
3. Inland objective: fecal coliform not to exceed log mean of 200 most probable number (MPN)/100 milliliters (ml) in 30-day period and not more than 10 percent of samples exceed 400 MPS/100ml. Beach objective: total coliform not to exceed 1,000 MPN/100 ml in more than 20% of samples in 30 days and not more than 10,000 MPN/100 ml at any time.

GROUNDWATER QUALITY

Groundwater monitoring in Alluvial Aquifer wells has shown chloride concentrations to be below the Basin Plan groundwater chloride objective of 150 mg/L, and nitrate concentrations to be below the 10 mg/L Basin Plan groundwater objective (LADRP 2003). The 1994 Basin Plan includes water quality objectives for bacteria, chemical constituents and radioactivity, mineral quality, nitrogen (nitrate, nitrite), taste and odor, TDS, sulfate, chloride and boron objectives for groundwater. All Basin Plan groundwater objectives are designed to protect groundwater for municipal drinking water purposes.

The groundwater quality of the Alluvial Aquifer is generally acceptable quality for domestic use without treatment, although Alluvial Aquifer water produced for domestic use is disinfected by the domestic water purveyors prior to delivery. The groundwater is generally of calcium bicarbonate, calcium sulfate or calcium-bicarbonate sulfate character, depending on location within the aquifer. TDS concentrations in the Alluvial Aquifer generally increase in concentration from approximately 550 to 610 mg/L in the eastern portion of the aquifer to approximately 660 to 710

mg/L in the western portion of the aquifer (Slade 2002). Other inorganic constituents follow similar trends.

The groundwater quality of the Saugus Formation is generally acceptable for domestic use without treatment, although Saugus Formation water produced for domestic use is disinfected by the domestic water purveyors prior to delivery. The groundwater is generally of calcium bicarbonate or calcium-magnesium sulfate character. Water quality generally deteriorates near the perimeter or base of the aquifer (e.g., near the geologic contact between the Saugus Formation and the underlying Pico Formation). Calculations of TDS concentrations in the Saugus Formation indicate levels greater than 800 ppm for both shallow (500 to 1,000 feet) and deep (2,000 to 2,500 feet) aquifers within the Saugus Formation (Slade 1988).

Groundwater produced by the water purveyors in the CLWA service area consistently meets drinking water standards set by the EPA and the CA DHS. In 2002, the local purveyors conducted additional water quality monitoring for constituents that lack drinking water standards in compliance with the federal and state Unregulated Contaminant Monitoring Rule (UCMR) regulations (SCVWP 2003).

Perchlorate – As of April 2003, according to the CA DHS, over 173 surface water and groundwater sampling points within the Los Angeles Region have detected perchlorate, ranging from 4 micrograms per liter (µg/L) to 159 µg/L (LARWQCB 2003). Within the CLWA service area, perchlorate has been a concern with respect to the groundwater quality since it was detected in four production wells in the eastern part of the Saugus Formation in 1997. Perchlorate is a chemical associated with many industrial applications, but primarily as a component of rocket fuel. Although there are neither Federal nor State limits/standards for perchlorate in drinking water, it was placed on the EPA's Drinking Water Contaminant Candidate List in 1998. In a further step to establish standards, the EPA required drinking water monitoring for perchlorate under the UCMR in 1999.

On December 6, 2002, the California Office of Environmental Health Hazard Assessment (OEHHA) proposed a public health goal, in the range of 2 to 6 parts per billion (ppb), for the amount of perchlorate present in drinking water (LADRP 2003a). Both the federal and state governments require monitoring for perchlorate and have recommendations for potable water uses of water sources exceeding 18 µg/L. The CA DHS has lowered the action level for perchlorate in drinking water from 18 ppb to 4 ppb (CA DHS 2002). In addition to the OEHHA's proposed public health goal, the CA DHS is required to adopt a primary drinking water standard for perchlorate by January 1, 2004 (LADRP 2003a). A Maximum Contaminant Level (MCL)[12] for perchlorate is not expected until 2004 (SCVWP 2003).

In 1997, perchlorate was detected in two production wells in the Saugus Formation, both of which are near the Whittaker-Bermite property, a former weapons manufacturing and testing site. These two wells had perchlorate levels above the 18 µg/L recommendation level and the use of these wells has been suspended. Two other production wells in the Saugus Formation

12 A MCL is the maximum permissible level of a contaminant in drinking water which is delivered to any user of a public water system. MCLs ensure that drinking water does not pose either a short-term or long-term health risk. MCLs are specified by the EPA, as authorized by the Safe Drinking Water Act.

have shown detectable levels of perchlorate below 18 µg/L and the use of these wells has been suspended. Due to the number and distribution of wells in the Santa Clarita Valley, the need to suspend use of these wells (the combined capacity of the four wells is 8,000 gallons/minute) has not had a substantial effect on overall water supply. In 2002, perchlorate was detected in one Alluvial Aquifer production well located near the Whittaker-Bermite property. That well tested positive for perchlorate at a level of 5.9 µg/L (SCVWP 2003). All five perchlorate-impacted wells have been removed from active water supply service (SCVWP 2003). The local purveyors are continuing to test for perchlorate in all of their active wells, and are developing a plan for a water treatment process to return the impacted wells to service.

The development and implementation of a cleanup plan for the Whittaker-Bermite site and the impacted groundwater is being coordinated among CLWA, the local purveyors, the City of Santa Clarita, DTSC, and the U.S. Army Corps of Engineers. In February 2003, the DTSC and the impacted local purveyors entered into an agreement in which DTSC will provide review and oversight of the response activities being undertaken by the impacted local purveyors related to the detection of perchlorate in the five impacted wells (SCVWP 2003). Under the scope of work of that agreement, the local purveyors will prepare: (a) well characterization reports; (b) a health-based risk assessment; (c) a regional groundwater flow model; and (d) a treatment technology evaluation report (SCVWP 2003). Several treatment technologies for the removal of perchlorate from water are currently available. As discussed above under the sub-heading of Water Supply, these various studies are underway.

In 2002, the EPA implemented the new Disinfectants and Disinfection Byproducts Rule, which in part, establishes a new MCL of 80 µg/L for total trihalomethanes (TTHM). TTHMs are a byproduct that is created when free chlorine is used as a means for disinfection. CLWA and the local purveyors are investigating alternative methods of disinfection to be able to maintain compliance with the new rule and future regulations relating to disinfection byproducts (SCVWP 2003).

Similarly, the EPA has revised the MCL for arsenic from 50 µg/L to 10 µg/L. Compliance with the federal standard is not required until 2006. However, in March of 2003, the OEHHA proposed a draft Public Health Goal for arsenic at 4 parts per trillion (ppt) (SCVWP 2003). CA DHS is required to establish a new MCL for arsenic by June 30, 2004. Historically, naturally occurring arsenic concentrations less than 5 µg/L have been detected in a few local groundwater supplies and less than 3 µg/L in SWP water supplies. Most groundwater wells in the Santa Clarita Valley have non-detectable concentrations of arsenic.

3.15.2 Impacts of the Project

3.15.2.1 Significance Criteria

The criteria listed below are based on Appendix G of the State CEQA Guidelines. The Project would have a significant impact on water resources if it would:

- violate (or cause the violation of) any water quality standards or waste discharge requirement;

- substantially deplete groundwater supplies or interfere substantially with naturally occurring groundwater recharge;
- substantially alter the existing drainage pattern of the site or area, including the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site;
- substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site;
- create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff;
- otherwise substantially degrade water quality;
- place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map;
- place within a 100-year flood hazard area structures which would impede or redirect flood flows;
- expose people or structures to significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam; or,
- cause inundation by seiche, tsunami, or mudflow.

3.15.2.2 *Environmental Impacts*

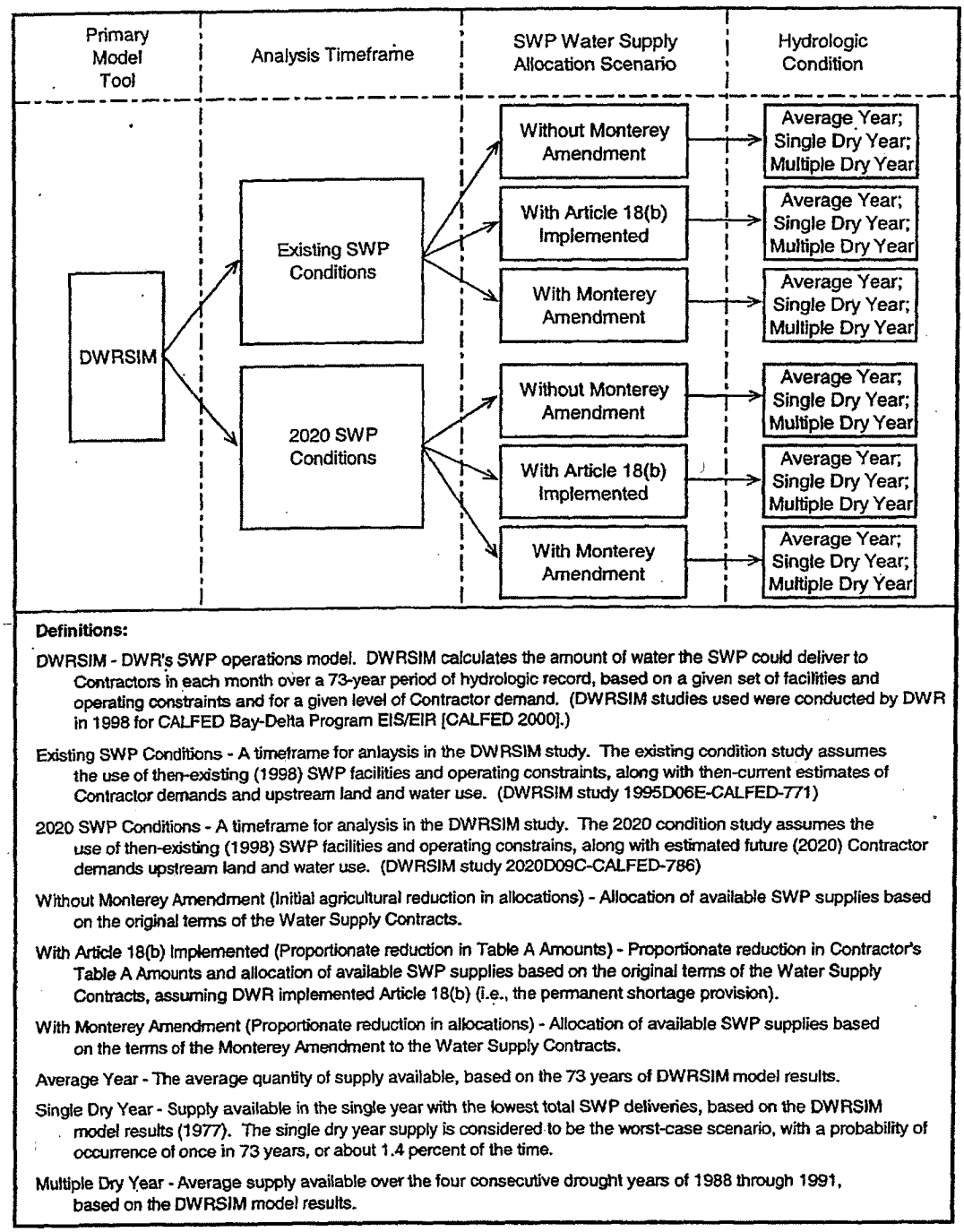
Analysis Methodology

The analysis of direct impacts focuses on the Project's potential to affect water quality, groundwater supplies, and surface water supplies associated with the SWP, WRMWSD, and CLWA. Alterations in elevation, depth, and surface area of water bodies, while not necessarily an impact to hydrology, can affect other resources such as aesthetics, biological resources, cultural resources, and geology and soils. These potential effects are considered within the impact discussions for the specific resources affected.

Figure 3.15-5 provides an overview of the SWP water supply analysis. The components shown in this figure, including the Primary Model Tool, Analysis Timeframe, SWP Water Supply Allocation Scenarios, and Hydrologic Conditions are described directly below. Following these discussions is a description of the general methodology followed in the analyses. Appendix D provides additional detail on the water supply analysis methodology and results.

PRIMARY MODEL TOOL AND ANALYSIS TIMEFRAME

The amount of SWP water supply that would be available for use by CLWA given the transfer of the Project's 41,000 AF of Table A Amount was assessed using results from DWR's planning



Definitions:

DWRSIM - DWR's SWP operations model. DWRSIM calculates the amount of water the SWP could deliver to Contractors in each month over a 73-year period of hydrologic record, based on a given set of facilities and operating constraints and for a given level of Contractor demand. (DWRSIM studies used were conducted by DWR in 1998 for CALFED Bay-Delta Program EIS/EIR [CALFED 2000].)

Existing SWP Conditions - A timeframe for anlaysis in the DWRSIM study. The existing condition study assumes the use of then-existing (1998) SWP facilities and operating constraints, along with then-current estimates of Contractor demands and upstream land and water use. (DWRSIM study 1995D06E-CALFED-771)

2020 SWP Conditions - A timeframe for analysis in the DWRSIM study. The 2020 condition study assumes the use of then-existing (1998) SWP facilities and operating constrains, along with estimated future (2020) Contractor demands upstream land and water use. (DWRSIM study 2020D09C-CALFED-786)

Without Monterey Amendment (Initial agricultural reduction in allocations) - Allocation of available SWP supplies based on the original terms of the Water Supply Contracts.

With Article 18(b) Implemented (Proportionate reduction in Table A Amounts) - Proportionate reduction in Contractor's Table A Amounts and allocation of available SWP supplies based on the original terms of the Water Supply Contracts, assuming DWR implemented Article 18(b) (i.e., the permanent shortage provision).

With Monterey Amendment (Proportionate reduction in allocations) - Allocation of available SWP supplies based on the terms of the Monterey Amendment to the Water Supply Contracts.

Average Year - The average quantity of supply available, based on the 73 years of DWRSIM model results.

Single Dry Year - Supply available in the single year with the lowest total SWP deliveries, based on the DWRSIM model results (1977). The single dry year supply is considered to be the worst-case scenario, with a probability of occurrence of once in 73 years, or about 1.4 percent of the time.

Multiple Dry Year - Average supply available over the four consecutive drought years of 1988 through 1991, based on the DWRSIM model results.

Figure 3.15-5. Water Supply Analysis Overview

model, DWRSIM. The two model studies used in this analysis simulate SWP and CVP operations and were conducted by DWR in 1998 for the CALFED Bay-Delta Program EIS/EIR (CALFED 2000). One of the model's inputs is a time series of monthly runoff based on historic hydrologic data from 1922 through 1994 (73 years), with that hydrologic data adjusted to reflect a current or future level of upstream land and water use. DWRSIM estimates the amount of water the SWP could deliver to Contractors in each month over the 73 years of operation, for a given set of facilities and operating constraints and for a given level of Contractor demand. The results are interpreted as the capability of the SWP to meet the assumed SWP demand, over a range of hydrologic conditions, for that assumed set of physical facilities and operating constraints.

The two DWRSIM studies both assume the use of SWP facilities and operating constraints that were present in 1998. One study uses 1998 estimates of existing Contractor demands and upstream land and water use, and the other uses 2020 projections for both Contractor demands and upstream land and water use.

These model runs provide the best estimates of SWP supply reliability that were available in 1998, and are consistent with the 1998 environmental setting used in this EIR. Since these studies were conducted, the modeling tool DWR uses to simulate operations has evolved (first to CALSIM I, and more recently to CALSIM II). However, while the modeling tool itself has changed, the criteria used in the models to simulate SWP operations have not significantly changed. While DWR has completed a more recent assessment of SWP reliability in its SWP Delivery Reliability Report using CALSIM II, the results of these new studies are comparable to the results of the DWRSIM studies (see Appendix D for a comparison of these model study results).

Although this EIR uses results from the two DWRSIM studies for determining SWP water supplies for both the pre-project 1998 environmental baseline and the project environmental impact analyses, it uses results from the CALSIM II studies from DWR's SWP Delivery Reliability Report (2003b) for determining estimates of SWP water supplies for the current environmental setting.

The estimates of SWP supplies associated with the 41,000 AF of Table A Amount based on DWR's SWP Delivery Reliability Report are slightly lower than the amounts under the DWRSIM studies for the comparable allocation scenario, particularly under "existing" conditions. The difference between SWP supply estimates in this EIR compared to estimates based on DWR's SWP Delivery Reliability Report is due to several reasons, including: (1) the use of two different models (DWRSIM in this EIR and CALSIM II in DWR's report), which show slightly different supply results in some years; (2) the results in this EIR account for the variable demand used by DWR in its model studies (consistent with the way DWR actually allocated water), while the results as presented in DWR's report do not (i.e., in DWR's report deliveries are presented as a percentage of Table A, regardless of the lower demands used in some years of the study); and, (3) the "existing" case in this EIR is based on 1998 SWP demand conditions, while the "existing" case in DWR's report is based on higher 2001 SWP demand conditions. The 2001 total SWP demand is higher than the 1998 demand due to increased M&I Contractor demands. A lower total demand can result in some years in more water being

allocated to the same Table A Amount, so the lower 1998 demand results in a slightly higher quantity of water associated with the 41,000 AF of Table A Amount.

SWP Water Supply Allocation Scenarios

The Project could be authorized under Article 41 of CLWA's original Water Supply Contract with DWR or under terms added to CLWA's contract as part of the Monterey Amendment (Article 53). Both contract terms allow for the transfer of Table A Amount between SWP Contractors. As described in section 1.3.2 under the Monterey Amendment, Agricultural Contractors committed, on a willing buyer-willing seller basis, to make available 130,000 AF of Table A Amount for permanent transfer to M&I Contractors (Article 53). The transfer of Table A Amount that is the subject of this EIR was implemented under this permanent transfer provision of the Monterey Amendment, although the transfer could be implemented under Article 41 of CLWA's original Water Supply Contract.

As was discussed in Chapter 1, DWR is in the process of preparing a new EIR for the Monterey Amendment. Since the Monterey Amendment changes the way SWP supplies are allocated among Contractors, this EIR provides three separate analyses of the Project's impacts to water supply available to WRMWSD and CLWA. The three analyses represent three possible scenarios for allocating available SWP supplies among Contractors, and provide an evaluation of the amount of SWP supply that would be associated with the 41,000 AF of Table A Amount under each of the allocation scenarios. The three analyses are governed by specific terms in the Water Supply Contracts, and are referred to in this EIR as: "SWP Allocation without the Monterey Amendment" (Without Monterey Amendment); "SWP Allocation without the Monterey Amendment and with Implementation of Article 18(b) Permanent Shortage Provision" (With Article 18(b) Implemented); and, "SWP Allocation with the Monterey Amendment" (With Monterey Amendment). The SWP allocation scenarios that form the basis of the three analyses are described below and summarized in Table 3.15-13. DWR is currently allocating SWP supplies in accordance with the Water Supply Contract as amended by the Monterey Amendment ("With Monterey Amendment").

It is important to note that the total amount of SWP supply is independent of the allocation scenario. The total amount of SWP supply available in a given year is a result of that year's hydrology, the amount of storage in SWP reservoirs at the beginning of the year, and the operational constraints that govern operations in the Delta (in 1998, Order WR 95-6 and currently, SWRCB Decision 1641).

SWP Allocation without the Monterey Amendment (i.e., Initial agricultural reduction in allocations), (Without Monterey Amendment) – Under the original terms of the Water Supply Contracts, water supply shortages, as well as any surplus water that might be available, were allocated differently among Contractors depending on whether Contractors' Table A Amounts were classified as agricultural or M&I. Under the original SWP contract terms, in a year with a water supply shortage (i.e., a year when total available SWP supplies were less than Contractor requests), available water supplies were allocated such that Agricultural Contractors received certain initial reductions in deliveries, and any remaining shortages were then allocated proportionately among all Contractors.

Conversely, when surplus water was available, Agricultural Contractors were given priority to this water. This priority to surplus water was given to both scheduled surplus water and unscheduled surplus water (refer to Table 3.15-3 for a definition of scheduled surplus water and unscheduled surplus water). Scheduled surplus water was generally available only during the early years of the SWP, when total Contractor demands were low. Due primarily to increasing Contractor demands for Table A supplies, scheduled surplus water has not been available since the mid-1980s.

Since WRMWSD's Table A Amount is classified as agricultural, the Table A Amount transferred to CLWA would be considered agricultural. Therefore, in this allocation scenario, under shortage conditions the 41,000 AF of Table A Amount would be subject to the initial agricultural reductions. Similarly, under surplus water conditions the 41,000 AF of Table A Amount would have the agricultural priority to surplus water.

SWP Allocation without the Monterey Amendment and with Implementation of Article 18(b) Permanent Shortage Provision (i.e., Proportionate Reduction in Table A Amounts), (With Article 18(b) Implemented) – Under the original terms of the Water Supply Contracts, DWR could invoke Article 18(b) of the Water Supply Contracts if DWR determined that the SWP was in a "permanent shortage" situation. With implementation of Article 18(b), DWR would determine a new "minimum project yield" for the SWP, and reduce Contractors' Table A Amounts proportionately[13] until they equaled the reduced minimum project yield.

There is a great deal of controversy and uncertainty regarding this allocation scenario and how it might have been implemented by DWR. More specifically, there are several different legal and contractual interpretations, particularly between Agricultural and M&I Contractors, primarily regarding whether DWR could have validly invoked Article 18(b), and assuming that it could have done so, how it could have allocated water under Article 18(b). In general, the water allocation rules that would apply under this allocation scenario are similar to the allocation rules described for the Without Monterey Amendment scenario described above, with Agricultural Contractors receiving initial reductions in shortage years and priority to surplus water when it was available. However, with all Contractor Table A Amounts reduced, shortages (i.e., supplies insufficient to meet Contractor requests for Table A water) would occur much less frequently (because the SWP could deliver the smaller Table A Amounts more regularly), and the initial agricultural reduction would be applied to a smaller Table A Amount (i.e., the reductions would be smaller). And with Table A Amounts reduced, SWP supplies in excess of the reduced minimum project yield would be available for scheduled delivery in most years. Unscheduled surplus water would be available under the same conditions, in the same amounts, and allocated in the same way as in the Without Monterey Amendment scenario.

13 Without the Monterey Amendment, Article 18(b) of the Water Supply Contracts stated "In the event that the State is unable to construct sufficient additional conservation facilities to prevent a reduction in the minimum project yield, or if for any other reason there is a reduction in the minimum project yield, which, notwithstanding preventive or remedial measures taken or to be taken by the State, threatens a permanent shortage in the supply of project water to be made available to the contactors: (1) The annual entitlements and the maximum annual entitlements of all Contractors, except to the extent such entitlements may reflect established rights under the area of origin statutes, shall, by amendment of Table A of this contract, be reduced proportionately by the State to the extent necessary so that the sum of the revised maximum annual entitlements of all Contractors will then equal such reduced minimum project yield...."

1

Table 3.15-13. Summary of SWP Water Supply Contract Without Monterey Amendment, With Article 18(b) Implemented and With Monterey Amendment Allocation Scenarios

	Without Monterey Amendment	*With Article 18(b) Implemented*	*With Monterey Amendment*
SWP Supplies Allocated Based on:	Original terms of Water Supply Contracts.	Original terms of Water Supply Contracts, assuming DWR implemented Article 18(b), (i.e., if it determined SWP was in "permanent shortage" situation). All Contractors' Table A Amounts proportionately reduced until they total new "minimum project yield," as determined by DWR.	Terms of Monterey Amendment to Water Supply Contracts.
Table A Water Shortage Allocation	Agricultural Contractors receive initial supply reduction (up to 50% of Table A Amount in one year, and up to 100% in any consecutive seven years). Any remaining shortage allocated proportionately among all Contractors.	Same as Without Monterey Amendment[1].	Shortages allocated in proportion to Contractors' Table A Amounts; no agricultural and M&I allocation differential.
Surplus Water Allocation	First priority given to Agricultural Contractors. Two categories of surplus water: • Scheduled surplus. • Unscheduled surplus.	Same as Without Monterey Amendment[2].	Surplus allocated in proportion to Contractors' Table A Amounts. Scheduled surplus water eliminated. Unscheduled surplus water renamed; referred to as Article 21 water.
Results for Contractors	Agricultural Contractors have: • Less reliable Table A supply than M&I Contractors (due to initial agricultural reductions), but, • More access to surplus water.	Supplies shift from M&I Contractors to Agricultural Contractors, due to: • Smaller and less frequent initial agricultural reductions, and, • More of available supply classified as surplus water (with agricultural priority).	Reliability of both Table A supply and surplus supply is same for Agricultural Contractors and M&I Contractors.

1. Same allocation rules apply, but because Table A Amounts are reduced, initial agricultural reductions are smaller and less frequent.
2. Same allocation rules apply, but because Table A Amounts are reduced, surplus supplies are available more frequently.

There are two primary uncertainties under this allocation scenario. This first unknown is what value of minimum project yield DWR would have used in reducing Table A Amounts. A specific value for minimum project yield had not been calculated in the several years leading up to the Monterey Amendment, but was commonly thought at the time to be in the range of 2.0 to 2.5 million AF (Cal. App. 3d PCL vs. DWR September 15, 2000). The second uncertainty is how any water supply in excess of minimum project yield would have been allocated. This is an area of controversy, with some Contractors contending it should be allocated as surplus water with Agricultural Contractors receiving a priority, and others contending it should be allocated in proportion to Table A Amounts.

Given these uncertainties, two Article 18(b) allocation scenarios that bound the various assumptions and interpretations described above were analyzed for this EIR. The first scenario assumes minimum project yield is reduced to 2.0 million AF, and scheduled surplus water is allocated with priority given to Agricultural Contractors. The second scenario assumes minimum project yield is reduced to 2.5 million AF, and deliveries above this amount are allocated in proportion to Table A Amounts. The first of these scenarios would result in more water being allocated to Agricultural Contractors than the second, and therefore would result in more water being associated with the Project's 41,000 AF of Agricultural Table A Amount. Because this first scenario would result in the worst case for purposes of analysis of potential growth impacts, only the results of the first scenario are presented in this EIR (for the water supply results of both scenarios, refer to Appendix D).

SWP Allocation with the Monterey Amendment (i.e., Proportionate reduction in allocations), (With Monterey Amendment) – Under the terms of the Water Supply Contracts as amended by the Monterey Amendment, all SWP water supplies are shared among all Contractors in proportion to their Table A Amounts. Therefore, the 41,000 AF of Table A Amount transferred to CLWA from WRMWSD would be subject to the same shortages as all other Table A Amounts (i.e., it would not be subject to an initial agricultural reduction and would not have the priority to certain surplus deliveries), and would have access to the same proportionate share of any available surplus water as all other Table A Amounts. As part of the Monterey Amendment, the category of scheduled surplus water was eliminated because it was no longer available, the category of unscheduled surplus water was retained but is now referred to as Article 21 water, and Article 18(b) was deleted.

HYDROLOGIC CONDITIONS

Because SWP water supplies vary from year to year depending on a variety of factors, this EIR presents water supply results for three different hydrologic conditions. A Contractor's "average year" supply is the average quantity of water available to the Contractor, based on the 73 years of DWRSIM model results. A Contractor's "single dry year" supply is the amount of water available to the Contractor in the single year with the lowest total SWP deliveries, based on the DWRSIM model results, which was 1977. The single dry year supply is considered to be a worst-case scenario, with a probability of occurrence of once in 73 years, or about 1.4 percent of the time. A Contractor's "multiple dry year period" supply is the average amount of water available over the four consecutive years drought years of 1988 to 1991, based on the DWRSIM model results.

GENERAL METHODOLOGY

The potential impacts of the Project to WRMWSD and CLWA SWP water supplies and to SWP facilities were evaluated using the general methodology described below. Appendix D provides additional detail on the water supply analysis methodology.

First, the amount of SWP water supply available to WRMWSD and CLWA, including the amount associated with the 41,000 AF of Table A Amount, was analyzed. Data from the DWRSIM model studies discussed above (including the M&I and Agricultural Contractor demands used as input to the studies, and the total annual SWP deliveries to all Contractors from the model study results) were used as a starting point for the analysis. For this analysis, these total annual deliveries were allocated among Contractors in accordance with the three SWP water allocation scenarios described above (Without Monterey Amendment, With Article 18(b) Implemented, and With Monterey Amendment), for each year over the model's period of record. The results of these analyses were used to determine the SWP deliveries that could be expected by WRMWSD and CLWA under each water allocation scenario, for each hydrologic condition considered.

Next, impacts to SWP facilities were analyzed. This analysis also used data from these same DWRSIM model studies as a starting point for the analysis, using model study results related to San Luis Reservoir operations (i.e., reservoir storage, diversions to and releases from storage, and Aqueduct flows upstream and downstream of the reservoir). The change in reservoir storage and Aqueduct flow due to the Project was then estimated based on the difference between WRMWSD and CLWA in the timing of monthly deliveries (i.e., the difference in timing between agricultural use and M&I use), given the allocated supplies determined in the supply analysis.

In the supply analyses conducted for this EIR, the classifications of Table A Amounts as agricultural or as M&I were maintained. The 41,000 AF of Table A Amount transferred from WRMWSD (through KCWA) is agricultural. Although CLWA serves M&I users, the agricultural classification of the 41,000 AF Table A Amount would remain because the classification is determined by the original Water Supply Contract terms according to anticipated use (i.e., KCWA's original Water Supply Contract) and has not changed. Agricultural Table A Amount can be used for M&I uses and, conversely, M&I Table A Amount can be used for agricultural uses. Of CLWA's 54,200 AF of SWP Table A Amount without the Project, 41,500 AF is classified as M&I, and 12,700 AF as agricultural.

In addition to Table A supplies, CLWA and WRMWSD can also receive deliveries of surplus water (see Table 3.15-3 for descriptions of types of surplus water). Unscheduled surplus water/Article 21 water is not included in the water supply analysis for any of the three water allocation scenarios. This is because it is not available on a routine or predictable basis, and is generally only available for short periods of time during low demand months when most Contractors have a limited ability to use it. It is noted, however, that unscheduled surplus water/Article 21 water could provide additional water supplies that could be used by WRMWSD and CLWA. Scheduled surplus water is only included in the With Article 18(b) Implemented allocation scenario, because with the reduced Table A Amounts under that scenario scheduled surplus water would have been available on a scheduled or more

dependable basis similar to Table A supplies (i.e., Contractors could schedule in advance, in a manner similar to their annual Table A requests, deliveries of scheduled surplus water). Scheduled surplus water is assumed to not be available under the Without Monterey Amendment and With Monterey Amendment allocation scenarios because (1) for the Without Monterey Amendment allocation scenario, scheduled surplus water was generally available only during the early years of the SWP, when total Contractor demands were low, and has not been available since the mid-1980s due primarily to increasing Contractor demands for Table A supplies, and (2) for the With Monterey Amendment allocation scenario, the category of scheduled surplus water was eliminated as part of the Monterey Amendment because it was no longer available (refer to Table 3.15-3).

For the purposes of estimating the impacts of the Project, the impact analyses assume that CLWA will take delivery of the entire amount of water made available from the 41,000 AF Table A Amount transferred. This assumption conservatively provides the largest effect on SWP operations, even though CLWA may not currently have the local demand for this entire amount of water in average and wetter hydrologic years.

State Water Project and Associated Facilities

DIRECT IMPACTS

The Project would not result in a change in the total amount of SWP supply available for delivery to SWP Contractors. The total amount of SWP supply available in a given year is a result of that year's hydrology, the amount of storage in SWP reservoirs at the beginning of the year, and the operational constraints that govern operations in the Delta (in 1998, SWRCB Order WR 95-6 and currently, SWRCB Decision 1641). The total available SWP supply is then allocated among the SWP Contractors and is independent of the location of use south of the Delta. Impacts described below and summarized in Table 3.15-14 for the SWP and associated facilities are primarily due to two changes as a result of the Project, which are:

- *Change in end use of water associated with the 41,000 AF Table A Amount* – The project would result in a change from agricultural end use to M&I end use of water associated with the 41,000 AF Table A Amount. Typically, agricultural water users use proportionately more of their annual water supply during the heavy irrigation months of the late spring and summer than do urban water users, and proportionately less of their supply than urban users during the remainder of the year. In the case of WRMWSD and CLWA, this difference in delivery during the year would result in a net reduction in deliveries of water associated with the 41,000 AF Table A Amount in May through September, and a net increase in deliveries during the remaining months of the year (October through April). In addition, deliveries to WRMWSD historically have peaked in July, while CLWA's deliveries historically have peaked in August.

- *Changes in the amount of water transported to the CLWA turnouts* – The Project would result in the delivery of water to the CLWA turnout that could have otherwise been delivered to the WRMWSD turnouts. Because the CLWA turnout is located further

down the Aqueduct than the WRMWSD turnout (see Figure 1.3-1), water associated with the Table A transfer would need to be transported this additional distance.

Table 3.15-14. Summary of Impacts to the SWP and Associated Facilities

The Delta	The Project would not change the total amount of SWP supply available for delivery to Contractors, so there would be no change in the total amount of water diverted from the Delta. The difference in timing of water used for urban purposes rather than agricultural purposes would result in a slight change in timing of deliveries of the 41,000 AF of Table A Amount. This change in timing could also result in a slight change in the timing of the filling of San Luis Reservoir, which could result in minor changes in the timing of Delta diversions. However, these changes would fall well within the range of historical and future anticipated SWP diversions from the Delta. Any change in Delta diversions that did occur would result in an imperceptible or minor change in Delta water quality (slight salinity decreases withy lower diversions, and slight salinity increase with higher diversions). All changes would be within applicable water quality standards and agreements. Impacts would be less than significant.
California Aqueduct from the Delta to San Luis Reservoir	If the changes in Delta diversions described above occurred, there would be a corresponding change in the timing of water transported in the California Aqueduct from the Delta facilities to San Luis Reservoir. This would not result in an environmental impact to water resources.
San Luis Reservoir	The difference in timing of water used for urban purposes rather than agricultural purposes would result in a slight increase in storage at San Luis Reservoir from July through November, and a slight decrease in storage during the remainder of the year. The change in storage at San Luis Reservoir resulting from the Project would represent a small portion of the total average storage in the SWP share of San Luis Reservoir, reflecting storage changes of less than 0.5 percent of average monthly storage in most months and not more than two percent in any month. This would not result in an environmental impact to water resources.
California Aqueduct downstream of San Luis Reservoir	The Project would result in a minor change in the timing of water transported in the Aqueduct between San Luis Reservoir and the WRMWSD turnouts, with a slight increase in the amount of water transported from October to April, and a slight decrease during the remainder of the year (May to September). This would not result in an environmental impact to water resources. The Project would result an annual increase of up to 41,000 AF transported in the California Aqueduct from the WRMWSD turnouts to the CLWA turnout. This increase would slightly increase the flow (velocity) in the California Aqueduct and may result in a minor change in the water level within the non-pipeline portions of the Aqueduct. This would not result in an environmental impact to water resources.
Castaic Lake	The Project would increase SWP water delivered to CLWA resulting in additional water being conveyed to, and delivered from, Castaic Lake, but would have little effect on the overall storage volume in the lake at any given time. This would not result in an environmental impact to water resources.
Other SWP Reservoirs (Quail and Pyramid lakes)	The Project would not result in changes to the overall volume of water stored in either Quail or Pyramid lakes, but would increase the amount of water that is conveyed to and released from the lakes. This would not result in an environmental impact to water resources.

Unless otherwise noted, the impacts of the Project to the SWP and associated facilities would be similar regardless of the SWP water allocation scenario (Without Monterey Amendment, With Article 18(b) Implemented, and With Monterey Amendment), and under both SWP demand conditions (existing and 2020).

The Delta – As discussed above, the Project would not change the total amount of SWP supply available for delivery to the Contractors. Therefore, there would be no change in the total amount of water diverted from the Delta. The difference in the timing of water used for urban purposes by CLWA rather than for agricultural purposes by WRMWSD would result in a slight change in the timing of deliveries of the 41,000 Table A Amount south of the Delta. This slight change in the timing of deliveries would require a slight change in operations (i.e., either in diversions from the Delta or in San Luis Reservoir operations). Generally, the SWP operates to divert as much water from the Delta as is available under prevailing hydrologic conditions, within the water quality standards and operational constraints that govern Delta operations (i.e., currently, SWRCB Decision 1641 and in 1998, Order WR 95-6). This is true regardless of the timing of deliveries south of the Delta because when Delta diversions exceed downstream deliveries, that excess is stored in San Luis Reservoir for delivery later in the year.

Because Delta diversions are limited by either water availability or operational/regulatory constraints, the change in the timing of deliveries of the 41,000 AF of Table A due to the Project would primarily result in changes in San Luis Reservoir storage (as is discussed in more detail below). These changes in storage could in some years result in the reservoir reaching full capacity at a slightly different time than if the Project were not implemented, which in turn could result in a slight change in Delta diversions (because diversions would generally be reduced when storage becomes full). Given the small magnitude of the change in the timing of deliveries, any change in the timing of Delta diversions that did occur would be minor, and would likely be on the order of hours or days (i.e., with the Project, certain changes in Delta diversions that would have occurred without the Project would still occur, but might shift by a few hours or days).

Delta diversions and their effect on Delta water quality vary from year to year. Any minor change in Delta diversions that did occur as a result of the Project would be small relative to total SWP diversions and would fall well within the range of historical and future anticipated SWP diversions from the Delta. Any minor change in the timing of Delta diversions due to the Project would result in an imperceptible or minor change in Delta water quality (slight salinity decrease with lower diversions, and slight salinity increase with higher diversions). Because (1) the Project would not change the operating criteria for diversions from the Delta, (2) the Project would very infrequently result in minor changes to Delta diversions within the applicable environmental and regulatory constraints, and (3) under those conditions that diversions could change, the changes would be minor, the Project would result in less than significant impacts to water resources, including water quality, within the Delta.

California Aqueduct from the Delta to San Luis Reservoir – As described above, the change in the timing of deliveries for WRMWSD and CLWA could result in some years in minor changes to Delta diversions. However, these changes would fall well within the range of historical and future anticipated SWP diversions from the Delta. If these timing changes in Delta diversions occurred, there would be a corresponding change in the timing of water transported in the

California Aqueduct from the Delta facilities to San Luis Reservoir. These changes in water transported in the Aqueduct would be minor. Water associated with the 41,000 AF of Table A Amount has historically been transported through this reach, and the amount of water transported would not exceed the capacity of the Aqueduct. Changing the timing of water transported in the Aqueduct would not result in an environmental impact to water resources.

San Luis Reservoir – As discussed in section 3.15.1.1, the general operation at San Luis Reservoir is to try to fill the reservoir during the high runoff months of the winter and early spring, and then release the stored water to supplement the more limited diversions from the Delta during the higher-demand summer and fall months to meet Contractor demands. The Project, in combination with the net change in the timing of deliveries during the year between WRMWSD and CLWA, would result in a slight increase in storage at San Luis Reservoir from July through November, and a slight decrease in storage during the remainder of the year. The magnitude of the storage increase would be greatest in August and September, averaging approximately 4,500 AF at existing SWP demand conditions and approximately 4,200 AF at 2020 SWP demand conditions. The magnitude of the reduction in storage would be greatest in March and April, averaging approximately 3,000 AF at existing SWP demand conditions and approximately 2,700 AF at 2020 SWP demand conditions. As shown on Figure 3.15-6, the change in storage at San Luis Reservoir resulting from the Project would represent a small portion of the total average storage in the SWP share of San Luis Reservoir (SWP capacity is over 1 million AF), reflecting storage changes of less than 0.5 percent of average storage in most months and not more than 2 percent in any month. The information provided above and in Figure 3.15-6 is based on implementation of the Project under the terms of the With Monterey Amendment scenario. These storage changes would be similar under the Without Monterey Amendment and With Article 18(b) Implemented scenarios because the amount and timing of deliveries under each of the allocation scenarios is quite similar.

These changes in storage are well within the substantial differences in San Luis Reservoir storage that occur in normal SWP operations over the course of the year and from year to year, and would not result in an environmental impact to water resources at San Luis Reservoir.

California Aqueduct downstream of San Luis Reservoir – The Project would result in a minor change in the timing of water transported in the Aqueduct between San Luis Reservoir and the WRMWSD turnouts. Within this reach of the Aqueduct, a slight increase in the amount of water transported would occur from October to April, and a slight decrease would occur during the remainder of the year (May to September). These changes in the amount of water transported from the Delta to the WRMWSD turnouts would result from the change in end use of the water (urban rather than agricultural use) and the associated shift in the timing of delivery. These changes in water transported in the Aqueduct would be minor. Water associated with the 41,000 AF of Table A Amount has historically been transported through this reach, and the amount of water transported would not exceed the capacity of the Aqueduct. Changing the timing of water transported in the Aqueduct would not result in an environmental impact to water resources.

The Project would result in an annual increase of up to 41,000 AF transported in the California Aqueduct from the WRMWSD turnouts to the CLWA turnout. This increase would slightly increase the flow (velocity) in the California Aqueduct and may result in a minor change in the water level within the non-pipeline portions of the Aqueduct. Because these changes in the

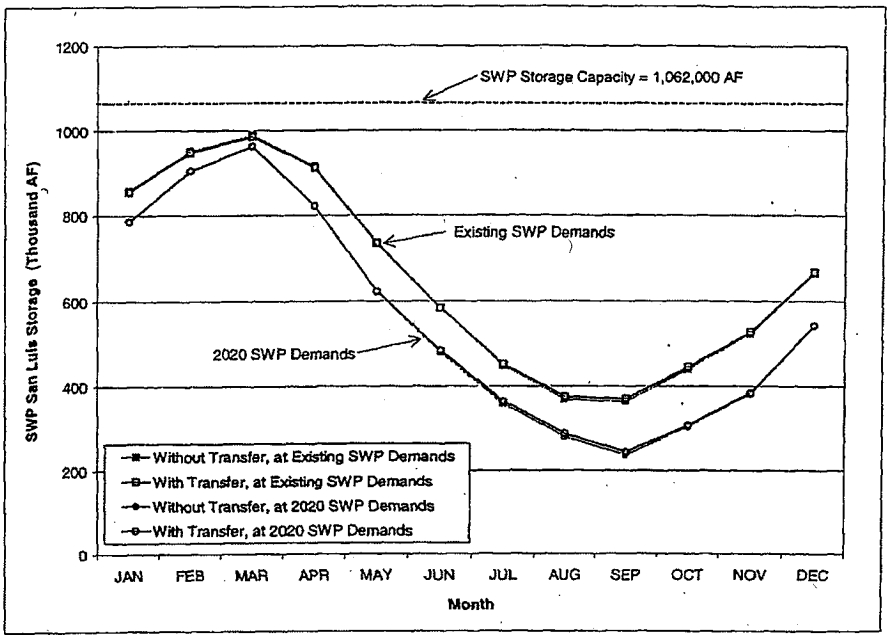


Figure 3.15-6. Average Monthly SWP San Luis Reservoir Storage With and Without the Project, under With Monterey Amendment SWP Allocations

amount of water transported in the Aqueduct would be minor, and because the Project would not result in changes to the operating criteria of the Aqueduct (i.e. the additional amount of water would not be allowed to exceed the capacity of the Aqueduct), these changes in timing of flows in the Aqueduct would not result in an environmental impact to water resources.

The Project would require the transport of water associated with the 41,000 AF Table A Amount through the Teerink, Chrisman, Edmonston, and Oso pumping plants (transport to WRMWSD also requires pumping a portion of the water through the Teerink and Chrisman pumping plants) and the Warne and Castaic power plants located within and between WRMWSD and Castaic Lake (refer to Figure 1.1-1). This would not result in an environmental impact to water resources.

The Project would not change the source of water in the California Aqueduct or otherwise affect water quality in the Aqueduct.

Castaic Lake – The amount of water stored at Castaic Lake would not be expected to change as a result of the Project. As discussed in section 3.15.1.2, Castaic Lake is the terminal reservoir on the West Branch of the California Aqueduct and is operated to help meet peak deliveries during the summer months for those SWP Contractors that receive deliveries from Castaic Lake and to provide an emergency water supply in case of a major supply system outage. Castaic Lake is also used for year-round recreational purposes. Under normal operations, the amount of storage that is withdrawn from Castaic Lake to make deliveries to Contractors over the summer (the amount withdrawn that exceeds the amount delivered to the lake) is typically about 30,000 AF (or about 10 percent of the lake's volume). The amount of this storage withdrawal is small

relative to total deliveries from the West Branch, which averaged about 403,000 AF from 1990 through 2000. In other words, most deliveries from the West Branch are conveyed through the California Aqueduct and Castaic Lake in about the same month the water is delivered to Contractors from the lake. In the future, DWR is expected to maintain this same general operation at Castaic Lake regardless of whether deliveries from the West Branch increase, and regardless of whether increased deliveries are due to increasing Contractor demands or due to Table A Amount transfers such as the Project.

Over the past decade, CLWA's Table A water deliveries from Castaic Lake have averaged only about 6 percent of the total SWP water delivered from the lake. Over this same period, the majority of the SWP water delivered from the lake (approximately 93 percent) was delivered to MWD due to its relatively larger Table A Amount and storage rights in Castaic Lake. The increase in water delivery to CLWA from the Project would result in additional water being conveyed to, and delivered from, Castaic Lake, but would have little effect on the overall storage volume in the lake at any given time. Because CLWA's deliveries from Castaic Lake with the Project would be minor compared to the total amount of water delivered from the lake, most of the SWP water is conveyed to the lake in the same month it is delivered to CLWA, and the Project would not change DWR's operating criteria for the lake, the Project would not result in an environmental impact to water resources at Castaic Lake. Because the Project would not change the source of water delivered to Castaic Lake and would result in minor, if any changes in the lake's volume, water quality would not be affected.

Although not an impact of the Project, it is noted that flexible storage is a component of the Monterey Amendment. CLWA would only have the ability to access water stored in Castaic Lake under the "flexible storage" provision of the Monterey Amendment in the With Monterey Amendment scenario. The amount of flexible storage available to CLWA would not change as a result of the Project.

Other SWP Reservoirs – Quail Lake and Pyramid Lake are located between the WRMWSD turnouts and the CLWA turnout on the West Branch of the California Aqueduct. DWR operates Quail Lake to re-regulate Aqueduct flows. Pyramid Lake is used in the operation of the Castaic Power Plant located between Pyramid and Castaic lakes, as well as to provide an emergency water supply for the West Branch Contractors. The Project would be implemented in accordance with DWR's existing operation of these lakes. As with Castaic Lake, most of the SWP water delivered to both Quail and Pyramid lakes is conveyed to, and released from, the lakes within the same month. Therefore, the Project would not result in changes to the overall volume of water stored in either Quail or Pyramid lakes, but would increase the amount of water that is conveyed to and released from the lakes. Because water is conveyed to and released from these lakes in approximately the same month, and because the project would not result in changes to DWR's operations of these facilities, the Project would not result in an environmental impact to water resources.

INDIRECT IMPACTS

Because the Project would be implemented in accordance with DWR's operation of the SWP and associated facilities, no indirect impacts to water resources would occur.

Wheeler Ridge-Maricopa Water Storage District

DIRECT IMPACTS

The Project reduces WRMWSD's Water Supply Contract Table A Amount by 41,000 AF (from 238,088 AF to 197,088 AF, a reduction of 17.2 percent). Because SWP water supplies are allocated among Contractors on the basis of Table A Amounts, this reduction in WRMWSD's Table A Amount would result in a reduction in the total amount of SWP water that WRMWSD could obtain (including both Table A and any available surplus supplies) from the SWP. Under all SWP allocation scenarios and hydrologic conditions, the Project would result in a maximum reduction in the SWP Table A water available to WRMWSD of approximately 17.2 percent.

As discussed in section 3.15.2.2, the supplies presented below are Table A supplies only (or in the case of the allocation scenario With Article 18(b) Implemented, Table A supplies and scheduled surplus water), and do not include unscheduled surplus water/Article 21 water.

Water Supply

All SWP Allocation Scenarios under Existing SWP Demand Conditions – Table 3.15-15 presents the results of the analysis of WRMWSD's SWP Table A supply under the existing (1998) SWP demand conditions used in the DWRSIM study, and under the various hydrologic conditions (average year, single dry year, and multiple dry year period) and water allocation scenarios considered (With Monterey Amendment, Without Monterey Amendment, and With Article 18(b) Implemented). Under current SWP allocation rules (With Monterey Amendment), implementation of the Project would result in a reduction in the Table A supply available to WRMWSD of 34,400 AF, 9,200 AF, and 18,100 AF under the average year, single dry year, and multiple dry year period conditions, respectively. Considering all allocation scenarios, the largest reduction in supplies available to WRMWSD with implementation of the Project would be 35,300 AF under average year conditions With Article 18(b) Implemented; 9,200 AF under a single dry year With Monterey Amendment; and 18,100 AF under a multiple dry year period With Monterey Amendment.

With the Project, WRMWSD would have sufficient SWP supplies at least 57 percent of the time to deliver Table A water in an amount that would independently meet its minimum demands under favorable economic conditions (180,000 AF). In addition, the average amount of Table A water WRMWSD could expect to receive with the Project under all allocation scenarios (157,000 to 169,500 AF) is greater than the average amount of historic SWP water deliveries to WRMWSD from 1990 to 1999 (137,360 AF) by approximately 14 and 23 percent, respectively. With the Project, sufficient SWP Table A water would be available within the district in years of average or greater than average SWP supplies. In years of less than average SWP supplies, and depending on that year's specific demand, WRMWSD may not have sufficient SWP Table A water to meet demands. In these years, WRMWSD would need to rely on other water management actions, such as previously banked water, and/or individual farmers within the district would use additional local groundwater.

As previously discussed, the decision to use local groundwater (i.e., groundwater pumped from wells owned and operated by farmers) or previously banked water supplies on lands within the district is predominately an economic decision made by farmers. In years when SWP deliveries

Table 3.15-15. WRMWSD's SWP Table A Supply at Existing SWP Demand Conditions, under all SWP Allocation Scenarios[1]

(all values in AF, rounded to the nearest 100 AF)

		Table A Amount	*Average Year*	*Single Dry Year*	*Multiple Dry Year Period*[2]
With Monterey Amendment	Without the Project	238,100	199,900	53,300	105,300
	With the Project	197,100	165,500	44,100	87,100
	Difference[3]	***41,000***	***34,400***	***9,200***	***18,100***
Without Monterey Amendment	Without the Project	238,100	189,700	0	79,700
	With the Project	197,100	157,000	0	65,900
	Difference[3]	***41,000***	***32,700***	***0***	***13,700***
With Article 18(b) Implemented[4]	Without the Project	113,800	204,800	11,500	100,600
	With the Project	94,200	169,500	9,500	83,200
	Difference[3]	***19,600***	***35,300***	***2,000***	***17,300***

Note: Numbers may not add due to rounding.
1. Based on water deliveries from DWRSIM study 1995D06E-CALFED-771. This study used 1998 DWR estimates of then-existing SWP Contractor demands.
2. Multiple dry year period supplies shown are average annual supplies over a four-year period.
3. Supplies shown are the amount of water attributable to the 41,000 AF of Table A Amount.
4. Under the SWP allocation scenario With Article 18(b) Implemented, the Table A Amounts shown are estimates of WRMWSD's reduced Table A Amount, based on its proportionate share of a reduced SWP minimum project yield of 2.0 million AF. The supplies shown include both Table A supplies and scheduled surplus supplies estimated to be available, with surplus supplies allocated based on priority for agricultural use.

are less than crop demands, individual farmers may choose to use local groundwater to meet demands. Because WRMWSD has substantially diversified its water sources through other water management actions, resulting in sufficient water available to the district to meet demands in most years at a lower fixed cost (when total costs are considered) than SWP water, increased reliance on groundwater would likely be a result of independent actions by the individual farmers (refer to Appendix C). However, it is reasonable to assume that some farmers may use local groundwater when SWP deliveries are not sufficient to meet demands, and, therefore, the Project may result in additional groundwater pumping in these years. Due to the complexity of factors that may be considered by individual farmers when deciding to use local groundwater in lieu of using imported water, the exact amount of additional reliance on groundwater that may occur in dry years cannot be determined. Because the Project could result in a reduction of up to 9,200 AF of Table A water in a single dry year and up to 18,100 AF of Table A water in a multiple dry year period, this is assumed to be the amount of additional groundwater use that could result from implementation of the Project in these year types. These amounts are small relative to the total amount of water in storage in the Kern County Groundwater Basin (total storage is 40 million AF; DWR 2003a) and the White Wolf sub-basin (total storage is about 2.5 million AF; BE 1975). Because groundwater levels in the portions of these basins underlying WRMWSD generally have been increasing over time (BE 1995), indicating that the basins could sustain an increase in use under these limited conditions

without resulting in a net deficit in aquifer volume or a lowering of the local groundwater table, impacts to groundwater would be less than significant.

As was discussed previously, the supplies presented above do not include unscheduled surplus water/Article 21 water. Generally, when this type of water is available, there is enough to meet all Contractor requests for it. It is only when total Contractor requests for this water exceed the amount available that DWR would need to allocate that limited supply among Contractors. If this situation occurred, the Project could result in a reduction in the amount of unscheduled surplus water/Article 21 water that WRMWSD could obtain (because it is allocated based on Contractor Table A Amounts). Because this reduction is minor, and would only occur infrequently, the reduction in the amount of unscheduled surplus water/Article 21 water that WRMWSD could obtain would not materially affect WRMWSD's surplus water supply and the impact would be less than significant.

All SWP Allocation Scenarios under 2020 SWP Demand Conditions – Table 3.15-16 presents the results of the analysis of WRMWSD's SWP Table A supply under the 2020 SWP demand conditions used in the DWRSIM study, and under the various hydrologic conditions considered (average year, single dry year, and multiple dry year period) and water allocation scenarios (With Monterey Amendment, Without Monterey Amendment, and With Article 18(b) Implemented). Under current SWP allocation rules (With Monterey Amendment), implementation of the Project would result in a reduction in the Table A supply available to WRMWSD of 32,000 AF, 9,200 AF, and 17,600 AF under the average year, single dry year, and multiple dry year period conditions, respectively. Considering all allocation scenarios, the largest reduction in supplies available to WRMWSD with implementation of the Project would be: 34,900 AF under average year conditions With Article 18(b) Implemented; 9,200 AF under a single dry year With Monterey Amendment; and 17,600 AF under a multiple dry year period With Monterey Amendment.

The amount of SWP supply available for a given Table A Amount is somewhat less under 2020 SWP demand conditions than under the existing SWP demand conditions discussed previously. This SWP supply reduction is primarily due to two factors: an increase in future water use upstream of the Delta, which reduces the amount of water flowing into the Delta and therefore the amount available for SWP supplies; and, an increase in SWP Contractor demands, which in certain years when supplies are limited, can result in less SWP supply being allocated to a given Table A Amount. This supply reduction is independent of the Project, and can be seen by comparing the supplies between Table 3.15-15 (existing SWP demands) and Table 3.15-16 (2020 SWP demands). Assuming that future WRMWSD water demand remains at current levels, it is likely that WRMWSD would need to rely more on other water management actions and/or individual farmers within the district would use additional local groundwater (i.e., groundwater pumped from wells owned and operated by farmers) to meet demands within the district (refer to Appendix C). This would occur with or without the Project, although the Project would exacerbate this condition.

Under current SWP allocation rules (With Monterey Amendment) and with implementation of the Project, WRMWSD could expect to receive at least 180,000 AF (their minimum demands under favorable economic conditions) approximately 31 percent of the time, and at least 190,000 AF approximately 20 percent of the time. In addition, WRMWSD could expect to receive an

Table 3.15-16. WRMWSD's SWP Table A Supply at 2020 SWP Demand Conditions, Under all SWP Allocation Scenarios[1]
(all values in AF, rounded to the nearest 100 AF)

		Table A Amount	*Average Year*	*Single Dry Year*	*Multiple Dry Year Period[2]*
With Monterey Amendment	Without the Project	238,100	185,700	53,500	102,200
	With the Project	197,100	153,800	44,300	84,600
	Difference[3]	***41,000***	***32,000***	***9,200***	***17,600***
Without Monterey Amendment	Without the Project	238,100	165,300	42,200	98,100
	With the Project	197,100	136,900	35,000	81,200
	Difference[3]	***41,000***	***28,500***	***7,300***	***16,900***
With Article 18(b) Implemented[4]	Without the Project	113,800	202,900	12,300	99,300
	With the Project	94,200	168,000	10,200	82,200
	Difference[3]	***19,600***	***34,900***	***2,100***	***17,100***

Note: Numbers may not add due to rounding.
1. Based on water deliveries from DWRSIM study 2020D09C-CALFED-786.
2. Multiple dry year period supplies shown are average annual supplies over the four-year period.
3. Supplies shown are the amount of water attributable to the 41,000 AF of Table A Amount.
4. Under the SWP allocation scenario With Article 18(b) Implemented, the Table A Amounts shown are estimates of WRMWSD's reduced Table A Amount, based on its proportionate share of a reduced SWP minimum project yield of 2.0 million AF. The supplies shown include both Table A supplies and scheduled surplus supplies estimated to be available, with surplus supplies allocated based on priority for agricultural use.

average SWP Table A supply approximately 11 percent greater than historic SWP deliveries to WRMWSD from 1990 to 1999 (137,360 AF). Considering all allocation scenarios, with implementation of the Project WRMWSD could expect to receive average SWP Table A supplies ranging from approximately 136,900 AF to 168,000 AF, which is approximately 0.3 percent less to 22 percent more than the amount of historic SWP deliveries to WRMWSD from 1990 to 1999.

As previously discussed, the decision to use local groundwater (i.e., groundwater pumped from wells owned and operated by farmers) or other previously banked water supplies on lands within WRMWSD is predominately an economic decision made by farmers. Due to the complexity of factors that may be considered by individual farmers when deciding to use local groundwater in-lieu of using imported water, the exact amount of additional reliance on groundwater that may occur in dry years cannot be determined (refer to Appendix C). Because the Project could result in a reduction in average year SWP supplies below historic average deliveries to WRMWSD from 1990 to 1999 (only in the Without Monterey Amendment scenario) of up to 9,200 AF of Table A water in a single dry year, and up to 17,600 AF of Table A water in a multiple dry year period, this is assumed to be the amount of additional use of local groundwater that could be contributed by the Project in these year types. These amounts are small relative to the total amount of water in storage in the Kern County Groundwater Basin (total storage is 40 million AF; DWR 2003a) and the White Wolf sub-basin (total storage is about 2.5 million AF; BE 1975). Because groundwater levels in the portions of these basins underlying

WRMWSD have been generally increasing over time (BE 1995), indicating that the basins could sustain an increase in use under these limited conditions without resulting in a net deficit in aquifer volume or a lowering of the local groundwater table, impacts to groundwater would be less than significant.

For reasons similar to those identified above, the Project would result in a minor reduction in the amount of unscheduled surplus water/Article 21 water that WRMWSD could obtain, although this reduction would not materially affect WRMWSD's surplus water supply.

Comparison of WRMWSD Supplies Presented to Supplies based on DWR's Recent SWP Delivery Reliability Report – As discussed in section 3.15.2.2, DWR recently completed an analysis of the delivery reliability of the SWP in its SWP Delivery Reliability Report. This DWR report presents the results of CALSIM II model studies run using current allocation rules (i.e., With Monterey Amendment). Starting with these same DWR results and applying the same methodology suggested by DWR in its report, the Project would result in a decrease in WRMWSD's SWP supplies: under "existing" (2001 in DWR's SWP Delivery Reliability Report) conditions of 29,400 AF, 8,000 AF, and 14,800 AF under the average year, single dry year, and multiple dry year period conditions, respectively; and under 2020 conditions of 30,600 AF, 8,200 AF, and 15,000 AF under the average year, single dry year, and multiple dry year period conditions, respectively.

Water Quality

All SWP Allocation Scenarios under Existing SWP Demand Conditions – Overall, within the WRMWSD the Project may result in a minor increase in the use of previously banked water and local groundwater in the drier hydrologic years. Water banked outside of the WRMWSD would be delivered to the district as a SWP water exchange, and would be the same quality as SWP supplies. Water banked within the WRMWSD would be the same quality as the groundwater quality, which has slightly higher TDS than SWP water. The Project may result in a minor increase in the use of water banked with the district and groundwater in the drier hydrologic years, and these sources generally have higher TDS concentrations. Because this water is of sufficient quality for agricultural operations, impacts to surface water quality would be less than significant. Because the increased use of water banked within the district and local groundwater would be minor and would occur infrequently (in drier hydrologic years), the minor use of these supplies and the additional increase in TDS from irrigation related uses would result in less than significant impacts to groundwater quality.

All SWP Allocation Scenarios under 2020 SWP Demand Conditions - The decrease in SWP delivery reliability due to an increase in future levels of demand by M&I Contractors would result, with the transfer, in the use of more groundwater and banked water to meet agricultural needs within the WRMWSD. For the reasons noted above, impacts to surface and groundwater quality would be less than significant.

INDIRECT IMPACTS

No indirect impacts to water resources would occur.

Castaic Lake Water Agency

DIRECT IMPACTS

Potential direct impacts from implementation of the Project to water supply, including groundwater resources and water quality are addressed below. Because the Project would be implemented using existing CLWA facilities and new facilities would not be required, construction and land disturbance related impacts would not occur.

The Project increases CLWA's Water Supply Contract Table A Amount by 41,000 AF (from 54,200 AF to 95,200 AF, an increase of 75.6 percent). Because SWP water supplies are allocated among Contractors on the basis of Table A Amounts, this increase in Table A would result in an increase in the total amount of SWP water that CLWA could obtain (including both Table A and any available surplus water supplies). Under all SWP allocation and hydrologic scenarios, the Project would result in a maximum increase in the SWP Table A water available to CLWA of approximately 75.6 percent.

As discussed in section 3.15.2.2, the supplies presented below are Table A supplies only (or in the case of the allocation scenario With Article 18(b) Implemented, Table A supplies and scheduled surplus water), and do not include unscheduled surplus water or Article 21 water.

Water Supply

All SWP Allocation Scenarios under Existing SWP Demand Conditions – Table 3.15-17 presents the results of the analysis of CLWA's SWP Table A supply under the existing (1998) SWP demand conditions used in the DWRSIM study, and under the various hydrologic conditions (average year, single dry year, and multiple dry year period) and water allocation scenarios (With Monterey Amendment, Without Monterey Amendment, and With Article 18(b) Implemented) considered. Under current SWP allocation rules (With Monterey Amendment), implementation of the Project would result in an increase in the Table A supply available to CLWA of 34,400 AF, 9,200 AF, and 18,100 AF under the average year, single dry year, and multiple dry year period conditions, respectively. Considering all allocation scenarios, the largest increase in supplies available to CLWA with implementation of the Project would be 35,300 AF under average year conditions With Article 18(b) Implemented; 9,200 AF under a single dry year With Monterey Amendment; and 18,100 AF under a multiple dry year period With Monterey Amendment. The Project would increase CLWA's SWP Table A Amount and increase the amount of SWP water that could be delivered to CLWA. This increased water supply would serve the needs of both existing water users and a portion of future water demand from anticipated growth within the CLWA service area.

Because CLWA could obtain up to an additional 41,000 AF of Table A water (depending on hydrologic conditions) to meet water demands of existing users and a portion of future water demand from anticipated growth within the service area, the Project would have a beneficial impact to water supplies in the CLWA service area. Because the Project would increase the amount of SWP water delivered to the CLWA service area, replacing water that could have otherwise been pumped from groundwater, the Project would have a beneficial impact to groundwater resources via indirect recharge (or percolation) through irrigation with SWP water.

Table 3.15-17. CLWA's Total SWP Table A Supply at Existing SWP Demand Conditions, under all SWP Allocation Scenarios[1]
(all values in AF, rounded to the nearest 100 AF)

		Table A Amount	*Average Year*	*Single Dry Year*	*Multiple Dry Year Period*
With Monterey Amendment	Without the Project	54,200	46,500	12,100	24,000
	With the Project	95,200	80,900	21,300	42,100
	Difference[3]	***41,000***	***34,400***	***9,200***	***18,100***
Without Monterey Amendment	Without the Project	54,200	47,400	13,100	25,200
	With the Project	95,200	80,100	13,100	38,900
	Difference[3]	***41,000***	***32,700***	***0***	***13,700***
With Article 18(b) Implemented[4]	Without the Project	25,900	46,400	12,900	24,400
	With the Project	45,500	81,700	14,900	41,700
	Difference[3]	***19,600***	***35,300***	***2,000***	***17,300***

Note: Numbers may not add due to rounding.
1. Based on water deliveries from DWRSIM study 1995D06E-CALFED-771. This study used 1998 DWR estimates of then-existing SWP Contractor demands.
2. Multiple dry year period supplies shown are average annual supplies over the four-year period.
3. Supplies shown are the amount of water attributable to the 41,000 AF of Table A Amount.
4. Under the SWP allocation scenario With Article 18(b) Implemented, the Table A Amounts shown are estimates of CLWA's reduced Table A Amount, based on its proportionate share of a reduced SWP minimum project yield of 2.0 million AF. The supplies shown include both Table A supplies and scheduled surplus supplies estimated to be available, with surplus supplies allocated based on priority for agricultural use.

As was discussed previously, the supplies presented above do not include unscheduled surplus water/Article 21 water. Generally, when this type of water is available, there is enough to meet all Contractor requests for it. It is only when total Contractor requests for this water exceed the amount available that DWR would need to allocate that limited supply among Contractors. If this situation occurred, the Project could result in an increase in the amount of unscheduled surplus water/Article 21 water that CLWA could obtain (because it is allocated based on Contractor Table A Amounts). Since this increase would only occur infrequently, the increase in the amount of unscheduled surplus water/Article 21 water that CLWA could obtain would not materially affect CLWA's surplus water supply.

All SWP Allocation Scenarios under 2020 SWP Demand Conditions – Table 3.15-18 presents the results of the analysis of CLWA's SWP Table A supply under the 2020 SWP demand conditions used in the DWRSIM study, and under the various hydrologic conditions (average year, single dry year, and multiple dry year period) and water allocation scenarios (With Monterey Amendment, Without Monterey Amendment, and With Article 18(b) Implemented) considered. Under current SWP allocation rules (With Monterey Amendment), implementation of the Project would result in an increase the Table A supply available to CLWA of 32,000 AF, 9,200 AF, and 17,600 AF under the average year, single dry year, and multiple dry year period conditions, respectively. Considering all allocation scenarios, the largest increase in supplies available to CLWA with implementation of the Project would be: 34,900 AF under the average year With Article 18(b) Implemented; 9,200 AF under a single dry year With Monterey Amendment; and 17,600 AF under a multiple dry year period With Monterey Amendment.

The Project would increase CLWA's SWP Table A Amount and increase the amount of SWP water that could be delivered to CLWA. This increased water supply would serve the needs of both existing water users and a portion of future water demand from anticipated growth within

the CLWA service area. Because CLWA could obtain up to an additional 41,000 AF of Table A water (depending on hydrologic conditions) to meet water demands of existing users and a portion of future water demand from anticipated growth within the service area, the Project would have a beneficial impact to water supplies in the CLWA service area. Because the Project would increase the amount of SWP water delivered to the CLWA service area, replacing water that could have otherwise been pumped from groundwater, the Project would have a beneficial impact to groundwater resources via indirect recharge (or percolation) through irrigation with SWP water.

For reasons similar to those identified above, the Project would result in an increase in the amount of unscheduled surplus water/Article 21 water that CLWA could obtain, although this increase would not materially affect CLWA's surplus water supply.

Table 3.15-18. CLWA's Total SWP Table A Supply at 2020 SWP Demand Conditions, under all SWP Allocation Scenarios[1]
(all values in AF, rounded to the nearest 100 AF)

		Table A Amount	*Average Year*	*Single Dry Year*	*Multiple Dry Year Period[2]*
With Monterey Amendment	Without the Project	54,200	42,900	12,200	23,300
	With the Project	95,200	74,900	21,400	40,900
	Difference[3]	***41,000***	***32,000***	***9,200***	***17,600***
Without Monterey Amendment	Without the Project	54,200	43,500	12,400	23,300
	With the Project	95,200	72,000	19,600	40,200
	Difference[3]	***41,000***	***28,500***	***7,300***	***16,900***
With Article 18(b) Implemented[4]	Without the Project	25,900	43,000	12,800	23,300
	With the Project	45,500	78,000	15,000	40,400
	Difference[3]	***19,600***	***34,900***	***2,100***	***17,100***

Note: Numbers may not add due to rounding.
1. Based on water deliveries from DWRSIM study 2020D09C-CALFED-786.
2. Multiple dry year period supplies shown are average annual supplies over the four-year period.
3. Supplies shown are the amount of water attributable to the 41,000 AF of Table A Amount.
4. Under the SWP allocation scenario With Article 18(b) Implemented, the Table A Amounts shown are estimates of CLWA's reduced Table A Amount, based on its proportionate share of a reduced SWP minimum project yield of 2.0 million AF. The supplies shown include both Table A supplies and scheduled surplus supplies estimated to be available, with surplus supplies allocated based on priority for agricultural use.

Comparison of CLWA Supplies Presented to Supplies based on DWR's Recent SWP Delivery Reliability Report – The existing SWP water supplies included in Table 3.15-7 are based on results from DWR's recent SWP Delivery Reliability Report, which presents the results of CALSIM II model studies run using current allocation rules (i.e., With Monterey Amendment). Starting with these same DWR results and applying the same methodology suggested by DWR in its report, the Project would result in an increase in CLWA's SWP supplies: under "existing" (2001 in DWR's SWP Delivery Reliability Report) conditions of 29,400 AF, 8,000 AF, and 14,800 AF under the average year, single dry year, and multiple dry year period conditions,

respectively; and under 2020 conditions of 30,600 AF, 8,200 AF, and 15,000 AF under the average year, single dry year, and multiple dry year period conditions, respectively.

Water Quality

The Project would result in the delivery of additional SWP water to the CLWA service area when demands are sufficient to make such deliveries feasible. Although SWP water quality varies from year to year depending on hydrologic conditions, regardless of the SWP allocation scenario (With Monterey Amendment, Without Monterey Amendment, and With Article 18(b) Implemented) and the SWP demand conditions (existing or 2020), the Project would not result in a direct impact to water quality within the CLWA service area. CLWA and the local purveyors would continue to meet all applicable drinking water standards and water quality criteria.

The Project would not result in direct surface water quality impacts. CLWA has no discharge permits regulating water quality and is only regulated with regard to the drinking water quality of distributed potable water. It is the actual use of the imported water and discharge after use (i.e., as wastewater) that has the potential to affect water quality of surface waters. This potential impact was considered in the Basin Plan and is considered in the discussion of indirect growth-related impacts in Chapter 4. The Project would not affect the frequency and magnitude of flood flow releases or spills from Castaic Lake. These events are related to rights of downstream users and not related to CLWA or the Project.

INDIRECT IMPACTS

Potential impacts from population growth that could occur as an indirect impact of the Project are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.15.3 Mitigation Measures

3.15.3.1 State Water Project and Associated Facilities

No significant direct or indirect impacts to water resources were identified; therefore no mitigation measures are required.

3.15.3.2 Wheeler Ridge-Maricopa Water Storage District

No significant direct or indirect impacts to water resources were identified; therefore no mitigation measures are required.

3.15.3.3 Castaic Lake Water Agency

No significant direct impacts to water resources were identified; therefore no mitigation measures are required. Mitigation measures for indirect impacts are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

3.15.4 Significant Unavoidable Impacts

No direct or indirect significant unavoidable adverse impacts have been identified within the SWP and associated facilities or within WRMWSD. No direct significant unavoidable adverse impacts have been identified within the CLWA service area. Indirect impacts within the CLWA service area, including significant unavoidable adverse impacts are addressed in Chapter 4, Growth-Inducing Effects and Growth-Related Impacts.

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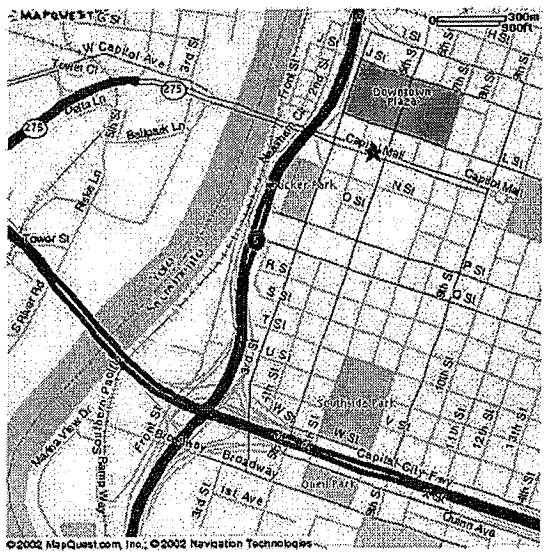

Parking Garages
*are located on **"L" STREET** under Macy's, on **3RD STREET** between **"L"** and **"K"**; off **5TH STREET** behind 455 Capitol Mall, and off **4TH STREET** in the Wells Fargo Bank Building.*

From the WEST on I-80, take **CAPITOL CITY FREEWAY**. Take the **JEFFERSON BLVD** exit towards **DOWNTOWN SACRAMENTO**. Merge on **CA-275 NORTH** towards **WEST SAC.** Cross the **TOWER BRIDGE** and you will be on **"CAPITOL MALL."** Turn **LEFT** at **5TH STREET** and the **5TH STREET** parking lot will be on your **LEFT**. Continue on **5TH STREET** and make a **LEFT** on **"L"** for the **"L" STREET** garages and to access the **4TH STREET** parking lot.

From the SOUTH on I-5, exit at **"Q" STREET**. Bear **RIGHT** on **"Q" STREET**. Turn **LEFT** on **5TH STREET**. Cross **"CAPITOL MALL"** and the **5TH STREET** parking lot will be on your **LEFT**. Continue on **5TH STREET** and make a **LEFT** on **"L"** for the **"L" STREET** garages and to access the **4TH STREET** parking lot.

From the EAST, Take **HWY 50** to **I-5 NORTH**. Exit **"Q" STREET**. Take a **LEFT** at **5TH STREET**. Cross **"CAPITOL MALL"** and the **5TH STREET** parking lot will be on your **LEFT**. Continue on **5TH STREET** and make a **LEFT** on **"L"** for the **"L" STREET** garages and to access the **4TH STREET** parking lot.

From the NORTHWEST on I-5. Take the **"J" STREET** exit. Turn **RIGHT** on **5TH STREET** and **RIGHT** again on **"L"** for the **"L" STREET** garages. Continue on **"L" STREET** and take a **LEFT** on **4TH STREET** to access the **4TH STREET** parking lot. Take a **LEFT** on **"CAPITOL MALL"** and another **LEFT** on **5TH STREET** to access the **5TH STREET** parking lot.

From the NORTHEAST, Take **I-80** to **I-5 SOUTH** and follow directions above. **OR**, take **CAPITOL CITY FREEWAY** and exit at **"P" STREET**. Go **WEST** until you reach **5TH STREET**. Turn **RIGHT**. Cross **"CAPITOL MALL"** and the **5TH STREET** parking lot will be on your **LEFT**. Continue on **5TH STREET** and make a **LEFT** on **"L"** for the **"L" STREET** garages and to access the **4TH STREET** parking lot.

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Attachment 24

LETTER 21

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STATE CAPITOL
ROOM 3086
SACRAMENTO, CA 95814-4900
(916) 445-2407
FAX (916) 323-2304

DISTRICT OFFICES
EAST CHANNEL STREET
ROOM 440
STOCKTON, CA 95202
(209) 948-7930
FAX (209) 948-7993

1020 N STREET, ROOM 502
SACRAMENTO, CA 95814
(916) 323-4306
FAX (916) 323-2596

California State Senate

MICHAEL J. MACHADO
SENATOR, FIFTH DISTRICT

COMMITTEES
BANKING, COMMERCE AND INTERNATIONAL TRADE
CHAIR
AGRICULTURE AND WATER RESOURCES
BUSINESS AND PROFESSIONS
GOVERNMENTAL ORGANIZATION
LOCAL GOVERNMENT

SUBCOMMITTEE
CALIFORNIA-EUROPEAN TRADE DEVELOPMENT
CHAIR

SELECT COMMITTEES
CAPITOL AREA FLOOD PROTECTION
CENTRAL VALLEY ECONOMIC DEVELOPMENT
DELTA RESOURCES AND DEVELOPMENT
CHAIR
INTERNATIONAL TRADE POLICY AND STATE LEGISLATION

October 30, 2002

Director Tom Hannigan
Department of Water Resources
1416 Ninth Street
Sacramento, CA 95814

Dear Director Hannigan:

I have asked the California Research Bureau to comment on the Draft State Water Project (SWP) Supply Reliability report because questions are being raised by many in the water community regarding the conclusions of the report. With outstanding questions still not addressed, it will be difficult to make progress on many of the critical water issues facing the state.

- Local development could be hampered if, when complying with SB 221 (Kuehl) and SB 610 (Costa) or California's Environmental Quality Act (CEQA), there are significant disputes over current and future water supplies.

- Conclusions of CalFed's Integrated Storage Investigation (ISI) will be suspect given that the same model is used in both the ISI and the SWP Reliability reports.

- Future statewide bonds for increasing water supply will be in jeopardy, if opponents can credibly challenge the underlying analysis.

It is critical that the final SWP Reliability report has widespread support. Until the Department of Water Resources (DWR) resolves concerns raised, the report seems premature and could lead to additional water challenges in the future.

Sincerely,

MICHAEL J. MACHADO
Senator, Fifth District

MJM:bw

Cc: Jonas Minton, Department of Water Resources
Lucinda Chipponeri, Department of Water Resources

Comments on the Department of Water Resources' Draft State Water Project Supply Reliability Report

Dennis O'Connor, Assistant Director
California Research Bureau

November 1, 2002

The Department should be commended for attempting to accurately describe the State Water Project's (SWP) supply reliability. If Californians are to plan effectively for their water future, it is important to that we describe our water supply reliability accurately and thereby avoid basing decisions on assumptions about water that exists only on paper. However, as these comments show, the Department's attempt so far falls short of this goal.

Senator Mike Machado asked that the California Research Bureau comment on the Draft State Water Project Supply Reliability Report (Report). He did so because there appears to be a lack of widespread confidence in the conclusions of the report. In particular, many think the modeling behind the report overstates the supply reliability of the SWP. If this is true, then instead of a "paper water" problem, we might have a "cyber water" problem.

What Does The Report Say?

The purpose of the report is to "assist the contractors of the State Water Project in the assessment of the adequacy of the SWP component of their overall water supplies."* It does so by constructing *delivery probability* charts for the SWP. These charts show the probability of the SWP delivering from the Sacramento-San Joaquin Delta a given quantity of water for a given year under a given set of conditions.

The Department calculated delivery probability charts for two years, 2001 and 2021. For both years, the Department assumed the current water facilities continue to operate as they do now. That is, no new water facilities would be added or removed, there would be no changes in operating rules or regulatory restrictions, etc. The only thing that would change between the two years is the "level of development"; that is, the amount of water used upstream of the Delta. That amount changes between 2001 and 2021 based on assumptions about future population growth and development. For both years, the Department assumes "variable demand"; that is, contractors will change the amount of water they request based on how wet or dry the year is. In addition, the Department created a delivery probability chart for 2021 that assumed all contractors requested their full "Table A" or contractual amount. (Table A amounts were formerly known as entitlements.)

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* California Department of Water Resources. *The State Water Project Delivery Reliability Report,* Draft. (Sacramento: The Department), August 2002. p. iii

In addition to Table A amounts, the Department also calculated delivery probabilities for Article 21 water. Article 21 water, also known as surplus water, refers to water that is available once all SWP demands are met. This means the reservoirs are full, all Table A requests are met, and there is still water legally available to export from the Delta.

The result of all this analysis was a series of delivery probability charts. The figure below shows the delivery probability chart for the 2001 level of development. The chart shows Table A delivery on the left axis, and the corresponding percent of full Table A contractual amounts on the right. The bottom axis shows the percent of time one would expect to receive a given quantity of water. The chart shows that for the 2001 level of development, the SWP would be able to deliver at least 804 thousand acre-feet (taf) of water 100 percent of the time – 804 taf is the minimum the SWP would ever deliver. The most the SWP would be able to deliver would be 3,845 taf. The median delivery is 3,297 taf. As the chart shows, the median delivery is the amount of water that corresponds to the 50 percent probability level. This means that for the 2001 level of development, half the time the SWP would deliver more than 3,297 taf, and half the time the SWP would deliver less.

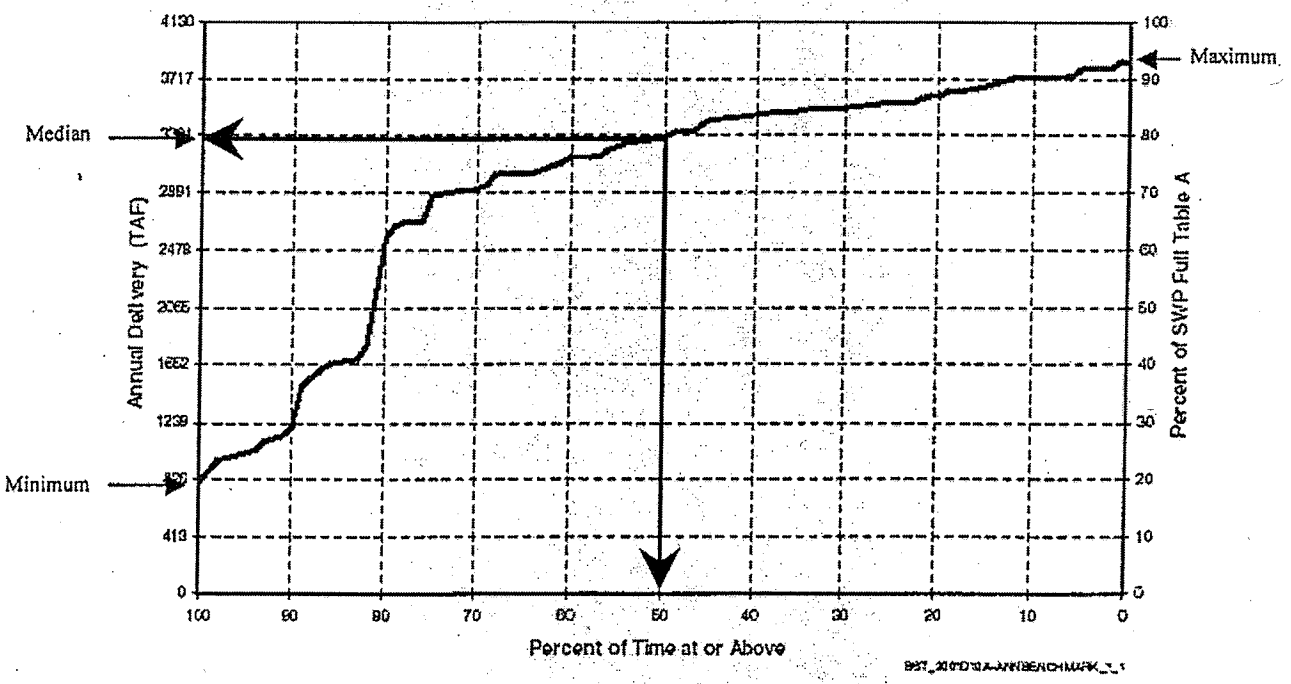


Figure B-1 Study 2001 SWP Delta delivery reliability

Similar charts were created for 2021 level of demand with contractor demands that vary with the weather and for 2021 with full Table A demand.

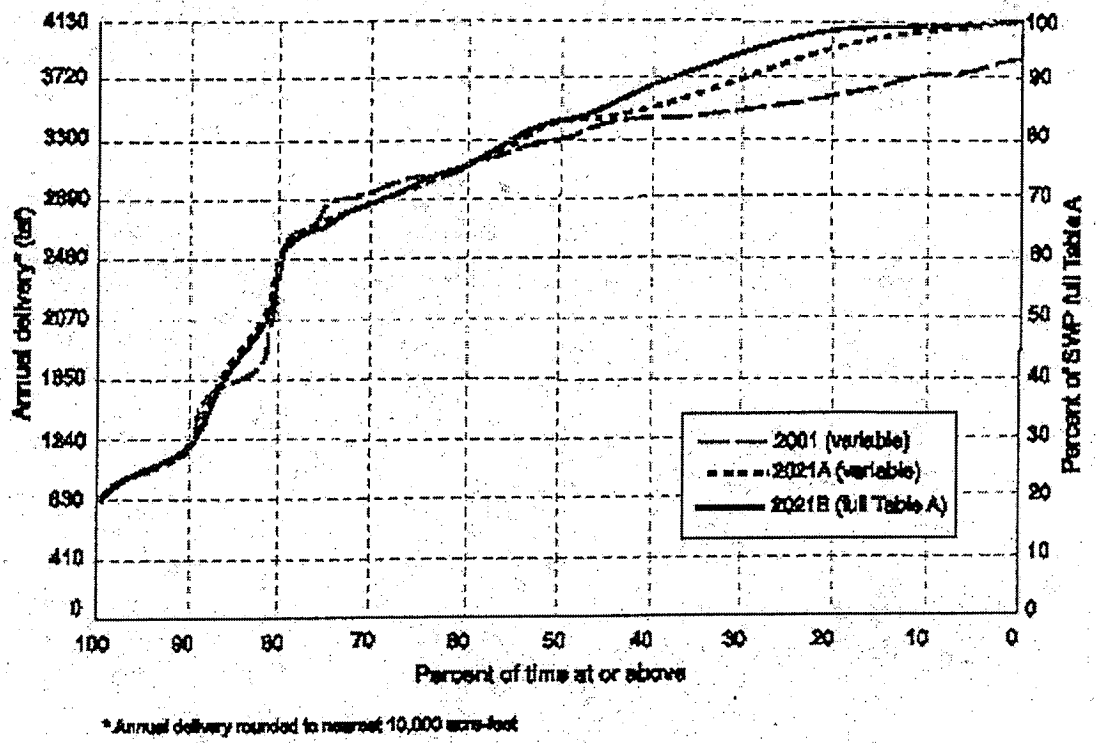
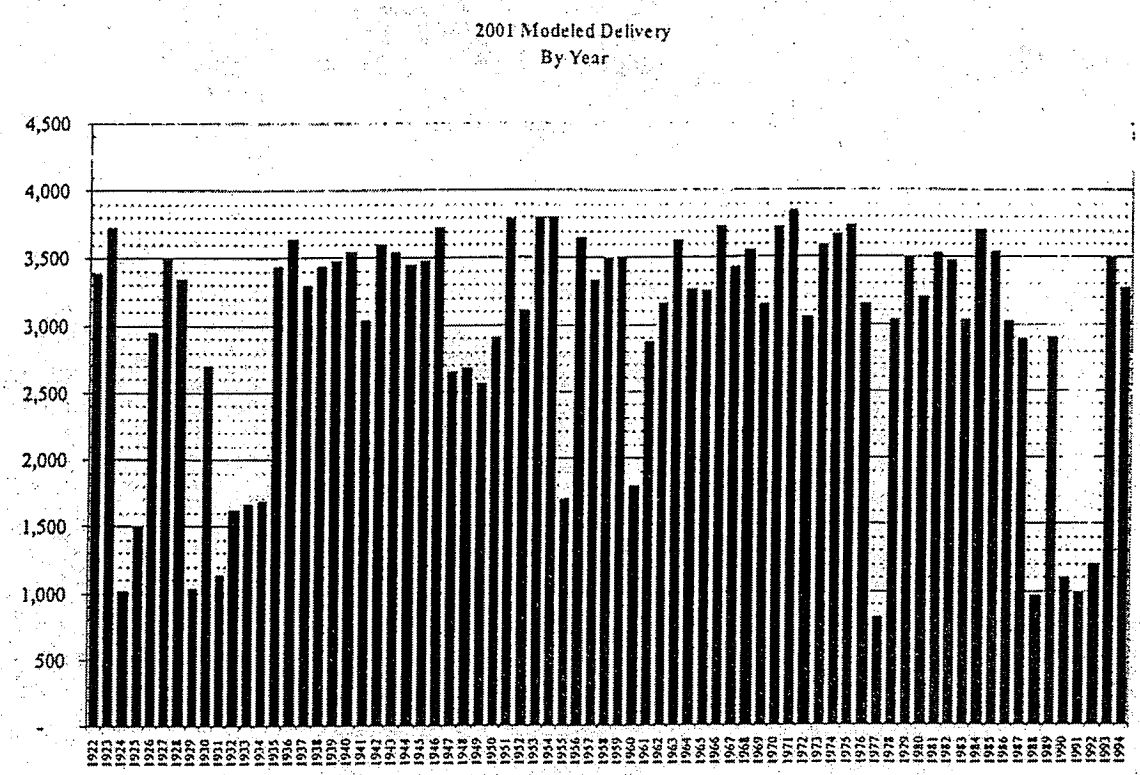


Figure 1 SWP Delta delivery probability (Table A)

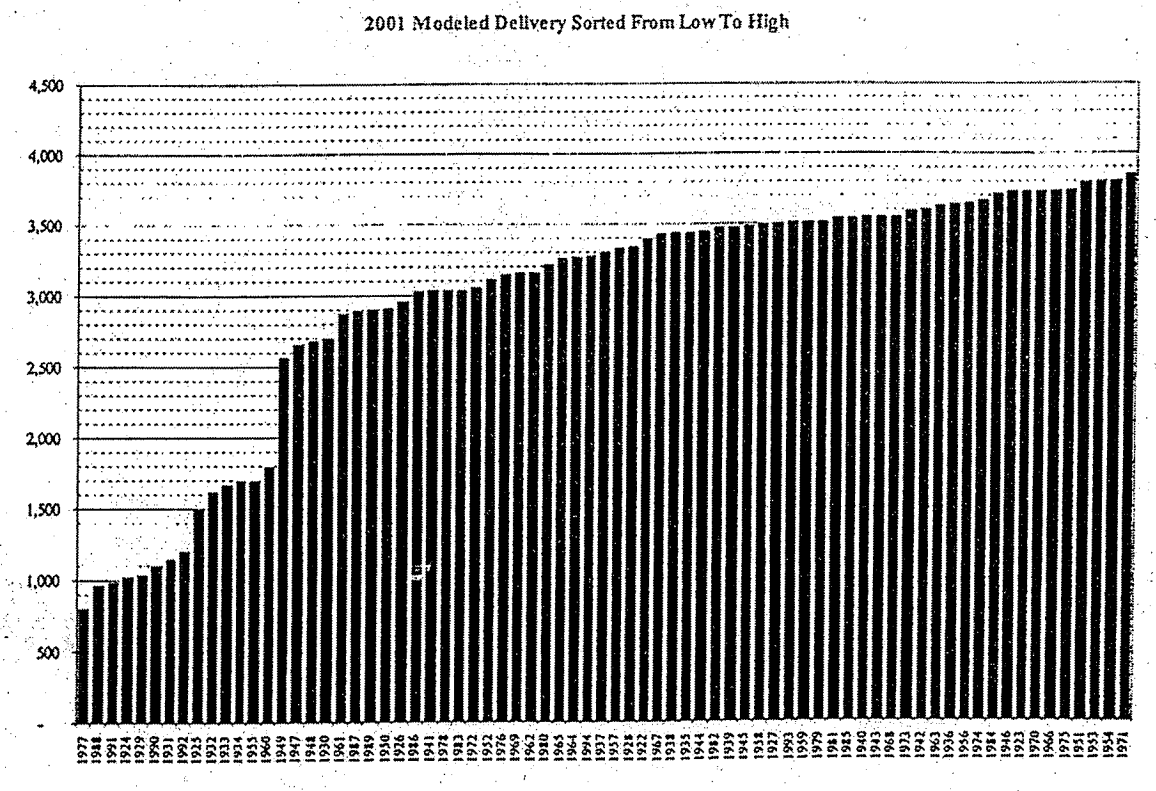
How Did The Department Estimate The Delivery Probabilities?

To estimate the delivery probabilities, the Department used a model called Calsim II. Calsim II is a complex linear programming model that attempts to mathematically simulate the operations of the SWP and the Central Valley project. To do this, Calsim II has a large set of equations that describe how all the various rivers, dams, canals, diversion points, discharge points, etc. all relate to each other. It has another large set of equations that describe the rules for operating the various water facilities – when to create flood control storage, when to reduce delta exports to meet water quality regulations, etc. Calsim II then associates with these equations data that describe the particular point in time under consideration. For the draft reliability report, those data describe the level of development in 2001 and 2021.

To develop the delivery probabilities, Calsim II is then asked the following question. Assuming all of these relations and conditions for 2001 stay the same, how much water would be available for export from the Delta if, instead of 2001's weather pattern, we had 1922's weather pattern instead. Then, given how full the reservoirs would have ended up after 1922's weather pattern, what would happen if we then we had 1923's weather pattern, 1924's weather, and so on. The following chart shows the Calsim II results for 2001 level of development.



The basis for the delivery probability chart becomes clear when these data are sorted from low to high.



Why Do People Question the Results?

People have raised a litany of concerns with the results. Some of these concerns are more valid than others. The major concerns seem to be:

- Recent deliveries were lower than the modeled 2001 conditions.
- 2021 does not seem to reflect any growth in upstream consumptive use.
- Calsim II has not been calibrated, tested, or otherwise verified.
- The results appear inconsistent with previous estimates and models.
- Calsim II is not being used as designed.

Each of these concerns is discussed in turn, with a short assessment of their legitimacy.

Recent deliveries were lower than the modeled 2001 conditions.
Chart 1 (attached) shows historic Table A deliveries along with the modeled maximum, minimum, and median level for 2001 conditions. Recall that under 2001 conditions, half the time one would expect to receive more than the median level, half the time less. As Chart 1 shows, not once has the SWP delivered Table A water equal to the median rate. So, many think Calsim II over estimates the SWP's delivery reliability.

Part of the problem is that Calsim II calculates Table A deliveries slightly differently from those reported in Bulletin 132. For example, Calsim II counts water contractors carryover in the year it is created, not the year it is delivered. That is, Calsim delivers water whenever it has the capacity, with no allowance for a contractor's desire to carry water over to the next year. The difference between actual Table A deliveries as reported in Bulletin 132 and as calculated in Calsim II is shown in Chart 2.

Chart 3 shows the actual Table A deliveries, adjusted for how Calsim II treats carryover, along with the modeled maximum, minimum, and median level for 2001 conditions. Once placed on an apples-to-apples basis, the adjusted Table A deliveries still look low compared to the modeled 2001 delivery reliability. Only once do deliveries reach the median rate – the amount the model says would be deliver half the time. And as shown in Chart 4, the picture doesn't change much when Article 21 (surplus) water is included. Recent experience seems lower than modeled 2001 conditions. So, Calsim II continues to look like it overstates the delivery reliability of the SWP.

A strong counter to the argument that Calsim II exaggerates the SWP's reliability would be that the reason the SWP hasn't delivered that much water in the past is because the contractors haven't asked for that much water. However, this doesn't seem to be the case. Chart 5 shows Actual Table A deliveries and contractors requested delivery. As the chart shows, on 9 occasions requests have been higher than the median rate, only once has the median rate been met. In fact, only once in the last 12 years has the SWP been able to deliver 95 percent or more of contractor requests. Again, Calsim II looks like it over estimates SWP reliability.

Nor does water year type seem to explain the discrepancy. Chart 6 is the same as Chart 5, except the water year type (Sacramento River Index) is shown above each

delivery amount. It shows, for example, that 1998 was a wet year, contractors requests were greater than the median rate, yet contractors received only half of their requested amount (as defined by Calsim II).

What the chart does not show, is that because of the heavy snow pack and spring runoff in 1998, the contractors did not want all of the water they had initially requested. They cut their demand, including carryover water, to just under 1.7 million acre feet (maf). However, the modeling didn't foresee this possibility. The modeling assumptions varied demand between 3.0 and 4.1 maf based on weather. The 3.0 maf demand used in the wettest years was well above the 1.7 maf ultimately demanded by the contractors in 1998. This suggests that the modeling assumptions might be part of the reason Calsim II seems to overstate delivery reliability.

While many try to compare the modeled 2001 reliability against historic SWP operations, it is not really appropriate for much of the period. As previously noted, Calsim II assumes there are no changes from 2001 in the physical and operational aspects of the SWP. Yet in the early history of the SWP, many facilities were not constructed. For example, the big pumps at Edmonston Pumping Plant didn't start pushing water over the Tehachapis until 1971. Also, Contractors' contractual claims for delivery as reflected in Table A were greatly diminished in the early years – it wasn't until 1990 that Table A amounts exceeded 4.0 maf. And, regulatory rules governing the Sacramento-San Joaquin Delta have also changed over the years. The current governing rules, D-1641, weren't issued until 1995. Consequently, comparing modeled 2001 reliability against actual deliveries is somewhat misleading much beyond the last few years.

So, lets look at recent years. Following the notion of water year further, Chart 7 is the 2001 modeled delivery, sorted by water year type (Sacramento River Index). This way one can compare recent years to the appropriate water year type reliability. The first thing one notices is that the median level for below normal years is *higher* than the median level for above normal years and is nearly the same as for wet years. Common sense would suggest that the median level in below normal years would be *less* than the level for above normal years. This suggests something odd is going on within Calsim II.

Water year 2001 was classified "dry" and contractors requested Table A deliveries of over 4.1 maf. Chart 8 shows actual 2001 Table A deliveries (adjusted) compared to modeled 2001 dry year reliability. It shows that 2001 deliveries were less than the least amount Calsim II would say would ever be delivered in a dry year. However, one would expect 2001 deliveries to be greater than the lowest dry year. 2001 was not the driest dry year – 1932 was. Also, 2001 followed an above average year, which itself followed five consecutive wet years. Consequently, the beginning storage in 2001 ought to have been much higher than in 1925, which followed the driest year modeled, or 1932, which followed a 3 year period of dry and critically dry years. This is further evidence that Calsim II overstates delivery reliability.

Water year 2000 was classified as "above normal." Chart 9 shows actual 2000 Table A deliveries compared to modeled 2001 above normal year reliability. It shows that 2000

deliveries were above the median for above normal years. This is seems reasonable, and appears to be the exception to the rule.

Water years 1998 and 1999 were classified "wet" and in both years contractors requested more than 3.3 maf. As Chart 10 shows, actual 1998 and 1999 Table A deliveries were again less than the least amount Calsim II would say would ever be delivered in a wet year. In fact, 1998 deliveries were 45 percent less than the lowest modeled delivery. In both years, because of a high snow pack and runoff, contractors did not want the full amount of water they initially requested. However, as noted above, the assumptions behind Calsim II did not consider that contactors might reduce their demand below 3.0 maf. This reinforces the notion that the modeling assumptions might be part of the reason Calsim II seems to overstate delivery reliability

In summary, while a strict comparison of historic Table A deliveries to modeled 2001 delivery reliability suggests Calsim II over estimates the SWP's delivery reliability, such a comparison is misleading. Part of problem is that Bulletin 132 and Calsim II calculate Table A deliveries slightly differently. Another problem is that Calsim II assumes there are no changes from 2001 in the physical and operational aspects of the SWP. Yet as recently as 1995, the Delta's regulatory operations were much different.

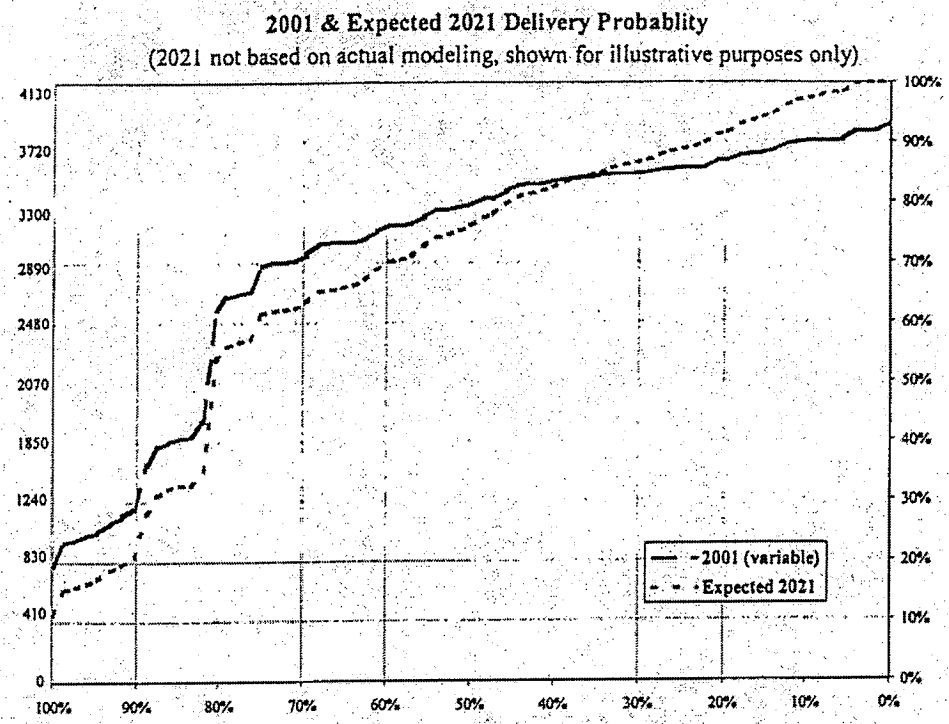
Nonetheless, there is still much evidence that suggests there is something wrong with the Calsim II results. For example, the median level for below normal years being *higher* than the median level for above normal years and being nearly the same as for wet years is quite curious.

Moreover, much of the evidence that suggests there is something wrong with the Calsim II results indicate that the modeled 2001 results overstate SWP delivery reliability.

- Only once in the last 12 years has the SWP been able to deliver 95 percent or more of contractor requests.
- The 3.0 maf contractor demand used in the wettest years was well above the 1.7 maf ultimately demanded by the contractors in 1998.
- 2001 deliveries were less than the least amount Calsim II would say would ever be delivered in a dry year, despite evidence that it should not have been.

All this implies there is either a problem with Calsim II, its assumptions, or both.

2021 does not seem to reflect any growth in upstream consumptive use.
The draft report shows SWP Delta delivery probabilities under 2001 and 2021 levels of development. Presuming that upstream development – and hence consumptive water use – will be greater in 2021 than in 2001, one would expect that during periods of water shortage, less water would be available for export in 2021 than in 2001. This is illustrated below.



However, the chart below from the report shows, for much of the time, the modeling results show *more* water being delivered in 2021 than in 2001. That might make sense during wet periods where the supply constraint would be small, such as when deliveries are at the 0-30 percent level. However, it is particularly troubling in dry periods when water supplies would be particularly tight, such as the 85-80 percent level. So again, the model appears to overstate SWP delivery reliability.

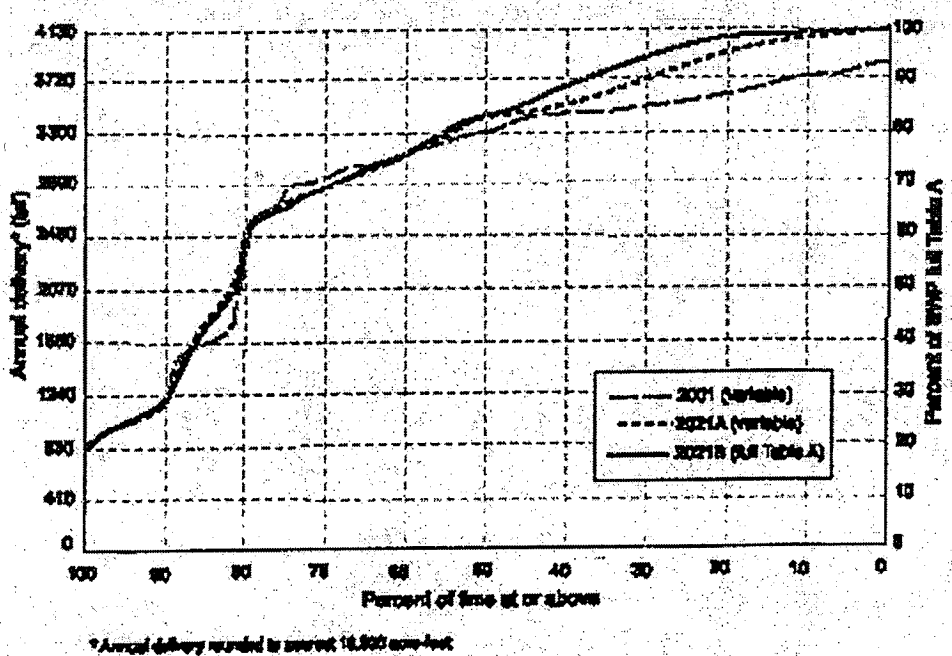


Figure 1 SWP Delta delivery probability (Table A)

Calsim II has not been calibrated, tested, or otherwise verified.
The Department is releasing this report based on results of a highly complex model that has not been calibrated, tested, or otherwise verified. Calibration is a systematic process of adjusting a model to ensure that the model output accurately matches actual experience. Such adjustments might have to do with changing assumed channel capacity, maximum or minimum water flow rates, reservoir operations, etc. When a model has not been calibrated or otherwise tested or verified, one cannot be sure that the model accurately reflects reality.

This lack of calibration or testing is especially troubling given the many changes made between this model and its predecessor.

These changes include:

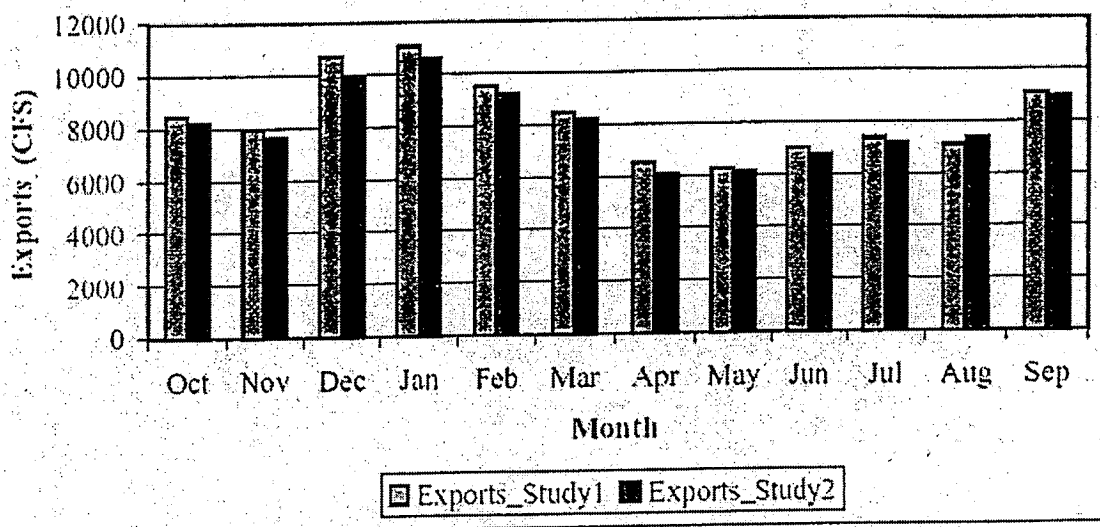
- New logic for determining deliveries to north-of-Delta and south-of-Delta CVP and south-of-Delta SWP contractors;
- New procedures for dynamic modeling of CVPIA 3406(b)(2) water and the Environmental Water Account (EWA);
- Addition of numerous surface streams and control points; and
- Incorporating groundwater into the modeling.

The interaction of groundwater into the modeling is a particular concern. The California Water Plan Update Modeling Workgroup meet last year to get an update on Calsim II. At the meeting, a Department staff person commented on the tendency for Calsim II to pump groundwater without regard to sustainable yield or capacity of the aquifer. That is, Calsim II tended to assume that upstream water users would pump groundwater beyond all practical limits. This might explain why, as discussed in the previous section, additional upstream development in 2021 did not affect dry year delivery reliability – the model might have assumed that more groundwater would be pumped to meet any assumed additional upstream demand. This is another reason why Calsim II appears to overstate SWP delivery reliability.

The results appear inconsistent with previous estimates and models.
The monthly timesteps used by Calsim II overestimates delta export capacity when compared to the daily timesteps used in DWR Delta Simulation Model (DWRDSM2). As noted in the In-Delta Storage Program's *Draft Report on Operation Studies*.

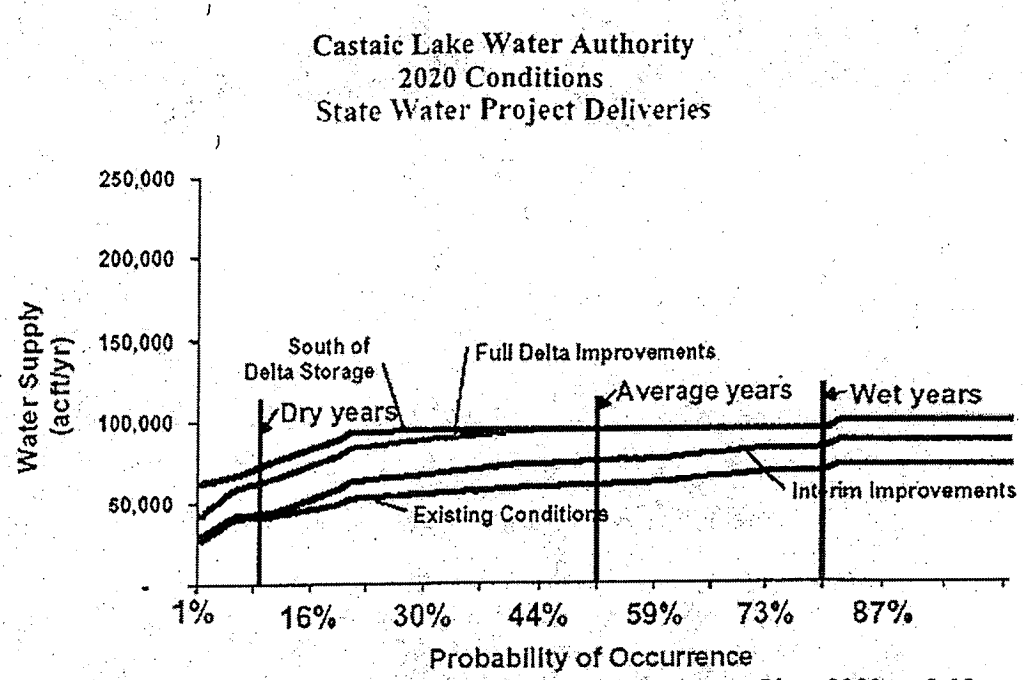
The daily fluctuations of inflow above and below the monthly mean cause a diversion pattern that reduces the exports from the Delta as compared to those achieved in the monthly model. This phenomenon is shown in Figure 6, where the monthly average amounts exported by the daily model are shown to be consistently lower than those in the monthly model, except for August. The lower exports inevitably impact on the annual deliveries.

Figure 6
Average Monthly Exports (CFS)



In Figure 6, reproduced above, the monthly Calsim II results are labeled Exports_Study1 and are the left bar for each month. The daily model results are labeled Exprts_Study2 and are the right bar for each month. The models clearly disagree on export capacity. However, we do not know which model more closely simulates actual export capacity.

Calsim II also shows higher delta export capacity when compared to the results of DWRSIM, the predecessor to Calsim II. Castaic Lake Water Agency, in developing their 2000 Urban Water Management Plan, used DWRSIM, to estimate their SWP delivery reliability. Their analysis showed that under 2020 conditions, with no changes to existing facilities or operating rules, the maximum delivery they could expect would be just over 70% of their maximum Table A deliveries. This is significantly different from the Calsim II results, which show they should expect to receive 100 percent of their maximum Table A deliveries nearly 10 percent of the time. Again, the models clearly disagree on export capacity. However, once again we do not know which model more closely simulates actual export capacity.



Castaic Lake Water Agency. *2000 Urban Water Management Plan*. 2000. p. 2-12.

Calsim II is not being used as designed.

Calsim II was designed to answer the following type of question. Given that we have a problem with something, such as meeting delta water quality requirements, would making a specific change to the system, such as adding a reservoir, make the problem better or worse? To answer the question, Calsim II is first set up and run to representing the way the system is currently. This is referred to as the "base" simulation. Then the model is adjusted to represent the specific change under consideration. This is called the "with project" simulation. Then the results of the two simulations are compared to see if the proposed change makes thing better or worse.

Calsim II was not designed to be used to establish absolute levels of exports, as it is in this report. As noted in the *Benchmark Studies Assumptions*:

It is intended, that CALSIM II be used in a comparative mode. The results from a "With Project" alternative simulation are compared to the results of a "base" simulation, to determine the incremental effects, of a project. The results from a single simulation may not necessarily represent the exact operations for a specific month or year, but should reflect long-term trends. – Benchmark Studies Assumptions, September 30, 2002

When used in the comparative mode, it is at least possible that any systematic problem with the model would "cancel each other out." This is not the case when used to establish absolute levels of exports, as it was in the draft reliability report.

People are understandably concerned whenever a model is used in a way different from that for which it was designed. This is especially true when the different use of the model has not been rigorously evaluated. Without testing or otherwise verifying Calsim II, it is simply not possible to know whether or not the model's results are reliable when Calsim II is used as it is in the draft reliability report.

Other Concerns

The proceeding are the most frequently mentioned concerns with the draft report. However, there are many others. These include:

- The "level of development" estimate was based on the oft-criticized Bulletin 160-98. One of the criticisms about Bulletin 160-98 was that it overestimated urban water demand, including areas upstream of the Delta. Because of these criticisms, the next edition of Bulletin 160 will use a different process for estimating urban water demand. Consequently, the concerns about using the Bulletin 160-98 estimates seem legitimate, though the effect on delivery reliability is uncertain.

- One cannot evaluate the reasonability of SWP delta exports without also looking at the CVP exports. These estimates are not reported and the US Bureau of Reclamation has not done a similar exercise. It is possible that one reason SWP delivery reliability seems high is that the model essentially took water from the CVP and delivered it to SWP. Without seeing the modeled exports for both projects, one simply cannot know.

- The Department's public explanations for why the model is reliable rely solely on the modeling analysis. There has been no outside corroboration of the model results. This is an issue of credibility, and again seems legitimate.

- Calsim II assumes that the system is run "by the book." However, there are numerous examples where the system was not run "by the book" with often significant consequences. For example, 1990 operating decisions "bet" that there would not be another critically dry year in 1991. This lead to disastrous conditions in 1991. While this is a legitimate criticism, it is not certain that the modeling would require some correction. It might be that the operators simply need follow the operating rules to more closely.

- Calsim II does not model curtailments at pumps for exceeding the take limits of endangered species. Yet this occurs somewhat frequently. This might be another reason why delivery reliability appears high.

- Calsim II assumes water delivered any time of year is useful to all contractors. This might be true for Metropolitan Water District of Southern California and the Kern County Water Authority as they have own storage options. This is not true for other contractors such as Santa Barbara County. Again, this might be part of the reason why the modeled delivery reliability seems to have been overestimated.

- Legislature has had credible testimony that the historic weather pattern is no longer a reliable indicator of the future. Yet, the simulation was based entirely on historic hydrology. A shift from snow to more rain predicted by climatologists would have big consequences for delta exports. However, it is not clear that such effects would be noticeable by 2021.

- Recent years are not included in analysis – the simulation ignores 1995-2001. While it might be unrealistic to expect all the data necessary for including 2000 or 2001 to been developed yet, it does seem reasonable to expect data for the 90s to be included.

Additional Issues That Cause Some Concern

- At some of the public briefings, the Department's explanations for increased reliability in future the occasionally referred to actions or programs not included in modeling; such as increase regulatory limits on exports or new facilities. Yet, such changes were not a part of the analysis, so those changes could not be part of the reason for higher delivery reliability.

- Much of the data are of poor quality – especially for groundwater effects. If you don't think the model inputs are accurate, it is difficult to accept that the model outputs are accurate.

- Calsim II is a linear model used to simulate what looks to be a non-linear system. This suggests the model is misspecified, with difficult to predict consequences.

- Department did not take testimony in public – public cannot hear others' concerns about the report before they submit their comments.

- Typos – Table B-3, column labeled "model variable demand" shows average 3712. Average of column is in fact 3709. All the data in the report need double checking.

Why is this a problem?

Many agencies will use the SWP Delivery Reliability report for many purposes. In addition, Calsim II is the basis for many water program analyses.

- Local water agencies will use the reliability report for local planning purposes, such as developing the Urban Water Management Plans required by Water Code Section 10610. Efficient local planning requires credible estimates of SWP reliability.

- Local agencies will also use the report to comply with the requirements of SB 221 and SB 610. These laws require water retailers to certify there is sufficient water to meet the requirements of new development projects.

- The California Water Plan Update plans to use Calsim II to describe the State's water conditions. The California Water Plan is to guide the strategic development of the State's water resources.

- Calfed is using Calsim II as part of its integrated storage investigations. The result of these investigations will be recommendations for potential new water supply projects.

- All of these investigations will be used to justify future statewide water bonds

However, if the delivery reliability of the SWP is overstated and Calsim II results are questionable, the consequences would be significant.

- Local agencies will mis-size local water projects.
- Local development could be hampered if, when complying with SB 610 and SB 221 or CEQA, there are significant disputes over current and future water supplies.
- The California Water Plan would once again be subject to widespread criticism.
- Conclusions of Calfed's Integrated Storage Investigation (ISI) will be suspect given that the same model is used in both the ISI and the SWP Reliability report.
- Future statewide bonds for increasing water supply will be in jeopardy, if opponents can credibly challenge the underlying analysis.

Solutions

As the Bay-Delta Modeling Forum's Ad hoc Modeling Protocols Committee noted in their *Protocols for Water and Environmental Modeling:*

In the highly technical and political arenas of California water, it is important that models enjoy a wide base of support from stakeholders and decision-makers, technical staff, and even the public. Modeling of water systems is not just a technical exercise. The objectives of modeling are to aid in planning, policy or operational decisions. Thus, models must be developed and used in ways that (1) provide assurance to decision-makers that the analysis is reasonable, (2) can be trusted by reasonable parties, and (3) addresses major technical concerns for the system's performance. – Protocols for Water and Environmental Modeling, January 21, 2000, p. 5

Unfortunately, Calsim II as used in the draft SWP Delivery Reliability report fails these requirements. While some of the issues raised about the report are misplaced, there are still a significant number of legitimate concerns.

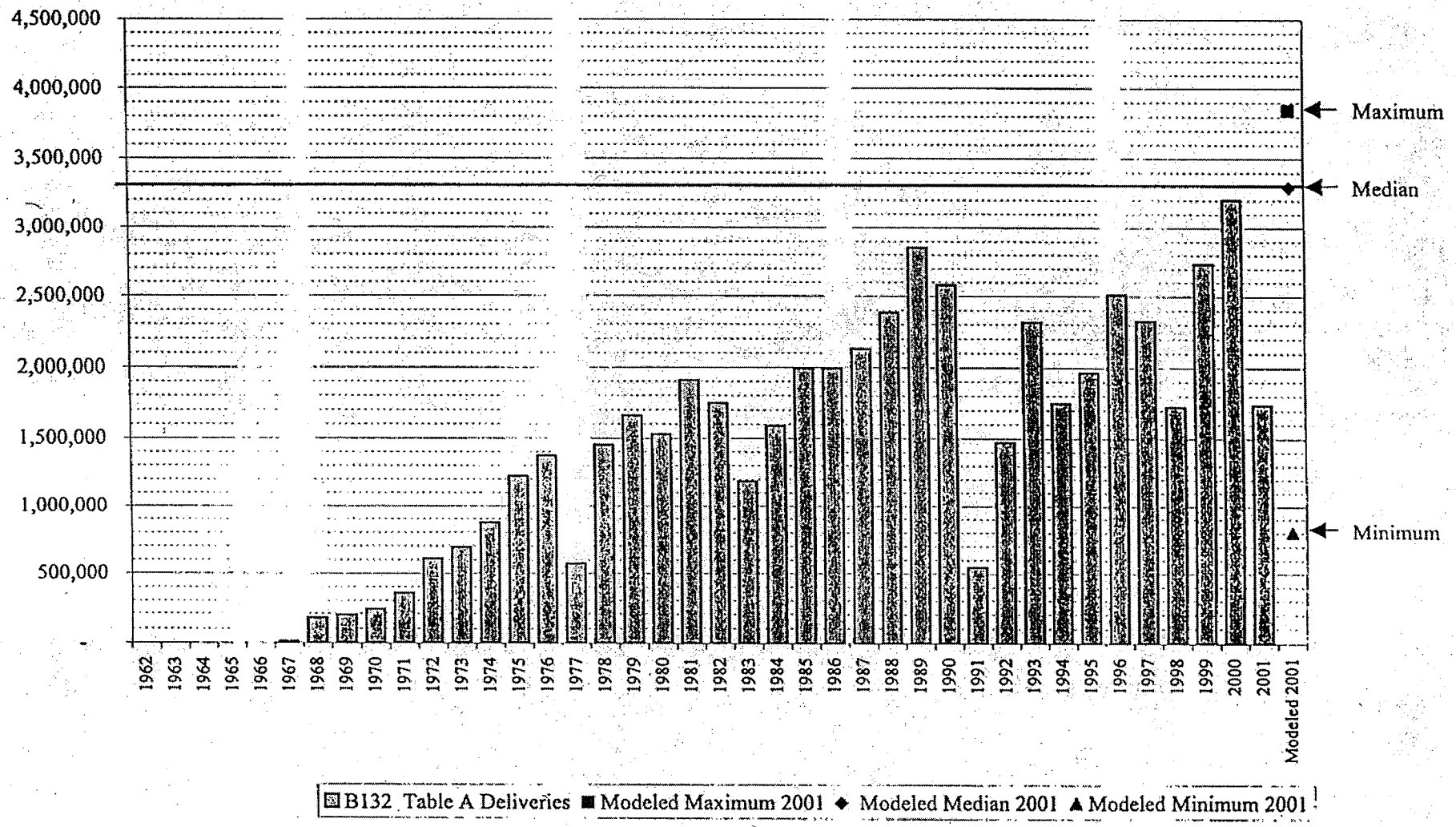
Department's plan to hold peer review, historic simulation, and sensitivity analysis of Calsim II is a good start toward restoring confidence, though there are some concerns.

- The peer review etc. will only suggest whether there is something structurally wrong with the model or its logic. It is possible that the model is properly designed, but the underlying data and assumptions are in error, leading to questionable output. The peer review will not show this.
- There is concern about simulating the recent past. Each year's estimate will explain only itself – results for one year do not necessarily imply anything about the accuracy of any other year. In statistical terms, it is equivalent to having zero degrees of freedom.

- It is unclear what the standard or threshold for acceptance or rejection of current model approach is. This will need to be clearly stated before the testing process begins.

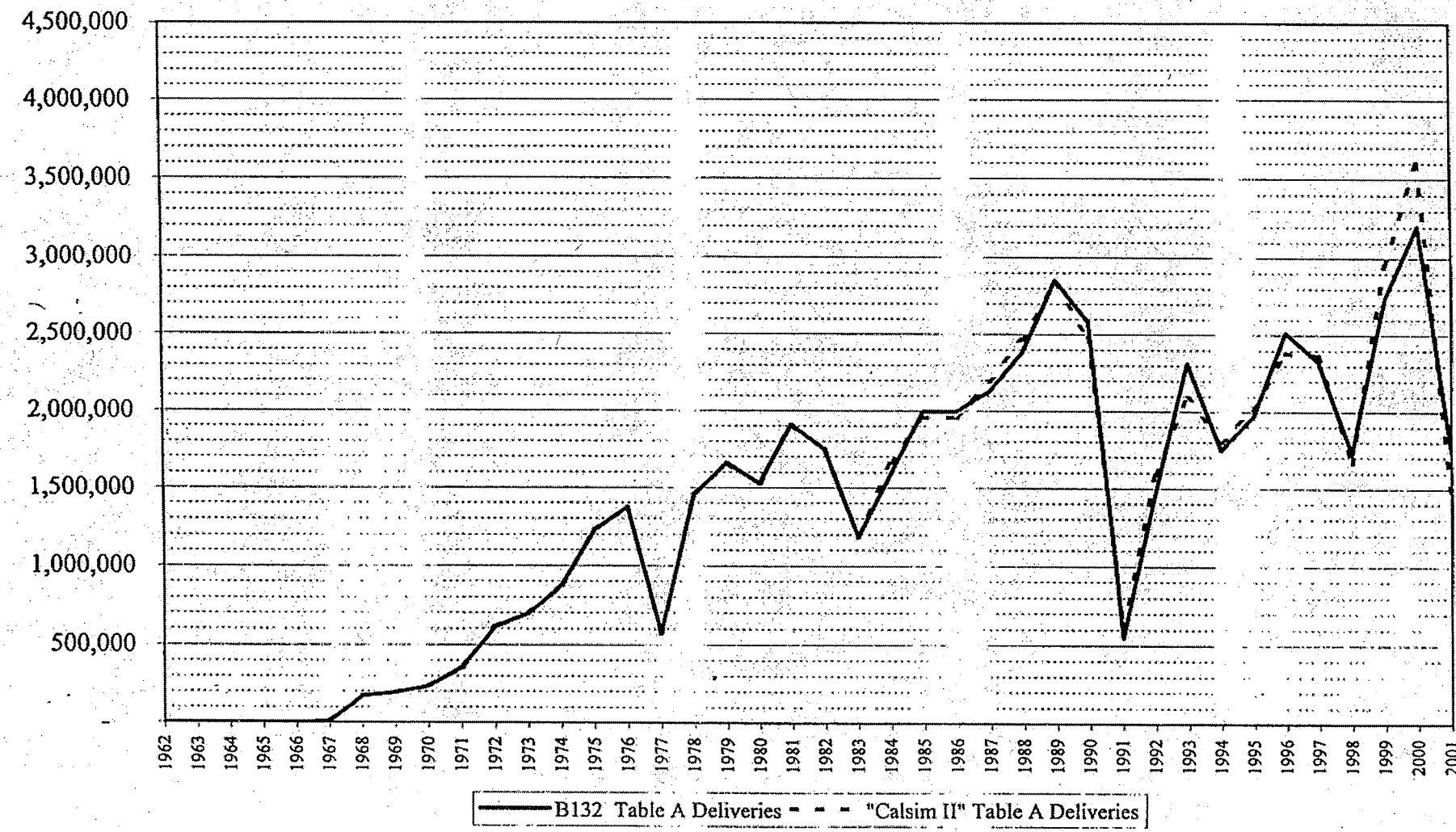
It is critical that this report's conclusions have widespread support. Unless and until the Department makes a concerted effort to resolve the concerns of the report's critics to the critics' satisfaction, the report seems premature. From a public policy perspective, it is better not to issue a final report, than to have a final report subject to significant dispute.

Compared To Historic Table A Deliveries,
The Modeled 2001 Delivery Reliability Looks High
(Not once do deliveries reach the median delivery rate)



Entitlement Deliveries
(Bulletin 132-00, Table 9-4 Draft Reliability Report, Appendix D)

The Difference Between Actual Table A Deliveries
As Reported In Bulletin 132 And As Calculated In Calsim II
(Eg., CalSim II counts carryover water in the year it is created, not the year it is delivered)



Entitlement Deliveries as reported in B-132 and as calculated in CalSim II
(CalSim II deliveries calculated per e-mail conversation with Frances Chung)

Still, The Actual Table A Deliveries (Adjusted) Look High Compared To The Modeled 2001 Delivery Reliability
(Only once do deliveries reach the median rate)

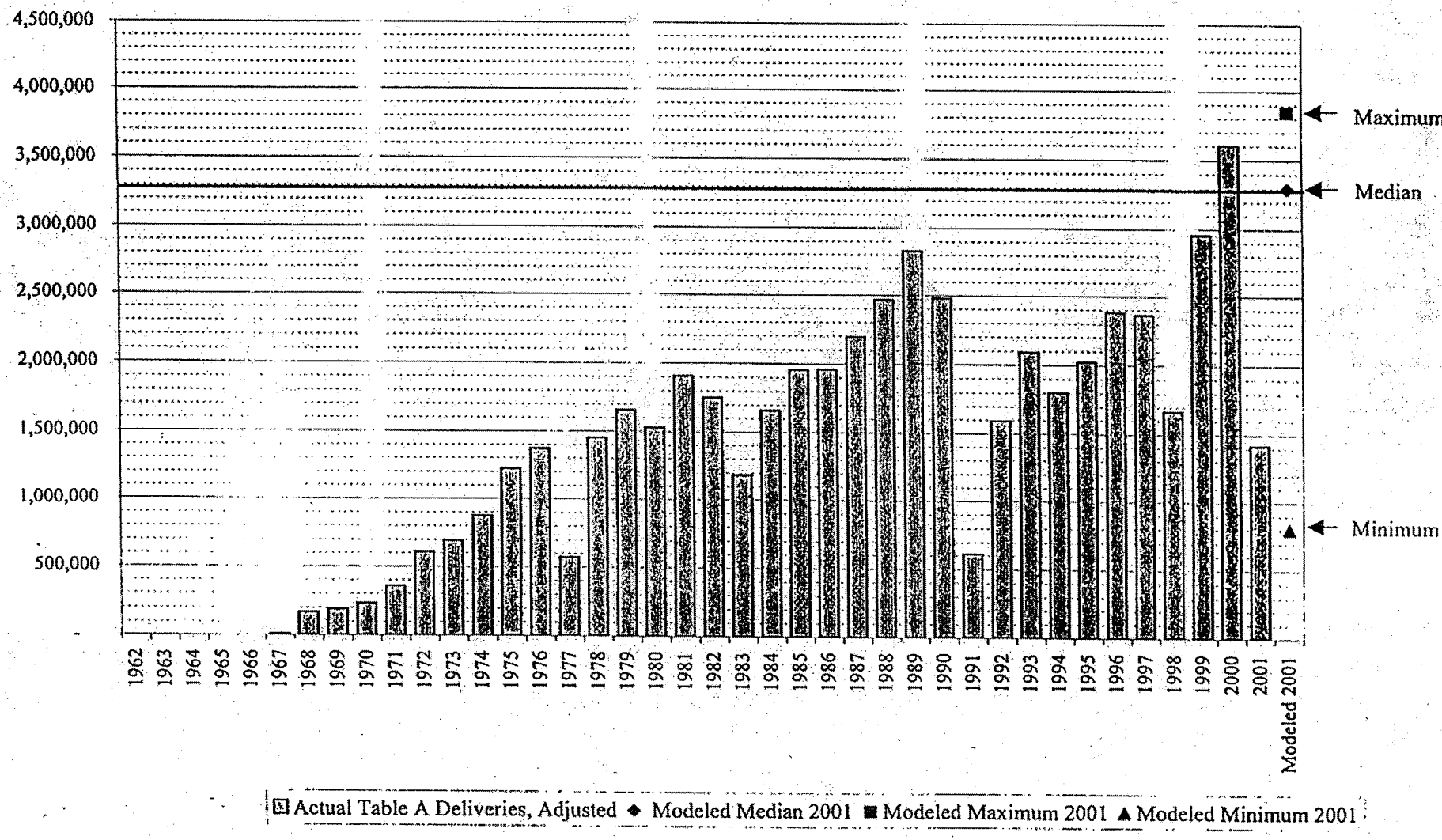
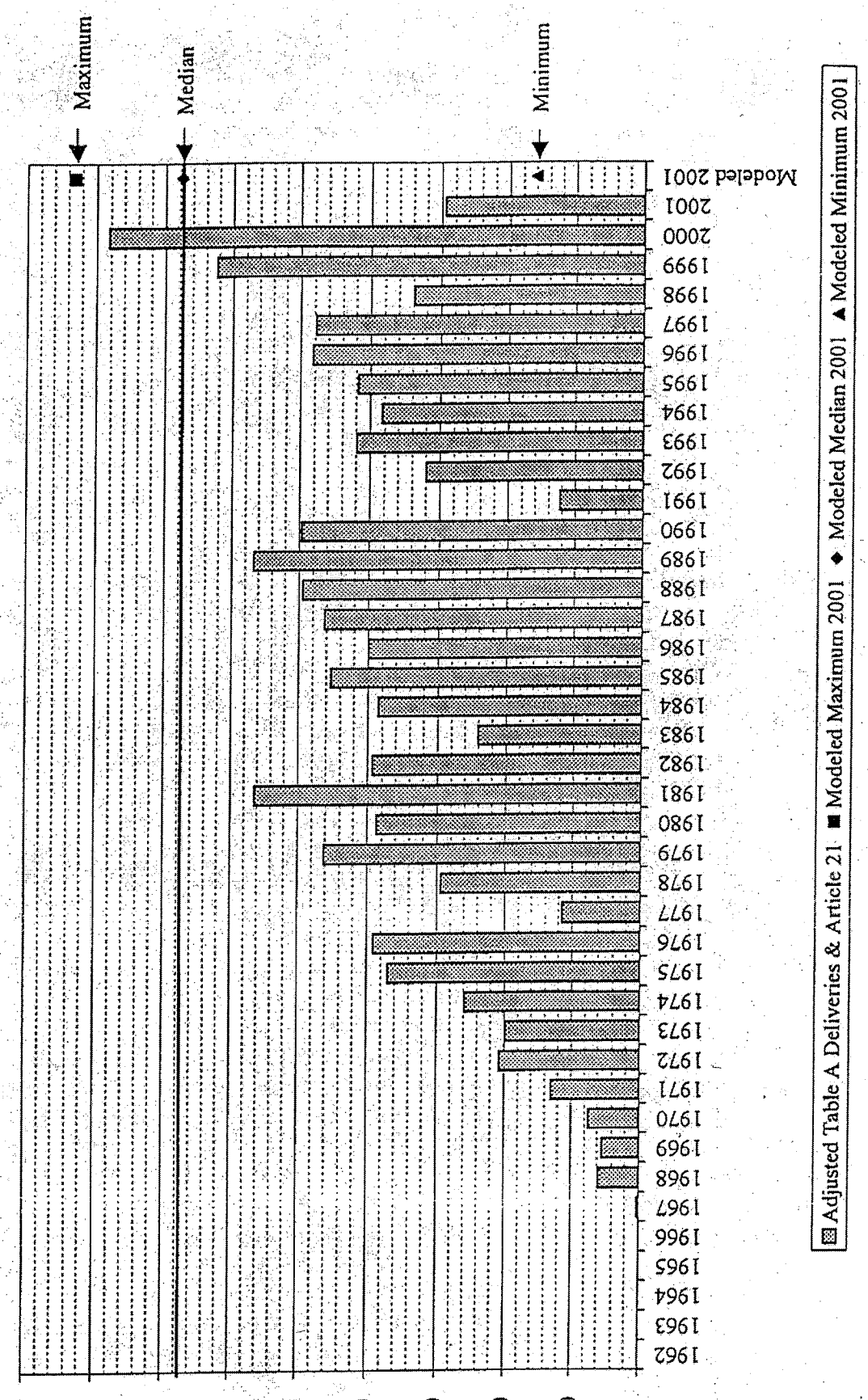


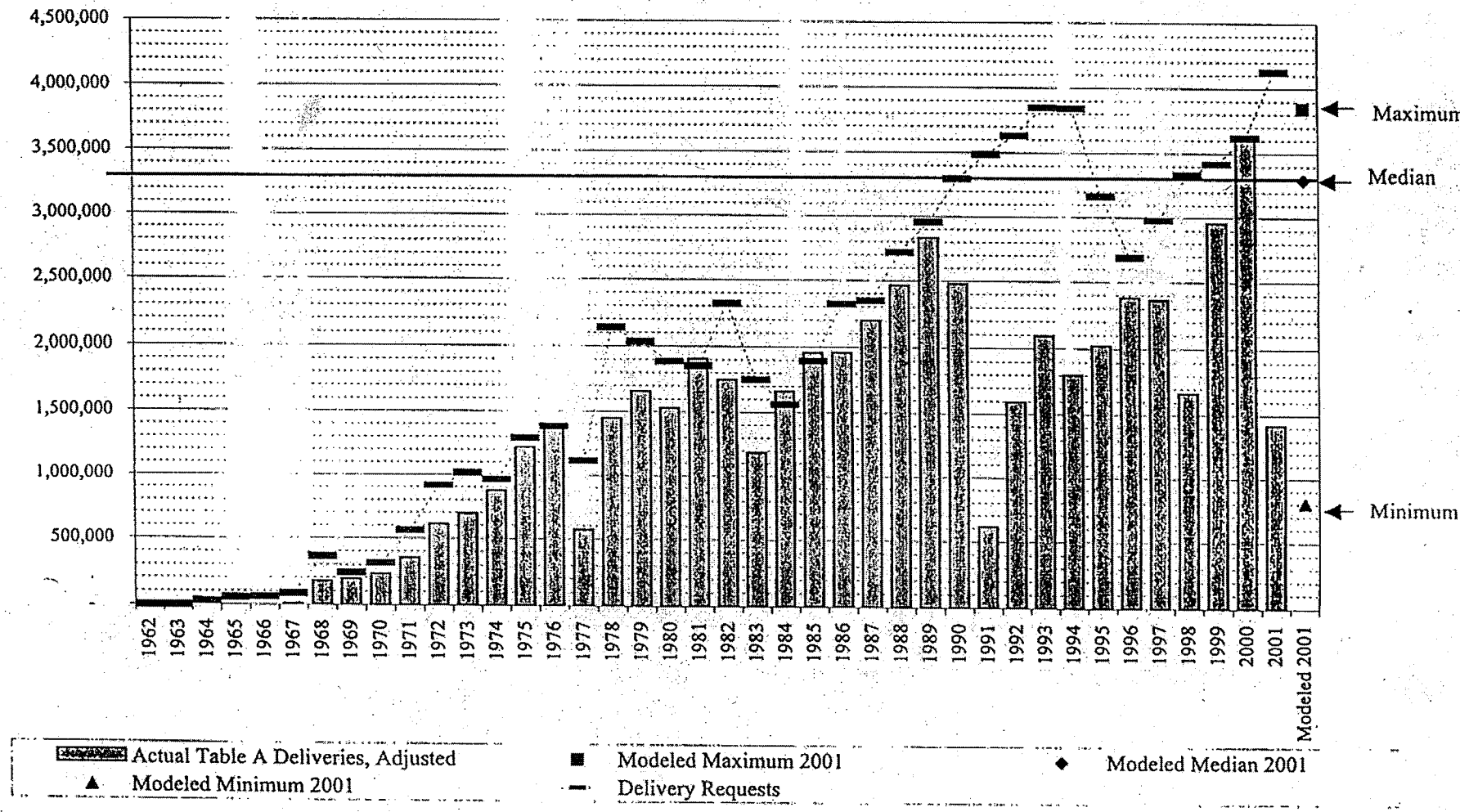
Chart 4

The Same Picture Holds When Including Article 21 (Surplus) Water
Modeled Deliveries Look High Relative To History
(Only once do deliveries reach the median rate)



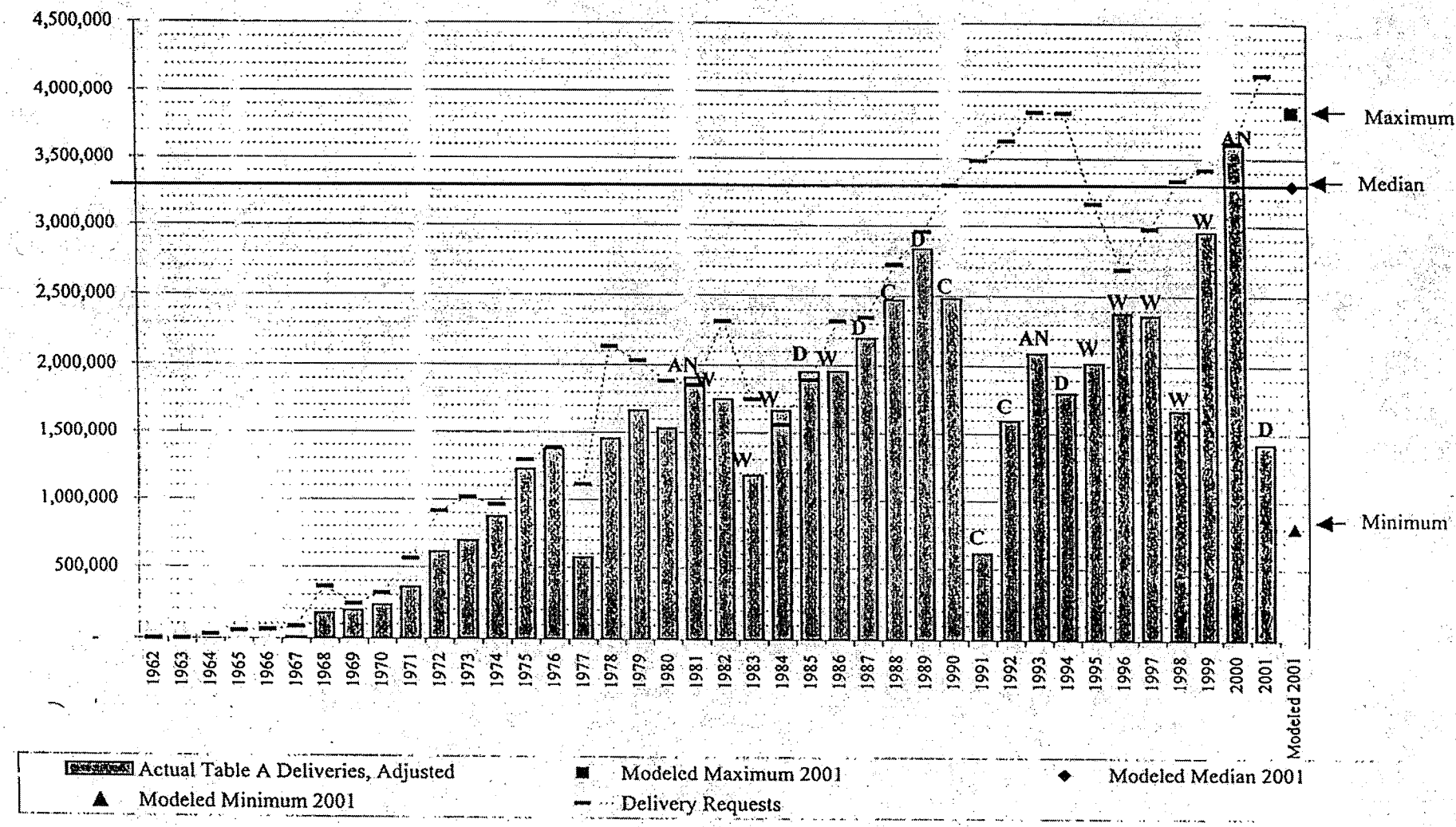
The Apparent Discrepancy Between Historic Deliveries And Modeled Reliability Doesn't Seem To Be An Issue Of Demand Vs. Capacity

(9 times requests have exceeded the median rate, only once has the median rate been exceeded)



Source for Requests: Frances Chung and spot checked against B132 various years

Nor Does Water Year Type Seem To Explain The Discrepancy
(Eg., 1998 was a wet year, requests were greater than the median rate,
yet contractors received only half of their requested amount (as defined by Calsim II))



Water year type based on the Sacramento River Index
W -- Wet AN -- Above Normal BN -- Below Normal D -- Dry C -- Critically Dry

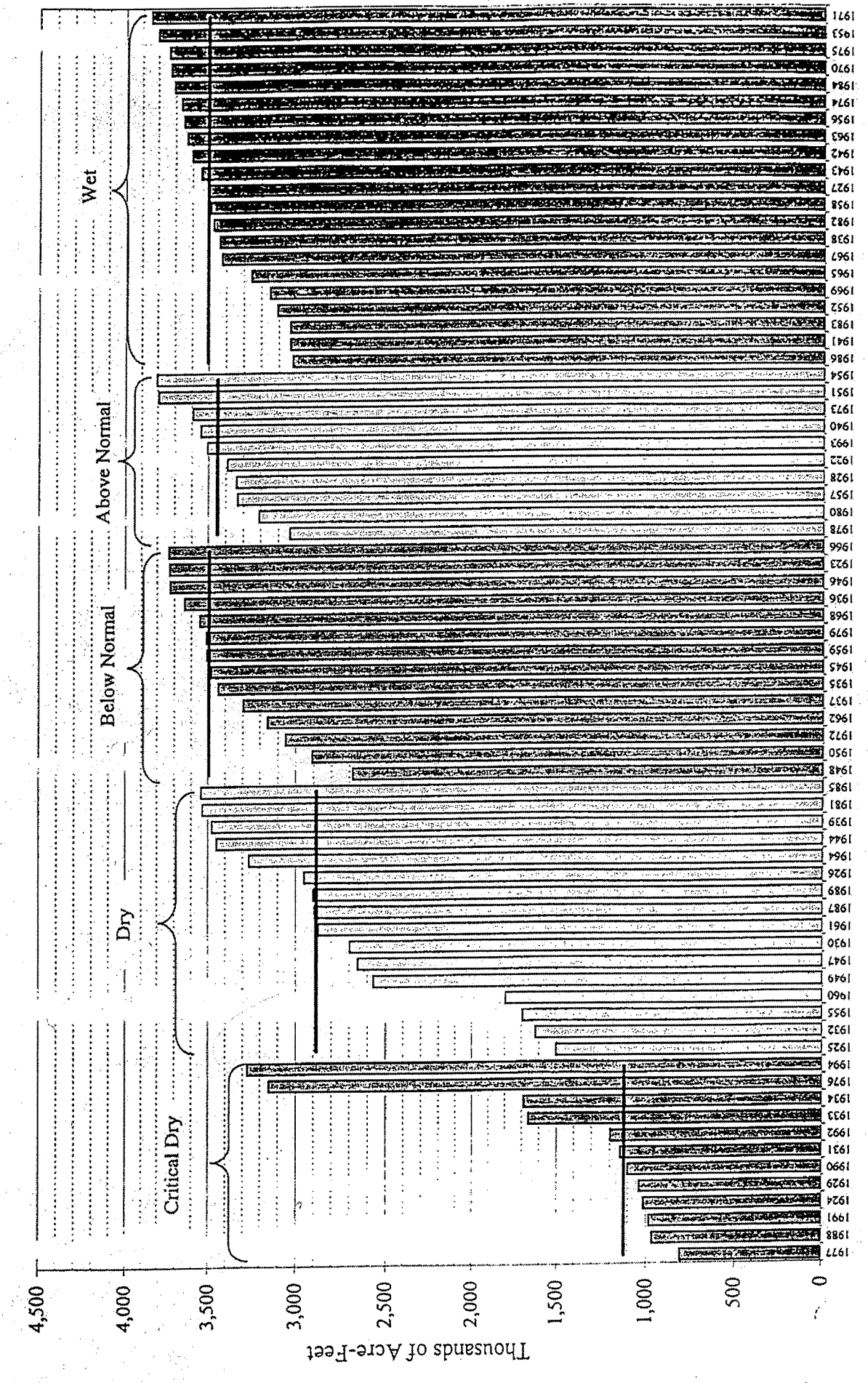
LETTER 21

Chart 7

2001 Modeled Reliablity Curves Sorted By Water Year Type

Show The 50 Percent Exceedence Rate Is *Higher* In Below Normal Years Than In Above Normal Years

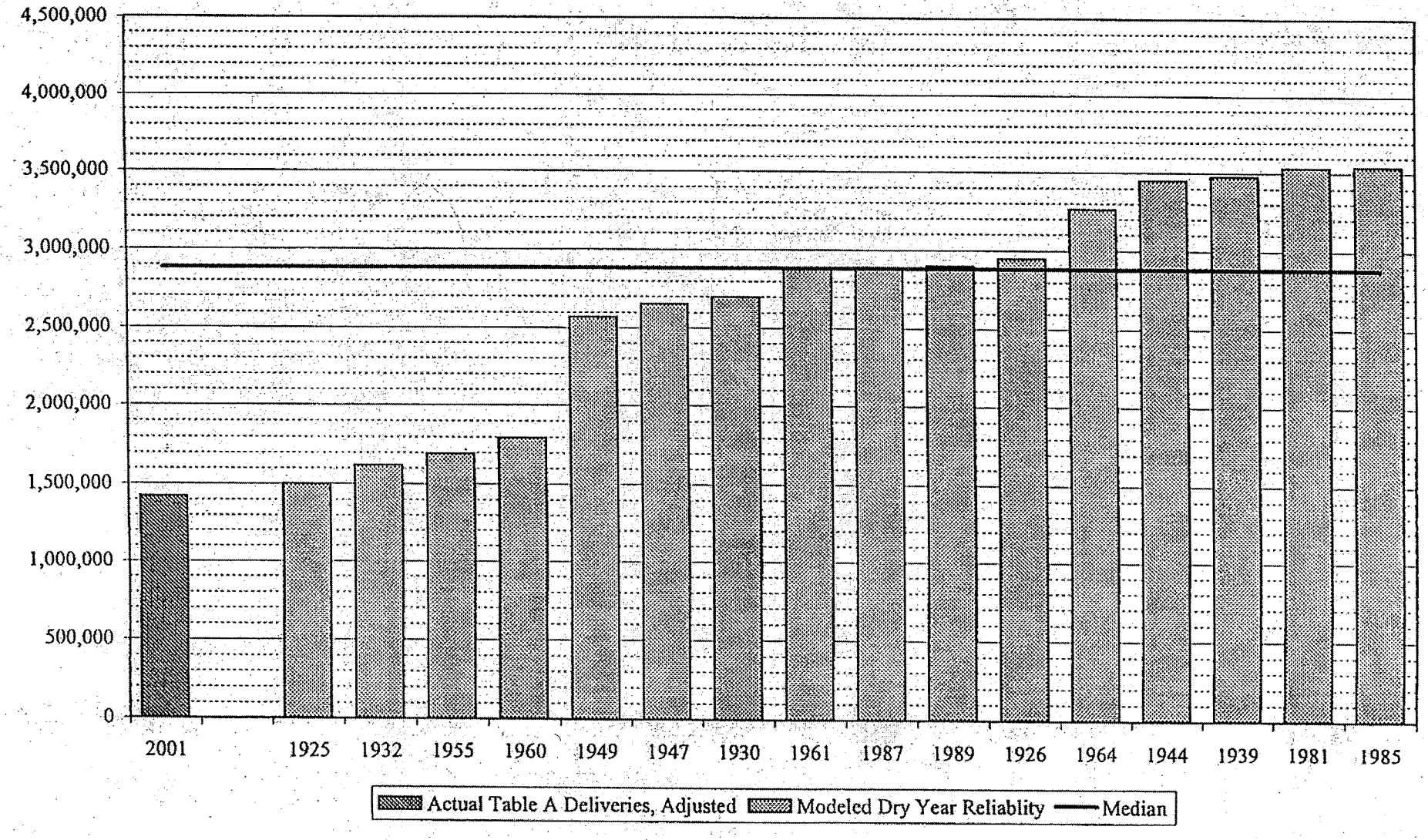
(Bold line shows the 50 percent exceedence rate for each water year type)



(Table B-3 "Model Delivery" grouped by Sacramento River Index water year type)

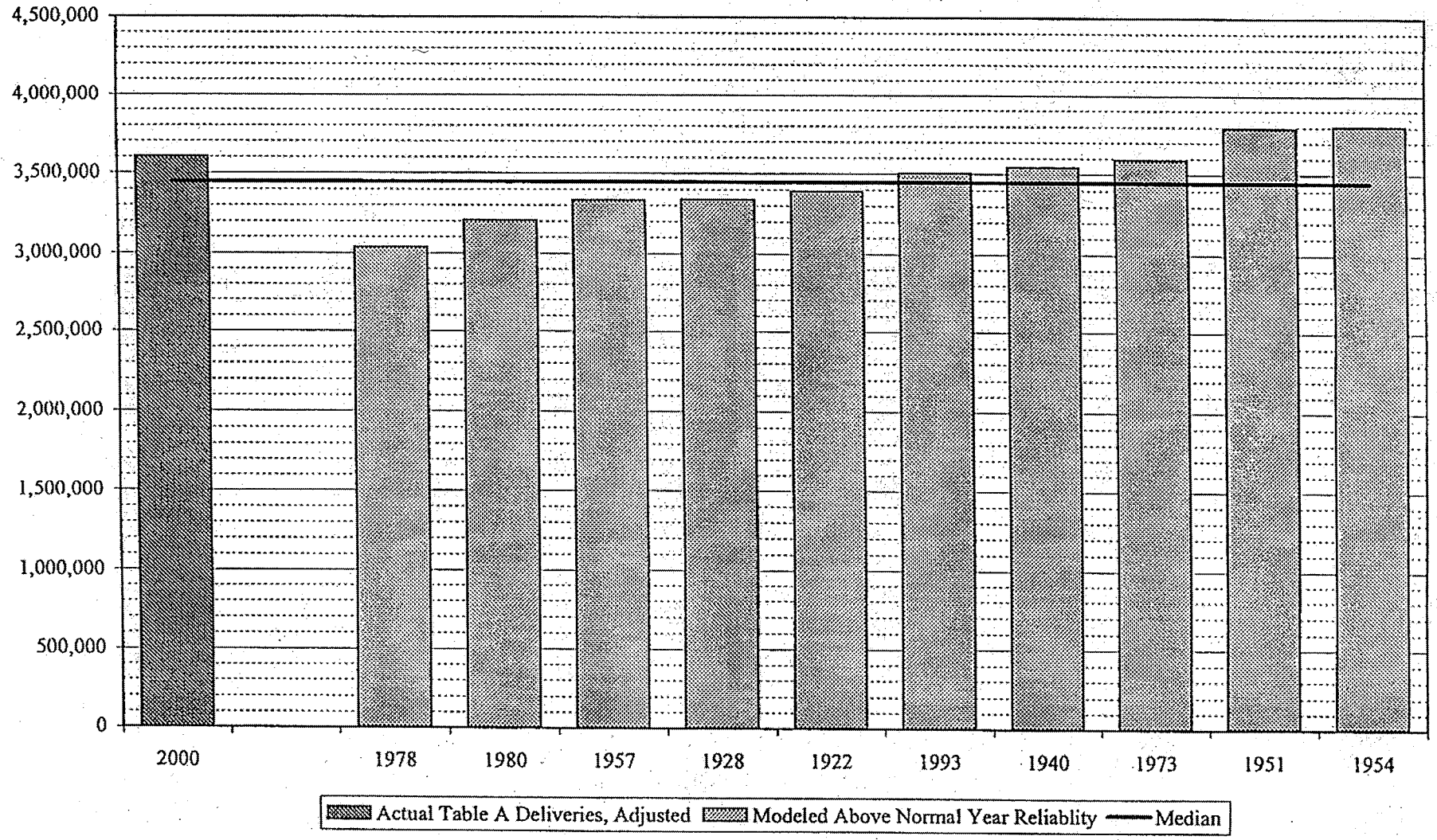
LETTER 21

Looking Only At Dry Years, Actual 2001 Table A Deliveries Were Less Than The Least Amount The Model Says Would Ever Be Delivered



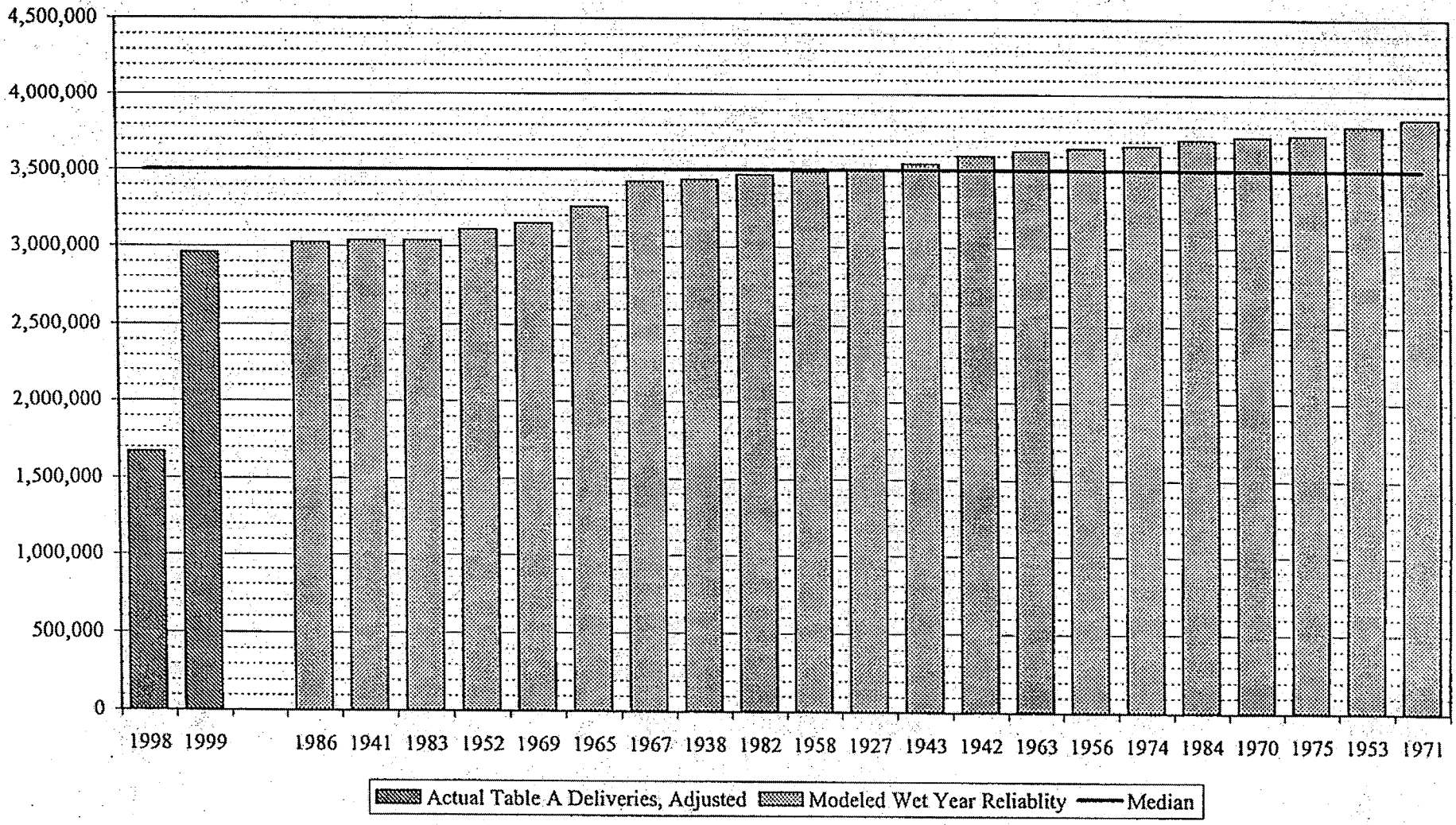
(Table B-3 "Model Delivery" for Sacramento River Index "dry" years)

Looking Only At Above Normal Years, Actual 2000 Table A Deliveries Were Above The 50 Percent Exceedence Level



(Table B-3 "Model Delivery" for Sacramento River Index "above normal" years)

Looking Only At Wet Years, Actual 1998 & 1999 Table A Deliveries Were Less Than The Least Amount The Model Says Would Ever Be Delivered
(1998 was 45 percent lower than the "least" amount)



(Table B-3 "Model Delivery" for Sacramento River Index "wet" years)

Attachment 25

LETTER 21

STATE OF CALIFORNIA -- THE RESOURCES AGENCY

GRAY DAVIS, *Governor*

DEPARTMENT OF WATER RESOURCES
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SACRAMENTO, CA 94236-0001
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March 11, 2003

Honorable Michael J. Machado
Member of the Senate
State Capitol, Room 3086
Sacramento, California 95814

Dear Senator Machado:

This is in response to your letter regarding Mr. Dennis O'Connor's comments on the Draft State Water Project Delivery Reliability Report.

Mr. O'Connor's comments describe five major concerns with the report and include miscellaneous observations and comments. The five concerns are:

1. Recent deliveries are lower than the modeled 2001 conditions.
2. The Year 2021 studies do not seem to reflect any growth in upstream consumptive use.
3. CALSIM II has not been calibrated, tested or otherwise verified.
4. The results appear inconsistent with previous estimates and models.
5. CALSIM II is not being used as designed.

In the draft report, the Department commits to an evaluation of the adequacy of using CALSIM II for estimating SWP delivery ability. This effort is underway and consists of the simulation of a recent drought period (1987-1992), a simulation of a longer historic period, a sensitivity analysis of the key parameters of CALSIM II and a peer review conducted by the CALFED Science Program. The entire evaluation is expected to be done within a year. The simulation of the recent drought is complete. The results of this analysis are included in the following discussion of the concern that recent deliveries are lower than the modeled 2001 conditions. The remaining four major concerns are also discussed in the following text. Other comments contained in Mr. O'Connor's report are addressed in Attachment 4.

<u>Recent deliveries are lower than the modeled 2001 conditions.</u>

This concern is expressed in several letters the Department of Water Resources received commenting on the draft report. The thrust of the concern is that the study results contained in this report for State Water Project deliveries are much higher than the amounts of water delivered by the SWP in the past and are, therefore, not accurate or reliable.

Recent amounts, as well as many historical SWP delivery amounts, are lower than the amounts estimated by the 2001 study. This occurs because the 2001 study is a projection of deliveries under year 2001 conditions. SWP contractors' requests for water have increased in recent years, and 2001 is the first year that contractors' requests exceeded 4.0 million acre-feet. Since the 2001 model study includes water demands that are significantly higher than historical levels, modeled water deliveries often exceed historical deliveries. The demands assumed in the model simulations serve as the upper limit for SWP deliveries. The simulation will export as much as allowable to meet the assumed demand; therefore, during wet times, the amount of deliveries is often controlled by the assumed demand. During dry periods, the assumed demands do not control the amount of delivery because water supply is the limiting factor. A good way to analyze how well CALSIM II simulates water system operations is to compare the results of the 2001 study to a recent dry period.

A comparison of adjusted historical and CALSIM II deliveries for the 1987-1992 dry period is shown on Attachment 1. It illustrates that the simulated values for deliveries in the draft report are significantly lower than the historical average deliveries; however, when the CALSIM II study is adjusted to reflect key conditions existing during that period, the resulting average delivery value is slightly lower (50,000 acre-feet per year) than the historical average delivery.

Rather than over-estimating deliveries, CALSIM II appears to slightly underestimate deliveries during periods when water supply is low. This is an important conclusion that should help improve general confidence in using CALSIM II as an analytical tool.

<u>The Year 2021 studies do not seem to reflect any growth in upstream consumptive use.</u>

The model does account for growth in upstream consumptive use as well as other factors affecting river flows. For the modeling of upstream consumptive use, the Sacramento Valley is divided into seven hydrologic units known as depletion study areas. The average total modeled depletion for the 7 areas is 4,749 taf/yr for the 2001 study and 4,875 taf/yr for the 2021A study, an increase of 126 taf/yr. This average increase in depletion is projected to be offset on an average annual basis by an increase in precipitation-runoff of 145 taf/yr attributed principally to increased runoff from urbanization. In addition, average annual net groundwater extraction is projected to increase by 61 taf in the 2021A study compared to 2001 study. Attachment 2 and Tables 1 through 4 in Attachment 4 provide additional information on land use estimates and modeled depletion, precipitation-runoff gain and groundwater pumping for the 2001 and 2021 studies.

CALSIM II has not been calibrated, tested or otherwise verified.

DWR continually checks CALSIM II to determine if it reasonably simulates water operations in the Sacramento – San Joaquin River system. Often this is done with the Bureau of Reclamation during the normal course of business and in coordination with interested stakeholders. The study comparing historical deliveries with modeled deliveries for 1987-1992 is an example of a check that can be done. Rigorous calibration techniques can be applied to only a few components of CALSIM II. Additional discussion of this concern is contained in Attachment 3.

The results appear inconsistent with previous estimates and models.

Mr. O'Connor cites two examples related to estimations of the delivery ability of the SWP and state that these are inconsistent with the studies used in the report. The first is a comparison of CALSIM II with a model using a daily time-step. CALSIM II uses a monthly time-step. The other refers to values contained in the Urban Water Management Plan (2000) for Castaic Lake Water Agency that are based upon DWRSIM, a predecessor to CALSIM II.

The results of the daily time-step are different than the CALSIM II results and the observation is made that it is unknown which model more closely simulates actual export capacity. The choice of the analytical tool depends upon the purpose of the analysis. A daily time-step may be useful in certain circumstances where daily level of detail is important. In other cases, it may not be appropriate. A daily time-step model requires computations to be done for each day of the period of concern. If applied over the entire 73-year period, it requires data be developed for each day of every year, whether the data exists or not. For example, assumptions must be made about the distribution of flows throughout a month to generate assumed daily flows. A monthly time-step model may be the most practical tool to analyze long-term trends and averages; however, it may describe the system in a way that implies the system is more manageable than it actually is.

DWR estimated the impact that a daily time-step can have upon the Delta exports estimates of CALSIM II. The initial modeling work using a daily time-step was done for the In-Delta Storage investigations. For the IDS study, a daily time-step Delta operational model was developed to assess the impact of daily variations on the balance of Delta outflow and the Central Valley Project and SWP exports. The net impact to the exports was sensitive to several other assumptions and resulted in a long-term annual average reduction of 100 to 200 taf/yr for the CVP and SWP combined. DWR is continuing to study the effect of the daily time-step upon long-term studies.

Regarding the 2000 Urban Water Management Plan for Castaic Lake Water Agency, DWR understands that the plan incorporates a more conservative interpretation of the results of the referenced DWRSIM study. DWR supports and encourages local water agencies to apply the level of SWP reliability they determine is appropriate for their areas, taking into account local supplies, other imported supplies, demand-management programs and local planning criteria. The SWP Delivery Reliability Report should serve as a reference document to help clarify decisions that are made at the local level.

CALSIM II is not being used as designed.

This comment relates to the fact that CALSIM II studies are best used as comparative studies. Although analyses based upon stand-alone studies are less certain than analyses using comparative studies, stand-alone studies provide very useful information. For example, DWR routinely uses stand-alone studies to develop strategies for operating the SWP. This process involves technical judgment and knowledge of key elements of the water system. This is the same process DWR encourages local water and planning agencies to take when applying the results in the report.

Your letter, as well as all others commenting on the draft report and the corresponding responses, will be included in an appendix to the final report. In addition, they will be posted on the State Water Project Delivery Reliability Report website (http://swpdelivery.water.ca.gov) this April.

Thank you for your comments and observations. If you wish to discuss these responses further, please contact me at (916) 653-7007 or your staff may contact Francis Chung, Chief of DWR's Bay-Delta Office Modeling Support Branch, at (916) 653-5924.

Sincerely,

Thomas M. Hannigan

Thomas M. Hannigan
Director

Attachments

cc: (See attached list.)

LETTER 21

Mr. Dennis O'Connor, Consultant to
Senate Committee on Agriculture and
Water Resources
State Capital, Room 406
Sacramento, California 95814

Ms. Jennifer Ruffulo
Research Program Analyst
California Research Bureau
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Sacramento, California 95841

Attachment 1

Comparison of Historical and CALSIM II Deliveries for 1987-1992

As explained on page 6 of the draft report, past deliveries cannot accurately predict future deliveries. There have been continual, significant changes in the factors that determine State Water Project water delivery, including water demand. SWP water contractors' requests for water have increased in recent years and 2001 is the first year that requests exceeded 4.0 million acre-feet (as shown in the attached Figure 1).

The 2001 model study used for the draft report assumes that current water-use conditions, including water demands, exist for each year analyzed in the 73-year model study. Since the 2001 model study includes water demands that are significantly higher than historical levels, modeled water deliveries often exceed historical deliveries. One exception to this would be during dry periods because supply, not demand, determines the amount of water delivery.

Historical values for SWP Table A deliveries from the Delta have been compared to the Table A delivery values of the 2001 model study for the dry period of 1987 through 1992 to assess how well CALSIM II simulates supply-limited conditions for a recent period. This comparison requires three adjustments to be made for the results to be comparable. One adjustment is made to the historical delivery data and two are made to the conditions assumed for CALSIM II.

The historical delivery data are adjusted to be comparable to the model results as follows. Historically, a portion of the annual water allocation is carried over in SWP storage facilities and delivered in the following year. The CALSIM II model does not currently have criteria and procedures to allow carryover of allocated water from one year to the next. To make the historical data comparable to model data, the historical Table A delivery data was adjusted to show all the "carryover water" being delivered in the year of allocation rather than the following year. The adjusted historical and 2001 model study deliveries for the 1987 through 1992 dry period are compared in Figure 2.

The modeled average delivery for this period is 1,670 taf/yr compared to the historical average of 2,030 taf/yr in CALSIM II format.

The two adjustments made to CALSIM II are 1) changing the regulatory requirements for Delta operation to match the ones in place during 1987-92, and 2) adjusting the reservoir storages at the beginning of the period to match those that actually existed at that time.

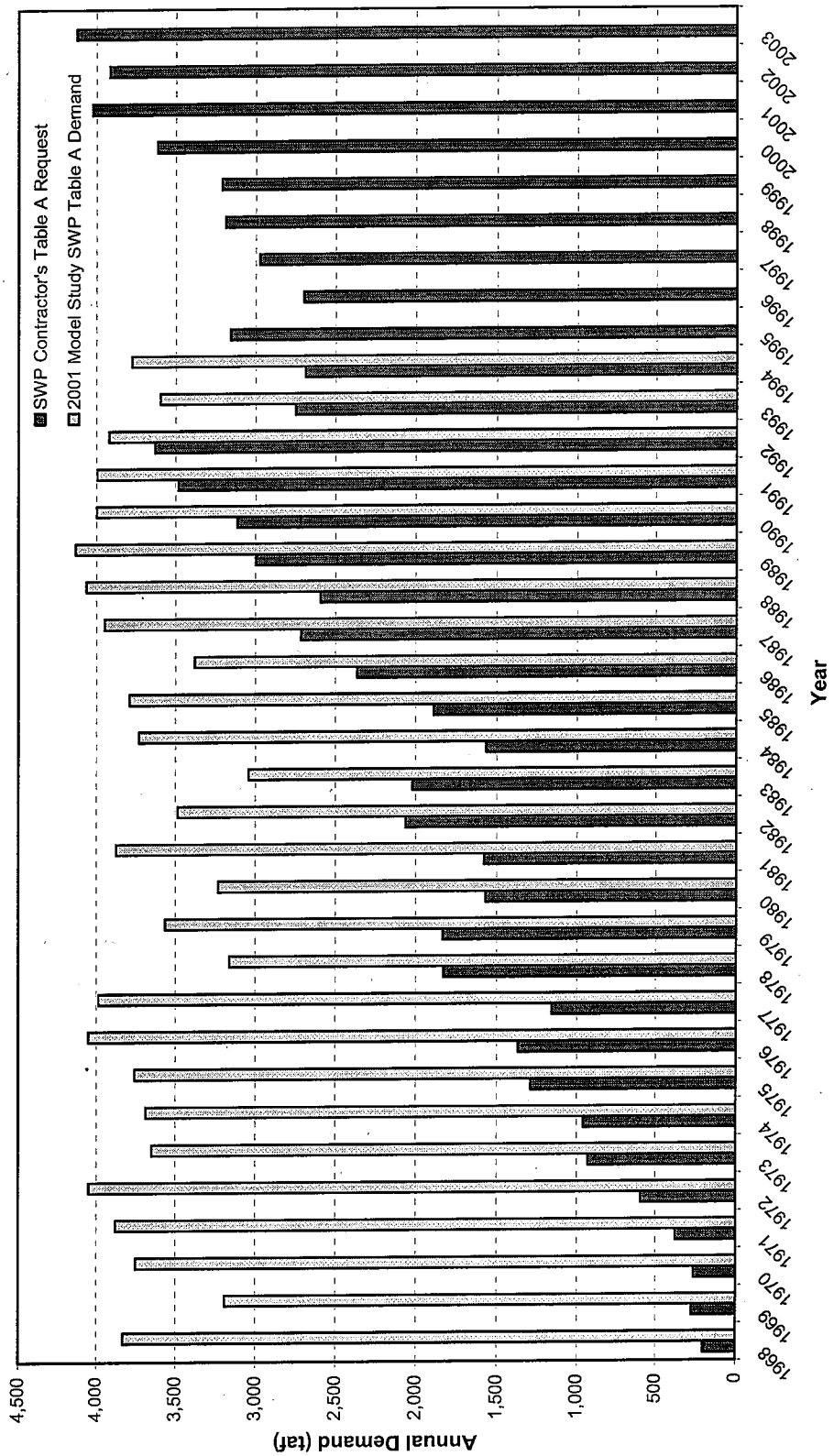
The 2001 model study in the draft report includes regulatory constraints that were not applicable to the 1987-1992 period (State Water Resources Control Board Decision 1641). For comparison purposes, a special 2001 model study was completed with the regulations that were in effect at that time (Decision 1485). As shown in Figure 3, this study produces higher SWP deliveries than the original study with the D-1641 constraints. The study's modeled average delivery for this period is 1,910 taf/yr,

compared to the average of 1,670 taf/yr for the original study. A comparison of the revised study results with the historical deliveries is shown as Figure 3.

Modeled SWP demand for 1986, a wet year just before the dry period, is 3,345 taf compared to the historical request of 2,364 taf. As a result of this higher model demand, modeled SWP storage at the beginning of the dry period is approximately 420 taf lower than the historical SWP storage. The modeled storage at the end of the dry period is essentially the same as the historical value. There is, therefore, an additional 420 taf of supply that would have been delivered in the model and the CALSIM delivery amounts during the dry period should be adjusted accordingly. To adjust for the 420 taf difference in storage, 70 taf was added to the modeled delivery for each of the six years in the dry period. This adjustment raises the average model delivery for the dry period to 1,980 taf/yr, 50 taf/yr lower than the historical average of 2030 taf/yr (Figure 4).

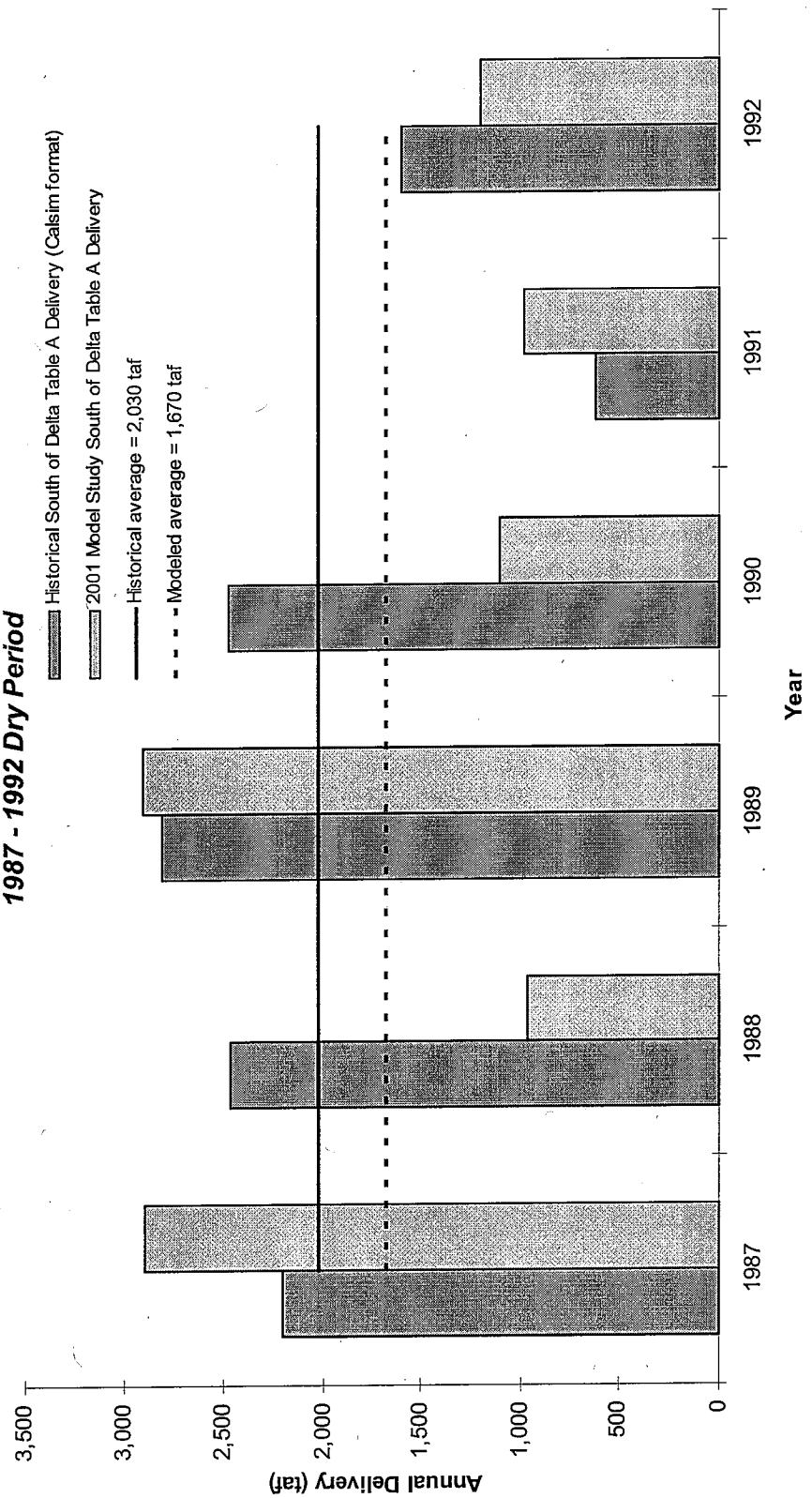
Attachment 1

Figure 1
SWP Contractor's Table A Request versus 2001 Model Study SWP Table A Demand



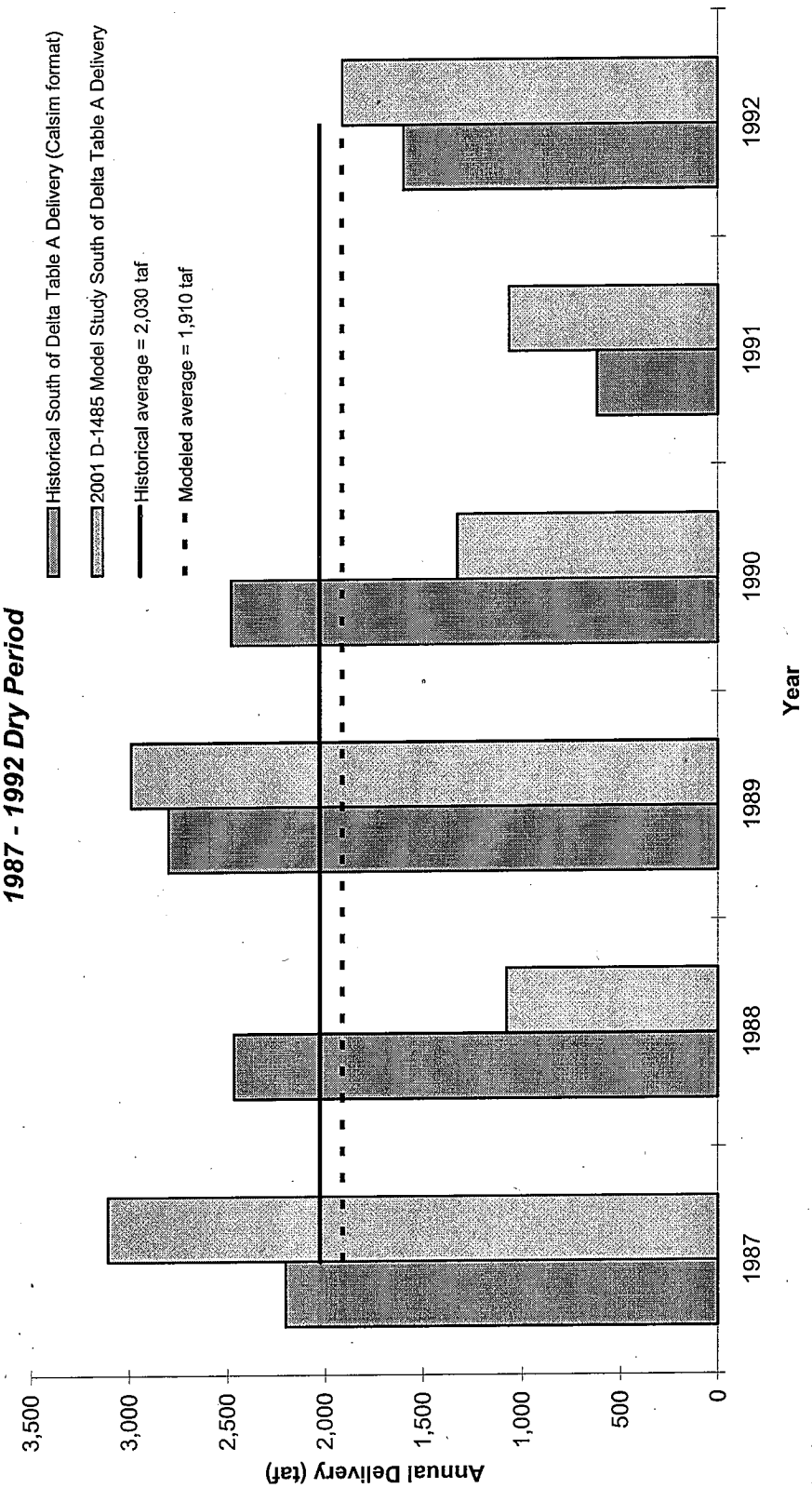
Attachment 1

Figure 2
Historical SWP Table A Delivery versus 2001 Model Study SWP Table A Delivery
1987 - 1992 Dry Period



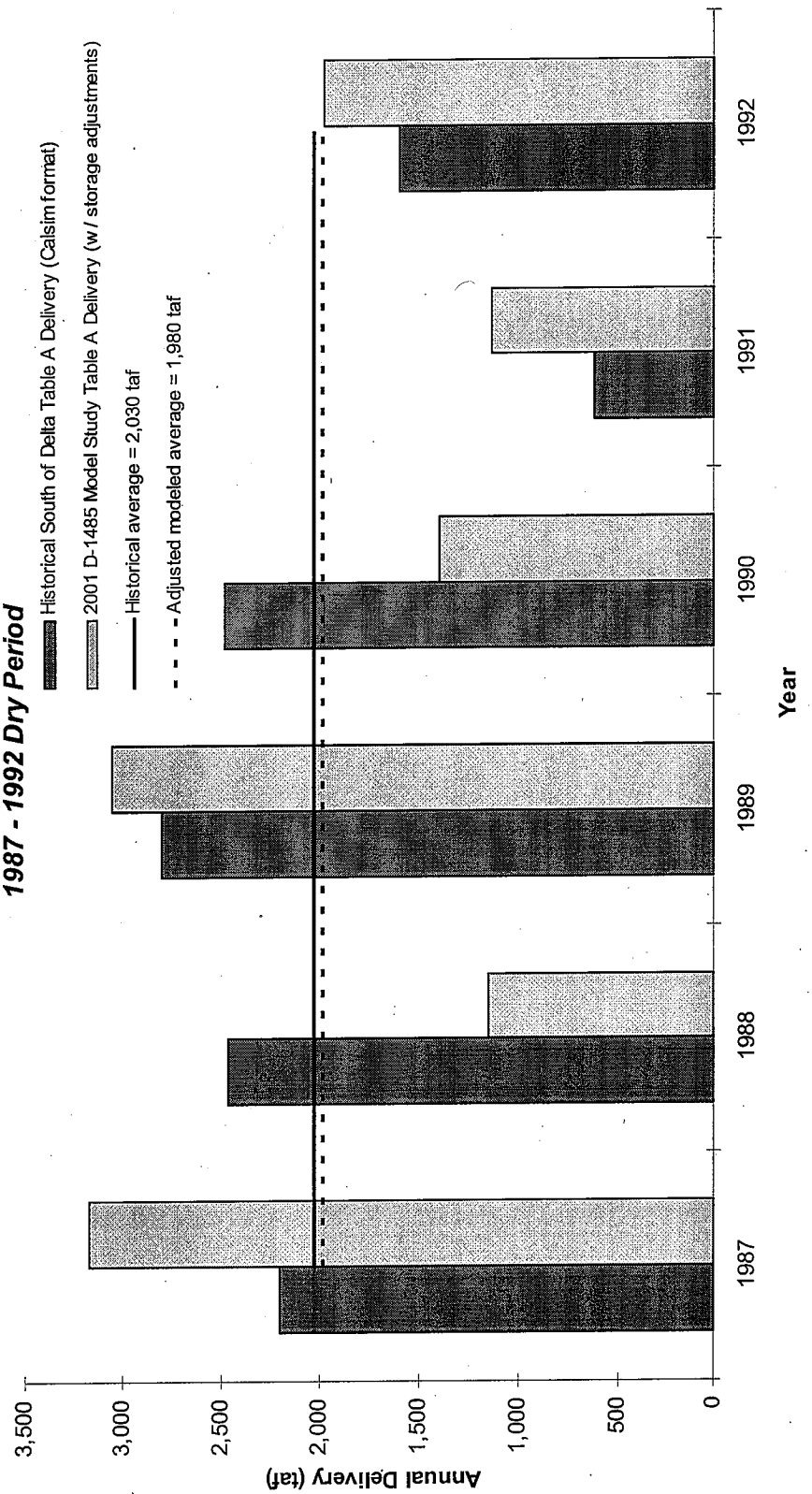
Attachment 1

Figure 3
Historical SWP Table A Delivery versus 2001 D-1485 Model Study SWP Table A Delivery
1987 - 1992 Dry Period



Attachment 1

Figure 4
Historical SWP Table A Delivery v. Adjusted 2001 D-1485 Model Study SWP Table A Delivery
1987 - 1992 Dry Period



Attachment 2

Upstream Depletion

Estimates of demands and water use are part of the hydrology development for CALSIM II. Areas upstream of the Sacramento-San Joaquin Delta are divided into hydrologic basins or units known as Depletion Study Areas. These depletion areas are categorized as valley floor areas and rim basin areas. Because valley floor areas are more complex, have large demands, and need to be integrated with the operation of the CVP/SWP, they are represented in CALSIM II in much greater detail than rim basins. Flows from rim basins are determined prior to simulating CALSIM II and are input as a fixed time series. The attached map shows the delineation of the DSA boundaries.

The land use acreage used to develop water demands for each DSA is based on the desired Level of Development. Fixed levels of land use are used to determine water demands for the existing (normalized year 1995) and future (year 2020) LOD. The table below contains land use assumptions for each DSA in the Sacramento Basin. Levels of development between 1995 and 2020 are estimated by linear interpolation.

Sacramento Basin, Valley Floor Land Use (acres)

	1995		2020		Difference	
DSA	Urban	Agriculture	Urban	Agriculture	Urban	Agriculture
58	67,400	37,400	110,000	33,700	42,600	-3,700
10	21,800	188,000	33,300	199,600	11,500	11,600
12	7,900	370,100	12,800	386,000	4,900	15,900
15	3,400	279,200	4,800	279,800	1,400	600
69	49,900	392,400	81,000	384,800	31,100	-7,600
65	38,100	265,400	61,100	255,600	23,000	-9,800
70	180,500	126,800	284,600	108,100	104,100	-18,700
54	17,900	297,700	28,800	291,300	10,900	-6,400
55	24,900	135,300	35,700	126,400	10,800	-8,900
Total	411,800	2,092,300	652,100	2,065,300	240,300	-27,000

Source: DWR, Bay-Delta Office, CU model input for use in CALSIM II, based on Bulletin 160-98 data.

Water consumption for different land use categories is calculated using DWR's Consumptive Use model. The CU model simulates monthly soil moisture conditions over the 73-year period of simulation for 12 different agricultural crop categories, urban irrigated landscape and native vegetation for each DSA. Based on minimum soil moisture requirements the CU model calculates the Consumptive Use of Applied Water for the irrigated land use categories. Municipal and industrial demands are not fully addressed in the CU model. A large portion of M&I demands are non-consumptive and, therefore, not considered by the CU model. M&I diversions can have a large influence on reservoir operations and have, therefore, been included in CALSIM II for the American and Lower Sacramento rivers. M&I water diversion requirements are determined based on recent historic diversions for existing LOD and contract amounts for future LOD.

The CU model uses a very simple approach to estimate outdoor urban water demands. The urban land use classification combines residential, commercial and industrial sectors. The total urban acreage is subsequently proportioned between "lawns," "vacant lots" and "impervious surfaces." To calculate the consumptive use of these three land types, the following assumptions are made:

- Consumptive use of lawns is identical to irrigated pasture;
- Consumptive use of vacant lots is identical to native vegetation; and
- All precipitation on impervious surface results in runoff, i.e., zero consumptive use.

The CU model assumes 10-15 percent of CUAW is lost to the system as non-recoverable losses. The CU model is also used to adjust the historical rainfall runoff due to any land use change. The table below contains average annual irrigation demands by crop and DSA as calculated by the CU model. The total average annual depletion (CUAW and non-recoverable losses) for the Sacramento Valley floor at 2001 LOD is 4,749 taf/yr compared to 4,875 taf/yr at 2020 LOD.

Consumptive Use of Applied Water (ac-ft/ac)

DSA	Alfalfa	Citrus	Cotton	Field	Grain	Truck	Orchard	Pasture	Rice	Sugar Beets	Toma-toes	Vines	Urban
10	2.6	1.6		1.4	0.2	1.3	2.2	3.0	3.5	2.0	2.1	1.8	0.8
12	2.8		2.0	1.5	0.3	1.4	2.2	3.1	3.6	2.1	2.0	1.9	0.8
15	2.8		2.0	1.5	0.3	1.3	2.2	3.2	3.6	2.1	2.0		0.8
58	2.3	1.4		1.3	0.1	1.2	2.1	2.7				1.7	0.7
65	2.7			1.5	0.2	1.4	2.2	3.1	3.6	2.1	2.0	1.7	0.8
69	2.6		2.0	1.4	0.2	1.3	2.2	3.0	3.5	2.0	1.9		0.7
70	2.7			1.5	0.2	1.3	2.3	3.0	3.5	2.1	1.9	1.9	0.8
55 lowland	1.9			1.3	0.0	0.9	1.3	2.6	3.4	1.5	1.2	1.2	0.6
55 upland	2.9			1.6	0.3	1.7	2.4	3.0	3.6	2.3	1.9	1.9	0.8

Notes: Blank values indicate that the crop is not grown in the region.
Reported urban CUAW is based on an assumed irrigated landscape area of 25%

The current figures in the SWP Delivery Reliability Report are based on Bulletin 160-98 land use estimates. The next revision of the report, planned in approximately two years, will be based on revised estimates in the California Water Plan Update 2003.

The calculation of irrigation demands for paddy rice differs from other crops. During the growing season rice fields are flooded to control weed growth. In the CU model water applied for flooding in April and subsequent months is treated as a consumptive use. The fields are assumed to be flooded to a depth of nine inches. The water recovered through draining the fields in September (1.5 to 2.0 inches) is added to the local water supply as an accretion. The quantity and timing of irrigation demands

represent average planting and harvesting conditions in each DSA. Return flows from rice drainage are added to the time series of accretions for each basin. Return flows average approximately 70 taf/yr from a total of 485,000 acres of paddy rice at the 2001 LOD. Over the last few decades there have been substantial changes in the quantities of water diverted for rice production. Applied water demands have dropped as irrigation efficiencies have increased and farmers have switched to varieties with shorter growing periods. More recently fall flooding of rice fields for decomposition of rice straw has been adopted as an alternative to burning. Irrigation demands for rice are currently being reviewed and it is likely that model demands will be adjusted for the CALSIM II runs required to support the California Water Plan Update 2003.

Attachment 3

CALSIM II Evaluation

DWR's Bay-Delta Office is currently undertaking a "historical project operations study" to investigate the accuracy of the model's water supply estimates. The purpose of the historical project operations study is to compare CALSIM II results with historical operations and investigate the source of any differences in historical and simulated performance. The historical project operations studies is part of a larger CALSIM II evaluation process. Other components of this evaluation will include a survey of stakeholders; a model peer review by leading academics and practitioners; and a sensitivity analysis on model inputs and parameters. Initial results from the historical project operations study are expected to be available by March 2003.

The historical project operations study, conducted by DWR, will compare CALSIM II model results to recent historical operations for water years 1975 to 1998. This 24-year period includes both the 1976-77 and 1987-92 droughts. It also includes water year 1998 that is one of two years for which detailed analysis of historical water supply and demand is being conducted as part of the California Water Plan Update 2003 (Bulletin 160-03).

For the historical project operations study, input to the current CALSIM II model will be changed to reflect historical conditions. The inflow hydrology will be revised to reflect historical rather than current or projected level of development. Demand will be calculated for the historical land use, based on DWR's land surveys and county commissioners' reports, rather than a fixed level of development. Project contracts and entitlements will be changed to their historical level. Lastly operation logic will be changed to reflect the changing regulatory base line such as the release of the State Water Resources Control Board 1995 Water Quality Control Plan and State and federal biological opinions for Delta smelt and Chinook salmon.

The study will be limited in geographical scope to a dynamic operation of the Sacramento Valley, the Delta, and CVP-SWP facilities south of the Delta. Delta inflows from the San Joaquin Valley and the East Side Streams will be fixed at their historical level. In dry years when the system is system is supply limited, the SWP target demands will be set equal to the historical requests. In wet years when the system is demand driven, target demands will be set equal to historical deliveries. Similarly for the CVP, historical requests or annual contract amounts will be an upper bound on CVP deliveries.

Modeling of the CVP-SWP system and areas contributory to the Sacramento-San Joaquin Delta requires considerable input data. The majority of the data relates to either system inflows or demand data for the 73-year period of simulation. As described in page 7 of the report, DWR has committed to undertake a sensitivity analysis on SWP water delivery reliability. This analysis would examine the effects of certain assumptions, parameters and input data on model results. The aim of the sensitivity analysis is to identify the input data that most strongly affect model results so that future

work within the Department can be focused on refining estimates of these key determinants.

The current representation of groundwater in CALSIM II is only a first step towards developing a fully integrated groundwater surface water model. The Department is currently developing the Central Valley Groundwater Surface water Model with the eventual aim of linking this model to CALSIM II to study impacts of surface water operations, groundwater pumping and land use change on groundwater elevations. The current groundwater model component of CALSIM II affects surface water operations through the calculation of the stream-groundwater interaction. There is considerable uncertainty about the magnitude of this interaction. In areas with high groundwater levels, groundwater inflow to streams is a function of groundwater head. In areas of low groundwater elevation where stream seepage flows to the groundwater, there is an assumed hydraulic disconnect between the stream and the aquifer so that seepage is independent of groundwater elevation. It is acknowledged that groundwater elevations are not accurately modeled in CALSIM II. As calculated by CALSIM II, groundwater inflows to the stream system in the upper Sacramento Valley average 255 taf/yr. Stream losses to groundwater in the lower Sacramento Valley average 40 taf/yr. This compares with an average annual Sacramento River inflow to the Delta (at Freeport) of approximately 16 maf/yr.

In any discussion on model "calibration" it is important to remember that CALSIM II is a mass-balance accounting model and *not* a distributed hydrologic model that simulates a physical process. It is also important to understand that the hydrology development is based on historical gage data. Valley floor accretions and depletions are calculated as closure terms in a hydrologic mass balance calculated for each Depletion Study Area. The accretions represent local ungaged runoff into the stream system and are calculated based on gage data for stream inflows and outflows across the hydrologic boundary and estimates of urban and agricultural consumptive use of applied water within the region. The accretions and depletions also contain all the errors in the mass balance stemming from poor gage data or incorrect estimates of groundwater extraction or agricultural and urban water use. True calibration techniques can only be applied to a few components of the CALSIM II model, such as the Artificial Neural Network used for determining flow-salinity relationships in the Delta and the multi cell groundwater model.

Attachment 4

Responses to Other Comments from Dennis O'Connor, Assistant Director, California Research Bureau

Comment: Except for the year 2000, historical deliveries are always less than the median modeled delivery of 3.3 maf.

Response: The 73-year median modeled delivery of 3.30 maf is based on year 2001 level of development including 2001 SWP demand conditions. SWP contractor's requests for water have increased in recent years and reached 4.1 maf in 2001 and initial requests for 2003 are also 4.1 maf. The highest SWP Contractor's request prior to 2001 was 3.6 maf which occurred in the years 1992 and 2000. This request is slightly lower than the 73-year median model demand of 3.74 maf. Since the 2001 model study includes SWP water demand which is significantly higher than historical levels prior to 2001, modeled water deliveries often exceed historical deliveries.

Comment: SWP contractor's Table A requests have been higher than the median modeled delivery on 9 occasions.

Response: Our records show that SWP contractor's Table A requests have exceeded the median modeled delivery of 3.3 maf in six years as shown in the following table. The years with requests above 3.3 maf are 1991, 1992, and 2000 through 2003.

Year	SWP Contractor's Table A Request (maf)
1986	2.4
1987	2.7
1988	2.6
1989	3.0
1990	3.1
1991	3.5
1992	3.6
1993	2.7
1994	2.7
1995	3.1
1996	2.7
1997	3.0
1998	3.2
1999	3.2
2000	3.6
2001	4.1
2002	3.9
2003	4.1

Comment: SWP has delivered 95 percent or more of contractor's requests only once in the last 12 years.

Response: For the period 1989-2002, the SWP allocated 100 percent of the contractor's requests in 1989, 1993 and 1996-1999. Project water delivery was 95 percent of the requested amount in 1989 and 93 percent of the requested amount in 1996. Project water deliveries in the years 1993 and 1997-1999 ranged from 55 to 85 percent of the initial requests due to substantial improvement in local water supplies after the request was submitted.

Comment: The minimum model demand of 3.0 maf is well above the 1.7 maf ultimately demanded by SWP contractor's in 1998. CALSIM does not consider that contractors might reduce their demand below 3.0 maf.

Response: Many factors must be considered when estimating the appropriate level of SWP model demand for each year including local rainfall in the water use areas. Currently, SWP model demands have only been determined through 1994. The wet year of 1998 had above normal winter precipitation as well as unusually high rainfall in May. Sacramento had 3.04 inches of rain in May 1998 (661 percent of normal) while the Los Angeles Civic Center had 3.10 inches (1,940 percent of normal). To the extent possible, actual 1998 conditions will be taken into account when modeling 1998.

Comment: The median model delivery in below-normal years is higher than the median model delivery in above-normal years.

Response: The median model delivery in below-normal years is 46 taf greater than the median model delivery in above-normal years. This occurs because the average model demand in below-normal years is 164 taf higher than the average model demand in above-normal years as shown in the attached Figure 1. In below-normal years, the resources are often still available to supply this higher demand.

Comment: The adjusted historical SWP Table A dry-year delivery of 1.4 maf in 2001 is less than all modeled Table A deliveries in years classified as dry.

Response: The adjusted delivery of 1.4 maf in 2001 does not include 160 taf of water allocated in 2001 and carried over and delivered in 2002. This carryover should be added to the 1.4 maf delivery to make it comparable to modeled deliveries. With this adjustment, the value for 2001 is 1.56 maf, which is slightly higher than the lower bound of the modeled delivery in dry years.

Comment: The adjusted historical SWP Table A wet-year deliveries of 1.7 maf in 1998 and 3.0 maf in 1999 are less than all modeled Table A deliveries in years classified as wet.

Response: Modeled deliveries are similar to 1999 in three years classified as wet. The wet year of 1998 had above normal winter precipitation as well as unusually high rainfall in May. To the extent possible, actual 1998 conditions will be taken into account when modeling 1998.

Comment: Why does 2021 delivery exceed 2001 delivery in the exceedance range of 80 to 85 percent in Figure 1 of the draft report?

Response: Increased urbanization from 2001 to the 2021 projected level of development results in greater precipitation-runoff. Increased 2021 demands will result in greater groundwater pumping. These two factors result in higher delivery in 2021 compared to 2001 in the 80 to 85 percent range of Figure 1 of the draft report. The dry years with higher delivery in 2021 compared to 2001 are 1932, 1933 and 1960. The modeled depletion, precipitation-runoff gain and groundwater pumping for the 2001 and 2021 studies for the 1922-1994 study period and each of these years are shown in Tables 1, 2, 3 and 4, respectively.

Comment: SWP delta exports cannot be evaluated without also looking at CVP delta exports.

Response: DWR and the Bureau of Reclamation, in coordination with public agencies, have spent over two years developing CALSIM II. For years, the Bureau and DWR used different computer models to conduct planning analyses. The Bureau and DWR now agree CALSIM II sufficiently represents the operation of the CVP and the SWP and is the best model of its type for analyzing proposed projects. The studies used in the report are referred to as Benchmark Studies (May 17, 2002) and have been reviewed and accepted by the Bureau and DWR. Summary reports of the results of these studies, including the values for CVP exports, are available on the Internet at http://modeling.water.ca.gov/hydro/studies/SWPReliability/index.html.

Comment: CALSIM II assumes water delivered any time of the year is useful to all contractors.

Response: The monthly model demands are based on historical data and information received from SWP contractors. Under some contracts, project water is delivered in a monthly pattern that assumes the individual contractor will provide local storage facilities when using SWP water to meet local water demand.

Comment: The historical weather pattern is no longer a reliable indicator of the future.

Response: The impact of global warming is being evaluated as part of the *2003 California Water Plan Update* (Bulletin 160). The incorporation of the potential effects of global warming in estimates of the delivery ability of the SWP is expected to be a topic addressed in the peer review and other public discussions regarding CALSIM II.

Comment: The modeling simulation does not include the years 1995-2001.

Response: We are currently updating the CALSIM II database to include the years 1995-1998. The quality-control process for some of the data needed for CALSIM II is a slow one. Updating CALSIM II with post-1998 data will be done at a later date.

Attachment 4

Table 1
Average Precipitation-Runoff Gain, Depletion and Groundwater Pumping for Sacramento Valley Depletion Study Areas
(1922-1994 average in taf/year)

	2001 Study	2021 Study	2021 Study minus 2001 Study
Precipitation-runoff gain	4,683	4,828	145
Depletion	4,749	4,875	126
Net groundwater pumping	1,217	1,278	61
Gain - depletion + pumping	1,151	1,231	80

Table 2
1932 Precipitation-Runoff Gain, Depletion and Groundwater Pumping for Sacramento Valley Depletion Study Areas
(taf/year)

	2001 Study	2021 Study	2021 Study minus 2001 Study
Precipitation-runoff gain	1,958	2,041	83
Depletion	5,026	5,144	118
Net groundwater pumping	1,995	2,085	90
Gain - depletion + pumping	-1,073	-1,018	55

Table 3
1933 Precipitation-Runoff Gain, Depletion and Groundwater Pumping for Sacramento Valley Depletion Study Areas
(taf/year)

	2001 Study	2021 Study	2021 Study minus 2001 Study
Precipitation-runoff gain	1,726	1,871	145
Depletion	5,190	5,295	105
Net groundwater pumping	-1,966	2,055	89
Gain - depletion + pumping	-1,498	-1,369	129

Table 4
1960 Precipitation-Runoff Gain, Depletion and Groundwater Pumping for Sacramento Valley Depletion Study Areas
(taf/year)

	2001 Study	2021 Study	2021 Study minus 2001 Study
Precipitation-runoff gain	3,060	3,221	161
Depletion	4,788	4,925	137
Net groundwater pumping	1,263	1,355	111
Gain - depletion + pumping	-465	-349	135

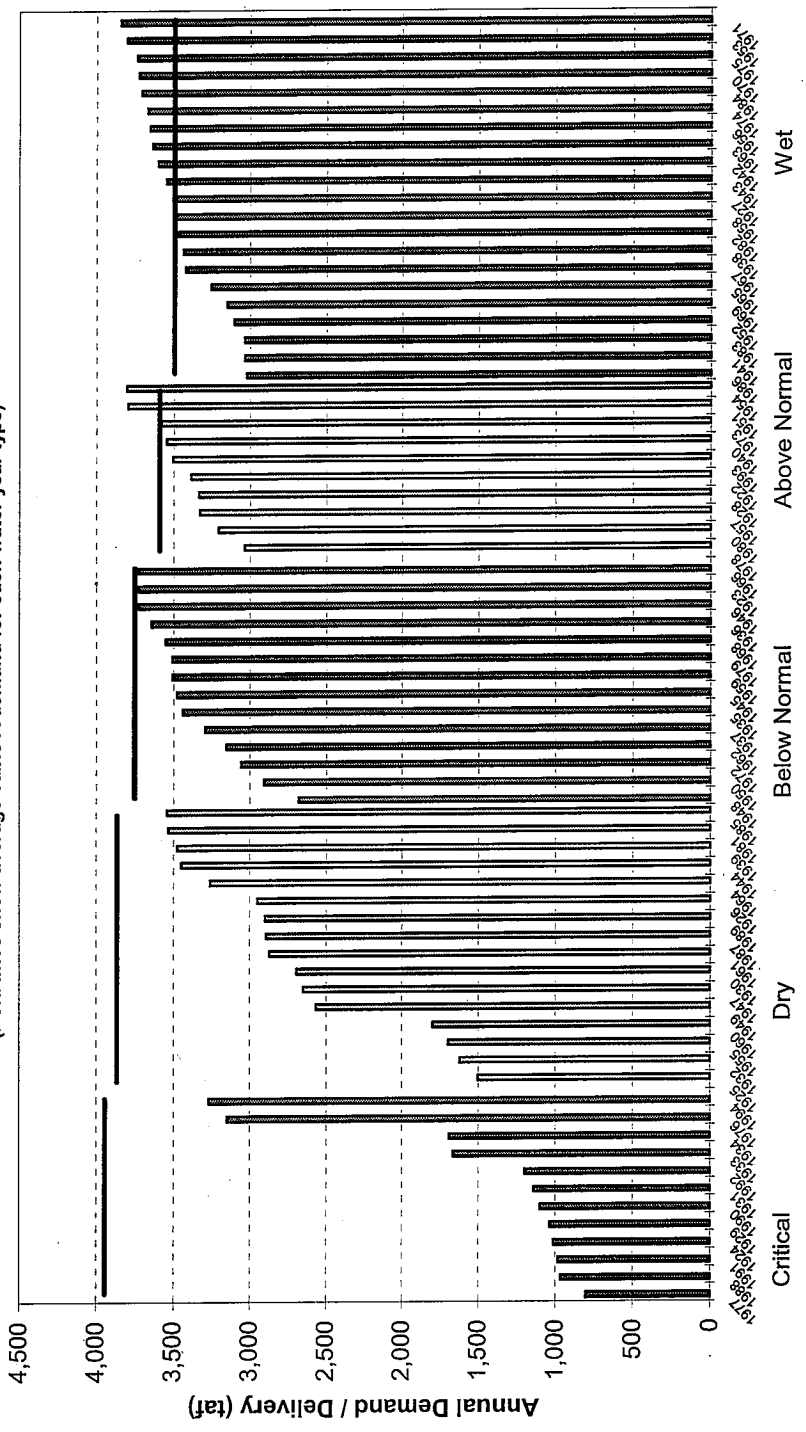
Note: Precipitation-runoff gain is the stream flow accretion due to local ungaged streams that are not modeled explicitly in CALSIM II.
Net groundwater pumping is the net groundwater extraction calculated as pumping less recharge from deep percolation.

Attachment 4

Figure 1

2001 Model Study Table A Delivery Sorted By Water Year Type

(Bold lines show average Table A demand for each water year type)



Attachment 26

LETTER 21

S.4

BILL LOCKYER
Attorney General

State of California
DEPARTMENT OF JUSTICE

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REC'D
LAND
ADVAN
DEPT.
VISION

October 23, 2006

County of San Bernardino
Land Use Services Department, Advance Planning Division
385 North Arrowhead Avenue, First Floor
San Bernardino, CA 92415-0182
Attn: James Squire

RE: DEIR on San Bernardino County General Plan Revision

TRANSMITTED BY FACSIMILE AND U.S. MAIL

Dear Mr. Squire:

The Attorney General of the State of California submits the following comments regarding the San Bernardino County General Plan Revision Draft Environmental Impact Report ("DEIR"). The Attorney General provides these comments pursuant to his independent power and duty to protect the natural resources of the State from pollution, impairment, or destruction in furtherance of the public interest. (*See* Cal. Const., art. V, § 13; Cal. Gov. Code, §§ 12511, 12600-12; *D'Amico v. Board of Medical Examiners*, 11 Cal.3d 1, 14-15 (1974).) These comments are made on behalf of the Attorney General and not on behalf of any other California agency or office. While these comments focus on some of the air quality and global warming issues raised by the DEIR, they are not an exhaustive discussion of all issues.

I. Introduction

The Plan is described as being San Bernardino County's "blueprint" for land use and development through 2030. The Plan projects population growth of about 25% by 2030 (DEIR, p. I-1), in an area that already accounts for about ten percent of the total daily trips made in the entire region. (Circulation and Infrastructure Background Report, p. 2-34.) However, the environmental analysis in the DEIR fails to adequately analyze air quality impacts and contains no analysis at all of the impact of the Plan on climate change; both omissions violate the California Environmental Quality Act ("CEQA"), Pub. Resources Code §§ 21000, et seq. As the DEIR acknowledges, San Bernardino County already has a critical air pollution problem, with state air quality standards for ozone and fine particulate matter having been exceeded on 91 days and 82 days, respectively, in 2002. (Conservation Background Report, p. 6-94.) Even though the County receives transported air pollution from the rest of the South Coast Air Basin, and from

1

the San Joaquin Valley (Conservation and Background Report, p. 6-92), the County itself contributes very significantly to this problem, with a very large rate of trips per day per resident, and an abysmally low rate of transit use. (Circulation and Infrastructure Background Report, p. 2-34.) The large amounts of land available for development present the probability that this problem will grow more severe during the lifetime of the General Plan revision. The environmental and public health concerns raised by the projected increases in vehicular travel under the proposed plan deserve, and CEQA requires, serious and thorough environmental analysis. 1

We note that the Legislature has recently enacted, and Governor Schwartzenegger has signed, AB 32, the landmark law to control and reduce the emission of global warming gases in California. We are extremely concerned that this legislation was not addressed in any way by either the draft General Plan revision or the DEIR. AB 32 requires both reporting of greenhouse gas emissions and their reduction on a brisk time schedule, including a reduction of carbon dioxide (CO2) emissions to 1990 levels by 2020. Local governments will be called upon to help carry out the legislation's provisions, and its General Plan revision is the appropriate place for the County to identify both CO2 and other greenhouse gas sources, as well as actions for mitigation of the increases in emissions in greenhouse gases resulting from actions set forth in the General Plan revision. Because global warming is perhaps the most serious environmental threat currently facing California, the DEIR should and must address the issue, provide full environmental disclosure of the effects on greenhouse gas emissions that the General Plan revision will cause, and adopt serious and real mitigation measures for those effects and emissions. 2

II. The General Plan Should Address and Include Measures to Reduce Greenhouse Gas Emissions, and the DEIR Should Discuss The Plan's Impact On Climate Change.

The General Plan revision projects that San Bernardino County's population will grow overall by about 25% by 2030, and the background documents indicate that the areas covered by Community Plans will experience about a 50% increase in population during that time. (DEIR App.C, p. 5.) The Plan relies upon on vehicular travel and improvements to freeways, roads and streets to deal with the travel needs of this expanded population, and acknowledges that the land uses permitted in the General Plan will increase traffic and may result in a substantial increase in vehicle trips unless mitigated. (DEIR, p. IV-169.) However, the DEIR never analyzes one of the most important environmental impacts of vehicle emissions -- greenhouse gases and resulting climate change. 3

Climate change results from the accumulation in the atmosphere of "greenhouse gases" produced by the burning of fossil fuels for energy. Because greenhouse gases (primarily, carbon

dioxide("CO_2"), methane and nitrous oxide) persist and mix in the atmosphere, emissions anywhere in the world impact the climate everywhere. The impacts on climate change from greenhouse gas emissions have been extensively studied and documented. (*See* Oreskes, Naomi, *The Scientific Consensus on Climate Change*, 306 Science 1686 (Dec. 3, 2004) [review of 928 peer- reviewed scientific papers concerning climate change published between 1993 and 2003, noting the scientific consensus on the reality of anthropogenic climate change]; J. Hansen, *et al.*, *Earth's Energy Imbalance: Confirmation and Implications*, Sciencexpress (April 28, 2004) (available at http://pubs.giss.nasa.gov/abstracts/2005/HansenNazarenkoR.html) [NASA and Department of Energy scientists state that emission of CO_2 and other heat-trapping gases have warmed the oceans and are leading to energy imbalance that is causing, and will continue to cause, significant warming, increasing the urgency of reducing CO_2 emissions].) **3**

In AB 32, the Legislature recognized California's particular vulnerability to the effects of global warming, making legislative findings that global warming will "have detrimental effects on some California's largest industries, including agriculture, wine, tourism, skiing, recreational and commercial fishing, and forestry." (Health and Saf. Code section 38501, subd. (b).) San Bernardino County will feel the effects of climate change in many of these areas, particularly given the importance to the County of its Mountain area's economic dependence on tourism, skiing, recreational fishing, and recreational second homes. (Economic Development Background Report, App. A, pp. 57-59.)) The Legislature also found that global warming will "increase the strain on electricity supplies necessary to meet the demand for summer air-conditioning in the hottest parts of the State." (Health and Saf. Code, section 38501, subd. (b).) Since San Bernardino, and especially its Desert areas, are among the parts of the State that do experience hot weather, the County will suffer acutely from any electricity shortages caused by the strains of global warming, as it will also feel the economic and public health damages from decreased snowpack and increased air pollution that a changed climate will bring -- indeed, is already bringing. **4**

To prevent these harms, AB 32 mandates that emissions of greenhouse gases to 1990 levels must be required by whatever regulatory scheme the Air Resources Board, the agency charged with carrying out the statute, ultimately adopts. (Health and Saf. Code section 38530.) Governments are not exempt from AB 32. The County, its cities, and the businesses within its borders will all have to comply with the regulations and plans that will be adopted to achieve the reduction of greenhouse gas emissions mandated by this legislation.

Nor is AB 32 the first state-wide recognition of the ravages global warming may wreak on California. In Executive Order S-3-05, issued on June 1, 2005, Governor Schwarzenegger recognized the significance of the impacts of climate change on the State of California, noting that "California is particularly vulnerable to the impacts of climate change." And, even before **5**

AB 32, the Legislature recognized the severe impacts that come from climate change, as well as a "projected doubling of catastrophic wildfires due to faster and more intense burning associated with drying vegetation." (Stats. 2002, ch, 200, Section 1, subd. (c)(4), enacting Health & Saf. Code § 43018.5). In the particular realm of vehicular travel and emissions from cars and truck, the California legislature went on to recognize that "passenger vehicles and light-duty trucks are responsible for *40 percent of the total greenhouse gas pollution in the state*." (*Ibid.*, subd. (e)(emphasis added).) Our knowledge of the existence and severity of the problem of greenhouse gas emissions and global warming is not new, but was apparent and recognized before the draft General Plan revision was issued by the County. 5

Despite the existence of Executive Order S-3-05 and the pendency of AB 32 during the time that the General Plan revision was being prepared, the County does not even mention the issue in its General Plan revision, although that revision is meant to cover the next quarter century. Nor does the DEIR analyze, on even the most superficial level, emissions of carbon dioxide, climate change or global warming, despite the obvious connection between such emissions and land use planning, transportation planning, or even air quality. No mitigation for emissions of greenhouse gases is proposed or adopted. 6

Under CEQA, an environmental impact report must identify and focus on the "significant environmental effects" of a proposed project. (Public Res. Code section 21100(b)(1); Cal. Code Regs., tit. 14, §§ 15126(a), 15126.2(a), 15143.) "'Significant effect on the environment' means a substantial, or potentially substantial, adverse change in the environment." (Public Res. Code section 21068). CEQA also provides that the CEQA guidelines "shall" specify certain criteria that *require* a finding that a project may have a significant effect on the environment:

> "(1) A proposed project has the potential to degrade the quality of the environment, curtail the range of the environment, or to achieve short-term, to the disadvantage of long-term, environmental goals.
>
> (2) The possible effects of a project are individually limited but cumulatively considerable. As used in this paragraph, "cumulatively considerable" means that the incremental effects of an individual project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.
>
> (3) The environmental effects of a project will cause substantial adverse effects on human beings, either directly or indirectly."
> (Public Res. Code section 21083(b).)

The CEQA Guidelines, Cal. Code of Regs., tit. 14, section 15064, subdivision (h)(3), provide that an agency may conclude that an environmental effect is not cumulatively considerable if it complies with an existing plan to meet environmental standards, such as a state implementation plan or a basin plan. The DEIR itself includes as one of its significance criteria for air quality the potential of the project to "[v]iolate any air quality standard or contribute substantially to an existing or projected air quality violation."[1] Here, the plans to reduce global warming are still to be formulated, but after the passage of AB 32, we know, as stated above, that a reduction of emissions of greenhouse gases to 1990 levels will be required by whatever regulatory scheme is ultimately adopted. (Health and Saf. Code section 38550.) This provision of the Guidelines does not exempt the County from doing a CEQA analysis of this issue. 7

In other words, if the General Plan revision could allow emissions of greenhouse gases to significantly affect the environment, directly, indirectly, or cumulative, then the EIR on the revision must analyze the issue, disclose all that can feasibly be found out and disclosed, and adopt all feasible mitigation measures. The DEIR reports that currently, San Bernardino generates about 5.2 million person trips per day (about 10.35 trips per household per day), and that over 84 % of the work trips are made by car. (Circulation and Infrastructure Background Report, p. 2-34.) Given that the DEIR projects an increase in population of about 436,500 people by 2030, vehicular miles traveled by the year 2030 can be expected to grow substantially. Considering that about 40% of greenhouse gas emissions come from motor vehicles, the revision clearly "has the potential to degrade the environment" as to greenhouse gases and global warming. (*See ibid.*, subd. (b)(1).) Moreover, the cumulative effects of this project on greenhouse gas emissions, when taken in consideration with the impacts statewide of increased population and vehicular travel over the next quarter century, are undeniable. (*See ibid.*, subd. (b)(2).) When considering the impacts of climate change on California, it is impossible to ignore that the impacts of this project will have either direct or indirect effects on human beings. (*See ibid.*, subd. (b)(3).) Given the scope of the General Plan revision, the projected increase in population and vehicle travel it projects, and the fact that it projects a steady and large increase in population, there is no question that the impacts of the General Plan revision on greenhouse gas emissions and climate change may, and likely will, have significant cumulative environmental impacts for California. These impacts should have been considered, analyzed, and mitigated in the DEIR. 8

Such an analysis is possible; the data are obtainable. Carbon dioxide emissions from cars can be quantified. In fact, under AB 32, an inventory of greenhouse gas emissions *must* be done in time to allow the 1990 level of such emissions to be determined by the statutory deadline of

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1. DEIR, p. IV-27.

January 1, 2008. (Health and Saf. Code sections 38530, 35850.)[2/] This is such a short time that such an emissions inventory should begin immediately. However, current information on the greenhouse gas emissions of cars, trucks and buses could be used to compile an estimated inventory. Once such an estimated inventory is completed, the projections of increased driving that are in the General Plan revision could be used to estimate future growth in greenhouse gas emissions associated with the revision. The California Air Resources Board has information that could be applied to the projected increase in driving. The impacts could be assessed as to their cumulative impact on climate change, assuming (as is highly probable based on the population growth in the General Plan revision and the widely distributed nature of that growth) that there would be a considerable impact from the increase in CO_2 resulting from the increased driving. (*See* Cal. Code Regs., tit. 14, § 15130(a) ["an EIR shall discuss cumulative impacts of a project when the project's incremental effect is cumulatively considerable."] *See also* Cal. Code Regs., tit. 14, § 15065(a)(3) ["'Cumulatively considerable' means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probably future projects."].) 8

Moreover, and most importantly, the General Plan revision could and should include mitigation for these impacts. The Governor has recognized, "mitigation efforts will be necessary to reduce greenhouse gas emissions and adaptation efforts will be necessary to prepare Californians for the consequences of global warming." (Executive Order S-3-05, June 1, 2005.) The County can both require mitigation measures from businesses and entities within its jurisdiction, through alternations to its building codes or permit requirements; e.g., it might require solar heating capabilities for all new development, or require that carbon sequestration credits be purchased for development of a certain size. The County could take direct action to offset its own carbon emissions, or those of its residents, by providing for increased public transportation service, increased support of alternative fuels and technologies, installation of electric vehicle charging stations, and other affirmative steps to reduce the transportation impacts of CO_2. These are real, achievable and available mitigation measures that could be considered when San Bernardino County recognizes its obligations to analyze greenhouse gas emissions and their impact on climate change as part of its long term transportation planning. As it currently stands, we believe that the draft EIR on the General Plan revision does not comply with CEQA. 9

III. The DEIR Does Not Adequately Discuss The General Plan Revision's Impact On Air Quality.

Besides its complete failure to analyze the effects of the General Plan revision on global 10

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2. The emissions inventories in the current documentation do not include greenhouse gases. (DEIR, p. IV-33; Conservation Background Report, p. 6-93.)

warming, the DEIR also fails adequately to analyze the revision's effects on conventional air pollutants.

Air pollution is already at critical, health-endangering levels in San Bernardino County. The federal standard for ozone was exceeded on 21 days in 2002, while the state ozone standard was exceeded on 91 days.[3] Similarly, the federal and state standard for respirable particulate matter was exceeded on 98 days in 2002. (*Id.*) And, while emissions trends for most pollutants show modest decreases, particulate matter emissions are projected to *increase*, in spite of the extraordinary measures being taken by the South Coast Air Quality Management District (SCAQMD).[4] The DEIR recognizes harm to air quality as one of the significant environmental effects of the General Plan revision that cannot be fully mitigated.[5] 10

The Air Quality section of the DEIR is extremely troubling. Air quality is well known to already damage the public health in the South Coast Air Basin, with children suffering decreased lung function simply by growing up in the area. (See Bustillo, M., "Smog Harms Children's Lungs for Life, Study Finds," Los Angeles *Times*, Sept. 9, 2004, https://www.latimes.com/news/yahoo/la-me-smog9sep09,1,6309811.story.) The DEIR recognizes that the increased driving that the General Plan revision projects will further damage air quality. (DEIR, p. I-21.) Yet, this effect, although recognized as significant, receives almost no analysis or discussion in the DEIR. Effects on air quality are discussed in a bare couple of pages, in the most general terms, such as statements that new growth will occur that will cause more driving, which will in turn create more pollutant emissions. The extremely brief, non-detailed discussion of air quality is very much out of proportion to the importance, and the probable public health impacts, of the expected effects. The CEQA Guidelines require that the discussion of significant effects of a project should include discussion of direct and indirect effects, impacts on public health, and effects on the resource base. (14 Cal. Code of Regs., tit. 14 sec. 15126.2.) In general, an EIR should contain discussions sufficient to advise the decision makers and the public of the nature and importance of the environmental effects being discussed, not merely the ultimate conclusion that an effect is significant. (*Assn. of Irritated Residents v. County of Madera* (2003) 107 Cal.App.4th 1383, 1390 ("The EIR must contain facts and analysis, not just the bare conclusions of the agency. . . . . An EIR must include detail sufficient to enable those who did not participate in its preparation to understand and to consider meaningfully the issues raised by the proposed project." [Internal citations and quotation marks 11

3. Conservation Background Report, p. 6-94.

4. Conservation Background Report, p. 6-95.

5. DEIR, p. IV-27.

omitted.]) As we read the DEIR, it does not conform to this standard. 11

Where, as here, the environmental effect is harm to human health, the EIR must clearly set out the relationship between the effects of the project and the health damage that can be expected. The CEQA Guidelines, at section 15126.2, subdivision (a), require an EIR to discuss, among other things, health and safety problems caused by the physical changes that the proposed project will precipitate. The DEIR here gives its conclusion that the General Plan revision will have significant and unavoidable adverse impacts on air quality, but it does not actually discuss or disclose what those impacts can be expected to be on the health of the County's residents. The EIR is required by CEQA to do so. (*Bakersfield Citizens for Local Control v. City of Bakersfield* (2004) 124 Cal.App.4th 1184, 1219-1220.) The summary table in the DEIR that merely sets out general health effects from exposure to pollutants[6] is not sufficient; actual levels of exposure expected from execution of the General Plan revision, correlated with actual populations that will be exposed and the probable health impacts on them, is required. CEQA is not just a formal exercise, where the County can state that an effect is significant and, having set out this conclusion as though it were a magic formula, move on. The EIR must spell out what that significant effect will really consist of, to allow both the decision makers and the residents whose health, and whose children's health, will be affected, to know and understand the health damage that will result from the choices in the General Plan revision. The DEIR does not do this, and must be revised so that it does. 12

The DEIR also fails to adopt adequate mitigation for the significant adverse effects on air quality that it does identify. The mitigation measures for the County's own emissions are few and minor. Many of these mitigation measures in the DEIR seem to be measures that are *already* required by the South Coast Air Quality Management District (SCAQMD), including its requirements that publicly owned vehicle fleets must shop from among clean-fuel vehicles. Measures that the County is already legally obliged to take should be considered part of the General Plan revision, not mitigation for its effects. The SCAQMD Fleet Rules already require public agency vehicle fleets to acquire clean-fuel vehicles. Where the County is already legally obligated to undertake pollution-reducing measures, these measures should be considered to be part of the project, not as mitigation. Such measures do not lessen or avoid the environmentally harmful effects of a project, because they must already be incorporated into the project as originally designed.[7] 13

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6. DEIR, pp. IV-31-32.

7. The same principle applies to greenhouse gas emission reductions. AB 32 mandates that regulatory programs adopted under its aegis require greenhouse gas emissions reductions that are *in addition* to reductions already required by law. (Health and Saf. Code section

CEQA forbids public agencies to approve projects that will harm the environment until and unless the agency has adopted *all* feasible mitigation for that harm. (Public Res. Code section 21002, 21081, subdivision a.) The County must explore all feasible mitigation that could be adopted to lessen the effects of the General Plan revision, and cannot rely upon those features of the project that are already required by law to substitute for the mitigation CEQA requires. The DEIR should be revised to adopt all feasible mitigation for its air quality effects. 13

Conclusion

The General Plan revision is the blueprint for development in this growing, vital area of Southern California for the next 24 years, and both current residents and the half-million additional residents expected in the County by 2030 will have to live with the choices the County makes in this revision. CEQA requires that the County fully disclose, both to the decision makers and the public, all the environmental harm that may result from this blueprint. This disclosure must include the environment effects on air quality and global warming, areas in which the DEIR is currently woefully deficient, or even totally silent. We urge the County to thoroughly revise the DEIR in these areas to bring it into compliance with CEQA. 14

Thank you for the opportunity to offer these comments. Any questions may be directed to the undersigned. We also request a copy of the final EIR when it is issued.

Sincerely,

Susan L Durbin

SUSAN DURBIN
Deputy Attorney General

For BILL LOCKYER
Attorney General

cc:
Kurt Weis, General Counsel
SCAQMD

38560.5, subdivision (d)(2).

LEAD AGENCY RESPONSE TO COMMENT LETTER S.4
CALIFORNIA DEPARTMENT OF JUSTICE, OCTOBER 23, 2006

RESPONSE S.4-1

The County agrees that there is a dispersion of air contaminants from one air basin to another air basin. The County believed it was appropriate to develop expanded discussions of these issues, thereby supplementing the individual responses, or acting as the responses themselves. In response to this comment, Categorical Discussions 1 and 2 are the most appropriate responses regarding the programmatic nature of the EIR and air quality analyses.

RESPONSE S.4-2, S.4-3, S.4-4, S.4-5, S.4-6, S.4-7, S.4-8

Assembly Bill 32 will create a new regulatory program intended to reduce statewide greenhouse gas emissions to their 1990 level. It is not yet clear how, or if, these future regulations would affect local governments or how they might influence local land use planning decisions. From the background discussion in Categorical Discussion #3, it is clear that the issue of greenhouse gas reductions extends well beyond the scope of local government actions incorporated in General Plans. Nevertheless, the County of San Bernardino recognizes the importance of this issue. Goals and policies already incorporated into the General Plan will serve to reduce vehicle trip generation when compared to existing conditions. For further information, please see Categorical Discussion #3. As described in that Categorical Discussion, based on the lack of any methodologies or significance thresholds that can be applied in determining whether the impacts of the General Plan revision will be significant in terms of greenhouse gas emissions or climate change, the County believes that this EIR currently includes the proper level of disclosure for a CEQA document.

RESPONSE S.4-9

Please see Categorical Discussion #3 for an extensive explanation absence of any methodology or agency guidance that would enable the County in this EIR or in this General Plan revision to assess or mitigate greenhouse gas emissions. The plan already includes policies to reduce emissions and those policies will help to reduce greenhouse gas emissions as well. In addition, the County respectfully disagrees with the argument that the Draft EIR should be recirculated for a second round of public review. Section 15088.5 of the CEQA Guidelines articulates the requirements for recirculation. Although the Board of Supervisors will make the final determination, none of the comments in this letter appear, from the staff's perspective to have triggered the requirements for recirculation of the Draft EIR. For further explanation, please see Categorical Discussion 6.

RESPONSE S.4-10

The County acknowledges the commenter's opinion regarding air quality in San Bernardino County. CEQA Guidelines, §15125 require that an EIR include a description of the environment within the vicinity of a proposed project as it exists at the time the NOP/IS is published, or if no NOP/IS is published, at the time the environmental analyses commences from both a local and regional perspective. The air quality analysis in the Draft EIR was prepared at a programmatic level based on data that was the most accurate at the time the NOP/IS was published. Further, Attachment 2 includes supplemental air quality information related to the existing air quality conditions and regulatory standards specific to the County of San Bernardino. This data, however, is provided for information only and does not alter the conclusions reached in the Draft EIR.

RESPONSE S.4-11

The County acknowledges the commenter's concern regarding air quality and public health in the County of San Bernardino. The air quality section of the Draft EIR begins on page IV-25 and continues through

page IV-36. The Draft EIR at page I-21 is only the Executive Summary. The purpose of the Executive Summary is to present the conclusions of the analysis without the detail.

The air quality analysis for the update of the General Plan for the County of San Bernardino was sufficiently prepared pursuant to the requirements outlined in the CEQA statutes beginning at Section 21000 of the California Public Resources Code, and also pursuant to the CEQA Guidelines at the California Code of Regulations, Title 14, beginning at Section 15000. Therefore, the proper analysis, evaluation of impacts, and identification of feasible mitigation measures has been accomplished in accordance with the appropriate state regulations.

The Draft EIR for this General Plan update has been prepared at a programmatic level. Program EIRs focus on policy rather than project-related impacts. They contain a more general discussion of impacts, alternatives, and mitigation measures. A General Plan EIR evaluates the large-scale impacts on the environment that can be expected to result from the adoption of the General Plan, but does not necessarily address the site-specific impacts of each of the many individual development projects that will follow and be implemented by the General Plan.

RESPONSE S.4-12

The County acknowledges the concerns regarding the public health concerns associated with mobile source emissions. Mobile source emissions from passenger vehicles, trucks, locomotive, ships, etc., are under the jurisdiction of the California Air Resources Control Board and EPA. These agencies currently enforce and will continue to enforce rule, regulations and controls to reduce emissions. The County of San Bernardino will adopt local, state and federal air quality regulations for both stationary and mobile source emissions in an effort to reduce air contaminants.

The impacts on the freeways and local roads are not an issue of County development, but a regional and even statewide issue. Not only growth in the County of San Bernardino, but every city within San Bernardino and surrounding counties and communities are contributing to the traffic on the regional freeway system. Preventing opportunities for growth in San Bernardino County alone will not sufficiently reduce traffic on the freeways.

Further, Attachment 2 includes supplemental air quality information related to the existing air quality conditions and regulatory standards specific to the County of San Bernardino. This data is provided for information only and does not alter the conclusions reached in the Draft EIR.

RESPONSE S.4-13

The County acknowledges the commentator's opinion regarding the need for additional mitigation measures to reduce the significant adverse effects on air quality. Since, the Draft EIR for the County of San Bernardino General Plan is a "Program EIR," it evaluates the broad-scale impacts of the proposed General Plan and contains a more general discussion of impacts, alternatives, and mitigation measures. The Draft EIR evaluates large-scale impacts on the environment that can be expected to result from the adoption of the General Plan, but does not necessarily address the site-specific impacts of each of the many individual development projects that may follow and be implemented by the General Plan.

The County disagrees with the comment that it is inappropriate to consider mitigation measures that are already required by the South Coast Air Quality Management District. It is common practice to include mitigation measures imposed or recommended by air quality regulatory agencies, and it is a sensible practice. The fact that such mitigation measures may be required by the District does not mean that they should not also be included as programs and policies in a general plan, as including such measures in a general plan provides an additional regulatory means of carrying out and implementing those measures.

Multiple commenter raised questions about the same or similar issues. The County believed it was appropriate to develop expanded discussions of these issues, thereby supplementing the individual responses, or acting as the responses themselves. In response to this comment, Categorical Discussions 1 and 2 are the most appropriate responses regarding the programmatic nature of the EIR and air quality analyses. Further, Attachment 2 includes supplemental air quality information related to the existing air quality conditions and regulatory standards specific to the County of San Bernardino. This data, however, is provided for information only and does not alter the conclusions reached in the Draft EIR.

RESPONSE S.4-14

The County respectfully disagrees that the Draft EIR's discussion on Air Quality effects is "woefully deficient." The County's position is that the air quality analysis corresponds closely to the guidance provided by the South Coast Air Quality Management District and the California Air Resources Board, both of which agencies were consulted in the preparation of the analysis. Neither agency chose to submit a letter of comment on the Draft EIR. In accordance with Section 15207 of the CEQA Guidelines, the County has concluded that these two agencies had no comments to make on the air quality analysis presented in the Draft EIR.

With regard to global warming issues, neither the California Air Resources Board nor the South Coast Air Quality Management District raised these issues during the Notice of Preparation period, nor did either agency provide comments on the Draft EIR. Categorical Discussion 3 provides further response on the analytical status of global warming issues at the present time.

Attachment 27

Growing Cooler: The Evidence on Urban Development and Climate Change

Reid Ewing, Keith Bartholomew, Steve Winkelman, Jerry Walters, and Don Chen

with Barbara McCann and David Goldberg

Urban Land Institute

Smart Growth America
Better Choices For Our Communities

Center for Clean Air Policy
Dialogue. Insight. Solutions.

National Center for Smart Growth Research & Education

This new book documents how key changes in land development patterns could help reduce vehicle greenhouse gas emissions. Based on a comprehensive review of dozens of studies by leading urban planning researchers, the book concludes that urban development is both a key contributor to climate change and an essential factor in combating it. The authors make the case that one of the best ways to reduce vehicle travel is compact development: building places in which people can get from one place to another without driving. This includes developments with a mix of uses and pedestrian-friendly designs. Changing demographics, shrinking households, rising gas prices, and lengthening commutes are contributing to the demand for smaller homes and lots, townhouses, and condominiums near jobs and other activities. Current government policies and regulations encourage sprawling, auto-dependent development. The book recommends changes that can be made to make green neighborhoods more available and more affordable.

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Growing Cooler: The Evidence on Urban Development and Climate Change

Reid Ewing, Keith Bartholomew, Steve Winkelman, Jerry Walters, and Don Chen

with Barbara McCann and David Goldberg

The policy recommendations presented in this book do not necessarily reflect the opinions of the Urban Land Institute.

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Reid Ewing
College Park, Maryland

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Executive Summary

The phrase "you can't get there from here" has a new application. For climate stabilization, a commonly accepted target would require the United States to cut its carbon dioxide (CO_2) emissions by 60 to 80 percent as of 2050, relative to 1990 levels. Carbon dioxide levels have been increasing rapidly since 1990, and so would have to level off and decline even more rapidly to reach this target level by 2050. This publication demonstrates that the U.S. transportation sector cannot do its fair share to meet this target through vehicle and fuel technology alone. We have to find a way to sharply reduce the growth in vehicle miles driven across the nation's sprawling urban areas, reversing trends that go back decades.

This publication is based on an exhaustive review of existing research on the relationship between urban development, travel, and the CO_2 emitted by motor vehicles. It provides evidence on and insights into how much transportation-related CO_2 savings can be expected with compact development, how compact development is likely to be received by consumers, and what policy changes will make compact development possible. Several related issues are not fully examined in this publication. These include the energy savings from more efficient building types, the value of preserved forests as carbon sinks, and the effectiveness of pricing strategies—such as tolls, parking charges, and mileage-based fees—when used in conjunction with compact development and expanded transportation alternatives.

The term "compact development" does not imply high-rise or even uniformly high density, but rather higher average "blended" densities. Compact development also features a mix of land uses, development of strong population and employment centers, interconnection of streets, and the design of structures and spaces at a human scale.

The Basics

Scientific consensus now exists that greenhouse gas accumulations due to human activities are contributing to global warming with potentially catastrophic consequences (IPCC 2007). International and domestic climate policy discussions have gravitated toward the goal of limiting the temperature increase to 2°C to 3°C by cutting greenhouse gas emissions by 60 to 80 percent below 1990 levels by the year 2050. The primary greenhouse gas is carbon dioxide, and every gallon of gasoline burned produces about 20 pounds of CO_2 emissions.

Driving Up CO_2 Emissions

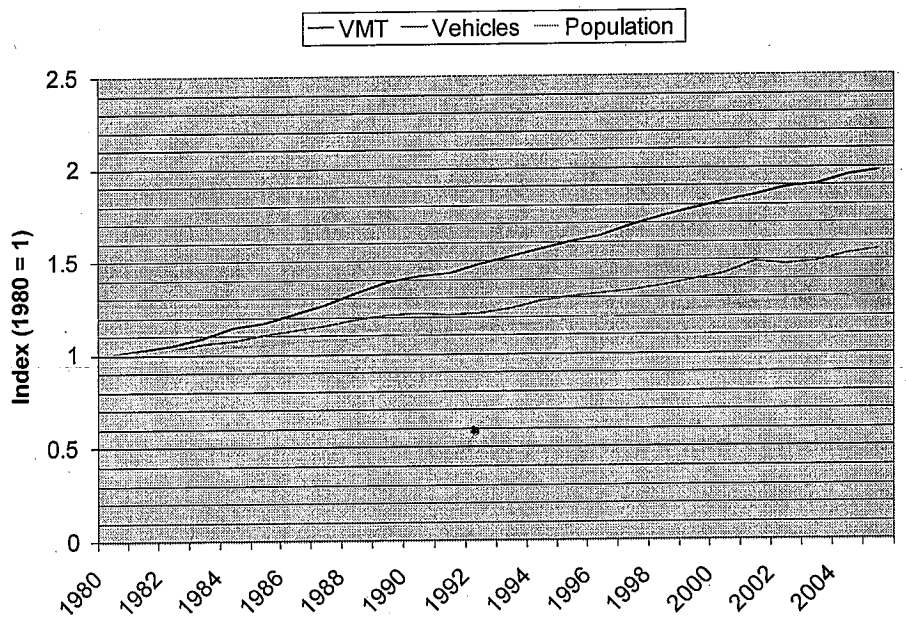
The United States is the largest emitter worldwide of the greenhouses gases that cause global warming. Transportation accounts for a full third of CO_2 emissions in the United States, and that share is growing as others shrink in comparison, rising from 31 percent in 1990 to 33 percent today It is hard to envision a "solution" to the global warming crisis that does not involve slowing the growth of transportation CO_2 emissions in the United States.

The Three-Legged Stool Needed to Reduce CO2 from Automobiles

Transportation CO2 reduction can be viewed as a three-legged stool, with one leg related to vehicle fuel efficiency, a second to the carbon content of the fuel itself, and a third to the amount of driving or vehicle miles traveled (VMT). Energy and climate policy initiatives at the federal and state levels have pinned their hopes almost exclusively on shoring up the first two legs of the stool, through the development of more efficient vehicles (such as hybrid cars) and lower-carbon fuels (such as biodiesel fuel). Yet a stool cannot stand on only two legs.

As the research compiled in this publication makes clear, technological improvement in vehicles and fuels are likely to be offset by continuing, robust growth in VMT. Since 1980, the number of miles Americans drive has grown three times faster than the U.S. population, and almost twice as fast as vehicle registrations (see Figure 0-1). Average automobile commute times in metropolitan areas have risen steadily over the decades, and many Americans now spend more time commuting than they do vacationing.

Figure 0-1 Growth of VMT, Vehicle Registrations, and Population in the United States relative to 1980 Values
Source: FHWA 2005.



This raises some questions, which this report addresses. Why do we drive so much? Why is the total distance we drive growing so rapidly? And what can be done to alter this trend in a manner that is effective, fair, and economically acceptable?

The growth in driving is due in large part to urban development, or what some refer to as the built environment. Americans drive so much because we have given ourselves little alternative. For 60 years, we have built homes ever farther from workplaces, created schools that are inaccessible except by motor vehicle, and isolated other destinations—such as shopping—from

work and home. From World War II until very recently, nearly all new development has been planned and built on the assumption that people will use cars virtually every time they travel. As a larger and larger share of our built environment has become automobile dependent, car trips and distances have increased, and walking and public transit use have declined. Population growth has been responsible for only a quarter of the increase in vehicle miles driven over the last couple of decades. A larger share of the increase can be traced to the effects of a changing urban environment, namely to longer trips and people driving alone.

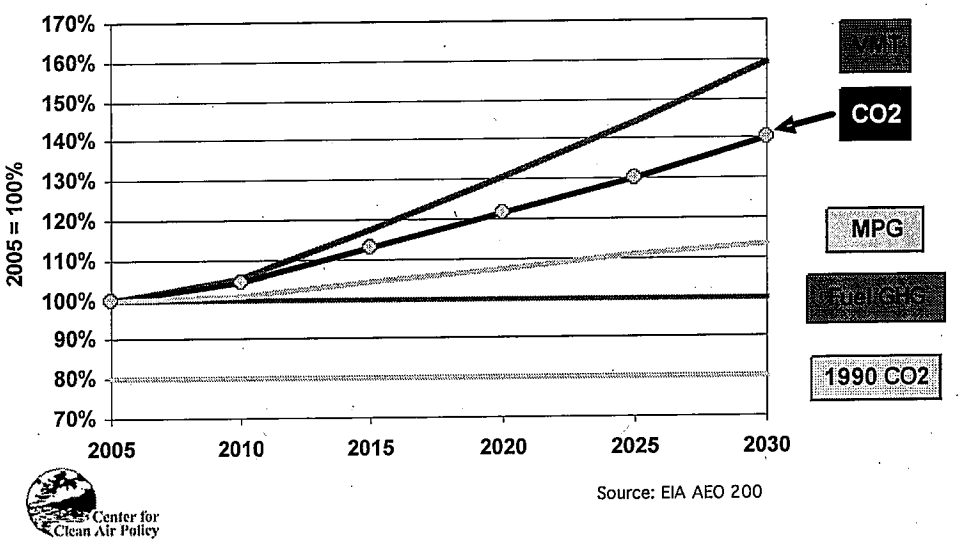
As with driving, land is being consumed for development at a rate almost three times faster than population growth. This expansive development has caused CO_2 emissions from cars to rise even as it has reduced the amount of forest land available to absorb CO_2.

How Growth in Driving Cancels Out Improved Vehicle Fuel Economy

Carbon dioxide is more difficult to control through vehicle technology than are conventional air pollutants. Conventional pollutants can be reduced in automobile exhaust with sophisticated emission control systems (catalytic converters, on-board computers, and oxygen sensors). Carbon dioxide, meanwhile, is a direct outcome of burning fossil fuels; there is no practical way to remove or capture it from moving vehicles. At this point in time, the only way to reduce CO_2 emissions from vehicles is to burn less gasoline and diesel fuel.

An analysis by Steve Winkelman of the Center for Clean Air Policy, one of the coauthors of this publication, finds that CO_2 emissions will continue to rise, despite technological advances, as the growth in driving overwhelms planned improvements in vehicle efficiency and fuel carbon content. The U.S. Department of Energy's Energy Information Administration (EIA) forecasts that driving will increase 59 percent between 2005 and 2030 (red line, Figure 0-2), outpacing the projected 23 percent increase in population. The EIA also forecasts a fleetwide fuel economy improvement of 12 percent within this time frame, primarily as a result of new federal fuel economy standards for light trucks (green line, Figure 0-2). Despite this improvement in efficiency, CO_2 emissions would grow by 41 percent (dark blue line, Figure 0-2).

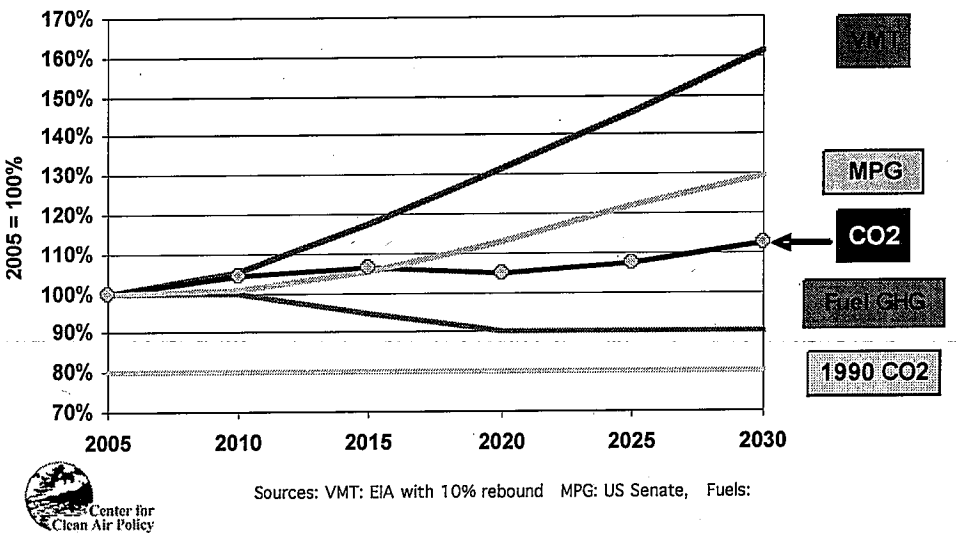
Figure 0-2 Projected Growth in CO_2 Emissions from Cars and Light Trucks
Source: EIA 2007.



U.S. fuel economy has been flat for almost 15 years, as the upward spiral of car weight and power has offset the more efficient technology. Federal and state efforts are underway to considerably boost vehicle efficiency and reduce greenhouse gas emissions. In June 2007, the U.S. Senate passed corporate average fuel economy (CAFE) standards that would increase new passenger vehicle fuel economy from the current 25 miles per gallon (mpg) to 35 mpg by 2020. (As of this writing, the House has not acted.). California plans to implement a low carbon standard for transportation fuels, specifically a 10 percent reduction in fuel carbon content by 2020.

Even if these more stringent standards for vehicles and fuels were to go into effect nationwide, transportation-related emissions would still far exceed target levels for stabilizing the global climate (see Figure 0-3). The rapid increase in driving would overwhelm both the increase in vehicle fuel economy (green line) and the lower carbon fuel content (purple line). In 2030, CO_2 emissions would be 12 percent *above* the 2005 level, and 40 percent above the 1990 level (turquoise line). For climate stabilization, the United States must bring the CO_2 level to 15 to 30 percent *below* 1990 levels by 2020 to keep in play a CO_2 reduction of 60 to 80 percent by 2050.

Figure 0-3 Projected Growth in CO_2 Emissions from Cars and Light Trucks Assuming Stringent Nationwide Vehicle and Fuel Standards*
Source: EIA 2007



As the projections show, the United States cannot achieve such large reductions in transportation-related CO_2 emissions without sharply reducing the growth in miles driven.

Changing Development Patterns to Slow Global Warming

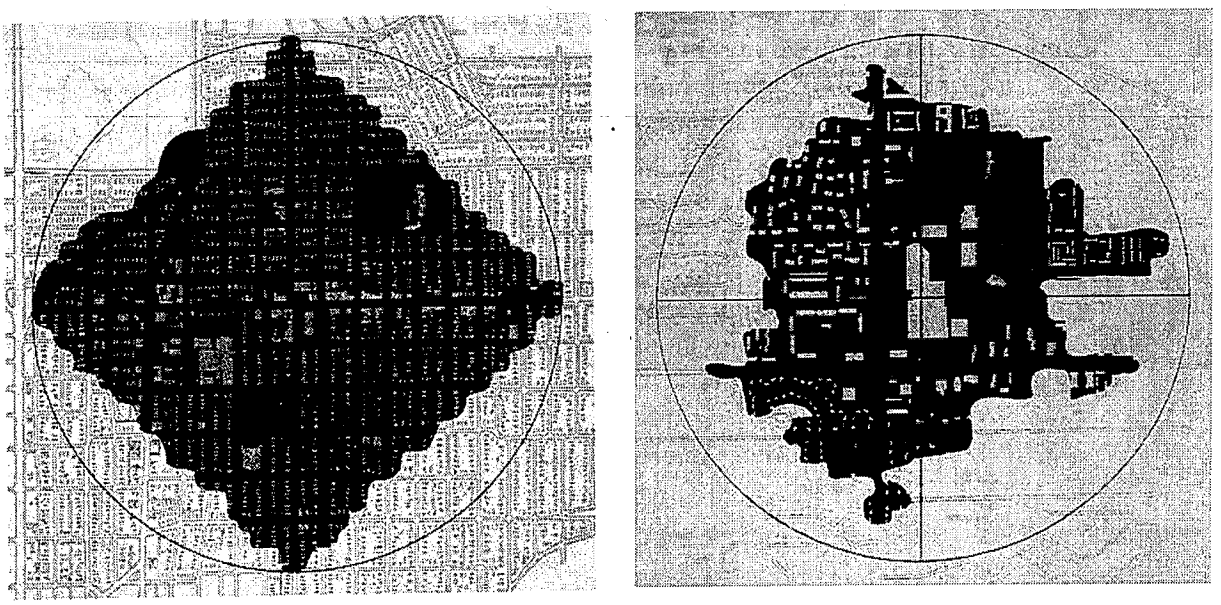
Recognizing the unsustainable growth in driving, the American Association of State Highway and Transportation Officials (AASHTO), representing state departments of transportation, is urging that the growth of vehicle miles driven be cut in half. How does a growing country—one with 300 million residents and another 100 million on the way by mid-century—slow the growth of vehicle miles driven?

Aggressive measures certainly are available, including imposing ever stiffer fees and taxes on driving and parking or establishing no-drive zones or days. Some countries are experimenting with such measures. However, many in this country would view such steps as punitive, given the reality that most Americans do not have a viable alternative to driving. The body of research surveyed here shows that much of the rise in vehicle emissions can be curbed simply by growing in a way that will make it easier for Americans to drive less. In fact, the weight of the evidence shows that, with more compact development, people drive 20 to 40 percent less, at minimal or reduced cost, while reaping other fiscal and health benefits.

How Compact Development Helps Reduce the Need to Drive

Better community planning and more compact development help people live within walking or bicycling distance of some of the destinations they need to get to every day—work, shops, schools, and parks, as well as transit stops. If they choose to use a car, trips are short. Rather than building single-use subdivisions or office parks, communities can plan mixed-use developments that put housing within reach of these other destinations. The street network can be designed to interconnect, rather than end in culs-de-sac and funnel traffic onto overused arterial roads. Individual streets can be designed to be "complete," with safe and convenient places to walk, bicycle, and wait for the bus. Finally, by building more homes as condominiums, townhouses, or detached houses on smaller lots, and by building offices, stores and other destinations "up" rather than "out," communities can shorten distances between destinations. This makes neighborhood stores more economically viable, allows more frequent and convenient transit service, and helps shorten car trips.

Figure 0-4 Destinations within One-Quarter Mile of Center for Contrasting Street Networks in Seattle
Source: Moudon et al. 1997.



This type of development has seen a resurgence in recent years, and goes by many names, including "walkable communities," "new urbanist neighborhoods," and "transit-oriented developments" (TODs). "Infill" and "brownfield" developments put unused lots in urban areas to new uses, taking advantage of existing nearby destinations and infrastructure. Some "lifestyle centers" are now replacing single-use shopping malls with open-air shopping on connected streets with housing and office space as part of the new development. And many communities have rediscovered and revitalized their traditional town centers and downtowns, often adding more housing to the mix. These varied development types are collectively referred to in this publication as "compact development" or "smart growth."

How We Know that Compact Development Will Make a Difference: The Evidence

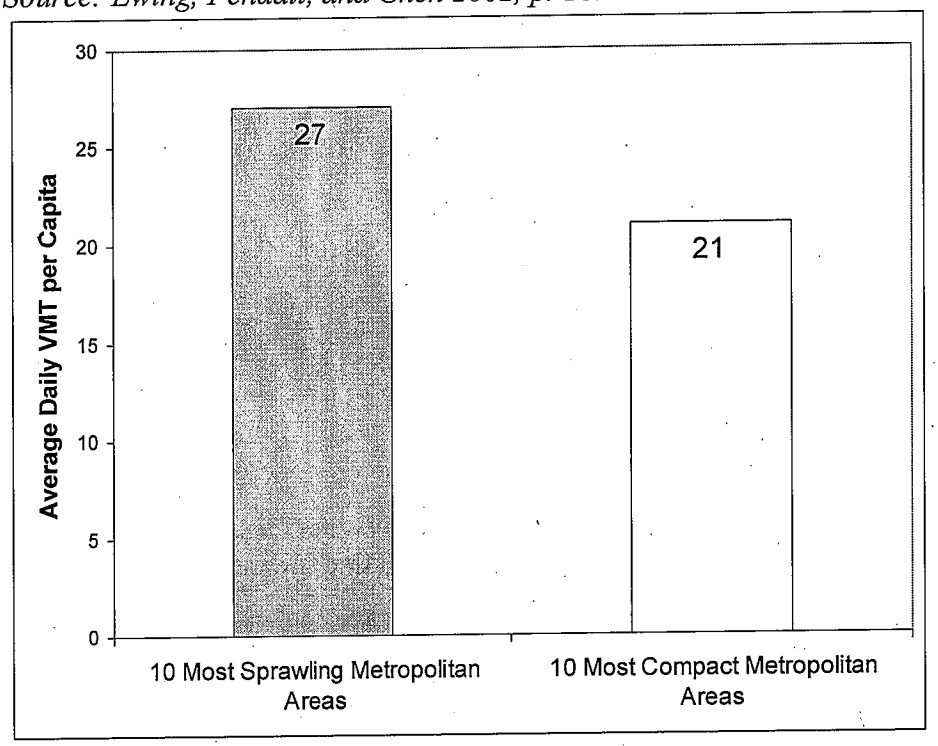
As these forms of development have become more common, planning researchers and practitioners have documented that residents of compact, mixed-use, transit-served communities do less driving. Studies have looked at the issue from varying angles, including:

- research that compares overall travel patterns among regions and neighborhoods of varying compactness and auto orientation;
- studies that follow the travel behavior of individual households in various settings; and
- models that simulate and compare the effects on travel of different future development scenarios at the regional and project levels.

Regardless of the approach, researchers have found significant potential for compact development to reduce the miles that residents drive.

A comprehensive sprawl index developed by coauthor Reid Ewing of the National Center for Smart Growth at the University of Maryland ranked 83 of the largest metropolitan areas in the United States by their degree of sprawl, measuring density, mix of land uses, strength of activity centers, and connectedness of the street network (Ewing, Pendall, and Chen 2002, 2003). Even accounting for income and other socioeconomic differences, residents drove far less in the more compact regions. In highly sprawling Atlanta, vehicles racked up 34 miles each day for every person living in the region. Toward the other end of the scale, in Portland, Oregon, vehicles were driven fewer than 24 miles per person, per day.

Figure 0-5 Average Daily Vehicle Miles Traveled
Source: Ewing, Pendall, and Chen 2002, p. 18.



This relationship holds up in studies that focus on the travel habits of individual households while measuring the environment surrounding their homes and/or workplaces. The link between urban development patterns and individual or household travel has become the most heavily researched subject in urban planning, with more than 100 rigorous empirical studies completed. These studies have been able to control for factors such as socioeconomic status, and can account for the fact that higher-income households tend to make more and longer trips than lower-income families.

One of the most comprehensive studies, conducted in King County, Washington, by Larry Frank of the University of British Columbia, found that residents of the most walkable neighborhoods drive 26 percent fewer miles per day than those living in the most sprawling areas. A meta-analysis of many of these types of studies finds that households living in developments with twice the density, diversity of uses, accessible destinations, and interconnected streets when compared to low-density sprawl drive about 33 percent less.

Many studies have been conducted by or in partnership with public health researchers interested in how the built environment can be better designed to encourage daily physical activity. These studies show that residents of communities designed to be walkable both drive fewer miles and also take more trips by foot and bicycle, which improves individual health. A recent literature review found that 17 of 20 studies, all dating from 2002 or later, have established statistically significant relationships between some aspect of the built environment and the risk of obesity.

Two other types of studies also find relationships between development patterns and driving: simulations that project the effect of various growth options for entire regions and simulations that predict the impact of individual development projects when sited and designed in different ways. In regional growth simulations, planners compare the effect of a metropolitan-wide business-as-usual scenario with more compact growth options. Coauthor Keith Bartholomew of the University of Utah analyzed 23 of these studies and found that compact scenarios averaged 8 percent fewer total miles driven than business-as-usual ones, with a maximum reduction of 31.7 percent (Bartholomew 2005, 2007). The better-performing scenarios were those with higher degrees of land use mixing, infill development, and population density, as well as a larger amount of expected growth. The travel models used in these studies would be expected to underestimate the impacts of site design, since most only crudely account for travel within neighborhoods and disregard walk and bike trips entirely.

Of the project-level studies, one of the best known evaluated the impact of building a very dense, mixed-use development at an abandoned steel mill site in the heart of Atlanta versus spreading the equivalent amount of commercial space and number of housing units in the prevailing patterns at three suburban locations. Analysis using transportation models enhanced by coauthor Jerry Walters of Fehr & Peers Associates (Walters, Ewing, and Allen 2000), and supplemented by the EPA's Smart Growth Index (to capture the effects of site design) found that the infill location would generate about 35 percent less driving and emissions than the comparison sites. The results were so compelling that the development was deemed a transportation control measure by the federal government for the purpose of helping to improve the region's air quality. The Atlantic Station project has become a highly successful reuse of central city industrial land.

Atlantic Station today. *Jacoby Development Company*

What Smart Growth Would Look Like

How would this new focus on compact development change U.S. communities? Many more developments would look like the transit-oriented developments and new urbanist neighborhoods already going up in almost every city in the country, and these developments would start filling in vacant lots or failing strip shopping centers, or would revitalize older town centers, rather than replacing forests or farmland. Most developments would no longer be single-use subdivisions or office parks, but would mix shops, schools, and offices together with homes. They might feature ground-floor stores and offices with living space above, or townhomes within walking distance of a retail center. Most developments would be built to connect seamlessly with the external street network.

The density increases required to achieve the changes proposed in this publication would be moderate. Nelson's work shows that the average density of residential development in U.S. urban areas was about 7.6 units per acre in 2003. His predictions of shifting market demand indicate that all housing growth to 2025 could be accommodated by building condominiums, apartments, townhomes, and detached houses on small lots, while maintaining the current stock of houses on large lots. Under this scenario, while new developments would average a density of 13 units per acre, the average density of metropolitan areas overall would rise modestly, to about nine units per acre. Much of the change would result from stopping the sprawling development that has resulted in falling densities in many metropolitan areas.

Several publications provide a glimpse of what this future might look like. Images of compact development are available in *This is Smart Growth* (Smart Growth Network 2006) and *Visualizing Density* (Lincoln Institute of Land Policy 2007).

The Potential of Smart Growth

The potential of smart growth to curb the rise in greenhouse gas emissions will, of course, be limited by the amount of new development and redevelopment that takes place over the next few decades, and by the share of it that is compact in nature. There seems to be little question that a great deal of new building will take place as the U.S. population grows toward 400 million. According to the best available analysis, by Chris Nelson of Virginia Tech, 89 million new or replaced homes—and 190 billion square feet of new offices, institutions, stores, and other nonresidential buildings—will be constructed through 2050. If that is so, two-thirds of the development on the ground in 2050 will be built between now and then. Pursuing smart growth is a low-cost climate change strategy, because it involves shifting investments that have to be made anyway.

Smart Growth Meets Growing Market Demand for Choice

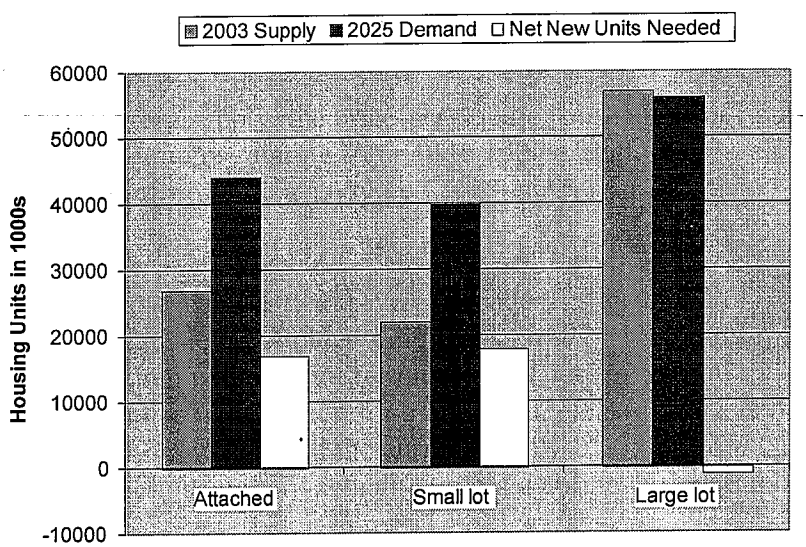
There is no doubt that moving away from a fossil fuel–based economy will require many difficult changes. Fortunately, smart growth is a change that many Americans will embrace. Evidence abounds that Americans are demanding more choices in where and how they live—and that changing demographics will accelerate that demand.

While prevailing zoning and development practices typically make sprawling development easier to build, developers who make the effort to create compact communities are encountering a responsive public. In 2003, for the first time in the country's history, the sales prices per square foot for attached housing—that is, condominiums and townhouses—was higher than that of detached housing units. The real estate analysis firm Robert Charles Lesser & Co. has conducted a dozen consumer preference surveys in suburban and urban locations[1] for a variety of builders to help them develop new projects. The surveys have found that in every location examined, about one-third of respondents prefer smart growth housing products and communities. Other studies by the National Association of Homebuilders, the National Association of Realtors, the Fannie Mae Foundation, high-production builders, and other researchers have corroborated these results—some estimating even greater demand for smart growth housing products. When smart growth also offers shorter commutes, it appeals to another one-quarter of the market, because many people are willing to trade lot or house size for shorter commutes.

Because the demand is greater than the current supply, the price-per-square foot values of houses in mixed-use neighborhoods show price premiums ranging from 40 to 100 percent, compared to houses in nearby single-use subdivisions, according to a study by Chris Leinberger of the Brookings Institution.

This market demand is only expected to grow over the next several decades, as the share of households with children shrinks and those made up of older Americans grows with the retiring of baby boomers. Households without children will account for close to 90 percent of new housing demand, and single-person households will account for a one-third. Nelson projects that the demand for attached and small-lot housing will exceed the current supply by 35 million units (71 percent), while the demand for large-lot housing will actually be less than the current supply.

Figure 0-6 2003 Housing Supply versus 2025 Housing Demand
Source: Nelson 2006.



[1] These locations include Albuquerque, Atlanta, Boise, Charlotte, Chattanooga, Denver, Orlando, Phoenix, Provo, Savannah, and Tampa.

Total Estimated VMT Reduction and Total Climate Impact

When viewed in total, the evidence on land use and driving shows that compact development will reduce the need to drive between 20 and 40 percent, as compared with development on the outer suburban edge with isolated homes, workplaces, and other destinations. It is realistic to assume a 30 percent cut in VMT with compact development.

Making reasonable assumptions about growth rates, the market share of compact development, and the relationship between CO_2 reduction and VMT reduction, smart growth could, by itself, reduce total transportation-related CO_2 emissions from current trends by 7 to 10 percent as of 2050. This reduction is achievable with land-use changes alone. It does not include additional reductions from complementary measures, such as higher fuel prices and carbon taxes, peak-period road tolls, pay-as-you drive insurance, paid parking, and other policies designed to make drivers pay more of the full social costs of auto use.

This estimate also does not include the energy saved in buildings with compact development, or the CO_2-absorbing capacity of forests preserved by compact development. Whatever the total savings, it is important to remember that land use changes provide a permanent climate benefit that would compound over time. The second 50 years of smart growth would build on the base reduction from the first 50 years, and so on into the future. More immediate strategies, such as gas tax increases, do not have this degree of permanence.

The authors calculate that shifting 60 percent of new growth to compact patterns would save 85 million metric tons of CO_2 annually by 2030. The savings over that period equate to a 28 percent increase in federal vehicle efficiency standards by 2020 (to 32 mpg), comparable to proposals now being debated in Congress. It would be as if the fleetwide efficiency for new vehicles had risen to 32 mpg by 2020. Every resident of a compact neighborhood would provide the environmental benefit expected from, say, driving one of today's efficient hybrid cars. That effect would be compounded, of course, if that person also drove such an efficient car whenever he or she chose to make a vehicle trip. Smart growth would become an important "third leg" in the transportation sector's fight against global warming, along with more efficient vehicles and lower-carbon fuels.

A Climate-Sparing Strategy with Multiple Payoffs

Addressing climate change through smart growth is an attractive strategy because, in addition to being in line with market demand, compact development provides many other benefits and will cost the economy little or nothing. Research has documented that compact development helps preserve farmland and open space, protect water quality, and improve health by providing more opportunities for physical activity.

Studies also have confirmed that compact development saves taxpayers money, particularly by reducing the costs of infrastructure such as roads and water and sewer lines. For example, the Envision Utah scenario planning process resulted in the selection of a compact growth plan that will save the region about $4.5 billion in infrastructure spending over a continuation of sprawling development.

Finally, unlike hydrogen-fueled vehicles and cellulosic ethanol, which get a lot of attention in the climate-change debate, the "technology" of compact, walkable communities exists today, as it has in one form or another for thousands of years. We can begin using this technology in the service of a cooler planet right now.

Policy Recommendations

In most metropolitan areas, compact development faces an uneven playing field. Local land development codes encourage auto-oriented development. Public spending supports development at the metropolitan fringe more than in already developed areas. Transportation policies remain focused on accommodating the automobile rather than alternatives.

The key to substantial greenhouse gas (GHG) reductions is to get all policies, funding, incentives, practices, rules, codes, and regulations pointing in the same direction to create the right conditions for smart growth. Innovative policies often are in direct conflict with the conventional paradigm that produces sprawl and automobile dependence.

Here, we outline three major policy initiatives at the federal level that would benefit states, metro regions, cities and towns in their efforts to meet the growing demand for compact development. These initiatives, as well as potential actions on the part of state and local governments, are discussed more fully in Chapter 7.

Federal Actions

Require Transportation Conformity for Greenhouse Gases. Federal climate change legislation should require regional transportation plans to pass a conformity test for CO_2 emissions, similar to those for other criteria pollutants. The Supreme Court ruling in Massachusetts v EPA established the formal authority to consider greenhouse gases under the Clean Air Act, and a transportation planning conformity requirement would be an obvious way for the EPA to exercise this authority to produce tangible results.

Enact "Green-TEA" Transportation Legislation that Reduces GHGs. The Intermodal Surface Transportation Efficiency Act of 1991 (known as ISTEA) represented a revolutionary break from past highway bills with its greater emphasis on alternatives to the automobile, community involvement, environmental goals, and coordinated planning. The next surface transportation bill could bring yet another paradigm shift; it could further address environmental performance, climate protection, and green development. We refer to this opportunity as "Green-TEA."

Provide Funding Directly to Metropolitan Planning Organizations (MPOs). Metropolitan areas contain more than 80 percent of the nation's population and 85 percent of its economic output. Investment by state departments of transportation in metropolitan areas lags far behind these percentages. The issue is not just the amount of funding; it is also the authority to decide how the money is spent. What is necessary to remedy the long history of structural and institutional causes of these inequities is a new system of allocating federal transportation funds directly to metropolitan areas. The amount of allocation should be closer to the proportion of an MPO's population and economic activity compared to other MPOs and non-MPO areas in the same state.

1. Introduction

The phrase "you can't get there from here" has a new application. The United States cannot achieve a 60 to 80 percent reduction in carbon dioxide (CO_2) emissions by 2050 relative to 1990 levels—a commonly accepted target for climate stabilization—unless the transportation sector contributes, and the transportation sector cannot do its fair share through vehicle and fuel technology alone. We have to sharply reduce the growth of vehicular travel across the nation's sprawling urban areas, reversing trends that go back decades.

With regard to urban development and travel demand management, this publication asks and answers three critical questions facing the urban planning profession, the land development community, and federal, state, and local policy makers:

- What reduction in vehicle miles traveled (VMT) is possible in the United States with compact development rather than continuing urban sprawl?
- What reduction in CO_2 emissions will accompany such a reduction in VMT?
- What policy changes will be required to shift the dominant land development pattern from sprawl to compact development?

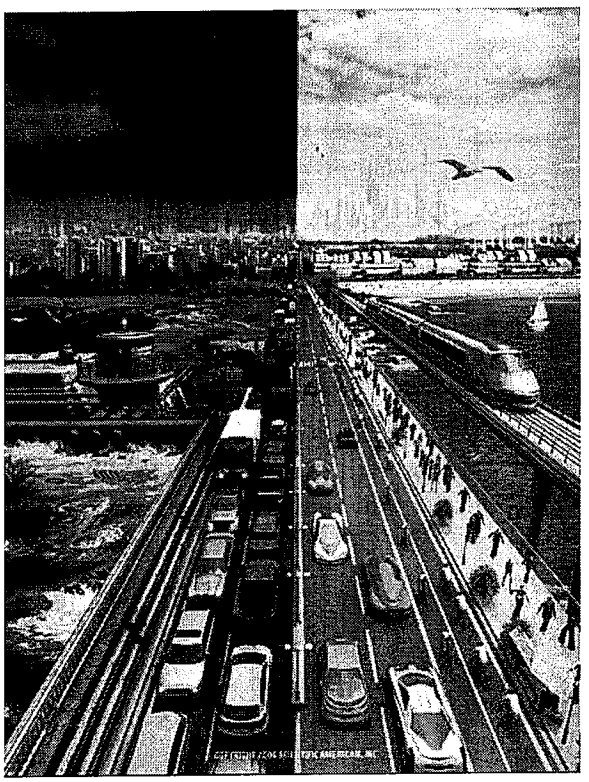
1.1 Background

The transportation sector accounts for 28 percent of total greenhouse gas (GHG) emissions in the United States and 33 percent of the nation's energy-related CO_2 emissions (EIA 2006, p. xvi; EIA 2007a, p. 15). The United States, in turn, is responsible for 22 percent of CO_2 emissions worldwide and close to a quarter of worldwide GHG emissions (EIA 2007b, p. 93). It is hard to envision a "solution" to the global warming crisis that does not involve slowing the growth of transportation CO_2 emissions in the United States

The transportation sector's CO_2 emissions are a function of vehicle fuel efficiency, fuel carbon content, and VMT, factors sometimes referred to as a "three-legged stool." Energy and climate policy initiatives at the federal and state levels have focused almost exclusively on technological advances in vehicles and fuels, the first two legs. Yet, there is a growing recognition that managing VMT has to be part of the solution, that the third leg is needed to support the stool.

In *A Call for Action*, the U.S. Climate Action Partnership (USCAP)—which is made up of major U.S. corporations and environmental groups—includes promoting "better growth planning" (USCAP 2007). The United Nations Intergovernmental Panel on Climate Change (IPCC 2007c, p. 20) lists "influenc[ing] mobility needs through land use regulations and infrastructure planning" among policies and measures shown to be effective in controlling GHG emissions." California's Climate Action Team (2007) expects "smart land use and intelligent transportation" to make the second-largest contribution toward meeting the state's ambitious GHG reduction goals.

The architects of the principal GHG stabilization framework are banking on major changes in urban development and travel patterns. "The task of holding global emissions constant would be out of reach, were it not for the fact that all the driving and flying in 2056 will be in vehicles not yet designed, most of the buildings that will be around then are not yet built, the locations of many of the communities that will contain these buildings and determine their inhabitants' commuting patterns have not yet been chosen . . ." (Socolow and Pacala 2006).



Alternative futures, circa 2056.
© Scientific American (Socolow and Pacala 2006)

A recent report by the U.S. Environmental Protection Agency (EPA) finds: "By themselves, individual approaches incorporating vehicle technologies, fuels, or transportation demand management (TDM) approaches could moderately reduce, but not flatten, emissions from now until 2050. Most of the system approaches analyzed, by contrast, could . . . nearly flatten the entire U.S. transportation sector emissions, despite the passenger vehicle category representing only half of the sector's emissions" (Mui et al. 2007). In other words, all three legs of the policy stool will be required to flatten transportation CO_2 emission levels.

1.2 The Nature of Compact Development

This publication makes the case for compact development—or its alias, smart growth—rather than continued urban sprawl. It does so in the context of global climate change.

The term "compact development" does not imply high-rise or even uniformly high-density development. A discussion of alternatives to urban sprawl always seems to gravitate toward high-density development, and leads to fears that more compact development will result in the "Manhattanization" of America. That is not what this book is about.

According to data provided by Chris Nelson of Virginia Tech, the blended average density of residential development in the United States in 2003 was about 7.6 units per net acre (see Figure 1-1). This estimate includes apartments, condominiums, and townhouses, as well as detached single-family housing on both small and large lots. A net acre is an acre of developed land, not including streets, school sites, parks, and other undevelopable land.

Because of changing demographics and lifestyle preferences, Nelson projects a significant change in market demand by 2025. The mix of housing stock required to meet this demand would have a blended density of approximately nine units per net acre. Given the excess of large-lot housing already on the ground relative to 2025 demand, all net new housing built between now and then would have to be attached or small-lot detached units (not including replacement of large-lot housing). The density of new and redeveloped housing would average about 13 units per net acre, 75 percent above 2003 average blended density. That is a typical density for a townhouse development. Apartments and condos boost the average, while single-family detached housing lowers it.

Figure 1-1 Projections of Housing Demand and Density in 2025
Source: Nelson 2006.

	Density (Units per Net Acre)	2003 Units (in 1,000s)	2025 Units (in 1,000s)	Difference (in 1,000s)
Attached	20	27,000	44,000	17,000
Small-lot detached	7	22,000	40,000	18,000
Large-lot detached	2	57,000	56,000	-1,000
Average blended density (per net acre)		7.6	9.1	13.3

The role of density, however, should not be overemphasized. As important as density is, it is no more fundamental to compact development than are the mixing of land uses, the development of strong population and employment centers, the interconnection of streets, and the design of structures and spaces at a human scale (see Figure 1-2). Images of compact development are available in *This is Smart Growth* (Smart Growth Network 2006) and *Visualizing Density* (Lincoln Institute of Land Policy 2007).

Figure 1-2 Nature of Compact Development versus Sprawl
Sources: Ewing 1997; Ewing, Pendall, and Chen 2002.

Compact Development	Sprawl
Medium to high densities	*Low densities*
Mixed uses	*Single uses*
Centered development	*Strip development*
Interconnected streets	*Poorly connected streets*
Pedestrian- and transit-friendly design	*Auto-oriented design*

1.3 The High Costs of Urban Sprawl and Automobile Dependence

In 1997, the *Journal of the American Planning Association* (JAPA) carried a pair of articles on the merits of urban sprawl versus compact development (Gordon and Richardson 1997; Ewing 1997). The authors debated the characteristics, causes, and costs of sprawl, and briefly discussed cures. Gordon and Richardson's lead article—titled "Are Compact Cities a Desirable Planning Goal?"—argued that U.S. real estate markets are producing what consumers want; that the social, economic, environmental, and geopolitical impacts of that development are benign; and hence that there is no need for urban planning intervention in markets. Most relevant to concerns over global climate change, the authors contended that a "global energy glut" and vehicle emission controls rendered compact development unnecessary.

Ewing's counterpoint—"Is Los Angeles–Style Sprawl Desirable?"—defined sprawl broadly as 1) leapfrog or scattered development, 2) commercial strip development, or 3) large expanses of low-density or single-use development, as in sprawling bedroom communities, and compact development as the reverse. The article argued that U.S. real estate markets have many imperfections that cause them to "fail," that the social welfare costs of such failure are enormous, and that urban planning interventions therefore are warranted. Particularly relevant to the global climate change debate is the following:

> While the best case envisioned by [Gordon and Richardson] has the real price of gasoline holding steady, it is the worst case that worries others . . . . The fact that the most recent large-scale war fought was in the Persian Gulf is itself a testament to the risk of relying on the political stability of this region for a commodity [oil] so essential to economic activity . . . . Being unregulated, carbon dioxide emissions represent a bigger threat to national welfare than do regulated emissions. There is now a near-consensus within the scientific community that carbon dioxide build-up in the atmosphere is causing global climate change, and that the long-term effects could be catastrophic.

A decade later, there seems to be little doubt that the "worst case" scenario is upon us. The urbanized area of the United States has grown almost three times faster than metropolitan population, as urban development sprawled outwards unchecked (see Figure 1-3). This development pattern has boosted VMT and reduced the amount of forest land available to absorb CO_2.

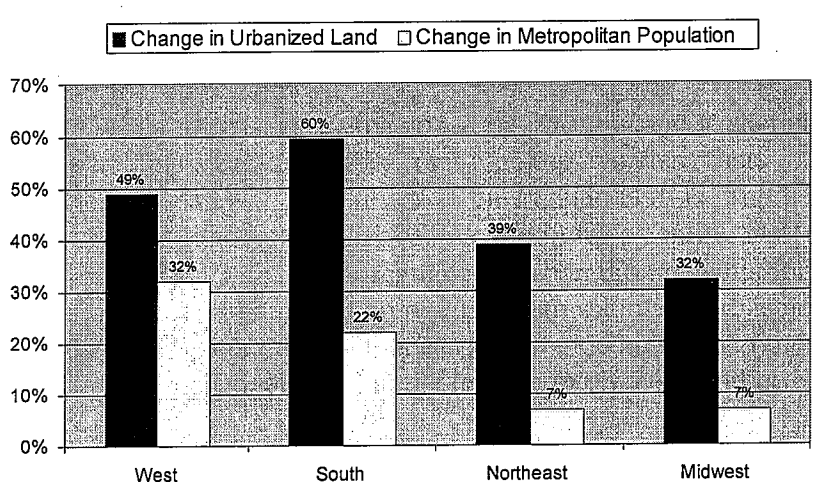
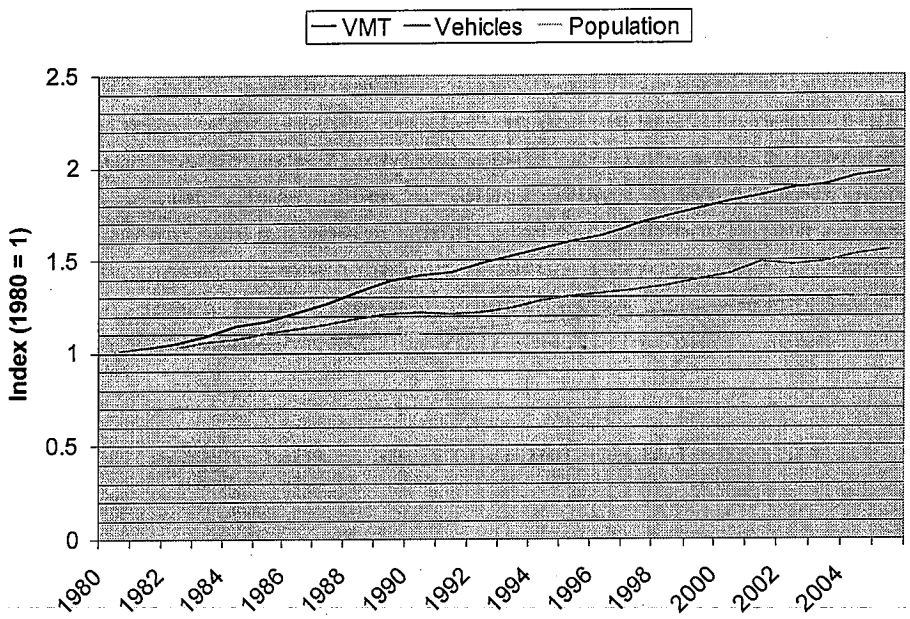


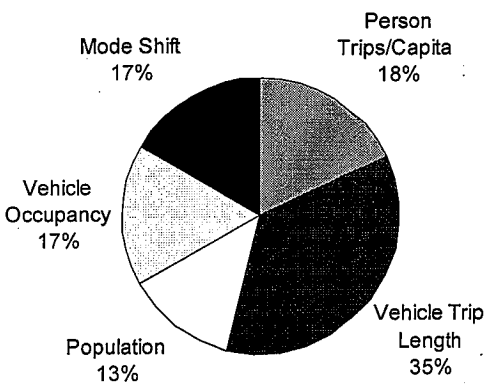
Figure 1-3 Growth of Population and Urbanized Land Area by Census Region between 1982 and 1997
Source: Fulton et al. 2001.

Vehicle miles traveled in the United States have grown three times faster than the population, and almost twice as fast as vehicle registrations (see Figure 1-4). In one analysis, 36 percent of the VMT growth was explained by increasing trip length (see Figure 1-5), which is a function of development patterns. Another 17 percent was explained by shifts to automobile trips from other modes of transportation. Again, development patterns are implicated. Yet another 17 percent was due to lower vehicle occupancy, as rates of carpooling declined. Only 13 percent of the growth in VMT was explained by population growth. Using comparable methodology, we estimate that one-third of the national growth in VMT between 1990 and 2001 was due to longer vehicle trips.[2]

Figure 1-4 Growth of VMT, Vehicle Registrations, and Population in the United States relative to 1980 Values
Source: FHWA 2005.

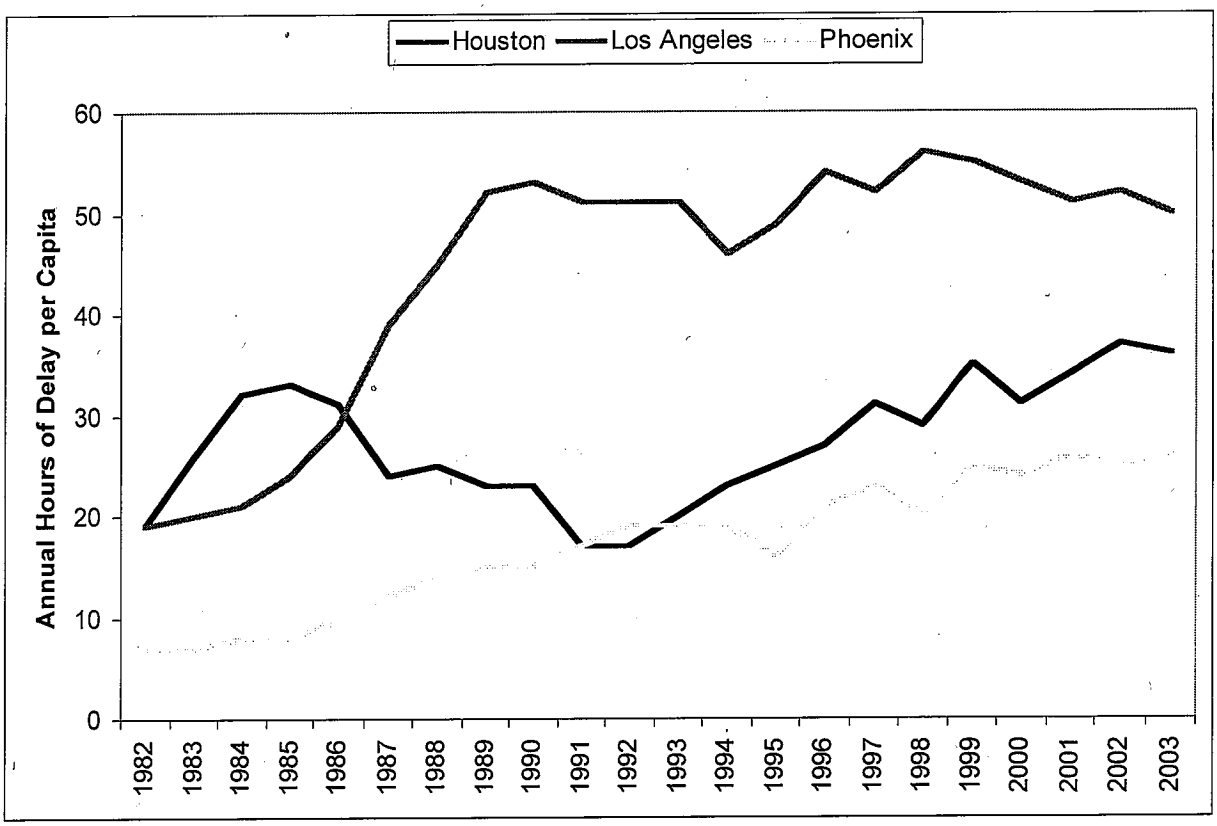


Vehicle miles traveled have grown more than twice as fast as highway capacity in urbanized areas of the United States. In all 85 urbanized areas for which statistics are available, highways became more congested between 1982 and 2003 (Schrank and Lomax 2005). This is true even in regions that struggled to pave their way out of congestion and appeared to be succeeding for a time (see Figure 1-6). Highway building itself induces more traffic and urban sprawl, in a never-ending spiral. (This will be discussed in greater detail in Chapter 5, Induced Traffic and Induced Development.)



[2] Between 1995 and 2001, total VMT in the United States increased by 34 percent, while average vehicle trip length increased by 11.5 percent (Hu and Reuscher 2004).

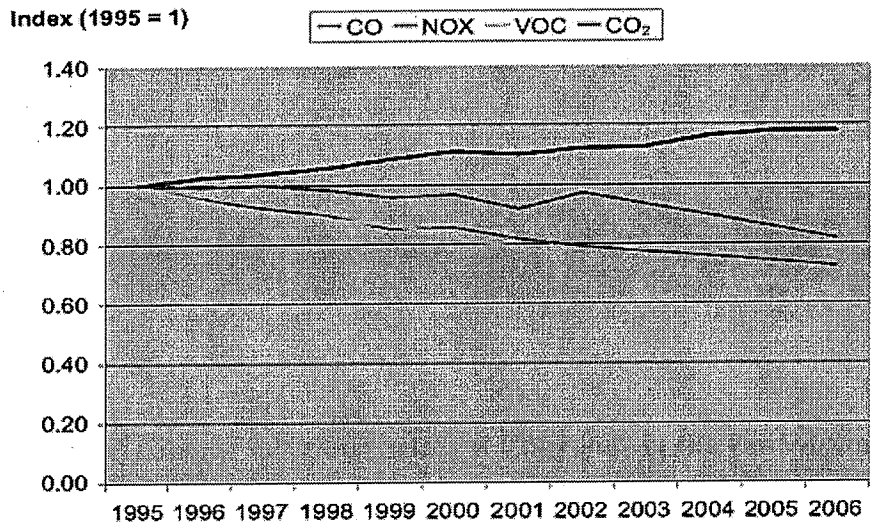
Figure 1-6 Growth of Annual Hours of Delay per Capita
Source: Schrank and Lomax 2005.



Carbon dioxide emissions from the transportation sector have grown while regulated pollutant emissions actually declined, thanks to improved fuel and engine technology (see Figure 1-7).[3] Carbon dioxide emissions are proportional to gasoline consumption and, during this period, improvements in vehicle fuel efficiency were overwhelmed by the growth in VMT. Under business-as-usual policies, VMT growth will continue to surpass technology gains. (See Chapter 2, The VMT/CO_2/Climate Connection, for more details.)

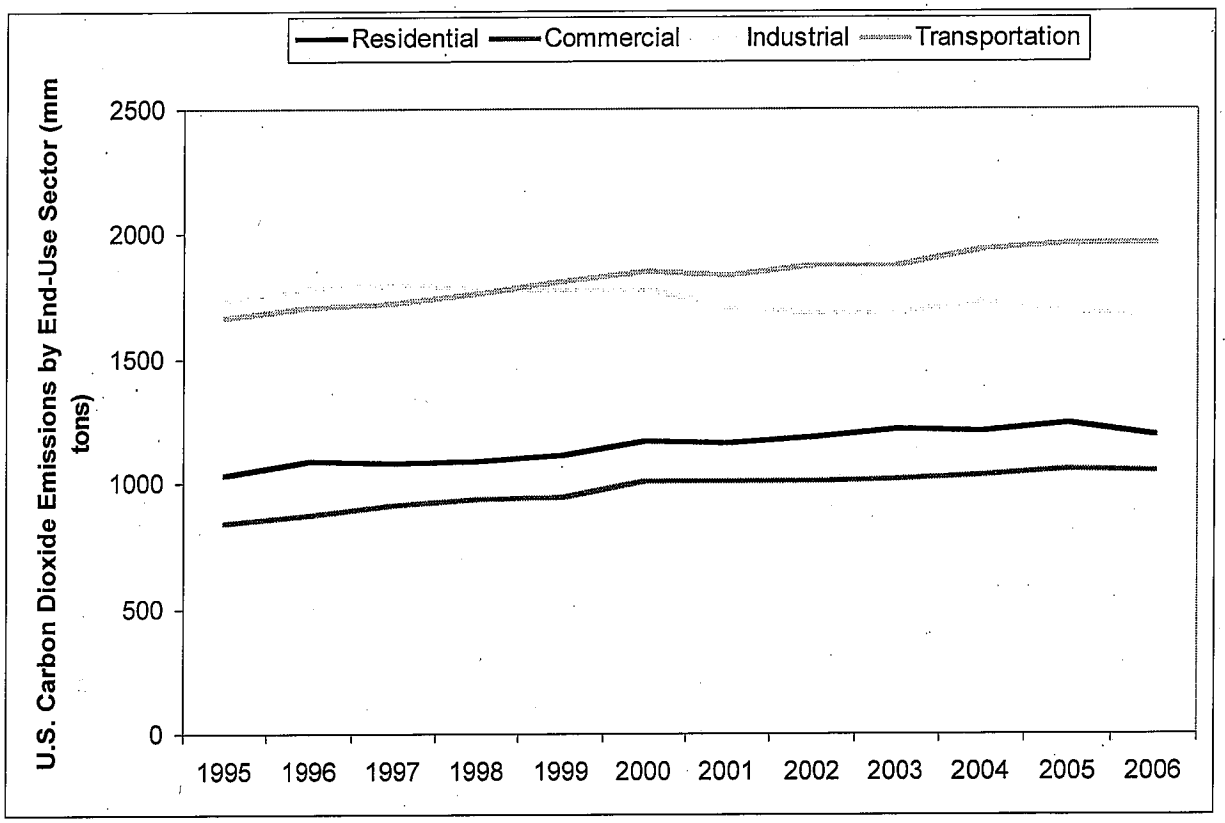
[3] The advent of "first-generation" catalytic converters in 1975 significantly reduced hydrocarbon and carbon monoxide (CO) emissions. Because lead inactivates the catalyst, 1975 also saw the widespread introduction of unleaded gasoline. The next milestone in vehicle emission control technology came in 1980 and 1981. Manufacturers equipped new cars with more sophisticated emission control systems that generally include a "three-way" catalyst (which converts CO and hydrocarbons to CO_2 and water, and also helps reduce nitrogen oxides to elemental nitrogen and oxygen). On-board computers and oxygen sensors help optimize the efficiency of the catalytic converters. Vehicle emissions are being further reduced under 1990 Clean Air Act amendments, which include even tighter tailpipe standards, improved control of evaporative emissions, and computerized diagnostic systems that identify malfunctioning emission controls.

Figure 1-7 Change in Transportation Emissions in the United States Relative to 1995 Values
Source: EPA undated.



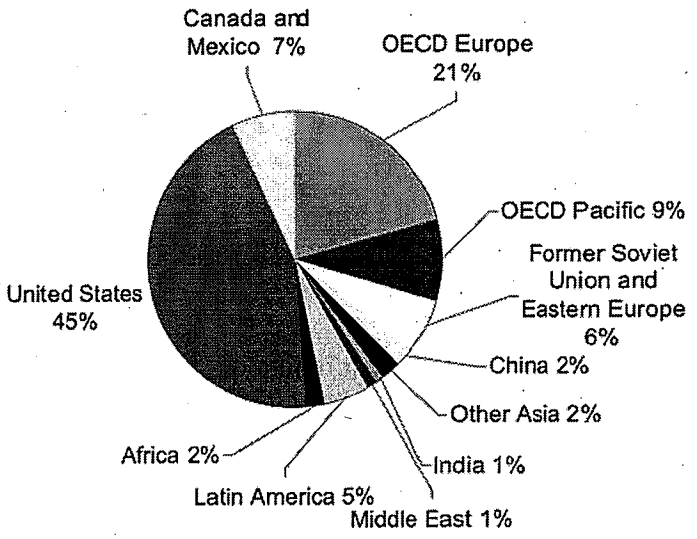
The transportation sector has become the largest source of CO_2 emissions in the United States, surpassing the industrial sector (see Figure 1-8). It now accounts for one-third of the U.S. total. Unless action is taken, the transportation sector's share of CO_2 emissions is expected to increase as VMT outpaces population growth (see Chapter 2).

Figure 1-8 U.S. Carbon Dioxide Emissions by End-Use Sector
Source: EIA 2007a.



The United States is home to only 5 percent of the world's population, but U.S. residents own almost a third of the world's cars, which account for 45 percent of the CO_2 emissions generated by cars worldwide (see Figure 1-9). U.S. cars play a disproportionate role in global warming because they are less fuel efficient than cars elsewhere in the world, and also because they are driven farther.

Figure 1-9 Light-Duty Vehicle Emissions by World Region, 2003
Source: DiCicco and Fung 2006.



1.4 A Perfect Storm in Climate Policy

Author Sebastian Junger coined the expression "a perfect storm" to describe the confluence of different weather conditions that created a powerful 1991 storm in the Atlantic Ocean. The phrase has come to describe the simultaneous occurrence of events which, taken individually, would be far less momentous than the result of their confluence. It seems an appropriate metaphor for what currently is happening in two areas of public policy and in private real estate markets. It also is a good metaphor for what will occur in U.S. urban development generally as these three forces collide.

U.S. climate policy is one area in which a perfect storm is brewing. The issue of climate change has risen to prominence worldwide, and become compelling in the United States, in only 15 years, as the following actions indicate.

- June 1992: The United Nations Framework Convention on Climate Change (UNFCCC), opened for signatures at the "Earth Summit" in Rio de Janeiro, calls for stabilizing GHG concentrations in the atmosphere. The United States is a signatory.

- December 1997: The Kyoto Protocol to the UNFCCC establishes a set of quantified GHG emission targets for developed countries. The United States does not ratify the protocol.

- June 2002: The U.S. government acknowledges for the first time that human activity is contributing to global warming, in a report issued by the U.S. Environmental Protection Agency (EPA) that is challenged by the White House.

- June 2006: A committee convened by the National Academies of Science concludes that human activities are largely responsible for recent global warming.

- September 2006: California becomes the first state to adopt legislation—the Global Warming Solutions Act of 2006 (AB 32)—requiring regulations and market actions to reduce the state's GHG emissions to 1990 levels by 2020. Eighteen other states later adopt similar targets or mandates.

The pace has accelerated in 2007:

- January 2007: Major U.S. corporations and environmental groups, banding together as the U.S. Climate Action Partnership, call for a 10 to 30 percent reduction in CO_2 emissions within 30 years (USCAP 2007).

- April: The U.S. Supreme Court rules that the EPA has the authority to regulate GHG emissions, and has the duty to do so unless it can provide a scientific basis for not acting.

- May: Tulsa, Oklahoma, becomes the 500th city to sign the U.S. Mayors Climate Protection Agreement to reduce greenhouse gas emissions (U.S. Conference of Mayors 2007).

- June: In the largest international public opinion survey ever taken, most of the world identifies environmental degradation as the greatest danger—above nuclear weapons, AIDS, and ethnic hatred (Pew Research Center 2007). Global warming, in particular, is viewed as a "very serious" problem (see Figure 1-11).

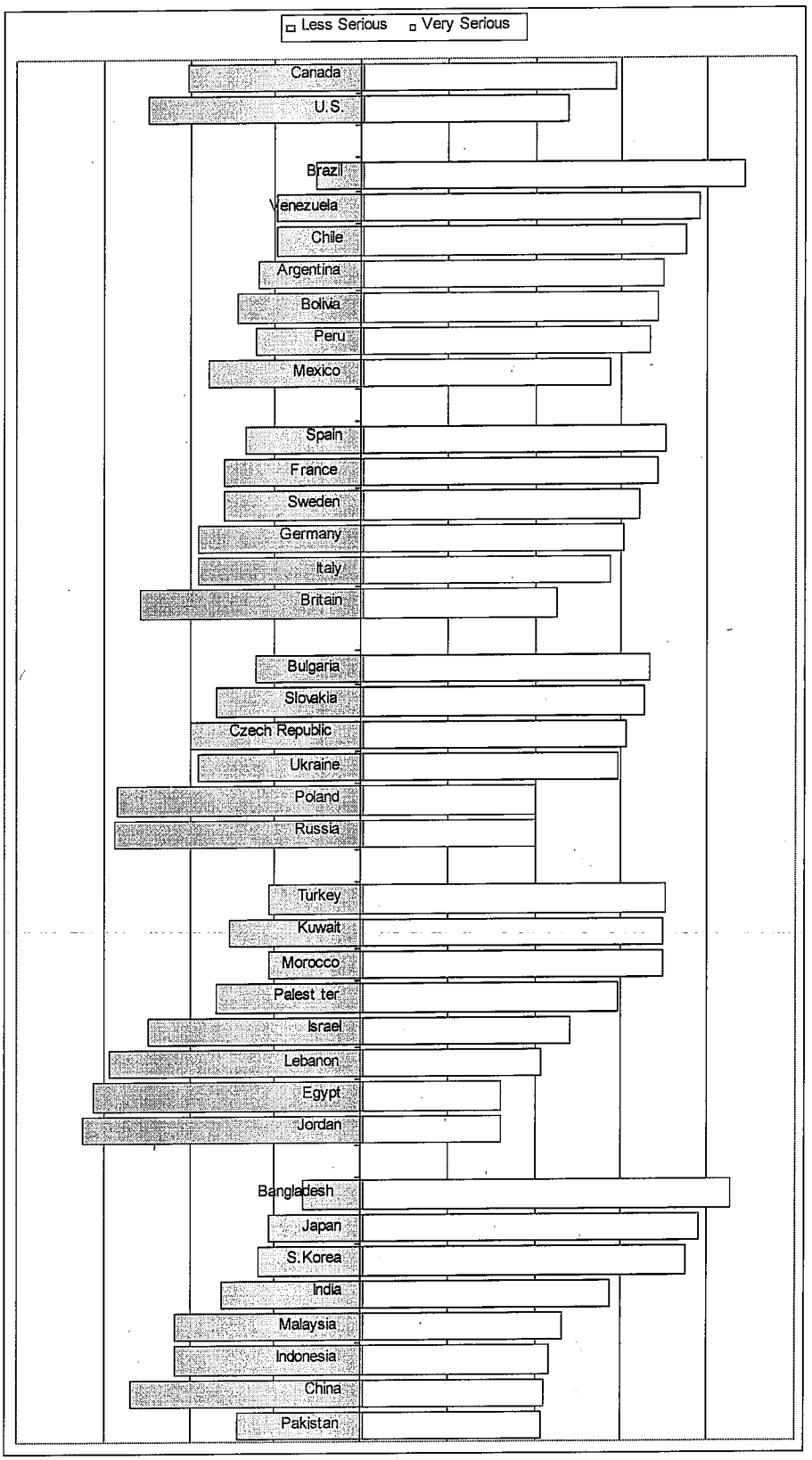
- July: Congressional lawmakers have introduced more than 125 bills, resolutions, and amendments specifically addressing global climate change and GHG emissions, compared with the 106 pieces of relevant legislation introduced during the entire two-year term of the previous Congress (Pew Center on Global Climate Change 2007).

- August: California's attorney general settles his sprawl and carbon emissions case with San Bernardino County. The county agrees to amend its general plan and create a new GHG reduction plan within 30 months to outline opportunities and strategies—especially land use decisions—to reduce GHG emissions.

- August: Russian minisubmarines plant a national flag under the North Pole, claiming the Artic seabed as Russian territory for future oil exploration and thus precipitating an Artic land grab. Arctic oil exploration will become feasible only because global warming is melting and thus shrinking the Artic icecap—and, ironically, the oil and gas extracted will only accelerate the problem as they are burned.

- September: President George W. Bush hosts a climate change summit for top officials from the world's major economies to come to agreement on a framework for lowering global GHG emissions in the post-Kyoto era.

Figure 1-10 World Views on Global Warming: How Serious a Problem?
Source: Pew Research Center 2007



A paradigm shift can occur very rapidly in the physical sciences, as the dominant scientific view changes in response to overwhelming evidence. The 29,000 data series drawn upon by the 2,500 top climate scientists on the U.N. Intergovernmental Panel on Climate Change (IPCC 2007b) constitute that evidentiary base.[4] Since the early 1990s, the scientific community has come to agree on the reality of climate change, on the contribution of human activity to climate change, and on the catastrophic consequences if current trends continue. Social revolutions are slower than scientific revolutions. Public opinion about global warming is changing more slowly than scientific opinion, and political action may be slower still. But they, too, are changing, irrevocably.

1.5 A Perfect Storm in Consumer Demand

There are many reasons why smart growth may be the "low-hanging fruit" for reducing CO_2 emissions in the transportation sector. The most compelling factor is the large and rising consumer demand for homes in neighborhoods that exhibit compact characteristics. The real estate analysis firm Robert Charles Lesser & Co. (RCLCO) has conducted a dozen consumer preference surveys in suburban and urban locations for a variety of builders to help them develop new projects.[5] The RCLCO surveys have found that about one-third of the respondents in every location are interested in smart growth housing products and communities (Logan 2007). Preference varies by geography, economic and demographic fundamentals, and buyer profiles; life stage and income are key variables. Other studies by the National Association of Homebuilders (NAH), the National Association of Realtors (NAR), the Fannie Mae Foundation, high-production builders, and other researchers have corroborated these results, with some estimating even greater demand for smart growth housing products (Myers and Gearin 2001).

Perhaps the best national assessment of the current demand for smart growth is the National Survey on Communities, conducted for Smart Growth America (a nonprofit advocacy group) and the NAR (Belden Russonello & Stewart 2004). In this survey, respondents were given a choice between communities labeled "A" and "B." Community A was described as having single-family homes on large lots, no sidewalks, shopping and schools located a few miles away, commutes to work of 45 minutes or more, and no public transportation. In contrast, community B was described as having a mix of single-family and other housing, sidewalks, shopping and schools within walking distance, commutes of less than 45 minutes, and nearby public transportation.

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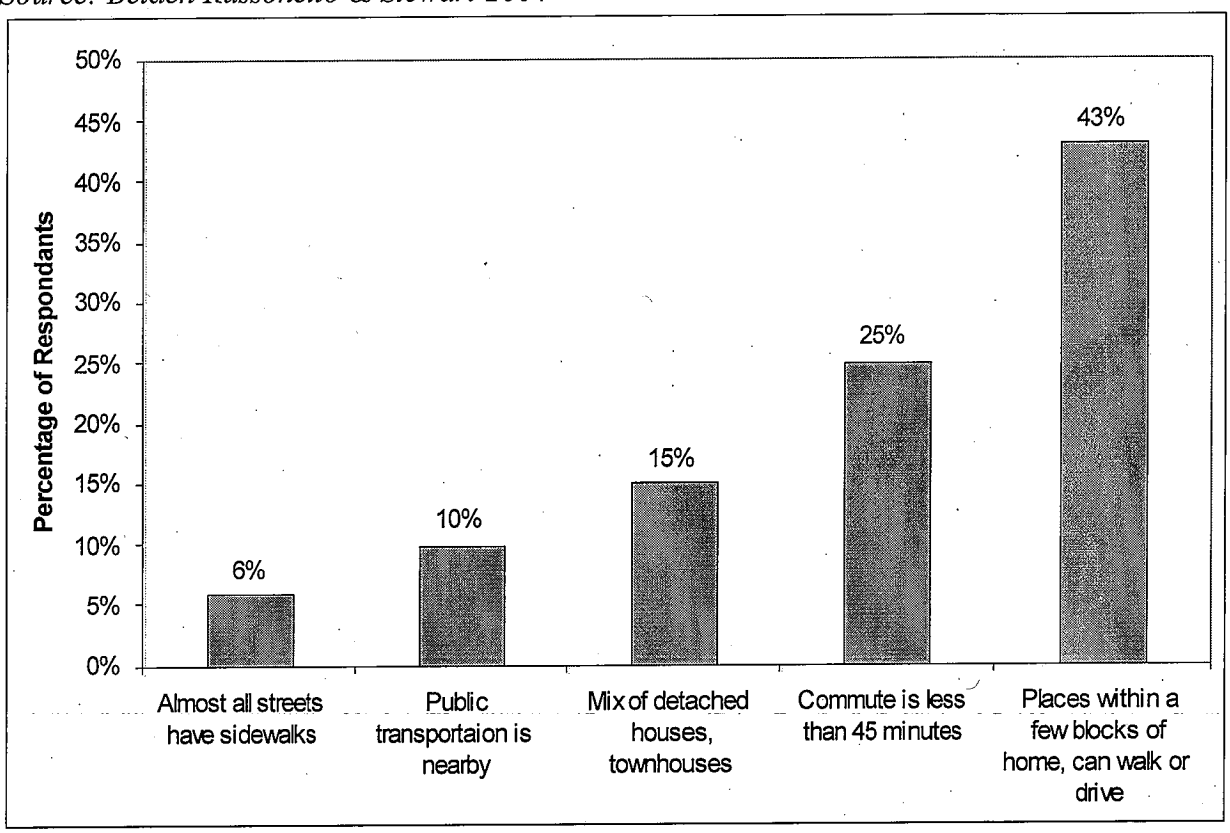
[4] The data series show significant changes in observations of physical systems (snow, ice, and frozen ground; hydrology; and coastal processes) and biological systems (terrestrial, marine, and freshwater biological systems), together with surface air temperature changes over the period 1970 to 2004. A subset of about 29,000 data series was selected from about 80,000 data series from 577 studies. These met the following criteria: 1) ending in 1990 or later; 2) spanning a period of at least 20 years; and 3) showing a significant change in either direction, as assessed in individual studies.

[5] These places include Albuquerque, Atlanta, Boise, Charlotte, Chattanooga, Denver, Orlando, Phoenix, Provo, Savannah, and Tampa.

Overall, 55 percent of Americans indicated a preference for community B, the smart growth community. Of those who said they think they will buy a house within the next three years, 61 percent are more likely to look for a home in a smart growth community than a conventional community. Commute time was a major factor in how respondents chose between A and B. It appears that about a third of the market would choose the smart growth community over the conventional community if commutes were comparable, and more than another quarter would choose the smart growth community if it were located closer to employment than the conventional alternative, thereby reducing commute time.

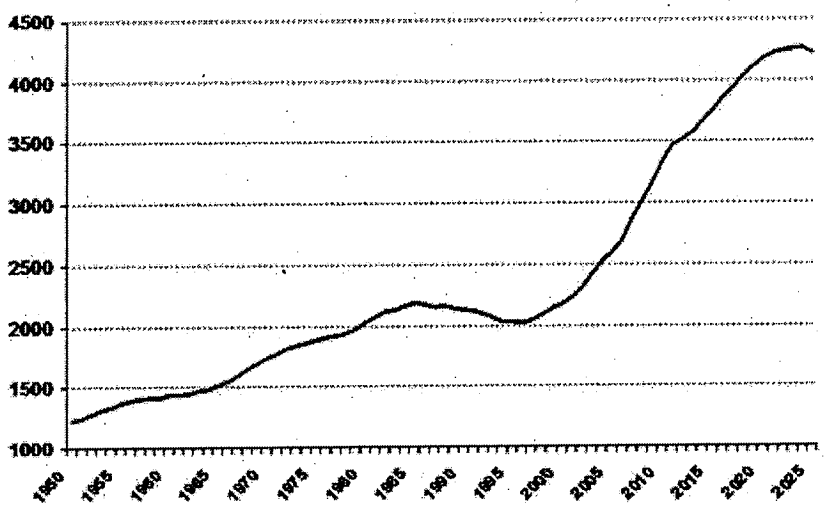
Figure 1-11 Attractions of a Smart Growth Community*
Source: Belden Russonello & Stewart 2004



* For those choosing the smart growth community. The question was "Look at the community you selected and choose the ONE most appealing characteristic of that community for you."

When it comes to housing demand, demographics are destiny. As baby boomers become empty nesters and retirees, they are exhibiting a strong preference for compact, walkable neighborhoods. So are single adults and married couples without children. These trends likely will continue, because the baby boom generation represents America's largest generational cohort. By 2020, the number of individuals turning 65 years of age will skyrocket to more than 4 million per year (see Figure 1-12) Between 2007 and 2050, the share of the U.S. population older than 65 years of age will grow from 11 percent to 15.9 percent (U.S. Census Bureau 2004).

Figure 1-12 Americans Turning 65 Years Old Annually, 1950 to 2025
Source: He et al. 2006

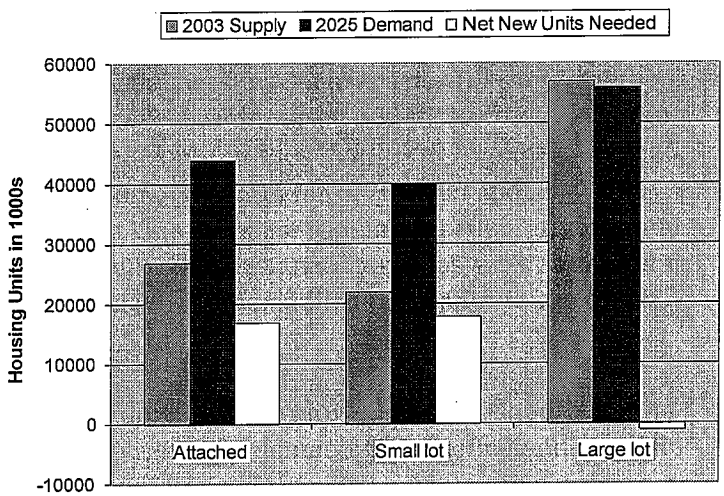


Growth in households without children (including one-person households) also will rise dramatically. From 2000 to 2025, households without children will account for 88 percent of total growth in households. (Thirty-four percent will be one-person households). By 2025, only 28 percent of households will have children (Nelson, 2006).

Some of this change in preferences also appears to be cultural, particularly among Generation Xers who are now fully engaged in the home buying market. According to research by Yankelovich, a leading marketing services consultancy, Gen Xers value traditional face-to-face relationships with neighbors and neighborhood characteristics such as sidewalks and nearby recreational facilities. Yankelovich president J. Walker Smith discussed these findings at the June 2004 NAHB conference, noting that "planned communities that foster togetherness and neighborhood life will resonate with this generation" (NAHB 2004). Another industry analyst, Brent Harrington of DMB Associates, reports that Gen Xers are looking for more diverse and compact communities characterized by smaller but better-designed homes as well as shopping and schools in more central locations, reflecting an "extreme disillusionment with the bland, vanilla suburbs" (Anderson 2004).

This means that the demand for homes located in downtown, in-town, close-in suburban, and other relatively compact locations will continue to rise. The demand for attached and small-lot housing will exceed the current supply by 35 million units (71 percent), while the demand for large-lot housing actually will be less than the current supply (see Figure 1-13).

Figure 1-13 2003 Housing Supply versus 2025 Housing Demand
Source: Nelson 2006.

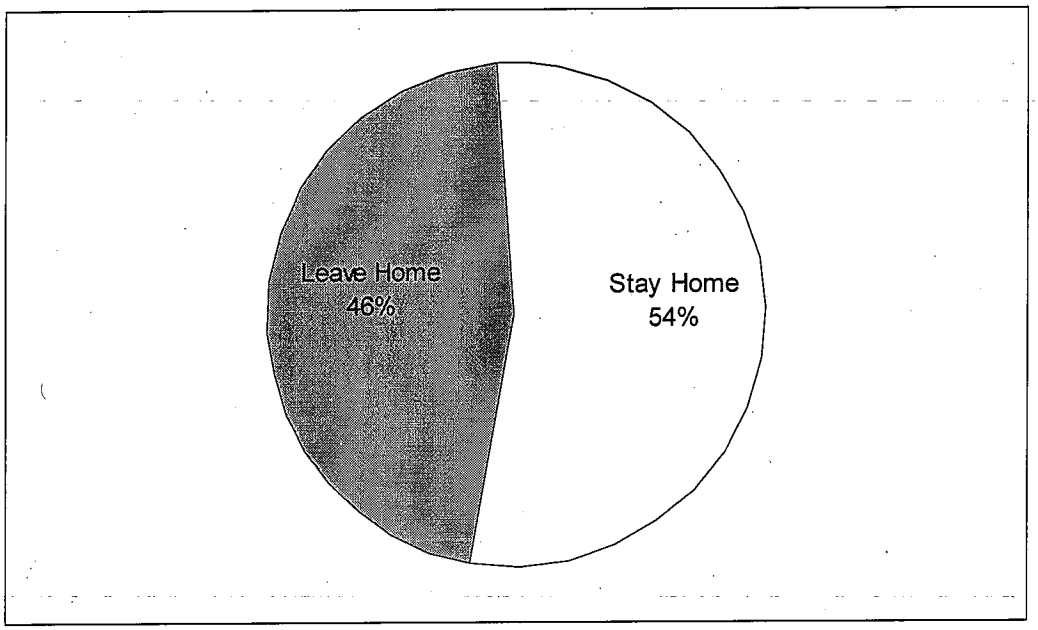


These trends are visible now: Downtown and in-town housing tops the list of hot markets each year in the Urban Land Institute's *Emerging Trends in Real Estate* (ULI 2005, 2006, 2007). In addition, new urban and smart growth communities are in such high demand that they not only

command a price premium at the point of purchase, but also hold their premium values over time (Eppli and Tu 1999, 2007; Leinberger 2007).

In addition to changing housing and neighborhood preferences, many stakeholders are carefully watching changes in travel behavior and needs, especially among older Americans. For example, the nonprofit association AARP has made transportation and quality-of-life matters one of its top policy issues to tackle in the next decade. The AARP is concerned because roughly one in five people over 65 years of age do not drive at all, and more than half drive only occasionally; that is, they do not drive on most days (STPP 2004). Older adults who lose their ability to drive tend to lose their independence unless they have other ways of accessing shopping, recreation, medical care, and other basic needs (see Figure 1-14).

Figure 1-14 Average Daily Travel Patterns for Non-drivers over Age 65
Source: STPP 2004.

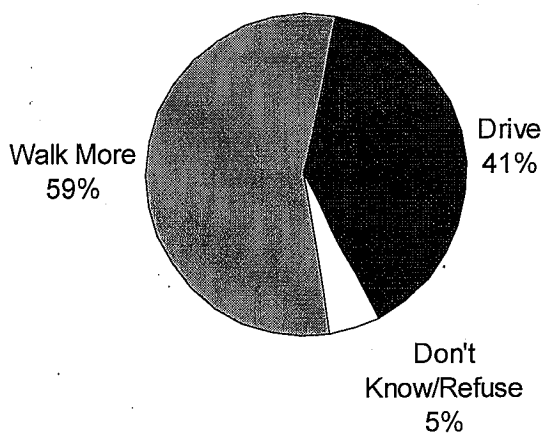


AARP surveys suggest that most people want to "age in place" (Bayer and Harper 2000; Mathew Greenwald & Associates 2003). In most areas where older Americans are aging in place, public transportation services are not available. In fact, according to a national poll, only 45 percent of Americans over 65 live within close proximity to public transportation (Mathew Greenwald & Associates 2003).

Fifty-five percent of respondents to another poll said that they would prefer to walk more throughout the day rather than drive everywhere (see Figure 1-15). The elderly are particularly inclined to walk when conditions are right (Mathew Greenwald & Associates 2003). These results, plus the high cost of special transportation services, are reasons for making sure older people can easily access transit and live in safe, walkable communities. Future community design, development, and transportation decisions will strongly influence their mobility choices.

Figure 1-15 Americans Want to Walk More*
Source: Belden Russonello & Stewart 2003.

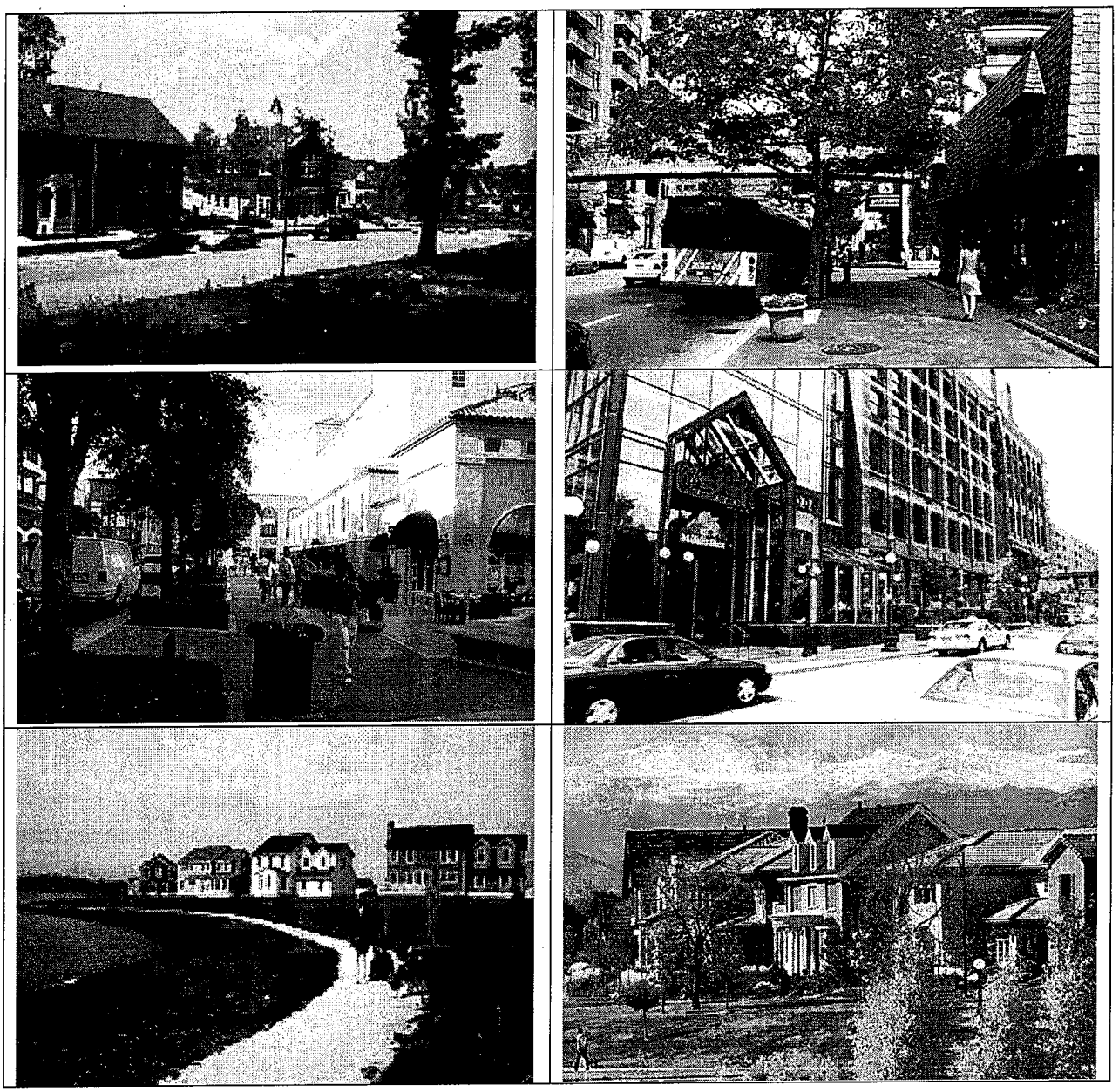
*The question was: Please tell me which of the following statements describe you more: A) If it were possible, I would like to walk more throughout the day either to get to specific places or for exercise, or B) I prefer to drive my car wherever I go?



1.6 And a Perfect Storm in Urban Planning

Yet another perfect storm is brewing in the land use and transportation planning fields. Although it is much less intense, this storm is swirling in the same direction as the ones in climate policy and consumer preferences. The urban planning field has been overtaken by movements promoting alternatives to conventional auto-oriented sprawl. Planners now advocate urban villages, neotraditional neighborhoods, transit-oriented developments (TODs), mixed-use activity centers, jobs/housing balance, context-sensitive highway designs, and traffic calming.

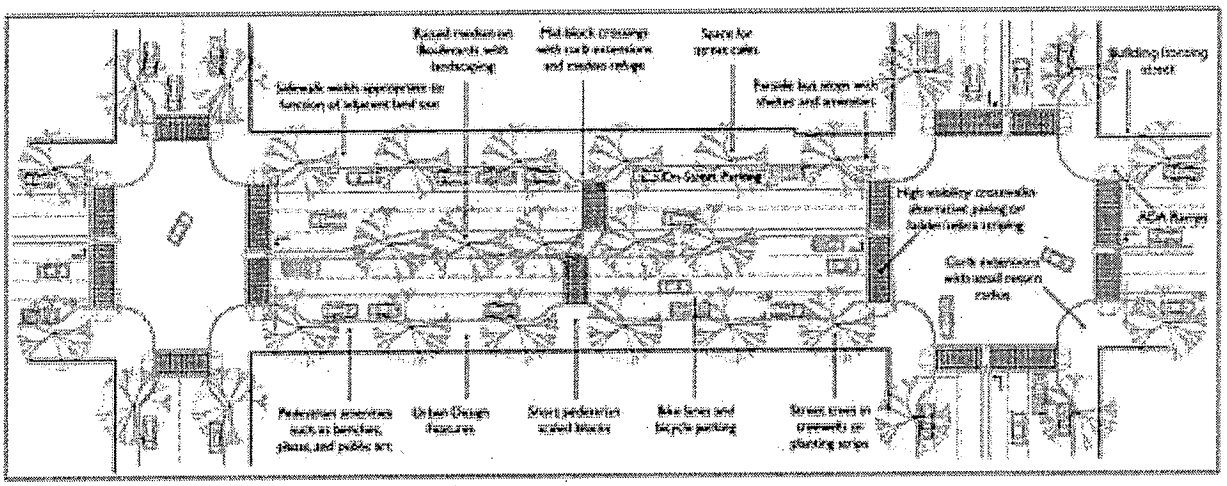
Alternative models of land development are everywhere. A 2003 listing shows 647 new urbanist developments in some state of planning or construction (New Urban News 2003), even though the new urbanist movement began only 12 years earlier. *Transit-Oriented Development in the United States: Experiences, Challenges, and Prospects* identifies 117 TODs on the ground or substantially developed as of late 2002 (Cervero et al. 2004). The first TOD guidelines were issued about a decade earlier. In 2004, there were more than 100 lifestyle centers (open-air shopping centers fashioned after main streets) in the United States, a 35 percent increase from 2000 (Robaton 2005). The U.S. Green Building Council's new rating and certification system for green development, LEED (Leadership in Energy and Environmental Design) for Neighborhood Development, generated 370 applications from land developers, many more than expected by the program sponsors.



This series of photographs illustrates alternative models of land development. Top left: Southern Village, a new urbanist village in North Carolina; top right: transit-oriented development in Bethesda, Maryland; middle left: CityPlace, a lifestyle center in West Palm Beach, Florida; middle right: infill/redevelopment (so-called "refill") in St. Paul, Minnesota; bottom left: green development in Prairie Crossing, Illinois; bottom right: Stapleton, a "new town in town" in Denver, Colorado.

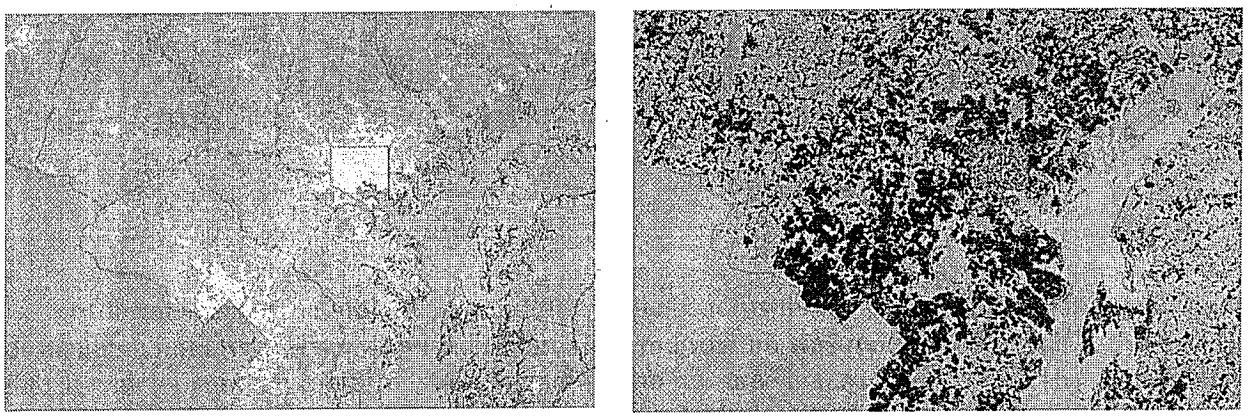
Recognizing the unsustainable growth in driving, the American Association of State Highway and Transportation Officials, representing state departments of transportation, recently called for VMT growth to be cut by half during the next 50 years (AASHTO 2007). Such unlikely allies as the Institute of Transportation Engineers and the Congress for the New Urbanism have teamed up to develop new context-sensitive street standards for walkable communities (see the illustration below). At the local level, several hundred traffic-calming programs have been created in the past decade; the term traffic calming was not even used in the United States until the mid-1990s (Ewing, Brown, and Hoyt 2005).

Elements of a context-sensitive urban highway.
Kimley-Horn and Associates et al. 2006



Loss of farmlands and natural areas—and the public benefits they provide—are behind a number of planning initiatives. The Maryland Smart Growth Program was motivated primarily by the rate at which the urban footprint was expanding into resource areas (see Figure 1-16). Nationally, most urbanized areas have seen their land area expand several times faster than their population (Fulton et al. 2001).

Figure 1-16 Parcel Development in Maryland, 1900 to 1960 (left) and 1961 to 1997 (right)



Fiscal constraints at the state and local levels are prompting governments to look for less expensive ways to meet infrastructure and service needs. Compact growth is less expensive to serve than sprawl, by an estimated 11 percent nationally for basic infrastructure (Burchell et al. 2002). The per capita costs of most services decline with density and rise as the spatial extent of urbanized land area increases (Carruthers and Ulfarsson 2003). The Envision Utah scenario planning process resulted in the selection of a compact growth plan that will save the region about $4.5 billion (17 percent) in infrastructure spending compared with a continuation of sprawling development (Envision Utah 2000). A major impetus for growth management is the desire to hold down public service costs.

The U.S. obesity epidemic and associated mortality, morbidity, and health care costs have added to the momentum for walkable communities. Circa 2000, a new collaboration between urban planning and public health advocates, began under the banner of active living. Out of this came the Active Living by Design Program of the Robert Wood Johnson Foundation, the Active Community Environments initiative of the Centers for Disease Control and Prevention (CDC), numerous Safe Routes to School programs, and dozens of Mayors' Healthy City initiatives. A recent literature review found that 17 of 20 studies, all dating from 2002 or later, had established statistically significant relationships between some aspect of the built environment and the risk of obesity (Papas et al. 2007).

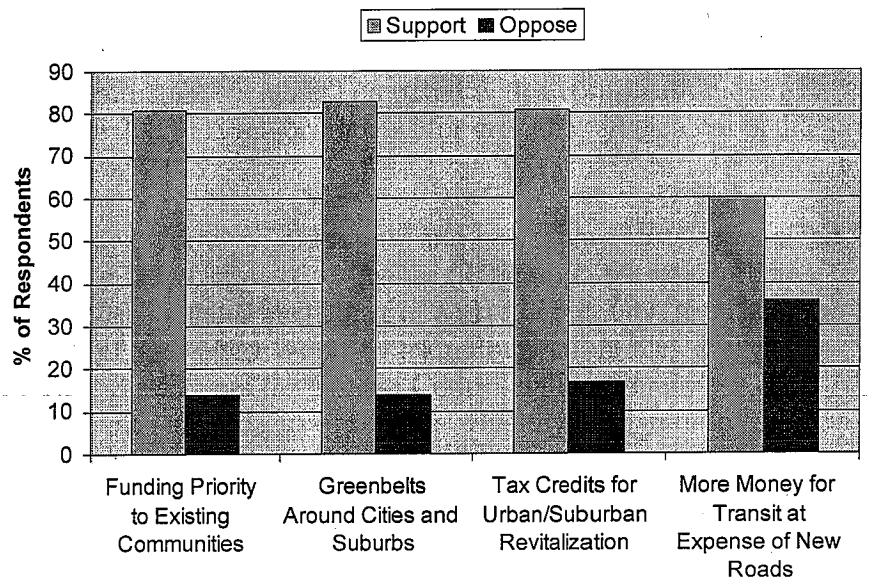
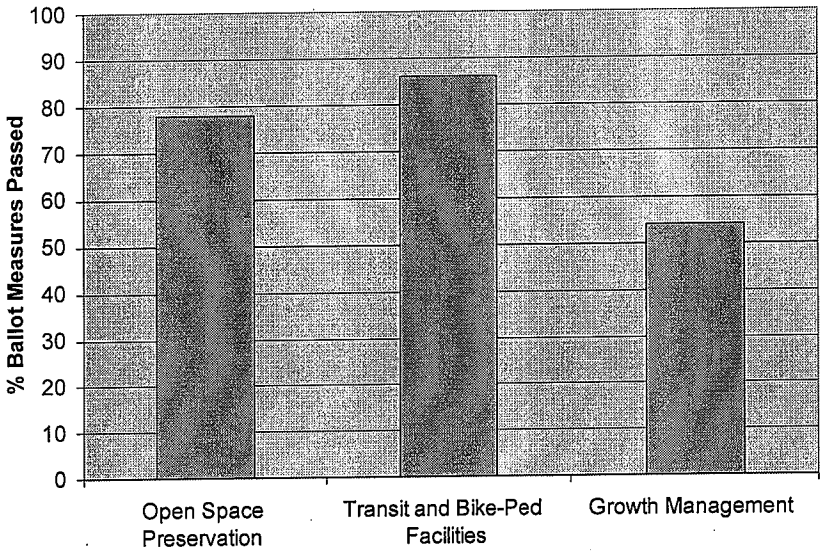


Figure 1-17 National Opinion Poll Results
Source: Belden Russonello & Stewart 2000.

Public support for smart growth policies appears to be strong and growing (Myers 1999; Myers and Puentes 2001; American Planning Association 2002; Kirby and Hollander 2005). In a 2000 national survey, a majority of respondents favored specific policies under the general heading of smart growth (see Figure 1-17). In the 2000 election, 553 state or local ballot initiatives in 38 states focused on "issues of planning or smart growth" and high percentages passed (see Figure 1-18). In 2004, voters approved 70 percent of ballot measures supporting public transit and rejected three out of four ballot initiatives on "regulatory takings" that could have significantly crimped planning efforts (Goldberg 2007).

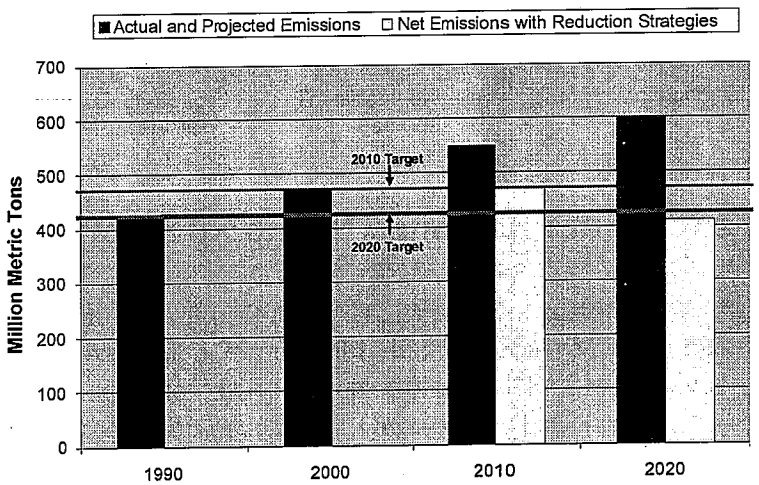
Figure 1-18 State and Local Ballot Measures Passed, 2000 Election
Source: Myers and Puentes 2001.



1.7 The Impact of Compact Development on VMT and CO_2 Emissions

California's landmark Global Warming Solutions Act of 2006 (AB 32) calls for restoring California's GHG emissions to 1990 levels by 2020, a 25 percent reduction relative to current emissions (see Figure 1-19). AB 32 also requires the Air Resources Board (ARB) to identify a list of "discrete early action greenhouse gas reduction measures." Once on the list, these measures are to be developed into regulatory proposals, adopted by the ARB, and made enforceable by January 1, 2010.

Figure 1-19 California's Projected GHG Emissions and Targets
Source: Climate Action Team 2007.



Pursuant to the act, the ARB released *Proposed Early Actions to Mitigate Climate Change in California* (ARB 2007). At the same time, the California Environmental Protection Agency's Climate Action Team recommended 21 additional actions for which GHG emission reductions have been quantified (Climate Action Team 2007). Of all the actions on the original list, those expected to achieve the second-largest reduction (originally 18 million metric tons per year CO_2 equivalent by 2020, since lowered to 10 million metric tons) fell under the heading of "smart land use and intelligent transportation." No details

were provided as to what this category of actions might entail, or how the targeted reduction might be achieved.
How much could a transition from sprawl to compact development reasonably reduce U.S. transport CO_2 levels relative to current trends? The answer is the product of the following six factors:

- market share of compact development;
- reduction in VMT per capita with compact development;
- increment of new development or redevelopment relative to the base;
- proportion of weighted VMT within urban areas;
- ratio of CO_2 to VMT reduction for urban travel; and
- proportion of transport CO_2 due to motor vehicle travel.

Each factor is discussed below and quantified in turn.

1.7.1 Market Share of Compact Development

The first factor that will determine CO_2 reduction with compact development is market penetration during the forecast period, 2007 to 2050. The market share of compact development in the United States is growing but probably still small (Sobel 2006). No comprehensive inventory exists.

Two factors, however, suggest that whatever the market share is today, it will increase dramatically during the forecast period. One factor is the current undersupply of compact development relative to demand (see section 1.5). "A review of existing studies on consumer demand for smart growth products as well as consumer surveys . . . consistently find that at least one third of the consumer real estate market prefers smart growth development" (Logan 2007). The other factor is changing demographics (also discussed in section 1.5). "The aging of the baby boomers is an inexorable force likely to increase the number of households desiring denser residential environments" (Myers and Gearin 2001). The question is, how fast will the supply of compact development respond to this demand?

Over the long run, it is reasonable to assume that what is supplied by the development industry will roughly equal what is demanded by the market, with a time lag. This will be true, provided government policies allow and encourage it. If a third of the market currently wants the density, diversity, and design of smart growth, and almost another third wants the destination accessibility of smart growth (see section 1.5), the market will be inclined to provide these product types.

Changing demographics and lifestyles will increase these proportions. The policy recommendations presented in Chapter 7 will facilitate market changes as well as make a contribution of their own to growing market shares. We will assume that between now and 2050,

the *lower bound on the proportion of compact development is six-tenths and the upper bound is nine-tenths*, consistent with demographic trends and the current undersupply. As discussed in subsection 1.7.3, this still leaves more than 40 percent of development as it is today, largely sprawling and auto oriented.

1.7.2 Reduction in VMT per Capita with Compact Development

Based on the urban planning literature reviewed in this publication, it appears that compact development has the potential to reduce VMT per capita by anywhere from 20 to 40 percent relative to sprawl. The actual reduction in VMT per capita will depend on two factors: how bad trend development patterns are in terms of the so-called "five Ds" (density, diversity, design, destination accessibility, and distance to transit); and how good alternative growth patterns are in terms of these same five Ds. The five Ds, which are described in Chapter 3, are qualities of the urban environment that urban planners and developers can affect, which in turn affect travel choices.

Considering all the evidence presented in Chapter 3, it is reasonable to assume an *average reduction in VMT per capita with compact development relative to sprawl of three tenths*. This fraction applies to each increment of development or redevelopment but does not affect base development.

1.7.3 Increment of New Development or Redevelopment Relative to the Base

The cumulative effect of compact development also depends on how much new development or redevelopment occurs relative to a region's existing development pattern. The amount of new development and redevelopment depends, in turn, on the time horizon and the area's growth rate. The longer the time horizon and the faster the rate of development or redevelopment, the greater will be the regionwide percentage change in VMT per capita.

A recent article in the *Journal of the American Planning Association* began with the following words: "More than half of the built environment of the United States we will see in 2025 did not exist in 2000, giving planners an unprecedented opportunity to reshape the landscape" (Nelson 2006). Between 2005 and 2050, the number of residential units of all types may grow from 124 million to 176 million, or a total of 52 million.[6] In addition, each decade, roughly 6 percent of the housing stock of the previous decade is replaced,[7] with about two-thirds being rebuilt on site and another third consisting of new units built elsewhere because of land use conversions (such as a strip mall replacing houses, with the displaced homes rebuilt elsewhere).[8] Counting compounding effects, perhaps 37 million homes will need to be replaced entirely through conversion processes between 2005 and 2050. The number of new plus replaced residential units

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[6] The American Housing Survey reports about 124 million residential units in 2005 while the Census reports a population of about 296 million for the same year, for a ratio of 0.42 units per capita. As household size is not projected to change substantially over the next generation, the Census projected population for 2050 is multiplied by the ratio of residential units to population in 2005 to estimate future residential demand (see http://www.census.gov/hhes/www/housing/ahs/ahs.html).

[7] The 1990 Census reports 102 million residential units while the 2000 Census reports that 96 million survived to 2000, indicating a loss rate of about 6 percent per decade (see www.census.gov).

[8] There is no consensus on the actual rate of loss of residential units through demolition and conversion to another land use. The one-third figure is conservative based on Delphi consensus of experts (see Nelson 2006).

may reach 89 million units between 2005 and 2050, or more than 70 percent of the stock that existed in 2005.

Even more dramatic is the construction of nonresidential space, largely because, on average, about 20 percent of such space turns over each decade.[9] Nonresidential space includes retail, office, industrial, government, and other structures. From 2005 to 2050, nonresidential space will expand from about 100 billion square feet[10] to about 160 billion square feet, or by 60 billion square feet.[11] However, about 130 billion square feet will be rebuilt; some structures will be rebuilt two or more times because their useful life is less than 20 years. Perhaps a total of 190 billion square feet of nonresidential space will be constructed between 2005 and 2050, or nearly twice the volume of space that existed in 2005.

The magnitude of development ahead suggests there may be unprecedented opportunities to recast the built environment in ways that reduce a variety of emissions, especially CO_2. Furthermore, as noted in section 1.5, a very large share of this new development will be driven by emerging market forces that desire compact development, not because it reduces CO_2 emissions but rather because it is responsive to changing tastes and preferences.

Much of the built environment existing in 2005 will remain, of course, including most existing residential stock, institutional buildings, and high-rise structures. Nonetheless, we may assume that easily *two-thirds of development on the ground in 2050* will be developed or redeveloped between now and then.

1.7.4 Proportion of Weighted VMT within Urban Areas

A shift to compact development will affect *urban* VMT, not *rural* VMT. Put another way, compact development policies will affect travel within cities, not travel between cities. Two-thirds of the total VMT in the United States currently is urban. Heavy vehicles produce about four times more CO_2 emissions per mile than light vehicles, and heavy vehicles represent a higher proportion of rural VMT. Weighting VMT accordingly, 62 percent of the nation's VMT is presently urban. This estimate includes cars, trucks, and buses.

The proportion of urban VMT is growing as the United States becomes ever more urbanized. Projecting current trends out to 2050, about *four-fifths of the weighted VMT in 2050 will be urban.*

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[9] The U.S. Department of Energy's Energy Information Administration conducts the Commercial Buildings Energy Consumption Survey (CBECS) about every five years. The 1992 survey reported 68 billion square feet of nonresidential space excluding industrial space. The 1999 survey (the most compatible in format) reported 58 billion nonresident square feet existing in 1992 surviving to 1999, or an imputed loss rate of slightly more than 20 percent per decade (see http://www.eia.doe.gov/emeu/cbecs/).

[10] This figure includes industrial space (see Nelson 2006).

[11] This figure assumes about 580 square feet of space per full- and part-time worker. It is the quotient of total nonresidential space (see Nelson 2006) and workers. The U.S. Department of Commerce's Bureau of Economic Analysis reported there were 173 million total full- and part-time workers in 2005 (see www.bea.gov.) In contrast, the CBECS for 2003 estimates 1,000 square feet per full time worker. The more conservative figure is used.

1.7.5 Ratio of CO_2 to VMT Reduction

Compact development may not reduce CO_2 emissions by exactly the same proportion as VMT. The reasons, discussed in Chapter 2, are the CO_2 penalties associated with cold starts and lower operating speeds in compact areas. For the project-level simulations presented in section 3.4, the ratio of CO_2 to VMT reduction for compact development projects is around 0.95.

The material presented in section 2.3.3 indicates that a reduction in VMT of 30 percent would be expected to produce a reduction in CO_2 of about 28 percent. This figure factors in CO_2 penalties associated with cold starts and reduced vehicle operating speeds. Thus the ratio of CO_2 to VMT reduction would be around 0.93.

Given these three pieces of evidence, and weighting the second most heavily, we will conservatively assume a *CO_2 reduction equal to nine-tenths of the VMT reduction.*

1.7.6 Proportion of Transportation CO_2 from Motor Vehicles

Motor vehicles (automobiles, light- and heavy-duty trucks, and buses) contributed 79 percent of transportation CO_2 emissions in 2005 (EPA 2007, Table 3-7). This percentage is increasing over time, largely because of the growth of heavy-vehicle traffic. We will assume that *motor vehicles contribute four-fifths of transportation CO_2 emissions*, with the balance coming from aircraft, ships, and trains.

1.7.7 Net CO_2 Reduction in Comparison to Other Actions

Projecting out to 2050, the net CO_2 reduction is estimated to be as follows:

6/10 to 9/10 (market share of compact development)
x
3/10 (reduction in VMT per capita with compact development)
x
2/3 (increment of new development or redevelopment relative to base)
x
4/5 (proportion of weighted VMT within urban areas)
x
9/10 (ratio of CO_2 to VMT reduction)
x
4/5 (*proportion of transportation CO_2 from motor vehicles).*

Doing the math, compact development has the potential to reduce U.S. transportation CO_2 emissions by 7 to 10 percent, when compared to continuing urban sprawl.

A 7 to 10 percent reduction in CO_2 emissions should be put into perspective. The long-term elasticity of VMT with respect to fuel price is around –0.3 (see review by Victoria Transport Policy Institute 2007). The price of gasoline would have to double to produce an equivalent (30 percent) reduction in VMT. If one-quarter of the projected gasoline use were replaced with petroleum diesel, biodiesel, or electricity (a replacement rate viewed as "reasonable" within a 25-year time frame), transportation CO_2 emissions would decline by an estimated 8 to 11 percent (Pickrell 2003). This does not include an adjustment for CO_2 from sources other than motor

vehicles. The CO_2 savings through 2030 would be at least as large as a 31-mile-per-gallon (mpg) corporate average fuel economy (CAFE) standard (2020 combined mpg for cars and light trucks), or one-third of the savings expected from the Senate's 35-mpg CAFE standard.

The 7 to 10 percent reduction is an end-year estimate. During the 43-year period, the cumulative drop in CO_2 emissions would be about half this amount. Yet, the very phenomenon that limits the short- and medium-term impacts of compact development—the long-lived nature of buildings and infrastructure—makes the reduction essentially permanent and compoundable. The next 50 years of compact development would build on the base reduction from the first 50 years, and so on into the future. More immediate strategies, such as gas tax increases, do not have the same degree of permanence.

The 7 to 10 percent reduction only relates to the transportation sector. Compact development, however, would reduce CO_2 emissions for other sectors as well. An order-of-magnitude estimate for the residential sector is provided in Chapter 6. Controlling for socioeconomic and climatic variables, an equivalent household uses 20 percent less primary energy for space heating and cooling in a compact area than in a sprawling one. This savings is primarily due to less exterior wall area in attached and multifamily housing, and less floor area consumed at higher densities.

The 7 to 10 percent reduction does not consider the impact of intelligent transportation systems, congestion pricing, pay-as-you-drive insurance, or other complementary strategies. These might be used to better manage existing roads and public transportation, supporting smart growth or, alternatively, could be used to accelerate highway capacity expansion, undermining the smart growth impacts documented in this publication.

1.8 The Organization of this Book

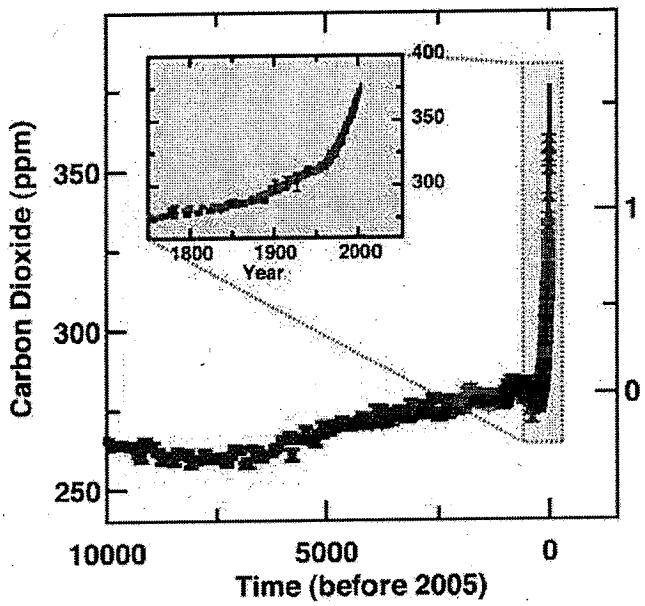
Chapter by chapter, this book addresses the impacts of the following:

- vehicular travel on greenhouse gas emissions;
- urban development on vehicular travel;
- residential preferences on urban development and travel;
- highway building on urban development and travel;
- urban development on residential energy use; and, finally,
- policy options for encouraging compact development and reducing vehicular travel.

2. The VMT/CO_2/Climate Connection

There is now a scientific consensus that greenhouse gas accumulations due to human activities are contributing to global climate change (Greenough et al. 2001; Barnett and Adger 2003; Hegerl et al. 2007; IPCC 2007a). The Fourth Assessment Report of the U.N. Intergovernmental Panel on Climate Change (IPCC 2007a, p. 2) concludes that: "Global atmospheric concentrations of carbon dioxide, methane and nitrous oxide have increased markedly as a result of human activities since 1750 and now far exceed preindustrial values determined from ice cores spanning many thousands of years." Greenhouse gas concentrations have risen from preindustrial levels of approximately 280 parts per million (ppm) CO_2 equivalent (CO_2e) to 430 ppm CO_2e (Stern 2006).[12]

Figure 2-1 Atmospheric Concentration of Carbon Dioxide (CO_2) over the Last 10,000 Years
Source: IPCC 2007a, p. 3.



The result is climate change. "Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global mean sea level" (IPCC 2007a, p. 5). Eleven of the last 12 years are among the 12 warmest globally since the instrumental record began in 1850 (IPCC 2007a, p. 5).[13] Long-term changes have been observed in Arctic temperatures and ice formations, ocean salinity, droughts, heavy precipitation, heat waves, and tropical cyclone intensity.

With current trends, the atmospheric concentration of CO_2e is expected to rise from 430 ppm to 630 ppm by 2050. Even if GHG emissions were held at year 2000 levels, the planet would warm by 1°C over the next 100 years. Under a variety of scenarios with differing assumptions about growth, technology, and climate feedback, the likely range of warming by 2100 is between 1.1°C and 6.4°C, with a best estimate of 1.8°C to 4.0°C (IPCC 2007a, p. 12).

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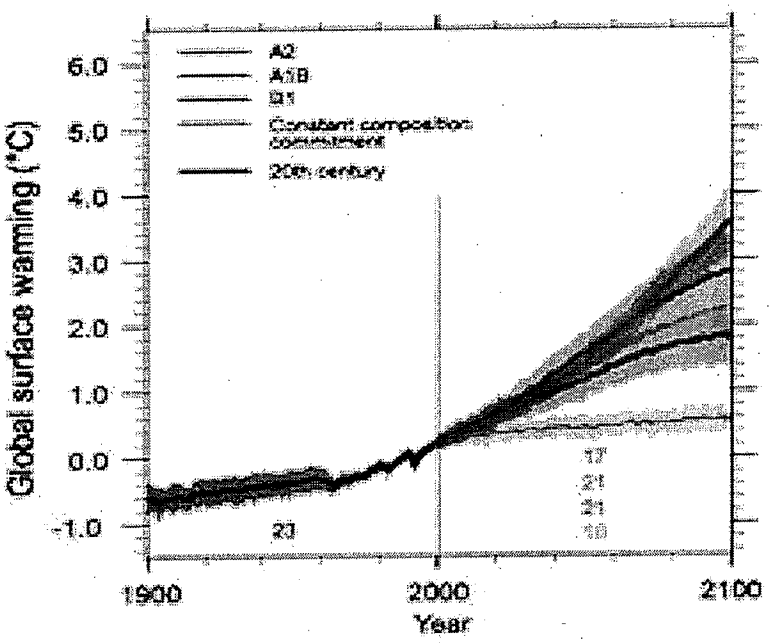
[12] Carbon dioxide equivalent (CO_2e) is an internationally accepted measure of the amount of global warming of greenhouse gases (GHGs) in terms of the amount of carbon dioxide (CO_2) that would have the same global warming potential.

[13] NASA's Goddard Institute for Space Studies identifies the five warmest years for global temperatures as (in descending order): 2005, 1998, 2002, 2003, and 2006 (Goddard 2007). Five of the last nine years have been the warmest on record in the United States (in descending order: 1998, 2006, 1999, 2001, 2005) (National Climate Data Center 2007).

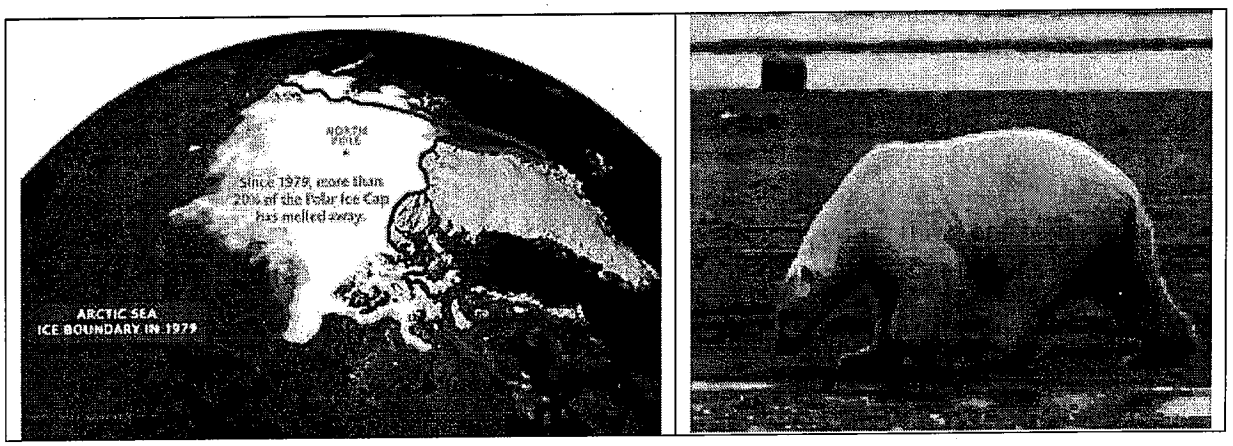
Figure 2-2 Global Average Surface Temperature Warming under Different Scenarios
Source: IPCC 2007a, p. 14.



International and domestic climate policy discussions have gravitated toward the goal of limiting the temperature increase to 2°C to 3°C (European Commission 2007). Stabilization at 450 ppm CO_2e is expected to produce a 50/50 chance of keeping warming to + 2°C above preindustrial levels, whereas 550 ppm would result in a 50/50 chance of keeping warming to +3°C (Meinshausen 2006).

With a 2°C increase in global average temperature, all coral reefs are at risk of being bleached. At 3°C, more than one-third of all species will be at risk of eventual extinction. With an increase of 2°C to 3°C, coastal flooding threatens to harm or displace 70 million to 250 million people, respectively, and hundreds of millions of people face an increased risk of hunger. In this same range of temperature increase, the Amazon rainforest and Great Lakes ecosystems are at risk of collapse (Meinshausen 2006). From 1°C to 4°C, a partial deglaciation of the Greenland Ice Sheet will occur, with the sea level destined to increase by four to six meters over centuries to millennia (IPCC 2007b, p. 17; DEFRA 2006).

A shrinking Arctic icecap threatens many species, including the polar bear.
NRDC undated



Stabilization at 450 ppm CO_2e would require global GHG emissions to peak around 2015 and be reduced 30 to 40 percent below 1990 levels by 2050 (Höhne, Phylipsen, and Moltmann 2007; Meinshausen and den Elzen 2005). The British government's review and the IPCC report show that the less we limit GHG emissions globally in the near term, the harder it will be to stabilize them at the target concentrations later (HM Treasury 2006; IPCC 2007c, p.15). For each five years that the peak in global emissions is delayed beyond 2015, the annual rate by which emissions must decline will increase by an additional 1 percent (Meinshausen and den Elzen 2005). One percent per year is a substantial level of effort, comparable to the reduction the United Kingdom achieved nationally after it switched all of its coal-fired power plants to natural gas in the 1990s (Helme and Schmidt 2007).

Determining the necessary GHG reductions in the United States to meet global targets requires assessment of and assumptions about expected GHG reductions in other countries. The emerging consensus is that industrialized countries will need to reduce their GHG emissions by 60 to 80 percent below 1990 levels by 2050 (European Commission 2007; Helme and Schmidt 2007; Höhne, Phylipsen, and Moltmann 2007; Meinshausen and den Elzen 2005; New England Governors/Eastern Canadian Premiers 2001; Schwarzenegger 2005). To meet this long-term goal, industrialized countries must reduce GHG emissions 15 to 30 percent below 1990 levels by 2020 (European Commission 2007; Höhne, Phylipsen, and Moltmann 2007; Meinshausen and den Elzen 2005). In August 2007, industrial nations agreed to GHG cuts 25 to 40 percent below 1990 levels by 2020 as a nonbinding starting point for a new round of international climate negotiations (Reuters 2007).

2.1 Prospects for the U.S. Transportation Sector

The transportation sector is responsible for 33 percent of U.S. CO_2 emissions (28 percent of U.S. GHG emissions), and its emissions are projected to grow faster than the average rate for all sectors of the economy (EIA 2007, Table A18). Passenger vehicles (cars and light trucks) are responsible for more than three-fifths of transportation sector CO_2 emissions.

The GHG reduction "required" from U.S. transportation is a function of the level of reductions that can be expected in other sectors of the economy to meet the 60 to 80 percent reduction target. While certain sectors of the economy may be able to reduce GHG emissions more than others, it is unlikely that they will be able to sufficiently overcompensate for limited progress in the transportation sector. As discussed below, current policy proposals on vehicle technology and fuels would leave passenger vehicle CO_2 emissions well above 1990 levels in 2030, significantly off course for meeting the 2050 target. Reduction in travel demand will be an important element of effective climate policy.

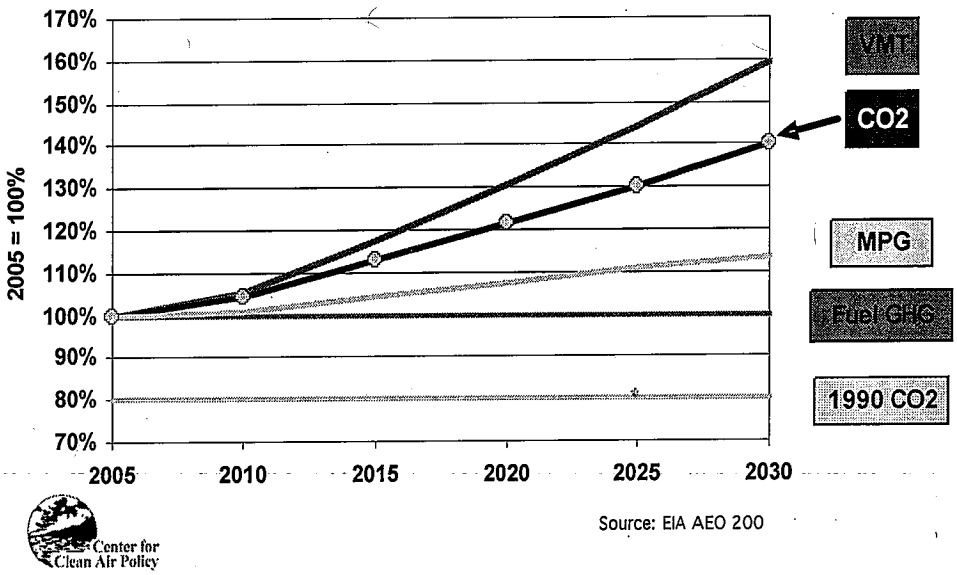
There is a popularly held expectation that electricity or hydrogen fuels will provide long-term solutions to energy security and transportation GHG concerns, essentially shifting transportation GHG emissions upstream to other sectors of the economy. Biofuels also could potentially play an important role, but their use will be limited because of land use constraints, high costs, and ecological and social concerns. A shift to electric or hydrogen cars could certainly reduce petroleum use if major technological breakthroughs and cost reductions are achieved on battery and fuel cell technologies. (Plug-in hybrid vehicles currently carry a cost premium on the order of $10,000, and the cost premium for hydrogen fuel cell vehicles is on the order of $500,000 to $1 million.)

Achieving significant GHG reductions also will require significant investments and political will. Since electricity and hydrogen are energy carriers, they result in GHG savings only if their production and transportation processes are relatively more carbon efficient than the current approach. Thus, for electricity or hydrogen to result in GHG reductions, they must be generated via low-emitting processes. Three primary energy sources could generate low-GHG electricity or hydrogen. First, renewable sources such as solar, biomass, and wind have significant but limited potential. Although these sources could potentially provide a large amount of energy, issues such as intermittent generation and local resource availability present difficulties. Second, nuclear power has great potential as a low-GHG energy source, but faces significant cost and political barriers. Third, carbon capture and sequestration (CCS)—in which CO_2 is removed from a coal (or other) power plant smokestack and injected underground into geological formations such as oil fields, gas fields, or saline formations—offers the possibility of continued use of coal resources with a much improved GHG profile. There is active research on CCS to assess costs, permanence, and storage capacity. Each of these three low-GHG energy sources holds significant promise but can offer no guarantees.

2.2 VMT and CO_2 Projections

The U.S. Department of Energy's Energy Information Administration (EIA) forecasts VMT to increase by 59 percent from 2005 to 2030 (the red line in Figure 2-3), outpacing projected population growth of 23 percent (EIA 2007, Table A7). The projected VMT increase represents a slowdown relative to historic VMT growth rates, but is within the likely range for future VMT growth (Polzin 2006). Over this time period, the EIA projects fuel economy for new passenger vehicles to increase by 16 percent (from 25 to 29 mpg) and the fuel economy of the full stock of vehicles (the green line in Figure 2-3) to increase by 13.3 percent as more efficient vehicles penetrate the fleet. CO_2 emissions would increase by 40 percent[14] over the same time frame (the dark blue line in Figure 2-3). In this case, transportation CO_2 emissions in 2030 would be 75 percent above 1990 levels (the turquoise line in Figure 2-3).

Figure 2-3 Projected Growth in CO_2 Emissions from Cars and Light Trucks
Source: EIA 2007.

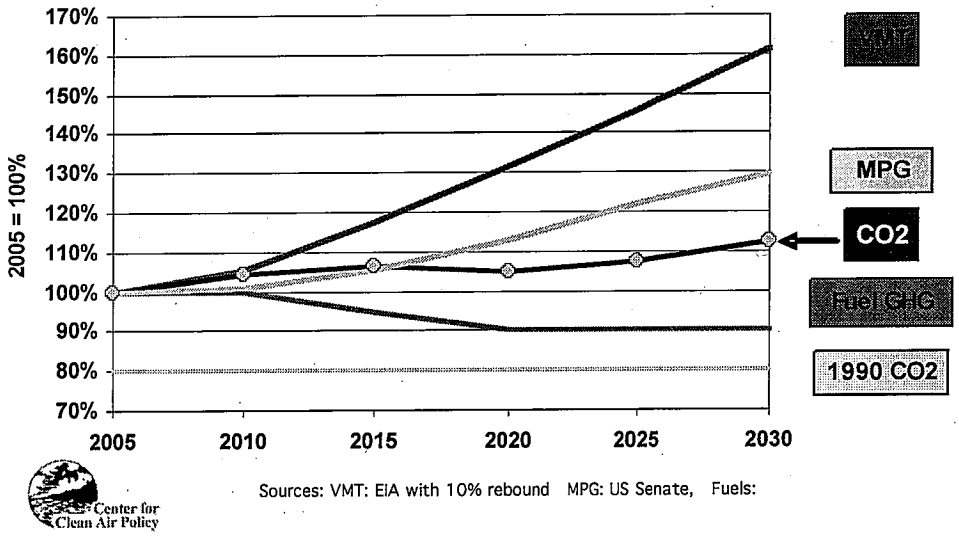


U.S. fuel economy has been flat for almost 15 years, as the upward spiral of car weight and power has offset more efficient technology (Schipper 2007). In June 2007, the U.S. Senate passed new CAFE standards that would increase new passenger vehicle fuel economy (cars and light trucks combined) to 35 mpg by 2020 (U.S. Congress 2007). The state of California is implementing a low carbon standard for transportation fuels that calls for a 10 percent reduction in fuel carbon intensity by 2020 (Schwarzenegger 2007). If California's low carbon fuel standard were applied at the national level (the purple line in Figure 2-4), in conjunction with the Senate's CAFE standard of 35 mpg by 2020 (the green line in Figure 2-4), passenger vehicle CO_2 emissions in 2030 would be 12 percent above 2005 levels, or 40 percent above 1990 levels. In other words, projected growth of VMT would still overwhelm the CO_2 savings from vehicle and fuel regulations.[15]

[14] 159% [vehicle miles traveled] / 1.133 [mpg] = 140% [CO_2] with constant fuel carbon content.
[15] In this scenario, VMT growth increases by 2 percentage points (61 percent growth by 2030) due to the "rebound effect" whereby driving increases as fuel economy increases (10 percent short-run elasticity).

Figure 2-4 Projected Growth in CO_2 Emissions from Cars and Light Trucks, Assuming Stringent Nationwide Vehicle and Fuel Standards*
Sources: EIA 2007; U.S. Congress 2007; Schwarzenegger 2007.

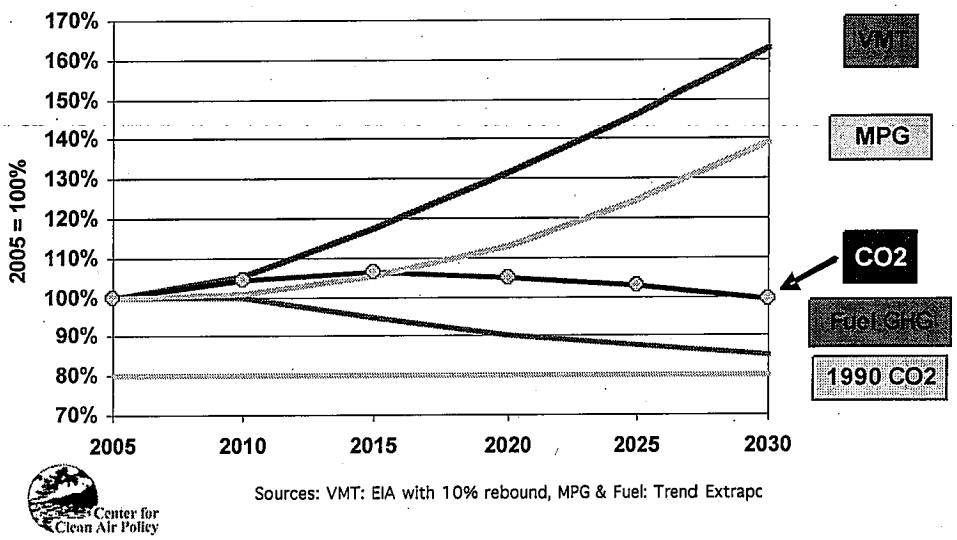
* With Senate new passenger vehicle fuel economy of 35 mpg and California low carbon fuel standard of –10 percent in 2020, applied nationally. Assumes a 10 percent rebound.



If the fuel economy and fuel carbon content trends represented in Figure 2-4 were extended through to 2030, so that new vehicle fuel economy would increase to 45 mpg and fuel carbon content would decrease to 15 percent below current levels, then 2030 CO_2 emissions would be reduced to 1 percent below 2005 levels, or 24 percent above 1990 levels (Figure 2-5).

Figure 2-5 Projected Growth in CO2 Emissions from Cars and Light Trucks, Assuming Even More Stringent Nationwide Vehicle and Fuel Standards*
Sources: EIA 2007; U.S. Congress 2007; Schwarzenegger 2007.

*Extrapolating trends from Figure 2-4 with new passenger vehicle fuel economy of 45 mpg in 2030 and low carbon fuel standard of –15 percent in 2030.



Clearly, lowering transportation CO_2 emissions to 60 to 80 percent below 1990 levels by 2050 would require even greater improvements in vehicles, fuels and, almost certainly, reductions in VMT per capita.

2.3 Other Influences on CO_2 Emissions

Carbon dioxide emissions are a function not only of VMT but also of numbers of vehicle trips (VT) and vehicle operating speeds. The number of vehicle trips is directly related to the number of vehicle starts, while average vehicle operating speed is a proxy for the entire driving cycle (starts, acceleration, cruising speed, deceleration, and stops). Both affect vehicle operating efficiency and CO_2 emissions per vehicle mile.

2.3.1 Vehicle Trip Frequencies

Starting a vehicle when it is cold uses more energy and emits more CO_2 than does starting the vehicle after it has warmed up. For an average car in California, the California Air Resources Board EMFAC model shows cold start emissions of 213 grams CO_2 after a 12-hour soak.[16] To put this in context, an average passenger car emits 386 grams of CO_2 per mile when traveling at an average speed of 30 miles per hour.[17]

Still, any cold start penalty associated with compact development is likely to be small. From the EMFAC model, CO_2 emissions from *all* vehicle starts (cold, intermediate, and hot) account for just 3.3 percent of total annual passenger vehicle CO_2 emissions in California.[18] Moreover, while there has been some speculation in the literature that compact development could increase trip frequencies, the weight of evidence suggests otherwise. Overall trip rates appear to depend largely on household socioeconomics and demographics. Controlling for these influences, vehicle trip rates are lower in compact areas because some of a household's daily trips shift from the automobile to other modes (Ewing, DeAnna, and Li 1996; Ewing and Cervero 2001).

2.3.2 Vehicle Operating Speeds

Compact development policies could have secondary effects on CO_2 emissions by lowering (or raising) average vehicle speeds. Motor vehicles with internal combustion engines are most efficient at an average speed of about 45 miles per hour, with lower efficiency and higher CO_2 emission rates for speeds above and below this "sweet spot" (see Figure 2-6). The data in Figure 2-6 come from the California Air Resources Board EMFAC model and represent average speed for vehicle trips that have been calibrated to reflect real-world driving behavior, including acceleration, starts, idling, and so forth.

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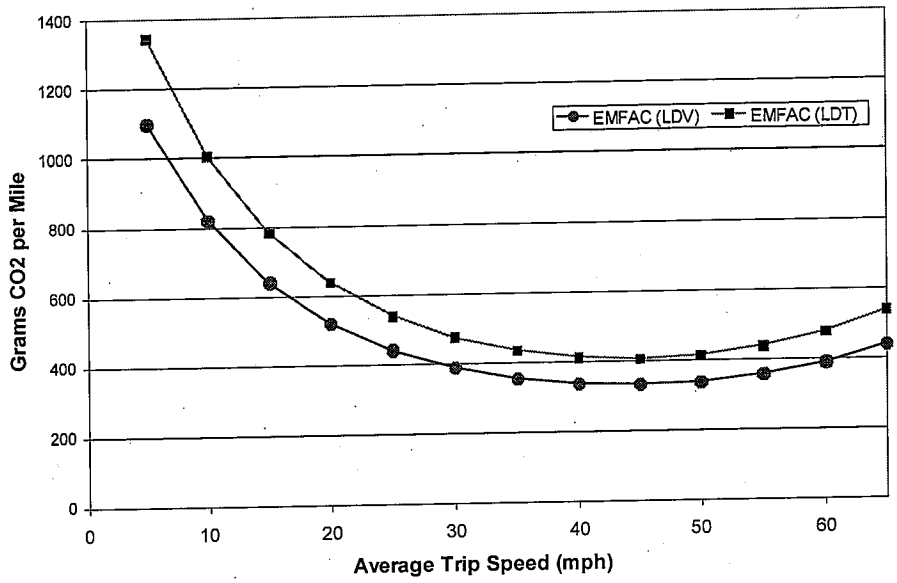
[16] Authors' calculations based on data from EMFAC 2007, V2.3 Nov. 1, 2006, provided by Jeff Long, California Air Resources Board, July 24, 2007.

[17] Authors' calculations based on data from EMFAC 2007, V2.3 Nov. 1, 2006, provided by Jeff Long, California Air Resources Board, April 25, 2007.

[18] Authors' calculations based on data from EMFAC 2007, V2.3 Nov. 1, 2006, provided by Jeff Long, California Air Resources Board, July 9, 2007.

Figure 2-6 CO_2 Emission Rate versus Average Vehicle Speed*
Source: Jeff Long, California Air Resources Board



*Data from EMFAC 2007, V2.3 Nov. 1, 2006, provided by Jeff Long, California Air Resources Board, April 2007. Data include all model years in the range 1965 to 2007. The magnitude of the curve (not the shape) is a function of temperature and humidity assumptions, in this case 80°F and relative humidity of 50 percent.

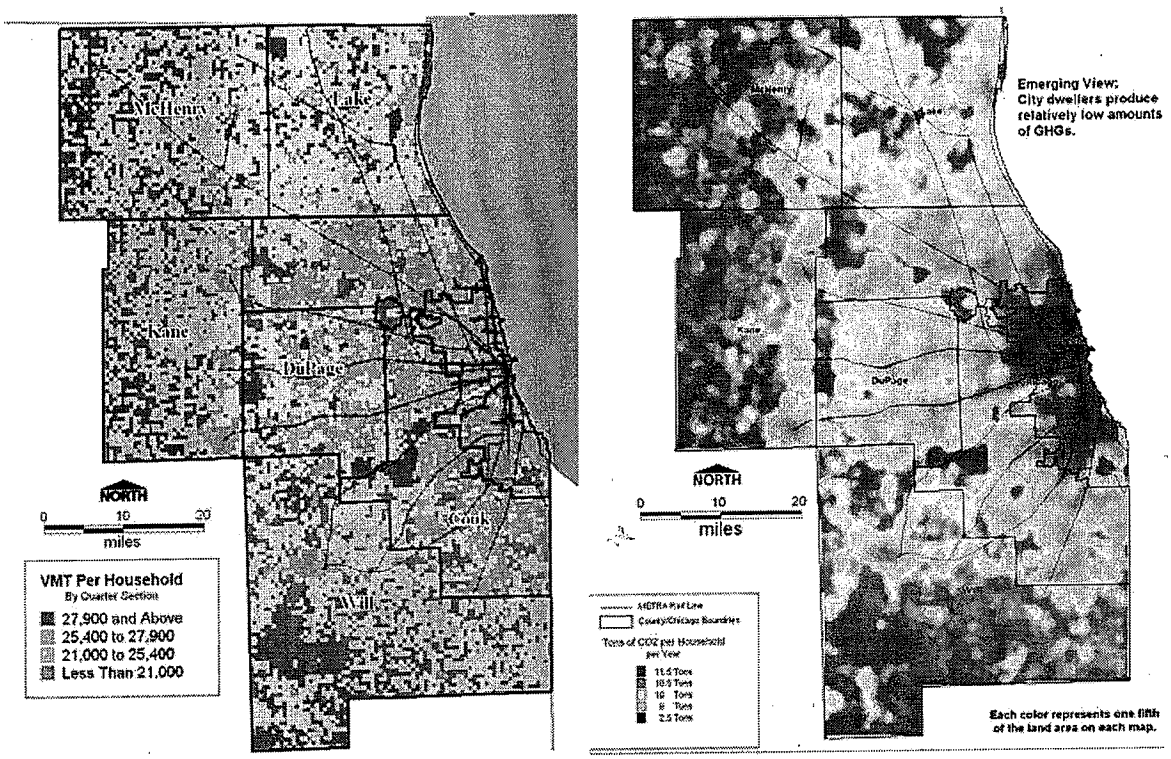
Can we therefore conclude that it would be most efficient to design cities and roadways to maximize vehicle operating efficiency? No, because the efficiency gained by designing roads for high average speeds would be negated by an increase in miles traveled. Development can and would become ever more dispersed. The phenomena of induced traffic and induced development are discussed in Chapter 5. Moreover, the most efficient speed for today's cars is probably higher than the most efficient speed for tomorrow's cars. Emission rate curves for hybrid vehicles, in particular, look different, because these vehicles experience less of a low-speed emissions penalty.

2.3.3 Synthesis

With the transition from sprawl to compact development, both VMT and VT would be expected to decline, though by different percentages. The result would be a drop in CO_2 emissions per capita. Vehicle trips will decline as travelers shift from the automobile to alternative modes, and VMT will decline as mode shifts occur and as automobile trips get shorter. Vehicle operating speeds also may decline, and would have an opposite effect on CO_2 emissions per capita. Compact development may mean lower cruising speeds and more stop-and-go driving, hence higher emissions per mile traveled (assuming conventional vehicle technology).

We can get a sense of the magnitude of these effects based on available information. All else being equal, there is a one-to-one relationship between VMT and CO_2 emissions; a 30 percent reduction in VMT will result in a 30 percent reduction in CO_2 emissions.

Figure 2-7 Close Relationship between VMT per Household and CO_2 Emissions in the Chicago Metropolitan Area
Source: Center for Neighborhood Technology undated.



Let us posit that regional density will be 50 percent higher in 2050 under compact development than with current trends, a not unreasonable assumption, given the data presented in section 1.7. Given an elasticity of peak hour speed with respect to density of –0.15 (see subsection 3.1.4), the average peak hour vehicle operating speed might decline by 0.15 times 50 percent, or 7.5 percent, with compact development. If so, average daily speed would decline by about 3 percent, since the morning and afternoon peak periods represents two-fifths of average daily traffic in metropolitan areas. Such a decline would cause a 1 to 2 percent increase in CO_2 emissions per mile at typical urban speeds (see subsection 2.3.2). Therefore, if compact development reduced VMT by 30 percent, lowered average vehicle operating speed by 3 percent, and had no effect on vehicle trips, the net impact would be a 28 percent drop in CO_2 emissions.[19]

The next chapter addresses the extent to which compact urban development can reduce VMT and associated CO_2 emissions.

[19] 100% – (70% [VMT] x 102% [CO_2 per mile] x 96.7% [running emissions] + 3.3% [start emissions]).

3. The Urban Development/VMT Connection

Four different rich empirical literatures inform the discussion of urban development and its impacts on VMT, the primary determinant of transportation-related CO_2 emissions:

- aggregate travel studies, such as sprawl index research conducted for Smart Growth America;
- disaggregate travel studies, such as Smart Growth Index elasticity estimates;
- regional simulation studies, such as Portland's LUTRAQ (Land Use, Transportation, Air Quality) study; and
- project simulation studies, such as the EPA's Atlantic Steel study.

In this chapter, we review each literature in turn and present order-of-magnitude effect sizes. For two literatures—disaggregate travel studies and regional simulation studies—the sample of studies is large enough to permit meta-analyses of study results. A meta-analysis is a special kind of literature synthesis, conducted most often in scientific fields. It is more than a literature review, as it generalizes across studies quantitatively, taking individual studies as units of analysis and combining study results to arrive at average effect sizes and confidence intervals.

The different literatures provide a consistent picture. Compact development has the potential to reduce VMT per capita by anywhere from 20 to 40 percent relative to sprawl. The actual reduction in VMT per capita will depend on the specific form of compact development, as outlined in the following sections.

3.1 Aggregate Travel Studies

For decades, it has been known that compact areas have lower levels of automobile use per capita and greater use of alternative modes of transportation than do sprawling areas. They also tend to generate shorter trips. The combined effect is significantly less VMT per capita in compact areas (see Figure 3-1). This fact has been documented most famously by Newman and Kenworthy (1989a, 1989b, 2006, 2007), Holtzclaw (1991, 1994), and Holtzclaw et al. (2002). This same-shaped exponential decline in vehicular travel with density is found in many data series (see Figures 3-2 and 3-3 for communities in the Baltimore area and for higher-income cities worldwide).

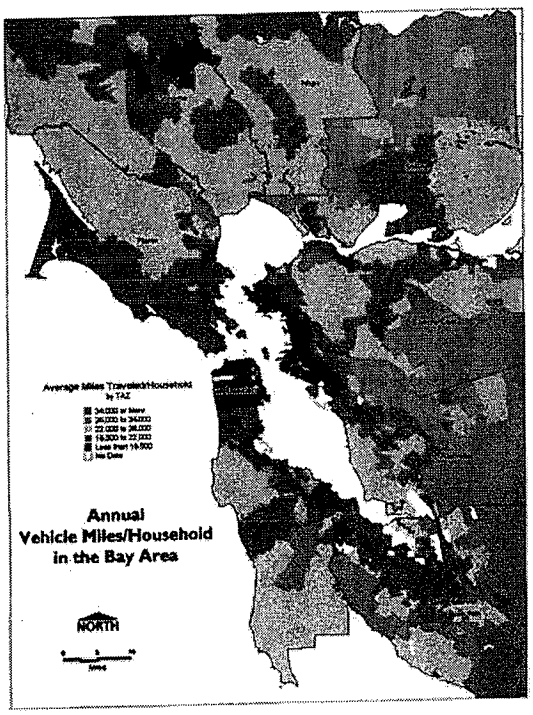


Figure 3-1 Vehicle Miles Traveled per Household for Neighborhoods in the San Francisco Metropolitan Area
Source: Holtzclaw et al. 2002.

Figure 3-2 Vehicle Miles Traveled per Capita versus Residential Density for Baltimore Neighborhoods
Source: Baltimore Metropolitan Council, 2001 Travel Survey.

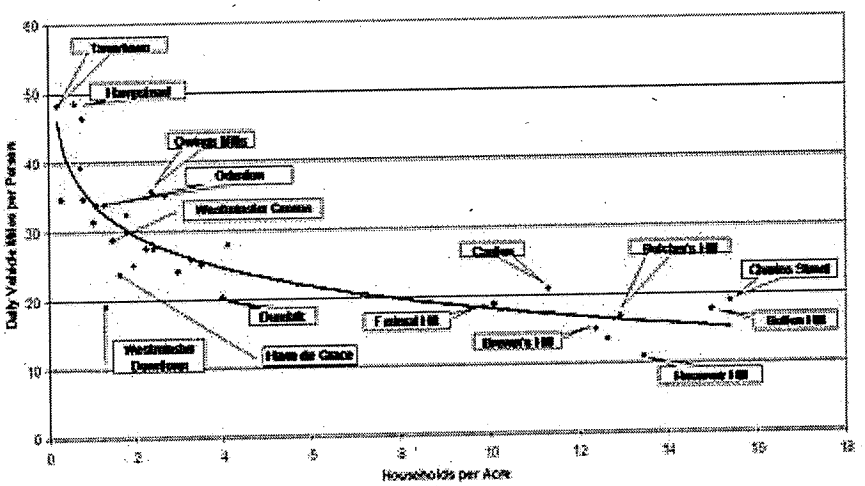
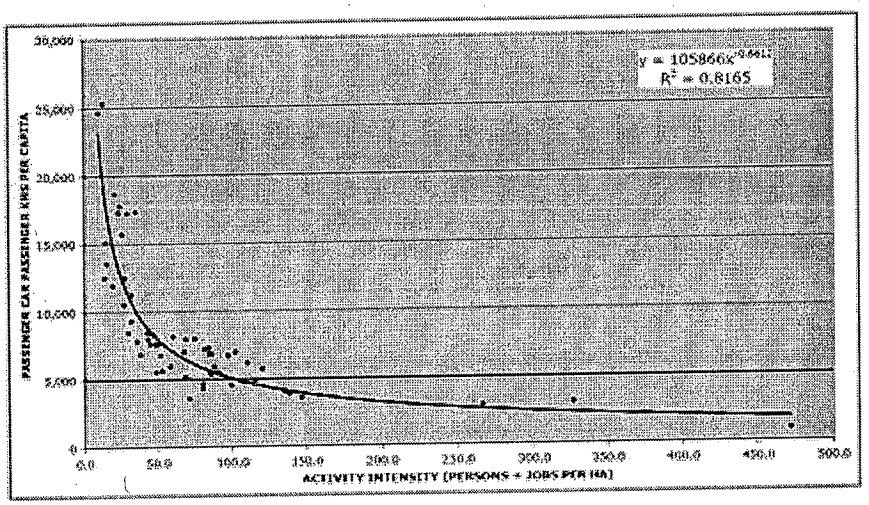


Figure 3-3 Vehicle Kilometers Traveled per Capita versus Activity Intensity for 58 Higher-Income Cities *Source: Newman and Kenworthy 2006.*



Four facts, however, preclude broad generalizations about urban development patterns and fuel consumption or CO_2 emissions. First, dense areas may experience more congestion and lower travel speeds than sprawling areas, hence lower vehicle fuel economy for whatever VMT they produce. Second, dense areas may have different population characteristics than sprawling areas, differences that could confound urban development and travel relationships. Third, density is only one aspect of urban form, albeit an important one. Urban sprawl is defined more broadly as any development pattern in which homes, workplaces, stores, schools, and other activities are widely separated from one another. Fourth, any relationships that appear in aggregate statistics

for neighborhoods, cities, or metropolitan areas would not necessarily apply to individual households, the ultimate travel decision makers.[20]

In a paper entitled "The Transport Energy Trade-Off: Fuel-Efficient Traffic versus Fuel-Efficient Cities," Newman and Kenworthy (1988) addressed the first of these qualifiers. They concluded that the lower VMT in compact areas overwhelms any effect of lower vehicle fuel economy (see Figure 3-4). They subsequently substantiated this relationship for many other places (Newman 2006; Newman and Kenworthy 2006, 2007).

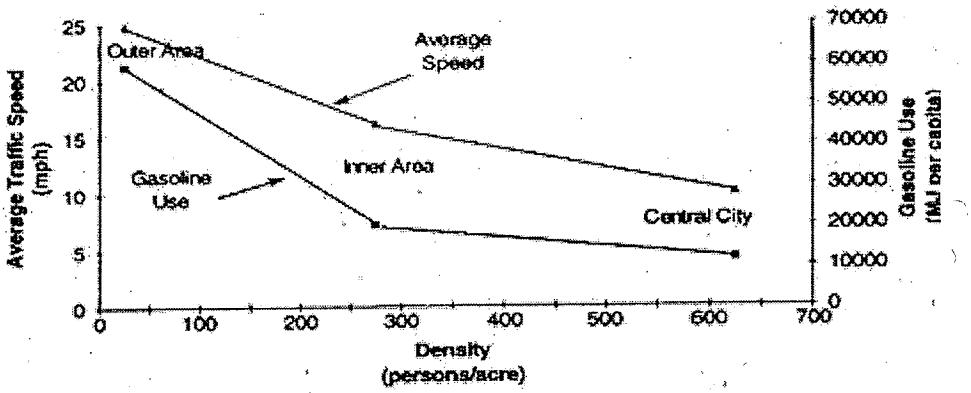


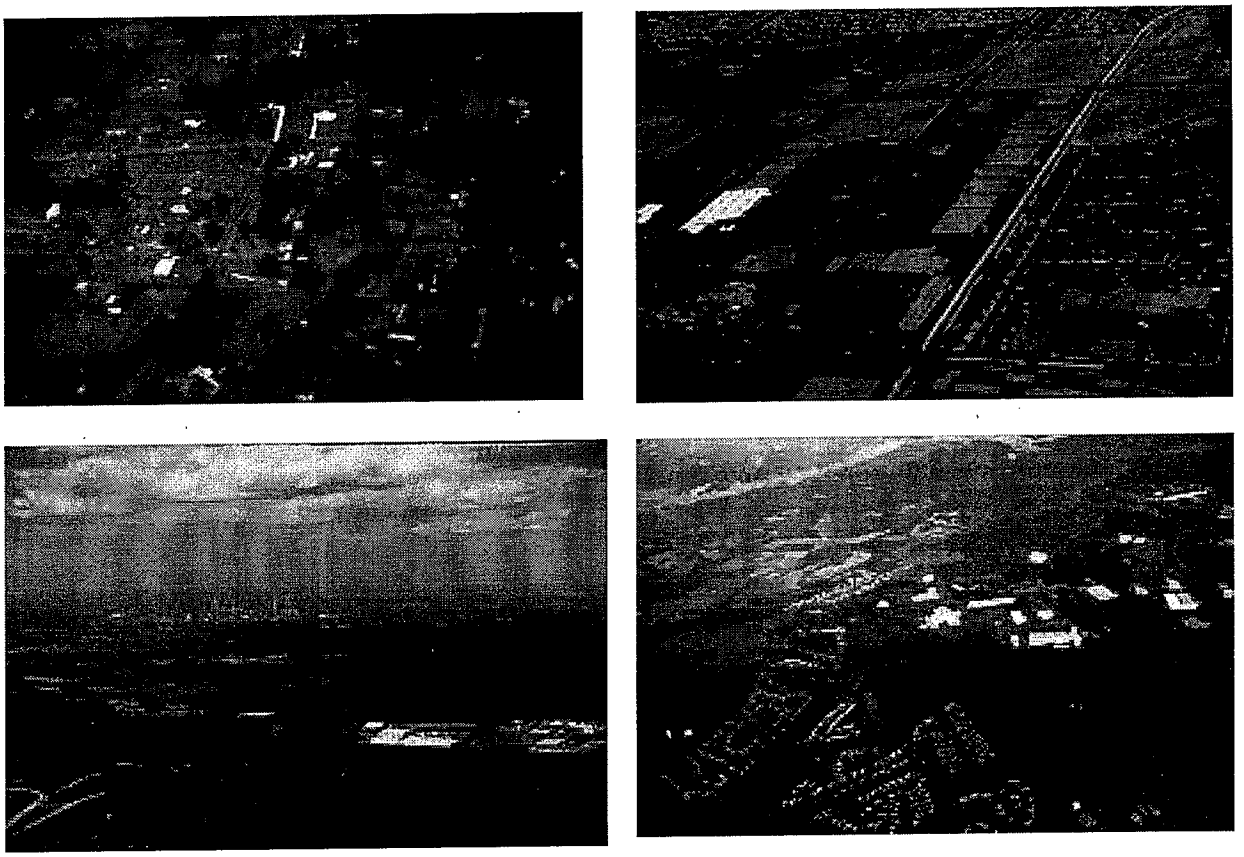
Figure 3-4. Per Capita Gasoline Consumption in Inner and Outer Portions of the New York Metropolitan Area
Source: Newman and Kenworthy 1988.

The second qualifier is not so easily dismissed. In Figures 3-2 through 3-4, residential density is not the only characteristic that distinguishes Taneytown from Charles Street in the Baltimore metropolitan area, or one higher-income city from another, or the inner and outer areas of the New York metropolitan area. Culture, socioeconomics, demographics, transit availability, and even gas prices could account for most or all of the differences in per capita vehicle use. Critics of these early studies argued, correctly, that until these other factors were controlled, the independent effect of urban development patterns would be unknown and unknowable (Gomez-Ibanez 1991; Gordon and Richardson 1989).

Likewise, the third qualifier also is not easily dismissed. If poor accessibility is the common denominator of sprawl, then sprawl is more than low-density development. The term also encompasses scattered or leapfrog development, commercial strip development, and single-use development such as bedroom communities. In scattered or leapfrog development, residents and service providers must pass vacant land on their way from one developed area to another. In classic strip development, consumers must pass other uses on the way from one store to the next; this is the antithesis of multipurpose travel to an activity center. In a single-use development, of course, different uses are located far apart as a result of the segregation of land uses. Poor accessibility also could be a product of fragmented street networks that separate urban activities more than need be (see the photos below of sprawling development patterns).

[20] This is due to the so-called ecological fallacy. The ecological fallacy is a widely recognized error in the interpretation of statistical data, whereby inferences about individuals are based solely upon aggregate statistics for the group to which those individuals belong.

Sprawling development patterns include low-density and single-use development (top left), uncentered strip development (top right), scattered and leapfrog development (bottom left), and sparse street networks (bottom right).



The fourth qualifier has led to a host of studies using disaggregate travel data; that is, data for individuals or households. Such studies are summarized in section 3.2. For now, the focus is on aggregate relationships, where the unit of analysis is the place.

3.1.1 Measuring Urban Sprawl

Around 2000, researchers began to measure the extent of urban sprawl. Their initial attempts were crude. For example, *USA Today*—on the basis of an index presented in its February 22, 2001, issue—declared: "Los Angeles, whose legendary traffic congestion and spread-out development have epitomized suburban sprawl for decades, isn't so sprawling after all. In fact, Portland, OR, the metropolitan area that enacted the nation's toughest antigrowth laws, sprawls more." Indeed, according to *USA Today*'s index, even the New York metropolitan area sprawls more than Los Angeles (Nasser and Overberg 2001).

The most notable feature of these early studies was their failure to define sprawl in all its complexity. Population density is relatively easy to measure, and hence served as the sole indicator of sprawl in several studies. Judged in terms of average population density, Los Angeles looks compact; it is the endless, uniform character of the city's density that makes it seem so sprawling. Another notable feature of these studies was the wildly different sprawl ratings given to different metropolitan areas by different analysts. With the exception of Atlanta, which always seems to rank among the worst, the different variables used to measure sprawl led to very different results. In one study, Portland was ranked as most compact and Los Angeles was way down the list. In another, their rankings were essentially reversed.

Meanwhile, others were developing more complete measures of urban sprawl. Galster et al. (2001) characterized sprawl in eight dimensions: density, continuity, concentration, clustering, centrality, nuclearity, mixed use, and proximity. The condition—sprawl—was defined as a pattern of land use that has low levels in one or more of these dimensions. Each dimension was operationally defined, and six of the eight were quantified for 13 urbanized areas. New York and Philadelphia ranked as the least sprawling of the 13, and Atlanta and Miami as the most sprawling.

Since then, Galster and his colleagues have extended their sprawl measures to 50 metropolitan areas, and are closing in on 100. Their recent work confirms the multidimensional nature of sprawl. In one study, metropolitan areas were ranked in 14 dimensions, some related to population, others to employment, and still others to both (Cutsinger et al. 2005). The 14 dimensions were reduced to seven factors through principal components analysis. Metropolitan areas ranking near the top on one factor were likely to rank near the bottom on another. Los Angeles, for example, ranked second on both "mixed use" and "housing centrality," but 48th on "proximity" and 49th on "nuclearity." With so many variables and esoteric names, this type of analysis can get very confusing.

Building on this work, Cutsinger and Galster (2006) identified four distinct sprawllike patterns among the 50 metropolitan areas: 1) deconcentrated, dense areas; 2) leapfrog areas; 3) compact, core-dominant areas with only moderate density; and 4) dispersed areas. Since none of the 50 metropolitan areas exhibited uniform sprawllike patterns in all dimensions, the authors judged it incorrect to treat sprawl as a single phenomenon.

Multidimensional sprawl indices also were developed for the U.S. EPA and Smart Growth America. They defined sprawl as any environment with 1) a population widely dispersed in low-density residential development; 2) a rigid separation of homes, shops, and workplaces; 3) a lack of major employment and population concentrations downtown and in suburban town centers and other activity centers; and 4) a network of roads marked by very large block size and poor access from one place to another. These indices were used to measure sprawl for 83 of the nation's largest metropolitan areas (Ewing, Pendall, and Chen 2002, 2003).

Principal components analysis was used to reduce 22 land use and street network variables to four factors representing these four dimensions of sprawl, each factor being a linear combination of the underlying operational variables.[21] The four factors represent a balanced scorecard of sprawl indicators. "Density" and "mix," while correlated, are very different constructs, as are "centeredness" and "street accessibility." The four factors were combined into an overall metropolitan sprawl index.

A simpler county sprawl index also was developed to measure the built environment at a finer geographic scale, the individual county. This index is a linear combination of six variables from the larger set, these six being available for counties, whereas many of the larger set were available only for metropolitan areas.[22] Initially calculated for 448 metropolitan counties (McCann and Ewing 2003), the index is now available for 954 metropolitan counties or county equivalents representing 82 percent of the nation's population (Ewing, Brownson, and Berrigan 2006).

All sprawl indices were standardized, with mean values of 100 and standard deviations of 25. The way the indices were constructed, the bigger the value of the index, the more compact the metropolitan area or county; the smaller the value, the more sprawling the metropolitan area or county. Thus, in the year 2000, the New York metropolitan statistical area had an index value of 178, while Atlanta had a value of 58. Manhattan had an index value of 352, while Geauga County (outside Cleveland) had a value of 63 (see photographs below).

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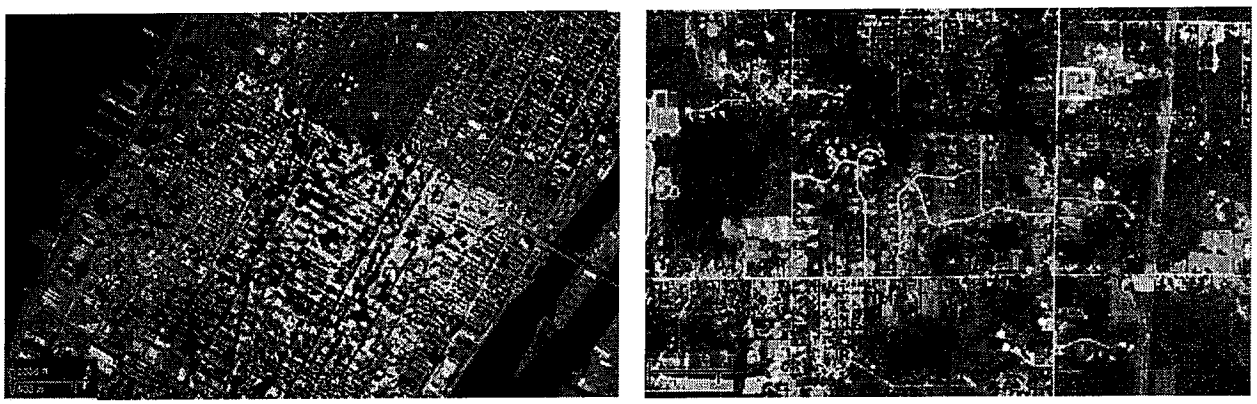
[21] "Residential density" was defined in terms of gross and net densities and proportions of the population living at different densities; seven variables made up the metropolitan density factor. "Land use mix" was defined in terms of the degree to which land uses are mixed and balanced within subareas of the region; six variables made up this factor. "Degree of centering" was defined as the extent to which development is focused on the region's core and regional subcenters; six variables made up this factor. "Street accessibility" was defined in terms of the length and size of blocks; three variables made up this factor.

[22] The six variables are as follows: 1) gross population density (persons per square mile); 2) percentage of the county population living at low suburban densities, specifically, densities between 101 and 1,499 persons per square mile, corresponding to less than one housing unit per acre; 3) percentage of the county population living at moderate to high urban densities, specifically, more than 12,500 persons per square mile, corresponding to about eight housing units per acre, the lower limit of density needed to support mass transit; 4) the net density in urban areas, which was derived from the estimated urban land area for each county; 5) average block size; and 6) percentage of blocks with areas less than 1/100 of a square mile, the size of a typical traditional urban block bounded by sides just over 500 feet in length.

Satellite photographs show the nation's most compact county—New York County, also known as Manhattan—at left and its most sprawling county—Geauga County, Ohio—at right. Both photographs are presented at the same scale.
Source: www.maps.google.com



3.1.2 Relating Urban Sprawl to Travel Outcomes

The study for the EPA and Smart Growth America analyzed relationships between sprawl and various travel outcomes. The overall sprawl index showed strong and statistically significant relationships to six outcome variables. All relationships were in the expected directions. As the index increases (that is, as sprawl decreases), average vehicle ownership, daily VMT per capita, the annual traffic fatality rate, and the maximum ozone level decrease to a significant degree. At the same time, shares of work trips by transit and walk modes increase to a significant degree.

The significance of these relationships rivaled or, in some cases, actually exceeded that of the sociodemographic control variables. The index was the only variable that rose to the level of statistical significance for walk share of work trips and maximum ozone level, and had the strongest association to daily VMT per capita and the annual traffic fatality rate. It had secondary, but still highly significant, associations with average vehicle ownership and transit share of work trips.

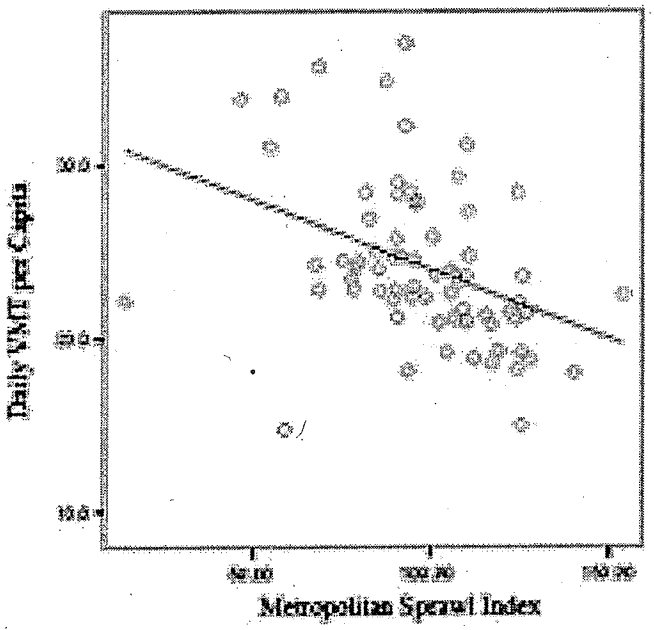
Obviously, these relationships are not independent of each other. The lower level of vehicle ownership in dense metropolitan areas contributes to higher mode shares for alternatives to the automobile. These, in turn, contribute to lower VMT, which contributes to lower traffic fatalities and ozone levels. Because of the different data sources, units of analysis, and sample sizes, it would be treacherous to model the causal paths among these outcome variables. But, intuitively, they should be related as indicated.

3.1.3 Sprawl versus VMT

The relationship between the overall metropolitan sprawl index and VMT per capita is plotted in Figure 3-5. The simple correlation is significant. The more compact an area (the larger the index value), the lower the VMT per capita.

Figure 3-5 Simple Correlation between Daily VMT per Capita and Metropolitan Sprawl Index*
Source: Ewing, Pendall, and Chen 2002.

*Larger index values = less sprawl.



Recall that the overall sprawl index is composed of four factors: density, mix, centeredness, and street accessibility (as discussed in section 3.1.1). The density factor has the strongest and most significant relationship to travel and transportation outcomes (see Figure 3-6). It has a significant inverse relationship to average vehicle ownership, VMT per capita, traffic fatality rate, and maximum ozone level, and a significant direct relationship to public transportation and walk shares of commute trips. With the exception of the traffic fatality rate, all relationships are significant at the 0.01 probability level or beyond.

To illustrate the strength of density relationships, a 50-unit increase in the density factor (from one standard deviation below average to one standard deviation above average) is associated with a drop of 10.75 daily VMT per capita (50 x –0.215). That is, controlling for metropolitan population, per capita income, and other factors, the difference between low- and high-density metropolitan areas is more than 10 VMT per capita per day, or 40 percent. Fifty units is roughly the difference in density between San Francisco (denser) and Washington, D.C. (less dense), or between Chicago (denser) and St. Louis (less dense).

The centeredness factor has the next most significant environmental influence on travel and transportation outcomes. It is inversely related to annual delay per capita and traffic fatality rate, and is directly related to public transportation and walk shares of commute trips. These associations are in addition to—and independent of—those of density, which is controlled in the same equations.

The relationship between degree of centering and VMT per capita is just short of significant at the 0.05 level. A 50-unit increase in the centeredness factor (from one standard deviation below the average to one standard deviation above) is associated with a 2.3 daily VMT per capita (50 x –0.0462), about one-quarter the change associated with the density factor. The two effects are additive. Fifty units is roughly the difference in degree of centering between New York (more centered) and Philadelphia (less centered), or between Portland (more centered) and Los Angeles (less centered).

Figure 3-6 Transportation Outcomes versus Sprawl Factors*
Source: Ewing, Pendall, and Chen 2002

	Transportation Outcomes							
	Vehicles per Household	*Transit Share of WorkTrips*	*Walk Share of WorkTrips*	*Mean Travel Time to Work*	*Annual Delay per Capita*	*VMT per Capita*	*Fatalities per 10,0000 Population*	*Peak Ozone Level*
Density factor	−−	++	++			−−	−	−−
Mix factor				−			−	+
Centers factor	−−	++	++	−	−	−	−	−
Streets factor				++	++			
Metro population		+		++	+			++
Average household size	+			++	++			
Percentage of working age	++				++	+		
Per capita income		++		++			−	
Adjusted R^2	0.56	0.67	0.36	0.61	0.63	0.28	0.44	0.40

*+ indicates a positive relationship significant at the 0.05 probability level; ++ a positive relationship significant at the 0.01 probability level; – a negative relationship significant at the 0.05 probability level; and – – a negative relationship significant at the 0.01 probability level.

The mix factor is significant for only three transportation outcomes: as a mitigating influence on travel time to work and fatal accidents and an aggravating influence on the maximum ozone level. The big surprise is that land use mix does not significantly affect other outcomes, including VMT per capita. It may be that land use mix has not been successfully operationalized because of problems with the underlying data sets (Ewing, Pendall, and Chen 2002).

The streets factor is significant for two transportation outcomes, albeit just barely and with unexpected signs. Average travel time for commute trips and annual traffic delay per capita are directly related to the streets factor. Perhaps the reason for this counterintuitive result is that the additional intersections in metro areas with dense street grids translate into more total delay, since most delays occur at intersections rather than on the stretches between them. This is the conventional wisdom among traffic engineers. In any case, street patterns appear to be much less important than land use patterns as correlates of travel and transportation outcomes.

3.1.4 Sprawl versus Congestion

It has been argued that the dispersal of jobs and housing allows residents to live closer to their workplaces than they could if jobs were concentrated in downtown and other centers. It also has been argued that the dispersal of jobs and housing eases traffic congestion by dispersing origins and destinations. These effects, if dominant, would lead to shorter trips and less congestion in sprawling metro areas. But the dispersal of jobs and housing also may result in jobs/housing imbalances across the region, cross commuting, and significantly more VMT per capita than with more compact urban development. The average commute has been getting steadily longer in miles and minutes (Hu and Reuscher 2004). The net effect of sprawl on traffic congestion is unclear a priori.

Evidence from aggregate travel studies suggests that density aggravates congestion, but not much. One study found that congestion rises with population density for counties in California (Boarnet, Kim, and Parkany 1998). Urbanized counties as a group are more congested than rural counties. However, this same study found "surprisingly congested counties that are either rural or on the fringe of urban areas." These fringe counties generate a lot of VMT. We reanalyzed congestion data from that study and, excluding one outlier, computed an elasticity of congestion with respect to density of 0.14.

Another study found little relationship between density and commute time in the largest urban areas (Gordon, Kumar, and Richardson 1989). "Travel times may be long in high- or low-density cities (e.g., New York or Houston) or short (e.g., Los Angeles or Dallas)." Basically, shorter trips and mode shifts in dense areas largely offset any effect of lower speeds.

The Texas Transportation Institute's Urban Mobility database for 85 urbanized areas also shows a weak relationship between density and congestion (Schrank and Lomax 2005). TTI measures congestion in terms of a travel time index; that is, the ratio of travel time in the peak period to travel time at free-flow conditions. A value of 1.35 indicates that a 20-minute free-flow trip takes, on average, 27 minutes in the peak period. In a cross-sectional analysis for 2003, the last year in the series, the elasticity of travel time with respect to population density is 0.085. This elasticity estimate controls for population size because bigger cities have more congestion regardless of their urban form. In a longitudinal analysis for the same 85 urbanized areas using the full TTI data series (1982 to 2003), the elasticity of change in travel time with respect to change in density is 0.107. This elasticity estimate controls for population growth because fast-growing areas have more congestion regardless of how they grow.

Such studies have been criticized for focusing on only one dimension of sprawl: "Other land use dimensions are less well studied in a comparative framework . . . while it is believed that land use patterns may play an important role in mitigating or slowing the growth of congestion in urban areas, few studies have explored the relationship between land use and congestion across more than a small number of urban areas or examined multiple measures of land use beyond population density" (Sarzynski et al. 2006).

In the Smart Growth America study, sprawl factors pulled in opposite directions (Ewing, Pendall, and Chen 2002, 2003). The overall sprawl index was not significantly related to either average commute time or annual traffic delay per capita. Both outcomes were a function primarily of metropolitan area population, and secondarily of other sociodemographic variables. Big metro areas generate longer trips to work and higher levels of traffic congestion. After controlling for population size and other sociodemographic variables, sprawl (overall) did not appear to have an effect on average commute time or annual traffic delay per capita.

Using the same overall metropolitan sprawl index as Ewing, Pendall, and Chen (2002), Kahn (2006) divided metropolitan areas into four categories and found that, relative to workers in compact metro areas, workers in sprawling ones commute an extra 1.8 miles each way. But their commute is still 4.3 minutes shorter; the extra commute distance is more than offset by higher travel speeds. Indeed, commute speed is estimated to be 9.5 mile per hour higher in the sprawling metro areas.

Why is there a difference in the sprawl/commute time relationship between two studies that test the same overall sprawl index? The first study uses U.S. Census commute data, the second American Housing Survey commute data. The first study treats sprawl as a continuous variable, the second as a categorical variable. Whatever their differences, both studies suggest higher VMT in sprawling metro areas than in compact ones.

Another recent study, by Galster and colleagues, related seven dimensions of sprawl to traffic congestion for 50 large metropolitan areas in 2000 (Sarzynski et al. 2006). Controlling for 1990 levels of congestion and changes in an urban area's transportation network and relevant demographics, the study found that density and housing centrality were positively related to year 2000 delay per capita and that housing/job proximity was negatively related to year 2000 commute time.

Differences between this and earlier studies may be due to the use of a lagged model structure, different land use measures, or a different sample of metropolitan areas. Since Sarzynski et al. were unable to study the effect of land use changes between 1990 and 2000 (for lack of sprawl indices for 2000), it is hard to interpret the coefficients of a lagged model. Relationships to delay could be bogus in all of these studies, since the delay measure used by everyone comes from the Texas Transportation Institute and is imputed rather than actually measured in the field. Considering all the evidence from aggregate travel studies, it is reasonable to assume some drop in average travel speeds with rising density. From this literature, we cannot draw any conclusions about travel speeds versus land use mix or other dimensions of sprawl.

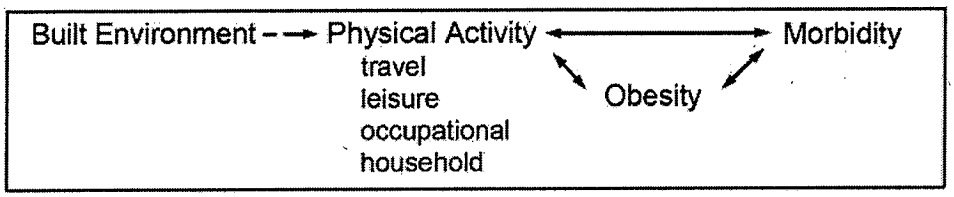
3.2 Disaggregate Travel Studies

Land use/travel studies date from the early 1960s, when urban density was first shown to affect auto ownership, trip rates, and travel mode shares. Around 1990, researchers began to use disaggregate travel data for individuals or households; made some effort to control for other influences on travel behavior, particularly the socioeconomic status of travelers; and tested a wider variety of local land use variables than had earlier studies.

The relationship between urban development patterns and individual or household travel has become the most heavily researched subject in urban planning. There are now close to 100 empirical studies conducted with a degree of rigor—that is, with decent sample sizes, sociodemographic controls, and statistical tests to determine the significance of the various effects (see literature reviews by Badoe and Miller (2000); Crane (2000); Ewing and Cervero (2001); Saelens, Sallis, and Frank (2003); and Heath et al. (2006)). The vast majority of these studies show significant relationships between development patterns and travel behavior. Today, only the direction of causality and strength of effects seems to be seriously debated.

When funding from public health sources became available after 2000, planning researchers morphed into physical activity researchers, and the literature grew even further (see reviews by Frank (2000), Frank and Engelke (2001, 2005), Lee and Moudon (2004), Owen et al. (2004), Badland and Schofield (2005), and Handy (2006)). Both types of physical activity—for transportation and for exercise—were studied together for the first time, and the physical environment was measured comprehensively in terms of development patterns and physical activity settings (see Figure 3-7). Again, nearly all studies show significant relationships. And, again, the debate is mainly over the direction of causality and effect sizes. A special Winter 2006 issue of the *Journal of the American Planning Association* was devoted to this new research.

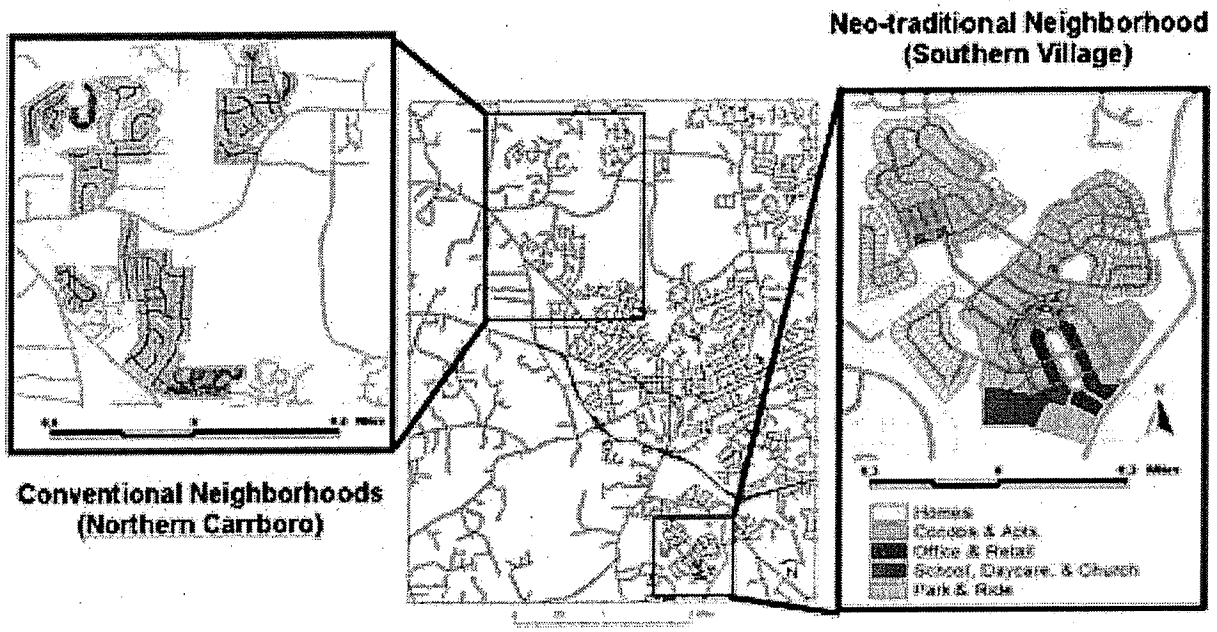
Figure 3-7 Causal Pathways Linking the Built Environment to Health
Source: Ewing et al. 2003.



3.2.1 Accessibility Again

The concept of sprawl seems particularly tailored to large areas such as metropolitan areas and their component counties. The degree to which employment is concentrated in central business districts or suburban centers, for example, is a characteristic of an entire metro area, not of an individual community or neighborhood. Yet there are analogous measures for subareas as small as neighborhoods (see Figure 3-8), and these analogous measures have been studied in depth for their relationships to trip frequency, trip distance, and mode choice.

Figure 3-8 Neighborhoods with Different Designs and Travel Characteristics in Chapel Hill, North Carolina
Source: Khattak and Rodriquez 2005.



Accessibility influences the way household needs are met through travel. Two types of accessibility have been shown to be significant. One is ease of access to activities from one's place of residence, the other ease of access to activities from other activities.

Residential accessibility affects the destination, mode and, arguably, even the frequency of home-based trips. It has been the focus of nearly all travel and physical activity research. However, the relevant environment for many trips is someplace other than home. Non–home based trips account for 25 to 30 percent of trips in most urban areas, and the percentage is growing as people's complex lives cause them to link trips into complex tours.

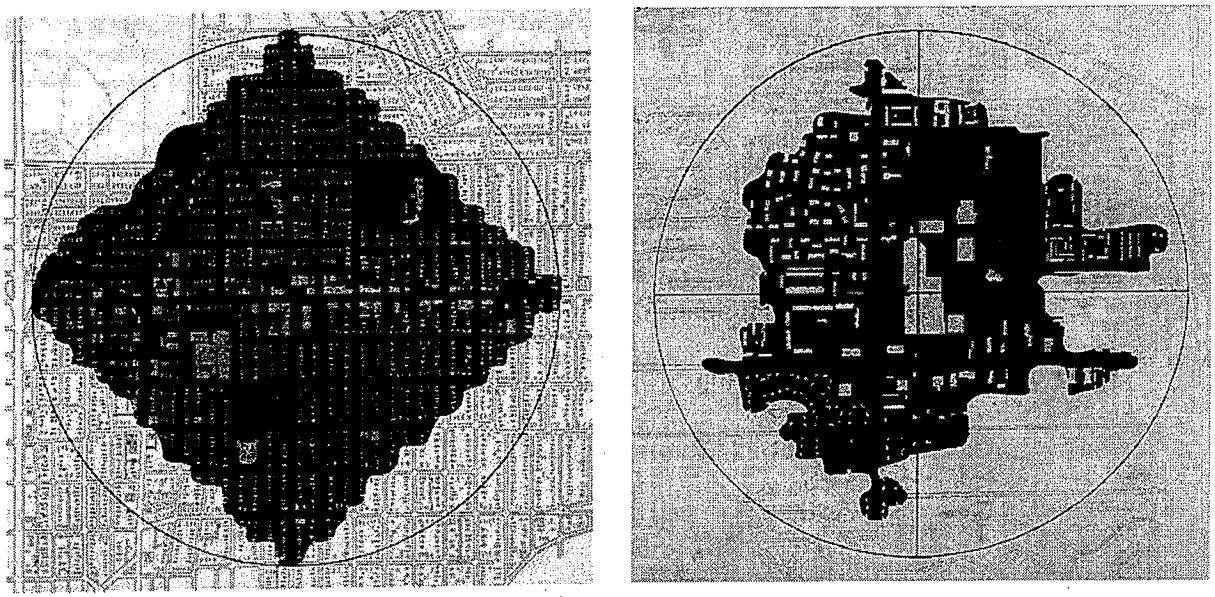
Trip chaining, or the linking of trips into tours, has been increasing over time (Levinson and Kumar 1995; McGuckin, Zmud, and Nakamoto 2005). Trips are more likely to be linked into long tours in areas of poor residential accessibility, simply because this is a way for households living in sprawl to economize on travel (Ewing, Haliyur, and Page 1994; Ewing 1995; Krizek 2003; Limanond and Niemeier 2004; Noland and Thomas 2006). The more sprawling the area, the more important it becomes to concentrate common destinations in centers, so a single auto trip can meet multiple needs. Conservatively, the ability to link trips in tours cuts overall household travel by 15 to 22 percent relative to separate trips for the same purposes (Oster 1978).

3.2.2 Measuring the Five Ds

In travel research, urban development patterns have come to be characterized by "D" variables. The original "three Ds," coined by Cervero and Kockelman (1997), are density, diversity, and design. The Ds have multiplied since then, with the addition of destination accessibility and distance to transit. If we could think of an appropriate label, parking supply and cost might be characterized as a sixth D.

Density usually is measured in terms of persons, jobs, or dwellings per unit area. Diversity refers to land use mix. It often is related to the number of different land uses in an area and the degree to which they are "balanced" in land area, floor area, or employment. Design includes street network characteristics within a neighborhood (see Figure 3-9). Street networks vary from dense urban grids of highly interconnected, straight streets to sparse suburban networks of curving streets forming "loops and lollipops." Street accessibility usually is measured in terms of average block size, proportion of four-way intersections, or number of intersections per square mile. Design also is measured in terms of sidewalk coverage, building setbacks, streets widths, pedestrian crossings, presence of street trees, and a host of other physical variables that differentiate pedestrian-oriented environments from auto-oriented ones.

Figure 3-9 Destinations within One-Quarter Mile of Center for Contrasting Street Networks in Seattle
Source: Moudon et al. 1997.



Destination accessibility is measured in terms of the number of jobs or other attractions reachable within a given travel time, which tends to be highest at central locations and lowest at peripheral ones. Distance to transit usually is measured from home or work to the nearest rail station or bus stop by the shortest street route.

3.2.3 D Variables versus VMT and VT

The D variables have a significant effect on the overall VMT and VT of individuals and households, mostly through their effect on the distance people travel and the modes of travel they choose (Ewing and Cervero 2001). Trip frequencies appear to be primarily a function of travelers' socioeconomic and demographic characteristics and secondarily a function of the built environment; trip lengths are primarily a function of the built environment and secondarily of socioeconomic and demographic characteristics; and mode choices depend on both, though probably more on socioeconomics.

Trip lengths are generally shorter at locations that are more accessible, have higher densities, or feature mixed uses. This holds true for both the home end (that is, residential neighborhoods) and nonhome end (activity centers) of trips. Alternatives to the automobile claim a larger share of all trips at higher densities and in mixed-use areas. Walk mode shares can rise to 20 percent or more in mixed-use neighborhoods even without high-quality transit service (see Figure 3-10).

These studies indicate that transit use varies primarily with local densities and secondarily with the degree of land use mixing (see Figure 3-11). Some of the density effect is, no doubt, due to shorter distances to transit service. Walking varies as much with the degree of land use mixing as with local densities (see Figure 3-12). An unresolved issue is whether the relationship of density to travel behavior is due to density itself or to other variables with which density co-varies, such as good transit service, limited parking, and so forth.

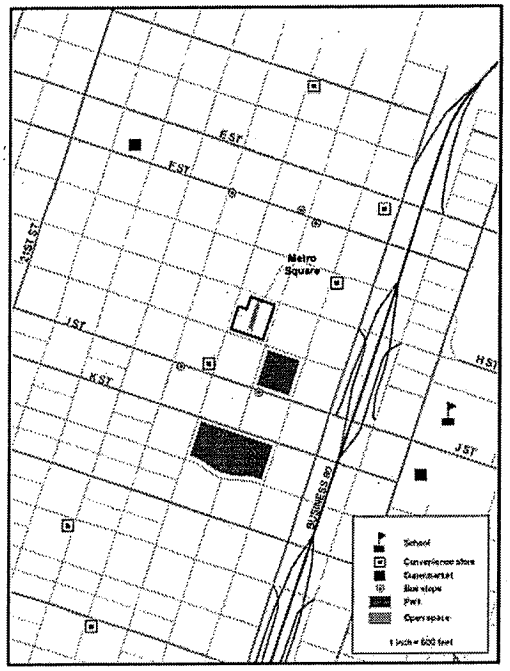


Figure 3-10 Built Environment and Mode Shares of Metro Square in Sacramento, California
Source: NRDC 2000.

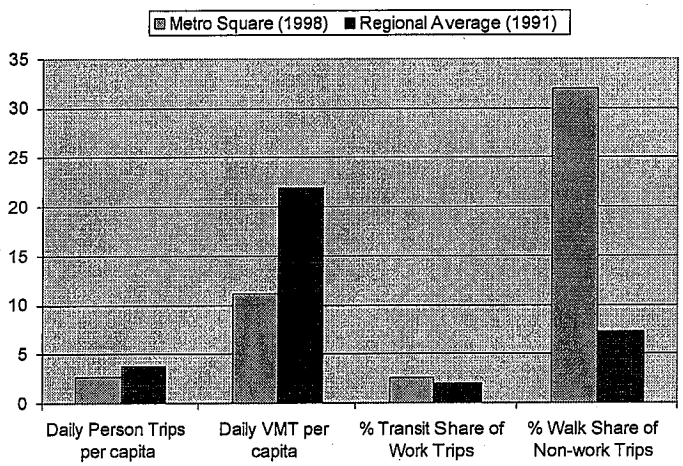
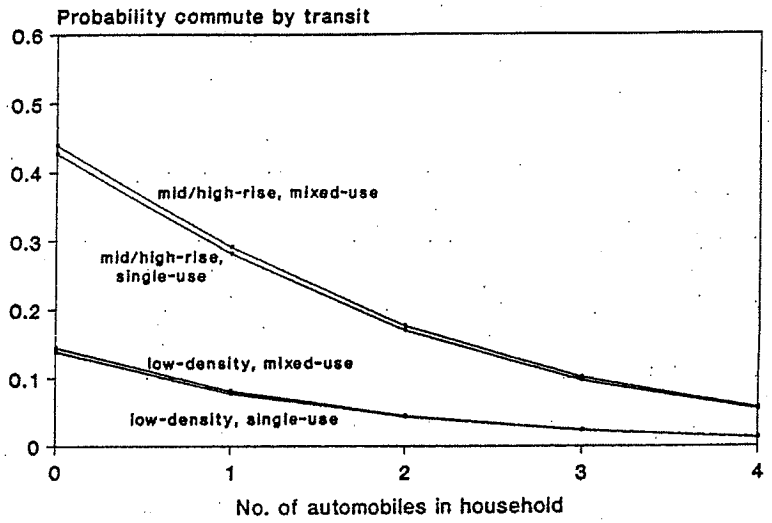


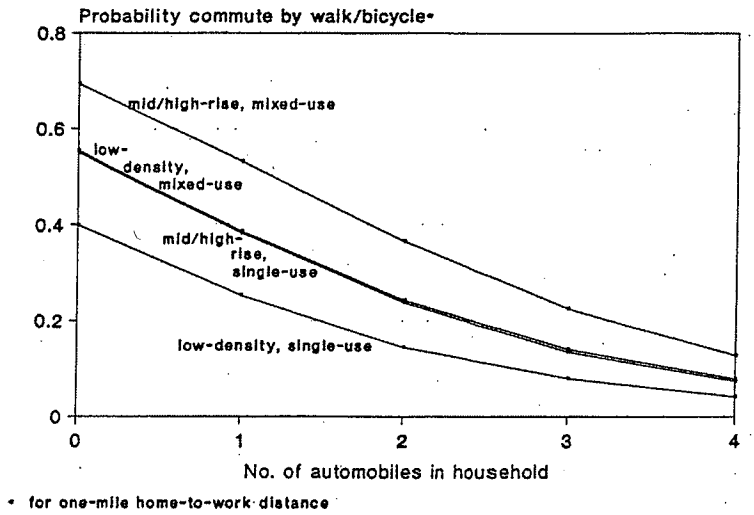
Figure 3-11 Effects of Density and Mixed Use on Choice of Transit for Commutes*
Source: Cervero 1996.



*Data for more than 45,000 U.S. households showed transit use primarily dependent on density of development. At higher densities, the addition of retail uses in neighborhoods was associated with several percentage point higher levels of transit commuting across 11 U.S. metropolitan areas.

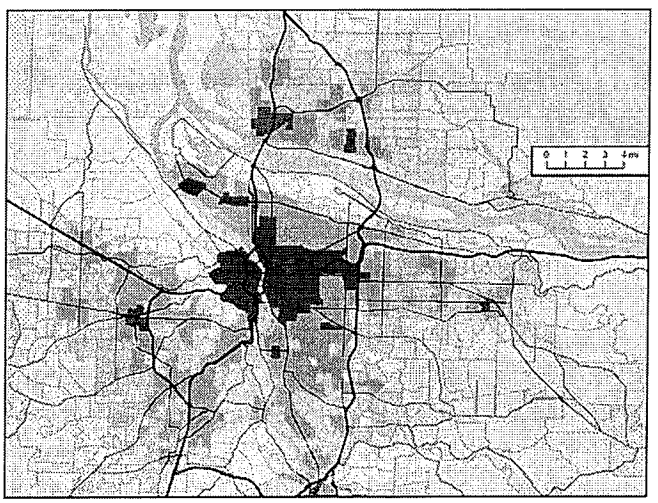
Figure 3-12 Effects of Density and Mixed Use on Choice of Walk/Bike for Commutes*
Source: Cervero 1996.

*Rates of walk and bicycle trips (for a one-mile home-to-work trip) are comparable for low-density, mixed-use neighborhoods as compared with high-density, single-use ones, controlling for vehicle ownership levels.



The third D—design—has a more ambiguous relationship to travel behavior than do the first two. Any effect is likely to be a collective one involving multiple design features. It also may be an interactive effect involving land use and transportation variables. This is the idea behind composite measures such as Portland, Oregon's "pedestrian environment factor" and Montgomery County, Maryland's "transit serviceability index" (see Figure 3-13). Portland's pedestrian environment factor is the sum of four variables related to 1) ease of street crossing, 2) sidewalk continuity, 3) street network connectivity, and 4) topography. Because of the subjective nature of these variables, the pedestrian environment factor has been replaced with an "urban design factor," which is a function of intersection density, residential density, and employment density.

Figure 3-13 Values of the Urban Design Factor across the Portland Metropolitan Area
Source: Portland Metro.



For 14 carefully controlled travel studies, Ewing and Cervero (2001) synthesized the literature by computing elasticities of VMT and VT with respect to the first four Ds—density, diversity, design, and destination accessibility. These summary measures were incorporated into the EPA's Smart Growth Index (SGI) model, a widely used sketch planning tool for travel and air quality analysis. In the SGI model, density is measured in terms of residents plus jobs per square mile; diversity in terms of the ratio of jobs to residents relative to the regional average; and design in terms of street network density, sidewalk coverage, and route directness (two of three measures relating to street network design). These are just a few of the many ways in which the 3Ds have been operationalized at the neighborhood level (see literature review, Ewing and Cervero 2001).

Figure 3-14 presents elasticities of VT and VMT with respect to the four Ds. An elasticity is a percentage change in one variable with respect to a 1 percent change in another variable. Hence, from the elasticities presented in Figure 3-14, we would expect a doubling of neighborhood density to result in approximately a 5 percent reduction in both VT and VMT, all other things being equal. The effects of the four Ds captured in this table are cumulative. Doubling all four Ds would be expected to reduce VMT by about one-third. Note that the elasticity of VMT with respect to destination accessibility is as large as the other three combined, suggesting that areas of high accessibility—such as center cities—may produce substantially lower VMT than dense mixed-use developments in the exurbs.

Figure 3-14 Typical Elasticities of Travel with Respect to the Four Ds
Source: Ewing and Cervero 2001.

	Vehicle Trips (VT)	Vehicle Miles Traveled (VMT)
Local Density	–.05	–.05
Local Diversity (Mix)	–.03	–.05
Local Design	–.05	–.03
Regional Accessibility	– –	–.20

3.2.4 Meta-Analysis of Disaggregate Travel Studies

Since Ewing and Cervero's 2001 literature review, the published literature on the built environment and travel has mushroomed. A more recent review identified 40 published studies of the built environment and travel, and selected 17 that met minimum methodological and statistical criteria (Leck 2006). While the analysis stopped short of estimating average effect sizes, it did evaluate the statistical significance of relationships between the built environment and travel. Residential density, employment density, and land use mix were found to be inversely related to VMT at the $p < 0.001$ significance level.

The number of rigorous studies now exceeds 100, including studies examining four or five D variables at once, studies comparing travel behavior across nations, studies focusing on children, and studies accounting for residential preferences that may confound results. The EPA is funding a full-blown meta-study of this ever-expanding literature, which will summarize the most pertinent literature qualitatively and, using standard methods of meta-analysis, will combine individual study results into average elasticities or percentage point adjustments of VMT, VT, and transit use and walking with respect to the D variables. Confidence intervals will be computed for the average values. These summary measures will become available for sketch planning applications.

3.3 Regional Growth Simulations

In the "old days," metropolitan planning organizations (MPOs) developed their plans by testing different transportation alternatives against a single future land use forecast. One alternative might have more highways, another more transit or a new beltway or more arterial street improvements. But future land use patterns were always assumed to be fixed.

Future land use projections typically were extrapolations of recent trends, assumed to be unaffected by additions to urban infrastructure, most importantly by transportation improvements. In other words, future land use patterns were treated as fixed inputs into the analysis, not as variables or possible outcomes.

All that changed in the early 1990s with the advent of regional scenario planning, which matches alternative land use plans with alternative transportation plans. These plans are run through simulation models to project impacts on VMT, land consumption rates, air pollutant emission levels, housing affordability indexes, and other outcome measures. In theory, the most cost-effective plan is adopted.

3.3.1 The Rise of Scenario Planning

Scenario planning got a major boost from the well-publicized success of Portland, Oregon's Land Use, Transportation, Air Quality (LUTRAQ) study, which called for combining light-rail investments with transit-oriented development and travel demand management policies (1000 Friends of Oregon 1997). Portland Metro, the regional government, turned down a proposed western bypass beltway in favor of the LUTRAQ plan when regional travel forecasts showed the LUTRAQ alternative would produce significantly fewer VMT and lower levels of congestion than would trend development with the new freeway (see Figure 3-15).

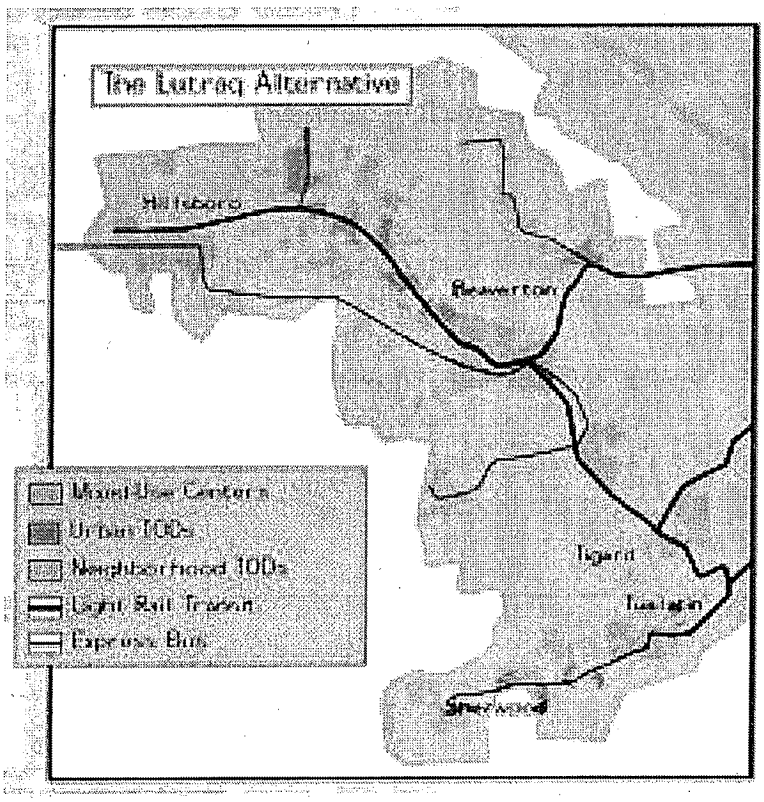
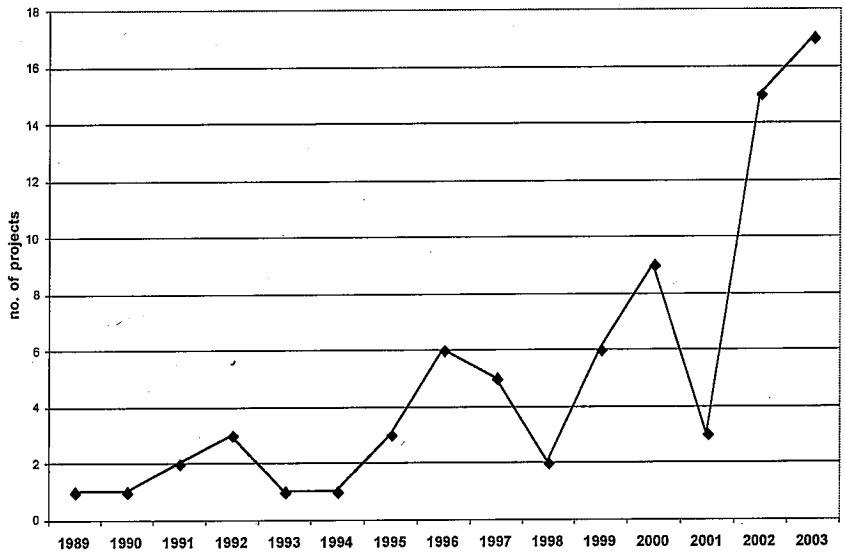


Figure 3-15 The LUTRAQ Plan for the Western Portland Metro
Source: 1000 Friends of Oregon 1997.

The number of scenario planning studies undertaken in the United States has grown dramatically since LUTRAQ (see Figure 3-16). Regional scenario planning has transitioned from state-of-the-art to state-of-the-practice at MPOs (Ewing 2007). Such studies also have become common outside the United States (Johnston 2006). In fact, many advances in integrated land use/transportation modeling have come from outside the United States.

Figure 3-16 Number of Scenario Planning Projects by Completion Date
Source: Bartholomew 2007.



3.3.2 The Scenario Planning Process

The typical scenario planning process compares a "trend" scenario to one or more alternative future "planning" scenarios. In the trend scenario, urban development and transportation investment patterns of the recent past are assumed to continue through the planning horizon (20 to 50 years in the future). The trend scenario—usually some version of urban sprawl—is assessed for its impacts on VMT and other regional outcomes.

This is followed by the formulation of one or more alternative futures that vary with respect to land use and transportation. Compared to the trend scenario, the planning alternatives usually have higher gross densities, mix land uses to a greater extent, and/or channel more development into urban centers. They may incorporate a variety of transportation infrastructure investments and pricing policies. One alternative may invest more in transit lines, another might invest more in high-occupancy-vehicle (HOV) lanes.

These alternative scenarios are then assessed for their impacts using the same travel forecasting models and same set of outcome measures as with the trend scenario. Vehicle miles traveled is almost always among the outcomes forecasted. The resulting comparison of scenarios can provide the basis for rational urban policy development.

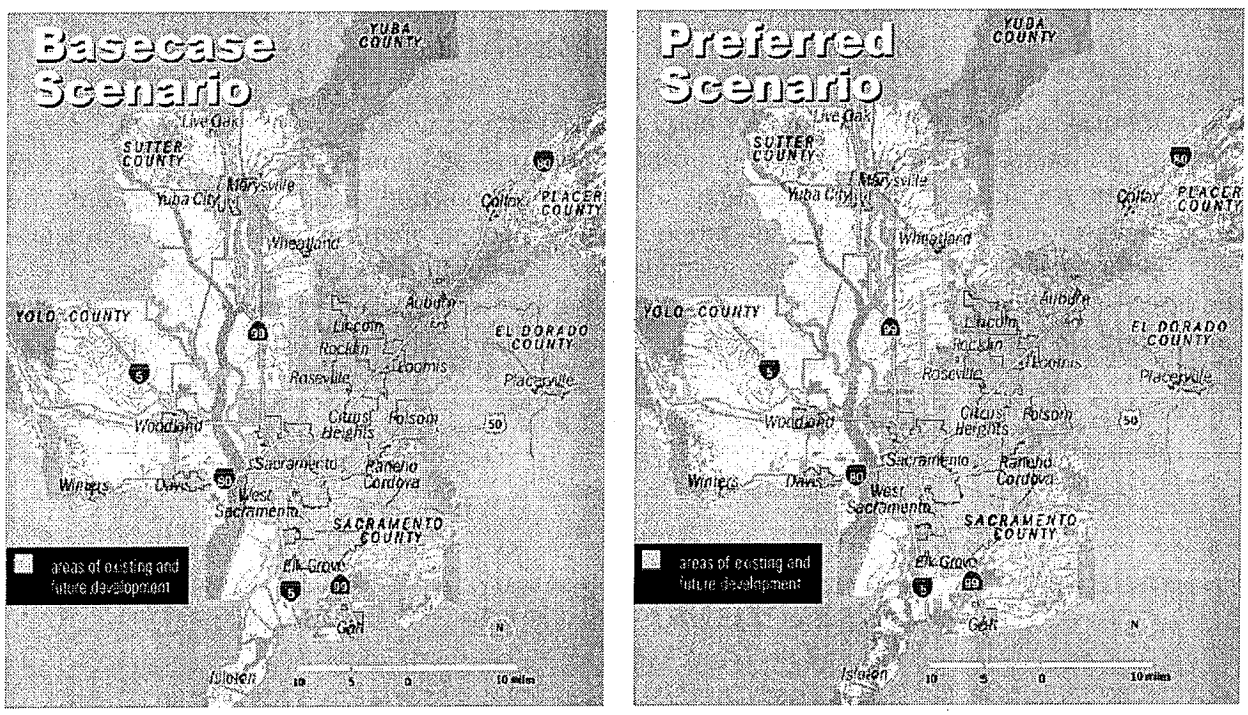
3.3.3 Case Study: The Sacramento Region Blueprint Study

A leading example of scenario planning technique comes from the Sacramento region. Concerned about dispersed future growth patterns, housing, transportation, and air quality, the Sacramento Area Council of Governments initiated the Sacramento Region Blueprint Transportation–Land Use Study to craft a future growth strategy for the region (SACOG undated). Scenarios were constructed through a bottom-up process, starting at the neighborhood level. At a series of 25 neighborhood workshops,

citizen participants were shown future "business as usual" development scenarios for their neighborhoods. Participants then were asked to develop a series of smart growth alternative scenarios, which were fed into a geographic information systems (GIS) modeling program that provided real-time assessments of each scenario's land use and transportation impacts.

The neighborhood scenarios provided the basis for countywide scenarios. Four scenarios were crafted for each of the region's six counties—a trend scenario plus three alternatives that combined different growth rates, land use mixes, housing types, densities, and infill/redevelopment proportions. These scenarios were analyzed for their land use and transportation impacts, creating information for several countywide workshops. The output of those workshops provided the basis for four regional-scale scenarios. Regionwide workshops then led to the creation of a fifth scenario—with a substantially smaller urban footprint than the so-called base case or trend—that ultimately was selected as the preferred option (see Figure 3-17).

Figure 3-17 Urban Footprints of Base Case and Preferred Scenarios for the Sacramento, California, Region
Source: SACOG (2005).



As illustrated in Figure 3-18, transit use and walking/bicycling increase and VMT decreases in the Sacramento region as the levels of density and infill development increase. The preferred scenario from the blueprint project is now being implemented through amendments to local government land use plans and through the region's long-range transportation plan.

Figure 3-18 Selected Data for Scenarios from the Sacramento Region Blueprint Study
Source: SACOG (2005).

Scenarios	Single-Family: Multifamily Hou	% Housing Growth throu Infill	% Auto Trips	% Transit	% Walk/Bi	Daily VM per House
A: Business as usual (trend)	75:25	27.0	91.0	1.6	7.3	51.08
B: Higher housing densities A, with growth focused at th urban fringe	67:33	39.0	83.2	4.0	12.7	37.60
C: Higher housing densities A, with growth focused on central infill sites	65:35	38.3	81.8	4.8	13.4	36.70
D: Higher housing and employment densities, with growth focused on central in sites	64:36	44.0	79.9	4.8	15.3	35.70
Preferred Scenario	65:35	41.0	83.9	3.3	12.9	34.90

3.3.4 A Sample of Regional Scenario Studies

An open-ended survey was conducted in 2003/2004 to gather information on current and past scenario planning practices (Bartholomew 2007). The survey initially was sent to the planning directors of 658 member organizations in the National Association of Regional Councils (NARC). Additional surveys were sent to members of the Association of Metropolitan Planning Organizations that were not also NARC members. Responses to the two surveys were supplemented by hundreds of e-mails, telephone calls, and Internet searches, resulting in an initial data pool of 153 studies.

This initial pool was subjected to a threshold analysis to determine whether the studies actually used land use/transportation scenario planning techniques. The primary discriminating criterion was whether future land use inputs—such as the density, diversity, design, and destination accessibility of growth—varied across scenarios. Those that held land use patterns static were excluded from the data set. This left a total of 80 studies, spread geographically across the country. Large and fast-growing regions are overrepresented in the sample.

Most studies test three or four scenarios (including a trend scenario) that vary in density, mix, and arrangement of future land uses. Half of the studies also test alternative transportation infrastructure investments. Twelve incorporate a transportation pricing element. Three-quarters of the studies evaluate scenarios for transportation impacts; more than half for impacts on open space and resource lands; 33 for impacts on criterion air pollutants; 18 for impacts on fuel use; and ten for greenhouse gas emissions (Bartholomew 2005).

A subset of 23 studies was selected for this publication, based on three criteria: simulations conducted at the regional scale, consistent population and employment totals across the scenarios, and availability of data for all scenarios on density, population growth, and VMT. Together, these studies tested a total of 85 regional development scenarios—one trend scenario per study, plus 62 planning scenarios that could be compared to trend.

3.3.5 Differences across Scenarios

The percentage difference in regional VMT for each planning scenario, relative to its respective trend scenario, is shown in Figure 3-19. Each bar represents a different planning scenario; the value shown is the percentage difference between that scenario and the study's trend scenario. Across studies, the median reduction in regional VMT is 5.7 percent, none too impressive. However, there is wide variation in values across scenarios, from + 5.2 percent to –31.7 percent, which suggests that regional growth patterns may have a substantial impact in the best case scenario.

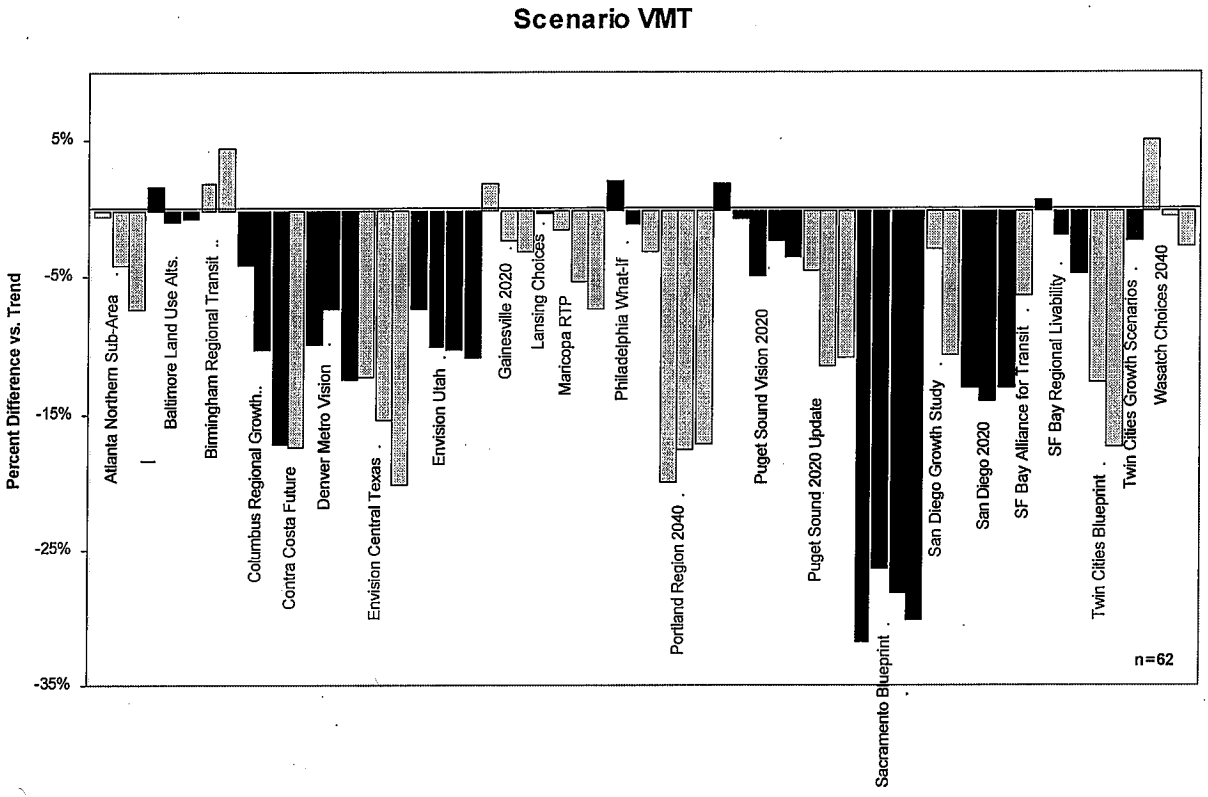
Why is there so much difference in VMT across scenarios? Bartholomew identifies many of the potential sources of variation that could be considered in a meta-analysis. These, with their presumed impact on VMT, include the following:

- nature of the scenarios (denser, more mixed, and more centered ones result in bigger VMT reductions);
- planning time horizon (longer horizons result in bigger VMT reductions);
- rate of growth (more growth that can be redirected results in bigger VMT reductions);
- reallocation of transportation dollars (higher transit investments result in bigger VMT reductions); and
- addition of travel demand management strategies (higher costs of automobile travel result in bigger VMT reductions).

While a few planning scenarios are more dispersed than trend, the great majority are more compact (see Figure 3-20). The median increase in regional density of planning scenarios over trend is 13.8 percent. Here, again, there is wide variation across scenarios, from a 14.8 percent lower density for the most dispersed scenario to a 64.3 percent higher density for the most compact scenario.

The two variables are plotted against one another in Figure 3-21. As anticipated, this simple scatter plot shows that higher scenario densities are associated with greater VMT reductions relative to the trend. The relationship appears strong and linear.

Figure 3-19 VMT Differences for 62 Scenarios Relative to the Trend Scenario*
Source: Bartholomew 2005.



*Additional information about most of these projects is available through a digital library on scenario planning maintained by the University of Utah (http://www.lib.utah.edu/digital/collections/highways/).

Figure 3-20 Scenario Densities for 62 Planning Scenarios Relative to the Trend Scenario
Source: Bartholomew 2005.

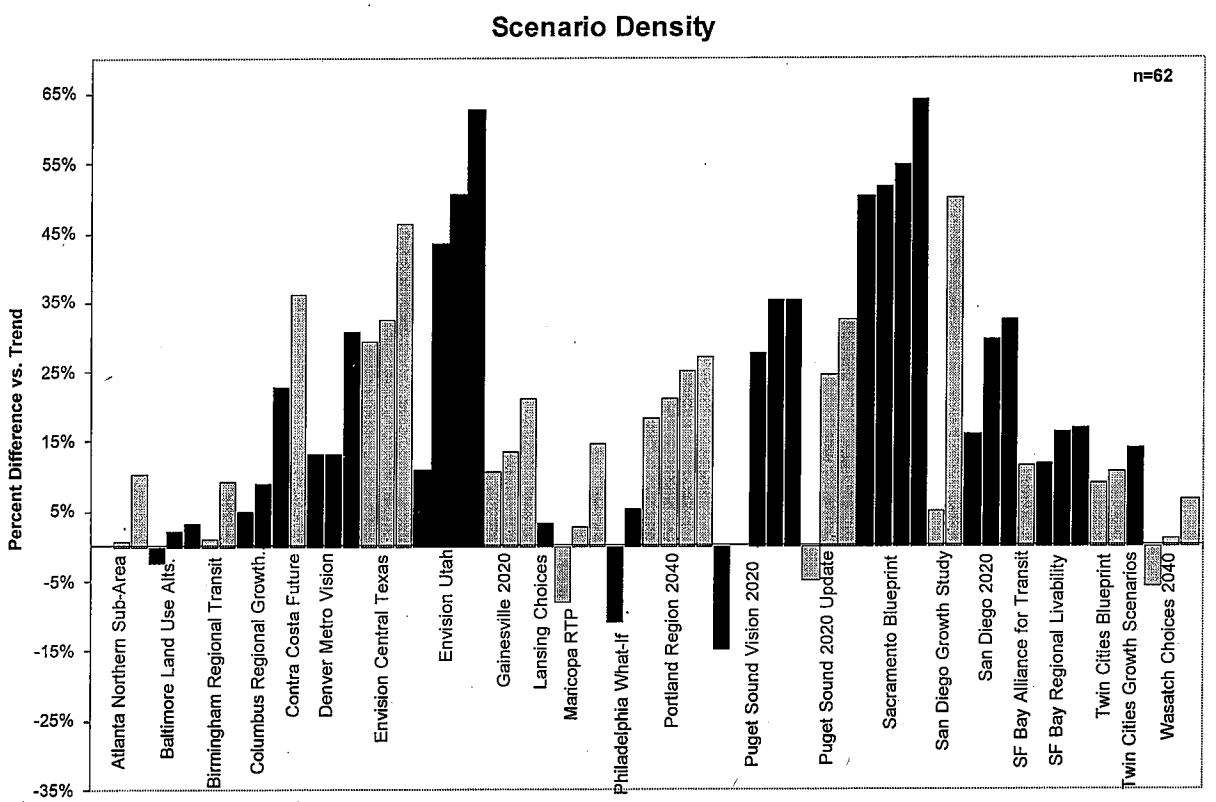
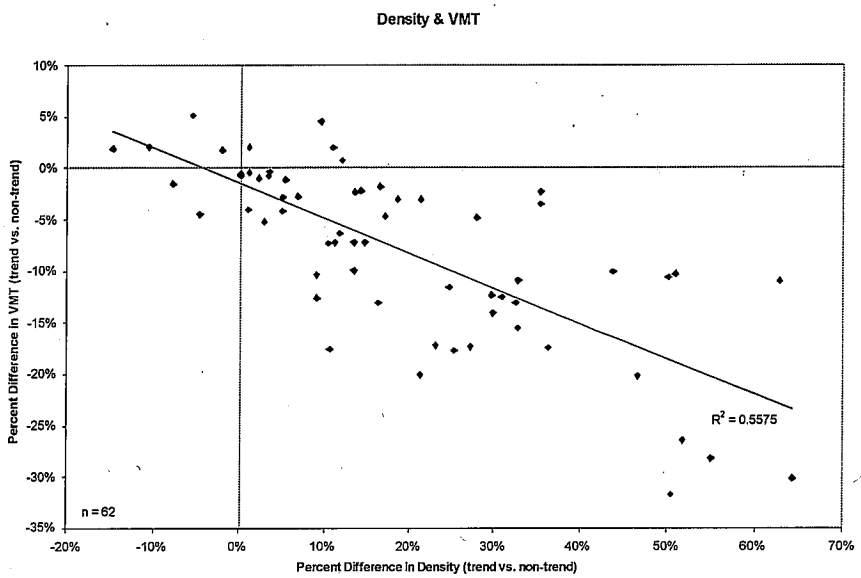
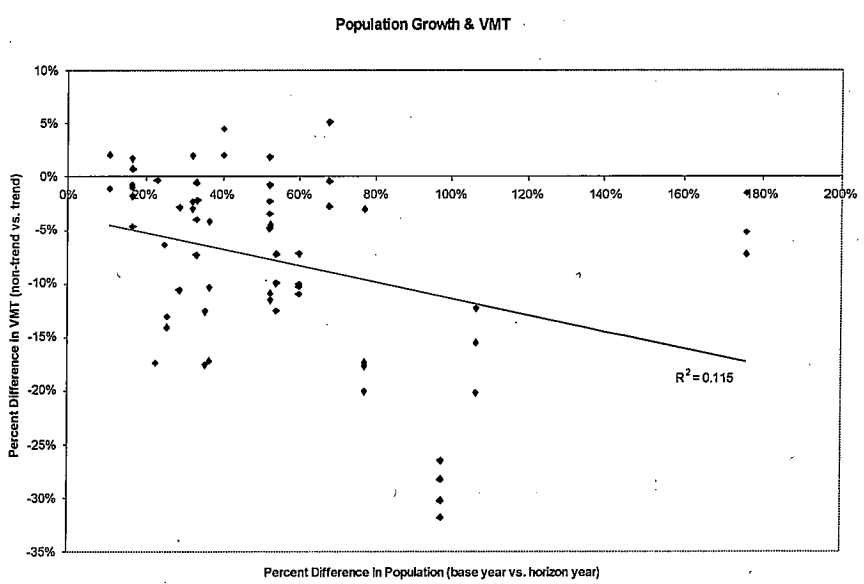


Figure 3-21 VMT versus Density for 62 Planning Scenarios Relative to the Trend
Source: Bartholomew 2005.



While much VMT reduction may be accounted for by higher densities, the scatter around the regression line in Figure 3.21 suggests that other factors also are at work. Figure 3-22 plots the percent difference in VMT for each planning scenario relative to trend against the percent population growth during the planning period for the metropolitan region as a whole (from base year to target year). Again, a correlation is apparent. The greater the increment of population growth that can be redirected in a planning scenario, the greater the difference in VMT. The growth increment is a function of both planning horizon (the further out, the more growth can be reallocated) and growth rate (the higher the growth rate, the more growth can be reallocated).

Figure 3-22 Percent Difference in VMT versus Percent Increase in Population for Planning Scenarios Relative to the Trend
Source: Bartholomew 2005.



Other variables may contribute to VMT changes as well. Several were represented by dummy variables in this meta-analysis. A dummy variable is a variable that assumes a value of one or zero, depending upon whether a condition is met. Dummies are regularly used to represent categorical variables in analyses such as this.

Lacking numeric data on these variables, we relied on narrative descriptions of scenarios in study documents to create dummy variables. For example, one dummy variable was used to distinguish between scenarios that mix and balance residential and commercial land uses to a high degree (assigned a value of one), and scenarios that mix and balance land uses only to the same degree as in trend development (assigned a value of zero). Some of the dummies were specific to scenarios; others were specific to regions and/or studies.

3.3.6 Meta-Analysis of Regional Simulation Studies

With so many independent variables, it becomes hard to discern relationships from simple scatter plots. This is a multivariate problem that requires a multivariate analysis to isolate the effect of each independent variable on the dependent variable, holding the other variables constant.

The analysis is further complicated by the multilevel nature of the data structure. Scenarios are "nested" within regions, with the typical region having two or three alternatives to the trend. Scenarios for the same region are not independent of each other, as they share the characteristics of their respective regions. Thus, standard (ordinary least squares) regression analysis cannot be used to analyze this multivariate data set. Rather, a hierarchical or multilevel modeling technique is required.[23]

A hierarchical linear model was estimated for the continuous outcome, percent difference in VMT relative to trend. Independent variables tested were at two levels, those specific to scenarios and those specific to studies (the latter common to all scenarios for a given region). Independent variables specific to scenarios were as follow:

- percent difference in gross density relative to trend development (–15 percent to +64 percent);
- development centralized/infill emphasized (one if yes, zero if no); and
- land uses highly mixed (one if yes, zero if no).

Independent variables common to scenarios for a given region but different across regions/studies are as follow:

- percent population growth increment relative base population (10 percent to 176 percent);
- auto use priced higher (one if yes, zero if no); and
- transportation investments coordinated with land uses (one if yes, zero if no).

---

[23] For region-level characteristics, ordinary least squares (OLS) regression analysis would underestimate standard errors of regression coefficients and would produce inefficient regression coefficient estimates. Hierarchical modeling overcomes these limitations, accounting for the dependence of scenarios for the same region and producing more accurate regression coefficient and standard error estimates (Raudenbush and Byrk 2002). Within a hierarchical model, each level in the data structure is represented by its own submodel. Each submodel captures the structural relations occurring at that level and the residual variability at that level. To represent such complex data structures, this study relied on HLM 6 (Hierarchical Linear and Nonlinear Modeling) software.

The best-fit model is presented in Figure 3-23. For theoretical reasons, the model was estimated with no constant term (as a regression through the origin). If nothing changes from trend, there should be no reduction in regional VMT. There are three significant influences on VMT: the population growth increment, centralized development, and mixed land use. All three are associated with decreases in VMT relative to trend. The increase in density relative to trend has the expected sign but falls just short of significance. Coordinated transportation investment also has the expected sign but is not significant.

The elasticity of VMT with respect to the population growth is –0.068, meaning that there is a 0.068 percent decrease in VMT per capita for every 1 percent increase in population relative to the base year. This does not argue for population growth per se, but simply indicates that regions that are growing rapidly have more opportunity to evolve toward a compact urban form than regions that are growing slowly.

Centralization of regional development and mixing of land uses both are inversely related to VMT at the 0.05 probability level. From their coefficients, we would expect a 1.5 percent drop in regional VMT with centralized development, and a 4.6 percent drop in regional VMT with mixed-use development (after controlling for other variables).

While the regional density variable is not statistically significant, our best guess at the elasticity of VMT with respect to regional density is –0.075, meaning that there would be a 0.075 percent decrease in VMT for every 1 percent increase in population density. This is a little higher than the elasticity estimate from the disaggregate travel studies in section 3.2. The density variable likely is soaking up some of the effect of other D variables that are not adequately represented in the regional growth simulations.

The coordinated transportation investment variable also is not statistically significant. Again, our best estimate of the impact of coordinated transportation investments, controlling for other variables, is a 2.1 percent reduction in regional VMT.

When forced into the model, the imposition of transportation pricing policies has a positive coefficient, suggesting that it would lead to higher VMT. This counterintuitive result is discussed in section 3.3.9.

Plugging realistic numbers into the best-fit model in Figure 3-23, we can estimate the VMT reduction associated with a shift to compact development. If such a shift increases average regional density by 50 percent in 2050, emphasizes infill, mixes land uses to a high degree, and has coordinated transportation investments, it would be expected to reduce regional VMT by about 18 percent over 43 years at an average metropolitan growth rate of 1.3 percent annually.[24]

[24] Computed as –0.074*50 – 1.50*1 – 4.64*1 – 0.068*73 – 2.12*1. The 73 in the preceding formula represents a growth increment of 73 percent, or 43 years at an average growth rate of just over 1.28 percent per year.

Figure 3-23 Best-Fit Model of Percent VMT Reduction Relative to Trend (with Robust Standard Errors)

	Coefficient	t	P
Difference in density (% above trend)	–0.074	–1.48	0.15
Development centralized	–1.50	–2.13	0.037
Land uses mixed	–4.64	–2.15	0.036
Population growth increment (% over base)	–0.068	–2.02	0.056
Transportation coordinated	–2.12	–1.01	0.33

3.3.7 The Conservative Nature of Scenario Forecasts

This forecasted reduction in regional VMT with compact development is almost surely an underestimate due to limitations of the travel demand models used in these studies. It is widely known, and oft-stated, that conventional regional travel models of the type used in most regional scenario studies are not sensitive to the effects of the first three Ds—density, diversity, and design (Walters, Ewing, and Allen 2000; Johnston 2004; Cervero 2006; DKS Associates and University of California 2007; Beimborn, Kennedy, and Schaefer undated). Conventional models can simulate land use and transportation system effects on travel at the gross scale of a region, but not at the fine scale of a neighborhood. In particular, they cannot account for the micromixing of land uses, interconnection of local streets, or human-scaled urban design. Most do not even consider walk or bike trips, adjust vehicle trip rates for car shedding at higher densities, or estimate internal trips within mixed-use developments.[25]

[25] What is missing from conventional travel demand models are five D variables. The following is true of nearly all conventional four-step models: 1) Only trips by vehicle are modeled, and trip rates are related only to characteristics of people, not characteristics of place. The possibility of households in urban settings making fewer vehicle trips—and instead using nonmotorized modes—is not considered. 2) Households, jobs, and other trip generators are assumed to be located at a single point, the zone centroid, and the entire local street network is reduced to one or more centroid connectors to the regional street network. This precludes the modeling of intrazonal travel in terms of the local built environment. 3) The choice between transit and auto modes is modeled solely in terms of characteristics of travelers and modes. The characteristics of origins and destinations—their transit-friendliness and walkability—are disregarded. 4) Trips are treated as unlinked, when a majority of trips nowadays are part of tours (trip chains) in which each trip depends on the trips preceding and following it, in a linked fashion. Destinations doubtless are chosen based not only on the attractions they contain, but also based on their accessibility to other trip attractions. 5) Trip attractions are summed for component land uses in a given zone, with each use treated as independent of the others. Yet mixed-use development is known to generate fewer vehicle trips than the component uses individually. 6) Daily travel is allocated to the peak hour based on fixed factors, disregarding the tendency for peak spreading when land uses become concentrated enough to produce serious peak-hour congestion. Peak spreading is the rescheduling of trips from the peak hour to the shoulders of the peak.

These failings and others have prompted:

- the U.S. Department of Transportation to spend millions of dollars developing a new generation of travel demand models under the Travel Model Improvement Program;
- the U.S. EPA to develop the Smart Growth Index model;
- leading MPOs such as Portland Metro (for the LUTRAQ study) to enhance their conventional "four-step" models with additional steps and feedback loops; and
- other leading MPOs to post-process model outputs or develop direct transit ridership models.

How much additional VMT reduction might be achieved with compact development, beyond that forecasted in regional growth simulations? To a first approximation, we can think of conventional travel models as accounting for one of the D variables, destination accessibility. The effects of the other D variables, outlined in section 3.2, are largely neglected. Were they factored into the analyses, one could easily reach VMT reductions of 20 percent or more.

3.3.8 Regional Growth and Vehicle Emissions

Our sample of regional growth studies is not large enough, and the studies themselves are not sophisticated enough, to support meta-analyses of impacts of smart growth on other outcomes (beyond VMT). At most, they support qualitative statements and inferences.

Vehicle emissions, including CO_2, are not merely a function of VMT, but also reflect the numbers of cold starts plus vehicle operating speeds (see section 2.3). Figure 3-24 shows that for many scenarios, an increase in density is associated with a drop in average peak hour operating speeds—an outcome that could result in increased emissions because gasoline engines function more efficiently at higher speeds.

Figure 3-24 Percent Differences in Peak Hour Average Speed versus Density for Planning Scenarios Relative to Trend

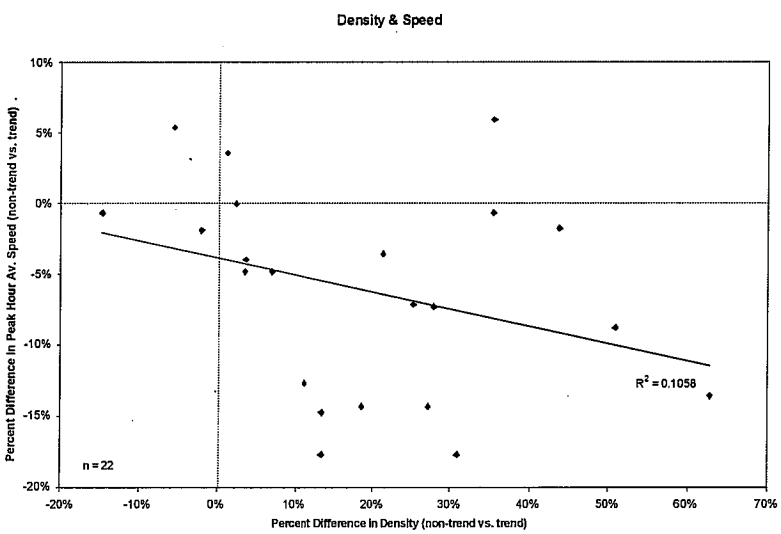


Figure 3-25. Percent Difference in NOx Emissions versus Percent Difference in Density for Planning Scenarios Relative to the Trend

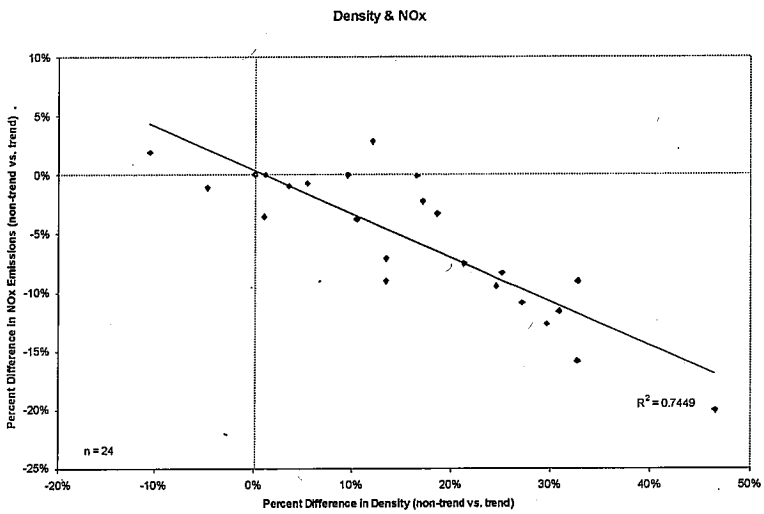
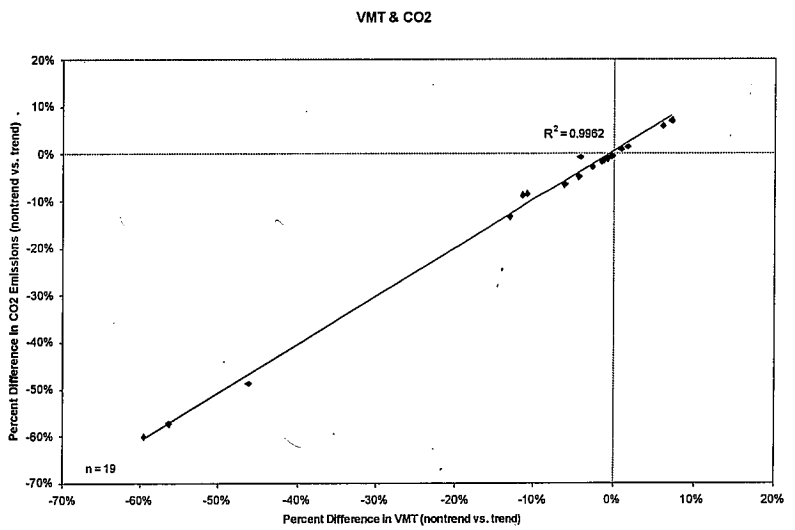


Figure 3-25 plots nitrogen oxide (NOx) emissions versus density differences for 24 planning scenarios. The scatter plot shows a strong association between the two variables. The strength of the association appears equivalent to that between VMT and density. Because most or all of these studies use vehicle emission models that account for differences in vehicle operating speeds, we can reasonably conclude from these data that any effect of density on emissions through vehicle operating speeds is overwhelmed by the effect of density on emissions through VMT. As with the observations above on energy consumption and speed (Figure 3-4), compact development is associated with lower emissions, notwithstanding possible reductions in vehicle speeds.

Data on regional CO_2 emissions are more limited. The scarcity of the forecasts indicates that the agencies undertaking scenario planning studies—primarily MPOs—have not focused on carbon emissions as a planning issue. Figure 3-26 plots VMT versus CO_2 differences for 19 planning scenarios. The near-perfect correlation and the elasticity value close to 1.0 suggest the multiplication of VMT by some constant factor to arrive at CO_2 forecasts.

Figure 3-26 Percent Difference in VMT and CO_2 Emissions for Planning Scenarios Relative to Trend



3.3.9 Regional Growth and Transportation Pricing

The meta-analysis in section 3.3.6 produced one anomalous result. When forced into the model, the imposition of transportation pricing policies has a positive coefficient, suggesting that it would lead to higher VMT. This is probably explained by confounding variables and the small sample of studies that actually test pricing policies.

In theory, the impact of pricing schemes on land development patterns could be positive or negative, depending on the pricing scheme. Increasing the price of driving (roads or parking) in only one part of a metropolitan region or along only a limited number of corridors could shift future economic and development activity away from the priced area or corridors and toward areas that are unpriced (Deakin et al. 1996). This could increase overall driving and VMT. Using an areawide pricing approach, however, could result in a concentration of future growth. This would occur as households and businesses seek to reduce or avoid the extra costs (Komanoff 1997). Some simulation-based evidence supports this conclusion (Gupta, Kalmanje, and Kockelman 2006).

If transportation pricing is ultimately adopted as a strategy to reduce VMT and CO_2, compact development could prove useful in both cushioning the blow to household budgets and enhancing the travel reduction effects (see Cambridge Systematics 1994). The LUTRAQ project, which was not included in the meta-analysis, provides data that support this conclusion. The project compared three scenarios: 1) a trend scenario that assumed the continuation of recent development practices and transportation investments, including a new highway; 2) the same scenario with an areawide parking pricing/free transit pass policy added;[26] and 3) a transit-oriented development scenario (LUTRAQ) with two additional rail lines and the same parking/transit pass component. Adding the LUTRAQ land use/transit element to the pricing/subsidy package tripled reductions in NOx and nearly quadrupled reductions in VMT and CO_2 emissions (see Figure 3-27).

Figure 3-27 Percentage Reduction in Transportation Outcomes with Transportation Pricing, and Pricing and Compact Development Combined
Source: 1000 Friends of Oregon 1996.

	Pricing/Subsidy	LUTRAQ w/ Pricing/Subsidy
Daily VMT	– 2%	– 7.9%
NOx Emissions (kg/day)	– 2.9%	– 8.7%
CO_2 Emissions (kg/day)	– 2%	– 7.9%

[26] The pricing policy assumed an areawide $3.00 per day parking charge for drive-alone work trips. The income was used to provide free transit passes to all commuters in the study area.

3.4 Project-Level Simulations

We also can assess the effects of the built environment through comparisons of VMT and vehicle emissions generated by individual land developments. These comparisons may be based on actual travel diaries or odometer readings for residents of existing developments. Or they may be based on simulations using conventional travel models calibrated and validated for the study region and, in some cases, enhanced to capture the effects of localized variations in density, diversity, and design.

Unlike regional scenario studies, project-level simulations have the advantage of focusing on the subset of the regional population for whom the built environment actually varies. Site plans can vary in density, diversity, or design, without differences in regional location or proximity to transit. Regional location can vary from transit-served brownfields to auto-only greenfields, without any difference in site plans. Or both can vary. The amount of development (housing and employment) generally is held constant in project-level simulations, but acreage may differ across site plans.

3.4.1 Case Study: Atlantic Steel Project XL

The 1999 study of the Atlantic Steel project—now known as Atlantic Station—is a prominent example of project-level simulation with both types of variation. The redevelopment project is on a 138-acre former steel mill and brownfield site in Midtown Atlanta. A developer proposed converting the vacant site into a "new town in town." Its location—close to primary regional destinations and to rapid transit—and its dense, mixed-use design made the proposed Atlantic Steel redevelopment a classic smart growth infill project, favored by everyone from the city's mayor to the vice president of the United States (at the time, Al Gore).

The dilemma was that the redevelopment project required a bridge over Interstate 75/85 to connect to a rapid transit station and a neighborhood to the east, plus ramps for access to the interstate highways. At the time, the Atlanta region was out of compliance with federal transportation conformity requirements and, as a result, could not tap into federal funds to add to its highway system. It could not even construct certain highway improvements using nonfederal funds. The proposed bridge and ramps were included in this prohibition.

Under a program called Project XL (excellence and leadership), the EPA has the power to waive environmental regulations when a superior environmental outcome may be achieved by some otherwise prohibited action. Based on an analysis showing that redevelopment of the Atlantic Steel site would produce less VMT and vehicle emissions than development of likely alternative sites in outlying areas, the EPA ultimately waived the conformity requirement for this project.

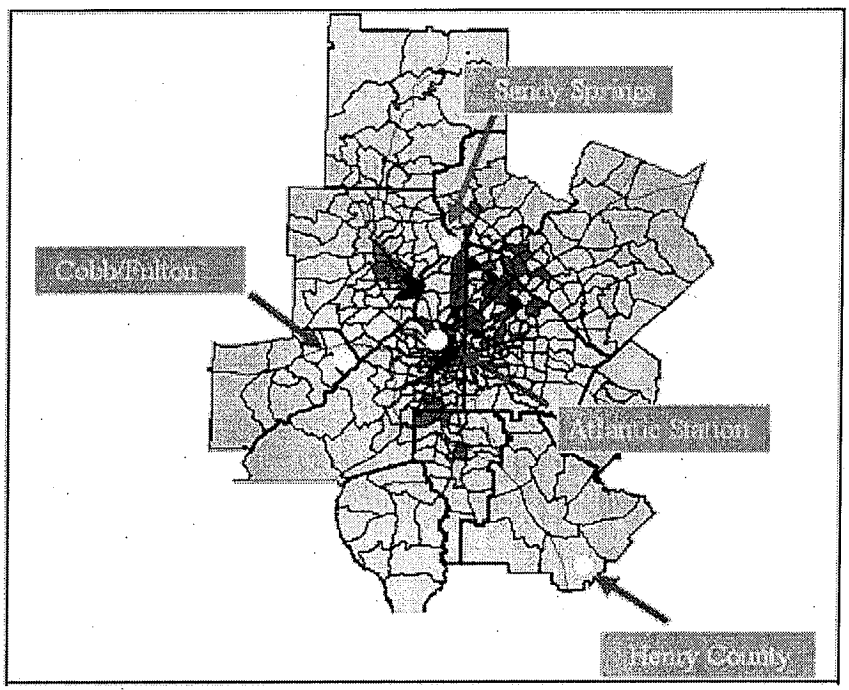
For this analysis, a team of consultants evaluated the Atlantic Steel project from two standpoints:

- *Regional location.* The Midtown site was compared to three greenfield sites large enough to accommodate the proposed development. The sites were at increasing distances from the urban core: a perimeter beltway location, a suburban location, and an exurban location, each with a development density and site plan typical of its location. The map below shows the location of the Atlantic Steel site and the three greenfield sites relative to the urban core.

- *Site plan.* Three alternative plans for the Atlantic Steel site—incorporating different intrasite densities, land use mixes, street networks, and streetscape design elements—were compared. They were the Jacoby Development Corporation's original site plan, an "improved new urbanism case" developed through a charrette process by Duany Plater-Zyberk & Company (DPZ), and a final compromise plan incorporating key DPZ concepts.

The original Jacoby design mixed land uses primarily on the site's east side, nearest the MARTA rapid transit station. On the west side, the developer proposed a single-use office park with buildings set back from the street and separated by stretches of undeveloped green area and parking. Residences were located between the office park and the retail/hotel district. The street network was an adaptation of the site's existing grid system, with some connections to neighborhood streets to the south.

Alternative regional locations evaluated.
Based on EPA (1999)



With everything riding on EPA approval, the agency had the leverage to push for a more integrated site plan. The DPZ plan, generated at a design charrette, mixed land uses within the site to a great degree, while holding the amount of office, retail, and residential development constant. Only the far west side retained the single-use character of the original site plan, in an office district. The redesign featured shorter blocks, narrower streets, improved streetscapes, and clear pedestrian paths. Auto speeds were controlled to provide a better pedestrian environment. Densities were increased near transit stops. The street grid of the surrounding neighborhood was extended into the site, and land uses were moved to permit shared parking.

Jacoby's final site plan is a compromise between the two earlier plans. The land use mix is more fine-grained than the original plan's but not as fine-grained as the DPZ redesign. The street network is more fine-meshed than the original plan's but less so than the redesign. Other concepts from the DPZ charrette, and from the literature on the built environment and travel, have been retained.

Alternative site plans evaluated
Based on EPA (1999)

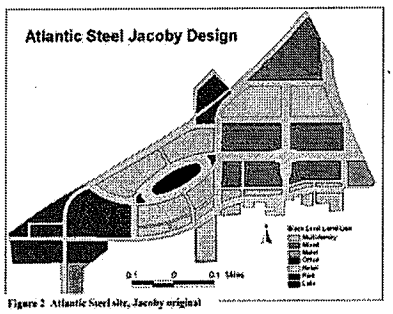


Figure 2 Atlantic Steel site, Jacoby original

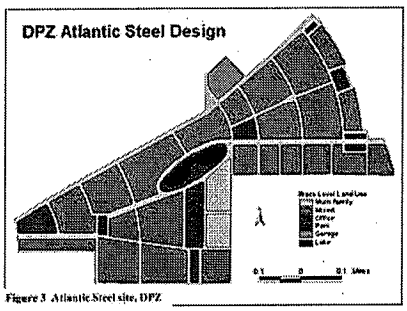


Figure 3 Atlantic Steel site, DPZ

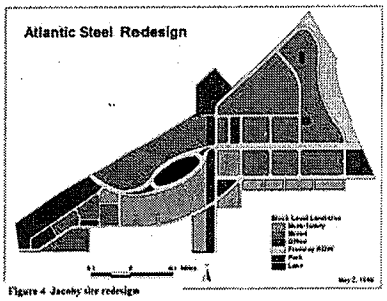
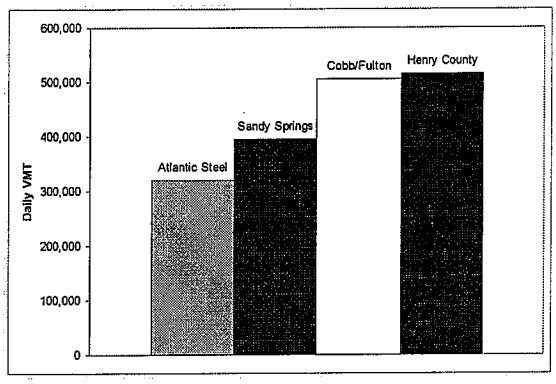


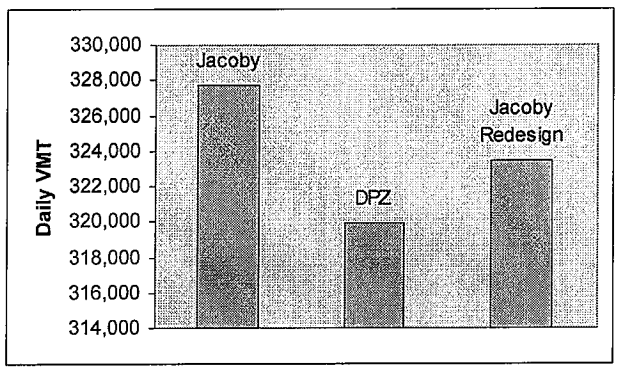
Figure 4 Jacoby site redesign

First, the EPA consultant team performed an in-depth evaluation of travel forecasting methods used in the Atlanta region. The evaluation resulted in various refinements to the Atlanta Regional Commission's conventional travel forecasting model to better account for regional location and destination accessibility, and in postprocessing of model outputs to better account for the first three Ds—density, diversity (mix), and design (Walters, Ewing, and Allen 2000). Postprocessing employed an early version of the Smart Growth Index model with elasticities derived from a review of recent research on the built environment and household travel (as described in section 3.2).

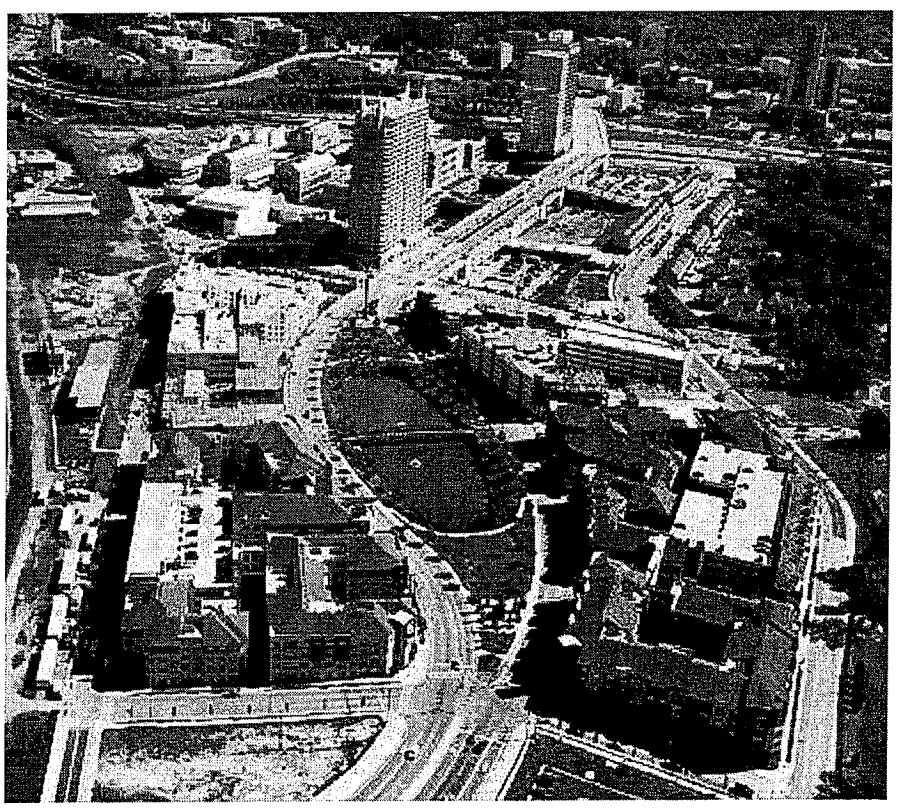
Model results demonstrated that VMT and emissions would be about 30 percent lower at the Atlantic Steel infill site than at the remote greenfield locations, and an additional 5 percent lower with the revised site plan (see Figure 3-28). As a result, for the first time, the EPA designated a land development proposal as a regional transportation control measure, allowing for approval of the project and funding of transportation Aimprovements. Atlantic Station has become a highly successful, largely built and occupied, infill community (see photographs below).

Figure 3-28 VMT Generated by Regional Location and Site Plan Alternatives
Source: EPA 1999.





Atlantic Station today.

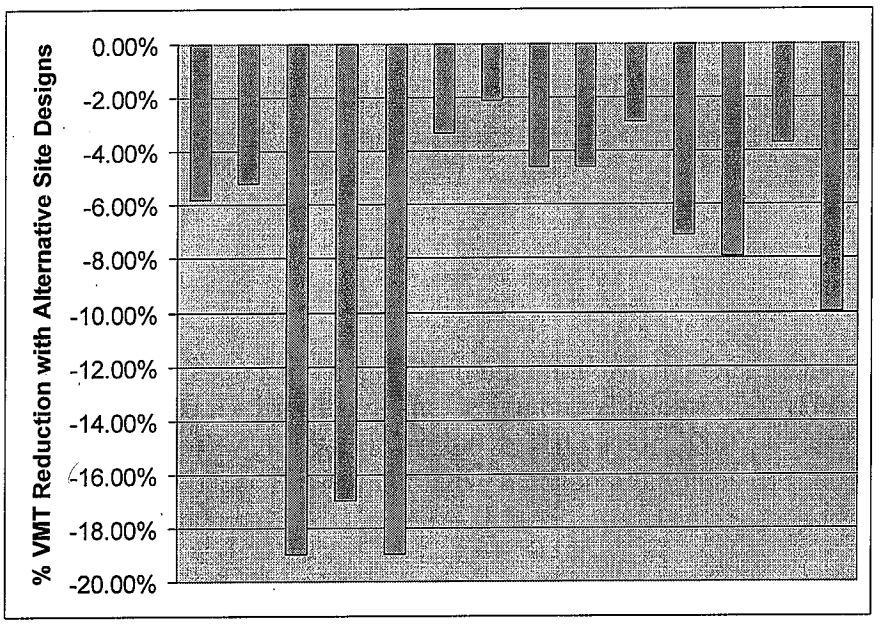


Source: Jacoby Development Company

3.4.2 Site Plan Influences on VMT

The Atlantic Steel study—and similar studies in San Diego, Wilmington, Portland, Oak Ridge, San Antonio, and Toronto—have forecasted the impacts of site design on vehicle trips, VMT, and/or CO_2 emissions (Hagler Bailly 1998; EPA 1999, 2001a, 2001b; IBI Group 2000). Figure 3-29 presents the findings of these studies. In each case, alternative development plans for the same site are compared to a baseline or trend plan.

Figure 3-29 Effect of Site Design Alone on VMT

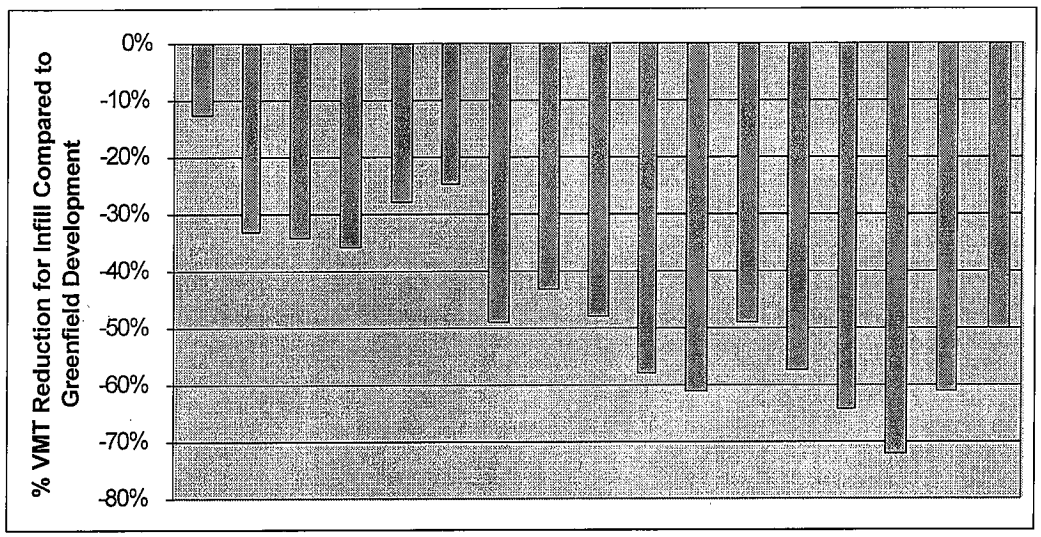


Results suggest that VMT and CO_2 per capita decline as site density increases and the mix of jobs, housing, and retail uses becomes more balanced. However, the limited number of studies, differences in assumptions and methodologies from study to study, and the variability of results make it difficult to generalize.

3.4.3 Regional Location Influences on VMT

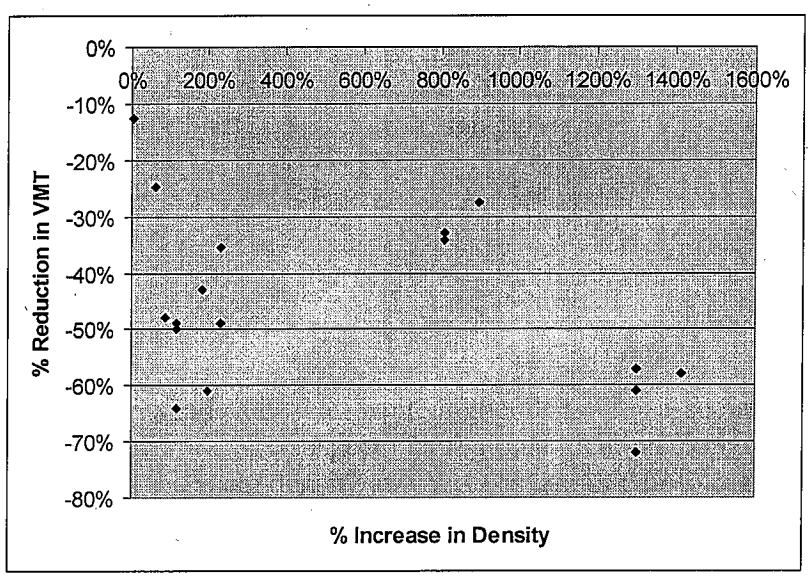
Approximately ten studies have considered the effects of regional location on travel and emissions generated by individual developments (EPA 1999, 2001a, 2001b, 2006; Hagler Bailly 1998; Hagler Bailly and Criterion Planners/Engineers 1999; IBI Group 2000; Allen and Benfield 2003; U.S. Conference of Mayors 2001). The studies differ in methodology and context, and in some cases include changes in site design. But they tend to yield the same conclusion: infill locations generate substantially lower VMT per capita than do greenfield locations, from 13 to 72 percent lower (see Figure 3-30).

Figure 3-30 Effect of Regional Location and Site Design on VMT



In Figure 3-31, the distribution of data points indicates that, while higher density is associated with reduced VMT, other factors also are at work. We suspect that regional location explains most of the scatter, and that the relationship between density and VMT is due in part to regional location as well. The highest densities are programmed for the most central locations.

Figure 3-31 Relationship between Density Increase and VMT Reduction

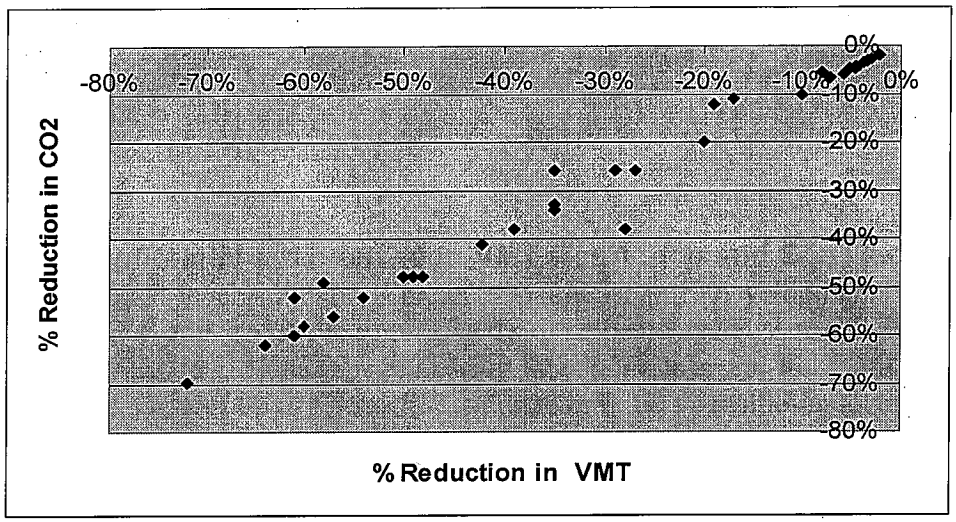


The data from project-level simulations are too limited to conduct a true meta-analysis of the variance in VMT per capita. However, the data clearly suggest that development that combines an infill location with higher density and good urban design can produce dramatic VMT reductions compared to typical greenfield development. VMT reductions cluster between about 30 and 60 percent. When compared with the results of the site design studies, which show VMT reductions of 2 to 19 percent, the effect of regional location appears much stronger than that of project density and site design alone.

3.4.4 The Relationship between VMT Reduction and CO_2 Reduction

These project-level simulations indicate that dense infill developments also are associated with reduced CO_2 emissions (see Figure 3-32). On a percentage basis, CO_2 reductions are not quite as large as VMT reductions. The regression line suggests an elasticity of CO_2 emissions with respect to VMT of 0.96. This is likely due to emission penalties associated with reduced vehicle operating speeds at infill locations.

Figure 3-32 Reduction in CO_2 Emissions versus Reduction in VMT



4. Environmental Determinism versus Self Selection

There is a long-running debate in urban planning about the degree to which the physical environment determines human behavior. The theory of environmental or architectural determinism ascribes great importance to the physical environment as a shaper of behavior. The counter view is that social and economic factors are the main or even exclusive determinants of behavior.

To outsiders, this debate may seem simplistic. Any extreme view would be. Yet, we all bring paradigms to the study of travel behavior, paradigms that affect our interpretation of the facts. Depending on one's point of view, the documented relationship between the built environment and travel might just as well be due to 1) individuals who want to walk or use transit selecting pedestrian- or transit-friendly environments (self selection) as it is to 2) pedestrian- and transit-friendly environments causing individuals to use these modes of travel more than they would otherwise (environmental determinism).

For many of the studies reviewed in Chapter 3, we can discount self selection because the unit of geographic analysis is the region or county. Travel preferences likely fall far down the list of factors—after job access, climate, cost-of-living, and family ties—that people consider when choosing a region or county in which to live. For those moving from one neighborhood to another, however, a desire to walk or use transit could be a factor in their decision, a possibility to which we now turn our attention.

4.1 The Empirical Literature on Self Selection

Does residential choice come first, and travel choice or some other outcome follow (environmental determinism)? Or do people's propensities for travel and physical activity determine their choice of residential environment (self selection)? Between environment and attitude, which drives behavior?

More than anything else recently, the possibility of self-selection bias has engendered doubt about the travel benefits of compact urban development patterns. According to a Transportation Research Board/Institute of Medicine report (2005), "If researchers do not properly account for the choice of neighborhood, their empirical results will be biased in the sense that features of the built environment may appear to influence activity more than they in fact do. (Indeed, this single potential source of statistical bias casts doubt on the majority of studies on the topic to date.)"

Self selection occurs if the choice of residence depends in a significant way on attitudes about, or preferences for, one mode of transportation over another. In the language of research, such attitudes will confound the relationship between residential environment and travel choices. Most of the "evidence" for or against self selection is circumstantial.

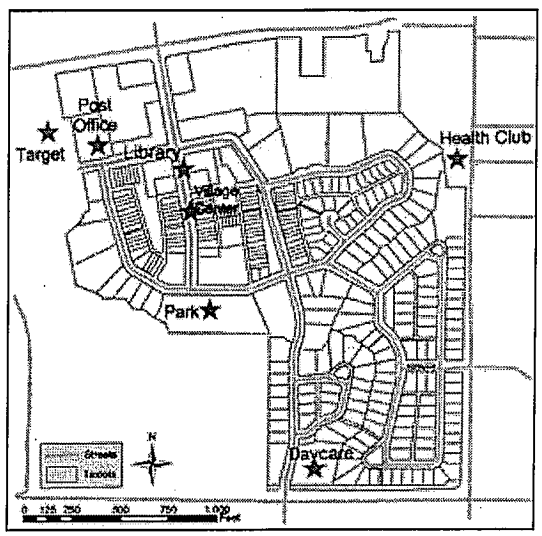
Many studies have cited associations between attitudes and travel choices as evidence of self selection. Favorable attitudes about walking correlate with walking; favorable attitudes about the environment correlate with transit use. It would be surprising, indeed, if travelers who are favorably disposed toward a given mode did not use that mode more frequently than others,

regardless of where they live. But this does not mean that attitudes account for the observed relationship between the built environment and travel. For self selection to occur, attitudes must also influence residential choices.

Planning researchers frequently ask new residents whether transit accessibility, walkability, or access to specific destinations were factors in their location decisions. Access considerations usually fall well down the list of location factors, after housing price and quality, neighborhood amenities, and school quality.

Typical of such surveys is one by Dill (2004). Fairview Village is a mixed-use, new urbanist neighborhood in suburban Portland, Oregon, with interconnected streets and attractive streetscapes (see the photograph and site plan below). Residents were asked to rate the importance of location factors in choosing their new home. The highest-rated factors were neighborhood safety, neighborhood style, and house price. Among access variables, "quick access to the freeway" was ranked highest at number eight. Pedestrian access ranked lower. "Having stores within walking distance" was 12th in importance, and "having a library within walking distance" was 14th. Still, pedestrian access was rated as more important in Fairview Village than in two nearby subdivisions matched for income, home value, home size, and year built. Apparently, self selection is present but weak. Whatever the underlying cause, attitude, or environment, walk trips are much more frequent in Fairview Village, and VMT per adult is 20 percent lower than in otherwise comparable suburban subdivisions (see Figure 4-1).

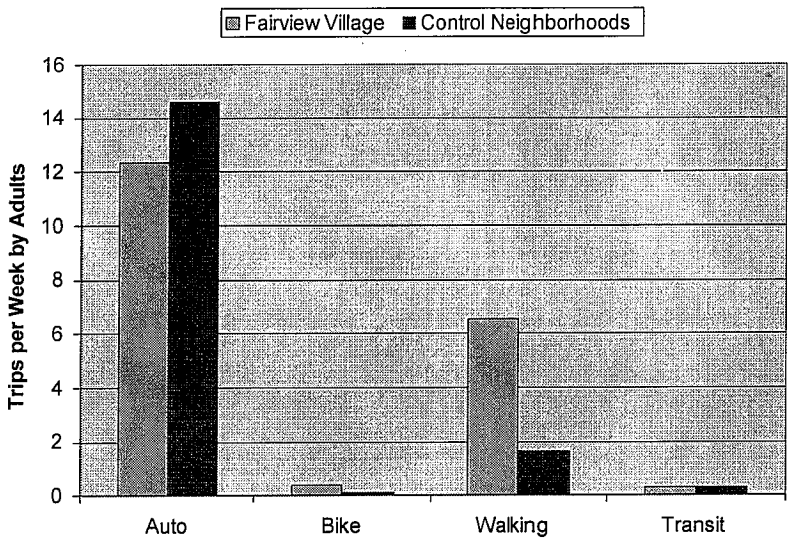
Fairview Village City Hall and nearby housing.



Fairview Village site plan.
Source: Rose 2004

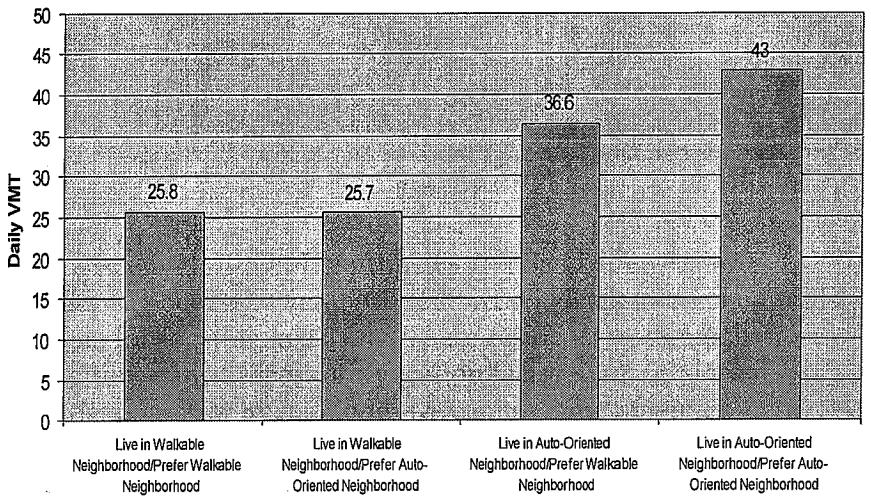
Figure 4-1 Number of Trips by Mode and by Neighborhood*
Source: Based on data in Dill 2004.

*By adults, per week.



The strongest survey-based evidence of self selection is Lund's (2006) study of people who had recently moved to transit-oriented developments (TODs) on rail lines in California. For TOD residents, transit access ranked third among location factors in San Francisco and fifth in Los Angeles and San Diego (where, amazingly, it ranked lower than highway access). One-third of all respondents mentioned transit access as one of the top three reasons for locating in a TOD. These residents were much more likely to use transit than those not citing transit access as a location factor. Yet, because the survey did not collect comparable data on prior travel mode, we cannot draw any inference regarding the strength of attitudes versus environment or on the effect of transit-oriented development on net regional transit use.

Figure 4-2 Average VMT by Neighborhood Type and Residential Preference
Source: Frank et al. forthcoming.



The strongest survey-based evidence of environmental determinism is Frank et al.'s (forthcoming) in-depth study of 8,000 households in Atlanta, which indicates that the built environment and availability of alternatives can lead anyone, regardless of preference, to drive less. Just comparing those who stated a preference for walkable environments, VMT was 40 percent lower among those who actually lived in a walkable neighborhood than among those who lived in an auto-oriented neighborhood (see Figure 4-2). Roughly one in three current residents of automobile-oriented neighborhoods would prefer to live in a walkable environment but were unable to find one, given current development patterns. This alone indicates a ready-made market for compact development.

At least 28 studies using different research designs have attempted to test and control for residential self selection (Mokhtarian and Cao forthcoming; Cao, Mokhtarian, and Handy 2006). Nearly all of them found "resounding" evidence of statistically significant associations between the built environment and travel behavior, independent of self-selection influences: "Virtually every quantitative study reviewed for this work, after controlling for self-selection through one of the various ways discussed above, found a statistically significant influence of one or more built environment measures on the travel behavior variable of interest (Cao, Mokhtarian, and Handy 2006).

Mokhtarian and colleagues find research designs used in studies to date all wanting in some respect. Still to be determined through future research are the absolute and relative magnitudes of this influence. What all of this tells us is that the built environment and self selection *both* influence travel choices; we just do not yet know enough to calculate their relative impacts.

4.2 The Built Environment May Matter in any Case

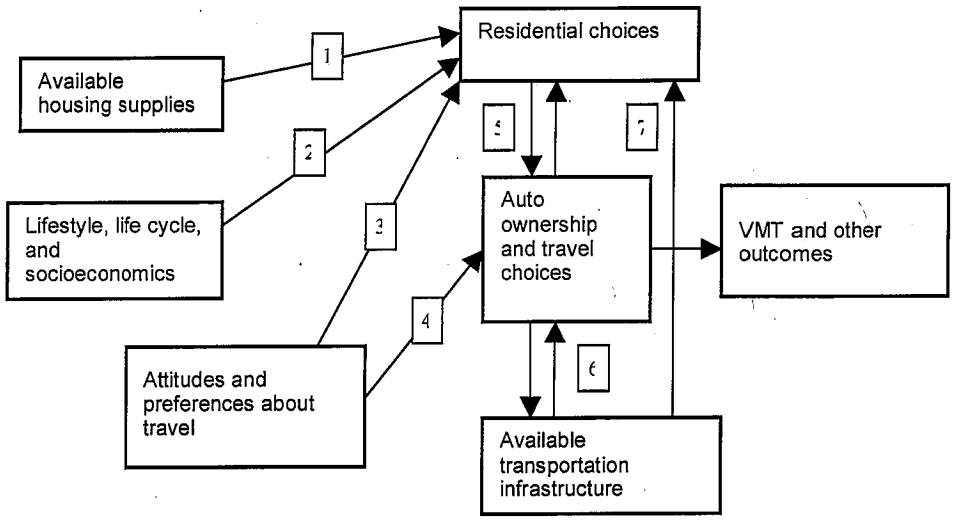
The fact that people to some extent "self select" into neighborhoods matching their attitudes is itself a demonstration of the importance of the built environment in travel behavior. If there were no such influence, people who prefer to travel by transit or nonmotorized modes might as well settle in sprawling areas, where they have no alternative to the automobile.

Whether the association between the built environment and travel is due to environmental determinism or self selection may have little practical import. Where people live ultimately depends on housing supply and demand. As Lund, Willson, and Cervero (forthcoming) note, ". . . if people are simply moving from one transit-accessible location to another (and they use transit regularly at both locations), then there is theoretically no overall increase in ridership levels. If, however, the resident was unable to take advantage of transit service at their prior residence, then moves to a TOD (transit-oriented development) and begins to use the transit service, the TOD is fulfilling a latent demand for transit accessibility and the net effect on ridership is positive)."

The conceptual model in Figure 4-3 indicates why self selection may be less important than the recent focus in the literature suggests. Attitudes about travel have direct effects on travel choices (link 4). Attitudes also may have indirect effects through the mediator, residential choice (link 3). This is the theory of self selection. If link 3 is strong relative to link 4, self selection may be the main mechanism through which the built environment affects travel and health outcomes. If link 3 is weak, residential choices may still affect travel directly through link 4. This is the theory of environmental determinism.

Note that strong self selection may actually enhance the effect of the built environment on travel, not render it insignificant, as some of the literature implies. Whether it does or not depends on housing supply (link 1) relative to demand (links 2 and 3). Housing supply may affect travel regionally if certain types of residential environments are undersupplied. We will refer to this as the theory of latent demand. As shown in Figure 4-4, the ability to self select (link 3) is moderated by housing supplies.

Figure 4-3 Mechanisms by which Attitudes and Preferences Might Affect Travel Choices and VMT



Think of travel outcomes in two dimensions (as in Figure 4-4). One dimension relates to the relative strength of self selection versus environmental determinism. The other depends on the supply of walkable or transit-served places relative to demand across a region. Of course, these dichotomies are false. Both dimensions are continuous, and reality almost certainly lies somewhere along a continuum.

But for three of the four extreme scenarios, the development of new walkable, transit-oriented places should lead to net increases in walking and transit use across the region. Even if self selection is the dominant mechanism through which the built environment influences travel, developers meeting latent demand for walkable, transit-oriented environments will be contributing to reduced VMT. Indeed, the only way that these developers will not have a positive impact is if such places already are adequately supplied.

This does not appear to be the case. There is ample evidence that the demand for walkable, transit-oriented environments far exceeds the current supply. In a study of residential preferences in Boston and Atlanta, Levine, Inam, and Tong (2005) find a huge unmet demand for pedestrian- and transit-friendly environments, particularly among Atlanta residents (see Figure 4-5). It causes these researchers to conclude:

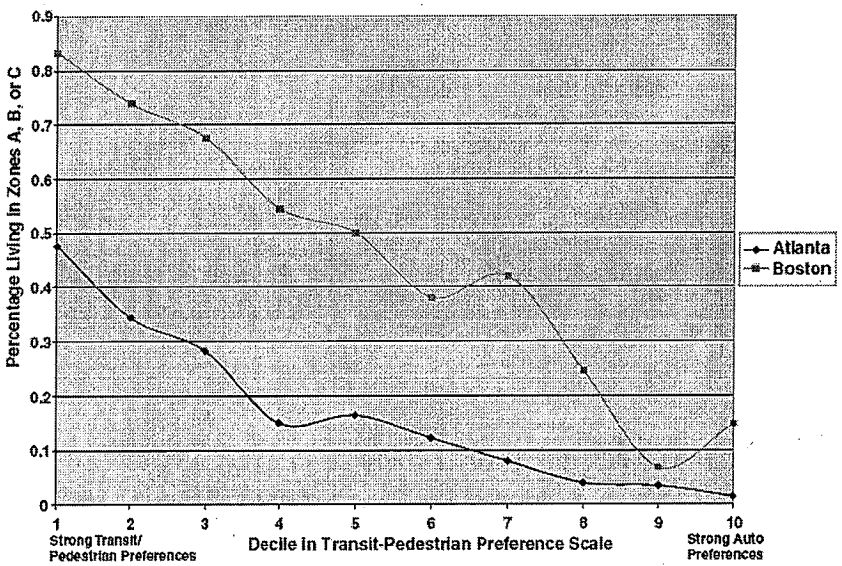
> . . . given the gap depicted in Figure [4.5], it seems unlikely that new transit-oriented housing in Atlanta would fill up with average Atlantans; rather, it would tend to be occupied by people with distinct preferences for such housing who previously lacked the ability to satisfy those preferences in the Atlanta environment. Self-selection in this case would be a real effect, but it would hardly negate the impact of urban form on travel behavior. This is because in the absence of such development, those households would be unlikely to reside in a pedestrian neighborhood and would have little choice but to adopt auto-oriented travel patterns.

For more data on the growing and unmet demand for compact development, see Belden Russonello & Stewart (2003), Myers and Gearin (2001), Center for Transit-Oriented Development (2004), Levine and Frank (2007), Logan (2007), and Nelson (2006).

Figure 4-4 Effect of New Walkable, Transit-Oriented Developments on Regional VMT

	Self Selection Dominates	Environmental Determinism Dominates
Walkable, transit-oriented places undersupplied at present	VMT decreases	VMT decreases
Walkable, transit-oriented place adequately supplied at present	VMT stays the same	VMT decreases

Figure 4-5 Relationship of Transit-Pedestrian Preference to Residence in Transit- and Pedestrian-Friendly Zones
Source: Levine, Inam, and Tong 2005



Thus, it is clear that both self selection and environmental determinism may account for VMT reductions with compact development. A recent study in the San Francisco Bay Area suggests that more than 40 percent of the ridership bonus associated with TOD is a product of residential self selection (Cervero and Duncan 2003). Whatever the source, regional transit ridership is higher than it would be otherwise, and regional VMT is lower.

5. Induced Traffic and Induced Development

Figure 4.3 illustrates two additional links with potential impacts on regional VMT. Link 6 represents a phenomenon called induced traffic, link 7 a related phenomenon called induced development.

Tony Downs of the Brookings Institution first explained the phenomenon of induced traffic in his 1962 "Law of Peak-Hour Traffic Congestion." As he explained more recently,

> ... traffic flows in any region's overall transportation networks form almost automatically self-adjusting relationships among different routes, times, and modes. For example, a major commuting expressway might be so heavily congested each morning that traffic crawls for at least thirty minutes. If that expressway's capacity were doubled overnight, the next day's traffic would flow rapidly because the same number of drivers would have twice as much road space. But soon word would spread that this particular highway was no longer congested. Drivers who had once used that road before and after the peak hour to avoid congestion would shift back into the peak period. Other drivers who had been using alternative routes would shift onto this more convenient expressway. Even some commuters who had been using the subway or trains would start driving on this road during peak periods. Within a short time, this triple convergence onto the expanded road during peak hours would make the road as congested as it was before its expansion (Downs 2004).

Controversy exists over whether and to what extent the addition of highway capacity induces new traffic and promotes urban development in proximity to the added highway capacity. The notion of induced traffic challenges the view that the expansion of existing roads or the building of new roads will necessarily relieve highway congestion.

The concept of induced development challenges the view that highway investments are a response to growth and development, as opposed to a cause of them. In the highway "wars" that ensue between environmental and development interests, opposing sides have very different positions on the nature and magnitude of induced traffic and induced development. In this brief review, we will attempt to sort out facts from debating points.

5.1 Case Study: Widening Interstate 270

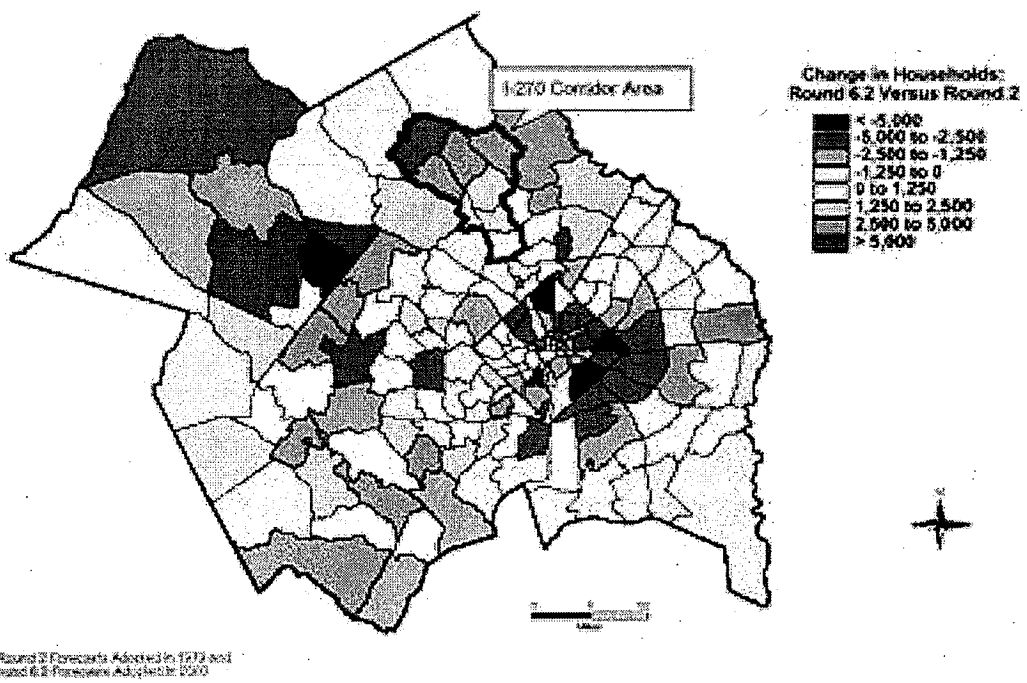
Interstate 270, which angles to the northwest from the Washington, D.C., beltway in Montgomery County, Maryland, was widened in the late 1980s and early 1990s. In 1999, the *Washington Post* ran a story comparing actual traffic volumes on I-270 to pre-construction projections (*Washington Post* 1999). The article declared the widening a failure based on the amount of induced traffic, which effectively used up the added capacity. By the year 2000, traffic volume for certain sections of I-270 already exceeded forecasts for 2010.

This was a time of growing interest in the phenomena of induced traffic and induced development. The Maryland-National Capital Park and Planning Commission and the Metropolitan Washington Council of Governments responded with a study that suggested that highway-induced development was mainly responsible for the high and premature levels of congestion on I-270 (NCRTPB/MWCOG 2001). Also blamed was the failure to build all transportation facilities in the adopted regional transportation plan. Some projects had been delayed and others dropped.

On the subject of induced development, the study concluded that "higher observed traffic volumes relative to the 1984 forecast appear to be due in large part to shifts in population, employment, and travel to the I-270 corridor from other areas in the region, rather than to entirely new travel." For the region as a whole, population growth was 5 percent lower than had been forecasted in 1984, while employment growth was 9 percent higher. The two together suggested small (if any) net impacts of I-270 on regional growth.

However, population and employment had clearly shifted to the I-270 corridor, at the expense of other areas. Specifically, population and employment in the I-270 corridor were, respectively, 23 and 45 percent higher than forecasted in 1984. For all of Montgomery County, they were 7 and 21 percent higher than forecasted. Meanwhile, population and employment were 9 and 23 percent lower than forecasted in Prince George's County, and 29 and 3 percent lower than forecasted in the District of Columbia. These shifts in development are illustrated in Figures 5-1 and 5-2.

Figure 5-1 Difference between Actual and Forecasted Households by Subarea (2000)
Source: NCRTPB/MWCOG 2001.



LETTER 21

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Lynda Parrish
Training Coordinator

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January 2008

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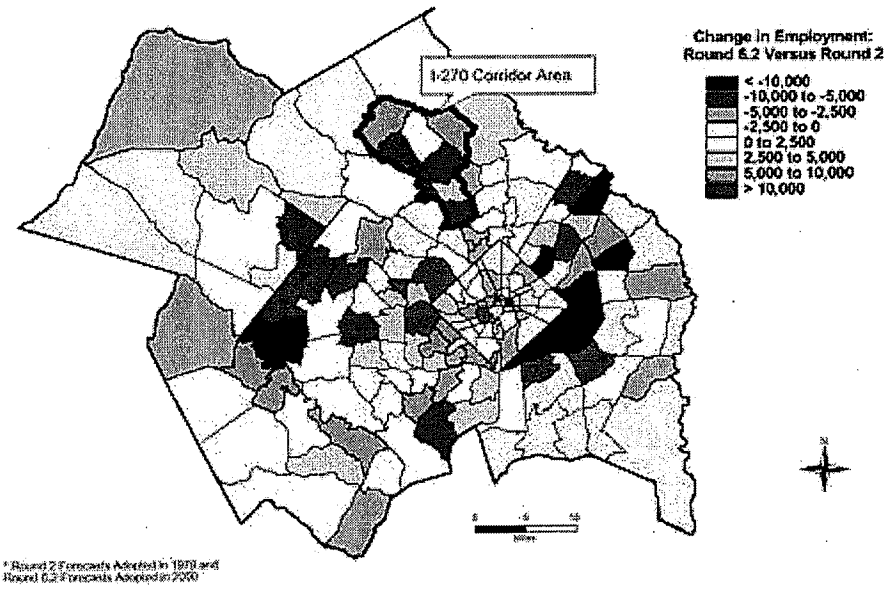
Excess Hours - 4 hours	Christmas Holiday	Excess Hours - 4 hours	Excess Hours - 4 hours	Excess Hours - 4 hours	
					30
31					
Excess Hours - 4 hours					

LETTER 21

Figure 5-2 Difference between Actual and Forecasted Employment by Subarea (2000)
Source: NCRTPB/MWCOG 2001.



The experience with the I-270 widening mirrors the literature on highway-induced traffic and highway-induced development.

5.2 The Magnitude of Induced Traffic

Cervero (2002) compares elasticity values across studies in a meta-analysis. Again, an elasticity is the percentage change in one variable that accompanies a 1 percent change in another variable. An elasticity of VMT with respect to lane miles of 0.5 implies that every 1 percent increase in lane miles is accompanied by a 0.5 percent increase in VMT. At the facility level, a 100 percent increase in lane miles is what we would get if a facility were widened from two to four lanes.

In his meta-analysis, Cervero (2002) extracts the average elasticities shown in Figure 5-3.

Figure 5-3 Elasticities of VMT with Respect to Capacity
Source: Cervero 2002.

	Facility-Specific Studies	Areawide Studies
Short-term	0	0.4
Medium-term	0.265	NA
Long-term	0.63	0.73

Based on the meta-analysis, Cervero (2002) concludes that ". . . the preponderance of research suggests that induced-demand effects are significant, with an appreciable share of added capacity being absorbed by increases in traffic, with a few notable exceptions." The average long-term elasticity of 0.73 suggests that for every 1 percent increase in areawide highway capacity, VMT increases by 0.73. The actual increase in a given corridor or metropolitan area depends on the level of congestion. Adding capacity in an area with no congestion has no effect; adding capacity in an area with severe congestion has huge effects. This is apparent from Figure 5-4, which shows the VMT increase per lane-mile of capacity added in California metropolitan areas. The induced traffic effect is greatest in the congested San Francisco, Los Angeles, and San Diego metro areas (see Figure 5-4).

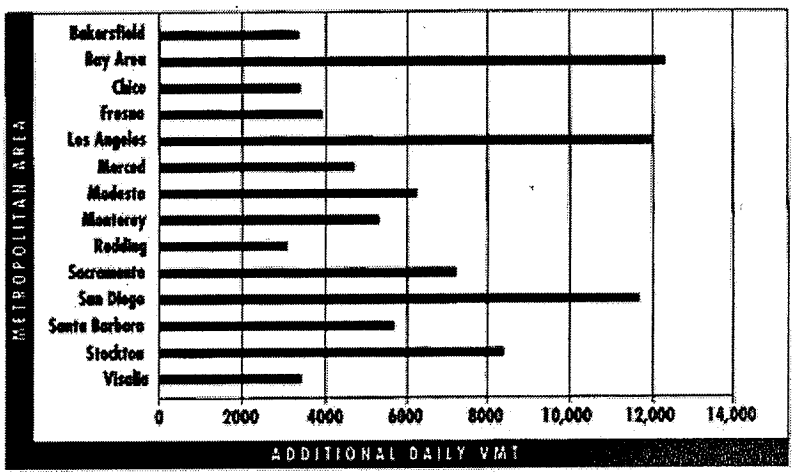


Figure 5-4 Estimated Additional VMT from an Additional Lane-Mile, California Metropolitan Areas *Source: Hansen and Huang 1997.*

5.3 The Role of Induced Development

Induced traffic and induced development are related. One can think of induced development as a cause of induced traffic, not immediately but over the longer term. To better understand induced traffic and its connection to induced development, it is necessary to explore the behavioral consequences of additions to roadway infrastructure capacity.

In the short term, a variety of behavioral changes can contribute to increased traffic without any induced development. These include route switches, mode switches, and changes in destination. In addition, new trips may be taken that would not have occurred without the addition in infrastructure capacity.

In the longer run, increases in highway capacity may lower travel times so that residents and businesses are drawn to locate in the area surrounding the expanded highway capacity. The question is always whether the new development that occurs in proximity to the highway was induced to locate there as a consequence of the expansion or whether it would have occurred anyway, regardless of the highway. Indeed, the highway investment may be a response to new or anticipated development, rather than vice versa. If the development itself would not have occurred otherwise, the development and the traffic it generates can be considered induced.

Definitionally, a gray area exists if the development that occurs near a highway would have occurred somewhere else in the region in the absence of the investment. Some would call this induced development, others redistributed development. We use the term induced development liberally, to mean any development that would not have occurred at a given location without a highway investment.

5.4 Historical Changes in Induced Development

Clearly, the impacts of highway investments are less today than they once were. Construction of the Interstate Highway System, in particular, has tied virtually every place in the country to everywhere else. Most studies finding sizable highway impacts (for example, Mohring 1961 and Czamanski 1966) date back to the first round of interstate highway construction, which created huge positive externalities for areas gaining access to the network. By the early 1970s, the Interstate Highway System was largely complete. Incremental additions or improvements to the network have since produced comparatively small improvements in interregional accessibility.

How great are highway impacts on economic and land development in the post-interstate era? This is a subject of great debate. In a well-known point-counterpoint, Giuliano (1995) minimized the importance of highway investments for three reasons: "The transportation system in most U.S. metropolitan areas is highly developed, and therefore the relative impact of even major investments will be minor. The built environment has a very long life. . . . Even in rapidly growing metropolitan areas, the vast proportion of buildings that will exist 10 to 20 years from now are already built. . . . Transport costs make up a relatively small proportion of household expenditures."

Cervero and Landis (1995) countered that "although new transportation investments no longer shape urban form by themselves, they still play an important role in channeling growth and determining the spatial extent of metropolitan regions by acting in combination with policies such as supportive zoning and government-assisted land assembly." They then challenged Giuliano's empirical evidence, and presented evidence of their own.

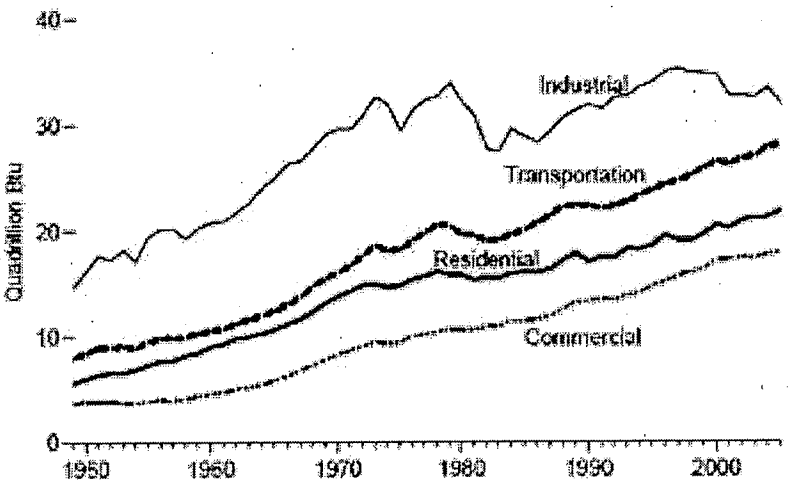
5.5 What Is Known about Induced Development

Who is right? Giuliano probably is right about aggregate impacts, while Cervero and Landis probably are right about localized impacts. The induced development literature has been reviewed by Huang (1994), Boarnet (1997), Boarnet and Haughwout (2000), Ryan (1999), and Bhatta and Drennan (2003). A recent review by Ewing (2007) concludes:

- Major highway investments have small net effects on economic growth and development within metropolitan areas. Instead, they mostly move development around the region to take advantage of improved accessibility. Induced development is very close to a zero-sum game.
- Highway investment patterns tend to favor suburbs over central cities, and thereby contribute to decentralization and low-density development.
- Major highway investments may actually hurt regional productivity, if they induce inefficient (read "low-density") development patterns.
- Corridors receiving major highway investments experience land appreciation, and therefore are likely to be developed at higher densities than developable lands outside the corridors.
- Highways may be necessary to induce development, but they are not sufficient to do so. To the extent that current planning and zoning caps hold, impacts within a corridor will be moderated.
- Counties receiving major highway investments attract population and employment growth to a greater degree than they would otherwise.
- Nearby counties may experience more or less growth than they would otherwise, depending on the strength of spillover effects.
- Nonresidential development is more strongly attracted to major highways than is residential development, particularly in the immediate vicinity of facilities.
- The induced development impacts of interstate-quality highways are wider and deeper than those of lesser highways and streets.
- It takes many years after construction for development to adjust to a new land use/transportation equilibrium.
- The induced development impacts of major highways extend out at least one mile, and probably farther.
- The relationship between highway capacity and growth is a two-way relationship, in that growth induces highway expansion as well as the reverse.

6. The Residential Sector

Figure 6-1 Total U.S. Energy Use by End-Use Sector, 1949 to 2005



With regard to development impacts on energy use and emissions, the transportation sector has gotten most of the attention (Ewing 1994; Kessler and Schroeer 1995; Burchell et al. 1998; Bento et al. 2003; EPA 2003; Frank and Engelke 2005; Frank et al. 2006). This is understandable. The transportation sector is the second-biggest energy user in the United States, and is catching up with the industrial sector (see Figure 6-1). It is the sector that is most reliant on oil as an energy source. However, as a long-term threat to the planet, energy use by the residential sector also is significant. In 2004, the U.S. residential sector produced more than one- fifth of total energy-related CO_2 emissions (EIA 2004).

As with the transportation sector, the United States has relied almost exclusively on technological advances to address the problem of limited energy supplies and constantly increasing energy demands of the residential sector (Siderius 2004). Evidence exists that per capita energy use and associated emissions will continue to rise, and that advances in technology alone will be insufficient to achieve sustainable growth in energy use (Kunkle et al. 2004; Lebot et al. 2004; Siderius 2004). Therefore, demand-side measures will be required to keep supply and demand in reasonable balance.

Also like the transportation sector, residential energy use and related emissions have a relationship to urban development patterns. Impacts are felt through changes in housing stock, urban heat islands (UHIs), and transmission and distribution losses (see Figure 6-2). The first two effects have been quantified (see Rong and Ewing 2007). After controlling for household characteristics, residential energy use varies with house type and size, which in turn vary with the degree of urban sprawl. These relationships, taken together, allow us to estimate the effects of urban sprawl on residential energy use, indirectly, through the mediators of house type and size. The average household living in a compact county, one standard deviation above the mean sprawl index, would be expected to consume 17,900 fewer BTUs of primary energy annually[27] than the same household living in a sprawling county, one standard deviation below the mean index.

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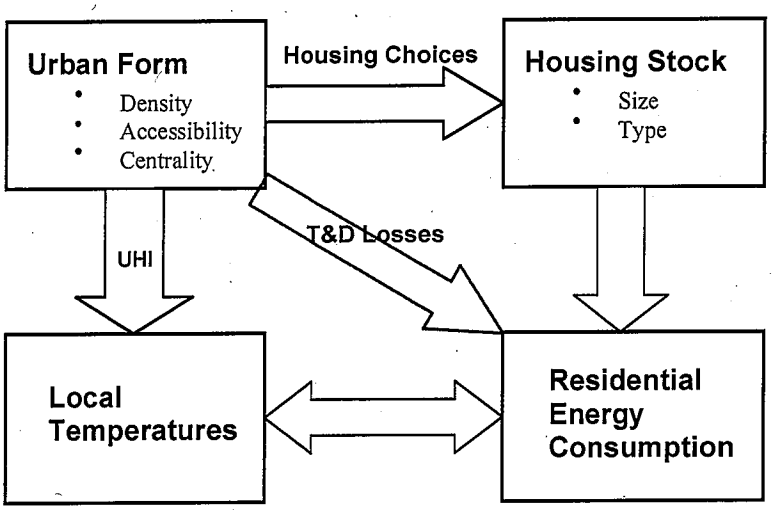
[27] Primary energy is energy contained in raw fuels, which is transformed in energy conversion processes to more convenient forms of energy, such as electrical energy and cleaner fuels. In energy statistics, these more convenient forms are called secondary energy.

Figure 6-2 Causal Paths between Urban Development Patterns and Residential Energy Consumption
Source: Rong and Ewing 2007.



UHI effects are strongest in compact areas, leading to an increase in cooling degree-days and a reduction in heating degree-days. Degree-days, in turn, directly affect space heating and cooling energy use. These relationships, taken together, allow us to estimate the effects of urban sprawl on residential energy use indirectly, through the mediating effect of UHIs. Nationwide, as a result of UHIs, an average household in a compact county, one standard deviation above the mean sprawl index, would be expected to consume 1,400 fewer BTUs of primary energy annually than an average household in a sprawling county, one standard deviation below the mean index.

Throughout most of the nation, the two effects, housing and UHI, are in the same direction, though the housing effect is much stronger than the UHI effect. The total average savings of 19,300 BTUs amounts to 20 percent of the average primary energy use per household in the United States

[NOTE: THE FOLLOWING CHAPTER IS STILL IN PRELIMINARY FORM AND IS SUBJECT TO CHANGE]

7. Policy and Program Recommendations

Climate stabilization will require the U.S. to reduce GHG emissions by 60 to 80 percent below 1990 levels by 2050. To stay on that path, our GHG emissions will need to be well below 1990 levels by 2030, and leading analysts believe we have less than 10 and possibly less than 5 years to get on track.[28] In the transportation sector, progress will be required on all three legs of the stool: vehicle efficiency, fuel content, and vehicle miles traveled (VMT).[29] The national policy discussion on vehicles and fuels is mature and active, and a variety of proposals would have the automobile and oil industries take responsibility for their contributions to GHG. But no one has been put in charge of reducing the GHG impacts of VMT growth.

In this chapter, we aim to identify the roles and responsibilities for various levels of government to meet our climate challenge. Civic leaders, consumers, businesses, and other stakeholders can also make substantial contributions.

The key to substantial GHG reductions is to get all policies, funding, incentives, practices, rules, codes, and regulations pointing in the same direction to create the right conditions for smart growth. Innovative policies are often in direct conflict with the conventional paradigm that produces sprawl and automobile-dependence. One example is the link between federal transportation funding and VMT levels, thereby rewarding states for VMT growth.[30] Another example is the low-density zoning that keeps localities car-dependent, undermining local expenditures on transit, walking, and cycling.

Fortunately, many communities and states have demonstrated that comprehensive reforms can both reduce the need for driving, and improve overall quality-of-life. They have responded to public demands and market forces pushing for compact development, and CO_2 emissions reductions have been a bonus.

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[28] Rosina Bierbaum, Dean of the School of Natural Resources at U. of Michigan, presentation to Presidential Climate Action Program analyzing trends in IPCC analyses, June 2006 at Wingspread Conference Center, Racine, WI

[29] Vehicle-hours of travel (VHT) is another useful indicator.

[30] Specifically, the formulas by which the total payout of dollars from the Federal Highway Trust Fund is sub-allocated or "apportioned" to each State rewards such factors as VMT fuel use and lane-miles of travel. An overview of the apportionment process is provided by the GAO 2006 report available at http://www.gao.gov/new.items/d06572t.pdf

7.1. Federal Policy Recommendations

Although land use planning and growth management are primarily local and state responsibilities, the federal government plays a powerful role in shaping growth patterns and travel choices through regulations, funding, tax credits, performance measures, technical assistance, and other policies. To accomplish the emissions reductions we have discussed in this book, we recommend the implementation of the following major federal policies. We have chosen these options because they are likely to deliver better performance results (e.g., greater return on investment for every public dollar invested) than the *status quo* while also fostering development with a smaller carbon footprint.

7.1.1. Require Transportation Conformity for Greenhouse Gases

Federal climate change legislation should require regional transportation plans to pass a conformity[31] test for carbon dioxide emissions, similar to other criteria pollutants. The Supreme Court ruling in *Massachusetts v. EPA* established the formal authority to consider greenhouse gases under the Clean Air Act, and a transportation planning conformity requirement would be an obvious way for EPA to exercise this authority to produce tangible results.

[31] Transportation conformity for conventional air pollutants (requiring regular assessments and course corrections to prevent transportation programs from undermining timely achievement of clean air standards) was created by the 1977 Clean Air Act Amendments and strengthened when that Act was amended in 1990. In 1991's Intermodal Surface Transportation Efficiency Act (ISTEA), Congress further codified conformity and created the Congestion Mitigation and Air Quality Improvement Program (CMAQ) as a complementary program to help regions achieve conformity (a "carrot" to conformity's "stick").

What is Conformity?[1]

Under Section 110 of the Clean Air Act,[1] states develop and implement air pollution control plans called State Implementation Plans (SIPs) to demonstrate attainment with National Ambient Air Quality Standards (NAAQS) set by EPA at levels deemed necessary to protect public health and welfare. The 1990 Clean Act Amendments, along with subsequent transportation legislation, required air quality and transportation officials to work together through a process known as conformity. A metropolitan region that has exceeded the emission standards for one or more of the pollutants must show that the region's transportation plan will conform to applicable SIPs and contribute to timely attainment of the NAAQS. According to the regulations, a proposed project or program must not produce new air quality violations, worsen existing violations, or delay timely attainment of the NAAQS.[1] The metropolitan planning organizations (MPOs) must demonstrate this conformity through their long range transportation plans and transportation improvement programs (TIPs) – which identify major highway and transit projects the area will undertake over a 20-25 year period. Projects that do not conform cannot be approved, funded or advanced through the planning process, nor can they be implemented unless the emissions budget in the SIP is revised.

If a region's TIP has expired without adopting a new TIP projected to stay within the motor vehicle emissions budget in the SIP, the area faces what is known as a conformity lapse. During this period, the MPO cannot approve funding for new transportation projects or new phases of previously funded transportation projects except for those projects that are adopted as Transportation Control Measures in the SIP or are otherwise exempt from conformity as air quality neutral activities. If an area fails to submit a required SIP by a deadline, it may face a "conformity freeze", in which it cannot approve any new projects until this deficiency is remedied, and if this failure is prolonged, can face the ultimate sanction of losing federal transportation funding. For some metropolitan areas, this potential loss of transportation funds can be more than $100 million per year.[1] While there have been 63 areas in the US that have suffered a conformity lapse, no state or region has ever lost federal transportation funds as a result of a conformity lapse, freeze, or sanctions.

State and local governments would be required to adopt mobile source CO_2 emission reduction budgets (like the emissions budgets for other pollutants) that demonstrate reasonable progress in limiting emissions.[32] Currently, regions that fail to develop transportation plans consistent with "Reasonable Further Progress" goals risk curbs on federal transportation funds. This could be reinforced by incentives that reward places that effectively reduce per capita VMT. Conversely, a portion of transportation funds could be withheld from places that fail to make progress toward reducing VMT *per capita* (see discussion below in State Policy section).

[32] The California Energy Commission offered a similar proposal to require regional transportation planning and air quality agencies to adopt regional growth plans that reduce GHG emissions to state-determined climate change targets. California Energy Commission, "The Role of Land Use in Meeting California's Energy and Climate Change Goals." http://www.energy.ca.gov/2007_energypolicy/documents/

Though we acknowledge that to date, land use and transportation demand management (TDM) policies have generally not played a large role in meeting regional conformity requirements,[33] we believe that comprehensive strategies would be more successful. Responsibility should be "nested" so that the federal government is responsible for the GHG impacts of federal transportation spending (see Green-TEA discussion below) and state and local governments bear responsibility for the GHG impacts of their transportation spending.

7.1.2 Use Cap-and-Trade (or Carbon Tax) Revenues to Promote Infill Development

Many climate proposals[34] focus on the creation of a market-based cap-and-trade system similar to policies adopted in Europe[35] and ones that are likely to be formed in California[36] and other states. By placing a price on greenhouse gas emissions, a cap-and-trade system can send the right signal for reducing the emissions associated with vehicle travel.[37] Moreover, regulated parties (such as oil companies) will have incentives to support policies that slow VMT growth, because actions that increase VMT will make carbon emission allowances more costly. Therefore, federal policies that subsidize growth patterns that increase *per capita* VMT would generate higher overall compliance costs.

A related issue that is being discussed within the federal cap-and-trade debate is how to best use the revenues generated by such a system. If cap-and-trade is adopted, the value of carbon allowances will be worth an estimated $50 to $300 billion per year by 2020 based on recent Congressional proposals. A portion of these revenues could be used to fund infrastructure for infill development, technical assistance to help communities seeking to rewrite codes and regulations that inhibit infill development, and transportation choices that support compact infill development.

In order to ensure adequate emission reductions, to accelerate the introduction of new technology into the marketplace and to moderate the price of allowances, some are proposing policies which complement a cap-and-trade system. Specifically, two of three legs of the transportation sector stool would be covered by new product performance standards. In the case of the auto industry, the longstanding tool is the Corporate Average Fuel Economy (CAFE) program. California is developing a low-carbon fuel standard (LCFS) that leads the nation. With the successful launch of the new Leadership in Energy and Environmental Design—Neighborhood Development

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[33] For example, in its 2002 SIP, the State of Maryland included smart growth policies that it expects to yield modest air quality benefits. Sacramento anticipates significant emissions savings from land use measures in its Blueprint transportation plan. In Atlanta, a modeling exercise on the emissions benefits of infill development rescued the region from its conformity lapse and associated restrictions on funding new transportation projects (1998-2000), but the region lacked the political support or transit funding to implement the modeled smart growth scenario. See CCAP (2004), "Two for the Price of One: Clean Air and Smart Growth (Workshop Primer)." http://www.ccap.org/transportation/smart_two.htm and "Atlanta's Experience with Smart Growth and Air Quality." http://www.ccap.org/transportation/smart_two.htm

[34] For example, see, Pew (2007), "Senate Greenhouse Gas Cap-And-Trade Proposals," http://www.pewclimate.org/docUploads/Economy-wide%20bills%20110th%20Senate%20-%20August%202.pdf

[35] See European Union Greenhouse Gas Emission Trading Scheme, http://ec.europa.eu/environment/climat/emission.htm

[36] For example, see California Market Advisory Committee, http://www.climatechange.ca.gov/policies/market_advisory.html

[37] For example, see Winkelman et. al (2000), "Transportation and Domestic Greenhouse Gas Emissions Trading," http://www.ccap.org/pdf/TGHG.pdf

(LEED-ND) certification standards from the U.S. Green Building Council, now may be the time to consider something analogous for new development products. This is especially so if public funding—allowance revenue, gas tax revenue—is to be made available to support such "cooler growth." Public support should be coupled with some sort of guarantee of performance, whether in the form of standards or similar policy for new development.

Other options, such as a carbon tax, are also being debated and could also provide reinforcing price signals for VMT reduction and revenue for compact development and more transportation choices.

7.1.3 Enact "Green-TEA" Transportation Legislation that Reduces GHGs

The Intermodal Surface Transportation Efficiency Act of 1991 (known as ISTEA), represented a revolutionary break from past highway bills with its greater emphasis on alternatives to the automobile, community involvement, environmental goals, and coordinated planning. The next surface transportation bill could bring yet another paradigm shift—it could further address environmental performance, climate protection and green development. We refer to this opportunity as "Green-TEA."[38]

Transportation policy is climate policy. With another $300 billion to be reauthorized by Congress in 2009, it represents the largest category of federal infrastructure funding. As discussed in this book, how this money gets spent has a major impact on the nation's VMT and greenhouse gas emissions.

Accountability for GHG Impacts of Transportation Spending. Congress should require the U.S. Department of Transportation (US DOT) to assess the GHG impact of proposed reauthorization bills to determine conformity with national climate goals (i.e., a target percentage below 1990 levels by 2030, consistent with reaching 60-80 percent below 1990 GHG levels by 2050). This analysis would be based in large part on newly required regional scenario analyses conducted by Metropolitan Planning Organizations (MPO). If the transportation bill is expected to generate emissions that are inconsistent with national climate goals, then US DOT should develop a national climate plan that conforms to a mobile source GHG emissions budget and work with MPOs to modify their plans accordingly.

More Funding for Transportation Choices. A half-century ago, the U. S. adopted the Federal-Aid Highway Act of 1956, launching an unprecedented engineering project that quickly changed everything about the way Americans travel and build communities. Today, the Interstates are complete, and we need to invest in an equally ambitious effort to complete the rest of the nation's transportation system. While we work to maintain our world-class highway network, we must build other world-class systems, including public transportation and bicycling and pedestrian networks. These should be complemented by policies that encourage compact, mixed-use development, telecommuting, and pricing of auto use to better manage congestion and raise revenue for alternatives, such as New York City's proposed congestion pricing system.[39]

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[38] As proposed by the Center for Clean Air Policy, see http://www.ccap.org/transportation/smart.htm.
[39] http://www.nyc.gov/html/planyc2030/downloads/pdf/full_report.pdf.

Such investment is badly needed. Demand for New Starts funding is so great that most cities offer far more than the required local match to secure federal funds. Roughly 300 transit projects are authorized in the current federal transportation bill, yet funding is far below demand, producing only about a dozen projects every six years. The process to secure federal funding is also notoriously burdensome and time-consuming. Bicycle and pedestrian travel has also increased in the last decade, and is anticipated to rise. Currently, dedicated federal funding for these "non-motorized" choices stands at about 1.4 percent, even though bike and walking trips account for between 8 and 9 percent of all trips taken.

More Funding for Repair and Reconstruction. Making repair and reconstruction of existing infrastructure the top priority is consistent with climate change goals. Less money should be allocated to new or expanded highways, until deficiencies in critical facilities (e.g., those that threaten public health and safety) are eliminated and even then, only if highway projects can be shown to reduce greenhouse gas emissions and VMT.

"Fix-it-first" policies would establish powerful incentives for reinvestment in existing neighborhoods.[40] New infrastructure investment would stimulate infill development and opportunities for more transportation choices, shorter trips, and reduced GHG emissions. Investment in repairs will help ensure that our bridges, tunnels, and other facilities are safe to use. Such investments can be justified on cost-effectiveness grounds. For example, a recent report from the Sacramento Area Council of Governments found that providing infrastructure for sprawl developments costs an average of $20,000 more per unit than for smart growth developments. With regard to repair, deferred maintenance may reduce expenditures in the short term, but years of neglect create poorly performing infrastructure with much larger long-term repair and reconstruction costs. Deteriorating infrastructure in a community can also discourage private investment.

Increased investment would make up for the federal government's flagging contribution to infrastructure maintenance over the past several decades. The graphs below show that although both capital and operations & maintenance (O & M) spending have grown dramatically since 1980, the federal share of O & M has not risen at the same rate. This has increased pressure on state and local governments to make up the gap in funding needed to maintain aging infrastructure. The problem is particularly evident in older suburban neighborhoods where developers are seeking to build compact mixed-use projects but are facing resistance from residents concerned about their capacity to accommodate growth.

A fix-it-first policy can be implemented through several mechanisms. One option is to apply strict performance-based criteria to core funding programs (National Highway System, Interstate Maintenance, Surface Transportation Program, and Bridge Program) so that no funds can be spent on new roadway capacity until all critical facilities are brought up to minimum safety standards. Another alternative is to create minimum set-aside requirements for repair and reconstruction. For existing programs, like the Bridge and Interstate Maintenance programs, funding could be also increased to ensure that such set-aside requirements are practical.

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[40] The declaration of findings in the 1991 ISTEA legislation includes an emphasis on maintaining and enhancing system components before investing in new ones; similar State legislation enacted in New Jersey could provide a model to follow in other States.

To ensure that locales follow through with plans for redevelopment, a share of federal funds could be held back and rewarded only after infill-enabling policies are implemented successfully. Such a strategy has been used for infrastructure investment under Massachusetts' smart growth program.

The private sector can also be enlisted in the effort. Specifically, tax credits and low-interest revolving fund loans should be offered to privately financed projects that revitalize and retrofit public infrastructure. Such investments would not only benefit those projects, but would also catalyze investment in adjacent areas.

7.1.4 Replace Funding Formulas with Funding Based on Progress Toward National Goals

We recommend that transportation agencies develop a system of performance measures to meet specific national, state, and local goals pertaining to climate stabilization, energy security, accessibility for low-income and disabled persons, and safety. We believe that a mode-neutral plan to achieve such goals will result in several-fold increases in funding for public transportation, bicycling and pedestrian facilities, and reinforcing land-use changes. The kinds of programs that might see major increases include federal New Starts and Small Starts, federal Safe Routes to School, Transportation Enhancements, the Non-Motorized Pilot Program (which should be converted from a pilot to a regular program), and the Jobs Access and Reverse Commute Program.

Applying performance criteria to roadway infrastructure will likely result in a decrease of unnecessary and traffic inducing highway projects, because most projects have never been scored against any rigorous performance criteria. Many are among the 6,371 new earmarks from the 2005 SAFETEA-LU Act or are otherwise justified based on criteria that are much looser than those faced by transit proposals. Also, they are less likely to be able to compete as well with regard to the urgent national priorities of energy security and climate change discussed in this book.

To achieve a performance-oriented approach, our nation will have to fundamentally transform its transportation policies. Current funding formulas are based on VMT, fuel use and lane miles – thus rewarding increased GHG emissions. Moreover, gasoline tax revenues are dependent on the steady or increasing VMT levels and more funding is allocated to areas with more VMT. As long as our transportation industry is dependent on VMT levels being high, the task of reducing VMT will be extremely difficult. The current crisis in the federal transportation trust fund is actually an excellent opportunity to rethink how revenues are raised in light of national priorities for energy and climate.

States could require metropolitan transportation improvement programs (TIPs) to demonstrate their compliance with statewide measures, creating pots of money to use as rewards for meeting desired targets, and tracking the effectiveness of various VMT-reduction strategies. Potential measures to be achieved by 2030 might include:

- Reduce per capita VMT in a metropolitan region by 25 percent;
- Reduce statewide per capita VMT by 20 percent;
- Reach a state of good repair for roads and bridges to address safety and maintenance issues; and
- Double access to transportation alternatives and increased mode shares for transit, bicycling, walking, carpooling, or telecommuting to expand the transportation choices available to all Americans.

The original ISTEA legislation, as passed by the Senate in 1991 (and way ahead of its time), provides a model of how federal funding could be transformed to a performance-based system. This legislation would have created an Energy Conservation, Congestion Mitigation, and Clean Air Act Bonus program. The original language was as follows:

> This paragraph shall apply beginning in fiscal year 1993 and shall apply only to those States with one or more metropolitan statistical areas with a population of two hundred fifty thousand or more. The amount of each such State's Surface Transportation Program funds determined pursuant to section 133(b)(1)(A)(i) shall be reduced by multiplying such amount by a factor of 0.9 if the State's vehicle miles of travel per capita is more than 110 per centum of its vehicle miles of travel in the base year. Reductions in apportionments made pursuant to the preceding sentence shall be placed in a Surface Transportation Bonus Fund and shall be used, to the extent such funds are available, to increase the amount of Surface Transportation Program funds determined pursuant to section 133(b)(1)(A)(i) by a factor of 1.1 for each State affected by this paragraph, if such State's vehicle miles of travel per capita is less than 90 per centum of its vehicle miles of travel per capita in the base year. Funds remaining thereafter in the Surface Transportation Bonus Fund, if any, shall be apportioned to the States affected by this paragraph in proportion to each State's share of Surface Transportation Program funds determined pursuant to section 133(b)(1)(A)(i) among all such States prior to any adjustments made pursuant to this paragraph. Funds so apportioned shall be treated as funds pursuant to section 133(b)(1)(A)(i) area treated. For the purposes of this paragraph, the term "base year" shall mean the year 1990 for fiscal years 1993, 1994, and 1995, and shall mean the year 1995 for fiscal years 1996 and all subsequent fiscal years."

Such a bonus program could be administered either through state allocations and metropolitan suballocations, or better still, through direct allocations to MPOs (as described in the next section).

7.1.5 Provide Funding Directly to Metropolitan Planning Organizations

When MPOs were first established and formally recognized, a number of federal programs requiring regional planning came within their purview (Lewis and Sprague 1997). With the "new federalism" of the Reagan administration, MPOs lost most of the programs they briefly controlled (McDowell 1984). The one program remaining was transportation planning, but new regulations gave states full sway in determining the functions for MPOs. This meant that many MPOs were in the role of merely "rubber-stamping" decisions already made by state highway departments (Solof 1997).

The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 reversed this trend, somewhat. ISTEA gave MPOs new authority and responsibilities. MPOs were to craft 20-year long-range transportation plans that were fiscally constrained to meet realistic revenue projections. They also had to adopt short-range transportation improvement programs to formally allocate federal transportation dollars to specific projects. They also now had some additional money to allocate. Before ISTEA, federal law mandated that states siphon off a tiny percentage (less than 1%) of their allocation of federal transportation dollars for MPOs. This money did not fund projects; it was to be used for MPO basic operations (staff, facilities, etc.). The funds for projects had to come through the state DOT, and hence was subject to the state's discretion and priorities.

ISTEA changed this by providing a minimum suballocation to MPOs (with 200,000+ population): in addition to providing some operating funds, states had to guarantee a minimal amount of project funding to their MPOs. Under the current transportation law, SAFETEA-LU, that amount is 5% of a state's federal highway allocation (Wolf, Puentes, Sanchez and Bryan 2007).

As important as these changes were, they have hardly made a dent in what is an increasingly inequitable distribution of transportation dollars. Metropolitan areas contain more than 80% of the nation's population and 85% of our economic output (Puentes and Bailey 2005). Investment by state DOTs in metropolitan areas lags far behind these percentages (Hill, Geyer, Puentes, et al 2005).

The issue is not just the *amount* of funding; it is also the authority to decide *how* the money is spent. More than one-third of the states that receive Congestion Management Air Quality funds—funds that by definition are to be used in MPO areas—do not suballocate those funds to their respective MPOs. Only 12 states suballocate federal Transportation Enhancement program dollars to MPOs. The state decides how these funds are to be spent. Even with the 5% of funds that are required to be suballocated to MPOs, many MPO staff report that the state DOT still wields substantial influence (Puentes and Bailey 2005).

What is necessary to remedy the long history of structural and institutional causes behind these inequities is a new system of allocating federal transportation funds directly to metropolitan areas. Instead of sending federal allocations to the states and expecting the states to "do the right thing" for metropolitan areas, future federal legislation should provide for the direct allocation funds to MPOs, without filtering funds through state DOTs.

Moreover, the amount of allocation should be closer to the proportion of an MPO's population and economic activity compared to other MPOs and non-MPO areas in the same state. A starting basis for making these calculations is the point-of-sale gas tax collection. Because different states have different relative demands for rural and interstate facilities, this formula could be adjusted on a state-by-state basis to reflect those variations.

7.1.6 Develop a National Blueprint Planning Process that Encourages Transportation Choices and Better System Management

Good planning is critical to the viability of alternative transportation modes and land use reforms at a regional scale. The State and Metropolitan Planning sections of the transportation reauthorization bill (Green-TEA) could require Land Use and Transportation Scenario Analyses for all regional transportation plans. Near-term Transportation Improvement Programs and Long Range Transportation Plans currently require alternatives analyses for specific large projects, but not for the full program or land use plans. It is difficult to discern the benefits from coordinated transportation land use policies on a project-by-project basis. Therefore, under the current system, innovative land use-based policies are more difficult to justify.

The next federal transportation bill should fix this problem by examining both the project scale and cumulative benefits of projects. It should also increase funding for coordinating regional transportation and land use planning to facilitate maximizing opportunities for transit-oriented development, intermodal transportation centers, and more compact, walkable neighborhoods. Scenario and visioning initiatives should also include robust public participation components. Efforts such as the California Blueprint Planning Grants and Blueprint Learning Network provide useful models for other states and regions.[41] Regions whose plans help attain performance goals should be able to access additional funding for implementation and other uses. A "Green-TEA" could establish a National Blueprint Learning Network and National Blueprint Planning Grants.

7.1.7 Place More Housing Within Reach

Many homebuyers "drive til they qualify," that is, they purchase a less expensive home further away from where they would ideally like to live.[42] With rising gasoline costs, the financial trade-off between a longer commute and cheaper housing is changing.[43] The potential savings from living in a convenient location with transportation choices is becoming a more important aspect of affordability.[44]

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[41] California Department of Transportation (2007), "Blueprint Learning Network." http://www.dot.ca.gov/hq/tpp/offices/orip/BLN.htm. Also see California Department of Transportation (2007), "California Regional Blueprint Planning Program." http://calblueprint.dot.ca.gov/

[42] Carrie Makarewicz, Tom Sanchez et. al. , Housing and Transportation Financial Tradeoffs and Burdens for Working Households in 28 Metropolitan Regions, Center for Neighborhood Technology and Virginia Tech, 2006, at H-T-Tradeoffs-for-Working-Families-n-28-Metros-FULL.pdf.

[43] Barbara Lipman (ed), A Heavy Load: The Combined Housing and Transportation Burdens of Working Families, Center for Housing Policy, National Housing Conference 2006 at www.nhc.org.

[44] Scott Bernstein, Carrie Makarewicz, Kevin McCarty; ***Driven to Spend***, Center for Neighborhood Technology and Surface Transportation Policy Partnership, 2005, at www.transact.org. Center for Neighborhood Technology and Center for Transit Oriented Development, The Affordability Index: A New Tool for Measuring the True

The Congressionally chartered Millennial Housing Commission has called for a dramatic increase in investment for housing that is affordable to a wide range of individuals and working families of modest means, including teachers, firefighters, nurses, and older Americans. Contrary to widespread beliefs, transit oriented development serves an extremely diverse population and will continue to do so.[45] Greatly expanding the supply of housing in walkable neighborhoods with high-quality transit is a way to satisfy this unmet demand and offer living arrangements that more people can afford. Recent studies for the Federal Transit Administration, the Dept. of Housing and Urban Development, and the Ford Foundation show that much of the need for housing over the next 30 years can be met within walking distance of the nation's 4,000 existing and development transit stations, with significant reduction of VMT.[46] Transportation investments, land development practices, and coordinated planning can also help achieve affordability and access goals while also reducing greenhouse gas emissions. Tax credits can provide a powerful incentive for investment in projects with coordinated land use and affordable housing.

Smart Location Tax Credit. The federal government and some state governments currently provide tax credits for hybrid vehicles, solar technology installation, and other technologies that reduce energy use. The same can be done for smart locations that inherently save energy from vehicle trips. The federal government should direct states to identify smart locations based on the "4D" performance criteria discussed in this book: density, diversity, design, and destination accessibility. Developers of new for-sale or rental units within the most efficient location tiers could qualify for a federal Smart Location Tax Credit. A portion of the incentive can be used to finance affordable units. The transportation choices available in these locations would reduce household transportation costs, an important cost saving to the people living in these homes.

Housing Rehabilitation Tax Credit: For existing housing, federal tax credits for rehabilitation should be provided to revitalize all existing housing units in neighborhoods that generate lower VMT per household than the regional average. As discussed above, federal guidelines would require each state to identify smart location zones that would benefit from the rehabilitation tax credit.

These tax credits serve multiple and critical national needs, from affordable housing to neighborhood reinvestment. They could be funded by reducing subsidies that are incompatible with a national focus on climate change, such as capping the tax-free parking benefit at its current level ($215 per month) or a reduced level (that is, capping it at $200 per month). Also, they could complement existing federal tax incentives that support affordable housing, reinvestment, and historic preservation. The value of tax credits could be increased when the Low Income Housing Tax Credit is also used to benefit smartly located and/or rehabilitation projects, which would help create housing choices for households of different income levels.

Affordability of a Housing Choice, Brookings Institution, 2006 at www.brookings.edu/metro/umi/pubs/20060127_affindex.htm.

[45] Preserving and Promoting Diverse Transit-Oriented Neighhborhoods, Center for Neighborhood Technology and Center for Transit Oriented Development, 2006 at http://www.cnt.org/repository/diverseTOD_FullReport.pdf.

[46] Hidden in Plain Sight: Meeting the Coming Demand for Housing Near Transit, Center for Transit Oriented Development 2005 at www.reconnectingamerica.org.

The federal Historic Preservation Tax Credit has been one of the most effective tools for revitalizing neighborhoods and repopulating older cities, suburbs, and towns. It should be strengthened and expanded to benefit a wider range of historic properties and to be combinable with other tax credits to facilitate more revitalization and affordable housing production.[47]

7.1.8 Create a New Program to Provide Funding to "Rewrite the Rules"

Builders, developers, and industry analysts have conducted market research studies that show a strong and growing demand for walkable, mixed-use neighborhoods with good transit access (see Chapter 1). However, outdated local development regulations (such as subdivision regulations, zoning, parking standards) often make this type of development the hardest thing for a developer to build. Ironically, creating neighborhoods that resemble some of our nation's most appealing places, such as the Georgetown neighborhood in Washington, D.C., or Charleston, South Carolina, is technically illegal in many places because such construction would violate current codes.

The problem is not lack of desire from cities, counties, or towns. In fact, many localities want to modernize their obsolete codes. However, limited planning funds make it hard to both run the development process and redesign it. The federal government provides vast technical assistance resources for everything from agricultural practices to homeland security. Congress should establish a new program to help communities update development rules to support more walkable, town-style, environmentally friendly development.

At the very least, such changes should allow smart growth and compact development a chance to compete by facing the same development process that conventional development must follow. Leveling the playing field would benefit consumers as they shop around for housing and development choices. Most communities already have a surplus of large-lot, single-family homes, and those that wish to change increasingly want to rewrite the rules to encourage compact development, much in the same way that conventional suburban development was subsidized and facilitated through federally discounted mortgages, infrastructure, planning and zoning rules, and other incentives. Changing the rules in just the 50 largest American metropolitan areas would quickly bring more housing, neighborhood, and transportation choices to about 168 million people, or more than half of all Americans.

7.2. State Policy Recommendations

In the absence of major federal action, many states are already moving ahead with plans to reduce CO_2 emissions. Some states have banded together in compacts like the Regional Greenhouse Gas Initiative and the Western Regional Climate Change Initiative to create cap-and-trade programs. In addition, twenty-nine individual states have created climate action plans; California and New York have some of the best defined plans.

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[47] Working with the Internal Revenue Service and State Historic Preservation Offices, the National Park Service in 2006 approved 1,253 rehabilitation projects that attracted a record-breaking $4.08 billion in private investment, which is equivalent to a more than 5 to 1 return on federal tax credits invested.

State climate plans in New York, Connecticut and Massachusetts include comprehensive VMT-reduction recommendations, though implementation has been mixed.[48] New York state requires its Metropolitan Planning Organizations to report GHG impacts of Transportation Improvement Programs and Long Range Transportation Plans (both are required to receive federal transportation funds).[49] Connecticut created an Office of Responsible Growth to promote transit-oriented development, provide transit alternatives, encourage walkable communities and target state funding to support development in designated Responsible Growth areas.[50] The California Energy Commission runs a working group tasked with developing recommendations on achieving GHG reductions from smart growth policies. In August 2007, the Commission released a set of policy recommendations on land use and climate change based on a comprehensive review of state and local efforts.[51]

Our recommendations for state policies incorporate development and land use as VMT and CO_2 reduction strategies and will work with or without the federal policies described above. They include:

1) Set state targets for VMT as part of a CO_2 reduction plan;
2) Adopt state transportation and land use policies that supports climate goals;
3) Improve transportation planning models to reflect the latest research on how the built environment affects travel behavior (regional travel forecasting, trip generation, etc.);
4) Align state spending with climate and smart growth goals;
5) Eliminate perverse local growth incentives; and
6) Create economic development incentives.

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[48] CCAP (2003) on Collaboration with the New York Greenhouse Gas Task Force, "Recommendations to Governor Pataki for Reducing New York State Greenhouse Gas Emissions." http://www.ccap.org/pdf/04-2003_NYGHG_Recommendations.pdf. See also CCAP(2004), "Connecticut Climate Change Stakeholder Dialogue: Recommendations to the Governor's Steering Committee." http://www.ccap.org/Connecticut.htm.

[49] ICF Consulting (2005), "Estimating Transportation-Related Greenhouse Gas Emissions and Energy Use in New York State." http://climate.dot.gov/docs/nys.pdf.

[50] Rell (2006), Executive Order 15. http://www.ct.gov/governorrell/cwp/view.asp?A=1719&Q=320908.

[51] California Energy Commission, "The Role of Land Use in Meeting California's Energy and Climate Change Goals," August 2007.
http://www.energy.ca.gov/2007publications/CEC-600-2007-008/CEC-600-2007-008-SF.PDF.

7.2.1. Set State Targets for Vehicle-Miles of Travel

Establish a GHG Reduction Plan That Includes a Target for VMT Reductions

If the federal government does not act to reduce GHG emissions and VMT, states can take the lead and establish their own goals. Whether federally or state driven, the state target should be allocated among local governments within the state, or, where localities are highly fragmented, to regional governments.

To achieve the targets, local and regional governments would submit plans to the state using the strategies that best fit their communities. States would then rate those plans and provide greater financial support and regulatory relief to those places with better implementation plans. Meeting VMT targets provides the opportunity to achieve significant co-benefits (e.g. greater housing and transportation choice, fiscal savings, providing services in underserved neighborhoods), so the state may also rate local plans according to their achievement of these benefits. To help communities meet these targets, the state can provide grants and technical assistance to help localities develop realistic plans that score better and become eligible for greater state aid. New federal transportation policy (Green-TEA) could help by providing supportive policies and incentives.

As explained in Section 7.1.1., this system is similar to the one currently employed to meet air quality standards under the Clean Air Act (CAA). Under the CAA, metropolitan regions must inventory their emissions sources and develop plans to bring those emissions in line with clean air standards. For example, most metro regions already inventory their VMT and associated emissions. They also project future VMT and develop strategies to reduce emissions from both current and future auto trips.

Washington State's Commute Trip Reduction program employs a similar strategy and is focused explicitly on reducing single-occupant vehicle commutes and greenhouse gases.[52] To achieve these goals, the state has set targets for reductions in single occupant vehicle commutes and VMT per commuter. Local jurisdictions must then set goals that are at least equal to the state goals and create plans for achieving the target measures. This program is described on the web site as follows:

> 1) **Program goals.** This section establishes the goals and targets for the CTR program that every city and county shall seek to achieve at a minimum for the affected urban growth area within the boundaries of its official jurisdiction. Every two years, the state shall measure the progress of each jurisdiction and region toward their established targets for reducing drive-alone commute trips and commute trip vehicle miles traveled per CTR commuter. Local and regional goals and measurement methodologies shall be consistent with the measurement guidelines established by WSDOT and posted on the agency's web site.

[52] See the Washington Department of Transportation Web site at http://apps.leg.wa.gov/WAC/default.aspx?cite=468-63-030

2) **Statewide minimum program goals and targets.** The goals and targets of local jurisdictions for their urban growth areas shall meet or exceed the minimum targets established in this section.

a) The first state goal is to reduce drive-alone travel by CTR commuters in each affected urban growth area. This will help urban areas to add employment and population without adding drive-alone commute traffic. The first state target based on this goal is a ten percent reduction from the jurisdiction's base year measurement in the proportion of single-occupant vehicle commute trips (also known as drive-alone commute trips) by CTR commuters by 2011.

b) The second state goal is to reduce emissions of greenhouse gases and other air pollutants by CTR commuters. The second state target based on this goal is a thirteen percent reduction from the jurisdiction's base year measurement in commute trip vehicle miles traveled (VMT) per CTR commuter by 2011.

3) **Local program goals and targets.** Local jurisdictions shall establish goals and targets that meet or exceed the minimum program targets established by the state. The goals and targets shall be set for the affected urban growth area in the city or county's official jurisdiction, and shall be targets for the year 2011 based on the base year measurement for the urban growth area.

a) Each local jurisdiction shall implement a plan designed to meet the urban growth area targets. Progress will be determined every two years based on the jurisdiction's performance in meeting its established drive-alone commute trips and VMT targets. Local jurisdictions shall establish base year values and targets for each major employer worksite in the jurisdiction. However, the targets may vary from major employer worksite to major employer worksite, based on the goals and measurement system implemented by the jurisdiction. Variability may be based on the following considerations:

7.2.2. Adopt State Transportation and Land Use Policies That Supports Climate Goals

Guide Transportation Investments to Projects That Support the Creation of Walkable Communities, More Transportation Choices, and the Achievement of Climate Goals

The prevailing method of transportation planning—trying to keep up with demand by simply "projecting and providing"—has proved to be both more expensive and less successful than many would wish. In spite of large transportation investments, congestion nationally continues to worsen year after year. Further, future projected needs far outstrip any reasonable estimates of available funds. Finally, beyond fiscal constraints, climate change, an aging population, changing market demand, and other macro-trends suggest that a continuation of strategies that rely nearly exclusively on automobile transportation is untenable.

Instead, states can work with localities and the public to identify future land use and transportation scenarios that provide a wide and suitable array of transportation choices, manage the growth of VMT and emissions, reduce household and government transportation expenses, and support greater access and mobility for all citizens. The California Department of Transportation is currently supporting this approach through its BluePrint project where localities proactively examine future growth scenarios and make investments to achieve the desired scenario. Similar processes have worked in Utah (Envision Utah) and Oregon (The LUTRAQ project). In these latter cases, the preferred future growth scenarios reduced vehicle miles of travel, created better traffic outcomes and saved infrastructure costs. Both studies are included in the literature reviewed above.

Once a future land use/transportation scenario is identified, states can then direct every new investment toward building that scenario. This is substantially different from the current process, because rather than simply responding to land use changes transportation investments now help to shape those changes in a way that leads to better outcomes. Investing in a specific vision for a region's or community's future will ensure that the future is more than just the sum of individual projects, and that development decisions and policies help meet economic, environmental, community, and fiscal goals. State policy changes that implement this approach include:

- A shared state and local vision of the future transportation system;
- Evaluating the full range of options and outcomes in a mode-neutral way, including system and demand management, land use, and alternative modes;
- A State transit village program to coordinate state policy for growing transit locations and identify future transit-oriented development (TOD) opportunities (e.g., New Jersey);
- State standards to allow roads to adapt to the surrounding land use and the adoption of context-sensitive design more broadly (many states, including Montana, Ohio, Massachusetts, Texas, and Washington);
- State access management policies that are consistent with the future transportation system (e.g., managing highway access for new developments to better manage traffic loads; leading examples include policies in Colorado, Maryland, Florida, Oregon, and Delaware);
- State connectivity policies that rely more on a larger number of smaller, interconnected road facilities, with accompanying state funding for smaller-scale roads;
- A Fix-it-First infrastructure policy (e.g., New Jersey's Fix-it-First program for transportation);
- Adoption of a "complete streets" policy and an emphasis on providing a variety of attractive transportation options to the maximum number of people (e.g., St. Louis and San Diego);
- Elimination of state restrictions that prohibit gasoline tax revenues from being spent on public transportation and other modes (most states do not have such prohibitions); and
- Requirements for developers to assess and mitigate climate impacts of large projects (e.g., Massachusetts[53]; King County, Washington[54]).

[53] Massachusetts Executive Office of Energy and Environmental Affairs (2007), "MEPA Greenhouse Gas Emissions Policy and Protocol." http://www.mass.gov/envir/mepa/pdffiles/misc/ghgemissionspolicy.pdf.

[54] King County (2007), "Executive Order on the Evaluation of Climate Change Impacts through the State Environmental Policy Act." http://www.metrokc.gov/exec/news/2007/pdf/climateimpacts.pdf.

Also, with successful trials around the globe, roadway pricing strategies will likely become a key tool in managing traffic congestion and raising revenue in the U.S. States will play a key role in approving metropolitan pricing schemes, as will the federal and local governments. Such efforts can have a major impact on VMT reduction and funding alternatives, such as infill development, cycling and walking infrastructure, transit operations and capital, and other priorities.

7.2.3. Align State Spending With Climate and Smart Growth Goals

Set Performance Standards for Discretionary and Formula-Allocated Spending, and Target Spending to Areas that Rank Better for Smart Growth

States should ensure that funding programs support climate and VMT reduction goals and should adopt policies to reward local governments that help to meet such goals. States should begin by inventorying all available discretionary funds in such areas as housing, economic development, infrastructure, water and sewer, schools, transportation, state facilities, and recreation. These funds can then be allocated to localities according to their performance in meeting state goals. This inventory should include not only state funds, but also federal funds passed through the state over which the state has discretionary control. These discretionary funds, if thoroughly identified and pooled, can amount to a significant incentive for counties and municipalities. When Massachusetts employed this approach, discretionary funds totaled roughly $500 million within an annual state budget of $27 billion.

After completing its inventory of discretionary funds, the state should develop a coordinated investment approach that would tie funding to local performance on the state's priorities for transportation, housing, tax reduction, and climate. One mechanism for judging performance is a scorecard modeled on the Commonwealth Capital Fund in Massachusetts. This scorecard system awards points when local governments change their development rules and funding to promote more compact, mixed-use, walkable neighborhoods. Communities that score well receive access to some funding when the rule changes are made, and receive access to the larger, remaining portion of funding when new development projects are permitted—tightly linking spending with results.[55] These incentives have lead directly to hundreds of changes to local zoning in Massachusetts cities and towns. These changes contributed to increased production of multi-family housing units from 3,800 to more than 7,000 units annually.

Another state scorecard system is used by the California Infrastructure and Economic Development Bank's Infrastructure State Revolving Fund Program. It rates applications on a 200-point scale that gives substantial preference to projects that:

1) are located in or adjacent to already developed areas and in a jurisdiction with an approved General Plan Housing Element;
2) are located in or adjacent to and directly benefit areas with high unemployment rates, low median family income, declining or slow growth in labor force employment, and/or high poverty rates; and
3) improve the quality of life by contributing to public safety, health care, education, day care, greater use of public transit, or downtown revitalization.

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[55] For more information on Massachusetts' Commonwealth Capital Fund and its scorecard, please see: www.mass.gov/?pageID=gov3topic&L=2&L0=Home&L1=Smart+Growth&sid=Agov3.

Unlike a state's discretionary funds, "formula funds" are distributed to localities on the basis of a formula that is applied annually to a given funding stream (e.g., gas tax revenues, housing funds). Thus, each locality is guaranteed a share of this money. Without changing the geographic allocation of these funds, states can ensure that these dollars are invested in projects that contribute to meeting state goals. The top priorities should be to minimize long-term costs of maintenance and maximize the safety and security of existing roads, bridges, transit, water systems, and other critical community infrastructure. In doing so, the state gets the additional and climate-friendly outcome of making infill and redevelopment more attractive. Therefore, states can designate that a certain percentage of "formula-funded" transportation, school, housing, or other funds to go to the operation and maintenance of existing transportation, water, and wastewater infrastructure.

The remaining funds can be made available to projects that perform best with respect to meeting state goals. Projects within a locality should compete for these funds based on performance, without a predetermined water treatment technology or transportation mode. With this "means neutrality" built in, more innovative projects will be able to successfully compete and become established in the market.

7.2.4. Create Economic Development Incentives

Modernize Incentives to Support Growth and Climate Goals

The average state enables and oversees more than 30 different kinds of company-specific economic development incentives. Most are effectively as-of-right (rather than competitive or discretionary), and many are granted by local or regional bodies. While a few (e.g., brownfield remediation credits) are *de facto* limited primarily to developed areas, they are not officially linked to state land use policy or to transportation planning through enabling legislation. Very few state incentives are harnessed to facilitate shorter commutes, transit-oriented development, or other efficient practices.

Maryland's Smart Growth Areas Act explicitly seeks to better coordinate economic development with planning. Enacted in 1997, the law designates Priority Funding Areas (PFAs), defined as those areas that are already served by water and sewer infrastructure or are planned to receive infrastructure (both urban and rural). The state will spend infrastructure and economic development money only within these PFAs. Areas outside the PFAs are ineligible for state assistance in the form of infrastructure spending or economic development incentives; if development happens there, it will happen without help from the state. The law is one of several Maryland initiatives to preserve rural lands and revitalize cities and towns.

Illinois' Business Location Efficiency Incentive Act, enacted in 2005, gives a small additional corporate income tax credit under one common state incentive (Economic Development in a Growing Economy) if the job site is accessible by public transportation and/or proximate to affordable workforce housing.[56] Companies seeking the additional credit at sites that do not initially qualify can later qualify with a site remediation plan that includes measures such as an employer-assisted housing plan, shuttle services, pre-tax transit cards, or carpooling assistance.

By virtue of their statutory control over both state tax credits and the most common kinds of local incentives, such as property tax abatements, tax increment financing districts, and enterprise zones, states have an enormous amount of unrealized power to recast economic development as a tool for efficient growth and reduced VMT.

7.2.5. Eliminate Perverse Local Growth Incentives

Reduce Competition Between Local Governments and Eliminate the "Fiscalization of Land Use" That Distorts Local Priorities

Local governments rely upon a variety of state-regulated revenue streams to fund local public services. But state policies sometimes depress one stream (e.g., property taxes) while enabling another (e.g., local sales tax increments), giving local governments a fiscal incentive to avoid, for example, residential land use and instead subsidize big-box retail projects. The result of these decisions can be the concentration of jobs far from workers, under-provision of affordable housing and housing for families, and attempts to export negative impacts of development to neighboring jurisdictions.

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[56] SB2855, at http://www.ilga.gov/legislation/BillStatus.asp?DocNum=2885&GAID=8&DocTypeID=SB&LegId=23994&SessionID=50, promoted by a coalition of public interest organizations including Good Jobs First, Center for Neighborhood Technology, Chicago Metropolis 2020 and other groups.

It is difficult for local governments to address these issues on their own. Those that are friendly to family housing or affordable housing can become overwhelmed if their neighbors seek to block these housing types. Localities that do not aggressively zone for commercial land use risk being out-competed by neighbors that do. While local governments in a few metro areas, such as Minneapolis/St. Paul and the City of Charlottesville and Albemarle County, Virginia, have developed pacts to deter intraregional competition, this is relatively rare.

States can eliminate the perverse incentives that local governments face in the development market. In Massachusetts, local governments were reluctant to permit housing for families, fearing that an influx of children would add to the cost of education. The state now provides towns with a hold-harmless guarantee: if education costs rise, the state makes up the difference. In Arizona, local government retail incentive packages became so large and so frequent that the state passed a law prohibiting them in the Phoenix metro area. For many New England states, property taxes are the dominant funding source, and property tax reform is seen as the potential solution. In parts of the West where property tax caps are more common, sales taxes can be a driver of land use decisions, and reform efforts must focus on this dynamic.

According to the National Association of Industrial and Office Properties' (NAIOP) web site, where localities have taken steps to reduce competition for tax base the following lessons can be drawn[57]:

- In the Twin Cities Region in Minnesota, this technique has notably reduced disparities among the localities included in the pool concerning their assessed non-residential property values per capita. When this arrangement was put into effect in 1975, the greatest disparity was 50 to 1; today it is 12 to 1. It is not clear whether this technique has greatly reduced competition among adjacent or nearby localities for added non-residential development projects.32
- In the Dayton, Ohio, region, this technique has made it possible for multiple municipalities to cooperate in promoting the economic development of the entire region, including the provision of affordable housing and cultural facilities serving the entire region.
- In the Hackensack Meadows District, in New Jersey, this technique has made it possible for a regional body to develop a land-use plan that is rational from the broader perspective of an entire region, even though that region encompasses parts of 14 municipalities and two counties, without causing fiscal disadvantages to any of the those 16 legal entities.
- In Rochester, New York, the city is able to collect more funds from the local option sales tax that flows through the county government than it could if it charged that tax only within its own boundaries.

[57] http://www.naiop.org/governmentaffairs/growth/rtbrs.cfm.

7.3. Regional and Local Policy Recommendations

Many local governments are committing to action to reduce greenhouse gas emissions; more than 650 mayors have signed on to the U.S. Conference of Mayors' Climate Protection Agreement,[58] and about 400 have signed on as "Cool Mayors" with ICLEI's Mayors for Climate Protection program.[59] The Sierra Club, in partnership with King County, Washington; Fairfax County, Virginia; and Nassau County, New York, recently launched the "Cool Counties" campaign. To achieve their greenhouse gas reduction goals, these localities will have to include policies that reduce VMT. The following policies can help local governments reach the CO_2 reductions they want, while also creating and supporting strong, healthy, diverse communities where people have more choices in where they live and how they get around:

1) Change the development rules to modernize zoning and allow mixed-use, compact development;
2) Favor location-efficient and compact projects in the approval process;
3) Prioritize and coordinate funding to support infill development;
4) Make transit, pedestrians, and bikes an integral part of community development; and
5) Invest in civic engagement and education.

7.3.1. Change the Development Rules

Examine the Rules and Regulations That Govern Development, and Determine if and how They Need to be Changed to Get Smart Growth That Reduces CO_2 Emissions

As discussed in the State Policy Recommendations section, many communities want to create mixed-use neighborhoods, integrate new development with transit stops, allow more density and more compact neighborhoods, offer more types of housing to allow people of different income levels to live in the same neighborhood, or require sidewalks, bike lanes, and other bicyclist and pedestrian amenities. But many find that their development rules do not allow them to get the type of development they want. Sometimes a community may even develop a vision of what its residents want from development, only to find that it simply is not possible to fulfill the vision under the existing regulations. Part of the strategy for reducing CO_2 emissions from vehicles is to make it easier to build more location efficient, compact developments that allow people to choose walking, bicycling, or public transit.

To achieve that goal, communities should examine their development rules and determine if and how they need to be changed to meet smart growth, CO_2 reduction, and other community goals. Several tools, such as scorecards and zoning code audits, are available to help communities figure out what they need to change to get the kind of development they want.[60] Some opportunities for reform include:

- zoning codes;
- subdivision regulations;

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[58] As of August 2007; see http://usmayors.org/climateprotection/listofcities.asp for the list of signatories.
[59] See http://www.coolmayors.com/common/directory/browse_mayors.cfm?clientID=11061 for the list of mayors.
[60] See, for example, the policy and code audit tools from the Smart Growth Leadership Institute at http://www.sgli.org/implementation.html and samples of scorecards from around the country at http://www.epa.gov/smartgrowth/scorecards/.

- street design standards;
- parking standards;
- annexation rules;
- design guidelines; and
- any other regulation that affects the location and design of development.

Rarely do these regulations require a complete overhaul to make smart growth projects permissible "by right"; many times, it can be done with tools like area plans or overlay zones.

For example, Nashville/Davidson County, Tennessee, had subdivision regulations that applied to rural, suburban, and urban areas equally. Therefore, building more dense and compact development in the central city was not possible. With assistance from the Smart Growth Leadership Institute, the county revised its subdivision regulations so that different standards could be applied to different areas.[61] Now the county can preserve the character of its rural areas while permitting the vibrant development it wants in more urban areas.

Such regulatory reform efforts are largely responding to market demand that is strong across the nation. A recent national survey of developers found that more than 60 percent agreed with the following statement about compact, walkable development: "In my region there is currently enough market interest to support significant expansion of these alternative developments," with a high of 70 percent in the Midwest and a low of 40 percent in the South Central region.[62]

State and local governments should also find ways to expedite and reward exemplary projects that meet the U.S. Green Building Council's LEED for Neighborhood Development (LEED ND) certification standards, and consider adopting those standards as their own. Illinois, for example, just passed "The Green Neighborhood Grant Act," which is the first state legislation to tie LEED ND standards to financial incentives. The Illinois program authorizes the Department of Commerce and Economic Opportunity to issue Requests for Proposals (RFPs) from model development projects that have received LEED ND certification, and award up to three grants to reimburse up to 1.5 percent of the total development costs.

7.3.2. Favor Good Projects in the Approval Process

Make It Easier, Faster, and More Cost Effective for Good Development Projects to Get Approved, and Offer Incentives and Flexibility to Get Better Development

Once communities have reformed their regulations to allow good development, they should make it easier for that good development to be approved. Predictability in the development process is valuable to everyone concerned: developers, local government, and community members. Laying out the guidelines and rules for what the local government considers a "good" development project makes the process more predictable and fair, as does defining the benefits developers will get from meeting or exceeding the community's standards. Two main ways to favor good projects are to offer them flexibility and to speed the approval process.

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[61] See http://www.nashville.gov/mpc/subdivregs/intro.htm and http://www.sgli.org/communities.htm#nashville

[62] Jonathan Levine and Aseem Inam, "The Market for Transportation-Land Use Integration: Do Developers Want Smarter Growth than Regulations Allow?" *Transportation*, Volume 31, Number 4, November 2004.

Flexibility in meeting requirements gives developers room for innovation and creativity, as well as cost savings. If a development project meets or exceeds the community's goals and vision, the developer should be rewarded with, for example, a density bonus that allows them to build more in exchange for providing an amenity the community wants, like affordable housing. Alternatively, local governments can calculate the traffic reduction benefits of a development and adjust accordingly how much parking, road improvements, or air-quality mitigation the developer needs to deliver.

Developers tend to favor an approval process in which projects that follow certain guidelines or are located in targeted areas get streamlined or fast-tracked approvals. Communities might guarantee review of the project within a certain amount of time, or they might coordinate the various departments that need to review development proposals so that review happens quickly and smoothly. Of course, the process must include several opportunities for meaningful public input and review and must ensure compliance with other environmental safeguards.

Some communities do this by setting out specific desirable criteria; any development that meets these criteria gets a fast track to approval. With the advent of the LEED-ND green development guidelines, communities have a good starting point for setting standards to define walkable, environmentally responsible neighborhoods.

In Austin, Texas, the city developed a matrix of smart growth criteria to help it analyze development proposals within areas where it wants to encourage development. The matrix measures how well the project meets the city's goals, including the location of the project, its mix of uses, its proximity to public transit, its pedestrian-friendly design, compliance with nearby neighborhoods' plans, and other policy priorities, including tax base increases. For projects that score above a certain level on the matrix, the city will waive some fees or invest public money in infrastructure for the development.[63]

In other places, an outside organization plays a similar role, setting up a list of criteria and offering public support for projects that meet those criteria. For example, the Greenbelt Alliance in the San Francisco Bay Area will endorse developments that are "pedestrian-oriented and transit accessible, use land efficiently, and provide affordable housing."[64] The Greenbelt Alliance will send a letter of support to the appropriate officials and actively support a project at public hearings if requested. Similar programs, with varying degrees of endorsement, are run through alliances in many other regions.[65] While this outside support doesn't guarantee a faster process, the stamp of approval from a neutral entity can help some projects get approved.

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[63] See http://www.ci.austin.tx.us/smartgrowth/default.htm.

[64] See http://www.greenbelt.org/whatwedo/prog_cdt_index.html.

[65] See, for instance, the Vermont Smart Growth Collaborative's Housing Endorsement Program (http://www.vtsprawl.org/Initiatives/sgcollaborative/VSGC_housingendorsement.htm) or the Urban Land Institute-supported Smart Growth Alliances Information Network. (http://www.uli.org/Content/NavigationMenu/MyCommunity/SmartGrowth/SmartGrowthAllianceInformationNetwork/Smart_Growth_Allianc.htm).

7.3.3. Prioritize and Coordinate Funding to Support Infill Development

Find Funding Sources to Support Infill Development, Coordinate Funding to Get the Most Impact, and Prioritize Infrastructure Projects to Determine Where the Investment will Do the Most Good

Just as at the federal and state levels, local governments should prioritize funding, including infrastructure spending, to support development that helps reduce CO_2 emissions and meets other community, economic, and environmental goals. By directing infrastructure funds to infill projects, whether to repair existing infrastructure or build new facilities, the community is investing in the type of development that can help reduce CO_2 emissions by creating more options for residents. Just as importantly, it is not subsidizing development in far-flung areas that will generate more vehicle trips. This money is a public investment, and it should be spent wisely and with the goal of doing the most good for the most people. As the Metropolitan Council of the Twin Cities region of Minnesota puts it:

> For the metropolitan transit and transportation system, putting growth where the infrastructure to support it already exists means roads that *don't have to be built.* Providing transportation options that include fast, convenient transit services means freeway lanes that *don't have to be added.* And, where new infrastructure is necessary, investments in more connected land-use patterns will be the most fiscally responsible use of limited public resources for transportation.[66] [emphasis theirs]

Scorecards are useful to set priorities for public spending. Similar to the scorecards mentioned previously in this chapter, communities can set up criteria based on location in an area designated for growth; proximity to transit, housing, workplaces, and other amenities; need for new infrastructure; and accommodation of automobiles, pedestrians, bicyclists, and transit. Infrastructure projects and other expenditures that score highly on the scorecard get priority, or get more public funding compared to projects that score poorly.

To get the most from their investments in infrastructure, transit, housing, and other expenditures, local governments should coordinate their land use policies with these investments. This means directing development to areas around transit stations, sharing parking among different uses, building new schools in places easily accessible to the neighborhoods they will be serving, and so forth.

7.3.4. Make Transit, Pedestrians, and Bikes an Integral Part of Community Development

Create a Comprehensive Vision and Plan for Creating Safe and Accessible Routes, Networks, Environments, and Linkages to Destinations. Rewrite Rules as Necessary, and Invest in Supportive Infrastructure.

If communities make it easier for people to walk, bike, or ride transit, they create new options for people besides driving. Making transit, bike, and pedestrian amenities part of planning guidelines creates predictability for developers and can help reduce traffic from new development, which is

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[66] *2030 Regional Development Framework*, Metropolitan Council, pp. 6-7, adopted January 14, 2004, amended December 14, 2006, http://www.metrocouncil.org/planning/framework/Framework.pdf.

a major concern of many of those who live in adjacent neighborhoods. Streets that are built with not only cars, but also bicycles, transit, and pedestrians in mind—often known as "complete streets"—are safer and make people feel more comfortable walking or biking. They are also often more attractive, with shade trees, benches, and other amenities. And they provide options for people who can't or choose not to drive, including children, older people, and people with disabilities.

Localities should adopt complete streets policies and design guidelines to create safe and welcoming environments for pedestrians, cyclists, and transit users. These policies require the accommodation of all users of the right of way, and set out new procedures for ensuring that construction, reconstruction, and maintenance projects balance the needs of all users. Accommodating new, walkable development on land that once held dead shopping centers or factories, or creating transit-oriented developments at rail stations, is likely to require investments in building or retrofitting a street network for pedestrians and cyclists.[67]

A great example of a place that has put all the elements together is Arlington County, Virginia, a suburb of Washington, D.C. Arlington County's master transportation plan includes elements for transit, bicycling, and walking.[68] The county has two subway lines, part of Washington's Metrorail system, and numerous bus routes. It has coordinated its land use with these transit investments, concentrating development along the subway lines and tailoring bus lines to key corridors. The county has emphasized safe and appealing walking and biking environments, putting in bike lanes, sidewalks, crosswalks (many with "countdown" pedestrian signals to let people know how much time they have left to cross the street), and bike and walking paths that connect to trails that go throughout the Washington metropolitan region. The county has also brought in car-sharing services to make it easier for residents to own one car instead of two, or to go without a car.

As a result of having all these transportation options, Arlington has some of the highest rates in the country of commuting by means other than personal automobile. Thirty-nine percent of Arlington residents commute by public transportation, twice the national average, and 6 percent walk to work, well above the national average of 1 percent.[69] The numbers are even higher in the subway corridors; in the Rosslyn-Ballston corridor, along Metrorail's Orange Line, 38 percent of residents who live within half a mile of a station take transit to work, and 73 percent of riders using these Metrorail stations walk to the stations. The foot traffic has fostered a lively commercial, retail, and residential corridor that comprises only 7.6 percent of the county's land area, yet produces about a third of its real estate tax revenue. Meanwhile, automobile traffic has been below projections as county population has grown, showing the benefits of these transportation options not only for the people who choose to bike, walk, or take transit, but also for those who drive.

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[67] See www.completestreets.org.

[68] See http://www.arlingtonva.us/Departments/EnvironmentalServices/dot/planning/mplan/MasterPlans.aspx for a copy of the master plan.

[69] Arlington Master Transportation Plan – Second Draft, Transportation Demand Management Element – November 2006, p. 9.

7.3.5. Invest in Civic Engagement and Education

Engage and Educate Citizens in Visioning Exercises, and Require Opportunities for Meaningful Citizen Participation in Development Decision-Making

For plans to be as successful as possible, the people who will be living and working in the community must be involved in creating them. This means that residents have to have opportunities to learn about the issues and give their input on decision-making. Education might mean public meetings, gathering and publishing data and maps in an easily understood format that's relevant to people's lives, or keeping a Web site up to date on local development issues. With a foundation of basic knowledge about these issues, people are better equipped to participate in development decisions and in guiding the future of their community. When residents are engaged in the decision-making process from the beginning and feel like their concerns and ideas are being heard and considered, they are less likely to fight new development. The extra money spent on these education and engagement efforts pays off in the long run in better development projects that move through the process more smoothly.

One popular form of engagement is a visioning exercise, usually held on a regional or local scale. Participants review various scenarios for the future of the region or community and choose the one that they prefer. Usually there is a "business as usual" scenario that shows how continuing along the current path will affect open space, traffic congestion, development, air and water quality, and other quality of life issues. Other scenarios illustrate what the future could look like with denser development, more transportation options, and development directed to certain areas to preserve open space.

Visioning exercises have been conducted all over the country. One of the best examples is the Sacramento Region's *Blueprint Transportation and Land Use Study*, which used an extensive public outreach process, cutting-edge Internet-accessible planning software, and a detailed business-as-usual baseline growth forecast to help participants to explore alternative growth scenarios through 2050. The adopted preferred scenario features sophisticated infill development and transportation investments that will produce 12.3 fewer daily vehicle-miles of travel per household by 2050, a 27 percent reduction below the baseline. Other well-known examples include Envision Utah, which began in 1997 and was the first large-scale scenario planning exercise in the nation, as well as Louisiana Speaks, which was launched to help coastal communities craft redevelopment plans after the devastation from Hurricanes Katrina and Rita and attracted over 27,000 participants.

Visioning exercises create general principles and strategies for development, but the public should also be engaged in making decisions on specific development projects. They need to be involved from the beginning for their input to be meaningful, and they need to know that their ideas and concerns are being listened to and taken seriously, even if they don't end up being incorporated into the project. Some of the tools communities use to get citizen input are design workshops, charrettes, public surveys, or public meetings.

In a planning ordinance approved in 2001, the town of Davidson, North Carolina, requires new development projects to hold a charrette to get public input. These workshops allow the developer and the town's residents to understand each other's concerns and goals and to work together to make sure the development meets the community's needs. The process gives citizens

the chance to have their voices heard, and it lets developers deal with problems before they can hold up the project in the approval process. Gathering public support at this early stage makes the approval process smoother for developers. Davidson has found that holding these *charrettes* helps preserve its small-town character and makes it easier to achieve its goal of making bicycling and walking safer and more pleasant.

7.4. Developing a Comprehensive Policy Package

Such a comprehensive overhaul of America's development processes will be a mighty challenge. But it is on the same ambitious scale as other proposals that are being considered in the climate change debate, including efforts to switch to renewable fuels, dramatically increase vehicle efficiency, end oil imports from hostile nations, or renew investment in nuclear power.

The fact is, no gigaton of reduction will come very easily, and few methods are likely to take advantage of consumer demand as much as those discussed in this book. In fact, many of the reforms discussed here focus on making government rules and regulations more flexible to give people more of what they want. Also, most of the communities that have adopted these reforms have done so for a wide variety of self-interested reasons, like traffic management or financial rewards, and not because they wished to reduce greenhouse gas emissions. We are confident that these improvements to the built environment can offer tremendous win-win benefits, and hope that these types of policies do get implemented across the nation and the world. They should become a sensible complement to any other climate policies that focus on energy, vehicles, power plants, or other strategies.

8. Conclusion

With regard to urban development and travel demand management, this publication asks and answers three critical questions facing the urban planning profession, land development community, and federal, state, and local policy makers:

- What reduction in vehicle miles traveled (VMT) is possible in the United States with compact development rather than continuing urban sprawl?
- What reduction in CO_2 emissions will accompany such a reduction in VMT?
- What policy changes will be required to shift the dominant land development pattern from sprawl to compact development?

The answer to the first question is a 20 to 40 percent reduction in VMT for each increment of new development or redevelopment, depending on the degree to which best practices are adopted (see Chapter 3). The answer to the second question is a 7 to 10 percent reduction in total transportation CO_2 emissions by 2050 relative to continuing sprawl (see section 1.7). The answer to the third question is a set of dramatic policy changes at all three levels of government (see Chapter 7).

Unlike other vehicle emissions, CO_2 emissions have never been regulated. Given the difficulty of changing longstanding policies, development patterns and, ultimately, lifestyles, is the 7 to 10 percent reduction in CO_2 emissions worth the effort? The answer, we believe, is "yes," for three primary reasons:

- The U.S. transportation sector cannot reach a sustainable level of CO_2 emissions through vehicle and fuel technology improvements alone. It also needs to reduce VMT, as the third leg supporting the policy stool (see Chapter 2).
- The shift from sprawl to compact development will have many other economic, environmental, and quality-of-life benefits, so any "costs" of this CO_2 reduction strategy will be offset by additional quantifiable benefits (see sections 1.5 and 1.6).
- Reductions in VMT and CO_2 emissions with compact development are sizable and long lasting compared to reductions achievable with other available actions (see section 1.7 and Chapter 3).
- Compact development provides an insurance policy against the worst effects of climate change and oil price spikes. In the worst case, current or future residents of compact development will have a variety of viable transportation options, while the residents of sprawl will not.

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Attachment 28

LETTER 21

International Expert Meeting on Urban Flood Management
20-21 November 2003, World Trade Center Rotterdam, The Netherlands

California Climate Change, Hydrologic Response, and Flood Forecasting

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Introduction

California has ecological, cultural, and geographical diversity with 10 natural bioregions (Northern Coastal, Central Coastal, Southern Coastal, Great Central Valley, Cascade Mountains, Sierra Nevada Mountains, East of Sierra Nevada, Mojave Desert, and Sonoran Desert), and several urban centers. Its population exceeds 33 million, with the largest concentrations in the Los Angeles Basin, San Francisco Bay Area, and within the Central Valley. It has an area of approximately 420,000 km^2, with over 2000 km of coastline, and 3000 km^2 of lakes, bays, and deltas. Areas within the San Francisco Bay Delta are below sea level and have levees, retaining walls, and drainage ponds, which along with the California coastal areas, are vulnerable to storm-generated tidal surges, flooding, erosion, and loss of property.

California has experienced long dry and unusually wet periods. Oxygen-18 isotope analyses (Ingram et al. 1996) of San Francisco Bay sediments dating back to about 1200 A.D have indicated changes in salinity, which are indicators of fresh water inflow to the San Francisco Bay. Periods of very high fresh water inflow to the San Francisco Bay (i.e. increased precipitation and low salinity) alternate with periods of low fresh water inflow (i.e. decreased precipitation and high salinity). During the 1500s, there appears to have been a drought that lasted more than 50 years (Fig. 1). Since the beginning of the 1900s, California has been wetter than average, and large engineering projects for water storage and conveyance of Sierra Nevada snowmelt runoff have contributed to the economic growth of California. The sustainability of this region is closely aligned with the availability of fresh water, the storage of this water during dry periods, and the reduction or adaptation to major floods that can potentially damage vital infrastructure.

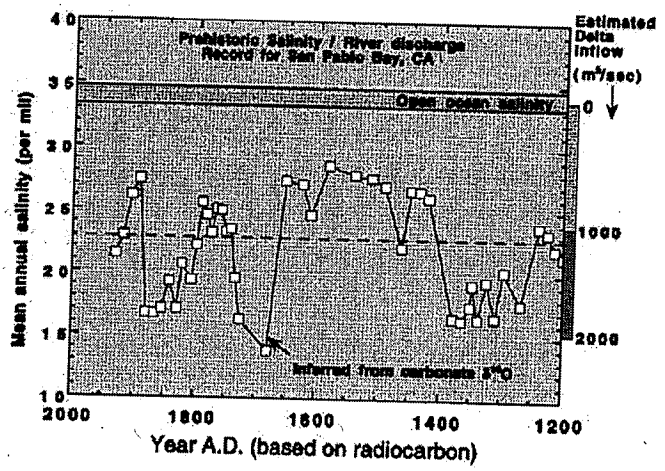


Fig. 1. Oxygen-18 isotope dating of sediments indicates pre-historic periods of high salinity and low inflow (low precipitation), and periods of low salinity and high inflow (high precipitation). The red side-bar represents the estimated fresh water inflow corresponding to the salinity concentration (Ingram et al. 1996).

California has a Mediterranean climate and receives precipitation from November to April, with May through October being dry month. Precipitation is from the Pacific Ocean and involves large-scale atmospheric circulations that are influenced by Pacific Ocean sea surface temperatures (SSTs). The SST patterns affect low frequency climate oscillations that impact precipitation rates in regions around the world through natural teleconnected climate variations. For California, the two most significant are the El Nino Southern Oscillation (ENSO) and the Pacific multi-Decadal Oscillation (PDO). ENSO has a 3-5 year cycle, responds to changes in the western equatorial Pacific Ocean SSTs, and is termed El Nino for its positive phase, and La Nina for its negative phase. The PDO responds to SST patterns in the northern, equatorial, and southern Pacific Ocean, has an approximately 30 year cycle, and is weaker than ENSO. Major El Nino phase events are shown in Fig. 2 and the global precipitation impacts due to the very large 1982-1983 El Nino are shown Fig. 3.

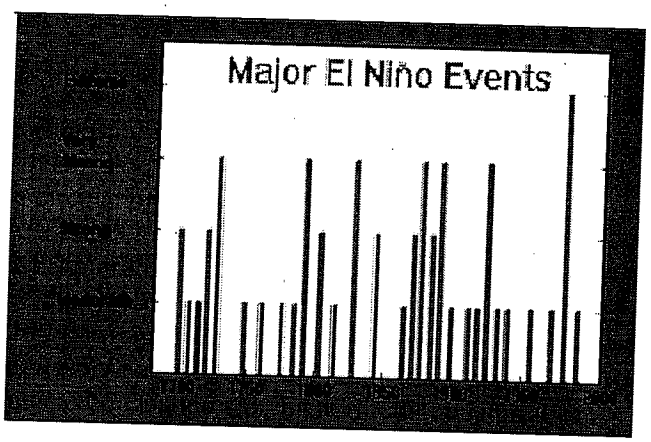


Fig. 2. Major El Nino events since 1700. The 1982-1983 event was the largest on record.

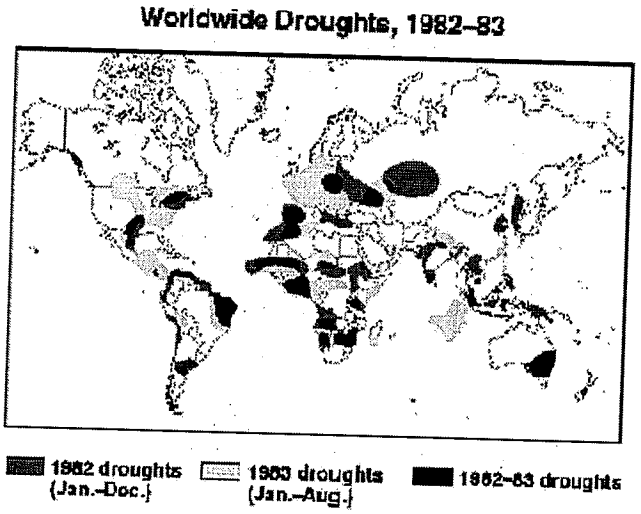


Fig. 3. During the 1982-1983 El Nino, teleconnected patterns caused global impacts, most importantly droughts and floods.

During the last 50 years, there has been an observed global warming of the lower atmosphere at rates greater than direct observations over the previous 150 years and greater than proxy studies that date back 1000 years (Fig. 4). As much as 30 percent of this recent warming can be attributed to natural climate variability, including ENSO, PDO, and other phenomena. However, studies have provided strong evidence of climate change due to the emission of carbon dioxide (CO_2) and other anthropogenic green house gas (GHG) emissions. Since the late 1950s, observations have indicated that the global temperature of the lower atmosphere (troposphere) has increased on average 0.1°C per decade, with the 1990s the warmest decade of the century. Global input of CO_2 to the atmosphere from fossil fuel combustion has exponentially increased since the beginning of the industrial revolution (i.e. 1860) at about 4% per year. Atmospheric CO_2 measurements (Keeling et al. 1989) from Mauna Loa, Hawaii beginning in the late 1950s show increasing atmospheric CO_2 concentrations from near 280 ppm during the late 1950s to concentrations greater than 360 ppm in the 1990s (Fig. 5). Ice core measurements from Vostok, Antarctica indicate that the atmospheric CO_2 concentration was less than 280 ppm for the last 100,000 years (Barnola et al. 1987). It is well understood that CO_2 and other anthropogenic emissions (e.g. methane, nitrous oxide, halocarbons) act as heat trapping GHGs, that radiatively force the global climate and increase tropospheric temperature. This increase in atmospheric CO_2 concentration and temperature appears to be causing a range of impacts, some of which may have adverse consequences.

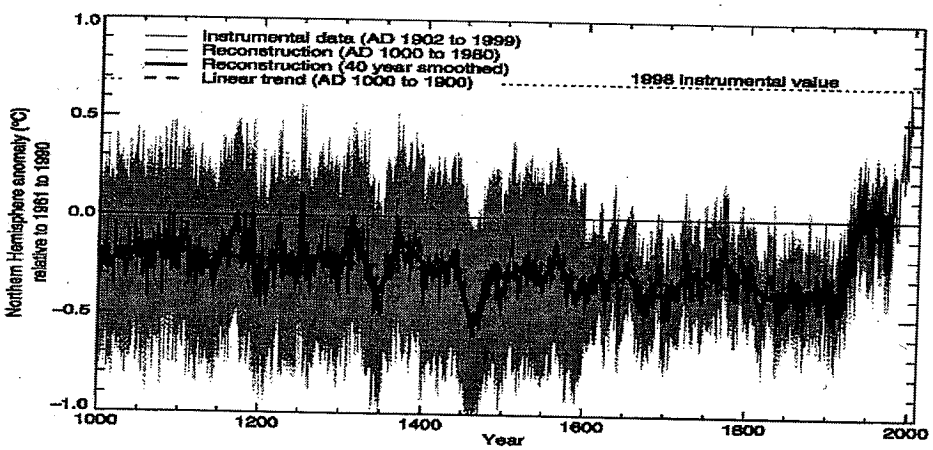
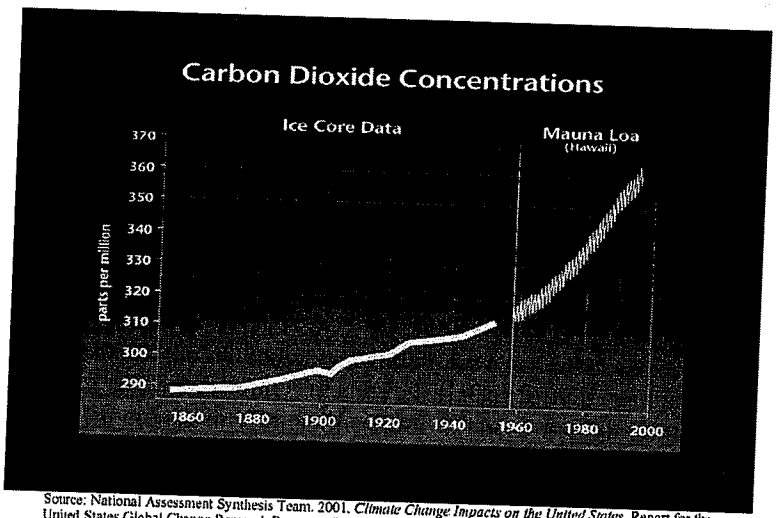


Fig. 4. The observed temperature record from 1860 to present is shown in red, the reconstructed paleo-temperature record for the period 1000 to 1980 AD is shown in blue, with a 40 year smoothed version of the paleo-record in black. The linear trend (red dashed) decreases until about 1860, when historically high rates of temperature increase are observed.

In response to this warming and the potential impacts, the Intergovernmental Panel on Climate Change (IPCC) was established in 1988 and the First Assessment Report released in 1990 provided a discussion of these concerns and provided global and regional climate model projections, framed with uncertainties (IPCC 1990). In 1995, the IPCC Second Assessment Report (IPCC 1995) stated that the balance of evidence suggested a discernable human influence on global climate. The Third Assessment Report (IPCC 2001) has stated that there is new and stronger evidence that most of the warming observed over the last 50 years is attributable to human activities, and warming will continue throughout the 21st century.

The IPCC (2001) ranked the confidence limits of major impacts to water resources due to observed and projected climate change as very high (0.95-1.00), high (0.67-0.95), medium (0.33-0.67), low (0.05-0.33), and very low (0.00-0.05). There is high confidence that the timing and amount of runoff is changing, and very high confidence that watersheds with substantial snowpack will experience major changes as temperature continues to rise. The impacts of this trend are a decrease in available water resources in California, primarily during the summer months, and a potential increase in wintertime floods. There is high confidence that California's Sierra Nevada will experience a continued trend of decreased snow accumulation and earlier snowmelt (e.g. Lettenmaier and Gan 1990; Jeton et al. 1996; Miller et al. 1999; Wilby and Dettinger 2000; Knowles and Cayan 2002; Miller et al. 2003).



Source: National Assessment Synthesis Team. 2001. *Climate Change Impacts on the United States*. Report for the United States Global Change Research Program. Cambridge Univ. Press. http://prod.gcrio.org/nationalassessment/

Fig. 5. The observed CO_2 concentration at Mauna Loa for 1959 to 1995 correlates well with the observed temperature increase shown in Fig. 4.

Precipitation change is very location-dependent and at present there is low confidence on changes in frequency, intensity, and persistence. There is medium confidence that there will be increased flooding in regions that experience large increases in precipitation. The IPCC (2001) suggests that flooding may become a major problem, raising concerns about property damage and levee failure. There is high confidence that increased temperature will cause sea level rise through thermal expansion and increased freshwater input (snow melt runoff, glacier calving). There is high confidence that this will impact groundwater aquifers, surface freshwater systems, and urban areas in The Netherlands, the San Francisco Bay-Delta, and other low lying regions. Sea level rise will cause an increase in erosion and storm surges increasing the extent of damage to coastal areas, bays, levees, and water conveyance structures.

Modeling Climate Change and Hydrology

Atmospheric-Ocean General Circulation Models (AOGCMs) represent a coarse spatial approximation of the global climate system and its response to changes in atmospheric composition. Climate projections are initialized by output from carbon cycle model projections indicating future CO_2 concentrations of 250 to 970 ppm representing GHG concentrations of 90 to 250% of the pre-industrial 280 ppm. This range brackets projected *Business as Usual* scenarios and significant GHG reduction scenarios. Aerosols such as sulphates and black carbon reflect solar radiation in the troposphere causing a cooling effect. Naturally occurring aerosols such as

volcanic emissions also play into this uncertainty. Since the 1990s, these aerosols have begun to be added as part of emission scenarios models along with CO_2 concentrations.

The IPCC AOGCM projections of 21st century climate, with a transient increase in greenhouse gas emissions, suggest that the global mean near-surface air temperature will increase by 1.4 to 5.8 °C, with a 95% probability interval of 1.7 to 4.9 °C by 2100 (Wigley and Raper 2001). The potential for impacts on water resources due to global warming requires a downscaled analysis of local watershed hydrology. To quantify the uncertainty in streamflow, upper and lower temperature and precipitation projections and specified incremental temperature and precipitation changes are used as input forcing to hydrologic models.

Miller et al. (2003) performed an analysis of California hydrologic response to 21st century future climate temperature and precipitation based on two AOGCM projections representing the spread of possible outcomes. The models used are the Hadley Centre HadCM2, a warm and wet projection, and the National Center for Atmospheric Research PCM, a cool and dry projection, relative to the mean of the IPCC AOGCM projections (Fig. 6). Climate change *perturbations* of the projected watershed mean-area temperature and precipitation were derived from the temperature difference and precipitation ratio between the projected climatology and the simulated present day baseline climate (1961 to 1990).

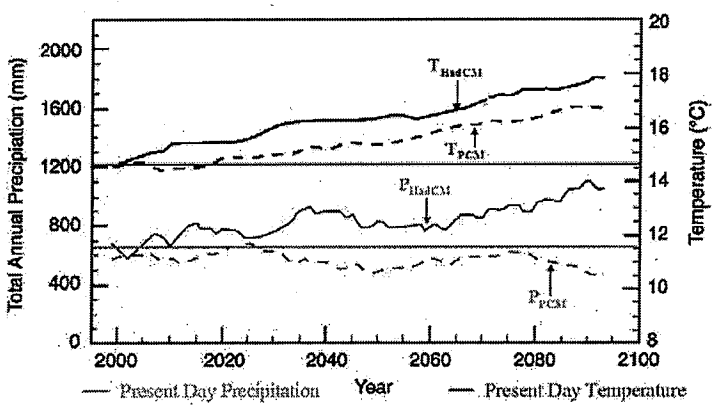


Fig. 6. The California area-averaged temperature for HadCM2 and PCM show an increase from present day (red) of approximately 4.5°C and 2.1°C, respectively, by 2100. While the HadCM2 shows a precipitation increase of approximately 1.9% and the PCM decreases by 0.85% from the present day precipitation (green).

Hydrologic Response to Climate Change

The hydrologic response was investigated using the U.S. National Weather Service Sacramento Soil Moisture Accounting Model and Anderson Snow Model (Burnash et al. 1973) for a set of representative study watersheds (Smith River, Sacramento River, Feather River, American River, Merced River, Kings River) forced by precipitation and temperature perturbations. These watersheds (Fig. 7) were selected to evaluate the shifts in timing and magnitude for runoff in the Cascade Mountains, Sierra Nevada Mountains, and Northern Coastal mountains, as 80% of California's fresh water comes from these regions. Comparisons were made between present-day (1961-1990) hydrology and the hydrologic response to the relatively warm, wet projection and the cool, dry projection. Changes in the rain-to-snow ratio, streamflow, and the range in daily high streamflow return periods (i.e. change in probability of floods) were determined. The

following discussion is focused on a subset of these watersheds; the Sacramento, the American, and the Merced.

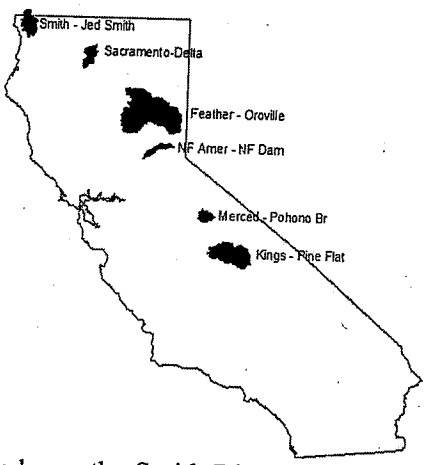


Fig. 7. California study watersheds are the Smith River, Sacramento River, Feather River, North Fork American River, Merced River, and the Kings River. These were chosen to examine the runoff response for major California fresh water sources via similarity. The discussion focuses primarily on the Sacramento, American, and Merced Rivers.

The resulting HadCM2-forced peak flow increases for the Sacramento, American and Merced during 2010 to 2039. During 2050 to 2079 and the 2080 to 2099, the peak flow magnitude continues to increase, with the greatest increase at the American River (Fig. 8, left column).

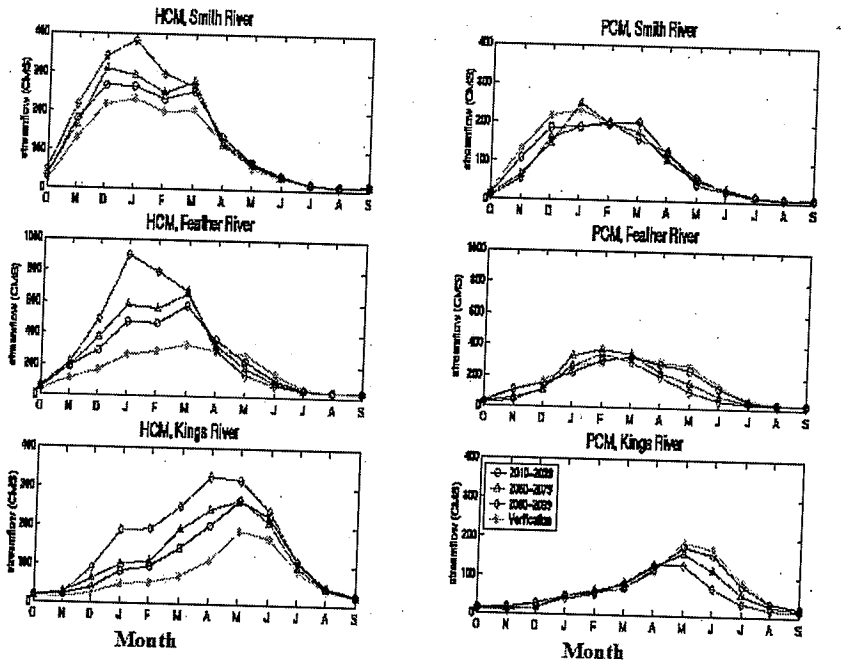


Fig. 8. Streamflow monthly climatologies based on HadCM2 (left column) and PCM (right column), for the Sacramento River, American River, and Merced River, for present day (light blue, validation), 2010-2039 (dark blue, circle), 2050-2079 (green, triangle), and 2079-2099 (red, diamond).

The peak flow timing during the 2080 to 2099 period for the American is a month earlier, occurring in February, while the Sacramento (rainfall-dominant watershed) timing remains relatively unchanged. The higher elevation Merced peak flow occurs one month later than the historical, and it also shows a secondary peak flow during December. This secondary high flow is due to increased early season snowmelt and higher snowline due to the increased temperature. The relatively cool, dry PCM-forced streamflow (right column figures) slightly decreases in total volume and significantly decreases during the March to July melt season. Peak flow remains close to the historical for the Sacramento and American for all projected periods, but the Merced shows an increase during the 2010 to 2039 period, and decreases during 2050 to 2079 and 2080 to 2099. For these projections, the American shows an earlier peak flow of one month, while the peak flow for the other two watersheds shown here remains consistent with the historical peak flow timing. Under the scenarios studied, peak streamflow in the snowmelt runoff watersheds occurs earlier and with increased magnitude and decreased summer season flow.

From a water resources perspective, the most significant finding common to both the HadCM2 and the PCM is a 50 percent decrease in total snow for California by 2100 (Fig.9). The one exception is the very high elevation Merced, which is sufficiently cold that it remains below freezing during most of the snow accumulation season. Such reductions in available fresh water will impact agricultural and urban water use. April 1st is the time when the California Department of Water Resources determines the amount of water available for the dry season.

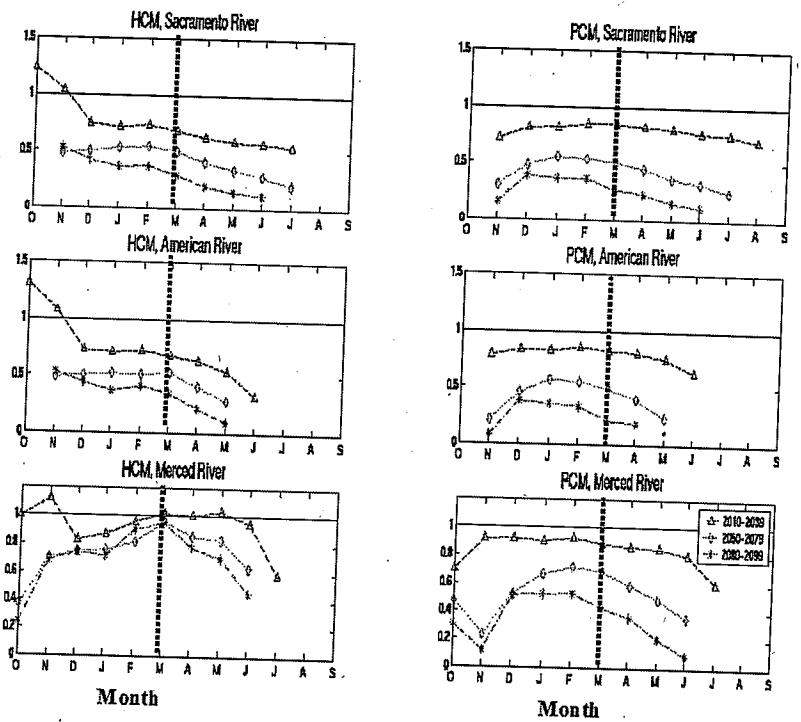


Fig. 9 The ratio of projected to present day total snow for each month based on the HadCM2 (left column) and the PCM (right column) for the Sacramento River, American River, and Merced River, for present day (light blue, validation), 2010-2039 (dark blue, circle), 2050-2079 (green, triangle), and 2079-2099 (red, diamond). The vertical dashed line represents the end of season snow amount.

Changes in the snowmelt timing coupled with increased winter-time warm precipitation (rain) suggest an increased likelihood of high streamflow days that may result in floods. To evaluate likelihoods of future flooding, 30 year high flow days were calculated and ranked for both the HadCM2 and PCM, as well as for the present day period. Fig. 10 indicates that for both the relatively warm, wet HadCM2 and cool, dry PCM, there is a significant increase in the likelihood of high flow days. For each curve shown in Fig. 10, the median of the annual maximum daily flow (50%) increases with increasing temperature. The 5% exceedance high flow (the rightmost symbols in each plot) for the projected climates exceeds current conditions, implying an increased likelihood of high flow days (i.e. floods).

Flood Modeling

The ability to forecast high flows sufficiently far in advance under present and future climate conditions can reduce the loss of property and life. One of the first successful 48-hour advance numerical weather and streamflow forecasts was performed in January 1995 (Miller and Kim 1996a) along the Russian River in Northern Coastal California (Fig. 11). During the first week of January 1995, there were three storm systems that made landfall in the Northern Coastal region closely spaced in time. After the second storm, the ground became saturated and forecasts indicated that flooding (500 CMS) would occur 42 hours after the forecast was made. This simulation was based on a three-step procedure. Our modeling system (Miller and Kim, 1997) automatically obtained, via file transfer protocol (FTP), a global forecast from the U.S. National Weather Service. The global forecast provided our regional scale numerical weather prediction model with the initial and lateral boundary conditions needed to generate a fine-scale forecast, which in turn provided input to our coupled hydrologic model.

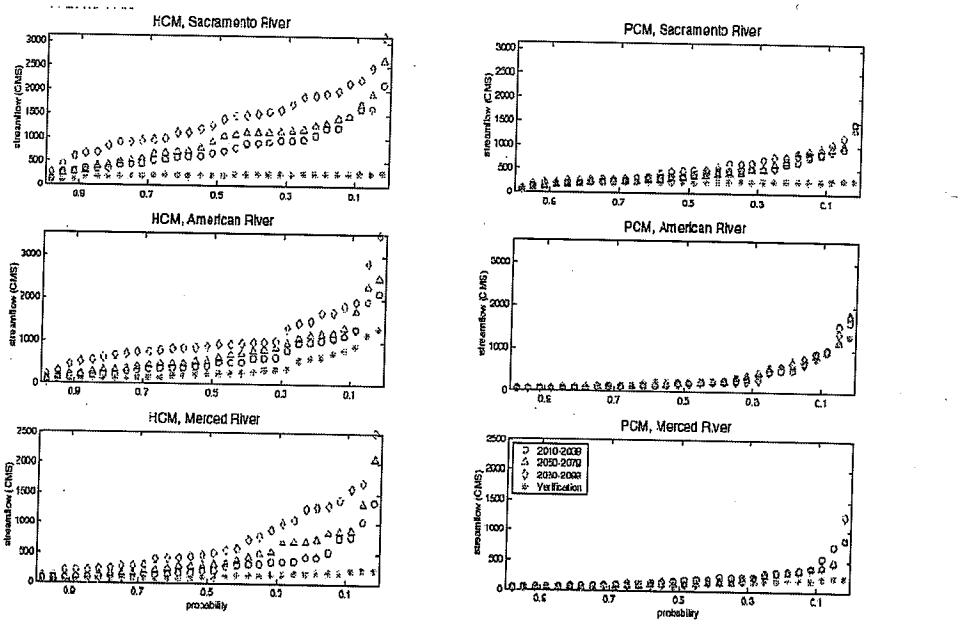


Fig. 10. Daily streamflow excedance probability based on the HadCM2 (left column) and the PCM (right column) for the Sacramento River, American River, and Merced River, for present day (light blue, validation), 2010-2039 (dark blue, circle), 2050-2079 (green, triangle), and 2079-2099 (red, diamond).

This initial work has since advanced with ensemble streamflow simulations and data assimilation. The U.S. National Weather Service-River Forecast Center has developed flash flood modeling techniques with increased forecast skill. There have been successful 72-hour streamflow forecasts when the weather system has good predictability. Now-casting has also emerged as an accurate approach for evaluating weather systems at very short time intervals based on weather radar and remote sensed data.

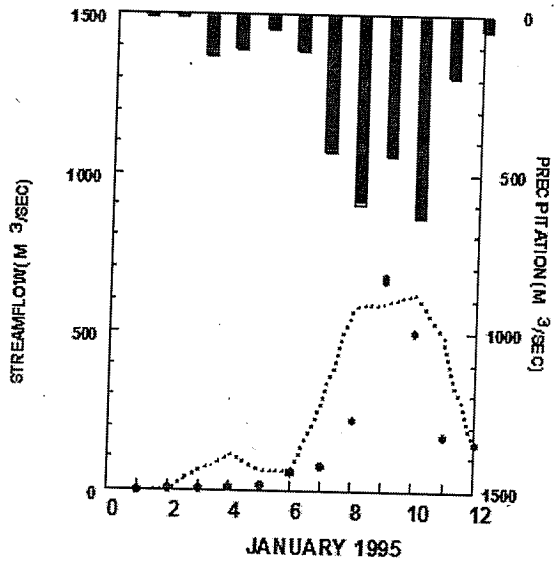


Fig. 9. One of the first 48-hour numerical weather-streamflow predictions was made for the first 12 days of January 1995. The green dashed line is the streamflow forecast, the red dots are stream gauge observations, and the blue bars are the precipitation forecast (Miller and Kim 1996).

During the last five years, the U.S. National Weather Service has been implementing the Advanced Hydrologic Prediction Services (AHPS). AHPS is a federally funded modernization initiative that allows for an incremental introduction of new products and services across the U.S.. The AHPS provide new forecast products depicting the magnitude and uncertainty of occurrence for hydrologic events from hours to days to weeks. The AHPS leverages data and systems from the U.S. National Weather Service and collaborators, including Lawrence Berkeley National Laboratory. It consists of radar data, river gage data, weather observations, snow cover/melt data, precipitation forecasts, climate predictions, reservoir releases, and satellite data.

Summary and Conclusions

There is strong evidence that the lower atmosphere has been warming at an unprecedented rate during the last 50 years, and it is expected to further increase at least for the next 100 years. Warmer air mass implies a higher capacity to hold water vapor and an increased likelihood of an acceleration of the global water cycle. This acceleration is not validated and considerable new research has gone into understanding aspects of the water cycle (e.g. Miller et al. 2003). Several significant findings on the hydrologic response to climate change can be reported. It is well understood that the observed and expected warming is related to sea level rise. In a recent seminar at Lawrence Berkeley National Laboratory, James Hansen (Director of the Institute for

Space Studies, National Aeronautics and Space Administration) stressed that a 1.25 Wm^{-2} increase in radiative forcing will lead to an increase in the near surface air temperature by 1°C. This small increase in temperature from 2000 levels is enough to cause very significant impacts to coasts. Maury Roos (Chief Hydrologist, California Department of Water Resources) has shown that a 0.3 m rise in sea level shifts the San Francisco Bay 100-year storm surge flood event to a 10-year event. Related coastal protection costs for California based on sea level rise are shown in Fig. 13 (Wilkinson et al. 2002).

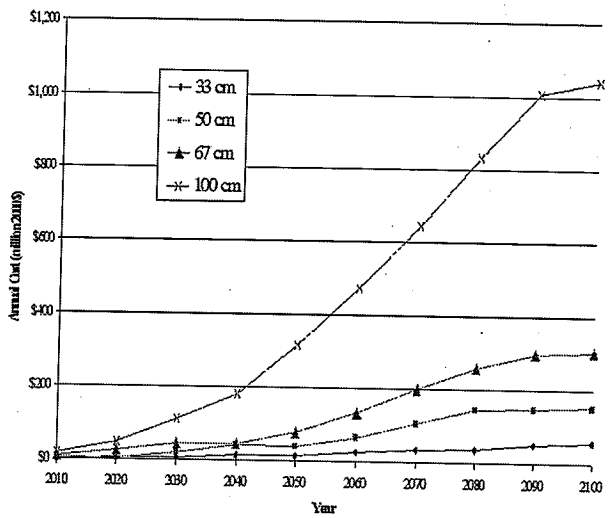


Fig. 13. California costs for coastal protection for sea level rise of 33cm, 50cm, 67cm, and 100cm.

In addition to rising sea level, snowmelt-related streamflow represents a particular problem in California. Model studies have indicated that there will be approximately a 50% decrease in snow pack by 2100. This potential deficit must be fully recognized and plans need to be put in place well in advance. In addition, the warmer atmosphere can hold more water vapor and result in more intense warm winter-time precipitation events that result in flooding. During anticipated high flow, reservoirs need to release water to maintain their structural integrity. California is at risk of water shortages, floods, and related ecosystem stresses.

More research needs to be done to further improve our ability to forecast weather events at longer time scales. Seasonal predictions have been statistical and only recently have studies begun to use ensemble simulations and historical observations to constrain such predictions. Understanding the mechanisms of large-scale atmospheric dynamics and its local impacts remain topics of intensive research.

The ability to predict extreme events and provide policy makers with this information, along with climate change and hydrologic response information, will help to guide planning to form a more resilient infrastructure in the future.

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Attachment 29

14

North America

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Executive summary

North America has experienced locally severe economic damage, plus substantial ecosystem, social and cultural disruption from recent weather-related extremes, including hurricanes, other severe storms, floods, droughts, heatwaves and wildfires (very high confidence).
Over the past several decades, economic damage from severe weather has increased dramatically, due largely to increased value of the infrastructure at risk. Annual costs to North America have now reached tens of billions of dollars in damaged property and economic productivity, as well as lives disrupted and lost. [14.2.3, 14.2.6, 14.2.7, 14.2.8]

The vulnerability of North America depends on the effectiveness and timing of adaptation and the distribution of coping capacity, which vary spatially and among sectors (very high confidence).
Although North America has considerable adaptive capacity, actual practices have not always protected people and property from adverse impacts of climate variability and extreme weather events. Especially vulnerable groups include indigenous peoples and those who are socially or economically disadvantaged. Traditions and institutions in North America have encouraged a decentralised response framework where adaptation tends to be reactive, unevenly distributed, and focused on coping with rather than preventing problems. 'Mainstreaming' climate change issues into decision making is a key prerequisite for sustainability. [14.2.6, 14.4, 14.5, 14.7]

Coastal communities and habitats will be increasingly stressed by climate change impacts interacting with development and pollution (very high confidence).
Sea level is rising along much of the coast, and the rate of change will increase in the future, exacerbating the impacts of progressive inundation, storm-surge flooding and shoreline erosion. Storm impacts are likely to be more severe, especially along the Gulf and Atlantic coasts. Salt marshes, other coastal habitats, and dependent species are threatened by sea-level rise, fixed structures blocking landward migration, and changes in vegetation. Population growth and the rising value of infrastructure in coastal areas increases vulnerability to climate variability and future climate change. Current adaptation is uneven and readiness for increased exposure is low. [14.2.3, 14.4.3, 14.5]

Climate change will constrain North America's over-allocated water resources, increasing competition among agricultural, municipal, industrial and ecological uses (very high confidence).
Rising temperatures will diminish snowpack and increase evaporation, affecting seasonal availability of water. Higher demand from economic development, agriculture and population growth will further limit surface and groundwater availability. In the Great Lakes and major river systems, lower levels are likely to exacerbate challenges relating to water quality, navigation, recreation, hydropower generation, water transfers and bi-national relationships. [14.2.1, 14.4.1, 14.4.6, Boxes 14.2 and 14.3]

Climate change impacts on infrastructure and human health and safety in urban centres will be compounded by ageing infrastructure, maladapted urban form and building stock, urban heat islands, air pollution, population growth and an ageing population (very high confidence).
While inertia in the political, economic, and cultural systems complicates near-term action, the long life and high value of North American capital stock make proactive adaptation important for avoiding costly retrofits in coming decades. [14.4.5, 14.4.6, 14.5, Box 14.3]

Without increased investments in countermeasures, hot temperatures and extreme weather are likely to cause increased adverse health impacts from heat-related mortality, pollution, storm-related fatalities and injuries, and infectious diseases (very high confidence).
Historically important countermeasures include early warning and surveillance systems, air conditioning, access to health care, public education, vector control, infrastructure standards and air quality management. Cities that currently experience heatwaves are expected to experience an increase in intensity and duration of these events by the end of the century, with potential for adverse health effects. The growing number of the elderly is most at risk. Water-borne diseases and degraded water quality are very likely to increase with more heavy precipitation. Warming and climate extremes are likely to increase respiratory illness, including exposure to pollen and ozone. Climate change is likely to increase risk and geographic spread of vector-borne infectious diseases, including Lyme disease and West Nile virus. [14.2.5, 14.2.6, 14.4.5, 14.4.6, 14.5]

Disturbances such as wildfire and insect outbreaks are increasing and are likely to intensify in a warmer future with drier soils and longer growing seasons (very high confidence).
Although recent climate trends have increased vegetation growth, continuing increases in disturbances are likely to limit carbon storage, facilitate invasive species, and disrupt ecosystem services. Warmer summer temperatures are expected to extend the annual window of high fire ignition risk by 10-30%, and could result in increased area burned of 74-118% in Canada by 2100. Over the 21st century, pressure for species to shift north and to higher elevations will fundamentally rearrange North American ecosystems. Differential capacities for range shifts and constraints from development, habitat fragmentation, invasive species, and broken ecological connections will alter ecosystem structure, function and services. [14.2.4, 14.2.2, 14.4.2, Box 14.1]

14.1 Introduction

The United States (U.S.) and Canada will experience climate changes through direct effects of local changes (e.g., temperature, precipitation and extreme weather events), as well as through indirect effects, transmitted among regions by interconnected economies and migrations of humans and other species. Variations in wealth and geography, however, lead to an uneven distribution of likely impacts, vulnerabilities and capacities to adapt. This chapter reviews and synthesises the

state of knowledge on direct and indirect impacts, vulnerability and adaptations for North America (comprising Canada and the U.S.). Hawaii and other U.S. protectorates are discussed in Chapter 16 on Small Islands, and Mexico and Central America are treated in Chapter 13 on Latin America. Chapter 15, Polar Regions, covers high-latitude issues and peoples.

14.1.1 Key findings from the Third Assessment Report (TAR)

Key findings for the North America chapter of the Third Assessment Report (TAR) (Cohen et al., 2001) are:

Resources and ecosystems

- In western snowmelt-dominated watersheds, shifts in seasonal runoff, with more runoff in winter. Adaptation may not fully offset effects of reduced summer water availability.
- Changes in the abundance and spatial distribution of species important to commercial and recreational fisheries.
- Benefits from warming for food production in North America but with strong regional differences.
- Benefits from farm- and market-level adjustments in ameliorating impacts of climate change on agriculture.
- Increases in the area and productivity of forests, though carbon stocks could increase or decrease.
- Major role of disturbance for forest ecosystems. The forest-fire season is likely to lengthen, and the area subject to high fire danger is likely to increase significantly.
- Likely losses of cold-water ecosystems, high alpine areas, and coastal and inland wetlands.

Human settlements and health

- Less extreme winter cold in northern cities. Across North America, cities will experience more extreme heat and, in some locations, rising sea levels and risk of storm surge, water scarcity, and changes in timing, frequency, and severity of flooding.
- The need for changes in land-use planning and infrastructure design to avoid increased damages from heavy precipitation events.
- For communities that have the necessary resources, reduced vulnerability by adapting infrastructure.
- Increased deaths, injuries, infectious diseases, and stress-related disorders and other adverse effects associated with social disruption and migration from more frequent extreme weather.
- Increased frequency and severity of heatwaves leading to more illness and death, particularly among the young, elderly and frail. Respiratory disorders may be exacerbated by warming-induced deterioration in air quality.
- Expanded ranges of vector-borne and tick-borne diseases in North America but with modulation by public health measures and other factors.

Vulnerability and adaptation

- Increased weather-related losses in North America since the 1970s, with rising insured losses reflecting growing affluence and movement into vulnerable areas.
- Coverage, since the 1980s, by disaster relief and insurance programmes of a large fraction of flood and crop losses, possibly encouraging more human activity in at-risk areas.
- Responses by insurers to recent extreme events through limiting insurance availability, increasing prices and establishing new risk-spreading mechanisms. Improving building codes, land-use planning and disaster preparedness also reduce disaster losses.
- Awareness that developing adaptation responses requires a long, interdisciplinary dialogue between researchers and stakeholders, with substantial changes in institutions and infrastructure.
- Recognition that adaptation strategies generally address current challenges, rather than future impacts and opportunities.

14.1.2 Key differences from TAR

This assessment builds on the findings from the TAR and incorporates new results from the literature, including:

- Prospects for increased precipitation variability, increasing challenges of water management.
- The need to include groundwater and water-quality impacts in the assessment of water resources.
- The potential that multi-factor impacts may interact non-linearly, leading to tipping points.
- The potential importance of interactions among climate change impacts and with other kinds of local, regional and global changes.
- The potential for adaptation, but the unevenness of current adaptations.
- The challenge of linking adaptation strategies with future vulnerabilities.
- Availability of much more literature on all aspects of impacts, adaptation and vulnerability in North America.

14.2 Current sensitivity/vulnerability

Annual mean air temperature, on the whole, increased in North America for the period 1955 to 2005, with the greatest warming in Alaska and north-western Canada, substantial warming in the continental interior and modest warming in the south-eastern U.S. and eastern Canada (Figure 14.1). Spring and winter show the greatest changes in temperature (Karl et al., 1996; Hengeveld et al., 2005) and daily minimum (night-time) temperatures have warmed more than daily maximum (daytime) temperatures (Karl et al., 2005; Vincent and Mekis, 2006). The length of the vegetation growing season has increased an average of 2 days/decade since 1950 in Canada and the conterminous U.S., with most of the increase resulting from earlier spring warming (Bonsal et al., 2001; Easterling, 2002; Bonsal and Prowse, 2003; Feng and Hu, 2004). The warming signal in North America during the latter half of the 20th century reflects the combined influence of greenhouse gases, sulphate aerosols and natural external forcing (Karoly et al., 2003; Stott, 2003; Zwiers and Zhang, 2003).

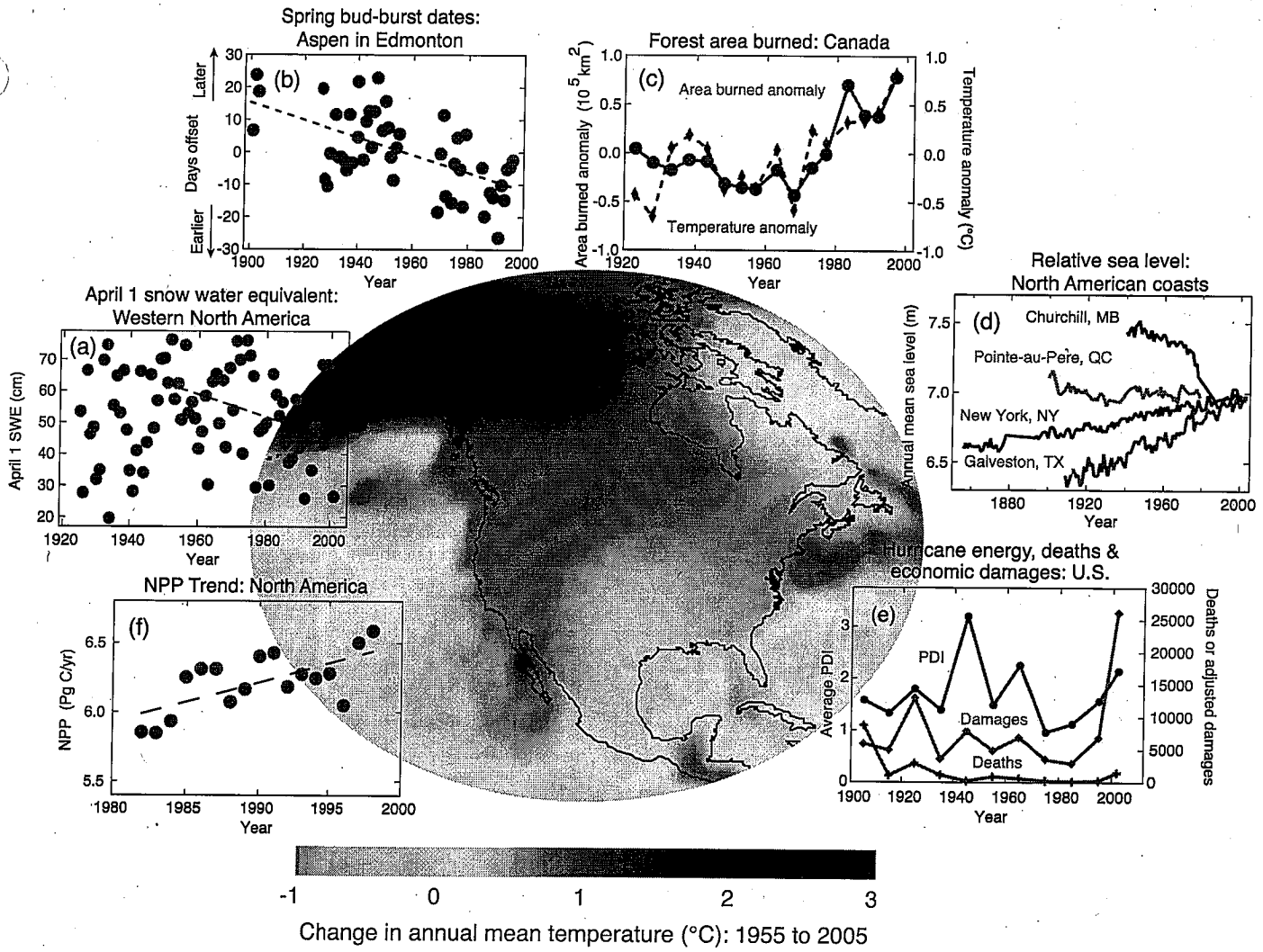

Figure 14.1. *Observed trends in some biophysical and socio-economic indicators. Background: change in annual mean temperature from 1955 to 2005 (based on the GISS2001 analysis for land from Hansen et al., 2001; and on the Hadley/Reyn_V2 analysis for sea surface from Reynolds et al., 2002). Insets: (a) trend in April 1 snow water equivalent (SWE) across western North America from 1925 to 2002, with a linear fit from 1950 to 2002 (data from Mote, 2003), (b) Spring bud-burst dates for trembling aspen in Edmonton since 1900 (data from Beaubien and Freeland, 2000), (c) anomaly in 5-year mean area burned annually in wildfires in Canada since 1930, plus observed mean summer air temperature anomaly, weighted for fire areas, relative to 1920 to 1999 (data from Gillett et al., 2004) (d) relative sea-level rise from 1850 to 2000 for Churchill, MB, Pointe-au-Père, QB, New York, NY, and Galveston, TX, (POL, 2006) (e) hurricane energy (power dissipation index (PDI) based on method of Emanuel, 2005), economic damages, million U.S. dollars (adjusted to constant 2005 US dollars and normalized accounting for changes in personal wealth and coastal population to 2004), and deaths from Atlantic hurricanes since 1900 (data from Pielke Jr. and Landsea, 1998 updated through 2005), and, (f) trend North American Net Primary Production (NPP) from 1981 to 1998 (data from Hicke et al., 2002).*

Annual precipitation has increased for most of North America with large increases in northern Canada, but with decreases in the south-west U.S., the Canadian Prairies and the eastern Arctic (see Working Group I Fourth Assessment (WGI AR4) Trenberth et al., 2007 Section 3.3.2.2, Figures 3.13 and 3.14) (Hengeveld et al., 2005; Shein, 2006). Heavy precipitation frequencies in the U.S. were at a minimum in the 1920s and 1930s, and increased to the 1990s (1895 to 2000) (Kunkel, 2003; Groisman et al., 2004). In Canada there is no consistent trend in extreme precipitation (Vincent and Mekis, 2006).

14.2.1 Freshwater resources

Streamflow in the eastern U.S. has increased 25% in the last 60 years (Groisman et al., 2004), but over the last century has decreased by about 2%/decade in the central Rocky Mountain region (Rood et al., 2005). Since 1950, stream discharge in both the Colorado and Columbia river basins has decreased, at the same time annual evapotranspiration (ET) from the conterminous U.S. increased by 55 mm (Walter et al., 2004). In regions with winter snow, warming has shifted the magnitude

and timing of hydrologic events (Mote et al., 2005; Regonda et al., 2005; Stewart et al., 2005). The fraction of annual precipitation falling as rain (rather than snow) increased at 74% of the weather stations studied in the western mountains of the U.S. from 1949 to 2004 (Knowles et al., 2006). In Canada, warming from 1900 to 2003 led to a decrease in total precipitation as snowfall in the west and Prairies (Vincent and Mekis, 2006). Spring and summer snow cover has decreased in the U.S. west (Groisman et al., 2004). April 1 snow water equivalent (SWE) has declined 15 to 30% since 1950 in the western mountains of North America, particularly at lower elevations and primarily due to warming rather than changes in precipitation (Figure 14.1a) (see Mote et al., 2003; Mote et al., 2005; Lemke et al., 2007: Section 4.2.2.2.1). Whitfield and Cannon (2000) and Zhang et al. (2001) reported earlier spring runoff across Canada. Summer (May to August) flows of the Athabasca River have declined 20% since 1958 (Schindler and Donahue, 2006). Streamflow peaks in the snowmelt-dominated western mountains of the U.S. occurred 1 to 4 weeks earlier in 2002 than in 1948 (Stewart et al., 2005). Break up of river and lake ice across North America has advanced by 0.2 to 12.9 days over the last 100 years (Magnuson et al., 2000).

Vulnerability to extended drought is increasing across North America as population growth and economic development create more demands from agricultural, municipal and industrial uses, resulting in frequent over-allocation of water resources (Alberta Environment, 2002; Morehouse et al., 2002; Postel and Richter, 2003; Pulwarty et al., 2005). Although drought has been more frequent and intense in the western part of the U.S. and Canada, the east is not immune from droughts and attendant reductions in water supply, changes in water quality and ecosystem function, and challenges in allocation (Dupigny-Giroux, 2001; Bonsal et al., 2004; Wheaton et al., 2005).

14.2.2 Ecosystems

Three clear, observable connections between climate and terrestrial ecosystems are the seasonal timing of life-cycle events or phenology, responses of plant growth or primary production, and biogeographic distribution. Direct impacts on organisms interact with indirect effects of ecological mechanisms (competition, herbivory[1], disease), and disturbance (wildfire, hurricanes, human activities).

Phenology, productivity and biogeography

Global daily satellite data, available since 1981, indicate earlier onset of spring 'greenness' by 10-14 days over 19 years, particularly across temperate latitudes of the Northern Hemisphere (Myneni et al., 2001; Lucht et al., 2002). Field studies confirm these satellite observations. Many species are expanding leaves or flowering earlier (e.g., earlier flowering in lilac - 1.8 days/decade, 1959 to 1993, 800 sites across North America (Schwartz and Reiter, 2000), honeysuckle - 3.8 days/decade, western U.S. (Cayan et al., 2001), and leaf expansion in apple and grape - 2 days/decade, 72 sites in north-eastern U.S. (Wolfe et al., 2005), trembling aspen - 2.6 days/decade since 1900, Edmonton (Beaubien and Freeland, 2000)) (Figure 14.1b). The timing of autumn leaf fall, which is controlled by a combination of temperature, photoperiod and water deficits, shows weaker trends (Badeck et al., 2004).

Net primary production (NPP) in the continental U.S. increased nearly 10% from 1982 to 1998 (Figure 14.1f) (Boisvenue and Running, 2006), with the largest increases in croplands and grasslands of the Central Plains due to improved water balance (Lobell et al., 2002; Nemani et al., 2002; Hicke and Lobell, 2004).

North American forests can be influenced indirectly by climate through effects on disturbance, especially from wildfire, storms, insects and diseases. The area burned in wildfires has increased dramatically over the last three decades (see Box 14.1).

Wildlife population and community dynamics

North American animals are responding to climate change, with effects on phenology, migration, reproduction, dormancy and geographic range (Walther et al., 2002; Parmesan and Yohe, 2003; Root et al., 2003; Parmesan and Galbraith, 2004; Root et al., 2005). Warmer springs have led to earlier nesting for 28 migrating bird species on the east coast of the U.S. (Butler, 2003) and to earlier egg laying for Mexican jays (Brown et al., 1999) and tree swallows (Dunn and Winkler, 1999). In northern Canada, red squirrels are breeding 18 days earlier than 10 years ago (Reale et al., 2003). Several frog species now initiate breeding calls 10 to 13 days earlier than a century ago (Gibbs and Breisch, 2001). In lowland California, 70% of 23 butterfly species advanced the date of first spring flights by an average 24 days over 31 years (Forister and Shapiro, 2003). Reduced water depth, related to recent warming, in Oregon lakes has increased exposure of toad eggs to UV-B, leading to increased mortality from a fungal parasite (Kiesecker et al., 2001; Pounds, 2001).

Many North American species have shifted their ranges, typically to the north or to higher elevations (Parmesan and Yohe, 2003). Edith's checkerspot butterfly has become locally extinct in the southern, low-elevation portion of its western North American range but has extended its range 90 km north and 120 m higher in elevation (Parmesan, 1996; Crozier, 2003; Parmesan and Galbraith, 2004). Red foxes have expanded northward in northern Canada, leading to retreat of competitively subordinate arctic foxes (Hersteinsson and Macdonald, 1992).

14.2.3 Coastal regions

The North American coast is long and diverse with a wide range of trends in relative sea level (Figure 14.1d) (Shaw et al., 1998; Dyke and Peltier, 2000; Zervas, 2001). Relative sea level (see glossary) is rising in many areas, yet coastal residents are often unaware of the trends and their impacts on coastal retreat and flooding (O'Reilly et al., 2005). In the Great Lakes, both extremely high and extremely low water levels have been damaging and disruptive (Moulton and Cuthbert, 2000). Demand for waterfront property and building land continues to grow, increasing the value of property at risk (Heinz Center, 2000; Forbes et al., 2002b; Small and Nichols, 2003).

[1] The consumption of plants by animals.

Box 14.1. Accelerating wildfire and ecosystem disturbance dynamics

Since 1980, an average of 22,000 km²/yr has burned in U.S. wildfires, almost twice the 1920 to 1980 average of 13,000 km²/yr (Schoennagel et al., 2004). The forested area burned in the western U.S. from 1987 to 2003 is 6.7 times the area burned from 1970 to 1986 (Westerling et al., 2006). In Canada, burned area has exceeded 60,000 km²/yr three times since 1990, twice the long-term average (Stocks et al., 2002). Wildfire-burned area in the North American boreal region increased from 6,500 km²/yr in the 1960s to 29,700 km²/yr in the 1990s (Kasischke and Turetsky, 2006). Human vulnerability to wildfires has also increased, with a rising population in the wildland-urban interface.

A warming climate encourages wildfires through a longer summer period that dries fuels, promoting easier ignition and faster spread (Running, 2006). Westerling et al. (2006) found that in the last three decades the wildfire season in the western U.S. has increased by 78 days, and burn durations of fires >1000 ha in area have increased from 7.5 to 37.1 days, in response to a spring-summer warming of 0.87°C. Earlier spring snowmelt has led to longer growing seasons and drought, especially at higher elevations, where the increase in wildfire activity has been greatest (Westerling et al., 2006). In Canada, warmer May to August temperatures of 0.8°C since 1970 are highly correlated with area burned (Figure 14.1c) (Gillett et al., 2004). In the south-western U.S., fire activity is correlated with El Niño-Southern Oscillation (ENSO) positive phases (Kitzberger et al., 2001; McKenzie et al., 2004), and higher Palmer Drought Severity Indices.

Insects and diseases are a natural part of ecosystems. In forests, periodic insect epidemics kill trees over large regions, providing dead, desiccated fuels for large wildfires. These epidemics are related to aspects of insect life cycles that are climate sensitive (Williams and Liebhold, 2002). Many northern insects have a two-year life cycle, and warmer winter temperatures allow a larger fraction of overwintering larvae to survive. Recently, spruce budworm in Alaska has completed its life cycle in one year, rather than the previous two (Volney and Fleming, 2000). Mountain pine beetle has expanded its range in British Columbia into areas previously too cold (Carroll et al., 2003). Insect outbreaks often have complex causes. Susceptibility of the trees to insects is increased when multi-year droughts degrade the trees' ability to generate defensive chemicals (Logan et al., 2003). Recent dieback of aspen stands in Alberta was caused by light snowpacks and drought in the 1980s, triggering defoliation by tent caterpillars, followed by wood-boring insects and fungal pathogens (Hogg et al., 2002).

Many coastal areas in North America are potentially exposed to storm-surge flooding (Titus and Richman, 2001; Titus, 2005). Some major urban centres on large deltas are below sea level (e.g., New Orleans on the Mississippi; Richmond and Delta on the Fraser), placing large populations at risk. Breaching of New Orleans floodwalls following Hurricane Katrina in 2005 (see Chapter 6, Section 6.4.1.2 and Box 6.4) and storm-wave breaching of a dike in Delta, British Columbia, in 2006 demonstrate the vulnerability. Under El Niño conditions, high water levels combined with changes in winter storms along the Pacific coast have produced severe coastal flooding and storm impacts (Komar et al., 2000; Walker and Barrie, 2006). At San Francisco, 140 years of tide-gauge data suggest an increase in severe winter storms since 1950 (Bromirski et al., 2003) and some studies have detected accelerated coastal erosion (Bernatchez and Dubois, 2004). Some Alaskan villages are threatened and require protection or relocation at projected costs up to US$54 million (Parson et al., 2001a). Recent severe tropical and extra-tropical storms demonstrate that North American urban centres with assumed high adaptive capacity remain vulnerable to extreme events. Recent winters with less ice in the Great Lakes and Gulf of St. Lawrence have increased coastal exposure to damage from winter storms. Winter ice provides seasonal shore protection, but can also damage shorefront homes and infrastructure (Forbes et al., 2002a).

Impacts on coastal communities and ecosystems can be more severe when major storms occur in short succession, limiting the opportunity to rebuild natural resilience (Forbes et al., 2004). Adaptation to coastal hazards under the present climate is often inadequate, and readiness for increased exposure is poor (Clark et al., 1998; Leatherman, 2001; West et al., 2001). Extreme events can add to other stresses on ecological integrity (Scavia et al., 2002; Burkett et al., 2005), including shoreline development and nitrogen eutrophication[2] (Bertness et al., 2002). Already, more than 50% of the original salt marsh habitat in the U.S. has been lost (Kennish, 2001). Impacts from sea-level rise can be amplified by 'coastal squeeze' (see Glossary) and submergence where landward migration is impeded and vertical growth is slower than sea-level rise (see Section 14.4.3) (Kennish, 2001; Scavia et al., 2002; Chmura and Hung, 2004).

14.2.4 Agriculture, forestry and fisheries

Agriculture

Over the last century, yields of major commodity crops in the U.S. have increased consistently, typically at rates of 1 to 2%/yr (Troyer, 2004), but there are significant variations across regions and between years. These yield trends are a result of cumulative changes in multiple factors, including technology, fertiliser use,

[2] Eutrophication is a process whereby water bodies, such as lakes, estuaries, or slow-moving streams receive excess nutrients that stimulate excessive plant growth (e.g., algal blooms and nuisance plants weeds).

seed stocks, and management techniques, plus any changes due to climate; the specific impact from any one factor may be ...itive or negative. In the Midwestern U.S. from 1970 to 2000, ...orn yield increased 58% and soybean yields increased 20%, with annual weather fluctuations resulting in year-to-year variability (Hicke and Lobell, 2004). Heavy rainfalls reduced the value of the U.S. corn crop by an average of US$3 billion/yr between 1951 and 1998 (Rosenzweig et al., 2002). In the Corn and Wheat Belt of the U.S., yields of corn and soybeans from 1982 to 1998 were negatively impacted by warm temperatures, decreasing 17% for each 1°C of warm-temperature anomaly (Lobell and Asner, 2003). In California, warmer nights have enhanced the production of high-quality wine grapes (Nemani et al., 2001), but additional warming may not result in similar increases. For twelve major crops in California, climate fluctuations over the last 20 years have not had large effects on yield, though they have been a positive factor for oranges and walnuts and a negative for avocados and cotton (Lobell et al., 2006).

North American agriculture has been exposed to many severe weather events during the past decade. More variable weather, coupled with out-migration from rural areas and economic stresses, has increased the vulnerability of the agricultural sector overall, raising concerns about its future capacity to cope with a more variable climate (Senate of Canada, 2003; Wheaton et al., 2005). North American agriculture is, however, dynamic. Adaptation to multiple stresses and opportunities, including changes in markets and weather, is a normal process for the ...ctor. Crop and enterprise diversification, as well as soil and ...ter conservation, are often used to reduce weather-related risks (Wall and Smit, 2005). Recent adaptations by the agricultural sector in North America, including improved water conservation and conservation tillage, are not typically undertaken as single discrete actions, but evolve as a set of decisions that can span several years in a dynamic and changing environment (Smit and Skinner, 2002) that includes changes in public policy (Goodwin, 2003). While there have been attempts to realistically model the dynamics of adaptation to climate change (Easterling et al., 2003), understanding of agriculture's current sensitivity to climate variability and its capacity to cope with climate change remains limited (Tol, 2002).

Forestry

Forest growth appears to be slowly accelerating (at a rate of less than 1%/decade) in regions where tree growth has historically been limited by low temperatures and short growing seasons (Caspersen et al., 2000; McKenzie et al., 2001; Joos et al., 2002; Boisvenue and Running, 2006). In black spruce at the forest-tundra transition in eastern Canada, height growth has been increasing since the 1970s (Gamache and Payette, 2004). Growth is slowing, however, in areas subject to drought. Radial growth of white spruce on dry south-facing slopes in Alaska has decreased over the last 90 years, due to increased drought stress (Barber et al., 2000). In semi-arid forests of the south-western ...S., growth rates have decreased since 1895, correlated with ...ought linked to warming temperatures (McKenzie et al., 2001). Relationships between tree-ring growth in sub-alpine forests and climate in the Pacific Northwest from 1895 to 1991 had complex topographic influences (Peterson and Peterson, 2001; Peterson et al., 2002). On high elevation north-facing slopes, growth of sub-alpine fir and mountain hemlock was negatively correlated with spring snowpack depth and positively correlated with summer temperatures, indicating growing-season temperature limitations. On lower elevation sites, however, growth was negatively correlated with summer temperature, suggesting water limitations. In Colorado, aspen have advanced into the more cold-tolerant spruce-fir forests over the past 100 years (Elliott and Baker, 2004). The northern range limit of lodgepole pine is advancing into the zone previously dominated by the more cold-tolerant black spruce in the Yukon (Johnstone and Chapin, 2003). A combination of warmer temperatures and insect infestations has resulted in economically significant losses of the forest resource base to spruce bark beetle in both Alaska and the Yukon (ACIA, 2004).

Freshwater fisheries

Most commercial freshwater fishing in North America occurs in rural or remote areas, with indigenous peoples often taking a major role. Recreational inland fisheries are also significant and increasing (DFO-MPO, 2002; DOI, 2002). Ecological sustainability of fish and fisheries productivity is closely tied to temperature and water supply (flows and lake levels). Climate change and variability increasingly have direct and indirect impacts, both of which interact with other pressures on freshwater fisheries, including human development (Schindler, 2001; Chu et al., 2003; Reed and Czech, 2005; Rose, 2005), habitat loss and alteration (including water pollution), biotic homogenisation due to invasions and introductions (Rahel, 2002), and over-exploitation (Post et al., 2002; Cooke and Cowx, 2004). Cold- and cool-water fisheries, especially Salmonids, have been declining as warmer/drier conditions reduce their habitat. The sea-run[3] salmon stocks are in steep decline throughout much of North America (Gallagher and Wood, 2003). Evidence for impacts of recent climate change is rapidly accumulating. Pacific salmon have been appearing in Arctic rivers (Babaluk et al., 2000). Salmonid species have been affected by warming in U.S. streams (O'Neal, 2002). Lake charr in an Ontario lake suffered recruitment[4] failure due to El Niño-linked warm temperatures (Gunn, 2002). Lake Ontario year-class productivity is strongly linked to temperature, with a shift in the 1990s toward warm-water species (Casselman, 2002). Walleye yield in lakes depends on the amount of cool, turbid habitat (Lester et al., 2004). Recent contraction in habitat for walleye in the Bay of Quinte, Lake Ontario was due in part to warming and lower water levels (Chu et al., 2005). Success of adult spawning and survival of the fry (new-borne) of brook trout is closely linked to cold groundwater seeps, which provide preferred temperature refuges for lake-dwelling populations (Borwick et al., 2006). Rates of fish-egg development and mortality increase with temperature rise within species-specific tolerance ranges (Kamler, 2002).

[3] Sea-run: having the habit of ascending a river from the sea, especially to spawn.

[4] Recruitment: the number of new juvenile fish reaching a size large enough to be caught by commercial fishing methods.

14.2.5 Human health

Many human diseases are sensitive to weather, from cardiovascular and respiratory illnesses due to heatwaves or air pollution, to altered transmission of infectious diseases. Synergistic effects of other activities can exacerbate weather exposures (e.g., via the urban heat island effect), requiring cross-sector risk assessment to determine site-specific vulnerability (Patz et al., 2005).

The incidence of infectious diseases transmitted by air varies seasonally and annually, due partly to climate variations. In the early 1990s, California experienced an epidemic of Valley Fever that followed five years of drought (Kolivras and Comrie, 2003). Water-borne disease outbreaks from all causes in the U.S. are distinctly seasonal, clustered in key watersheds, and associated with heavy precipitation (in the U.S. Curriero et al., 2001) or extreme precipitation and warmer temperatures (in Canada, Thomas et al., 2006). Heavy runoff after severe rainfall can also contaminate recreational waters and increase the risk of human illness (Schuster et al., 2005) through higher bacterial counts. This association is strongest at beaches closest to rivers (Dwight et al., 2002).

Food-borne diseases show some relationship with historical temperature trends. In Alberta, ambient temperature is strongly but non-linearly associated with the occurrence of three enteric pathogens, *Salmonella, E. coli* and *Campylobacter* (Fleury et al., 2006).

Many zoonotic diseases[5] are sensitive to climate fluctuations (Charron, 2002). The strain of West Nile virus (WNV) that emerged for the first time in North America during the record hot July 1999 requires warmer temperatures than other strains. The greatest WNV transmissions during the epidemic summers of 2002 to 2004 in the U.S. were linked to above-average temperatures (Reisen et al., 2006). Laboratory studies of virus replication in WNV's main *Culex* mosquito vector show high levels of virus at warmer temperatures (Dohm and Turell, 2001; Dohm et al., 2002). Bird migratory pathways and WNV's recent advance westward across the U.S. and Canada are key factors in WNV and must be considered in future assessments of the role of temperature in WNV dynamics. A virus closely related to WNV, Saint Louis encephalitis, tends to appear during hot, dry La Niña years, when conditions facilitate transmission by reducing the extrinsic incubation period[6] (Cayan et al., 2003).

Lyme disease is a prevalent tick-borne disease in North America for which there is new evidence of an association with temperature (Ogden et al., 2004) and precipitation (McCabe and Bunnell, 2004). In the field, temperature and vapour pressure contribute to maintaining populations of the tick *Ixodes scapularis* which, in the U.S., is the micro-organism's secondary host. A monthly average minimum temperature above -7°C is required for tick survival (Brownstein et al., 2003).

Exposure to both extreme hot and cold weather is associated with increased morbidity and mortality, compared to an intermediate 'comfortable' temperature range (Curriero et al., 2002). Across 12 U.S. cities, hot temperatures have been associated with increased hospital admissions for cardiovascular disease (Schwartz et al., 2004a). Emergency hospital admissions have been directly related to extreme heat in Toronto (Dolney and Sheridan, 2006). Heat-response plans and heat early warning systems (EWS) can save lives (Ebi et al., 2004). After the 1995 heatwave, the city of Milwaukee initiated an 'extreme heat conditions plan' that almost halved heat-related morbidity and mortality (Weisskopf et al., 2002). Currently, over two dozen cities worldwide have warning systems focused on monitoring for dangerous air masses (Sheridan and Kalkstein, 2004).

14.2.6 Human settlements

Economic base of resource-dependent communities

Among the most climate-sensitive North American communities are those of indigenous populations dependent on one or a few natural resources. About 1.2 million (60%) of the U.S. tribal members live on or near reservations, and many pursue lifestyles with a mix of traditional subsistence activities and wage labour (Houser et al., 2001). Many reservation economies and budgets of indigenous governments depend heavily on agriculture, forest products and tourism (NAST, 2001). A 1993 hantavirus outbreak related indirectly to heavy rainfall led to a significant reduction in tourist visits to the American South-west (NAST, 2001). Many indigenous communities in northern Canada and Alaska are already experiencing constraints on lifestyles and economic activity from less reliable sea and lake ice (for travelling, hunting, fishing and whaling), loss of forest resources from insect damage, stress on caribou, and more exposed coastal infrastructure from diminishing sea ice (NAST, 2001; CCME, 2003; ACIA, 2005). Many rural settlements in North America, particularly those dependent on a narrow resource base, such as fishing or forestry, have been seriously affected by recent declines in the resource base, caused by a number of factors (CDLI, 1996). However, not all communities have suffered, as some Alaskan fishing communities have benefited from rising regional abundance of selected salmon stocks since the mid-1970s (Eggers, 2006).

Infrastructure and extreme events

About 80% of North Americans live in urban areas (Census Bureau, 2000; Statistics Canada, 2001b). North American cities, while diverse in size, function, climate and other factors, are largely shielded from the natural environment by technical systems. The devastating effects of hurricanes Ivan in 2004 and Katrina, Rita and Wilma in 2005, however, illustrate the vulnerability of North American infrastructure and urban systems that were either not designed or not maintained to adequate safety margins. When protective systems fail, impacts can be widespread and multi-dimensional (see Chapter 7, Boxes 7.2 and 7.4). Disproportionate impacts of Hurricane Katrina on the poor, infirm, elderly, and other dependent populations were amplified by inadequate public sector development and/or

[5] Zoonotic diseases: diseases caused by infectious agents that can be transmitted between (or are shared by) animals and humans.

[6] Extrinsic incubation period: the interval between the acquisition of an infectious agent by a vector and the vector's ability to transmit the agent to other hosts.

execution of evacuation and emergency services plans (Select Bipartisan Committee, 2006).

Costs of weather-related natural disasters in North America rose at the end of the 20th century, mainly as a result of the increasing value of infrastructure at risk (Changnon, 2003, 2005). Key factors in the increase in exposure include rising wealth, demographic shifts to coastal areas, urbanisation in storm-prone areas, and ageing infrastructure, combined with substandard structures and inadequate building codes (Easterling et al., 2000; Balling and Cerveny, 2003; Changnon, 2003, 2005). Trends in the number and intensity of extreme events in North America are variable, with many (e.g., hail events, tornadoes, severe windstorms, winter storms) holding steady or even decreasing (Kunkel et al., 1999; McCabe et al., 2001; Balling and Cerveny, 2003; Changnon, 2003; Trenberth et al., 2007: Section 3.8.4.2).

North America very likely will continue to suffer serious losses of life and property simply due to growth in property values and numbers of people at risk (very high confidence) (Pielke Jr., 2005; Pielke et al., 2005). Of the US$19 trillion value of all insured residential and commercial property in the U.S. states exposed to North Atlantic hurricanes, US$7.2 trillion (41%) is located in coastal counties. This economic value includes 79% of the property in Florida, 63% of the property in New York, and 61% of the property in Connecticut (AIR, 2002). Cumulative decadal hurricane intensity in the U.S. has risen in the last 25 years, following a peak in the mid 20th century and later decline (Figure 14.1e). North American mortality (deaths and death rates) from hurricanes, tornadoes, floods and lightning have generally declined since the beginning of the 20th century, due largely to improved warning systems (Goklany, 2006). Mortality was dominated by three storms where the warning/evacuation system did not lead to timely evacuation: Galveston in 1900, Okeechobee in 1926, and Katrina in 2005.

Flood hazards are not limited to the coastal zone. River basins with a history of major floods (e.g., the Sacramento (Miller, 2003), the Fraser (Lemmen and Warren, 2004), the Red River (Simonovic and Li, 2004) and the upper Mississippi (Allen et al., 2003)) illustrate the sensitivity of riverine flooding to extreme events and highlight the critical importance of infrastructure design standards, land-use planning and weather/flood forecasts.

14.2.7 Tourism and recreation

The U.S. and Canada rank among the top ten nations for international tourism receipts (US$112 billion and US$16 billion, respectively) with domestic tourism and outdoor recreation markets that are several times larger (World Tourism Organization, 2002; Southwick Associates, 2006). Climate variability affects many segments of this growing economic sector. For example, wildfires in Colorado (2002) and British Columbia (2003) caused tens of millions of dollars in tourism losses by reducing visitation and destroying infrastructure (Associated Press, 2002; Butler, 2002; BC Stats, 2003). Similar economic losses were caused by drought-affected water levels in rivers and reservoirs in the western U.S. and parts of the Great Lakes (Fisheries and Oceans Canada, 2000; Kesmodel, 2002; Allen, 2003). The ten-day closure and clean-up following Hurricane Georges (September 1998) resulted in tourism revenue losses of approximately US$32 million in the Florida Keys (EPA, 1999). While the North American tourism industry acknowledges the important influence of climate, its impacts have not been analysed comprehensively (Scott et al., 2006).

14.2.8 Energy, industry and transportation

North American industry, energy supply and transportation networks are sensitive to weather extremes that exceed their safety margins. Costs of these impacts can be high. For example, power outages in the U.S. cost the economy US$30 billion to 130 billion annually (EPRI, 2003; LaCommare and Eto, 2004). The hurricanes crossing Florida in the summer of 2004 resulted in direct system restoration costs of US$1.4 billion to the four Florida public utilities involved (EEI, 2005). From 1994 to 2004, fourteen U.S. utilities experienced 81 other major storms, which cost an average of US$49 million/storm, with the highest single storm impact of US$890 million (EEI, 2005).

Although it was not triggered specifically by the concurrent hot weather, the 2003 summer outage in north-eastern U.S. and south-eastern Canada illustrates costs to North American society that result from large-scale power interruptions during periods of high demand. Over 50 million people were without power, resulting in US$180 million in insured losses and up to US$10 billion in total losses (Fletcher, 2004). Business interruptions were particularly significant, with costs of over US$250,000/hr incurred by the top quartile of recently surveyed companies (RM, 2003).

The impacts of Hurricanes Katrina, Rita and Wilma in 2005 and Ivan in 2004 demonstrated that the Gulf of Mexico offshore oil and natural gas platforms and pipelines, petroleum refineries, and supporting infrastructure can be seriously harmed by major hurricanes, which can produce national-level impacts, and require recovery times stretching to months or longer (Business Week, 2005; EEA, 2005; EIA, 2005a; Levitan and Associates Inc., 2005; RMS, 2005b; Swiss Re, 2005b, c, d, e).

Hydropower production is known to be sensitive to total runoff, to its timing, and to reservoir levels. For example, during the 1990s, Great Lakes levels fell as a result of a lengthy drought, and in 1999 hydropower production was down significantly both at Niagara and Sault St. Marie (CCME, 2003).

14.3 Assumptions about future trends

14.3.1 Climate

Recent climate model simulations (Ruosteenoja et al., 2003) indicate that by the 2010 to 2039 time slice, year-round temperatures across North America will be outside the range of present-day natural variability, based on 1000 year Atmosphere-Ocean General Circulation Model (AOGCM) simulations with either the CGCM2 or HadCM3 climate models. For most combinations of model, scenario, season and region, warming in the 2010 to 2039 time slice will be in the range of 1 to 3°C.

Late in the century, projected annual warming is likely to be 2 to 3°C across the western, southern, and eastern continental edges, but more than 5°C at high latitudes (Christensen et al., 2007: Section 11.5.3.1). The projected warming is greatest in winter at high latitudes and greatest in the summer in the south-west U.S. Warm extremes across North America are projected to become both more frequent and longer (Christensen et al., 2007: Section 11.5.3.3).

Annual-mean precipitation is projected to decrease in the south-west of the U.S. but increase over the rest of the continent (Christensen et al., 2007: Section 11.5.3.2). Increases in precipitation in Canada are projected to be in the range of +20% for the annual mean and +30% for the winter. Some studies project widespread increases in extreme precipitation (Christensen et al., 2007: Section 11.5.3.3), with greater risks of not only flooding from intense precipitation, but also droughts from greater temporal variability in precipitation. In general, projected changes in precipitation extremes are larger than changes in mean precipitation (Meehl et al., 2007: Section 10.3.6.1)

Future trends in hurricane frequency and intensity remain very uncertain. Experiments with climate models with sufficient resolution to depict some aspects of individual hurricanes tend to project some increases in both peak wind speeds and precipitation intensities (Meehl et al., 2007: Section 10.3.6.3). The pattern is clearer for extra-tropical storms, which are likely to become more intense, but perhaps less frequent, leading to increased extreme wave heights in the mid-latitudes (Meehl et al., 2007: Section 10.3.6.4).

El Niño events are associated with increased precipitation and severe storms in some regions, such as the south-east U.S., and higher precipitation in the Great Basin of the western U.S., but warmer temperatures and decreased precipitation in other areas such as the Pacific Northwest, western Canada, and parts of Alaska (Ropelewski and Halpert, 1986; Shabbar et al., 1997). Recent analyses indicate no consistent future trends in El Niño amplitude or frequency (Meehl et al., 2007: Section 10.3.5.4).

14.3.2 Social, economic, and institutional context

Canada and the U.S. have developed economies with per capita gross domestic product (GDP) in 2005 of US$31,572 and US$37,371, respectively (UNECE, 2005a,b). Future population growth is likely to be dominated by immigration (Campbell, 1996). Interests of indigenous peoples are important in both Canada and the U.S., especially in relation to questions of land management. With ageing populations, the costs of health care are likely to climb over several decades (Burleton, 2002).

Major parts of the economies of Canada and the U.S. are directly sensitive to climate, including the massive agricultural (2005 value US$316 billion) (Economic Research Service, 2006; Statistics Canada, 2006), transportation (2004 value US$510 billion) (Bureau of Transportation Statistics, 2006; Industry Canada, 2006) and tourism sectors (see Section 14.2.4, 14.2.7 and 14.2.8). Although many activities have limited direct sensitivity to climate (Nordhaus, 2006), the potential realm of climate-sensitive activities expands with increasing evidence that storms, floods, or droughts increase in frequency or intensity with climate change (Christensen et al., 2007: Section 11.5.3.3 and Meehl et al., 2007: Sections 10.3.6.1 and 10.3.6.2).

The economies of Canada and the U.S. have large private and public sectors, with strong emphasis on free market mechanisms and the philosophy of private ownership. If strong trends toward globalisation in the last several decades continue through the 21st century, it is likely that the means of production, markets, and ownership will be predominantly international, with policies and governance increasingly designed for the international marketplace (Stiglitz, 2002).

14.4 Key future impacts and vulnerabilities

14.4.1 Freshwater resources

Freshwater resources will be affected by climate change across Canada and the U.S., but the nature of the vulnerabilities varies from region to region (NAST, 2001; Environment Canada, 2004; Lemmen and Warren, 2004). In certain regions including the Colorado River, Columbia River and Ogallala Aquifer, surface and/or groundwater resources are intensively used for often competing agricultural, municipal, industrial and ecological needs, increasing potential vulnerability to future changes in timing and availability of water (see Box 14.2).

Surface water

Simulated annual water yield in basins varies by region, General Circulation Model (GCM) or Regional Climate Model (RCM) scenario (Stonefelt et al., 2000; Fontaine et al., 2001; Stone et al., 2001; Rosenberg et al., 2003; Jha et al., 2004; Shushama et al., 2006), and the resolution of the climate model (Stone et al., 2003). Higher evaporation related to warming tends to offset the effects of more precipitation, while magnifying the effects of less precipitation (Stonefelt et al., 2000; Fontaine et al., 2001).

Warming, and changes in the form, timing and amount of precipitation, will very likely lead to earlier melting and significant reductions in snowpack in the western mountains by the middle of the 21st century (high confidence) (Loukas et al., 2002; Leung and Qian, 2003; Miller et al., 2003; Mote et al., 2003; Hayhoe et al., 2004). In projections for mountain snowmelt-dominated watersheds, snowmelt runoff advances, winter and early spring flows increase (raising flooding potential), and summer flows decrease substantially (Kim et al., 2002; Loukas et al., 2002; Snyder et al., 2002; Leung and Qian, 2003; Miller et al., 2003; Mote et al., 2003; Christensen et al., 2004; Merritt et al., 2005). Over-allocated water systems of the western U.S. and Canada, such as the Columbia River, that rely on capturing snowmelt runoff, will be especially vulnerable (see Box 14.2).

Lower water levels in the Great Lakes are likely to influence many sectors, with multi-dimensional, interacting impacts (Figure 14.2) (high confidence). Many, but not all, assessments project lower net basin supplies and water levels for the Great Lakes – St. Lawrence Basin (Mortsch et al., 2000; Quinn and Lofgren, 2000; Lofgren et al., 2002; Croley, 2003). In addition

Box 14.2. Climate change adds challenges to managing the Columbia River system

Current management of water in the Columbia River basin involves balancing complex, often competing, demands for hydropower, navigation, flood control, irrigation, municipal uses, and maintenance of several populations of threatened and endangered species (e.g., salmon). Current and projected needs for these uses over-commit existing supplies. Water management in the basin operates in a complex institutional setting, involving two sovereign nations (Columbia River Treaty, ratified in 1964), aboriginal populations with defined treaty rights ('Boldt decision' in U.S. *vs.* Washington in 1974), and numerous federal, state, provincial and local government agencies (Miles et al., 2000; Hamlet, 2003). Pollution (mainly non-point source) is an important issue in many tributaries. The first-in-time first-in-right provisions of western water law in the U.S. portion of the basin complicate management and reduce water available to junior water users (Gray, 1999; Scott et al., 2004). Complexities extend to different jurisdictional responsibilities when flows are high and when they are low, or when protected species are in tributaries, the main stem or ocean (Miles et al., 2000; Mote et al., 2003).

With climate change, projected annual Columbia River flow changes relatively little, but seasonal flows shift markedly toward larger winter and spring flows and smaller summer and autumn flows (Hamlet and Lettenmaier, 1999; Mote et al., 1999). These changes in flows will likely coincide with increased water demand, principally from regional growth but also induced by climate change. Loss of water availability in summer would exacerbate conflicts, already apparent in low-flow years, over water (Miles et al. 2000). Climate change is also projected to impact urban water supplies within the basin. For example, a 2°C warming projected for the 2040s would increase demand for water in Portland, Oregon by 5.7 million m^3/yr with an additional demand of 20.8 million m^3/yr due to population growth, while decreasing supply by 4.9 million m^3/yr (Mote et al., 2003). Long-lead climate forecasts are increasingly considered in the management of the river but in a limited way (Hamlet et al., 2002; Lettenmaier and Hamlet, 2003; Gamble et al., 2004; Payne et al., 2004). Each of 43 sub-basins of the system has its own sub-basin management plan for fish and wildlife, none of which comprehensively addresses reduced summertime flows under climate change (ISRP/ISAB, 2004).

The challenges of managing water in the Columbia River basin will likely expand with climate change due to changes in snowpack and seasonal flows (Miles et al., 2000; Parson et al., 2001b; Cohen et al., 2003). The ability of managers to meet operating goals (reliability) will likely drop substantially under climate change (as projected by the HadCM2 and ECHAM4/OPYC3 AOGCMs under the IPCC IS92a emissions scenario for the 2020s and 2090s) (Hamlet and Lettenmaier, 1999). Reliability losses are projected to reach 25% by the end of the 21st century (Mote et al., 1999) and interact with operational rule requirements. For example, 'fish-first' rules would reduce firm power reliability by 10% under present climate and 17% in years during the warm phase of the Pacific Decadal Oscillation. Adaptive measures have the potential to moderate the impact of the decrease in April snowpack, but lead to 10 to 20% losses of firm hydropower and lower than current summer flows for fish (Payne et al., 2004). Integration of climate change adaptation into regional planning processes is in the early stages of development (Cohen et al., 2006).

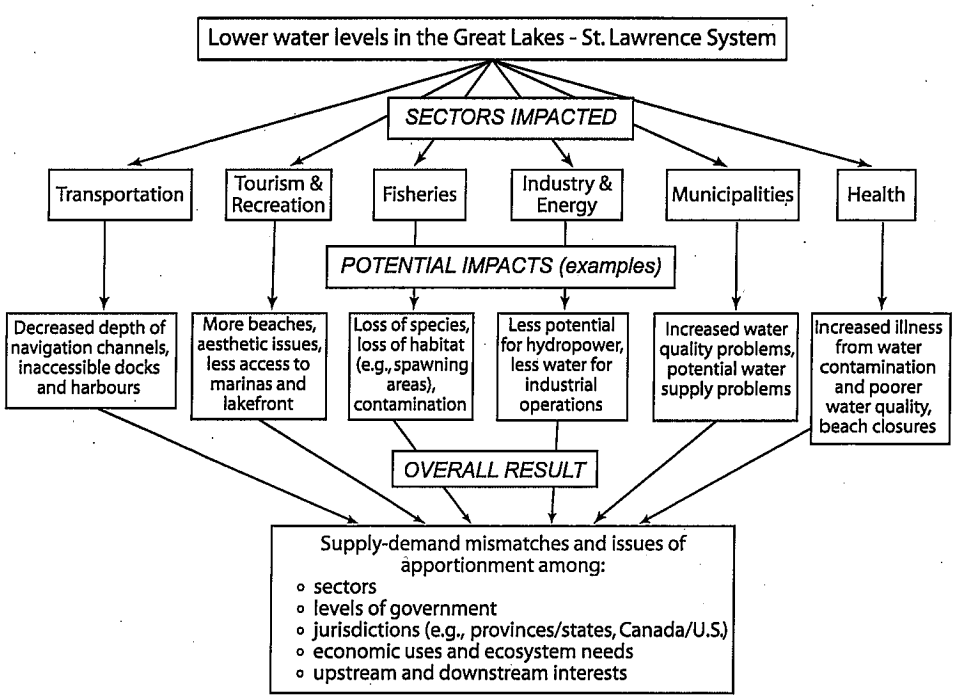

Figure 14.2. *Interconnected impacts of lower water levels in the Great Lakes - St Lawrence system (modified from Lemmen and Warren, 2004).*

to differences due to climate scenarios, uncertainties include atmosphere-lake interactions (Wetherald and Manabe, 2002; Kutzbach et al., 2005). Adapting infrastructure and dredging to cope with altered water levels would entail a range of costs (Changnon, 1993; Schwartz et al., 2004b). Adaptations sufficient to maintain commercial navigation on the St. Lawrence River could range from minimal adjustments to costly, extensive structural changes (St. Lawrence River-Lake Ontario Plan of Study Team, 1999; D'Arcy et al., 2005). There have been controversies in the Great Lakes region over diversions of water, particularly at Chicago, to address water quality, navigation, water demand and drought mitigation outside the region. Climate change will exacerbate these issues and create new challenges for bi-national co-operation (very high confidence) (Changnon and Glantz, 1996; Koshida et al., 2005).

Groundwater

With climate change, availability of groundwater is likely to be influenced by withdrawals (reflecting development, demand and availability of other sources) and recharge (determined by temperature, timing and amount of precipitation, and surface water interactions) (medium confidence) (Rivera et al., 2004). Simulated annual groundwater base flows and aquifer levels respond to temperature, precipitation and pumping – decreasing in scenarios that are drier or have higher pumping and increasing in a wetter scenario. In some cases there are base flow shifts - increasing in winter and decreasing in spring and early summer (Kirshen, 2002; Croley and Luukkonen, 2003; Piggott et al., 2003). For aquifers in alluvial valleys of south-central British Columbia, temperature and precipitation scenarios have less impact on groundwater recharge and levels than do projected changes in river stage[7] (Allen et al., 2004a,b).

Heavily utilised groundwater-based systems in the southwest U.S. are likely to experience additional stress from climate change that leads to decreased recharge (high confidence). Simulations of the Edwards aquifer in Texas under average recharge project lower or ceased flows from springs, water shortages, and considerable negative environmental impacts (Loáiciga, 2000; Loáiciga et al., 2000). Regional welfare losses associated with projected flow reductions (10 to 24%) range from US$2.2 million to 6.8 million/yr, with decreased net agricultural income as a consequence of water allocation shifting to municipal and industrial uses (Chen et al., 2001). In the Ogallala aquifer region, projected natural groundwater recharge decreases more than 20% in all simulations with warming of 2.5°C or greater (based on outputs from the GISS, UKTR and BMRC AOGCMs, with three atmospheric concentrations of CO_2: 365, 560 and 750 ppm) (Rosenberg et al., 1999).

Water quality

Simulated future surface and bottom water temperatures of lakes, reservoirs, rivers, and estuaries throughout North America consistently increase from 2 to 7°C (based on 2×CO_2 and IS92a scenarios) (Fang and Stefan, 1999; Hostetler and Small, 1999; Nicholls, 1999; Stefan and Fang, 1999; Lehman, 2002; Gooseff et al., 2005), with summer surface temperatures exceeding 30°C in Midwestern and southern lakes and reservoirs (Hostetler and Small, 1999). Warming is likely to extend and intensify summer thermal stratification, contributing to oxygen depletion. A shorter ice-cover period in shallow northern lakes could reduce winter fish kills caused by low oxygen (Fang and Stefan, 1999; Stefan and Fang, 1999; Lehman, 2002). Higher stream temperatures affect fish access, survival and spawning (e.g., west coast salmon) (Morrison et al., 2002).

Climate change is likely to make it more difficult to achieve existing water quality goals (high confidence). For the Midwest, simulated low flows used to develop pollutant discharge limits (Total Maximum Daily Loads) decrease over 60% with a 25% decrease in mean precipitation, reaching up to 100% with the incorporation of irrigation demands (Eheart et al., 1999). Restoration of beneficial uses (e.g., to address habitat loss, eutrophication, beach closures) under the Great Lakes Water Quality agreement will likely be vulnerable to declines in water levels, warmer water temperatures, and more intense precipitation (Mortsch et al., 2003). Based on simulations, phosphorus remediation targets for the Bay of Quinte (Lake Ontario) and surrounding watershed could be compromised as 3 to 4°C warmer water temperatures contribute to 77 to 98% increases in summer phosphorus concentrations in the bay (Nicholls, 1999), and as changes in precipitation, streamflow and erosion lead to increases in average phosphorus concentrations in streams of 25 to 35% (Walker, 2001). Decreases in snow cover and more winter rain on bare soil are likely to lengthen the erosion season and enhance erosion, increasing the potential for water quality impacts in agricultural areas (Atkinson et al., 1999; Walker, 2001; Soil and Water Conservation Society, 2003). Soil management practices (e.g., crop residue, no-till) in the Cornbelt may not provide sufficient erosion protection against future intense precipitation and associated runoff (Hatfield and Pruger, 2004; Nearing et al., 2004).

14.4.2 Ecosystems

Several simulations (Cox et al., 2000; Berthelot et al., 2002; Fung et al., 2005) indicate that, over the 21st century, warming will lengthen growing seasons, sustaining forest carbon sinks in North America despite some decreased sink strength resulting from greater water limitations in western forests and higher respiration in the tropics (medium confidence). Impacts on ecosystem structure and function may be amplified by changes in extreme meteorological events and increased disturbance frequencies. Ecosystem disturbances, caused either by humans or by natural events, accelerate both loss of native species and invasion of exotics (Sala et al., 2000).

Primary production

At high latitudes, several models simulate increased NPP as a result of expansion of forests into the tundra and longer growing seasons (Berthelot et al., 2002). In the mid-latitudes, simulated changes in NPP are variable, depending on whether there is sufficient enhancement of precipitation to offset

[7] River stage: water height relative to a set point.

increased evapotranspiration in a warmer climate (Bachelet et al., 2001; Berthelot et al., 2002; Gerber et al., 2004; Woodward and Lomas, 2004). Bachelet et al. (2001) project the areal extent of drought-limited ecosystems to increase by 11%/°C warming in the continental U.S. By the end of the 21st century, ecosystems in the north-east and south-east U.S. will likely become carbon sources, while the western U.S. remains a carbon sink (Bachelet et al., 2004).

Overall forest growth in North America will likely increase modestly (10-20%) as a result of extended growing seasons and elevated CO_2 over the next century (Morgan et al., 2001), but with important spatial and temporal variations (medium confidence). Growth of white spruce in Québec will be enhanced by a 1°C temperature increase but depressed with a 4°C increase (Andalo et al., 2005). A 2°C temperature increase in the Olympic Mountains (U.S.) would cause dominant tree species to shift upward in elevation by 300 to 600m, causing temperate species to replace sub-alpine species over 300 to 500 years (Zolbrod and Peterson, 1999). For widespread species such as lodgepole pine, a 3°C temperature increase would increase growth in the northern part of its range, decrease growth in the middle, and decimate southern forests (Rehfeldt et al., 2001).

Population and community dynamics

For many amphibians, whose production of eggs and migration to breeding ponds is intimately tied to temperature and moisture, mismatches between breeding phenology and pond drying can lead to reproductive failure (Beebee, 1995). Differential responses among species in arrival or persistence in ponds will likely lead to changes in community composition and nutrient flow in ponds (Wilbur, 1997). Changes in plant species composition in response to climate change can facilitate other disturbances, including fire (Smith et al., 2000) and biological invasion (Zavaleta and Hulvey, 2004). Bioclimate modelling based on output from five GCMs suggests that, over the next century, vertebrate and tree species richness will decrease in most parts of the conterminous U.S., even though long-term trends (over millennia) ultimately favour increased richness in some taxa and locations (Currie, 2001). Based on relationships between habitat area and biodiversity, 15 to 37% of plant and animal species in a global sample are likely to be 'committed to extinction' by 2050, although actual extinctions will be strongly influenced by human forces and could take centuries (Thomas et al., 2004).

14.4.3 Coastal regions

Added stress from rapid coastal development, including an additional 25 million people in the coastal U.S. over the next 25 years, will reduce the effectiveness of natural protective features, leading to impaired resilience. As property values and investment continue to rise, coastal vulnerability tends to increase on a broad scale (Pielke Jr. and Landsea, 1999; Heinz Center, 2000), with a sensitivity that depends on the commitment to and flexibility of adaptation measures. Disproportionate impacts due to socio-economic status are likely to be exacerbated by rising sea levels and storm severity (Wu et al., 2002; Kleinosky et al., 2006).

Sea-level rise has accelerated in eastern North America since the late 19th century (Donnelly et al., 2004) and further acceleration is expected (high confidence). For The IPCC Special Report on Emissions Scenarios (SRES, Nakićenović and Swart, 2000) scenario A1B, global mean sea level is projected to rise by 0.35 ± 0.12 m from the 1980 to 1999 period to the 2090 to 2099 period (Meehl et al., 2007: Section 10.6.5). Spatial variability of sea-level rise has become better defined since the TAR (Church et al., 2004) and the ensemble mean for A1B shows values close to the global mean along most North American coasts, with slightly higher rates in eastern Canada and western Alaska, and stronger positive anomalies in the Arctic (Meehl et al., 2007: Figure 10.32). Vertical land motion will decrease (uplift) or increase (subsidence) the relative sea-level rise at any site (Douglas and Peltier, 2002).

Superimposed on accelerated sea-level rise, the present storm and wave climatology and storm-surge frequency distributions lead to forecasts of more severe coastal flooding and erosion hazards. The water-level probability distribution is shifted upward, giving higher potential flood levels and more frequent flooding at levels rarely experienced today (very high confidence) (Zhang et al., 2000; Forbes et al., 2004). If coastal systems, including sediment supply, remain otherwise unchanged, higher sea levels are likely to be correlated with accelerated coastal erosion (Hansom, 2001; Cowell et al., 2003).

Up to 21% of the remaining coastal wetlands in the U.S. mid-Atlantic region are potentially at risk of inundation between 2000 and 2100 (IS92a emissions scenario) (Najjar et al., 2000). Rates of coastal wetland loss, in Chesapeake Bay and elsewhere (Kennish, 2002), will increase with accelerated sea-level rise, in part due to 'coastal squeeze' (high confidence). Salt-marsh biodiversity is likely to be diminished in north-eastern marshes through expansion of cordgrass (*Spartina alterniflora*) at the expense of high-marsh species (Donnelly and Bertness, 2001). Many salt marshes in less developed areas have some potential to keep pace with sea-level rise (to some limit) through vertical accretion (Morris et al., 2002; Chmura et al., 2003; Chmura and Hung, 2004). Where rapid subsidence increases rates of relative sea-level rise, however, as in the Mississippi Delta, even heavy sediment loads cannot compensate for inundation losses (Rybczyk and Cahoon, 2002).

Potentially more intense storms and possible changes in El Niño (Meehl et al., 2007: Sections 10.3.5.4 and 10.3.6.3) are likely to result in more coastal instability (medium confidence) (see Section 14.3.1) (Scavia et al., 2002; Forbes et al., 2004; Emanuel, 2005). Damage costs from coastal storm events (storm surge, waves, wind, ice encroachment) and other factors (such as freeze-thaw) have increased substantially in recent decades (Zhang et al., 2000; Bernatchez and Dubois, 2004) and are expected to continue rising (high confidence). Higher sea levels in combination with storm surges will cause widespread problems for transportation along the Gulf and Atlantic coasts (Titus, 2002). More winters with reduced sea ice in the Gulf of St. Lawrence, resulting in more open water during the winter storm season, will lead to an increase in the average number of storm-wave events per year, further accelerating coastal erosion (medium confidence) (Forbes et al., 2004).

14.4.4 Agriculture, forestry and fisheries

Agriculture

Research since the TAR supports the conclusion that moderate climate change will likely increase yields of North American rain-fed agriculture, but with smaller increases and more spatial variability than in earlier estimates (high confidence) (Reilly, 2002). Most studies project likely climate-related yield increases of 5 to 20% over the first decades of the century, with the overall positive effects of climate persisting through much or all of the 21st century. This pattern emerges from recent assessments for corn, rice, sorghum, soybean, wheat, common forages, cotton and some fruits (Adams et al., 2003; Polsky et al., 2003; Rosenberg et al., 2003; Tsvetsinskaya et al., 2003; Antle et al., 2004; Thomson et al., 2005b), including irrigated grains (Thomson et al., 2005b). Increased climate sensitivity is anticipated in the south-eastern U.S. and in the U.S. Cornbelt (Carbone et al., 2003), but not in the Great Plains (Mearns et al., 2003). Crops that are currently near climate thresholds (e.g., wine grapes in California) are likely to suffer decreases in yields, quality, or both, with even modest warming (medium confidence) (Hayhoe et al., 2004; White et al., 2006).

Recent integrated assessment model studies explored the interacting impacts of climate and economic factors on agriculture, water resources and biome boundaries in the conterminous U.S. (Edmonds and Rosenberg, 2005; Izaurralde et al., 2005; Rosenberg and Edmonds, 2005; Sands and Edmonds, 2005; Smith et al., 2005; Thomson et al., 2005a,b,c,d), concluding that scenarios with decreased precipitation create important challenges, restricting the availability of water for irrigation and at the same time increasing water demand for irrigated agriculture and urban and ecological uses.

The critical importance of specific agro-climatic events (e.g., last frost) introduces uncertainty in future projections (Mearns et al., 2003), as does continued debate about the CO_2 sensitivity of crop growth (Long et al., 2005). Climate change is expected to improve the climate for fruit production in the Great Lakes region and eastern Canada but with risks of early season frost and damaging winter thaws (Bélanger et al., 2002; Winkler et al., 2002). For U.S. soybean yield, adjusting the planting date can reduce the negative effects of late season heat stress and can more than compensate for direct effects of climate change (Southworth et al., 2002).

Vulnerability of North American agriculture to climatic change is multi-dimensional and is determined by interactions among pre-existing conditions, indirect stresses stemming from climate change (e.g., changes in pest competition, water availability), and the sector's capacity to cope with multiple, interacting factors, including economic competition from other regions as well as advances in crop cultivars and farm management (Parson et al., 2003). Water access is the major factor limiting agriculture in south-east Arizona, but farmers in the region perceive that technologies and adaptations such as crop insurance have recently decreased vulnerability (Vasquez-Leon et al., 2002). Areas with marginal financial and resource endowments (e.g., the U.S. northern plains) are especially vulnerable to climate change (Antle et al., 2004). Unsustainable land-use practices will tend to increase the vulnerability of agriculture in the U.S. Great Plains to climate change (Polsky and Easterling, 2001).

Forestry

Across North America, impacts of climate change on commercial forestry potential are likely to be sensitive to changes in disturbances (Dale et al., 2001) from insects (Gan, 2004), diseases (Woods et al., 2005) and wildfires (high confidence) (see Box 14.1). Warmer summer temperatures are projected to extend the annual window of high fire ignition risk by 10-30%, and could result in increased area burned of 74-118% in Canada by 2100 (Brown et al., 2004; Flannigan et al., 2004). In the absence of dramatic increases in disturbance, effects of climate change on the potential for commercial harvest in one study for the 2040s ranged from mixed for a low emissions scenario (the EPPA LLH emissions scenario) to positive for a high emissions scenario (the EPPA HHL emissions scenario) (Perez-Garcia et al., 2002). Scenarios with increased harvests tend to lead to lower prices and, as a consequence, reduced harvests, especially in Canada (Perez-Garcia et al., 2002; Sohngen and Sedjo, 2005). The tendency for North American producers to suffer losses increases if climate change is accompanied by increased disturbance, with simulated losses averaging US$1 billion to 2 billion/yr over the 21st century (Sohngen and Sedjo, 2005). Increased tropospheric ozone could cause further decreases in tree growth (Karnosky et al., 2005). Risks of losses from Southern pine beetle likely depend on the seasonality of warming, with winter and spring warming leading to the greatest damage (Gan, 2004).

Warmer winters with more sporadic freezing and thawing are likely to increase erosion and landslides on forest roads, and reduce access for winter harvesting (Spittlehouse and Stewart, 2003).

Freshwater fisheries

Cold-water fisheries will likely be negatively affected by climate change; warm-water fisheries will generally gain; and the results for cool-water fisheries will be mixed, with gains in the northern and losses in the southern portions of ranges (high confidence) (Stefan et al., 2001; Rahel, 2002; Shuter et al., 2002; Mohseni et al., 2003; Fang et al., 2004). Salmonids, which prefer cold, clear water, are likely to experience the most negative impacts (Gallagher and Wood, 2003). Arctic freshwaters will likely be most affected, as they will experience the greatest warming (Wrona et al., 2005). Many warm-water and cool-water species will shift their ranges northward or to higher altitudes (Clark et al., 2001; Mohseni et al., 2003). In the continental U.S., cold-water species will likely disappear from all but the deeper lakes, cool-water species will be lost mainly from shallow lakes, and warm-water species will thrive except in the far south, where temperatures in shallow lakes will exceed survival thresholds (see Section 14.4.1) (Stefan et al., 2001). Species already listed as threatened will face increased risk of extinction (Chu et al., 2005), with pressures from climate exacerbated by the expansion of predatory species like smallmouth bass (Jackson and Mandrak, 2002). In Lake Erie, larval recruitment of river-spawning walleye will depend on temperature and flow changes, but lake-spawning stocks will likely decline due to the effects of

warming and lower lake levels (Jones et al., 2006). Thermal habitat suitable for yellow perch will expand, while that for lake trout will contract (Jansen and Hesslein, 2004). While temperature increases may favour warm-water fishes like smallmouth bass, changes in water supply and flow regimes seem likely to have negative effects (Peterson and Kwak, 1999).

14.4.5 Human health

Risks from climate change to human health will be strongly modulated by changes in health care infrastructure, technology, and accessibility as well as ageing of the population, and patterns of immigration and/or emigration (UNPD, 2005). Across North America, the population over the age of 65 will increase slowly to 2010, and then grow dramatically as the Baby Boomers join the ranks of the elderly – the segment of the population most at risk of dying in heatwaves.

Heatwaves and health

Severe heatwaves, characterised by stagnant, warm air masses and consecutive nights with high minimum temperatures, will intensify in magnitude and duration over the portions of the U.S. and Canada where they already occur (high confidence) (Cheng et al., 2005). Late in the century, Chicago is projected to experience 25% more frequent heatwaves annually (using the PCM AOGCM with a business-as-usual emissions scenario, for the period 2080 to 2099) (Meehl and Tebaldi, 2004), and the projected number of heatwave days in Los Angeles increases from 12 to 44-95 (based on PCM and HadCM3 for the A1FI and B1 scenarios, for the 2070 to 2099 period) (Hayhoe et al., 2004).

Air pollution

Surface ozone concentration may increase with a warmer climate. Ozone damages lung tissue, causing particular problems for people with asthma and other lung diseases. Even modest exposure to ozone may encourage the development of asthma in children (McConnell et al., 2002; Gent et al., 2003). Ozone and non-volatile secondary particulate matter generally increase at higher temperatures, due to increased gas-phase reaction rates (Aw and Kleeman, 2002). Many species of trees emit volatile organic compounds (VOC) such as isoprene, a precursor of ozone (Lerdau and Keller, 1998), at rates that increase rapidly with temperature (Guenther, 2002).

For the 2050s, daily average ozone levels are projected to increase by 3.7 ppb across the eastern U.S. (based on the GISS/MM5 AOGCM and the SRES A2 emissions scenario), with the cities most polluted today experiencing the greatest increase in ozone pollution (Hogrefe et al., 2004). One-hour maximum ozone follows a similar pattern, with the number of summer days exceeding the 8-hour regulatory U.S. standard projected to increase by 68% (Bell et al., 2007). Assuming constant population and dose-response characteristics, ozone-related deaths from climate change increase by approximately 5% from the 1990s to the 2050s (Knowlton et al., 2004; Bell et al., 2007). The large potential population exposed to outdoor air pollution translates this small relative risk into a substantial attributable health risk.

Pollen

Pollen, another air contaminant, is likely to increase with elevated temperature and atmospheric CO_2 concentrations. A doubling of the atmospheric CO_2 concentration stimulated ragweed-pollen production by over 50% (Wayne et al., 2002). Ragweed grew faster, flowered earlier and produced significantly greater above-ground biomass and pollen at urban than at rural locations (Ziska et al., 2003).

Lyme disease

The northern boundary of tick-borne Lyme disease is limited by cold temperature effects on the tick, *Ixodes scapularis*. The northern range limit for this tick could shift north by 200 km by the 2020s, and 1000 km by the 2080s (based on projections from the CGCM2 and HadCM3 AOGCMs under the SRES A2 emissions scenario) (Ogden et al., 2006).

14.4.6 Human settlements

Economic base

The economies of resource-dependent communities and indigenous communities in North America are particularly sensitive to climate change, with likely winners and losers controlled by impacts on important local resources (see Sections 14.4.1, 14.4.4 and 14.4.7). Residents of northern Canada and Alaska are likely to experience the most disruptive impacts of climate change, including shifts in the range or abundance of wild species crucial to the livelihoods and well-being of indigenous peoples (high confidence) (see Chapter 15 Sections 15.4.2.4 and 15.5) (Houser et al., 2001; NAST, 2001; Parson et al., 2001a; ACIA, 2005).

Infrastructure, climate trends and extreme events

Many of the impacts of climate change on infrastructure in North America depend on future changes in variability of precipitation and extreme events, which are likely to increase but with substantial uncertainty (Meehl et al., 2007: Section 10.5.1; Christensen et al., 2007: Section 11.5.3). Infrastructure in Alaska and northern Canada is known to be vulnerable to warming. Among the most sensitive areas are those affected by coastal erosion and thawing of ice-rich permafrost (see Chapter 15 Section 15.7.1) (NAST, 2001; Arctic Research Commission, 2003; ACIA, 2005). Building, designing, and maintaining foundations, pipelines and road and railway embankments will become more expensive due to permafrost thaw (ACIA, 2005). Examples where infrastructure is projected to be at 'moderate to high hazard' in the mid-21st century include Shishmaref, Nome and Barrow in Alaska, Tuktoyaktuk in the Northwest Territories, the Dalton Highway in Alaska, the Dempster Highway in the Yukon, airfields in the Hudson Bay region, and the Alaska Railroad (based on the ECHAM1-A, GFDL89 and UKTR climate models) (Nelson et al., 2002; Instanes et al., 2005).

Since the TAR, a few studies have projected increasing vulnerability of infrastructure to extreme weather related to climate warming unless adaptation is effective (high confidence). Examples include the New York Metropolitan Region (Rosenzweig and Solecki, 2001) (see Box 14.3), the mid-Atlantic Region (Fisher, 2000; Barron, 2001; Wu et al.,

Box 14.3. North American cities integrate impacts across multiple scales and sectors

Impacts of climate change in the metropolitan regions of North America will be similar in many respects. Los Angeles, New York and Vancouver are used to illustrate some of the affected sectors, including infrastructure, energy and water supply. Adaptation will need to be multi-decadal and multi-dimensional, and is already beginning (see Section 14.5).

Infrastructure

Since most large North American cities are on tidewater, rivers or both, effects of climate change will likely include sea-level rise (SLR) and/or riverine flooding. The largest impacts are expected when SLR, heavy river flows, high tides and storms coincide (California Regional Assessment Group, 2002). In New York, flooding from the combination of SLR and storm surge could be several metres deep (Gornitz and Couch, 2001; Gornitz et al., 2001). By the 2090s under a strong warming scenario (the CGCM climate model with the CCGG emissions scenario), today's 100-year flood level could have a return period of 3 to 4 years, and today's 500-year flood could be a 1-in-50-year event, putting much of the region's infrastructure at increased risk (Jacob et al., 2001; Major and Goldberg, 2001).

Energy supply and demand

Climate change will likely lead to substantial increases in electricity demand for summer cooling in most North American cities (see Section 14.4.8). This creates a number of conflicts, both locally and at a distance. In southern California, additional summer electricity demand will intensify inherent conflicts between state-wide hydropower and flood-control objectives (California Regional Assessment Group, 2002). Operating the Columbia River dams that supply 90% of Vancouver's power would be complicated by lower flows and environmental requirements (see Box 14.2). In New York, supplying summer electricity demand could increase air pollutant levels (e.g., ozone) (Hill and Goldberg, 2001; Kinney et al., 2001; Knowlton et al., 2004) and health impacts could be further exacerbated by climate change interacting with urban heat island effects (Rosenzweig et al., 2005). Unreliable electric power, as in minority neighbourhoods during the New York heatwave of 1999, can amplify concerns about health and environmental justice (Wilgoren and Roane, 1999).

Water supply systems

North American city water supply systems often draw water from considerable distances, so climate impacts need not be local to affect cities. By the 2020s, 41% of the supply to southern California is likely to be vulnerable to warming from loss of Sierra Nevada and Colorado River basin snowpack (see Section 14.4.1). Similarly, less mountain snowpack and summer runoff could require that Vancouver undertakes additional conservation and water restrictions, expands reservoirs, and develops additional water sources (Schertzer et al., 2004). The New York area will likely experience greater water supply variability (Solecki and Rosenzweig, 2007). The New York system can likely accommodate this, but the region's smaller systems may be vulnerable, leading to a need for enhanced regional water distribution protocols (Hansler and Major, 1999).

Adaptation

Many cities in North America have initiated 'no regrets' actions based on historical experience. In the Los Angeles area, incentive and information programmes of local water districts encourage water conservation (MWD, 2005). A population increase of over 35% (nearly one million people) since 1970 has increased water use in Los Angeles by only 7% (California Regional Assessment Group, 2002). New York has reduced total water consumption by 27% and per capita consumption by 34% since the early 1980s (City of New York, 2005). Vancouver's 'CitiesPLUS' 100-year plan will upgrade the drainage system by connecting natural areas and waterways, developing locally resilient, smaller systems, and upgrading key sections of pipe during routine maintenance (Denault et al., 2002).

2002; Rygel et al., 2006) and the urban transportation network of the Boston metropolitan area (Suarez et al., 2005). For Boston, projections of a gradual increase (0.31%/yr) in the probability of the 100-year storm surge, as well as sea-level rise of 3 mm/yr, leads to urban riverine and coastal flooding (based on the CGCM1 climate model), but the projected economic damages do not justify the cost of adapting the transportation infrastructure to climate change.

Less reliable supplies of water are likely to create challenges for managing urban water systems as well as for industries that depend on large volumes of water (see Sections 14.2.1, 14.4.1). U.S. water managers anticipate local, regional or state-wide water shortages during the next ten years (GAO, 2003). Threats to reliable supply are complicated by the high population growth rates in western states where many water resources are at or approaching full utilisation (GAO, 2003) (see Section 14.4.1). Potential increases in heavy precipitation, with expanding impervious surfaces, could increase urban flood risks and create additional design challenges and costs for stormwater management (Kije Sipi Ltd., 2001).

14.4.7 Tourism and recreation

Although coastal zones are among the most important recreation resources in North America, the vulnerability of key tourism areas to sea-level rise has not been comprehensively assessed. The cost to protect Florida beaches from a 0.5 m rise in sea level, with sand replenishment, was estimated at US$1.7 billion to 8.8 billion (EPA, 1999).

Nature-based tourism is a major market segment, with over 900 million visitor-days in national/provincial/state parks in 2001. Visits to Canada's national parks system are projected to increase by 9 to 25% (2050s) and 10 to 40% (2080s) as a result of a lengthened warm-weather tourism season (based on the PCM GCM and the SRES B2 emissions scenario, and the CCSR GCM with A1) (Jones and Scott, 2006). This would have economic benefits for park agencies and nearby communities, but could exacerbate visitor-related ecological pressures in some parks. Climate-induced environmental changes (e.g., loss of glaciers, altered biodiversity, fire- or insect-impacted forests) would also affect park tourism, although uncertainty is higher regarding the regional specifics and magnitude of these impacts (Richardson and Loomis, 2004; Scott et al., 2007a).

Early studies of the impact of climate change on the ski industry did not account for snowmaking, which substantially lowers the vulnerability of ski areas in eastern North America for modest (B2 emissions scenario) but not severe (A1) warming (based on 5 GCMs for the 2050s) (Scott et al., 2003; Scott et al., 2007b). Without snowmaking, the ski season in western North America will likely shorten substantially, with projected losses of 3 to 6 weeks (by the 2050s) and 7 to 15 weeks (2080s) in the Sierra Nevada of California (based on PCM and HadCM3 GCMs for the B1 and A1FI scenarios), and 7 to 10 weeks at lower elevations and 2 to 14 weeks at higher elevations at Banff, Alberta (based on the PCM GCM with the B2 emissions scenario, and the CCSR GCM with A1, for the 2050s) (Hayhoe et al., 2004; Scott and Jones, 2005). With advanced snowmaking, the ski season in Banff shortens at low but not at high altitudes. The North American snowmobiling industry (valued at US$27 billion) (ISMA, 2006) is more vulnerable to climate change because it relies on natural snowfall. By the 2050s, a reliable snowmobile season disappears from most regions of eastern North America that currently have developed trail networks (based on the CGCM1 and HadCM3 GCMs with IS92a emissions, the PCM GCM with B2 emissions and the CCSR GCM with A1 emissions) (Scott, 2006; Scott and Jones, 2006).

14.4.8 Energy, industry and transportation

Energy demand

Recent North American studies generally confirm earlier work showing a small net change (increase or decrease, depending on methods, scenarios and location) in the net demand for energy in buildings but a significant increase in demand for electricity for space cooling, with further increases caused by additional market penetration of air conditioning (high confidence) (Sailor and Muñoz, 1997; Mendelsohn and Schlesinger, 1999; Morrison and Mendelsohn, 1999; Mendelsohn, 2001; Sailor, 2001; Sailor and Pavlova, 2003; Scott et al., 2005; Hadley et al., 2006). Ruth and Amato (2002) projected a 6.6% decline in annual heating fuel consumption for Massachusetts in 2020 (linked to an 8.7% decrease in heating degree-days) and a 1.9% increase in summer electricity consumption (12% increase in annual cooling degree-days). In Québec, net energy demand for heating and air conditioning across all sectors could fall by 9.4% of 2001 levels by 2100 (based on the CGCM1 GCM and the IS92a emissions scenario), with residential heating falling by 10 to 15% and air conditioning increasing two- to four-fold. Peak electricity demand is likely to decline in the winter peaking system of Quebec, while summer peak demand is likely to increase 7 to 17% in the New York metropolitan region (Ouranos, 2004).

Energy supply

Since the TAR, there have been regional but not national-level assessments of the effects of climate change on future hydropower resources in North America. For a 2 to 3°C warming in the Columbia River Basin and British Columbia Hydro service areas, the hydroelectric supply under worst-case water conditions for winter peak demand will likely increase (high confidence). However, generating power in summer will likely conflict with summer instream flow targets and salmon restoration goals established under the Endangered Species Act (Payne et al., 2004). This conclusion is supported by accumulating evidence of a changing hydrologic regime in the western U.S. and Canada (see Sections 14.2.1, 14.4.1, Box 14.2). Similarly, Colorado River hydropower yields will likely decrease significantly (medium confidence) (Christensen et al., 2004), as will Great Lakes hydropower (Moulton and Cuthbert, 2000; Lofgren et al., 2002; Mirza, 2004). James Bay hydropower will likely increase (Mercier, 1998; Filion, 2000). Lower Great Lake water levels could lead to large economic losses (Canadian $437 million to 660 million/yr), with increased water levels leading to small gains (Canadian $28 million to 42 million/yr) (Buttle et al., 2004; Ouranos, 2004). Northern Québec hydropower production would likely benefit from greater precipitation and more open-water conditions, but hydro plants in southern Québec would likely be affected by lower water levels. Consequences of changes in seasonal distribution of flows and in the timing of ice formation are uncertain (Ouranos, 2004).

Wind and solar resources are about as likely as not to increase (medium confidence). The viability of wind resources depends on both wind speed and reliability. Studies to date project wind resources that are unchanged by climate change (based on the HadGCM2 CGSa4 experiment) or reduced by 0 to 40% (based on CGCM1 and the SRES A1 scenario, and HadCM2 and RegCM2 and a 1%/yr CO_2 increase) (Segal et al., 2001; Breslow and Sailor, 2002). Future changes in cloudiness could slightly increase the potential for solar energy in North America south of 60°N (using many models, the A1B scenario and for 2080 to 2099 *vs.* 1980 to 1999) (Meehl et al., 2007: Figure 10.10). However, Pan et al. (2004) projected the opposite: that increased cloudiness will likely decrease the potential output of photovoltaics by 0 to 20% (based on HadCM2 and RegCM2 and a 1%/yr CO_2 increase for the 2040s).

Bioenergy potential is climate-sensitive through direct impacts on crop growth and availability of irrigation water. Bioenergy crops are projected to compete successfully for agricultural acreage at a price of US$33/Mg, or about US$1.83/10^9 joules (Walsh et al., 2003). Warming and precipitation increases are expected to allow the bioenergy crop switchgrass to compete effectively with traditional crops in the central U.S. (based on RegCM2 and a $2\times CO_2$ scenario) (Brown et al., 2000).

Construction

As projected in the TAR, the construction season in Canada and the northern U.S. will likely lengthen with warming (see Section 14.3.1 and Christensen et al., 2007 Section 11.5.3). In permafrost areas in Canada and Alaska, increasing depth of the 'active layer' or loss of permafrost can lead to substantial decreases in soil strength (ACIA, 2004). In areas currently underlain by permafrost, construction methods are likely to require changes (Cole et al., 1998), potentially increasing construction and maintenance costs (high confidence) (see Chapter 15 Section 15.7.1) (ACIA, 2005).

Transportation

Warmer or less snowy winters will likely reduce delays, improve ground and air transportation reliability, and decrease the need for winter road maintenance (Pisano et al., 2002). More intense winter storms could, however, increase risks for traveller safety (Andrey and Mills, 2003) and require increased snow removal. Continuation of the declining fog trend in at least some parts of North America (Muraca et al., 2001; Hanesiak and Wang, 2005) should benefit transport. Improvements in technology and information systems will likely modulate vulnerability to climate change (Andrey and Mills, 2004).

Negative impacts of climate change on transportation will very likely result from coastal and riverine flooding and landslides (Burkett, 2002). Although offset to some degree by fewer ice threats to navigation, reduced water depth in the Great Lakes would lead to the need for 'light loading' and, hence, adverse economic impacts (see Section 14.4.1) (du Vair et al., 2002; Quinn, 2002; Millerd, 2005). Adaptive measures, such as deepening channels for navigation, would need to address both institutional and environmental challenges (Lemmen and Warren, 2004).

Warming will likely adversely affect infrastructure for surface transport at high northern latitudes (Nelson et al., 2002). Permafrost degradation reduces surface load-bearing capacity and potentially triggers landslides (Smith and Levasseur, 2002; Beaulac and Doré, 2005). While the season for transport by barge is likely to be extended, the season for ice roads will likely be compressed (Lonergan et al., 1993; Lemmen and Warren, 2004; Welch, 2006). Other types of roads are likely to incur costly improvements in design and construction (Stiger, 2001; McBeath, 2003; Greening, 2004) (see Chapter 15 Section 15.7.1).

An increase in the frequency, intensity or duration of heat spells could cause railroad track to buckle or kink (Rosetti, 2002), and affect roads through softening and traffic-related rutting (Zimmerman, 2002). Some problems associated with warming can be ameliorated with altered road design, construction and management, including changes in the asphalt mix and the timing of spring load restrictions (Clayton et al., 2005; Mills et al., 2006).

14.4.9 Interacting impacts

Impacts of climate change on North America will not occur in isolation, but in the context of technological, economic (Nakićenović and Swart, 2000; Edmonds, 2004), social (Lebel, 2004; Reid et al., 2005) and ecological changes (Sala et al., 2000). In addition, challenges from climate change will not appear as isolated effects on a single sector, region, or group. They will occur in concert, creating the possibility of a suite of local, as well as long-distance, interactions, involving both impacts of climate change and other societal and ecosystem trends (NAST, 2001; Reid et al., 2005). In some cases, these interactions may reduce impacts or decrease vulnerability, but in others they may amplify impacts or increase vulnerability.

Effects of climate change on ecosystems do not occur in isolation. They co-occur with numerous other factors, including effects of land-use change (Foley et al., 2005), air pollution (Karnosky et al., 2005), wildfires (see Box 14.1), changing biodiversity (Chapin et al., 2000) and competition with invasives (Mooney et al., 2005). The strong dependence of ecosystem function on moisture balance (Baldocchi and Valentini, 2004), coupled with the greater uncertainty about future precipitation than about future temperature (Christensen et al., 2007: Section 11.5.3), further expands the range of possible futures for North American ecosystems.

People also experience climate change in a context that is strongly conditioned by changes in other sectors and their adaptive capacity. Interactions with changes in material wealth (Ikeme, 2003), the vitality of local communities (Hutton, 2001; Wall et al., 2005), the integrity of key infrastructure (Jacob et al., 2001), the status of emergency facilities and preparedness and planning (Murphy et al. 2005), the sophistication of the public health system (Kinney et al., 2001), and exposure to conflict (Barnett, 2003), all have the potential to either exacerbate or ameliorate vulnerability to climate change. Among the unexpected consequences of the population displacement caused by Hurricane Katrina in 2005 is the strikingly poorer health of storm evacuees, many of whom lost jobs, health insurance, and stable relationships with medical professionals (Columbia University Mailman School of Public Health, 2006).

Little of the literature reviewed in this chapter addresses interactions among sectors that are all impacted by climate change, especially in the context of other changes in economic activity, land use, human population, and changing personal and political priorities. Similarly, knowledge of the indirect impacts on North America of climate change in other geographical regions is very limited.

14.5 Adaptation: practices, options and constraints

The U.S. and Canada are developed economies with extensive infrastructure and mature institutions, with important regional and socio-economic variations (NAST, 2000; Lemmen and Warren, 2004). These capabilities have led to adaptation and coping strategies across a wide range of historic conditions, with

both successes and failures. Most studies on adaptive strategies consider implementation based on past experiences (Paavola and Adger, 2002). Examples of adaptation based on future projections are rare (Smit and Wall, 2003; Devon, 2005). Expanding beyond reactive adaptation to proactive, anticipatory adaptive strategies presents many challenges. Progress toward meeting these challenges is just beginning in North America.

14.5.1 Practices and options

Canada and the U.S. emphasise market-based economies. Governments often play a role implementing large-scale adaptive measures, and in providing information and incentives to support development of adaptive capacity by private decision makers (UNDP, 2001; Michel-Kerjan, 2006). In practice, this means that individuals, businesses and community leaders act on perceived self interest, based on their knowledge of adaptive options. Despite many examples of adaptive practices in North America, under-investment in adaptation is evident in the recent rapid increase in property damage due to climate extremes (Burton and Lim, 2005; Epstein and Mills, 2005) and illustrates the current adaptation deficit.

Adaptation by individuals and private businesses

Research on adaptive behaviour for coping with projected climate change is minimal, though several studies address adaptations to historic variation in the weather. About 70% of businesses face some weather risk. The impact of weather on businesses in the U.S. is an estimated US$200 billion/yr (Lettre, 2000). Climate change may also create business opportunities. For example, spending on storm-worthiness and construction of disaster-resilient homes (Koppe et al., 2004; Kovacs, 2005b; Kunreuther, 2006) increased substantially after the 2004 and 2005 Atlantic hurricanes, as did the use of catastrophe bonds (CERES, 2004; Byers et al., 2005; Dlugolecki, 2005; Guy Carpenter, 2006).

Businesses in Canada and the U.S. are investing in climate-relevant adaptations, though few of these appear to be based on projections of future climate change. For example:

- Insurance companies are introducing incentives for homeowners and businesses that invest in loss prevention strategies (Kim, 2004; Kovacs, 2005b).
- Insurance companies are investing in research to prevent future hazard damage to insured property, and to adjust pricing models (Munich Re., 2004; Mills and Lecomte, 2006).
- Ski resort operators are investing in lifts to reach higher altitudes and in snow-making equipment (Elsasser et al., 2003; Census Bureau, 2004; Scott, 2005; Jones and Scott, 2006; Scott et al., 2007a).
- With highly detailed information on weather conditions, farmers are adjusting crop and variety selection, irrigation strategies and pesticide application (Smit and Wall, 2003).
- The forest resources sector is investing in improved varieties, forest protection, forest regeneration, silvicultural management and forest operations (Loehle et al., 2002; Spittlehouse and Stewart, 2003).

Adaptation by governments and communities

Many North American adaptations to climate-related risks are implemented at the community level. These include efforts to minimise damage from heatwaves, droughts, floods, wildfires or tornados. These actions may entail land-use planning, building code enforcement, community education and investments in critical infrastructure (Burton et al., 2002; Multihazard Mitigation Council, 2005).

Flooding and drought present recurring challenges for many North American communities (Duguid, 2002). When the City of Peterborough, Canada, experienced two 100-year flood events within three years, it responded by flushing the drainage systems and replacing the trunk sewer systems to meet more extreme 5-year flood criteria (Hunt, 2005). Recent droughts in six major U.S. cities, including New York and Los Angeles, led to adaptive measures involving investments in water conservation systems and new water supply-distribution facilities (Changnon and Changnon, 2000). To cope with a 15% increase in heavy precipitation, Burlington and Ottawa, Ontario, employed both structural and non-structural measures, including directing downspouts to lawns to encourage infiltration and increasing depression and street detention storage (Waters et al., 2003).

Some large cities (e.g., New Orleans) and important infrastructure (e.g., the only highway and rail link between Nova Scotia and the rest of Canada) are located on or behind dykes that will provide progressively less protection unless raised on an ongoing basis. Some potential damages may be averted through redesigning structures, raising the grade, or relocating (Titus, 2002). Following the 1996 Saguenay flood and 1998 ice storm, the province of Québec modified the Civil Protection Act and now requires municipalities to develop comprehensive emergency management plans that include adaptation strategies (McBean and Henstra, 2003). More communities are expected to re-examine their hazard management systems following the catastrophic damage in New Orleans from Hurricane Katrina (Kunreuther et al., 2006).

Rapid development and population growth are occurring in many coastal areas that are sensitive to storm impacts (Moser, 2005). While past extreme events have motivated some aggressive adaptation measures (e.g., in Galveston, Texas) (Bixel and Turner, 2000), the passage of time, new residents, and high demand for waterfront property are pushing coastal development into vulnerable areas.

Climate change will likely increase risks of wildfire (see Box 14.1). FireWise and FireSmart are programmes promoting wildfire safety in the U.S. and Canada, respectively (FireSmart, 2005; FireWise, 2005). Individual homeowners and businesses can participate, but the greatest reduction in risk will occur in communities that take a comprehensive approach, managing forests with controlled burns and thinning, promoting or enforcing appropriate roofing materials, and maintaining defensible space around each building (McGee et al., 2000).

Public institutions are responsible for adapting their own legislation, programmes and practices to appropriately anticipate climate changes. The recent Québec provincial plan, for example, integrates climate change science into public policy. Public institutions can also use incentives to encourage or to

overcome disincentives to investment by private decision makers (Moser, 2006). Options, including tax assistance, loan guarantees and grants, can improve resilience to extremes and reduce government costs for disaster management (Moser, 2005). The U.S. National Flood Insurance Program is changing its policy to reduce the risk of multiple flood claims, which cost the programme more than US$200 million/yr (Howard, 2000). Households with two flood-related claims are now required to elevate their structure 2.5 cm above the 100-year flood level, or relocate. To complement this, a 5-year, US$1 billion programme to update and digitise flood maps was initiated in 2003 (FEMA, 2006). However, delays in implementing appropriate zoning can encourage accelerated, maladapted development in coastal communities and flood plains.

14.5.2 Mainstreaming adaptation

One of the greatest challenges in adapting North America to climate change is that individuals often resist and delay change (Bacal, 2000). Good decisions about adapting to climate change depend on relevant experience (Slovic, 2000), socio-economic factors (Conference Board of Canada, 2006), and political and institutional considerations (Yarnal et al., 2006; Dow et al., 2007). Adaptation is a complex concept (Smit et al., 2000; Dolan and Walker, 2006), that includes wealth and several other dimensions.

Experience and knowledge

The behaviour of people and systems in North America largely reflects historic climate experience (Schipper et al., 2003), which has been institutionalised through building codes, flood management infrastructure, water systems and a variety of other programmes. Canadian and U.S. citizens have invested in buildings, infrastructure, water and flood management systems designed for acceptable performance under historical conditions (Bruce, 1999; Co-operative Programme on Water and Climate, 2005; UMA Engineering, 2005; Dow et al., 2007). Decisions by community water managers (Rayner et al., 2005; Dow et al., 2007) and set-back regulations in coastal areas (Moser, 2005) also account for historic experience but rarely incorporate information about climate change or sea-level rise. In general, decision makers lack the tools and perspectives to integrate future climate, particularly events that exceed historic norms (UNDP, 2001).

Examples of adaptive behaviour influenced exclusively or predominantly by projections of climate change are largely absent from the literature, but some early steps toward planned adaptation have been taken by the engineering community, insurance companies, water managers, public health officials, forest managers and hydroelectric producers. Some initiatives integrate consideration of climate change into the environmental impact assessment process. Philadelphia, Toronto and a few other communities have introduced warning programmes to manage the health threat of heatwaves (Kalkstein, 2002). The introduction of Toronto's heat/health warning programme was influenced by both climate projections and fatalities from past heatwaves (Koppe et al., 2004; Ligeti, 2006).

Weather extremes can reveal a community's vulnerability or resilience (RMS, 2005a) and provide insights into potential adaptive responses to future events. Since the 1998 ice storm, Canada's two most populous provinces, Ontario and Québec, have strengthened emergency preparedness and response capacity. Included are comprehensive hazard-reduction measures and loss-prevention strategies to reduce vulnerability to extreme events. These strategies may include both public information programmes and long-term strategies to invest in safety infrastructure (McBean and Henstra, 2003). Adaptive behaviour is typically greater in the communities that recently experienced a natural disaster (Murphy et al., 2005). But the near absence of any personal preparedness following the 2003 blackout in eastern North America demonstrated that adaptive actions do not always follow significant emergencies (Murphy, 2004).

Socio-economic factors

Wealthier societies tend to have greater access to technology, information, developed infrastructure, and stable institutions (Easterling et al., 2004), which build capacity for individual and collective action to adapt to climate change. But average economic status is not a sufficient determinant of adaptive capacity (Moss et al., 2001). The poor and marginalised in Canada and the U.S. have historically been most at risk from weather shocks (Turner et al., 2003), with vulnerability directly related to income inequality (Yohe and Tol, 2002). Differences in individual capacity to cope with extreme weather were evident in New Orleans during and after Hurricane Katrina (Kunreuther et al., 2006), when the large majority of those requiring evacuation assistance were either poor or in groups with limited mobility, including elderly, hospitalised and disabled citizens (Murphy et al., 2005; Kumagi et al., 2006; Tierney, 2006).

Political and institutional capacity for autonomous adaptation

Public officials in Canada and the U.S. typically provide early and extensive assistance in emergencies. Nevertheless, emergency response systems in the U.S. and Canada are based on the philosophy that households and businesses should be capable of addressing their own basic needs for up to 72 hours after a disaster (Kovacs and Kunreuther, 2001). The residents' vulnerability depends on their own resources, plus those provided by public service organisations, private firms and others (Fischhoff, 2006). When a household is overwhelmed by an extreme event, household members often rely on friends, family and other social networks for physical and emotional support (Cutter et al., 2000; Enarson, 2002; Murphy, 2004). When a North American community responds to weather extremes, non-governmental organisations often coordinate support for community-based efforts (National Voluntary Organizations Active in Disaster, 2006).

An active dialogue among stakeholders and political institutions has the potential to clarify the opportunities for adaptation to changing climate. However, public discussion about adaptation is at an early stage in the U.S. and Canada (Natural Resources Canada, 2000), largely because national governments have focused public discussion on mitigation, with less attention to adaptation (Moser, 2005). Some public funds have been directed to research on impacts and adaptation, and

both countries have undertaken national assessments with a synthesis of the adaptation literature, but neither country has a formal adaptation strategy (Conference Board of Canada, 2006). Integrating perspectives on climate change into legislation and regulations has the potential to promote or constrain adaptive behaviour (Natural Resources Canada, 2000). North American examples of public policies that influence adaptive behaviour include water allocation law in the western U.S. (Scheraga, 2001), farm subsidies (Goklany, 2007), public flood insurance in the U.S. (Crichton, 2003), guidance on preservation of wetlands and emergency management.

14.5.3 Constraints and opportunities

Social and cultural barriers

High adaptive capacity, as in most of North America, should be an asset for coping with or benefiting from climate change. Capacity, however, does not ensure positive action or any action at all. Societal values, perceptions and levels of cognition shape adaptive behaviour (Schneider, 2004). In North America, information about climate change is usually not 'mainstreamed' or explicitly considered (Dougherty and Osaman Elasha, 2004) in the overall decision-making process (Slovic, 2000; Leiss, 2001). This can lead to actions that are maladapted, for example, development near floodplains or coastal areas known to be vulnerable to climate change. Water managers are unlikely to use climate forecasts, even when they recognise the vulnerability, unless the forecast information can fit directly into their everyday management decisions (Dow et al., 2007).

Informational and technological barriers

Uncertainty about the local impacts of climate change is a barrier to action (NRC, 2004). Incomplete knowledge of disaster safety options (Murphy, 2004; Murphy et al., 2005) further constrains adaptive behaviour. Climate change information must be available in a form that fits the needs of decision-makers. For example, insurance companies use climate models with outputs specifically designed to support decisions related to the risk of insolvency, pricing and deductibles, regulatory and rating agency considerations, and reinsurance (Swiss Re, 2005a). Some electrical utilities have begun to integrate climate model output into planning and management of hydropower production (Ouranos, 2004).

A major challenge is the need for efficient technology and knowledge transfer. In general, questions about responsibility for funding research, involving stakeholders, and linking communities, government and markets have not been answered (Ouranos, 2004). Another constraint is resistance to new technologies (e.g., genetically modified crops), so that some promising adaptations in the agricultural, water resource management and forestry sectors are unlikely to be realised (Goklany, 2000, 2001).

Financial and market barriers

In the U.S., recent spending on adaptation to extremes has been a sound investment, contributing to reduced fatalities, injuries and significant economic benefits. The Multihazard Mitigation Council (2005) found that US$3.5 billion in spending between 1993 and 2003 on programmes to reduce future damages from flooding, severe wind and earthquakes contributed US$14 billion in societal benefits. The greatest savings were in flood (5-fold) and wind (4-fold) damage reduction. Adaptation also benefited government as each dollar of spending resulted in US$3.65 in savings or increased tax revenue. This is consistent with earlier case studies; the Canadian $65 million invested in 1968 to create the Manitoba Floodway has prevented several billion dollars in flood damage (Duguid, 2002).

Economic issues are frequently the dominant factors influencing adaptive decisions. This includes community response to coastal erosion (Moser, 2000), investments to enhance water resource systems (Report of the Water Strategy Expert Panel, 2005), protective retrofits to residences (Simmons et al., 2002; Kunreuther, 2006), and changes in insurance practices (Kovacs, 2005a). The cost and availability of economic resources clearly influence choices (WHO, 2003), as does the private versus public identity of the beneficiaries (Moser, 2000).

Sometimes, financial barriers interact with the slow turnover of existing infrastructure (Figure 14.3). Extensive property damage in Florida during Hurricane Andrew in 1992 led to significant revisions to the building code. If all properties in southern Florida met this updated code in 1992, then property damage from Hurricane Andrew would have been lower by nearly 45% (AIR, 2002). Florida will, however, still experience extensive damage from hurricanes through damage to the large number of older homes and businesses. Other financial barriers come from the challenge property owners face in recovering the costs of protecting themselves. Hidden adaptations tend to be undervalued, relative to obvious ones. For example, homes with storm shutters sell for more than homes without this visible adaptation, while less visible retrofits, such as tie-down straps to hold the roof in high winds, add less to the resale value of the home, relative to their cost (Simmons et al., 2002).

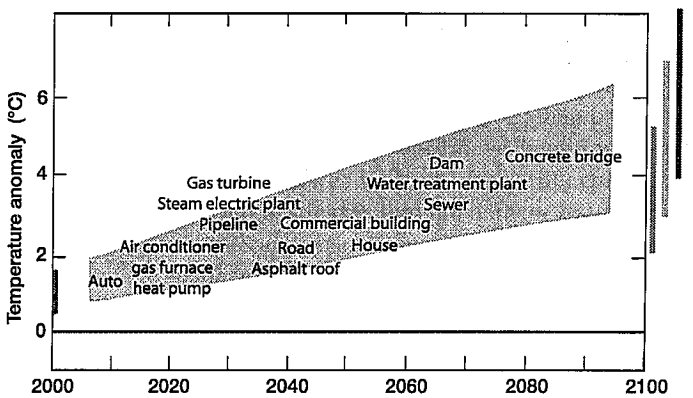

Figure 14.3. *Typical infrastructure lifetimes in North America (data from Lewis, 1987; Bettigole, 1990; EIA, 1999, 2001; Statistics Canada, 2001a; BEA, 2003), in relation to projected North American warming for 2000 to 2100 (relative to 1901-1950) for the A1B scenario, from the IPCC AR4 Multi-Model Dataset (yellow envelope). Measured and modelled anomalies for 2000 are shown with black and orange bars, respectively. Projected warming for 2091 to 2100 for the B1, A1B and A2 scenarios are indicated by the blue, yellow and red bars, respectively at the right (data from Christensen et al., 2007: Box 11.1 Figure 1).*

14.6 Case studies

Many of the topics discussed in this chapter have important dimensions, including interactions with other sectors, regions and processes, that make them difficult to assess from the perspective of a single sector. This chapter develops multi-sector case studies on three topics of special importance to North America – forest disturbances (see Box 14.1), water resources (using the Columbia River as an example) (see Box 14.2) and coastal cities (see Box 14.3).

14.7 Conclusions: implications for sustainable development

Climate change creates a broad range of difficult challenges that influence the attainment of sustainability goals. Several of the most difficult emerge from the long time-scale over which the changes occur (see Section 14.3) and the possible need for action well before the magnitude (and certainty) of the impacts is clear (see Section 14.5). Other difficult problems arise from the intrinsic global scale of climate change (EIA, 2005b). Because the drivers of climate change are truly global, even dedicated action at the regional scale has limited prospects for ameliorating regional-scale impacts. These two sets of challenges, those related to time-scale and those related to the global nature of climate change, are not in the classes that have traditionally yielded to the free-market mechanisms and political decision making that historically characterise Canada and the U.S. (see Section 14.5). Yet, the magnitude of the climate change challenge calls for proactive adaptation and technological and social innovation, areas where Canada and the U.S. have abundant capacity. An important key to success will be developing the capacity to incorporate climate change information into adaptation in the context of other important technological, social, economic and ecological trends.

The preceding sections describe current knowledge concerning the recent climate experience of North America, the impacts of the changes that have already occurred, and the potential for future changes. They also describe historical experience with and future prospects for dealing with climate impacts. The key points are:

- North America has experienced substantial social, cultural, economic and ecological disruption from recent climate-related extremes, especially storms, heatwaves and wildfires [14.2].
- Continuing infrastructure development, especially in vulnerable zones, will likely lead to continuing increases in economic damage from extreme weather [14.2.6, 14.4.6].
- The vulnerability of North America depends on the effectiveness of adaptation and the distribution of coping capacity, both of which are currently uneven and have not always protected vulnerable groups from adverse impacts of climate variability and extreme weather events [14.5].
- A key prerequisite for sustainability is 'mainstreaming' climate issues into decision making [14.5].
- Climate change will exacerbate stresses on diverse sectors in North America, including, but not limited to, urban centres, coastal communities, human health, water resources and managed and unmanaged ecosystems [14.4].
- Indigenous peoples of North America and those who are socially and economically disadvantaged are disproportionately vulnerable to climate change [14.2.6, 14.4.6].

14.8 Key uncertainties and research priorities

The major limits in understanding of climate change impacts on North America, and on the ability of its people, economies and ecosystems to adapt to these changes, can be grouped into seven areas.

- Projections of climate changes still have important uncertainties; especially on a regional scale (Christensen et al., 2007: Section 11.5.3). For North America, the greater uncertainty about future precipitation than about future temperature substantially expands the uncertainty of a broad range of impacts on ecosystems (see Section 14.4.2), hydrology and water resources (see Sections 14.4.1, 14.4.7), and on industries (see Sections 14.4.6, 14.4.7).
- North American people, economies and ecosystems tend to be much more sensitive to extremes than to average conditions [14.2]. Incomplete understanding of the relationship between changes in the average climate and extremes (Meehl et al., 2007: Section 10.3.6; Christensen et al., 2007: Section 11.5.3.3) limits our ability to connect future conditions with future impacts and the options for adaptation. There is a need for improved understanding of the relationship between changes in average climate and those extreme events with the greatest potential impact on North America, including hurricanes, other severe storms, heatwaves, floods, and prolonged droughts.
- For most impacts of climate change, we have at least some tools for estimating gradual change (see Section 14.4), but we have few tools for assessing the conditions that lead to tipping points, where a system changes or deteriorates rapidly, perhaps without further forcing.
- Most of the past research has addressed impacts on a single sector (e.g., health, transportation, unmanaged ecosystems). Few studies address the interacting responses of diverse sectors impacted by climate change, making it very difficult to evaluate the extent to which multi-sector responses limit options or push situations toward tipping points (see Section 14.4.9).
- Very little past research addresses impacts of climate change in a context of other trends with the potential to exacerbate impacts of climate change or to limit the range of response options (see Section 14.4.9) (but see Reid et al., 2005 for an important exception). A few North American examples of trends likely to complicate the development of strategies for dealing with climate change include continuing development in coastal areas (see Section 14.2.3), increasing demand on

freshwater resources (see Section 14.4.1), the accumulation of fuel in forest ecosystems susceptible to wildfire (see Box 14.1), and continued introductions of invasive species with the potential to disrupt agriculture and ecosystem processes (see Section 14.2.2, 14.2.4). In the sectors that are the subject of the most intense human management (e.g., health, agriculture, settlements, industry), it is possible that changes in technology or organisation could exacerbate or ameliorate impacts of climate change (see Section 14.4.9).

- Indirect impacts of climate change are poorly understood. In a world of ever-increasing globalisation, the future of North American people, economies and ecosystems is connected to the rest of the world through a dense network of cultural exchanges, trade, mixing of ecosystems, human migration and, regrettably, conflict (see Section 14.3). In this interconnected world, it is possible that profoundly important impacts of climate change on North America will be indirect consequences of climate change impacts on other regions, especially where people, economies or ecosystems are unusually vulnerable.
- Examples of North American adaptations to climate-related impacts are abundant, but understanding of the options for proactive adaptation to conditions outside the range of historical experience is limited (see Section 14.5).

All of these areas potentially interact, with impacts that are unevenly distributed among regions, industries, and communities. Progress in research and management is occurring in all these areas. Yet stakeholders and decision makers need information immediately, placing a high priority on strategies for providing useful decision support in the context of current knowledge, conditioned by an appreciation of the limits of that knowledge.

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Attachment 30

LETTER 21

STATE OF CALIFORNIA
THE RESOURCES AGENCY

FILE ID: R198888

ANNUAL SUMMARY BY AGENCY, WATER TYPE
YEAR 1988

DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT ANALYSIS OFFICE

DATE: 02/16/88
PAGE: 1

COUNTY OF BUTTE TOTAL = 1200								
	M&I ENT = 1200							
PLUMAS CO FCWCD TOTAL = 960								
	M&I ENT = 960							
YUBA CITY TOTAL = 1400								
	M&I ENT = 1400							
NAPA CO FCWCD TOTAL = 5745								
	M&I ENT = 5745							
SOLANO CO FCWCD TOTAL = 26820								
TOT ENT = 15660	M&I ENT = 700		BFN ENT = 10860		VAL ENT = 4100			
TOT MISC = 11160	V&L PMT = 11160							
ZONE-7 ALAMEDA TOTAL = 30000								
TOT ENT = 30000	M&I ENT = 21493		M GW ENT = 6212		AGR ENT = 2295			
ALAMEDA CO WD TOTAL = 40165								
TOT ENT = 34500	M&I ENT = 8775		M GW ENT = 22525		A GW ENT = 3200			
TOT MISC = 5665	WET WTHR = 5665							
SANTA CLARA VWD TOTAL = 88000								
TOT ENT = 88000	M&I ENT = 85370		M GW ENT = 2630					
DEVIL'S DEN WD TOTAL = 20000								
	AGR ENT = 12700							
	AGR SUR = 7300							
DUDLEY RIDGE WD TOTAL = 55639								
	AGR ENT = 53500							
	AGR SUR = 2139							
EMPIRE WS ID TOTAL = 6000								
	AGR ENT = 3000							
	AGR SUR = 3000							
KERN COUNTY WA TOTAL = 1225892								
TOT ENT = 1074600	M&I ENT = 46220		M GW ENT = 77680		AGR ENT = 950700			
TOT SUR = 151292	AGR SUR = 151292							
COUNTY OF KINGS TOTAL = 4000								
	M&I ENT = 4000							
OAK FLAT WD TOTAL = 7300								
	AGR ENT = 5400							
	AGR SUR = 1900							

1988

STATE OF CALIFORNIA
THE RESOURCES AGENCY

FILE ID: R198888

ANNUAL SUMMARY BY AGENCY, WATER TYPE
YEAR 1988

DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT ANALYSIS OFFICE

TULARE LK BWSD	TOTAL = 225000	AGR ENT = 105600					
		AGR SUR = 106500					
		WET WTHR = 12900					
AVEK WA	TOTAL = 46000						
	TOT ENT = 46000	M&I ENT = 24000	AGR ENT = 22000				
CASTAIC LAKE WA	TOTAL = 18400	M&I ENT = 18400					
COACHELLA VALLY	TOTAL = 20652	M GW ENT = 20652					
CRESTLINE-LA WA	TOTAL = 2000	M&I ENT = 2000					
DESERT WA	TOTAL = 34000	M&I ENT = 34000					
LITTLEROCK CR	TOTAL = 1953						
	TOT ENT = 1953	M&I ENT = 100	AGR ENT = 1853				
METROPOLITAN WD	TOTAL = 1026348						
	TOT ENT = 1026348	M&I ENT = 750048	M GW ENT = 86000	BYPS ENT = 190300			
PALMDALE WD	TOTAL = 6210	M&I ENT = 6210					
SAN BERNARDINO	TOTAL = 23000						
	TOT ENT = 23000	M&I ENT = 9600	M GW ENT = 13400				
SAN GABRIEL	TOTAL = 10500	M GW ENT = 10500					
SHELL CAL PROD.	TOTAL = 2295	REPAYMNT = 2295					
JG BOSWELL	TOTAL = 8000	REPAYMNT = 8000					
FISH & GAME	TOTAL = 660	REC/F&WL = 660					
PARKS & RECREAT	TOTAL = 90	REC/F&WL = 90					
REC/FISH&WILDLF	TOTAL = 7130	REC/F&WL = 7130					

LETTER 21

FILE DUMP

FILE IDENTIFICATION: R198888 02/16/88. SHEET 1

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
COUNTY OF BUTTE	M&I ENT=WT10	FR	50	50	120	70	70	90	170	200	170	90	60	60	1200
	*** TOTAL ***		50	50	120	70	70	90	170	200	170	90	60	60	1200
PLUMAS CO FCWCD	M&I ENT=WT10	FR	24	29	40	73	94	138	152	152	152	39	34	33	960
	*** TOTAL ***		24	29	40	73	94	138	152	152	152	39	34	33	960
YUBA CITY	M&I ENT=WT10	FR	0	0	0	0	0	0	500	500	300	100	0	0	1400
	*** TOTAL ***		0	0	0	0	0	0	500	500	300	100	0	0	1400
NAPA CO FCWCD	M&I ENT=WT10	3NB	932	467	65	261	539	602	665	708	593	344	272	297	5745
	*** TOTAL ***		932	467	65	261	539	602	665	708	593	344	272	297	5745
SOLANO CO FCWCD	M&I ENT=WT10	1NB	70	70	70	70	70	70	0	0	70	70	70	70	700
SOLANO CO FCWCD	VAL PMT =WT71	1NB	55	55	55	115	200	300	400	400	240	150	85	55	2110
SOLANO CO FCWCD	BEN ENT =WT46	3NA	790	622	803	931	1004	915	1066	1056	1004	972	909	788	10860
SOLANO CO FCWCD	VAL ENT =WT47	3NA	363	363	365	365	366	366	226	226	365	365	365	365	4100
SOLANO CO FCWCD	VAL PMT =WT71	3NA	300	300	300	750	1020	1070	1480	1480	1000	750	300	300	9050
	*** TOTAL ***		1578	1410	1593	2231	2660	2721	3172	3162	2679	2307	1729	1578	26820
ZONE-7 ALAMEDA	M&I ENT=WT10	1SB	2	1	3	8	21	31	33	36	29	21	7	3	195
ZONE-7 ALAMEDA	M&I ENT=WT10	2SB	405	376	453	609	920	1083	1213	1141	880	625	405	409	8519
ZONE-7 ALAMEDA	M GW ENT=WT08	4SB	257	259	259	259	259	259	259	259	259	259	259	259	3106
ZONE-7 ALAMEDA	AGR ENT=WT01	4SB	1	1	82	223	387	404	414	380	18	113	1	1	2025
ZONE-7 ALAMEDA	M GW ENT=WT08	5SB	257	259	259	259	259	259	259	259	259	259	259	259	3106
ZONE-7 ALAMEDA	AGR ENT=WT01	5SB	0	0	0	10	30	30	30	10	0	10	0	0	120
ZONE-7 ALAMEDA	M&I ENT=WT10	6SB	609	564	679	914	1380	1624	1820	1712	1320	937	607	613	12779
ZONE-7 ALAMEDA	AGR ENT=WT01	6SB	0	0	0	5	20	40	45	35	5	0	0	0	150
	*** TOTAL ***		1531	1460	1735	2287	3276	3730	4073	3832	2770	2224	1538	1544	30000
ALAMEDA CO WD	M GW ENT=WT08	7SB	975	1125	1470	2055	2300	2645	2570	2570	2570	1955	1515	775	22525
ALAMEDA CO WD	A GW ENT=WT22	7SB	0	0	0	300	400	400	400	400	400	400	300	200	3200
ALAMEDA CO WD	WET WTHR=WT07	7SB	0	0	310	0	370	815	1020	1020	595	405	265	865	5665
ALAMEDA CO WD	M&I ENT=WT10	8SB	829	829	829	414	829	829	829	829	829	414	829	486	8775
	*** TOTAL ***		1804	1954	2609	2769	3899	4689	4819	4819	4394	3174	2909	2326	40165
SANTA CLARA VWD	M&I ENT=WT10	9SB	4950	4200	5130	7950	8900	9200	9680	9680	9680	6500	4900	4600	85370
SANTA CLARA VWD	M GW ENT=WT08	9SB	200	200	200	0	780	480	0	0	0	370	200	200	2630
	*** TOTAL ***		5150	4400	5330	7950	9680	9680	9680	9680	9680	6870	5100	4800	88000
DEVIL'S DEN WD	AGR ENT=WT01	31A	254	381	762	1016	1270	2032	2286	2286	1143	508	381	381	12700
DEVIL'S DEN WD	AGR SUR=WT04	31A	1496	1349	1438	364	0	0	774	674	0	0	0	1205	7300
	*** TOTAL ***		1750	1730	2200	1380	1270	2032	3060	2960	1143	508	381	1586	20000
DUDLEY RIDGE WD	AGR ENT=WT01	8D	1070	1605	1900	3680	8612	10000	12377	7867	2189	1968	730	1502	53500
DUDLEY RIDGE WD	AGR SUR=WT04	8D	0	0	0	0	0	1014	1125	0	0	0	0	0	2139
	*** TOTAL ***		1070	1605	1900	3680	8612	11014	13502	7867	2189	1968	730	1502	55639

LETTER 21

FILE DUMP

FILE IDENTIFICATION: R198888 02/16/88. SHEET 2

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
EMPIRE WS ID	AGR ENT=WT01	8C	60	90	180	240	300	480	540	540	270	120	90	90	3000
EMPIRE WS ID	AGR SUR=WT04	8C	390	160	320	60	0	320	460	460	330	80	260	160	3000
*** TOTAL ***			450	250	500	300	300	800	1000	1000	600	200	350	250	6000
KERN COUNTY WA	M GW ENT=WT08	9	0	150	200	0	300	400	500	717	200	200	200	1166	4033
KERN COUNTY WA	AGR ENT=WT01	9	500	3000	7300	9300	10800	18900	22000	20733	10200	6300	5300	5300	119633
KERN COUNTY WA	AGR SUR=WT04	9	0	0	0	0	500	3700	4500	3300	1100	0	0	0	13100
KERN COUNTY WA	M&I ENT=WT10	10A	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	M GW ENT=WT08	10A	0	150	500	300	600	700	800	1117	200	200	200	0	4767
KERN COUNTY WA	AGR ENT=WT01	10A	442	5563	18512	23985	27737	36888	42152	41667	8971	2093	1472	1547	211029
KERN COUNTY WA	AGR SUR=WT04	10A	0	0	3316	2412	5615	16924	21682	18132	3819	0	0	0	71900
KERN COUNTY WA	M&I ENT=WT10	11B	0	0	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	15000
KERN COUNTY WA	AGR ENT=WT01	11B	0	0	8111	7192	8852	28155	33854	36459	6513	2691	979	815	133621
KERN COUNTY WA	M&I ENT=WT10	12E	1490	1370	1590	2190	2890	3100	3390	3520	2790	2310	1690	1590	27920
KERN COUNTY WA	M GW ENT=WT08	12E	550	980	920	1670	6940	11610	9940	7440	5120	6690	6970	10050	68880
KERN COUNTY WA	AGR ENT=WT01	12E	966	2999	5998	9514	13430	19978	20394	19986	9047	3032	449	249	106042
KERN COUNTY WA	AGR SUR=WT04	12E	100	200	4317	4412	5115	12624	13382	11557	5218	0	0	0	56925
KERN COUNTY WA	AGR ENT=WT01	13B	1376	988	0	1008	1385	7376	7443	1851	773	975	832	7868	31875
KERN COUNTY WA	AGR SUR=WT04	13B	1718	987	541	1000	1187	0	0	3934	0	0	0	0	9367
KERN COUNTY WA	M&I ENT=WT10	14A	40	40	40	45	45	45	45	40	40	40	40	40	500
KERN COUNTY WA	AGR ENT=WT01	14A	0	0	3700	1800	3700	6700	7400	6700	2200	1200	1200	1700	36300
KERN COUNTY WA	AGR ENT=WT01	14B	0	0	10420	6420	10420	14420	15420	14420	4420	3420	2920	2420	84700
KERN COUNTY WA	AGR ENT=WT01	14C	0	0	4830	3330	4830	7330	7330	7330	3330	2830	2330	3330	46800
KERN COUNTY WA	AGR ENT=WT01	15A	0	0	3000	3600	3000	6000	7400	6600	2500	3000	3500	4000	42600
KERN COUNTY WA	M&I ENT=WT10	16A	0	0	0	300	500	500	500	500	500	0	0	0	2800
KERN COUNTY WA	AGR ENT=WT01	16A	0	0	1000	1900	1200	1700	2350	1850	1700	1600	1000	1500	15800
KERN COUNTY WA	AGR ENT=WT01	31A	0	0	4300	11000	17500	20700	24800	24700	8000	1700	3900	5700	122300
*** TOTAL ***			7182	16427	80095	92878	128046	219250	246782	234053	78141	39781	34482	48775	1225892
COUNTY OF KINGS	M&I ENT=WT10	8C	400	400	400	400	0	400	400	400	400	400	0	400	4000
*** TOTAL ***			400	400	400	400	0	400	400	400	400	400	0	400	4000
OAK FLAT WD	AGR ENT=WT01	2A	0	162	324	594	648	864	972	972	486	216	162	0	5400
OAK FLAT WD	AGR SUR=WT04	2A	0	50	200	400	600	310	340	0	0	0	0	0	1900
*** TOTAL ***			0	212	524	994	1248	1174	1312	972	486	216	162	0	7300
TULARE LK BWSD	AGR ENT=WT01	8C	3000	5000	3000	5000	2000	8000	7000	8000	1000	2000	4000	8000	56000
TULARE LK BWSD	WET WTHR=WT07	8C	0	0	0	0	0	0	0	0	0	0	0	5900	5900
TULARE LK BWSD	AGR SUR=WT04	8C	6888	4832	4664	4552	6440	7104	6992	6992	496	776	2832	6932	59500
TULARE LK BWSD	AGR ENT=WT01	8D	1000	4000	3000	3000	1000	9000	9000	9000	600	2000	3000	5000	49600
TULARE LK BWSD	WET WTHR=WT07	8D	0	0	0	0	0	1000	0	0	1000	0	0	5000	7000
TULARE LK BWSD	AGR SUR=WT04	8D	3000	3000	0	0	2000	6000	13000	11000	1000	0	2000	6000	47000
*** TOTAL ***			13888	16832	10664	12552	11440	31104	35992	34992	4096	4776	11832	36832	225000
AVEK WA	M&I ENT=WT10	19	200	160	200	320	400	400	480	600	400	320	320	200	4000
AVEK WA	AGR ENT=WT01	19	19	469	1139	2165	3160	3180	3970	4390	1625	485	48	0	20650
AVEK WA	M&I ENT=WT10	20A	900	720	900	1440	1800	1800	2160	2700	1800	1440	1440	900	18000
AVEK WA	AGR ENT=WT01	20A	1	1	1	10	15	20	30	30	25	15	2	0	150
AVEK WA	M&I ENT=WT10	22A	100	80	100	160	200	200	240	300	200	160	160	100	2000
AVEK WA	AGR ENT=WT01	22A	30	30	110	125	125	150	150	180	150	100	50	0	1200
*** TOTAL ***			1250	1460	2450	4220	5700	5750	7030	8200	4200	2520	2020	1200	46000

LETTER 21

FILE DUMP

FILE IDENTIFICATION: R198888 02/16/88. SHEET 3

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
CASTAIC LAKE WA	M&I ENT=WT10	30	1104	1104	1288	1472	1840	1840	2208	2208	1656	1472	1104	1104	18400
*** TOTAL ***			1104	1104	1288	1472	1840	1840	2208	2208	1656	1472	1104	1104	18400
COACHELLA VALLY	M GW ENT=WT08	26A	1721	1721	1721	1721	1721	1721	1721	1721	1721	1721	1721	1721	20652
*** TOTAL ***			1721	1721	1721	1721	1721	1721	1721	1721	1721	1721	1721	1721	20652
CRESTLINE-LA WA	M&I ENT=WT10	24	143	124	105	105	152	171	220	300	220	160	160	140	2000
*** TOTAL ***			143	124	105	105	152	171	220	300	220	160	160	140	2000
DESERT WA	M&I ENT=WT10	26A	2833	2833	2833	2833	2833	2833	2833	2833	2833	2833	2833	2837	34000
*** TOTAL ***			2833	2833	2833	2833	2833	2833	2833	2833	2833	2833	2833	2837	34000
LITTLEROCK CR	M&I ENT=WT10	21	0	0	0	0	0	25	25	25	25	0	0	0	100
LITTLEROCK CR	AGR ENT=WT01	21	0	0	217	217	217	192	192	192	192	217	217	0	1853
LITTLEROCK CR	M&I ENT=WT10	22A	0	0	0	0	0	0	0	0	0	0	0	0	0
*** TOTAL ***			0	0	217	217	217	217	217	217	217	217	217	0	1953
METROPOLITAN WD	M&I ENT=WT10	26A	246	5246	4646	9446	14246	17046	24546	19946	13646	14046	15046	5042	143148
METROPOLITAN WD	M GW ENT=WT08	26A	8000	8000	8000	8000	8000	8000	3000	3000	8000	8000	8000	8000	86000
METROPOLITAN WD	M&I ENT=WT10	28H	2000	2000	3200	3600	4000	5700	6900	6500	5200	4400	2400	2400	48300
METROPOLITAN WD	BYPS ENT=WT59	28H	4800	9800	9200	14000	18800	21700	23000	23000	18200	18600	19600	9600	190300
METROPOLITAN WD	M&I ENT=WT10	28J	400	400	400	400	400	13000	13000	13000	400	400	400	400	42600
METROPOLITAN WD	M&I ENT=WT10	30	35000	35000	40000	40000	45000	48000	48000	48000	48000	45000	42000	42000	516000
*** TOTAL ***			50446	60446	65446	75446	90446	113446	118446	113446	93446	90446	87446	67442	1026348
MOJAVE WA	M&I ENT=WT10	22B	0	0	0	0	0	0	0	0	0	0	0	0	0
*** TOTAL ***			0	0	0	0	0	0	0	0	0	0	0	0	0
PALMDALE WD	M&I ENT=WT10	20A	0	0	0	0	0	0	0	0	0	0	0	0	0
PALMDALE WD	M&I ENT=WT10	20B	0	0	690	690	690	690	690	690	690	690	690	0	6210
*** TOTAL ***			0	0	690	690	690	690	690	690	690	690	690	0	6210
SAN BERNARDINO	M&I ENT=WT10	26A	0	0	0	0	1600	1600	1600	1600	1600	1600	0	0	9600
SAN BERNARDINO	M GW ENT=WT08	26A	1400	1400	1400	1400	1400	1400	1000	1000	1000	1000	1000	0	13400
*** TOTAL ***			1400	1400	1400	1400	3000	3000	2600	2600	2600	2600	1000	0	23000
SAN GABRIEL	M GW ENT=WT08	26A	0	0	0	0	2100	2100	2100	2100	2100	0	0	0	10500
*** TOTAL ***			0	0	0	0	2100	2100	2100	2100	2100	0	0	0	10500
VENTURA CO FCD	M&I ENT=WT10	29H	0	0	0	0	0	0	0	0	0	0	0	0	0
VENTURA CO FCD	M&I ENT=WT10	30	0	0	0	0	0	0	0	0	0	0	0	0	0
*** TOTAL ***			0	0	0	0	0	0	0	0	0	0	0	0	0
SHELL CAL PROD.	REPAYMNT=WT09	11B	0	0	0	0	0	0	0	0	0	585	840	870	2295
*** TOTAL ***			0	0	0	0	0	0	0	0	0	585	840	870	2295

LETTER 21

STATE OF CALIFORNIA
THE RESOURCES AGENCY

FILE ID: Q198989

ANNUAL SUMMARY BY AGENCY, WATER TYPE
YEAR 1989

DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT ANALYSIS OFFICE

DATE: 12/22/88
PAGE: 1

1989

COUNTY OF BUTTE TOTAL = 1200	M&I ENT = 1200							
PLUMAS CO FCWCD TOTAL = 1000	M&I ENT = 1000							
YUBA CITY TOTAL = 1500	M&I ENT = 1500							
NAPA CO FCWCD TOTAL = 6166	M&I ENT = 6166							
SOLANO CO FCWCD TOTAL = 28235								
TOT ENT = 18420	M&I ENT = 1300	BEN ENT = 11220	VAL ENT = 5900					
TOT MISC = 9815	VAL PMT = 9815							
ZONE-7 ALAMEDA TOTAL = 31000								
TOT ENT = 31000	M&I ENT = 22301	M GW ENT = 6419	AGR ENT = 2280					
ALAMEDA CO WD TOTAL = 35700								
TOT ENT = 35700	M&I ENT = 9700	M GW ENT = 24450	A GW ENT = 1550					
SANTA CLARA VWD TOTAL = 90000								
TOT ENT = 90000	M&I ENT = 86400	M GW ENT = 3600						
DEVILS DEN WD TOTAL = 20000	AGR ENT = 12700							
	AGR SUR = 7300							
DUDLEY RIDGE WD TOTAL = 65167	AGR ENT = 55600							
	CYOV ENT = 9567							
EMPIRE WS ID TOTAL = 6000	AGR ENT = 3000							
	AGR SUR = 3000							
KERN COUNTY WA TOTAL = 1188805								
TOT ENT = 1112300	M&I ENT = 56318	M GW ENT = 76882	AGR ENT = 979100					
TOT MISC = 76505	CYOV ENT = 76505							
COUNTY OF KINGS TOTAL = 4000	M&I ENT = 4000							
OAK FLAT WD TOTAL = 7900	AGR ENT = 5600							
	AGR SUR = 1900							
	CYOV ENT = 400							

LETTER 21

TULARE LK BWSD	TOTAL = 373600						
		AGR ENT = 109900					
		AGR SUR = 233500					
	TOT MISC = 30200	WET WTHR = 8600		CYOV ENT = 21600			
AVEK WA	TOTAL = 55000						
	TOT ENT = 55000	M&I ENT = 31390		AGR ENT = 23610			
CASTAIC LAKE WA	TOTAL = 24480						
		M&I ENT = 24480					
COACHELLA VALLY	TOTAL = 21873						
		M GW ENT = 21873					
CRESTLINE-LA WA	TOTAL = 2465						
		M&I ENT = 2465					
DESERT WA	TOTAL = 36500						
		M&I ENT = 36500					
LITTLEROCK CR	TOTAL = 2070						
		M&I ENT = 2070					
METROPOLITAN WD	TOTAL = 1312627						
	TOT ENT = 1312627	M&I ENT = 949127		M GW ENT = 100000		BYPS ENT = 263500	
MOJAVE WA	TOTAL = 360						
		M&I ENT = 360					
PALMDALE WD	TOTAL = 8190						
		M&I ENT = 8190					
SAN BERNARDINO	TOTAL = 34800						
	TOT ENT = 34800	M&I ENT = 10800		M GW ENT = 24000			
SAN GABRIEL	TOTAL = 13000						
		M GW ENT = 13000					
SHELL CAL PROD.	TOTAL = 4298						
		REPAYMNT = 4298					
JG BOSWELL	TOTAL = 8000						
		REPAYMNT = 8000					
FISH & GAME	TOTAL = 1200						
		REC/F&WL = 1200					
PARKS & RECREAT	TOTAL = 163						
		REC/F&WL = 163					

LETTER 21

FILE DUMP

FILE IDENTIFICATION: Q198989 12/22/88. SHEET 1

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
COUNTY OF BUTTE	M^I ENT=WT10	FR	50	50	120	70	70	90	170	200	170	90	60	60	1200
	*** TOTAL ***		50	50	120	70	70	90	170	200	170	90	60	60	1200
PLUMAS CO FCWCD	M^I ENT=WT10	FR	25	30	41	75	99	144	159	159	159	40	35	34	1000
	*** TOTAL ***		25	30	41	75	99	144	159	159	159	40	35	34	1000
YUBA CITY	M^I ENT=WT10	FR	0	0	0	0	0	0	500	600	300	100	0	0	1500
	*** TOTAL ***		0	0	0	0	0	0	500	600	300	100	0	0	1500
NAPA CO FCWCD	M^I ENT=WT10	3NB	508	501	549	574	517	410	442	444	556	633	519	513	6166
	*** TOTAL ***		508	501	549	574	517	410	442	444	556	633	519	513	6166
SOLANO CO FCWCD	M^I ENT=WT10	1NB	100	100	100	100	125	125	125	125	100	100	100	100	1300
SOLANO CO FCWCD	VAL PMT =WT71	1NB	25	25	25	85	150	245	275	275	210	120	55	25	1515
SOLANO CO FCWCD	BEN ENT =WT46	3NA	816	643	830	962	1037	946	1101	1091	1037	1009	937	811	11220
SOLANO CO FCWCD	VAL ENT =WT47	3NA	483	483	483	483	509	509	509	509	483	483	483	483	5900
SOLANO CO FCWCD	VAL PMT =WT71	3NA	250	250	250	700	975	1025	1250	1250	950	700	350	350	8300
	*** TOTAL ***		1674	1501	1688	2330	2796	2850	3260	3250	2780	2412	1925	1769	28235
ZONE-7 ALAMEDA	M^I ENT=WT10	1SB	3	2	2	8	21	30	34	36	29	20	7	3	195
ZONE-7 ALAMEDA	M^I ENT=WT10	2SB	428	400	483	644	956	1127	1261	1196	881	647	407	413	8843
ZONE-7 ALAMEDA	M GW ENT=WT08	4SB	267	267	267	267	269	270	270	270	267	267	267	267	3215
ZONE-7 ALAMEDA	AGR ENT=WT01	4SB	1	1	83	217	380	397	407	368	12	107	1	1	1975
ZONE-7 ALAMEDA	M GW ENT=WT08	5SB	267	267	267	267	267	267	267	267	267	267	267	267	3204
ZONE-7 ALAMEDA	AGR ENT=WT01	5SB	0	0	0	10	40	40	40	20	0	10	0	0	160
ZONE-7 ALAMEDA	M^I ENT=WT10	6SB	641	600	724	966	1434	1690	1892	1794	1321	970	611	620	13263
ZONE-7 ALAMEDA	AGR ENT=WT01	6SB	0	0	0	5	35	20	45	35	5	0	0	0	145
	*** TOTAL ***		1607	1537	1826	2384	3402	3841	4216	3986	2782	2288	1560	1571	31000
ALAMEDA CO WD	M GW ENT=WT08	7SB	2150	2010	2150	2180	2260	2180	2260	2260	2180	1950	1340	1530	24450
ALAMEDA CO WD	A GW ENT=WT22	7SB	0	0	0	200	200	200	200	200	200	200	150	0	1550
ALAMEDA CO WD	WET WTHR=WT07	7SB	0	0	0	0	0	0	0	0	0	0	0	0	0
ALAMEDA CO WD	M^I ENT=WT10	8SB	827	747	827	800	827	800	827	827	800	827	800	791	9700
	*** TOTAL ***		2977	2757	2977	3180	3287	3180	3287	3287	3180	2977	2290	2321	35700
SANTA CLARA VWD	M^I ENT=WT10	9SB	5000	3700	5800	6500	6700	8000	9000	9000	9000	8300	7800	7600	86400
SANTA CLARA VWD	M GW ENT=WT08	9SB	200	200	200	0	800	500	0	500	400	400	200	200	3600
	*** TOTAL ***		5200	3900	6000	6500	7500	8500	9000	9500	9400	8700	8000	7800	90000
DEVIL'S DEN WD	AGR ENT=WT01	31A	254	381	762	1016	1270	2032	2286	2286	1143	508	381	381	12700
DEVIL'S DEN WD	AGR SUR=WT04	31A	1496	1349	1438	364	0	0	774	674	0	0	0	1205	7300
	*** TOTAL ***		1750	1730	2200	1380	1270	2032	3060	2960	1143	508	381	1586	20000
DUDLEY RIDGE WD	AGR ENT=WT01	8D	0	0	3675	2937	6499	10613	12990	11415	2560	2548	1020	1343	55600
DUDLEY RIDGE WD	CYOV ENT=WT69	8D	4089	5478	0	0	0	0	0	0	0	0	0	0	9567
	*** TOTAL ***		4089	5478	3675	2937	6499	10613	12990	11415	2560	2548	1020	1343	65167

LETTER 21

FILE DUMP

FILE IDENTIFICATION: Q198989 12/22/88. SHEET 2

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
EMPIRE WS ID	AGR ENT=WT01	8C	60	90	180	240	300	480	540	540	270	120	90	90	3000
EMPIRE WS ID	AGR SUR=WT04	8C	390	160	320	60	0	320	460	460	330	80	260	160	3000
*** TOTAL ***			450	250	500	300	300	800	1000	1000	600	200	350	250	6000
KERN COUNTY WA	AGR ENT=WT01	9	50	50	5100	8100	10200	16200	16200	15200	10100	4000	3000	3000	91200
KERN COUNTY WA	CYOV ENT=WT69	9	3000	4325	0	0	0	0	0	0	0	0	0	0	7325
KERN COUNTY WA	M^I ENT=WT10	10A	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	M GW ENT=WT08	10A	0	0	0	0	0	0	0	2700	0	0	0	0	2700
KERN COUNTY WA	AGR ENT=WT01	10A	3289	3664	7049	15117	39053	49281	47849	44703	23502	4526	4128	4707	246868
KERN COUNTY WA	CYOV ENT=WT69	10A	1000	13000	0	0	0	0	0	0	0	0	0	0	14000
KERN COUNTY WA	AGR SUR=WT04	10A	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	M^I ENT=WT10	11B	1666	1667	1666	1667	1667	1667	1667	1667	1667	1666	1666	1667	20000
KERN COUNTY WA	AGR ENT=WT01	11B	0	0	6801	7323	22255	22490	22173	32149	7520	4163	2391	2758	130023
KERN COUNTY WA	CYOV ENT=WT69	11B	4000	7000	0	0	0	0	0	0	0	0	0	0	11000
KERN COUNTY WA	M^I ENT=WT10	12E	0	0	0	0	7890	8624	10202	5802	0	1000	0	0	33518
KERN COUNTY WA	M GW ENT=WT08	12E	1778	2967	5734	6312	1500	16900	12700	7300	9101	2156	2367	2367	71182
KERN COUNTY WA	AGR ENT=WT01	12E	4578	7078	10128	11328	17128	26428	25278	24766	18188	3828	3428	3328	155484
KERN COUNTY WA	CYOV ENT=WT69	12E	7500	12000	0	0	0	0	0	0	0	0	0	0	19500
KERN COUNTY WA	AGR SUR=WT04	12E	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	M GW ENT=WT08	13B	0	0	0	0	0	0	0	3000	0	0	0	0	3000
KERN COUNTY WA	AGR ENT=WT01	13B	0	0	625	2330	1675	7930	8962	5200	225	1400	998	4280	33625
KERN COUNTY WA	CYOV ENT=WT69	13B	930	750	0	0	0	0	0	0	0	0	0	0	1680
KERN COUNTY WA	AGR SUR=WT04	13B	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	M^I ENT=WT10	14A	67	67	67	67	67	67	67	67	67	67	67	63	800
KERN COUNTY WA	AGR ENT=WT01	14A	1000	1500	3700	2800	4600	7500	8200	7500	1100	1100	500	600	40100
KERN COUNTY WA	CYOV ENT=WT69	14A	540	960	0	0	0	0	0	0	0	0	0	0	1500
KERN COUNTY WA	AGR ENT=WT01	14B	1000	1500	9300	7300	10700	13000	11000	12000	3500	1700	1300	1500	73800
KERN COUNTY WA	CYOV ENT=WT69	14B	2220	3000	0	0	0	0	0	0	0	0	0	0	5220
KERN COUNTY WA	AGR ENT=WT01	14C	1000	2000	4200	2700	4300	6500	8000	6600	1500	1000	500	1000	39300
KERN COUNTY WA	CYOV ENT=WT69	14C	1740	2880	0	0	0	0	0	0	0	0	0	0	4620
KERN COUNTY WA	AGR ENT=WT01	15A	500	500	3600	4300	3300	7000	8800	7000	2500	1800	1200	1550	42050
KERN COUNTY WA	CYOV ENT=WT69	15A	900	1500	0	0	0	0	0	0	0	0	0	0	2400
KERN COUNTY WA	M^I ENT=WT10	16A	0	0	0	0	291	382	394	394	369	170	0	0	2000
KERN COUNTY WA	AGR ENT=WT01	16A	500	500	1200	2000	1400	2300	2300	2200	1700	1500	500	550	16650
KERN COUNTY WA	CYOV ENT=WT69	16A	600	660	0	0	0	0	0	0	0	0	0	0	1260
KERN COUNTY WA	AGR ENT=WT01	31A	0	0	7300	14000	17000	17000	17000	18100	8000	4300	3500	3800	110000
KERN COUNTY WA	CYOV ENT=WT69	31A	4000	4000	0	0	0	0	0	0	0	0	0	0	8000
KERN COUNTY WA	AGR SUR=WT04	31A	0	0	0	0	0	0	0	0	0	0	0	0	0
*** TOTAL ***			41858	71568	66470	85344	143026	203269	200792	196348	89039	34376	25545	31170	1188805
COUNTY OF KINGS	M^I ENT=WT10	8C	400	400	400	400	0	400	400	400	400	400	0	400	4000
*** TOTAL ***			400	400	400	400	0	400	400	400	400	400	0	400	4000
OAK FLAT WD	AGR ENT=WT01	2A	0	168	336	616	672	896	1008	1008	504	224	168	0	5600
OAK FLAT WD	CYOV ENT=WT69	2A	200	200	0	0	0	0	0	0	0	0	0	0	400
OAK FLAT WD	AGR SUR=WT04	2A	0	57	211	400	600	300	332	0	0	0	0	0	1900
*** TOTAL ***			200	425	547	1016	1272	1196	1340	1008	504	224	168	0	7900
TULARE LK BWSD	AGR ENT=WT01	8C	625	396	1500	1400	4079	8142	7527	7584	4729	1300	1750	5768	44800
TULARE LK BWSD	WET WTHR=WT07	8C	26	730	750	220	0	0	262	53	0	0	359	0	2400
TULARE LK BWSD	CYOV ENT=WT69	8C	5300	5300	0	0	0	0	0	0	0	0	0	0	10600
TULARE LK BWSD	AGR SUR=WT04	8C	14000	13500	7700	3400	900	11800	12100	12300	5200	3700	2900	14000	101500

LETTER 21

FILE DUMP

FILE IDENTIFICATION: Q198989 12/22/88. SHEET 3

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
TULARE LK BWSD	AGR ENT=WT01	8D	0	1875	0	400	1875	11300	12250	12198	7438	0	3750	14014	65100
TULARE LK BWSD	WET WTHR=WT07	8D	0	1951	2250	375	0	0	275	275	0	0	1074	0	6200
TULARE LK BWSD	CYOV ENT=WT69	8D	5500	5500	0	0	0	0	0	0	0	0	0	0	11000
TULARE LK BWSD	AGR SUR=WT04	8D	21300	17500	11100	5900	4800	15500	14200	14300	6000	6700	1900	12800	132000
*** TOTAL ***			46751	46752	23300	11695	11654	46742	46614	46710	23367	11700	11733	46582	373600
AVEK WA	M^I ENT=WT10	19	170	300	350	400	450	500	575	575	500	400	250	225	4695
AVEK WA	AGR ENT=WT01	19	5	305	1885	2920	3080	3190	3500	3500	2180	1475	335	25	22400
AVEK WA	M^I ENT=WT10	20A	1275	1150	1300	1800	2225	2500	2800	3025	2200	1800	1650	1275	23000
AVEK WA	AGR ENT=WT01	20A	2	3	5	15	20	25	35	35	30	15	3	2	190
AVEK WA	M^I ENT=WT10	20B	5	5	5	5	5	5	5	5	5	5	5	5	60
AVEK WA	M^I ENT=WT10	22A	195	210	250	290	320	365	430	430	410	325	220	190	3635
AVEK WA	AGR ENT=WT01	22A	20	20	100	100	150	150	150	150	100	50	20	10	1020
*** TOTAL ***			1672	1993	3895	5530	6250	6735	7495	7720	5425	4070	2483	1732	55000
CASTAIC LAKE WA	M^I ENT=WT10	30	1415	1415	1650	1986	2458	2458	2930	2930	2222	1986	1515	1515	24480
*** TOTAL ***			1415	1415	1650	1986	2458	2458	2930	2930	2222	1986	1515	1515	24480
COACHELLA VALLY	M GW ENT=WT08	26A	1822	1822	1822	1822	1822	1822	1822	1822	1822	1822	1822	1831	21873
*** TOTAL ***			1822	1822	1822	1822	1822	1822	1822	1822	1822	1822	1822	1831	21873
CRESTLINE-LA WA	M^I ENT=WT10	24	227	133	133	137	184	207	265	362	265	192	192	168	2465
*** TOTAL ***			227	133	133	137	184	207	265	362	265	192	192	168	2465
DESERT WA	M^I ENT=WT10	26A	3041	3041	3041	3041	3041	3041	3041	3041	3041	3041	3041	3049	36500
*** TOTAL ***			3041	3041	3041	3041	3041	3041	3041	3041	3041	3041	3041	3049	36500
LITTLEROCK CR	M^I ENT=WT10	21	0	0	230	230	230	230	230	230	230	230	230	0	2070
LITTLEROCK CR	AGR ENT=WT01	21	0	0	0	0	0	0	0	0	0	0	0	0	0
*** TOTAL ***			0	0	230	230	230	230	230	230	230	230	230	0	2070
METROPOLITAN WD	M^I ENT=WT10	26A	24837	20337	8637	15437	21637	16537	18537	19037	23037	20437	17657	0	206127
METROPOLITAN WD	M GW ENT=WT08	26A	8000	12000	15000	15000	12000	8000	3000	3000	8000	8000	8000	0	100000
METROPOLITAN WD	M^I ENT=WT10	28H	2200	2200	3600	4000	4500	6200	7600	7100	5800	4900	2700	2700	53500
METROPOLITAN WD	BYPS ENT=WT59	28H	29700	25200	13500	20300	26600	21400	23000	23000	27900	25400	27500	0	263500
METROPOLITAN WD	M^I ENT=WT10	28J	400	400	400	400	400	13000	13000	13000	400	400	400	13300	55500
METROPOLITAN WD	M^I ENT=WT10	30	0	60000	60000	60000	50000	50000	60000	60000	60000	60000	60000	54000	634000
*** TOTAL ***			65137	120137	101137	115137	115137	115137	125137	125137	125137	119137	116257	70000	1312627
MOJAVE WA	M^I ENT=WT10	22B	0	0	0	0	0	0	60	60	60	60	60	60	360
*** TOTAL ***			0	0	0	0	0	0	60	60	60	60	60	60	360
PALMDALE WD	M^I ENT=WT10	20A	0	0	0	0	0	0	0	0	0	0	0	0	0
PALMDALE WD	M^I ENT=WT10	20B	0	0	910	910	910	910	910	910	910	910	910	0	8190
*** TOTAL ***			0	0	910	910	910	910	910	910	910	910	910	0	8190

LETTER 21

STATE OF CALIFORNIA
THE RESOURCES AGENCY

FILE ID: P199090

ANNUAL SUMMARY BY AGENCY, WATER TYPE
YEAR 1990

DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT ANALYSIS OFFICE

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COUNTY OF BUTTE	TOTAL =	1200						
			M&I ENT =	1200				
PLUMAS CO FCWCD	TOTAL =	1038						
			M&I ENT =	1038				
YUBA CITY	TOTAL =	1800						
			M&I ENT =	1800				
NAPA CO FCWCD	TOTAL =	6387						
			M&I ENT =	6387				
SOLANO CO FCWCD	TOTAL =	30500						
TOT ENT =		21250	M&I ENT =	5850	BEN ENT =	11600	VAL ENT =	3800
TOT MISC =		9250	VAL PMT =	9250				
ZONE-7 ALAMEDA	TOTAL =	32000						
TOT ENT =		32000	M&I ENT =	25242	M GW ENT =	4520	AGR ENT =	2238
ALAMEDA CO WD	TOTAL =	42000						
TOT ENT =		36900	M&I ENT =	9700	M GW ENT =	26150	A GW ENT =	1050
TOT MISC =		5100	WET WTHR =	5100				
SANTA CLARA VWD	TOTAL =	122830						
TOT ENT =		92000	M&I ENT =	72200	M GW ENT =	19800		
TOT MISC =		30830	PURCHASD =	30830				
DEVIL'S DEN WD	TOTAL =	20000						
			AGR ENT =	12700				
			AGR SUR =	7300				
DUDLEY RIDGE WD	TOTAL =	66507						
			AGR ENT =	57700				
			CYOV ENT =	8807				
EMPIRE WS ID	TOTAL =	7942						
			AGR ENT =	3000				
			AGR SUR =	3000				
			TRANSFER =	1942				
KERN COUNTY WA	TOTAL =	1217081						
TOT ENT =		1153400	M&I ENT =	51086	M GW ENT =	83610	AGR ENT =	1018704
TOT MISC =		63681	CYOV ENT =	63681				
COUNTY OF KINGS	TOTAL =	4000						
			M&I ENT =	4000				
OAK FLAT WD	TOTAL =	7700						
			AGR ENT =	5700				
			AGR SUR =	2000				

LETTER 21

STATE OF CALIFORNIA
THE RESOURCES AGENCY

FILE ID: P199090

ANNUAL SUMMARY BY AGENCY, WATER TYPE
YEAR 1990

DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT ANALYSIS OFFICE

DATE: 12/15/89
PAGE: 2

TULARE LK BWSD	TOTAL = 156802	AGR ENT = 118500						
		PURCHASD = 38302						
AVEK WA	TOTAL = 55000							
	TOT ENT = 55000	M&I ENT = 31390	AGR ENT = 23610					
CASTAIC LAKE WA	TOTAL = 22550	M&I ENT = 22550						
COACHELLA VALLY	TOTAL = 23100	M GW ENT = 23100						
CRESTLINE-LA WA	TOTAL = 2665	M&I ENT = 2665						
DESERT WA	TOTAL = 38100	M&I ENT = 38100						
LITTLEROCK CR	TOTAL = 2300							
	TOT ENT = 2300	M&I ENT = 1716	AGR ENT = 584					
METROPOLITAN WD	TOTAL = 1463800							
	TOT ENT = 1463800	M&I ENT = 1052300	M GW ENT = 100000	BYPS ENT = 191500	STOR ENT = 120000			
MOJAVE WA	TOTAL = 360	M&I ENT = 360						
PALMDALE WD	TOTAL = 10440	M&I ENT = 10440						
SAN BERNARDINO	TOTAL = 28800							
	TOT ENT = 28800	M&I ENT = 10800	M GW ENT = 18000					
SAN GABRIEL	TOTAL = 14000	M GW ENT = 14000						
VENTURA CO FCD	TOTAL = 5000	M&I ENT = 5000						
SHELL CAL PROD.	TOTAL = 1000	REPAYMNT = 1000						
JG BOSWELL	TOTAL = 8000	REPAYMNT = 8000						
FISH & GAME	TOTAL = 660	REC/F&WL = 660						

LETTER 21

FILE DUMP

FILE IDENTIFICATION: P199090 12/15/89. SHEET 1

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
COUNTY OF BUTTE	M&I ENT=WT10	FR	50	50	120	70	70	90	170	200	170	90	60	60	1200
	*** TOTAL ***		50	50	120	70	70	90	170	200	170	90	60	60	1200
PLUMAS CO FCWCD	M&I ENT=WT10	FR	26	31	42	72	104	150	166	166	166	44	36	35	1038
	*** TOTAL ***		26	31	42	72	104	150	166	166	166	44	36	35	1038
YUBA CITY	M&I ENT=WT10	FR	0	0	0	0	0	100	600	600	400	100	0	0	1800
	*** TOTAL ***		0	0	0	0	0	100	600	600	400	100	0	0	1800
NAPA CO FCWCD	M&I ENT=WT10	3NB	487	302	314	355	564	719	742	742	608	548	459	547	6387
	*** TOTAL ***		487	302	314	355	564	719	742	742	608	548	459	547	6387
SOLANO CO FCWCD	M&I ENT=WT10	1NB	135	135	165	495	495	525	660	685	680	640	640	595	5850
SOLANO CO FCWCD	VAL PMT =WT71	1NB	0	0	0	20	110	205	235	235	120	55	20	0	1000
SOLANO CO FCWCD	BEN ENT =WT46	3NA	845	665	860	995	1070	975	1140	1125	1075	1045	965	840	11600
SOLANO CO FCWCD	VAL ENT =WT47	3NA	300	300	300	330	330	340	340	330	330	300	300	300	3800
SOLANO CO FCWCD	VAL PMT =WT71	3NA	500	500	500	600	900	950	1200	1100	800	600	300	300	8250
	*** TOTAL ***		1780	1600	1825	2440	2905	2995	3575	3475	3005	2640	2225	2035	30500
ZONE-7 ALAMEDA	M&I ENT=WT10	1SB	3	2	2	8	21	30	34	36	29	20	7	3	195
ZONE-7 ALAMEDA	M&I ENT=WT10	2SB	514	479	540	679	988	1191	1297	1257	1088	873	595	518	10019
ZONE-7 ALAMEDA	M GW ENT=WT08	4SB	188	188	188	188	188	188	192	192	188	188	188	188	2264
ZONE-7 ALAMEDA	AGR ENT=WT01	4SB	1	1	82	219	382	399	409	370	11	107	1	1	1983
ZONE-7 ALAMEDA	M GW ENT=WT08	5SB	188	188	188	188	188	188	188	188	188	188	188	188	2256
ZONE-7 ALAMEDA	AGR ENT=WT01	5SB	0	0	0	10	30	30	30	10	0	10	0	0	120
ZONE-7 ALAMEDA	M&I ENT=WT10	6SB	772	719	809	1019	1482	1786	1945	1886	1631	1310	892	777	15028
ZONE-7 ALAMEDA	AGR ENT=WT01	6SB	0	0	0	15	20	35	35	25	5	0	0	0	135
	*** TOTAL ***		1666	1577	1809	2326	3299	3847	4130	3964	3140	2696	1871	1675	32000
ALAMEDA CO WD	M GW ENT=WT08	7SB	1230	1390	1813	2700	2363	2533	2573	2573	2473	2437	2835	1230	26150
ALAMEDA CO WD	A GW ENT=WT22	7SB	0	0	0	0	100	200	200	200	200	150	0	0	1050
ALAMEDA CO WD	WET WTHR=WT07	7SB	0	0	0	200	845	602	535	535	662	721	500	500	5100
ALAMEDA CO WD	M&I ENT=WT10	8SB	824	744	824	797	824	797	824	824	797	824	797	824	9700
	*** TOTAL ***		2054	2134	2637	3697	4132	4132	4132	4132	4132	4132	4132	2554	42000
SANTA CLARA VWD	M&I ENT=WT10	9SB	0	0	0	7000	9000	9300	9500	9500	9300	9000	4800	4800	72200
SANTA CLARA VWD	M GW ENT=WT08	9SB	0	0	0	3410	1760	1640	1810	1810	1640	1760	2970	3000	19800
SANTA CLARA VWD	PURCHASD=WT76	9SB	10360	9710	10760	0	0	0	0	0	0	0	0	0	30830
	*** TOTAL ***		10360	9710	10760	10410	10760	10940	11310	11310	10940	10760	7770	7800	122830
DEVIL'S DEN WD	AGR ENT=WT01	31A	254	381	762	1016	1270	2032	2286	2286	1143	508	381	381	12700
DEVIL'S DEN WD	AGR SUR=WT04	31A	1496	1349	1438	364	0	0	774	674	0	0	0	1205	7300
	*** TOTAL ***		1750	1730	2200	1380	1270	2032	3060	2960	1143	508	381	1586	20000
DUDLEY RIDGE WD	AGR ENT=WT01	8D	0	0	3410	4290	6825	10730	12760	11105	3010	2630	1420	1520	57700
DUDLEY RIDGE WD	CYOV ENT=WT69	8D	3116	5691	0	0	0	0	0	0	0	0	0	0	8807
	*** TOTAL ***		3116	5691	3410	4290	6825	10730	12760	11105	3010	2630	1420	1520	66507

FILE IDENTIFICATION: P199090

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
EMPIRE WS ID	AGR ENT=WT01	8C	60	90	180	240	300	480	540	540	270	120	90	90	3000
EMPIRE WS ID	AGR SUR=WT04	8C	390	160	320	60	0	320	460	460	330	80	260	160	3000
EMPIRE WS ID	TRANSFER=WT67	8C	775	1167	0	0	0	0	0	0	0	0	0	0	1942
	*** TOTAL ***		1225	1417	500	300	300	800	1000	1000	600	200	350	250	7942
KERN COUNTY WA	AGR ENT=WT01	9	5100	8100	13600	12600	11600	18900	23900	22950	9600	6600	4300	3900	141150
KERN COUNTY WA	CYOV ENT=WT69	9	6700	8800	0	0	0	0	0	0	0	0	0	0	15500
KERN COUNTY WA	M&I ENT=WT10	10A	100	100	100	100	100	100	100	100	100	100	100	100	1200
KERN COUNTY WA	M GW ENT=WT08	10A	200	350	400	200	500	800	800	1000	800	0	0	0	5050
KERN COUNTY WA	AGR ENT=WT01	10A	855	2420	8467	20611	31752	52790	59807	55860	13364	5674	4974	4961	261535
KERN COUNTY WA	CYOV ENT=WT69	10A	5629	8096	0	0	0	0	0	0	0	0	0	0	13725
KERN COUNTY WA	AGR SUR=WT04	10A	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	M&I ENT=WT10	11B	1258	1258	1258	1258	1258	1258	1258	1258	1258	1258	1258	1258	15096
KERN COUNTY WA	AGR ENT=WT01	11B	2810	6864	6601	5764	7775	19773	35751	34864	4667	3017	2651	2773	133310
KERN COUNTY WA	CYOV ENT=WT69	11B	5616	5616	0	0	0	0	0	0	0	0	0	0	11232
KERN COUNTY WA	M&I ENT=WT10	12E	2090	1970	2280	2470	2950	3180	3490	3440	2900	2590	1980	2090	31430
KERN COUNTY WA	M GW ENT=WT08	12E	3450	3750	1300	500	2400	9975	14335	12235	7125	5940	6120	11430	78560
KERN COUNTY WA	AGR ENT=WT01	12E	3764	5228	5238	7584	17424	25270	26120	20347	14892	1528	764	0	128159
KERN COUNTY WA	CYOV ENT=WT69	12E	3329	3795	0	0	0	0	0	0	0	0	0	0	7124
KERN COUNTY WA	AGR SUR=WT04	12E	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	AGR ENT=WT01	13B	250	1521	2675	2785	3298	8035	9635	7301	0	0	0	0	35500
KERN COUNTY WA	AGR SUR=WT04	13B	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	M&I ENT=WT10	14A	67	67	66	67	67	66	67	67	66	67	67	66	800
KERN COUNTY WA	AGR ENT=WT01	14A	0	0	6200	5800	5700	11200	12500	11700	3900	1600	1100	700	60400
KERN COUNTY WA	CYOV ENT=WT69	14A	1100	4000	0	0	0	0	0	0	0	0	0	0	5100
KERN COUNTY WA	AGR ENT=WT01	14B	0	0	4000	3000	4000	8000	8000	8000	2000	1000	1000	600	39600
KERN COUNTY WA	CYOV ENT=WT69	14B	1100	3000	0	0	0	0	0	0	0	0	0	0	4100
KERN COUNTY WA	AGR ENT=WT01	14C	0	0	4000	3000	4000	8000	8000	8000	2000	1000	1000	600	39600
KERN COUNTY WA	CYOV ENT=WT69	14C	1100	3000	0	0	0	0	0	0	0	0	0	0	4100
KERN COUNTY WA	AGR ENT=WT01	15A	0	0	4100	3400	6500	8200	9000	7300	3000	3300	2200	1600	48600
KERN COUNTY WA	CYOV ENT=WT69	15A	400	2000	0	0	0	0	0	0	0	0	0	0	2400
KERN COUNTY WA	M&I ENT=WT10	16A	0	0	0	100	320	320	344	320	420	736	0	0	2560
KERN COUNTY WA	AGR ENT=WT01	16A	0	0	600	2400	2600	3500	3900	3200	2300	1700	1200	1500	22900
KERN COUNTY WA	CYOV ENT=WT69	16A	200	200	0	0	0	0	0	0	0	0	0	0	400
KERN COUNTY WA	AGR ENT=WT01	31A	2650	4000	5900	10800	17600	17000	17000	15100	8000	5300	1500	3100	107950
KERN COUNTY WA	AGR SUR=WT04	31A	0	0	0	0	0	0	0	0	0	0	0	0	0
	*** TOTAL ***		47768	74135	66785	82439	119844	196367	234007	213042	76392	41410	30214	34678	1217081
COUNTY OF KINGS	M&I ENT=WT10	8C	400	400	400	400	0	400	400	400	400	400	0	400	4000
	*** TOTAL ***		400	400	400	400	0	400	400	400	400	400	0	400	4000
OAK FLAT WD	AGR ENT=WT01	2A	0	171	342	627	684	912	1026	1026	513	228	171	0	5700
OAK FLAT WD	AGR SUR=WT04	2A	0	64	208	500	600	304	324	0	0	0	0	0	2000
	*** TOTAL ***		0	235	550	1127	1284	1216	1350	1026	513	228	171	0	7700
TULARE LK BWSD	AGR ENT=WT01	8C	920	1633	1938	3774	2536	7153	6771	6714	2083	2898	4993	5988	47401
TULARE LK BWSD	PURCHASD=WT76	8C	9725	6643	0	0	0	0	0	0	0	0	0	0	16368
TULARE LK BWSD	AGR ENT=WT01	8D	1381	2449	2906	5662	3803	10729	10156	10070	3124	4347	7489	8983	71099
TULARE LK BWSD	PURCHASD=WT76	8D	13609	8325	0	0	0	0	0	0	0	0	0	0	21934
	*** TOTAL ***		25635	19050	4844	9436	6339	17882	16927	16784	5207	7245	12482	14971	156802

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AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
AVEK WA	M&I ENT=WT10	19	170	300	350	400	450	500	575	575	500	400	250	225	4695
AVEK WA	AGR ENT=WT01	19	55	285	1885	2920	3080	3190	3600	3250	2180	1475	285	45	22250
AVEK WA	M&I ENT=WT10	20A	1275	950	1300	2000	2225	2500	3000	2825	2200	1800	1650	1275	23000
AVEK WA	AGR ENT=WT01	20A	2	3	5	15	20	25	35	35	30	15	3	2	190
AVEK WA	M&I ENT=WT10	20B	5	5	5	5	5	5	5	5	5	5	5	5	60
AVEK WA	M&I ENT=WT10	22A	195	210	250	290	320	365	430	430	410	325	220	190	3635
AVEK WA	AGR ENT=WT01	22A	20	20	100	100	150	150	250	200	100	50	20	10	1170
*** TOTAL ***			1722	1773	3895	5730	6250	6735	7895	7320	5425	4070	2433	1752	55000
CASTAIC LAKE WA	M&I ENT=WT10	30	1200	1350	1500	1900	2300	2300	2300	2300	2300	2100	1600	1400	22550
*** TOTAL ***			1200	1350	1500	1900	2300	2300	2300	2300	2300	2100	1600	1400	22550
COACHELLA VALLY	M GW ENT=WT08	26A	0	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	23100
*** TOTAL ***			0	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	2100	23100
CRESTLINE-LA WA	M&I ENT=WT10	24	246	144	144	148	199	224	286	390	286	208	208	182	2665
*** TOTAL ***			246	144	144	148	199	224	286	390	286	208	208	182	2665
DESERT WA	M&I ENT=WT10	26A	0	3464	3464	3464	3464	3464	3464	3464	3464	3464	3464	3460	38100
*** TOTAL ***			0	3464	3464	3464	3464	3464	3464	3464	3464	3464	3464	3460	38100
LITTLEROCK CR	M&I ENT=WT10	21	0	0	131	150	187	225	262	244	225	161	131	0	1716
LITTLEROCK CR	AGR ENT=WT01	21	0	0	44	50	63	75	88	81	75	64	44	0	584
*** TOTAL ***			0	0	175	200	250	300	350	325	300	225	175	0	2300
METROPOLITAN WD	STOR ENT=WT60	12E	15000	15000	15000	15000	0	0	0	0	15000	15000	15000	15000	120000
METROPOLITAN WD	M&I ENT=WT10	26A	0	4436	5736	7736	15236	8936	16936	16936	25036	16236	11736	3740	132700
METROPOLITAN WD	M GW ENT=WT08	26A	0	15000	15000	15000	9000	8000	3000	3000	3000	10000	10000	9000	100000
METROPOLITAN WD	M&I ENT=WT10	28H	0	4500	7000	8000	9000	10000	9000	9000	8000	6000	5000	4000	79500
METROPOLITAN WD	BYPS ENT=WT59	28H	0	10100	11300	13300	20800	14500	22500	22500	28000	21800	17300	9400	191500
METROPOLITAN WD	M&I ENT=WT10	28J	6900	400	400	400	400	13000	13000	13000	400	400	400	13300	62000
METROPOLITAN WD	M&I ENT=WT10	30	55100	49000	56000	63000	72000	69000	72000	72000	69000	72000	63000	66000	778100
*** TOTAL ***			77000	98436	110436	122436	126436	123436	136436	136436	148436	141436	122436	120440	1463800
MOJAVE WA	M&I ENT=WT10	22B	30	30	30	30	30	30	30	30	30	30	30	30	360
*** TOTAL ***			30	30	30	30	30	30	30	30	30	30	30	30	360
PALMDALE WD	M&I ENT=WT10	20A	0	0	0	0	0	0	0	0	0	0	0	0	0
PALMDALE WD	M&I ENT=WT10	20B	0	0	1160	1160	1160	1160	1160	1160	1160	1160	1160	0	10440
*** TOTAL ***			0	0	1160	1160	1160	1160	1160	1160	1160	1160	1160	0	10440
SAN BERNARDINO	M&I ENT=WT10	26A	0	0	0	0	1800	1800	1800	1800	1800	1800	0	0	10800
SAN BERNARDINO	M GW ENT=WT08	26A	0	0	2000	2000	2000	2000	2000	2000	2000	2000	2000	0	18000
*** TOTAL ***			0	0	2000	2000	3800	3800	3800	3800	3800	3800	2000	0	28800
SAN GABRIEL	M GW ENT=WT08	26A	0	0	0	1750	1750	1750	1750	1750	1750	1750	1750	0	14000

STATE OF CALIFORNIA
THE RESOURCES AGENCY

FILE ID: 0199191

ANNUAL SUMMARY BY AGENCY, WATER TYPE
YEAR 1991

DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT ANALYSIS OFFICE

DATE: 11/05/90
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COUNTY OF BUTTE	TOTAL = 1200							
		M&I ENT = 1200						
PLUMAS CO FCWCD	TOTAL = 1080							
		M&I ENT = 1080						
YUBA CITY	TOTAL = 2000							
		M&I ENT = 2000						
NAPA CO FCWCD	TOTAL = 6745							
		M&I ENT = 6745						
SOLANO CO WA	TOTAL = 32150							
TOT ENT = 22300		M&I ENT = 6500	BEN ENT = 12000	VAL ENT = 3800				
TOT MISC = 9850		VAL PMT = 9850						
ZONE-7 ALAMEDA	TOTAL = 34000							
TOT ENT = 34000		M&I ENT = 26825	M GW ENT = 4693	AGR ENT = 2482				
ALAMEDA CO WD	TOTAL = 42000							
TOT ENT = 38400		M&I ENT = 9700	M GW ENT = 28150	A GW ENT = 550				
TOT MISC = 3600		WET WTHR = 3600						
SANTA CLARA VWD	TOTAL = 122907							
TOT ENT = 94000		M&I ENT = 72200	M GW ENT = 21800					
TOT MISC = 28907		PURCHASD = 28907						
SANTA BARBARA	TOTAL = 3600							
		M&I ENT = 3600						
DEVIL'S DEN WD	TOTAL = 20000							
		AGR ENT = 12700						
		AGR SUR = 7300						
DUDLEY RIDGE WD	TOTAL = 58128							
		AGR ENT = 57700						
		CYOV ENT = 428						
EMPIRE WS ID	TOTAL = 6221							
		AGR ENT = 3000						
		AGR SUR = 3000						
		CYOV ENT = 221						
KERN COUNTY WA	TOTAL = 1324663							
TOT ENT = 1153400		M&I ENT = 52210	M GW ENT = 82390	AGR ENT = 1018800				
TOT MISC = 171263		12D AGR = 100000	78MWD 30 = 21547	X82 ORO = 46393	X82 MWD = 3323			
COUNTY OF KINGS	TOTAL = 6000							
		AGR ENT = 4000						
		12D AGR = 2000						

1991

LETTER 21

STATE OF CALIFORNIA
THE RESOURCES AGENCY

FILE ID: 0199191

ANNUAL SUMMARY BY AGENCY, WATER TYPE
YEAR 1991

DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT ANALYSIS OFFICE

DATE: 11/05/90
PAGE: 2

OAK FLAT WD	TOTAL = 7200	AGR	ENT = 5700					
		AGR	SUR = 1500					
TULARE LK BWSD	TOTAL = 264712	AGR	ENT = 118500					
	TOT MISC = 146212	12D	AGR = 59250	WET WTHR =	80662	CYOV ENT =	6300	
AVEK WA	TOTAL = 63492							
	TOT ENT = 63492	M&I	ENT = 45984	AGR	ENT = 17508			
CASTAIC LAKE WA	TOTAL = 26100	M&I	ENT = 26100					
COACHELLA VALLY	TOTAL = 23100	M&I	ENT = 23100					
CRESTLINE-LA WA	TOTAL = 2420	M&I	ENT = 2420					
DESERT WA	TOTAL = 38100	M GW	ENT = 38100					
LITTLEROCK CR	TOTAL = 2300							
	TOT ENT = 2300	M&I	ENT = 1716	AGR	ENT = 584			
METROPOLITAN WD	TOTAL = 1774000							
	TOT ENT = 1749130	M&I	ENT = 1245030	M GW	ENT = 70000	BYPS ENT =	314100	SWP STOR = 120000
	TOT MISC = 24870	78 EX	GW = 21547	X82	GW = 3323			
MOJAVE WA	TOTAL = 50800	M GW	ENT = 50800					
PALMDALE WD	TOTAL = 13050	M&I	ENT = 13050					
SAN BERNARDINO	TOTAL = 30000							
	TOT ENT = 30000	M&I	ENT = 10000	M GW	ENT = 20000			
SAN GABRIEL	TOTAL = 18000	M GW	ENT = 18000					
VENTURA CO FCD	TOTAL = 6180	M&I	ENT = 5000					
		CYOVMENT =	1180					
THERMALITO ID	TOTAL = 8200	LOCAL	= 8200					

LETTER.21

FILE DUMP

FILE IDENTIFICATION: 0199191 11/05/90. SHEET 1

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
COUNTY OF BUTTE	M&I ENT=WT10	FR	50	50	120	70	70	90	170	200	170	90	60	60	1200
	*** TOTAL ***		50	50	120	70	70	90	170	200	170	90	60	60	1200
PLUMAS CO FCWCD	M&I ENT=WT10	FR	27	32	43	79	109	156	173	173	173	42	37	36	1080
	*** TOTAL ***		27	32	43	79	109	156	173	173	173	42	37	36	1080
YUBA CITY	M&I ENT=WT10	FR	0	0	0	0	0	200	600	700	400	100	0	0	2000
	*** TOTAL ***		0	0	0	0	0	200	600	700	400	100	0	0	2000
NAPA CO FCWCD	M&I ENT=WT10	3NB	539	335	371	511	609	684	715	651	618	578	550	584	6745
	*** TOTAL ***		539	335	371	511	609	684	715	651	618	578	550	584	6745
SOLANO CO WA	M&I ENT=WT10	1NB	335	385	385	590	670	695	700	695	695	560	405	385	6500
SOLANO CO WA	VAL PMT =WT71	1NB	0	0	0	20	110	205	235	235	120	55	20	0	1000
SOLANO CO WA	BEN ENT =WT46	3NA	875	690	885	1030	1110	1010	1180	1165	1110	1080	1000	865	12000
SOLANO CO WA	VAL ENT =WT47	3NA	300	300	300	330	330	340	340	330	330	300	300	300	3800
SOLANO CO WA	VAL PMT =WT71	3NA	550	550	550	650	950	1000	1250	1150	850	650	350	350	8850
	*** TOTAL ***		2060	1925	2120	2620	3170	3250	3705	3575	3105	2645	2075	1900	32150
ZONE-7 ALAMEDA	M&I ENT=WT10	1SB	2	2	3	11	23	31	34	37	31	21	6	2	203
ZONE-7 ALAMEDA	M&I ENT=WT10	2SB	372	347	448	599	763	849	921	914	791	639	431	379	7453
ZONE-7 ALAMEDA	M GW ENT=WT08	4SB	196	196	196	196	196	196	196	196	196	196	196	196	2352
ZONE-7 ALAMEDA	AGR ENT=WT01	4SB	0	0	83	218	432	449	460	424	13	108	0	0	2187
ZONE-7 ALAMEDA	M GW ENT=WT08	5SB	195	195	195	195	195	195	195	196	195	195	195	195	2341
ZONE-7 ALAMEDA	AGR ENT=WT01	5SB	0	0	0	10	40	40	40	20	0	10	0	0	160
ZONE-7 ALAMEDA	M&I ENT=WT10	6SB	956	894	1151	1542	1962	2182	2369	2351	2034	1643	1109	976	19169
ZONE-7 ALAMEDA	AGR ENT=WT01	6SB	0	0	0	15	20	35	35	25	5	0	0	0	135
	*** TOTAL ***		1721	1634	2076	2786	3631	3977	4250	4163	3265	2812	1937	1748	34000
ALAMEDA CO WD	M GW ENT=WT08	7SB	1230	1110	1530	2670	2970	3170	3280	3280	2870	2710	2080	1250	28150
ALAMEDA CO WD	A GW ENT=WT22	7SB	0	0	0	0	100	100	100	100	100	50	0	0	550
ALAMEDA CO WD	WET WTHR=WT07	7SB	0	0	0	200	300	500	500	500	400	400	400	400	3600
ALAMEDA CO WD	M&I ENT=WT10	8SB	824	744	824	797	824	797	824	824	797	824	797	824	9700
	*** TOTAL ***		2054	1854	2354	3667	4194	4567	4704	4704	4167	3984	3277	2474	42000
SANTA CLARA VWD	M&I ENT=WT10	9SB	0	0	0	7000	9000	9300	9500	9500	9300	9000	4800	4800	72200
SANTA CLARA VWD	M GW ENT=WT08	9SB	0	0	0	3410	1760	1640	1810	1810	1640	1760	3970	4000	21800
SANTA CLARA VWD	PURCHASD=WT76	9SB	9950	9000	9957	0	0	0	0	0	0	0	0	0	28907
	*** TOTAL ***		9950	9000	9957	10410	10760	10940	11310	11310	10940	10760	8770	8800	122907
SANTA BARBARA	M&I ENT=WT10	30	383	346	383	370	383	279	95	95	130	383	370	383	3600
	*** TOTAL ***		383	346	383	370	383	279	95	95	130	383	370	383	3600
DEVIL'S DEN WD	AGR ENT=WT01	31A	254	381	762	1016	1270	2032	2286	2286	1143	508	381	381	12700
DEVIL'S DEN WD	AGR SUR=WT04	31A	1496	1349	1438	364	0	0	774	674	0	0	0	1205	7300
	*** TOTAL ***		1750	1730	2200	1380	1270	2032	3060	2960	1143	508	381	1586	20000

FILE DUMP

FILE IDENTIFICATION: 0199191 11/05/90. SHEET 2

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
DUDLEY RIDGE WD	AGR ENT=WT01	8D	2567	6411	2970	3503	6041	10152	10082	9551	2098	1957	1127	1241	57700
DUDLEY RIDGE WD	CYOV ENT=WT69	8D	428	0	0	0	0	0	0	0	0	0	0	0	428
*** TOTAL ***			2995	6411	2970	3503	6041	10152	10082	9551	2098	1957	1127	1241	58128
EMPIRE WS ID	AGR ENT=WT01	8C	60	90	180	240	300	480	540	540	270	120	90	90	3000
EMPIRE WS ID	CYOV ENT=WT69	8C	100	121	0	0	0	0	0	0	0	0	0	0	221
EMPIRE WS ID	AGR SUR=WT04	8C	390	160	320	60	0	460	460	320	330	80	260	160	3000
*** TOTAL ***			550	371	500	300	300	940	1000	860	600	200	350	250	6221
KERN COUNTY WA	AGR ENT=WT01	9	3550	6390	7100	8520	8410	17300	24880	17750	4260	2840	710	5822	107532
KERN COUNTY WA	M&I ENT=WT10	10A	100	100	100	100	100	100	100	100	100	100	100	100	1200
KERN COUNTY WA	M GW ENT=WT08	10A	0	150	300	0	300	800	800	1200	900	0	0	0	4450
KERN COUNTY WA	AGR ENT=WT01	10A	3805	20530	16799	16417	28268	45916	54253	50436	8430	1160	290	2564	248868
KERN COUNTY WA	12D AGR=WT13	10A	0	0	136	0	0	0	0	0	1000	1000	1652	2000	5788
KERN COUNTY WA	X82 ORO=WT51	10A	0	0	5758	6000	0	0	0	0	5000	5000	1348	1000	24106
KERN COUNTY WA	M&I ENT=WT10	11B	1258	1258	1258	1258	1258	1258	1258	1258	1258	1258	1258	1162	15000
KERN COUNTY WA	AGR ENT=WT01	11B	2810	6864	6601	5764	7775	19773	35751	34864	4667	3017	2651	2869	133406
KERN COUNTY WA	M&I ENT=WT10	12E	2110	1990	2300	2490	3010	3220	3500	3450	2920	2610	2000	2110	31710
KERN COUNTY WA	M GW ENT=WT08	12E	450	750	1300	500	5030	13815	14355	17245	5825	5940	6320	6410	77940
KERN COUNTY WA	AGR ENT=WT01	12E	2990	10761	7900	12076	20200	27500	26050	25452	13200	0	0	0	146129
KERN COUNTY WA	12D AGR=WT13	12E	0	2729	7833	10000	2100	6100	6100	7702	10100	13640	13640	13640	93584
KERN COUNTY WA	78MWD 30=WT16	12E	0	0	0	0	0	0	0	0	2047	6500	6500	6500	21547
KERN COUNTY WA	X82 ORO=WT51	12E	0	0	0	0	0	0	0	0	1239	5000	5000	5000	16239
KERN COUNTY WA	X82 MWD=WT52	12E	0	0	0	0	0	0	0	0	323	1000	1000	1000	3323
KERN COUNTY WA	AGR ENT=WT01	13B	300	1575	2907	3001	3585	11000	11000	5593	400	800	800	3324	44285
KERN COUNTY WA	12D AGR=WT13	13B	0	0	0	0	0	0	0	0	0	0	0	628	628
KERN COUNTY WA	X82 ORO=WT51	13B	0	0	0	0	0	0	0	0	0	0	0	6048	6048
KERN COUNTY WA	M&I ENT=WT10	14A	67	69	69	69	69	69	69	69	69	69	69	63	820
KERN COUNTY WA	AGR ENT=WT01	14A	392	2747	3139	1766	2747	5494	6475	5101	1177	785	392	3015	33230
KERN COUNTY WA	M&I ENT=WT10	14B	0	6	6	6	6	6	6	6	6	6	6	0	60
KERN COUNTY WA	AGR ENT=WT01	14B	1101	7708	8809	4955	7708	15417	18170	14315	3304	2202	1101	8463	93253
KERN COUNTY WA	M&I ENT=WT10	14C	0	2	2	2	2	2	2	2	2	2	2	0	20
KERN COUNTY WA	AGR ENT=WT01	14C	506	3545	4051	2279	3545	7090	8356	6583	1519	1013	506	3895	42888
KERN COUNTY WA	M&I ENT=WT10	15A	0	0	10	0	10	10	10	10	0	0	0	0	50
KERN COUNTY WA	AGR ENT=WT01	15A	1000	1000	4000	2000	6000	8000	8000	5000	3000	3000	2000	6943	49943
KERN COUNTY WA	M&I ENT=WT10	16A	0	0	10	360	1002	970	998	10	0	0	0	0	3350
KERN COUNTY WA	AGR ENT=WT01	16A	100	100	600	600	1200	1300	1704	1992	1460	1244	580	986	11866
KERN COUNTY WA	AGR ENT=WT01	31A	2700	4000	5900	10800	17000	17000	17000	15100	8000	5300	1500	3100	107400
*** TOTAL ***			23239	72274	86888	88963	119325	202140	238837	213238	80206	63486	49425	86642	1324663
COUNTY OF KINGS	AGR ENT=WT01	8C	400	400	400	400	0	400	400	400	400	400	0	400	4000
COUNTY OF KINGS	12D AGR=WT13	8C	100	130	110	90	140	340	370	280	80	60	140	160	2000
*** TOTAL ***			500	530	510	490	140	740	770	680	480	460	140	560	6000
OAK FLAT WD	AGR ENT=WT01	2A	64	171	342	456	627	1026	1026	1026	513	228	171	50	5700
OAK FLAT WD	AGR SUR=WT04	2A	0	0	108	273	423	238	324	134	0	0	0	0	1500
*** TOTAL ***			64	171	450	729	1050	1264	1350	1160	513	228	171	50	7200
TULARE LK BWSD	AGR ENT=WT01	8C	1892	1121	578	873	2652	9731	11165	7706	1058	740	3868	6015	47399
TULARE LK BWSD	12D AGR=WT13	8C	1210	1540	1320	1100	1640	4060	4390	3290	990	770	1640	1760	23710
TULARE LK BWSD	WET WTHR=WT07	8C	1640	2090	1790	1490	2240	5530	5980	4480	1340	1040	2240	2402	32262

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FILE IDENTIFICATION: 0199191 11/05/90. SHEET 3

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
TULARE LK BWSD	CYOV ENT=WT69	8C	1700	800	0	0	0	0	0	0	0	0	0	0	2500
TULARE LK BWSD	AGR ENT=WT01	8D	2839	1682	868	1309	3978	14597	16748	11560	1588	1109	5801	9022	71101
TULARE LK BWSD	12D AGR=WT13	8D	1810	2300	1970	1640	2470	6090	6580	4940	1480	1150	2470	2640	35540
TULARE LK BWSD	WET WTHR=WT07	8D	2470	3140	2690	2240	3360	8290	8960	6720	2020	1570	3360	3580	48400
TULARE LK BWSD	CYOV ENT=WT69	8D	2600	1200	0	0	0	0	0	0	0	0	0	0	3800
*** TOTAL ***			16161	13873	9216	8652	16340	48298	53823	38696	8476	6379	19379	25419	264712
AVEK WA	M&I ENT=WT10	18A	1	1	1	1	1	1	3	4	5	6	7	8	39
AVEK WA	M&I ENT=WT10	19	410	500	610	765	840	1025	1125	1090	870	680	490	470	8875
AVEK WA	AGR ENT=WT01	19	26	395	1483	1887	2145	2507	2397	2390	1870	860	141	127	16228
AVEK WA	M&I ENT=WT10	20A	1435	1375	1765	2565	3275	3620	4305	3850	3295	2875	2340	1885	32585
AVEK WA	AGR ENT=WT01	20A	10	10	15	15	20	20	20	15	15	10	10	10	170
AVEK WA	M&I ENT=WT10	20B	70	65	120	105	150	150	160	170	140	140	115	110	1495
AVEK WA	M&I ENT=WT10	22A	145	155	205	245	305	325	365	365	325	245	165	145	2990
AVEK WA	AGR ENT=WT01	22A	10	20	80	100	125	140	250	220	100	50	10	5	1110
*** TOTAL ***			2107	2521	4279	5683	6861	7788	8625	8104	6620	4866	3278	2760	63492
CASTAIC LAKE WA	M&I ENT=WT10	30	1450	1200	1750	1800	2300	2750	3000	3000	3000	2400	1850	1600	26100
*** TOTAL ***			1450	1200	1750	1800	2300	2750	3000	3000	3000	2400	1850	1600	26100
COACHELLA VALLY	M&I ENT=WT10	26A	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	23100
*** TOTAL ***			1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	23100
CRESTLINE-LA WA	M&I ENT=WT10	24	224	131	131	135	180	203	260	355	260	188	188	165	2420
*** TOTAL ***			224	131	131	135	180	203	260	355	260	188	188	165	2420
DESERT WA	M GW ENT=WT08	26A	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	38100
*** TOTAL ***			3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	38100
LITTLEROCK CR	M&I ENT=WT10	21	0	0	131	150	187	225	262	244	225	161	131	0	1716
LITTLEROCK CR	AGR ENT=WT01	21	0	0	44	50	63	75	88	81	75	64	44	0	584
*** TOTAL ***			0	0	175	200	250	300	350	325	300	225	175	0	2300
METROPOLITAN WD	SWP STOR=WT60	12E	0	0	0	0	0	0	0	0	30000	30000	30000	30000	120000
METROPOLITAN WD	M&I ENT=WT10	26A	20700	17900	21400	22900	32900	29500	29500	29500	30530	15400	15400	15000	280630
METROPOLITAN WD	M GW ENT=WT08	26A	10000	10000	10000	10000	0	0	0	0	0	10000	10000	10000	70000
METROPOLITAN WD	78 EX GW=WT37	26A	0	0	0	0	0	0	0	0	2047	6500	6500	6500	21547
METROPOLITAN WD	X82 GW=WT54	26A	0	0	0	0	0	0	0	0	323	1000	1000	1000	3323
METROPOLITAN WD	M&I ENT=WT10	28H	5000	5000	7000	10000	10000	10000	10000	10000	10000	9000	7000	6000	99000
METROPOLITAN WD	BYPS ENT=WT59	28H	25900	23000	26500	26000	26000	26000	26000	26000	26000	27000	28000	27700	314100
METROPOLITAN WD	M&I ENT=WT10	28J	3800	3400	6600	2400	1400	9400	9400	9400	2400	2400	1400	400	52400
METROPOLITAN WD	M&I ENT=WT10	30	72000	29000	72000	70000	72000	70000	72000	72000	70000	72000	70000	72000	813000
*** TOTAL ***			137400	88300	143500	141300	142300	144900	146900	146900	171300	173300	169300	168600	1774000
MOJAVE WA	M GW ENT=WT08	24	5580	5580	5580	5580	5580	5580	0	0	5580	5580	5580	580	50800
*** TOTAL ***			5580	5580	5580	5580	5580	5580	0	0	5580	5580	5580	580	50800

LETTER 21

STATE OF CALIFORNIA
THE RESOURCES AGENCY

ANNUAL SUMMARY BY AGENCY, WATER TYPE
YEAR 1992

DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT ANALYSIS OFFICE

DATE: 03/30/92
PAGE: 1

FILE ID: N199292

COUNTY OF BUTTE	TOTAL =	1085	M&I	ENT =	1085						
PLUMAS CO FCWCD	TOTAL =	1120	M&I	ENT =	1120						
YUBA CITY	TOTAL =	2200	M&I	ENT =	2200						
NAPA CO FCWCD	TOTAL =	7840	M&I	ENT =	7840						
SOLANO CO WA	TOTAL =	41457									
	TOT ENT =	24170	M&I	ENT =	7720	BEN ENT =	12320	VAL ENT =	4130		
	TOT MISC =	17287	VAL PMT =		17287						
ZONE-7 ALAMEDA	TOTAL =	45970									
	TOT ENT =	45970	M&I	ENT =	26065	M GW ENT =	6949	AGR ENT =	2956	WETMWTHR =	10000
ALAMEDA CO WD	TOTAL =	42000									
	TOT ENT =	42000	M&I	ENT =	9700	M GW ENT =	30200	WETAWTHR =	2100		
SANTA CLARA VWD	TOTAL =	96000									
	TOT ENT =	96000	M&I	ENT =	84400	M GW ENT =	11600				
DEVIL'S DEN WD	TOTAL =	7300									
			12D	AGR =	3810						
			AGR	SUR =	3490						
DUDLEY RIDGE WD	TOTAL =	59200									
			AGR	ENT =	57700						
			91DRBANK =		1500						
EMPIRE WS ID	TOTAL =	6000									
	TOT ENT =	6000	AGR	ENT =	3000	12D AGR =	3000				
KERN COUNTY WA	TOTAL =	1324663									
	TOT ENT =	1253400	M&I	ENT =	52210	M GW ENT =	82390	AGR ENT =	1018800	12D AGR =	100000
	TOT MISC =	71263	78MWD 30 =		21547	X82 DRO =	46393	X82 MWD =	3323		
COUNTY OF KINGS	TOTAL =	8000									
	TOT ENT =	8000	AGR	ENT =	4000	12D AGR =	4000				
OAK FLAT WD	TOTAL =	7200									
	TOT ENT =	7200	AGR	ENT =	5700	12D AGR =	1500				
TULARE LK BWSD	TOTAL =	258412									
	TOT ENT =	258412	AGR	ENT =	118500	12D AGR =	59250	WETAWTHR =	80662		

LETTER 21

STATE OF CALIFORNIA
THE RESOURCES AGENCY

ANNUAL SUMMARY BY AGENCY, WATER TYPE
YEAR 1992

DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT ANALYSIS OFFICE

FILE ID: N199292

AVEK WA	TOTAL =	65779							
	TOT ENT =	65779	M&I ENT =	50459	AGR ENT =	15320			
CASTAIC LAKE WA	TOTAL =	39504							
	TOT ENT =	39504	M&I ENT =	26804	AGR ENT =	12700			
COACHELLA VALLY	TOTAL =	23100							
			M&I ENT =	23100					
CRESTLINE-LA WA	TOTAL =	2050							
			M&I ENT =	2050					
DESERT WA	TOTAL =	38100							
			M GW ENT =	38100					
LITTLEROCK CR	TOTAL =	2300							
	TOT ENT =	2300	M&I ENT =	1930	AGR ENT =	370			
METROPOLITAN WD	TOTAL =	1937000							
	TOT ENT =	1937000	M&I ENT =	1331331	M GW ENT =	213669	BYPS ENT =	272000	STOR ENT = 120000
MOJAVE WA	TOTAL =	24000							
			M GW ENT =	24000					
PALMDALE WD	TOTAL =	13200							
			M&I ENT =	13200					
SAN BERNARDINO	TOTAL =	32000							
	TOT ENT =	32000	M&I ENT =	12000	M GW ENT =	20000			
SAN GABRIEL	TOTAL =	18000							
			M GW ENT =	18000					
VENTURA CO FCD	TOTAL =	5000							
			M GW ENT =	5000					
SHELL CAL PROD.	TOTAL =	7362							
			REPAYMNT =	7362					
JG BOSWELL	TOTAL =	9000							
			REPAYMNT =	9000					
FISH & GAME	TOTAL =	660							
			REC/F&WL =	660					
PARKS & RECREAT	TOTAL =	90							
			REC/F&WL =	90					

FILE DUMP

FILE IDENTIFICATION: N199292 03/30/92. SHEET 1

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
COUNTY OF BUTTE	M^I ENT=WT10	FR	65	55	505	205	55	50	10	10	10	10	25	85	1085
	*** TOTAL ***		65	55	505	205	55	50	10	10	10	10	25	85	1085
PLUMAS CO FCWCD	M^I ENT=WT10	FR	28	33	44	81	114	162	180	180	180	43	38	37	1120
	*** TOTAL ***		28	33	44	81	114	162	180	180	180	43	38	37	1120
YUBA CITY	M^I ENT=WT10	FR	0	0	0	0	0	200	700	700	400	200	0	0	2200
	*** TOTAL ***		0	0	0	0	0	200	700	700	400	200	0	0	2200
NAPA CO FCWCD	M^I ENT=WT10	3NB	562	358	409	603	737	796	798	798	772	730	633	644	7840
	*** TOTAL ***		562	358	409	603	737	796	798	798	772	730	633	644	7840
SOLANO CO WA	M^I ENT=WT10	1NB	405	455	455	740	835	870	715	710	870	750	485	430	7720
SOLANO CO WA	VAL PMT =WT71	1NB	0	0	0	40	240	255	500	500	350	255	220	0	2360
SOLANO CO WA	BEN ENT =WT46	3NA	895	705	910	1055	1140	1040	1210	1195	1140	1110	1030	890	12320
SOLANO CO WA	VAL ENT =WT47	3NA	300	300	300	500	500	565	100	100	565	300	300	300	4130
SOLANO CO WA	VAL PMT =WT71	3NA	900	900	900	1435	1435	1435	1435	1435	1435	1435	1435	747	14927
	*** TOTAL ***		2500	2360	2565	3770	4150	4165	3960	3940	4360	3850	3470	2367	41457
ZONE-7 ALAMEDA	M^I ENT=WT10	1SB	15	14	19	28	40	47	58	60	55	44	19	15	414
ZONE-7 ALAMEDA	M^I ENT=WT10	2SB	450	440	350	590	860	870	920	840	760	500	590	630	7800
ZONE-7 ALAMEDA	M GW ENT=WT08	4SB	290	290	290	290	290	290	290	290	290	290	290	290	3480
ZONE-7 ALAMEDA	AGR ENT=WT01	4SB	10	30	265	350	390	430	461	460	55	175	0	0	2626
ZONE-7 ALAMEDA	WETMWTHR=WT87	4SB	729	729	729	729	729	729	731	731	729	729	729	729	8752
ZONE-7 ALAMEDA	M GW ENT=WT08	5SB	287	288	290	290	290	290	290	290	290	290	287	287	3469
ZONE-7 ALAMEDA	AGR ENT=WT01	5SB	0	0	0	15	40	40	40	25	0	10	0	0	170
ZONE-7 ALAMEDA	WETMWTHR=WT87	5SB	104	104	104	104	104	104	104	104	104	104	104	104	1248
ZONE-7 ALAMEDA	M^I ENT=WT10	6SB	929	836	1300	1640	1903	1841	1903	1903	1841	1887	1058	810	17851
ZONE-7 ALAMEDA	AGR ENT=WT01	6SB	0	0	0	20	20	40	40	30	10	0	0	0	160
	*** TOTAL ***		2814	2731	3347	4056	4666	4681	4837	4733	4134	4029	3077	2865	45970
ALAMEDA CO WD	M GW ENT=WT08	7SB	1530	1390	1840	2700	3070	3270	3380	3380	3270	2760	2080	1530	30200
ALAMEDA CO WD	WETAWTHR=WT07	7SB	0	0	0	0	200	200	350	350	300	300	200	200	2100
ALAMEDA CO WD	M^I ENT=WT10	8SB	824	744	824	797	824	797	824	824	797	824	797	824	9700
	*** TOTAL ***		2354	2134	2664	3497	4094	4267	4554	4554	4367	3884	3077	2554	42000
SANTA CLARA VWD	M^I ENT=WT10	9SB	4400	4200	5300	7000	9000	9500	10000	9800	9200	7000	4700	4300	84400
SANTA CLARA VWD	M GW ENT=WT08	9SB	0	0	900	2600	1060	1020	560	760	1000	2500	1200	0	11600
	*** TOTAL ***		4400	4200	6200	9600	10060	10520	10560	10560	10200	9500	5900	4300	96000
SANTA BARBARA	M^I ENT=WT10	30	0	0	0	0	0	0	0	0	0	0	0	0	0
	*** TOTAL ***		0	0	0	0	0	0	0	0	0	0	0	0	0
DEVIL'S DEN WD	12D AGR=WT13	31A	762	686	762	190	0	0	419	343	0	0	0	648	3810
DEVIL'S DEN WD	AGR SUR=WT04	31A	698	628	698	175	0	0	384	314	0	0	0	593	3490
	*** TOTAL ***		1460	1314	1460	365	0	0	803	657	0	0	0	1241	7300

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AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
DUDLEY RIDGE WD	AGR ENT=WT01	8D	2100	5200	2700	3400	6500	9600	10000	9400	2800	2500	1600	1900	57700
DUDLEY RIDGE WD	91DRBANK=WT91	8D	800	700	0	0	0	0	0	0	0	0	0	0	1500
	*** TOTAL ***		2900	5900	2700	3400	6500	9600	10000	9400	2800	2500	1600	1900	59200
EMPIRE WS ID	AGR ENT=WT01	8C	60	90	180	240	300	480	540	540	270	120	90	90	3000
EMPIRE WS ID	12D AGR=WT13	8C	390	160	320	60	0	320	460	460	330	80	260	160	3000
	*** TOTAL ***		450	250	500	300	300	800	1000	1000	600	200	350	250	6000
KERN COUNTY WA	AGR ENT=WT01	9	3550	6390	7100	8520	7810	14200	19880	18750	4260	2840	710	4822	98832
KERN COUNTY WA	M&I ENT=WT10	10A	100	100	100	100	100	100	100	100	100	100	100	100	1200
KERN COUNTY WA	M GW ENT=WT08	10A	0	150	300	0	300	800	800	1200	900	0	0	0	4450
KERN COUNTY WA	AGR ENT=WT01	10A	3898	20456	16938	16375	28582	45885	54143	50025	9588	2309	2091	4676	254966
KERN COUNTY WA	X82 ORD=WT51	10A	0	0	5758	6000	0	0	0	0	5000	5000	1348	1000	24106
KERN COUNTY WA	M&I ENT=WT10	11B	1258	1258	1258	1258	1258	1258	1258	1258	1258	1258	1258	1162	15000
KERN COUNTY WA	AGR ENT=WT01	11B	2660	5320	10640	10640	13300	21280	31920	26600	5320	2660	1330	1426	133096
KERN COUNTY WA	M&I ENT=WT10	12E	2110	1990	2300	2490	3010	3220	3500	3450	2920	2610	2000	2110	31710
KERN COUNTY WA	M GW ENT=WT08	12E	450	750	1300	500	5030	13815	14355	17245	5825	5940	6320	6410	77940
KERN COUNTY WA	AGR ENT=WT01	12E	9181	19681	16092	12076	20300	31600	30150	29600	15300	1640	1640	1640	188900
KERN COUNTY WA	12D AGR=WT13	12E	0	0	0	5263	7000	0	1350	2000	18459	21400	23900	20628	100000
KERN COUNTY WA	78MWD 30=WT16	12E	0	0	0	0	0	0	0	0	2047	6500	6500	6500	21547
KERN COUNTY WA	X82 ORD=WT51	12E	0	0	0	0	0	0	0	0	1239	5000	5000	5000	16239
KERN COUNTY WA	X82 MWD=WT52	12E	0	0	0	0	0	0	0	0	323	1000	1000	1000	3323
KERN COUNTY WA	AGR ENT=WT01	13B	300	1400	1400	1400	2500	11000	11000	6500	0	0	0	8226	43726
KERN COUNTY WA	X82 ORD=WT51	13B	0	0	0	0	0	0	0	0	0	0	0	6048	6048
KERN COUNTY WA	M&I ENT=WT10	14A	67	69	69	69	69	69	69	69	69	69	69	63	820
KERN COUNTY WA	AGR ENT=WT01	14A	200	2698	2498	1198	1898	4998	6598	4698	598	298	198	400	26280
KERN COUNTY WA	M&I ENT=WT10	14B	0	6	6	6	6	6	6	6	6	6	6	0	60
KERN COUNTY WA	AGR ENT=WT01	14B	700	7394	10194	5694	8194	12794	14394	12194	3294	2094	1394	1200	79540
KERN COUNTY WA	M&I ENT=WT10	14C	0	2	2	2	2	2	2	2	2	2	2	0	20
KERN COUNTY WA	AGR ENT=WT01	14C	1000	3598	2998	1998	3298	4998	6298	5198	1398	1198	798	1200	33980
KERN COUNTY WA	M&I ENT=WT10	15A	0	0	10	0	10	10	10	10	0	0	0	0	50
KERN COUNTY WA	AGR ENT=WT01	15A	700	600	3890	2400	5090	5490	6390	4490	2100	2400	900	1800	36250
KERN COUNTY WA	M&I ENT=WT10	16A	0	0	10	360	1002	970	998	10	0	0	0	0	3350
KERN COUNTY WA	AGR ENT=WT01	16A	100	100	590	600	790	1190	1494	1882	1260	944	580	500	10030
KERN COUNTY WA	AGR ENT=WT01	31A	2700	4000	5900	10800	17600	20100	19100	15100	8000	6800	0	3100	113200
	*** TOTAL ***		28974	75962	89353	87749	127149	193785	223815	200387	89266	72068	57144	79011	1324663
COUNTY OF KINGS	AGR ENT=WT01	8C	400	400	400	400	0	400	400	400	400	400	0	400	4000
COUNTY OF KINGS	12D AGR=WT13	8C	335	335	335	335	335	335	335	335	330	330	330	330	4000
	*** TOTAL ***		735	735	735	735	335	735	735	735	730	730	330	730	8000
OAK FLAT WD	AGR ENT=WT01	2A	64	171	342	456	627	1026	1026	1026	513	228	171	50	5700
OAK FLAT WD	12D AGR=WT13	2A	0	0	108	273	423	238	324	134	0	0	0	0	1500
	*** TOTAL ***		64	171	450	729	1050	1264	1350	1160	513	228	171	50	7200
TULARE LK BWSD	AGR ENT=WT01	8C	174	498	498	997	997	10682	12938	10812	692	0	2993	6119	47400
TULARE LK BWSD	12D AGR=WT13	8C	1210	1540	1320	1100	1640	4060	4390	3290	990	770	1640	1760	23710
TULARE LK BWSD	WETAWTHR=WT07	8C	1640	2090	1790	1490	2240	5530	5980	4480	1340	1040	2240	2402	32262
TULARE LK BWSD	AGR ENT=WT01	8D	262	748	748	1496	1496	16024	19406	16219	1038	0	4488	9175	71100
TULARE LK BWSD	12D AGR=WT13	8D	1810	2300	1970	1640	2470	6090	6580	4940	1480	1150	2470	2640	35540
TULARE LK BWSD	WETAWTHR=WT07	8D	2470	3140	2690	2240	3360	8290	8960	6720	2020	1570	3360	3580	48400

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AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
*** TOTAL ***			7566	10316	9016	8963	12203	50676	58254	46461	7560	4530	17191	25676	258412
AVEK WA	M&I ENT=WT10	18A	1	1	1	1	1	1	3	4	5	6	7	8	39
AVEK WA	M&I ENT=WT10	19	0	0	0	0	0	0	0	0	0	0	0	0	0
AVEK WA	AGR ENT=WT01	19	7	7	58	162	185	210	220	175	172	61	46	11	1314
AVEK WA	M&I ENT=WT10	19C	430	522	627	797	870	1061	1128	1110	918	714	530	490	9197
AVEK WA	AGR ENT=WT01	19C	22	390	1221	1445	1648	1994	1887	1815	1312	741	145	122	12742
AVEK WA	M&I ENT=WT10	20A	1641	1572	1920	2575	3330	3717	4398	3940	3390	3067	2635	2138	34323
AVEK WA	AGR ENT=WT01	20A	8	8	9	12	16	20	20	20	15	10	8	8	154
AVEK WA	M&I ENT=WT10	20B	70	65	120	170	230	230	240	255	210	200	160	150	2100
AVEK WA	M&I ENT=WT10	22A	235	245	350	375	490	510	560	570	490	410	295	270	4800
AVEK WA	AGR ENT=WT01	22A	10	20	80	100	125	140	250	220	100	50	10	5	1110
*** TOTAL ***			2424	2830	4386	5637	6895	7883	8706	8109	6612	5259	3836	3202	65779
CASTAIC LAKE WA	M&I ENT=WT10	30	1414	747	1661	1884	2381	1994	3465	3016	3394	2293	1963	2592	26804
CASTAIC LAKE WA	AGR ENT=WT01	31A	254	381	762	1016	1270	2032	2286	2286	1143	508	381	381	12700
*** TOTAL ***			1668	1128	2423	2900	3651	4026	5751	5302	4537	2801	2344	2973	39504
COACHELLA VALLY	M&I ENT=WT10	26A	1916	1916	1916	1916	1916	1916	1916	1916	1916	1916	1916	2024	23100
*** TOTAL ***			1916	1916	1916	1916	1916	1916	1916	1916	1916	1916	1916	2024	23100
CRESTLINE-LA WA	M&I ENT=WT10	24	158	174	160	100	135	146	216	226	207	178	180	170	2050
*** TOTAL ***			158	174	160	100	135	146	216	226	207	178	180	170	2050
DESERT WA	M GW ENT=WT08	26A	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	38100
*** TOTAL ***			3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	38100
LITTLEROCK CR	M&I ENT=WT10	21	60	60	130	150	200	240	280	280	240	150	80	60	1930
LITTLEROCK CR	AGR ENT=WT01	21	0	0	30	40	50	60	60	60	40	30	0	0	370
*** TOTAL ***			60	60	160	190	250	300	340	340	280	180	80	60	2300
METROPOLITAN WD	STOR ENT=WT60	12E	0	0	0	0	0	0	0	0	30000	30000	30000	30000	120000
METROPOLITAN WD	M&I ENT=WT10	26A	9789	0	9789	4509	24669	23709	39549	39549	38109	17229	16509	17121	240531
METROPOLITAN WD	M GW ENT=WT08	26A	22320	7509	22320	14400	7440	7200	11160	11160	10800	33480	32400	33480	213669
METROPOLITAN WD	M&I ENT=WT10	28H	6000	6000	10000	11000	10000	10000	14100	14100	13700	10000	10000	10000	124900
METROPOLITAN WD	BYPS ENT=WT59	28H	26200	23900	22200	20000	22200	25400	22500	22500	21700	22200	21000	22200	272000
METROPOLITAN WD	M&I ENT=WT10	28J	400	400	400	400	400	5400	10400	10400	5400	400	400	400	34800
METROPOLITAN WD	M&I ENT=WT10	30	75300	70400	75300	72800	75300	72800	75300	75300	72800	75300	93700	96800	931100
*** TOTAL ***			140009	108209	140009	123109	140009	144509	173009	173009	192509	188609	204009	210001	1937000
MOJAVE WA	M GW ENT=WT08	24	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	24000
*** TOTAL ***			2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	2000	24000
PALMDALE WD	M&I ENT=WT10	20B	0	0	1450	1450	1600	1600	1600	1600	1450	1450	1000	0	13200
*** TOTAL ***			0	0	1450	1450	1600	1600	1600	1600	1450	1450	1000	0	13200

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STATE OF CALIFORNIA
THE RESOURCES AGENCY

FILE ID: M199393

ANNUAL SUMMARY BY AGENCY, WATER TYPE
YEAR 1993

DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT ANALYSIS OFFICE

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COUNTY OF BUTTE	TOTAL =	1106										
	TOT ENT =	1106	M&I	ENT =	1106							
PLUMAS CO FCWCD	TOTAL =	1160										
	TOT ENT =	1160	M&I	ENT =	1160							
YUBA CITY	TOTAL =	2700										
	TOT ENT =	2700	M&I	ENT =	2700							
NAPA CO FCWCD	TOTAL =	8490										
	TOT ENT =	8490	M&I	ENT =	8490							
SOLAND CO WA	TOTAL =	44417										
	TOT ENT =	27130	M&I	ENT =	9600	BEN ENT =	12730	VAL ENT =	3800	CYOVMENT =	1000	
	TOT MISC =	17287	VAL	PMT =	17287							
ZONE-7 ALAMEDA	TOTAL =	46000										
	TOT ENT =	46000	M&I	ENT =	24677	M GW ENT =	10413	AGR ENT =	2910	WETMWTHR =	8000	
ALAMEDA CO WD	TOTAL =	42000										
	TOT ENT =	42000	M&I	ENT =	24626	M GW ENT =	16774	WETAWTHR =	600			
SANTA CLARA VWD	TOTAL =	98000										
	TOT ENT =	98000	M&I	ENT =	86000	M GW ENT =	12000					
DUDLEY RIDGE WD	TOTAL =	58200										
	TOT ENT =	58200	AGR	ENT =	57700	CYOV ENT =	500					
EMPIRE WS ID	TOTAL =	6000										
	TOT ENT =	6000	AGR	ENT =	3000	12D AGR =	3000					
KERN COUNTY WA	TOTAL =	1347313										
	TOT ENT =	1276050	M&I	ENT =	52810	M GW ENT =	81790	AGR ENT =	1018800	12D AGR =	100000	CYOV ENT = 22650
	TOT MISC =	71263	78MWD	30 =	21547	X82 ORO =	46393	X82 MWD =	3323			
COUNTY OF KINGS	TOTAL =	8200										
	TOT ENT =	8200	AGR	ENT =	4000	12D AGR =	4200					
OAK FLAT WD	TOTAL =	7200										
	TOT ENT =	5700	AGR	ENT =	5700							
	TOT SUR =	1500	AGR	SUR =	1500							
TULARE LK BWSD	TOTAL =	350000										
	TOT ENT =	262012	AGR	ENT =	118500	12D AGR =	59250	WETAWTHR =	80662	CYOV ENT =	3600	
	TOT SUR =	87988	AGR	SUR =	87988							
AVEK WA	TOTAL =	53906										
	TOT ENT =	53906	M&I	ENT =	43778	AGR ENT =	10128					

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STATE OF CALIFORNIA
THE RESOURCES AGENCY

ANNUAL SUMMARY BY AGENCY, WATER TYPE
YEAR 1993

DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT ANALYSIS OFFICE

FILE ID: M199393

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CASTAIC LAKE WA	TOTAL =	51653						
	TOT ENT =	48163	M&I ENT =	31653	AGR ENT =	12700	12D AGR =	3810
	TOT SUR =	3490	AGR SUR =	3490				
COACHELLA VALLY	TOTAL =	23100						
	TOT ENT =	23100	M&I ENT =	23100				
CRESTLINE-LA WA	TOTAL =	2350						
	TOT ENT =	2350	M&I ENT =	2350				
DESERT WA	TOTAL =	38100						
	TOT ENT =	38100	M GW ENT =	38100				
LITTLEROCK CR	TOTAL =	2300						
	TOT ENT =	2300	M&I ENT =	1930	AGR ENT =	370		
METROPOLITAN WD	TOTAL =	2011500						
	TOT ENT =	2011500	M&I ENT =	1525780	M GW ENT =	213720	BYPS ENT =	272000
MOJAVE WA	TOTAL =	36000						
	TOT ENT =	36000	M GW ENT =	36000				
PALMDALE WD	TOTAL =	16200						
	TOT ENT =	16200	M&I ENT =	14300	CYOVMENT =	1900		
SAN BERNARDINO	TOTAL =	32000						
	TOT ENT =	32000	M&I ENT =	12000	M GW ENT =	20000		
SAN GABRIEL	TOTAL =	24000						
	TOT ENT =	24000	M GW ENT =	24000				
VENTURA CO FCD	TOTAL =	5000						
	TOT ENT =	5000	M GW ENT =	5000				
SHELL CAL PROD.	TOTAL =	11040						
	TOT MISC =	11040	REPAYMNT =	11040				
JG BOSWELL	TOTAL =	9000						
	TOT MISC =	9000	REPAYMNT =	9000				
FISH & GAME	TOTAL =	660						
	TOT MISC =	660	REC/F&WL =	660				
PARKS & RECREAT	TOTAL =	90						
	TOT MISC =	90	REC/F&WL =	90				
REC/FISH&WILDLF	TOTAL =	7460						
	TOT MISC =	7460	REC/F&WL =	7460				

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STATE OF CALIFORNIA
THE RESOURCES AGENCY

ANNUAL SUMMARY BY AGENCY, WATER TYPE
YEAR 1993

DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT ANALYSIS OFFICE

FILE ID: M199393

FRESNO COUNTY	TOTAL = 3000		
	TOT MISC = 3000	CVC WLNG =	3000
HILLS VALLEY ID	TOTAL = 3346		
	TOT MISC = 3346	CVC WLNG =	3346
KERN-TULARE WD	TOTAL = 40000		
	TOT MISC = 40000	CVC WLNG =	40000
LOWER TULE RIVR	TOTAL = 31102		
	TOT MISC = 31102	CVC WLNG =	31102
PIXLEY ID	TOTAL = 31102		
	TOT MISC = 31102	CVC WLNG =	31102
RAG GULCH WD	TOTAL = 13300		
	TOT MISC = 13300	CVC WLNG =	13300
TRI-VALLEY WD	TOTAL = 1142		
	TOT MISC = 1142	CVC WLNG =	1142
TULARE COUNTY	TOTAL = 5308		
	TOT MISC = 5308	CVC WLNG =	5308

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FILE DUMP

FILE IDENTIFICATION: M199393 03/05/93. SHEET 1

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
COUNTY OF BUTTE	M&I ENT=WT010	FR	70	55	505	205	57	52	12	12	12	12	27	87	1106
	*** TOTAL ***		70	55	505	205	57	52	12	12	12	12	27	87	1106
PLUMAS CO FCWCD	M&I ENT=WT010	FR	36	41	45	83	114	162	180	180	180	51	45	43	1160
	*** TOTAL ***		36	41	45	83	114	162	180	180	180	51	45	43	1160
YUBA CITY	M&I ENT=WT010	FR	0	0	0	0	0	400	800	800	500	200	0	0	2700
	*** TOTAL ***		0	0	0	0	0	400	800	800	500	200	0	0	2700
NAPA CO FCWCD	M&I ENT=WT010	3NB	574	419	474	676	814	877	927	877	799	746	649	658	8490
	*** TOTAL ***		574	419	474	676	814	877	927	877	799	746	649	658	8490
SOLANO CO WA	CYOVMENT=WT077	1NB	0	0	0	0	0	300	100	200	0	0	0	0	600
SOLANO CO WA	M&I ENT=WT010	1NB	470	535	535	880	1000	1050	1050	1050	1050	905	575	500	9600
SOLANO CO WA	VAL PMT =WT071	1NB	0	0	0	40	240	255	500	500	350	255	220	0	2360
SOLANO CO WA	CYOVMENT=WT077	3NA	0	0	0	0	0	0	400	0	0	0	0	0	400
SOLANO CO WA	BEN ENT =WT046	3NA	925	730	940	1090	1175	1075	1250	1240	1175	1145	1065	920	12730
SOLANO CO WA	VAL ENT =WT047	3NA	300	300	300	330	330	340	340	330	330	300	300	300	3800
SOLANO CO WA	VAL PMT =WT071	3NA	900	900	900	1435	1435	1435	1435	1435	1435	1435	1435	747	14927
	*** TOTAL ***		2595	2465	2675	3775	4180	4455	5075	4755	4340	4040	3595	2467	44417
ZONE-7 ALAMEDA	M&I ENT=WT010	1SB	15	14	19	29	39	46	58	60	55	45	18	15	413
ZONE-7 ALAMEDA	M&I ENT=WT010	2SB	426	414	481	618	833	890	958	934	850	730	513	442	8089
ZONE-7 ALAMEDA	M GW ENT=WT008	4SB	682	682	682	682	682	682	682	682	682	682	682	682	8184
ZONE-7 ALAMEDA	AGR ENT=WT001	4SB	31	34	117	261	411	530	531	393	47	146	33	31	2565
ZONE-7 ALAMEDA	WETMWTHR=WT087	4SB	524	524	524	524	524	524	524	524	524	524	524	524	6288
ZONE-7 ALAMEDA	M GW ENT=WT008	5SB	184	186	186	186	186	186	186	186	186	186	186	185	2229
ZONE-7 ALAMEDA	AGR ENT=WT001	5SB	0	0	0	20	50	50	50	30	0	10	0	0	210
ZONE-7 ALAMEDA	WETMWTHR=WT087	5SB	141	143	143	143	143	143	143	143	143	143	143	141	1712
ZONE-7 ALAMEDA	M&I ENT=WT010	6SB	852	828	962	1237	1665	1780	1915	1868	1699	1460	1026	883	16175
ZONE-7 ALAMEDA	AGR ENT=WT001	6SB	0	0	0	5	25	35	35	25	5	5	0	0	135
	*** TOTAL ***		2855	2825	3114	3705	4558	4866	5082	4845	4191	3931	3125	2903	46000
ALAMEDA CO WD	M GW ENT=WT008	7SB	0	0	0	2260	2460	2470	2560	2560	2380	2084	0	0	16774
ALAMEDA CO WD	WETAWTHR=WT007	7SB	0	0	0	0	0	200	200	200	0	0	0	0	600
ALAMEDA CO WD	M&I ENT=WT010	8SB	809	730	809	1427	1475	2716	2807	2807	2716	2807	2716	2807	24626
	*** TOTAL ***		809	730	809	3687	3935	5386	5567	5567	5096	4891	2716	2807	42000
SANTA CLARA VWD	M&I ENT=WT010	9SB	4400	4200	4300	5200	9000	9500	10200	10000	9400	7500	7000	5300	86000
SANTA CLARA VWD	M GW ENT=WT008	9SB	0	0	1000	2660	1260	1100	540	740	1000	2500	1200	0	12000
	*** TOTAL ***		4400	4200	5300	7860	10260	10600	10740	10740	10400	10000	8200	5300	98000
DUDLEY RIDGE WD	AGR ENT=WT001	8D	2400	5600	2700	3400	6500	9600	10000	9900	2400	2200	1500	1500	57700
DUDLEY RIDGE WD	CYOV ENT=WT069	8D	209	291	0	0	0	0	0	0	0	0	0	0	500
	*** TOTAL ***		2609	5891	2700	3400	6500	9600	10000	9900	2400	2200	1500	1500	58200
EMPIRE WS ID	AGR ENT=WT001	8C	60	90	180	240	300	480	540	540	270	120	90	90	3000

LETTER 21

FILE DUMP

FILE IDENTIFICATION: M199393 03/05/93. SHEET 2

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
EMPIRE WS ID	12D AGR=WT013	8C	390	160	320	60	0	320	460	460	330	80	260	160	3000
*** TOTAL ***			450	250	500	300	300	800	1000	1000	600	200	350	250	6000
KERN COUNTY WA	AGR ENT=WT001	9	0	0	2425	7800	9200	17750	23450	23155	4260	2840	2840	4500	98220
KERN COUNTY WA	CYOV ENT=WT069	9	2150	2150	3255	0	0	0	0	0	0	0	0	0	7555
KERN COUNTY WA	M&I ENT=WT010	10A	0	0	0	150	200	300	325	350	200	175	150	150	2000
KERN COUNTY WA	AGR ENT=WT001	10A	2448	17996	13348	16095	29492	48135	56373	53385	10488	2309	2961	4198	257228
KERN COUNTY WA	CYOV ENT=WT069	10A	950	950	3435	0	0	0	0	0	0	0	0	0	5335
KERN COUNTY WA	X82 ORO=WT051	10A	0	0	5758	6000	0	0	0	0	5000	5000	1348	1000	24106
KERN COUNTY WA	M&I ENT=WT010	11B	1258	1258	1258	1258	1258	1258	1258	1258	1258	1258	1258	1162	15000
KERN COUNTY WA	AGR ENT=WT001	11B	60	5320	10640	10640	13300	22280	32920	27200	5320	2660	1330	1426	133096
KERN COUNTY WA	CYOV ENT=WT069	11B	2600	0	0	0	0	0	0	0	0	0	0	0	2600
KERN COUNTY WA	M&I ENT=WT010	12E	2110	1990	2300	2490	3010	3220	3500	3450	2920	2610	2000	2110	31710
KERN COUNTY WA	M GW ENT=WT008	12E	450	900	1600	500	5130	14115	15255	18445	6725	5940	6320	6410	81790
KERN COUNTY WA	AGR ENT=WT001	12E	17005	53531	41792	24076	21000	31400	29350	28400	14400	1640	1640	1640	265874
KERN COUNTY WA	12D AGR=WT013	12E	0	0	0	5263	7000	0	1350	2000	18459	21400	23900	20628	100000
KERN COUNTY WA	78MWD 30=WT016	12E	0	0	0	0	0	0	0	0	2047	6500	6500	6500	21547
KERN COUNTY WA	X82 ORO=WT051	12E	0	0	0	0	0	0	0	0	1239	5000	5000	5000	16239
KERN COUNTY WA	X82 MWD=WT052	12E	0	0	0	0	0	0	0	0	323	1000	1000	1000	3323
KERN COUNTY WA	AGR ENT=WT001	13B	4000	1500	1500	1500	3000	10000	10000	7000	0	0	0	4202	42702
KERN COUNTY WA	X82 ORO=WT051	13B	0	0	0	0	0	0	0	0	0	0	0	6048	6048
KERN COUNTY WA	M&I ENT=WT010	14A	67	67	67	67	67	67	67	67	67	67	67	63	800
KERN COUNTY WA	AGR ENT=WT001	14A	0	0	2400	2200	1900	3400	4000	3500	1000	600	100	100	19200
KERN COUNTY WA	CYOV ENT=WT069	14A	300	500	0	0	0	0	0	0	0	0	0	0	800
KERN COUNTY WA	AGR ENT=WT001	14B	0	1500	4500	4800	7600	9500	9600	9000	2500	1200	700	400	51300
KERN COUNTY WA	CYOV ENT=WT069	14B	1200	500	0	0	0	0	0	0	0	0	0	0	1700
KERN COUNTY WA	AGR ENT=WT001	14C	0	1500	3500	2200	4000	4200	4000	3800	1800	1000	600	300	26900
KERN COUNTY WA	CYOV ENT=WT069	14C	1000	0	0	0	0	0	0	0	0	0	0	0	1000
KERN COUNTY WA	AGR ENT=WT001	15A	1500	1700	3000	2700	4800	6400	4500	3000	1300	2500	1300	1800	34500
KERN COUNTY WA	M&I ENT=WT010	16A	0	0	0	360	992	960	988	0	0	0	0	0	3300
KERN COUNTY WA	AGR ENT=WT001	16A	100	200	600	700	1300	1500	1004	1792	1260	1244	780	300	10780
KERN COUNTY WA	AGR ENT=WT001	31A	4000	4000	4000	5000	10000	15000	15000	8000	5000	4600	2600	1800	79000
KERN COUNTY WA	CYOV ENT=WT069	31A	1000	660	2000	0	0	0	0	0	0	0	0	0	3660
*** TOTAL ***			42198	96222	107378	93799	123249	189485	212940	193802	85566	69543	62394	70737	1347313
COUNTY OF KINGS	AGR ENT=WT001	8C	400	400	400	400	0	400	400	400	400	400	0	400	4000
COUNTY OF KINGS	12D AGR=WT013	8C	400	400	400	400	100	400	400	400	400	400	100	400	4200
*** TOTAL ***			800	800	800	800	100	800	800	800	800	800	100	800	8200
OAK FLAT WD	AGR ENT=WT001	2A	64	171	342	456	627	1026	1026	1026	513	228	171	50	5700
OAK FLAT WD	AGR SUR=WT004	2A	0	0	108	273	423	238	324	134	0	0	0	0	1500
*** TOTAL ***			64	171	450	729	1050	1264	1350	1160	513	228	171	50	7200
TULARE LK BWSD	AGR ENT=WT001	8C	2548	0	333	333	1807	8532	8532	8532	3195	2068	5388	6132	47400
TULARE LK BWSD	12D AGR=WT013	8C	1208	1536	1316	1096	1644	4060	4388	3292	988	768	1644	1760	23700
TULARE LK BWSD	WETAWTHR=WT007	8C	1644	2092	1792	1492	2240	5528	5976	4480	1344	1044	2240	2393	32265
TULARE LK BWSD	CYOV ENT=WT069	8C	1152	288	0	0	0	0	0	0	0	0	0	0	1440
TULARE LK BWSD	AGR SUR=WT004	8C	3176	3112	428	952	11523	921	145	2632	1376	1780	2072	7078	35195
TULARE LK BWSD	AGR ENT=WT001	8D	3823	0	499	499	2711	12798	12798	12798	4792	3102	8082	9198	71100
TULARE LK BWSD	12D AGR=WT013	8D	1812	2304	1974	1644	2466	6090	6582	4938	1482	1152	2466	2640	35550
TULARE LK BWSD	WETAWTHR=WT007	8D	2466	3138	2688	2238	3360	8292	8964	6720	2016	1566	3360	3589	48397
TULARE LK BWSD	CYOV ENT=WT069	8D	1728	432	0	0	0	0	0	0	0	0	0	0	2160

LETTER 21

FILE IDENTIFICATION: M199393

FILE DUMP

03/05/93.

AGENCY	WATER TYPE		RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
TULARE LK BWSD	AGR	SUR=WT004	8D	4764	4668	642	1428	17284	1382	218	3948	2064	2670	3108	10617	52793
*** TOTAL ***				24321	17570	9672	9682	43035	47603	47603	47340	17257	14150	28360	43407	350000
AVEK WA	M&I	ENT=WT010	18A	12	12	12	12	12	12	12	12	12	12	12	12	144
AVEK WA	AGR	ENT=WT001	19	5	5	27	42	65	90	105	120	117	65	51	21	713
AVEK WA	M&I	ENT=WT010	19C	405	390	435	560	670	875	950	1005	785	545	560	430	7610
AVEK WA	AGR	ENT=WT001	19C	11	141	576	968	1008	1376	1562	1202	971	635	181	26	8657
AVEK WA	M&I	ENT=WT010	20A	600	850	910	1950	2735	3425	4495	5265	3275	2775	2415	1560	30255
AVEK WA	AGR	ENT=WT001	20A	0	0	9	12	16	20	20	20	15	10	8	8	138
AVEK WA	M&I	ENT=WT010	20B	35	35	60	65	80	85	100	130	130	125	70	50	965
AVEK WA	M&I	ENT=WT010	22A	185	150	330	290	355	550	620	700	485	455	395	285	4800
AVEK WA	AGR	ENT=WT001	22A	0	0	0	60	110	100	135	135	60	20	0	0	620
AVEK WA	M&I	ENT=WT010	29F	0	0	0	0	4	0	0	0	0	0	0	0	4
*** TOTAL ***				1253	1583	2359	3959	5055	6533	7999	8589	5850	4642	3692	2392	53906
CASTAIC LAKE WA	M&I	ENT=WT010	30	1921	1782	2352	2520	2874	3118	3320	3349	3222	2811	2080	2304	31653
CASTAIC LAKE WA	AGR	ENT=WT001	31A	254	381	762	1016	1270	2032	2286	2286	1143	508	381	381	12700
CASTAIC LAKE WA	12D	AGR=WT013	31A	762	686	762	190	0	0	419	343	0	0	0	648	3810
CASTAIC LAKE WA	AGR	SUR=WT004	31A	698	628	698	175	0	0	384	314	0	0	0	593	3490
*** TOTAL ***				3635	3477	4574	3901	4144	5150	6409	6292	4365	3319	2461	3926	51653
COACHELLA VALLY	M&I	ENT=WT010	26A	1916	1916	1916	1916	1916	1916	1916	1916	1916	1916	1916	2024	23100
*** TOTAL ***				1916	1916	1916	1916	1916	1916	1916	1916	1916	1916	1916	2024	23100
CRESTLINE-LA WA	M&I	ENT=WT010	24	181	200	183	115	155	167	248	259	237	204	206	195	2350
*** TOTAL ***				181	200	183	115	155	167	248	259	237	204	206	195	2350
DESERT WA	M GW	ENT=WT008	26A	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	38100
*** TOTAL ***				3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	38100
LITTLEROCK CR	M&I	ENT=WT010	21	60	60	130	150	200	240	280	280	240	150	80	60	1930
LITTLEROCK CR	AGR	ENT=WT001	21	0	0	30	40	50	60	60	60	40	30	0	0	370
*** TOTAL ***				60	60	160	190	250	300	340	340	280	180	80	60	2300
METROPOLITAN WD	M&I	ENT=WT010	26A	19789	9949	7589	26709	34669	33709	49549	49549	41509	33629	26509	21521	354680
METROPOLITAN WD	M GW	ENT=WT008	26A	22320	7560	22320	14400	7440	7200	11160	11160	10800	33480	32400	33480	213720
METROPOLITAN WD	M&I	ENT=WT010	28H	6000	6000	10000	11000	10000	10000	14100	14100	13700	10000	10000	10000	124900
METROPOLITAN WD	BYPS	ENT=WT059	28H	26200	23900	20000	22200	22200	25400	22500	22500	21700	22200	21000	22200	272000
METROPOLITAN WD	M&I	ENT=WT010	28J	400	400	400	400	400	5400	10400	10400	5400	400	400	400	34800
METROPOLITAN WD	M&I	ENT=WT010	30	75300	86800	96800	93700	75300	77800	85300	80300	72800	96800	83700	86800	1011400
*** TOTAL ***				150009	134609	157109	168409	150009	159509	193009	188009	165909	196509	174009	174401	2011500
MOJAVE WA	M GW	ENT=WT008	24	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	36000
*** TOTAL ***				3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	36000
PALMDALE WD	CYOVMENT	WT077	20B	0	900	300	300	100	100	100	100	0	0	0	0	1900
PALMDALE WD	M&I	ENT=WT010	20B	0	0	1500	1500	1700	1700	1700	1700	1500	1500	1500	0	14300

STATE OF CALIFORNIA
THE RESOURCES AGENCY

ANNUAL SUMMARY BY AGENCY, WATER TYPE
YEAR 1994

DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT ANALYSIS OFFICE

FILE ID: W199494

COUNTY OF BUTTE TOTAL = 1101
TOT ENT = 1101 M&I ENT = 1101

PLUMAS CO FCWCD TOTAL = 1200
TOT ENT = 1200 M&I ENT = 1200

YUBA CITY TOTAL = 2700
TOT ENT = 2700 M&I ENT = 2700

NAPA CO FCWCD TOTAL = 9135
TOT ENT = 9135 M&I ENT = 9135

SOLANO CO WA TOTAL = 45367
TOT ENT = 28080 M&I ENT = 11150 BEN ENT = 13130 VAL ENT = 3800
TOT MISC = 17287 VAL PMT = 17287

ZONE-7 ALAMEDA TOTAL = 48793
TOT ENT = 42551 M&I ENT = 27458 M GW ENT = 8329 AGR ENT = 4213 CYOVMENT = 2551
TOT MISC = 6242 LOCAL = 6242

ALAMEDA CO WD TOTAL = 42001
TOT ENT = 42001 M&I ENT = 24419 M GW ENT = 17582

SANTA CLARA VWD TOTAL = 100000
TOT ENT = 100000 M&I ENT = 88000 M GW ENT = 12000

DUDLEY RIDGE WD TOTAL = 57700
TOT ENT = 57700 AGR ENT = 57700

EMPIRE WS ID TOTAL = 6000
TOT ENT = 6000 AGR ENT = 3000 12D AGR = 3000

KERN COUNTY WA TOTAL = 1324663
TOT ENT = 1253400 M&I ENT = 52710 M GW ENT = 81890 AGR ENT = 1018800 12D AGR = 100000
TOT MISC = 71263 78MWD 30 = 21547 X82 ORD = 46393 X82 MWD = 3323

COUNTY OF KINGS TOTAL = 8200
TOT ENT = 8200 AGR ENT = 4000 12D AGR = 4200

OAK FLAT WD TOTAL = 6200
TOT ENT = 6200 AGR ENT = 5700 12D AGR = 500

TULARE LK BWSD TOTAL = 272812
TOT ENT = 258412 AGR ENT = 118500 12D AGR = 59250 WETAWTHR = 80662
TOT SUR = 14400 AGR SUR = 14400

AVEK WA TOTAL = 55902
TOT ENT = 55902 M&I ENT = 45774 AGR ENT = 10128

CASTAIC LAKE WA	TOTAL =	45100						
	TOT ENT =	41610	M&I ENT =	25100	AGR ENT =	12700	12D AGR =	3810
	TOT SUR =	3490	AGR SUR =	3490				
COACHELLA VALLY	TOTAL =	23100						
	TOT ENT =	23100	M&I ENT =	23100				
CRESTLINE-LA WA	TOTAL =	1950						
	TOT ENT =	1950	M&I ENT =	1950				
DESERT WA	TOTAL =	38100						
	TOT ENT =	38100	M GW ENT =	38100				
LITTLEROCK CR	TOTAL =	2300						
	TOT ENT =	2300	M&I ENT =	1930	AGR ENT =	370		
METROPOLITAN WD	TOTAL =	2011500						
	TOT ENT =	2011500	M&I ENT =	1525780	M GW ENT =	213720	BYPS ENT =	272000
MOJAVE WA	TOTAL =	50800						
	TOT ENT =	50800	M GW ENT =	50800				
PALMDALE WD	TOTAL =	15060						
	TOT ENT =	15060	M&I ENT =	15060				
SAN BERNARDINO	TOTAL =	30000						
	TOT ENT =	30000	M&I ENT =	12000	M GW ENT =	18000		
SAN GABRIEL	TOTAL =	16000						
	TOT ENT =	16000	M GW ENT =	16000				
VENTURA CO FCD	TOTAL =	5000						
	TOT ENT =	5000	M GW ENT =	5000				
SHELL CAL PROD.	TOTAL =	11040						
	TOT MISC =	11040	REPAYMNT =	11040				
JG BOSWELL	TOTAL =	14170						
	TOT MISC =	14170	REPAYMNT =	14170				
FISH & GAME	TOTAL =	1000						
	TOT MISC =	1000	REC/F&WL =	1000				
PARKS & RECREAT	TOTAL =	189						
	TOT MISC =	189	REC/F&WL =	189				
REC/FISH&WILDLF	TOTAL =	7460						
	TOT MISC =	7460	REC/F&WL =	7460				

FRESNO COUNTY	TOTAL =	3000						
	TOT MISC =	3000	CVC WLNG =	3000				

LETTER 21

RUN IDENTIFICATION: W199596 10/20/95 SHEET 1

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
COUNTY OF BUTTE	M&I ENT=WT010	FR	65	55	505	205	57	52	12	12	12	12	27	87	1101
*** TOTAL ***			65	55	505	205	57	52	12	12	12	12	27	87	1101
PLUMAS CO FCWCD	M&I ENT=WT010	FR	36	36	36	120	150	180	180	150	120	96	48	48	1200
*** TOTAL ***			36	36	36	120	150	180	180	150	120	96	48	48	1200
YUBA CITY	M&I ENT=WT010	FR	0	0	0	0	0	400	800	800	500	200	0	0	2700
*** TOTAL ***			0	0	0	0	0	400	800	800	500	200	0	0	2700
NAPA CO FCWCD	M&I ENT=WT010	3NB	636	432	491	706	912	980	980	980	867	768	715	668	9135
*** TOTAL ***			636	432	491	706	912	980	980	980	867	768	715	668	9135
SOLANO CO WA	M&I ENT=WT010	1NB	535	610	610	1025	1165	1225	1230	1230	1225	1055	665	575	11150
SOLANO CO WA	VAL PMT =WT071	1NB	0	0	0	40	240	255	500	500	350	255	220	0	2360
SOLANO CO WA	BEN ENT =WT046	3NA	955	750	970	1125	1215	1110	1290	1275	1215	1180	1095	950	13130
SOLANO CO WA	VAL ENT =WT047	3NA	300	300	300	330	330	340	340	330	330	300	300	300	3800
SOLANO CO WA	VAL PMT =WT071	3NA	900	900	900	1435	1435	1435	1435	1435	1435	1435	1435	747	14927
*** TOTAL ***			2690	2560	2780	3955	4385	4365	4795	4770	4555	4225	3715	2572	45367
ZONE-7 ALAMEDA	M&I ENT=WT010	1SB	19	20	22	37	57	64	67	69	64	53	24	19	515
ZONE-7 ALAMEDA	M&I ENT=WT010	2SB	0	0	0	673	979	1100	1142	1142	977	808	579	500	7900
ZONE-7 ALAMEDA	CYOVMENT=WT077	4SB	1176	0	0	0	0	0	0	0	0	0	0	0	1176
ZONE-7 ALAMEDA	M GW ENT=WT008	4SB	0	597	595	595	595	595	595	595	595	1198	1193	1176	8329
ZONE-7 ALAMEDA	AGR ENT=WT001	4SB	49	80	250	374	435	458	489	439	368	305	259	95	3601
ZONE-7 ALAMEDA	LOCAL =WT024	4SB	0	579	595	604	605	386	305	403	605	0	0	0	4082
ZONE-7 ALAMEDA	AGR ENT=WT001	5SB	24	24	32	40	48	48	48	48	48	48	40	24	472
ZONE-7 ALAMEDA	LOCAL =WT024	5SB	180	180	180	180	180	180	180	180	180	180	180	180	2160
ZONE-7 ALAMEDA	CYOVMENT=WT077	6SB	1375	0	0	0	0	0	0	0	0	0	0	0	1375
ZONE-7 ALAMEDA	M&I ENT=WT010	6SB	97	1417	1594	1346	1957	2199	2373	2333	1955	1615	1158	999	19043
ZONE-7 ALAMEDA	AGR ENT=WT001	6SB	0	0	0	10	25	35	35	25	5	5	0	0	140
*** TOTAL ***			2920	2897	3268	3859	4881	5065	5234	5234	4797	4212	3433	2993	48793
ALAMEDA CO WD	M GW ENT=WT008	7SB	0	0	0	2554	2517	2495	2517	2517	2495	2455	32	0	17582
ALAMEDA CO WD	M&I ENT=WT010	8SB	2074	1873	2074	2007	2074	2007	2074	2074	2007	2074	2007	2074	24419
*** TOTAL ***			2074	1873	2074	4561	4591	4502	4591	4591	4502	4529	2039	2074	42001
SANTA CLARA VWD	M&I ENT=WT010	9SB	4400	4200	4400	5470	9200	9580	10460	10260	9600	8030	7100	5300	88000
SANTA CLARA VWD	M GW ENT=WT008	9SB	0	0	1000	2660	1260	1100	540	740	1000	2500	1200	0	12000
*** TOTAL ***			4400	4200	5400	8130	10460	10680	11000	11000	10600	10530	8300	5300	100000
DUDLEY RIDGE WD	AGR ENT=WT001	8D	2800	5800	3000	3400	5700	9600	10000	9800	2400	2200	1500	1500	57700
*** TOTAL ***			2800	5800	3000	3400	5700	9600	10000	9800	2400	2200	1500	1500	57700
EMPIRE WS ID	AGR ENT=WT001	8C	60	90	180	240	300	480	540	540	270	120	90	90	3000
EMPIRE WS ID	12D AGR=WT013	8C	390	160	320	60	0	320	460	460	330	80	260	160	3000
*** TOTAL ***			450	250	500	300	300	800	1000	1000	600	200	350	250	6000

FILE IDENTIFICATION: W199494

FILE DUMP

10/28/93.

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
KERN COUNTY WA	AGR ENT=WT001	9	1200	1200	5680	8800	9200	14750	21300	19900	5260	2840	3340	4500	97970
KERN COUNTY WA	M&I ENT=WT010	10A	100	100	100	150	150	150	150	150	150	100	100	100	1500
KERN COUNTY WA	AGR ENT=WT001	10A	3248	9947	13809	22095	29492	47535	54923	51075	11588	5309	3309	4198	256528
KERN COUNTY WA	X82 ORD=WT051	10A	0	8699	8307	0	0	0	0	0	3100	2000	1000	1000	24106
KERN COUNTY WA	M&I ENT=WT010	11B	1258	1258	1258	1258	1258	1258	1258	1258	1258	1258	1258	1162	15000
KERN COUNTY WA	AGR ENT=WT001	11B	2660	5320	10640	10640	13300	21280	31920	26600	5320	2660	1330	1426	133096
KERN COUNTY WA	M&I ENT=WT010	12E	2110	1990	2300	2490	3010	3220	3500	3450	2920	2610	2000	2110	31710
KERN COUNTY WA	M GW ENT=WT008	12E	450	900	1600	500	6243	15028	15368	17206	5925	5940	6320	6410	81890
KERN COUNTY WA	AGR ENT=WT001	12E	2990	13490	9900	20076	30000	31200	30950	32100	25200	13640	13640	12170	235356
KERN COUNTY WA	12D AGR=WT013	12E	15000	20000	22900	9000	0	0	0	0	4000	8000	8000	5000	91900
KERN COUNTY WA	78MWD 30=WT016	12E	0	0	0	0	0	0	0	0	2047	6500	6500	6500	21547
KERN COUNTY WA	X82 ORD=WT051	12E	0	0	0	0	0	0	0	0	1239	5000	5000	5000	16239
KERN COUNTY WA	X82 MWD=WT052	12E	0	0	0	0	0	0	0	0	323	1000	1000	1000	3323
KERN COUNTY WA	AGR ENT=WT001	13B	0	0	2200	2200	3000	6700	10000	5500	0	0	2000	10150	41750
KERN COUNTY WA	X82 ORD=WT051	13B	0	0	0	0	0	0	0	0	0	0	0	6048	6048
KERN COUNTY WA	M&I ENT=WT010	14A	67	67	67	67	67	67	67	67	67	67	67	63	800
KERN COUNTY WA	AGR ENT=WT001	14A	300	1500	1000	1500	1800	3500	4500	4500	1000	300	200	800	20900
KERN COUNTY WA	AGR ENT=WT001	14B	1000	8500	2900	2400	4400	9800	12200	11400	3000	1400	1200	2400	60600
KERN COUNTY WA	AGR ENT=WT001	14C	500	6000	2000	1300	2300	4500	5600	4700	1500	700	500	1300	30900
KERN COUNTY WA	AGR ENT=WT001	15A	300	1500	700	3400	4800	7400	7700	4200	3700	2200	2200	2300	40400
KERN COUNTY WA	M&I ENT=WT010	16A	0	0	0	219	457	657	679	679	1001	8	0	0	3700
KERN COUNTY WA	AGR ENT=WT001	16A	200	1000	0	1519	2553	3657	3671	2779	1613	908	300	600	18800
KERN COUNTY WA	AGR ENT=WT001	31A	4000	4000	4000	6000	11000	15000	15000	9000	5500	4600	2600	1800	82500
KERN COUNTY WA	12D AGR=WT013	31A	0	0	0	0	0	3100	5000	0	0	0	0	0	8100
*** TOTAL ***			35383	85471	89361	93614	123030	188802	223786	194564	85711	67040	61864	76037	1324663
COUNTY OF KINGS	AGR ENT=WT001	8C	400	400	400	400	0	400	400	400	400	400	0	400	4000
COUNTY OF KINGS	12D AGR=WT013	8C	400	400	400	400	100	400	400	400	400	400	100	400	4200
*** TOTAL ***			800	800	800	800	100	800	800	800	800	800	100	800	8200
OAK FLAT WD	AGR ENT=WT001	2A	64	171	342	456	627	1026	1026	1026	513	228	171	50	5700
OAK FLAT WD	12D AGR=WT013	2A	250	250	0	0	0	0	0	0	0	0	0	0	500
*** TOTAL ***			314	421	342	456	627	1026	1026	1026	513	228	171	50	6200
TULARE LK BWSD	AGR ENT=WT001	8C	1240	2190	1030	1030	1060	8970	10710	9360	630	1360	3830	6000	47410
TULARE LK BWSD	12D AGR=WT013	8C	1200	1536	1316	1096	1644	4060	4388	3292	988	768	1644	1768	23700
TULARE LK BWSD	WETAWTHR=WT007	8C	1644	2092	1792	1492	3240	5528	3026	4480	1344	1044	4190	2393	32265
TULARE LK BWSD	AGR SUR=WT004	8C	500	500	100	100	2000	0	0	400	200	300	300	1300	5700
TULARE LK BWSD	AGR ENT=WT001	8D	1860	3280	1550	1550	1590	13460	16060	14040	940	2040	5750	8970	71090
TULARE LK BWSD	12D AGR=WT013	8D	1812	2304	1974	1644	2466	6090	6582	4938	1482	1152	2466	2640	35550
TULARE LK BWSD	WETAWTHR=WT007	8D	2466	3138	2688	2238	4860	8292	4539	6720	2016	1566	6285	3589	48397
TULARE LK BWSD	AGR SUR=WT004	8D	800	800	100	200	2900	0	0	700	300	400	700	1800	8700
*** TOTAL ***			11522	15840	10550	9350	19760	46400	45305	43930	7900	8630	25165	28460	272812
AVEK WA	M&I ENT=WT010	18A	12	12	12	12	12	12	12	12	12	12	12	12	144
AVEK WA	AGR ENT=WT001	19	5	5	27	42	65	90	105	120	117	65	51	21	713
AVEK WA	M&I ENT=WT010	19C	405	390	435	560	670	875	950	1005	785	545	560	430	7610
AVEK WA	AGR ENT=WT001	19C	11	141	576	968	1008	1376	1562	1202	971	635	181	26	8657
AVEK WA	M&I ENT=WT010	20A	1200	1450	1710	1950	2735	3425	4495	5265	3275	2775	2415	1560	32255
AVEK WA	AGR ENT=WT001	20A	0	0	9	12	16	20	20	20	15	10	8	8	138
AVEK WA	M&I ENT=WT010	20B	35	35	60	65	80	85	100	130	130	125	70	50	965
AVEK WA	M&I ENT=WT010	22A	185	150	330	290	355	550	620	700	485	455	395	285	4800

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
AVEK WA	AGR ENT=WT001	22A	0	0	0	60	110	100	135	135	60	20	0	0	620
*** TOTAL ***			1853	2183	3159	3959	5051	6533	7999	8589	5850	4642	3692	2392	55902
CASTAIC LAKE WA	M&I ENT=WT010	30	1524	1413	1865	1998	2279	2472	2633	2656	2555	2229	1649	1827	25100
CASTAIC LAKE WA	AGR ENT=WT001	31A	254	381	762	1016	1270	2032	2286	2286	1143	508	381	381	12700
CASTAIC LAKE WA	12D AGR=WT013	31A	762	686	762	190	0	0	419	343	0	0	0	648	3810
CASTAIC LAKE WA	AGR SUR=WT004	31A	698	628	698	175	0	0	384	314	0	0	0	593	3490
*** TOTAL ***			3238	3108	4087	3379	3549	4504	5722	5599	3698	2737	2030	3449	45100
COACHELLA VALLY	M&I ENT=WT010	26A	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	23100
*** TOTAL ***			1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	23100
CRESTLINE-LA WA	M&I ENT=WT010	24	150	165	152	96	128	138	206	215	197	170	171	162	1950
*** TOTAL ***			150	165	152	96	128	138	206	215	197	170	171	162	1950
DESERT WA	M GW ENT=WT008	26A	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	38100
*** TOTAL ***			3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	38100
LITTLEROCK CR	M&I ENT=WT010	21	60	60	130	150	200	240	280	280	240	150	80	60	1930
LITTLEROCK CR	AGR ENT=WT001	21	0	0	30	40	50	60	60	60	40	30	0	0	370
*** TOTAL ***			60	60	160	190	250	300	340	340	280	180	80	60	2300
METROPOLITAN WD	M&I ENT=WT010	26A	19780	9940	7580	26700	34660	33700	49540	49540	41500	33620	26500	21620	354680
METROPOLITAN WD	M GW ENT=WT008	26A	22320	7560	22320	14400	7440	7200	11160	11160	10800	33480	32400	33480	213720
METROPOLITAN WD	M&I ENT=WT010	28H	6000	6000	10000	11000	10000	10000	14100	14100	13700	10000	10000	10000	124900
METROPOLITAN WD	BYPS ENT=WT059	28H	26200	23900	20000	22200	22200	25400	22500	22500	21700	22200	21000	22200	272000
METROPOLITAN WD	M&I ENT=WT010	28J	400	400	400	400	400	5400	10400	10400	5400	400	400	400	34800
METROPOLITAN WD	M&I ENT=WT010	30	75300	86800	96800	93700	75300	77800	85300	80300	72800	96800	83700	86800	1011400
*** TOTAL ***			150000	134600	157100	168400	150000	159500	193000	188000	165900	196500	174000	174500	2011500
MOJAVE WA	M GW ENT=WT008	24	4225	4235	4235	4235	4235	4235	4235	4235	4235	4235	4235	4225	50800
*** TOTAL ***			4225	4235	4235	4235	4235	4235	4235	4235	4235	4235	4235	4225	50800
PALMDALE WD	M&I ENT=WT010	20B	500	1000	1600	1600	1800	1800	1800	1800	1500	550	600	510	15060
*** TOTAL ***			500	1000	1600	1600	1800	1800	1800	1800	1500	550	600	510	15060
SAN BERNARDINO	M&I ENT=WT010	26A	0	0	0	1000	1000	1500	2000	2000	2000	1500	1000	0	12000
SAN BERNARDINO	M GW ENT=WT008	26A	1000	1000	1000	2000	2000	2000	2000	2000	2000	1000	1000	1000	18000
*** TOTAL ***			1000	1000	1000	3000	3000	3500	4000	4000	4000	2500	2000	1000	30000
SAN GABRIEL	M GW ENT=WT008	26A	0	0	0	2000	2000	2000	2000	2000	2000	2000	2000	0	16000
*** TOTAL ***			0	0	0	2000	2000	2000	2000	2000	2000	2000	2000	0	16000
VENTURA CO FCD	M GW ENT=WT008	29H	2000	0	0	0	0	0	0	0	0	0	1000	2000	5000
*** TOTAL ***			2000	0	0	0	0	0	0	0	0	0	1000	2000	5000

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100%


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COUNTY OF BUTTE TOTAL =     800
            TOT  ENT =     800  M&I  ENT =     800
--------------------------------
PLUMAS CO FCWCD TOTAL =    1250
            TOT  ENT =    1250  M&I  ENT =    1250
--------------------------------
YUBA CITY       TOTAL =    3450
            TOT  ENT =    3450  M&I  ENT =    3450
--------------------------------
NAPA CO FCWCD   TOTAL =    9780
            TOT  ENT =    9780  M&I  ENT =    9780
--------------------------------
SOLANO CO WA    TOTAL =   45640
            TOT  ENT =   34240  M&I  ENT =   17800  BEN ENT =   13540  VAL ENT =    2900
            TOT MISC =   11400  VAL PMT =   11400
--------------------------------
ZONE-7 ALAMEDA  TOTAL =   49932
            TOT  ENT =   42000  M&I  ENT =   25605  M GW ENT =   11350  AGR  ENT =    5045
            TOT MISC =    7932  GEN WLNG =     667  LOCAL    =    7265
--------------------------------
ALAMEDA CO WD   TOTAL =   42000
            TOT  ENT =   42000  M&I  ENT =   22624  M GW ENT =   19376
--------------------------------
SANTA CLARA VWD TOTAL =  100000
            TOT  ENT =  100000  M&I  ENT =   88000  M GW ENT =   12000
--------------------------------
DUDLEY RIDGE WD TOTAL =   59800
            TOT  ENT =   59800  AGR  ENT =   57700  CYOV ENT =    2100
--------------------------------
EMPIRE WS ID    TOTAL =   6430
            TOT  ENT =    6430  AGR  ENT =    3000  12D  AGR =    2560  CYOV ENT =     870
--------------------------------
KERN COUNTY WA  TOTAL = 1247400
            TOT  ENT = 1247400  M&I  ENT =   52910  M GW ENT =   81690  AGR  ENT = 1018800  12D  AGR =   94000
--------------------------------
COUNTY OF KINGS TOTAL =   8000
            TOT  ENT =    8000  AGR  ENT =    4000  12D  AGR =    4000
--------------------------------
OAK FLAT WD     TOTAL =   5700
            TOT  ENT =    5700  AGR  ENT =    5700
--------------------------------
TULARE LK BWSD  TOTAL =  300812
            TOT  ENT =  258412  AGR  ENT =  118500  12D  AGR =   59250  WETAWTHR =   80662
            TOT  SUR =   42400  AGR  SUR =   42400
--------------------------------
AVEK WA         TOTAL =  138390
            TOT  ENT =  138390  M&I  ENT =  126590  AGR  ENT =   11800
```

STATE OF CALIFORNIA
THE RESOURCES AGENCY

ANNUAL SUMMARY BY AGENCY, WATER TYPE
YEAR 1995

DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT ANALYSIS OFFICE

FILE ID: V1995.95

CASTAIC LAKE WA	TOTAL =	47998							
	TOT ENT =	44508	M&I ENT =	27998	AGR ENT =	12700	12D AGR =	3810	
	TOT SUR =	3490	AGR SUR =	3490					
COACHELLA VALLY	TOTAL =	23100							
	TOT ENT =	23100	M&I ENT =	23100					
CRESTLINE-LA WA	TOTAL =	1950							
	TOT ENT =	1950	M&I ENT =	1950					
DESERT WA	TOTAL =	38100							
	TOT ENT =	38100	M GW ENT =	38100					
LITTLEROCK CR	TOTAL =	2300							
	TOT ENT =	2300	M&I ENT =	1930	AGR ENT =	370			
METROPOLITAN WD	TOTAL =	2011500							
	TOT ENT =	2011500	M&I ENT =	1525780	M GW ENT =	213720	BYPS ENT =	272000	
MOJAVE WA	TOTAL =	50800							
	TOT ENT =	50800	M GW ENT =	50800					
PALMDALE WD	TOTAL =	15560							
	TOT ENT =	15560	M&I ENT =	15560					
SAN BERNARDINO	TOTAL =	54000							
	TOT ENT =	54000	M&I ENT =	34000	M GW ENT =	20000			
SAN GABRIEL	TOTAL =	10000							
	TOT ENT =	10000	M GW ENT =	10000					
VENTURA CO FCD	TOTAL =	20000							
	TOT ENT =	20000	M&I ENT =	15000	M GW ENT =	5000			
JG BOSWELL	TOTAL =	14170							
	TOT MISC =	14170	REPAYMNT =	14170					
FISH & GAME	TOTAL =	1200							
	TOT MISC =	1200	REC/F&WL =	1200					
PARKS & RECREAT	TOTAL =	189							
	TOT MISC =	189	REC/F&WL =	189					
REC/FISH&WILDLF	TOTAL =	7460							
	TOT MISC =	7460	REC/F&WL =	7460					
FRESNO COUNTY	TOTAL =	3000							
	TOT MISC =	3000	CVC WLNG =	3000					

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AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
COUNTY OF BUTTE	M&I ENT=WT010	FR	35	45	110	310	64	64	24	24	24	24	34	42	800
	*** TOTAL ***		35	45	110	310	64	64	24	24	24	24	34	42	800
PLUMAS CO FCWCD	M&I ENT=WT010	FR	45	50	60	125	140	150	150	150	150	100	65	65	1250
	*** TOTAL ***		45	50	60	125	140	150	150	150	150	100	65	65	1250
YUBA CITY	M&I ENT=WT010	FR	0	0	0	0	0	500	1000	1000	500	450	0	0	3450
	*** TOTAL ***		0	0	0	0	0	500	1000	1000	500	450	0	0	3450
NAPA CO FCWCD	M&I ENT=WT010	3NB	699	494	556	773	958	1031	1031	1031	944	790	730	743	9780
	*** TOTAL ***		699	494	556	773	958	1031	1031	1031	944	790	730	743	9780
SOLANO CO WA	M&I ENT=WT010	1NB	450	450	475	1525	1950	1950	1950	1950	1950	1950	1650	1550	17800
SOLANO CO WA	VAL PMT =WT071	1NB	0	0	0	0	0	25	25	25	25	0	0	0	100
SOLANO CO WA	BEN ENT =WT046	3NA	845	950	990	1140	1235	1235	1310	1300	1235	1205	1205	890	13540
SOLANO CO WA	VAL ENT =WT047	3NA	0	0	0	0	0	500	500	500	500	500	400	0	2900
SOLANO CO WA	VAL PMT =WT071	3NA	900	900	900	900	1000	1000	1000	1000	1000	900	900	900	11300
	*** TOTAL ***		2195	2300	2365	3565	4185	4710	4785	4775	4710	4555	4155	3340	45640
ZONE-7 ALAMEDA	M&I ENT=WT010	1SB	3	2	10	20	34	41	44	46	39	28	9	4	280
ZONE-7 ALAMEDA	M&I ENT=WT010	2SB	488	474	545	698	1077	1140	1140	1140	1093	861	610	510	9776
ZONE-7 ALAMEDA	M GW ENT=WT008	4SB	200	49	230	1040	1140	1130	1170	1170	1170	1170	1130	871	10470
ZONE-7 ALAMEDA	AGR ENT=WT001	4SB	114	135	338	438	568	602	643	580	409	310	231	97	4465
ZONE-7 ALAMEDA	LOCAL =WT024	4SB	430	371	480	0	0	0	0	0	0	0	0	99	1380
ZONE-7 ALAMEDA	M GW ENT=WT008	5SB	0	0	0	0	0	80	180	180	180	180	80	0	880
ZONE-7 ALAMEDA	AGR ENT=WT001	5SB	12	12	22	52	52	52	52	52	46	51	45	12	460
ZONE-7 ALAMEDA	LOCAL =WT024	5SB	180	180	180	180	180	100	0	0	0	0	100	180	1260
ZONE-7 ALAMEDA	GEN WLNG=WT079	6SB	0	0	71	90	112	115	122	102	44	11	0	0	667
ZONE-7 ALAMEDA	M&I ENT=WT010	6SB	0	0	0	686	2021	2433	2652	2684	2141	1711	1221	0	15549
ZONE-7 ALAMEDA	AGR ENT=WT001	6SB	0	0	0	5	15	35	35	25	5	0	0	0	120
ZONE-7 ALAMEDA	LOCAL =WT024	6SB	977	948	1019	620	20	0	0	0	0	0	0	1021	4605
	*** TOTAL ***		2404	2171	2895	3829	5219	5728	6038	5979	5127	4322	3426	2794	49932
ALAMEDA CO WD	M GW ENT=WT008	7SB	1228	1109	1228	1782	1841	2079	2148	2148	2079	1841	972	921	19376
ALAMEDA CO WD	M&I ENT=WT010	8SB	1332	1203	1691	2007	2074	2007	2074	2074	2007	2074	2007	2074	22624
	*** TOTAL ***		2560	2312	2919	3789	3915	4086	4222	4222	4086	3915	2979	2995	42000
SANTA CLARA VWD	M&I ENT=WT010	9SB	4400	4200	4400	5470	9200	9580	10460	10260	9600	8030	7100	5300	88000
SANTA CLARA VWD	M GW ENT=WT008	9SB	0	0	1000	2660	1260	1100	540	740	1000	2500	1200	0	12000
	*** TOTAL ***		4400	4200	5400	8130	10460	10680	11000	11000	10600	10530	8300	5300	100000
SAN LUIS OBISPO	M&I ENT=WT010	33A	0	0	0	0	0	0	0	0	0	0	0	0	0
SAN LUIS OBISPO	M&I ENT=WT010	34	0	0	0	0	0	0	0	0	0	0	0	0	0
	*** TOTAL ***		0	0	0	0	0	0	0	0	0	0	0	0	0
DUDLEY RIDGE WD	AGR ENT=WT001	8D	1690	6350	1960	1520	2760	11700	11980	11700	2860	2000	1240	1940	57700
DUDLEY RIDGE WD	CYOV ENT=WT069	8D	310	850	940	0	0	0	0	0	0	0	0	0	2100

FILE IDENTIFICATION: V199595

AGENCY	WATER TYPE		RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
*** TOTAL ***				2000	7200	2900	1520	2760	11700	11980	11700	2860	2000	1240	1940	59800
EMPIRE WS ID	AGR	ENT=WT001	8C	60	90	180	240	300	480	540	540	270	120	90	90	3000
EMPIRE WS ID	12D	AGR=WT013	8C	0	0	360	0	0	400	400	400	300	100	300	300	2560
EMPIRE WS ID	CYOV	ENT=WT069	8C	400	470	0	0	0	0	0	0	0	0	0	0	870
*** TOTAL ***				460	560	540	240	300	880	940	940	570	220	390	390	6430
KERN COUNTY WA	AGR	ENT=WT001	9	1200	1200	5680	8800	9200	14750	21300	19900	5260	2840	3340	4500	97970
KERN COUNTY WA	M&I	ENT=WT010	10A	100	100	100	150	150	150	150	150	150	100	100	100	1500
KERN COUNTY WA	AGR	ENT=WT001	10A	3248	9947	13609	22095	29592	47735	55473	50575	11038	5309	3309	4198	256128
KERN COUNTY WA	M&I	ENT=WT010	11B	1258	1258	1258	1258	1258	1258	1258	1258	1258	1258	1258	1162	15000
KERN COUNTY WA	AGR	ENT=WT001	11B	2660	5320	10640	10640	13300	21280	31920	26600	5320	2660	1330	1426	133096
KERN COUNTY WA	M&I	ENT=WT010	12E	2110	1990	2300	2490	3010	3220	3500	3450	2920	2610	2000	2110	31710
KERN COUNTY WA	M GW	ENT=WT008	12E	250	300	500	500	3200	9185	9025	10635	5225	5940	6320	6410	57490
KERN COUNTY WA	AGR	ENT=WT001	12E	1320	11420	10220	17921	24920	32525	34425	27120	20120	15920	14220	12625	222756
KERN COUNTY WA	12D	AGR=WT013	12E	15000	15000	21900	9000	0	0	0	0	4000	8000	8000	5000	85900
KERN COUNTY WA	M GW	ENT=WT008	13B	0	1000	0	0	2000	8000	8000	4000	1200	0	0	0	24200
KERN COUNTY WA	AGR	ENT=WT001	13B	0	0	1750	2200	3500	10700	13500	8000	0	0	2000	9600	51250
KERN COUNTY WA	M&I	ENT=WT010	14A	67	67	67	67	67	67	67	67	67	67	67	63	800
KERN COUNTY WA	AGR	ENT=WT001	14A	200	700	2100	2000	1000	4100	6000	4400	700	400	100	600	22300
KERN COUNTY WA	AGR	ENT=WT001	14B	2300	4600	8200	4500	3600	12000	14600	12900	3400	2000	1500	2800	72400
KERN COUNTY WA	AGR	ENT=WT001	14C	700	1300	1800	2400	2500	5200	6200	5700	1700	800	1100	1700	31100
KERN COUNTY WA	M&I	ENT=WT010	15A	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	AGR	ENT=WT001	15A	600	1200	1700	3000	800	5500	6300	3600	2100	3100	500	1000	29400
KERN COUNTY WA	M&I	ENT=WT010	16A	0	0	0	0	219	457	657	679	679	1001	208	0	3900
KERN COUNTY WA	AGR	ENT=WT001	16A	300	100	300	819	1653	2857	3479	1979	813	700	100	300	13400
KERN COUNTY WA	AGR	ENT=WT001	31A	5000	4000	4000	7000	11000	16300	17000	9000	5500	4600	2600	3000	89000
KERN COUNTY WA	12D	AGR=WT013	31A	0	0	0	0	0	3100	5000	0	0	0	0	0	8100
*** TOTAL ***				36313	59502	86124	95059	111207	198584	237876	190013	71772	56512	47844	56594	1247400
COUNTY OF KINGS	AGR	ENT=WT001	8C	400	400	400	0	400	400	400	400	0	400	400	400	4000
COUNTY OF KINGS	12D	AGR=WT013	8C	400	400	400	400	0	400	400	400	400	0	400	400	4000
*** TOTAL ***				800	800	800	400	400	800	800	800	400	400	800	800	8000
OAK FLAT WD	AGR	ENT=WT001	2A	114	171	342	456	570	912	1026	1026	513	228	171	171	5700
*** TOTAL ***				114	171	342	456	570	912	1026	1026	513	228	171	171	5700
TULARE LK BWSD	AGR	ENT=WT001	8C	320	320	600	1920	1240	9200	10440	9800	80	80	6680	6720	47400
TULARE LK BWSD	12D	AGR=WT013	8C	160	160	300	960	620	4600	4121	4481	1139	459	3340	3360	23700
TULARE LK BWSD	WETAWTHR	=WT007	8C	4320	3520	4440	3520	3200	600	200	840	1960	4000	840	4825	32265
TULARE LK BWSD	AGR	SUR=WT004	8C	0	0	0	280	40	3720	4280	3920	0	0	2640	2080	16960
TULARE LK BWSD	AGR	ENT=WT001	8D	480	480	900	2880	1860	13800	15660	14700	120	120	10020	10080	71100
TULARE LK BWSD	12D	AGR=WT013	8D	240	240	450	1440	930	6900	6182	6722	1708	688	5010	5040	35550
TULARE LK BWSD	WETAWTHR	=WT007	8D	6480	5280	6660	5280	4800	900	300	1260	2940	6000	1260	7237	48397
TULARE LK BWSD	AGR	SUR=WT004	8D	0	0	0	420	60	5580	6420	5880	0	0	3960	3120	25440
*** TOTAL ***				12000	10000	13350	16700	12750	45300	47603	47603	7947	11347	33750	42462	300812
AVEK WA	M&I	ENT=WT010	18A	12	12	12	12	12	12	12	12	12	12	12	12	144
AVEK WA	AGR	ENT=WT001	19C	12	142	779	1371	1209	1480	2065	1405	973	635	181	26	10278
AVEK WA	M&I	ENT=WT010	20A	950	925	1700	2750	3130	3200	4500	3720	3640	3650	2300	1000	31465

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
LETTER 21	*** TOTAL ***		12000	10000	13350	16700	12750	45300	47603	47603	7947	11347	33750	42462	300812
AVEK WA	M&I ENT=WT010	18A	12	12	12	12	12	12	12	12	12	12	12	12	144
AVEK WA	AGR ENT=WT001	19C	12	142	779	1371	1209	1480	2065	1405	973	635	181	26	10278
AVEK WA	M&I ENT=WT010	20A	950	925	1700	2750	3130	3200	4500	3720	3640	3650	2300	1000	31465
AVEK WA	AGR ENT=WT001	20A	8	8	9	12	16	20	20	20	15	10	8	8	154
AVEK WA	M&I ENT=WT010	20B	0	0	0	0	0	0	0	0	0	0	0	0	0
AVEK WA	M&I ENT=WT010	22A	90	90	200	435	450	465	670	480	450	450	240	120	4140
AVEK WA	AGR ENT=WT001	22A	5	5	10	60	110	100	135	135	60	20	10	5	655
	*** TOTAL ***		11600	11600	11600	11500	11500	11500	11500	11500	11500	11500	11490	11600	138390
CASTAIC LAKE WA	M&I ENT=WT010	30	1700	1576	2080	2229	2542	2758	2937	2962	2850	2486	1840	2038	27998
CASTAIC LAKE WA	AGR ENT=WT001	31A	254	381	762	1016	1270	2032	2286	2286	1143	508	381	381	12700
CASTAIC LAKE WA	12D AGR=WT013	31A	762	686	762	190	0	0	419	343	0	0	0	648	3810
CASTAIC LAKE WA	AGR SUR=WT004	31A	698	628	698	175	0	0	384	314	0	0	0	593	3490
	*** TOTAL ***		3414	3271	4302	3610	3812	4790	6026	5905	3993	2994	2221	3660	47998
COACHELLA VALLY	M&I ENT=WT010	26A	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	23100
	*** TOTAL ***		1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	23100
CRESTLINE-LA WA	M&I ENT=WT010	24	150	165	152	96	128	138	206	215	197	170	171	162	1950
	*** TOTAL ***		150	165	152	96	128	138	206	215	197	170	171	162	1950
DESERT WA	M GW ENT=WT008	26A	6505	5876	6505	6296	6505	6296	117	0	0	0	0	0	38100
	*** TOTAL ***		6505	5876	6505	6296	6505	6296	117	0	0	0	0	0	38100
LITTLEROCK CR	M&I ENT=WT010	21	60	60	130	150	200	240	280	280	240	150	80	60	1930
LITTLEROCK CR	AGR ENT=WT001	21	0	0	30	40	50	60	60	60	40	30	0	0	370
	*** TOTAL ***		60	60	160	190	250	300	340	340	280	180	80	60	2300
METROPOLITAN WD	M&I ENT=WT010	26A	16450	7239	4250	23370	31539	30579	52598	52715	44675	36795	29675	24795	354680
METROPOLITAN WD	M GW ENT=WT008	26A	22320	7560	22320	14400	7440	7200	11160	11160	10800	33480	32400	33480	213720
METROPOLITAN WD	M&I ENT=WT010	28H	6000	6000	10000	11000	10000	10000	14100	14100	13700	10000	10000	10000	124900
METROPOLITAN WD	BYPS ENT=WT059	28H	26200	23900	20000	22200	22200	25400	22500	22500	21700	22200	21000	22200	272000
METROPOLITAN WD	M&I ENT=WT010	28J	400	400	400	400	400	5400	10400	10400	5400	400	400	400	34800
METROPOLITAN WD	M&I ENT=WT010	30	75300	86800	96800	93700	75300	77800	85300	80300	72800	96800	83700	86800	1011400
	*** TOTAL ***		146670	131899	153770	165070	146879	156379	196058	191175	169075	199675	177175	177675	2011500
MOJAVE WA	M GW ENT=WT008	24	4225	4235	4235	4235	4235	4235	4235	4235	4235	4235	4235	4225	50800
	*** TOTAL ***		4225	4235	4235	4235	4235	4235	4235	4235	4235	4235	4235	4225	50800
PALMDALE WD	M&I ENT=WT010	20B	500	700	1500	1800	1800	1850	2000	2000	1500	600	800	510	15560
	*** TOTAL ***		500	700	1500	1800	1800	1850	2000	2000	1500	600	800	510	15560
SAN BERNARDINO	M&I ENT=WT010	26A	1000	1000	1000	2000	3000	4000	4000	5000	5000	4000	3000	1000	34000
SAN BERNARDINO	M GW ENT=WT008	26A	1000	1000	1000	2000	2000	3000	3000	2000	2000	1000	1000	1000	20000
	*** TOTAL ***		2000	2000	2000	4000	5000	7000	7000	7000	7000	5000	4000	2000	54000
SAN GABRIEL	M GW ENT=WT008	26A	0	0	0	0	1800	1800	1800	1800	1800	1000	0	0	10000

COUNTY OF BUTTE	TOTAL =	800									
	TOT ENT =	800	M&I ENT =	800							
PLUMAS CO FCWCD	TOTAL =	1300									
	TOT ENT =	1300	M&I ENT =	1300							
YUBA CITY	TOTAL =	3150									
	TOT ENT =	3150	M&I ENT =	3150							
NAPA CO FCWCD	TOTAL =	10425									
	TOT ENT =	10425	M&I ENT =	10425							
SOLANO CO WA	TOTAL =	48810									
	TOT ENT =	37800	M&I ENT =	19770	BEN ENT =	13540	EXMCOENT =	4490			
	TOT MISC =	11010	VAL PMT =	11010							
ZONE-7 ALAMEDA	TOTAL =	51667									
	TOT ENT =	44000	M&I ENT =	20461	M GW ENT =	5750	AGR ENT =	5789	EXMCOENT =	12000	
	TOT MISC =	7667	GEN WLNC =	667	LOCAL =	7000					
ALAMEDA CO WD	TOTAL =	42000									
	TOT ENT =	42000	M&I ENT =	25432	M GW ENT =	3468	STOR ENT =	1000	EXMCOENT =	12100	
SANTA CLARA VWD	TOTAL =	100000									
	TOT ENT =	100000	M&I ENT =	74800	M GW ENT =	10200	EXMCOENT =	15000			
SAN LUIS OBISPO	TOTAL =	25000									
	TOT ENT =	788	M&I ENT =	788							
	TOT MISC =	24212	PURPOOLA =	24212							
SANTA BARBARA	TOTAL =	42986									
	TOT ENT =	3851	M&I ENT =	3851							
	TOT MISC =	39135	PURPOOLA =	39135							
DUDLEY RIDGE WD	TOTAL =	53370									
	TOT ENT =	53370	AGR ENT =	43370	A GW ENT =	10000					
EMPIRE WS ID	TOTAL =	5998									
	TOT ENT =	5998	AGR ENT =	3000	WETAWTHR =	2998					
KERN COUNTY WA	TOTAL =	1271123									
	TOT ENT =	1199860	M&I ENT =	37510	M GW ENT =	82190	AGR ENT =	874360	EXACOENT =	121300	EXMCOENT = 1700
			CARY OVR =	82800							
	TOT MISC =	71263	78MWD 30 =	21547	X82 ORO =	46393	X82 MWD =	3323			
COUNTY OF KINGS	TOTAL =	4000									
	TOT ENT =	4000	AGR ENT =	4000							

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OAK FLAT WD	TOTAL =	5700									
	TOT ENT =	5700	AGR ENT =	5700							
TULARE LK BWSD	TOTAL =	168500									
	TOT ENT =	168500	AGR ENT =	113500	EXACOENT =	5000	CYOV ENT =	50000			
AVEK WA	TOTAL =	140085									
	TOT ENT =	56822	M&I ENT =	44548	AGR ENT =	12274					
	TOT MISC =	83263	TRANSFER =	1685	PURPOOLA =	81578					
CASTAIC LAKE WA	TOTAL =	39800									
	TOT ENT =	39800	M&I ENT =	27100	AGR ENT =	12700					
COACHELLA VALLY	TOTAL =	23100									
	TOT ENT =	23100	M&I ENT =	23100							
CRESTLINE-LA WA	TOTAL =	4150									
	TOT ENT =	4150	M&I ENT =	1950	STOR ENT =	2200					
DESERT WA	TOTAL =	38100									
	TOT ENT =	38100	EXCHMENT =	38100							
LITTLEROCK CR	TOTAL =	2300									
	TOT ENT =	2300	M&I ENT =	1930	AGR ENT =	370					
METROPOLITAN WD	TOTAL =	738800									
	TOT ENT =	738800	M&I ENT =	492800	BYPS ENT =	71000	STOR ENT =	75000	EXMCOENT =	100000	
	TOT MISC =	0	78 EX GW =	21547	X82 GW =	3323	-78EX GW =	-21547	-X82 GW =	-3323	
MOJAVE WA	TOTAL =	20000									
	TOT ENT =	20000	TRANMENT =	1382	M GW ENT =	18618					
PALMDALE WD	TOTAL =	17300									
	TOT ENT =	17300	TRANMENT =	303	M&I ENT =	16997					
SAN BERNARDINO	TOTAL =	27000									
	TOT ENT =	27000	M&I ENT =	17000	M GW ENT =	10000					
SAN GABRIEL	TOTAL =	16000									
	TOT ENT =	16000	M GW ENT =	16000							
VENTURA CO FCD	TOTAL =	10000									
	TOT ENT =	10000	M&I ENT =	5000	M GW ENT =	5000					
FISH & GAME	TOTAL =	1200									
	TOT MISC =	1200	REC/F&WL =	1200							
PARKS & RECREAT	TOTAL =	189									
	TOT MISC =	189	REC/F&WL =	189							

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LETTER 21

AGENCY	WATER TYPE	RUN	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
COUNTY OF BUTTE	M&I ENT=WT010	FR	35	45	110	310	64	64	24	24	24	24	34	42	800
*** TOTAL ***			35	45	110	310	64	64	24	24	24	24	34	42	800
PLUMAS CO FCWCD	M&I ENT=WT010	FR	50	60	60	125	150	150	150	150	150	125	65	65	1300
*** TOTAL ***			50	60	60	125	150	150	150	150	150	125	65	65	1300
YUBA CITY	M&I ENT=WT010	FR	0	0	0	0	0	500	1000	1000	500	150	0	0	3150
*** TOTAL ***			0	0	0	0	0	500	1000	1000	500	150	0	0	3150
NAPA CO FCWCD	M&I ENT=WT010	3NB	735	531	596	822	1006	1083	1083	1083	1019	862	797	808	10425
*** TOTAL ***			735	531	596	822	1006	1083	1083	1083	1019	862	797	808	10425
SOLANO CO WA	M&I ENT=WT010	1NB	335	350	375	2020	2170	2170	2270	2270	2170	2070	2020	1550	19770
SOLANO CO WA	VAL PMT =WT071	1NB	55	40	50	80	30	250	140	120	160	150	40	45	1160
SOLANO CO WA	BEN ENT =WT046	3NA	845	950	990	1140	1235	1235	1310	1300	1235	1205	1205	890	13540
SOLANO CO WA	VAL ENT =WT047	3NA	0	0	0	0	0	0	0	0	0	0	0	0	0
SOLANO CO WA	VAL PMT =WT071	3NA	500	550	600	750	950	1000	1150	1150	1100	1000	550	550	9850
SOLANO CO WA	EXMCOENT=WT116	3A	0	0	0	0	0	0	0	0	0	0	0	4490	4490
*** TOTAL ***			1735	1890	2015	3990	4385	4655	4870	4840	4665	4425	3815	7525	48810
ZONE-7 ALAMEDA	AGR ENT=WT001	1SB	11	14	16	68	94	108	81	83	79	59	16	7	636
ZONE-7 ALAMEDA	M&I ENT=WT010	2SB	343	337	369	568	967	967	967	967	967	828	579	485	8344
ZONE-7 ALAMEDA	—LOCAL =WT024	2SB	121	101	129	94	0	0	0	0	0	0	0	0	445
ZONE-7 ALAMEDA	M GW ENT=WT008	4SB	346	314	346	456	477	460	477	477	477	350	338	356	4874
ZONE-7 ALAMEDA	AGR ENT=WT001	4SB	34	105	124	226	461	478	498	470	178	201	97	29	2901
ZONE-7 ALAMEDA	M GW ENT=WT008	5SB	73	73	73	73	73	73	73	73	73	73	73	73	876
ZONE-7 ALAMEDA	AGR ENT=WT001	5SB	10	10	20	60	70	80	80	80	40	30	10	10	500
ZONE-7 ALAMEDA	GEN WLNG=WT079	6SB	0	0	0	0	0	0	0	0	667	0	0	0	667
ZONE-7 ALAMEDA	M&I ENT=WT010	6SB	0	0	0	0	1323	1730	1992	2404	1613	1657	964	434	12117
ZONE-7 ALAMEDA	AGR ENT=WT001	6SB	15	63	94	164	230	270	300	250	179	109	63	15	1752
ZONE-7 ALAMEDA	—LOCAL =WT024	6SB	1049	995	1128	1526	914	71	9	0	0	0	229	634	6555
ZONE-7 ALAMEDA	EXMCOENT=WT116	3A	0	0	0	0	0	0	0	0	0	0	0	12000	12000
*** TOTAL ***			2002	2012	2299	3235	4609	4237	4477	4804	4273	3307	2369	14043	51667
ALAMEDA CO WD	M GW ENT=WT008	7SB	0	0	0	0	0	716	740	740	716	556	0	0	3468
ALAMEDA CO WD	STOR ENT=WT060	7SB	0	0	0	0	0	0	0	0	0	0	0	1000	1000
ALAMEDA CO WD	M&I ENT=WT010	8SB	2009	1389	2009	2189	2262	2189	2262	2262	2189	2262	2189	2221	25432
ALAMEDA CO WD	EXMCOENT=WT116	3A	0	0	0	0	0	0	0	0	0	0	0	12100	12100
*** TOTAL ***			2009	1389	2009	2189	2262	2905	3002	3002	2905	2818	2189	15321	42000
SANTA CLARA VWD	M&I ENT=WT010	9SB	3740	3570	3740	4649	7820	8143	8891	8721	8160	6825	6035	4506	74800
SANTA CLARA VWD	M GW ENT=WT008	9SB	0	0	850	2261	1071	935	459	629	850	2125	1020	0	10200
SANTA CLARA VWD	EXMCOENT=WT116	3A	0	0	0	0	0	0	0	0	0	0	0	15000	15000
*** TOTAL ***			3740	3570	4590	6910	8891	9078	9350	9350	9010	8950	7055	19506	100000
SAN LUIS OBISPO	PURPOOLA=WT112	3A	0	0	0	0	0	0	0	0	0	0	0	24212	24212
SAN LUIS OBISPO	M&I ENT=WT010	34	0	0	0	0	0	0	0	0	0	0	195	195	390
SAN LUIS OBISPO	M&I ENT=WT010	35	0	0	0	0	0	0	0	0	0	0	199	199	398

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AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
*** TOTAL ***			0	0	0	0	0	0	0	0	0	0	394	24606	25000
SANTA BARBARA	PURPOOLA=WT112	3A	3557	3557	3557	3558	3558	3558	3558	3558	3558	3558	3558	0	39135
SANTA BARBARA	M&I ENT=WT010	35	0	0	0	0	0	0	0	0	0	0	0	3851	3851
*** TOTAL ***			3557	3557	3557	3558	3558	3558	3558	3558	3558	3558	3558	3851	42986
DUDLEY RIDGE WD	AGR ENT=WT001	8D	1800	5000	2000	1000	2800	7200	9200	9000	3000	1000	800	570	43370
DUDLEY RIDGE WD	A GW ENT=WT022	8D	0	0	0	0	0	0	0	0	0	4000	4000	2000	10000
*** TOTAL ***			1800	5000	2000	1000	2800	7200	9200	9000	3000	5000	4800	2570	53370
EMPIRE WS ID	AGR ENT=WT001	8C	60	90	180	240	300	480	540	540	270	120	90	90	3000
EMPIRE WS ID	WETAWTHR=WT007	8C	400	400	400	0	100	500	500	500	198	0	0	0	2998
*** TOTAL ***			460	490	580	240	400	980	1040	1040	468	120	90	90	5998
KERN COUNTY WA	EXACOENT=WT115	3A	0	0	0	0	0	0	0	0	0	0	0	121300	121300
KERN COUNTY WA	EXMCOENT=WT116	3A	0	0	0	0	0	0	0	0	0	0	0	1700	1700
KERN COUNTY WA	AGR ENT=WT001	9	600	1000	1000	9800	10200	15750	21300	19980	7260	3840	3840	5000	99570
KERN COUNTY WA	CARY OVR=WT027	9	3000	3000	5000	0	0	0	0	0	0	0	0	0	11000
KERN COUNTY WA	M&I ENT=WT010	10A	50	50	100	100	100	100	100	100	100	100	50	50	1000
KERN COUNTY WA	AGR ENT=WT001	10A	2898	18996	2666	3345	4342	39735	59173	51175	15088	7859	5359	3158	213794
KERN COUNTY WA	X82 ORO=WT051	10A	0	8699	8307	0	0	0	0	0	3100	2000	1000	1000	24106
KERN COUNTY WA	M&I ENT=WT010	11B	150	150	150	150	150	150	150	150	150	150	150	150	1800
KERN COUNTY WA	AGR ENT=WT001	11B	2660	5320	9640	9640	11800	17280	25120	20600	3485	2660	1330	1426	110961
KERN COUNTY WA	M&I ENT=WT010	12E	2110	1990	2300	2490	3010	3220	3500	3450	2920	2610	2000	2110	31710
KERN COUNTY WA	M GW ENT=WT008	12E	250	300	500	500	1700	11185	11225	13635	5225	5940	6320	6410	63190
KERN COUNTY WA	AGR ENT=WT001	12E	0	0	2250	5776	12500	24660	28760	30560	13620	4859	2000	1700	126685
KERN COUNTY WA	CARY OVR=WT027	12E	15000	15000	15000	0	0	0	0	0	0	0	0	0	45000
KERN COUNTY WA	78MWD 30=WT016	12E	0	0	0	0	0	0	0	0	2047	6500	6500	6500	21547
KERN COUNTY WA	X82 ORO=WT051	12E	0	0	0	0	0	0	0	0	1239	5000	5000	5000	16239
KERN COUNTY WA	X82 MWD=WT052	12E	0	0	0	0	0	0	0	0	323	1000	1000	1000	3323
KERN COUNTY WA	M GW ENT=WT008	13B	0	0	0	0	0	6000	7000	6000	0	0	0	0	19000
KERN COUNTY WA	AGR ENT=WT001	13B	0	1400	1000	2300	4500	18000	15350	10600	0	0	3300	10500	66950
KERN COUNTY WA	X82 ORO=WT051	13B	3800	2000	248	0	0	0	0	0	0	0	0	0	6048
KERN COUNTY WA	M&I ENT=WT010	14A	67	67	67	67	67	67	67	67	67	67	63	0	800
KERN COUNTY WA	AGR ENT=WT001	14A	200	700	2100	2000	1000	4100	6000	4400	700	400	100	600	22300
KERN COUNTY WA	CARY OVR=WT027	14A	200	700	2100	0	0	0	0	0	0	0	0	0	3000
KERN COUNTY WA	AGR ENT=WT001	14B	2300	4600	8200	4500	3600	12000	14600	12900	3200	2000	1500	2700	72100
KERN COUNTY WA	CARY OVR=WT027	14B	2300	4600	8200	0	0	0	0	0	0	0	0	0	15100
KERN COUNTY WA	AGR ENT=WT001	14C	700	1300	1800	2400	2500	5200	6200	5700	1700	800	1100	1700	31100
KERN COUNTY WA	CARY OVR=WT027	14C	700	1300	1800	0	0	0	0	0	0	0	0	0	3800
KERN COUNTY WA	AGR ENT=WT001	15A	600	1200	1700	3000	800	5500	5400	3600	2100	3100	500	1000	28500
KERN COUNTY WA	CARY OVR=WT027	15A	600	1200	900	0	0	0	0	0	0	0	0	0	2700
KERN COUNTY WA	M&I ENT=WT010	16A	0	0	0	200	300	400	400	400	300	200	0	0	2200
KERN COUNTY WA	AGR ENT=WT001	16A	300	100	300	1080	1696	2736	3544	2044	500	700	100	300	13400
KERN COUNTY WA	CARY OVR=WT027	16A	900	700	600	0	0	0	0	0	0	0	0	0	2200
KERN COUNTY WA	M GW ENT=WT008	31A	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	AGR ENT=WT001	31A	5000	4000	4000	7000	11000	16300	17000	9000	5500	4600	2600	3000	89000
*** TOTAL ***			44385	78372	79928	54348	69265	182383	224889	194361	68624	54385	43816	176367	1271123
[illegible]	AGR ENT=WT001	2A	114	171	342	456	570	912	1026	1026	513	228	171	171	5700

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LETTER	COUNTY OF KINGS	AGR	ENT=WT001	8C	400	400	400	0	400	400	400	400	0	400	400	400	4000	
	OAK FLAT WD	AGR	ENT=WT001	2A	114	171	342	456	570	912	1026	1026	513	228	171	171	5700	
	*** TOTAL ***				114	171	342	456	570	912	1026	1026	513	228	171	171	5700	
	TULARE LK BWSD	AGR	ENT=WT001	8C	0	0	0	1000	2800	8400	9600	8400	800	400	6800	7200	45400	
	TULARE LK BWSD	CYOV	ENT=WT069	8C	10000	6000	4000	0	0	0	0	0	0	0	0	0	20000	
	TULARE LK BWSD	EXACO	ENT=WT115	8C	0	0	0	0	0	0	0	0	0	0	0	2000	2000	
	TULARE LK BWSD	AGR	ENT=WT001	8D	0	0	0	1500	4200	12600	14400	12600	1200	600	10200	10800	68100	
	TULARE LK BWSD	CYOV	ENT=WT069	8D	15000	9000	6000	0	0	0	0	0	0	0	0	0	30000	
	TULARE LK BWSD	EXACO	ENT=WT115	8D	0	0	0	0	0	0	0	0	0	0	0	3000	3000	
	*** TOTAL ***				25000	15000	10000	2500	7000	21000	24000	21000	2000	1000	17000	23000	168500	
	AVEK WA		PURPOOLA=WT112	3A	0	0	0	0	0	0	0	0	0	0	0	81578	81578	
	AVEK WA	AGR	ENT=WT001	19	3	3	105	120	140	70	85	95	87	72	31	11	822	
	AVEK WA	M&I	ENT=WT010	19C	473	498	513	608	685	752	830	844	772	629	567	538	7709	
	AVEK WA	AGR	ENT=WT001	19C	10	115	816	1063	1361	1726	1991	1631	1106	263	125	25	10232	
	AVEK WA	TRANSFER	=WT067	19C	18	79	92	108	80	150	205	160	180	140	120	50	1382	
	AVEK WA	M&I	ENT=WT010	20A	1307	1218	1784	2738	3018	3721	4801	4724	4298	2580	1771	1629	33589	
	AVEK WA	AGR	ENT=WT001	20A	9	9	9	10	10	10	11	10	10	10	9	9	116	
	AVEK WA	TRANSFER	=WT067	20A	7	10	12	27	33	42	59	49	34	22	6	2	303	
	AVEK WA	M&I	ENT=WT010	20B	0	0	0	0	0	0	0	0	0	0	0	0	0	
	AVEK WA	AGR	ENT=WT001	22A	115	100	144	278	295	389	539	442	404	233	158	153	3250	
	*** TOTAL ***				1944	2034	3567	5044	5804	7042	8703	8137	6983	4041	2789	83997	140085	
	CASTAIC LAKE WA	M&I	ENT=WT010	30	1645	1526	2014	2157	2461	2669	2843	2867	2759	2406	1780	1973	27100	
	CASTAIC LAKE WA	AGR	ENT=WT001	31A	254	381	762	1016	1270	2032	2286	2286	1143	508	381	381	12700	
	*** TOTAL ***				1899	1907	2776	3173	3731	4701	5129	5153	3902	2914	2161	2354	39800	
	COACHELLA VALLY	M&I	ENT=WT010	26A	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	23100	
	*** TOTAL ***				1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	23100	
	CRESTLINE-LA WA	M&I	ENT=WT010	24	95	61	52	111	152	164	242	253	232	198	200	190	1950	
	CRESTLINE-LA WA	STOR	ENT=WT060	24	0	0	0	0	0	1100	1100	0	0	0	0	0	2200	
	*** TOTAL ***				95	61	52	111	152	1264	1342	253	232	198	200	190	4150	
	DESERT WA		EXCHMENT=WT099	26A	6505	5876	6505	6296	6505	6296	117	0	0	0	0	0	38100	
	*** TOTAL ***				6505	5876	6505	6296	6505	6296	117	0	0	0	0	0	38100	
	LITTLEROCK CR	M&I	ENT=WT010	21	60	60	130	150	200	240	280	280	240	150	80	60	1930	
	LITTLEROCK CR	AGR	ENT=WT001	21	0	0	30	40	50	60	60	60	40	30	0	0	370	
	*** TOTAL ***				60	60	160	190	250	300	340	340	280	180	80	60	2300	
	METROPOLITAN WD		EXMCOENT=WT116	3A	0	0	0	0	0	0	0	0	0	0	0	100000	100000	
	METROPOLITAN WD	STOR	ENT=WT060	10A	0	0	0	0	0	0	0	0	0	0	0	0	0	
	METROPOLITAN WD	M&I	ENT=WT010	26A	500	0	500	10500	25000	25000	25000	28500	14500	9500	3500	3500	146500	
	METROPOLITAN WD	78 EX	GW=WT037	26A	0	0	0	0	21500	27500	26500	0	2047	6500	6500	6500	21547	
	METROPOLITAN WD	-78EX	GW=WT038	26A	0	0	0	0	0	0	0	0	-2047	-6500	-6500	-6500	-21547	
	METROPOLITAN WD	X82	GW=WT054	26A	0	0	0	0	0	0	0	0	323	1000	1000	1000	3323	

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FILE IDENTIFICATION: U199696 — FILE DUMP — 08/26/96. — SHEET 4

AGENCY	WATER TYPE		RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
METROPOLITAN WD	-X82	GW=WT055	26A	0	0	0	0	0	0	0	0	-323	-1000	-1000	-1000	-3323
METROPOLITAN WD	M&I	ENT=WT010	28H	4000	1500	3000	4000	6000	6000	6000	6000	6000	4000	4000	4000	54500
METROPOLITAN WD	BYPS	ENT=WT059	28H	0	0	5000	10000	10000	13000	13000	14000	6000	0	0	0	71000
METROPOLITAN WD	M&I	ENT=WT010	28J	400	400	400	400	400	400	400	400	400	400	400	400	4800
	*** TOTAL ***			11000	8000	10000	23000	20000	20000	29000	29000	26000	36000	37000	38000	287000
MOJAVE WA	TRANMENT	=WT083	19C	15900	9900	16900	47900	82900	91900	99900	77900	52900	49900	44900	145900	738800
MOJAVE WA	M GW ENT	=WT008	24	18	79	92	108	80	150	205	160	180	140	120	50	1382
	*** TOTAL ***			1082	921	1008	1192	1920	1850	795	1040	2120	2360	2380	1950	18618
PALMDALE WD	TRANMENT	=WT083	20A	1100	1000	1100	1300	2000	2000	1000	1200	2300	2500	2500	2000	20000
PALMDALE WD	M&I	ENT=WT010	20B	7	10	12	27	33	42	59	49	34	22	6	2	303
	*** TOTAL ***			1693	1140	1203	1273	1870	1861	1844	1854	1869	1127	723	540	16997
SAN BERNARDINO	M&I	ENT=WT010	26A	1700	1150	1215	1300	1903	1903	1903	1903	1903	1149	729	542	17300
SAN BERNARDINO	M GW	ENT=WT008	26A	500	500	500	1000	1500	2000	2000	2500	2500	2000	1500	500	17000
	*** TOTAL ***			500	500	500	1000	1000	1500	1500	1000	1000	500	500	500	10000
SAN GABRIEL	M GW	ENT=WT008	26A	1000	1000	1000	2000	2500	3500	3500	3500	3500	2500	2000	1000	27000
	*** TOTAL ***			0	0	0	2000	2000	2000	2000	2000	2000	2000	2000	0	16000
SAN GORGONIO	M GW	ENT=WT008	26A	0	0	0	0	0	0	0	0	0	0	0	0	0
	*** TOTAL ***			0	0	0	0	0	0	0	0	0	0	0	0	0
VENTURA CO FCD	M GW	ENT=WT008	29H	2000	0	0	0	0	0	0	0	0	0	0	0	0
VENTURA CO FCD	M&I	ENT=WT010	30	0	0	0	0	0	0	0	0	0	0	0	0	0
	*** TOTAL ***			2000	0	0	0	0	0	0	0	0	0	0	0	0
SHELL CAL PROD.	REPAYMNT	=WT009	11B	0	0	0	0	0	0	0	0	0	1000	2000	5000	8000
	*** TOTAL ***			0	0	0	0	0	0	0	0	0	2500	2500	5000	10000
FISH & GAME	REC/F&WL	=WT002	3	20	20	20	50	50	150	200	200	200	50	20	20	1000
FISH & GAME	REC/F&WL	=WT002	5	0	0	10	30	40	40	40	30	10	0	0	0	200
	*** TOTAL ***			20	20	30	80	90	190	240	230	210	50	20	20	1200
PARKS & RECREAT	REC/F&WL	=WT002	3	3	3	6	8	13	31	31	31	31	18	10	4	189
	*** TOTAL ***			3	3	6	8	13	31	31	31	31	18	10	4	189
REC/FISH&WILDLF	REC/F&WL	=WT002	5SB	34	30	34	33	34	33	34	34	33	34	33	34	400
REC/FISH&WILDLF	REC/F&WL	=WT002	1	5	4	5	4	4	4	4	4	4	4	4	4	50
REC/FISH&WILDLF	REC/F&WL	=WT002	20A	10	10	10	20	20	20	26	24	20	20	10	10	200
REC/FISH&WILDLF	REC/F&WL	=WT002	24	9	9	9	18	18	18	23	22	18	18	9	9	180
REC/FISH&WILDLF	REC/F&WL	=WT002	28J	60	60	60	120	120	120	178	172	120	120	60	60	1250
	*** TOTAL ***			388	383	388	727	728	727	965	926	727	728	386	387	7460
USBR (SAN LUIS)	FEDERAL	=WT015	3A	4800	4200	6400	8600	12400	14600	15200	14600	12600	7600	8500	6500	116000
				10	10	11	26	28	79	102	102	102	31	12	10	523

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COUNTY OF BUTTE TOTAL =	800										
TOT ENT =	800	M&I ENT =	800								
PLUMAS CO FCWCD TOTAL =	1350										
TOT ENT =	1350	M&I ENT =	1350								
YUBA CITY TOTAL =	3700										
TOT ENT =	3700	M&I ENT =	3700								
NAPA CO FCWCD TOTAL =	10425										
TOT ENT =	10425	M&I ENT =	10425								
SOLANO CO WA TOTAL =	40810										
TOT ENT =	32310	M&I ENT =	14000	BEN ENT =	13090	VAL ENT =	2900	EXMCOENT =	2320		
TOT MISC =	8500	VAL PMT =	8500								
ZONE-7 ALAMEDA TOTAL =	53342										
TOT ENT =	45347	M&I ENT =	25369	M GW ENT =	14110	AGR ENT =	5868				
TOT MISC =	7995	GEN WLNG =	667	LOCAL =	7328						
ALAMEDA CO WD TOTAL =	39800										
TOT ENT =	34800	M&I ENT =	27387	M GW ENT =	7413						
TOT MISC =	5000	LOCAL =	5000								
SANTA CLARA VWD TOTAL =	100000										
TOT ENT =	100000	M&I ENT =	26400	M GW ENT =	3600	STOR ENT =	40000	EXMCOENT =	30000		
SAN LUIS OBISPO TOTAL =	5885										
TOT ENT =	3676	M&I ENT =	3676								
TOT MISC =	2209	PURPOOLA =	2209								
SANTA BARBARA TOTAL =	38986										
TOT ENT =	22892	M&I ENT =	22892								
TOT MISC =	16094	PURPOOLA =	16094								
DUDLEY RIDGE WD TOTAL =	53370										
TOT ENT =	53370	AGR ENT =	52370	A GW ENT =	1000						
EMPIRE WS ID TOTAL =	3000										
TOT ENT =	3000	AGR ENT =	3000								
KERN COUNTY WA TOTAL =	1183993										
TOT ENT =	1112730	M&I ENT =	38210	M GW ENT =	83390	AGR ENT =	934830	EXACOENT =	56300		
TOT MISC =	71263	78MWD 30 =	21547	X82 ORC =	46393	X82 MWD =	3323				
COUNTY OF KINGS TOTAL =	4000										
TOT ENT =	4000	AGR ENT =	4000								

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STATE OF CALIFORNIA
THE RESOURCES AGENCY

ANNUAL SUMMARY BY AGENCY, WATER TYPE
YEAR 1997

DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT ANALYSIS OFFICE

FILE ID: T199797

DATE: 09/12/97
PAGE: 2

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OAK FLAT WD       TOTAL =     5700
                  TOT  ENT =     5700  AGR  ENT =     5700
-------------------------------
TULARE LK BWSD    TOTAL =   118500
                  TOT  ENT =   118500  AGR  ENT =   118500
-------------------------------
AVEK WA           TOTAL =   140118
                  TOT  ENT =    60957  M&I  ENT =    44246  AGR  ENT =    16711
                  TOT MISC =    79161  TRANSFER =     3725  PURPOOLA =    75436
-------------------------------
CASTAIC LAKE WA TOTAL =    54200
                  TOT  ENT =    40565  M&I  ENT =    21000  AGR  ENT =    16000  FLEXSTOR =     3565
                  TOT MISC =    13635  PURPOOLA =    13635
-------------------------------
COACHELLA VALLY TOTAL =    23100
                  TOT  ENT =    23100  M&I  ENT =    23100
-------------------------------
CRESTLINE-LA WA TOTAL =     1950
                  TOT  ENT =     1950  M&I  ENT =     1950
-------------------------------
DESERT WA         TOTAL =    38100
                  TOT  ENT =    38100  EXCHMENT =    38100
-------------------------------
LITTLEROCK CR     TOTAL =     2300
                  TOT  ENT =     2300  M&I  ENT =     1930  AGR  ENT =      370
-------------------------------
METROPOLITAN WD TOTAL =  1044100
                  TOT  ENT =  1044100  M&I  ENT =   641014  BYPS ENT =   128086  STOR ENT =    75000  EXMCOENT =   200000
-------------------------------
MOJAVE WA         TOTAL =    14600
                  TOT  ENT =    14600  TRANMENT =     1500  M GW ENT =    13100
-------------------------------
PALMDALE WD       TOTAL =    17300
                  TOT  ENT =    17300  M&I  ENT =    17300
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*** TOTAL ***			35	45	110	315	65	60	25	25	20	20	35	45	800
PLUMAS CO FCWCD	M&I ENT=WT010	FR	65	65	70	125	150	150	150	150	150	125	75	75	1350
*** TOTAL ***			65	65	70	125	150	150	150	150	150	125	75	75	1350
YUBA CITY	M&I ENT=WT010	FR	0	0	0	0	0	500	1000	1200	500	500	0	0	3700
*** TOTAL ***			0	0	0	0	0	500	1000	1200	500	500	0	0	3700
NAPA CO FCWCD	M&I ENT=WT010	3NB	100	99	117	169	163	220	1833	1834	1722	1460	1348	1360	10425
*** TOTAL ***			100	99	117	169	163	220	1833	1834	1722	1460	1348	1360	10425
SOLANO CO WA	M&I ENT=WT010	1NB	450	450	475	1070	1420	1420	1420	1620	1620	1420	1370	1265	14000
SOLANO CO WA	VAL PMT =WT071	1NB	0	0	0	0	0	25	25	25	25	0	0	0	100
SOLANO CO WA	EXMCOENT=WT116	1NB	0	0	0	0	0	0	0	0	0	0	0	1060	1060
SOLANO CO WA	BEN ENT =WT046	3NA	850	850	850	950	950	1300	1430	1400	1250	1250	1160	850	13090
SOLANO CO WA	VAL ENT =WT047	3NA	0	0	0	0	0	500	500	500	500	500	400	0	2900
SOLANO CO WA	VAL PMT =WT071	3NA	900	900	900	900	1000	500	500	500	500	400	500	900	8400
SOLANO CO WA	EXMCOENT=WT116	3NA	0	0	0	0	0	0	0	0	0	0	0	1260	1260
*** TOTAL ***			2200	2200	2225	2920	3370	3745	3875	4045	3895	3570	3430	5335	40810
ZONE-7 ALAMEDA	AGR ENT=WT001	1SB	1	4	6	38	59	76	79	81	77	59	16	2	498
ZONE-7 ALAMEDA	M&I ENT=WT010	2SB	452	437	483	727	1140	1140	1140	1140	1140	1002	698	604	10103
ZONE-7 ALAMEDA	LOCAL =WT024	2SB	89	74	110	55	0	0	0	0	0	0	0	0	328
ZONE-7 ALAMEDA	M GW ENT=WT008	4SB	850	770	850	1120	1170	1130	1170	1170	1170	860	830	860	11950
ZONE-7 ALAMEDA	AGR ENT=WT001	4SB	34	106	124	228	463	482	502	475	181	202	98	29	2924
ZONE-7 ALAMEDA	LOCAL =WT024	4SB	24	10	2	0	0	0	0	0	0	0	0	0	36
ZONE-7 ALAMEDA	M GW ENT=WT008	5SB	180	180	180	180	180	180	180	180	180	180	180	180	2160
ZONE-7 ALAMEDA	AGR ENT=WT001	5SB	10	10	20	60	70	80	80	80	40	30	10	10	500
ZONE-7 ALAMEDA	GEN WLNG=WT079	6SB	0	0	0	0	0	0	0	0	667	0	0	0	667
ZONE-7 ALAMEDA	M&I ENT=WT010	6SB	0	0	0	98	1483	2184	2626	2611	2211	2203	1260	590	15266
ZONE-7 ALAMEDA	AGR ENT=WT001	6SB	15	78	122	188	250	284	314	265	200	137	78	15	1946
ZONE-7 ALAMEDA	LOCAL =WT024	6SB	1146	1086	1255	1620	914	71	9	0	0	0	229	634	6964
*** TOTAL ***			2801	2755	3152	4314	5729	5627	6100	6002	5866	4673	3399	2924	53342
ALAMEDA CO WD	M GW ENT=WT008	7SB	0	0	0	0	0	500	500	500	913	2000	2000	1000	7413
ALAMEDA CO WD	LOCAL =WT024	7SB	0	0	0	0	500	500	500	500	500	500	1000	1000	5000
ALAMEDA CO WD	M&I ENT=WT010	8SB	2326	2101	2326	2251	2326	2251	2326	2326	2251	2326	2251	2326	27387
*** TOTAL ***			2326	2101	2326	2251	2826	3251	3326	3326	3664	4826	5251	4326	39800
SANTA CLARA VWD	M&I ENT=WT010	9SB	1000	1000	2200	2200	2450	3100	3500	3500	3150	1750	1150	1400	26400
SANTA CLARA VWD	M GW ENT=WT008	9SB	0	0	300	350	400	450	550	550	500	300	200	0	3600
SANTA CLARA VWD	STOR ENT=WT060	10A	0	0	0	0	0	20000	20000	0	0	0	0	0	40000
SANTA CLARA VWD	EXMCOENT=WT116	10A	0	0	0	0	0	0	0	0	0	0	0	30000	30000
*** TOTAL ***			1000	1000	2500	2550	2850	23550	24050	4050	3650	2050	1350	31400	100000
SAN LUIS OBISPO	PURPOOLA=WT112	3A	0	0	0	0	0	0	0	0	0	0	0	2209	2209
SAN LUIS OBISPO	M&I ENT=WT010	3A	111	100	120	122	224	225	225	225	225	225	210	293	2305

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FILE IDENTIFICATION: T199797 FILE DUMP 09/12/97. SHEET 2

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
SAN LUIS OBISPO	TRANSFER=WT067	34	0	0	0	0	0	0	0	0	0	0	0	0	0
SAN LUIS OBISPO	M&I ENT=WT010	35	89	82	85	105	114	134	155	155	133	118	106	95	1371
*** TOTAL ***			200	182	205	227	338	359	380	380	358	343	316	2597	5885
SANTA BARBARA	PURPOOLA=WT112	3A	0	0	0	0	0	0	0	0	0	0	0	16094	16094
SANTA BARBARA	M&I ENT=WT010	35	1423	1279	1509	1903	2217	2338	2469	2444	2232	1964	1643	1471	22892
*** TOTAL ***			1423	1279	1509	1903	2217	2338	2469	2444	2232	1964	1643	17565	38986
DUDLEY RIDGE WD	AGR ENT=WT001	8D	1900	2300	2200	3300	4200	9700	12500	10800	1900	1700	1300	570	52370
DUDLEY RIDGE WD	A GW ENT=WT022	8D	0	0	0	0	0	0	0	0	0	0	0	1000	1000
*** TOTAL ***			1900	2300	2200	3300	4200	9700	12500	10800	1900	1700	1300	1570	53370
EMPIRE WS ID	AGR ENT=WT001	8C	60	90	180	240	300	480	540	540	270	120	90	90	3000
*** TOTAL ***			60	90	180	240	300	480	540	540	270	120	90	90	3000
KERN COUNTY WA	EXACOENT=WT115	3A	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	EXMCOENT=WT116	3A	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	AGR ENT=WT001	9	700	700	5600	10400	12500	19640	26000	20860	6900	3800	3800	3910	114810
KERN COUNTY WA	EXACOENT=WT115	9	0	0	0	0	0	0	0	0	0	0	0	45000	45000
KERN COUNTY WA	M&I ENT=WT010	10A	25	25	50	50	50	50	50	50	50	50	25	25	500
KERN COUNTY WA	AGR ENT=WT001	10A	1950	6100	13600	14800	16100	40350	60000	53000	17800	9400	6250	1550	240900
KERN COUNTY WA	X82 ORC=WT051	10A	0	0	6205	5812	5813	6276	0	0	0	0	0	0	24106
KERN COUNTY WA	M&I ENT=WT010	11B	167	167	167	167	167	167	167	166	166	166	166	167	2000
KERN COUNTY WA	AGR ENT=WT001	11B	1267	2533	10453	10453	13067	24946	31360	26133	5227	2613	1307	1306	130665
KERN COUNTY WA	M&I ENT=WT010	12E	2110	1990	2300	2490	3010	3220	3500	3450	2920	2610	2000	2110	31710
KERN COUNTY WA	M GW ENT=WT008	12E	0	0	0	0	2800	14685	13025	15035	5225	5940	7320	7360	71390
KERN COUNTY WA	AGR ENT=WT001	12E	0	0	0	3000	10300	32000	33500	24300	3346	1000	1000	1209	109655
KERN COUNTY WA	78MWD 30=WT016	12E	0	0	0	0	0	0	0	0	2047	6500	6500	6500	21547
KERN COUNTY WA	X82 ORC=WT051	12E	0	0	0	0	0	0	0	0	1239	5000	5000	5000	16239
KERN COUNTY WA	X82 MWD=WT052	12E	0	0	0	0	0	0	0	0	323	1000	1000	1000	3323
KERN COUNTY WA	EXACOENT=WT115	12E	0	0	0	0	0	0	0	0	0	0	0	10000	10000
KERN COUNTY WA	M GW ENT=WT008	13B	0	0	0	0	0	0	0	0	0	0	0	12000	12000
KERN COUNTY WA	AGR ENT=WT001	13B	0	0	2000	1000	5000	10100	9800	8900	300	200	2500	2000	41800
KERN COUNTY WA	X82 ORC=WT051	13B	3800	2000	248	0	0	0	0	0	0	0	0	0	6048
KERN COUNTY WA	M&I ENT=WT010	14A	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	AGR ENT=WT001	14A	500	750	2000	2400	2300	5600	7850	4700	1500	300	200	300	28400
KERN COUNTY WA	AGR ENT=WT001	14B	1700	2000	7600	5400	7500	16000	21300	13000	2700	2000	1300	2200	82700
KERN COUNTY WA	AGR ENT=WT001	14C	750	1250	1800	3000	4300	6700	9500	5600	2300	1100	700	1000	38000
KERN COUNTY WA	AGR ENT=WT001	15A	400	800	2500	2500	4900	6400	7500	4900	2500	3000	2300	2000	40700
KERN COUNTY WA	M&I ENT=WT010	16A	0	0	0	480	496	480	744	744	424	480	152	0	4000
KERN COUNTY WA	AGR ENT=WT001	16A	150	200	600	1680	2496	2836	4094	2544	1500	1100	500	500	18200
KERN COUNTY WA	EXACOENT=WT115	16A	0	0	0	0	0	0	0	0	0	0	0	1300	1300
KERN COUNTY WA	M GW ENT=WT008	31A	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	AGR ENT=WT001	31A	960	960	5500	6500	11000	17500	19000	12580	6500	4000	2500	2000	89000
*** TOTAL ***			14479	19475	60623	71132	102799	209950	251390	199962	62967	50259	44520	96437	1183993
TULARE LK BWSD	AGR ENT=WT001	8C	0	0	648	2836	1416	8880	9124	8880	1184	1012	5872	7548	47400
TULARE LK BWSD	AGR ENT=WT001	8D	0	0	972	4254	2124	13320	13686	13320	1776	1518	8808	11322	71100
*** TOTAL ***			0	0	1620	7090	3540	22200	22810	22200	2960	2530	14680	18870	118500
AVEK WA	PURPOOLA=WT112	3A	0	0	0	0	0	0	0	0	0	0	0	0	0
AVEK WA	AGR ENT=WT001	10													

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KERN COUNTY WA	AGR ENT=WT001	31A	960	960	5500	6500	11000	17500	19000	12580	6500	4000	2500	2000	89000		
LETTER 21																	
*** TOTAL ***			14479	19475	60623	71132	102799	209950	251390	199962	62967	50259	44520	96437	1183993		
COUNTY OF KINGS	AGR ENT=WT001	8C	0	0	400	400	400	400	400	400	400	400	400	400	4000		
*** TOTAL ***			114	171	342	456	570	912	1026	912	912	912	912	912	9120		
TULARE LK BWSD	AGR ENT=WT001	8C	0	0	648	2836	1416	8880	9124	8880	1184	1012	5872	7548	47400		
TULARE LK BWSD	AGR ENT=WT001	8D	0	0	972	4254	2124	13320	13686	13320	1776	1518	8808	11322	71100		
*** TOTAL ***			0	0	1620	7090	3540	22200	22810	22200	2960	2530	14680	18870	118500		
AVEK WA	PURPOOLA=WT112	3A	0	0	0	0	0	0	0	0	0	0	75436	75436			
AVEK WA	AGR ENT=WT001	19	3	3	4	123	143	49	89	94	94	65	33	12	712		
AVEK WA	M&I ENT=WT010	19C	430	454	476	595	710	781	869	894	776	639	566	506	7696		
AVEK WA	AGR ENT=WT001	19C	95	312	1360	1407	1541	2646	2623	2350	1808	452	230	20	14844		
AVEK WA	TRANSFER=WT067	19C	120	66	81	313	425	466	472	469	445	400	39	52	3348		
AVEK WA	M&I ENT=WT010	20A	1070	1223	1488	2400	2989	3604	4297	4039	3942	2802	2048	1545	31447		
AVEK WA	AGR ENT=WT001	20A	9	9	9	10	10	10	10	10	10	10	9	9	115		
AVEK WA	TRANSFER=WT067	20A	15	8	16	24	32	55	48	51	50	38	21	19	377		
AVEK WA	M&I ENT=WT010	20B	33	46	49	84	109	137	151	173	76	210	105	79	1252		
AVEK WA	M&I ENT=WT010	22A	121	153	154	302	295	405	556	513	616	366	209	161	3851		
AVEK WA	AGR ENT=WT001	22A	0	10	70	70	150	180	190	220	100	30	20	0	1040		
*** TOTAL ***			1896	2284	3707	5328	6404	8333	9305	8813	7917	5012	3280	77839	140118		
CASTAIC LAKE WA	M&I ENT=WT010	30	1010	1010	1010	1230	1550	2280	3060	3170	2780	1850	1040	1010	21000		
CASTAIC LAKE WA	PURPOOLA=WT112	30	0	0	0	0	0	0	0	0	0	0	0	13635	13635		
CASTAIC LAKE WA	FLEXSTOR=WT117	30	3565	0	0	0	0	0	0	0	0	0	0	0	3565		
CASTAIC LAKE WA	AGR ENT=WT001	31A	1000	1500	1500	1500	1500	1500	2000	2500	500	0	1500	1000	16000		
*** TOTAL ***			5575	2510	2510	2730	3050	3780	5060	5670	3280	1850	2540	15645	54200		
COACHELLA VALLY	M&I ENT=WT010	26A	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	23100		
*** TOTAL ***			1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	23100		
CRESTLINE-LA WA	M&I ENT=WT010	24	95	61	52	111	152	164	242	253	232	198	200	190	1950		
*** TOTAL ***			95	61	52	111	152	164	242	253	232	198	200	190	1950		
DESERT WA	EXCHMENT=WT099	26A	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	38100		
*** TOTAL ***			3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	38100		
LITTLEROCK CR	M&I ENT=WT010	21	60	60	130	150	200	240	280	280	240	150	80	60	1930		
LITTLEROCK CR	AGR ENT=WT001	21	0	0	30	40	50	60	60	60	40	30	0	0	370		
*** TOTAL ***			60	60	160	190	250	300	340	340	280	180	80	60	2300		
METROPOLITAN WD	EXMCOENT=WT116	3A	0	0	0	0	0	0	0	0	0	0	0	200000	200000		
METROPOLITAN WD	STOR ENT=WT060	10A	0	0	0	0	25000	25000	25000	0	0	0	0	0	75000		
METROPOLITAN WD	M&I ENT=WT010	26A	4000	5000	6400	38200	43600	41500	43600	36100	29700	24300	14400	4491	291291		
METROPOLITAN WD	78 EX GW=WT037	26A	0	0	0	0	0	0	0	0	0	0	0	0	0		
METROPOLITAN WD	-78EX GW=WT038	26A	0	0	0	0	0	0	0	0	0	0	0	0	0		
METROPOLITAN WD	X82 GW=WT054	26A	0	0	0	0	0	0	0	0	0	0	0	0	0		
METROPOLITAN WD	-X82 GW=WT055	26A	0	0	0	0	0	0	0	0	0	0	0	0	0		
METROPOLITAN WD	M&I ENT=WT010	28H	4300	3200	4660	4300	6400	8600	8600	9600	7500	6400	5300	5300	74160		
METROPOLITAN WD	BYPS ENT=WT059	28H	0	0	0	19512	17900	19512	20000	20162	19000	4000	4000	4000	128086		
METROPOLITAN WD	M&I ENT=WT010	28J	340	340	340	323	323	323	420	420	420	300	300	300	4149		

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AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
METROPOLITAN WD	M&I ENT=WT010	20	19300	19300	25700	22688	20100	22688	21100	24238	21100	28600	28600	18000	271414
*** TOTAL ***			27940	27840	37100	85023	113323	117623	118720	90520	77720	63600	52600	232091	1044100
MOJAVE WA	TRANMENT=WT083	20A	100	80	85	110	120	170	235	175	160	120	60	85	1500
MOJAVE WA	M GW ENT=WT008	22B	750	1140	1500	1600	1630	600	600	600	600	1530	1500	1050	13100
*** TOTAL ***			850	1220	1585	1710	1750	770	835	775	760	1650	1560	1135	14600
PALMDALE WD	M&I ENT=WT010	20B	1700	1150	1215	1300	1903	1903	1903	1903	1903	1149	729	542	17300
*** TOTAL ***			1700	1150	1215	1300	1903	1903	1903	1903	1903	1149	729	542	17300
SAN BERNARDINO	M&I ENT=WT010	26A	0	0	500	1000	1500	2200	2500	2500	2500	2200	1600	500	17000
SAN BERNARDINO	M GW ENT=WT008	26A	0	0	500	1000	1000	1000	1000	1000	1000	500	500	500	8000
*** TOTAL ***			0	0	1000	2000	2500	3200	3500	3500	3500	2700	2100	1000	25000
SAN GABRIEL	M GW ENT=WT008	26A	0	0	1778	1778	1778	1778	1778	1778	1778	1778	1776	0	16000
SAN GABRIEL	PURPOOLA=WT112	26A	0	0	0	0	0	0	0	0	0	0	0	12800	12800
*** TOTAL ***			0	0	1778	1778	1778	1778	1778	1778	1778	1778	1776	12800	28800
SAN GORGONIO	M GW ENT=WT008	26A	0	0	0	0	0	0	0	0	0	0	0	0	0
*** TOTAL ***			0	0	0	0	0	0	0	0	0	0	0	0	0
VENTURA CO FCD	M GW ENT=WT008	29H	2000	0	0	0	0	0	0	0	0	0	1000	2000	5000
VENTURA CO FCD	M&I ENT=WT010	30	0	0	0	0	0	0	0	0	0	0	2500	2500	5000
*** TOTAL ***			2000	0	0	0	0	0	0	0	0	0	3500	4500	10000
THERMALITO ID	LOCAL =WT024	FR	106	90	94	137	227	321	462	422	309	245	177	90	2680
*** TOTAL ***			106	90	94	137	227	321	462	422	309	245	177	90	2680
SHELL CAL PROD.	REPAYMNT=WT009	11B	0	0	0	0	0	0	0	0	0	0	0	0	0
*** TOTAL ***			0	0	0	0	0	0	0	0	0	0	0	0	0
FISH & GAME	REC/F&WL=WT002	3	20	20	20	50	50	150	200	200	200	50	20	20	1000
FISH & GAME	REC/F&WL=WT002	5	0	0	10	30	40	40	40	30	10	0	0	0	200
*** TOTAL ***			20	20	30	80	90	190	240	230	210	50	20	20	1200
PARKS & RECREAT	REC/F&WL=WT002	3	2	2	3	5	7	6	8	8	8	8	3	2	62
*** TOTAL ***			2	2	3	5	7	6	8	8	8	8	3	2	62
REC/FISH&WILDLF	REC/F&WL=WT002	5SB	34	30	34	33	34	33	34	34	33	34	33	34	400
REC/FISH&WILDLF	REC/F&WL=WT002	1	5	4	5	5	4	4	4	4	4	4	4	4	50
USBR (SAN LUIS)	FEDERAL =WT015	3A	4800	4200	6400	8600	12400	14600	15200	14600	12600	7600	8500	6500	116000
USBR (SAN LUIS)	R/F&WLSL=WT078	3	10	10	11	26	28	79	102	102	102	31	12	10	523
USBR (SAN LUIS)	FEDERAL =WT015	3	500	300	700	1500	2700	4200	6000	5200	3100	1600	500	700	27000
USBR (SAN LUIS)	FEDERAL =WT015	4	10860	6080	12600	14560	18470	33680	37810	29980	6740	5870	11300	25330	217280
USBR (SAN LUIS)	R/F&WLSL=WT078	5	7	4	7	7	7	10	11	11	9	9	4	4	90
USBR (SAN LUIS)	FEDERAL =WT015	5	35310	19770	40960	47310	60020	109450	122880	97450	21890	19070	36720	95330	706160

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LETTER 21

THE RESOURCES AGENCY

STATE WATER PROJECT ANALYSIS OFFICE

FILE ID: S199898

DATE: 10/27/99
PAGE: 1

COUNTY OF BUTTE TOTAL = 400
TOT ENT = 400 M&I ENT = 400

PLUMAS CO FCWCD TOTAL = 700
TOT ENT = 700 M&I ENT = 700

YUBA CITY TOTAL = 1575
TOT ENT = 1575 M&I ENT = 1575

NAPA CO FCWCD TOTAL = 5533
TOT ENT = 5533 M&I ENT = 5533

SOLANO CO WA TOTAL = 30655
TOT ENT = 19355 M&I ENT = 10485 BEN ENT = 7420 VAL ENT = 1450
TOT MISC = 11300 VAL PMT = 11300

ZONE-7 ALAMEDA TOTAL = 38456
TOT ENT = 35845 M&I ENT = 18344 M GW ENT = 720 AGR ENT = 7436 STOR ENT = 7500 CYOVMENT = 941
CYOV ENT = 904
TOT MISC = 2611 LOCAL = 2611

ALAMEDA CO WD TOTAL = 26000
TOT ENT = 21000 M&I ENT = 21000
TOT MISC = 5000 LOCAL = 5000

SANTA CLARA VWD TOTAL = 50000
TOT ENT = 50000 M&I ENT = 50000

SAN LUIS OBISPO TOTAL = 3970
TOT ENT = 3970 TRANMENT = 50 M&I ENT = 2799 14B M&I = 1121

SANTA BARBARA TOTAL = 19493
TOT ENT = 19493 M&I ENT = 19493

DUDLEY RIDGE WD TOTAL = 29885
TOT ENT = 29885 AGR ENT = 26685 A GW ENT = 3200

EMPIRE WS ID TOTAL = 4500
TOT ENT = 4500 AGR ENT = 1500 WETAWTHR = 3000

KERN COUNTY WA TOTAL = 565365
TOT ENT = 565365 M&I ENT = 5650 M GW ENT = 56150 AGR ENT = 482065 CYOV ENT = 21500

COUNTY OF KINGS TOTAL = 2000
TOT ENT = 2000 AGR ENT = 2000

OAK FLAT WD TOTAL = 2850
TOT ENT = 2850 AGR ENT = 2850

LETTER 21

STATE OF CALIFORNIA
THE RESOURCES AGENCY

ANNUAL SUMMARY BY AGENCY, WATER TYPE
YEAR 1998

DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT ANALYSIS OFFICE

FILE ID: SI99898 DATE: 10/27/99
PAGE: 2

TULARE LK BWSD	TOTAL =	59250							
	TOT ENT =	59250	AGR ENT =	59250					
AVEK WA	TOTAL =	35857							
	TOT ENT =	33083	M&I ENT =	22050	AGR ENT =	11033			
	TOT MISC =	2774	TRANSFER =	2774					
CASTAIC LAKE WA	TOTAL =	27100							
	TOT ENT =	27100	M&I ENT =	25300	AGR ENT =	1800			
COACHELLA VALLY	TOTAL =	11550							
	TOT ENT =	11550	M&I ENT =	11550					
CRESTLINE-LA WA	TOTAL =	1950							
	TOT ENT =	1950	M&I ENT =	1950					
DESERT WA	TOTAL =	11550							
	TOT ENT =	11550	EXCHMENT =	11550					
LITTLEROCK CR	TOTAL =	1150							
	TOT ENT =	1150	M&I ENT =	965	AGR ENT =	185			
METROPOLITAN WD	TOTAL =	1197950							
	TOT ENT =	1197950	M&I ENT =	779750	BYPS ENT =	126000	STOR ENT =	75000	EXMCDENT = 200000 14B AGR = 17200
MOJAVE WA	TOTAL =	7500							
	TOT ENT =	7500	TRANMENT =	1500	M GW ENT =	6000			
PALMDALE WD	TOTAL =	9650							
	TOT ENT =	9650	M&I ENT =	9650					
SAN BERNARDINO	TOTAL =	49800							
	TOT ENT =	49800	M&I ENT =	22300	M GW ENT =	27500			
SAN GABRIEL	TOTAL =	14400							
	TOT ENT =	14400	M GW ENT =	14400					
VENTURA CO FCD	TOTAL =	5000							
	TOT ENT =	5000	M&I ENT =	925	M GW ENT =	4075			
FISH & GAME	TOTAL =	1200							
	TOT MISC =	1200	REC/F&WL =	1200					
PARKS & RECREAT	TOTAL =	64							
	TOT MISC =	64	REC/F&WL =	64					
REC/FISH&WILDLF	TOTAL =	7460							
	TOT MISC =	7460	REC/F&WL =	7460					

FILE ID: SI99898

LETTER 21

FILE DUMP

FILE IDENTIFICATION: S199898 10/27/99. SHEET 1

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
COUNTY OF BUTTE	M&I ENT=WT010	FR	18	23	55	158	33	30	13	13	10	10	18	19	400
	*** TOTAL ***		18	23	55	158	33	30	13	13	10	10	18	19	400
PLUMAS CO FCWCD	M&I ENT=WT010	FR	38	38	38	68	75	75	75	75	75	70	38	35	700
	*** TOTAL ***		38	38	38	68	75	75	75	75	75	70	38	35	700
YUBA CITY	M&I ENT=WT010	FR	0	0	0	0	0	250	500	500	250	75	0	0	1575
	*** TOTAL ***		0	0	0	0	0	250	500	500	250	75	0	0	1575
NAPA CO FCWCD	M&I ENT=WT010	3NB	386	283	319	435	526	567	567	567	547	467	433	436	5533
	*** TOTAL ***		386	283	319	435	526	567	567	567	547	467	433	436	5533
SOLANO CO WA	M&I ENT=WT010	1NB	200	200	200	200	1420	1420	1420	1620	1620	1185	500	500	10485
SOLANO CO WA	VAL PMT =WT071	1NB	200	200	200	200	0	25	25	25	25	150	200	200	1450
SOLANO CO WA	BEN ENT =WT046	3NA	420	500	700	700	700	800	800	800	500	500	500	500	7420
SOLANO CO WA	VAL ENT =WT047	3NA	0	0	0	0	0	450	500	500	0	0	0	0	1450
SOLANO CO WA	VAL PMT =WT071	3NA	900	900	900	900	1000	550	500	500	1000	900	900	900	9850
	*** TOTAL ***		1720	1800	2000	2000	3120	3245	3245	3445	3145	2735	2100	2100	30655
ZONE-7 ALAMEDA	M&I ENT=WT010	1SB	0	5	11	25	34	39	43	45	42	35	20	6	305
ZONE-7 ALAMEDA	AGR ENT=WT001	1SB	0	0	0	0	0	0	0	0	0	0	0	0	0
ZONE-7 ALAMEDA	LOCAL =WT024	1SB	1	0	0	0	0	0	0	0	0	0	0	0	1
ZONE-7 ALAMEDA	CYOVMENT=WT077	2SB	490	451	0	0	0	0	0	0	0	0	0	0	941
ZONE-7 ALAMEDA	M&I ENT=WT010	2SB	0	0	0	0	251	559	1140	1140	1135	954	638	530	6347
ZONE-7 ALAMEDA	STOR ENT=WT060	2SB	0	8	551	725	708	511	0	0	0	0	0	0	2503
ZONE-7 ALAMEDA	LOCAL =WT024	2SB	0	0	0	0	0	0	0	0	0	0	0	0	0
ZONE-7 ALAMEDA	M GW ENT=WT008	4SB	0	0	0	0	0	0	0	0	0	0	0	0	0
ZONE-7 ALAMEDA	AGR ENT=WT001	4SB	0	115	455	482	541	606	614	598	563	455	327	89	4845
ZONE-7 ALAMEDA	CYOV ENT=WT069	4SB	64	0	0	0	0	0	0	0	0	0	0	0	64
ZONE-7 ALAMEDA	M GW ENT=WT008	5SB	180	180	180	180	0	0	0	0	0	0	0	0	720
ZONE-7 ALAMEDA	AGR ENT=WT001	5SB	0	40	90	90	90	90	90	90	90	70	40	10	790
ZONE-7 ALAMEDA	CYOV ENT=WT069	5SB	10	0	0	0	0	0	0	0	0	0	0	0	10
ZONE-7 ALAMEDA	GEN WLNG=WT079	6SB	0	0	0	0	0	0	0	0	0	0	0	0	0
ZONE-7 ALAMEDA	M&I ENT=WT010	6SB	0	0	0	330	351	521	2073	2120	2095	1866	1275	1061	11692
ZONE-7 ALAMEDA	AGR ENT=WT001	6SB	0	72	119	175	232	256	281	247	192	144	64	19	1801
ZONE-7 ALAMEDA	STOR ENT=WT060	6SB	0	749	933	1020	1125	1170	0	0	0	0	0	0	4997
ZONE-7 ALAMEDA	CYOV ENT=WT069	6SB	830	0	0	0	0	0	0	0	0	0	0	0	830
ZONE-7 ALAMEDA	LOCAL =WT024	6SB	170	170	170	100	443	453	483	404	175	42	0	0	2610
	*** TOTAL ***		1745	1790	2509	3127	3775	4205	4724	4644	4292	3566	2364	1715	38456
ALAMEDA CO WD	M GW ENT=WT008	7SB	0	0	0	0	0	0	0	0	0	0	0	0	0
ALAMEDA CO WD	LOCAL =WT024	7SB	485	438	485	470	485	470	485	485	470	727	0	0	5000
ALAMEDA CO WD	M&I ENT=WT010	8SB	1664	1503	1664	1611	1664	1611	1664	1664	1611	2138	2069	2137	21000
	*** TOTAL ***		2149	1941	2149	2081	2149	2081	2149	2149	2081	2865	2069	2137	26000
SANTA CLARA VWD	M&I ENT=WT010	9SB	2200	2100	2700	4065	5230	5340	5500	5500	5300	5265	4150	2650	50000
SAN LUIS OBISPO	TRANMENT=WT083	34	0	0	0	0	0	0	0	0	50	0	0	0	50
SAN LUIS OBISPO	M&I ENT=WT010	34	0	0	0	210	266	370	424	429	377	259	247	217	2799
											0	0	0	0	1121

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AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
SANTA CLARA VWD	M&I ENT=WT010	9SB	2200	2100	2700	4065	5230	5340	5500	5500	5300	5265	4150	2650	50000
	*** TOTAL ***		2200	2100	2700	4065	5230	5340	5500	5500	5300	5265	4150	2650	50000
SAN LUIS OBISPO	TRANMENT=WT083	34	0	0	0	0	0	0	0	0	50	0	0	0	50
SAN LUIS OBISPO	M&I ENT=WT010	34	0	0	0	210	266	370	424	429	377	259	247	217	2799
SAN LUIS OBISPO	14B M&I=WT043	34	374	373	374	0	0	0	0	0	0	0	0	0	1121
	*** TOTAL ***		374	373	374	210	266	370	424	429	427	259	247	217	3970
SANTA BARBARA	M&I ENT=WT010	33A	1093	1016	1213	1611	1813	2189	2299	2123	1963	1595	1368	1210	19493
	*** TOTAL ***		1093	1016	1213	1611	1813	2189	2299	2123	1963	1595	1368	1210	19493
DUDLEY RIDGE WD	AGR ENT=WT001	8D	200	1500	1600	1900	2300	4600	5700	5600	1700	800	785	0	26685
DUDLEY RIDGE WD	A GW ENT=WT022	8D	1600	1600	0	0	0	0	0	0	0	0	0	0	3200
	*** TOTAL ***		1800	3100	1600	1900	2300	4600	5700	5600	1700	800	785	0	29885
EMPIRE WS ID	AGR ENT=WT001	8C	400	400	400	0	100	100	100	0	0	0	0	0	1500
EMPIRE WS ID	WETAWTHR=WT007	8C	100	100	100	200	100	500	500	500	200	100	300	300	3000
	*** TOTAL ***		500	500	500	200	200	600	600	500	200	100	300	300	4500
KERN COUNTY WA	AGR ENT=WT001	9	610	610	2420	3020	4220	7230	12030	7230	1220	620	620	353	40183
KERN COUNTY WA	CYOV ENT=WT069	9	300	300	2500	0	0	0	0	0	0	0	0	0	3100
KERN COUNTY WA	EXACOENT=WT115	9	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	M&I ENT=WT010	10A	25	25	50	50	50	50	50	50	50	50	25	25	500
KERN COUNTY WA	AGR ENT=WT001	10A	550	700	2200	2600	15050	27000	37300	27300	1100	550	475	297	115122
KERN COUNTY WA	CYOV ENT=WT069	10A	450	950	1000	0	0	0	0	0	0	0	0	0	2400
KERN COUNTY WA	X82 ORO=WT051	10A	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	M&I ENT=WT010	11B	167	167	167	167	167	167	167	166	166	166	166	167	2000
KERN COUNTY WA	AGR ENT=WT001	11B	1267	2533	5067	5067	6333	10133	16200	12667	2533	1266	633	634	64333
KERN COUNTY WA	CYOV ENT=WT069	11B	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	M&I ENT=WT010	12E	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	M GW ENT=WT008	12E	0	0	0	0	2250	15900	18050	14817	3133	1000	500	500	56150
KERN COUNTY WA	AGR ENT=WT001	12E	0	0	0	950	5250	15650	18300	14100	223	0	800	760	56033
KERN COUNTY WA	CYOV ENT=WT069	12E	1000	3000	0	0	0	0	0	0	0	0	0	0	4000
KERN COUNTY WA	78MWD 30=WT016	12E	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	X82 ORO=WT051	12E	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	X82 MWD=WT052	12E	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	EXACOENT=WT115	12E	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	M GW ENT=WT008	13B	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	AGR ENT=WT001	13B	0	0	0	0	1000	6000	7750	5650	0	0	0	0	20400
KERN COUNTY WA	CYOV ENT=WT069	13B	1000	3000	1000	0	0	0	0	0	0	0	0	0	5000
KERN COUNTY WA	X82 ORO=WT051	13B	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	M&I ENT=WT010	14A	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	AGR ENT=WT001	14A	500	750	1000	1200	1150	3640	4290	3055	975	150	100	100	16910
KERN COUNTY WA	CYOV ENT=WT069	14A	300	400	600	0	0	0	0	0	0	0	0	0	1300
KERN COUNTY WA	AGR ENT=WT001	14B	1700	2000	3800	2700	3750	10400	11440	7719	1755	1000	650	650	47564
KERN COUNTY WA	CYOV ENT=WT069	14B	850	1000	1200	0	0	0	0	0	0	0	0	0	3050
KERN COUNTY WA	AGR ENT=WT001	14C	750	1250	900	1500	2150	4355	4875	3640	1495	550	350	350	22165
KERN COUNTY WA	CYOV ENT=WT069	14C	400	500	750	0	0	0	0	0	0	0	0	0	1650
KERN COUNTY WA	AGR ENT=WT001	15A	400	800	1250	1750	2450	4160	4095	3185	1625	1500	1150	1150	23515
KERN COUNTY WA	CYOV ENT=WT069	15A	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	M&I ENT=WT010	16A	0	0	0	725	725	740	558	402	0	0	0	0	3150
KERN COUNTY WA	AGR ENT=WT001	16A	150	200	300	850	1490	1915	2229	1527	1329	550	250	250	11040
KERN COUNTY WA	CYOV ENT=WT069	16A	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	EXACOENT=WT115	16A	0	0	0	0	0	0	0	0	0	0	0	0	0
KERN COUNTY WA	M GW ENT=WT008	31A	0	0	0	0	0	0	0	0	0	0	0	0	0

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AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
KERN COUNTY WA	AGR ENT=WT001	31A	1000	1500	2500	4600	8900	12000	11900	11400	5000	3000	2000	1000	64800
KERN COUNTY WA	CYOV ENT=WT069	31A	1000	0	0	0	0	0	0	0	0	0	0	0	1000
*** TOTAL ***			12419	19685	26704	25179	54935	119340	149234	112908	20604	10402	7719	6236	565365
COUNTY OF KINGS	AGR ENT=WT001	8C	0	0	0	0	0	400	400	400	0	0	400	400	2000
*** TOTAL ***			0	0	0	0	0	400	400	400	0	0	400	400	2000
OAK FLAT WD	AGR ENT=WT001	2A	57	86	171	228	285	456	513	513	257	114	86	84	2850
*** TOTAL ***			57	86	171	228	285	456	513	513	257	114	86	84	2850
TULARE LK BWSD	AGR ENT=WT001	8C	0	0	0	800	560	5080	5800	5760	80	200	1200	4220	23700
TULARE LK BWSD	AGR ENT=WT001	8D	0	0	0	1200	840	7620	8700	8640	120	300	1800	6330	35550
*** TOTAL ***			0	0	0	2000	1400	12700	14500	14400	200	500	3000	10550	59250
AVEK WA	AGR ENT=WT001	19	38	38	52	112	122	80	107	87	120	110	90	57	1013
AVEK WA	M&I ENT=WT010	19C	117	132	171	249	300	367	393	415	355	288	196	157	3140
AVEK WA	AGR ENT=WT001	19C	25	242	870	906	1084	1402	1603	1512	1104	520	95	11	9374
AVEK WA	TRANSFER=WT067	19C	60	23	79	223	318	345	355	352	333	311	90	41	2530
AVEK WA	M&I ENT=WT010	20A	691	538	946	1338	1711	2200	2117	2253	2027	1361	933	805	16920
AVEK WA	AGR ENT=WT001	20A	5	5	5	7	7	7	7	7	7	6	5	5	73
AVEK WA	TRANSFER=WT067	20A	7	9	20	19	24	24	30	35	37	20	10	9	244
AVEK WA	M&I ENT=WT010	20B	0	0	0	0	0	0	0	0	0	0	0	0	0
AVEK WA	M&I ENT=WT010	22A	77	64	109	158	200	279	254	248	263	163	92	83	1990
AVEK WA	AGR ENT=WT001	22A	0	8	56	56	74	64	81	80	77	50	25	2	573
*** TOTAL ***			1020	1059	2308	3068	3840	4768	4947	4989	4323	2829	1536	1170	35857
CASTAIC LAKE WA	M&I ENT=WT010	30	1012	1012	1265	1771	2530	3036	3542	3542	3289	2277	1012	1012	25300
CASTAIC LAKE WA	AGR ENT=WT001	31A	108	162	162	162	162	162	252	270	72	0	162	126	1800
*** TOTAL ***			1120	1174	1427	1933	2692	3198	3794	3812	3361	2277	1174	1138	27100
COACHELLA VALLEY	M&I ENT=WT010	26A	962	962	962	962	962	962	962	962	962	962	962	968	11550
*** TOTAL ***			962	962	962	962	962	962	962	962	962	962	962	968	11550
CRESTLINE-LA WA	M&I ENT=WT010	24	95	61	52	111	152	164	242	253	232	198	200	190	1950
*** TOTAL ***			95	61	52	111	152	164	242	253	232	198	200	190	1950
DESERT WA	EXCHMENT=WT099	26A	0	0	0	3850	3850	3850	0	0	0	0	0	0	11550
*** TOTAL ***			0	0	0	3850	3850	3850	0	0	0	0	0	0	11550
LITTLEROCK CR	M&I ENT=WT010	21	30	30	65	75	100	120	140	140	120	75	40	30	965
LITTLEROCK CR	AGR ENT=WT001	21	0	0	15	20	25	30	30	30	20	15	0	0	185
*** TOTAL ***			30	30	80	95	125	150	170	170	140	90	40	30	1150
METROPOLITAN WD	EXMCOENT=WT116	3A	0	0	0	0	0	0	0	0	0	0	0	200000	200000
METROPOLITAN WD	STOR ENT=WT060	10A	0	0	0	0	25000	25000	25000	0	0	0	0	0	75000
METROPOLITAN WD	M&I ENT=WT010	26A	9000	7000	7000	41150	36150	40150	31650	51650	34650	28000	22000	12000	320400

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AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
METROPOLITAN WD	78 EX GW=WT037	26A	0	0	0	0	0	0	0	0	0	0	0	0	0
METROPOLITAN WD	-78EX GW=WT038	26A	0	0	0	0	0	0	0	0	0	0	0	0	0
METROPOLITAN WD	X82 GW=WT054	26A	0	0	0	0	0	0	0	0	0	0	0	0	0
METROPOLITAN WD	-X82 GW=WT055	26A	0	0	0	0	0	0	0	0	0	0	0	0	0
METROPOLITAN WD	M&I ENT=WT010	28H	4000	3000	4000	5000	6000	7000	8000	9000	8000	6000	5000	5000	70000
METROPOLITAN WD	BYPS ENT=WT059	28H	0	0	0	20000	19000	21000	23000	21000	22000	0	0	0	126000
METROPOLITAN WD	M&I ENT=WT010	28J	300	300	300	300	300	300	300	300	300	300	300	300	3600
METROPOLITAN WD	M&I ENT=WT010	30	30000	39000	46000	17200	24000	26000	29500	28050	26000	40000	44000	36000	385750
METROPOLITAN WD	14B AGR=WT014	30	0	0	0	17200	0	0	0	0	0	0	0	0	17200
	*** TOTAL ***		43300	49300	57300	100850	110450	119450	117450	110000	90950	74300	71300	253300	1197950
MOJAVE WA	TRANMENT=WT083	22B	100	80	85	110	120	170	235	175	160	120	60	85	1500
MOJAVE WA	M GW ENT=WT008	22B	325	530	708	745	755	265	233	263	270	705	720	481	6000
	*** TOTAL ***		425	610	793	855	875	435	468	438	430	825	780	566	7500
PALMDALE WD	M&I ENT=WT010	20B	1000	0	0	0	300	600	2903	1903	1100	800	600	444	9650
	*** TOTAL ***		1000	0	0	0	300	600	2903	1903	1100	800	600	444	9650
SAN BERNARDINO	M&I ENT=WT010	26A	500	500	700	1500	2000	2700	3100	3100	3100	2600	1800	700	22300
SAN BERNARDINO	M GW ENT=WT008	26A	500	500	500	1000	4000	5000	5000	5000	4000	1000	500	500	27500
	*** TOTAL ***		1000	1000	1200	2500	6000	7700	8100	8100	7100	3600	2300	1200	49800
SAN GABRIEL	M GW ENT=WT008	26A	0	0	0	2400	2400	2400	2400	2400	2400	0	0	0	14400
SAN GABRIEL	PURPOOLA=WT112	26A	0	0	0	0	0	0	0	0	0	0	0	0	0
	*** TOTAL ***		0	0	0	2400	2400	2400	2400	2400	2400	0	0	0	14400
SAN GORGONIO	M GW ENT=WT008	26A	0	0	0	0	0	0	0	0	0	0	0	0	0
	*** TOTAL ***		0	0	0	0	0	0	0	0	0	0	0	0	0
VENTURA CO FCD	M GW ENT=WT008	29F	0	0	0	0	0	0	0	0	1575	0	0	0	1575
VENTURA CO FCD	M GW ENT=WT008	29H	0	0	0	0	0	0	0	0	0	0	1250	1250	2500
VENTURA CO FCD	M&I ENT=WT010	30	77	77	77	77	77	77	78	77	77	77	77	77	925
	*** TOTAL ***		77	77	77	77	77	77	78	77	1652	77	1327	1327	5000
SHELL CAL PROD.	REPAYMNT=WT009	11B	0	0	0	0	0	0	0	0	0	0	0	0	0
	*** TOTAL ***		0	0	0	0	0	0	0	0	0	0	0	0	0
FISH & GAME	REC/F&WL=WT002	3	20	20	20	50	50	150	200	200	200	50	20	20	1000
FISH & GAME	REC/F&WL=WT002	5	0	0	10	30	40	40	40	30	10	0	0	0	200
	*** TOTAL ***		20	20	30	80	90	190	240	230	210	50	20	20	1200
PARKS & RECREAT	REC/F&WL=WT002	3	2	2	3	4	6	7	8	9	8	8	4	3	64
	*** TOTAL ***		2	2	3	4	6	7	8	9	8	8	4	3	64
REC/FISH&WILDLF	REC/F&WL=WT002	5SB	34	30	34	33	34	33	34	34	33	34	33	34	400
REC/FISH&WILDLF	REC/F&WL=WT002	1	5	4	5	4	4	4	4	4	4	4	4	4	50

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THE RESOURCES AGENCY — STATE WATER PROJECT ANALYSIS OFFICE

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COUNTY OF BUTTE	TOTAL =	2890									
	TOT ENT =	800	M&I ENT =	800							
	TOT MISC =	2090	ANTTRNBK =	2090							
PLUMAS CO FCWCD	TOTAL =	363									
	TOT ENT =	363	M&I ENT =	363							
YUBA CITY	TOTAL =	9600									
	TOT ENT =	2400	M&I ENT =	2400							
	TOT MISC =	7200	ANTTRNBK =	7200							
NAPA CO-FCWCD	TOTAL =	15850									
	TOT ENT =	15850	M&I ENT =	15850							
SOLANO CO WA	TOTAL =	50570									
	TOT ENT =	39170	M&I ENT =	14000	BEN ENT =	15170	VAL ENT =	2900	ANTEXMCO =	7100	
	TOT MISC =	11400	VAL PMT =	11400							
ZONE-7 ALAMEDA	TOTAL =	61494									
	TOT ENT =	46000	M&I ENT =	22508	M GW ENT =	8242	AGR ENT =	6580	STOR ENT =	8670	
	TOT MISC =	15494	GEN WLNG =	1000	LOCAL =	14494					
ALAMEDA CO WD	TOTAL =	48000									
	TOT ENT =	42000	M&I ENT =	30763	M GW ENT =	3737	STOR ENT =	7500			
	TOT MISC =	6000	LOCAL =	6000							
SANTA CLARA VWD	TOTAL =	100000									
	TOT ENT =	100000	M&I ENT =	60750	M GW ENT =	9250	STOR ENT =	10000	ANTEXMCO =	20000	
SAN LUIS OBISPO	TOTAL =	25000									
	TOT ENT =	7126	M&I ENT =	7126							
	TOT MISC =	17874	ANTTRNBK =	17874							
SANTA BARBARA	TOTAL =	45486									
	TOT ENT =	31115	M&I ENT =	31115							
	TOT MISC =	14371	ANTTRNBK =	14371							
DUDLEY RIDGE WD	TOTAL =	53370									
	TOT ENT =	53370	AGR ENT =	51370	A GW ENT =	2000					
EMPIRE WS ID	TOTAL =	6000									
	TOT ENT =	6000	AGR ENT =	3000	WETAWTHR =	3000					
KERN COUNTY WA	TOTAL =	1184730									
	TOT ENT =	1184730	M&I ENT =	6900	M GW ENT =	112700	AGR ENT =	965130	EXCHMENT =	2000	EXACDENT = 97000
			ANTEXACO =	1000							
COUNTY OF KINGS	TOTAL =	5000									
	TOT ENT =	5000	AGR ENT =	4000	CYOV ENT =	1000					

STATE OF CALIFORNIA
THE RESOURCES AGENCY

ANNUAL SUMMARY BY AGENCY, WATER TYPE
YEAR 1999

DEPARTMENT OF WATER RESOURCES
STATE WATER PROJECT ANALYSIS OFFICE

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OAK FLAT WD	TOTAL =	6150							
	TOT ENT =	6150	AGR ENT =	5700	CYOV ENT =	450			
TULARE LK BWSD	TOTAL =	162500							
	TOT ENT =	162500	AGR ENT =	118500	CYOV ENT =	44000			
AVEK WA	TOTAL =	141900							
	TOT ENT =	72918	M&I ENT =	47718	AGR ENT =	25200			
	TOT MISC =	68982	TRANSFER =	1500	EXCHANGE =	2000	ANTTRNBK =	65482	
CASTAIC LAKE WA	TOTAL =	54200							
	TOT ENT =	37700	M&I ENT =	25000	AGR ENT =	12700			
	TOT MISC =	16500	ANTTRNBK =	16500					
COACHELLA VALLY	TOTAL =	23100							
	TOT ENT =	23100	M&I ENT =	23100					
CRESTLINE-LA WA	TOTAL =	5800							
	TOT ENT =	1950	M&I ENT =	1950					
	TOT MISC =	3850	ANTTRNBK =	3850					
DESERT WA	TOTAL =	38100							
	TOT ENT =	38100	M GW ENT =	38100					
LITTLEROCK CR	TOTAL =	2300							
	TOT ENT =	2300	M&I ENT =	1930	AGR ENT =	370			
METROPOLITAN WD	TOTAL =	1380000							
	TOT ENT =	1380000	M&I ENT =	592978	BYPS ENT =	233022	STOR ENT =	154000	EXMCOENT = 200000 ANTEXMCO = 200000
MOJAVE WA	TOTAL =	20000							
	TOT ENT =	20000	TRANMENT =	1500	M GW ENT =	18500			
PALMDALE WD	TOTAL =	22300							
	TOT ENT =	22300	M&I ENT =	12300	EXMCOENT =	5000	ANTEXMCO =	5000	
SAN BERNARDINO	TOTAL =	102600							
	TOT ENT =	102600	M&I ENT =	39600	M GW ENT =	63000			
SAN GABRIEL	TOTAL =	28800							
	TOT ENT =	18000	M GW ENT =	18000					
	TOT MISC =	10800	ANTTRNBK =	10800					
VENTURA CO FCD	TOTAL =	2050							
	TOT ENT =	2050	M&I ENT =	1850	M GW ENT =	200			
FISH & GAME	TOTAL =	1200							
	TOT MISC =	1200	REC/F&WL =	1200					

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
COUNTY OF BUTTE	M&I ENT=WT010	FR	35	45	110	315	65	60	25	25	20	20	35	45	800
COUNTY OF BUTTE	ANTTRNBK=WT133	FR	172	173	172	173	172	173	172	172	173	172	173	193	2090
	*** TOTAL ***		207	218	282	488	237	233	197	197	193	192	208	238	2890
PLUMAS CO FCWCD	M&I ENT=WT010	FR	10	10	10	10	10	67	75	75	66	10	10	10	363
	*** TOTAL ***		10	10	10	10	10	67	75	75	66	10	10	10	363
YUBA CITY	M&I ENT=WT010	FR	0	0	0	0	0	300	900	900	300	0	0	0	2400
YUBA CITY	ANTTRNBK=WT133	FR	600	600	600	600	600	600	600	600	600	600	600	600	7200
	*** TOTAL ***		600	600	600	600	600	900	1500	1500	900	600	600	600	9600
NAPA CO FCWCD	M&I ENT=WT010	3NB	900	940	1200	1235	1490	1630	1605	1755	1605	1440	1080	970	15850
	*** TOTAL ***		900	940	1200	1235	1490	1630	1605	1755	1605	1440	1080	970	15850
SOLANO CO WA	M&I ENT=WT010	1NB	450	450	475	1070	1420	1420	1420	1620	1620	1420	1370	1265	14000
SOLANO CO WA	VAL PMT =WT071	1NB	0	0	0	0	0	25	25	25	25	0	0	0	100
SOLANO CO WA	ANTEXMCO=WT131	1NB	592	592	592	592	592	592	592	592	592	592	592	588	7100
SOLANO CO WA	BEN ENT =WT046	3NA	955	955	970	1225	1380	1560	1660	1660	1315	1300	1200	990	15170
SOLANO CO WA	VAL ENT =WT047	3NA	0	0	0	0	0	500	500	500	500	500	400	0	2900
SOLANO CO WA	VAL PMT =WT071	3NA	900	900	900	900	1000	1000	1000	1000	1000	900	900	900	11300
	*** TOTAL ***		2897	2897	2937	3787	4392	5097	5197	5397	5052	4712	4462	3743	50570
ZONE-7 ALAMEDA	M&I ENT=WT010	1SB	3	2	5	13	26	33	37	39	36	27	11	3	235
ZONE-7 ALAMEDA	M&I ENT=WT010	2SB	0	0	0	70	834	1211	1456	1455	1252	1044	688	434	8444
ZONE-7 ALAMEDA	LOCAL =WT024	2SB	526	492	618	740	240	60	0	0	0	0	0	134	2810
ZONE-7 ALAMEDA	M GW ENT=WT008	4SB	0	0	0	1120	1170	1130	1170	1170	1170	232	0	0	7162
ZONE-7 ALAMEDA	AGR ENT=WT001	4SB	37	145	227	360	586	612	611	590	333	302	146	37	3986
ZONE-7 ALAMEDA	LOCAL =WT024	4SB	850	770	850	0	0	0	0	0	0	0	0	0	2470
ZONE-7 ALAMEDA	M GW ENT=WT008	5SB	0	0	0	180	180	180	180	180	180	0	0	0	1080
ZONE-7 ALAMEDA	AGR ENT=WT001	5SB	10	10	30	70	100	110	140	120	90	60	40	20	800
ZONE-7 ALAMEDA	LOCAL =WT024	5SB	180	180	180	0	0	0	0	0	0	0	0	0	540
ZONE-7 ALAMEDA	M&I ENT=WT010	6SB	1002	900	1120	0	0	0	2191	2900	2503	2077	1136	0	13829
ZONE-7 ALAMEDA	AGR ENT=WT001	6SB	10	56	99	171	234	276	302	262	186	126	62	10	1794
ZONE-7 ALAMEDA	LOCAL =WT024	6SB	49	84	115	1620	2149	2541	720	10	0	10	240	1136	8674
ZONE-7 ALAMEDA	GEN WLNG=WT079	10A	0	500	500	0	0	0	0	0	0	0	0	0	1000
ZONE-7 ALAMEDA	STOR ENT=WT060	10A	0	0	0	0	0	0	0	8670	0	0	0	0	8670
	*** TOTAL ***		2667	3139	3744	4344	5519	6153	6807	15396	5750	3878	2323	1774	61494
ALAMEDA CO WD	M GW ENT=WT008	7SB	0	0	0	0	237	750	750	750	750	500	0	0	3737
ALAMEDA CO WD	LOCAL =WT024	7SB	0	0	0	0	0	1500	1500	1500	1500	0	0	0	6000
ALAMEDA CO WD	M&I ENT=WT010	8SB	2613	2360	2613	2528	2613	2528	2613	2613	2528	2613	2528	2613	30763
ALAMEDA CO WD	STOR ENT=WT060	10A	0	0	0	0	0	0	3750	3750	0	0	0	0	7500
	*** TOTAL ***		2613	2360	2613	2528	2850	4778	8613	8613	4778	3113	2528	2613	48000
SANTA CLARA VWD	M&I ENT=WT010	9SB	1750	1700	1800	4500	5000	6000	8000	8000	8000	7000	5000	4000	60750
SANTA CLARA VWD	M GW ENT=WT008	9SB	0	0	900	1000	1200	1200	1200	1200	1000	1000	550	0	9250
SANTA CLARA VWD	ANTEXMCO=WT131	9SB	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	1663	20000
SANTA CLARA VWD	STOR ENT=WT060	10A	0	0	0	0	0	10000	0	0	0	0	0	0	10000
	*** TOTAL ***		3417	3367	4367	7167	7867	18867	10867	10867	10667	9667	7217	5663	100000

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AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
SANTA CLARA VWD	ANTEXMCO=WT131	9SB	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	1667	1663	20000
SANTA CLARA VWD	STOR ENT=WT060	10A	0	0	0	0	0	10000	0	0	0	0	0	0	10000
SAN LUIS OBISPO	M&I ENT=WT010	33A	474	418	484	544	622	692	772	796	690	613	545	476	7126
SAN LUIS OBISPO	ANTTRNBK=WT133	33A	1490	1490	1490	1490	1490	1490	1490	1490	1490	1490	1490	1484	17874
	*** TOTAL ***		1964	1908	1974	2034	2112	2182	2262	2286	2180	2103	2035	1960	25000
SANTA BARBARA	M&I ENT=WT010	33A	1965	1794	2133	2548	3083	3139	3283	3232	2962	2643	2272	2061	31115
SANTA BARBARA	ANTTRNBK=WT133	33A	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1198	1193	14371
	*** TOTAL ***		3163	2992	3331	3746	4281	4337	4481	4430	4160	3841	3470	3254	45486
DUDLEY RIDGE WD	AGR ENT=WT001	8D	400	3000	3100	3600	4400	8800	10900	10700	3300	1500	1600	70	51370
DUDLEY RIDGE WD	A GW ENT=WT022	8D	0	0	0	0	0	0	0	0	0	0	0	2000	2000
	*** TOTAL ***		400	3000	3100	3600	4400	8800	10900	10700	3300	1500	1600	2070	53370
EMPIRE WS ID	AGR ENT=WT001	8C	60	90	180	240	300	480	540	540	270	120	90	90	3000
EMPIRE WS ID	WETAWTHR=WT007	8C	400	400	400	0	100	500	500	500	200	0	0	0	3000
	*** TOTAL ***		460	490	580	240	400	980	1040	1040	470	120	90	90	6000
KERN COUNTY WA	AGR ENT=WT001	9	600	600	4800	7200	9000	14400	20400	14400	2400	1200	2400	2766	80166
KERN COUNTY WA	M&I ENT=WT010	10A	25	25	50	50	50	50	50	50	50	50	25	25	500
KERN COUNTY WA	AGR ENT=WT001	10A	3950	6750	11400	18500	42500	58500	65700	56100	24700	16100	5416	2994	312610
KERN COUNTY WA	M&I ENT=WT010	11B	167	167	167	167	167	167	167	166	166	166	166	167	2000
KERN COUNTY WA	AGR ENT=WT001	11B	2610	5220	10440	10440	13052	20881	31322	26102	5221	2610	1305	1305	130508
KERN COUNTY WA	M GW ENT=WT008	12E	500	1000	0	0	6250	24900	28400	21385	5225	7500	4500	1040	100700
KERN COUNTY WA	AGR ENT=WT001	12E	500	2000	0	2000	8000	28000	30700	24600	4446	3000	3700	0	106946
KERN COUNTY WA	EXACOENT=WT115	12E	15000	32000	50000	0	0	0	0	0	0	0	0	0	97000
KERN COUNTY WA	ANTEXACO=WT132	12E	83	83	83	83	83	83	83	83	83	83	83	87	1000
KERN COUNTY WA	M GW ENT=WT008	13B	0	0	0	0	1000	3000	4000	4000	0	0	0	0	12000
KERN COUNTY WA	AGR ENT=WT001	13B	0	0	2000	1000	5000	8800	9800	8000	300	200	5000	1700	41800
KERN COUNTY WA	AGR ENT=WT001	14A	500	1600	2700	2200	1500	2500	3000	4200	1000	800	200	100	20300
KERN COUNTY WA	AGR ENT=WT001	14B	1500	7500	7000	3700	5000	14100	16500	12500	4000	2000	1100	1000	75900
KERN COUNTY WA	AGR ENT=WT001	14C	700	3200	4000	2100	2600	6700	9600	8800	2500	1500	1000	300	43000
KERN COUNTY WA	AGR ENT=WT001	15A	1000	2000	4500	3600	5000	6000	7800	7200	3500	3000	1700	2200	47500
KERN COUNTY WA	M&I ENT=WT010	16A	0	0	368	960	648	544	744	744	192	200	0	0	4400
KERN COUNTY WA	AGR ENT=WT001	16A	200	200	1000	1080	1596	2036	2444	2744	1000	400	400	300	13400
KERN COUNTY WA	EXCHMENT=WT099	19	0	0	0	200	300	300	300	300	300	300	0	0	2000
KERN COUNTY WA	AGR ENT=WT001	31A	3200	2600	3400	9400	12700	17000	17000	10600	7800	5200	2600	1500	93000
	*** TOTAL ***		30535	64945	101908	62680	114446	207961	248010	201974	62883	44309	29595	15484	1184730
COUNTY OF KINGS	AGR ENT=WT001	8C	0	0	400	400	400	400	400	400	400	400	400	400	4000
COUNTY OF KINGS	CYOV ENT=WT069	8C	400	300	300	0	0	0	0	0	0	0	0	0	1000
	*** TOTAL ***		400	300	700	400	400	400	400	400	400	400	400	400	5000
OAK FLAT WD	AGR ENT=WT001	2A	114	171	342	456	570	912	1026	1026	513	228	171	171	5700
OAK FLAT WD	CYOV ENT=WT069	2A	150	300	0	0	0	0	0	0	0	0	0	0	450
	*** TOTAL ***		264	471	342	456	570	912	1026	1026	513	228	171	171	6150
TULARE LK BWSD	AGR ENT=WT001	8C	0	0	1440	2680	1640	8440	9680	8880	2600	1040	3600	7400	47400
TULARE LK BWSD	CYOV ENT=WT069	8C	7200	6400	4000	0	0	0	0	0	0	0	0	0	17600
TULARE LK BWSD	AGR ENT=WT001	8D	0	0	2160	4020	2460	12660	14520	13320	3900	1560	5400	11100	71100
TULARE LK BWSD	CYOV ENT=WT069	8D	10800	9600	6000	0	0	0	0	0	0	0	0	0	26400

AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
*** TOTAL ***			18000	16000	13600	6700	4100	21100	24200	22200	6500	2600	9000	18500	162500
AVEK WA	AGR ENT=WT001	19	2	101	201	315	420	450	490	300	190	160	30	5	2664
AVEK WA	TRANSFER=WT067	19	100	80	85	110	120	170	235	175	160	120	60	85	1500
AVEK WA	EXCHANGE=WT093	19	0	0	0	200	300	300	300	300	300	300	0	0	2000
AVEK WA	M&I ENT=WT010	19C	301	332	381	522	648	682	820	898	756	585	459	370	6754
AVEK WA	AGR ENT=WT001	19C	70	430	1781	1986	2511	3179	3773	3697	2761	955	260	40	21443
AVEK WA	M&I ENT=WT010	20A	1216	1472	2514	2795	3658	4629	4325	5002	3638	2723	2084	1378	35434
AVEK WA	AGR ENT=WT001	20A	8	8	8	10	10	10	11	11	10	8	8	8	110
AVEK WA	ANTTRNBK=WT133	20A	5457	5457	5457	5457	5457	5457	5457	5457	5457	5457	5457	5455	65482
AVEK WA	M&I ENT=WT010	20B	43	50	103	101	181	151	193	207	172	107	71	65	1444
AVEK WA	M&I ENT=WT010	22A	127	163	328	343	410	554	510	609	381	290	230	141	4086
AVEK WA	AGR ENT=WT001	22A	0	10	54	73	60	100	176	195	140	130	45	0	983
*** TOTAL ***			7324	8103	10912	11912	13775	15682	16290	16851	13965	10835	8704	7547	141900
CASTAIC LAKE WA	M&I ENT=WT010	30	1000	1000	1250	1750	2500	3000	3500	3500	2250	3250	1000	1000	25000
CASTAIC LAKE WA	ANTTRNBK=WT133	30	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	1375	16500
CASTAIC LAKE WA	AGR ENT=WT001	31A	762	1143	1143	1143	1143	1143	1778	1905	508	0	1143	889	12700
*** TOTAL ***			3137	3518	3768	4268	5018	5518	6653	6780	4133	4625	3518	3264	54200
COACHELLA VALLY	M&I ENT=WT010	26A	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	23100
*** TOTAL ***			1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	23100
CRESTLINE-LA WA	M&I ENT=WT010	24	95	61	52	111	152	164	242	253	232	198	200	190	1950
CRESTLINE-LA WA	ANTTRNBK=WT133	24	321	321	321	321	321	321	321	321	321	321	321	319	3850
*** TOTAL ***			416	382	373	432	473	485	563	574	553	519	521	509	5800
DESERT WA	M GW ENT=WT008	26A	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	38100
*** TOTAL ***			3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	38100
LITTLEROCK CR	M&I ENT=WT010	21	60	60	130	150	200	240	280	280	240	150	80	60	1930
LITTLEROCK CR	AGR ENT=WT001	21	0	0	30	40	50	60	60	60	40	30	0	0	370
*** TOTAL ***			60	60	160	190	250	300	340	340	280	180	80	60	2300
METROPOLITAN WD	STOR ENT=WT060	10A	0	0	9000	9000	9000	9000	9000	9000	0	0	0	0	54000
METROPOLITAN WD	STOR ENT=WT060	12E	0	0	7000	10000	10000	12000	12000	12000	11000	10000	9000	7000	100000
METROPOLITAN WD	M&I ENT=WT010	26A	10609	0	14896	24080	35080	35080	24080	24080	24080	28080	22080	25080	267225
METROPOLITAN WD	EXMCOENT=WT116	26A	50000	50000	50000	50000	0	0	0	0	0	0	0	0	200000
METROPOLITAN WD	ANTEXMCO=WT131	26A	16667	16667	16667	16667	16667	16667	16667	16667	16667	16667	16667	16663	200000
METROPOLITAN WD	M&I ENT=WT010	28H	3069	700	4000	5000	7000	9000	9000	10000	9000	8000	5000	4000	73769
METROPOLITAN WD	BYPS ENT=WT059	28H	22	0	14000	24000	24000	25000	25000	26000	25000	25000	23000	22000	233022
METROPOLITAN WD	M&I ENT=WT010	28J	300	300	300	300	300	300	300	300	300	300	300	300	3600
METROPOLITAN WD	M&I ENT=WT010	30	22080	16846	19846	21846	13846	14846	15846	33846	20846	25846	20846	21844	248384
*** TOTAL ***			102747	84513	135709	160893	115893	121893	111893	131893	106893	113893	96893	96887	1380000
MOJAVE WA	TRANMENT=WT083	19	100	80	85	110	120	170	235	175	160	120	60	85	1500
MOJAVE WA	M GW ENT=WT008	26A	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	1500	18000
PALMDALE WD	M&I ENT=WT010	20A	12	8	16	23	1584	1948	1958	1950	1950	1925	463	463	12300
PALMDALE WD	EXMCOENT=WT116	20A	1500	1500	1000	1000	0	0	0	0	0	0	0	0	5000
PALMDALE WD	ANTEXMCO=WT131	20A	417	417	417	417	417	417	417	417	417	417	417	413	5000

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THE RESOURCES AGENCY — STATE WATER PROJECT ANALYSIS OFFICE

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COUNTY OF BUTTE	TOTAL =	2890											
	TOT ENT =	800	M&I ENT =	800									
	TOT MISC =	2090	ANTTRNBK =	2090									
PLUMAS CO FCWCD	TOTAL =	1510											
	TOT ENT =	1510	M&I ENT =	1510									
YUBA CITY	TOTAL =	9600											
	TOT ENT =	1500	M&I ENT =	1500									
	TOT MISC =	8100	ANTTRNBK =	8100									
NAPA CO FCWCD	TOTAL =	19825											
	TOT ENT =	19825	M&I ENT =	15325	ANTEXMCO =	1000	CYOVMENT =	3500					
SOLANO CO WA	TOTAL =	58120											
	TOT ENT =	46720	M&I ENT =	13600	BEN ENT =	14670	VAL ENT =	2900	EXMCOENT =	7100	ANTEXMCO =	8450	
	TOT MISC =	11400	VAL PMT =	11400									
ZONE-7 ALAMEDA	TOTAL =	77440											
	TOT ENT =	68000	M&I ENT =	22352	M GW ENT =	9367	TRANAENT =	12000	AGR ENT =	5976	STOR ENT =	13000	
			ANTEXMCO =	5305									
	TOT MISC =	9440	GEN WLNG =	1000	LOCAL =	8440							
ALAMEDA CO WD	TOTAL =	44000											
	TOT ENT =	42000	M&I ENT =	29643	M GW ENT =	4857	STOR ENT =	7500					
	TOT MISC =	2000	LOCAL =	2000									
SANTA CLARA VWD	TOTAL =	122000											
	TOT ENT =	122000	M&I ENT =	33000	M GW ENT =	11000	STOR ENT =	20000	EXMCOENT =	22000	ANTEXMCO =	36000	
SAN LUIS OBISPO	TOTAL =	25000											
	TOT ENT =	4068	M&I ENT =	4068									
	TOT MISC =	20932	ANTTRNBK =	20932									
SANTA BARBARA	TOTAL =	45486											
	TOT ENT =	32876	M&I ENT =	32876									
	TOT MISC =	12610	ANTTRNBK =	12610									
DUDLEY RIDGE WD	TOTAL =	56370											
	TOT ENT =	56370	AGR ENT =	48370	EXACOENT =	3000	ANTEXACO =	5000					
EMPIRE WS ID	TOTAL =	6000											
	TOT ENT =	3000	AGR ENT =	3000									
	TOT SUR =	3000	AGR SUR =	3000									
KERN COUNTY WA	TOTAL =	1075580											
	TOT ENT =	1075580	M&I ENT =	6729	M GW ENT =	111849	AGR ENT =	901152	EXACOENT =	54850	ANTEXACO =	1000	

COUNTY OF KINGS TOTAL = 4000
TOT ENT = 4000 AGR ENT = 4000

OAK FLAT WD TOTAL = 6300
TOT ENT = 6300 AGR ENT = 5700 CYOV ENT = 600

TULARE LK BWSD TOTAL = 148500
TOT ENT = 148500 AGR ENT = 118500 CYOV ENT = 30000

AVEK WA TOTAL = 142251
TOT ENT = 68770 M&I ENT = 38816 AGR ENT = 29954
TOT MISC = 73481 TRANSFER = 3851 ANTTRNBK = 69630

CASTAIC LAKE WA TOTAL = 95200
TOT ENT = 36000 M&I ENT = 28000 AGR ENT = 8000
TOT MISC = 59200 ANTTRNBK = 59200

COACHELLA VALLY TOTAL = 23100
TOT ENT = 23100 M&I ENT = 23100

CRESTLINE-LA WA TOTAL = 5800
TOT ENT = 1950 M&I ENT = 1950
TOT MISC = 3850 ANTTRNBK = 3850

DESERT WA TOTAL = 38100
TOT ENT = 38100 M GW ENT = 38100

LITTLEROCK CR TOTAL = 2300
TOT ENT = 2300 M&I ENT = 2070 AGR ENT = 230

METROPOLITAN WD TOTAL = 1507135
TOT ENT = 1507135 M&I ENT = 1011636 BYPS ENT = 245499 STOR ENT = 50000 ANTEXMCO = 200000

MOJAVE WA TOTAL = 75800
TOT ENT = 13200 TRANMENT = 1500 M GW ENT = 11700
TOT MISC = 62600 ANTTRNBK = 62600

PALMDALE WD TOTAL = 26624
TOT ENT = 26624 TRANMENT = 351 M&I ENT = 20949 EXMCOENT = 3968 14B M&I = 1356

SAN BERNARDINO TOTAL = 102600
TOT ENT = 20000 M&I ENT = 7719 M GW ENT = 12281
TOT MISC = 82600 ANTTRNBK = 82600

SAN GABRIEL TOTAL = 28800
TOT ENT = 14000 M GW ENT = 14000
TOT MISC = 14800 ANTTRNBK = 14800

SAN GORGONIO TOTAL = 3000

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AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
COUNTY OF BUTTE	M&I ENT=WT010	FR	85	45	135	240	65	60	25	25	20	20	35	45	800
COUNTY OF BUTTE	ANTTRNBK=WT133	FR	174	174	174	175	174	174	174	174	174	175	174	174	2050
	*** TOTAL ***		259	219	3 9	415	239	234	199	199	194	195	209	219	2890
PLUMAS CO FCWCD	M&I ENT=WT010	FR	90	90	95	150	150	150	150	150	150	150	95	90	1510
	*** TOTAL ***		90	90	95	150	150	150	150	150	150	150	95	90	1510
YUBA CITY	M&I ENT=WT010	FR	0	0	0	0	0	188	562	563	187	0	0	0	1500
YUBA CITY	ANTTRNBK=WT133	FR	675	675	675	675	675	675	675	675	675	675	675	675	8100
	*** TOTAL ***		675	675	675	675	675	863	1237	1238	862	675	675	675	9600
NAPA CO FCWCD	CYOVMENT=WT077	3NB	1000	1000	1500	0	0	0	0	0	0	0	0	0	3500
NAPA CO FCWCD	M&I ENT=WT010	3NB	882	920	1160	1197	1436	1568	1544	1685	1544	1389	1052	948	15325
NAPA CO FCWCD	ANTEXMCC=WT131	3NB	83	84	83	83	84	83	83	84	83	83	84	83	1000
	*** TOTAL ***		1965	2004	2743	1280	1520	1651	1627	1769	1627	1472	1136	1031	19825
SOLANO CO WA	M&I ENT=WT010	1NB	450	450	475	1070	1420	1420	1420	1420	1420	1420	1370	1265	13600
SOLANO CO WA	VAL PMT =WT071	1NB	0	0	0	0	0	25	25	25	25	0	0	0	100
SOLANO CO WA	EXMCNENT=WT116	1NB	1775	1775	1775	1775	0	0	0	0	0	0	0	0	7100
SOLANO CO WA	ANTEXMCC=WT131	1NB	625	625	625	625	625	625	625	625	625	625	625	625	7500
SOLANO CO WA	BEN ENT =WT046	3NA	955	955	970	1225	1380	1460	1460	1460	1315	1200	1300	990	14670
SOLANO CO WA	VAL ENT =WT047	3NA	0	0	0	0	0	500	500	500	500	500	400	0	2900
SOLANO CO WA	VAL PMT =WT071	3NA	900	900	900	900	1000	1000	1000	1000	1000	900	900	900	11300
SOLANO CO WA	ANTEXMCC=WT131	3NA	79	80	78	79	80	79	79	80	78	79	80	79	950
	*** TOTAL ***		4784	4785	4823	5674	4505	5109	5109	5110	4963	4724	4675	3859	58120
ZONE-7 ALAMEDA	M&I ENT=WT010	1SB	9	9	9	20	31	37	47	50	46	38	24	19	339
ZONE-7 ALAMEDA	ANTEXMCC=WT131	1SB	443	440	443	443	441	442	443	441	443	443	440	443	5305
ZONE-7 ALAMEDA	GEN WLNG=WT079	2SB	0	0	0	0	0	0	0	0	1000	0	0	0	1000
ZONE-7 ALAMEDA	M&I ENT=WT010	2SB	0	0	56	854	985	1092	1352	167	106	1223	890	664	7389
ZONE-7 ALAMEDA	LOCAL =WT024	2SB	418	356	438	0	0	0	0	0	0	0	0	0	1212
ZONE-7 ALAMEDA	M GW ENT=WT008	4SB	676	502	686	905	945	913	671	684	945	695	670	695	8987
ZONE-7 ALAMEDA	AGR ENT=WT001	4SB	32	124	190	329	545	577	582	565	325	282	132	32	3715
ZONE-7 ALAMEDA	LOCAL =WT024	4SB	12	132	0	0	0	0	0	0	0	0	0	0	144
ZONE-7 ALAMEDA	M GW ENT=WT008	5SB	0	0	0	0	0	97	0	0	146	137	0	0	380
ZONE-7 ALAMEDA	AGR ENT=WT001	5SB	10	10	20	60	69	80	80	79	40	30	10	10	498
ZONE-7 ALAMEDA	LOCAL =WT024	5SB	160	160	160	160	160	53	0	0	0	9	160	160	1182
ZONE-7 ALAMEDA	M&I ENT=WT010	6SB	0	0	0	1049	1899	987	1507	2769	2247	2439	1691	36	14624
ZONE-7 ALAMEDA	AGR ENT=WT001	6SB	10	63	82	179	242	266	291	247	184	126	63	10	1763
ZONE-7 ALAMEDA	LOCAL =WT024	6SB	837	709	969	498	53	889	916	9	0	0	53	969	5902
ZONE-7 ALAMEDA	TRANAENT=WT074	10A	0	0	0	2000	2000	2000	2000	2000	2000	0	0	0	12000
ZONE-7 ALAMEDA	STOR ENT=WT060	10A	0	0	0	0	0	0	13000	0	0	0	0	0	13000
	*** TOTAL ***		2607	2505	3053	6497	7370	7433	7869	20011	7482	5422	4133	3038	77440
ALAMEDA CO WD	M GW ENT=WT008	7SB	0	0	0	0	0	957	800	800	1800	500	0	0	4857
ALAMEDA CO WD	LOCAL =WT024	7SB	0	0	0	0	0	0	1000	1000	0	0	0	0	2000
ALAMEDA CO WD	M&I ENT=WT010	8SB	2613	2360	2613	2528	2613	2528	2613	2613	2528	2613	1562	2459	29643
ALAMEDA CO WD	STOR ENT=WT060	10A	0	0	0	0	0	0	3750	3750	0	0	0	0	7500
	*** TOTAL ***		2613	2360	2613	2528	2613	3485	8163	8163	4328	3113	1562	2459	44000

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AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
SANTA CLARA VWD	M&I ENT=WT010	9SB	0	0	0	0	0	2700	7700	7600	5900	3800	500	4800	33000
SANTA CLARA VWD	M GW ENT=WT008	9SB	0	0	0	0	0	900	900	900	1800	2500	2000	2000	11000
SANTA CLARA VWD	EXMCOENT=WT116	9SB	0	1100	6000	4500	5400	5000	0	0	0	0	0	0	22000
SANTA CLARA VWD	ANTEXMCO=WT131	9SB	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	3000	36000
SANTA CLARA VWD	STOR ENT=WT060	10A	0	0	5000	5000	5000	5000	0	0	0	0	0	0	20000
*** TOTAL ***			3000	4100	14000	12500	13400	16600	11600	11500	10700	9300	5500	9800	122000
SAN LUIS OBISPO	M&I ENT=WT010	33A	276	256	285	310	349	392	423	428	381	385	301	282	4068
SAN LUIS OBISPO	ANTTRNBK=WT133	33A	1744	1745	1744	1744	1745	1744	1744	1745	1744	1744	1745	1744	20932
*** TOTAL ***			2020	2001	2029	2054	2094	2136	2167	2173	2125	2129	2046	2026	25000
SANTA BARBARA	M&I ENT=WT010	33A	1787	1599	2372	2818	3352	3416	3563	3507	3231	2886	2511	1834	32876
SANTA BARBARA	ANTTRNBK=WT133	33A	1051	1051	1050	1051	1051	1051	1051	1051	1050	1051	1051	1051	12610
*** TOTAL ***			2838	2650	3422	3869	4403	4467	4614	4558	4281	3937	3562	2885	45486
DUDLEY RIDGE WD	AGR ENT=WT001	8D	3700	1600	2900	3700	7200	8199	10762	9395	914	0	0	0	48370
DUDLEY RIDGE WD	EXACOENT=WT115	8D	3000	0	0	0	0	0	0	0	0	0	0	0	3000
DUDLEY RIDGE WD	ANTEXACO=WT132	8D	417	416	417	417	416	417	417	416	417	417	416	417	5000
*** TOTAL ***			7117	2016	3317	4117	7616	8616	11179	9811	1331	417	416	417	56370
EMPIRE WS ID	AGR ENT=WT001	8C	60	90	180	240	300	480	540	540	270	120	90	90	3000
EMPIRE WS ID	AGR SUR=WT004	8C	400	400	400	0	100	500	500	500	200	0	0	0	3000
*** TOTAL ***			460	490	580	240	400	980	1040	1040	470	120	90	90	6000
KERN COUNTY WA	AGR ENT=WT001	9	585	585	4681	7021	8776	14042	19893	14042	2340	1170	2341	2697	78173
KERN COUNTY WA	EXACOENT=WT115	9	2000	2900	0	0	0	0	0	0	0	0	0	0	4900
KERN COUNTY WA	M&I ENT=WT010	10A	24	25	49	48	49	49	49	49	48	49	25	24	488
KERN COUNTY WA	AGR ENT=WT001	10A	3852	6582	11117	18040	41443	57045	64067	54705	17519	5949	4631	2920	287870
KERN COUNTY WA	EXACOENT=WT115	10A	5000	7000	8500	0	0	0	0	0	0	0	0	0	20500
KERN COUNTY WA	M&I ENT=WT010	11B	163	163	162	163	163	163	163	162	161	162	162	163	1950
KERN COUNTY WA	AGR ENT=WT001	11B	2545	5090	10181	10180	12728	20361	30544	25453	5091	2545	1272	1273	127263
KERN COUNTY WA	EXACOENT=WT115	11B	2500	2500	0	0	0	0	0	0	0	0	0	0	5000
KERN COUNTY WA	M GW ENT=WT008	12E	488	975	0	0	6094	24281	27694	20854	5095	7313	6339	1014	100147
KERN COUNTY WA	AGR ENT=WT001	12E	488	1950	0	1950	7801	27304	29937	23988	4336	2925	1658	0	102337
KERN COUNTY WA	ANTEXACO=WT132	12E	83	84	83	83	84	83	83	84	83	83	84	83	1000
KERN COUNTY WA	M GW ENT=WT008	13B	0	0	0	0	975	2926	3900	3901	0	0	0	0	11702
KERN COUNTY WA	AGR ENT=WT001	13B	0	0	975	0	2438	9264	11019	8581	488	0	4876	3120	40761
KERN COUNTY WA	EXACOENT=WT115	13B	3000	5750	0	0	0	0	0	0	0	0	0	0	8750
KERN COUNTY WA	AGR ENT=WT001	14A	585	975	1950	1951	2535	3413	4388	3413	1658	780	390	585	22623
KERN COUNTY WA	EXACOENT=WT115	14A	600	1000	295	0	0	0	0	0	0	0	0	0	1895
KERN COUNTY WA	AGR ENT=WT001	14B	1950	3901	4095	3901	6436	10434	10921	9946	5559	3120	975	1658	62896
KERN COUNTY WA	EXACOENT=WT115	14B	2000	4000	620	0	0	0	0	0	0	0	0	0	6620
KERN COUNTY WA	AGR ENT=WT001	14C	1268	1462	2146	2437	4876	4973	4096	3218	2633	1267	1268	975	30619
KERN COUNTY WA	EXACOENT=WT115	14C	1300	1500	325	0	0	0	0	0	0	0	0	0	3125
KERN COUNTY WA	AGR ENT=WT001	15A	488	487	3316	2925	6534	7508	7509	4875	2633	2146	975	975	40371
KERN COUNTY WA	EXACOENT=WT115	15A	500	500	505	0	0	0	0	0	0	0	0	0	1505
KERN COUNTY WA	M&I ENT=WT010	16A	0	0	0	468	484	679	725	726	655	554	0	0	4291
KERN COUNTY WA	AGR ENT=WT001	16A	195	195	975	1560	2243	3218	3316	3120	1658	1463	195	195	18333
KERN COUNTY WA	EXACOENT=WT115	16A	200	200	155	0	0	0	0	0	0	0	0	0	555
KERN COUNTY WA	AGR ENT=WT001	31A	4291	3412	3413	6144	12189	16089	16090	11213	7314	5851	2437	1463	89906
KERN COUNTY WA	EXACOENT=WT115	31A	2000	0	0	0	0	0	0	0	0	0	0	0	2000

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AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
*** TOTAL ***			36105	51236	53543	56871	115848	201832	234394	188330	57271	35377	27628	17145	1075580
COUNTY OF KINGS	AGR ENT=WT001	8C	0	0	400	400	400	400	400	400	400	400	400	400	4000
*** TOTAL ***			0	0	400	400	400	400	400	400	400	400	400	400	4000
OAK FLAT WD	AGR ENT=WT001	2A	114	171	342	456	570	912	1026	1026	513	228	171	171	5700
OAK FLAT WD	CYOV ENT=WT069	2A	200	400	0	0	0	0	0	0	0	0	0	0	600
*** TOTAL ***			314	571	342	456	570	912	1026	1026	513	228	171	171	6300
TULARE LK BWSD	AGR ENT=WT001	8C	0	0	1600	2040	2000	9520	9880	10080	800	400	3760	7320	47400
TULARE LK BWSD	CYOV ENT=WT069	8C	8000	4000	0	0	0	0	0	0	0	0	0	0	12000
TULARE LK BWSD	AGR ENT=WT001	8D	0	0	2400	3060	3000	14280	14820	15120	1200	600	5640	10980	71100
TULARE LK BWSD	CYOV ENT=WT069	8D	12000	6000	0	0	0	0	0	0	0	0	0	0	18000
*** TOTAL ***			20000	10000	4000	5100	5000	23800	24700	25200	2000	1000	9400	18300	148500
AVEK WA	AGR ENT=WT001	19	2	2	110	225	350	570	595	595	390	270	30	10	3149
AVEK WA	TRANSFER=WT067	19	100	80	85	110	120	170	235	175	160	120	60	85	1500
AVEK WA	ANTTRNBK=WT133	19	5802	5803	5802	5803	5802	5803	5802	5803	5802	5803	5802	5803	69630
AVEK WA	M&I ENT=WT010	19C	364	379	421	542	681	791	911	981	812	624	494	406	7406
AVEK WA	AGR ENT=WT001	19C	230	580	1421	2682	3351	3386	4494	4546	3076	1300	345	195	25606
AVEK WA	TRANSFER=WT067	19C	0	0	0	200	300	300	300	300	300	200	100	0	2000
AVEK WA	M&I ENT=WT010	20A	1196	1036	1414	1625	2472	3081	3766	4344	2952	2536	1866	1525	27813
AVEK WA	AGR ENT=WT001	20A	15	15	17	21	21	21	21	21	21	16	15	16	220
AVEK WA	TRANSFER=WT067	20A	12	8	16	23	35	48	58	50	50	25	13	13	351
AVEK WA	M&I ENT=WT010	22A	144	118	172	215	342	402	518	617	351	297	246	175	3597
AVEK WA	AGR ENT=WT001	22A	2	24	109	82	119	138	165	165	105	55	12	3	979
*** TOTAL ***			7867	8045	9567	11528	13593	14710	16865	17597	14019	11246	8983	8231	142251
CASTAIC LAKE WA	M&I ENT=WTC10	30	1400	1260	1680	2240	2520	2800	3920	3920	2940	2520	1400	1400	28000
CASTAIC LAKE WA	ANTTRNBK=WT133	30	4541	4543	4541	4541	4543	4541	4541	4543	4541	4541	4543	4541	54500
CASTAIC LAKE WA	AGR ENT=WT001	31A	500	500	1000	1000	1000	1000	1000	1000	1000	0	0	0	8000
CASTAIC LAKE WA	ANTTRNBK=WT133	31A	392	391	392	392	391	392	392	391	392	392	391	392	4700
*** TOTAL ***			6833	6694	7613	8173	8454	8733	9853	9854	8873	7453	6334	6333	95200
COACHELLA VALLY	M&I ENT=WTC10	26A	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	23100
*** TOTAL ***			1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	1925	23100
CRESTLINE-LA WA	M&I ENT=WT010	24	95	61	52	111	152	164	242	253	232	198	200	190	1950
CRESTLINE-LA WA	ANTTRNBK=WT133	24	321	321	320	321	321	321	321	321	320	321	321	321	3850
*** TOTAL ***			416	382	372	432	473	485	563	574	552	519	521	511	5800
DESERT WA	M GW ENT=WT008	26A	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	38100
*** TOTAL ***			3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	3175	38100
LITTLEROCK CR	M&I ENT=WT010	21	90	90	150	160	220	230	240	240	210	170	150	120	2070
LITTLEROCK CR	AGR ENT=WT001	21	0	0	0	0	30	40	60	60	40	0	0	0	230
*** TOTAL ***			90	90	150	160	250	270	300	300	250	170	150	120	2300

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AGENCY	WATER TYPE	RCH	JAN	FEB	MAR	APR	MAY	JUN	JLY	AUG	SEP	OCT	NOV	DEC	TOTAL
METROPOLITAN WD	ANTE XMCO=WT131	3	16667	16666	16667	16667	16666	16667	16667	16666	16667	16667	16666	16667	200000
METROPOLITAN WD	STOR ENT=WT060	12E	0	0	8330	8330	8330	8330	8330	8350	0	0	0	0	50000
METROPOLITAN WD	M&I ENT=WT010	26A	20931	13758	14433	29502	16889	22296	24096	24903	21509	32151	25320	13582	259370
METROPOLITAN WD	BYPS ENT=WT059	28H	4030	348	4500	6200	7267	8500	9289	10582	8500	7770	5799	5158	81076
METROPOLITAN WD	M&I ENT=WT010	28J	300	300	300	300	300	300	300	300	300	300	300	300	3600
METROPOLITAN WD	M&I ENT=WT010	30	55273	50312	60462	63724	45805	46504	48656	50320	47448	68676	66469	63941	667590
	*** TOTAL ***		106238	94642	122302	145147	119846	126393	131927	129680	118220	150153	138350	124237	1507135
MOJAVE WA	TRANMENT=WT083	19	100	80	85	110	120	170	235	175	160	120	60	85	1500
MOJAVE WA	ANTTRNBK=WT133	19	5217	5216	5217	5217	5216	5217	5217	5216	5217	5217	5216	5217	62600
MOJAVE WA	M GW ENT=WT008	22B	1400	1200	1200	300	210	260	260	260	335	2125	2150	2000	11700
	*** TOTAL ***		6717	6496	6502	5627	5546	5647	5712	5651	5712	7462	7426	7302	75800
PALMDALE WD	TRANMENT=WT083	20A	12	8	16	23	35	48	58	50	50	25	13	13	351
PALMDALE WD	14B M&I=WT043	20A	339	339	339	339	0	0	0	0	0	0	0	0	1356
PALMDALE WD	M&I ENT=WT010	20B	694	800	1500	1500	1845	2250	2285	2300	2300	1845	1785	1845	20949
PALMDALE WD	EXMCO ENT=WT116	20B	800	900	1100	1168	0	0	0	0	0	0	0	0	3968
	*** TOTAL ***		1845	2047	2955	3030	1880	2298	2343	2350	2350	1870	1798	1858	26624
SAN BERNARDINO	M&I ENT=WT010	26A	390	585	584	780	780	779	839	838	780	584	390	390	7719
SAN BERNARDINO	M GW ENT=WT008	26A	390	585	779	1365	1365	1364	1365	1364	1365	974	780	585	12281
SAN BERNARDINO	ANTTRNBK=WT133	26A	6883	6884	6883	6883	6884	6883	6883	6884	6883	6883	6884	6883	82600
	*** TOTAL ***		7663	8054	8246	9028	9029	9026	9087	9086	9028	8441	8054	7858	102600
SAN GABRIEL	M GW ENT=WT008	26A	0	0	0	0	1000	3000	3100	3100	3000	800	0	0	14000
SAN GABRIEL	ANTTRNBK=WT133	26A	1233	1234	1233	1233	1234	1233	1233	1234	1233	1233	1234	1233	14800
	*** TOTAL ***		1233	1234	1233	1233	2234	4233	4333	4334	4233	2033	1234	1233	28800
SAN GORGONIO	ANTTRNBK=WT133	26A	250	250	250	250	250	250	250	250	250	250	250	250	3000
	*** TOTAL ***		250	250	250	250	250	250	250	250	250	250	250	250	3000
VENTURA CO FCD	M GW ENT=WT008	29H	0	0	0	0	0	0	0	0	3150	0	0	0	3150
VENTURA CO FCD	M&I ENT=WT010	30	1154	1154	1154	1154	1154	1154	1154	1154	1154	1154	2654	2656	16850
	*** TOTAL ***		1154	1154	1154	1154	1154	1154	1154	1154	4304	1154	2654	2656	20000
SHELL CAL PROD.	REPAYMNT=WT009	11B	0	0	0	0	0	0	0	0	0	0	0	0	0
	*** TOTAL ***		0	0	0	0	0	0	0	0	0	0	0	0	0
FISH & GAME	REC/F&WL=WT002	3	20	20	20	50	50	150	200	200	200	50	20	20	1000
FISH & GAME	REC/F&WL=WT002	5	0	0	10	30	40	40	40	30	10	0	0	0	200
	*** TOTAL ***		20	20	30	80	90	190	240	230	210	50	20	20	1200
PARKS & RECREAT	REC/F&WL=WT002	3	3	3	4	5	6	7	8	9	9	9	4	3	70
REC/FISH&WILDLF	REC/F&WL=WT002	5SB	34	34	33	34	33	34	34	33	34	33	34	34	400
REC/FISH&WILDLF	REC/F&WL=WT002	5	4	5	4	4	4	4	4	4	4	4	4	4	50
REC/FISH&WILDLF	REC/F&WL=WT002	20A	10	10	20	20	20	26	24	20	20	10	10	10	200
REC/FISH&WILDLF	REC/F&WL=WT002	24	9	9	18	18	18	23	20	18	18	9	9	9	180

Welcome to California

CVBDB Home

Real Time Monitoring

20mm Delta Smelt Survey

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Fall Midwater Trawl Survey

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Midwater Trawl

Reporting Date: January 9, 2008

YOUNG-OF-THE-YEAR STRIPED BASS INDICES

Survey	2005	2006	2007
September	40	236	32
October	29	18	34
November	26	39	14
December	26	70	2
Fall Index	121	363	82

DELTA SMELT INDICES

Survey	2005	2006	2007
September	3	33	9
October	10	3	4
November	7	4	5
December	7	1	10
Fall Index	27	41	28

The Fall Midwater Trawl Index is the sum of the four monthly indices.

- **Table of monthly abundance indices of selected species from Fall Midwater Trawl Survey, 1967 - 2007.**
- **Trends in abundance of selected species from Fall Midwater Trawl Survey, 1967 - 2007.**

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The California Environmental Quality Act
Mitigation for Global Warming Impacts

California Attorney General's Office

Under the California Environmental Quality Act (CEQA), local agencies have a very important role to play in California's fight against global warming. Local agencies must require feasible mitigation for global warming impacts caused by the projects they permit, and must include feasible mitigation in their own projects. By the sum of their individual decisions, local agencies are helping to move the State away from "business as usual" and toward a low-carbon future.

This document provides general information that may be helpful to local agencies in carrying out their duty to mitigate global warming. The measures set forth in this package are examples; the list is not intended to be exhaustive. Moreover, the measures cited may not be appropriate for every project. The lead agency must use its own informed judgment in deciding which measures it will analyze, and which measures it will require, for a given project.

The first section of this document lists examples of mitigation measures that could be undertaken or funded by a diverse range of projects. Such projects may include, for example, a private residential or commercial development, a public works or infrastructure project, a local "Climate Action Plan," or a general plan update (where a given measure could be fashioned into a goal, policy, program, or land use designation), as appropriate. The lead agency must design mitigation measures to be enforceable, and commit sufficient resources to enforcement.

In general, a given mitigation measure should not be considered in isolation, but as part of a larger set of measures that, working together, reduce greenhouse gas emissions and the effects of global warming. And in selecting a mitigation set, the relevant environmental goal must kept in view – emissions reductions not just for the project, but for the region and for California.

The second section of this document lists examples of potential mitigation in the general plan context. This section is included both to suggest how the larger set of measures set forth in the first section could be incorporated into a general plan, as well as to identify measures that are general plan specific. The measures in the second section may also be appropriate for inclusion in larger scale plans, including regional plans (*e.g.*, blueprint plans) and specific plans.

The third section provides links to sources of information on global warming impacts and mitigation measures. The list is not complete, but may be a helpful start for local agencies seeking more information to carry out their CEQA obligations as they relate to global warming.

The Endnotes set forth just some of the many examples of exemplary mitigation measures already being implemented by local government and agencies, utilities, private industry, and others. As these examples evidence, California at every level is taking up the challenge, devising new and innovative solutions, and leading the charge in the fight against global warming.

(1) Mitigation Measures

Energy Efficiency[1]

- Design building to be energy efficient. Site buildings to take advantage of shade, prevailing winds, landscaping and sun screens to reduce energy use.[2]
- Install efficient lighting and lighting control systems. Use daylight as an integral part of lighting systems in commercial buildings.
- Install light colored "cool" roofs, cool pavements, and strategically placed shade trees.[3]
- Provide information on energy management services for large energy users.[4]
- Install energy efficient heating and cooling systems, appliances and equipment, and control systems.[5]
- Install light emitting diodes (LEDs) for traffic, street and other outdoor lighting.[6]
- Limit the hours of operation of outdoor lighting.
- Use solar heating, automatic covers, and efficient pumps and motors for pools and spas.[7]
- Provide education on energy efficiency.[8]

Renewable Energy

- Install solar and wind power systems, solar and tankless hot water heaters, and energy-efficient heating ventilation and air conditioning. Educate consumers about existing incentives.[9]
- Install solar panels on carports and over parking areas where appropriate.[10]
- Use combined heat and power in appropriate applications.[11]

Water Conservation and Efficiency[12]

- Create water-efficient landscapes.[13]
- Install water-efficient irrigation systems and devices, such as soil moisture-based irrigation controls.
- Use reclaimed water for landscape irrigation in new developments and on public property. Install the infrastructure to deliver and use reclaimed water.
- Design buildings to be water-efficient. Install water-efficient fixtures and appliances.
- Use graywater. (Graywater is untreated household waste water from bathtubs, showers, bathroom wash basins, and water from clothes washing machines.) For example, install dual plumbing in all new development allowing graywater to be used for landscape irrigation.[14]
- Restrict watering methods (*e.g.*, prohibit systems that apply water to non-vegetated surfaces) and control runoff.
- Restrict the use of water for cleaning outdoor surfaces and vehicles.
- Implement low-impact development practices that maintain the existing hydrologic character of the site to manage storm water and protect the environment. (Retaining storm water runoff onsite can drastically reduce the need for energy-intensive imported water at the site.)[15]
- Devise a comprehensive water conservation strategy appropriate for the project and location. The strategy may include many of the specific items listed above, plus other innovative measures

that are appropriate to the specific project.
- Provide education about water conservation and available programs and incentives.[16]

Solid Waste Measures

- Reuse and recycle construction and demolition waste (including, but not limited to, soil, vegetation, concrete, lumber, metal, and cardboard).
- Provide interior and exterior storage areas for recyclables and green waste and adequate recycling containers in public areas.
- Recover by-product methane to generate electricity.[17]
- Provide education and publicity about reducing waste and available recycling services.[18]

Land Use Measures

- Incorporate mixed-use, infill, and higher density development to reduce vehicle trips, promote alternatives to individual vehicle travel, and promote efficient delivery of services and goods. (Infill development generates fewer vehicle miles traveled per capita and reduced emissions of greenhouse gases, and denser development is associated with increased public transit use.)[19]
- Avoid development that will increase passenger vehicle miles traveled.
- Incorporate public transit into project design were appropriate.[20]
- Preserve and create open space and parks. Preserve existing trees, and plant replacement trees at a set ratio.
- Develop "brownfields" and other underused or defunct properties near existing public transportation and jobs.
- Include pedestrian and bicycle-only streets and plazas within developments. Create travel routes that ensure that destinations may be reached conveniently by public transportation, bicycling or walking.[21]

Transportation and Motor Vehicles

- Limit idling time for commercial vehicles, including delivery and off-road construction vehicles.
- Use low or zero-emission vehicles, including off-road construction vehicles.
- Promote ride sharing programs *e.g.*, by designating a certain percentage of parking spaces for ride sharing vehicles, designating adequate passenger loading and unloading and waiting areas for ride sharing vehicles, and providing a web site or message board for coordinating rides.
- Create car sharing programs. Accommodations for such programs include providing parking spaces for the car share vehicles at convenient locations accessible by public transportation.[22]
- Create local "light vehicle" networks, such as neighborhood electric vehicle (NEV) systems.[23]
- Provide the necessary facilities and infrastructure to encourage the use of low or zero-emission vehicles (*e.g.*, electric vehicle charging facilities and conveniently located alternative fueling stations).
- Increase the cost of driving and parking private vehicles by, *e.g.*, imposing tolls and parking fees.
- Build or fund a transportation center where various public transportation modes intersect.

- Encourage the use of public transit systems by enhancing safety and cleanliness on vehicles and in and around stations, and convenience by, *e.g.*, installing electronic signs that provide real-time information on schedules and service.
- Provide shuttle service to public transit.
- Provide public transit incentives such as free or low-cost monthly transit passes.
- Incorporate bicycle lanes and/or routes into street systems, new subdivisions, and large developments.
- Incorporate bicycle-friendly intersections into street design.
- For commercial projects, provide adequate bicycle parking near building entrances to promote cyclist safety, security, and convenience. For large employers, provide facilities that encourage bicycle commuting, including, *e.g.*, locked bicycle storage or covered or indoor bicycle parking.
- Create bicycle lanes and walking paths directed to the location of schools, parks and other destination points.[24]
- Restore and/or expand school bus services.
- Institute a formal telecommute work program. Provide information, training, and incentives to encourage participation. Provide incentives for equipment purchases to allow high-quality teleconferences.
- Provide information on all options for individuals and businesses to reduce transportation-related emissions. Provide education and information about public transportation.

Carbon Offsets

In some instances, a lead agency may decide to go beyond measures that will directly reduce a project's emissions. A lead agency may consider whether carbon offsets would be appropriate. The project proponent could, for example, fund off-site projects (*e.g.*, alternative energy projects, or energy or water audits for existing projects) that will reduce carbon emissions, conduct an audit of its other existing operations and agree to retrofit, or purchase "credits" from another entity that will undertake mitigation projects. The lead agency should ensure that any mitigation taking the form of carbon offsets is specifically identified and that such mitigation will in fact occur.

(2) General Plans

Mitigation measures for global warming may be reflected in a general plan as goals, policies, or programs; in land use designations; and/or as additional mitigation measures identified during the CEQA review process. Many of the mitigation measures listed above may be appropriate for inclusion in a general plan. In addition, a non-exhaustive list of measures specific to the general plan context follows. The examples are listed under required general plan elements. A given example may, however, be appropriate for inclusion in more than one element, or in a different element than listed. Global warming mitigation measures may, alternatively, be included in an optional Climate Change or Energy element.

Conservation[25]

- Climate Action Plan or Policy: Include a comprehensive climate change action plan that requires a baseline inventory of greenhouse gas emissions from all sources by a date certain;

greenhouse gas emissions reduction targets and deadlines; and enforceable greenhouse gas emissions reduction measures.[26] (Note: If the Climate Action Plan complies with the requirements of Section 15064(h)(3) of the CEQA Guidelines, it may allow for the streamlining of individual projects that comply with the plan's requirements.)

- Climate Action Plan Implementation Program: Include mechanisms to ensure regular review of progress toward the emission reduction targets established by the Climate Action Plan, report progress to the public and responsible officials, and revise the plan as appropriate, using principles of adaptive management. Allocate funding to implement the plan. Fund staff to oversee implementation of the plan.
- Strengthen local building codes for new construction and renovation to require a higher level of energy efficiency.[27]
- Require that all new government buildings, and all major renovations and additions, meet identified green building standards.[28]
- Adopt a "Green Building Program" to require or encourage green building practices and materials.[29] The program could be implemented through, *e.g.*, a set of green building ordinances.
- Require orientation of buildings to maximize passive solar heating during cool seasons, avoid solar heat gain during hot periods, enhance natural ventilation, and promote effective use of daylight. Orientation should optimize opportunities for on-site solar generation.
- Provide permitting-related and other incentives for energy efficient building projects, *e.g.*, by giving green projects priority in plan review, processing and field inspection services.[30]
- Conduct energy efficiency audits of existing buildings by checking, repairing, and readjusting heating, ventilation, air conditioning, lighting, water heating equipment, insulation and weatherization.[31] Offer financial incentives for adoption of identified efficiency measures.[32]
- Provide innovative, low-interest financing for energy efficiency and alternative energy projects. For example, allow property owners to pay for energy efficiency improvements and solar system installation through long-term assessments on individual property tax bills.[33]
- Fund incentives to encourage the use of energy efficient vehicles, equipment and lighting.[34] Provide financial incentives for adoption of identified efficiency measures.
- Require environmentally responsible government purchasing.[35] Require or give preference to products that reduce or eliminate indirect greenhouse gas emissions, *e.g.*, by giving preference to recycled products over those made from virgin materials.[36]
- Require that government contractors take action to minimize greenhouse gas emissions by, for example, using low or zero-emission vehicles and equipment.
- Adopt a "heat island" mitigation plan that requires cool roofs, cool pavements, and strategically placed shade trees.[37] (Darker colored roofs, pavement, and lack of trees may cause temperatures in urban environments to increase by as much as 6-8 degrees Fahrenheit as compared to surrounding areas.[38]) Adopt a program of building permit enforcement for re-roofing to ensure compliance with existing state building requirements for cool roofs on non-residential buildings.
- Adopt a comprehensive water conservation strategy. The strategy may include, but not be limited to, imposing restrictions on the time of watering, requiring water-efficient irrigation equipment, and requiring new construction to offset demand so that there is no net increase in water use.[39]
- Adopt water conservation pricing, *e.g.*, tiered rate structures, to encourage efficient water use.[40]
- Adopt water-efficient landscape ordinances.[41]

- Strengthen local building codes for new construction and implement a program to renovate existing buildings to require a higher level of water efficiency.
- Adopt energy and water efficiency retrofit ordinances that require upgrades as a condition of issuing permits for renovations or additions, and on the sale of residences and buildings.[42]
- Provide individualized water audits to identify conservation opportunities.[43] Provide financial incentives for adopting identified efficiency measures.
- Provide water audits for large landscape accounts. Provide financial incentives for efficient irrigation controls and other efficiency measures.
- Require water efficiency training and certification for irrigation designers and installers, and property managers.[44]
- Implement or expand city or county-wide recycling and composting programs for residents and businesses. Require commercial and industrial recycling.
- Extend the types of recycling services offered (*e.g.*, to include food and green waste recycling).
- Establish methane recovery in local landfills and wastewater treatment plants to generate electricity.[45]
- Implement Community Choice Aggregation (CCA) for renewable electricity generation, if feasible. (CCA allows cities and counties, or groups of them, to aggregate the electric loads of customers within their jurisdictions for purposes of procuring electrical services. CCA allows the community to choose what resources will serve their loads and can significantly increase renewable energy).[46]
- Preserve existing conservation areas (*e.g.*, forested areas, agricultural lands, wildlife habitat and corridors, wetlands, watersheds, and groundwater recharge areas) that provide carbon sequestration benefits.
- Establish a mitigation program for development of conservation areas. Impose mitigation fees on development of such lands and use funds generated to protect existing, or create replacement, conservation areas.
- Provide public education and information about options for reducing greenhouse gas emissions through responsible purchasing, conservation, and recycling.

Land Use[47]

- Adopt land use designations to carry out policies designed to reduce greenhouse gas emissions, *e.g.*, policies to reduce vehicle miles traveled, encourage development near existing public transportation corridors, encourage alternative modes of transportation, and promote infill, mixed use, and higher density development.
- Concentrate commercial, mixed use, and medium to higher density residential development in areas near jobs, transit routes, schools, shopping areas and recreation.
- Identify and facilitate the development of land uses not already present in local districts – such as supermarkets, parks, and schools in neighborhoods; or residential uses in business districts – to reduce vehicle miles traveled and encourage bicycling and walking.
- Increase density in single family residential areas located near transit routes or commercial areas. For example, allow duplexes in residential areas, and allow increased height multi-unit buildings on main arterial streets, under specified conditions.
- Impose minimum residential densities in areas designated for transit-oriented, mixed use

development to ensure higher density in these areas.

- Require bike lanes and bicycle/pedestrian paths.
- Site schools to increase the potential for students to walk and bike to school.
- Enact ordinances and programs to limit or prohibit "sprawl" – development that requires additional or longer passenger vehicle commutes between employment, services, and residential areas.[48]
- In areas designated for mixed use, require rather than merely allow mixed use.
- Promote infill, mixed use, and higher density development by, for example, reducing developer fees or granting property tax credits for qualifying projects;[49] providing fast-track permit processing; reducing processing fees; funding infrastructure loans; and giving preference for infrastructure improvements in these areas.
- Where appropriate, adopt and enforce growth boundaries to encourage infill. Provide new services and infrastructure only within the growth boundary.[50]
- Transfer a portion of the county's housing allocation to existing cities to encourage infill were services and employment already exist; preserve open space, agricultural land, and water quality; and reduce vehicle miles traveled.
- Require best management practices in agriculture and animal operations to reduce emissions, conserve energy and water, and utilize alternative energy sources, including biogas, wind and solar.

Circulation[51]

- In conjunction with measures that encourage public transit, ride sharing, bicycling and walking, implement circulation improvements that reduce vehicle idling. For example, coordinate controlled intersections so that traffic passes more efficiently through congested areas.[52]
- Create an interconnected transportation system that allows a shift in travel from private passenger vehicles to alternative modes, including public transit, ride sharing, bicycling and walking. Before funding transportation improvements that increase vehicle miles traveled, consider alternatives such as increasing public transit or improving bicycle or pedestrian travel routes.
- Give funding preference to investment in public transit over investment in infrastructure for private automobile traffic.[53]
- Include safe and convenient bicycle and pedestrian access in all transportation improvement projects. Ensure that non-motorized transportation systems are connected and not interrupted by impassable barriers, such as freeways[54] and include amenities such as secure bicycle parking.
- Provide adequate and affordable public transportation choices including expanded bus routes and service and other transit choices such as shuttles, light rail, and rail where feasible.
- Assess transportation impact fees on new development in order to maintain and increase public transit service.[55]
- Provide public transit incentives, including free or reduced fare areas.[56]
- Adopt a comprehensive parking policy that discourages private vehicle use and encourages the use of alternative transportation.[57] For example, reduce parking for private vehicles while increasing options for alternative transportation; eliminate minimum parking requirements for new buildings; "unbundle" parking (require that parking is paid for separately and is not

included in rent for residential or commercial space); and set appropriate pricing for on-street parking.

- Develop school transit plans to substantially reduce automobile trips to, and congestion surrounding, schools. (According to some estimates, parents driving their children to school account for 20-25% of the morning commute.) Plans may address, *e.g.*, necessary infrastructure improvements and potential funding sources; replacing older diesel buses with low or zero-emission vehicles; mitigation fees to expand school bus service; and Safe Routes to School programs[58] and other formal efforts to increase walking and biking by students.
- Create financing programs for the purchase or lease of vehicles used in employer ride sharing programs.
- Enter into partnerships to create and/or expand polluting vehicle buy-back programs to include vehicles with high greenhouse gas emissions.
- Provide public education and information about options for reducing motor vehicle-related greenhouse gas emissions. Include information on trip reduction; trip linking; public transit; biking and walking; vehicle performance and efficiency (*e.g.*, keeping tires inflated); low or zero-emission vehicles; and car and ride sharing.

Housing[59]

- Improve the jobs-housing balance and promote a range of affordable housing choices near jobs, services and transit to reduce vehicle miles traveled.

Open Space[60]

- Preserve forested areas, agricultural lands, wildlife habitat and corridors, wetlands, watersheds, groundwater recharge areas and other open space that provide carbon sequestration benefits.
- Establish a mitigation program for development of open space. Impose mitigation fees on development of such lands and use funds generated to protect existing, or create replacement, open space.
- Allow alternative energy projects in areas zoned for open space where consistent with other uses and values.
- Protect existing trees and encourage the planting of new trees. Adopt a tree protection and replacement ordinance, *e.g.*, requiring that trees larger than a specified diameter that are removed to accommodate development must be replaced at a set ratio.
- Connect parks and publicly accessible open space through shared pedestrian/bike paths and trails to encourage walking and bicycling.

Safety[61]

- Address expected effects of climate change that may impact public safety, including increased risk of wildfires, flooding and sea level rise, salt water intrusion; and health effects of increased heat and ozone, through appropriate policies and programs.
- Adopt land use designations that restrict or prohibit development in areas that may be more severely impacted by climate change, *e.g.*, areas that are at high risk of wildfire, sea level rise, or

flooding.
- Adopt programs for the purchase, transfer or extinguishment of development rights in high risk areas.
- Monitor the impacts of climate change. Use adaptive management to develop new strategies, and modify existing strategies, to respond to the impacts of climate change.

(3) Resources

The following web sites and organizations provide general information about mitigating global warming impacts at the local level. These sites represent only a small fraction of the available resources. Local agencies are encouraged to conduct their own research in order to obtain the most current and relevant materials.

- The Institute for Local Government (ILG) maintains a list of local agencies that have Climate Action Plans. The list is available here: http://www.cacities.org/index.jsp?zone=ilsg&previewStory=27035. According to ILG, the list includes Marin County and the cities of Arcata, Berkeley, Los Angeles, Palo Alto, San Diego, and San Francisco. Many additional local governments are in the process of conducting greenhouse gas inventories.

- The U.S. Conference of Mayors' Climate Protection Agreement contains valuable information for the many local agencies that are joining the fight against global warming. The Agreement is available here: http://www.coolcities.us/resources/bestPracticeGuides/USM_ClimateActionHB.pdf. Over one hundred and twenty California cities have joined the "Cool Cities" campaign, which means they have signed the U.S. Mayor's Climate Protection Agreement and are taking concrete steps toward addressing global warming. These steps include preparing a city-wide greenhouse gas emissions inventory and creating and implementing a local Climate Action Plan. Additional resources, including various cities' Climate Action Plans, are located at the Cool Cities website: http://www.coolcities.us/resources.php.

- In July 2007, Alameda County became one of twelve charter members of the "Cool Counties" initiative. Participating counties sign a Climate Stabilization Declaration, which is available at the website for King County (Washington State): http://www.metrokc.gov/exec/news/2007/0716dec.aspx. Participating counties agree to work with local, state, and federal governments and other leaders to reduce county geographical greenhouse gas emissions to 80% below current levels by 2050 by developing a greenhouse gas emissions inventory and regional reduction plan. Current member counties are recruiting new members and are committed to sharing information. Cool Counties contact information is available at: http://www.kingcounty.gov/exec/coolcounties/Joinus.aspx.

- Local Governments for Sustainability, a program of International Cities for Local Environmental Initiatives (ICLEI), has initiated a campaign called Cities for Climate Protection (CCP). The membership program is designed to empower local governments worldwide to take action on climate change. Many California cities have joined ICLEI. More information is available at the organization's website: http://www.iclei.org/.

- The Institute for Local Government, an affiliate of the California State Association of Counties and the

League of California Cities, has instituted a program called the California Climate Action Network (CaliforniaCAN!). The program provides information about the latest climate action resources, best practices, and case studies. More information is available at the CaliforniaCAN! website: http://www.cacities.org/index.jsp?displaytype=&section=climate&zone=ilsg.

- The Governor's Office of Planning and Research provides valuable resources for lead agencies related to CEQA and global warming at http://opr.ca.gov/index.php?a=ceqa/index.html. Among the materials available are a list of environmental documents addressing climate change and greenhouse gas emissions and a list of local plans and policies addressing climate change.

- The California Air Pollution Control Officers Association has prepared a white paper entitled "CEQA and Climate Change" (January 2008). The document includes a list of mitigation measures and information about their relative efficacy and cost. The document is available at http://www.capcoa.org/ceqa/?docID=ceqa.

- The Attorney General's global warming website includes a section on CEQA. See http://ag.ca.gov/globalwarming/ceqa.php. The site includes all of the Attorney General's public comment letters that address CEQA and global warming.

For information on the general plan process, see Governor's Office of Planning and Research, General Plan Guidelines (1998), available at http://ceres.ca.gov/planning/genplan/gpg.pdf.

(4) Endnotes

1. Energy efficiency leads the mitigation list because it promises significant greenhouse gas reductions through measures that are cost-effective for the individual residential and commercial energy consumer.

2. Leadership in Energy and Environmental Design (LEED) administers a Green Building Ratings program that provides benchmarks for the design, construction, and operation of high-performance green buildings. More information about the LEED ratings system is available at http://www.usgbc.org/DisplayPage.aspx?CategoryID=19. Build it Green is a non-profit, membership organization that promotes green building practices in California. The organization offers a point-based, green building rating system for various types of projects. See http://www.builditgreen.org/guidelines-rating-systems. Lawrence Berkeley National Laboratories' Building Technologies Department is working to develop coherent and innovative building construction and design techniques. Information and publications on energy efficient buildings are available at the Department's website at http://btech.lbl.gov.

3. For more information, see Lawrence Berkeley National Laboratories, Heat Island Group at http://eetd.lbl.gov/HeatIsland/.

4. See California Energy Commission, "How to Hire an Energy Services Company" (2000) at http://www.energy.ca.gov/reports/efficiency_handbooks/400-00-001D.PDF.

5. Energy Star is a joint program of the U.S. Environmental Protection Agency and the U.S. Department of Energy that certifies energy efficient products and provides guidelines for energy efficient practices for homes and businesses. More information about Energy Star-certified products is available at http://www.energystar.gov/. The Electronic Product Environmental Assessment Tool (EPEAT) is a system that ranks computer products based on their conformance to a set of environmental criteria, including energy efficiency. More information about EPEAT is available at http://www.epeat.net/AboutEPEAT.aspx.

6. LED lighting is substantially more energy efficient than conventional lighting and can save money. See http://www.energy.ca.gov/efficiency/partnership/case_studies/TechAsstCity.pdf (noting that installing LED traffic signals saved the City of Westlake about $34,000 per year). As of 2005, only about a quarter of California's cities and counties were using 100% LEDs in traffic signals. See California Energy Commission (CEC), Light Emitting Diode Traffic Signal Survey (2005) at p. 15, available at http://www.energy.ca.gov/2005publications/CEC-400-2005-003/CEC-400-2005-003.PDF. The CEC's Energy Partnership Program can help local governments take advantage of energy saving technology, including, but not limited to, LED traffic signals. See http://www.energy.ca.gov/efficiency/partnership/.

7. See Palm Desert Energy Partnership at http://www.sce.com/rebatesandsavings/palmdesert. The City, in partnership with Southern California Edison, provides incentives and rebates for efficient equipment. See Southern California Edison, Pool Pump and Motor Replacement Rebate Program at http://www.sce.com/RebatesandSavings/Residential/_Pool/PoolPumpandMotor/.

8. Many cities and counties provide energy efficiency education. See, for example, the City of Stockton's Energy Efficiency website at http://www.stocktongov.com/energysaving/index.cfm. See also "Green County San Bernardino," http://www.greencountysb.com/ at pp. 4-6. Private projects may also provide education. For example, a homeowners' association could provide information and energy audits to its members on a regular basis.

9. See http://www.gosolarcalifornia.ca.gov/documents/CEC-300-2007-008-CMF.PDF. At the direction of Governor Schwarzenegger, the California Public Utilities Commission (CPUC) approved the California Solar Initiative on January 12, 2006. The initiative creates a $3.3 billion, ten-year program to install solar panels on one million roofs in the State. See http://www.gosolarcalifornia.ca.gov/nshp/index.html.

10. For example, Alameda County has installed two solar tracking carports, each generating 250 kilowatts. By 2005, the County had installed eight photovoltaic systems totaling over 2.3 megawatts. The County is able to meet 6 percent of its electricity needs through solar power. See http://www.acgov.org/gsa/Alameda%20County%20-%20Solar%20Case%20Study.pdf.

11. Many commercial, industrial, and campus-type facilities (such as hospitals, universities and prisons) use fuel to produce steam and heat for their own operations and processes. Unless captured, much of this heat is wasted. Combined heat and power (CHP) captures waste heat and re-uses it, *e.g.*, for residential or commercial space heating or to generate electricity. See U.S. EPA, Catalog of CHP Technologies at http://www.epa.gov/chp/documents/catalog_of_%20chp_tech_entire.pdf. The average efficiency of fossil-fueled power plants in the United States is 33 percent. By using waste heat recovery technology, CHP systems typically achieve total system efficiencies of 60 to 80 percent. CHP can also substantially reduce emissions of carbon dioxide. http://www.epa.gov/chp/basic/efficiency.html. Currently, CHP in California has a capacity of over 9 million kilowatts. See list of California CHP facilities at http://www.eea-inc.com/chpdata/States/CA.html.

12. The California Energy Commission has found that the State's water-related energy use – which includes the conveyance, storage, treatment, distribution, wastewater collection, treatment, and discharge – consumes about 19 percent of the State's electricity, 30 percent of its natural gas, and 88 billion gallons of diesel fuel every year, and this demand is growing. See http://www.energy.ca.gov/2007publications/CEC-999-2007-008/CEC-999-2007-008.PD

F. Accordingly, reducing water use and improving water efficiency can help reduce energy use and associated greenhouse gas emissions.

13. The Water Conservation in Landscaping Act of 2006 (AB 1881) requires the Department of Water Resources (DWR), not later than January 1, 2009, to update the Model Water Efficient Landscape Ordinance. The draft of the entire updated Model Water Efficient Landscape Ordinance will be made available to the public. See http://www.owue.water.ca.gov/landscape/ord/updatedOrd.cfm.

14. See Graywater Guide, Department of Water Resources, Office of Water Use Efficiency and Transfers at http://www.owue.water.ca.gov/docs/graywater_guide_book.pdf. See also The Ahwahnee Water Principles, Principle 6, at http://www.lgc.org/ahwahnee/h2o_principles.html. The Ahwahnee Water Principles have been adopted by City of Willits, Town of Windsor, Menlo Park, Morgan Hill, Palo Alto, Petaluma, Port Hueneme, Richmond, Rohnert Park, Rolling Hills Estates, San Luis Obispo, Santa Paula, Santa Rosa, City of Sunnyvale, City of Ukiah, Ventura, Marin County, Marin Municipal Water District, and Ventura County.

15. See Office of Environmental Health Hazard Assessment and the California Water and Land Use Partnership, Low Impact Development, at http://www.coastal.ca.gov/nps/lid-factsheet.pdf.

16. See, for example, the City of Santa Cruz, Water Conservation Office at http://www.ci.santa-cruz.ca.us/wt/wtcon/index.html; Santa Clara Valley Water District, Water Conservation at http://www.valleywater.org/conservation/index.shtm; and Metropolitan Water District and the Family of Southern California Water Agencies, Be Water Wise at http://www.bewaterwise.com. Private projects may provide or fund similar education.

17. See CEC Public Interest Energy Research Program, Dairy Power Production Program, Dairy Methane Digester System, 90-Day Evaluation Report, Eden Vale Dairy (Dec. 2006) at http://www.energy.ca.gov/2006publications/CEC-500-2006-083/CEC-500-2006-083.PDF. See also discussion in the general plan section, below, relating to wastewater treatment plants and landfills.

18. Many cities and counties provide information on waste reduction and recycling. See, for example, the Butte County Guide to Recycling at http://www.recyclebutte.net. The California Integrated Waste Management Board's website contains numerous publications on recycling and waste reduction that may be helpful in devising an education project. See http://www.ciwmb.ca.gov/Publications/default.asp?cat=13. Private projects may also provide education directly, or fund education.

19. See U.S. EPA, Our Built and Natural Environments, A Technical Review of the Interactions between Land Use, Transportation, and Environmental Quality (Jan. 2001) at

pp. 46-48 http://www.epa.gov/dced/pdf/built.pdf.

20. The U.S. Conference of Mayors cites Sacramento's Transit Village Redevelopment as a model of transit-oriented development. More information about this project is available at http://www.cityofsacramento.org/planning/projects/65th-street-village/. The California Department of Transportation maintains a searchable database of 21 transit-oriented developments at http://transitorienteddevelopment.dot.ca.gov/miscellaneous/NewHome.jsp.

21. Palo Alto's Green Ribbon Task Force Report on Climate Protection recommends pedestrian and bicycle-only streets sections under its proposed actions. See http://www.city.palo-alto.ca.us/civica/filebank/blobdload.asp?BlobID=7478.

22. There are a number of car sharing programs operating in California, including City CarShare http://www.citycarshare.org/, Zip Car http://www.zipcar.com/ and Flexcar http://www.flexcar.com/.

23. The City of Lincoln has a NEV program. See http://www.lincolnev.com/index.html.

24. See, for example, Marin County's Safe Routes to Schools program at http://www.saferoutestoschools.org/.

25. The Conservation Element addresses the conservation, development, and use of natural resources including water, forests, soils, rivers, and mineral deposits. Measures proposed for the Conservation Element may alternatively be appropriate for other elements. In practice, there may be substantial overlap in the global warming mitigation measures appropriate for the Conservation and Open Space Elements.

26. See the Attorney General's settlement agreement with the County of San Bernardino, available at http://ag.ca.gov/cms_pdfs/press/2007-08-21_San_Bernardino_settlement_agreement.pdf. See also Marin County Greenhouse Gas Reduction Plan (Oct. 2006) at http://www.co.marin.ca.us/depts/CD/main/pdf/final_ghg_red_plan.pdf; Marin Countywide Plan (Nov. 6, 2007) at http://www.co.marin.ca.us/depts/CD/main/fm/cwpdocs/CWP_CD2.pdf; Draft Conservation Element, General Plan, City of San Diego at http://www.sandiego.gov/planning/genplan/pdf/generalplan/ce070918.pdf.

27. Public Resources Code Section 25402.1(h)2 and Section 10-106 of the Building Energy Efficiency Standards establish a process that allows local adoption of energy standards that are more stringent than the statewide Standards. More information is available at the California Energy Commission's website. See http://www.energy.ca.gov/title24/2005standards/ordinances_exceeding_2005_building_standards.html.

28. See, *e.g.*, LEED at http://www.usgbc.org/DisplayPage.aspx?CategoryID=19; see also Build it Green at http://www.builditgreen.org/guidelines-rating-systems.

29. The City of Santa Monica, for example, has instituted a Green Building Program. See http://www.greenbuildings.santa-monica.org/. The City of Pasadena also has a green building ordinance that applies to public and private buildings. See http://www.ci.pasadena.ca.us/permitcenter/greencity/building/gbprogram.asp and http://ordlink.com/codes/pasadena/index.htm?Search_Code=Begin+Searching+Municipal+Code at Title 14. The City of San Francisco is considering adopting green building performance requirements that would apply to public and private buildings. See http://www.sfenvironment.org/downloads/library/gbtfrrreleasev1.3.pdf.

30. See, *e.g.*, "Green County San Bernardino," http://www.greencountysb.com/. As part of its program, the County is waiving permit fees for alternative energy systems and efficient heating and air conditioning systems. See http://www.greencountysb.com/ at p. 3. For a representative list of incentives for green building offered in California and throughout the nation, see U.S. Green Building Council, Summary of Government LEED Incentives (updated quarterly) at https://www.usgbc.org/ShowFile.aspx?DocumentID=2021.

31. For example, Riverside Public Utilities offers free comprehensive energy audits to its business customers. See http://www.riversideca.gov/utilities/busi-technicalassistance.asp.

32. Under Southern California Gas Company's Energy Efficiency Program for Commercial/Industrial Large Business Customers, participants are eligible to receive an incentive based on 50% of the equipment cost, or $0.50 per therm saved, whichever is lower, up to a maximum amount of $1,000,000 per customer, per year. Eligible projects require an energy savings of at least 200,000 therms per year. See http://www.socalgas.com/business/efficiency/grants/.

33. The City of Berkeley is in the process of instituting a "Sustainable Energy Financing District." According to the City, "The financing mechanism is loosely based on existing 'underground utility districts' where the City serves as the financing agent for a neighborhood when they move utility poles and wires underground. In this case, individual property owners would contract directly with qualified private solar installers and contractors for energy efficiency and solar projects on their building. The City provides the funding for the project from a bond or loan fund that it repays through assessments on participating property owners' tax bills for 20 years." See http://www.cityofberkeley.info/Mayor/PR/pressrelease2007-1023.htm.

34. As described in its Climate Action Plan, the City of San Francisco uses a combination of incentives and technical assistance to reduce lighting energy use in small businesses such as grocery stores, small retail outlets, and restaurants. The program offers free energy audits and coordinated lighting retrofit installation. In addition, the City offers residents

the opportunity to turn in their incandescent lamps for coupons to buy fluorescent units. See San Francisco's Climate Action Plan, available at http://www.sfenvironment.org/downloads/library/climateactionplan.pdf.

35. Among other strategies for reducing its greenhouse gas emissions, Yolo County has adopted purchasing policies for computers and electrical equipment. http://www.yolocounty.org/docs/press/GreenhouseGas.htm.

36. See, for example, Los Angeles County Green Purchasing Policy, June 2007 at http://www.responsiblepurchasing.org/UserFiles/File/General/Los%20Angeles%20County,%20Green%20Purchasing%20Policy,%20June%202007.pdf. The policy requires County agencies to purchase products that minimize environmental impacts, including greenhouse gas emissions.

37. Some local agencies have implemented a cool surfaces programs in conjunction with measures to address storm water run off and water quality. See, for example, The City of Irvine's Sustainable Travelways/Green Streets program at http://www.cityofirvine.org/depts/redevelopment/sustainable_travelways.asp; The City of Los Angeles's Green Streets LA program at http://water.lgc.org/water-workshops/la-workshop/Green_Streets_Daniels.pdf/view; see also The Chicago Green Alley Handbook at http://egov.cityofchicago.org/webportal/COCWebPortal/COC_EDITORIAL/GreenAlleyHandbook_Jan.pdf.

38. See the website for Lawrence Berkeley National Laboratory's Urban Heat Island Group at http://eetd.lbl.gov/HeatIsland/LEARN/ and U.S. EPA's Heat Island website at www.epa.gov/heatisland/. To learn about the effectiveness of various heat island mitigation strategies, see the Mitigation Impact Screening Tool, available at http://www.epa.gov/heatisld/resources/tools.html.

39. For example, the City of Lompoc has a policy to "require new development to offset new water demand with savings from existing water users, as long as savings are available." See http://www.ci.lompoc.ca.us/departments/comdev/pdf07/RESRCMGMT.pdf.

40. The Irvine Ranch Water District in Southern California, for example, uses a five-tiered rate structure that rewards conservation. The water district has a baseline charge for necessary water use. Water use that exceeds the baseline amount costs incrementally more money. While "low volume" water use costs $.082 per hundred cubic feet (ccf), "wasteful" water use costs $7.84 per ccf. See http://www.irwd.com/AboutIRWD/rates_residential.php. Marin County has included tiered billing rates as part of its general plan program to conserve water. See Marin County Countywide Plan, page 3-204, PFS-2.q, available at http://www.co.marin.ca.us/depts/CD/main/fm/cwpdocs/CWP_CD2.pdf.

41. See the City of Fresno's Watering Regulations and Ordinances at http://www.fresno.gov/Government/DepartmentDirectory/PublicUtilities/Watermanagement/Conservation/WaterRegulation/WateringRegulationsandRestrictions.htm.

42. See, *e.g.*, the City of San Diego's plumbing retrofit ordinance at http://www.sandiego.gov/water/conservation/selling.shtml.

43. The City of Roseville offers free water conservation audits through house calls and on-line surveys. See http://www.roseville.ca.us/eu/water_utility/water_conservation/for_home/programs_n_rebates.asp.

44. See Landscape Performance Certification Program, Municipal Water District of Orange County at http://waterprograms.com/wb/30_Landscapers/LC_01.htm.

45. For example, San Diego's Metropolitan Wastewater Department (SDMWD) installed eight digesters at one of its wastewater treatment plants. Digesters use heat and bacteria to break down the organic solids removed from the wastewater to create methane, which can be captured and used for energy. The methane generated by SDMWD's digesters runs two engines that supply enough energy for all of the plant's needs, and the plant sells the extra energy to the local grid. See http://www.sandiego.gov/mwwd/facilities/ptloma.shtml. In addition, the California Air Resources Board approved the Landfill Methane Capture Strategy as an early action measure. http://www.arb.ca.gov/cc/ccea/landfills/landfills.htm. Numerous landfills in California, such as the Puenta Hills Landfill in Los Angeles County (http://www.lacsd.org/about/solid_waste_facilities/puente_hills/clean_fuels_program.asp) the Scholl Canyon Landfill in the City of Glendale (http://www.glendalewaterandpower.com/Renewable%20Energy%20Development.asp), and theYolo Landfill in Yolo County, are using captured methane to generate power and reduce the need for other more carbon-intensive energy sources.

46. On April 30, 2007, the Public Utilities Commission authorized a CCA application by the Kings River Conservation District on behalf of San Joaquin Valley Power Authority (SJVPA). SJVPA's Implementation Plan and general CCA program information is available at www.communitychoice.info. See also http://www.co.marin.ca.us/depts/CD/main/comdev/advance/Sustainability/Energy/cca/CCA.cfm. (County of Marin); and http://sfwater.org/mto_main.cfm/MC_ID/12/MSC_ID/138/MTO_ID/237 (San Francisco Public Utilities Commission).

47. The Land Use Element designates the type, intensity, and general distribution of uses of land for housing, business, industry, open-space, education, public buildings and grounds, waste disposal facilities, and other categories of public and private uses.

48. Samples of local legislation to reduce sprawl are set forth in the U.S. Conference of Mayors' Climate Action Handbook. See http://www.iclei.org/documents/USA/documents/CCP/Climate_Action_Handbook-0906.pdf.

49. The City of Berkeley has endorsed the strategy of reducing developer fees or granting property tax credits for mixed-use developments in its Resource Conservation and Global Warming Abatement Plan. City of Berkeley's Resource Conservation and Global Warming Abatement Plan p. 25 at http://www.baaqmd.gov/pln/GlobalWarming/BerkeleyClimateActionPlan.pdf.

50. For a lists and maps related to urban growth boundaries in California, see Urban Growth Boundaries and Urban Line Limits, Association of Bay Area Governments (2006) at http://www.abag.ca.gov/jointpolicy/Urban%20Growth%20Boundaries%20and%20Urban%20Limit%20Lines.pdf**.**

51. The Circulation Element works with the Land Use element and identifies the general location and extent of existing and proposed major thoroughfares, transportation routes, terminals, and other local public utilities and facilities.

52. See Orange County Transportation Authority, Signal Synchronization at http://www.octa.net/signals.aspx. Measures such as signal synchronization that improve traffic flow must be paired with other measures that encourage public transit, bicycling and walking so that improved flow does not merely encourage additional use of private vehicles.

53. San Francisco's "Transit First" Policy is listed in its Climate Action Plan, available at http://www.sfenvironment.org/downloads/library/climateactionplan.pdf. The City's policy gives priority to public transit investments and provides public transit street capacity and discourages increases in automobile traffic. This policy has resulted in increased transit service to meet the needs generated by new development.

54. The City of La Mesa has a Sidewalk Master Plan and an associated map that the City uses to prioritize funding. As the City states, "The most important concept for sidewalks is connectivity. For people to want to use a sidewalk, it must conveniently connect them to their intended destination." See http://www.ci.la-mesa.ca.us/index.asp?NID=699.

55. San Francisco assesses a Downtown Transportation Impact Fee on new office construction and commercial office space renovation within a designated district. The fee is discussed in the City's Climate Action plan, available at http://www.sfenvironment.org/downloads/library/climateactionplan.pdf.

56. For example, Seattle, Washington maintains a public transportation "ride free" zone in its downtown from 6:00 a.m. to 7:00 p.m. daily. See http://transit.metrokc.gov/tops/accessible/paccessible_map.html#fare.

57. Reforming Parking Policies to Support Smart Growth, Metropolitan Transportation Commission (June 2007) at http://www.mtc.ca.gov/planning/smart_growth/parking_seminar/Toolbox-Handbook.pdf.

58. See Safe Routes to School Toolkit, National Highway Traffic Safety Administration (2002) at www.nhtsa.dot.gov/people/injury/pedbimot/bike/Safe-Routes-2002; see also www.saferoutestoschools.org (Marin County).

59. The Housing Element assesses current and projected housing needs. In addition, it sets policies for providing adequate housing and includes action programs for that purpose.

60. The Open Space Element details plans and measures for preserving open space for natural resources, the managed production of resources, outdoor recreation, public health and safety, and the identification of agricultural land. As discussed previously in these Endnotes, there may be substantial overlap in the measures appropriate for the Conservation and Open Space Elements.

61. The Safety Element establishes policies and programs to protect the community from risks associated with seismic, geologic, flood, and wildfire hazards.

LETTER 22

CITIZENS PLANNING ASSOCIATION OF SANTA BARBARA COUNTY, INC.
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10 January 2008

Delores Brown
Chief, Office of Environmental Compliance
California Department of Water Resources
901 P Street
Sacramento, CA 95814

Re: Draft Environmental Impact Report, Monterey Amendment, SCH#: 200301118

Dear Ms. Brown:

Please accept the attached comments in behalf of the Citizens Planning Association of Santa Barbara County (CPA), one of the original plaintiffs in the matter of **PCL et al v. DWR.** The comments have been prepared by Mr. Arve R. Sjovold, our representative to the plaintiffs' committee and a participant in the EIR process. Although Mr. Sjovold participated in many of the EIR committee meetings, he is distressed that virtually none of the comments and suggestions made in the long tenure of this committee were recognized or adopted in the preparation of the document. Accordingly, he regrets that his name is listed as one of the committee responsible for preparing this document. Nonetheless, he will honor his pledge to be of service to the committee and to DWR in this matter. 22-1

The comments are divided up into several distinct sections. The first deals with what Mr. Sjovold shows are critical flaws in the CALSIM II model, which was used as the primary analytic tool for the impact analyses. Based on Mr. Sjovold's review of the model, CPA finds this Draft EIR is seriously deficient. The CALSIM II review presents several analytic findings that are seminal with regard to this model's flaws; they should be addressed by DWR before this process continues. The CALSIM II review also points to critical failures in the application of the CALSIM II results in the analysis.

The second section addresses other areas of the impact analyses while the third section is an attachment of comments and criticisms of the DWR paper on incorporating climate change in to CALSIM II. Since DWR made this report central to their analyses of climate change impacts in the EIR, it is entirely appropriate to include such comments. 22-2

Finally, there are two appendices which support the CALSIM II analysis presented by Mr. Sjovold. They point to constructive changes that should be included in CALSIM II before it is used again.

These comments do not reach all the analyses presented in the Draft; there was not sufficient time to do so. However, because of the central importance of CALSIM II to the Draft's analyses, the flaws that have been shown by Mr. Sjovold are sufficient to render the entire Draft as inadequate. 22-3

We appreciate your serious consideration of these significant concerns.

Sincerely,

Steve Dunn, CPAPresident Arve Sjovold, CPA Board Member & Plaintiff Representative

CC: Attorney General Edmund G. Brown, Department of Justice
Secretary Mike Chrisman, California Department of Resources
Assemblymember Pedro Nava, California State Assembly

AN ANALYSIS OF CALSIM II
AS USED IN THE DRAFT EIR
By: Arve R. Sjovold

Introduction

The draft EIR uses CALSIM II as its primary methodology in analyzing the impacts of the Monterey Amendments (with Settlement additions) and therefore deserves detailed scrutiny as to its accuracy and appropriateness as a tool for environmental impact analysis. The accuracy problem is paramount given that the Appellate Court found that the original Monterey EIR had not considered the ramifications of the SWP's inability to deliver anywhere near the full entitlement values prescribed in the SWP contracts. A consequence of this finding is the acknowledgement that any entity relying on full entitlements as actual deliveries that cannot be fulfilled is dealing with "paper water". To quantify how much water the project can deliver reliably requires a model with a high degree of absolute accuracy. And the degree to which the project falls short of delivering reliably against expected full entitlements is the measure of "paper water". DWR's analyses of reliability of delivery rely totally on the use of its CALSIM II model; thus the accuracy of CALSIM II is essential. 22-4

DWR has not properly calibrated CALSIM II so its accuracy is still in question. The EIR does not reference any calibration exercise of CALSIM II and assumes that it delivers accurate estimates of delivery given the assumptions that are made in its development and use.

CALSIM II is referred to as a "simulation model" though in fact it is an optimization model, which is designed to determine the maximum amount of water that can be exported given the constraints of hydrology and SWRCB rules that govern the project's operations. There are troubling features of CALSIM II, which in all likelihood render the model as unsuitable as an estimator of project deliveries. The troubling features include: 22-5

- Its water year indices
- The lack of statistical rigor in characterizing the hydrology
- The inability to use environmental parameters as inputs to study impacts
- The lack of calibrations

Model Suitability for Environmental Impact Analyses

The fact that the model is an optimization model and not a simulation as purported, misleads the analysis of environmental impact. This is particularly true considering that **the optimization objective is maximizing export of water from the Delta and not the maximizing of environmental qualities.** Admittedly, quantifying environmental qualities for a mathematical model is an extremely difficult task. However, the model should at least allow ready testing of various proposals to improve the environmental health of the Delta. Instead, the model treats the existing set of water 22-6

rights rules and regulations as hard-coded constraints within the model code such that it is very cumbersome to change them for use in environmental studies**. Furthermore, the constraints coded in the model are only those that the SWRCB has promulgated as regulations on the project that reflect the past history of the project and its observed impacts on the Delta. It is a tenuous proposition to pretend that those constraints are adequate to protect the environment as we move forward with this project.** For example, DWR admits that the model does not include within its code any sense of Endangered Species Act requirements, which given the current state of the Delta should be its primary focus. Furthermore, the last 12 months have seen several court rulings that acknowledge the inadequacy of the current operations and regulations to protect endangered species. As a result of these rulings, Delta exports have been dramatically reduced. As currently configured, CALSIM II is not well suited to help solve these problems. 22-6 (con't.)

The SWRCB constraints that are most limiting on exports are the salinity constraints in the Delta and these operate to control salinity mostly in the western Delta. **In fact, it is fair to say that the model assumes that as long as it meets the salinity constraints in the Delta it has met its requirement for environmental protection in the Delta.**

For example, there are no routines in the model to deal with reverse flows in the San Joaquin River and the consequent mortality of Delta Smelt in the project pumps. Yet there is sufficient data to provide a competent predictor based on flow and pumping conditions to predict when reverse flows are likely to occur. It could be used as a constraint on Delta pumping in order to protect the fish. (See Appendix A)

Even in the case of modeling the salinity, the model uses a predictive equation that relies on one position in the western Delta, is dependent only on Delta outflow, and is independent of project pumping. Yet the historical sense on this issue is the knowledge that heavy pumping in the South Delta can affect the position and variability of the salinity gradient in the Delta. With the relationship that presently exists in the model, the prediction of the salinity appears to be unaffected by export operations. 22-7

Furthermore, it is a tenuous scientific proposition that a single point for measuring the affects of the project on salinity in the Delta is sufficient given the magnitude and complexity of the Delta. For example, the Delta Smelt is a species that lives entirely within the brackish water of the Delta and its movements to and fro in the Delta are largely dependent on the salinity variations. DWR should use its modeling talents to predict salinity gradients throughout the Delta and how they vary under different hydrologic and pumping scenarios. The EIR is largely silent on this matter and yet it would seem, given the present dire state of the Delta, that analyses of this sort would be a primary focus of the EIR.

The presently used systems of modeling the Delta by DWR rely on CALSIM II in concert with DSM2, a more detailed model that is intended to calculate the flows throughout the myriad Delta channels. It depends on CALSIM II to provide the input and export flows to and from Delta using the CALSIM II calculations for the Sacramento and San Joaquin valleys; in effect CALSIM II provides the boundary conditions for the operation of DSM2. Thus, DSM2 is limited in the scope of its calculations by the CALSIM II constrained inputs. The limitations of CALSIM II as an export optimization

model are visited upon the DSM2 calculations independent of the capability of DSM2 to investigate salinity variations more broadly.

It would be extremely useful to the analysis of the environmental impacts of the project if first model calculations could be obtained for a scenario without regulation of input flows and no exports to establish the conditions in the Delta for which the Delta Smelt are adapted. From this baseline it may be possible to determine the degree to which project operations affect Delta habitat and hence the species that rely on it.

22-7 (con't.)

The Problem With Water Year Indices in CALSIM II

CALSIM II uses as a primary input to its calculations a designation called "Water Year Type", which can take on one of five discreet values corresponding to whether the year in question is "wet", "above normal", "below normal", "dry", or "critical". These designations are used as input data to govern project operations in the model (and in practice), particularly in setting environmental constraints and are developed from the historical record spanning 73 years, 1922-1994, the basic hydrologic record used to drive CALSIM II.

Water year type is derived from a "Water Year Index" which is in turn developed from a runoff index. There are two sets of runoff indices, one for the Sacramento Basin runoff and one for the San Joaquin basin runoff. The basin runoff indices are calculated from the measured runoffs from the four major rivers in the Sacramento Basin and the four major rivers in the San Joaquin. These major rivers capture about 80% of the total runoff in the respective basins and are believed to be reliable surrogates for runoff. This runoff data is available on a monthly basis.

For each water year (October through September) a water year index is calculated as the weighted sum of 40% of the current forecast for the upcoming April to July runoff, plus 30% of the current October through March runoff, plus 30% of the previous year's water index. Thus the weighted formulation necessarily spans parts of two water years although it purports to represent the current water year. Depending on the value of the index for a given water year an assignment into one of the water year types is made. For project operations, the index is set by the first of the month forecast beginning in February and continues until the final determination based on the May forecast of runoff.

22-8

For use in CALSIM II a water-year type and a water year index are provided as fixed assignments for a given year in a "look-up table" for use in the calculations. **Because of the way in which these two attributes are derived they in effect provide the simulation with "perfect" information as to the upcoming runoff season (December through May) for a given water year, a circumstance that is not possible for making decisions for real time operations.** Also there is the fundamental question posed by the derivation of the water year index in that it combines the runoff from two successive water years. **There is no scientific merit to the notion that the previous year's runoff should affect the subsequent year's runoff, which is precisely what the 40-30-30 weighting does.** A simple serial correlation of the annual runoff record shows that there is no significant correlation, meaning that the current water year's runoff is independent of the previous water year. The water index is without any scientific merit and it should not be used, as is the case for the dependent parameter, water year type.

How the use of these indices biases the CALSIM II calculations and the actual project operations is difficult to deduce, but it is sufficiently clear to state that none of the calculations can be considered useful in the analyses of the EIR.

The additional fact that the indices as they are used are provided to the calculations in a fashion that gives the calculations "perfect information" ahead of the unfolding water year run-off is also sufficient to discredit any claim that this model is a simulation of system hydrology. In a simulation, one tries to replicate the decision structure that faces the system in real time. Knowing how the water year is going to end well before it is experienced allows CALSIM II to begin pumping early in the water year when at times little runoff has materialized. In effect, the early pumping borrows water from the Delta in the knowledge that it will be made up during the spring runoff. However, in real time the system operators do not know that spring runoff will be ample and therefore must restrict early pumping until events on the ground dictate that it is safe to pump.

22-8 (con't.)

Environmental Inputs

The object of environmental impact analyses is to evaluate the degree to which project operations and requirements affect what is broadly referred to as the environment. Because environmental attributes are difficult to quantify a good approach is to develop quantitative methods that at least allow ready evaluation of various alternatives intended to both achieve environmental protection and project operations. The present form of CALSIM II focuses only on project operations. It limits its treatment of the environment to what can be hard coded into the model as purported environmental constraints. Even in this regard no attempt has been made to have the model address important environmental questions such as that posed by the dangerous declines in Delta fish species.

A peer review panel of nationally recognized experts was convened to review the CALSIM II model as a tool to support water planning (See Appendix G of the EIR). However, that panel "did not specifically address the manner in which CALSIM II represents the environmental regulations and objectives established for the Central Valley water system", as stated in a study(1) by the National Heritage Foundation. That study builds on the peer review study to examine just how CALSIM II treats environmental constraints and objectives in the model.

22-9

The NHI study found that CALSIM II and actual operations are not faithful to the constraints and requirements that have been levied on the projects to protect the environment and the Delta. The study also attempts to examine what would be required in terms of additional changes and requirements that might be necessary to restore Delta health. The EIR does not address the current lack of compliance nor what additional measures might be necessary to begin to restore the Delta. Given the current state of the Delta this deficiency is deplorable and the EIR is again deficient.

(1) Jeffrey T. Payne et al, "**An Environmental Review of CalSim-II** : Defining "Full Environmental Compliance" and "Environmentally Preferred" Formulations of the CalSim-II Model, Natural Heritage Institute, November 2005

Lack of Statistical Rigor in Characterizing the Hydrology

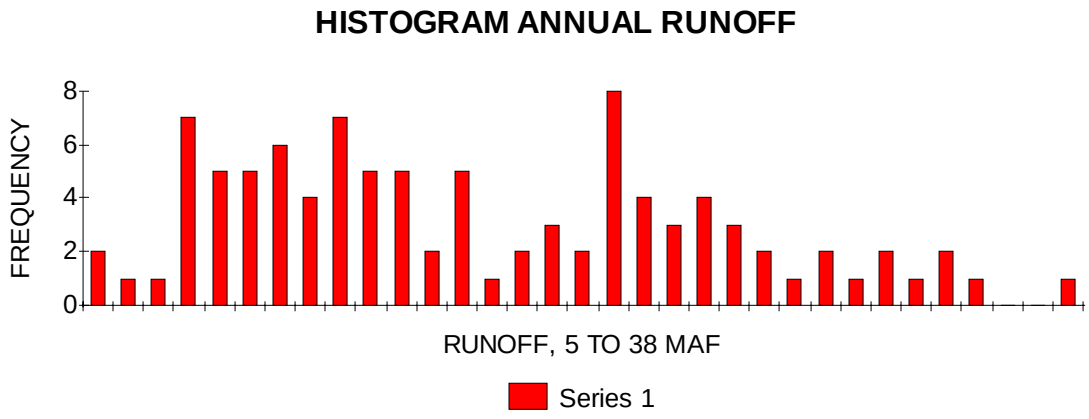
CALSIM II uses a 73-year historical record of runoff as the primary input to the model. The variation evident in this record is assumed to be an accurate representation of the variation to be expected in the future and this assumption is relied on in characterizing the likelihood of the various output results. For the estimate of reliability of delivery, the model arranges the outputs in ascending order and ranks them in terms of the percentage of outputs exceeding a particular level of delivery. This percentage is used as an indicator of how well the project can meet its delivery requirements. Used in this way the frequency of occurrence takes on the quality of probability. But before any notion of probability can be assigned, the underlying stochastic character of the input variable, runoff, must be ascertained. In fact this information must be available to adequately design the model in the first place. This seems not to have taken place in the development of CALSIM II.

A careful examination of the statistical character of Central Valley runoff (using the 8-river runoff index--the combination of Sacramento and San Joaquin runoff) shows that runoff comprises two distinct groupings, a group that can be described as dry years and the other as wet years. Figure 1 presents a crude histogram of the 98-year runoff record for the 8-river index and it is quite clear that there are two distinct modes (central tendencies). These two tendencies

22-10

Figure 1

Runoff Distribution in the Central Valley
8-River Index
(Frequency of occurrence of annual flows-98 year record)



comprise two independent probability distributions and must be treated as such. The overall average runoff for the record (the 8-river index) is 18.04 million acre-feet, which is located in the minimum between the two central tendencies. Accordingly, the average is a relatively unlikely event, certainly not representative of what is normally referred to as “normal.” Thus to characterize individual water years as “normal”, “above normal”, or “below normal” conveys no real meaning. Another characteristic of the dry side

distribution is that the only sense of a threshold that could be described as "critical" are the lowest four years in the distribution, which are all 7 MAF or less.

There are 55 years (56% of the record) that comprise the dry year distribution and 43 years (44%) that are in the wet year distribution. These characterizations are based on total annual runoff. Since project operations cannot know at the beginning of the water year in September what the eventual runoff for the year will be, and the previous year is no indicator for what may happen in the current water year, it is of interest to examine the monthly runoff variations to establish when, in a given water year, a reliable conclusion can be drawn as to the likely amount of total runoff. This is where the look-up table of water year index and water year type bias the calculations by in effect telling CALSIM II what the water year will be before it is fully experienced. (Typically, runoff in the first few months of the water year is not very high and appreciable runoff does not occur until significant rain occurs.) **This is very important to the environmental management of the Delta because it could be extremely detrimental to the fisheries if massive pumping was initiated before a reasonable forecast could be made of the amount of water to be made available.** Since in general significant runoff seldom occurs before December, prudence would dictate reduced pumping rates in the fall until runoff is sufficient to provide exports and assure a healthy Delta habitat. Of necessity the project has to be operated this way because it cannot pump water that is not really available. **However, that level of early year pumping that can both protect the Delta environment and provide for exports has not been ascertained, either for operations or for CALSIM II calculations and the EIR fails to show as much.**

22-10 (con't.)

Significant runoff can occur in December and generally runoff increases going into winter and peaks in the spring when snowmelt becomes the major source of runoff. However, the record shows that December and even January and February have widespread variations in runoff. Figures 2, 3, and 4 present the histograms of runoff for those months respectively based on the 98-year runoff record. What is remarkable about these histograms is that they are highly skewed to dry months, so much so that the most likely (mode) runoff is approximately 1/3 of the average runoff for either December or January. More than half the data points in December are in the first three bars of the histogram, which means that for most of the years it is very unlikely that even modest export levels should be entertained. The same is true for January and even February. Again it must be observed that the average values of monthly runoff are not very representative of anything and can be very misleading. The likelihood of an average runoff is about 1/3 that of the most likely runoff. If pumping operational decisions were to be dictated by the average level of runoff, in most years there would be insufficient water for Delta health. This may in fact be the central reason in explaining the current declines in several of the threatened and endangered species in the Delta.

Given the above characteristics for monthly runoff, it is of great interest to establish when at the earliest the overall character of the year can be discerned. To this end some illuminating regression analyses have been performed to see how well earlier monthly runoff can predict total annual runoff (See Appendix B). A fairly good predictor is obtained by taking the sum of December and January runoff as an independent variable and regressing total runoff against that variable. Figure 5 is a scatter-plot of this data and shows distinctly that the Dec-Jan variable divides the data set into wet and dry domains. (There is a gap in the scatter-plot that demarks the two domains.) All the dry year totals

except one are delimited when the Dec-Jan sum is 3.9 MAF or less. That threshold also captures approximately 5 years that belong to the wet year group. The mean of the sum of December and January is 4.46 MAF so a sum of 3.9 or less signifies a dry winter as well. The average annual runoff (8-river index) is 18.04 MAF and the scatter-plot shows few data points surrounding this total, further confirmation that the average does not confer any sense of "normal."

CALSIM II needs to be revised to correctly account for the bi-modal statistical distribution of runoff. The analysis presented in Appendix B shows one possible direction. That direction would lead to a decision framework that would restrict pumping significantly in the fall and early winter until the amount of runoff that has materialized in combination with whatever snow-pack measurements indicate that more pumping can resume. And if that decision framework were put in place it would most likely eliminate the notion that there is any surplus water in January, February, and possibly March, to be used to implement Article 21, Carryover, or Turnback pool provisions in the Monterey Amendments.

22-10
(con't.)

Figure 2
Histogram of Dec Flow
Frequency vs. MAF

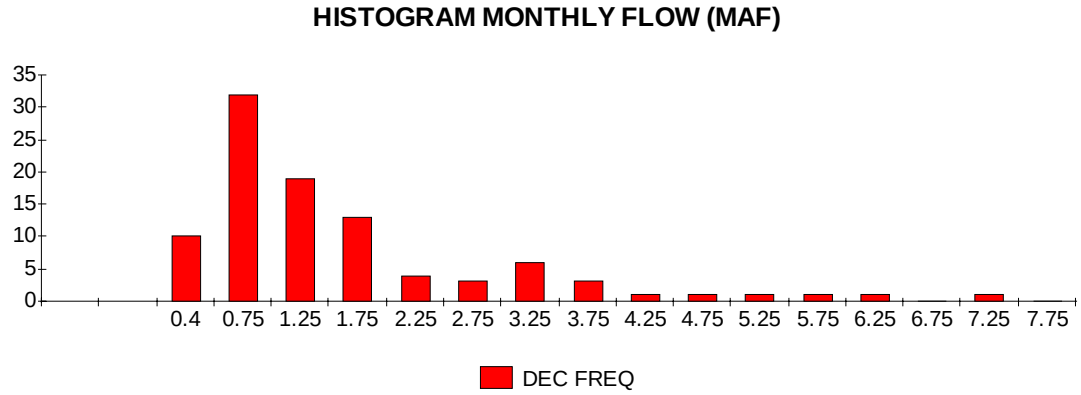


Figure 3
Histogram of Jan Flow
Frequency vs. MAF

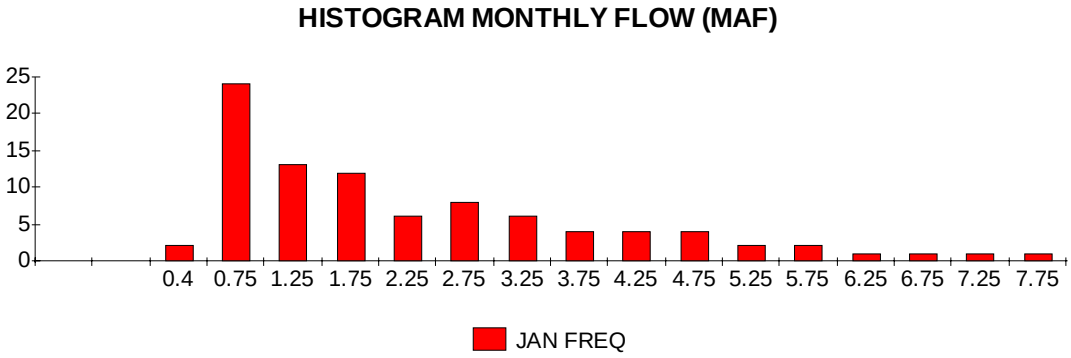


Figure 4
Histogram of Feb Flow
Frequency vs. MAF

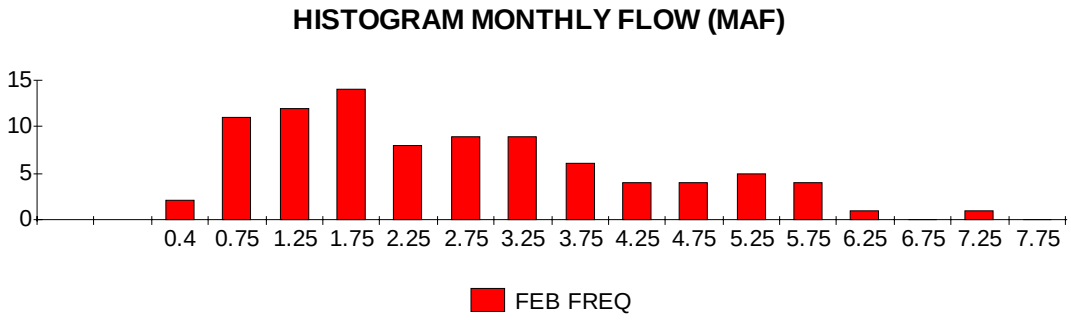
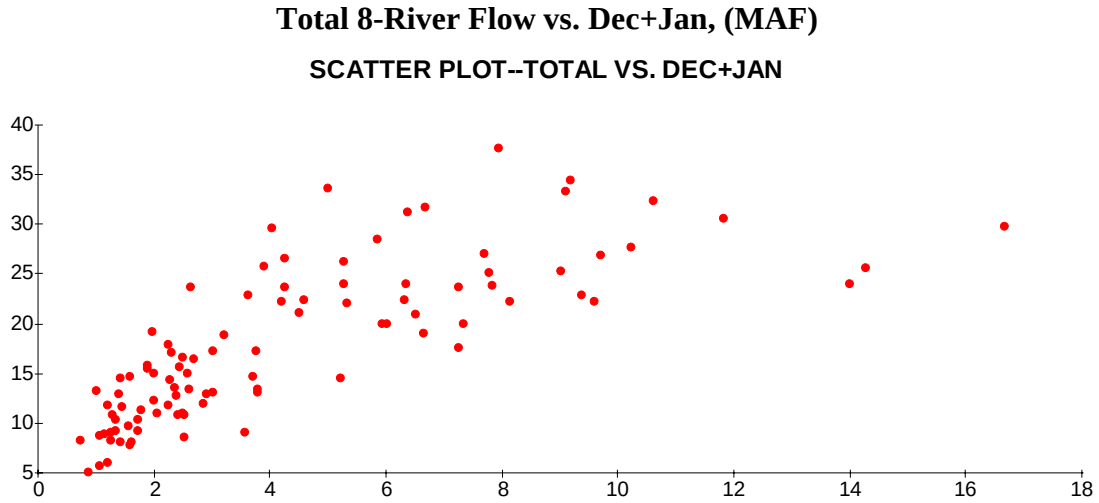


Figure 5

22-10
(con't.)



22-10 (con't.)

The Lack of Calibration of CALSIM II

It was stated above that it is necessary that CALSIM II be calibrated if it is to serve any useful function in environmental assessment or in assessing delivery reliability. DWR claims that its model gives reasonable answers and that it can be relied on for relative accuracy. A peer review of the model strongly recommended that the model be calibrated, especially if it is to be used where absolute accuracy is required and even if it is used for relative accuracy, as in comparisons of cases, given that it is an optimization model. **Calibrating an optimization model is essential in order to establish that whatever optima are calculated are real or possible solutions. This has not been done for CALSIM II and there can be no assurance of how well its calculated values represent reality.**

On the other hand, from the data at hand and with an understanding of how CALSIM II works it is possible to develop some estimates of its accuracy. What is required are CALSIM II estimates for a sequence of years for which there is also actual delivery data and which can be reasonably asserted are for the same conditions assumed for the CALSIM II estimates.

22-11

The EIR and the Reliability Report (Final 2005 Report) use CALSIM II estimates for a record that spans 1922-1994 and studies cases for levels of development corresponding to the years 2001, 2003, and 2021. The EIR reports in Table 6-7 the requests and subsequent actual Table A deliveries for the years 1996-2005, a period that spans the assumed level of development for year 2001 but there are no CALSIM II results for those years. The EIR also identifies the water year types associated with the actual deliveries.

Because the CALSIM II runs noted above do not include in its record the years 1996-2005 it is not possible to perform a direct comparison of estimates with deliveries. However, an examination of the CALSIM II results reported in the Reliability Report for the 73-year record shows two sequences of 10 years that are very similar to the 1996-2005 period, as judged by water year type. Those sequences are 1940-1949 and 1978-1987.

Table 1 presents the actual deliveries for the 1996-2005 period, along with the water year type and the contractor requests as reported in the EIR. Also shown are the reported actual deliveries as reported in the DWR reliability report, which show some disagreement from the EIR. Table 2 presents the water year type, assumed level of demand, and the CALSIM II deliveries for the selected 10-year sequences judged equivalent to the 1996-2005 period. The estimated deliveries are from Table B-3 of the reliability report as is the level of assumed demand, year 2001, or roughly the midpoint of the 10-year span. Water year types for these two sequences were taken from the input data file assembled for CALSIM II.

Table 1
SWP Actual Deliveries
Table A as reported (TAF)

		(From EIR)		(2005 Rel Rep)
YEAR	**YR TYPE**	**REQ**	**DEL**	**DEL**
1996	W	2676	2515	2206
1997	W	2976	2326	2308
1998	W	3335	1726	1595
1999	W	3147	2738	2521
2000	AN	3617	3201	2703
2001	D	4124	1547	1374
2002	D	3914	2573	2511
2003	AN	4126	2901	2964
2004	BN	4128	2600	2312
2005	AN	4127	2828	
	AVG	**3617**	**2495.5**	**2277.1**

22-11 (con't.)

It is assumed that "Requests" as reported in Table 6-7 of the EIR is a reasonable representation of the "demand" as used in the CALSIM II runs. Table 1 shows quite clearly that deliveries fall far short of requests. There is also the troubling observation that the EIR and Reliability Report do not agree; there is a little more than a 200 TAF difference in the averages. The EIR and the Reliability Report both profess to provide a detailed tabulation of actual deliveries. Since actual deliveries should be a matter of record there should be no discrepancy.

Table 2

Estimated CALSIM II Deliveries
Table A (TAF)
(From 2005 Reliability Report)

YEAR	TYPE	DEMAND	DEL	YEAR	TYPE	DEMAND	DEL
1940	AN	3713	3544	1978	AN	3126	3036
1941	W	3013	3036	1979	BN	3527	3509
1942	W	3583	3599	1980	AN	3197	3208
1943	W	3632	3545	1981	D	3834	3532
1944	D	3563	3449	1982	W	3451	3471
1945	BN	3612	3479	1983	W	3007	3036
1946	BN	3710	3724	1984	W	3692	3706
1947	D	3954	2652	1985	D	3753	3540
1948	BN	3959	2681	1986	W	3345	3023
1949	BN	3864	2568	1987	D	3905	2894
AVG		**3660**	**3227**			**3483.7**	**3295**

22-11
(con't.)

For both of the sequences presented in Table 2, looking at just the averages, CALSIM II estimates deliveries that are nearly equal to the assumed level of demand. For either sequence the level of demand is very nearly the same as the level of requests shown in Table 1 above. However, the level of estimated deliveries for each of these sequences is substantially higher than was shown as actual deliveries for the period 1996-2005. The estimated averages are roughly 700 TAF or 950 TAF above the actual average deliveries as reported by the EIR and the Reliability Report respectively for the period 1996-2005.

The two sequences are not perfect reproductions of the hydrologic sequence shown in Table 1 for the period 1996-2005. However, the balance of wetter than normal and drier than normal years is comparable. In fact, there are fewer drier years in the actual delivery sequence than in the two CALSIM II sequences. If there were to be any bias due to this difference it should reduce the estimated delivery level, which is already too high in comparison to the actual.

Based on these comparisons, one must conclude that either the level of demand assumed for the CALSIM II estimates is without foundation or that the model is seriously biased. In fact, until the source of this difference can be discovered and corrected the model is too inaccurate to be used for either absolute or relative accuracy in any study. It should be noted here that the list of contractor requests, which are used to drive CALSIM

II, does include some unrealistic requests. For example, a full Table A request of 25,000 acre-feet is shown for San Luis Obispo County which would be impossible to fulfill since the pipeline to San Luis Obispo County is sized to pass only 4800 acre-feet. What the model does with this excess water is a mystery.

One may conjecture that the bias is due to the difference between the operations implicit in an optimization model and the operations in actual practice. The model is given perfect information concerning the hydrology and only considers constraints that are promulgated by the SWRCB while actual operations must always be governed by the uncertainties of the hydrology ahead and environmental conditions as they materialize, of which the ESA actions are the most important. The optimization model is not really a good simulator of actual operations.

22-11 (con't.)

Other Comments on the Utility of CALSIM II in the EIR

Use of Averages in Reporting

Because the EIR relies so strongly on CALSIM II wherever it makes quantitative findings, it is questionable if such findings are of any merit given the deficiencies in the model. Even the methodology for reporting the model's calculations is misleading. First, because the model construction has ignored the underlying stochastic character of the input hydrology, the use of averages everywhere in the report give little insight as to the effects of project operations. For example, many lengthy tables are presented showing average flows throughout the system as calculated by CALSIM II. Table 7.1-2 of chapter 7 of the EIR presents tables that show average monthly flows for a number of stations over a fairly lengthy record. It is not certain what this table is intended to demonstrate since the record spans the period with CVP-only operations up to and including the period when both the SWP and the CVP are operating. What would be more interesting is to show the typical changes in these flows as the projects mature to maximum entitlements. **Furthermore, given the highly skewed character of the monthly flow distributions as shown above, it is more important to show what the flows are for the dry as well as wet domains. We have already shown that the average monthly flow is an uninteresting statistic and lends no meaning to the analysis.**

22-12

OTHER COMMENTS ON THE DRAFT MONTEREY + EIR

Use of Partial Hydrologic Records in Some Impact Analyses

In several instances the analysis relies on restricted hydrologic records in quantifying a particular point. The analysis of the effects of "borrowing" from lakes Castaic and Perris is a particular egregious example of distorting the impact by use of a restricted record. The analysis tries to show that the borrowing has little or no impact by comparing operations at these lakes before and after the Monterey amendments. Central to this analysis are the recorded data of operations from 1974 through 1994 for the before and the recorded data of operations from 1995 through 2003. The problem with this comparison is that the before record has an embedded 6-year drought and the after is an acknowledged wet period. Thus borrowing under Monterey occurred during a wet period while the basis for comparison has a mixed hydrologic record. Given the variations in lake parameters over ordinary operations those records are also too short to give confidence to the conclusions drawn. 22-13

If CALSIM II did not have so many flaws, this would have been a good example for its use to establish over the variation of a 98-year record the relative changes in lake levels due to borrowing. This would be standard practice for a study of this kind for which a large simulation had been developed. Unfortunately, CALSIM II is not a simulation and is not an appropriate tool. This leaves the analysis of the impact of borrowing resting on comparisons of a very restricted record. 22-14

In section 7.1, which characterizes the environmental setting in the major rivers and the Delta, data is presented which comprises significant variations in record lengths. Some data records span the period of SWP start-up but stop before full maturation of project contract entitlements. Only averages over these periods are reported so it is puzzling to discern just what the EIR is attempting to portray. Clearly, what would be much more informative would be to show the trends in stream flows as the project matures. Also, because the data represent several different sources, there are inconsistencies in the data. Inflows do not necessarily add up to Delta outflow (Table 7.1-2), as one would expect from the ensemble of rivers represented. The same can be said of the presentation of pre-project water quality data. If the environmental setting is to serve as a basis for comparison in impact analysis, the presentations leave much to be desired, especially when more informative presentations could have been prepared. 22-15

Use of frequency charts

Another reporting method is the use of the "frequency of return" charts that appear throughout the EIR. They purport to give the sense of probability of occurrence. However, because there are really two underlying probability distributions for the hydrology ("dry period" and "wet period" as we show above) the frequency charts are misleading and give an optimistic picture of the project's capabilities. They should not be used in the EIR 22-16

Article 21, Carryover, and Turn-back Pool Deliveries

These three categories of contractual water deliveries raise serious questions regarding pumping and Delta health. All are deliveries to be made in January, February, or March when certain conditions prevail. Article 21-water is termed surplus water but the only definition for it comes from the SWP contracts. There is certainly no test of whether it is surplus to the Delta. **DWR must develop a definition of surplus water that is properly constrained by considerations of Delta ecological health. This constraint must supersede the definition of surplus water in the master contract. The EIR must be considered deficient until such a requirement has been met.** 22-17

The Monterey Amendments eliminates all the conditions and constraints on delivery of surplus water that were in the original contract and substituted a new Article 21. One of the original provisions was the responsibility to determine that surplus water not be used in any manner that would constitute the development of a permanent-like economy due to its use. The new definition would seem to allow much more latitude to the use of surplus water for M&I uses that might not be allowed under the original contract. The EIR should analyze the impact of this provision in creating still more paper water.

Carryover and Turn-back Pool water are also contractual definitions and, together with Article 21 water, all three definitions have been modified by the Monterey Amendments. Carryover water is strictly a consequence of the difference between the definitions of contract year and water year. "Carryover" as used in the contract does not deal at all with reserving water in one water year to make it available in a subsequent water year, which is the normally intended meaning of the word. Instead, at the end of December when a new contract year starts, whatever Table A amounts that were scheduled but not delivered in the old year may be delivered in the new contract year even though it is in the same water year. The demand for this delivery occurs in the same months as for Article 21 water when, as we have shown, there is great uncertainty as to how the water year will turnout. The same is basically true for Turn-back Pool water. It too is a creation of the difference between contract and water years. Both "Carryover" and "Turn-back Pool" create opportunities for the contractors to "game" the system to get more Table A deliveries, all under the guise of strict adherence to the contracts. Because these categories are basically contractual creations of Monterey, invocation of them to cause deliveries in the first three months of the contract year should be carefully scrutinized in the EIR for impacts on Delta health. In fact, it would be extremely useful to examine project operations without these provisions. Furthermore, an alternative scenario for full EIR examination should be generated which requires the contract year to be coincident with the water year. 22-18 22-19 22-20

EWA operations

The EIR's discussions of the Environmental Water Account (EWA) do not help the reader understand how the EWA is supposed to work. On one hand it sounds like it is intended to reserve water to be made available for fish in the Delta when circumstances indicate that more flow into the Delta is necessary. On the other hand the EIR talks about 22-21

storing EWA water in the San Luis Reservoir. If it is in the San Luis Reservoir how is it made available to the fish when needed? The obvious question is could the water be kept above the Delta so that its release for fish is direct and to the point? Why must the water be delivered to San Luis Reservoir if it is anticipated that it will be needed for the EWA? Are those who are selling their water south of the Delta making a profit on it? And if it is a project obligation to adhere to the ESA why doesn't DWR act cautiously to make sure that it keeps enough water above the Delta to assure their ESA obligations? All of these questions should be addressed in the EIR.

22-21 (con't.)

Energy Impacts

Since the SWP is a very large net consumer of power, and given the present urgency about energy use and global warming, the analysis of the project's energy impacts is very important. Probably the most important direct energy effect of the Monterey Amendments per se is the transfer of 130 TAF of water from agriculture in the San Joaquin to urban users, most of which are outside the San Joaquin Valley. For those transfers to Southern California the transferred water must be pumped over the Tehachapi Mountains, which constitutes a net increase of pumping energy over and above that which would have been required if the water was used in the Southern San Joaquin as originally called for in the contracts. However, there are many more facets to the impacts of energy requirements associated with this project.

First and foremost, because the project has rarely delivered close to full Table A allotments, there is the question of how the energy required for pumping will be supplied when the project deliveries approach the full allotments. Since the SWP is at present a net energy consumer, any additional deliveries must be presumed to require more pumping energy, which must necessarily come from commercial power from the grid. Given the difficulties that California has in meeting peak demands in the most recent years, it is not at all certain that additional pumping energy can be had without significant impacts on the competing demands of California residents. It may be argued that this particular problem would attend the SWP without Monterey, but we should point out that all of DWR's calculations with CALSIM II predict increased deliveries, so much so that they have made those calculations the basis of their reliability analyses. The same CALSIM II calculations also are used to claim that the amended SWP now has much less "paper water". In any event, to make their calculations consistent they should assess the net increase in pumping energy demands associated with their claim that they can deliver more water than in the past.

22-22

A correct reckoning and portrayal of the energy impacts should use the actual record of deliveries as a basis for comparison instead of the CALSIM II generated numbers for year 2020. (There is particular concern in the period 2000 to 2005 when increased Delta pumping during December, January, and February occurred and a tabulation and comparison to prior years would be very informative.) The energy problem is how the additional energy to get to 2020 conditions is to be generated.

Another aspect of the Monterey Amendments that impacts energy demands is the transfer of the Kern Water Bank to the Kern Water Bank Authority (KWBA) combined with the Monterey created delivery categories of Article 21, Carryover, and Turn-back Pool. The combined effect allows the KWBA to request water from these various

accounts to put in the Kern Water Bank for the benefit of the KWBA, which incidentally comprises water entities that are not direct contract recipients of SWP. Thus a demand is placed on the SWP to pump water that would not have necessarily been pumped if KWBA had not been given the Kern Water Bank. The analysis must show how operations of the Kern Water Bank would have been expected to occur if it had remained as an SWP project facility. Also there is the question as to whether non-project participants, such as those comprising the KWBA, should benefit from project contractual provisions regarding the prices they pay for pumping energy. Given that additional energy increments above the previous baseline must come from commercial power, it seems that non-project participants should pay that marginal cost for pumping to fill the Kern water Bank. In other words all other legitimate SWP contractors must pay slightly more for their pumping energy needs because of costs imposed by operations of the KWBA.

22-22 (con't.)

In summary, the impact analyses must trace all the different flows that follow from the Monterey Amendments and accurately calculate the pumping energy differences and compare those differences to the previous actual baseline, and not to the year 2020 level of demand.

Land Use and Planning

In California one of the most important elements in land use planning is the availability of a reliable water supply. Because the first Monterey Agreement EIR failed to deal with the well-recognized inability of the SWP to deliver even close to full entitlements the EIR was held to be deficient. The Appellate Court made note that this lack of candid treatment in that EIR placed local planners in a difficult decision as to how much firm water they could count on in approving or rejecting development projects. Because the pre-Monterey contracts had provisions in them to allow DWR to bring entitlements into consonance with real capabilities to deliver and the Monterey Agreement made it a specific objective to eliminate those provisions, the Court stated that a new EIR must be drafted that analyses the consequences of utilizing the eliminated provisions to bring promises of delivery in accord with the project's capability to deliver. The current EIR has attempted to do this, relying on calculations with CALSIM II, but because of the total inadequacy of CALSIM II as presently configured those analyses are flawed. **This brings us to the point in the EIR impact analysis where a fundamental requirement promulgated by the Court of Appeals has not been fulfilled**. The present section of Land Use and Planning is therefore of little use. Nonetheless, there are some observations that can be made that may be useful in correcting the analysis in a future document.

22-23

The analysis of impacts on Land Use and Planning avoids the most obvious consequences of the project. Table 7.10-1 attempts to guide the reader to the most important impacts but ignores what must be considered the first order impacts. The table indicates that the only concern with the permanent transfers of water from agriculture to others is with the changes in land uses and agricultural practices of the land from which the water is transferred. However, it should be clear that any transfers to urban uses raises profound issues with changes in developed land use whenever additional water supplies

are make available. A prime example of this is the development now being pursued in the Castaic region solely because the Castaic Lake Water Agency claims to have reliable additional water supplies made available from transfers from Kern County Water Agency, all under the auspices of the Monterey Amendments. How the EIR can be silent on this matter is beyond comprehension. 22-23 (con't.)

Furthermore, the amounts of additional, reliable water claimed in the transfers are solely based on DWR's CALSIM II calculations as they are presented in the settlement-mandated provision requiring a reliability report. Because CALSIM II has already been shown to be a grossly inaccurate calculator of reliable water, its use in assessing how much water can be relied upon just continues the problem of "paper water", which the Appellate Court and the Settlement Agreement state must be eliminated from land use planning. 22-24

The table also misses the point on the Kern Water Bank transfer. By changing the water bank from a SWP facility to one owned and operated for the benefit of a limited set of water users, the SWP plans for delivery have been necessarily impacted and as a direct consequence the plans regarding the use of whatever water the water bank could have made available for all the SWP contractors are impacted. 22-25

Also the Reliability Report fails to account for the presence or absence of local water sources and its guidance to SWP contractors is too simple to be of any practical planning use. For example, many SWP contractors, taking their cue from the Reliability Report, assume a number around 75% reliability, which they apply to their Table A amount in reckoning their reliable supply. In truth, the way that the 75% is calculated depends on the project being able to deliver substantial amounts of Table A to Kern County Water Agency and the Metropolitan Water District because they have large reservoirs and can accept these large amounts in off-demand periods. By contrast, most other SWP contractors do not have such storage means and must take their Table A amounts during seasonal demands and the average amounts that can be relied on under those conditions is much less than 75%. Accordingly, a planner depending on water from one of these other SWP contractors would be misled. It is also an interesting observation that any development which is permitted solely on the basis of a SWP supply can really only depend on approximately 15% of whatever Table A allotment it may have because that is the lowest delivery level in the record. This has proven to be a realistic possibility in Santa Barbara County where transfers of SWP allotments among SWP subcontractors are being made to support developments outside existing water district boundaries. DWR needs to instruct its SWP contractors on how to use the information developed by them respecting each individual contractor's ability to receive SWP water in concert with whatever other water sources it has available. 22-26

In summary, the analysis in the EIR of impacts on Land Use and Planning is too superficial and limited to be of any use in prospective project decisions.

APPENDIX A

An Analysis of Reverse Flows at the South Delta Pumps

Recently, additional information on several factors was obtained that could explain the observed Pelagic Organism Decline (POD) in the Delta. It had been posited earlier that unusually high pumping by the SWP in the months of December, January, February, and March could be the cause. The additional information now focuses on the fact that high reverse flows in the Old San Joaquin River brought on by SWP/CVP pumping may explain the loss of the Delta Smelt. The investigations that brought this information to light also were concerned with the same four months (D,J,F,M). This information has been analyzed to relate the Old River flows to export pumping, river flows at Vernalis on the San Joaquin, and the Sacramento at Freeport. To date one quantitative relationship has been developed that explains the reverse flows quite well. The method used was multiple regression analysis and the best relationship so far is given below:

OLDSJ = 243-0.942*EXP+.533*SJVER

Where SJVER = San Joaquin flow at Vernalis, cfs
EXP = export pumping, cfs

Since export pumping is generally much greater than flows at Vernalis, this relationship yields negative flows for Old River in most instances.

22-27

The data set covered the years 1981 to 2006. Two data points appear as clear outliers, 1983 and 1997, which were very high run-off years. The standard error for this equation is 430 cfs while the corresponding percentage error of the fit is 18.5%. All coefficients are very significant ("t" values are respectively, 15.11 and 20.23).

What seems clear is that export pumping is a very strong variable; reverse (i.e. negative) Old River flows could be reduced by directly reducing exports. It seems also clear from perusing the input data that San Joaquin flows at Vernalis are not substantial enough to overcome the export reverse draw. This is probably due to the fact that in most years almost all of the San Joaquin is diverted for irrigation.

Another factor not yet analyzed is the magnitude of the exports compared to the volumes of water in the sloughs and Clifton Court forebay. When exports typically average 10,000 cfs for days at a time, the transit time through the sloughs may be quite short. (For example, 10,000 cfs equates to 20,000 acre-feet per day, which could be on the order of the volumetric capacity of Clifton Court forebay.) It seems that the biologists should look at what happens at all the levels of the aquatic food chain when that happens. Perhaps the reduction in smelt numbers and the observation of smaller smelt later in the spring are related to the reduction in biologically available food.

It might also be profitable to take a restricted look at the months of just December and January. Using all four months tends to obscure the fact that quite often river flows in the first two months of the four month period can be quite low, so much so that

exports would be even more devastating. The biologists should be asked to investigate the relationship of POD to just the pumping and flows in the first two months.

The sheer magnitude of the export flows is also interesting. There was a levy failure in one of the Jones tracts during a period when most observers would not have expected any stress on the levies. However, the maps show that the tracts in question are along the channels that lead directly to the pumps. Is it possible that the magnitude of the flows to the pumps was an important factor in the levy failure?

22-27 (con't.)

COMMENTS ON DWR'S TECHNICAL MEMORANDUM

"Progress on Incorporating Climate Change into Management of California's Water Resources", July 2006

By Arve R. Sjovold
September 2, 2006

In DWR'S year 2002 report on the "The State Water Project Delivery Reliability Report" it was explicitly acknowledged that climate change would affect the timing and amounts of snowfall and possibly precipitation and that sea level rise was likely. At that time the timing of these impacts was speculative. That report promised that more definitive studies of the impact on climate change would be provided, possibly as soon as the update of the California Water Plan Update 2003. Thus, it was with some anticipation that I looked forward to a comprehensive study of the affects of climate change on the SWP. The subject report fails to provide that comprehensive study. Although DWR did engage in some rather elaborate computerized calculations, the subject of those calculations studiously avoided the impacts, now more widely recognized, but clearly acknowledged in the 2002 Reliability Report. Any keenly interested observer of the debate on climate change would have expected a cogent and objective analysis of the effects of sea level rise and changed Sierra run-off patterns as first order effects.

The report devotes considerable of its quantitative analyses to the calculations of the effects of a very modest sea level rise of 15 inches on the ability of the Delta to deliver water to the pumps without severe violations of salinity thresholds. It does so based on assumptions that upstream reservoir operations are not changed and that sea level rise does not change the hydraulic network in the Delta. Another assumption for this analysis is that the salinity gradient in the western Delta does not change with this sea level rise. No supporting evidence or analysis is given as to why these assumptions are reasonable. In other words, a primary assumption is that the current system of Delta levies remains in tact with a 15 inch sea level rise. I won't argue that that level of sea level rise may indeed leave the levies operationally in tact, but it misses the first order question of what level of sea level rise will compromise the system of levies. There are good maps (produced by DWR, if I am not mistaken) of what the Delta may look like with 1, 2, 4, and 10-foot sea level rises. From these maps it is clear that somewhere between 2 and 4 feet of rise there is little assurance that the Delta can perform as a delivery network of fresh water to the South Delta pumps. Since the subject report acknowledges that 2.9 feet of sea level rise is likely under one of the scenarios studied by the International Panel on Climate Change (IPCC) by the end of the century, clearly the most important question to be addressed by DWR is to calculate at what level the Delta's levies cannot be relied upon. **The subject report does not do this and does not offer a qualitative discussion.**

22-28

The other major assumption underlying their quantitative calculations is that reservoir operations (that is, Oroville and Shasta) are not changed by climate change impacts. That this is an untenable assumption is apparent from the report's side study that shows, under 3 different scenarios, that peak discharge from the Feather River may be

substantially altered. In fact, the most severe scenario carefully quantifies that peak discharge for a "15 year event" may be 2 ½ times the current estimate of a 15-year peak discharge. Clearly, any inquiring mind would wonder how reservoir operations might be affected by such a finding. Curiously, the report does not inquire further. But that may be the most intriguing finding of the report. If as a matter of hydrology peak discharges at any return level are 2 ½ times higher, such a finding would call into question the ability of the dams to function as designed. First, 2 1/2 times peak discharge would probably tax the design limits of dam spillways. Second, flood pools in reservoirs would have to be enlarged compromising water conservation objectives. Third, passage of discharges 2 1/2 times as large would undoubtedly cause havoc below the dams. None of this is addressed in the report even though that is where it should logically lead.

In conclusion, the report shows no scientific curiosity concerning the very likely first order impacts of climate change. The detailed quantitative analyses that are performed are totally irrelevant to what are the major questions that are posed by climate change. The report should candidly state that the most reasonable forecasts of what climate change might produce would seriously compromise the project, to the extent that the SWP may be obsolete in its current configuration within the current century. This is certainly a different tone than that conveyed by this report.

Specific Criticisms

1) The report still relies on CALSIM II as a reliable model to study the impacts of climate change. First, as we have so many times stated in the past CALSIM II is a fatally flawed model. It has not been calibrated and is not a true simulation model, as it is commonly referred to. Second, the indices that are use to drive the model in certain of its calculations are without scientific or practical merit. They provide the so-called simulation with perfect information of stream flows in advance of simulated operational decisions and the indices are highly distorted representations of the true stochastic nature of the operational problem, simulating operations in the face of uncertain future stream flows. It is particularly noteworthy that the CALSIM II run labeled "Base" in the report does not resemble the CALSIM II 2021-runs performed for the Reliability Report for ostensibly the very same assumptions. In fact, the variance between these two case studies, the "2021" study in the reliability report and the "Base" in the climate change study, is roughly the same as the differences reported between the "Base" case in the climate change study and the alternative scenarios. (See Table 1 below.) In stark terms, we are using a measuring instrument that is too imprecise to reliably distinguish differences among the scenarios. Scientifically, the model is inappropriate just on that finding and DWR staff should be required to establish why there are such differences between these two reports.

22-28 (con't.)

2) Throughout a significant portion of the report detailing previous hydrologic history of the Central Valley, there are many regression analyses results that are portrayed to establish certain trends that may have some significance. The report does not state why they may be relevant. I find it difficult to see any

such relevance except if it is to acknowledge that some climate change may have already occurred. Even then, I fail to see the relevance absent any analysis that shows why it should be. Beyond that observation of relevance, there is the more important issue of deciding when a calculated trend is significant. It appears from the data presented in the report that many of the trends are statistically insignificant at normally accepted thresholds. Why such trends are reported as maybe "real" is puzzling.

3) The preoccupation with the affects of climate change on stream flow temperatures is probably misplaced. Given that current project operations are decimating species in the Delta, the concern seems an attempt to show that the species are doomed anyway and we shouldn't worry about what the projects are doing now. That is a very shortsighted view and seems to be extremely self-serving with respect to current operations. My view would show more emphasis on characterizing future overall stream flow amounts and timing rather than on speculations on stream-flow temperatures as if the basic stream flows are relatively unperturbed.

4) The report does provide a fairly decent summary of the extant scientific theories supporting global warming and the effects on climate. The report depends most strongly on the work reported by the IPCC and the scenarios they cast. However, other more recent work out of the Goddard Space Science Institute (GSSI) strongly suggests that ice sheet breakup of the Greenland and/or Antarctic ice sheets may accelerate sea level rise significantly, an event that is not a major factor in the IPCC scenarios. If the GSSI theory is more correct the integrity of the Delta in the nearer future may be in doubt. Neither the IPCC nor the GSSI can offer precise timelines as to when significant sea level rise may occur. Nonetheless, it is vitally important that DWR include a candid appraisal of the likelihood of sea level impacts on the Delta beyond the mere 15-inch rise assumed in their studies. Calculations can easily show that the generally accepted existing level of climate forcing, .85 watts/m^2, is sufficient to melt sufficient ice to raise sea level by 0.4 feet per year. What is not certain is how future climate forcing will divide between melting ice and warming the biosphere. It is very clear right now that the rate of sea level rise cannot be estimated precisely but the potential for rapid sea level rise is the most important feature of global warming. The report should candidly state so.

22-28 (con't.)

5) The report summarizes the past history that has been developed for global warming over the past 650,000 years which shows that within our recorded history the Earth is near a peak warm temperature for this interval. (See; James Hansen, "A Slippery Slope", Climatic Change, 68, 269-279, 2005). If the report had included the corresponding data on the coincidence of greenhouse gas concentrations and sea levels with temperature it would be quite clear that greenhouse gases are the most significant driver of temperature change and consequent sea level rise. The DWR report does

include a table of the existing concentrations of CO_2 and methane, corroborated in the attachment, which are higher than ever measured by the ice cores within the past 650,000 years. This remarkable finding should require the widest possible range of possible changes rather than the restricted ranges chosen by the report. In short, the authors of the report did not delve deeply enough into the current research being performed on climate change and the report cannot claim to have met its objective of "incorporating climate change into the SWP."

6) The analysis to incorporate climate change into CALSIM II involves an intricate attempt to translate IPCC climate change scenarios into specific quantitative changes in major Northern California river run-off as the basis of the computer calculations that form the major effort of the report. It is noted in the analysis that the climate change scenarios are based on global models that incorporate only six grid points to characterize expected rainfall for all of California. The analysis then proceeds to use the information developed for these six grid points to generate estimated changes for 10 of the major rivers. Another model, the Variable Infiltration Capacity (VIC) model, is used to calculate these estimated changes of rainfall into run-off. An important assumption in this exercise is the use of the VIC model to develop perturbation ratios due to climate change that can then be used to modify the characteristic run-off measurements for these rivers. The clear flaw in this methodology is the measured run-off used to characterize the rivers. The analysts chose the year 1976, a readily acknowledged drought year to characterize the average or "normal" run-off. Since 1976 was well below average for any river system in California, this choice necessarily biases the estimated changes low. 1976 run-off was probably less than half the average. Therefore, on translating changed rainfall into estimated run-off for the major rivers feeding the CVP and SWP, the use of 1976 as a basis to scale from as described in the report necessarily underestimates the run-offs under climate change by a significant amount. Accordingly, the entire exercise with the Delta model, DSM, is not even a reasonable estimate. Since this computer exercise seems to comprise the most substantive portion of the report, it calls into question any and all of its findings. DWR should be required to justify the choice of 1976 (although on its face it seems that this can't be done). A standard analysis of this type would have done so as a matter of course.

22-28 (con't.)

Table 1
Comparison of "Base" and 2021 CALSIM II Runs

(Million acre-feet per year)

Water Year	Climate Change Report SWP Exports	2002 Reliability Report SWP Exports Fixed Demand	Deviation
76	2.97	2.78	.19
77	1.00	0.83	.17
78	3.61	3.91	.30
79	3.70	3.49	.21
80	4.10	3.46	.64
81	3.33	3.40	.07
82	4.71	4.13	.58
83	3.68	4.13	.45
84	3.42	4.10	.68
85	3.52	3.32	.20
86	4.20	3.01	1.19
87	2.57	2.84	.27
88	1.54	0.99	.55
89	2.72	2.90	.18
90	1.60	1.15	.45
91	1.10	1.00	.10
Average Deviation			**0.39**

22-28 (con't.)

APPENDIX B

Development of a Preliminary Algorithm To Guide Pumping from the Delta In the Months of December and January

A look at monthly flows for the runoff record reveals that significant runoff begins in December and increases on through May. The highest runoff measurements generally occur in the spring. However, from time-to-time there are some early winter runoffs that are quite high. When looking at just the dry year portion of the record it is quite clear that the drier years are almost always characterized by runoff in both December and January that are much below average. Thus if the water year is going to produce reasonable runoff it must come from above average spring runoff. But the operators of the projects cannot safely assume that spring will be above average and must then adopt prudent operations when beginning export in the fall and winter. Therefore, an operational procedure must be developed that begins with the assumption that the water year will be dry until conditions show that it is likely to be wet. (We dismiss the notion that the previous water year has any useful information contained in its runoff record as is intimated by the "40-30-30" index.) The question is then, how can we establish with some certainty how much runoff is likely for the year?

To answer this question, we analyzed the relationship between total runoff recorded by the end of the water year to the measurements of monthly runoff as they occur. A perusal of the record shows that trying to rely on December runoff alone does not provide a reliable indicator. Next we examined the potential of the combined runoff of December and January to indicate the character of the impending water year.

We started by defining simple indicator variables. Since we desire to provide indicators that are most useful in the early part of the water year we concentrated on the months of December and January to see how much they could tell us. The indicators that seem to work reasonable well are as follows:

22-29

DRYWINTER, which takes on the value of either one or zero. If it is one, then it signifies a combined December-January runoff that is quite dry for that period. We first tried a combined runoff of less than 2.5 million acre-feet (MAF), which is just over half the average for this period. Later we tried a value of less than 2.25 MAF which is just about half.

WETWIN, which takes on the value of either one or zero. If it is one then it signifies a combined December-January runoff of greater than 4.24 MAF, which is the average for this period.

WETSPR, which takes on the value of either one or zero. If it is one then it signifies a combined April-May runoff of greater than 7.4 MAF, which is the average for these two months. Later we tried a threshold value of 6.5 MAF, or slightly less than the average. We felt that more precision in the spring runoff is not necessary since one must wait until spring to measure the runoff. So the role of this indicator variable is to establish explanatory power for the desired relationship for predicted total runoff. Besides operations

can be modified once we have passed beyond the months of December and January and the water year record unfolds.

The best relationship that we could find is given below:

TOTAL= 12.81- 2.99 (DRWWINTER) + 7.22(WETWIN) + 5.17(WETSPR)
Where:
TOTAL = total water year runoff in MAF
DRYWINTER = 1,0 where 1 is sum of Dec-Jan when less than 2.25 MAF
WETWIN = 1,0 where 1 is sum of Dec-Jan when more than 4.24 MAF
WETSPR = 1,0 where 1 is sum of April-May runoff when greater than 6.5 MAF

These variables were then tried in a linear multiple regression relationship to examine their explanatory power. All of the indicator variables were highly significant and the standard deviation of the fit was 3.27 MAF. Nine of the 98 data points in the sample were deleted from the regression calculation as probably too extreme on a probability basis. 7 of those 9 were for extremely high runoff years. Since the problem of export pumping is much less dependent on very high runoff years these deletions are not of prime importance and their inclusion only tends to skew the results. It is also noteworthy that the deletion of these data points appears not to affect the coefficients materially but does improve the precision of the relationship.

Conclusions 22-29 (con't.)

With three independent, stratifying variables that take on either of two possible values there are 6 independent outcomes. They are:

DRYWINTER and a dry spring (1,0,0), which produces an estimate of TOTAL of 9.82 MAF.

A winter (December-January runoff) that is greater than 2.25 but less than 4.24 MAF and a dry spring (0,0,0), which produces an estimated total runoff of 12.8 MAF.

DRYWINTER and a WETSPR (1,0,1), which produces an estimated total runoff of 15.0 MAF

A winter that is greater than 2.25 but less than 4.24 MAF and a WETSPR (0,0,1), which produces an estimated total runoff of 18.0 MAF.

WETWIN and a dry spring (0,1,0), which produces an estimated total runoff of 20.5 MAF.

WETWIN and WETSPR (0,1,1), which produces an estimated total runoff of 25.7 MAF.

Of the 98 years of the runoff record, nearly half the points (47) are included in the three categories that have estimated runoff less than the average for the total record.

Twenty four (24) of the 47 points are associated with the estimate of 9.82 MAF. 15 are associated with the estimate of 12.8 MAF and 8 are associated with the estimate of 15.0 MAF. All three of these categories are determined by the combined monthly runoff of December and January and make no assumption that the spring will be wet. Accordingly, one may conclude that all December and January operations should assume that the water year is part of the dry period until spring runoff dictates otherwise. It is particularly important to note that for fully one quarter of the record (24 years), only 9.82 MAF can be relied upon. This should be the starting point for developing operations criteria for export pumping that take due care to preserve the Delta environment. 22-29 (con't.)

At present it appears that December and January pumping are little modified by the hydrologic indications to that time. Since project demands are low at this time of the year, these months are used to fill south of the Delta reservoirs. Only the constraints on Delta outflow and salinity may limit the pumping; and the restrictions here are highly skewed because of the influence of the erroneous "water year index" discussed in the body of the text. Questions that should be asked include: Should there be much of any export pumping if December and January runoff is below 2.25 MAF? Can the health of the Delta fisheries and its broader ecology be assured under such low flow conditions? Of those 24 years that comprise this condition three are for years that are extremely dry, averaging just under 6 MAF. What would be prudent operations under those conditions? The same questions must be answered for the other two dry year categories. The biologists should be asked to weigh in on what would be desirable under these drier conditions to assure Delta health. 22-30

It is possible that integration of snow-pack measurements might improve the ability to forecast more accurately or at least earlier with the same accuracy. However, reliable snow-pack measurements are usually not available until the end of March. Accordingly, early runoff is the most readily available and reliable indicator that can be useful. 22-31

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LETTER 23

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January 14, 2008

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
3251 S Street
Sacramento, CA 95816
Via email: delores@water.ca.gov

Re: Comments on Draft EIR for Monterey Amendments to the State Water Project

Dear Ms. Brown,

On behalf of the above-listed organizations, I am submitting comments on the Environmental Impact Report for the Monterey Amendments to the State Water Project. Our concerns are focused on the adequacy of Chapter 10.4, Environmental Justice. Specifically, this document fails to acknowledge the impact of the proposed project on farmworkers and on small rural communities.

According to this document, "because existing water supplies would not be reduced for any specific community based upon race, origin or economic status as part of this project…potential impacts that could constrain water supply availability, preclude use, or cause other environmental justice effects would not be expected to occur…." This statement inappropriately narrows the definition of environmental justice. An action need not be intentionally directed at a specific community in order to be considered an environmental justice effect. It is the impact itself, not the intent behind the action that determines whether a low-income or minority community has been disproportionately impacted. This document must analyze the impacts of this project on low-income and minority communities, and must note any impacts that would affect low-income and minority communities disproportionately. The document should recognize that an equivalent impact can be felt disproportionately; for instance, an increase in the cost of water disproportionately impacts low-income ratepayers. 23-1

Our review of the document indicates several areas where low-income and minority communities are likely to be disproportionately affected.

The proposal to reduce agricultural deliveries by 5% has the potential to impact farmworker communities and local economies. The EIR must evaluate how and where such reductions might occur, and how those changes might disproportionately affect low-income and minority communities. At a minimum, this document should investigate how:

- Offsetting the reduction in SWP deliveries through increased groundwater pumping could impact the groundwater tables in local communities. This document should analyze that impact, particularly for local communities that rely on groundwater for their drinking water supplies;

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- Permanent crop fallowing may be used to meet the 5% reduction, and the impact on farmworkers and local economies;
- A 5% reduction in supply concentrated in a small geographic area might disproportionately impact farmworkers and the local economy.

Unless the project places specific prohibitions on these activities, this document must assume that they will occur in response to a reduction in supply, and measure their impact.

Potential mitigation actions for these impacts could include the establishment of;

- A Local Economy Drought Relief Fund to provide job assistance and tax relief to rural communities impacted by crop fallowing. The Fund would be generated through surcharges on SWP deliveries.
- A Conservation account, generated through surcharges on SWP deliveries, to provide low-interest loans and grants for implementation of water conservation projects for SWP contractors and for communities impacted by SWP operations.
- A Groundwater Protection Program, in concert with the State Water Resource Control Board, to ensure that groundwater resources are not depleted by increased pumping to make up for the 5% reduction.

The proposal to reduce urban drought reliability has the potential to foster a drought water transfer market. The document should analyze the environmental justice impacts of such a market, including;

- Potential reduction of jobs and housing in farmworker communities, as well as the reduction in the tax base of rural communities due to large-scale agricultural fallowing;
- Rate impacts due to cost of water transfers. (Note that disadvantaged communities are seldom able to take advantage of the most common conservation incentive offered by urban water agencies – rebates. Additionally, multigenerational immigrant families tend to be penalized by tiered rate structures that assess water usage by connection, rather than by household size. This, in addition to the impact of rate increases on low-income households will result in impacts that fall disproportionately upon disadvantaged and immigrant communities).

23-1 (con't.)

Potential mitigation actions for these impacts could include the establishment of;

- A Local Economy Drought Relief Fund to provide job assistance and tax relief to rural communities impacted by crop fallowing. The Fund would be generated through surcharges on SWP deliveries and water transfers.
- A requirement that urban agencies participating in the agreement provide either a lifeline rate for low-income rate payers or implement a conservation program targeted at low-income communities
- A conservation account, generated through surcharges on SWP deliveries, to provide low-interest loans and grants for implementation of water conservation projects for SWP contractors and for communities impacted by SWP operations.

The proposal to privatize the Kern Groundwater Bank will reduce the state's ability to regulate its operation and to meet its obligation to provide safe ensure the best and highest use of its groundwater supplies. One effect of this is project is the reduction in the state's ability to ensure the provision of safe drinking water to its residents. Specifically, in 2008, several water systems in Kern County will be found in violation of the 2006

23-2

LETTER 23

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federal drinking water standard for arsenic [See attached spreadsheet]. A water bank under state administration could help these communities remediate their water quality problems through transfers or a conjunctive use program. A water bank under private control is under no such obligation.

23-2 (con't.)

Suggested mitigation; remove this provision from the program.

Thank you for allowing us the opportunity to comment on this document.

Sincerely,

Jennifer Clary
On behalf of
Environmental Justice Coalition for Water

LETTER 24

FEDERATION OF FLY FISHERS
Northern California Council
Conserving - Restoring - Educating Through Fly Fishing
1287 Greeley Way
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(209) 951-7900

Daniel A. McDaniel
President - Past Director

January 11, 2008

Ms. Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
3251 S Street
Sacramento, CA 95816

Via email: delores@water.ca.gov

RE: Comments on the Draft Environmental Impact Report for the Monterey Amendments to the State Water Project (including Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement - SCH#: 2003011118

Dear Ms. Brown:

Please accept these comments on the Draft Environmental Impact Report for the Monterey Plus (DEIR), on behalf of the Northern California Council of the Federation of Fly Fishers. 24-1

The proposed project in the DEIR does not appear to have been negotiated either in the public forum or in the public interest. It is an unlawful gift of state property without adequate consideration. 24-2

Furthermore, it represents the most substantial amendments to the State Water Project contracts in the history of the State Water Project (SWP). We urge DWR to carefully consider the implications for California's environment, citizens, and economy before finalizing a decision on the Monterey Amendments.

In view of the dramatic change and decline in the conditions of the Delta within the last several months, the DEIR is inadequate and should be revisited after further analysis of the more recent events within the last several months within the Delta. 24-3

Already, the interim implementation of the Monterey Amendments has contributed to significant environmental degradation in the Bay Delta Estuary and reduced water reliability for residents in Southern California.

Since the implementation of the Monterey Amendments in 1996, the Bay Delta Estuary has fallen into a critical decline with several species, including the delta smelt, at historic low abundance. Increases in SWP pumping have been identified as a primary contributor

to this decline. Such impacts were in part the result of the increased winter and the spring export of Article 21 and turnback pool. Provisions of the Monterey Amendments have in part facilitated these increased exports from the Bay Delta Estuary and the resulting environmental degradation.

24-3 con't

In addition, elimination of Article 18 (b) (the permanent shortage provision) has perpetuated the reliance on paper water. By eliminating of Article 18(b), DWR would also be giving up a critical safety valve that allows SWP entitlements to be cut back in light of changing climate conditions and/or regulatory constraints imposed to restore the Bay Delta ecosystem. Elimination of the urban preference for SWP water delivery, contained in Article 18(b), has also contributed to reduced water reliability for millions of Californians.

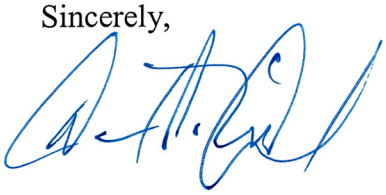
24-4

DWR has many alternatives to the proposed Monterey Amendments. For instance, DWR could assist SWP contractors in aggressively implementing the 3.1 million acre feet of urban water conservation and the 1.4 million acre feet of recycled water potential identified in the California Water Plan. Such implementation would increase water reliability of SWP contractors while avoiding the environmental impacts associated with the Monterey Amendments.

In our view it would be premature, in derogation of DWR's public trust responsibility, and unlawful, to proceed as planned. We strongly urge DWR to reject the Monterey Amendments as proposed in the DEIR, issue a new, comprehensive DEIR, and adopt an alternative that can better serve and preserve the assets of California.

24-5

Sincerely,



LETTER 25

Northern California/Nevada Council
Federation of Fly Fishers

January 10, 2008

Ms. Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
3251 S Street
Sacramento, CA 95816

Via email: delores@water.ca.gov (sent 1-12-08)

Re: Comments on the Draft Environmental Impact Report for the Monterey Amendments to the State Water Project (including Kern Water Bank Transfer)

Dear Ms. Brown:

I am writing on behalf of the Northern California Council, Federation of Fly Fishers, representing 31 member fly fishing clubs in Northern California, and approximately 4,000 member fly fishers. We provide the following comments on the Draft Environmental Impact Report for the Monterey Plus (DEIR).

The proposed project in the DEIR represents the most substantial amendments to the State Water Project in the history of the system. We strongly feel the implications to California's environment; citizens and economy are detrimental to all concerned. We have witnessed results from the interim implementation of the Monterey Amendments over the past 10 plus years, and they have contributed to significant environmental degradation in the Bay Delta estuary, its fish and ecosystem. It has also contributed to reduced water reliability for residents in Southern California. 25-1 25-2

Since the implementation of these amendments in 1996, the Bay Delta estuary and its fishery has fallen into significant decline, including both pelagic fish species, like the Delta Smelt, as well as anadromous species relative to San Joaquin River tributaries. Central Valley Steelhead continues to be in serious decline in nearly all tributaries to the Delta. Increases in SWP pumping has been identified as a primary contributor to this decline. These impacts were in part the result of the increased winter and spring exports of Article 21 and turnback pool water. The Monterey Amendments made these increases in water diversion of Article 21 water possible. 25-3

Of another concern to us is the elimination of Article 18 (b), the permanent shortage provision. This has resulted in reduced water reliability for urban users in Southern 25-4

California, and forgoes a critical safety aspect that allows SWP entitlements to be cut back if we have changes in climate conditions (anticipated) or regulatory constraints needed to restore the Bay Delta ecosystem. It also reduces the availability of water to support fisheries in times of drought, or other challenges.

25-4 (con't.)

DWR has many alternatives to the proposed Monterey Amendments. It could assist SWP contractors in aggressively implementing the 3.1 million acre feet of urban water conservation and the 1.4 million acre feet of recycled water potential identified in the California Water Plan. Simply implementing the recommendation in the State Water Plan would increase water reliability for SWP contractors and avoid the environmental damage associated with the Amendments. With the current crisis in the Bay Delta, partially caused by the actions resulting from the interim implementation of the Amendments, it is totally inappropriate to make them permanent.

25-5

We strongly urge DWR to reject the Monterey Amendments as proposed in the DEIR, and to adopt alternatives that better serve our natural environment, fisheries, and all Californians.

Sincerely,

Dr. C. Mark Rockwell, D.C.
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LETTER 26

10.405.02

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January 11, 2008

VIA EMAIL AND U.S. MAIL

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California Department of Water Resources
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Re: Comments of Friends of the Santa Clara River, Citizens Committee to Complete the Refuge, and North Coast Rivers Alliance on the Draft Environmental Impact Report Regarding the Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Associated Actions as Part of the Settlement Agreement (Monterey Plus)

Dear Ms. Brown:

Friends of the Santa Clara River, Citizens Committee to Complete the Refuge, and North Coast Rivers Alliance (Conservation Groups) present the following comments on the Department of Water Resources' (DWR's) Draft Environmental Impact Report (DEIR) on the Monterey Amendment to the State Water Project (SWP) Contracts and Associated Actions.

At the outset, Conservation Groups would like to voice their objection to DWR's plan to give away the State-owned Kern Fan Element to the Kern County Water Agency. This storage facility should be retained by California to allow DWR to mitigate, to the extent possible, future water shortfalls. Additionally, Conservation Groups object to the amendment to the SWP contracts that requires that water shortages be shared equally among all contractors in proportion to their Table A amounts. Thus, whenever a water shortage occurs, DWR will be required to cut equally from farms and from cities. This change will put more pressure on DWR to maintain high levels of exports to meet the unyielding demands of both without evaluation of which users are practicing water conservation and which are not, even when such exports will intensify the environmental destruction of the Bay-Delta.

26-1

26-2

Conservation Groups are deeply concerned that the permanent adoption of the Monterey Amendment to the SWP contracts will perpetuate the already alarming decline of endangered fish species in the San Francisco Bay-Delta. Rather than taking this opportunity to focus on reducing water exports from the Bay-Delta, DWR seems determined to continue to operate under the same water policies that have caused the recent precipitous deterioration of the Bay-Delta ecosystem. Scientists, and more recently the courts, are advising SWP administrators to rethink the fundamental operational concepts that are driving the environmental degradation of the Bay-Delta before the harmful impacts of the water exports become irreversible. For

26-3

example, the U.S. District Court in Fresno recently ruled that DWR's pumping activities must be drastically limited in the future to avoid extinction of the threatened Delta Smelt. *Natural Resources Defense Council v. Kempthorne*, ___ F.Supp.2d ___ (2007), 2007 WL 4462391. Approval of the permanent adoption of the Monterey Amendments must factor in these clearly significant export limitations; otherwise DWR risks relying on water that will not be available in the future. 26-3 (con't.)

Accordingly, Conservation Groups urge DWR to return to the negotiating table to hammer out new contract amendments that will dramatically reduce future reliance on the state's limited water supplies. In so doing, DWR may be able to strike a lasting balance between the needs of the SWP water contractors and of the imperiled fishery resources that the SWP's current operational plan now places in jeopardy. 26-4

While the DEIR attempts to address some of these concerns, it fails to adequately confront and rectify the dire environmental impacts of approving the Monterey Amendment, as discussed thoroughly below.

1. The DEIR Violates CEQA Because It Relies on Mitigation Measures That Will Be Created and Evaluated in the Future.

The DEIR impermissibly relies on mitigation measures that will be provided in the as-yet-unfinished Delta Smelt Biological Opinion to mitigate the impacts of the Monterrey Amendments. ES-6. Specifically, the DEIR states that the "new Biological Opinion would . . . provide the mitigation required to address the impacts of this proposed project." *Id.*

CEQA, however, does not allow agencies to defer consideration of mitigation measures to future environmental documents. In a parallel situation, the California Supreme Court recently rejected an agency's similar attempt to put off consideration of a project's impacts until the completion of a future, related environmental review. *Vineyard Area Citizens for Responsible Growth, Inc. v. City of Rancho Cordova* (2007) 40 Cal.4th 412, 440. The Court explained: 26-5

> Instead of itself providing an analytically complete and coherent explanation, the FEIR notes that a full analysis of the planned conjunctive use program must await environmental review of the Water Agency's Zone 40 master plan update, which was pending at the time the FEIR was released. The Board's findings repeat this explanation. To the extent the FEIR attempted, in effect, to tier from a *future* environmental document, we reject its approach as legally improper under CEQA. If the environmental impact analysis the Water Agency expects to perform on its Zone 40 master plan update is important to understanding the long-term water supply for the Sunrise Douglas project, it should be performed in the Sunrise Douglas project FEIR even though that might result in subsequent duplication by the master plan update. If, as Rancho Cordova argues, such duplication would be an impractical waste of resources, the County could instead have deferred analysis and approval of the Sunrise Douglas project until the master plan update analysis was complete, then tiered the project FEIR from the programmatic analysis it performed there. *What the County could not do was avoid full discussion of the likely water sources for the Sunrise Douglas project by referring to a not yet complete comprehensive analysis*

> *in the Zone 40 master plan update. CEQA's informational purpose "is not satisfied by simply stating information will be provided in the future*." (*Santa Clarita, supra,* 106 Cal.App.4th at p. 723, 131 Cal.Rptr.2d 186.)

Id., second emphasis added. As the Supreme Court ruled forcefully in *Vineyard*, DWR cannot approve the present project by relying on future study and mitigation of the impacts of the Monterey Amendment. It must analyze the impacts of its project in a manner that provides the public and the decisionmakers with enough information *now* to understand the consequences of the approval on the effected natural resources – in particular, on the threatened Delta Smelt population.

26-5 (con't.)

Because the DEIR fails to adequately assess the mitigation measures needed to protect Delta Smelt and other threatened species, and defers such analysis to a future environmental study, it violates CEQA. The DEIR should be revised to include specific, enforceable Delta Smelt mitigation measures, or, in the alternative, DWR should wait until a legally adequate biological opinion is prepared and then incorporate the enforceable mitigation measures from that documents into the DEIR and approval of the Monterey Amendments, as required by *Vineyard*.

2. The DEIR Violates CEQA Because Its Discussion of Alternatives Is Inadequate

The DEIR's five alternatives do not satisfy CEQA's requirement that "all reasonable alternatives to proposed projects [be] thoroughly assessed by the responsible official." *Save Round Valley Alliance v. County of Inyo*, ___ Cal.App.4th ___, 2007 WL 4376023, citing *San Joaquin Raptor/Wildlife Rescue Center v. County of Stanislaus* (1994) 27 Cal.App.4th 713, 735 and Public Resources Code § 21002.1, subd. (a). Rather DWR specifically limited its discussion of alternatives to those that would fulfill the terms of the Settlement Agreement and original Monterey Agreement. DEIR, p. 4-1 and 4-2. While the project objectives state that the "overall objective is to resolve the underlying issues that led to the Monterey Amendment," the alternatives that are analyzed do not take into account any alternatives that are not directly tied to the already-agreed-upon Monterey Agreement and related Settlement Agreement. The DEIR admits that its analysis is strictly limited by the Monterey Agreement when it states:

26-6

> The Monterey Agreement provided in Principle 13 that the proposal was an integrated package. Contractors had to choose to participate in all the provisions of the Agreement or none. In other words, the Monterey Amendment resulted from a package deal of negotiated concessions that required achieving all of the above objectives in order to settle significant disputes among the contractors.

DEIR, p. 4-1. The alternatives analysis is also constrained by the Settlement Agreement, as described in the DEIR:

> While the Settlement Agreement does not have the same language that the Monterey Agreement had with regard to an integrated package, the Settlement Agreement also was a package deal of negotiated concessions that require achieving all of the above objectives in order to settle significant disputes between the parties. Thus to fulfill

the intent and purpose of the project, it is essential that all of the above objectives are achieved.

DEIR, p. 4-1 to 4-2. These limitations on the alternatives analysis eliminate the possibility of any true alternatives being developed, studied, and potentially adopted. Rather, the narrow range of the project objectives – to implement the Monterey Amendment and the Settlement Agreement – preordains the conclusion that the proposed project is the only project that will fulfill the project objectives. No alternatives are discussed that address the original problem – the contractors' dissatisfaction with certain contract provisions – outside of the constraints of the Monterey Agreement. Such a foreshortened analysis ends the search for a better alternative before it is even begun. Accordingly, it violates CEQA.

26-6 (con't.)

3. The DEIR Violates CEQA by Effectively Ignoring the Impact of the Project on the X2 Salinity Barrier and Thereby Glossing Over One of the Major Impacts of the Project.

The DEIR dismisses the impact of increased pumping on the X2 salinity barrier by claiming that the barrier would move approximately 100 meters, but such movement is essentially immeasurable, "and therefore, [the impact] is not considered a substantial alteration of habitat used by special-status species." DEIR, p. ES-15. The DEIR's facile dismissal of this critically important adverse impact of the project violates CEQA.

First, under the CEQA Guidelines, the agency "shall find that a project may have a significant effect on the environment . . . where there is substantial evidence . . . that . . . the project has the potential to substantially reduce the habitat of a fish or wildlife species [or] substantially reduce the number or restrict the range of an endangered, rare or threatened species." CEQA Guidelines § 15065 subd. (a)(1). The DEIR's estimation that the X2 salinity barrier will move approximately 100 meters further inland as a result of the project demonstrates that the project will have "the potential to substantially reduce" the habitat and "restrict the range" of the threatened Delta Smelt and other imperiled pelagic species. The DEIR thus should include a mandatory finding of significance and thoroughly analyze this impact.

26-7

Second, even if DWR maintains that the impact on the Delta Smelt's habitat is too small to matter on its own, it still cannot avoid finding that the impact on the X2 barrier is significant. The same CEQA Guideline also requires a mandatory finding of significance if "[t]he project has possible environmental effects that are individually limited but cumulatively considerable," such that "the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects." CEQA Guidelines § 15065 subd. (a)(3); see also, *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal.App.3d 692, 718. Thus, in light of the extreme encroachment of saltwater into the Delta caused by the years of excessive pumping of fresh Delta water, this retreat in the salinity barrier should be consider an incremental cumulative impact exacerbating the ongoing decline in Delta Smelt and other wildlife habitat. Therefore it should not have been dismissed by the DEIR as an inconsequential byproduct of the project operations.

4. The DEIR Violates CEQA Because It Does Not Address the Monterey Amendment's Impact on the Flexibility of the SWP's Operations.

The Monterey Amendment's inexorable transfer of agricultural water to urban uses will constrain future water planning and disaster management by reducing the SWP's water planning flexibility. Such flexibility will become increasingly important as the SWP faces required restrictions on exports to protect Delta Smelt and other species, and reduced water supplies resulting from global warming. The DEIR fails to address this deleterious impact on future SWP water planning and operations.

In shifting water use from agricultural to municipal, the project tends to lock in wasteful urban water demands, thereby impairing DWR's ability to reduce exports through water conservation. Reducing urban water demands is more challenging than agricultural water conservation. For example, agricultural lands can be retired, farmers can switch crops to those that require less water, or they can install drip irrigation systems that reduce the amount of water necessary to grow the same crops. Urban water demands, by contrast, tend to be less elastic, and more permanent than agricultural demands. Therefore they cannot as readily be managed to reduce demand. Thus, the Monterey Amendment's pivotal election to accommodate increases in urban water demand on the SWP could ultimately stimulate the growth of less flexible water demands, in turn reducing future water planning flexibility. 26-8

The DEIR fails to take this important impact into account. As the state's water crisis continues to worsen, due to an ever-growing population and an ever-declining water supply, it is becoming increasingly important to refrain from stimulating urban uses whose growing water demands may exceed future supplies. The DEIR must address the decreased water planning flexibility that will result from the project. For this reason among others, the DEIR should consider and discuss the projected water supplies and demands, and water conservation efforts, that are described in the SWP contractors' and related urban users' urban water management plans.

5. The DEIR's Limited Planning Horizon Hinders Evaluation of the Long-term Impact of this Large-scale Project and Thereby Violates CEQA.

The DEIR's analysis only extends to 2020 – twelve years from now. DEIR, p. 5-1. This time frame is far too short to provide a comprehensive understanding of the effects of the project. Most importantly, this limited planning horizon fails to grapple with the long term and growing effects of global warming on the project and its impacts. This omission trivializes the SWP's increased vulnerability to global warming under the inflexible operational plan the Monterey Agreement proposes. 26-9

Conclusion

For these reasons, Conservation Groups ask DWR to decline to certify the DEIR and to reject the Monterey Amendment and the associated actions. Conservation Groups urge DWR to renegotiate the SWP contracts in light of the severe limitations on water deliveries in the future in hopes of providing enough water flowing through the Bay-Delta to protect the important natural biological resources that live therein. 26-10

Very truly yours,

Stephan C. Volker
Attorney for Friends of the Santa Clara River, Citizens Committee to Complete the Refuge, and North Coast Rivers Alliance

SCV:taf

LETTER 27

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November 17, 2007

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resource
Post Office Box 942836
Sacramento, CA 94236-0001

Re: Extension of Public Review Period for the Environmental Impact Report prepared for the Monterey Amendments to the State Water Project

Dear Ms. Brown:

On behalf of seven organizations that work together through a county-wide coalition called the Green Vision Project, we request the Department of Water Resource (DWR) extend the public review period for the Draft Environmental Impact Report (DEIR) for the Monterey Amendments to the State Water Project (SWP) in order to provide agencies and the public with sufficient time to review and comment on the DEIR. Our detailed reasons for the extension are set forth below. 27-1

CEQA requires a review period that is sufficient to achieve the Act's objective for public review, which is to assist the lead agency in identifying potentially significant effects of a project, alternatives, and mitigation measures.

The Monterey Amendments to the State Water Project DEIR has implications of statewide significance including but not limited to the following, which must be carefully evaluated by those commenting on this Environmental Impact Report:

- The elimination of contract provisions that provide drought safeguards for urban areas. DWR's own analysis shows that in dry years like 2001, water supplies for homes and businesses in urban areas will be reduced by over 400,000 acre-feet (a reduction of 26% of total urban water deliveries from the SWP), if the Monterey Amendments are adopted; 27-2
- A give away of the state-owned Kern Water Bank, the largest water storage facility in California; 27-3
- The elimination of the common-sense provision in the original contract which required DWR to determine the realistic yield of the SWP. Without knowing the actual capacity of the SWP, DWR will continue to promise to deliver "paper water," water which actually does not exist in the real world. Already, the promise of paper water has lead to over-reliance on the water from the fragile Bay-Delta, over-pumping, inevitable cutbacks in water supplies, and ultimately decreased water supply reliability; 27-4
- The transfer of millions of dollars in costs to California taxpayers, while rebating millions of dollars to individual water agencies; and 27-5

- The encouragement of over-pumping of Delta water in the winter and spring months, which has already, under the provisional use of the Monterey Amendments, contributed to the massive decline of the Delta smelt and other Bay-Delta fish populations. 27-6

The document is massive in size and the issues addressed are extremely complex. Accordingly, we respectfully request that you extend the comment period on this DEIR for at least an additional 45 days, to enable to the public to have sufficient time to review and provide comments on this extensive project. 27-7

Your timely response to this request is necessary in order to ensure that members of the public can effectively plan their review of the DEIR. Thank you for your consideration of this request and your prompt attention to this matter.

Very Truly Yours,

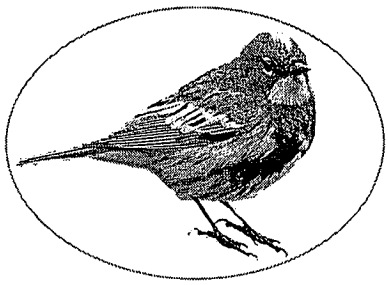
Melanie Schlotterbeck

Melanie Schlotterbeck
Outreach Coordinator

The following organizations signed on to this letter as well:

Ed Amador, Canyon Land Conservation Fund
Sherri Loveland, Orange County Interfaith Coalition for the Environment
Fern Pirkle, Friends of Newport Coast
Lee Reeder, Inland Empire Waterkeeper
Claire Schlotterbeck, Hills For Everyone
Dan Silver, M.D., Endangered Habitats League

LETTER 28



Kern Audubon Society
PO Box 3581
Bakersfield CA 93385

November 30, 2007

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
P.O. Box 942836
Sacramento, CA 94236

Dear Ms. Brown:

The Kern Audubon Society would like to comment on the Monterey Amendments to the State Water Project contracts. We ask that our comments be made part of the official record. Kern Audubon Society strongly opposes the proposed amendments. We are concerned that if the amendments are adopted permanently, they would have profound negative consequences for the health of California's environment. 28-1

First and foremost, we oppose the giveaway to private interests of the Kern Water Bank, which was created and developed at the cost of several millions of public dollars. The Kern Water Bank is an important public resource which should remain in public ownership.

Second, we are concerned that the amendments would enable the increased transfer of water from northern California to the south, and from agricultural use to urban areas, without sufficient public oversight and accountability. 28-2

Third, we are concerned that the amendments would end the prohibition on using surplus water from the Delta for permanent development. These surpluses will be needed to meet demand in drought years and to provide adequate water for wildlife and fish. They should not be used to promote further sprawl and development that would destroy wildlife habitat while having an uncertain future water supply. 28-3

Finally, we are particularly concerned that the amendments would eliminate the requirement that the Department of Water Resources determine the reliable safe yield of water that can be pumped from the San Francisco Bay/Sacramento-San Joaquin Delta estuary. The amendments would open the Bay Delta ecosystem to levels of pumping that are environmentally unsustainable. The Bay Delta has already been severely over-pumped in the past seven years, with the result that fish populations have declined dramatically. 28-4

We urge that the amendments not be implemented.

Sincerely,

Douglas W. Dodd, Ph.D.
Conservation Chair

LETTER 29

LEAGUE OF WOMEN VOTERS OF CALIFORNIA

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(916) 442-7215 ▪ Fax (916) 442-7362 ▪ (888) 870-8683
Web site: www.lwvc.org ▪ E-mail: lwvc@lwvc.org

January 14, 2008

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
Sent by e-mail: delores@water.ca.gov

Re: Draft Environmental Impact Report (Draft EIR) for the Monterey Amendments to the State Water Project Contracts

Dear Ms. Brown:

The League of Women Voters of California supports measures that promote the management and development of water resources in ways that are beneficial to the environment with emphasis on conservation. We are opposed to making the Monterey Amendments to State Water Project (SWP) contracts permanent. We believe that the Department of Water Resources (DWR) should operate the State Water Project as it did prior to the development of these amendments. 29-1

We oppose the Monterey Amendments for several reasons.

These amendments were developed in secret meetings between the DWR and selected SWP contractors. The League of Women Voters believes that governmental bodies must protect the citizen's right to know and has long worked to insure that citizens have an opportunity to provide input into policy making. 29-2

Now that the contents of the amendments have seen the light of day, we find many of their provisions to be objectionable.

The amendments eliminate provisions of the original SWP contracts that provide safeguards for urban areas in drought conditions. DWR itself estimates that in dry years, water supplies for urban homes and businesses could be reduced by over 400,000 acre-feet. 29-3

The Monterey Agreement, implemented by the Monterey Amendments, also proposes to give the state-owned Kern Water Bank to a joint powers authority including the Kern County Water Agency. As we anticipate the effects of climate change, we feel it imperative that the state should maintain control of this important state water resource. 29-4

We are very concerned about the use of intermittently available or unreliable "paper water" sources, as allowed under the Monterey Amendments, to support uses such as 29-5

housing development or permanent crops. DWR should continue to attempt to determine the realistic yield of the SWP and should not promise to provide water that cannot be reliably delivered. 29-5 (con't.)

We fear that the Monterey Agreement may be an important contributor to the current problems in the Sacramento-San Joaquin Delta in that it has resulted in over-pumping and has added to the crisis in the Delta. 29-6

The Draft Environmental Impact Report does not adequately address these concerns. We must register our opposition to making the Monterey Amendments permanent. 29-7

We appreciate the opportunity to submit these comments.

Sincerely,

Janis R. Hirohama
President

PLANNING AND CONSERVATION LEAGUE

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January 14, 2008

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
Email: delores@water.ca.gov
(916) 651-9560

RE: Planning and Conservation League comments on the Draft Environmental Impact Report, *Monterey Amendment to the State Water Project Contracts (Including the Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement (Monterey Plus)*, SCH# 2003011118 ("Draft Monterey Plus EIR")

Dear Ms. Brown:

This letter is to provide comments on the Department of Water Resources' Draft Monterey Plus EIR (DEIR), a document whose preparation PCL has actively sought and anticipated for more than a decade. When finalized, this EIR will be used as the decision-making document framing a decision by DWR on the so-called Monterey Amendments. If such amendments to the contracts governing the operations of the State Water Project were adopted and implemented, they would result in a drastic contractual restructuring of the State Water Project, now 47 years old. Our comments here do not speak extensively to the legality (or not) of this proposed decision to modify provisions of the contracts governing operations of the State Water Project, which are based on and carry out directions specifically adopted by the voters of California. This letter focuses on the environmental review document, and its adequacy. 30-1

In the litigation that compelled DWR's preparation of this EIR, PCL sought to ensure that DWR—the only entity with the statewide duty to manage and administer the State Water Project[1]—would correct the profound errors of process and substance that fatally infected the

[1] DWR's State Water Project duties, as envisioned by Governor Pat Brown and approved by the voters of California, are codified in the Burns-Porter Act, Wat. Code, §§12930, *et seq.* They also formed the basis for the prototype State Water Project validated by the California Supreme Court in *Metropolitan Water District v. Marquardt* (1963) 59 Cal. 2d 159. No Court has yet addressed the validity of the Monterey Amendments, whose final status necessarily awaits DWR's decision-making.

Central Coast Water Authority's review and approval of the 1995 EIR supporting the Monterey Amendments. In *Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892 ("*PCL v. DWR*"), the Third District Court of Appeal unanimously vindicated PCL and its co-plaintiffs[2] on both grounds. Pointing to "the…contractors and the members of the public who were not invited to the table" in the negotiations that led to the Monterey Agreement, the Court held that "CEQA compels process…a meticulous process designed to ensure that the environment is protected." (83 Cal.App.4th at 905, 911.) Recognizing the "aura of unreality" surrounding discussions of the State Water Project, which has historically been unable to deliver even half the amounts referenced in Table A of the State Water Project contracts[3], the court found that CCWA's EIR "failed to meet the most important purpose of CEQA, to fully inform decision makers and the public of the environmental impacts of the choices before them." (*Id.* at pp. 913, 920.)

30-1 (con't.)

PCL entered into a 2003 Settlement Agreeement[4] with the expectation that DWR would counteract these historic errors and find "an effective way to cooperate" with the plaintiffs and other stakeholders in the preparation of an EIR fully complying with CEQA. DEIR, ex. D, and Exh. 3-A. Section III of the Settlement Agreement therefore confirmed, and elaborated on, DWR's EIR duties as previously recognized by the Court of Appeal. *Id.* at pp. 9-15.

The Settlement Agreement also made clear that the final outcome of the Monterey Amendments remains unwritten, so that DWR's new environmental review is not directed, even in part, at a *fait accompli*. While the Monterey Amendments are presently effective, they are effective only under an *interim* court order, made under Public Resources Code section 21168.9. The interim effectiveness of the Monterey Amendments will expire once DWR makes its new decision on all project components, recorded in new Notice of Determination, and files its return to the superior court's writ of mandate.[5] Once DWR completes an adequate environmental review, it is DWR's prerogative, and its duty as State Water Project manager, to render an entirely new final decision, and to choose which path to follow: the "Monterey Plus" project, the "no project" alternative, or one of the project alternatives reviewed in the EIR.

30-2

Since the Settlement Agreement went into effect (more than four years ago), PCL has participated in more than two dozen meetings of a Monterey Amendments EIR Committee, seeking to ensure that the EIR would produce a thorough and genuine CEQA analysis of the Monterey Plus actions. The EIR is the "heart and soul"[6] of both CEQA and the Settlement

30-3

[2] The co-plaintiffs were Plumas County Flood Control and Water Conservation District, one of the 29 state water contractors, and the Citizens Planning Association of Santa Barbara County.

[3] See, e.g., DEIR, Appendix C (Long Term Water Supply Contract between DWR and Kern County Water Agency), § 6 and Table A.

[4] DEIR, Appendix D.

[5] DEIR, Appendix D, §§ II, V.F, VII.C; ex. 3-A.

[6] *PCL v. DWR*, 83 Cal. App. 4th at p. 911.

Agreement. Regrettably, DWR's Draft EIR falls far short of what CEQA requires from DWR. In short, the EIR is simply not adequate under CEQA. First, the DEIR does not adequately address specific concerns raised by the court in *PCL v. DWR*, including DWR's clear duty to analyze and disclose the consequences of implementing pre-Monterey article 18(b). That provision of the contract (which the Monterey Amendments would eliminate) requires DWR to reconcile contract amounts with the "humbler, leaner reality"[7] of deliverable supplies—prior to its elimination.

30-3 (con't.)

30-4

Second, the DEIR threatens a litany of potential new CEQA violations. To mention just several key problems:

- It improperly inserts key components of the Monterey Amendments into the project baseline, distorting the ability of the EIR to compare the project with the "no project" and project alternatives. 30-5
- It improperly uses an optimization model, CALSIM II, in a manner that effectively excludes the possibility of operating the project in a manner that would reduce rather than increase exports from the imperiled Bay-Delta Estuary, and fails to disclose project impacts to that estuary. 30-6
- It summarily rejects feasible alternatives and mitigation measures that would meaningfully address project objectives without requiring damaging and unlawful levels of new pumping. 30-7
- It fails to disclose the institutional and environmental consequences of transferring to local interests the ownership of a key part of the State Water Project—the Kern Water Bank, the world's largest underground storage facility—without any effective statewide accountability, and fails to study alternatives aimed at restoring that accountability. 30-8
- It evades, rather than engages, the "common-sense notion that land use decisions are appropriately predicated in some large part on the available water supply,"[8] thereby avoiding an analysis of the project's contributions to sprawl and environmentally destructive new growth. 30-9
- It avoids a required discussion of the project's creation of new "paper water" arising from a variety of sources, including the redefinition of article 21 "interruptible" water, administrative changes to the State Water Project, and overstatement of feasible deliveries in DWR's biennial Reliability Reports.[9] 30-10
- It fails to address the environmental consequences of the Monterey Amendments' financial restructuring of the State Water Project. 30-11

[7] *Id.* at p. 914, n. 7.

[8] *PCL v. DWR*, 83 Cal. App. 4th at p. 915.

[9] PCL and its co-plaintiffs provided many of these comments to DWR in connection with its work on the Monterey EIR committee. Attachment A to these comments compiles some of these comments, which were not adequately addressed in the DEIR, or were simply ignored. These comment letters are therefore incorporated by reference in these comments, with the request that DWR specifically respond to them. We also incorporate comments made on behalf of PCL at public hearings.

- It recognizes the major problems that climate changes poses for the State Water Project generally, only to evade full assessment of project-related climate changes and defer the task to the very local decision-makers who will need to rely on DWR's programmatic assessment. 30-12

Finally, DWR must address these deficiencies at a critical juncture in California's water history, and make its final decision based on conditions as they exist in 2008, not 1995. The depth of the environmental crisis the State Water Project now faces deserves special emphasis. For the first time ever in 2007, the State Water Project's pumps were turned off temporarily to avoid an environmental catastrophe. Separate lawsuits have undercut DWR's ability to operate as in the past, without state permits and without federal biological opinions to justify continued pumping. Climate change, by the current estimations of DWR, could substantially cut project availability by mid-century. Moreover, California now faces the worst drought conditions it has experienced since the early 1990s. 30-13

These conditions underscore the crucial importance of delivering a Final EIR that fulfills, rather than avoids, the mandates of *PCL v. DWR* and the Settlement Agreement. In other settings, including Delta Vision, the California Water Plan, and recent reports and actions on climate change, California has commenced the difficult and necessary task of bringing to water policy a new era of realism that transcends the "build it and the water will follow" dictum of a previous generation.[10] Yet the DEIR seems conspicuously disconnected from the state's direction in other settings, to the point that "the plaintiffs" are chided for even suggesting alternatives that are sustainable and would not cause additional injury to the Delta.[11] To meet the hydrological, ecological and legal demands of our time, the Final EIR must rise to the occasion, rather than resorting to evasion. 30-14

Specific Comments

I. The DEIR evades key concerns raised by the Court in *PCL v. DWR*.

A. *PCL v. DWR* must serve as the starting point for DWR's EIR responsibilities.

As detailed below, the DEIR in key respects simply attempts to explain away, rather than directly address, the key holdings of the Court of Appeal in *PCL v. DWR*. The EIR must, as a starting point, analyze the substance of the court of appeal's decision in *PCL v. DWR* and ensure that its new project assessment is consistent with the Third District's analysis in that case. The key components of the ruling are as follows 30-15

- **Lead agency requirement**

[10] R. Kanouse, "Water Supply Planning and Smart Growth," in C. Davis, *et al.*, Navigating Rough Waters (American Water Works Association, 2001), p. 84. See also E. Rarick, CALIFORNIA RISING (2005), p. 213 (quoting Governor Pat Brown's statement that "I wanted to build a water project, and worry about the philosophy of land use later on").

[11] DEIR, pp. 11-6, 11-7.

Holding that CCWA erroneously acted as lead agency, the court ruled that CEQA required DWR, the only entity with the requisite "statewide perspective and expertise," to assume its proper role as lead agency in preparing a new EIR. (83 Cal. App. 4th at p. 907.) The Court noted the interconnected nature of the statewide project that the Monterey Amendments would transform: "[T]he allocation of water to one part of the state has potential implications for distribution throughout the system. DWR is painfully familiar with the problems plaguing the Delta and the possible impacts of the Delta Accord, an agreement between the federal and state governments on the Kern Fan Element." (*Id.)*[12] 30-15 (con't.)

- **"No project" alternative**

The court also held that the CCWA EIR was fatally defective under CEQA for failing to analyze implementation of pre-Monterey state water contract terms, and particularly the permanent shortage provisions of article 18(b), as part of the EIR's no-project alternative. Under the contracts that the Monterey Amendments would change , a permanent shortage occurs when the state is unable to reliably to deliver the full 4.23 million annual acre-feet (MAF) of previously-labeled "entitlements" listed in Table A of the project contracts. In that case, article 18(b) requires the state to make a proportional reduction of each contractor's amount listed in Table A, to match the available supply. The court held that an adequate EIR must analyze the impacts of eliminating these provisions. 30-16

- **"Paper water" problem**

The relationship between so-called "entitlements" and land-use planning was central to the court's holding that the EIR failed to address the "no project" alternative. The court connected this error to the risk of statewide land-use decisions made on the basis of "paper" water entitlements not grounded in real, deliverable water. The court openly criticized the false expectation that the State Water Project will deliver on its full "entitlement" level of 4.23 million acre-feet when the project's historic capability, evidenced in DWR's own data, has only been roughly half this level. The ruling therefore noted the "huge gap between what is promised and what can be delivered." (83 Cal.App.4th at 908.)[13] 30-17

- **Validation procedure** 30-18

[12] As described in section V below, the Kern Fan Element is an approximately 20,000 acre-foot property on an alluvial fan, and the site of the Kern Water Bank, the world's largest groundwater storage facility. Article 52 of the Monterey Amendments call for DWR to relinquish control of the bank to the Kern Country Water Agency, which held the bank for only one day before retransferring it to a privately controlled joint powers agency, the Kern Water Bank Authority. Whether any statewide accountability will accompany the bank's operation is a key issue for DWR's new project decision.

[13] With respect to the "humbler, leaner reality" of project capability, the Court also noted the implicit assumption in the Monterey Amendments' financial restructuring of the State Water Project (article 51) that key facilities originally envisioned for the SWP will not be built. (*Id.* at 914.)

In addition to ruling for the plaintiffs on these CEQA claims, the court of appeal found that the plaintiffs had properly initiated a proceeding to question the substantive validity of the Monterey Amendments, including DWR's transfer of a 20,000-acre conservation and storage facility—the Kern Water Bank. . The court rejected a procedural challenge based on the theory that nonparty state water contractors were indispensable to the validation challenge. (83 Cal. App. 4th at pp. 920-926.)

30-18 (con't.)

- **Scope of the new EIR**

DWR must prepare an entirely new EIR as lead agency addressing the project as a whole. In *PCL v. DWR*, the Court of Appeal opined that it "need not hypothesize on the remaining issues" presented by the plaintiffs—such as the presence of a faulty project definition and the inadequate study of the Kern Water Bank's divestment—"because DWR, with its expertise on the statewide impacts of water transfers, may choose to address those issues in a *completely different and more comprehensive manner."* (83 Cal. App. 4th at p. 920 (emphasis added).)

30-19

B. Fundamental flaws in the DEIR undermine DWR's fulfillment of its lead agency duties recognized in *PCL v. DWR.*

As the court-directed lead agency with "principal responsibility " to carry out and approve the project (Pub. Res. Code, § 21067), DWR has an inherent responsibility to render a cohesive EIR that serves as the requisite environmental "alarm bell" in accordance with CEQA. The court recognized this obligation in *PCL v. DWR*, observing:

> The lead agency must independently participate, review, analyze and discuss the alternatives in good faith … Moreover, the agency's opinion on matters within its expertise is of particular value … As the process continues, "the lead agency may determine an environmentally superior alternative is more desirable or mitigation measures must be adopted … In sum, the lead agency plays a pivotal role in defining the scope of environmental review, lending its expertise in areas within its particular domain, and in ultimately recommending the most environmentally sound alternative.

(*PCL v. DWR*, 83 Cal. App. 4th at p. 904 (citing *Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal. App. 3d 692, 736-737).)

30-20

As elucidated further below, the current DEIR is not written in a way that will allow DWR to fulfill its lead agency obligations as required under CEQA. The DEIR consistently masks impacts and confuses readers. The DEIR obscures project impacts by presenting no project alternatives that include components of the proposed project. It fails, in other words, adequately to distinguish the proposed project from continued current conditions. The DEIR also limits options for decision makers by failing to provide alternatives distinguishable from the proposed action. These flaws prevent a sufficient analysis of the impacts and implications of moving forward with the proposed project. By limiting the outcomes of the alternatives included in the DEIR, and thus constraining the range of potential management decisions, the DEIR

30-21

attempts to absolve DWR of its decisional responsibilities as a lead agency. Therefore, the DEIR prevents DWR from fulfilling the lead agency role as defined and anticipated by the court in *PCL v. DWR*.

30-21 (con't.)

C. The DEIR fails to analyze the No Project Alternative as directed in *PCL v. DWR* and the Settlement Agreement

1. *PCL v. DWR* and the Settlement Agreement establish clear standards for the assessment and review of the no project alternative.

CEQA requires that the no project alternative address "existing conditions" as well as "what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services." (14 Cal. Code Regs. §15126(e)(2).) That requirement compels DWR in its new EIR fully to study the consequences of enforcing the terms of pre-Monterey water supply contracts prior to eliminating them.

To overcome the prejudicial error noted in the appellate ruling, DWR must "fulfill its mandate" in the new EIR "to present a complete analysis of the environmental consequences" of enforcing the pre-Monterey permanent shortage provision, article 18(b). (*PCL v. DWR*, 83 Cal.App.4th at 915.) Article 18(b) is the single most controversial aspect of the Monterey Amendments; controversy over its enforcement was the "driving force" behind the Monterey negotiations. (*Id.* at p. 908.) While the original contracts for the State Water Project (SWP) estimated the delivery capacity of the fully constructed SWP to be 4.23 million acre-feet of water, the contracts also anticipated the likelihood that this estimate could be wrong or fail to eventuate. The original contracts prudently included a safety valve in article 18(b), which would allow contracts to be reconciled with the "humbler, leaner reality" of SWP capacity. (*Id.* at p. 914, n.7.) The court of appeal recognized the need for such a safety valve, observing the "huge gap" between SWP entitlements and existing supplies connecting that holding to the risk of planning decisions grounded in "paper" rather than real, deliverable water.[14]

30-22

Because the Monterey Amendments, if adopted, would eliminate article 18(b), it is incumbent on DWR to come to terms with its "paper water" problem before finalizing that change to the project contracts. (*Id.*)The EIR must directly evaluate reduced Table A allocations resulting from application of that article. As a useful starting point, DWR should carefully review and perform the analysis requested in public comments referenced in the Third District's opinion. (*Id.* at 908, 915.)[15]

[14] "Paper water," the court observed, was "always an illusion," steeped in the "unfulfilled dreams" of a water culture that had fostered an inflated expectation of what could be delivered. (*PCL v. DWR* (2000) 83 Cal. App. 4th 892, 914 fn. 7.)

[15] As one comment accurately suggested, the EIR "must include a parametric analysis of alternative levels of a lowered project yield tested by use of DWR's simulation model to establish which level of yield provides for the maximum reliability of deliveries given some tolerable threshold for failure to meet requests (i.e., with what frequency will Article 18(a) be

Section III.C.2 of the Settlement Agreement provides further guidance. It provides that the new EIR shall include "[a]s part of the CEQA-mandated 'no-project' alternative analysis, an analysis of the effect of pre-Monterey Amendment SWP contracts, including implementation of article 18 therein. This analysis shall address, at a minimum, (a) the impacts that might result from application of the provisions of article 18(b) of the SWP Contracts, as such provision existed prior to the Monterey Amendments, and (b) the related water delivery effects that might follow from any other provisions of the SWP Contracts." As PCL informed DWR in its March 28, 2003 scoping comments, two of the "other" contract provisions inevitably related to this assessment are articles 18(a) and 21, which prior to Monterey required, respectively, that agricultural contractors endure the first cutbacks in water allocations in times of temporary shortage and receive the first allocations in times of surplus.

30-22 (con't.)

The environmental effects of proportional reductions in Table A amounts, as calculated in the no project assessment, must be directly compared to those of the proposed project. As the court of appeal made clear in *PCL v. DWR*, neither claims of "infeasibility" nor purported legal disagreements can serve as an excuse for avoiding comparison of the environmental consequences of the no project alternative and the project. (*PCL v. DWR*, 83 Cal.App.4th at 918.

2. A dispositive error undermines the integrity of the DEIR's "no project" assessment.

The DEIR recognizes that if pre-Monterey article 18(b) were enforced, Table A amounts would be reduced to less than half their original levels—1.9 million acre-feet— to reflect the firm yield of the SWP. However, the DEIR assumes that this reduction in Table A would not tangibly reduce actual water deliveries, because water not delivered under Table A would be delivered as "surplus" water under article 21 of the pre-Monterey SWP contracts. In numerous passages, the DEIR offers variations on this same basic premise.[16]

30-23

This premise, the key to the DEIR's refusal to take article 18(b) reductions seriously, is startlingly close to reasoning in CCWA's decertified 1995 EIR that the Court of Appeal expressly rejected. CCWA's EIR posited that "[i]f Table A entitlements were adjusted, less entitlement water would be delivered and *more surplus water would be delivered pursuant to*

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invoked and with what consequences). All this can be accomplished without modification of the existing contracts." (83 Cal. App. 4th at 908.)

[16] See, e.g., DEIR, p. 2-16 (implementing article 18(b) "would not … have altered the amount of water that the Department delivered to the contractors in the many years when more than the minimum SWP yield was available in the SWP system. Instead, such water would have been delivered to contractors under Article 21"); p. 4-5 (with the elimination of article 18(a)'s agriculture-first shortage provision, "it no longer mattered whether a shortage was a temporary one or a permanent one, since the allocation of available supply would be the same in either situation"); p. 6-54 ("the altered allocation procedures provided for by Articles 18 and 21 result primarily in a shift in deliveries from one contractor to another and do not affect total deliveries").

Article 21. The total amount of water would be *essentially unchanged.*" (*PCL v. DWR*, 83 Cal. App. 4th at p. 929 (emphasis added).) The court specifically addressed this assumption, stating:

> This response does little more than acknowledge the paper commitment to build SWP facilities and the obvious fact that the hopes and dreams upon which the entitlements are based do not create a greater annual supply of water. None of the commenters suggested that implementation of article 18, subdivision (b), altered the contractual and political commitment to complete the SWP. They did, however, suggest that the elimination of paper water would impact land planning decisions that might reduce the need for as many SWP facilities. Under that scenario, article 18, subdivision (d), might not be invoked nor would surplus water under article 21 be tapped and exhausted.

(*PCL v. DWR*, 83 Cal. App. 4 h at p. 919.)

30-23 (con't.)

For multiple reasons, this premise in the DEIR is as baseless now as it was when the failure of DWR to address this key issue resulted in the judicial decertification of the 1995 EIR. First, the DEIR simply assumes as a foregone conclusion something that was very much in doubt. In 1994, prior to the initial enactment of the Monterey Amendments, the California Research Bureau (CRB) prepared a paper analyzing twenty options for changing the State Water Project's repayment system, one of which (Option 5) called for the implementation of pre-Monterey article 18(b) (CRB Report).[17] The report found that "[t]here is no guarantee" that implementing article 18(b) "would 'create' any surplus water. If the DWR implemented Article 18(b), they might also change how it operates the SWP reservoirs. They might decide, for example, not to distribute 'surplus' water and instead decide to store the water for distribution as entitlement water in another year."[18]

Second, the analysis incorrectly assumes that demand for SWP water in the Monterey and non-Monterey scenarios would be the same. That assumption is untenable, because The Monterey Amendments, if adopted, would fundamentally change the definition of Article 21 water. In particular, those amendments delete the pre-Monterey proviso in article 21(g)(1) that "the State shall refuse to deliver such surplus water to any contractor" to the extent that "the State determines that such delivery would tend to encourage the development of an economy within the area served by a contractor which would be dependent upon the sustained delivery which would be dependent upon the sustained delivery of water in excess of the contractor's maximum entitlement."[19]

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[17] Dennis O'Connor, FINANCING THE STATE WATER PROJECT: OPTIONS FOR CHANGE (CRB, August 1994). This CRB Report is included as Attachment B to these comments.

[18] Attachment B (CRB Report), p. 21.

[19] See DEIR, p. 2-17; DEIR, Appendix C (Amendment No. 1 to Kern Contract, p. 9). Metropolitan Water District's pre-Monterey contract included this language in Article 21(g)(1). The Monterey Amendments delete this language. DEIR, Appendix C (Amendment No. 23 to Kern contract, p. 13).

Third, other Monterey Amendments-related managerial changes also could profoundly affect the demand for article 21water. These include the removal of limitations on access to storage facilities, and the creation of a "turnback pool," which allows the contractors to sell their unused Table A amounts, acting as though the water resources of the state, which belong to the public, are actually the private property of the contractors. In short, the Monterey Amendments clearly removed constraints that would have limited demand for SWP water and capacity to accept SWP water. Yet the DEIR, recycling reasoning that discredited the 1995 EIR, assumes that these contract provisions are meaningless and have no bearing on demand or capacity to receive water. 30-25

Fourth, the DEIR fails to recognize that perceived and explicit disclosure of water reliability can impact demand for SWP water and the use of that water. The shortage provisions (article 18 (a) and 18 (b)) of the pre-Monterey SWP contracts recognized that the reliability of water fluctuates. The contracts also reflected the reality that the level of reliability necessary for certain uses also fluctuates. The pre-Monterey contracts attempted to reconcile water reliability and water allocation with article 18 (a) and 18 (b). The pre-Monterey SWP contracts recognized that water availability would fluctuate according to hydrology, area of origin demand, and environmental needs. Therefore, only a limited amount of water could be reliably delivered during drought and other shortages. The original contract provision of article 18(a) reflected that municipal contractors require a higher reliability of water than agricultural contractors. Thus, article 18(a) provided that level of reliability by providing municipal contractors a preference for water in drought and short term shortage. 30-26

In short, the existing (pre-Monterey) contracts recognized that article 21 water, the least reliable category of water under the contract, is unsuitable for use as a prolonged source of supply. Municipal contractors could not depend on sources of unreliable water in the same manner that they depend and use reliable sources, because doing so would put people, businesses and the environment at significant risk. Indeed, the risk that municipal contractors may inappropriately approve permanent development based on unreliable water is the essence of "paper water."[20] Like the invocation of article 18(b), article 21(g)(1)'s prohibition against founding permanent economies on vulnerable "surplus" water provided a powerful "safety valve" against paper water-based development. It provided decision-makers with a clear understanding that deliveries beyond the SWP's minimum yield are unreliable. In such a case, municipal water agencies would be legally and contractually restricted from relying on water in excess of the estimated minimum yield of water for development, as well as for prolonged supplies. By contrast, the Monterey Amendments—provisionally under the present implementation, and permanently under the proposed project—would remove these safeguards. 30-27

Yet the DEIR fails to analyze the impacts of these realities. Instead, the DEIR assumes that all water provided by the SWP, either Table A, article 21 or otherwise would be used in the same manner and would procure equal demand regardless of the explicit disclosure of reliability 30-28

[20] "Paper water always was an illusion. "Entitlements" is a misnomer, for contractors surely cannot be entitled to water nature refuses to provide or the body politic refuses to harvest, store and deliver." (*PCL v. DWR* (2000) 83 Cal. App. 4th at p. 914, n. 7.)

by the state. The DEIR is thereby assuming that SWP contractors are able to utilize very unreliable water[21] in the same way they demand very reliable water. This assumption is not supported by analysis and is not supported by law. In short, the current DEIR attempts to recycle the same skewed logic that led to the 1995 EIR's specious dismissal of the "paper water" problem.[22]

30-28 (con't.)

II. The DEIR fails to provide an accurate, stable and finite definition of the proposed project.

A. CEQA demands an accurate, stable and finite project definition that addresses the "whole of the action" under review.

Leading CEQA decisions have long since recognized that "an accurate, stable and finite project definition is the *sine qua non* of an informative and legally sufficient EIR." (*County of Inyo v. City of Los Angeles (III)* (1977) 71 Cal.App.3d 185, 199.) The CEQA process cannot "freeze the ultimate proposal in the precise mold of the initial project; indeed, new and unforeseen insights might emerge during the investigation, evoking revision of the original proposal." (*Id.*)

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Precision and consistency in a lead agency's characterization of the project under review also reinforces related principles of CEQA: that the project must embrace the "whole of the action" (14 Cal. Code Regs., § 15378(a)); and that assessments in an EIR may not be used to justify a decision already made. In sum, CEQA "compels an interactive process of assessment of environmental impacts and responsive modification which must be genuine." (*County of Inyo v. City of Los Angeles* (*VI*) (1984) 160 Cal.App.3d 1178, 1185.)

B. The DEIR substantially understates the scope of the Monterey Amendments' proposed restructuring of the State Water project, and does not explain the source of authority for that proposed restructuring.

The description of the proposed project provides a very abbreviated summary of the changes in the SWP that would accompany the permanent adoption and implementation of the Monterey Amendments – in other words, those changes that would become permanent if the project were approved. Adopting what might be termed a "greatest hits" format, the analysis is limited to five bullet points, a few clarifying paragraphs, and a title line for all the remaining parts of these complex amendments. DEIR, §§ 4.3-4.4, pp. 4-2 to 4.8. Similarly, the background paper on the SWP is limited to a brief description of several articles, divorced from their legal and institutional context. DEIR, Ch. 2, pp. 2-1 to 2-19.

30-30

[21] See, e.g., DWR, 2005 RELIABILITY REPORT, p. 15 (article 21 water is "highly unpredictable and unreliable").

[22] *PCL v. DWR*, 83 Cal. App. 4th at p. 914.

These cursory discussions fail to illuminate critical aspects of the SWP that relate to the project's essential mission and statewide environmental accountability, and how this system would be fundamentally changed if the Monterey Amendments become permanent. In the deliberations that framed the SWP, the Governor, DWR, and the Legislature created a water project to enable the state to more evenly to distribute scarce water supplies, which the state controlled as a common good. To develop that resource, DWR and the Governor's office developed--and the Legislature and people approved--a system unique in the country. Unlike the federal Central Valley Water Project, where the federal government paid all project costs, the SWP focused upon water as a public good that belonged to the people.[23]

30-30 (con't.)

Authorization of the SWP therefore was premised on an understanding that the voters of California would therefore decide on whether they agreed to the distribution of water in the SWP. If they agreed to that redistribution, the voters would agree to back an issuance of bonds to construct the project with the provisos that (1) agencies contracting for the water would pay back the costs of constructing the project solely for the *right* to have water delivered to them through the project's facilities; and (2) although agencies would repay the costs of constructing the project, the facilities and the water would continue to belong to the State, as a *public* resource.[24]

30-31

The project framers also anticipated that the state water project would operate based upon long-term water service contracts that would remain in effect until the retirement of all water resources development bonds no sooner than 2035. These contracts would be unique, in that they were based upon: (1) DWR's inherent responsibility to manage the state's water resources fairly and equitably; (2) the principle that all contractors were to be treated equally; (3) the provision that any agency or district in California could contract with the department for water service; and (4) a trusteeship requiring the project to be constructed and managed for the good of the people of California.[25]

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[23] See P.A. Towner, *Brief History of the Negotiation of Water Supply Contracts for the State Water Project*, presented to the California Water Commission (Dec. 3, 1976).

[24] *Ibid.*

[25] The objective of the state water project to operate for the good of the people of California became part of the Bond Act. Once the Act was passed, it was incorporated into the Water Code (Wat. Code, §12930, *et seq.*) Governor Brown signed the prototype long-term water service contract with Metropolitan Water District just before the 1960 election. (Rarick, *supra*, at p. 221.) To further ensure that the people of California would not be responsible for repaying the bonds used to construct the facilities, DWR required agencies with which it contracted to have taxing authority, so that if the agency could not meet its payments to DWR, it would be required to tax residents to make these payments. (Wat. Code, §12937.) Conversely, if the SWP were "sold" into private ownership, it would potentially threaten the tax-exempt status of the project's general obligation bonds. Attachment B (CRB Report), p. 51.

To develop and secure approval of the state water project, DWR and the Governor first prepared a "statement of principles" for the long-term water service contractors.[26] These principles are derived from the "utility theory," which Governor Brown described to the Legislature as recognizing "our obligation to insure that water will be available to meet the proper demands of every part of the State."[27] These principles were the ones used to promote the project to California voters, and those principles reflected project sponsors' understanding that voters would not vote for project financing to support water facilities they did not own or control. Moreover, those principles specified that DWR would be acting as an agent and trustee of the people to manage water resources for the good of all Californians. After preparing these principles, the framers prepared and secured voter approval of the Burns-Porter Act.[28]

The SWP thus was premised on a fundamental *quid pro quo*: its contractors would benefit from project operation, but the public always would control the project itself, and the project's works truly were to be part of a "state" water project, which would be publicly owned and operated for public benefit. After securing passage of the Bond Act, DWR and the Governor determined the redistribution patterns of water throughout California based on estimated need and secured the water rights for those areas in the amount of estimated need until 2035, the end of the project repayment period. They also negotiated with agencies throughout California for water service contracts. The amount of water these agencies could expect to receive over the life of the project was subject to limitations, including limitations from water rights permits, climatological and environmental conditions. The contracts were to extend until 2035. The Department could not predict all conditions affecting water conditions until 2035. Consequently, state water service contracts were written so that DWR could not be held responsible for water it could not deliver provided that it made reasonable attempts to do so.[29]

30-31 (con't.)

On their face, key features of the Monterey Amendments, if made permanent, would differ sharply from the central tenets of the SWP contracts as originally framed, approved, and validated by the voters, shifting a substantial degree of control from SWP to the contractors. To name several examples:

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[26] Cal. State Senate Fact Finding Committee on Water Resources, Partial Report, *Contracts, Financing, Cost Allocations for State Water Development* (March 1960), pp. 51-52.

[27] E.G. Brown, Water Message to Legislature, Cal. Sen. J., Vol. 1 (1959) 222, 224-225. The Governor's principles constituted a "contemporary administrative directive, which was known to the voters at the time of the election," and were also accepted by the Legislature. (*Goodman v. County of Riverside*, (1983) 140 Cal. App. 3d 900, 907-908.)

[28] Wat. Code, § 12930, *et seq.*

[29] Under the state water project, contractors "are obligated to pay for their contractual entitlements of water" from the project, "*whether the water is delivered or not.*" (*PCL v. DWR*, 83 Cal. App. 4th at p. 899.)

- Major changes in article 18 would remove the temporary shortage provision requiring "agriculture first" cutbacks (article 18(a)) and the permanent shortage provision requiring Table A amounts to be reconciled with available supplies.
- Article 51 transforms the financial structure of the SWP, allowing the contractors "a rebate for the costs previously assessed for facilities that have never been built."[30]
- Article 52 facilitates the transfer of the Kern Water Bank property to local control, in exchange for the "retirement" of 45,000 acre-feet of Table A amount that two agricultural contractors-- Kern County Water Agency and Dudley Ridge Water District—had no assurance or reasonable expectation of ever receiving in deliverable water.
- Article 53 authorizes the transfer of 130,000 acre-feet in new agriculture-to-urban transfers, eases requirements for other transfers, and allows the transportation of water in state facilities to other contractors, or entities other than non-contractors.
- Article 54 provides for local control and management of the two terminal reservoirs.
- Article 55 allows contractors to transport non-project water in SWP facilities at the lower costs referenced in the SWP contracts.
- Article 56 allows contractors to sell water outside their service areas.

Collectively, these changes far exceed any other changes in the project's history. At present, the Monterey Amendments are proceeding under the authority of the Sacramento Superior Court's interim order under Public Resources Code section 21168.9.[31] But the DEIR never identifies the source of authority to make the amendments permanent. DWR should address these changes in light of Water Code section 12397(b)(4), the source of DWR's contracting authority, which provides that "[s]uch contracts shall not be impaired by subsequent acts of the Legislature during the time when any of the bonds authorized herein are outstanding and the state may be sued with respect to said contracts." DWR should indicate the source authority, if any, for the project as proposed to become permanent without the approval of the Legislature, or of the voters of California.

30-32 (con't.)

This issue of authority cannot be marginalized as a mere "legal" issue divorced from the environmental consequences of the project. Rather, on a host of environmental issues discussed in these comments, a foundational question is for whose benefit the project exists, the people of California or the State Water Contractors. The answer to this question may have profound consequences for the environment, particularly in times of water scarcity. DWR's clarification of its source of authority may therefore help illuminate whether its approach to managing the SWP can proceed consistently consistent with its duties as CEQA lead agency.[32]

C. The DEIR does not adequately clarify the "uses of the EIR." 30-33

[30] *PCL v. DWR*, 83 Cal. App. 4th at p. 914, n.7.

[31] Settlement Agreement, Appendix 3-A.

[32] *PCL v. DWR*, 83 cal. App. 4th at 903-907.

When finalized, the EIR will be used primarily by DWR, as lead agency, to decide whether to approve, modify, or disapprove the components of the proposed project: the Monterey Amendments and the further actions described in the Settlement Agreement. The DEIR summarizes the proposed project in Chapter 4, which also briefly describes the Monterey Amendments and the Settlement Agreement. As required by the writ of mandate issued by the Superior Court to implement the decision of the Court of Appeal in *PCL v. DWR*, "upon completion and certification of the new EIR, Respondent DWR shall make written findings and decisions and file a Notice of Determination identifying the components of the project analyzed in the EIR, all in the manner prescribed by sections 15091-15094 of the CEQA guidelines."[33]

Despite some helpful language, the DEIR's section of the "intended uses of this EIR (DEIR, § 1.2) contains one phrase that is ambiguous. It indicates that DWR as lead agency, and the State Water Contractors as responsible agencies, will use the EIR to "decide whether to *continue* operating under the proposed project: the Monterey Amendment and the Settlement Agreement, as described in Chapter 4, or to decide to implement one of the alternatives to the proposed project." (*Id.* at p. 1-1 (emphasis added).

The Monterey Amendments are presently proceeding only under an interim order that will expire following DWR's new Notice of Determination and return to the writ. The use of the word "continue" should not suggest that the default condition will be to make that interim operation permanent, or that DWR's approval decision on the "Monterey" part of the Monterey Plus project can be relegated to the past tense.

30-33 (con't.)

Instead, DWR must determine, based on its assessment of project impacts, alternatives, and mitigation measures, whether to (a) approve and execute the Monterey Amendments as initially proposed in 1994 and approved and executed in 1995; (b) approve and execute the Monterey Amendments and the further actions described in the Settlement Agreement; (c) approve and execute the Monterey Amendments as further modified in response in response to the analysis in and public comment on the present EIR; (d) approve and execute an alternative to the Monterey Amendments; or (e) approve no project at all. The EIR will also be used to determine whether or not to authorize the permanent transfer of the Kern Fan Element, and to proceed with the 41,000 acre-foot Kern/ Castaic transfer as part of the final project.

The Superior Court's writ of mandate requires DWR's *de novo* determinations and actions, because at present no project elements have been approved, except for the Superior Court's interim order under Public Resources Code section 21168.9. The exercise of that discretionary power cannot vitiate the fundamental CEQA duties of lead and responsible agencies to precede their final project decisions by the completion and certification of a valid EIR. The EIR will thus be used to DWR to meet these requirements of law and proceed once the section 21168.9 order ceases to be in effect.

PCL requests that the EIR specifically address each of the following questions, which it raised more than a year ago in a letter to the DWR Director:

[33] Settlement Agreement, Appendix 3-A.

1. Once DWR has completed and certified its EIR, will DWR make a new decision on all components of the project, recorded in a new notice of determination?

2. If DWR makes a new project decision, will that decision determine whether or not DWR will approve and execute the Monterey Amendments?

3. If DWR makes a new project decision to approve a project that includes the Monterey Amendments:

    a. Will the decision consider a no project alternative that includes no actions taken under the Monterey Amendments?
    b. Will the decision determine whether or not to adopt alternatives to the Monterey Amendments?
    c. Will the decision determine whether or not to adopt mitigation measures for any significant impacts of the Monterey Amendments?
    d. Will the decision determine whether to authorize the permanent transfer of the Kern Fan Element?
    e. Will the decision determine whether or not DWR approves of water deliveries under the 41,000 acre-foot Kern/Castaic transfer?[34]

30-33 (con't.)

III. The DEIR's "aura of unreality"[35] undermines its ability to meaningfully address the distinct environmental consequences of the project.

30-34

[34] The 1999 contracts framing this agriculture-to-urban transfer were not the subject of a validation challenge. However, those transfer contracts were expressly based upon the Monterey Amendments, whose final authorization remains unknown, and DWR has never approved the transfer outside of the Monterey Amendments, which would subject it to the pre-Monterey agricultural deficiency provisions of article 18(a) and undermine its reliability to support urban uses. (See Attachment C (2002 letter of Castaic's counsel).) The Los Angeles Superior Court decertified Castaic's stand-alone 2004 EIR in May 2007 (*Planning and Conservation League v. Department of Water Resources* (LASC No. BS 098724.) While Los Angeles Superior Court Judge James Chalfant characterized the *1999* transfer contracts as "final," he recognized that DWR could still take actions that could "undermine" the ability of the transfer to deliver water. *Id.* at p. 13. He also relied partially on representations of DWR's counsel that DWR had the discretion to take steps that might curtail deliveries under the transfer. *Id.* at p.20 All parties except for DWR have appealed that decision, and it is pending in the Second District Court of Appeal. In addition to fully studying the Monterey-associated impacts of this sprawl-supportive transfer and appropriate mitigation, the EIR should fully consider PCL's proposed alternative that would consider alternative dispositions of its water. In a time of statewide water shortage, the need for DWR's careful evaluation is particularly acute.

[35] *PCL v. DWR*, 83 Cal. App. 4th at p. 912.

A. The DEIR analysis is predicated upon a defective environmental baseline.

Without the development of an adequate baseline condition, "analysis of impacts, mitigation measures and project alternatives becomes impossible." (*County of Amador v. El Dorado County Water Agency* (1999) 76 Cal. App. 4th 931, 953.)[36] The baseline for these assessments must be based on an analysis of "real conditions on the ground," rather than mere opinion or narrative. (*Save Our Peninsula Committee v. Monterey County Board of Supervisors* (2001) 87 Cal.App. 4th 99, 121.)

The DEIR accurately notes that that the baseline for assessment here is "complicated" by the implementation of the Monterey Amendments before 2003, when DWR issued its Notice of Preparation.[37] Nonetheless, a series of glaring errors undermine the baseline's integrity to serve as the basis for assessing the project's environmental impacts.

First, the DEIR states that the baseline has been "*adjusted to include events that are expected to occur over time"* that it assumes are "not related to the Monterey Amendment and the Settlement Agreement."[38] That "adjustment" constitutes an error of law under CEQA. It is the "no project" alternative, rather than the baseline, that, in addition to existing conditions, must account for "what would be reasonably expected to occur in the foreseeable future if the project were not approved, based upon current plans and consistent with available infrastructure and community services." CEQA Guidelines, § 15126.6(e)(2). But the "no project" alternative is "not the baseline for determining whether the project's proposed impacts may be significant, unless it is identical to the existing environmental setting analysis which does establish that baseline." *Id.*at 15126.6(e)(1). Here, where the "no project" analysis is much more complex, and by no means "identical" to the environmental setting, there is no basis for making these forecasting adjustments to the baseline, and the resulting mistake fatally infects the comparison between the baseline and impact assessment.

30-34 (con't.)

Second, the baseline does not accurately reflect pre-Monterey contract provisions that set limitations for contractors, and thus does not accurately reflect constrained demands or capacity

[36] See also CEQA Guidelines, § 15125(a) (the environmental setting will "normally constitute baseline physical conditions by which a lead agency determines whether an impact is significant"); DEIR, p. 5-1.

[37] The DEIR inaccurately lists the Monterey Amendments' implementation date as 1995. DEIR, p. 5-2.

[38] DEIR, p. 5-2 (emphasis added); see also DEIR, p. 3 (postulating that "other changes and transfers" alleged to be "unrelated" to the Monterey Amendment, have occurred or are anticipated to occur by 2020). Although DWR attempts to project baseline and project conditions through 2020, the project involves changes to SWP project contracts that will remain effective until 2035. DWR's impact assessment does not demonstrate why it fails to make reasonable attempts to take account of the additional 15 years of project impacts.

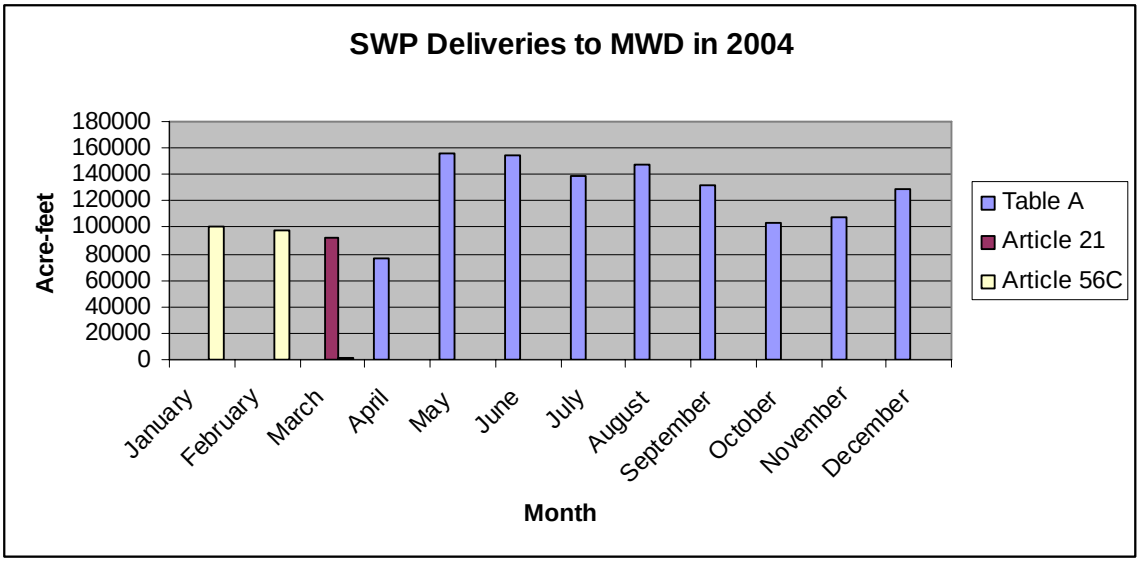
to accept SWP water under pre-Monterey contracts. These provisions, changed under Monterey as noted above, include the following:

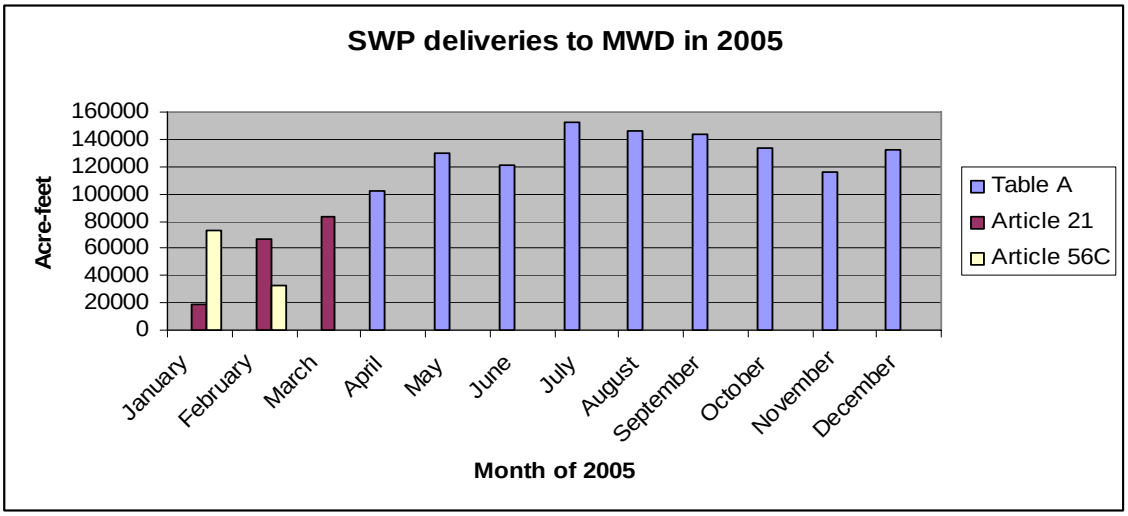
• The pre-Monterey contracts precluded SWP contractors from storing water outside of their own service areas. This provision limited contactors' capacity to accept SWP water to the real-time customer demands plus the amount of water that could be stored in facilities within the contractors' service areas. Eliminating this provision in the Monterey Amendments significantly expanded storage options available to contractors, and thereby enhanced contractors' capacity to take water. Yet the DEIR assumes that the baseline water demand is the same as demands when such limitations are not applied to contractors (as in the proposed project).

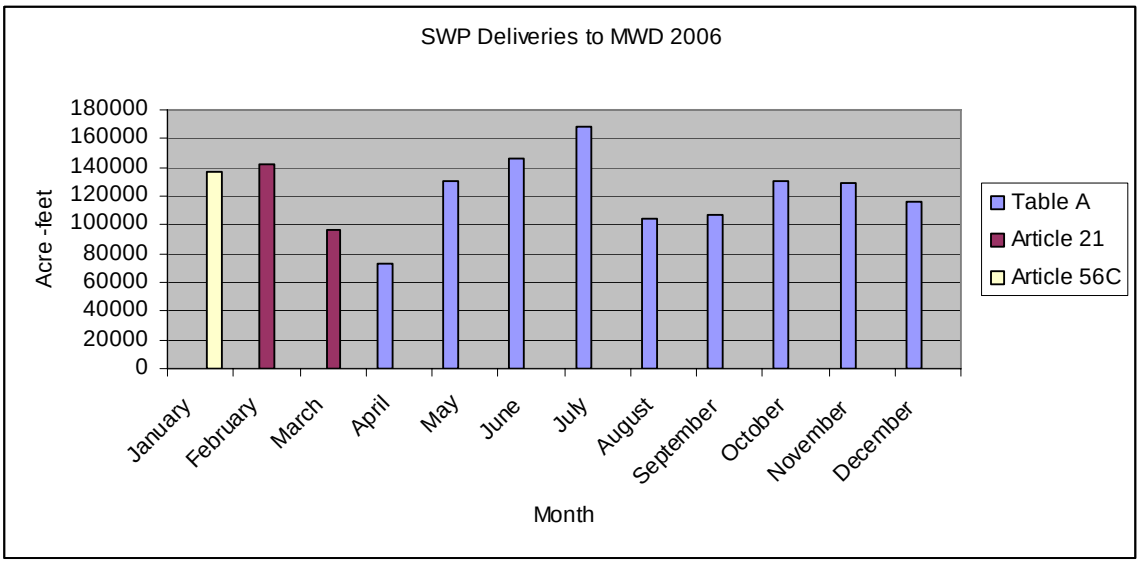
• The baseline also does not reflect how Article 21(g) (1) of the pre-Monterey contracts precluded the use and therefore demands for Article 21 water. As noted above, Article 21 (g) (1) prevents the state from delivering "surplus" water where it determines that it would contractor to the extent that the State determines that such delivery would tend to "encourage the development of an economy within the area served by sustained delivery of surplus water." This article established a specific limiting provision for delivery of Article 21 water, and the baseline should assume that DWR would implement it and withhold delivery of water where appropriate. By contrast, the Monterey Amendments have been in effect on an interim basis without that limitation. Several contractors now have economies that are dependent on continued delivery of Article 21 water. According to tables provided by DWR for water years 2004 and 2005, some urban contractors now take Article 21 and carry-over water in the winter months while taking little or no Table A supplies and take Table A supplies later in the year (see tables below). This indicates that some contractors are using Article 21 supplies to sustain the hard demands of their service area in winter months.[39]

30-34 (con't.)

[39] In fact, review of the historic deliveries of article 21 water demonstrates that municipal demands for Article 21 water supplies have *increased* since implementation of the Monterey project. Such use would have been prohibited under the pre-Monterey contracts. This increased demand for article 21 water should not be included in the baseline. The EIR should further analyze whether proposed contract amendments have indeed resulted in hardened demand for article 21 water, and corresponding shifts in delivery, demand, and request patterns for Table A supplies.


SWP Deliveries to MWD in 2004
Acre-feet
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
January
February
March
April
May
June
July
August
September
October
November
December
Month
Table A
Article 21
Article 56C


SWP deliveries to MWD in 2005
Acre-feet
160000
140000
120000
100000
80000
60000
40000
20000
0
January
February
March
April
May
June
July
August
September
October
November
December
Month of 2005
Table A
Article 21
Article 56C


SWP Deliveries to MWD 2006
Acre -feet
180000
160000
140000
120000
100000
80000
60000
40000
20000
0
January
February
March
April
May
June
July
August
September
October
November
December
Month
Table A
Article 21
Article 56C

30-34
(con't.)

Source data provided electronically to Mindy McIntyre by DWR staff in 2007

Third, the baseline inappropriately excludes an accurate analysis of allowable operations under the current regulatory setting. The baseline does not include operational constraints of the federal Endangered Species Act (FESA) and the California Endangered Species Act (CESA). As detailed further in section III.B, *infra*, recent state and federal court rulings have determined that SWP operations as modeled in the DEIR do not comply with either CESA or FESA, and are therefore illegal.[40]

Fourth, the DEIR fails to recognize climate change in the baseline (and in the analysis of alternatives). The DEIR incorrectly states that too little is known about climate change to warrant incorporation of findings into the baseline and alternative. Rather, the DEIR provides a cursory discussion of climate change in a separate section of the EIR[41]. This assertion is contradicted by numerous studies and findings, including research published by DWR well before the release of the DEIR.

30-34 (con't.)

DWR has prepared and released significant information on climate change impacts to the SWP system and to California water resources. The Department's own "Progress on Incorporating Climate Change into Water Management," outlines several feasible scenarios for climate change. CEQA does not require definitive information prior to incorporation into analysis. Indeed, as noted by the Intergovernmental Panel on Climate Change, it is very unlikely that future California hydrology will be the same as past hydrology:

> The IPCC (2001) ranked the confidence limits of major impacts to water resources due to observed and projected climate change as very high (0.95-1.00), high (0.67-0.95), medium (0.33-0.67), low (0.05-0.33), and very low (0.00-0.05). There is high confidence that the timing and amount of runoff is changing, and very high confidence that watersheds with substantial snowpack will experience major changes as temperature continues to rise. The impacts of this trend are a decrease in available water resources in California, primarily during the summer months, and a potential increase in wintertime floods. There is high confidence that California's Sierra Nevada will experience a continued trend of decreased snow accumulation

[40] See, e.g., *Natural Resources Defense Council v. Kempthorne* (E.D. Cal. 2007), 2007 U.S. Dist. LEXIS 42263 (existing and planned future operations in the Central Valley Project and State Water Project may jeopardize the Delta Smelt, creating ESA compliance problems. While the baseline excludes compliance with these state and federal endangered species laws, the DEIR simultaneously relies on the FESA process to mitigate for many of the significant impacts of the proposed project. However, the DEIR provides no analysis to demonstrate that the FESA process is capable of mitigating these impacts.

[41] See DEIR, Ch. 12, addressed in section of these comments, *infra.*

and earlier snowmelt (e.g. Lettenmaier and Gan 1990; Jeton et al. 1996; Miller et al. 1999; Wilby and Dettinger 2000; Knowles and Cayan 2002; Miller et al. 2003).[42]

In fact, and as discussed fiurther below, widely available data demonstrate that climate change is already occurring in California, with trends of declining snowpack and earlier annual peak runoff.[43] Numerous studies, listed in attachment D to these comments, address climate change and its effects on water resources in California are available. Despite this overwhelming body of evidence of current and future climate change, the DEIR ignores climate change in the baseline and in all alternatives. Instead, the baseline and all alternatives are based on past hydrology.

30-34 (con't.)

In sum, the DEIR's baseline fails to provide an accurate basis for comparison of environmental impacts associated with the proposed project or other alternatives. The baseline must be adjusted to reflect the pre-Monterey SWP contracts, pre-Monterey SWP operations and the impacts of climate change. Without such adjustments, the baseline is an inadequate reference from which to determine the impacts of the proposed project and project alternatives.

B. The DEIR fails to reflect the current regulatory framework, and in particular the impact of the Delta Smelt/OCAP decision on the delivery reliability of the SWP.

DWR's final decision on the "Monterey Plus" must reflect and address SWP and environmental conditions as they exist now, rather than freezing them in 1995 or 2003. The recent ruling invalidating the biological opinion for the Delta Smelt is one of the most significant current environmental constraints for the SWP. Yet the DEIR fails to incorporate the impact of this decision in alternatives analysis or recognize this significant decision in Section 6.3 (Changes in SWP Operations Since 1995 Unrelated to the Proposed Project). The federal court's

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[42] *California Climate Change, Hydrologic Response, and Flood Forecasting* , Norman L. Miller Earth Sciences Division, Berkeley National Laboratory, Berkeley, California, USA . Presented at the International Expert Meeting on Urban Flood Management 20-21 November 2003, World Trade Center Rotterdam, The Netherlands April 30, 2004. http://www.lbl.gov/Science-Articles/Archive/assets/images/2004/Apr-30/California_Flooding.pdf

[43] *Potential effects of global warming on the Sacramento/San Joaquin watershed and the San Francisco estuary*. Noah Knowles and Daniel R. Cayan, Geophysical Research Letters, VOL. 29, NO. 18, 1891, doi:10.1029/2001GL014339, 2002, http://natypete.andradedowns.googlepages.com/knowles2002.pdf; No. 119. Effects On Water Resources: Monitoring Snowmelt Runoff And Sea Level for Climate Change, Maurice Roos, California Department of Water Resources, presented at the U.S. Climate Change Science Program (CCSP) workshop on November 14-16, 2005, in Arlington, Virginia http://www.climatescience.gov/workshop2005/posters/P-WE2.8_Roos.pdf

summary judgment decision was issued on May 25, 2007, many months before the DEIR and the final ruling has now been issued.[44]

DWR has publicly recognized the impact of the Delta Smelt ruling outside of the DEIR. DWR's Chief of Project Operations Planning Branch, John Leahigh, stated that under the interim remedy actions proposed by the United States Fish and Wildlife Service (USFWS), SWP 2008 deliveries would be reduced anywhere between 8% (91,000 AF) to 27% (305,000 AF) from a baseline delivery of 1.15 MAFY in a dry year; and from between 8% (252,000 AF) and 31% (305,000) from a baseline of 3 MAFY in an average year. (Attachment F, *NRDC v. Kempthorne*, Doc. 398, Declaration of J. Leahigh, dated July 9, 2007, at ¶¶ 6. 36-37.)

While the ruling initially imposed an interim remedy only, it is reasonable to expect that the next biological opinion will impose permanent restrictions that are similar or more stringent to the interim remedy. It is very unlikely that the USFWS will issue a biological opinion significantly similar to the pre-ruling opinion. Given this likelihood, the EIR should reflect the operations imposed by the court in the Delta Smelt ruling. Indeed, the ruling demonstrates that existing operations, as modeled in the DEIR, are not lawful. The Delta Smelt ruling will alter the way the proposed project can be implemented. The interim remedy imposed by the court restricts winter and spring SWP pumping in the Delta. Such restrictions will necessarily impact deliveries of Article 21 water, as well as Turnback Pool transfers. Any conclusions included in the DEIR regarding deliveries of Article 21, Turnback Pool water and other water deliveries in the winter and spring are now inaccurate. The EIR must recognize the Delta Smelt ruling, and fully incorporate it into the environmental analysis for the project.[45]

30-35 (con't.)

C. The DEIR improperly uses CALSIM II as the principal tool to analyze baseline condition and environmental impacts.

The DEIR relies on CALSIM II to analyze the impacts of water allocation and deliveries under the baseline, the proposed project and the alternatives. CALSIM II results are relied upon to estimate SWP delivery and export impacts as well as to derive environmental impacts on the Delta and upstream tributaries. While CALSIM II may be a sophisticated and useful modeling tool for certain purposes, it is inappropriate for determining environmental impacts and for estimating impacts in export and deliveries. It has been criticized by a panel of expert reviewers for several weaknesses, including its lack of amenability to proper calibration. (*See* A. Close, *et al., A Strategic Review of CALSIM II and its Use for Water Planning, Management and Operations in Central California* submitted to California Bay Delta Authority Science Program, December 4, 2003.

30-36

[44] Attachment E, *NRDC v. Kempthorne*, 1:05-cv-1207 (EDCA), Doc. 560, Interim Remedial Order Following Summary Judgment and Evidentiary Hearing, dated Dec. 14, 2007, Attachment F, *NRDC v. Kempthorne*, Doc. 323, Order Granting In Part and Denying In part Plaintiffs' Motion for Summary Judgment, dated May 25, 2007.

[45] The EIR also needs to discuss the *time of year* in which cutbacks of pumping will be necessary to achieve the restoration of the Delta Smelt. The timing of these cutbacks may well occur in spring and winter, ordinarily a heavy period for SWP pumping.

In addition, CALSIM II assumes foresight on the part of operators, and thus assumes that operators will not take actions that will result in later violations of environmental standards or other operating constraints. This assumption can lead to great underestimation of environmental impacts, for in the real world operators do not have such foresight and thus may make decisions without realizing the consequences ultimately resulting from those decisions.

Furthermore a recent analysis has revealed additional flaws in the statistical basis for CALSIM II. ("Analysis of CALSIM's Statistical Basis,"by Arve Sjovold, December 28, 2004, previously provided to DWR).

CALSIM II predictions are only as accurate as the data and assumptions that are plugged into the model. Here, those assumptions may be wrong; for example, the DEIR assumption that future water flow patterns will be similar to those that have occurred in the past is inconsistent with the ample literature on the substantial effects of global warming on California water flows. These input data errors and uncertainties further undermine the ability of the DEIR's modeling analysis to make the kind of predictions necessary to support a genuine analysis of impacts.

Because CALSIM II is an optimization model that does not necessarily reflect options available to water operators, it may predict levels of exports. However, federal and state water quality and endangered species laws and regulations probably would prohibit such high export levels for water quality problem. The DEIR assumes that future water exports from the Delta will be nearly twice the historic average. Yet this prediction fails to recognize that DWR has chronically failed to meet water quality standards in the Delta under historic operations, and significant environmental degradation has taken place under such conditions, resulting in new regulatory actions. In light of the recent pelagic organism declines in the Bay Delta Estuary, and resulting rulings invalidating the biological opinion for Delta smelt, it is prudent to ensure the DEIR modeling assumptions predictions are conservative, rather than "optimizing" to ensure assumed deliveries would not violate conditions of the Federal Clean Water Act, the Federal or California Endangered Species Acts, or any other environmental permit condition, regulation, standard, or law.

30-36 (con't.)

Finally, the DEIR's presentation of modeling results is flawed. Throughout the DEIR, modeled predictions—for example, statements that salmonid mortality will increase by a certain percentage—are presented as though certain, and discussion of possible error or of ranges of possible outcomes is almost entirely absent. The models used cannot possibly produce such certainty, however; at best, they can predict, given a certain set of data and assumptions, a range of possible outcomes, with some outcomes potentially more probable than others, and with all predictions limited by both known and unknown sources of error. An accurate discussion of the DEIR's modeling results therefore cannot provide certain predictions, and instead should show the range of possible outcomes. By omitting both possible sources of error and potential outcome ranges, the DEIR projects a false certainty that the impacts of the project will be relatively small. Indeed, if the modeling results were properly presented, with ranges of outcomes fully described, the study might show that the models actually predict that significantly larger impacts are entirely capable of occurring.

PCL does not argue that models should never have been used to inform the analysis in the DEIR. But the CALSIM II used cannot possibly provide a near-certain conclusion that significant environmental effects will not occur, or will be fully mitigated especially when both common sense, existing knowledge of the Delta system, and the analyses of other agencies all indicate the extremely high likelihood of such impacts. Indeed, PCL believes that if modeling results were properly reported, they would indicate the reasonable likelihood of significant impacts.

As participants in the EIR Committee process, PCL has previously submitted comments expressing our concerns regarding the adequacy of CALSIM II for analyzing baseline conditions and assessing environmental impacts. The DEIR has not adequately addressed our previous comments, and we resubmit those comments on CALSIM II by reference to the DEIR.

30-36 (con't.)

If DWR includes CALSIM II model analyses in future EIR drafts, we request clear explanations and justification of all assumptions made in the CALSIM II model runs. In addition, we request that DWR explicitly state when findings are based on post processing and when findings are based on direct model results. When findings are based on post processing, the rationale behind these post-processing decisions should be clearly articulated.

V. The DEIR fails in its duty to analyze the transfer, development and operation of the Kern Water Bank, and alternatives that would restore its public accountability.

A. DWR must independently study, and exercise its own judgment on, the "transfer, development and operation" of the Kern Water Bank.

As provided in the settlement agreement, "the new EIR shall include an independent study by DWR, as the lead agency, and the exercise of its judgment regarding the impacts related to the transfer, development and operation of the Kern Water Bank" in light of existing environmental permits. (Section III.F.) That study "shall identify SWP and any non-SWP sources of deliveries to the Kern Water Bank." (*Id.*) The EIR must provide this analysis to ensure compliance with the agreement and the requirements of CEQA.

30-37

The 2003 Settlement Agreement, which allows the Monterey Amendments to proceed on an interim basis, that "KWBA shall retain title to the KWBA lands. KWBA may continue to operate and administer the KWB lands including the water bank, subject to restrictions herein."[46] The agreement also provides that "[t]he restrictions in this Section V shall become final only upon (1) filing of the Notice of Determination following the completion of New EIR, (2) discharge of the writ of mandate in the underlying litigation as provided below, and (3) conclusion of all litigation in a manner that does not invalidate any Monterey Amendment (or any portion thereof) or the Kern Fan Element Transaction."[47]

[46] Settlement Agreement, § 5.A.

[47] Settlement Agreement, § V.F.

B. **The DEIR's study methods are too narrow to support DWR's independent judgment on the future of the Kern Water Bank.**

DWR's final decision addressing ownership and operation of the world's largest groundwater storage facility, the one million acre-foot capacity Kern Water Bank located west of Bakersfield, raises critical issues involving public trust accountability and environmental responsibility. The various stakes involved in the bank's operation—financial, institutional and environmental—are of immense importance to California's future. Built to capacity, the groundwater bank is capable of delivering 240,000 acre-feet of water per year, enough to supply the needs of roughly 500,000 households.[48]

The facility is also crucial because of its location, providing storage to the southern San Joaquin Valley.[49] When developed, the Kern Fan Element, in combination with the provisions of the proposed project allowing storage outside an SWP service area, significantly increase SWP contractors' capacity to accept water from the Delta.

But the DEIR's draft study on the Kern Water Bank (DEIR, Appendix E) says very little that would alert the reader to momentous environmental significance of DWR's forthcoming decision. The "methods" section of that study (DEIR, Appx. E, p. 5) suggests a possible reason for its benign assessment. Of the three sources of information noted in the study, the only information source that does not come directly from the Kern agencies, KCWA and KWBA, is that DWR contacted personnel from the California Department of Fish and Game and the United States Fish and Wildlife Service. That focus is far too narrow. The substantial environmental issues associated with the loss of statewide environmental accountability over the bank require a more probing analysis that could not be addressed simply by consulting wildlife and fisheries agencies, and it is DWR, as SWP manager, that must provide that analysis. As detailed below, even if the KWBA has been a responsible steward of the Kern Fan Element property that holds the bank, the concerns that arise from the decision for the bank to serve local rather than statewide interests would persist. 30-38

DWR's narrow study methods are surprising, because the broader issues surrounding the transfer, development and operation of the Kern Water Bank have been the subject of major public controversy, addressed in the media[50] and in reports that are referenced and discussed nowhere in the DEIR. One of those reports, prepared by Public Citizen, contends that while the

[48] In August 1996, one day following DWR's transfer of the bank to Kern County Water Agency in its interim implementation of the Monterey Amendments in 1996, KCWA retransferred the bank to the Kern Water Bank Authority (KWBA), which consists of five local public water agencies and a private mutual water company.

[49] Sandino, *California's Groundwater Management Since the Governor's Commission Review: The Consolidation of Local Control* (2005) 36 MCGEORGE L. REV. 471, 489 n. 171.

[50] M. Arax, *Massive Farm Owned by L.A. Man Uses Water Bank Conceived for State Needs,* Los Angeles Times (online), December 19, 2003.

KWBA is formally public entity, it is effectively majority-controlled by one of the world's largest farming companies, Paramount Farming, and largely serves the interests of two corporations with large landholdings in the service area.[51] The Public Citizen report charges that the divestment of the bank from state authority has been environmentally destructive, raising issues that are nowhere addressed in the DEIR.[52] While we believe that DWR is very much aware of this report, and should thus have included a reaction to the report as part of the DEIR environmental analysis of the proposed transfer of the Kern Fan Element, we will attach the Public Citizen Report to these comments, so that DWR will have no excuse not to analyze its findings in connection with producing the final EIR.

Whether or not DWR concurs with them, it would be irresponsible not to address these well-known allegations before taking its final action on the proposed Kern Water Bank transfer.[53] Indeed, broad concerns about the lack of institutional and environmental accountability among Kern County's local water agencies have drawn the attention, not simply of environmental groups, but also some of the most respected scholars of California's water history. For example, Norris Hundley's discussion observes that such local districts "are ordinarily managed by boards of directors made up of a homogeneous, single interest body of people representing the large water users and guided by a rigid set of goals: maximization of water use at minimum cost with little or no regard for the environment or for the welfare of the people of California."[54] In short, the EIR will disserve decision-makers and the public unless DWR is able to step outside the mindset of the local Kern agencies, and address the Kern Water

30-38 (con't.)

[51] J. Gibler, WATER HEIST (Public Citizen, December 2003)("Public Citizen report"), included as Attachment G to these comments. The EIR should specifically address the Public Citizen report as if it were set forth directly in these comments.

[52] See Public Citizen report, p. 2 (arguing that the bank should not "provide a handful of corporations with the keys to a virtual 'switchyard' for controlling water deals between agribusiness and real estate developers").

[53] To assist decision-makers and the public, PCL also requests that DWR include in the EIR a documentary appendix compiling key reference sources on the Kern Water Bank. The public should have an opportunity to directly review such key documents as (1) the 1987 DWR/ KCWA memorandum of understanding; (2) the purchase agreements framing the transfer of the Kern Fan Element from DWR to KCWA, and from KCWA to KWBA; (3) the 1995 KWBA Statement of Principles; (4) the 1995 KWBA Joint Powers Agreement; and (5) the 1995 KWBA Operations and Monitoring Memorandum of Understanding.

[54] N. Hundley, THE GREAT THIRST (2001), p. 536; see also R. Gottlieb and M. Fitzsimmons, THIRST FOR GROWTH (1991), pp. 96-97 ("With new purchases and related expansion of irrigated acreage becoming a speculative spiral, the Kern landowners raced to establish new water districts to contract for State Project water….The tendency toward concentration and overextension, already prevalent in the county from the days of *Lux v. Haggin*, was enormously magnified with the arrival of the aqueduct. A handful of landowners dominated the key water districts affiliated with the [Kern County Water Agency], and these districts, in turn, dominated the agency").

bank issues with the "statewide perspective and expertise" required in its stewardship of the State Water Project.[55]

30-38 (con't.)

C. The EIR fails to fully disclose how the transfer of the Kern Fan Element out of DWR's control alters the central purpose of the Kern Water Bank.

Although the DEIR briefly refers to the transfer of the Kern Fan Element out of state ownership, and its subsequent control by the KWBA (DEIR, p. 4-11), it never fully acknowledges how this transformation affected the fundamental purpose of the Kern Water Bank. The DEIR appendix on the transfer briefly references the 1987 Memorandum of Understanding (1987) between DWR and KCWA, which formed the basis for DWR's acquisition of the Kern property from Tenneco West.[56] But it never mentions how two key statewide and public protections referenced in the 1987 MOU were later removed:

- **Shift of bank purpose to serve local rather than statewide interests.**

The 1987 MOU clarified that the "primary purpose" of the Kern Water Bank is to "augment the dependable water supply of the State Water Project"; and that "[i]ncidental" to its primary purpose the bank will produce "local benefits." It defined the bank as a "SWP conservation facility" to be integrated with other SWP operations.

30-39

By contrast, the 1995 joint powers agreement for the KWBA reversed the priorities, ensuring that "the Authority will be operated and maintained "*for its benefit and the benefit of the Member Entities*."[57]

- **Failure to acknowledge statewide trust protection**

Although the MOU conferred upon the Agency a ten-year option to purchase the bank, it imposed conditions of that purchase that would have preserved DWR's trust responsibilities under the Water Code. Under the MOU, the Agency's purchase of the bank could only occur "[p]rovided that the *Department's right to use the area for project purposes* will be preserved. Consistent with section 11464 of the Water Code, the Department shall not sell facilities acquired for the Kern Water Bank."[58]

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[55] *PCL v. DWR*, 83 Cal. App. 4th at p. 907.

[56] DEIR, appx. E, p. 10.

[57] 1995 JPA for the KWBA, recitals at ¶ 5.

[58] The non-alienation provision in Water Code section 11464 provides that "no water right, reservoir, conduit, or facility for the generation, production, transmission, or distribution of electric power, acquired by the department shall ever be sold, granted, or conveyed by the department so that the department thereby is divested of the title to and ownership of it."

By contrast, neither article 52 of the Monterey Amendments, nor the conveyance agreements with the Kern agencies for the Kern Fan Element transfer, ever referenced or incorporated DWR's continuing authority, even in the context of local ownership, to use the bank as needed for SWP purposes. Instead, the transfer agreements took the form of unrestricted fee simple transfers, without any discussion of the state's underlying trust duties.

In its EIR, DWR must fully analyze the circumstances surrounding the removal of safeguards for the public and the state, and the environmental consequences of bank operation without these protections. It must also study alternatives that would not eliminate these protections, even in the context of local ownership and administration of the bank.

30-39 (con't.)

D. **The EIR must more fully describe DWR's experiences and purposes in attempting to develop the Kern Water Bank.**

The DEIR barely discusses DWR's original plans for the KWB and attempts to develop it. In a 1979 article, then-DWR director Ronald Robie described a variety of environmental advantages to DWR developing an underground storage facility for the SWP. He concluded that "an SWP ground water program will add flexibility to SWP operations and can be a hedge against earthquake or other disablement of the California Aqueduct."[59] Following the release of technical studies, DWR focused on the possibilities of developing SWP groundwater recharge operations in Kern County.

In 1986, DWR prepared an EIR for a state-run water bank, contemplating purchase of approximately 20,000 acres of land from Tenneco West, located on the Kern River's alluvial fan (the area that ultimately became the bank's site is sometimes referred to as the Kern Fan Element).[60] The present DEIR does not disclose that in its own environmental reviews, DWR recognized that operation of the bank might have an impact on the Bay-Delta.[61]

DWR made substantial investments in studies and other activities with the expectation of implementing the state-owned bank. Some estimates have placed the total amount DWR paid to develop the bank, including the initial purchase, over $70 million.[62] The EIR should disclose the full amount of that investment, including any investment in environmental study and mitigation.

30-40

[59] *Id.* at 45.

[60] See also Kletzing, *Imported Groundwater Banking: The Kern Water Bank - A Case Study*, (1988). 19 PAC. L.J. 1225.

[61] DWR, First Stage Kern Fan Element Draft Supplemental Environmental Impact Report (1990). pp. 38-42.

[62] Public Citizen, p. 2.

E. The EIR does not fully disclose the circumstances that caused DWR to relinquish control of the KWB.

The EIR should more fully disclose the circumstances that caused DWR to stop developing the KWB. In this regard, several documents that PCL obtained from DWR, included as attachment H, are illuminating. During the early 1990s, KCWA, joined by other local water districts and the State Water Contractors organization, sought to have DWR cease all "planning, design and land acquisition" activities relating to the water bank, even requesting that it be "mothballed."[63] They also argued that since DWR would not be developing the bank, it should be transferred to local control. In response, DWR director David Kennedy ultimately endorsed divestment of the water bank to the Agency, which then became a key principle in the 1994 Monterey Agreement.[64] 30-41

Although DWR had earlier been trying to proceed with the state-run project, two factors--potential ESA impacts, and Kern non-cooperation—thwarted these efforts. The latter reflected both ESA impacts, which KCWA did not want to address, and partly KCWA's reluctance to allow DWR to protect statewide interests in the bank. DWR had reached a HCP addressing on-site impacts, and that HCP was satisfactory to everyone but the Kern interests. However, DWR staff reported that Kern "wanted to recharge and extract at their will and not pay for 'any stinking mitigation costs'. When DWR objected, Kern's Tom Clark responded, "if we think we must, we will buy it."[65]

F. The EIR inadequately addresses the details of DWR's purchase agreement with Kern County Water Agency.

The EIR identifies the agricultural contractors' retirement of 45,000 acre-feet of agricultural entitlement (almost all by KCWA) as the ostensible consideration (the price paid) for DWR's transfer of the Kern Water Bank. But it does not adequately analyze the circumstances surrounding that exchange: 30-42

• DWR estimated the bank's worth at just over $33 million. That figure was just two million more than the state had paid in 1988, despite the state's subsequent investment of approximately $40 million in the bank's development. The state apparently valued the element based upon its purchase piece of marginal agricultural land rather than its more important value—a capitalization of the land's highest and best use as a water bank.

[63] Attachment H (February 18, 1993 draft letter from SWC to DWR).

[64] Attachment H (1992 SWC action report; February 18, 1993 draft letter from SWC to DWR; February 9, 1993 and April 19, 1993 letters from DWR to SWC).

[65] Attachment H (Memorandum of Jack Erickson, DWR to John Pacheco, dated February 13, 1996).

- KCWA's retired agricultural "entitlements" existed only as an accounting tool, and Kern had no realistic expectation of receiving actual wet water under those entitlements. Nevertheless, KCWA was obligated—pursuant to the contracts it signed—to pay the state for that entitlement amount. By retiring those entitlements, KCWA therefore relieved itself of a substantial liability while losing little, if any, chance at wet water. The retired debit would appear to have a substantially higher value than the retired entitlements.

- DWR and KWBA have yet to provide a full accounting of the sources of water going into the Kern Water Bank, an issue that DWR is called upon to address in the Monterey settlement agreement within the Monterey Plus EIR. It seems likely that the other inexpensive sources of water made available to the Kern agencies through the Monterey Amendments—including "interruptible" (formerly surplus) water, carryover storage water, and turnback pool water—might have more than replaced the purported "loss" of KCWA's 45,000 acre-feet of paper entitlements with less expensive sources.

30-42 (con't.)

- The state's divestment also included some of its water. DWR conveyed title to half the water stored in the bank, as well as all the water stored during 1995. As the KWBA recognized in its financial statement, "the participants [in the KWBA] received Kern Water Bank land and facilities and 42,380 acre-feet of banked water. The 42,830 acre-feet of water subsequently was transferred to each of the participants in proportion to their ownership. This transaction was reflected as a contribution of capital in the amount of $27,858,500 by the respective participants."[66]

G. The DEIR fails to analyze key environmental consequences of the Kern Water Bank's operation without statewide trust accountability.

The DEIR fails to study the major environmental consequences of the Kern Water Bank, other than some smaller issues that centrally focus on KWBA's administration of the Kern Fan Element lands. Notably, the analysis fails to answer important questions about foreseeable trends in water marketing and groundwater banking due to the project.[67] Instead, the DEIR abruptly concludes that impacts are less than significant because multiple factors increased groundwater banking, and because of a beneficial impact on groundwater levels.[68]

30-43

The EIR must carefully study the following issues:

- **Pressures on the Delta**

[66] KWBA, *Financial Statements* (December 31, 2000 and 1999).

[67] Neither Chapter 8 on growth-inducing impacts, nor Chapter 9 addressing water supply reliability and "paper water," address the transfer and operation of the Kern Water Bank. The effects of available storage and related transfers must be included in those analyses even if the bank is addressed separately in Appendix E.

[68] DEIR, appx. E, p. 49.

The transfer of the Kern Fan Element resulted in a shift in use of the facility. The state had intended to use the facility as a drought mitigation bank. In local control, it has become a new resource to maximize deliveries of SWP water and an economic resource. Local agencies now benefit from aggressively developing the Kern Fan Element. Under the Monterey Amendments, all contractors can use the Kern Water Bank to store SWP water. Therefore, the bank transfer has a significant potential to increase demand for and export of Delta water. The DEIR does not adequately analyze the impact on SWP demand and Delta export resulting from the transfer and development of the Kern Fan Element.

DWR's records, although not yet disclosed in the EIR, suggest a possible close connection between the Kern Water Bank, Delta pumping, and Delta environmental issues. The bank's relationship to Delta pumping and environmental conditions came up repeatedly in DWR's correspondence with other agencies,[69] as well as with the contractor constituencies represented in the Monterey negotiations.[70] In general, those records suggest DWR was well aware that operation of the Kern Bank could lead to increased Delta pumping, and that those increases could affect endangered species.

30-43 (con't.)

Additional research by PCL, previously brought to DWR's attention[71], also shows the Kern Bank's role in increased deliveries to southern contractors.[72] These documents highlight how filling the bank can impact the Delta. For example:

[69] See, Attachment H, including: Letter from Wayne White, Department of Interior to David Kennedy, dated September 30, 1991 ("we are concerned about potential adverse effects of the project in the Sacramento-San Joaquin River Estuary (Delta) area in central California. The reason for this concern is that water storage capacity within the Kern Water Bank would be filled through additional water exports from the Delta averaging approximately 90,000 acre-feet per year"); *id.* (potential adverse effects on Delta smelt and winter-run Chinook salmon); Letter from John Turner, Department of Fish and Game, to Dan Masnada of CCWA, dated July 20, 1995 (development of storage facilities, along with other Monterey operational changes, "combine to create substantial potential for program effects in the Delta and upstream"); *id.* (full study of Kern Water Bank's "potential impacts on the Delta has never been completed").

[70] See Attachment H: MWD letter to Tom Clark dated May 29, 1992 (identifying relevance of Chinook impacts); Memorandum of Jack. A. Erickson, DWR, dated April 20, 1993 (acknowledging Delta issues associated with Kern Fan Element); DWR, Kern Fan Element Re-evaluation Study, February 1996 (acknowledging Kern-Delta link).

[71] See Appendix A.

[72] Several other provisions in the Monterey Amendments also facilitate increased pumping of KWB-bound water. These provisions include liberalized requirements for "interruptible" water, allowance of "carryover" water, and creation of a "turnback pool."

--A KCWA brochure reported that in 2001, the banking program had boosted local supplies by "almost 200,000 acre-feet" and urban Southern California supplies by 81,000 acre-feet.

--Numerous reports from the manager of KCWA member Lost Hills Water District document, among other things, Paramount Farming's use of water banking to obtain inexpensive sources of state water for future water transfers and sales.

--A Georgia State University paper on water sales from 1990-2001 recorded purchases from the Monterey Amendments turnback pool by KCWA, Dudley Ridge and other contractors at prices of $5.90 to $11.79 per acre.[73]

--The Urban Water Management Plan of the McAllister Ranch Irrigation District, a former agricultural area near Bakersfield that is turning to residential development with the assistance of the Kern Water Bank.

--KCWA's 1996 Water Supply report contradicts the assumption that Monterey provisions including the Kern Fan transfer have only had a minor effect on deliveries, reflecting an understanding that it expected the Kern water bank, along with Monterey managerial changes, to help increase its SWP yield.

30-43 (con't.)

- **Depleting the Environmental Water Account**

There appears to be significant evidence that effective possession of the Kern Water Bank enabled Paramount Farming subsidiary Westside Mutual and other interests within the KWBA to secure "surplus" water from the state, only to sell it back to the state's Environmental Water Account at a profit.[74] If DWR itself operated the bank, such privately-profitable sales would not have resulted in a transfer of money out of the state system; DWR could pump its own surplus water to the bank (rather than selling it at bargain-basement prices) and then at times of environmental need could pump that water, without paying marked-up prices for it, to users in lieu of Delta deliveries. By paying less for water, DWR thus could slow the depletion of EWA assets, which in turn would allow the EWA to take more protective actions. That change could become crucially important during a drought, for in times of scarcity the KWBA member agencies could charge far higher prices for their water, and the financial difference between a DWR-managed bank and a privately managed bank, and thus the difference in depletion of EWA funds, could be enormous.

- **Increasing the agribusiness footprint**

[73] M. Czetwertynski, *The Sale and Lease of Water Rights in Western States: An Overview for the Period 1990-2001* (March 2002), pp. 16-17.

[74] The evidence is available at http://www.ewg.org/reports/CAWaterTakings/part4.php; http://www.watertransfers.water.ca.gov/water_trans/water_trans_index.cfm. Despite its prominent role in securing the divestment of the Kern Water Bank and benefiting from it, Paramount Farming—whose wholly owned subsidiary Westside Mutual Water Company owns more than 48 percent of the bank--is only cryptically referred to in the DEIR analysis of the Kern bank, and not by name. See DEIR, Appx. E, p. 17 (noting that Westside was formed by "a landowner").

The profit stream to Paramount Farming and other Roll International affiliates deserves further attention. The bank, which was intended to help balance out the state's water supply to cities, farms and fish, has instead allowed Paramount Farming to double its acreage of nuts and fruits since 1994."[75] If the Kern Bank has indeed allowed a private company to put substantial additional acreage to agricultural use, that change could have multiple environmental consequences, including local habitat loss, increased pollutant loading, and, perhaps more importantly, increasing and hardening overall south-of-Delta water demand, which in turn could increase Delta impacts in the next drought.

- **Constrained public uses**

Private operation of the bank outside DWR control would hamper the state's ability to manage water resources for a variety of public purposes, including drought storage for emergency preparedness, urban uses, environmental protection, river restoration, and water quality.[76] The specialty crops and urban uses supported by the bank, due to their inflexibility in times of drought, may increase pressure for water exports from the overburdened Bay Delta during times of critical shortage.

30-43 (con't.)

- **Supporting growth and development**

In KCWA's March 1995 newsletter, its general manager describes "our local groundwater basin" as "a multi-billion dollar resource."[77] The Public Citizen report alleged that the privately controlled water bank serves as "switchyard" for transactions between agribusiness and real estate interests in Southern California.[78] The DEIR must investigate these allegations, as well as suggestions that the bank may promote sprawl development.[79]

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[75] Arax, *supra*.

[76] "Water banking could be used as drought protection to statewide benefit and to help improve water quality in the heavily depleted San Joaquin Valley groundwater basin. Operating banks for water marketing will have the opposite effect, fueling increased dependence upon distant water supplies for new growth…." Public Citizen, *Water for People and Place* (Nov. 2005), p. 28.

[77] KCWA General *Manager* Jim Beck, quoted in *Water Age*, March 2005, p. 3.

[78] Public Citizen report, p. 2.

[79] See, e.g., V. Pollard, *Los Angeles Eyeing Kern Water Source*, Bakersfield Californian, March 24, 2002 (online) ("DWP officials have had early talks with representatives of Paramount Farming Co. and other participants in the about possible purchase of an as-yet-unspecified amount of water…The chairman of the Kern Water Bank Authority Board, Bill Phillimore, said sales from the water bank were contemplated from the time the bank was acquired by Kern County water agencies…."). The Public Citizen report asserts that Roll International affiliate WV Acquisitions has contracted with Lennar / LNR subsidiary Newhall Land and farming for

H. The DEIR fails to analyze alternatives that would restore state trust accountability to the Kern Water Bank's operation.

In light of the history and risks described above, it is essential that DWR develop and analyze a meaningful project alternative that would restore some measure of statewide accountability over the manner in which the KWB is operated. That alternative may even be compelled by the need to comply with Water Code section 11464 and other applicable laws.

Throughout its participation in this EIR review, PCL proposed two alternatives that would have addressed the Kern issues. The first was a "Kern Fan retention" alternative, which assumes state ownership and operation to enhance dry-year reliability. The second was a "Kern Fan Transfer with trust conditions" alternative that would allow the Kern Water Bank to remain in local control, subject to operational and financial criteria designed to maximize environmental benefits. It would require the bank to store environmental water in time of surplus and make it available at no cost to the state in time of drought, in exchange for allowing the asset to operate the rest of the time for local purposes. In sum, a variety of operating and financial arrangements must be explored to maximize the bank's contributions to the State's environment. CEQA requires a full analysis of these feasible alternatives, as part of the DEIR prepared on the proposed action. 30-44

Unfortunately, the DEIR summarily rejected the "Kern transfer with trust conditions" alternative with a cursory, untenable explanation. DEIR,§ 11.2.6, p. 11-16. The DEIR asserts that this alternative would fail to "meet the objectives" of the Monterey Amendment, but does not explain why. On the contrary, allowing local control of the bank to continue subject to the imposition of a state trust—which closely resembles the approach to local control of the bank already set forth in the 1987 DWR/ KCWA MOU—would be a balanced way to "[r]esolve legal and institutional issues related to storage of SWP water" in the county that would harmonize local and statewide interests.[80] In light of Water Code section 11464 and legal constraints

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sales of water entitlement. See http://www.hoovers.com/the-newhall-land-and-farming-company/--ID__11074--/free-co-factsheet.xhtml (describing Newhall as the "landing strip fot urban flight"). PCL has no independent knowledge of these accounts, but believes they deserve analysis.

[80] DEIR, p. 4-1 (listing project objectives). The "local control subject to DWR trust" approach does not appear incompatible with any of the other fundamental project objectives either. Moreover, the prospect that stakeholders might challenge the approach would provide no reason to summarily reject it as a project alternative. *PCL v. DWR*, 83 Cal. App. 4th at p. 915. Nor would the need for local agreement and funding be grounds to summarily dismiss this alternative from consideration (cf. DEIR, p. 11-6), particularly if DWR finds that it is the only lawful manner to proceed with local ownership of the bank.

related to conditions in the Delta, this alternative may well constitute the only lawful manner in which DWR can make a final decision that allows the bank to remain in local ownership.[81]

30-44 (con't.)

I. The EIR must answer additional questions about the Kern Water Bank's transfer, development and operation.

PCL requests that the EIR answer the following additional questions, each of which relates to potentially significant environmental impacts, as outlined in this comment letter, and each of which CEQA requires be addressed:

1. Does the KWBA actually acquire and sell water, or does it merely provide a facility that allows its member agencies to store and recover water that they acquire and sell?[82]

2. If the KWBA does actually acquire and sell water, how much water does it acquire and sell on a yearly basis?

3. How much water have each of the KWBA members, including Westside, bought and sold during each year of the Kern Bank's operations, using the Kern Bank in connection with such purchases and sales?

4. To whom has water stored in the Kern Bank been sold?

5. At what price has Kern Bank water been sold? Does that represent a markup beyond costs?

6. How much has the KWBA charged for storage in the Kern Bank ?

7. Has DWR purchased Kern Bank water? For what purpose and place of use? How much has come from the KWBA, and how much from particular agencies? At what price?

8. What are the sources of water that go to the Kern Bank? Each year, how much has come from: (a) SWP Table A allocations; (b) SWP Article 21 water; (c) CVP water; (d) surface runoff; (e) Kern River water?

9. Is there any evidence that DWR delivered water to the Kern Bank knowing it would later need to repurchase that water? Or is there evidence that DWR

30-45

[81] The DEIR's premise that alternatives cannot be used here simply to improve "the health of the environment" (DEIR, 11-6) could not be more at odds with the elementary requirements of CEQA, which may be used to *mandate* feasible alternatives or mitigation measures. Pub. Res. Code, § 21002.

[82] Under the joint powers agreement, the KWBA is empowered to acquire and sell water, but it is less clear where it would get such water, or how it would access recharge or withdrawal facilities; the JPA appears to assign shares of facility use exclusively to the member agencies.

delivered water to the Kern Bank while simultaneously repurchasing earlier-delivered supplies?

10. Does the KWBA pay taxes on the land it owns?

11. Does the KWBA pay taxes on profits from water sales (if sales are above-cost)?

12. Does Westside profit from water sales, and if so does it pay taxes on those profits?

13. Have the KWBA member agencies obtained SWRCB approval for changing (either temporarily or long-term) the place or purpose of use of water stored in the Kern Bank and transferred to different users?

14. What are the KWBA member agencies doing with the profits from their sales, and what are the environmental consequences?

30-45 (con't.)

VI. The DEIR's assessment of alternatives is defective.

A. The DEIR presents multiple muddled versions of the No Project Alternative, blurring the distinction between "no project" and project alternatives.

CEQA defines the purpose of a No Project Alternative as, "to allow decision makers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project" (CEQA Guidelines, § 15125).[83] Making up in quantity for what they lack in accuracy, the DEIR identifies multiple iterations of the No Project Alternative. As demonstrated here, each of these attempts is incoherent, and in some instances, they muddle the distinction between the No Project Alternative and project alternatives.

30-46

A brief synopsis of these attempts highlights their flaws:

• The No Project Alternative 1 (NPA1) assumes at the state would have developed the Kern Fan Element to a capacity of 350,000 acre-feet by 2003 and to 500,000 acre feet by 2020. The capacities used appear to be entirely arbitrary, and may well serve simply to narrow the distance between the no-project and the project without factual foundation. Moreover, the EIR appears to be internally inconsistent as the subject of how much state bank development was foreseeable.[84]

[83] PCL has already explained above why the no project assessment has not met the requirements of *PCL v. DWR*. This section describes, in addition, how the DEIR develops no project alternatives that are muddled with project alternatives.

[84] Inclusion in the No Project Alternative suggests a belief that state development could be "reasonably expected to occur in the foreseeable future," CEQA Guidelines, § 15126.6(c)(2); but

• The No Project Alternative 2 (NPA2) includes a number of the Table A transfers facilitated under the Monterey Agreements, conveyance of non-project water, and storage of contractor water outside of the contractors' service area-all key components and other provisions of the proposed project that were implemented as of 2003. The DEIR argues that these projects and policies would have been approved by the Department regardless of the Monterey project. However, that argument is entirely speculative, and in no way excuses the CEQA-mandated no project analysis. Each of these components was initiated as a direct result of the Monterey Amendments. As such, they are components of the very action under review and cannot be included in a no project alternative. [85]

• Court-Ordered No Project Alternative 3 (CNPA3) and Court-Ordered No Project Alternative 4 both contain significant flaws. As discussed above, neither of these alternatives provided the rigorous review anticipated by the court in *PCL v. DWR* and by plaintiffs in the settlement agreement.

• CNPA3 is also based on water allocation methods that were not in place at prior to the Monterey agreement. CPNA3 does not reflect the agricultural and groundwater replenishment priority for article 21 that was a specific requirement of the pre-Monterey contracts. Without the Monterey Amendment, this contract provision would remain in place. Therefore the only appropriate no project alternative is one which includes all pre-Monterey contract provisions, including the "agriculture first" and groundwater replenishment provisions of Article 21.

• The no project alternative must reflect the actual 'no project' condition. Rather than speculate that DWR might alter contract provisions, approve water transfers and overcome significant challenges to aggressively develop the Kern Fan Element, the no project alternative should assume that DWR would have implemented the pre-Monterey SWP contracts as written, including enforcement of all limitations and conditions.

30-46 (con't.)

B. The DEIR summarily rejected feasible alternatives to the project.

The DEIR must examine a range of reasonable alternatives that would feasibly obtain most of the project objectives, but avoid or substantially lessen any significant adverse effects of the project. (14 Cal. Code Regs. §15126.6.) In its screening and review of alternatives, the EIR must provide more than "cursory" analysis. (*PCL v. DWR*, 83 Cal. App. 4th at 919.) It should not construe project objectives so tautologically that only the proposed project could conceivably be capable of achieving them. Nor should the EIR allow the mere "threat of litigation" under a proposed alternative to prevent its environmental review. *Id.* at 914.

30-47

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in DWR's Kern study, it asserts that uncertainties made state bank development "infeasible." DEIR, Appendix E, p. 10

[85] Rather than include these components in the NPA2, subsequent drafts of the EIR must include this analysis of a limited set of policies (as opposed to the entire suite of Monterey Amendments) in the alternatives section of the EIR.

DEIR summarily eliminated *nine alternatives* that were suggested by PCL and the two other plaintiffs within the EIR committee process, each without any satisfactory explanation.[86] These alternatives were offered in order to provide a reasonable range of alternatives within the EIR analysis consistent with the requirements of CEQA. But the DEIR provides unjustified conclusions for each alternative that derailed any further review of them. Although increasing exports south of the Delta is notably (and properly) absent from the list of project objectives (DEIR, p. 4-1), the DEIR's alternatives analysis implicitly appears to assume that unless the contractors' pumping objectives are met, an alternative is infeasible.

The DEIR also gratuitously, and incoherently, chides "the plaintiffs" for seeking in proposed alternatives to improve the *environment.* (DEIR, pp. 11-5 to 11-7.) That reasoning would have been faulty if DWR's EIR had been done in 1995, but it particularly suspect in 2008, in light of the pelagic organism decline in the Delta and recent court rulings, discussed above, that will require constraints on pumping south of the Delta. Moreover, the summary exclusion of alternatives that attempt to balance contractors' and environmental objectives is entirely inconsistent with efforts the state is engaged in elsewhere, including Delta Vision and updates to the California Water Plan. Indeed, the state has long been aware of a variety of approaches that would serve the SWP's financial, management and operational goals while *also* considering environmental protection.[87] This context underscores the practicality of PCL's proposed alternatives.

30-47 (con't.)

A review of the grounds for dismissing the **"Improved Reliability through Environmental Enhancement" (IREE)**[88] alternative illustrates how the DEIR avoided analyzing a reasonable range of alternatives. Similar grounds were also used to reject other alternatives. The EIR's reasoning suggests that DWR views the project objectives so tautologically that seemingly only the Monterey Amendments (or a negligible variation on them) could feasibly accomplish them:

- The DEIR claims that the IREE "alternative was not considered in detail in the EIR because it would not meet any of the objectives of the Monterey Amendments. Furthermore, it would be in conflict with the basic terms of the long-term water supply contracts." DEIR, p. 11-6. But in summarily dismissing this alternative, the DEIR provides no substantiating evidence or analysis to demonstrate that the alternative would not meet any of the project objectives.

[86] These alternatives, listed in PCL's December 18, 2006 comments on the last administrative draft EIR (Attachment A) pp. 12-15, are incorporated by reference. PCL proposes again that they be considered for full-fledged review rather than summary rejection.

[87] CRB report, attachment B to these comments.

[88] This alternative "would involve the Department reducing stress on fishery resources in the Delta by directly implementing water use efficiency measures, water recycling, storm water capture, and other local water system enhancements that stabilize water demand and improve SWP reliability." DEIR, p. 11-5.

• The assertion that IREE would not meet any of the project objectives is false. A key objective of the project provided in the DEIR is to increase the flexibility of the SWP. DEIR, p. 4-1. DWR specifically identifies environmental regulations as a primary limitation, in addition to hydrologic conditions, to delivery of water through the SWP. [Cite] [89] It is reasonable to expect that enhancements in the environment of the Delta would reduce the need for regulatory agencies to set new regulations or mandate actions to enforce existing regulations. Reduced regulatory actions would result in increased flexibility of the SWP. The DEIR does not provide any analysis which would indicate that such an assumption is unfounded or inaccurate.

• The DEIR's further claim that the IREE alternative is in conflict with the basic terms of the water supply contracts is also without merit. The proposed project is a set of contract amendments. It follows that alternatives to the proposed project would appropriately incorporate contract amendments. In fact, many of the provisions of the proposed project are in direct conflict with the basic terms of the pre-Monterey long-term water supply contracts. [90]

• The DEIR's rejection of IREE rests heavily on the notion that DWR already operates in compliance with Delta water quality and flow objectives "as constrained by the need to protect threatened and endangered fish species listed pursuant to federal and state Endangered Species Acts." DEIR, p. 11-6. As discussed above, the pelagic species crash and the *Kempthorne* decisions on the Delta Smelt shatter the foundations of this assertion, which must now be revisited. There is now a compelling legal, as well as environmental, reason not to summarily reject an alternative that could feasibly accomplish most of the project objectives, while also reducing injury to the Delta.

• The DEIR also rejects IREE on the preposterous theory that "the Monterey Amendment is not an appropriate tool for mandating that |SWP water be used to benefit the Delta environment. DEIR, p. 11-6. That is a remarkable assertion, considering that, as discussed elsewhere, the proposed project could result in increased pumping and thereby injure the Delta.

• Finally, the DEIR rejects IREE, as well as some other alternatives, based upon the legally erroneous theory that it would require action by local agencies; according to DWR, such agencies would have to propose water efficiency measures, which DWR recognizes it could

30-47 (con't.)

[89] In fact, environmental problems in the Delta were contributing factors which led to the reductions in SWP deliveries in the early 1990's, and the contractor disputes that precipitated the Monterey Amendments. *PCL v. DWR*, 83 Cal. App. 4th at p. 908.

[90] For instance, eliminating the "agriculture first" reduction in article 18(a) of the contract, as is proposed in the proposed project, is in direct conflict with the pre-Monterey contracts. If such conditions were applied to all alternatives, then the proposed project would also have to be eliminated. Alternatives should not be held to a standard that is not imposed on the proposed project.

fund. DEIR, 11-5,11- 6. That misstates CEQA, which does not foreclose an alternatives assessment simply because other agency action may be required.[91] 30-47 (con't.)

C. The DEIR fails to analyze a reasonable range of alternatives to the project.

While unreasonably rejecting all of the alternatives proposed by plaintiffs, the DEIR remarkably provides *only one* project alternative to the DEIR. Alternative 5 "would be the same as the proposed project except that the Monterey water management practices would not be implemented." DEIR, p. 11-3. The DEIR's very limited range of alternatives is misleading and incomplete. In order to provide for reasonable comparison, alternatives to the proposed project must be distinguishable from the proposed project. However, alternative 5 (and NPA2) inappropriately includes significant portions of the proposed project. As a result the DEIR inappropriately concludes that all available courses of action have roughly similar impacts and outcomes.

The DEIR rationalizes this approach by suggesting that many of the actions taken under Monterey could have occurred under the original contracts. Prior to Monterey, however, these policies were not widely adopted by the SWP and they were not commonly practiced under the previous contract. Had DWR decided to implement these actions under a different hypothetical approach, DWR would still have had to complete CEQA review prior to taking those actions. Therefore, it is not appropriate to include these actions in Alternative 5 or NPA2. Since DWR has proposed to take these actions as part of the Monterey Amendments, these actions must be properly treated as potential decisions rather than assumed components of the no project alternative. 30-48

In sum, the EIR should include alternatives that are clearly distinguishable from the "no project" and proposed project. These alternatives should not include polices or actions that are being proposed for implementation as part of the proposed project.

VII. The DEIR contains faulty and legally unsupportable assessments of project impacts.

A. The DEIR uses inconsistent time periods for its analyses.

In the historical analysis provided in Chapter 6 the DEIR uses different time periods for analyses in various sections of the EIR. For instance, carryover in Dan Luis is analyzed from 1996 through 2004, while the flexible starage provisions are analyzed from 1996 through 2003 (see DEIR at 6-57 through 6-58).These variations make it impossible to determine the full impact of any of the proposed project and alternatives included in the DEIR. No explanation is provided as to why certain sections are analyzed under differing time periods. Subsequent draft EIR analyses must use a consistent time period throughout the EIR. 30-49

[91] See, e.g., *Friends of the Eel River v. Sonoma County Water Agency* (2003) 108 Cal. App. 4th 859. 864-867. Similar grounds are improperly used to summarily reject other of PCL's proposed alternatives, such as the "urban preference and dry year reliability" and "no urban preference and dry year reliability" alternatives. DEIR, pp. 11-4, 11-5.

B. The DEIR inadequately analyzes impacts resulting from eliminating and changing contract provisions.

- **Altered Article 21 rules for "surplus"**

As extensively discussed in connection with the baseline, the DEIR failed to analyze the impact of eliminating article 21(g)(1), the prohibition on using "surplus water" (or post-Monterey, "interruptible" water) to build permanent local economies. The EIR must fully analyze how eliminating this provision and simultaneous transfer of the Kern Water Bank and allowance of water storage outside of the SWP service area has altered or will alter SWP contractor demand and ability to receive article 21 water.

The EIR must analyze the degree to which eliminating use provisions for article 21 and providing urban users with increased access to article 21 water resulted in new uses of that water, including serving new growth-fostering water transfers. Analyses should also identify the degree to which altered article 21 previsions have shifted scheduling and delivery of Table A water and whether such shifts have resulted in changes to SWP operations (including changes in the timing or amount of water released from Lake Oroville and San Luis Reservoir). 30-50

The proposed project would eliminate pre-Monterey allocation rules for article 21. The priority for agricultural use and groundwater replenishment would be removed, and a new allocation method allowing access to article 21 based on Table A amount percentages would be adopted. Eliminating pre-Monterey contract allocations allows more contractors, including municipal contractors that had not historically received significant deliveries of article 21, to access this water and put it to use for purposes that are much different than per-Monterey uses of Article 21.

The DEIR fails to disclose the implications of this potential change in allocation. In particular, the DEIR fails to clearly account for the impact resulting from allocating Article 21 to municipal contractors that may use the water for hardened demand and development. Subsequent versions of the EIR must include analysis and clear disclosure of the implications of altering Article 21 allocations.

- **Turnback Pool**

With the Monterey Amendments in place, all SWP contractors have an incentive to request their full contract amounts. In addition, the Turnback Pool provisions of the Monterey Amendments provide a new incentive for SWP contractors to maximize their annual demand for their full contract amounts. The DEIR recognizes that pre-Monterey some contractors could not use their full Table A amounts, and in some cases that resulted in reduced water deliveries through the SWP. That water which was not captured or delivered by the SWP would have thus been left instream for environmental benefit. 30-51

However, the Turnback Pools allow the contractors to benefit financially by requesting their full Table A amounts, even if that contractor does not require such water within its own service area. Other contractors who can make use of the water are encouraged under the

Monterey Amendments to purchase Turnback Pool water. It follows that under the proposed project, all contractors would request full contract allocations, regardless of need for that water. As PCL has long since noted, that tendency is likely to harden, and increase, the demand for Delta pumping.[92]

30-51 (con't.)

- **Storage Outside of Service Area**

In allowing SWP contractors to store SWP water outside of their service area, the proposed project significantly expands SWP contractors' ability to accept water, and increases the demand for water from the Delta. The DEIR obscures this fact by assuming that much of the water stored outside contractors' service areas under the provisional implementation of the Monterey Amendments *could* have been stored within the contractors' service area. This assumption is very speculative. It assumes that infrastructure including transport facilities was available; cost of delivery, water quality, access to the right to store water, and other factors impacting the availability of storage capacity within the service area would not have prevented storage of that water within the service area. None of these factors were analyzed when the lead agency determined that water delivered out of the service areas could have been received within the service areas. Rather, the DEIR explains that the assumption is based on, "a telephone survey of contractors conducted by DWR."[93]

30-52

The DEIR further seeks to reduce the perceived impact of water delivered to out of service area storage by assuming that such water would have instead been stored in San Luis Reservoir and delivered to other contractors via article 21 or increased Table A. Again, this assumption is purely speculative. It assumes that other contractors could have received the water and placed it within service area storage. These assumptions clearly seek to minimize the appearance of impacts. Indeed, through this methodology, the DEIR determines that of the 1,092,647 acre-feet of water delivered to out of service area storage between 1996 and 2003, only 44,000 acre feet are actually attributable to the proposed project. This is due to the multiple assumptions inappropriately incorporated into the baseline. However, as explained above, these assumptions do not belong in the baseline, and must be removed from the EIR.

- **Altered allocation under Articles 18 (a) and 21**

The DEIR fails to disclose the impacts of altered allocations under article 18(a). Specifically, the DEIR fails to how altered allocations that expose municipal contractors to reduced reliability could tend to encourage municipal contractors to increase demand for water in normal and wet years in order to restore dry year and shortage reliability.

30-53

The pre-Monterey article 18(a) provision requiring an agriculture-first reduction in the event of water shortages provided municipal contractors with a higher degree of drought reliability. Under the proposed project's alteration of article 18(a) this protection is eliminated. The proposed project thus exposes municipal contractors to reduced water reliability during

[92] See Attachment A (PCL comments on Draft Chapter 9, p. 6.)

[93] DEIR, p. 6-60 (No details of that survey are presented).

periods of shortage. Moreover, because the Monterey Amendments would, if finalized, permanently delete article 18(a)'s agriculture-first cutbacks, they would remove a major obstacle to agriculture-to-urban transfers that facilitate growth.[94]

It is reasonable and foreseeable to expect that municipal contractors will seek to mitigate the impact on their water reliability. In fact, the proposed project provides water management tools that would assist contractors in such an effort. The proposed project allows these contractors to greatly expand storage options, it provides these contractors with greater access to article 21 water and eliminates restrictions on use of that water, and it establishes the Turnback Pool giving these contractors greater access to water that would not be used by other contractors.

It is reasonable to assume that given the changes proposed, municipal contractors would have a greater incentive to maximize use of the tools provided in the proposed contract (maximizing Table A requests, utilizing article 21, Turnback Pool and carryover provisions to maximize water in newly available storage) in order restore their dry year and shortage reliability.

30-53 (con't.)

It is important to note that both Turnback Pool and article 21 water are usually available in the winter and the spring. SWP exports during these periods have been identified as a primary contributor to the Pelagic Organism Decline in the Delta Any action that would tend to encourage increased demand and increased export for these categories of water would therefore have a significant impact on the Delta.

The EIR must explicitly disclose the impact of eliminating the protections for municipal contractors under Article 18 (a), and the resulting impacts on the Delta. As elaborated below, the DEIR omits analysis of impacts or provides inadequate analysis of significant impacts associated with the proposed project.

- **Environmental consequences of financial restructuring under Article 51**

The DEIR briefly describes, but never analyzes the environmental consequences of article 51, one of the most important structural revisions in the SWP system that would be initiated by the Monterey Amendments, should they be adopted. DEIR, p. 4-8. Among other revisions, article 51 changes the way that DWR addresses revenues exceeding the cost of operating the SWP system.[95] As Environmental Defense documented years ago in legislative

30-54

[94] The record of such transfers during the interim enforcement of the Monterey Amendments deserves careful study. There is no evidence to support the speculative assertion that these Table A transfers would have occurred anyway in the absence of the Monterey Amendments. Rather, as the EIR correctly points out (DEIR 6-10), only one occurred previously (Devil's Den), and it was expressly subject to agriculture-first cutbacks even after transfer to urban use.

[95] In *PCL v. DWR*, the court of appeal recognized the interrelationship between revised articles 18 and 51 in the Monterey Amendments. The court "agree[d] with plaintiffs that inclusion of article 51 in the amended contracts implies that DWR and the contractors have forsaken their expectation that the SWP facilities will be built as planned and will deliver 4.23 MAF of water annually. Article 51 allows contractors a rebate for the costs previously assessed for facilities

testimony on the Monterey Amendments, appended as attachment I, the revenue stream returned to the contractors under article 51 is enormous over the life of the project contracts.

The new EIR must carefully analyze the environmental consequences of article 51 as an integral part of the Monterey Amendments, rather than summarily assuming that because this provision is "economic" in nature it would not contribute to such impacts. Although CEQA does not require analysis of purely economic or social changes, it requires analysis of environmental impacts that can be traced to such changes. (See, e.g., 14 Cal. Code Regs, § 15131; *San Franciscans Upholding the Downtown Plan v. City and County of San Francisco* (2002) 102 Cal.App.4th 656, 695-98.) Here, the EIR must analyze the relationship between articles 18 and 51, and must compare the project to the no-project scenario in which table A amounts are reduced *without* article 51 rebates. The EIR must also evaluate the environmental consequences of article 51's effect on water rates, and consider the financial adjustments made in article 51 when making its assessment of project alternatives and mitigation.

30-54 (con't.)

- **Reduction of state oversight of water transfers under Article 53**

Prior to the Monterey Amendments, DWR had contractual responsibility to oversee and approve transfers of water through the SWP. Under the proposed project, DWR largely excuses itself from this responsibility for certain transfers. Contractors are now permitted to transfer project and no project water at their convenience. DWR has essentially given up effective ability to control where and how water is used within the SWP.

This provision is particularly important for its implications on growth in California. As stated above, the pre-Monterey contracts recognized the difference between municipal reliability and agricultural reliability. Agricultural Table A amounts were explicitly conditioned by their reliability. Thus, it would be inappropriate to use agricultural water transfers for certain purposes, including development. However, provisions of the proposed project including elimination of article 18(b) and changes in 18(a) now imply that all water in the SWP has equal reliability. This new dynamic risks creating, rather than eliminating, a paper water problem. Under the proposed project, DWR would abandon its role in clearly articulating the difference in reliability of water and hand that responsibility to local agencies.

30-55

The proposed project implies that all water under the SWP has equal reliability, yet very little water has been removed from the total Table A amount. Given that the original contracts explicitly stated that Table A amounts for agriculture were not as reliable as municipal contracts, it is illogical to assume that suddenly, the SWP can reliably deliver water to all contractors. Yet under the proposed project, agricultural to municipal transfers will be more common and there will be no requirement to address the issue of reliability. This scenario risks inducing growth based on unrealistic assumptions of water reliability.

- **The DEIR fails to disclose impacts to the Bay Delta Estuary.**

30-56

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that have never been built. Indeed, fiscal and environmental pressures militate against completion of the project." (83 Cal.App.4th at p. 914, n. 7.)

As discussed above, the Bay Delta Estuary is in critical decline. Fisheries populations have declined dramatically since 2000. Several fish species, including the Delta Smelt, are now at historic low population indices. State and Federal scientist have determined that increased Delta exports, and in particular, exports occurring in the winter and spring are a significant contributor to these declines.

Yet many of the provisions of the proposed project would *increase* the amount of water exported by the SWP during times of "excess" in the Delta. Excess conditions usually occur in the winter and spring, the very time that delta smelt have become vulnerable to project operations. For instance, the DEIR admits that the Turnback Pool and Article 21 are both provisions that seek to capture water earlier in the year. Yet the DEIR fails to incorporate that timing factor into the analysis of impacts in the DEIR.

30-56 (con't.)

C. The DEIR fails to adequately growth-inducing impacts, and impermissibly defers the responsibility to analyze them.

The DEIR attempts to absolve DWR of fully analyzing and mitigating the growth inducing impacts of the proposed project. That evasion has profound environmental consequences, due to the stakes involved: as the DEIR concedes, the combination of new table A and article 21 deliveries in the project could support new populations ranging from 405,103 in the "more resource-intensive" scenario, and 561,684 in a "less resource-intensive" scenario. DEIR, p. 8-9. Yet the DEIR asserts in that DWR is *not* required to extensively analyze the growth inducing impacts of water delivered by DWR because DWR is not responsible for land-use decision. *Id.* at pp. 8-13, 14. The DEIR further holds that DWR is not responsible for differentiating between the impacts of water deliveries that stimulate new growth and the impacts of water deliveries used to enhance dry year reliability. *Id.*, p. 13.

30-57

This indifference to a major environmental consequence of the project, if finalized, would constitute a major evasion of CEQA responsibility. CEQA requires a lead agency, such as DWR, to analyze the full environmental consequences of its decisions. That responsibility creates a duty to analyze the consequences of removing an obstacle to growth, or accommodating growth. In this context, the DEIR's principal strategy—to defer the real analysis to post-decision *local* determination, is completely untenable.[96] None of these local decision-makers will have the opportunity to analyze the cumulative consequences of accommodating half a million Californians before the suite of growth-inducing changes in the Monterey Amendments become a *fait accompli.* Moreover, particularly given the decade-plus history with interim enforcement of the Monterey Amendments, there is no basis to support the EIR's premise that the consequences are speculative. Remarkably, the EIR does not even attempt to address the growth-inducing or growth-accommodating impacts of known projects that have relied, in whole or in part, on the Monterey Amendments.[97] The EIR must disclose the impacts associated with

[96] See DEIR, p. 8-14.

[97] The EIR should start by analyzing the documentary history of such projects as Dougherty Valley in Contra Costa County, as well as numerous projects in Los Angeles County: among

the decision to remove the state oversight of SWP water that was embodied in the original pre-Monterey contracts.[98]

While the DEIR argues that DWR does not have responsibility for how water is put to use, it is indisputable that DWR has specific and fundamental responsibilities for overseeing the use of SWP water. Under the Monterey Amendments, DWR has given local agencies increased flexibility, and therefore increased ability to use the water in a way that would potentially impact the environment. While DWR cannot be expected to predict with absolute certainty how contractors and land-use agencies will use the water in the future, DWR has a responsibility to disclose all *potential* significant impacts resulting from this decision and the proposed project. DWR simply cannot be excused from disclosing the impacts of eliminating previously held responsibilities.

The EIR must include adequate analysis of growth inducing impacts, including analysis of how, where and for what purpose water made available under the Monterey Amendments has been put to use, and will likely be used should DWR adopt the proposed project. This analysis must disclose the growth inducing implications of eliminating article 18(b) and article 21(g)(1) of the original contracts, facilitating transfers between agricultural and urban contractors, conveying non-project water, providing municipal contractors increased access to Article 21, permitting unlimited storage outside of the service area, and implementing the Turnback Pool. In addition, the EIR must fully disclose how these provisions may tend to increase the demand for such water and the resulting impacts on the Delta and upstream operations of delivery of such water.

30-57 (con't.)

The EIR must specifically state the percentage of water which contractors now have access to under the Monterey Amendments that is likely to be stored for dry year reliability and the percentage which will be used for new growth. Also, the EIR must disclose the degree to which water made available under the Monterey Amendments will be used for resource-intensive growth and urban sprawl. Impacts analysis should include a study of the impacts of the growth likely to be induced by the proposed project water deliveries (i.e. resource intensive sprawl or infill development). For instance, water made available to Castaic Lake Water Agency is likely to result in development of open space and agricultural lands (and require new annexations), whereas water made available to Los Angeles Department of Water and Power is likely to result in development in already developed areas.

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them, West Creek, Gate-King, Riverpark, Northlake, Mission Village, Soledad, River Valley, and Newhall Ranch.

[98] Prior to the Monterey amendment, DWR had explicit oversight of storage of SWP water, water transfers through the SWP, Table A transfers, use of article 21 water, and allocation of water in times of shortage. article 18(b) also required DWR to provide explicit information on the reliability of SWP water through determining the minimum yield of the Delta. Furthermore, under article 18(b), DWR has the authority to reconcile Table A amounts with that minimum yield. Such authority provided the State will direct discretion over the amount of water that could be determined to be reliable.

In addition, as discussed extensively in section V above, the EIR must analyze how the transfer of the Kern Water Bank to local control has facilitated growth-inducing uses of the facility, as compared to operations that would prioritize dry year reliability. 30-57 (con't.)

D. The DEIR's assessment of the reliability of water supplies and growth evades, rather than analyzes, the problem of "paper water."

Regrettably, the DEIR's chapter on the reliability of water supplies (Chapter 9) and growth virtually ignores everything that PCL submitted to DWR on the subject during years of EIR planning that preceded the public draft. PCL therefore references its previous submissions on this issue[99] and once again requests specific responses. In a case of "fighting the hypothetical," the DEIR does not seriously engage the "common sense" connection between water availability and growth identified in *PCL v. DWR*, and instead, undertakes to dispute the premise. Essentially, DWR argues that growth based upon paper water never existed, that its extent has been exaggerated, and that new measures (biennial reliability reports, Urban Water Management Plans, and SB 221/ 610) will prevent it from happening in the future. DEIR, pp. 9-2 to 9-11.

This analysis is fatally flawed. First, it asks the wrong question about the historical role of paper water, focusing on whether inflated water reliability estimates have subjectively motivated land-use decision-makers to approve projects. The DEIR answers the question in the negative, not because paper water isn't real, but because ignoring water reliability has been so pervasive that Table A amounts can't be considered uniquely responsible. DEIR, p, 9-10. But a "but for" causation test is not what CEQA requires. What matters is the following: 30-58

- Historically and recently, land use decision-makers in California have frequently approved projects with little regard for the availability of adequate water supplies to support the development. Many of these projects have involved State Water Project water resources.[100] Moreover, a consistent body of CEQA case law, from *Kings County* through *Vineyard*, underscores the depth of the problem of decision-makers ignoring the reliability of water supplies,

- The pre-Monterey Amendments SWP contracts had mechanisms that could have been used to take "paper water" out of the calculus regardless of decision-makers' subjective motivations where SWP water was involved: enforcement of article 18(b)'s permanent shortage provision, and article 21(g)(1)'s proscription on using "surplus" water to build permanent economies.

- If the Monterey Amendments become permanent, these safeguards will disappear from the SWP contracts, regardless of what local decision-makers may later do in review of specific projects.

[99] See Attachment A, particularly the comments addressing the chapter on paper water and growth.

[100] See Attachment J (Kanouse/ EBMUD study).

The problem of "paper water"—stated in its simplest terms, of development decisions grounded in expectations of water supplies exceeding what can actually be delivered—emerged as one of the central themes in the Third District's ruling, and is perhaps the issue with which *PCL v. DWR* is most closely associated in both case law and in public discussion. [101] Rather than providing the thorough and candid assessment of "paper water" and development anticipated in the appellate ruling, the DEIR provides little more than a cursory historical summary, a description of planning laws and practices, and a superficial discussion of Urban Water Management Plans. Indeed, the analysis presented here bears more resemblance to arguments about "paper water" unsuccessfully presented to the court of appeal than the probing and comprehensive assessment anticipated in the appellate ruling and settlement.

A puzzling duality pervades the DEIR's discussion. The historical overview is dismissive of the notion that inflated expectations of SWP deliveries affected development decisions. But rather than debunking the notion that such inflated expectations were present in projects relying on SWP water, the chapter argues, if anything, that they were all too real; that decision-makers so pervasively failed to consider potential constraints on SWP water deliveries that they would have paid little attention to the amounts of "entitlement" referenced in the project contracts.

30-58 (con't.)

The core of this analysis posits that planners assume that *local water agencies* will obtain the supply necessary to meet the long-term water demand that results from planned growth. But far from "disproving" reliance on SWP paper water, this analysis points to planners and decision-makers trusting the water agencies; in other words, they are presumed to have relied upon the same pervasive "water culture" in which the court grounded its historical analysis of the "huge gap" between entitlements and available supplies. Instead of analyzing the historical paper water problem, the DEIR repackages it.

A similar circularity pervades the chapter's extremely cursory analysis of SWP water supply and urban planning in the future. From the historical position that planners and decision-makers rarely even considered water supply, the draft swings to a somewhat exaggerated faith that they now "get it," due in part to changes produced by the *PCL v. DWR* decision and settlement, and in part due to parallel legislative changes (notably, SB 610 and SB 221). But the DEIR does not even begin to show that the "modern" mechanisms, such as SB 610/ 221 and Urban Water Management Plans, have now made paper water disappear. [102] Notably, the DEIR does not even analyze two new sources of paper water that are specifically associated with this project. The first, extensively discussed above, is the growing reliance on article 21 water to support permanent developments. The second is that DWR's over-reliance on CALSIM in its reliability reports, which have induced local decision-makers to rely on estimates of SWP yield

[101] See, e.g., *Santa Clarita Organization for Planning the Environment v. County of Los Angeles* (2003) 106 Cal. App. 4th 715, 721; Kibel and Epstein, *Sprawl and 'Paper Water': A Reality Check for the California Courts* 20 CALIFORNIA REAL PROPERTY JOURNAL 22, 23 (Winter/ Spring 2002).

[102] Indeed, the DEIR has not yet addressed PCL's earlier criticisms of its analysis of Urban Water Management Plans, included in Attachment A,

that are vastly beyond historical deliveries. DWR still has yet to come to terms with this "cyber water" problem, which PCL identified in its scoping comments more than four years ago.[103] 30-58 (con't.)

D. The DEIR avoids, and impermissibly delegates to subsequent local review, project-related climate change impacts.

Climate change has been extensively addressed above in connection with baseline issues. The separate chapter on climate change in the DEIR (Chapter 12) creates additional CEQA problems, by systematically avoiding full and responsible discussion of project-related climate impacts. First, the analysis relies heavily on the dubious premise that, because DWR had concluded that the project would not affect *statewide* population growth, it would not affect growth-related greenhouse gas emissions "within the SWP service area as a whole." DEIR, p. 12-14. But DWR provides no support for the speculative premise that the location of development is inconsequential to greenhouse emissions. In fact, sprawling patterns of development cause considerably more greenhouse gas emissions than more compact forms of development that occur within existing urban areas. Turning "surplus" water into water that facilitates permanent new development in areas that are currently rural or agricultural will have a very significant impact on greenhouse gas emissions, and the DEIR needs to analyze how the proposed Monterey Amendments will affect that possibility. 30-59

Second, the DEIR does not study whether the elimination of pre-Monterey safeguards—including the permanent shortage provision in article 18(b) and the proscription on using "surplus" water to build permanent economies in article 21(g)(i)—may impact climate change by removing useful tools to reconcile supplies and deliveries in a climate-constrained project. The DEIR should study from a climate change perspective whether there is a difference between those pre-Monterey approaches and the post-Monterey approach (reliability reports and liberalized use of article 21).

Finally, the DEIR does not analyze whether would be a project-related difference in emissions due to the difference between serving urban and agricultural contractors. The elimination of the pre-Monterey "agriculture first" preference may make that distinction tangible.

E. The DEIR inadequately addresses cumulative impacts. 30-60

[103] As PCL observed in its March 2003 scoping comments (p. 8), a detailed analysis by Dennis O'Connor, then of the California Research Bureau, concluded that DWR's reliability report had no credible explanation for exceeding historic deliveries by around 50 percent. He concluded that the results were inconsistent with previous estimates and models, and recent deliveries were lower than the modeled conditions. His assessment also observes that CALSIM II is not calibrated or otherwise verified, and that the reliability report did not use the CALSIM II model as designed. O'Connor's analysis warns that DWR's assessments of reliability should not replace the "paper water" problem with a new, simulation-based "cyber water" problem. While O'Connor was addressing the draft 2002 report, the problems have never been corrected.

Although the cumulative impacts discussion (Chapter 10) mentions the Central Valley Project, it does not analyze the important question of how the project will affect the environment via CVP use of Delta export capacity. The DEIR analyzes the impact on the availability of water (DEIR, pp. 7-55 to 7-57), but the environmental impacts due to increased pumping from the Delta were not.

30-60 (con't.)

VII. Recommended mitigation of impacts

PCL expects that with the additional analysis suggested above, the Final EIR will determine that the proposed project has significant impacts on the environment. Therefore, we provide the following recommendations that could be utilized to mitigate for some, although not all, of the significant impacts identified in these comments.

- To partially prevent growth inducing impacts, the EIR can require DWR to provide a clear statement that Article 21, transfers of Article 21 and reliance on Turnback Pool water are not reliable sources of water and that such sources are not suitable for support of permanent economy, including development. To avoid any confusion, the EIR should commit DWR to excluding these sources of water from the Report on the Delivery Reliability of the State Water Project.

- To partially mitigate impacts associated with eliminating Article 18(b), the EIR should commit DWR to provide explicit guidance on how to interpret reliability curves included in the SWP Delivery Reliability Report.

- To partially mitigate potential impacts to the Delta from increased pumping of Article 21 water, the EIR can prohibit declaration of Article 21 when fish agencies determine that there would be threat to fish species from export of such water.

- To partially mitigate for the loss of statewide oversight of the use of SWP water, the EIR should commit DWR to providing full disclosure of accounting, pumping and delivery of SWP water to the public in a timely (weekly) basis.

- To partially mitigate for the loss of the Kern Fan Element as a public trust resource, the EIR should impose conditions requiring that public trust agencies will have priority for the capacity of the Kern Fan Element for the storage of water to protect public trust resources including the health of the Delta.

30-61

These measures would not fully mitigate the impacts of proposed project. Impacts such as increased demand for SWP water to offset dry year by municipal contractors would not be addressed by the proposed mitigation measures above. However, the final EIR would need to address all impacts of the proposed project.

As an original plaintiff in the Monterey Amendments litigation, PCL has an interest in ensuring that the final EIR provide the public and decision-makers with an accurate and thorough

30-62

analysis of the proposed Monterey Plus actions and a thorough comparison of viable and feasible alternatives, consistent with the original *PCL v. DWR* court decision.

We are distressed that despite the direction provided by the Court of Appeal, and despite our participation in the EIR process, and despite the significant events that have occurred since 1995, including the collapse of the Delta, the Monterey Plus DEIR is largely based on the same unfounded assumptions included in the CCWA EIR, and EIR rejected by the Court of Appeal.

The current DEIR manifestly fails to provide the full review demanded by the Court – and by the California Environmental Quality Act – and that was anticipated by plaintiffs in the settlement agreement.

30-62 (con't.)

We urge DWR to remedy the significant flaws in the current DEIR by fully analyzing, disclosing and mitigating the impacts of the proposed project in future versions of the EIR, as CEQA most emphatically requires.

Thank you for taking our strongly felt comments into consideration.

Sincerely yours,

Gary A. Patton, Executive Director

Roger B. Moore
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CC:
Lester Snow
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Brian Morris
Senator Machado
Senator Steinberg
Senator Lowenthal
Assemblywoman Wolk
MWD Board
SWP contractors

ATTACHMENT A

COMMENTS ON DISCUSSION PAPERS DRAFTED BY EIR CONSULTANT TEAM

September 15, 2003

By Arve R. Sjovold

Discussion Paper #1

This paper begins with a broad brush on the general issues of growth in the U.S. It invokes the previously introduced Brookings Study. At the time it was first introduced I had strenuously objected to its relevance. Since then I have had time to study the report and can conclude that this study has no place in this EIR analysis. (See my piece on the technical deficiencies of this study.) The discussion paper continues with other reference material, even to include comments I made verbally to a team member on the growth moratoria adopted here in Santa Barbara County approximately 30 years ago. I was very candid in what I thought were the forces at play but I suggested that this team member do research on the subject from official files and news stories at the time. Nonetheless, the experiences we had here in Santa Barbara are instructive and continue to be so. The discussion paper doesn't discriminate as to what the team thinks is important among the anecdotal evidence it presents. That is why I believe that it is necessary to eliminate the Brookings study from the discussion in that it dilutes the other material, aside from the fact that the Brookings study should not be used because of its flaws. 30-63

Another aspect of the discussion paper that I find inappropriate is the reference to "plaintiff" arguments. It should be clear by now that the only references of this sort that should be made are to the Appellate Court decision. In that decision the Court made clear that it found no merit in the Contractor/DWR arguments regarding growth inducement insofar as they involve Article 18(b). The consultant should not be using the EIR venue to reargue the issues that the Appellate Court ruled on. To be more specific, the Court did not agree with the logic that the defendants used to justify why they did not study Article 18(b). And the Court stated clearly that the EIR was deficient because it did not study the "no project alternative with Article 18(b) invoked." There was no reference to any notion that the no project alternative might not include invocation of Article 18(b). The only argument on this subject was made by the defendants and was rejected by the Court. Accordingly, we are off on the wrong track by positing a "no project alternative" in which things proceed much as they have and Article 18(b) is never invoked. I stated once before that I thought this was a waste of time; I believe even more so today. If the consultant team needs guidance on this matter it should at least refer to the text of the Court's decision to make sure it knows where it is going. 30-64

The findings that this discussion paper is prepared to make are not really supported. Finding number 1 can't be supported if we throw out the Brookings study. Finding number 2 is reasonably accurate but too brief to draw anything meaningful from it. Finding number 3 is not accurate. It is speculative to state that planning in advance of demonstrated need removes water as a factor. A more careful study of the projects for Los Angeles and San Francisco were at the time very expensive. These expenses manifest 30-65

themselves by large fixed costs and thus necessitate more rapid growth to help pay for them. And this is what Los Angeles did when it built the aqueduct. Immediately, smaller suburbs that had been stalled in their growth were annexed to Los Angeles, largely for the guarantee of a water supply. Communities in the San Fernando Valley are good examples. Finding number 4 is very argumentative and goes to the heart of the growth issue. Right now the State finds itself promulgating effective rezoning throughout the State to be able to handle an expected large increment of population growth and it has done this without making any finding that the resources are there to support such a venture. So is it correct to state that water may limit growth when in fact growth plans are made without respect to the availability of water? We have two laws that require a bonafide showing of a reliable supply of water before any new development shall be given a permit to proceed. The State's promulgation seems to be in direct contradiction of its own laws. All of this goes to show that water and growth are highly political and cannot be easily resolved into cause and effect. Finding number 4 does not advance this issue. Finding number 5 is in a similar vein. To state that it water in general doesn't limit growth except in a few isolated cases is the consequence of citing broad studies such as the Brookings study uncritically and laying that reference down along side the anecdotes noting the cases in Santa Barbara and the like.

I believe that this discussion paper does not advance the EIR in its effort to develop a competent analysis of growth impacts. It says as much in its finding number 6 by stating that CEQA court decisions do not provide much guidance. I am sure that if the consultant team were to make a concerted effort it could do a creditable job on growth impacts. The present effort will not do.

30-65 (con't.)

Discussion Paper #2

This paper gets off on the wrong foot by misstating the Court's decision. The Appellate Court clearly stated at page 3 of its decision that the "…trial court erred by finding CCWA's EIR sufficient despite its failure under CEQA to discuss the implementation article 18(b), as a "no project" alternative." This language makes it clear that the Court acknowledged that the proper "no project" alternative is the existing contract with article 18(b) implemented. The discussion paper intimates that the Court found the EIR deficient because it did not study the effects of elimination of article 18(b). Clearly, this is not what the Court said and it is important that the consultant team understand the mandate of the Court if they are to get it right.

Because the consultant team has interpreted the Court's decision wrongly, it has taken a wrong turn with its finding that we need to study a baseline with the original contract in force but without article 18(b) implemented. I don't believe there is any CEQA derived necessity and the consultant team and DWR are free to study such case if they think they are enlightening. However, if time and resources are limited it seems to me to be a waste of both.

The discussion presents a section titled "Plaintiff's Arguments." In that discussion the reader is led to believe that these are still contentions of the plaintiffs when in fact they are the Court's findings. There is no need to present these as tenuous findings when in fact they are better described as the Court's findings. It is disingenuous of the consultant team to engage in the rearguing of the court case. It would be better if the team

30-66

took the Court's findings and proceeded from that to craft the EIR. Rearguing the case can only confuse the reader as to what is required by this EIR. This discussion paper is wholly inappropriate. 30-66 (con't.)

There are other errors in the discussion that should be corrected. Where the paper states in the second paragraph that "The plaintiff's believe that city and county planners and decision-makers influenced by ……..would be more likely to approve new development …", it should be noted that this is the Court's language in the decision and is not simply the plaintiff's belief. 30-67

Under the sub-heading, "Court decision", the statement is wrong. That is not what the Court decided as I have already stated.

Under the major heading, **"REQUIRED ANALYSIS,"** a statement is made that Article 18(b) was eliminated in 1995, that too is wrong. The earliest in fact that Article 18(b) could have been eliminated is August 1996 after the Monterey Amendments had been further amended to eliminate the automatic stay that was in its original construction if it became under legal challenge. Up to that time the Monterey Amendment could not have been in effect.

Under the heading, **"ANALYTICAL METHOD,"** the critical question that is posed does not readily follow from the Court's dictum that 18(b) posed a serious question concerning the effects of "paper water." The question should be faithful to the Court's surmise regarding the seduction of city and county planners, not speculation on whether it would of itself slow the pace of growth. The proposed analytic approach does not deal with the issue raised by the Court regarding 18(b). The Court also stated what analytically would be required to study the impact of invoking 18(b). The Court, taking from one of the comments on the EIR, stated that "The DEIR must analyze this 'no project' alternative if we are to take any of it seriously. The analysis must include a parametric analysis of alternative levels of a lowered project yield tested by use of DWR's simulation model to establish which level of yield provides for the maximum reliability of deliveries given some tolerable threshold for failure to meet the requests(i.e. with what frequency will Article 18(a) be allowed to be invoked and with what consequences.)" The quantitative requirements for this analysis cannot be more clearly stated and that should be the starting point in defining the required analytic method. 30-68

COMMENTS ON THE STUDY BY THE BROOKINGS INSTITUTE

"CITY GROWTH AND THE 2000 CENSUS: WHICH PLACES GREW, AND WHY"

By: Arve R. Sjovold

September 15, 2003

The Brookings study is being cited by the DWR/EIR consultant team as some of the evidence to be relied on for the analysis of growth inducement in the EIR. At a previous EIR committee meeting, questions were raised concerning the applicability of this particular study to the question of growth and growth inducement. A careful review of the study report raises more serious questions as to whether the study is useful for any purpose. Its presumptuous title begs the question as to whether this body of research can really answer the question as to "why" places grew.

The study's interpretations depend strongly on the results of a multiple regression result relating rates of growth to posited explanatory variables. The study's authors offer no rationales or hypotheses why these particular variables were selected or any comments on other variables tested and rejected. The study states that all of the variables used in their multiple regression equation tested significantly and that the regression equation explains 43% of the variation found in the set of city growth rates used as the dependent variable. Little other analysis of the validity of the regression result is offered in the study report. An inspection of the limited regression results presented in the study report begs for much more analysis of the regression exercise.

First, the choice of dependent variable is the published census data on city growth over the last decade of the twentieth century. Now it is well known that formally designated large cities used for census data have strict boundaries and are incorporated. There is no assurance that a city's incorporated boundaries remain constant between censuses. It is a well known fact that many cities show rapid growth by annexing rapidly growing bedroom communities surrounding them. Other large cities may not experience any such annexations because they are already hemmed in by other incorporated cities. An example of the latter is Los Angeles or even San Francisco, which long ago filled in the entire area encompassed by San Francisco County. However, in the early history of Los Angeles, there were many annexations of surrounding communities, basically because Los Angeles had a developed water supply that could be used to expand some of these surrounding communities. The census does not distinguish cities by how they grew. The study report makes no mention if there was any attempt to normalize the data to take in to account the effects of annexations in the data base. This one deficiency alone disqualifies the study for any possible use.

If the study can survive the questionable data base, its merit as a scientifically correct regression exercise is thoroughly wanting. Such a regression exercise would begin with a discussion of dependent and independent variables and the hypothesis on why they might be connected. The discussion would also inquire as to what is the correct form for the regression analysis. None of this is apparent in the study report which leaves the

30-69

reader with very little confidence in its purported results. The following are questions raised regarding the correctness of the inquiry.

1) Given the range of growth rates evidenced in the data one has to question the choice of independent variable form. A more suitable choice would have used a proportionate form such as the logarithm of the ratio rather than the crude percentage. In support of this choice one should take notice of the range in crude growth rates shown which span from single digit percentages up to 85%.
2) The form of the regression equation is simple linear. The question is raised as to whether other forms were tested. Log-linear? Non-linear? Additive error terms? Multiplicative error terms? These are all questions that should be addressed at least qualitative before the regression is even started. The inquiry in to equation forms should also posit the expected effect of each of the variables; e.g., should it have a positive effect or a negative one? None of this appears to have been done. Without this type of inquiry one is left with trying to rationalize the results obtained without a unifying thesis. At best this is very poor science.
3) The residuals from the regression analysis, that is, the differences between the actual and predicted dependent variable, growth, do not shown even a close approximation of randomness, which indicates that there are very likely additional, important explanatory variables to be included.
4) The study makes the claim that the regression result explains 43% of all the variation evident in the dependent variable across all of the cities over 100,000 population included in the study. This is clearly not a true statement for the city groups that grew less than 10%. Here the results shown in Tables 2, 3, and 4, show variations in the predicted growth that are far greater than that inherent in the dependent variable. Indeed, the regression equation for these groups adds significant variation and is without any explanatory power whatsoever. The authors' claim is not warranted.
5) Looking at some of the textual matter in the report there are some curious presentations that deserve explanation. The report talks about temperature as an explanatory variable; a chart is shown portraying growth rate against "Avg. daily Jan. temp(F), 1981-1990," but the regression equation uses the variable "temp" as the mean July temp. Is the text right? The text in general does not try to maintain fidelity to the regression equation. In fact, the reader is left with the notion that the text could have been written without benefit of the regression result.

Much more could be written about the deficiencies of this study or of questions that should be addressed. If this study is to be taken as an objective evaluation of the reasons cities grow these deficiencies and questions must be addressed and peer reviewed. As it stands it is extremely poor science and very poor practice in the art of regression analysis.

30-69
(con't.)

COMMENTS ON MEETING SUMMARY (9/17/03)
AND DISCUSSION PAPER #3

By: Arve R. Sjovold
November 17, 2003

Summary Paper

With regard to the initial position articulated by John Davis on the approach to growth analysis, I would just reiterate that the two steps he announced is not acceptable to me. The analysis of the impacts of the project on growth must not be conditioned on whether or not more water from the Delta is withdrawn under the auspices of the project. It is vitally important to note that there can be fundamental impacts in contractor regions from this project even if no additional water is withdrawn from the Delta. I believe the three bulleted comments regarding this issue expresses the concerns.

Of the numerous committee comments noted in the extensive list of bulleted items, I have a serious concern with the equivocal language concerning the possible use of the Brookings Institute Study. I have reviewed this study and it does not conform to even the rudimentary scientific methods and is totally without merit. This does not say that the conclusions of the authors may be wrong; it does say that their study in no way can be used as scientific support of those conclusion. Their conclusions should have no more weight than the individuals who wrote them. 30-70

I also am strongly in favor of establishing a rigorous definition of what water we can include in the term "reliable delivery." I believe I have on several occasions stated that only Table A deliveries should be considered under that term. Because "interruptible water" is just that it cannot be considered as reliable in character.

These are my most important concerns with the summary paper.

Discussion Paper #3

Under "Scenarios," subhead "Proposed project scenario," I should note that the post project impacts from 1995 to present cannot be known because the project includes the settlement agreements which did not become effective until about a year ago. So there is a significant task to discern what additional impacts may have occurred it the project with settlement agreements had been in effect since 1995. 30-71

On the question of the amount of transfers that have taken place, the descriptions must be clear that the 41,000 acre-feet is not final and therefore there is a potential of 57,000 acre-feet remaining under the Monterey provisions that still could be transferred, not simply the 18,000 acre-feet which presumes that the 41,000 acre-feet is final.

Under the subhead "No Project Alternative A Scenario," the discussion is too brief and omits significant information. There is a question as to whether DWR on its own initiative can reduce charges during hardships without informing the Bond Underwriters and holders. After all it is there money that is at risk. Second, it seems to me that the financial difficulties that some of the Ag districts in Kern faced should first be addressed to Kern County Water Agency, the entity that actually holds the contract with 30-72

the State and which has pledged its tax base to make payments. Only if Kern County Water Agency refuses to make payments can default to DWR be declared.

There is also the question if under pre-Monterey how Ag-to-urban transfers were to be considered under Article 18(a) of the contract. Clearly, if such a transfer occurred the risk that Ag bears during shortages would make such entitlement increments worth very little to urban.

In the last paragraph of the No Project Alternative A Scenario, the depiction is to brief. It is also too speculative in what it states would be likely. I think that it is also important to point out that if the Kern Bank had been fully developed by DWR the benefits of this south-of-Delta storage would benefit all the contractors and so would have to be figured in the calculations of what reliable deliveries might be. I also think that we should be absolutely clear as to the full extent of possible development that might have obtained with the Kern Water Bank. I think that there was early analysis that considered 1 million acre-feet of storage capability.

With regard to the No Project Alternative B Scenario, the first sentence seems too speculative to me. If DWR had started the process in 1994/1995, one could fairly ask if the Monterey Meeting would have occurred at all. There may have been other meetings but they would have had a different agenda. The speculation that 2 to 2.2 million acre-feet for the minimum project yield would be the likely range is misinformed. The average delivery from 1992 to 2002 is actually just over 1.9 million. Thus, one would expect that if we are to select ad hoc a range to guide the study that it should embrace the historical, recent average.

So far we have heard only that changes in Table A downward are only likely to change contractors' access to **surplus** water, not all SWP water and it is not quite obvious why urban contractors would see less of it. If we create more surplus water we increase the possibilities for urban contractors to bid for and receive surplus water. It is a matter to be shown by the EIR study whether or not urban access is affected and in which direction. I also think that the statements in the next paragraph are without foundation and in fact may not be right. Whether or not contractors would develop additional groundwater storage south of the Delta under this scenario is very speculative and I would encourage the EIR consultant to cast it in that language. The statement regarding the change in acreage of permanent crops needs modification. At this time we can only state that there would be a shift in the type of permanent crops grown; not all permanent crops have the same applied water requirement. The sentence that speculates on the responses of Ag and urban contractors to the change in Table A amounts is argumentative.

Finally, the last paragraph begins with a very speculative statement that really requires some support. I don't believe that the record will show unequivocally that water agencies develop supply well in advance of demand. We do create the illusion in contracts that we have done so but the facts on the ground seem to indicate otherwise.

30-72 (con't.)

Use of CALSIM II

There is much yet to be studied by the modeling subcommittee before its finding can be a clear guide to the EIR evaluations. However, the recitation that is presented here is fair statement of what has been discussed to date. Even so I do have a few comments.

30-73

The statement regarding why the Kern Water Bank is not modeled must be corrected to note that the no project scenarios will require it because it was then still a part of the SWP. Having said that, I think that even if it is now outside of the system it still deserves to be included in the model explicitly since it figures so prominently in the use of surplus and EWA water. In fact, this general concern can be probably be addressed to CALSIM II in general since it seems to have been formulated after Monterey.

30-73
(con't.)

In conclusion, my general feeling about the Discussion Paper #3 is that is too loose in its speculations as to what would be the foreseeable course of events under the different scenario. I would like to see either some logical explanations for some of the statements or some other support.

LETTER 30

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March 12, 2004

Via email and U.S. mail
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Re: Plaintiff Representatives' Preliminary Comments on "Draft Action Outline: Monterey Settlement Agreement Attachment B Guidelines to Assist Municipal and Industrial Contractors in Providing Accurate Information to Land-Use Planning Agencies"

Dear Mr. Ripperda:

The plaintiff representatives on the EIR committee appreciate the opportunity to provide their preliminary comments on the draft action outline for the forthcoming "Attachment B" guidelines to assist municipal and industrial contractors in providing accurate information to land-use planning agencies, distributed at the February 18, 2004 "Monterey Plus" EIR meeting.

It is unclear to us whether the action outline is intended simply as a background paper "to assist plaintiffs and contractors" in their role as consultants on these guidelines, or as an early draft of the guidelines themselves. In our view, the draft action outline lacks the breadth and specificity needed to satisfy the latter purpose. In these preliminary comments, we identify in a general way subjects that should be addressed in a draft version of the guidelines, focusing mostly on their legal context. We have also requested our technical consultants to assist DWR in developing more specific recommendations to assist land-use planning agencies. Since DWR is already more than two months behind the publication date listed in the "Monterey Plus" settlement agreement, we trust and expect that DWR will accord a high priority to working with us on a new version of the guidelines that achieves their intended purposes.

30-74

These purposes are clarified in the settlement agreement. Attachment B, paragraph 2 provides that "DWR shall develop and by January 1, 2004 publish guidelines to assist Municipal and Industrial Contractors in providing accurate information to land-use planning agencies with jurisdiction within the Contractors' respective service areas regarding local and regional programs to manage or supplement [State Water Project] supplies." Attachment B, paragraph 3 places a continuing obligation on DWR to provide assistance enabling M&I contractors to provide complete and accurate information to land-use planning agencies. That assistance must "assure that local land-use decisions reflect accurate information on the availability of water from state, local and other sources."

The draft action outline provides a partial list of laws requiring planners to assess water supply reliability, and links addressing implementation of these laws. We agree that discussion of these laws provides valuable context for analyses of water reliability. However, the outline omits key parts of the legal context, including the Monterey Amendments court ruling and settlement provisions, CEQA case law addressing water reliability assessment, and other legal and regulatory constraints affecting the reliability of water deliveries. Moreover, the outline must do more than describe existing laws to be useful for planners. The sources in the draft outline would not provide planners with guidance that they would need to comply with existing laws, and to credibly address uncertainties and inaccuracies that have plagued projections of water availability. Finally, the "links" section is missing sources of valuable information that should be incorporated into the draft guidelines.

Legal Discussion

30-74 (con't.)

DWR's draft action plan describes some, but not all, of the laws applicable to the relationship between land use and water planning. While this information is useful, guidelines based upon these descriptions alone would not satisfy the mandate of Attachment B, principle 2, which requires DWR to prepare a report on water supply reliability.

Our preliminary comments focus on several general improvements that DWR should make to its discussion of applicable law in the draft guidelines. Although the discussion will need to be succinct and readable to be useful for planners, it should address the following:

- The discussion should provide an overview of the ways in which the various laws interact and of the overall legal scheme that they create.

- The discussion should summarize pertinent provisions of the Monterey Amendments court ruling and settlement agreement.

- The discussion should describe requirements for water supply reliability analysis under CEQA and associated case law.

- The discussion should list other legal and regulatory constraints affecting the reliability of water deliveries.

- The discussion of SB 221 and SB 610 should clarify, and be more specific about, the ways

in which those bills make assessment of reliability a legal necessity.

1. The Absence of an Overview

The draft action plan provides information specific to SB 221 and SB 610, without providing a general summary of how those laws require analysis of reliability, or how those laws fit with CEQA and other laws to create an overall legal scheme requiring land use planners to address the reliability of their water supplies. We urge DWR to open its discussion with such an overview, which we believe will help frame the more specific discussion that follows. That overview should survey the relevant statutes, case law, and project contracts that relate to assumptions about water reliability.

2. Monterey Amendments Court Ruling and Settlement Agreement

Given the origin of the guidelines requirement, the draft guidelines must discuss the Monterey Amendments court ruling and subsequent settlement agreement that gave rise to these guidelines. In *Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892, the Third District Court of Appeal recognized that "the allocation of water to one part of the state has potential implications for distribution throughout the system." (*Id.* at 907.) Rejecting the EIR prepared by the Central Coast Water Authority as prejudicially defective, the court ordered DWR, the agency possessing "a statewide perspective and expertise," to serve as lead agency and prepare an entirely new EIR. The ruling openly criticized the false expectation that the SWP will deliver on "entitlement" levels of 4.23 million acre-feet when the project's historic capability has been roughly half this level or less. The court drew this conclusion from data reported in DWR's Bulletin 132 series, also citing DWR's acknowledgement there that the SWP "does not have the storage facilities, delivery capabilities, or the water supply necessary to deliver full amounts of entitlement water." (*Id.* at 912.)

30-74 (con't.)

Recognizing a "huge gap between what is promised and what is delivered," the court in *Planning and Conservation League* observed that "the [e]ntitlements represent nothing more than hopes, expectations, water futures, or as the parties call them, 'paper water'." (83 Cal. App. 4th at 908.) The court found that public comments assessing the "paper water" problem, including those of plaintiff organizations, "corroborate the common sense notion that land use decisions are appropriately predicated in some large part on assumptions about the available water supply. There is certainly the possibility that local decision makers are seduced by contractual entitlements and approve projects dependent on water worth little more than a wish and a prayer." (*Id.* at 915.)

The new guidelines will need to replace the "aura of unreality" criticized in *Planning and Conservation League* with information that is sufficiently rigorous to allow planners to base their decisions on available supplies rather than paper entitlements. They must disclose contract provisions framing expectations about water supply, notably those in article 18 and article 21. They must specifically describe the new contract revisions and other DWR commitments in the settlement agreement directed at the paper water problem. These include removal of the term "entitlement" from operative provisions of the project contracts, the biennial report requirement mandated in new article 58, and DWR's continuing duty under attachment B to assist M&I contractors in ensuring that local land-use decisions are grounded in accurate information about

water availability.

The guidelines must also explain that crucial issues relating to M&I expectations of water availability are still being addressed in the "Monterey Plus" EIR mandated in the settlement agreement. They must inform the reader that while the court-ordered agreement allows for interim implementation of the Monterey Amendments and "Attachment A" amendments, DWR will not render its final Notice of Determination on the entire project until after the new EIR has been completed and certified. See Settlement Agreement, §§ II, VII.B, C. G. The agreement's restrictions on approval of new projects relying on the decertified Monterey Agreement EIR must also be disclosed. See *id*, § VII.A.

Although the information in the preceding paragraph will already be obvious to some contractors and planners, recent experience with Monterey-based transfers in local planning underscores that it is essential for DWR's guidelines to state it anyway. For example, the settlement agreement designates a specific list of completed Table A transfers as "final," and excludes from that list the proposed transfer of 41,000 acre-feet from Kern County Water Agency to Castaic Lake Water Agency, which is recognized as the subject of still-pending litigation. (See Settlement Agreement, §§ III.D and attachment E (listing "final" transfers); § III.E (agreement on Kern-Castaic transfer).) In the new "Monterey Plus" EIR, DWR must conduct its own environmental review of that transfer, along with others relying upon the Monterey Amendments.

Yet planning documents submitted to the Los Angeles County's Regional Planning Department have repeatedly, and at least twice in just the past few months, relied upon representations from the Castaic Lake Water Agency that this water is already a secure part of its Table A amount. (West Creek Project, No. 98-008; River Village Project, No. 00-196.) Clarification of these points in the new guidelines would help ensure that local planning decisions are not grounded in a false expectation of finality.

30-74 (con't.)

3. CEQA and Water Supply

Guidelines for land-use and water supply planning would be incomplete without discussion of CEQA and its relevant case law. CEQA establishes requirements that overlap partly, but not completely, with the requirements of SB 221 and SB 610. CEQA applies to projects to which those bills do not, and establishes rigorous procedural and substantive requirements that extend beyond those bills even where they do apply. DWR's draft action plan does not address CEQA, and the draft guidelines must do so.

Planning and Conservation League is part of a long line of CEQA cases recognizing legal links between land use and water planning. These cases indicate that a CEQA analysis of a project is legally deficient if it fails to identify the source of project water will come from. The courts have reasoned that since water must come from somewhere and developing additional water supply will likely have significant environmental impacts, a project decision that fails to address its water supply leaves unanalyzed the impacts of developing that supply. (See, *e.g. Santiago County Water District v. County of Orange* (1981) 118 Cal. App. 3d 818; *Stanislaus Natural Heritage Project v. County of Stanislaus* (1996) 48 Cal. App. 4th 182.) These cases also indicate that a CEQA analysis may not stop at analysis of theoretical water rights; instead, planners must address whether the

water that would supply their projects exists in actuality as well as on paper. *Planning and Conservation League v. Department of Water Resources*, 83 Cal.App.4th at 915; *Santa Clarita Organization for Planning the Environment v. County of Los Angeles* (2003) 106 Cal. App. 4th 715; *see Friends of the Eel River v. Sonoma County Water Agency* (2003) 108 Cal. App. 4th 859.) Finally, these cases indicate that CEQA requires analysis of alternative supplies if the primary identified supply is not sufficiently reliable. (*Kings County Farm Bureau v. City of Hanford* (1990) 221 Cal. App. 3d 692; *Napa Citizens for Honest Government v. Napa County Board of Supervisors* (2001) 91 Cal. App. 4th 342.

A more comprehensive list of CEQA cases involving insufficient discussions of water resource impacts is appended to this letter. Taken together, these cases clearly establish that under CEQA, planners who predicate their projects upon the availability of SWP water must fully analyze the reliability of that water. Since the State cannot reliably deliver the full Table A amounts, those planners must also analyze the availability of, and the impacts of using, alternatives to that water.

4. Legal and Regulatory Constraints on Deliveries

Under the settlement agreement, DWR must provide assistance to ensure that local land-use decisions reflect accurate information not only on the availability of water from the SWP, but from local and other sources as well. To provide useful guidance for all of these sources, the guidelines must provide information about other regulatory and environmental constraints on deliveries besides those already mentioned. Although a full list is beyond the scope of these preliminary comments, a partial list would include Delta water quality standards, endangered species requirements, competing water rights, elements of the CALFED program, area of origin laws, and constraints on the export or use of groundwater. 30-74 (con't.)

5. The SB 221/SB 610 discussion

Most of the draft action plan describes these two companion bills and provides links to additional information. It notes that these laws increase the legal linkage between land use and water supply planning, and also describes the ways in which an urban water management plan can be used to help satisfy the requirements of SB 221 and SB 610.

All of this is helpful, but this description would leave planners without key information about the stringent requirements of SB 221 and 610. The description does not indicate that both laws require that the detailed water supply availability information include not only identification of water sources but also detailed assessment of their *reliability*. (Gov. Code § 66473.7(g); Water Code §§ 10631(c), 10910(d).) Likewise, both bills require identification not just of targeted sources but also alternate sources in case the target ones might be insufficient. (Gov. Code § 66473.7(b); Water Code § 10910(b).) If those alternative sources do not yet exist, the planners must show that they will be developed. All this information must support *proof* that water will be available to meet project needs. (*See* Gov. Code § 66473.7(b)(1).) In short, both bills require more than just an assessment of water supply availability; they require demonstration of availability, and reliability assessment must be a core component of this demonstration.

DWR's description in the draft action plan might leave planners unaware of these

requirements, with the unfortunate result that that planner will fail to realize the essential importance of evaluating the reliability of the water he or she procures from DWR. DWR therefore should revise its discussion of these laws to clarify the importance they place upon a detailed and accurate analysis of water supply reliability.

Substantive Discussion of Availability and Limitations

Although an accurate description of legal requirements is crucial, and has been our principal focus here, we anticipate that the heart of the document will provide substantive guidance on water resource availability suitable for land-use agencies. That guidance must recognize the range of variability in SWP supply and uncertainties about the extent to which it can reliably provide water. The guidelines need to provide a focused discussion of the delivery system and its natural constraints, environmental constraints on deliveries, and the record of historic deliveries. They must also discuss predictions of future deliveries, accurately disclosing recently expressed concerns about the precision and reliability of these predictions.

The information referenced in the draft action plan would not provide these agencies with meaningful guidance on how to address inaccuracies and uncertainties in the projections of water availability. Some of these deficiencies are discussed in the peer review of CALSIM II, which PCL recently addressed in a February 2, 2004 letter to DWR. To provide more useful guidance, our technical consultants are presently working on specific recommendations that would assist land-use agencies in using uncertain water supply projects, using multiple methods of projection as well as strategies intended to minimize the consequences of error. Those forthcoming recommendations will supplement these preliminary comments.

30-74 (con't.)

Links Discussion

The "links" section of the draft guidelines will also need to include sources other than those mentioned in the draft action plan. In addition to websites associated with SB 221 and 610, and DWR's guidance for implementing these laws, those links should at least include DWR's Monterey Amendments and CALSIM sites, DWR's reliability report and associated public comments, and information from the CALSIM peer review referenced in our February 2, 2004 letter. A fuller list of useful links will accompany our forthcoming substantive recommendations.

Conclusion

We hope that our efforts will contribute to a final set of guidelines that provide focused and understandable guidance to M& I contractors and land-use planners, enabling them to ensure that their decisions are grounded in accurate information about water availability. Failure to do so would perpetuate the paper water problem discussed in *Planning and Conservation League*, encouraging inappropriate reliance on water supplies that may not exist in the future.

Respectfully,

Roger B. Moore

Counsel to Plaintiffs

Cc: Peggy Bernardy

Appendix: CEQA cases involving insufficient discussions of water resources

People v. County of Kern (1974) 39 Cal. App. 3d 830

People v. County of Kern (1976) 62 Cal. App. 3d 761

Santiago County Water District v. County of Orange (1981) 118 Cal. App. 3d 818

Kings County Farm Bureau v. City of Hanford (1990) 221 Cal. App. 3d 692

Stanislaus Natural Heritage Project v. County of Stanislaus (1996) 48 Cal. App. 4th 182

County of Amador v. El Dorado County Water Agency (1999) 76 Cal. App. 4th 931

Planning and Conservation League v. Department of Water Resources (2000) 83 Cal. App. 4th 892

Napa Citizens for Honest Government v. Napa County Board of Supervisors (2001) 91 Cal. App. 4th 342

Save Our Peninsula Committee v. Monterey County Bd. of Supervisors (2001) 87 Cal. App. 4th 99

Friends of the Eel River v. Sonoma County Water Agency (2003) 108 Cal. App. 4th 859

Friends of the Santa Clara River v. Castaic Lake Water Agency (2002) 95 Cal. App. 4th 1373

Santa Clarita Organization for Planning the Environment v. County of Los Angeles (2003) 106 Cal. App. 4th 715

LETTER 30

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April 6, 2004

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Re: Plaintiff representatives' preliminary comments on Draft Table 6-3A: "Analytical Methods for Determining Potential Effects of Monterey Amendment on SWP Operations"

Dear Ms. Brown and staff:

This letter provides the plaintiff representatives' initial comments on draft table 6-3A for the forthcoming "Monterey Plus" EIR. We will have further suggestions as DWR refines its attempts to accurately analyze the potential range of project impacts. The draft table, distributed at the March 17 EIR committee meeting, provides a capsule summary of many of the provisions in the original Monterey Amendments. The table attempts to identify whether each provision is expected to have a "potential effect on SWP or contractor operations." It also identifies whether the "primary analytical method" in the EIR for each provision would be CALSIM II or another method.

We begin with a series of general comments. If DWR wishes to use this table, it must more clearly identify the listed provisions of the Monterey Amendments and address their cumulative and interrelated operation. DWR also needs to clarify the intended use of the table in its forthcoming CEQA analysis, the standard used to identify potential effects, and the reasoning informing its choice of primary analytical method. We also provide specific comments, focusing on several items presently listed as having no potential effect that in our view deserve careful assessment. These comments are not intended to supersede, or substitute for, our more thematic comments about potential project impacts in meetings of the EIR committee and scoping comments submitted last year. 30-75

Although a refined and corrected version of the table might assist in identifying some initial priorities for analysis in the EIR, we strongly recommend against its use as a template to summarily eliminate items from CEQA analysis, or as a substitute for DWR's duty to provide a statewide

assessment of the direct, indirect and cumulative environmental impacts of the project. We look forward to working with DWR as it refines its summary of project provisions and brings to fruition its statewide assessment of project impacts, alternatives, and mitigation measures. As anticipated in the appellate ruling directing the preparation of this EIR, DWR's analysis must "fully inform the decision makers and the public of the environmental impacts of the choices before them." (*Planning and Conservation League v. Department of Water Resources* (2000*)* 83 Cal.App.4th 893, 920.)

General Comments

The one-line summaries in the draft table do not sufficiently explain listed provisions in the Monterey Amendments so that a reader without prior expertise could intelligibly follow the checklists on potential effects and analytical methods. We recommend that in Chapter 6, if not earlier, the EIR provide a fuller description of each of the Monterey Amendment provisions being assessed for potential impacts. That description should also compare the amendments to the pre-Monterey version of the contracts. Such descriptions are particularly important in light of the decertified 1995 EIR's failure to adequately inform decision-makers and the public of the environmental consequences of the specific amendments. Some of these amendments, such as the definition change in article 1(d), were not even referenced in the more general Monterey Agreement principles that were the focus of the 1995 EIR, while others received only a cursory or misleading description in the EIR.

As discussed at the March 17 EIR meeting, a central deficiency in the draft table's division into discrete Monterey Amendment provisions is its failure to address the amendments' cumulative and interrelated operation. Provisions listed in the table may well produce significant impacts by nature of their interaction with other provisions, even if taken in isolation they would not. Indeed, the original 1994 Monterey Agreement principles referred to a package of forthcoming interdependent provisions. Focusing simply on isolated provisions would not be consistent with CEQA's definition of a "project" as "the whole of an action, which has a potential for resulting in either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment." (14 Cal. Code Regs., § 15378.)

30-75 (con't.)

The role of the draft table in the EIR's assessment of project impacts is also unclear, since the table refers simply to potential effects "on SWP or contractor operations" rather than potential environmental impacts. Section III.C of the Settlement Agreement anticipates review of "the potential environmental impacts of changes in SWP operations and deliveries" resulting from the project as only one of a longer list of items that at minimum must be addressed in the new EIR. Quantitative studies must also be directed to environmental impacts and not merely to project operations, since not all environmental impacts will be precisely correlated with operations impacts.

The table also does not identify its standard of review for identifying "potential effects" on project or contractor operations. At the March 17 meeting, the draft table was analogized to a CEQA initial study, in which a "yes" response would signify that a fair argument could be made of significant effects. For purposes of the specific comments below, we will therefore assume that if such an argument could be made, the checklist should answer "yes" rather than "no." Finally, the table does not describe the criteria used to select CALSIM II or "other" as the primary analytical

method. On this point we incorporate by reference the concerns about CALSIM II raised in PCL's February 2, 2004 letter. As noted there, the EIR must come to terms with both the applications and limitations of the model if it is to be used to support DWR's new project decision.

A final general comment, while more mundane, is essential to a precise understanding of the amendments. The Monterey Amendments of each contractor contain minor variations in numbering and sequence. For example, amended article 12(f), referenced in the draft table, is article 12(g) in the Santa Barbara district's contract. A chart would be useful to cross-reference the parallel provisions in each revised contract.

Specific Comments

For the reasons set forth in our general comments, we consider it premature to evaluate any tabulation of the effects of the Monterey Amendments, and believe that it is more appropriate to think in terms of initial priorities for DWR's forthcoming CEQA analysis. With these considerations in mind, we identify several provisions listed as "no" on the checklist that in our view are likely to merit a "yes" response, and at minimum deserve more careful assessment in the EIR. We also suggest the need for further clarifications in the explanation of these provisions.

Article 1(d)

This provision elevates an "assignee" to the status of contractor. DWR has never clarified the scope and limitations of that assignment clause. We are assuming, and it would be useful for DWR to clarify, that for any assignee to serve as a contractor, it must still possess the requisite taxing authority specified in the Burns-Porter Act. (Wat. Code, § 12937.) Entities that have a contractual relationship with a SWP contractor but lack that authority, such as the Central Coast Water Authority or the Kern Water Bank Authority, would not qualify as "contractors" under this provision. Our understanding is that KWBA would also not qualify as an assignee for the further reason that has not been assigned a contract "of the type" published in DWR Bulletin 141, as required by article 1(d). 30-75 (con't.)

If DWR intends to apply this provision in a more open-ended manner, however, it could have substantial effects on SWP operations, and the operations of the contract would need to be studied quantitatively to evaluate potential impacts on deliveries. The definition change could be highly significant if, for example, it allowed the KWBA to have full access to the facilities of the SWP, or to claim access to the subsidized power rates presently accorded contractors when it pumps from and inject water into the bank. Similarly, such effects could occur if CCWA no longer had to seek approval from its underlying SWP contractor (Santa Barbara Flood Control and Water Conservation District) for any requests to DWR. As a starting point for evaluating prospective impacts, DWR and the contractors should provide a list of any present or prospective assignees.

Article 1(hh)

The EIR needs to address whether the addition of new items to definition for "Water System Facilities" could produce additional environmental impacts. The revised definition also excludes from the definition of "water system facilities" land acquired for the Kern Fan Element after

December 31, 1995. That change could be significant in combination with article 52 on the Kern Water Bank, which is already acknowledged to affect SWP and contractor operations.

Article 1(jj)

The definition of "interruptible water" provided here is a substantial departure from "surplus water" as defined and limited in article 21 of the pre-Monterey contracts. See, e.g., article 21(a)(2) (defining "surplus water"), 21(g) (identifying restrictions on deliveries). Taken in combination with changes in article 21, this definition could substantially affect project operations, and requires careful assessment in the EIR for potential environmental impacts. For example, DWR must address whether the revised definition would remove environmental constraints on the delivery of interruptible water, and whether it could facilitate the development of economies in reliance on water exceeding the amounts DWR can reliably deliver. The draft table already lists amended article 21 as having a potential effect on SWP and contractor operations, and the definition change in article 1(jj) is an integral part of that revision.

Article 12(a)(2)

The provision addressing the amounts, times, and rates of delivery is amended to include express reference to delivery of annual quantities allocated in accordance with revised article 18. DWR needs to analyze this provision to clarify whether it affects project operations rather than simply changing nomenclature. If the revised definition were construed in a manner that ignores or minimizes constraints on delivery systems, it would potentially encourage deliveries that may not be achievable.

30-75 (con't.)

Article 12(f)

This amendment adds a new provision to the SWP contracts establishing a list of priorities in the event of conflicts. Although the one-line summary in the draft table describes it as "clarifying" these priorities, DWR needs to analyze whether the list could produce operational changes rather than simply clarifying pre-Monterey procedure. (The term "interruptible" water, referenced in items two and six on this list, is not part of the pre-Monterey project contracts). We have previously expressed concerns to the EIR committee that the procedure for setting the amounts, times and rates of delivery might facilitate the "gaming" of the system, allowing low initial table A "requests" to be followed by much higher "interruptible" deliveries. The quantitative evaluations in the EIR must analyze the potential for gaming of the system, and DWR must consider how it can ensure against that potential.

Article 21

The draft table correctly recognizes that implementation of the new "interruptible water service" provision would affect SWP and contractor operations. The evaluations of impact must also consider the consequences of water rates.

Article 25(d)(3)

The Monterey Amendments revise this provision, relating to the criteria for interim adjustment in the allocation of power costs, so that it is based upon April revisions in delivery schedules for "project and nonproject water for contractors," instead of merely revisions in deliveries of table A amounts. The EIR, which needs to consider quantitative impacts on power as well as water deliveries, should analyze how deliveries of non-contract water (and the rights of non-contractors) may affect power rates. The definition of "contractor," as discussed above, may also affect the analysis of this issue.

Article 51

As was generally acknowledged during discussions of the project description last fall, article 51 is among the most important structural revisions in the SWP system initiated by the Monterey Amendments. Among other revisions, article 51 changes the way that DWR addresses revenues exceeding the cost of operating the SWP system. In *PCL v. DWR*, the court of appeal recognized the interrelationship between revised articles 18 and 51 in the Monterey Amendments. The court "agree[d] with plaintiffs that inclusion of article 51 in the amended contracts implies that DWR and the contractors have forsaken their expectation that the SWP facilities will be built as planned and will deliver 4.23 MAF of water annually. Article 51 allows contractors a rebate for the costs previously assessed for facilities that have never been built. Indeed, fiscal and environmental pressures militate against completion of the project." (83 Cal.App.4th at p. 914, n. 7.)

The new EIR must carefully analyze the environmental implications of article 51 as an integral part of the Monterey Amendments, rather than summarily assuming that because this provision is "economic" in nature it would not contribute to such impacts. Although CEQA does not require analysis of purely economic or social changes, it requires analysis of environmental impacts that can be traced to such changes. (See, e.g., 14 Cal. Code Regs, § 15131; *San Franciscans Upholding the Downtown Plan v. City and County of San Francisco* (2002) 102 Cal.App.4th 656, 695-98.) Here, the EIR must analyze the relationship between articles 18 and 51, and must compare the project to the no-project scenario in which table A amounts are reduced without article 51 rebates. The EIR must also evaluate the environmental consequences of article 51's effect on water rates, and consider the financial adjustments made in article 51 when making its assessment of project alternatives and mitigation.

30-75 (con't.)

Article 52

The draft table correctly recognizes that this provision, addressing the conveyance of the Kern Water Bank, will have potential effects on SWP and contractor operations. However, footnote "e" to the table contains the further statement that this article "virtually eliminates the possibility that the Kern Water Bank would be developed as part of the SWP." That language should not be used to supersede the duty, under section III.F of the Settlement Agreement, for DWR to prepare its own "independent study" in the new EIR and exercise its "judgment regarding the impacts related to the transfer, development and operation of the Kern Water Bank in light of the Kern Environmental Permits."

Conclusion

We hope that our general and specific initial comments on Draft Table 6-3A are useful to assist DWR in its efforts to establish initial priorities for EIR analysis. However, the draft table would be counterproductive if it is used to summarily exclude analysis of Monterey Amendment provisions, or compromise DWR's duty to provide the full measure of analysis required under CEQA and the Settlement Agreement.

30-75 (con't.)

Respectfully,

Roger B. Moore

Counsel to Plaintiffs

LETTER 30

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July 20, 2004

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Re: Plaintiff representatives' comments on status of EIR committee work for the "Monterey Plus" EIR

Dear Ms. Brown and staff:

This memo briefly lists several of the plaintiff representatives' key procedural and substantive concerns in advance of tomorrow's "Monterey Plus" EIR committee meeting, the first meeting since April due to the meeting cancellations in May and June. We appreciate the attention to some of our previous suggestions evident in tomorrow's agenda, including the scheduling of a discussion of SWP financial structure, the revival of the modeling subcommittee, and the continuation of our discussions of CALSIM II.

Nonetheless, we remain concerned about the lack of significant progress on foundational issues, and the amount of unfinished business that remains. We therefore offer these guideposts in the hope of assisting DWR in producing an EIR that can "fully inform the decision makers and the public of the environmental impacts of the choices before them." (*Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 893, 920.) 30-76

Procedural Concerns

Although we appreciate that summer scheduling difficulties can interrupt the pace of work, cancellation of the May and June meetings came at a time in which the anticipated schedule of work on the EIR had already slipped significantly. A handout in June 2003 estimated that work on the Final EIR was expected to be complete by October 2004. By November 2003, that estimate was revised to February 2005. In February 2004, the estimated time for the Final EIR moved to May 2005. The present estimate in the July 2004 meeting handout is that the Final EIR will be

published in November 2005. Completion of work on the Final EIR therefore remains as far away as was expected more than a year ago.

The schedule revisions reflect in part the EIR committee's recognition of the complexity and depth of matters to be addressed in the EIR, and we would not recommend a path that would shortchange the substance of the EIR to expedite its completion. Nonetheless, the schedule changes also underscore the need for the committee to make the most productive possible use of time, with maximum participation. To that end, we reiterate several suggestions. If at all possible, new substantive analysis should be distributed to committee members ten days or more before the meeting. Committee members should be notified at least three weeks in advance of any meeting cancellations or changes in schedule. Finally, at least until significant progress is made on the issues noted below, meetings should cover all or most of the day rather than only a few hours in the afternoon.

30-76 (con't.)

Substantive Concerns

Although the committee has worked cooperatively to make progress on some issues, we have seen little evidence of significant progress thus far on two significant ones that have been the subjects of recurring discussion. We have repeatedly raised concerns about the lack of calibration and validation of the CALSIM II model, and limitations on its use as a predictive tool in this context. Sage Sweetwood's February 2, 2004 letter to you highlighted the December 2003 findings the CALSIM II external review panel, which corroborated these concerns. As several plaintiff representatives discussed at the April meeting, these concerns go directly to the credibility and legal adequacy of the environmental analysis in the forthcoming EIR. At the April meeting, DWR committed to prepare a matrix addressing its approaches to the use of CALSIM II in light of recent criticisms, including those of the peer review panel. We are glad that a CALSIM II update is on the agenda for tomorrow, and hope that this is a sign that DWR is taking these criticisms seriously.

30-77

The assessment of growth inducement is a second area in which little progress has been made so far despite recurrent discussion and critique. The EIR team's first attempt to address this issue, presented in a discussion paper last summer, placed erroneous emphasis on a general nationwide Brookings Institution survey of urban population growth that has no bearing on the specific connections between water and growth in California. Those connections have been a hallmark of California history since before the time of William Mulholland.

The second attempt, presented this February, erred by focusing simply on the general plan stage, an approach that necessarily excluded analysis of the stages of decision-making in which water and growth are the most closely related. Indeed, a historic problem in California has been the widespread *failure* of general plans to adequately analyze long-term water reliability, a legacy that has prompted recent legislative reforms. DWR's EIR will stand on tenuous ground if its analysis attempts to fight what the court of appeal rightly called the "common sense notion that land use decisions are appropriately predicated in some large part on assumptions about the available water supply." (*Planning and Conservation League*, 83 Cal.App.4th at p. 915.)

30-78

Both these previous approaches to growth assessment failed to adequately address CEQA's standards for assessment of growth inducement. As we have emphasized in the EIR meetings for

the past year, the CEQA guidelines expressly decline to limit findings of growth inducement to circumstances where there is a definitive causal link between water and growth. CEQA Guidelines, § 15126.2(d) (projects that "*could foster* economic or population growth, or the construction of new housing, either directly or indirectly, in the surrounding environment"); *id.* (projects that would *"remove obstacles"* to population growth and those that "encourage and facilitate" other activities that could significantly affect the environment, individually or cumulatively) (emphasis added). Growth accommodation, and not just growth causation, must be included in the analysis. CEQA case law is also consistent with this broader understanding of growth inducement. (See, e.g., *City of Livermore v. Local Agency Formation Commission of Alameda County* (1986) 184 Cal. App. 3d 53; *Federation of Hillside and Canyon Associations v. Los Angeles* (2000) 83 Cal. App. 4th 1252.)

30-78 (con't.)

As reflected in the February 18, 2004 meeting minutes, the project team has promised to develop a "robust methodology" for growth analysis. Since growth inducement is not specifically mentioned in the July agenda, we hope to discuss a timetable for receiving and reviewing an approach to growth inducement that satisfies CEQA and does justice to the subject.

In addition to these two substantive areas, assignments remain from previous meetings. Several of these are noteworthy:

- We are expecting to work with the EIR committee on an improved version of the "Attachment B Guidelines to Assist Municipal and Industrial Contractors in Providing Accurate Information to Land-Use Planning Agencies." Our preliminary comments on the previous version were submitted to DWR on March 12, 2004. We expect to provide DWR with an additional set of technical suggestions during August.

- We are expecting a revised version of the "Summary of State Water Project Operations and Historical Performance" in response to our comments on this summary dated March 25, 2004.

- We are expecting a revised version of Draft Table 6-3A ("Analytical Methods for Determining Potential Effects of Monterey Amendment on SWP Operations"), which addresses our comments on this table dated April 6, 2004.

30-79

Finally, we are hoping that the July meeting can include some preliminary discussion of the timetable for addressing additional EIR issues that have received little or no attention so far. The EIR must include sufficient analysis to meet the requirements of CEQA and the specific commitments made in section III of the settlement agreement. Additional issues are mentioned in more detail in the settlement agreement and in our March 2003 scoping comments, but several deserve specific mention here:

- The EIR must analyze the direct and cumulative effects of the project, including potential environmental impacts of changes in operations and deliveries resulting from the project. (Settlement Agreement, § III.C.3.)

- The EIR must analyze the potential environmental effects relating to Monterey-related transfers of Table A amounts, including the contested Kern-Castaic 41,000 acre-foot transfer and

the transfers referenced in attachment E to the settlement Agreement. (Settlement Agreement, § III.C.4.)

• The EIR must include DWR's independent study of the "transfer, development and operation of the Kern Water Bank in light of the Kern Environmental Permits," framing DWR's exercise of judgment regarding the impacts of these. (Settlement Agreement, § III.F.) That analysis must identify both SWP and non-SWP sources of water deliveries to the bank. (*Ibid.)*

• The EIR must develop and analyze a reasonable range of project alternatives, in addition to the no project assessment.

30-79 (con't.)

Conclusion

We offer these comments in the spirit of constructive cooperation, hoping that they assist DWR in fulfilling a mutual desire for an exemplary EIR meeting the needs of decision-makers and the public. We look forward to working with DWR and the EIR committee on the issues identified here.

Respectfully,

Roger B. Moore

Counsel to Plaintiffs

Cc: Peggy Bernardy
EIR Committee

Section: Draft Chapter 9
Agency:
Commentor Name: PCL

Monterey Plus EIR
Comment Form
Preliminary Draft
8/23/04

Comment Number	Page Number	Line, Figure, or Table No.	Comment
	4	5	[As presented, this draft chapter does not describe "the potential effects of the proposed project on the water supplies of the…CVP, CVP contractors and other water agencies." It also fails to include or adequately quantify the effects of key provisions of the project on SWP supplies].
	4	16	"…changes in management of SWP and non-project water."
	4	35-40	The draft notes that the historical record from 1995 to 2004 is of limited use because it is only a small part of the historical record. However, no disclaimer is made here about any limitations of the Calsim methodology used for the majority of the data presented in chapter, despite the fact that the model does not incorporate many of the Monterey Amendments provisions that affect the supplies analyzed in this chapter. Calsim data are presented in Figures WB-1, WB-2 to a fidelity of 1/10th of 1%, without comment as to its accuracy. How many digits can be reported with confidence for these two charts? We are asked to believe that the model distinguishes Kern and Met deliveries within 0.1 TAF, amid estimated average annual deliveries to each of these agencies of up to 1000 TAF or more, an accuracy of 0.01%: see Tables WB-4, WB-5, WB-6, WB-8, WB-13 and WB-15. In the case of WB-6, Calsim results are reported to estimate the amount that the project changes Met

30-80

			deliveries with a fidelity of +/- 0.007%. In the case of WB-7, WB-8, and WB-14, we are asked to believe that the model distinguishes changes in average deliveries to individual contractors within +/- 1 acre foot, 15 years from now. Again, if the usefulness of historical records of the actual amount of water delivered is questionable, then what is a reasonable estimate of the true accuracy of these modeled estimates? How useful are these model results that do not include key Monterey provisions affecting supply?	30-80 con't
	5	4-6	It would be helpful to list each relevant Monterey management or other provision not reflected in Calsim, including carryover, turnback, terminal reservoir, out-of-area storage, KWB and non-project water.	
	6	3	"…millions of acre feet…in most years." In some years deliveries have totaled less than 1 MAF.	
	14	10-11	The CVP and SWP divert about 8 million a-f per year from the Delta: is this a historic or modeled figure. Is there a projected trend? Based on what assumptions?	
	14-15	Through line 22	Development of KWB was a physical change particularly relevant to Monterey. Regarding changes in physical setting such as E Branch, DVL, KWB, conjunctive use facilities—how do these interact with Monterey non-project water, turnback, transfer, out-of-area storage and carryover provisions?	
	14-15	Through line 22	Enhancement of groundwater banking/conjunctive use infrastructure through local and state funding, particularly in the Kern area, has been a physical change.	
	16		"Both average and maximum deliveries show a rising trend." Can DWR statistically separate the affect of wetter years to assess the impact of other factors?	
	18	15-19	"The increase in total annual deliveries of SWP water to contractors between 1994 and 2003 was largely the result of circumstances in the contractors' service areas and was affected very little by the change in terms of the SWP contracts brought about by the Monterey Amendment." Since this segment	

			of the Chapter is based on Calsim analysis that does not incorporate management flexibility provisions of the Monterey Amendments, and the Chapter also does not address non-project water and KWB provisions, it is overreaching to conclude that SWP deliveries were affected "very little" by the project. Also, "circumstances in the contractors' service area" interact with Monterey provisions (which were likely negotiated partly to make use of contractor assets and meet contractor needs). For instance, KWB and other groundwater banks facilitate the use of Monterey turnback and out-of-area storage provisions; Diamond Valley Lake could be filled partly by using non-project water.	
	19	12-13	Calsim runs suggest that Ag contractors would receive less overall wet-year water, on average, under the proposed project. Does the historical record suggest that this has happened? For instance, irrigated acres were subject to long-term decline in Kern Count prior to Monterey, but rebounded afterwards, possibly partly due to Montrey's greater guarantee of dry-year supplies. Did this increased security for agriculture increase wet year water demand?	
	19	39-40	Monterey Amendment contract language allowing out-of-area groundwater storage and borrowing from terminal reservoirs "are not simulated by the Calsim II model." From 1995-2003, six contractors stored over 1.2 MAF of water in out-of-area groundwater banks. While only 92,885 has been withdrawn so far, it is clear that filling and withdrawing water from this storage has the potential to increase exports. As the draft notes, this storage "could potentially increase average deliveries of SWP water." This EIR must (a) quantify the range of potential effects for water management methods and KWB to increase deliveries and (b) quantify the potential for these management techniques to increase critical-year supplies and thereby support urban growth.	30-80 con't
	20	23-24	What is the range of potential effects of the use of out-of-area groundwater storage on critically-dry year deliveries?	
	21	4-5	By how much could contractors as a whole potentially increase average annual deliveries and dry and critical year deliveries by using out-of-area storage?	
	21	30	Monterey allowed out-of-area surface storage of up to 961,800 acre-feet of water for some years and an infinite amount in others, including San Luis and non-project surface storage. What is the range of potential effects of Monterey-Amendment-related storage on critical year deliveries? Will use of carryover storage be	

			affected by actions aimed at solving San Luis lowpoint?
	22	34-41	Historical records indicate that contractors used an annual average of 174 TAF of carryover storage in San Luis since Monterey was implemented. The draft suggests that San Luis Carryover storage has increased annual SWP deliveries by up to 6% for all SWP contractors and 10.5% for those contractors using this Monterey Amendment program: "Thus, carryover in San Luis Reservoir has the potential to increase effective average deliveries of SWP water to contractors." We note that average annual deliveries rose by 13% during the pre- and post-Monterey periods compared on page 16. This suggests that carryover storage alone, which is not reflected in Calsim, could account for a significant share of increased deliveries. What is the range of possible impacts of carryover storage on (a) average annual deliveries and (b) deliveries in single critical and dry and multiple-dry year scenarios?
	23	20	With respect to terminal reservoirs, assuming Department approval of future contractor borrowing, what is the range of potential effects on critical-year supplies for the three relevant contractors?
	24	16	What is a reasonable quantification of the affect of turnback pool deliveries on average annual deliveries and on deliveries in each year type? What is the range of potential impacts of turnback pool delieveries on overall and water-year-type deliveries? What is the net cost per acre foot to urban contractors of water "turned back" to agricultural contractors, compared to the cost of Table A water? Does the option of recovering costs by selling turnback pool water potentially increase requests?
	24	25	It would be helpful at this juncture to quantify and sum the total historical and potential affects of the Monterey Amendments management provisions on deliveries, and to incorporate this summary in the following sections of the chapter.
	26	22-23	… "some" urban contractors took advantage of Monterey Amendment management strategies to offset the effects of the elimination of ag-first cutbacks. What is the potential for more or all urban contractors to do this in the future? What is the potential quantified effect on critical, dry, and multiple-dry-year deliveries? What would be the effect on wet year deliveries?

30-80 con't

	26	32	What is the basis of the conclusion that Met "probably" did not offset its dry year losses by its use of Monterey management provisions such as storing 760,000 acre feet of water in out-of-area storage? When each of the management provisions are considered together, what is the estimated effect on Met deliveries?	30-80 con't
	29	42-43	"…agricultural contractors would receive less water in wet and above normal years" under the Monterey Amendments. Given all the provisions of the Amendments, including carryover, turnback, non-project water, Kern Bank and other storage-related provisions, does the historical record suggest that this reduction in wet-year deliveries to agricultural contractors has happened?	
	30	45-46	What is the range of potential effects of out-of-area storage on average and water year type deliveries in the future? Similarly, what is the range of potential affects of carryover storage, terminal reservoir borrowing, turnback pool, non-project water, and Kern Water Bank?	
	34	5	Is there evidence in the record of reduced average annual deliveries and a "significant adverse impact" to Kern and the other named contractors, given the already pre-existing trend towards lower ag deliveries?	
	32	16	"…between 1994 and 2003 less surplus water was available to agricultural contractors." Do turnback and carryover deliveries effectively offset any reduction in surplus?	
	34	24-25	How would the presumed decrease in opportunities to use offsets to reduced critical year deliveries be affected by the lower-demand scenario in the 2005 State Water Plan?	
	34	41-44	"…municipal contractors with large groundwater resources within their service areas would not be adversely affected by reductions in critical year deliveries of SWP water and so would probably not engage in the new management practices." From what sources and in what amounts might these municipal contractors recharge groundwater resources depleted during critical years?	

	41	WB-3	This table includes Table A deliveries and, separately, a group of other delivery types. Since Monterey created or modified several contractural types of water, the EIR should include a table summarizing each relevant type (i.e., non-project water, turnback pool water, Kern Water Bank deliveries), with textual analysis explaining the implications of these provisions.	30-80 con't
	45		Table WB-3 shows historic table A and surplus water deliveries. How does it incorporate carryover, turnback, Kern Water Bank and non-project water?	
	51	WB-9	Over 70% of outside-of-area carryover storage is currently in Semitropic. Semitropic is advertising construction of 600,000 af more capacity with 200,000 af of annual ability to supply to the Aquaduct. How will this affect OOA storage allowable under Monterey? Is it likely that Semitropic will continue to dominate use of the OOA Monterey provision? Do other entities have plans for expanded capacity? When the export capacities of all of the forseeable OAA storage facilities are totaled, how much could this capacity affect supplies and demands in different year types?	
	50		Calsim runs show (Table WB-8) that with-project deliveries to MWD in critical years are 138,000 acre feet below no-project deliveries, ignoring the effects of Monterey Amendment water management provisions. What is the potential range of this figure for MWD and other contractors when turnback, carryover, terminal reservoir borrowing, Kern Water Bank and non-project supplies are considered? Could Monterey water management provisions facilitate increased wet-year storage in DVL in a manner that would affect this figure?	

LETTER 30

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September 13, 2004

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Re: Plaintiff representatives' initial comments on partial Preliminary Draft EIR, dated August 23, 2004

Dear Ms. Brown and staff:

This memo provides the plaintiffs' initial comments on the August 23, 2004 Preliminary Draft EIR, which covers all or part of Chapters 1 (Introduction), 2 (State Water Project overview) 3 (Project Need), 4 (Proposed Project), and 7 and 8 (respectively, effects of proposed project and alternatives on SWP and contractor operations). The purpose of these initial comments is to identify some broad themes that have emerged in our reading of the draft, highlighting some areas that require revised assessment before release of the Draft EIR. More specific comments, and perhaps some additional themes, will follow on the individual chapters once we have had the opportunity to discuss our initial comments at the September 15, 2004 EIR meeting. 30-81

To serve as a decision-making document, DWR's EIR must carefully address the substantive concerns identified in the Third District Court of Appeal's ruling and in the settlement agreement, as well as the admonition of the court of appeal that CEQA compels a "meticulous process designed to ensure the environment is protected." (*Planning and Conservation League v. Department of Water Resources* (2000) 83 Cal.App.4th 892, 926.)

Purposes of the EIR

The draft accurately states that the forthcoming EIR is "primarily a program EIR, but it contains some elements of a project-specific EIR." Draft at 1-3. Yet the draft fails to clearly identify the areas where the EIR is intended apply on a project-specific level, and where it is meant to serve as a program document. The discussion of "tiering" should also point out that if the program document is decertified, any project-specific EIR relying upon its assessments also be 30-82

vulnerable to judicial challenge. (See *Friends of the Santa Clara River v. Castaic Lake Water Agency* (2000) 83 Cal. App.4th 892 (decertifying "tiered" EIR for 41,000 acre-foot Kern/ Castaic transfer due to reliance upon 1995 Monterey EIR). 30-82 (con't.)

Third District Appellate Ruling

The introduction and the chapter on project need make passing reference to the Third District's ruling (see, e.g., Draft at 1-1, 3-7). But their cursory discussion substantially understates the centrality of that ruling, which should serve, along with the settlement agreement, as the foundational documents framing the forthcoming EIR. Lacking in this summary, to list several examples, are the court's extensive discussion of the "huge gap" between the SWP's full Table A amounts and its historic record of deliveries, its references to the risk of land-use decision-making grounded in "paper" rather than real water, and any reference to plaintiffs' validation claim. The text also inaccurately states that the appellate ruling found a "failure to name and serve indispensable parties" (Draft at 3-7), the reverse of its actual holding. For fuller and more accurate discussions of the Third District decision, refer to the scoping comments submitted by this office on behalf of the plaintiffs, as well as those submitted by Robert C. Wilkinson. 30-83

Environmental Setting

The partial discussion of State Water Project history in Chapter 2 should be revised to address plaintiffs' comments on the draft "Summary of State Water Project Operations and Historical Performance" distributed at the March 17 EIR meeting. Even more fundamentally, this partial history cannot serve as a substitute for the full discussion of the environmental setting required by CEQA. As we emphasized in scoping comments, the EIR must analyze "the range of legal and environmental constraints, other than the contracts and hydrologic conditions, that could impact water deliveries to SWP contractors and the environmental impacts of these deliveries. These constraints might include such matters as Delta water quality standards, endangered species requirements, the SWP's coordinated operations agreement with the Central Valley Project (CVP), competing water rights, and elements of the CALFED program. Such constraints should be studied both as they existed before any elements of Monterey were implemented and as they have evolved since that time." 30-84

Climate Change

Recent studies have predicted that climate change will strongly affect hydrology over the foreseeable life of the project, which is likely to extend at least through the expiration of SWP contracts in 2035. For example, a study entitled "Emission Pathways, Climate Change, and Impacts on California," in the *Proceedings of the National Academy of Sciences*, states at page 12425, "Stream inflows to major reservoirs decline because of diminished snow pack and increased evaporation before mid-century, except where precipitation increases." This is particularly problematic for the SWP because the Feather River watershed is relatively low elevation. To date, DWR has maintained that it could not factor in the effects of climate change because no one had downscaled the global climate models to the watershed level. On the contrary, it is now crucial that the EIR study the consequences of climate change, both in the "no project" alternative and in its assessment of the project and project alternatives. DWR's revision of its 2003 *SWP Delivery* 30-85

Reliability Report should also identify what SWP deliveries are projected to be with the projected decrease in snow pack. 30-85 (con't.)

Joint Federal/ State Project Operation

The project discussion does not adequately assess the consequences of the proposed action for joint state and federal operation of the SWP and the Central Valley Project. Without integrated study of the projects, it will be impossible to discern in the EIR whether reliability attributed to the SWP was based upon water from the SWP. Like the plaintiffs, the Bureau of Reclamation emphasized in its EIR scoping comments that prominent influences on SWP operations facilitated by the Monterey Amendments (including the Kern Water Bank and the eastside Storage reservoir) were not considered in the development of the 1986 Coordinated Operations Agreement. BOR correctly noted that the EIR must study how the proposed action would affect CVP access to Delta export capacity, and the environmental and socioeconomic effects of any such changes. 30-86

SWP Operations and Environmental Impacts

The draft does not clearly identify what counts as a "significant" impact, either to SWP operations or to the environment. That failure may simply be a matter of drafting sequence, since the EIR team has chosen to first analyze impacts on project operations, and then address environmental impacts and growth inducement in later chapters 9 and 10. It bears emphasis, however, that significant impacts to the *environment*, whether direct, indirect, or cumulative, are what the EIR must ultimately identify. 30-87

Interim and Final Project Operation

The present draft inadequately distinguishes between "interim" and final operation of the Monterey Amendments (see, e.g., Draft at 4-9). Additional detail should be incorporated from Sections II and VII, which specify which portions of the agreement will, combined with the Monterey Amendments, govern *interim* operations pending DWR's filing of its new NOD and the superior court's discharge of the writ of mandate. The superior court's June 2003 Interim Implementation Order also addresses this issue. By contrast, no provisions of the project, including the Monterey Amendments, become *final* until after DWR makes its new project decision referenced in the new Notice of Determination and the superior court addresses the return to the writ. The statement in the draft that "no other approvals or permits" are needed to implement the Monterey Agreement and the settlement (Draft at 4-13) is unclear, and should not be misconstrued to treat any aspect of the project (including the original Monterey Amendments) as a *fait accompli* prior to filing of the NOD and discharge of the writ. 30-88

Mischaracterization of Kern/ Castaic Transfer

Although plaintiffs recognize that the Castaic Lake Water Agency (Castaic) has proceeded on the assumption that the 41,000 acre-foot Kern/ Castaic transfer is already final, they strongly object to the mischaracterization of this transfer as a "past action" (Draft at 7-11), which provides it with a false veneer of finality. On the contrary, that transfer is expressly excluded from the list of transfers the parties recognized as "final" in attachment E of the settlement agreement. As was the 30-89

case at the time of that agreement, even the interim status of that transfer remains the subject of pending litigation following the decertification of the project EIR in the *Friends* appeal. Moreover, premature acceptance of that transfer's finality stands in a collision course with the present EIR, in which DWR must study and exercise judgment on the same transfer from a statewide perspective. (Settlement Agreement, § III.C.4 and attachment E.)

30-89 (con't.)

Kern Water Bank

The settlement agreement requires both an "independent study" by DWR and "the exercise of its judgment" regarding "the impacts related to the transfer, development and operation of the Kern Water Bank, " in light of existing environmental permits. (Section III.F.) That study "shall identify SWP and any non-SWP sources of deliveries to the Kern Water Bank." (*Id.*) In light of DWR's decision-making role, the Kern Water Bank study should be a key part of the EIR's impacts assessment, rather than a technical issue for placement in an appendix. As the draft correctly recognizes, state operation of the Kern Water Bank must be addressed as part of the "no project" assessment. Regrettably, however, the draft undercuts this critical point by speculating that it was "unlikely but not impossible" the state would have developed the bank. The no project alternative must contain an unambiguous assessment of the consequences of state bank operation, operated for statewide rather than merely local benefit.

30-90

New Decisions Affecting Project Operations

Two recent federal court decisions also will have direct effects upon the distribution of SWP water, and therefore must be addressed in this EIR. In *Westlands Water District v. Hoopa Valley Tribe*, the Ninth Circuit upheld the Department of the Interior's decision to decrease the amount of water diverted from the Trinity River to the Sacramento River. This decision will reduce the total amount of water in the Sacramento River, and those reductions in turn may force either or both the CVP and SWP to decrease their water diversions.

30-91

The Eastern District of California's recent decision in the Friant Dam litigation (*NRDC v. Rogers*, E.D. Cal. 2004) could have a similar effect. The court held that the Bureau of Reclamation acted illegally in drying up the San Joaquin River. As a consequence of that decision, water that previously was diverted for human use will now need to remain in the river. By reducing the amount of water available to diverters, that decision also will affect ongoing SWP operations.

Pumping from Delta Facilities

The Bureau of Reclamation, CALFED, DWR and other agencies have indicated their intent to increase pumping at the SWP's Delta facilities. Those increases are now well-defined projects, and should be addressed in the cumulative impacts analysis for this EIR. Implementation of those projects should not, however, be assumed, for DWR and BOR have promised further decisions before increased pumping takes place. Therefore, while increased pumping should be addressed in the cumulative impacts analysis, alternatives to increased pumping, including maintaining pumping at or below current levels, must also be studied.

30-92

Assessment of Impacts on SWP Operations

30-93

The assessment of project and "no project" impacts on SWP operations in chapters 7 and 8 is largely contingent upon (1) model-dependent analysis and "systematic qualitative analysis" that remains to be performed (e.g., Draft at 7-9), and (2) assumptions on which there is reportedly no "consensus" (e.g., Draft at 7-13, 7-14, 8-7). Plaintiffs will therefore reserve most of their comments until they have the benefit of additional information. For now, we will briefly register our concerns that the impacts assessment places inadequate focus on extended dry year scenarios, gives inadequate attention to factors that may limit the availability of "surplus" or "interruptible" water, and neglects the advice in our scoping comments not to use the meeting of contractor requests as a way to avoid direct focus on SWP reliability problems. Likewise, "no project" alternative B must study directly the consequences of fully enforcing article 18(b) on a permanent basis. Rather than doing so, the present draft hinges its analysis on hypothetical contract interpretations that demand further legal explanation.

30-93 (con't.)

Terminal Reservoirs

For reasons discussed in the attached paper by Arve Sjovold, the draft's assessment of new management practices (Draft at 7-15 to 7-25) inadequately addresses the impacts of the Monterey Amendment provision (Article 54) authorizing changes in operation, and shifting toward local management, of the "terminal reservoirs" at Castaic Lake and Lake Perris. As noted in that paper, these changes, rather than benign shifts in project management, may prove to compound the problem of decision-making grounded in "paper" rather than actual water.

30-94

Conclusion

We hope that these comments are a useful step toward an EIR that is equal to the historic project decision awaiting DWR, serving the needs of decision-makers and the public. We look forward to working with DWR and the EIR committee on the issues identified here.

Respectfully,

Roger B. Moore

Counsel to Plaintiffs

Cc: EIR Committee

REVIEW OF PARAGRAPH 7.3.4.1
Flexible Storage in Castaic Lake and Perris Lake,
Early draft of Monterey EIR

By Arve Sjovold, September 13, 2004

The draft section regarding proposed new operations at Lake Castaic and Lake Perris is nothing more than a slight revision of the material appearing in the original Monterey EIR. The Appeals Court decision declared the original EIR deficient in part because of its failure to deal with "paper water." The Appeals Court decision did not reach the specifics of this proposed element of the Monterey Amendments, but it should be absolutely clear that all the provisions in the original EIR should have at least been revisited with respect to this general deficiency. This section in the proposed new draft fails that requirement. 30-95

The draft needs much more information describing the existing operations pre-Monterey. It must be presumed that the original project designs had good reasons for why these two lakes were sized as they were. To propose without any clarifying reasons why there should be available storage in these lakes to be used for local contractor operations makes it impossible to study the impacts. For example, it is known that Castaic Lake was designed for, among other reasons, to support a pumped storage operation with Pyramid Lake upstream. Without describing those operations for typical dry and wet periods, it is impossible to establish the likelihood of risks to those operations if local contractors were to use a substantial part of the storage for their own purposes. And there are many other aspects of these proposed operations also need much more work as well. 30-96

Characteristics of the Reservoirs

Under this subheading the draft should take care to explain the original purposes of these reservoirs. And for a baseline, the operations at these reservoirs should be subject to analyses by mathematical simulation over the entire 73 hydrologic record rather than just the recent 21 year period of 1974-1994. The scenarios to be investigated should include the selected years agreed upon by the EIR committee. The outputs of the analyses should show not just the variations in lake levels but the expected outputs of pumped storage operations. The table showing actual lake variations for the period 1974-1994 is totally inadequate as a baseline and should be deleted from the draft as irrelevant. 30-97

Description of the Proposed Project

This element of EIR preparation is missing from this section of the draft (7.3.4.1). It may appear elsewhere but it is paramount that it also appear here for context. This section refers to the proposal in terms of the general amount of borrowing by local contractors (up to 50% of the storage capacity) with some additional terms such as the amount that would be allowed for use by MWD. This is not an adequate description. It leaves out the criteria that will apply to contractors in general. If MWD does not use all of its allocation, is CLWA allowed to borrow the unused portion? What criteria would be 30-98

applied in times of drought? Do contractors' requirements for local use supersede SWP requirements for delivering water to all contractors equitably? And the draft should explain in sufficient detail the needs of the local contractors for this borrowing. Although the contractors are "repaying" the construction costs, they do not own these reservoirs or parts of them to any degree. They are owned by the SWP for the benefit of the project. If there should be any significant impacts to SWP operations because of these proposed operations, it will be necessary to weigh the benefits to local contractors against these impacts. The draft fails to provide a sufficient basis for this kind of assessment.

30-98 (con't.)

Potential Effects on Reservoir Operations

The draft explains that the one of the primary goals to be achieved in these reservoir operation was to maintain them as full as possible at all times. That may be an objective but it is not sufficient to cast environmental impacts in such a simple one dimensional parameter as lake level which this draft attempts to do. As pointed out above, the operations of the SWP include the requirements for pumped storage operations between Lakes Castaic and Pyramid.

The draft also speaks rather simple of payback provisions. It has been acknowledged that the project is deficient in its ability to supply full contractual amounts, especially in dry periods. The ability of payback must be demonstrated sufficiently accurately to assure that the borrowings do not just become another burden on the supply capabilities of the project. We are disturbed with the reference in the draft to "the availability of water from the California Aqueduct." This seems to imply that even if the borrower can't or won't pay back in the next year, that it becomes the burden of the project to assure that lake levels are not impacted. There is also the matter as to how this borrowed water is to be treated contractually. Is it to be considered "Table A" water? What if the contractor is receiving his full "Table A" request, can he still borrow? Is it expected that payback will come from that contractor's SWP deliveries? If so what happens if extended drought prevents him from accomplishing payback?

30-99

The draft's presentation of actual operations under Monterey in the most recent years is totally misleading. This period was after all one of the wettest periods on record and in no way can be used as a basis for assessing the abilities of contractors to repay. The draft should show what happens by calculations over the representative 73 year hydrologic record. This draft even fails to establish the sources of payback during this most recent period. The use of the most recent period operations as a demonstration of impacts is totally inadequate.

LETTER 30

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To: Delores Brown, DWR
From: Eddy Moore, Roger Moore, Arve Sjovold
Re: Plaintiffs' Preliminary Comments on First Draft of Chapter 11, "Monterey Plus" EIR
Date: February 1, 2005

This memorandum presents our preliminary comments on draft Chapter 11 to the "Monterey Plus" EIR, "Paper Water and Growth." As was the case with Draft Chapter 10, we are not responding in the suggested format of "line by line" comments, due to our strong sense that the deficiencies and omissions highlighted here cannot be readily fixed with minor corrections in the existing text. Rather, core deficiencies in both the methodology and analysis in this chapter demand comprehensive revision, not to achieve some elusive standard of CEQA perfection, but to honor DWR's duties articulated in the Third District's appellate ruling, meet the commitments DWR made in the settlement agreement, and satisfy the requirements of CEQA. In key respects, the draft Chapter 11 analysis sidesteps the substance of criticisms that plaintiffs' representatives have articulated in EIR committee meetings for more than a year.

Flawed Context for Paper Water Assessment

The problem of "paper water"—stated in its simplest terms, of development decisions grounded in expectations of water supplies exceeding what can actually be delivered—emerged as one of the central themes in the Third District's ruling, and is perhaps the issue with which *PCL v. DWR* is most closely associated in both case law and in public discussion. (See, e.g., *Santa Clarita Organization for Planning the Environment v. County of Los Angeles* (2003) 106 Cal. App. 4th 715, 721; Kibel and Epstein, *Sprawl and 'Paper Water': A Reality Check for the California Courts* 20 CALIFORNIA REAL PROPERTY JOURNAL 22, 23 (Winter/ Spring 2002).)

30-100

The court of appeal recognized the "huge gap" between SWP entitlements and existing supplies, connecting that holding to the risk of planning decisions grounded in "paper" rather than real, deliverable water. "Paper water," the court observed, was "always an illusion," steeped in the "unfulfilled dreams" of a water culture that had fostered an inflated expectation of what could be delivered. (*PCL v. DWR* (2000) 83 Cal. App. 4th 892, 914 fn. 7.) Because the Monterey Amendments eliminated article 18(b), the provision that would have reduced entitlements to "meet a humbler, leaner reality," the court recognized that it would be incumbent upon DWR to come to terms with its "paper water" problem before finalizing that change to the project contracts. (*Id.*)

Rather than providing the thorough and candid assessment of "paper water" and development anticipated in the appellate ruling, draft Chapter 11 provides little more than a cursory historical summary, a description of planning laws and practices, and a startlingly inaccurate new table of the purported SWP "reliability" figures reported in several water contractors' Urban Water Management Plans. Indeed, the analysis presented here bears more resemblance to arguments about "paper water" unsuccessfully presented to the court of appeal than the probing and comprehensive assessment anticipated in the appellate ruling and settlement.

A puzzling duality pervades the discussion in Chapter 11. The historical overview is dismissive of the notion that inflated expectations of SWP deliveries affected development decisions. But rather than debunking the notion that such inflated expectations were present in projects relying on SWP water, the chapter argues, if anything, that they were all too real; that decision-makers so pervasively failed to consider potential constraints on SWP water deliveries that they would have paid little attention to the amounts of "entitlement" referenced in the project contracts. (See, e.g., page 11 ("because planners and decision-makers paid little attention to water availability in general, it follows that they have been influenced very little, or not at all, by the Table A amounts in the SWP contracts or any information on the delivery capabilities of the SWP"). 30-100 (con't.)

The core of this analysis posits that planners "appear to assume that *local water agencies* will obtain the supply necessary to meet the long-term water demand that results from planned growth." (*Id.* at p. 10 (emphasis added.) But far from "disproving" reliance on SWP paper water, this analysis points to planners and decision-makers trusting the water agencies; in other words, they are presumed to have relied upon the same pervasive "water culture" in which the court grounded its historical analysis of the "huge gap" between entitlements and available supplies. Instead of analyzing the historical paper water problem, Chapter 11 repackages it.

A similar circularity pervades the chapter's extremely cursory analysis (pages 12-14) of SWP water supply and urban planning in the future. From the historical position that planners and decision-makers rarely even considered water supply, the draft swings to a somewhat exaggerated faith that they now "get it," due in part to changes produced by the *PCL v. DWR* decision and settlement, and in part due to parallel legislative changes (notably, SB 610 and SB 221). But as detailed below, the failure to provide consistent definitions, the paucity of analysis, and the avoidance of critical lingering sources of "paper" water ultimately undermines the discussion.

Improper Narrowing of "Paper Water" Definition

The theme of the draft assumes that "paper water" is only involved when a contractor presumes that it will get the *full* amount of Table A water. This drastically understates the scope of the paper water problem, which will remain present as long as planners and decision-makers continue to rely on *inflated* assumptions about water available for delivery. By contrast, the court of appeal never suggested that paper water was merely a "full" entitlement issue; rather, it addressed the gap between those amounts and available supplies. Moreover, the court indicated that paper water must be understood in connection with article 18(b), the contractual method available to eliminate the "paper" from the water referenced in the project contracts. The Court even outlined a method for arriving at the amount of paper water, citing public comments that DWR should by 30-101

simulation determine what level of Table A reductions would lead to an acceptable level of article 18(a) short term reductions, taking into account both the magnitude and frequency of such article 18(a) reductions. This DWR has not yet done. Therefore, the amount of "paper water" in the contracts still has not been defined. The notion that reliance of some average delivery that is below the Table A level will eliminate the "paper water" in the contracts is entirely without analytic merit.

30-101 (con't.)

Flawed Assessment of Urban Water Management Plans

The draft analysis resorts to Urban Water Management Plans (Umps) to ascertain if any agencies have been relying on full Table A amounts. Finding none, the report is willing to conclude that the SWP "paper water" problem is absent . The draft relies on the data in a table that they assembled to present the findings of the survey of UWMPs. The table reports the levels of Table A that a selected subset of SWP contractors have shown in their UWMPs. The reported levels indeed do not show any SWP contractor relying on full Table A amounts.

However, what is not shown is the reality for these same selected SWP entities. A table has been prepared and is shown below that documents the **actual average and percentage deliveries over the time period 1990-2002** according to the data presented in DWR's SWP reliability report. It is quite clear that all the UWMPs overstate what the historical record is quite clear on. It is not even certain where the values reported in the draft's table came from. It is certainly not historical. If anything the draft table when compared to the historical record shows that there is substantial "paper water" in all the current UWMPs except for the possible case of the Desert Water Agency. Even here it is unlikely that Desert WA will be able to get the amounts that it has in the past when all the other urban water contractors will be asking for more entitlement water than they may have in the past.(This is especially true if one considers the case where MWD starts to ask for greater amounts than it has in the past. Any increases to MWD can have profound downward effects on the smaller SWP contractors.)

30-102

SWP RECORDED WATER DELIVERIES

TABLE A, 1990-2002

(KAF)

AGENCY	TABLE A	1990	1991	1992	1993	1994	1995	19
Mojave	75.8	0.0	3.4	10.7	11.5	16.2	3.7	
CLWA	54.2	22.1	4.5	17.9	23.0	25.5	25.7	3
Alameda	42.0	33.0	10.0	17.8	10.3	21.9	17.8	1

Alameda 7	48 or 78	29.6	9.4	14.7	32.9	20.2	30.1	1
San Gorg	17.3	0.0	0.0	0.0	0.0	0.0	0.0	
SCVWD	100.0	92.0	28.2	42.8	61.6	52.9	28.7	8
Palmdale	21.3	8.6	3.9	4.0	7.6	8.2	7.0	1
MWD	2,011.5	1,363.0	381.0	629.0	487.0	808.0	397.0	55
Desert WA	38.1	38.1	11.4	17.2	38.1	20.1	38.1	3
		(No such						
		SWP						
		contract						
Antelope WA		or)						
AVEK	141.4	47.2	9.6	28.0	41.4	47.7	47.3	5
Solano	47.8	19.1	5.2	9.9	26.1	15.2	21.3	2

30-102 (con't.)

In sum, if the EIR wants to stand on information in UWMPs then it must present data on how those numbers came about. And if they are the product of CALSIM II or predecessor models, those models must be defended against a proper peer review. There is no reason to use CALSIM II results when there is a sufficient history to rely on for SWP delivery reliability.

Failure to Account for Additional Sources of Paper Water

Local governments have not concerned themselves with water supply when making growth-related decisions until recently, because the agencies with responsibility and expertise in supplying water (DWR, CVP, and water agencies) have given the impression that water supply is not a constraint to the approval of new growth. On the one hand, successive State Water Plans have projected that demands will outstrip supply. On the other hand, these Plans have generally suggested projects that could be built to meet supply needs, giving the impression that the constraints on supply are caused by a lack of infrastructure and engineering rather than limits to the availability environmentally sustainable water supplies.

Similarly, at the regional water agency level, it is MWD's current policy to maintain water supplies ten years ahead of growth in its region, thus shielding local agencies from concerns about water supply constraints (see page 9 of MWD's Integrated Regional Plan). It is in this sense that local land use agencies have been "seduced" to believe that almost unlimited amounts of water are available for new growth. Thus, we must look to the state, and federal and water agency levels, and not simply to local decision-making, for evidence of "paper water" or "cyber water" rather than to cities or counties.

30-103

The state's charge in assessing available water supplies involves multiple elements that have not begun to be addressed in substance in draft Chapter 11:

- **Non-State Water Project Supplies**

While the Monterey Plus EIR must necessarily focus on the SWP portion of water supplies, these supplies cannot be understood in a vacuum. A drought on the Colorado River increases

demands for SWP exports. Major improvements in locally-controlled South-of-Delta groundwater storage facilities increase the ability of local agencies to receive SWP exports. Actions on the CVP, such as the recent court decision requiring new flows below Friant Dam to restore the San Joaquin River will affect flows into the Delta, where SWP contractors plan to increase exports of "surplus" water. Any "paper water" in one part of the system will increase demands on other parts of the system.

30-103 (con't.)

- **Environmental Baseline**

The "paper water" concept implies an environmental baseline, which is not yet delineated in the proposed Draft EIR. State and federal agencies must balance competing water interests. For instance, in deciding how much to water export from the Bay Delta, DWR must judge how much is needed to meet environmental and recreational interests. While water exports are far from the only variable affecting habitat in the Bay and its contributing rivers, expert opinion suggests that the current level of exports is not environmentally sustainable and threatens the existence of protected species and scarce habitat. A few notes from The Bay Institute (TBI) suggest the level of flow-related habitat effects from water exports:

- Overall, TBI recently judged freshwater inflow a "D" on a scale from A to F for environmental impacts. TBI stated "Reduced inflows are still degrading the Bay ecosystem, and recent gains from wetter years and new standards are being eroded."
- In 2001, native Bay fish abundance was just half of that measured 30 years ago.
- In 2003, total annual freshwater inflow to the Bay was reduced by 45% compared to natural conditions. While 2003 was an average year for the watershed, fresh water flows reaching the Bay were reduced to the amount expected in a dry year. During the critical spring period, less than half of natural freshwater inflow reached the Bay. Only 1 of 3 target restoration pulse flows to the Bay was met. In the Delta, Spring flows were reduced by 35% of natural flows, while summer flows were more than doubled. While diversion rates were cut five times during winter and spring to reduce fish killed at the export pumps, the ESA take limit for spring-run Chinook salmon was exceeded twice.
- 2003 Spring flows in the Sacramento Basin were reduced by up to 72%, while summer flows conveying water to the Delta for export ran two to ten times what natural flows would have been.
- Looking at some of the basic food chain supplies in the Suisun Bay, during the past 30 years Neomysis shrimp abundance declined over 99% and average zooplankton weight decreased by 80%. Only 1% of copepod individuals in 2001 were native species. TBI scored the current food web as an "F."
- In 2002, springtime Bay inflows were nearly 20% lower than needed to maintain low salinity habitat, or X2, at the desired position. X2 is viewed as a broad measure of habitat health for this portion of the Bay. While the regulatory standard allows for technical compliance through modeling, the actual location of X2 was 2 km further upstream than originally called for. TBI is concerned that existing X2 targets, even if fully met, are insufficient to restore the ecological function of the Bay.
- Current environmental restoration (ERP) targets for the Bay were mostly met until the early 1970's, when pumping levels were much lower than today. Since 1976, due to increased Delta pumping, none of the ERP inflow targets have been fully met in 58% of years. Even during the six-year wet period from 1995-2000, two of three flow targets were fully met and

30-104

a third partially met in only half of these years. Bay inflows often barely exceed legal minimums, but are not near restoration targets in many years. The increased ability of exporters to capture "surplus" flows should not be permitted unless a net increase in Bay inflows to achieve restoration targets is assured.

While these indications suggest that Delta exports should be reduced accommodate basic environmental goals, SWP's largest contractors are actively pursuing larger overall exports, with the cooperation of DWR. The largest contractor, MWD is assuring its member agencies that it will supply sufficient water to accommodate new growth for 20 years, including a firm reliance on increased SWP contract deliveries. With DWR financial assistance, the second largest contractor, KCWA, is greatly expanding its ability to accept and store increased exports, partly for transfer to MWD during droughts. Also, DWR is working closely with CVP to coordinate new infrastructure and operational changes to increase overall Delta exports. We would suggest that this is the kind of activity that creates "paper water," by pushing for increased exports rather than strongly signaling to contractors and local governments that there are prudent environmental limits to water supplies.

30-104 (con't.)

- **Drought Planning**

The effective limit of "wet water" is its firm availability to M&I uses during either a sharp or a lengthy drought. The state has encouraged water agencies to submit plans (UWMPs) every 5 years that include average-year, single-worst-year and 3-year drought scenarios.

In 1991, SWP delivered about 522 TAF of Table A water—about 12% of Table A. Some may argue that, in general, SWP delivered less water in earlier years partly because it was not demanded. However, this argument does not apply to 1991, since demands during that year greatly exceeded deliveries. In this sense, 1991 represents a "worst" single-year SWP drought in the recent actual record. Also, while modeling may choose an earlier "worst" period based on hydrology, we know that during 1991-1993, SWP delivered an average of 32% of Table A for a 3-year period.

Individual UWMP's make various choices about what constitutes a single or multi-year drought, and thus the 2000 UWMP's do not provide comparable data. DWR should standardize this reporting (and require the use of the single and multiple worst years for each major supply source) so that the data produce a consistent, robust estimate of drought delivery capability. For purposes of this EIR, DWR should request equivalent single and multi-year drought scenarios (agencies are required to produce these this year anyway) and should provide guidance to local agencies to combine worst-case scenarios for each supply source.

30-105

Also, as the Chapter 11 Table 11-1 suggests, key data are missing from the UWMP's. Of the 13 UWMP's reviewed for Table 11-1, 5 apparently report no data for a "critically dry" year and 6 apparently have incomplete data for a "dry" year.

In summary, for this EIR DWR should provide scrutiny, comparability, and completeness of data in its search for paper water.

Here are some examples of UWMP methodologies that highlight the need for DWR to not only summarize, but also scrutinize the plans and make its own independent estimate of whether

there is "paper water" in the system:

1. KCWA ID No. 4:

One of SWP's larger M&I contractors, KCWA Improvement District No. 4, reports in its 2000 UWMP that it relies on 82 TAF in SWP "entitlement." It uses about 32 TAF for its water treatment plant, and recharges 41 TAF to the ground (about 10 TAF meets exchange payback requirements). In all "average" water year scenarios (2000, 2005, 2010, 2015, and 2020), ID No. 4 reports that it can rely on the full "entitlement" amount of 82.9 TAF. During the most severe single-year drought, ID No. 4 relies on 63.8 TAF (78% of full "entitlement"). For its 3-year drought scenario, ID No. 4 apparently chooses 2001-2003 as the appropriate 3-year drought period. During this drought period, it expects full "entitlement" the first year and 85% of full entitlement in Years 2 and 3.

In an attachment to the UWMP, KCWA asserts that the district "can provide full demands to its urban retail purveyors, at an average 56% shortage, for seven years due to 250 TAF in banked groundwater. This will cover the entire length of the historic seven-year drought without any shortages." The UWMP reports that the groundwater can be recovered at 39 TAF per year.

This example UWMP raises several questions. First, ID No. 4 relies on full "entitlement" amounts, with no discounting for SWP deliveries below that amount during "average" years and during the first year of a 3-year drought (possibly this is due to an arrangement with KCWA, which has a much larger SWP entitlement—but it is at least unclear how ID No. 4 has an entitlement that is largely unaffected by SWP delivery fluctuations, even after the Monterey Amendments apportions drought reductions equally to M&I contractors). Second, ID No. 4 chooses drought scenarios that do not reflect the worst droughts on record. Third, the UWMP implies that a large share of the 39 TAF per year groundwater pumping capacity will be devoted to ID No. 4 during an extended drought. Would contracts by other agencies for water banked in Kern County compete for that pumping capacity during a drought? If there is ample pumping capacity, have recent and ongoing improvements in pumping and conveyance capacity significantly increased drought yields for SWP in Southern California? How are these physical improvements related to Monterey Amendment flexible operations, out-of-service-area storage, and non-project water conveyance provisions?

30-105 (con't.)

2. Castaic Lake Water Agency 2000 UWMP:

DWR's draft Chapter 11 notes correctly that many UWMP's discuss variability in SWP supplies, and that this upfront discussion of reliability issues gives enough warning to any diligent local agency to eliminate concerns about paper water. CLWA's is an example of a plan that extensively discusses variability in SWP supplies. It is also a clear example of how such a plan can still be filled with paper water. It is worth noting that, rather than being vigilant watchdogs searching for "paper" in local water agency supplies, local land use agencies can be all to eager to believe that uncertain supplies are reliably available for new development.

CLWA uses a modeled 10% excedence for a single-year drought, rather than choosing the single worst year in the record. By contrast, Alameda County Water District uses 1977 SWP

deliveries as the single-year. The difference is that CLWA counts on receiving 40% of its purported 95,200 TAF Table A supply in the worst dry year, while Alameda County only counts on 15% of its Table A.

According to its plan, CLWA's multi-year drought scenario rests on modeling of 1990, 1991, and 1992 SWP deliveries. CLWA counts on 40% of Table A for these three years (surprisingly, the same amount as the 10% excedence used for the single drought year). Arguably, the 32% Table A deliveries from 1991-1993 would be more robust.

CLWA also relies upon a 41 TAF permanent transfer from the Monterey Amendments, which is in question in the instant EIR. This transfer comprises 43% of CLWA's SWP supply. Without this 41 TAF, CLWA SWP Table A supplies could be estimated at 6.5 TAF and 17.3 TAF (based on 12% and 32% single and multi-year SWP Table A supplies) in the single and multi-drought years, respectively, rather than the firm 37.9 TAF reported. In reality, Castaic received only 706 acre feet of SWP delivery in 1991 and an average of 14.7 TAF of Table A during the 1991-1993 period, according to the SWP Delivery Reliability Report Attachment D, page D-24.

CLWA also relies on perchlorate-tainted groundwater supplies that have been discounted in recent litigation.

Finally, the 2000 CLWA UWMP includes extensive discussion of current and future benefits from groundwater banking and water transfer provisions relevant to Monterey Plus EIR. These segments of the UWMP suggest that Kern Water Bank, water transfer, and non-project water conveyance provisions in the Monterey Amendments will become a key part of water supplies for CLWA, supporting and promoting growth in this major SWP contractor's service area. DWR should incorporate this information into the growth inducement analysis for all jurisdictions affected.

30-105 (con't.)

3. No UWMP analysis for this EIR can be complete without a thorough examination of MWD's drought planning, since MWD is the largest contractor by far. MWD has issued several relevant documents, including a March 2003 "Report on Metropolitan's Water Supplies," an UWMP, and a July 2004 Integrated Regional Plan. While all of these documents should be examined for consistency with each other and with statewide reliability planning, a few observations suggest the kinds of questions that would be relevant to a rigorous search for "paper water."

MWD's Report on Water Supplies ("Blueprint") draws on the SWP Reliability Report modeling results to estimate an average delivery of 77% of its SWP Table A amount through 2010, or about 1.6 MAF. However, during the dozen years from 1991-2002, MWD actually averaged 700 TAF in SWP supplies (average drawn from SWP Delivery Reliability Report Appendix D actual historic delivery figures).

For the single dry year under 2005 conditions, MWD's Blueprint relies upon 418 TAF of SWP deliveries (not specified as only Table A) and 50 TAF of San Luis Carryover. In 1991, MWD actually received 381 TAF of SWP Table A deliveries (19% of Table A) and only 10 TAF of carryover water. According to the Blueprint, SWP's single largest contractor is confident through

2025 that the 418 TAF Table A delivery bottom line will stay firm, without impact from environmental regulations, water quality concerns, Northern California growth, climate change, or delta levee failure. Is this a secure foundation upon which to expand M&I reliance on SWP?

The Blueprint also suggests that Semitropic and Arvin Edison groundwater banking will yield 197 TAF during drought years through 2025. This is considerably more than the 106,500 TAF reported in the 2000 UWMP. It is also considerably more than the 2002 MWD IRP "Report Card" estimate that these combined water banks would produce 110 TAF, but only after the projects are "fully developed." This Report Card noted that these projects could deliver only 60 TAF in 2000. What is the real delivery capacity of this groundwater banking right now? While efforts to secure Semitropic storage were initiated prior to Monterey, were the Monterey provisions easing transfer rules intended to accommodate these transfers? What is the total call by all contractors (and non-contractors) on transfer capacity from Kern County water banks? Will it meet the single- and multi-year drought demands of Met and others? How has the capacity of this expanded storage, pumping, and conveyance, which has been significantly financed by DWR, been analyzed for environmental purposes? How much will this expanded conjunctive use capacity increase SWP exports during critically dry, dry, average and wet years?

Between the 2002 Report on MWD Water Supplies and the 2003 Blueprint, estimated use of Diamond Valley Lake (DVL) to meet single dry-year demand rose from 150 TAF for DVL to 510 TAF for DVL plus Lakes Matthews and Skinner. Matthews and Skinner have a combined operational storage of 75 TAF, so 435 TAF of the projected 1-year drought use would come from DVL. Added to this 290% increase in single-year DVL reliance, is a 57% increase in planned reliance on surface storage at Lakes Castaic and Perris (the terminal reservoirs addressed in the Monterey Amendments). Or as Met's most recent IRP put it "With the completion and filling of Diamond Valley Lake (DVL) and the flexible storage provisions of the SWP Monterey Amendment, Metropolitan has exceeded the in-region dry-year storage capacity identified in the 1996 IRP." What does this sharply increased reliance on surface storage do to multiple-year drought planning and what source water will be used to refill storage? If dry year demands for Met ran 2.5 MAF, and combined SWP and CA supplies fell to 1 MAF, would reliance on storage leave Met vulnerable to multiple dry years? This question has been raised in a review of the Blueprint by the agency most dependent upon MWD, the San Diego Water Authority (SDWA). SDWA raises a series of other questions about the true reliability of MWD projections.

Future drought planning relies heavily on purchasing transfers from agriculture. The EIR must address how reliable will this supply be amid competition during a drought.

30-105 (con't.)

- **CALSIM II**

We have outlined elsewhere our concerns regarding CalSim II, which implicitly underlies much of the analysis in the draft chapter. . Calibration and validation of its results, which were called for in scientific peer review, are necessary for presenting any CalSim II analysis in this EIR. This calibration and validation should explore not only uncertainty deriving from the operation of the model, but also uncertainty stemming from data inputs. Sensitivity analysis should be performed to determine which inputs are most important for calibration and validation.

30-106

Key elements of local supply and storage, including the Kern Water Bank have been absent from CalSim runs used for this EIR and we have been told they are too resource and time-intensive to produce. Meanwhile, DWR has developed and is refining a Kern Bank simulation to investigate new SWP storage options. Rough Kern Bank modeling was done in DWRSIM. In sum, the existing draft has not begun to address the potential for a second-generation "paper water" problem (or as public commenters labeled it, a "cyber water" problem) arising from unsupported and uncalibrated assumptions in Calsim II that have once again inflated the estimates of reliable deliveries.

30-106
(con't.)

To: Delores Brown, DWR
From: Eddy Moore, Roger Moore
Re: Plaintiffs' Additional Comments on Growth Inducement (Chapter 10), "Monterey Plus" EIR
Date: March 15, 2005

During the January 19, 2005 Monterey Plus EIR meeting, representatives raised several issues that should be addressed in the growth inducement chapter (Chapter 10). The following comments elaborate on some of those issues, supplementing our January 6, 2005 comments in light of the discussion at our last EIR meeting

As we discussed, substantial revisions must be made in the analysis in order to provide a satisfactory and legally adequate analysis of growth inducement. Comments made by contractor representatives created the impression been that, from the perspective of contractors and DWR, the Monterey Amendments affected only the distribution of Bay Delta SWP exports between certain agricultural and M&I contractors, and did not increase exports. They have posited furthermore that the Monterey Amendments' management flexibility provisions simply clarified existing practices and made little difference on the ground to trends that would have occurred otherwise without the changes. Under this narrow view, with only small (and often counter-balancing or declining) water redistribution effects, the Monterey Amendments induced little growth.

By contrast, plaintiff representatives have already raised substantial reservations regarding analytical methods (i.e., modeling), which must be credibly addressed before any such conclusions could be drawn. Beyond these, however, plaintiffs have also maintained that DWR has failed to diligently seek the extent and impact of the growth impacts fostered by permanent transfers, and has so far ignored the growth inducing impacts of other contract provisions in the Monterey Amendments. This memorandum focuses on these latter points, with the hope that it will help foster a fuller and fairer assessment of project-related growth inducement.

30-107

Monterey and Growth Inducement: Broadening the Discussion

A brief review of historical documents explaining the Monterey Agreement and Amendments sharply calls into question the view that Monterey merely clarified existing practice, and indicates that each management flexibility and supply reliability contract provision must be analyzed for significant growth inducement. With these documents as a starting point, DWR must include a review of water deliveries and transfers in the historical record, a probing statistical analysis, and an assessment of potential future trends in water management under the Monterey Amendments.

Bulletin 132-95, the 1995 edition of the annual official report summarizing SWP operations and events, announced "…two historic documents—the Monterey Principals and the Bay-Delta Accord." While the negotiations leading to the Monterey Agreement "began as an answer to a single but critical problem in managing the SWP: how to allocate the available water supply equitably during times of shortage," they "grew into

an omnibus revision of then SWP long-term contracts and their administration…" requiring "major contract modifications…"

Bulletin 132-95 summarized the following contract changes intended to allow local water agencies to "maximize existing facilities" (although new facilities were clearly contemplated in the case of Kern Bank):

- "transfer control of the Kern Water Bank property to the agricultural contractors
- provide for permanent sales of water among contractors
- provide more flexibility in using certain reservoirs for local use
- Implement a simpler program for interruptible water supplies
- provide new rules for transportation of non-SWP water to contractors
- provide new rules for storing water outside a contractors [sic] service area"

Another contract change—adopting "new rules" allowing contractors to turn back water and creating a turnback pool for water sales—was presented as increasing "reliability of existing supplies:"

So far, preliminary analysis of growth inducement in this Draft EIR has selected only one of the above seven changes—"permanent sales of water among contractors" as a possible source of induced growth (or environmental impact more generally). Implicitly and without real analysis, DWR finds no effects on Delta exports from the rest of the contract changes, although they were negotiated primarily by the two largest export recipients. On the contrary, we suggest that all of the above "major contract modifications" allowing local agencies receiving water deliveries from SWP to "maximize existing facilities," plus the turnback provisions, will likely tend to increase Delta exports and to affect the distribution and timing of exports and deliveries.

Furthermore, B-132-95 reported that "In the future, other agreements will be negotiated to transfer water from willing sellers to willing buyers—**an action made possible by the [Monterey] agreement.**" (emphasis added) Contractors have speculated in our meetings that at least some post-Monterey transfer activity probably would have happened without Monterey. We question of whether such agricultural-to-urban transfers could ever have become feasible on a large scale while the Table A amounts in question remained subject to pre-Monterey cutbacks under article 18(a). Furthermore, DWR's recent description of the intention to arrange transfers "made possible" under the new authority of the Amendments raises the question: What has been the historical record of transfer activity and reliance upon potential future transfers prior to and after Monterey?

30-107 (con't.)

Monterey Amendment Changes with Growth-Inducing Potential

A brief perusal of recent DWR activities and DWR and contractor documents suggests that the EIR can find ample evidence of Monterey-related potential for growth inducement, growth accommodation, and environmental impact. Although this list may not be exhaustive, it is illustrative of the need for DWR to broaden its discussion of the Monterey program's growth-inducing potential.

30-108

1. Kern Water Bank: DWR has maintained that development of The Kern Water Bank by the state was stalled at the time of Monterey and that, despite millions of dollars of investment, it would not have gone forward. Nevertheless, the Bank was rapidly developed after Article 52 of the Monterey Amendments authorized its fee simple transfer in exchange for the relinquishment of paper entitlements. It has since become a significant factor in Southern California water operations and planning. This EIR should assess the effects of its operations, based on historical records of all activity related to the Kern Fan Element or infrastructure created to service it and connect it to other water conveyance and storage facilities, and contrast those effects with the baseline (no Bank) condition and with a state-operated alternative. In general, it seems clear that the use of the Kern Bank to store otherwise un-storable exports during wet periods and to bolster dry-year deliveries—along with the pro-groundwater storage and pro-transfer provisions of Monterey clearly—increases overall average exports, exports during wet years, and dry year deliveries.

30-109

Also, it has come to our attention that code has been developed to model Kern Water Bank within CalSim II as part of DWR-led efforts to investigate new storage proposals. We were previously informed that developing Kern Bank modeling code was too time and resource intensive to be feasible for our Monterey Plus EIR purposes. If DWR decides to use CalSimII for this EIR, the effects of modeling potential future KWB effects on exports and particularly multiple-dry-year supplies (rather than simply post processing) should be made explicit. KWB effects depend in part on KWB operations. Current modeling depicts KWB as a receiving bank, without export capability assumptions. Even this modeling shows increased Delta export deliveries, particularly in combination with any new NOD storage. Reported prior DWRSIM modeling conducted for state KWB investigations may have included operational assumptions. New operational scenarios are being developed for a July modeling meeting on new storage proposals. Public documents suggest that DWR-funded improvements to groundwater banking infrastructure in Kern County are creating the capacity to export 300 TAF in a single year. Since KWB modeling work has been proceeding in parallel with the Monterey EIR process, DWR should ensure that this modeling carefully incorporates Monterey purposes.[1]

30-110

2. Groundwater banking: The Monterey Amendment groundwater banking provisions extend beyond the Kern Bank. Article 56 (b) states that "The [Resources] Agency shall cooperate with other contractors in the development and establishment of groundwater storage programs." Article 56(c) includes a table outlining potential amounts of water that could be stored under these provisions under certain conditions, although DWR has emphasized that the Monterey Amendments set "no limits on groundwater storage of SWP water outside a contractor's service area." The Resources Agency has spent considerable public funds helping develop groundwater storage and related conveyance capacity. The facilitation of this capacity and its use for Article 56 (c) purposes ("Storage

30-111

[1] Similarly, ongoing DWR/BOR efforts to model the effects of climate change should be incorporated into the 2005 SWP Reliability Report required by the Monterey Settlement Agreement.

of Project Water Outside of Storage Area") should be assessed from the historic record and from grant documents, and should be assessed for potential increased future use.

30-111 (con't.)

3. Turnback pool: DWR must explain the impact on exports for the Turnback Pool provisions of the Monterey Amendments. Article 56 of the Amendments established a process for contractors to sell their project water via a turnback pool. During the 18 years prior to the Monterey Amendments, turnback pool deliveries occurred only once—114 TAF in 1987. In the other 17 years, there were zero turnback pool deliveries, so average turnback deliveries prior to the Monterey Amendments were about 5 TAF per year. Starting immediately after the Monterey Amendments, turnback pool deliveries have been made in every single year from 1996 to 2004. These deliveries have averaged about 100 TAF per year and have ranged as high as 282 TAF in a single year. Put another way, turnback deliveries are on schedule to total about 1 MAF in the decade after Monterey, while they totaled about 1/10th that amount in the decade before Monterey. These deliveries must be accounted for in the Monterey EIR growth and environmental impact analysis:

TURNBACK POOL DELIVERIES (From SWP Reliability Report and recent notices to contractors)

Decade Before Monterey		Decade After Monterey	
1985	0	1995	0
1986	0	1996	174,909
1987	114,907	1997	62,544
1988	0	1998	75,000
1989	0	1999	217,437
1990	0	2000	282,305
1991	0	2001	18,140
1992	0	2002	45,252
1993	0	2003	29,770
1994	0	2004	17,240

30-112

The Amendments also included a provision allowing contractors to temporarily reduce Table A entitlement amounts and receive associated rate reductions. Have these provisions been implemented, and if so have they been coordinated with the turnback pool? If so, the net effect may have been to increase overall demands and ultimately overall deliveries.

4. Carryover Rules: According to Bulletin 132-96 Chapter 10, "Rules for carryover in SWP surface conservation reservoirs are expanded, allowing storage by contractors from year to year when space is available. Within certain constraints, SWP water may be stored year-to-year in non-SWP surface storage facilities outside a contractor's service area for later use within the service area." During the eight years of post-Monterey data

30-113

available from the Reliability Report Appendix D, contractors received an average of 117 TAF in carryover deliveries, versus 70 TAF per year during the ten pre-Monterey years. This represents a 67% increase in annual average increased carryover activity. Could this activity expand in future years? What is record of out-of-area storage?

Similarly, Bulletin 132 reports suggest the following non-project water received by contractors post-Monterey through SWP:

’02 117 TAF
’01 113 TAF
’00 79 TAF
’99 25 TAF
’98 99 TAF
’97 ?
’96 ?

It appears that these deliveries were facilitated by the Monterey Amendments, since B 132 reporting prior to the Monterey Amendments does not separately report non-project water deliveries to contractors. What is the potential for such deliveries to continue and/or expand?

30-113 (con't.)

5. Drought Planning and “Flexible Management”: Shifting from state records to those assembled by state water contractors, MWD drought planning documents suggest an increasing reliance on the “flexible management” provisions of Monterey, raising several questions: (1) what is the magnitude of increased SOD supply from Monterey and (2) what are its environmental impacts and reliability?

The 2003 Met “Blueprint for Water Reliability” outlines several seemingly Monterey-related future delivery sources (see Appendix C of this document):

- Met relies on 26-129 TAF of San Luis carryover deliveries in different year types under the currently-applicable Monterey carryover provisions. Again, this suggests that Monterey carryover provisions have had an effect on deliveries. What is the reliability of this water supply, given known historic carryover amounts?
- The Blueprint outlines a “California Aquaduct Dry-year Transfer Program,” which relies on banking a portion of 180 TAF per year of Kern Delta pre-1914 Kern River water and 25.5 TAF of Kern Delta SWP Table A water, to be delivered later during droughts at up to 50 TAF per year. While separate environmental documentation was prepared for the operation of drought water banks in 1993, this plan seems to rely on or be facilitated by the Monterey language negotiated during the following year which increased the ability to transfer non-project water through SWP facilities, facilitated exchanges, and possibly other “flexible management” provisions. What other transfer programs implemented by MWD or other

30-114

contractors benefit from Monterey? Is the net effect of these programs to increase dry-year reliability, and if so, by how much?

- Non-project water transfers are also apparently assumed for a dry-year spot market purchase program that secured 167 TAF in 2003. This non-project water transfer ability also may have been aimed at potential transfers of CVP water. As Met points out, under the 1992 CVPIA, which closely preceded the Monterey negotiations, "water agencies, such as Metropolitan, may for the first time be able to acquire a portion of the Central Valley Project's 7.8 million acre-feet of supply."

30-114 (con't.)

These examples suggest some ways in which Monterey's "omnibus" revision of state contracts may significantly affect current deliveries and water agency plans for the future. We hope that DWR will make a thorough and convincing effort to explore the potential effects of these provisions on the timing and amount of exports, deliveries.

Regional Growth Assessment

To provide an informative and lawful assessment, DWR must go beyond convincingly explaining the effects of the Amendments on water supply. With respect to growth inducement, the Court of Appeal in *Planning and Conservation League v. Department of Water Resources* emphasized the State's responsibility and unique purview for purposes of growth analysis and related environmental impacts analysis. For instance, the state can easily compare water use efficiency in different geographical regions and jurisdictions throughout the state (for example, a brief web search indicates that Santa Barbara uses about 150 gallons per capita per day, while Fresno uses about 330—new growth in either location probably uses a different amount). DWR collects per capita water use efficiency data for the B-160 and B-166 processes.

It would be most helpful to focus on data deriving from new and recent growth, rather than overall average per capita water use, since growth is the issue here. DWR should thus indicate the actual range of water use efficiencies for recent new growth in the state's various jurisdictions. Water use efficiency in the particular areas receiving Monterey transfers should be compared to this range, and should also be used to calculate potential growth inducement estimates. The reason for DWR to use this or other methods to estimate growth inducing impacts is that only the state has the overview of different possible efficiencies with which water could be used, and this level of efficiency affects both the amount of growth induced and the state's overall water planning. As the state decides how to allocate limited water resources to a range of purposes (supply, reliability, environment, and recreation, for instance), water use efficiency affects its ability to balance these important purposes.

30-115

Growth-related environmental impacts go beyond water use. In each geographic area and jurisdiction, recent growth has a characteristic footprint of per-capita land use, energy use, traffic and related motor vehicle fuel use, air emissions, and the like. As with water use efficiency, the state also has access to statewide data on the range within which these kinds of environmental impacts can occur. Some types of growth use more land, energy,

and water per capita than others, or create more impervious surface. What is the range? Where does Monterey-induced growth fall in that range? What is the trend for expected growth supported by Monterey-related water supplies? What are the implications for habitat, air quality, hydrology and water quality? What are the implications for drought reliance on SWP and other supplies?

Agricultural Cutbacks Changed to Ag and Urban Cutbacks:

The Monterey Amendments' abandonment of automatic agricultural cutbacks—and reliance instead on equal cutbacks to agricultural and urban contractors—on its face altered drought reliability for existing urban customers at the time of the implementation of the Amendments. As suggested above, the reliability of urban water supplies is one important element in how much urban development can be sustained. The EIR should explain how this shift away from ag-only cutbacks affected supply reliability for existing urban areas and what its implication is for growth. Furthermore, if the suite of Monterey changes increased water supplies to urban areas, thereby inducing growth, but the elimination of ag-only cutbacks eroded reliability, the Monterey Amendments may have led to a more volatile urban SWP water supply. These are basic issues that must be addressed in any EIR analysis of the Monterey Amendments.

CalSim II and Growth Assessment

Thus far in our discussions, DWR has signaled an intention to rely upon CalSim II simulations for several EIR-related purposes. As detailed elsewhere, CalSim II was recently reviewed by a scientific peer review panel that suggested that it lacks needed calibration and validation and that it systematically overestimates available exports. At the minimum, DWR must therefore should document potential sources of error within CalSim II and its data inputs, and where possible, provide estimates of the range of error that could be derived from these potential error sources. If DWR cannot accurately pinpoint likely sources and magnitudes of error, it must identify possible sources and ranges of error—a "ballpark idea" of how accurate the model is and where uncertainties lie. Also, DWR must clarify if, and how, the provisions of Monterey are reflected in CalSim II. For instance, how does CalSim II account for the non-project water, turnback water, carrover water, and transferred and ground-banked water envisioned under Monterey's provisions?

30-115 (con't.)

"Paper Water" and Urban Water Management Plans

UWMP's: One tool to explore the possible growth inducing effects of "paper water" may be UWMP data. While there are hundreds of UWMP's, an appropriate subset of the total could provide a window into local plans to rely on SWP water (in choosing this subset, DWR should check to see whether non-SWP contractors are relying on supplies from SWP contractors either in average or drought years). For instance, how much SWP water do local agencies plan to use during the multiple-year drought scenario? How does this planned amount of SWP water compare to what will likely be available during an extended drought? Will that reliance hold if climate change exacerbates droughts? We

are aware that UWMP's often omit data. By choosing a manageable subset of UWMP's, any key missing pieces of data can be requested from the responsible agencies. We have provided further comments on UWMP's in our comments on paper water.

Conclusion

In sum, plaintiffs are concerned that DWR's preliminary attempts so far to probe growth inducement and other environmental effects of the Monterey Amendments have fallen far short of a thorough and convincing effort. The most sweeping "major contract modifications," negotiated against the backdrop of the Bay Delta Accord and the maturing of SWP water demand during a lengthy drought, have so far been found to have little effect despite the apparently vigorous and far-ranging operation of their provisions. We look forward to a more searching analysis.

30-115
(con't.)

COMMENTS ON CHAPTER 9 OF THE EIR

July 3, 2005
By: Arve R. Sjovold

General:

Chapter 9 is titled "Water Supply" but gives the strong impression that anything that does not find its way into impacts in this chapter will probably not find any further analyses in the rest of the document. This is especially evident in the nature of the text throughout the document where impacts on supply have simply morphed into "impacts." Given that the objective of the EIR is to analyze environmental impacts, it is curious to have a full chapter devoted to water supply impacts as if that were the *sine qua non* for impact analysis for this project. The fundamental assertion (or assumption) driving this chapter seems to be that if the project doesn't change the amount of water exported from the Delta then there can be no environmental impact. This is of course too simple-minded to be taken seriously. Furthermore, there is substantial data to suggest that project operations do in fact alter project supplies beyond the quantitative analyses shown in the draft. 30-116

However, the main difficulty, even for the restricted scope of water supply impact analyses, is the fact the main quantitative tool seems to be incapable of addressing the effects of many of the Monterey Amendments provisions. It is also noteworthy that the draft, in characterizing the tool CALSIM II, acknowledges that many of the presently necessary environmental constraints on project operations are not included in the model (e.g. the Endangered Species Act).

A critical difficulty is that the structure of this model, which is being erroneously passed off as a "simulation," is in fact an optimization model in which the objective function is to maximize exports subject to the few constraints that are included in the model. A true simulation would be able to produce as output information that could be used to deduce environmental impacts as a function of different operational scenarios. What we have here is the exact opposite; a model that produces a maximum export quantity for a given, fixed environmental constraint. This model is not what should be used to study the environmental effects of the project and its alternatives. 30-117

The model is also suspect because it has not been calibrated and DWR has refused to do so even after being put on notice over 4 years ago. Even an international set of experts that performed a peer review of this model stated that it should be calibrated if it is to be used for such purposes as environmental impact and reliability analyses. As it presently stands, the model predicts average deliveries of 1 MAF more than has been demonstrated in the past 10 to 15 years. A calibration would reveal where in the model the calculations allow such a result and point the direction for correction. A 1 MAF error is a 50% error and with this magnitude of error it is unduly dangerous to rely on its relative accuracy for comparison of results with different scenarios. In short, this model is an improper tool for impact analysis and its results should not be made part of the EIR.

The model is said to simulate the hydrology of the Sacramento River watershed. This is an overstatement. Fully 80% of the input to the so-called hydrologic simulation is

in fact gauged river runoff from the rivers as they exit the mountains. The only thing simulated is the rainfall and water use on the agricultural lands in the valley. Accordingly, a calibration of even this sub-model would contain 80% of the amounts of water in question of both sides of the calibration; the model's calculations and its comparisons to the historical record.

There are other first order problems with the CALSIM II model. One, which is not of their creation but the nonetheless is vital to the model, is the use of water year categories derived from the Water Year Index, which I believe was first promulgated for the purposes of water quality regulations in the Delta by the State Water Resources Control Board (SWRCB). It can be readily shown that the scientific bases for these designations are fatally flawed. (See my piece, "RESPONSE TO THE INFORMATION PRESENTED IN THE 'Inventory of Water Year Types in CALSIM II'") In that study, it was also found that the use of the SWRCB indices in CALSIM II gives the so-called simulation advance information of the coming water year in a manner that can never be realized in actual operations. This advance information deals primarily with establishing the water quality constraints on the project. The simulation assumes that if those constraints are satisfied the calculated exports by the optimization methods are reasonable. It is the same as saying; "If we knew how the water year was going to turn out, we could easily manage to export more water than we do under the actual uncertainties that appear to the project operators." That is not a correct assumption upon which to base environmental impact. Since SWRCB regulations are the result of hearings on the evidence at the time demonstrating the need for such regulations, they cannot be taken as any absolute standards for constraints. In the case of the present regulations, they were promulgated when the project was diverting around 2 MAF per year and are based on the observations of undesired effects at that level of diversion. To now assume that those same standards are adequate to protect the Delta when diversions are predicted by CALSIM II to increase by 50% on average has no basis in fact. Indeed, it is the object of this EIR to analyze such impacts and find what changes in the constraints will be necessary to protect the Delta. This analysis does no such thing and therefore fails in the most fundamental requirement of all environmental impact analysis.

30-117 (con't.)

It is also noteworthy at this time to mention the very serious concerns with potential collapse of the basic Delta ecosystem. The very recent and precipitous decline appears to be correlated with changes in the pumping regimen since about year 2000. Could this be a consequence of the Monterey Amendments? The draft should address this very real concern.

Having stated my general concerns with the draft Chapter 9, I now turn to more specific comments on the actual text page by page.

Page 4

Why is the hydrologic record for CALSIM II runs now only 67 years? Previously it was 73 years and there are even data for 102 years. In the middle of the second paragraph the draft asserts that "The Settlement Agreement commits the Department to various actions, but with a single exception these actions do not affect SWP and SWP contractor operations." This cannot be so if we accept that the changes in urban and agricultural deliveries to contractors will cause at least some contractors to change

operations to incorporate changes in deliveries into their Urban Water Management Plans.

Page 5

At the top of the page, the reference to operations being more complex than can be simulated by CALSIM II or any other model appears to be mere assertion. Can DWR provide some data or context for this statement? It is inadequate for DWR to relegate new water management methods to qualitative methods at this time. They must show why their chosen quantitative tool, CALSIM II, cannot do the job. If it is a problem because CALSIM II doesn't have the fidelity to quantify such management methods then it is tenuous to assume that it has the fidelity to find supply impacts of the very small orders cited on this page as the thresholds of significance.

The draft needs some rationale to justify the chosen levels of significance. Here, they just appear out of thin air. This is not acceptable. It would also be desirable to list some standards for thresholds of significance for environmental impacts.

30-117 (con't.)

Page 6

The first sentence engages in a little hyperbole. There are two years in the record where the project delivered substantially less than 1 MAF. The reference to Central California as a source of supply is also an exaggeration since the SWP has no dams on the Central Sierra streams.

The third paragraph refers to 25 contractors for 1994; I thought there were 29. Which contractors are they excluding? This paragraph also refers to Table WB-1. the table appears to be correct for 1994 but the values for Table A for 2003 and 2020 are unrecognizable. The values for 2003 do not correspond to the values in the table in Appendix C of the SWP reliability report which are supposed to be for 2001. We know of no transfers or other adjustments that could have occurred in that two year interval. Also the values for 2020 seem portend some significant changes from the present. Where did these originate. The reduction of 100,000 AF in MWD's allocation for 2020 is unexplained, and there are others. In fact, this would be a good place to include a careful compilation of all the transfers that have been recognized by the settlement agreement. Some explanatory arithmetic would be helpful. Table WB-1 also needs to present those numbers that are truly operational for impact analysis. For example, the San Luis Obispo allocation is shown as 25,000 AF. That is correct for certain financial calculations, but is absolutely wrong for water supply operations. San Luis Obispo County has acquired only 4800 AF of capacity in the Coastal Aqueduct which therefore represents its maximum demand function for the purposes of delivering water. It is known that CALSIM II assumes in its calculations that each contractor's maximum Table A is the demand function, except for KCWA and MWD, that the model tries to satisfy. If that is indeed the case, any CALSIM II calculation based on 25,000 AF for San Luis Obispo County would deliver water that could not be physically carried through the aqueduct.

30-118

Page 7

30-119

The very first full paragraph in the page refers to Table WB-2 and it is very puzzling as to how this information is to be used. With respect to entities like Santa Barbara County, its citation that the County relies 100% on SWP deliveries is ill informed. The County is not a water wholesaler for all the County's water. It is only an intermediary for SWP water. Each of the subscribing entities within the County have a number of other local sources and at this time SWP is not the major source except for Santa Maria City. I am not sure what to make of this table for the purposes of impact analysis. It could be very fruitful if DWR were to make comprehensive investigations into all users of SWP at the retail level to establish accurate demand functions for SWP water rather than merely assuming that maximum Table A allocations will be delivered whenever the water is available to be pumped from the Delta.

Page 9

The statement concerning CCWA's management authority for San Luis Obispo County's Table A allocation is in error. CCWA only manages 4800 AF of the County's Table A. Under Santa Barbara County, the statement alleging that CCWA delivers treated and untreated water is not correct. CCWA had constructed a regional treatment plant that necessarily treats all SWP water delivered to both San Luis Obispo and Santa Barbara Counties.

Page 13

30-119
(con't.)

The bottom paragraph dealing with the CVP does not mention how much water the CVP delivers to the Sacramento Valley, including settlement contractors.

Page 14

The first paragraph states that the CVP and SWP divert about 8MAF from the Delta. This is not correct. According to historical records the correct amount is about 5 MAF. Even a 1994 DWRSIM run predicted that together they would average approximately 6 MAF over the 73 year hydrologic record. That includes an average of nearly 3 MAF for the SWP which it has never attained in practice.

Page 15

The second paragraph dealing with MWD's Diamond Valley reservoir deserves more detail. Since Diamond Valley has come online post Monterey it would serve a useful purpose in the impact analyses to demonstrate how it may benefit from Monterey's provisions, and it would be extremely enlightening to provide data on how and when it was filled. It is possible that it was first filled during the middle of the State's energy crisis and it would be informative to show how the project interacts and impacts the State's energy requirements over time.

Page 16

The second full paragraph states that the maximum delivery for SWP occurred in 1990. According to the record it was 1989. It is also not necessary to speculate about whether the period 1995 through 2001 was wetter than normal since DWR has the data in hand to resolve this conjecture.

For the third paragraph, it would be extremely useful to any reader if arithmetic calculations were presented to show how allocations were determined before and after Monterey.

In the fourth paragraph it is puzzling why the period 1999 to 2004 was chosen for presentation of allocations of selected contractors. It would be more useful if rationales for the selection of contractors and that particular period were presented. The year 1999 is 3 years after Monterey went into effect.

For all of page 16 it would be very useful to present in a table the yearly requests made by the contractors, which requests after all drive the system's actual operations and its allocations.

Page 17

The first paragraph dismisses the transfers to Napa and Solano counties as too small for significance. This is of course false on its face. The amounts transferred are in excess of the percentages cited upfront in the draft as significant thresholds. All the statements of changes in allocations need to be backed up by showing the arithmetic by which the changes were derived.

The third paragraph seems to suggest that analysis of impacts need go no further than citing a collection of anecdotal examples. This is inadequate.

30-119 (con't.)

The last paragraph is too quick to dismiss the importance of the historical record. In fact, the only reliable predictions we can make at this time must be based on the historical record as far as it can take us since the CALSIM II model is too flawed to develop such predictions for environmental impact analysis.

Page 18

The first paragraph again refers to the 67 year record. We have already questioned why the record for these analyses was reduced from 73 years.

The second paragraph asserts that the increase between 1994 and 2003 shown in Table WB-5 is due to increased demand. Without contractor requests for this period it is facetious to make such a claim. In fact, it would be very illuminating to show actual contractor requests for these years along side the demand functions assumed for CALSIM II.

The fourth paragraph states the amount of Table A transferred under Monterey between 1994 and 2003 as 114 KAF. This is not in accord with the Settlement Agreement (which is supposed to be the context for this EIR) which specifically states that the 41000 AF transfer from KCWA to Castaic is not included in the list of transfers assumed to be final.

The last paragraph again dismisses the changes in allocations due to transfers as not significant. Clearly, the amount for Castaic, with or without the 41,000 AF, is greater than the level of significance cited early in the draft.

Page 19

New management practices set into motion by Monterey are not included in the CALSIM II calculations. With regard to reservoirs Castaic, Perris, and San Luis, the draft needs to verify that these management practices will not compromise the primary purposes of these reservoirs. The initial requirements for these reservoirs stated that they were all for operations of the project, not for conservation. The uses to now be allowed by Monterey seem to change that requirement and it is not at all certain that these new uses will not impact the primary operational requirements. In the particular case of the San Luis Reservoir it is not obvious how it can serve to provide carryover storage when it is so essential to just maintaining promised in-year deliveries.

Pages 20 to 34

I have not performed critical review of these pages as yet.

Page 37

Figure WB-1 needs to identify what the percentages refer to. It is not at all obvious.

Page 38

The same criticism as for page 37

Page 39

The columns for 2003 and 2020 are not substantiated or accurate.\

Page 40

The purpose of this table is obscure. Also the entry for Santa Barbara County is very misleading. Also it seems that there should be no need to present only a partially filled table; aren't there urban water management plans that could be use as refernces?

Page 41

Why does the table stop at the year 2001? Surely there are data in hand for years 2002 and 2003. 2003 is interesting because it is one of their chosen scenario years.

Page 43

Since the title of the table refers to the historical analysis of the effects of Monterey on Table A allocations, it seems natural to ask what happened to the years of

30-119
(con't.)

1996 through 1998? Also the table presents in one evaluation, the combined effects of transfers and allocations. Not all transfers occurred in the same year.

Page 51

The amounts shown for storage outside of service areas deserves more explanation as to how this process works. For example, storage by entities north of the water banks in Kern County don't actually retrieve stored water from the bank, so it must be done by exchange of Table A allocations. Thus, water stored in Semitropic's bank can be taken by having some of Semitropic's allocation diverted to the more northerly entity and Semitropic can claim an equal amount for its own use. By that logic, Semitropic should never store more than its maximum annual Table A since calls for more than that amount from the bank cannot be met by exchange of Table A amounts. In the table it seems that Semitropic has actually stored more than its maximum Table A for entities north of Kern. This needs further explanation.

30-119
(con't.)

Page 52

Before the data in Table WB-10 can be of any use, it will be necessary to show how, operationally, carryover storage in San Luis Reservoir is managed without impacting its traditional operations and also those of the CVP.

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PLANNING AND CONSERVATION LEAGUE

TO: DWR
FROM: PCL
DATE: July 6, 2005
RE: Draft Chapter 9 and Related Considerations

This memo provides a broader response to Draft Chapter 9 in addition to comments provided on the provided form. Also, we have included an attachment suggesting related considerations that should be included in the EIR.

Draft Chapter 9 attempts to quantify the project's water supply impacts on individual contractors, with an eye towards later growth inducement analysis. The results outlined in this Chapter will inform other chapters addressing hydrologic and biological impacts, Kern Water Bank, energy impacts and potentially other project impacts, because each of these topics involve the amount, timing and location of water exports and deliveries. We are thus concerned to ensure the completeness and accuracy of the assumptions and results in this Chapter.

30-120

The Chapter includes two types of analysis: (a) results from Calsim II studies and (b) qualitative findings from non-Calsim analysis.

The Calsim II analysis is focused on changes in the distribution of deliveries between various agricultural and urban contractors. It is built on the assumption that the overall amount of these Calsim deliveries is the same before and after the Monterey Amendments. As the Chapter admits, Calsim does not incorporate key Monterey Amendments provisions (or others, such as Kern Water Bank, increased conveyance of non-project water and borrowing from terminal reservoirs).[1] Thus, any computer-modeling-based conclusion that the un-modeled water management and storage provisions have little or no effect on supply is circular.

The non-Calsim analysis focuses on some (but not all) of the new water management methods created by the Monterey Amendments, such as increased out-of-area storage, carryover storage, and the turnback pool program. As the Chapter admits, Calsim does not incorporate these key Monterey Amendments provisions. Neither Calsim nor the non-Calsim analysis incorporates Kern Water Bank, increased conveyance of non-project water, borrowing from terminal reservoirs, and possibly other relevant contract provisions.[2]

30-121

As mentioned in the draft Chapter and discussed in the June 15, 2005 workshop on this chapter, these management provisions likely increase Bay Delta exports. As such, they will affect SWP deliveries and CVP diversions (for instance, due to storage of section 215 water in Kern County groundwater banks).

30-122

[1]. Calsim II "...simulates some provisions of the Monterey Amendments...but not the new water management practices."
[2]. Calsim II "...simulates some provisions of the Monterey Amendments...but not the new water management practices."

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We have several concerns about this approach:

(1) Calsim modeling that does not incorporate Monterey provisions cannot accurately reflect implementation of Monterey. The Calsim results presented are the most numerically clear results in the chapter. But that clarity is misleading because the Calsim results do not address key Monterey provisions and include no measure of uncertainty. This is the wrong foundation for later growth impacts analysis or other analyses..[3].

30-122 (con't.)

(2) DWR should develop a numerical range reflecting the potential water supply impacts of each of the Monterey water management provisions, including Kern Bank. The stated approach of this EIR is to present parallel analysis, where possible, based on historic records rather than projections from the un-calibrated model that does not include key Monterey provisions. This chapter presents some historical data, but little analysis based upon it. For instance, as suggested below, extensive records exist of groundwater banking and water marketing activities promoted by Monterey. From these records and known physical capacities of facilities, some range of potential supply impacts should be derived. Any estimated amounts of increased SWP or CVP exports and diversions must be included in the water supply, growth, energy and other environmental impacts analysis.

(3) The EIR also must estimate the range of potential future effects of these practices..[4]. The "Future Impacts" segment of this draft finds that future increased SWP deliveries are "affected very little by the change in terms of the SWP contracts brought about by the Monterey Amendment."

30-123

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[3] The Ninth Circuit court of appeals recently ruled that such non-disclosure of known uncertainties or assumptions renders a model-based environmental study legally defective. *See Lands Council v. Forester of Region One of the United States Forest Service*, 395 F.3d 1019, 1031-32 (9th Cir. 2004). The court wrote that

> [t]he Forest Service's heavy reliance on the WATSED model in this case does not meet the regulatory requirements because there was inadequate disclosure that the model's consideration of relevant variables is incomplete. Moreover, the Forest Service knew that WATSED had shortcomings, and yet did not disclose these shortcomings until the agency's decision was challenged on the administrative appeal. We hold that this withholding of information violated NEPA, which requires up-front disclosures of relevant shortcomings in the data or models.

Just like NEPA, CEQA demands disclosure of uncertainties, and DWR should not present as exact, or rely upon to show an absence of impact, outputs from a model that does not consider crucial variables, and that is not capable of producing exact outputs.

[4]. The draft points out that some provisions, such as the turn-back pool, may not be used under a 2020 scenario due to the potential growth of Table A demands. However, the recently-released 2005 State Water Plan projects that water demand may stay about the same or even decline over the next twenty years largely due to reduced agricultural demand. Under this scenario, turnback pool operations would continue to be relevant. Even if turnback phases out, DWR should estimate that magnitude of turn-back pool use during the period that it is used.

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Again, this conclusion is reached based on Calsim runs that the draft admits do not reflect several Monterey provisions and that, as the draft admits, could affect deliveries. This EIR must quantify the range of potential affects, as they might be used in combination with each other and with existing and planned physical improvements to storage and conveyance capacities available to SWP contractors.

30-123 (con't.)

(4) As mentioned above, this chapter does not address a key part of the Monterey Amendments—the Kern Water Bank. While KWB may be addressed elsewhere in the EIR, it is obvious that increased available storage—whether controlled by SWP or not—affects the potential for contractors to receive deliveries, particularly in combination with the other Monterey Amendment provisions intended to facilitate the use of such facilities. This EIR must address head-on the Monterey Amendment's facilitation of a growing water market and its effects on the amount and timing of exports.

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ATTACHMENT A

This Attachment expands upon themes outlined in our memo of March 15, 2005. It also may assist in the preparation of analysis of the Kern Water Bank, which was explicitly excluded from the first draft EIR water supply chapter 9, and which must be analyzed for that chapter.

In our earlier memo, we pointed out that, while DWR and SWP contractors have maintained until our June 15, 2005 meeting that the Monterey Amendments did not change the amount of water exported from the Bay Delta, water delivery records suggest that Monterey affects the amount and timing of Bay Delta and San Joaquin diversions. Yet, DWR continues to rely upon Calsim II analyses that assume no increased water diversions as part of Chapter 9 water supply analyses..[5].

Relying largely on B-132 records of actual deliveries, our prior memo highlighted evidence of increased carryover, turnback, and non-project exports under Monterey Plus operations. We also urged DWR to search historic records of all deliveries and exports from Kern Water Bank and other groundwater storage operations for evidence that groundwater banking provisions of Monterey Plus allowed increased exports, potentially fostering growth. Finally, we suggested that the management flexibility provisions of Monterey likely enhanced contractors' ability to accept new Monterey Amendment categories of water and to use KWB and other available groundwater and surface storage methods—all with the result of increased overall exports and increased water supplies during droughts, when growth inducement concerns are most salient.

30-125

This memo provides further evidence that Monterey Plus provisions have encouraged increased Bay Delta water exports. It also suggests that they have affected water resources otherwise available to the San Joaquin River. This evidence is a small and almost random sampling (what can be gleaned from a brief internet search) of the data relevant to this topic. Through its own records and those of its contractors, DWR has the ability to develop a much more complete picture of the magnitude and timing of export, water marketing and groundwater banking activities under Monterey Plus. This task remains critical to the validity of the EIR.

At the March 2005 EIR meeting, DWR presented a 5-year analysis of historical Table A allocations under the Monterey Amendments. That analysis concluded by promising to "Review other historic data

[5]. DWR has produced spreadsheet results analyzing some no-project scenarios of Kern Water Bank operations based on a 1990 state plan for operating the bank. These scenarios do not address with-project current and future potential operations of the Bank. For instance, DWR's analysis assumes that the bank initially could hold 350,000 AF and eventually 500,000 AF. However, in 2000 KCWA reported to DWR that the bank held 870,000 AF. The DWR spreadsheet analysis assumes that the Bank can recharge and recover water at 15,000 AF and 6,200 AF per month, respectively. KCWA reported in 2000 that recharge and recovery capabilities for KWB are 450,000 AF and 287,000 AF per year, respectively, or up to 380% of the rates assumed in DWR's no-project analysis. As noted throughout this memo, DWR should examine actual operations of the Bank and explore the potential for these operations to intensify in the future, including realistic parameters for Bank operations.

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for inclusion in the historical analysis." In that spirit, we urge a thorough exploration of the water marketing, groundwater storage, management flexibility provisions of the Amendments and their effect on SWP/CVP exports and the growth and other activities it supports.

30-125 (con't.)

INDEPENDENT STUDY FOR DWR FINDS THAT MONTEREY AMENDMENTS INCREASED WATER MARKETING:

In 2002, the Public Policy Institute of California prepared a report "for presentation to the Department of Water Resources" entitled "California's Water Market by the Numbers."[6].

The author, Ellen Hanak, found that "In 1994, contractors of the State Water Project (SWP) concluded negotiations for the 'Monterey Agreement,' which included a number of measures to make it easier for contractors to transfer water to one another."

She presented the following series of water transfer amounts within SWP:

30-126

	AF Transferred Within SWP	
1985	15,489	
1986	7,950	
1987	6,171	
1988	300	
1989	2,691	
1990	3,561	
1991	2,696	
1992	4,919	
1993	197	
1994	1,726	
1995	4,500	
1996	207,496	[←First Full Year of Monterey Amendments]
1997	66,144	
1998	201,810	
1999	241,390	
2000	286,305	
2001	18,240	

[6]. "California's Water Market by the Numbers," Public Policy Institute of California, 2002, see the front cover of the report for the quote.

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She attributes the apparent increase in water sales and transfers to state and federal intervention, particularly the Monterey Amendments:

> … the size and scope of the [water] market are strongly influenced by the intervention of state and federal authorities. This influence stems not only from an important direct role in purchases, but also from the relative ease water users have in gaining approval for transfers within the confines of the state and federal projects. Since 1988, direct government purchases have accounted for nearly one-third of the total volume traded. Transfers among contractors within the same projects (SWP, CVP and the Colorado River Project) account for more than half of all water sold (Figure 2). Transfers within the CVP and the SWP have generally increased in response to the more flexible trading rules adopted by those projects in the early 1990s. **The growth has been most pronounced within the SWP, for which internal transfers were rare prior to the Monterey Agreement.** [emphasis added]

Hanak specifically mentions the turnback pool created by the Monterey Amendments, as follows:

> It is nevertheless interesting to note that the post-Monterey introduction of "turn-back" pools within the State Water Project has made a significant amount of urban agency water available to agricultural users in wet years. Under the program, SWP contractors are able to sell back amounts of project water they will not need if there are willing SWP buyers. From 1998 to 2000, the turn-back pool generated 200,000 acre feet or more of water per year, or roughly one-fifth of total market supply.

30-126 (con't.)

While most water transfers are local or regional, Hanak finds that "the only 'exports' are the turn-back pool, purchased by San Joaquin valley agricultural districts."

Again, most of DWR's data presented so far assumes that the Monterey Amendments did not lead to quantifiable increased water diversions by SWP or CVP. Yet, water transfer and marketing activities assisted by the Monterey Amendments and involving hundreds of thousands of acre feet of water per year either (a) increased diversions, (b) kept them exactly the same, or (c) decreased them. It is difficult to believe that the water marketing summarized by Hanak and reported to DWR just prior to the initiation of this EIR led to lower exports, or that export levels coincidentally have turned out to be exactly the same. Rather, the vigorous marketing activity involving SWP's largest export recipients and major new storage facilities likely reflects increased exports. We urge DWR to begin quantifying the range of potential impacts of this activity.

KERN BROCHURES REINFORCE HANAK'S REPORT TO DWR:

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Brochures currently distributed by KCWA announce that its groundwater banking operations are the "Largest banking projects in the world."[7]. The flier continues:

> Kern County also has about 10 million acre-feet of groundwater storage capacity for use as a huge reservoir. By comparison, Shasta Lake, the State's largest reservoir, stores about 4 million acre-feet of water. So Kern County has an underground "reservoir" capable of storing 2.5 times the entire volume of Shasta Lake!

These groundwater banking facilities, of which Kern Water Bank is the largest, are "blessed with an inter-connected conveyance system" that "ties together the major surface water sources" and "has multiple outlets for recovering banked groundwater…and conveying it to areas of need."

As the brochure notes, this capacity was "designed to bolster declining water supplies from State and federal water projects." In furtherance of that goal, KCWA has "stored over three million acre-feet since 1995, the largest formalized banking program in the world." According to Kern, during the 2001 shortage this banking program boosted local supplies by "almost 200,000 acre feet" and urban Southern California supplies by 81,000 acre-feet. Keeping in mind that *total* SWP deliveries were 491,000 acre-feet in 1991 and SWP deliveries to MWD were 391,000 acre-feet, these represent potentially dramatic dry-year additions to supply.

30-126 (con't.)

Plaintiffs reiterate that Calsim code omitting storage "2.5 times the entire volume of Shasta Lake," including KWB, cannot accurately assess the impact of the Monterey Amendments. Furthermore, KCWA asserts that KWB operations and other groundwater banking activities, which are facilitated by Monterey, were "designed to bolster declining water supplies from State and federal water projects." They were designed for this purpose and doubtless have helped meet it. One task of this EIR is to quantify the potential range of this supply increase.

SEMITROPIC "NEW UNIT" IS "AVAILABLE FOR SUBSCRIPTION"

Semitropic Water Storage District currently distributes a similar brochure, aimed at "Private Investors," "Developers Requiring Assured Water Supply," "Environmental Water Account," water contractors, and others..[8].

This brochure is designed to market a new "available Capacity" of 650,000 acre feet of storage which is "under construction," but "available for subscription." New extraction capacity of 150,000 acre feet

[7]. "Kern County Groundwater Banking Projects," p. 1. [no date included, but this document was supplied by KCWA in June 2005].
[8]. "Semitropic Groundwater Banking Program: New Opportunities for Storage," [no date included, but distributed June 2005.

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annually will augment the 50,000 acre feet of existing pumping. This new facility will use a 10-foot diameter pipe to make deliveries to the California Aquaduct. This facility is

> ...sized to deliver up to 200,000 acre-feet per year to the California Aquaduct...(200,000 acre feet per year, is 10% of the SWP yield in a 50% year). [*sic.*]

"For more information," the brochure urges potential investors to contact the rural groundwater bank's office on Wilshire Boulevard in Los Angeles ("State of the Art Offices in LA's entertainment district," according to the office building's website).

30-126 (con't.)

This is an example of water marketing infrastructure foreseen and facilitated by Monterey Amendments provisions such as urban reliance on out-of-area storage rather than agricultural cutbacks during droughts. This EIR should take into account and quantify the potential for projects like this, where "private investors" and "developers" come together to finance the capacity to deliver "10% of SWP yield...."

Calsim does not incorporate this Monterey Amendments activity, yet this EIR must analyze it. Also, the marketing of this new water supply to "developers requiring assured water supply" is a strong indication of the current connection between water and growth.

EXAMINATION OF LOST HILLS WATER DISTRICT MANAGER'S REPORTS:

Publicly-available monthly managers' reports from Lost Hills Water District (LHWD), a KCWA member, mention that SWP water is being stored in KWB. Since KWB was not operating before the Monterey Amendments, it seems that the use of the Bank to recharge and recover SWP exports must generally increase SWP exports. For instance, the February 18, 2005 LHWD Manager's Report states that "District Article 21 water is currently being banked in the Pioneer, Berrenda Mesa and Kern Water Bank projects." As the Bakersfield Californian reported on December 12, 2003, "Each of the [KWB] participants can use the water bank to store their own water from the state project, the Kern River or other sources, and pump it out as they need it."

30-127

In Sept 2003, the LHWD Manager made the following report to his board members:

> During Article 21 water deliveries, the District banked 365 acre-feet and Paramount banked 6 acre-feet and delivered 1,739 acre-feet to San Luis Reservoir for EWA. The Agency has banked 3,000 acre-feet in the Pioneer Project for the District and Paramount has banked 4,000 acre-feet in the West Kern Project under a program between the Kern Water Bank and West Kern.

This report shows that KWB operation is coordinated with other groundwater banks and water districts, enhancing their combined ability to receive deliveries. The degree of this coordination is enhanced by the fact that the state did not retain any control over the Bank's operations. The December 2003 report

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alludes further to this enhanced ability to maximize the receipt of exports: "The Agency [KCWA] Board authorized the General Manager to approve the West Kern WD – Kern Water Bank Long-Term Banked Water Exchange Program." Again, the degree of interdependence and coordination is suggested by the April 22, 2005 report: "The Agency Board authorized staff to revise accounting of groundwater banking and overdraft correction accounts between Pioneer and the Kern Water Bank."

The use of exchange agreements, in conjunction with groundwater banking using Monterey Amendments storage and contract provisions, enables coordination not only among banks, but also among the state and federal project contractors. An understanding of this coordination is necessary in order to examine possible Monterey Plus effects on CVP exports.

Also, in order to assess the impact of devolving control of the Bank, DWR must present some understanding of the operations of KWB's controlling Board member, Paramount Farms. While not a direct SWP contractor, Paramount is the most influential KWB director and thus influences the receipt and disposition of SWP water. For instance, in June of 2004 LHWD reported that "Paramount has requested 1,050 acre-feet of carryover water be transferred to Belridge Water Storage District and 625 acre-feet be banked in the Kern Water Bank." Without the Monterey Amendments, neither the 1,050 acre feet of carryover water, nor the 625 acre feet of KWB storage would be available to Paramount. What effect does the availability of carryover, turnback, non-project and surplus water, along with KWB direction by non-SWP parties, have on the demand for and timing of SWP exports?

30-127
(con't.)

The EIR analysis also must take into account the interaction between Paramount, KWB, its storage partners, and water marketing opportunities such as those provided by the Environmental Water Account. The December 2004 LHWD Managers' Report notes that

> Staff reviewed a preliminary plan for the Agency [KCWA] to sell water to EWA to off-set lost property tax revenue. Agency staff estimates its tax revenue will be $2.8 million less in 2005 and 2006.

This report suggests that KCWA and its members rely upon EWA as a revenue source. The Sept 2003 Report notes that

> The 2003 EWA program includes 4,952 acre-feet from the District program and 25,000 acre-feet of water Paramount plans to exchange to facilitate delivery.

To what degree do EWA operations generate revenue for KCWA and members such as Paramount/KWB? Does use of KWB to meet EWA needs encourage water demand among certain contractors? How much do "exchange" operations involving large amounts of water, such as the 25,000 acre feet mentioned above, increase SWP or CVP deliveries?

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MORE ON NEW MONTEREY WATER CATEGORIES, WATER BANKING, AND WATER MARKETING:

Plaintiffs' representatives have raised the question several times over the past two years of whether the Monterey Amendments fostered the acquisition of increased exports of non-Table A water partly by making it available at lower prices. We have been assured in EIR meetings, particularly in the case of "surplus" or interruptible water, that this is not the case.

The LHWD manager posts a March 3, 2004 Memo to "Water Users" notifying them that "The Agency estimates the cost of Article 21 water to be $12 per acre-foot. District delivery charges will have to be added to the $12 per acre-foot." How should this $12 interruptible water rate be properly compared to the KCWA equivalent unit charge, which is reported as $91.18 per AF in Bulletin 132-03?

Water sales have been examined in a Georgia State University water policy working paper that tabulated water sales in all Western states from 1990-2001..[9]. This paper records six purchases totaling 183,324 AF from the Monterey Amendments turnback pool by KCWA and nearby Dudley Ridge WD and Tulare Lake Basin WD in May of 1999. Average prices for this water ranged from $5.90 to $11.79 per acre. Coachella Valley WA and Desert WA purchased another 47,380 AF in 1999 for $5.90 per acre feet. In the following year (2000), SWP contractors purchased just over 280,000 AF of turnback pool water, some at $5.99 per AF and some at $11.97 per AF.

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These are significant volumes of water, purchased at apparently low prices under a program created by the Monterey Amendments, and seemingly concentrated in Kern and contiguous districts. The Monterey Agreements facilitated groundwater storage, water transfers and water marketing through several provisions. It also created new categories of water that historic records seem to indicate have been stored through those provisions, particularly in the groundwater banks of the most prominent agencies that negotiated the agreements. DWR must determine through the historic record how these deliveries have affected the magnitude and timing of demands and exports from the Delta, and projections of the potential range of future effects..

Furthermore, DWR should examine whether water banking and marketing facilitated by the Monterey Amendments has enhanced the financial incentive for contractors to take increased SWP deliveries and to invest in storage and conveyance infrastructure (such as the expansion to Semitropic described above) for that purpose. The September 2004 issue of "Water Strategist" notes that DWR entered into a one-year purchase agreement for 35,000 AF of water from KCWA at $190 per AF for environmental purposes—a potential one-year purchase of almost $7 million. Could some of this water be the $5.90 per acre foot turnback pool water delivered to KCWA earlier under the Monterey Amendments?

[9]. "The Sale and Lease of Water Rights in Weatern States: An Overview for the Period 1990-2001," Mariella Czetwertynski, March 2002, pp 16-17.

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EXAMINATION OF MCALISTER RANCH IRRIGATION DISTRICT UWMP:

The McAlister Ranch Irrigation District (MRID) lies "...in Kern County adjacent to the City of Bakersfield and the Kern Water Bank." (MRID UWMP, November 2003). Historically a farming operation, it is being turned into a residential development. It relies completely on groundwater pumping, which apparently will decline once houses are built, compared to its former agricultural water use. The UWMP emphasizes that residential development of the Ranch will reduce groundwater overdraft, and that water supplies for the development will be extremely secure because it sits over a huge groundwater bank.

In a technical analysis of the groundwater resources available to MRID, the UWMP notes that "The lowest water levels occurred during 1992 before operation of the Kern Water Bank and the Pioneer Project. The dip in water levels in 2001 were the result of a large 180,000-foot recovery of banked water by the various projects in the Kern Fan."

This excerpt strongly suggests that operation of KWB under Monterey Plus significantly raised groundwater levels in the largest groundwater banking operation in the state. Where did the water placed in these banks come from? How much came, respectively, from the Bay Delta and Friant Kern Canal? How have "large" recoveries and refillings of this Bank affected demand for SWP and CVP diversions, and will this demand increase as the state and local agencies pursue improvements to banking and conveyance infrastructure?

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A CEQA negative declaration documenting the sale of EWA water from KCWA provides further evidence of the magnitude of potential KWB use. It estimates 1,449,000 AF of existing groundwater storage among Buena Vista, Berenda Mesa, Pioneer, and KWB, of which over half (870,000 AF) is KWB. These year 2000 KCWA figures estimate KWB maximum annual recharge at 450,000 AF and maximum annual recovery at 287,000 AF. These figures suggest a significant ability for KWB to recharge increased SWP/CVP imports during wet years which presumably would allow increased Southern California water supplies in dry years.

MRID includes several attachments to its UWMP, including two pages excerpted from a Kern County Water Agency "Initial Water Management Plan." These pages provide a "Long Term Water Balance" and a "Historic Groundwater Recharge" summary. The long term water balance shows the following major supplies to Kern County from 1970-1998:

SWP:	805,800 AF
Kern River:	771,800 AF
CVP:	395,100 AF
Rainfall:	224,900 AF

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To the degree that districts within Kern can cooperate through exchange agreements and other arrangements to maximize imports, it seems that this cooperation would affect demand for the single largest source of water to Kern County—SWP. To the degree that devolution of KWB and the management flexibility provisions of Monterey Plus are aiding this activity, Monterey Plus is affecting SWP and CVP deliveries..[10].

The table labeled "Historic Groundwater Recharge" indicates that "combined" water sources are stored in KWB (whereas some other groundwater banks store "SWP," "Kern," or Friant-Kern water). Additions to this storage under the Kern Water Bank Authority (KWBA) during the four years from 1995-1998 under Monterey totaled 796,784 AF, or an average of about 200,000 AF per year. KWBA also likely helped arrange the storage of water in other banks. Apart from the existence of KWBA pursuant to the Monterey Amendments, this chart shows only 688 AF being stored in KWB over the prior 24 years, or less than 30 AF per year on average.

Similarly, this chart shows about 50,000 AF of annual groundwater banking during the 1971-1993 period, but an average of 338,221 AF of groundwater banking in the first four Monterey Amendment years (1995-1998). This nearly seven-fold increase deserves careful explanation as part of this EIR. Particularly, how have average annual increases of over 200,000 AF in KWB banking and about 300,000 AF of overall banking affected diversions from either SWP or CVP. Given almost 300,000 of annual extraction capability for KWB alone, what are the potential future effects?

Other MRID UWMP attachments describe the groundwater monitoring and operations agreements between representatives of all of the local water entities involved in the various nearby water banks. These banks and agricultural and industrial parties cooperate in tracking not only the amount, but also the rate of inputs and withdrawals from the banks, which are connected and often contiguous. Again, an understanding of the coordinated operation of these banks before and after SWP ceded control of the largest of these banks is essential to the Monterey EIR.

30-129 (con't.)

KERN COUNTY WATER AGENCY DOCUMENTS:

As KCWA reports in its March 2005 "Water Age" newsletter, "Our local groundwater basin is a multi-billion dollar resource." .[11].

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[10]. While storage of SWP water in KWB is documented above and elsewhere, storage of CVP water in KWB is documented in federal BOR delivery records and further suggested in KCWA's Water Supply Report 1996, which states ""Central Valley project Water is recharged in… recharge facilities on the Kern River alluvial fan." (p. 59).

[11]. KCWA General Manager Jim Beck, quoted in "Water Age," March 2005, p. 3

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The value of this resource lies partly in its ability to sustain the County's nationally-significant agricultural economy, and partly in its potential as a water supply for urban development within and outside the County. This value and its related activity were enhanced by devolution of Kern Water Bank under Monterey and by the availability of various categories of SWP and CVP surface supplies to be stored and later used or sold.

KCWA's Water Supply Report 1996, covering the first full year of Monterey Amendments implementation, explains that "Groundwater banking is a water management tool that has increased in use in recent years, and is directly related to the decreasing ability of the SWP and CVP to provide a reliable water supply.".[12]. This summary implies that, in the absence of KWB and increased management flexibility provisions under Monterey, SWP and CVP faced a declining reliability baseline, rather than a constant one. By implication, Monterey's groundbanking provisions have helped offset a perceived trend towards reduced SWP and CVP reliability for KCWA members.

Also, it seems clear during this early-Monterey period, soon after helping negotiate the transfer of KWB, that KCWA understood that it would help increase SWP yield:

> The Kern Water Bank was originally planned as a banking/recovery program that would have provided as much as 100,000 acre feet of annual dry-year yield for the State Water Project. Through the terms of the Monterey Amendments, ownership and operation of the Kern Water Bank was transferred to local districts, which formed the Kern Water Bank Authority late in 1995…It [the Authority] expects the Water Bank to reach an ultimate storage capacity of nearly 1,000,000 acre-feet..[13].

30-130 (con't.)

This understanding apparently contradicts the ongoing assumption by DWR in the current EIR that Monterey provisions have only "minor" or "slight" effects on deliveries. If KWB were operated as envisioned by KCWA in this document, then this Monterey provision alone would increase SWP dry-year yield by more than 5%, without taking into Account other Monterey provisions such as increased carryover storage, non-project water deliveries, or turnback pool operations.

Despite the notorious variability in hydrology and project supplies, in 1996 KCWA anticipated not just a longterm transformation in banking and marketing opportunities, but immediate and specific gains: "KCWA projects that a net increase in groundwater storage will occur in 1997, of about 500,000 acre feet. Such an increase would continue the pattern of wet-year storage programs begun in 1995 and continued in 1996.".[14]. Again, how much of this 500,000 acre feet would have been received absent KWB, the coordination it enabled, and the management flexibility provisions of Monterey, and what is the physical source of the increased surface supplies for banking?

[12]. KCWA "Water Supply Report 1996," July 2000, p 62.
[13]. Ibid., p. 62
[14]. Ibid., p. 85

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KCWA focuses in more than one document not only on the local benefits of groundwater recharge, with its positive effect on agricultural pumping depths, but also on the strong interest by others in 1996 in receiving exports from the Bank:

> A potential source of water available for export exists in the ability to move banked water supplies out of the groundwater basin to out-of-county interests. Many water districts not located in Kern County have expressed interest in storing water via water banking programs that have been proposed as a result of the Monterey Amendments..[15].

What entities have expressed interest in using or benefiting from KWB, and what is the potential range of such interest in the future, given the current and expected build-out of groundwater banking capacity in KCWA?

30-130 (con't.)

Finally, the 1996 Water Supply Report Suggests that KWB plays a major part in the overall KCWA groundwater banking program, and it raises again the question of how significant Monterey-Amendment-related groundwater recharge could possibly occur without causing increases in overall diversions and critical/dry year deliveries. The Report states in part, that "In a dramatic change from 1994-95, very few areas within the basin showed water level declines" due to "ample supplies of surface water" in 1996 and to "large-scale groundwater recharge programs…Areas that showed the greatest changes in water levels were near the Kern Water Bank, City of Bakersfiekd 2800 Acres Spreading Grounds and KCWA Pioneer Recharge Facility. Water levels near these recharge areas rose as much as 110 feet above 1995 depth…".[16].

CONCLUSION:

The devolution of KWB and the promotion of groundwater banking and flexible storage and transfer arrangements are defining elements of the Monterey Plus project that must be understood and explained to complete a valid EIR. So far, DWR has produced no historical record of KWB operations and no analysis of the historical record of interaction between groundwater banking and related Monterey Plus contract changes. Analyses so far also have not summarized the use of KWB and Monterey contract provisions to help store of CVP water (such as section 215 deliveries)..[17]. Rather, EIR discussions have included only limited theoretical modeling of a project that has been busily operating for a decade.

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This EIR must account for the millions of acre feet of the public's water that has flowed into and out of KCWA, KWB, and other storage programs under the management flexibility and marketing provisions

[15]. Ibid., p. 52
[16]. Ibid., p. 73
[17]. For instance, KCWA Water Supply Report 1999 shows that "A total of 49,948 acre feet of "Section 215" water was delivered in 1999, most of which was delivered to KCWA for groundwater recharge and banking programs." (p. 8).

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implemented under Monterey Plus. Any analysis—such as Calsim runs that cannot distinguish these key elements of Monterey—is not really an analysis of the Monterey Amendments. Doubtless, careful records have been kept by those with a financial interest in its movement and storage, who include the most prominent and powerful water interests in the State. Furthermore, it is likely that these and other elements of the Monterey Amendments were studied prior to Monterey to estimate their potential effects on SWP supply. As the guardian of the public's interest in this public resource, DWR should closely track and publicly explain the environmental impact of this activity. We urge DWR to assess at least the following topics as a necessary part of this EIR:

1. What is the current and planned storage and recharge/extraction capacity of KWB?
2. How is it and may it be used in coordination with other groundwater and conveyance facilities to maximize storage for various purposes?
3. Are there plans to increase the capacity to maximize these facilities through physical infrastructure changes or through changes in operating rules?
4. What role have exchanges or other agreements that do not require physical delivery of water to KWB (or extraction from it) played in the use of this facility?.[18]
5. What types and amounts of SWP, CVP, and other water sources have been stored in KWB?
6. How much did the various types of water banked under Monterey provisions (SWP turnback, CVP 215, etc) cost?
7. What extractions have been made from or coordinated with KWB? What extractions are planned or could be made to maximize use of this facility, either alone or in coordination with other facilities?
8. How much was paid for extractions or exchange deliveries of water banked under Monterey provisions?
9. How have turnback, carryover, non-project water provisions of the Monterey Amendments been implemented? What is their potential for future implementation?
10. How have the Monterey Amendments facilitated water marketing and increased groundwater banking? What are the foreseeable trends in these areas?
11. Does the greater security provided by elimination of the ag-first shortage affect the ability of agricultural contractors to engage in agriculture and water marketing or dry year transfers?
12. Taking into account each of the above topics, what is the historical and potential impact of the Monterey Plus project on the timing and amount of SWP and CVP diversions for each water year type? What is the effect in the driest and wettest years and in multi-dry-year scenarios?

We look forward to your expanded analysis and your response on these issues.

30-131 (con't.)

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.[18]. PCL notes that the water exchange arrangements fostered by the Monterey Amendments may be complex, as suggested in this excerpt from page 6-119 of the 2003 Environmental Water Account Draft EIR: "Westside Mutual pumped its KWB account in exchange for a like amount of Cawelo's 2800-acre account that was assigned to Belridge on behalf of Westside Mutual."

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AN ANALYSIS OF THE INFORMATION PRESENTED IN "Inventory of 'WATER YEAR TYPES' used in CALSIM II"

By: Arve R. Sjovold
July 7, 2005

There may be a fundamental problem within CALSIM II with regard to the use of various indices in the model code. Of particular concern are the indices that are used to establish what type water year is to be designated for each annual step in the model.

I have done some quantitative research on how the water year index and the water year type are determined. To date, I can find no scientific or logical rationale for the development of these indices. I realize that the "water year type," derived from the "40-30-30," and the "60-20-20" indices, have been in use for many years and have become embedded in the rules and regulations regarding Delta flows and salinity. Also, I am not sanguine on the view that the use of these indices and their impact can be determined by sensitivity studies using the CALSIM II model. We must proceed on the assumption that the amount of water that can be safely and reliably exported from the Delta depends to the first order on the requirements that must be **first** met to protect the Delta. After all, the allocation of the available water must be considered in a "zero sum" context. Any water that must be used to meet an environmental constraint must first be allocated before we can decide how much can be exported. It is here where I think that the indices are flawed and biased. How they are biased is to be determined, which is one of the fundamental reasons why the model needs to be calibrated. A competent calibration should reveal the source of any bias in the model.

The basis of my view on the inadequacy of the indices is based on the demonstrable lack of any logical analysis of their derivation and the clear demonstration that can be afforded by simply looking at the fundamental statistical nature of the raw input information. I have constructed simple histograms of the raw data input, its first convolution in to the "water year index", and the resulting convolution in to "water year designation." The results of this exercise are shown in the figure attached below.

If the problem of allocating water among the various objectives is viewed as decision making in the face of uncertainty as to what the coming water year holds, the problem is best exemplified by the histogram, "RIVER INDEX RUN-OFF." This histogram defines the distribution that must be fundamentally dealt with in establishing the risk-payoff of the set of the operational decisions of the project operators. The "RIVER INDEX RUN-OFF" is the four-river index run-off for the Sacramento River basin and is statistically accepted as a very good surrogate for the actual run-off if all the stream inputs were aggregated for every year. It can be shown that this index reliably captures more than 80% of the true total run-off. Therefore, it depicts quite accurately the variation that can be expected over a long period (in this case, 98 years of record).

Some very obvious conclusions can immediately drawn by studying this histogram. First, it is very clear that there are really two central tendencies, in effect, two distributions. Second, if a correlation study is performed on the year-to-year correlation, it is readily demonstrated that there is no significant correlation. In other words, what

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happened the previous water year has virtually no effect in the determination of the subsequent year's run-off. This second conclusion is extremely important in that it calls in to question immediately any index that is based on a weighted average across two successive water year run-offs. Thus, we are in a very good position to question the validity of the "WATER YEAR INDEX."

That the "WATER YEAR INDEX" is flawed is also immediately realized when examining the second histogram. There it is seen that the two distributions of the input data, "RIVER INDEX RUN-OFF," have been convoluted into a distribution with one central tendency. The fundamental decision problem has been fundamentally and arbitrarily altered. It has been altered to degree that the basic decision problem posed by the two distribution raw data is completely different. I have seen no scientific or logical rationale to support this fundamental convolution. Without some credible defense of this index's derivation, it cannot be accepted for modeling purposes.

The third histogram presents the third and final convolution of the "WATER YEAR INDEX" into the "WATER YEAR DESIGNATION," or more correctly, "Water Year type." There it is seen that even the "WATER YEAR INDEX" has been further adulterated to a distribution with an over abundance of "Wet Years." Again the logic behind these designations deserves more scrutiny and explanation.

A further note: It is also clear that when looking at the basic "RIVER INDEX RUN-OFF," there is no such thing as a "normal" year. Ordinarily, one usually assumes that a reference to normal is really a reference to the average. In this case, the average is at a minimum in the distribution profile. It is the least likely occurrence in any given year based simply on this past history. Accordingly, "normal" is a meaningless term in describing the character of the run-off history.

If one examines the designations of water year type, it is immediately clear that some so-called "below normal" years can be better than the average, and vice versa. This is the direct result of the reliance on the "WATER YEAR INDEX" to establish year type. The "WATER YEAR INDEX" includes a weighted contribution from the previous year's run-off and is the reason that year types are wrongly designated. As I have already pointed out, the weighted combination of two successive years of run-off is without merit, and here it is biasing the designation of year types and I can think of no rationale for it, either in hydrologic terms or logical terms.

It is my view based on my examination, that the entire system of indices is suspect and should be revisited as to why they are being used. It is unfortunate that they have become embedded in the regulatory constraints emanating from the State Water Resources Control Board. Since the entire debate in the Delta is about protection of the Delta, we can demand no less than a reopening of all the regulatory constraints and developing a correct scientific basis for them.

30-133
(con't.)

TO: Delores Brown, DWR
FROM: PCL
DATE: July 22, 2005
RE: Assumptions for Monterey Plus EIR Baseline document

Without reiterating our general comments on the use of Calsim II for this EIR, we provide the following comments on the Assumptions table distributed two days ago:

1. Line 4: the EIR should include a detailed explanation of the Table A request assumptions, particularly for the time series provided by the largest contractors.

2. Line 6: How will the turnback pool be reflected in modeling runs. Discussion in this week's meeting revealed that DWR modelers have not been asked to incorporate turnback pool and other Monterey Amendments management provisions in Calsim II modeling used for this EIR. We ask that DWR incorporate these management provisions into any modeling it performs for this EIR.

3. Line 7: Demand for non-project water may have been affected by the Monterey Amendments, which include provisions guaranteeing the right to wheel non-project water through project facilities at incremental costs. Also, exchange agreements involving Kern Fan Element involve the wheeling of non-project water. Finally, historic records seem to indicate an increase in SWP delivery of non-project water following implementation of the Monterey Amendments. "Same as baseline" cannot be assumed for this variable without further explanation.

4. Line 9: how will changes in the priority for use of Article 21 water be reflected in this analysis?

5. Line 10: Article 21 requests may not be "same as baseline." How will physical changes, such as E Branch Aqueduct and Diamond Valley be treated in baseline vs. no-project? These, plus new groundwater storage such as KFE, could affect Artcle 21 water requests.

6. Line 11: We are very skeptical that DWR can assume that local storage in KFE is "same as baseline." The issue of local vs. SWP use of KFE storage was a difficult one prior to transfer of the property from state ownership into total local control.

7. Line 12: Under the MP option, SWP and KCWA either could have continued in stalemate over section 11258 agreement, or the state could have developed and operated a share of the storage. This does not seem to be reflected in your "initially the same as baseline" plus transfer of La Hacienda water scenario.

30-134

8. Line 15: We are concerned that the vague no-project assumption that “new storage programs develop” may obscure the impacts of the project. What assumptions will be used on this specific issue of extended carryover storage?

9. Line 17: Please discuss the assumptions behind the proposed non-project water amounts.

30-134
(con't.)

December 18, 2006

Delores Brown
Department of Water Resources
3251 S Street
Sacramento, CA 95816

RE: Comments on the Monterey Plus Administrative Draft EIR

Dear Ms. Brown,

The Planning and Conservation League, Plumas County Flood Control and Water Conservation District, and Citizens Planning Association of Santa Barbara County, Inc. (Plaintiffs) submit the following comments on the Administrative Draft of the Monterey Plus Environmental Impact Report (Administrative Draft). These comments are supplemented by separate comment on section 1.4 ("Uses of this EIR") provided concurrently by Rossmann and Moore, LLP.

As the original plaintiffs in the Monterey Amendments litigation, we share a common interest in ensuring that the Administrative Draft and subsequent drafts of the Monterey Plus EIR provide the public and decision makers with an accurate and thorough analysis of the proposed Monterey Plus actions and a thorough comparison of viable and feasible alternatives. We are concerned that after over ten years of Monterey Amendments implementation, six years since the Court of Appeal's judgment, three years since the Settlement Agreement and writ of mandate, and significant time investments in the EIR committee process, the Administrative Draft is incomplete and includes inadequate and misleading analysis.

We find it especially disappointing that the sections most pertinent to the central issues in the original *Planning and Conservation League v. Department of Water Resources* (*PCL v. DWR*) litigation will be prepared during the final stages of the EIR development process, when participation of the Plaintiffs is most constrained by limited time and resources. The Plaintiffs, based on the original schedule provided by DWR for EIR completion, have nearly exhausted the financial resources dedicated for our participation in the EIR Committee. Due to numerous project delays, without additional resources Plaintiffs will not be able to participate further in the development of the EIR, effectively terminating the collaborative process that was envisioned in the Settlement Agreement.

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Our comments below outline our primary concerns with the Administrative Draft. These comments are supplemented by the detailed comments submitted by our groups over the course of the EIR committee process, which we submit by reference. Many of the issues described in those past comments have not been addressed adequately in the Administrative Draft.

While we remain hopeful that these issues can be resolved in subsequent drafts of the EIR, we are concerned that the current method of analysis and the approach established

in the Administrative Draft will fail to produce an EIR that meets the terms of the Settlement Agreement or the standards of CEQA.

30-135 (con't.)

COMMENTS:

1.) The Administrative Draft fails to address the lead agency responsibility and accountability issues brought by the Plaintiffs in *PCL v. DWR* in a substantive manner.

A lead agency is charged with evaluating a project, proposing alternatives, determining the impacts of each alternative (including the implications of doing nothing - the No Project Alternative), and then deciding, based upon that information, whether and how best to implement the project.

The Administrative Draft does not allow DWR to fulfill its obligations as the lead agency. The Administrative Draft proposes a No Project Alternative that includes project components, it fails to adequately distinguish the proposed project from continued current conditions, and it fails to provide alternatives distinguishable from the proposed action. These flaws prevent a sufficient analysis of the impacts and implications of moving forward with the proposed project. Worse, by limiting the outcomes of the alternatives included in the EIR, and thus constraining the range of potential management decisions, the Administrative Draft attempts to absolve DWR of its decisional responsibilities as a lead agency.

30-136

2.) Significant elements critical to the analysis and comparison of the Monterey Plus project remain incomplete or missing in the Administrative Draft.

Section 9.1-3.3 Cumulative Effects, Section 9.1-12 Water Quality, Section 5.4 Alternatives, Appendix E Kern Water Bank Study, and other sections were missing or incomplete in the Administrative Draft. Other sections, including section 1.4 Intended Uses of This EIR, were provided very late in the comment period. Unfortunately, the unfinished sections are those sections that relate directly to primary issues raised in the *PCL v. DWR* litigation. Without completion of these sections, it is very difficult to evaluate the adequacy of the Administrative Draft.

30-137

3.) The Administrative Draft confuses the project alternatives and the No Project Alternative.

CEQA defines the purpose of a No Project Alternative in the following way, “The purpose of describing and analyzing a No Project Alternative is to allow decision makers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project” (CEQA Guidelines, Section 15125).

The No Project Alternative in the Administrative Draft does not provide the basis for an accurate comparison of impacts as required by CEQA. Instead, the No Project Alternative includes key components of the proposed project, preventing accurate analysis of the impacts resulting from implementation of these decisions.

30-138

As described in the Administrative Draft, the No Project Alternative includes a number of the Table A transfers facilitated under the Monterey Agreements, conveyance of non-project water, and storage of contractor water outside of the contractors' service area-all key components of the Monterey project. The Administrative Draft does not clearly disclose how other provisions of Monterey, including the use and transfer of the Kern Water Bank, carry-over storage and article 55 are treated in the No Project Alternative.

Analysis of this limited set of policies, (as opposed to the entire suite of Monterey Amendments), properly belongs in the Alternatives section of the EIR rather than in the No Project analysis.

The Administrative Draft argues that these projects and policies would have been approved by the Department regardless of the Monterey project. However, that argument is based on speculation, and in no way excuses analysis of a proper No Project Alternative, as required by CEQA.

In subsequent drafts of the EIR, the No Project Alternative must reflect the actual 'no project' condition. Rather than speculate that the Department would continually provide exceptions to the original contract, the No Project Alternative should assume that DWR would have implemented the pre-Monterey SWP contracts as written, including enforcement of all limitations and conditions.

30-138 (con't.)

4.) The Administrative Draft provides an inappropriate baseline.

It is customary for the baseline in EIRs to be defined as current or pre-project conditions. Rather than reflect the reality of the baseline conditions prior to Monterey, the Administrative Draft considers full build-out of the SWP project as the baseline. According to that baseline, the SWP would deliver over 4 million acre feet of water (maf) per year. As the Court found, that assumption is not based on actual SWP delivery capability, but rather the "hopes and dreams" upon which the original water contracts were based – paper water.

The baseline provided in the Administrative Draft could more accurately be described as a future expectation rather than a historic benchmark reflecting per-Monterey conditions. Thus, the baseline provided in the Administrative draft does not provide an accurate basis for comparison of environmental impacts associated with the proposed project or other alternatives.

The baseline condition included in the Administrative Draft does not reflect provisions included in the original contract. Specifically, the baseline fails to analyze the implications of the original contract provision that prevented storage of SWP water outside of SWP service areas. This provision limited a contractor's ability to take SWP water to the real-time customer demands plus the amount of water that could be stored in facilities within the contractor's service area. Eliminating this provision in the Monterey

30-139

Amendments significantly expanded storage options available to contractors, and thereby enhanced contractors' ability to take water.

However, the baseline and alternatives do not reflect these implications. Instead, the Administrative Draft assumes that contractor demand is the same regardless of whether DWR enforces the contract provision to limit storage of SWP water within the service area or if DWR allows water to be stored outside of the contractors' service area. Future drafts of the EIR must include a thorough analysis of the relationship of the storage provision to contractor demands.

In addition, the baseline does not reflect Article 21(g)(1) of the original SWP contracts, which states that "[i]n providing for the delivery of surplus water pursuant to this article, the State shall refuse to deliver such surplus water to any contractor or non-contractor to the extent that the State determines that such delivery would tend to encourage the development of an economy within the area served by sustained delivery of surplus water." This article established a specific provision for delivery of Article 21 water that limited its use by contractors.

This provision was eliminated in the Monterey Amendments. It is our understanding that several contractors now have economies that are dependent on continued delivery of Article 21 water. According to tables provided by DWR for water years 2004 and 2005, some urban contractors now take Article 21 and carry-over water in the winter months while taking little or no Table A supplies and take Table A supplies later in the year. This indicates that some contractors are using Article 21 supplies to meet the hard demands of their service area in winter months.

30-139 (con't.)

Demands for Article 21 water supplies and in particular urban demand has increased since implementation of the Monterey project. However, the baseline in the Administrative Draft ignores the limiting conditions of Article 21(g)(1) in the pre-Monterey baseline. In fact, the Administrative Draft fails to provide any analysis of the impacts of eliminating this article. Instead, the Administrative Draft assumes that baseline Article 21 demand (and operations to meet that demand) is identical to post-Monterey Article 21 demand and operations regardless of the contract provisions directing delivery and use. Ignoring Article 21(g)(1) in the baseline and failing to disclose how elimination of this provision impacted operations and demands prevents a proper analysis of the impacts associated with the proposed project. Subsequent drafts of the EIR must analyze the impacts of the presence of this provision in the baseline, and analyze the impacts of removing this provision in the proposed project. The EIR should further analyze whether proposed contract amendments have indeed resulted in hardened demand for Article 21 water, and corresponding shifts in delivery, demand, and request patterns for Table A supplies.

In sum, the baseline assumes that DWR will operate the SWP to meet contractor requests regardless of contract provisions, and that contractor requests are not influenced by contract provisions limiting use or ability to take water. Subsequent drafts of the EIR must include an analysis of operations and demands resulting from the original contract

provisions, and the degree to which demands and operations have been or will be influenced by eliminating these contract provisions.

30-139 (con't.)

In addition, the Administrative Draft fails to incorporate climate change in the baseline or in the alternatives analyses. The Administrative Draft incorrectly states that too little is known about climate change to warrant incorporation of findings into the EIR. This assertion is contradicted by numerous studies and findings, including research published by DWR well before the release of the Administrative Draft.

DWR has prepared and released significant information on climate change impacts to the SWP system and to California water resources. The Department's own "Progress on Incorporating Climate Change into Water Management," outlines several feasible scenarios for climate change. CEQA does not require definitive information prior to incorporation into analysis. Indeed, as noted by the Intergovernmental Panel on Climate Change, it is very unlikely that future California hydrology will be the same as past hydrology:

> The IPCC (2001) ranked the confidence limits of major impacts to water resources due to observed and projected climate change as very high (0.95-1.00), high (0.67-0.95), medium (0.33-0.67), low (0.05-0.33), and very low (0.00-0.05). There is high confidence that the timing and amount of runoff is changing, and very high confidence that watersheds with substantial snowpack will experience major changes as temperature continues to rise. The impacts of this trend are a decrease in available water resources in California, primarily during the summer months, and a potential increase in wintertime floods. There is high confidence that California's Sierra Nevada will experience a continued trend of decreased snow accumulation and earlier snowmelt (e.g. Lettenmaier and Gan 1990; Jeton et al. 1996; Miller et al. 1999; Wilby and Dettinger 2000; Knowles and Cayan 2002; Miller et al. 2003). [i]

30-140

In fact, widely available data demonstrates that climate change is already occurring in California, with trends of declining snowpack and earlier annual peak runoff.[ii]

In addition, several studies on climate change and its effects on water resources in California are available.[iii]

Despite this overwhelming body of evidence of current and future climate change, DWR has based all analyses in the EIR on past hydrology.

Subsequent drafts of the Monterey EIR should include impact analyses under a minimum of two feasible climate change scenarios. One analysis should be based on hydrology that extends into the future the current observed trends in temperature, sea level rise, amount and timing of rainfall, amount and timing of snowpack in the Sacramento and Feather River watersheds and the timing of peak runoff. A second analysis should utilize

hydrology based on one of the feasible scenarios identified by the Intergovernmental Panel on Climate Change and by the California Climate Action Team.

The baseline must be adjusted to reflect the pre-Monterey SWP contracts, pre-Monterey SWP operations and the impacts of climate change. Without such adjustments, the baseline is an inadequate reference from which to determine the impacts of the proposed project and project alternatives.

30-140 (con't.)

5.) The Administrative Draft utilizes inaccurate, inconsistent and incomplete analysis.

Inconsistent time periods used for analyses:
The Administrative Draft uses different time periods for analyses in various sections of the EIR. These variations make it impossible to determine the full impact of any of the alternatives included in the Administrative Draft. No explanation is provided as to why certain sections are analyzed under differing time periods. Arve Sjovold previously submitted comments regarding the use of various time periods in his comment to DWR on Chapter 9. We resubmit those comments by reference. Subsequent draft EIR analyses must use a consistent time period throughout the EIR.

30-141

Inappropriate tool for analyzing environmental conditions and subsequently determination of environmental impacts:
The Plaintiffs have previously submitted comments expressing our concerns regarding the adequacy of CALSIM II for analyzing baseline conditions or assessing environmental impacts. The Administrative Draft has not adequately addressed our previous comments, and we resubmit those comments on CALSIM II by reference on the Administrative Draft.

Plaintiffs recommend that subsequent drafts of the Monterey EIR include analysis conducted with tools other than the CALSIM II model.

If DWR includes CALSIM II model analyses in future EIR drafts, we request clear explanations and justification of all assumptions made in the CALSIM II model runs. In addition, we request that DWR explicitly state when findings are based on post processing and when findings are based on direct model results. When findings are based on post processing, the rationale behind these post-processing decisions should be clearly articulated.

30-142

New information including, the Pelagic Organism Decline (POD) and winter pumping impacts have not been incorporated into the environmental impact analysis:
The Administrative Draft includes a brief description of the recent decline of pelagic organisms, including the endangered delta smelt. However, the Administrative Draft fails to incorporate findings from the POD science team into the impact analysis. The POD studies indicate that changes in timing, and in particular increased delta water exports in the winter and early spring have negatively impacted pelagic organisms. POD studies

30-143

also indicate that operations of the temporary barriers have impacts on sensitive species.[iv]

A recent analysis conducted by Arve Sjovold found that since the implementation of the Monterey Amendments, SWP winter time exports (December through March) have increased while water releases from Oroville have decreased. In addition Mr. Sjovold found that in recent years SWP winter exports have exceeded Oroville releases, while previously Oroville winter releases had always exceeded SWP winter exports in the Delta. Mr. Sjovold further found that pumping of categories of water created in Monterey, including carry-over and turn-back pool and increased use of Article 21 water accounts for much of the increase in winter time pumping. (See attachments, Supplemental Information on SWP Pumping Regimes in the Delta, 1996-2004, September 18, 2004 by Arve Sjovold and Additional Data on Oroville Storage 1996-2004 October 8, 2006 by Arve R. Sjovold).

30-143 (con't.)

Subsequent drafts of the EIR must fully incorporate POD findings including findings presented at the October 2006 California Bay Delta Authority Science Conference. Furthermore, subsequent EIR drafts must explicitly state how Monterey provisions including turn-back pool, carry-over water and new allocations of Article 21 water have contributed to increased winter pumping and resulting Oroville lake levels and releases. Analyses should also include explicit studies on the degree to which increased winter demand has been or will be facilitated through storage outside of SWP service area, and the degree to which water pumped in the winter has been and will be stored outside of the SWP service area.

Insufficient analysis of impacts resulting from eliminating and changing contract provisions:
As stated in comment 4, the Administrative Draft failed to analyze the impact of eliminating Article 21(g)(1). Subsequent drafts must fully analyze how eliminating this provision and simultaneous transfer of the Kern Water Bank and allowance of water storage outside of the SWP service area has altered or will alter SWP contractor demand and ability to receive Article 21 water.

In addition, subsequent drafts must analyze the degree to which eliminating use provisions for Article 21 and providing urban users with increased access to Article 21 water resulted in new uses of Article 21 water, including serving new growth fostering water transfers. Analyses should also identify the degree to which altered Article 21 previsions have shifted scheduling and delivery of Table A water and whether such shifts have resulted in changes to SWP operations (including changes in the timing or amount of water released from Lake Oroville and San Luis Reservoir).

30-144

Impacts and costs to Environmental Water Account must be disclosed:
The Monterey Agreement was signed the same month that the Bay Delta Accord was finalized (December, 1994). Due to the exclusive nature of the Monterey negotiations, it is not clear that the Bay Delta Accord or the subsequent CALFED analysis fully incorporated Monterey Amendment provisions. In particular, it is not clear that the

30-145

Environmental Water Account (EWA) is appropriately sized to accommodate the provisions of the Monterey Amendments. Monterey Amendment provisions including the turn-back pool, carry-over water and increased uses of Article 21 water have the potential to significantly alter timing and duration of Delta exports.

The EWA is not currently sized to accommodate multiple winter fisheries actions, as could be necessary to accommodate Monterey-type pumping impacts. Subsequent drafts of the EIR must analyze and disclose impacts to the EWA resulting from revised contract provisions and changes to SWP operations. These analyses should incorporate the new information from the POD studies (see above) that indicate that winter and early spring pumping is having a significant effect on pelagic organisms. In addition, it should analyze the project's impact on the necessary resources to achieve EWA objectives, including impacts to the number and duration of necessary fisheries actions and appropriate sizing of the account. Lastly, the findings presented at the November 2006 EWA technical review must also be incorporated.

30-145 (con't.)

The Administrative Draft fails to adequately address growth inducing impacts:
The Plaintiffs strongly object to the assertion in the Administrative Draft that DWR is not required to fully and extensively analyze the growth inducing impacts of water delivered by DWR. In particular, Plaintiffs disagree with the assertion that DWR does not need to differentiate between the impacts of water deliveries that stimulate new growth and the impacts of water deliveries used to enhance dry year reliability.

CEQA requirements direct a lead agency, such as DWR to analyze the full implications of lead agency decisions. DWR's proposed project has and, if adopted, will continue to fundamentally alter the operations and policies of the SWP. This decision has (and if adopted in the final EIR will continue to have) implications beyond water management that must be properly analyzed.

In particular, the growth inducing impacts analysis must include an analysis of how, where and for what purpose water made available under the Monterey Amendments has been put to use, and will likely be used should DWR adopt the proposed project. This analysis must disclose the growth inducing implications of eliminating Article 21(g)(1) of the original contracts, facilitating transfers between agricultural and urban contractors, conveying non-project water, providing increased access to Article 21 to urban contractors, allowing storage outside of the service area, and implementing the turn-back pool.

DWR must specifically state the percentage of water made available under the Monterey Amendments that is likely to be stored for dry year reliability, and the percentage which will be used for new growth. Also, DWR must disclose the degree to which water made available under the Monterey Amendments will be used for resource-intensive growth and urban sprawl. Impacts analysis should include a study of the type of growth likely to be induced by the proposed project water deliveries (i.e. resource intensive sprawl or infill development).

30-146

In addition, DWR must analyze how the transfer of the Kern Water Bank to local control has facilitated growth inducing uses of the facility as compared to operations that would prioritize dry year reliability.

30-146 (con't.)

6.) The Administrative Draft includes inappropriate alternatives analysis:

The discussion of alternatives in the Administrative Draft is misleading and incomplete. In order to provide for reasonable comparison, alternatives to the proposed project must be distinguishable from the proposed project. However, all alternatives in the Administrative Draft inappropriately include significant portions of the proposed project. By including similar provisions in each alternative, the Administrative Draft inappropriately concludes that all available courses of action have similar impacts and outcomes.

The Administrative Draft asserts that many of the actions taken under Monterey could have occurred under the original contracts. Prior to Monterey, however, these policies were not widely adopted by the SWP and they were not commonly practiced under the previous contract. Had DWR decided to implement these actions under a different decision process, DWR would still have had to complete CEQA review prior to taking those actions. Therefore, it is not appropriate to include these actions in each alternative. Since DWR has proposed to take these actions as part of the Monterey amendment, these actions must be properly treated as potential decisions rather than assumed components of the pre-existing condition.

30-147

Subsequent drafts should include alternatives that are distinguishable from the No Project and proposed project. These alternatives should not include polices or actions that are being proposed for implementation as part of the proposed project.

7.) Recommendations for the missing sections of the Administrative Draft.

The following comments provide recommendations for sections Section 9.1-12 “Water Quality”, Section 9.1-3.3 “Cumulative Effects”, and Section 5.4 “Alternatives to the Project” which were not provided in the Administrative Draft. The Plaintiffs received the draft Section 1.4 on November 15, 2006, and have had limited opportunity to analyze this section. A separate comment letter will be submitted to DWR with our comments on Section 1.4 “Purposes of the EIR.”

30-148

<u>Section 9.1-12 Water Quality</u>

All alternatives must analyze the full water quality implications of proposed courses of action. The alternatives analyses should specifically include water quality impacts associated with actions that result in changes in timing, salinity, or temperature of water in Lake Oroville, the Feather River, the Sacramento River and the Bay Delta Estuary. Alternatives (other than the No Project Alternative) should address the full impacts resulting from implementation of the turn-back pool (including the sale of water to non-

contractors), carry-over water, Table A transfers, as well as water quality impacts from changes in the timing and amount of water demand facilitated by Monterey Amendment provisions including storage outside of the SWP storage area and expanded use of Article 21.

The EIR should also specifically state how each alternative would contribute to addressing the water quality concerns that resulted in the water supply constraints that prompted development of the Monterey Agreement.

30-148 (con't.)

According to Bulletin 132-95, the following were significant events relating to water quality in 1994, the year the Monterey Amendments were negotiated:

Significant Events

- The NMFS winter-run chinook salmon and USFWS delta smelt biological opinions guided much of the SWP Delta operations during the first half of 1994.
- All Decision 1485 critical year water quality and flow requirements were met during 1994.
- Salvage estimates set by USFWS delta smelt incidental take permit were exceeded on May 23 and for 17 subsequent days into early June.
- The NMFS 1994 incidental take permit limit (SWP/CVP) of 905 winter-run chinook salmon was not exceeded, and all operational measures in the biological opinion were met except for average QWEST minimum flows, which were exceeded for 6 days in February.
- The 1994 forecast Sacramento River Index of 8.0 MAF resulted in a Decision 1485 critical year designation and "drought watch" status.

(Bulletin 132-95, Chapter 6 Water Quality)

30-149

As stated in Bulletin 132-95, endangered species issues directed the operation of the SWP for much of 1994. Accordingly, the draft EIR should include discussion of how each alternative will impact listed species. The EIR must also clearly indicate whether the actions included in the proposed project or the alternatives will prevent the recovery of listed species. These analyses should also indicate whether alternatives and the proposed project are consistent with DWR permits and agreements under the California and the Federal Endangered Species Acts.

Section 9.1-3.3 Cumulative Effect

The draft EIR must include a full analysis of cumulative impacts of the proposed project, all other projects now planned to be implemented by DWR (including SDIP), all projects that DWR has approved or plans to approve (such as the Intertie), all projects DWR has implemented, is implementing, or plans to implement in coordination with the U.S. Bureau of Reclamation, and all foreseeable water diversion projects that will reduce the amount of flow or change the timing, temperature or quality of flow in the Feather River, the Sacramento River and the Bay Delta Estuary.

30-150

The Draft EIR must also analyze the cumulative growth inducing impacts of allowing water to be stored outside of SWP service area, permitting Table A water to be sold to non-project contractors, eliminating the provision 21 (g)(1) in the original contract (specifically, allowing urban growth to rely on Article 21 supplies), the continuing trend of transferring agricultural water to urban users, and the wholesale approval of transfers and transport of non-project water for contractors and non-contractors.

The cumulative impacts analysis should include an analysis of all greenhouse gases generated by the project and other projects in California. The EIR should include measures to reduce, avoid, fully mitigate, and minimize these impacts.

The cumulative impacts analysis should include an analysis of how the project and other projects in California may increase other impacts of Climate Change.
Climate change is rapidly changing water conditions in California, including changing the timing and amount of peak flows, the frequency of storms and drought, the balance between rain and snow, water quality and temperature of water. These changed conditions will impact species, and affect the flood management capabilities of the SWP system. Cumulative impacts analysis should include a discussion on the cumulative effects of the proposed project and all other foreseeable projects (including but not limited to the re-licensing and operation of Oroville Reservoir) on cold water pools, water temperature, water quality, salinity and habitat loss that will be exacerbated by the already stressful conditions of climate change. The analysis should also analyze whether the project will exacerbate flood or drought conditions that are likely to occur with climate change. In particular, EIR should include an analysis of the degree to which the proposed project and all other DWR project will restrict the use of Oroville Reservoir as a flood control facility.

30-150 (con't.)

Section 5.4: Alternatives to the Project:

The Plaintiffs propose the following set of alternatives for inclusion in subsequent drafts of the Monterey Plus EIR. Some of the proposed alternatives suggest refinements, revisions, and re-characterization of the alternatives included in the Administrative Draft. We also propose these alternatives in order to target analysis of various potential impacts and in order to provide proper points of comparison for the proposed project. Other suggested alternatives are offered as measures that could reduce conflicts that prompted the Monterey Amendments, while significantly reducing the negative impacts of implementation of the Monterey Amendments.

30-151

The alternatives discussed below are titled as follows: “the Full Build Out-2020 Alternative”, the “18b No Project Alternative”, the “Monterey Today-Current Operations Alternative”, the “Urban Preference and Dry Year Reliability Alternatives”, the “Coordinated CVP-SWP Systems Alternative”, the “Kern Fan Retention Alternative” the “Kern Fan Transfer with Trust Conditions Alternative, the “Improved Reliability through Environmental Enhancement Alternative,” and the “No Kern/ Castaic Transfer Alternative.”

Proposed revisions and re-characterization of information provided in the Administrative Draft:

The "Full Build Out to 2020 Alternative"
This alternative should include the set of assumptions currently included in the Administrative Draft's baseline. As discussed above, the assumptions included in the Administrative Draft baseline do not represent a historical frame of reference or conditions prior to implementation of the project and are more appropriately characterized as an alternative.

This suite of assumptions represents a promise to fully build-out the SWP and achieve 100% delivery reliability for 4.185 maf annually of Table A amounts. As the Court found in *PCL v. DWR*, this promise may not be achievable, and it would perpetuate the problems associated with paper water. However, if DWR chooses to analyze this alternative, all environmental impacts associated with a decision to carry out these actions would have to be analyzed.

The "18b No Project Alternative"
This alternative captures the plausible circumstance under which environmental and water quality degradation in the Delta would significantly and permanently constrain the timing and/or the volume of water exported from the Delta. Such additional constraints on Delta exports are reasonably foreseeable given the present condition of listed species in the Delta and given the multiple legal challenges associated with operations of the SWP and CVP (including, but not limited to current challenges regarding SWP compliance with the California Endangered Species Act).

30-151 (con't.)

Therefore, the 18b No Project Alternative should assume (as required by the Court of Appeal) that the original contracts, including Article 18b would be implemented. SWP Table A amounts for this alternative should total 1.9 maf (the historical average annual delivery of the SWP up to 1994) and each contractor's Table A allocation would be recalibrated according to Article 18, including recognizing the rights of the five area of origin contractors. Unlike the 18b alternative provided in the Administrative Draft, this 18b No Project Alternative would not include implementation of aspects of the Monterey Amendment.

The Plaintiffs recommend that DWR use the current Bulletien160-05 and the *Investment Strategy for California Water* prepared by PCL as references for developing demand scenarios and to identify alternate water supply management options that should be included in the analysis of this alternative.

The "Monterey Today and Current Operations Alternative"
This alternative should include implementation of all post-1995 actions undertaken by DWR. In order to determine the impacts specific to actions proposed in this alternative, a clear distinction should be made between pre-1995 actions and the post-1995 suite of actions. The bulk of the impacts analysis currently included in the Administrative Draft

would be appropriately placed in this section. These analyses should be removed from discussions and analyses of the No Project and baseline sections of the Draft EIR.

30-151 (con't.)

Proposed additional alternatives that better disclose and more broadly analyze the implications of potential project actions.

The "Urban Preference and Dry Year Reliability Alternatives"
These alternatives are intended to provide a frame of reference for comparing impacts (including growth inducing impacts) associated with water priority provisions of pre-and post Monterey.

These alternatives should include analyses of alternate methods of allocating water between urban and agricultural contractors during shortages. The first alternative should consider the re-institution of the pre-Monterey urban preference and a separate second alternative should consider the continued "elimination of urban preference in dry years" included in the Monterey Amendments. Both the urban preference and the non-urban preference alternatives should describe how the SWP system would be re-operated to capture, convey, and store "wet year" water in groundwater banks and storage reservoirs within and outside of the SWP service area in order to guarantee "wet water" to urban development during multiple-year droughts.

These alternatives should assume that DWR would monitor use of groundwater storage and use of storage in non- project reservoirs. Specifically, DWR would ensure proposed actions would result in increased drought reliability for urban contractors, and would not result in inducing new urban growth. These alternatives should also analyze whether it would be reasonable and foreseeable that agricultural contractors would transfer Table A water to urban contractors rather than shift to permanent crops.

30-152

These alternatives would also recognize that new developments cannot be approved without adequate water supplies, and that DWR as a result of the *PCL v. DWR* must provide local governments with an independent and accurate assessment of SWP delivery reliability during multi-year droughts. Absent the Monterey Amendment provisions providing favorable delivery priority for SWP contractors with low drought reliability, these alternatives should assume that a 75% to 100% percent reliability standard would be necessary before water supplies should be relied on to accommodate urban growth.

The "Coordinated CVP-SWP Systems Alternative"
This alternative should analyze a scenario in which pumping and storage of additional surplus and Table A water from the Delta would be maximized through the coordinated re-operation of the CVP and SWP systems.

This alternative should recognize and analyze the essential role played by coordinated CVP and SWP storage north of the Delta in capturing "wet year" water (surplus water and floodwaters).

This alternative should analyze coordination beyond the CVP-SWP pumping and conveyance coordination that is presently described in the Administrative Draft. This alternative would specifically analyze and identify impacts of coordinating operations of Northern California reservoirs (Shasta, Folsom, Millerton, and Oroville) in order to maximize capture and export of CVP-SWP contract and surplus water from Northern California for delivery in Southern California.

This alternative would be designed to disclose the methods and impacts resulting from use of coordinated CVP-SWP operations to provide the desired 4 maf of deliveries in all water year types.

This alternative should also comprehensively analyze operations and conditions occurring in 2003. The Administrative Draft used 2003 as a basis for analyses of impacts in several places, including in determining the impacts to Lake Oroville storage levels. In 2003, the SWP held record carry-over storage in Lake Oroville and SWP exported record levels of surplus water from the Delta. It is also important to note that 2003 followed a "dry" water year and proceeded a "below normal" water year.

This alternative should use actual data from 2003 to determine the impacts of operations necessary to move water through system, including operations of Oroville, Folsom, Shasta, and Millerton reservoirs, operations of the CVP and SWP pumps, operations of the three terminal reservoir areas, Castaic, Perris and the Kern Water bank, and delivery of water to groundwater banks, storage in non-SWP reservoirs, or to new urban developments. This alternative should analyze how 2003 operations and deliveries affected 2004 (a below average water year) and how 2004 operations differed from operations in 2003.

30-152 (con't.)

The "Kern Fan Retention Alternative"
This alternative should analyze the impacts and benefits that would result with State ownership of Kern Water Bank. This alternative should assume that the State would operate the Kern Water Bank to enhance dry year reliability and not for the purpose of increasing water supplies.

The "Kern Fan Transfer with Trust Conditions Alternative"
This alternative should analyze the impacts and benefits that would result with the Kern Water Bank transferred out of State ownership, but with conditions installing a public trust on the Bank's operation to maximize benefit and minimize cost to provide Statewide environmental benefit from that operation.

The "Improved Reliability through Environmental Enhancement Alternative"
Poor environmental conditions in the Bay Delta Estuary resulting in degraded water quality and declines in important fish species all contributed to SWP water supply constraints that compelled DWR to enter into the Monterey Amendments negotiations. The Monterey EIR process provides an opportunity for DWR to assess an alternative that would increase SWP contractor water reliability and reduce the stress on the Delta that results in pumping constraints.

Under this alternative, all water use efficiency, water recycling, stormwater capture and other local water enhancements would be aggressively implemented in order to stabilize water demand and improve water supply reliability in SWP contractors' service areas. DWR should utilize the estimates provided in Bulletin 160-05 to determine the potential yields of these measures. For this analysis purposes, DWR should assume that article 56 contract funds would be provided to fund, in part, these water supply enhancements. Fifty percent of all water produced through these measures would be assumed to directly reduce the water demand of SWP contractors.

Water demands for this alternative should be based on the demand projections included in Bulletin 160-05.

In addition, this alternative should assume that equal priority for access to Article 21 water would be provided for environmental purposes, including environmental enhancements in the Delta. DWR would work with the Department of Fish and Game and the federal fisheries agencies to determine the best use of all water acquired for the environment under these conditions. Uses of water could include increased Delta outflow or storage in the state owned Kern Water Bank. (For purposes of this analysis, it should be assumed that DWR retains the Kern Water Bank and operates it to increase drought water supplies and enhance environmental resources of the Bay Delta and its watersheds.)

This alternative would emphasize development of local water supplies to increase SWP water contractor water reliability, and reduced stressors on the Bay Delta Estuary. This analysis should include a full accounting of the environmental enhancements that could be achieved from the above outlined actions.

30-152 (con't.)

The "No Kern/ Castaic Transfer Alternative"

The contested transfer of 41,000 acre-feet of State Water Project Table A amount from Kern County Water Agency (acting through one of its member districts, the Wheeler Ridge-Maricopa Water Storage District) to Castaic Lake Water Agency has been implemented only on an interim basis, and was excluded from the list of transfers designated as "final" in the Settlement Agreement. This alternative would assume that this transfer would not be approved as a "final" transfer, and would analyze the impacts and benefits of alternative dispositions of the amount of that transfer.

Conclusion:

The Plaintiffs maintain a strong interest in the Monterey EIR process and will continue to work toward a document that meets the standards of CEQA and the Settlement Agreement. However, given the extended schedule, the apparent lack of progress in addressing the substantive issues raised in the original Monterey litigation, and funding constraints, the Plaintiffs reaffirm their grave concern with the existing Monterey EIR development process. We hope that subsequent drafts of the EIR will address the

30-153

comments enumerated above and look forward to discussing with DWR how to resolve these concerns. 30-153 (con't.)

Respectively,

Mindy McIntyre,
Planning and Conservation League

Brian Morris,
Plumas County Flood Control and Water Conservation District

Arve Sjovold,
Citizens Planning Association of Santa Barbara County, Inc.

---

[i] *California Climate Change, Hydrologic Response, and Flood Forecasting* , Norman L. Miller Earth Sciences Division, Berkeley National Laboratory, Berkeley, California, USA . Presented at the International Expert Meeting on Urban Flood Management 20-21 November 2003, World Trade Center Rotterdam, The Netherlands April 30, 2004. http://www.lbl.gov/Science-Articles/Archive/assets/images/2004/Apr-30/California_Flooding.pdf

[ii] *Potential effects of global warming on the Sacramento/San Joaquin watershed and the San Francisco estuary.* Noah Knowles and Daniel R. Cayan
Geophysical Research Letters, VOL. 29, NO. 18, 1891, doi:10.1029/2001GL014339, 2002, http://natypete.andradedowns.googlepages.com/knowles2002.pdf

No. 119. Effects On Water Resources: Monitoring Snowmelt Runoff And Sea Level for Climate Change, Maurice Roos, California Department of Water Resources, presented at the The U.S. Climate Change Science Program (CCSP) workshop on November 14-16, 2005, in Arlington, Virginia http://www.climatescience.gov/workshop2005/posters/P-WE2.8_Roos.pdf

[iii] Many studies have been conducted that estimate the impacts of climate change on California water resources. These studies include:
Documentation of Inputs to Macroeconomic Assessment of the *2006 Climate Action Team Report to the Governor and Legislature*, Final Version. Posted: March 24, 2006.

Learning From State Action on Climate Change . Pew Center On Global Climate Change, November 2005 Update, reprinted with permission. Posted: December 8, 2005.

Scenarios of Climate Change in California: An Overview . **FINAL** report from California Energy Commission, Public Interest Energy Research (PIER) Program, California Climate Change Center, publication # CEC-500-2005-186-SF, posted: February 27, 2006.

An Assessment of Impacts of Future CO2 and Climate on Agriculture.
FINAL white paper from California Climate Change Center, publication # CEC-500-2005-187-SF, posted: March 15, 2006.

Analysis of Climate Effects on Agricultural Systems.,**FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-188-SF, posted: February 27, 2006.

Climate Change: Challenges and Solutions for California Agricultural Landscape.
FINAL white paper from California Climate Change Center, publication # CEC-500-2005-189-SF, posted: February 27, 2006.

Climate Change and Wildfire In and Around California: Fire Modeling and Loss Modeling.
FINAL white paper from California Climate Change Center, publication # CEC-500-2005-190-SF, posted: February 27, 2006.

The Response of Vegetation Distribution, Ecosystem Productivity, and Fire in California to Future Climate Scenarios Simulated by the MC1 Dynamic Vegetation Model.
FINAL white paper from California Climate Change Center, publication # CEC-500-2005-191-SF, posted: February 27, 2006.

Fire and Sustainability: Considerations for California's Altered Future Climate.
FINAL white paper from California Climate Change Center, publication # CEC-500-2005-192-SF, posted: February 27, 2006.

Climate Change Impact on Forest Resources.
FINAL white paper from California Climate Change Center, publication # CEC-500-2005-193-SF, posted: March 16, 2006.

Climate Change Impacts on Water for Agriculture in California: A Case Study in the Sacramento Valley.
FINAL white paper from California Climate Change Center, publication # CEC-500-2005-194-SF, posted: March 15, 2006.

Climate Warming and Water Supply Management in California, **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-195-SF. March 16, 2006.

Predicting the Effect of Climate Change on Wildfire Severity and Outcomes in California: A Preliminary Analysis, **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-196-SF, posted: March 22, 2006.

Public Health-Related Impacts of Climate Change in California, **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-197-SF, posted: March 22, 2006.

Preparing for the Impacts of Climate Change in California: Opportunities and Constraints for Adaption, **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-198-SF, posted: March 22, 2006.

Climate Change Impacts on High Elevation Hydropower Generation in California's Sierra Nevada: A Case Study in the Upper American River, **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-199-SF, posted: March 22, 2006.

Predictions of Climate Change Impacts on California Water Resources Using CALSIM-II: A Technical Note, **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-200-SF, posted: February 27, 2006.

Climate Change and Electricity Demand in California, **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-201-SF, posted: February 27, 2006.

Projecting Future Sea Level, **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-202-SF, posted: March 15, 2006.

Climate Scenarios for California, **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-203-SF, posted: March 15, 2006.

Climate Change Projected Santa Ana Fire Weather Occurrence, **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-204-SF, posted: February 27, 2006.

[iv] **2006 California Bay Delta Authority CALFED Science Conference**

On October 23-25, 2006, the California Bay Delta Authority held its biennial science conference at the Sacramento Convention Center. Many of the presentations and posters at the conference contained information that has direct bearing on the baseline conditions and potential environmental impacts of the Monterey EIR. Due to their complexity and broad scope, these findings must be included in the analysis of the Monterey EIR.

We specifically urge DWR to analyze the scientific hypotheses, methods, data and conclusions from the following presentations:

"Delta Smelt Growth and Survival during the Recent Pelagic Organism Decline: What Causes Them Summertime Blues?"

On Tuesday, October 24th, William A. Bennett of the Center for Watershed Sciences & Bodega Marine Laboratory presented his latest findings from research into the growth and survival of Delta smelt (see attached 10/24/06 Contra Costa Times article). His research shows that, during the years of the Pelagic Organism Decline, only those smelt that are spawned while springtime export pumping is reduced as part of the implementation of the Vernalis Adaptive Management Plan (VAMP) survive to adulthood. The female smelt that spawn during the VAMP period are generally smaller and weaker than females who spawn earlier in the season and their offspring are generally smaller and weaker as well. Because the larvae of the healthier fish are destroyed during periods of higher pumping, the only offspring that survive are overall weaker and less resilient to environmental stressors. Bennett believes these less-fit offspring face a higher risk of mortality from other changes in the estuary such as increased fall salinity caused by water project operations. Bennett's research should be analyzed because it demonstrates the positive impact to the threatened Delta smelt from reduced exports and the detrimental impact to Delta smelt from periods of high exports.

"South Delta Fish Studies: Do Our Fish Have Behavioral Problems"

On Tuesday, October 24th, Lenny Grimaldo of the Department of Water Resources presented his preliminary findings from ongoing research into the Pelagic Organism Decline. Using particle tracking analysis, Grimaldo showed that changes to hydrology caused by the South Delta barriers draw Delta smelt deep into the South Delta towards the export pumps. This information should be carefully analyzed as it raises serious concerns about the potential impacts on threatened and endangered species of SWP operations, including operations under the proposed Monterey principles.

Grimaldo also found that nighttime salvage of striped bass and Delta smelt has increased during the POD years, likely due to increased nighttime exports. As the smelt and striped bass in the South Delta migrate from the bottom of the water column to the top during the night, they are more susceptible to salvage and entrainment, especially at the Banks Pumping station. The increases in nighttime exports since 2000 would therefore cause considerably more Delta smelt and striped bass to be drawn into the export facilities than increases at times when these species are less susceptible to pumping. This information should be analyzed

to ensure that water managers place adequate restrictions on nighttime exports to eliminate increased nighttime entrainment and salvage of threatened and endangered aquatic species.

"Spatio-Temporal Variability in Delta Smelt Stock Structures during Pre-POD and POD Years"

On October 24th, 2006, James A. Hobbs of the Bodega Marine Laboratory presented his findings documenting the decrease in Delta smelt stock habitat during the POD years, especially in the Western Delta. Dr. Hobbs noted correlations between changes in X-2 and declining spatio-temporal variability of Delta smelt. This information should be carefully examined in light of the potential impacts of the implementation of the proposed project on Delta salinity.

"Hydrodynamic Influences on Historical Patterns in Delta Smelt Salvage"

On October 24th, 2006, Peter E. Smith of the USGS presented his latest findings on the effects of hydrodynamics on Delta smelt salvage. He and his colleagues also prepared a poster summarizing their work (see attached). His research shows that high salvage of Delta smelt strongly correlates to periods with low San Joaquin inflows, moderate to high exports and negative flows on Old and Middle River. He also found that pulses on the Sacramento River may trigger the movement of Delta smelt towards the South Delta. This information should be analyzed to determine how the proposed project may exacerbate the effects of these hydrodynamics on the Delta environment.

"Ensemble Analysis of Climate Change Impacts for Central Valley Project and State Water Project Operations"

On October 25th, 2006, Levi D. Brekke of the US Bureau of Reclamation (BOR) presented the latest efforts by the BOR to model the impacts of climate change on the CVP and SWP. He stated that the BOR's modeling efforts were more robust than those described in DWR's July 2006 "*Progress towards Incorporating Climate Change into Management of California's Water Resources.*" For example, the BOR effort analyzes a much larger array of climate scenarios, utilizes more advanced development predictions and includes other modified assumptions. Mr. Brekke expects BOR's modeling to be available for public review in six months, approximately late April 2007.

"Climate Change Impacts on Evapotranspiration in California"

On October 25th, 2006, Roy M. Peterson Jr. of DWR presented findings from the DWR/USBR climate change team on the impacts of climate change in plant evapotranspiration. He noted that a 3 degree increase in temperature could result in an 18.7 percent increase in evapotranspiration. DWR must analyze this and similar studies to determine how the areas of origin for the water deliveries under the proposed project, including agricultural areas in the Sacramento Valley, will be impacted by these increases in evapotranspiration.

Judge Robie's recent decision for the Third District Court of Appeal in the State Water Resources Control Board Cases, 136 Cal.App.4th 674 (2006), concludes that impacts to the area of origin, including impacts to wildlife and habitat, take precedent over other beneficial uses. If increased evaportranspiration in the areas of origin require changes in hydrodynamic regimes to protect habitat, this may reduce the availability of water for delivery south of the Delta. The Monterey EIR must determine the likelihood and potential severity of these changes to determine the foreseeable impacts from the proposed action.

Many other presentations and posters at the CALFED science conference had bearing on the proposed action and should be analyzed as well. We include those presentations and posters into the record by reference.

ATTACHMENT B

LETTER 30

CRB

ISSUE SUMMARY

Financing The State Water Project

Options For Change

By
Dennis O'Connor

August 1994

California Research Bureau
California State Library
CRB-IS-94-005

900 N Street, Room 300
Sacramento, California 95814
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LETTER 30

EXECUTIVE SUMMARY

This is the third in a series of reports on State Water Project (SWP) financing produced by the California Research Bureau (CRB) at the request of Senator Dan McCorqudale. The first report described in some detail how the state finances the SWP.[1] In a much shorter note, the CRB explored the need to change the SWP's repayment system.[2]

This paper presents 20 options for changing the SWP's repayment system. Each option is designed to resolve at least one of the criticisms raised by academics, SWP contractors, or other water-interest groups.

We grouped the options by their common strategy.

Options That Change Short-Term Shortage Provisions

Option 1 Eliminates Article 18(a)'s Agriculture-Is-Cut-First Provisions & Eliminates Agriculture's Priority For Surplus Water
Option 2 Eliminates Article 18(a)'s Agriculture-Is-Cut-First Provision & Reduces Agricultural Entitlements By One-Seventh
Option 3 Auctions Water Shortage Reductions
Option 4 Creates A Delta Water Charge "Fee-bate"

Options That Reduce The Official Project Yield

Option 5 Executes Article 18(b)
Option 6 Declares The SWP Complete
Option 7 Declares the SWP "Complete" And Designates A New California Water Project
Option 8 Imposes A Water-Conservation Surcharge

Options That Set A Fixed Per-Acre-Foot Price

Option 9 Sets A Price Based On Full Entitlements
Option 10 Sets A Price Based On Expected Deliveries

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1 Dennis O'Connor, "Financing The State Water Project", CRB Issue Brief CRB-IS-94-004, (Sacramento: The CRB, June 1994)

2 Dennis O'Connor, "Is It Time To Talk About Changing The State Water Project's Financing System?", CRB Note vol. 2, no.3., (Sacramento: The CRB, June 15,1994).

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INTRODUCTION

On January 21, 1994, the Senate Committee on Agriculture and Water Resources held a hearing on the financing of the State Water Project (SWP). The California Research Bureau (CRB) opened the testimony by presenting an overview of the SWP's financing system.[3] Then, SWP contractors and other interest groups gave their perspective on how well the SWP's repayment system operated. Many of the participants seemed dissatisfied with the current repayment system.[4] The source of this dissatisfaction varied. For some, it was how the Department of Water Resources (DWR) allocated water during periods of water shortages. For others, it was the "take-or-pay" aspects of the contracts.[5] Still others expressed concern about the perceived misallocation of one of the State's most valuable resources to low value products.

Purpose

This is the third in a series of reports on SWP financing produced by the CRB at the request of Senator Dan McCorqudale. The first report described in some detail how the state finances the SWP.[6] That report provided the framework for the CRB's presentation to the committee on January 21, 1994. In a much shorter note, the CRB explored the need to change the SWP's repayment system.[7]

The purpose of this paper is to explore options for changing the SWP's repayment system. In particular, we are interested in how the SWP's repayment system might be improved in

---

3 In our first two papers, we used the term *financing* broadly. Any aspect of the SWP and its operations that affected either the SWP's bonded indebtedness, SWP costs, contractor repayment, or per acre-foot charges fit our use of the term *financing*. The DWR draws a distinction between the SWP financing system and the SWP repayment system. To the DWR, *financing* refers to the management of SWP debt through the sale of bonds and commercial paper, refunding of outstanding bonds, etc. *Repayment* refers to how the contractors repay the DWR for costs incurred in the construction and operation of the SWP. For the rest of this paper, we will follow the DWR's convention.

4 See, for example: Kern County Water Agency, "Financing of the State Water Project", *Presentation to Senate Agriculture and Water Resources Committee,* January 31, 1994; Conni Barker, "Comments of the Association of California Water Agencies", Submitted to the State Senate Committee on Agriculture and Water, January 31, 1994; and John Krautkreamer, "Testimony of Environmental Defense Fund on State Water Project Financing", January 18, 1994.

5 "Take-or-pay" means that regardless of whether the contractors take delivery of water or not, they pay for it.

6 Dennis O'Connor, "Financing The State Water Project", CRB Issue Brief CRB-IS-94-004, (Sacramento: The CRB, June 1994)

7 Dennis O'Connor, "Is It Time To Talk About Changing The State Water Project's Financing System?", CRB Note vol. 2, no.3., (Sacramento: The CRB, June 15,1994).

the eyes of various stake-holders and interest groups. These groups include the DWR, the SWP contractors, customers of the contractors, environmentalists, and other interest groups.

Problem

The goal of this paper is to propose options for improving the SWP repayment system. However, contrary to standard research procedures, we do so without an objective problem statement. This is because it is virtually impossible to develop a problem statement to which everyone would agree. Each person defines the problem(s) with the SWP's repayment system differently, depending on their own personal perspective. For example, nearly everyone would agree with the following statement:

> *The SWP cannot now, and may never reliably deliver the amount of water promised in the water supply contracts.*

However, there is little agreement about what that statement means. Some argue that this gap between promised and deliverable supplies is the source of all SWP problems. Others would argue that this gap is not a problem at all, especially since the contracts contain provisions for resolving this situation. Indeed, this latter group would argue that if there is a problem with this supply gap, it is the reluctance of the DWR to implement the appropriate contract provisions.

Since it was not possible to develop a universally acceptable problem statement, we took a different approach. Instead of objectively identifying problems with the current repayment system, we identified criticisms. We examined perceptions of what the SWP's financial problems might be, not necessarily actual problems themselves. Indeed, some may argue that this paper is not concerned with problems at all, only symptoms of problems. So be it.

Identify Criticisms

Criticism identification had two stages. First, we wanted to know what problems academics suggest the SWP's repayment system might have. Then, and more importantly, we were interested in the views of those more directly involved with the SWP. That is, we wanted to know what the contractors and other interest groups specifically liked and disliked about the current repayment system.

Academic Views

The literature on public utility financing is voluminous. However, little has been written directly about the SWP. Consequently, the literature search focused more on specific aspects of utility financing that might apply to the SWP, rather than the SWP's repayment system itself.[8]

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[8] The author recommends four books in particular: Edward E. Zajac, Fairness of Efficiency: An Introduction To Public Utility Pricing, (Cambridge, Mass: Ballinger Publishing Company, 1978);

Water-Interests' Views

Beginning in early May 1994, the author had a series of group and individual meetings with representatives of:

- The Department of Water Resources
- SWP contractors, including both:
  - Urban contractors, their member agencies and customers
  - Agricultural contractors, their member agencies and customers
- The financial community, including:
  - The DWR's bond counsel
  - The DWR's financial advisors
- Environmental interest groups
- Other interested groups and individuals

At the group meetings, free-flowing and often vigorous group discussions centered on the following four basic questions:

- What aspects of the SWP repayment system do you particularly like?
- What aspects of the SWP repayment system do you particularly dislike?
- What features do you need or want in any SWP repayment system?
- What are your specific likes or concerns with declaring the SWP complete?

Criticisms

The survey of economic literature and the group meetings each revealed criticisms of the current repayment system.[9] The following is a synthesis of the general and specific criticisms:

- The DWR's allocation of water among contractors during shortages has been inequitable.
- The SWP cannot now, and may never reliably deliver the official project yield.
- Average cost per acre-foot varies wildly from year to year.
- Average cost per acre-foot is higher than contractors were lead to believe it would be back in the 1960's.
- The current repayment system is economically inefficient.
- The DWR does not appear to be frugal, nor is the DWR accountable for its actions.
- The contracts require the contractors to repay more than just the costs to operate and maintain the SWP and repay all loans.

Michael A Crew and Paul R. Kleindorfer, The Economics of Public Utility Regulation, (Cambridge, Mass: MIT Press, 1986); James C. Bonbright, Albert L. Canielsen, David R. Kamerschen, Principles of Public Utility Rates, (Arlington Virginia: Public Utilities Reports, Inc., 1988); and Organization for Economic Cooperation and Development (OECD), Pricing of Water Services, (Paris: OECD, 1987)

9 The appendix presents the the water-interests' criticisms some detail.

Options

Based on the results of the literature review and the interviews, we developed options for changing the SWP's repayment system. Some of the options have been suggested before. However, at least half originate with the author. Each option is designed to resolve at least one of the criticisms raised by academics or the stake-holders. Besides simply describing the options, we also broadly characterize the potential implications of implementing the options. The analysis stops short of precisely calculating how each option would change each contractor's bill. State water project repayment is complex. Such an analysis would require data and analysis beyond the scope of this report. Instead, we present "back-of-the-envelope" estimates of the likely changes, given relatively broad assumptions on how the options would be implemented.[10]

Organization

The next seven sections of this paper present the options. Each section describes options that use the same basic strategy to resolve criticisms of the SWP repayment system.

The Strategies

We group the options by their basic strategy. These groups are:

- Options that change short-term shortage provisions
- Options that reduce the official project yield
- Options that set a fixed per acre-foot price
- Options that promote economic efficiency
- Options that reallocate costs for the environment
- Options that change SWP administration
- Options that change technical features of the SWP contracts

BOXES

Frequently, the language of SWP financing is confusing. Words that have general meaning in everyday conversation often have specific meaning in discussions of the SWP. Important differences may exist between terms that usually have similar meaning. The definition of some of the terminology requires so much explanation that few outside the SWP even attempt to understand it. Yet, to fully understand some of the options we present, it is vital that the reader understands certain key terms and concepts.

Throughout this report, we explain important terms and concepts in boxes like this.

10 For some of the estimates we needed legal-sized envelopes. However, for most we needed oversized manila envelopes.

We begin each group of options with a description of the criticisms this group of options tries to resolve. Then, we discuss each option in turn. The discussions begin with a general description of the option. Then, where necessary, we present details to clarify how the option would operate. Finally, we discuss the potential implications of implementing each option.[11]

Caveats

This paper does not present an exhaustive list of options. There are many variations on these themes. New options could be created, for example, by combining many of the options we present in this paper. Also, some of the options that follow are provocative. The CRB neither recommends nor embraces any of these options. Rather, the purpose is to help frame and stimulate debate.

We made no attempt to "validate" any of the criticisms. In particular, this paper does not consider the possibility that some criticisms of the SWP repayment system are not a symptom of a system-wide problem. Indeed, the source of some criticisms of the SWP might be problems internal to individual contractors. If, in fact, problems that individual contractors have with the SWP are unique, it might be more appropriate to deal with that contractor's particular problem directly than to reform the entire SWP repayment system.

This paper also does not consider "solutions" that do not involve changing the SWP's repayment system. For example, in our second paper we observed:

> *Most financing problems disappear when the project yields sufficient water. The problem is that it cannot do so on a reliable basis. There are options for permanently increasing the project's yield. The difficulties are:*
>
> - *Developing additional sources of water*
> - *Moving the water south of the Delta*
> - *At a price contractors are willing to pay.*[12]

Finally, this paper does not discuss in much detail *who* would implement each option nor *how* they would implement it. This is because the *who's* and *how's* for each option varies depending upon the option's proponents and opponents. If all players agree to implement an option, the DWR and contractors could simply amend their contracts. If, on the other hand, some players seriously objected to an option, implementation might require California's voters to approve a state-wide ballot proposition or constitutional amendment. Indeed, most of these key players contend that they hold veto-power over many types of changes. These key players include:

---

11 The option discussions assume the reader has a general understanding of SWP financing. The first report in this series provides sufficient background.

12 Dennis O'Connor, "Is It Time To Talk About Changing The State Water Project's Financing System?", CRB Note vol. 2, no.3., (Sacramento: The CRB, June 15,1994), p.5.

- The Legislature,
- The DWR,
- The SWP contractors, and
- The bond holders.

OPTIONS THAT CHANGE SHORT-TERM SHORTAGE PROVISIONS

The key objectives of these options are to:

- *Reallocate water among contractors during periods of shortages*
- *Stabilize the average cost per acre-foot of water*
- *Clarify key provisions of the contracts*

When the contractors signed the contracts in the 1960's, they recognized there would be short term shortages. However, most believed that the shortages would rarely extend beyond the agriculture-is-cut-first provisions of Article 18(a). In addition, most believed that surplus water would regularly be available in other years in sufficient quantity to at least make up any Article 18(a) reductions. This is proving not to be the case, and the ramifications have proved troubling to the DWR and the contractors.

Background

The DWR has implemented Article 18(a) five times: 1977, 1990, 1991, 1992, and 1994. Once, in 1990, the DWR reduced deliveries only to agricultural contractors. Three times the reductions went beyond the agriculture-is-cut-first provisions of Article 18(a): 1977, 1991, and 1992. First round cuts to agricultural contractor reached the "100 percent in any seven years" limit in 1992. Consequently, the DWR has imposed cuts on all contractors proportionally in 1994.

ARTICLE 18(a)

If the DWR cannot deliver sufficient water due to drought or other temporary cause, Article 18(a) of the SWP contracts dictates how the DWR is to reduce requests. Article 18(a) establishes a two-tiered approach to reducing requests. The first round reduces agricultural requests:

(a) "... up to fifty percent (50%) ... of that portion of the contractor's annual entitlement for the respective year ..."; but not more than

(b) "... a total of one hundred percent (100%) [of one year's entitlement] in any series of seven consecutive years ...".

If the first-round cuts are insufficient, Article 18(a) requires the DWR to make any additional cuts without regard to whether the contractor serves urban or agricultural customers. Under the second round of cuts, "... the state shall reduce deliveries to each contractor in an amount which bears the same proportion to the total amount of such necessary further reduction that the contractor's annual entitlement bears to the total of the annual entitlements of all contractors for that year ...". However, the DWR "... may apportion on some other basis if such is required to meet minimum demands for domestic supply, fire protection, or sanitation during the year."

REQUESTED DELIVERY VS. APPROVED ENTITLEMENTS

By October 1 each year, the contractors submit their preliminary delivery *requests* to the DWR. The DWR reviews the requests to ensure that the amounts, times, and rates of delivery for the up coming year are consistent with the state's overall delivery abilities. If the requests are not consistent with the state's overall delivery abilities, the DWR can modify the request(s), after first consulting with the affected contractor(s).

By December 1 each year, the DWR must give the contractors the initial water delivery schedule for the following year. In doing so, the DWR establishes the initial *approved entitlements* for each contractor for that year. As actual precipitation and snow depth data become known, the DWR updates its water supply estimates. When the updated water supply estimates change significantly, the DWR updates the delivery schedule and (generally) increases the approved entitlement.

The Criticisms

Concerns about Article 18(a) date back at least to the beginning of the 1987-92 drought. In 1987, the DWR formed a task force to review Article 18(a). The task force concluded:

> *Article 18 of the Contract should be comprehensively amended for developments not foreseen by its writers -- such as the mismatch of entitlements and deliveries and the inability to complete project conservation facilities in advance of buildup needs.*[13]

There have been two major criticisms associated with Article 18(a). One criticism relates to the effect implementation has had on some agricultural contractors. The other criticism relates to the way the DWR has interpreted it.

ENTITLEMENTS VS. DELIVERIES

The contracts establish a number of different classes of water. The most important class of water is *entitlement* water. Article 6 of each contract details by year the contractors annual entitlements. The contracts define the annual entitlement as the *maximum* amount of SWP water the DWR is required to deliver, *given sufficient supply.*

The DWR allocates available water supplies among contractors based on their annual entitlements. However, having an entitlement for a certain amount of water does not guarantee that a contractor will receive that amount. *Deliveries* are the amount of water a contractor receives based on their relative entitlement and available supplies.

The key difference is that entitlements are a contractual definition ("paper" deliveries) and deliveries are the actual amount of water the contractor receives ("wet" deliveries).

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13 Water Service Contractors Council Memo No. 1878, November 12, 1987, p. 2.

Effect On Agriculture

The SWP delivered virtually no water to agriculture in 1991. Since then, the banks have been reluctant to lend money to farmers that rely solely on the SWP for water. The lenders reason that the farmers no longer have a reliable water supply, and so the land has virtually no value. Farming is a highly leveraged business. A farmer who cannot borrow money, is not a farmer for long. Indeed, some agricultural water districts are having problems with delinquent water bills already.

DWR's Interpretation

There has been a long standing dispute between the urban contractors, agricultural contractors, and the DWR as to the "correct" interpretation of Article 18(a). Some would argue that the DWR's various interpretations clearly favored the agricultural contractors over the urban interests.[14] This year, instead of strictly following Article 18(a), the DWR claimed authority under other sections of the contracts and reduced some of the initial request *before* making the Article 18(a) reductions. In response, the Metropolitan Water District (MWD) deferred approving their annual SWP payment of $413.8 million. This meant MWD did not make the $67 million payment to the state by the January 1, 1994 due date.[15] The parties resolved the issue for this year, and the MWD did pay their bill before it became delinquent. However, the potential for future conflict remains.

The Options

The four options in this section change how the DWR allocates delivery cuts. The first two options simply redefine Article 18(a) and the surplus water provisions. The second two options replace Article 18(a) with provisions based more on market principles.

Option 1 Eliminate Article 18(a)'s Agriculture-Is-Cut-First Provisions & Eliminate Agriculture's Priority For Surplus Water

The original premise behind the agriculture-is-cut-first and agriculture priority for surplus water was that agriculture was more flexible in its use of water and could gear up or throttle down depending on the supply. Most people expected that the agriculture-is-cut-first provisions would be sufficient to cover any temporary shortages. No one anticipated that agriculture would receive virtually no water in a year. Since the basic premise is no longer applicable, this option simply removes both provisions.[16]

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14 When implementing Article 18(a), the DWR traditionally has allocated the reductions based on the contractors' requested deliveries, not entitlements. The DWR argues that if they allocate water among the contractors on any basis besides beneficial use, they would violate Article X, Section 2 of the California Constitution. This section requires water to be put to a "beneficial use".

15 The bills are due on January 1, and are delinquent on January 31. According to the DWR, contractors typically make their payment on January 30. This way the contractors can maximize their interest earnings.

16 The DWR and some urban contractors assert that the agriculture-is-cut-first provisions were a part of a package deal. They contend that agriculture received numerous "advantages" in addition to the

SURPLUS WATER

The water supply contracts define surplus water as water in excess of that required to meet:

1. All entitlement demands,
2. Reservoirs storage goals,
3. Water quality requirements, and
4. All other SWP requirements (such as recreation water).

The key aspects of surplus water are that the DWR can release it from reservoirs and schedule delivery in advance. The contracts give first priority for surplus water to SWP contractors for agricultural use or for groundwater replenishment. Second priority goes to SWP contractors for other uses, and non-SWP contractors receive the lowest priority.

Details

Each year the DWR estimates the probable supply of SWP water. This amount is either more than, the same as, or less than the contractors' *entitlement* requests. Under this option, in years where the supply is less than contractors requests, the DWR would cutback deliveries to *all* contractors in proportion to their entitlements. In years where the supply is more than contractors entitlement requests, the DWR would allocate *surplus* water based on a new priority system.

This option would require new surplus water priority system. One alternative would be to simply remove agriculture's priority from the current hierarchy. The new priority would then be:

1. Ground water recharge
2. Any SWP contractor
3. Any non-contractor

Some argue that agriculture received an undue benefit from surplus water deliveries early in the project's operation. Therefore, they contend that agricultural contractors ought to give something up to even the books. One alternative is to reduce agricultural contractors' Article 12(d) balances equal to the amount of surplus water deliveries.[17] Some Agricultural contractors might not have sufficient Article 12(d) balances to cover all historical surplus water deliveries. Should that be the case, the surplus water deliveries could be considered a draw against future Article 12(d) balances.

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priority to surplus water. The other advantages agriculture is purported to have received as a part of the package include:

- Greater summer deliveries than urban contractors (18% peaking factor vs. 11%)
- "Easy Payment Plan" for transportation facilities, and
- Capacity at less than full cost.

As with most criticisms of the repayment system, these observations are not universally embraced.

Implications

Under this option, urban contractors would lose some insulation from short-term shortages. However, some observe that urban areas seem better able to adapt to temporary water shortages than agriculture. In addition, this option would likely prevent agriculture from experiencing a true zero year again.

Option 2 Eliminate Article 18(a)'s Agriculture-Is-Cut-First Provision & Reduce Agricultural Entitlements By One-Seventh

The DWR originally proposed this option, among other proposals, during Article 18 negotiations. This option presumes that with today's water situation, the DWR will always cut agriculture 100 percent in any seven year period. Furthermore, given the slim prospects for future surplus water, this option presumes agriculture would receive virtually no benefit in exchange for the agriculture-is-cut-first provisions.

Details

This option would be implemented as follows:

- Eliminate the agriculture-is-cut-first provisions of Article 18(a);
- Reduce all agricultural contractors' annual entitlements by 1/7th;
- Reallocate fixed cost among all contractors to reflect the new entitlements.

In years that the DWR estimate of the supply of SWP is less than contractors requests, the DWR would cutback deliveries to *all* contractors in proportion to their entitlements.

Implications

This option would shift costs and water.

Cost Shifts

Some fixed costs would shift from agriculture to urban water users. For example, the Delta water charges comprise between 30 and 50 percent of the agricultural contractors' total SWP bill. The net effect to agriculture of lower entitlements and higher Delta water charges is about a 10 percent reduction in the Delta water charges. These costs would shift to urban water users. The urban water users would see about a five percent increase in Delta water charges. Fixed transportation costs would shift in different amounts but for similar reasons.

Water Shifts

If agriculture retains its current priority to surplus water, this option would shift some water from urban contractors to agricultural contractors.[18] This is because agricultural

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[17] When the DWR is unable to deliver requested water due to circumstances beyond DWR's control, such as a drought, the DWR credits the contractor's Article 12(d) balances. The contractors can then request delivery of their Article 12(d) water in a later year.

[18] Assuming no change in annual "wet" yield.

Hypothetical Fee-Bate Schedule*								
Fee-Bate Class	Yield Priority (Thousand Acre-Feet)	Fee-Bate (Per Acre-Foot)	Contractor Entitlements & Fee-Bate By Class Total (Thousand Acre-Feet & $ Millions)					
			Contractor A	Contractor B	Contractor C	Contractor D	Contractor E	Total
Class 1	0-800	$20	450 $9.0	150 $3.0	0 $0.0	100 $2.0	100 $2.0	800 $16.0
Class 2	801-1,800	$10	390 $3.9	100 $1.0	300 $3.0	110 $1.1	100 $1.0	1,000 $10.0
Class 3	1,801-3,200	$0	0 $0.0	590 $0.0	540 $0.0	270 $0.0	0 $0.0	1,400 $0.0
Class 4	3,201-4,200	-$26	0 $0.0	0 $0.0	0 $0.0	360 -$9.4	640 -$16.6	1,000 -$26.0
Total Entitlements Per Contractor			840 $12.9	840 $4.0	840 $3.0	840 -$6.3	840 -$13.6	4,200 $0.0
* Assumes the probability of delivery is symmetric around 2.1 million acre-feet per year								

Contractors would decide how much of their entitlement they wanted within each class of the fee-bate structure. They could request that their entitlement be spread somewhat evenly across all classes, or clustered in just one or two classes. In the example above, all contractors have entitlements totaling 840,000 acre-feet. Contractor A required a very firm supply of water and bought only Class 1 and Class 2 water. Consequently, Contractor A's total *fee*-bate would be $12.9 million. Contractor B bought water in each of the first three classes. Its *fee*-bate would total $4.0 million. Contractor C bought all of its water in the middle two classes, and would pay a total *fee*-bate of $3.0 million. Contractor D bought water in all four classes. Because most of its water was in the last two classes, Contractor D received a fee-*bate* of $6.3 million. Finally, Contractor E required some firm and very firm water, but most could be undependable. Contractor E received a fee-*bate* of $13.6 million.

Each year the DWR would estimate the supply of SWP water for the year. It would then determine how many "classes" of water it could provide. For example, assume the DWR estimated the supply in a year to be 2.5 million acre-feet. According to the hypothetical fee-bate schedule, the estimated supply falls right in the middle of Class 3. Consequently, the contractors would receive all of their Class 1 and Class 2 entitlements, and half of their Class 3 entitlements. No class four water would be distributed that year.

Implications:

This option replaces 18(a) and the surplus water provisions with a market based allocation system. It is quite similar to the non-interruptable and interruptable classes of service offered by many retail water agencies.

Few if any contractors serve 100 percent agricultural or 100 percent municipal and industrial customers. Most contractors have at least some customers of both types. Also, not all customers of the same "type" require the same firmness of supply. Farmers that grow permanent crops may be willing to pay more for a very firm water supply than, for example, a public golf course. By allowing contractors to buy water in each of the classes, they would be better able to match their costs with their customers' demand.

OPTIONS THAT REDUCE THE OFFICIAL PROJECT YIELD

The key objectives of these options are to:

- *Reduce the gap between entitlements and deliveries*
- *Stabilize the average cost per acre-foot of water*
- *Reduce the demand for SWP water*

When the DWR and the contractors signed the water supply contracts, they all believed the project would reliably deliver the official project yield of 4.2 million acre-feet of water per year. However, the SWP can not supply near that much water. The DWR estimates that the current SWP facilities can deliver 2.8 million acre-feet of water in an average year -- 2.2 million acre-feet in a drought year.[19] (However, the SWP delivered only 549,000 acre-feet in 1991.) According to many, this gap between the official project yield and actual project deliveries is at the root of most SWP repayment problems.

Background

The SWP provides water to 29 local and regional agencies under terms specified in the individual water contracts. The 29 water service contracts entitle these agencies to request a total of 4,154,201 acre-feet of water from the SWP in 1994. By 2021, these *entitlements* will increase to an ultimate total of 4,217,786 million acre-feet per year.

OFFICIAL MINIMUM PROJECT YIELD VS. FIRM YIELD

There are two key measures of SWP water supply: The official minimum project yield and firm yield.

The water supply contracts define *minimum project yield* as "the dependable annual supply of project water to be made available, estimated to be 4,230,000 acre-feet per year..." The DWR has executed contracts to deliver the full amount of the minimum project yield.

Typically, firm yield is used to describe the dependable annual water of existing facilities under current operating rules and restrictions, even during periods of drought. It is likely no one knows what the firm yield is currently. Through 1990, the DWR estimated the firm yield was about 2.4 million acre-feet.[20] However, given recent events, the yield is likely to be even lower.

The key difference is that the minimum project yield is a contractual definition ("paper" yield) and the firm yield is the actual yield ("wet" yield).

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19 Assumes 1990 "level of development" and environmental restrictions no more severe than D1485. Department of Water Resources, California Water Plan Update, Draft Bulletin 160-93, (Sacramento: The Department, November 1993), p. 310.

20 See for example, Department Of Water Resources, "Management Of The State Water Project", Bulletin 132-90, (Sacramento: The Department, September 1990), p. 86.

ARTICLE 18(b)

The SWP contracts include a provision for reducing total entitlements when the dependable yield of the SWP permanently drops below the official minimum project yield. That provision is Article 18(b). Under Article 18(b), the DWR would proportionally reduce the entitlements of all contractors until the reduced entitlements equaled the "new" minimum project yield. To the extent possible, the DWR must give the contractors five years notice before implementing Article 18(b) reductions.

The Criticisms

Almost every aspect of the SWP repayment system somehow relates to the contractors' entitlements. The DWR allocates fixed costs among contractors based on entitlements. The DWR allocates water among contractors based on entitlements. Indeed, since the amount of water delivered determines the variable costs, entitlements at least partially determine even the variable charges.

THE CONTRACTORS' WATER BILLS

The contractors' annual water bills consist of two charges:

- The Delta water charge, and
- The transportation charge.

Delta Water Charge

The purpose of the Delta water charge is to recover the costs of acquiring and storing water It consists of two components:

- Capital cost component, and
- Minimum operation, maintenance, power and replacement (minimum OMP&R) component.

The DWR calculates the Delta water charge as a fixed rate per acre-foot of entitlements. Each contractor's annual Delta water charge is the fixed rate times the contractor's annual entitlement. Consequently, the Delta water charge *does not vary* with "wet" deliveries.

Transportation Charge

The purpose of the transportation charge is to recover the costs of moving SWP water to the contractors. It consists of four components:

- Capital cost component,
- Minimum OMP&R component,
- Minimum OMP&R component -- off-aqueduct power facilities, and
- Variable OMP&R component.

The DWR allocates transportation costs among contractors based on relative *use*. The contracts define *use* differently for each component. For the capital and minimum OMP&R components, use is based on the contractors' annual entitlements. Therefore, the annual charges for these two components *do not vary* with "wet" deliveries. For the off-aqueduct power facilities and variable OMP&R components, use is the amount of electricity needed to pump the water to the contractor. The annual charges for these two components *do vary* with "wet" deliveries.

The project repayment methodology was designed assuming that deliveries and entitlements would be approximately the same. Since deliveries have been much less than entitlements, there are problems. The contractors' bills are different than they anticipated. Most noticeably, the average cost per acre-foot of water varies widely from year to year.

The Options

The principle feature that the following four options share is that they all reduce the official minimum project yield of the current SWP. The purpose is to bring the official "paper" yield more in line with the actual "wet" yield. The first option simply imposes Article 18(b) reductions. The second declares the SWP "complete", thereby halting expenditures for any future projects. The third declares the SWP "complete" and authorizes a new California water project. This option shifts the cost of the transportation system's excess capacity to the new project, only those who choose to participate in the new California water project would pay for it. The fourth option approaches the problem of insufficient supply differently, by reducing demand through water conservation projects.

Option 5 Execute Article 18(b)

The DWR could, either independently or by legislative mandate, implement Article 18(b). In either case, the DWR would reduce all contractors' entitlements proportionally until total entitlements more nearly equaled the dependable project yield.

Details

To implement this option, the DWR would first recalculate the minimum project yield.

If the DWR imposed Article 18(b) independently:

- The DWR would decide whether to include prospective projects like Los Banos Grandes in the recalculation; and
- Give the contractors 5-years notice before implementing Article 18(b), *to the extent possible*.

If the Legislature directed the DWR to impose Article 18(b), then the Legislature could presumably:

- Direct the DWR to include or exclude specific projects in the calculation of the revised minimum project yield; and
- Establish an effective date for the entitlement reduction without regard to the five year delay.

Implications

Alone, the imposition of Article 18(b) would not change the contractors' water bills. The contractors' bills are based mostly on the relative distribution of entitlements -- invoking Article 18(b) does not change that relative distribution. However, the imposition of

Article 18(b) would likely change the amount of water each contractor receives. Consequently, this option would have four main effects. It would:

- Reduce entitlement *deliveries* disproportionately among some contractors;
- Reduce occurrences of short-term shortages;
- Increase availability of surplus water; and
- Stabilize the average cost per acre-foot of water.

Reduced Entitlement Deliveries

If the DWR executed Article 18(b), it would reduce all contractors' entitlements proportionally. However, not all contractors currently request delivery of their full entitlements. Consequently, reducing entitlements by invoking Article 18(b) would affect contractors differently. Contractors who currently request delivery of their full entitlements would see a greater reduction in entitlement deliveries than those who request delivery of less than their full entitlements. This is because in the first case, the reduced entitlements represent reduced "wet" water deliveries, while in the later case the reduced entitlements represent reduced "paper" deliveries. This is illustrated in the table below.

Effect Of Implementing Article 18(b)
Example Of A Contractor Requesting Delivery Of Full Entitlement
Vs A Contractor Requesting Delivery of Less Than Full Entitlements

	Contractor "A"	Contractor "B"
Total Entitlements:	100,000 acre-feet	100,000 acre-feet
• "Wet" Deliveries	100,000 acre-feet	50,000 acre-feet
• "Paper" Deliveries	0 acre-feet	50,000 acre-feet
50 Percent Reduction In Entitlements	-50,000 acre-feet	-50,000 acre-feet
Total Entitlements:	50,000 acre-feet	50,000 acre-feet
• "Wet" Deliveries	50,000 acre-feet	50,000 acre-feet
• "Paper" Deliveries	0 acre-feet	0 acre-feet
Percent Reduction:		
• "Wet" Deliveries	-50%	0%
• "Paper" Deliveries	0%	100%

In this example, both Contractor A and Contractor B have annual entitlements totaling 100,000 acre-feet. Contractor A currently requests delivery of its full 100,000 acre-feet of entitlements each year. Contractor B currently requests delivery of only 50,000 acre-feet of its entitlements each year, thereby taking the delivery of the half of its entitlements as "paper" deliveries. Assume the DWR now reduces entitlements by 50 percent. Both Contractor A and Contractor B would now have annual entitlements totaling 50,000 acre-feet. Contractor B could still request delivery of its traditional 50,000 acre-feet of "wet"

deliveries. However, Contractor A could request delivery of only half of its traditional 100,000 acre-feet of "wet" deliveries.[21]

Article 18(a)

By reducing the minimum project yield, the DWR would reduce or eliminate the gap between the "paper" and "wet" yields of the SWP. Consequently, the SWP ought to experience shortages less often than before. This means the DWR would need to apply Article 18(a) reductions less frequently.

The effect of a less frequent application of Article 18(a) depends on how much the DWR lowered the minimum project yield. If the DWR lowered the yield such that agriculture continued to experience 100 percent reductions within every seven year period, there would be no change in water distribution. However, if agriculture no longer regularly gave up 100 percent of one year's entitlements, agriculture would receive more water -- water that otherwise would have gone to urban contractors under current policies.

Surplus Water

This option does nothing to change the "wet" yield of the SWP. Therefore, imposing Article 18(b) does not "create" surplus water. Instead, it reclassifies existing water from entitlement water to surplus water.[22] Agriculture receives first priority to surplus water. "Creating" surplus water benefits agriculture and harms urban water users. This is because the "creation" of surplus water is really a shifting of water from urban users to agricultural users. Since the DWR charges less for surplus water than entitlement water, this option would also shifts costs to urban users from agriculture.

There is no guarantee, however, that this option would "create" any surplus water. If the DWR implemented Article 18(b), they might also change how it operates the SWP reservoirs. They might decide, for example, not to distribute "surplus" water and instead decide to store the water for distribution as entitlement water in another year.

Stabilize Average Cost

This option narrows the gap between the "paper" and "wet" yield of the SWP. As the gap narrows, any pressure that might be on the DWR to "drain the reservoirs" in order to deliver full entitlements would likely drop. The DWR could then change its reservoir operations to deliver a more constant supply of water from year to year. Since about 70 percent of the contractors' bills do not vary with the amount of water delivered, more constant deliveries would lead to a more stable average cost per acre-foot of water.

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21 In this example, the Contractor B's "excess" entitlements acted as an "insurance policy" against delivery reductions. "Excess" entitlements can play a similar insurance like role in Article 18(a) reductions.

22 No necessarily. If this option were implemented, the DWR might also change how it operates the SWP reservoirs. They could decide, for example, not to distribute "surplus" water and instead decide to store the water for distribution as entitlement water in another year.

Option 6 Declare The SWP Complete

Under this option, the Legislature would declare the SWP complete. In doing so, the Legislature could:

- Define which facilities are and are not a part of the SWP;
- Require the DWR to stop charging the contractors for work on projects that are not a part of the newly defined SWP; and
- Require the DWR to determine the new project yield and implement Article 18(b).

> ***THE BURNS-PORTER ACT***
>
> The Burns-Porter Act is the keystone to SWP financing and project repayment. The object of the Burns-Porter Act was to provide funds to assist in the construction of the SWP. It did so by:
>
> 1. Authorizing $1.75 billion in general obligation bonds
> 2. Defining SWP facilities
> 3. Establishing repayment priorities
> 4. Prohibiting the Legislature from impairing the contracts so long as any of the general obligation bonds are outstanding.
>
> Most aspects of the act became effective on November 8, 1960, when California's voters approved Proposition 1, on a vote of 2,857,586 to 2,719,942.

Details

Changes to the Burns-Porter Act would require a majority vote of the state's voters. However, the Legislature might be able to make changes in the SWP without changing the Burns-Porter Act. The Legislature might, for example be able to exclude any additional Delta facilities from the SWP. The Burns-Porter Act defined the SWP facilities to include:

> *(3) Master levees, control structures, channel improvements, and appurtenant facilities in the Sacramento-San Joaquin Delta for water conservation, water supply in the Delta, transfer of water across the Delta, flood and salinity control, and related functions.*[23]

To exclude future Delta facilities from being a part of the SWP, the Legislature might find that only Delta facilities operating as of a specified date are SWP facilities. This might allow the state, without violating the Burns-Porter act, to prohibit additional SWP expenditures on new Delta facilities.

The precise wording of the legislation that declares that the SWP complete is important. For example, suppose such legislation declared that the SWP consisted of only those facilities in operation as of a specific date. Such language could disenfranchise some contractors from the SWP. The SWP, for example, does not currently connect to three contractors -- San Luis Obispo County FC&WCD, Santa Barbara County FC&WCD, and San Gorgonio Pass Water Agency. The Burns-Porter Act might prohibit the newly

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[23] Water Code §12934

reconstituted SWP from excluding service to these contractors. If it did not, the act almost certainly would require the SWP to refund to these contractors all money they have paid the SWP. If, in this example, the Legislature did not intend to disenfranchise these contractors, the legislation would need to specifically include transportation facilities to these contractors in the completed SWP.

Implications

Besides the effects described above from invoking Article 18(b), there are two additional effects of declaring the project complete. First, there would be a reduction in charges to SWP contractors for work not a part of the completed SWP. This might simply be an avoidance of future costs and charges, depending on how the Legislature defines the completed project.

Second, should some become disenfranchised, SWP charges would increase. To date, SWP charges to San Luis Obispo County FC&WCD, Santa Barbara County FC&WCD, and San Gorgonio Pass Water Agency total $14.6 million, $28.4 million, and $27.9 million, respectively. If the SWP had to refund their contributions to date *with interest*, it would total over $105 million. If the SWP had to refund money to any contractor, the DWR presumably would spread the costs of the refund to the remaining contractors.

Option 7 Declare the SWP "Complete" And Designate A New California Water Project

Under this option, the Legislature would not only declare the project complete, but it would also authorize a new California Water Project (CWP). A new CWP would allow for new facilities funded only by those interested in repaying the costs to construct and operate the CWP. If a current SWP contractor found the CWP price too high, they could choose not to participate. In addition, those currently outside the SWP could choose to participate in the new CWP without harming current SWP contractors.

Details

This option could be implemented in two stages. In stage 1, the Legislature would declare the current project complete and authorize the development of a new California Water Project. In stage 2, the DWR would implement those changes necessary for the joint operation of the SWP and the CWP.

Stage 1

During stage 1, the DWR would execute the changes associated with declaring the project complete, as described previously. The DWR would also work out the details of the CWP, including:

- Identifying the source(s) of water for the new project;
- Estimating the annual supply from these sources;
- Establishing the joint operating policies for the two projects, especially regarding priority to water and to use of transportation facilities; and
- Identifying CWP contractors and their amount of CWP entitlements.

Stage 2

Stage 2 would begin after the DWR worked out the major details of the CWP. In stage 2, the DWR would perform final yield simulations under the various priority rules. The priority to water, for example, might be:

1st All SWP entitlements
2nd All CWP entitlements
3rd Any SWP surplus
4th Any CWP surplus

The simulation would allow the DWR to finalize the yields of the SWP and CWP. If necessary, the DWR would make a final adjustment to the SWP contractors' entitlement levels. Once the DWR determined the yield of the two projects, the DWR would reallocate costs between the two projects to reflect the proportionate use of the transportation facilities.

Implications

The implications of this option are many. However, the impact of this option on the contractors cannot be easily quantified without making many critical assumptions. Two particularly important unknowns include:

- The joint operation rules of the SWP and CWP, including priority, and
- The absolute and relative "wet" and "paper" yields of the SWP and CWP.

Regardless of the precise answer to the above, the results of this option would be similar to the two previous options. That is, this option would:

- Reduce entitlement deliveries disproportionally among some SWP contractors;
- Reduce occurrences of short-term shortages;
- Stabilize the average cost per acre-foot of SWP water;
- Reduce charges to SWP contractors for work not a part of the completed SWP; and
- Shift costs from any disenfranchised SWP contractors to the remaining SWP contractors.

In addition, the shifting of transportation costs from the SWP to CWP would lower costs to SWP contractors presumably without reducing SWP deliveries. For example, the transportation facilities were built to accommodate delivery of 4.2 million acre-feet per year. If the adjusted yield of the SWP and CWP was 2.8 million acre-feet per year and 1.4 million acre-feet per year respectively, one third of the fixed transportation charges could

shift from the SWP to the CWP. There could be a similar shifting of costs for some conservation facilities as well.

Option 8 Impose A Water Conservation Surcharge

This option imposes a water conservation surcharge on all water delivered by the SWP. The proceeds would be used to fund water conservation projects within the SWP service area.

Most contractors point out that the SWP was designed to deliver 4.2 million acre-feet per year; yet it can reasonably be expected to deliver on average only 2.8 million acre-feet per year. Consequently, from their perspective, there is an under supply of water. That may be true. However, another interpretation is that there is an over-demand for water. This option is designed to reduce demand for SWP water.

Details

This option would impose a fixed surcharge on delivered water -- for example $5 per acre-foot. Assuming the SWP will deliver on average 2.8 million acre-feet per year, this option would raise $14 million per year. Water conservation projects funded by this program should have to demonstrate that they would reduce consumption of SWP water a measurable amount. The types of projects eligible could be diverse -- ranging from toilet retrofit projects, to agricultural land retirement, to reclaimed water projects. Upon completion of each water conservation project, the DWR would reduce the entitlements of the contractor serving the area of the project. To encourage participation, the program might reduce the entitlement by less than one acre-foot for every acre-foot conserved.

Current law might prohibit the use of WSS revenues to fund conservation projects. The Burns-Porter Act restricts the use of revenues generated by the SWP. In priority order, these uses are:

1. Payment of reasonable annual operation and maintenance costs for the SWP;
2. Annual debt service on the general obligation bonds issued for the SWP;
3. Transfer to the California Water Fund as reimbursement for any funds used from it for construction of SWP facilities; and
4. Use for acquisition and construction of:
   - the SWP,
   - facilities authorized as a part of the state Central Valley Project, or
   - facilities authorized as a part of the California Water Plan.[24]

To ensure that the revenues raised by the surcharge could be used to fund conservation projects, the Legislature might define the conservation program as a *facility* in the California Water Plan.

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[24] California Water Code §12937

Implications:

The United States Marine Fisheries Service (USMFS) has upgraded its listing of the winter-run chinook salmon from *threatened* to *endangered.* The United States Fish and Wildlife Service has also recently listed the Delta smelt as *threatened*, and has proposed listing the California splittail smelt as *threatened* as well. For each of these fish, the USMFS places a ceiling on how many fish the SWP can *take*[25] during normal project operations. When the DWR exceeds the take limit, the DWR must shut down pumping operations.

The take limits for the winter run salmon especially limit SWP operations and reduce water supplies, because the winter run occurs during the prime water exporting season. Indeed, the underlying premise of the SWP was to export water during the winter runoff period, when there was more water than once thought necessary for habitat maintenance or water quality. Listing of the delta smelt further complicates SWP operations, because the smelt spends its entire life cycle in the Delta.

Protecting winter-run salmon and delta smelt makes it increasingly difficult to maintain the current "wet" yield. Considering the difficulties of increasing project yield, a program to reduce SWP demand might be less expensive than alternative yield increasing options.

25 "Take" is broadly defined to include the following: harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any of preceding actions. 16 USC §1532(19), 50 CFR §17.3.

OPTIONS THAT SET A FIXED PER ACRE-FOOT PRICE

The key objectives of these options are to:

- *Stabilize the average cost per acre-foot of water*
- *Lower the average cost per acre-foot of water*
- *Reduce demand for SWP water*

In our meetings with the different water-interests, most agricultural contractors and farmers seemed to agree on one point. They believe the SWP ought to operate under a new principle -- "You pay for what you get." If a contractor receives delivery of full entitlement, they agree the contractor should pay the full entitlement costs. Conversely, if a contractor gets half the supply, they feel the contractor should pay half the full entitlement costs.

Background

The DWR, in operating the SWP, does not *set* a price on SWP water. Instead, prices, in the form of average costs, result from two independent sets of actions. These actions are:

- Allocating costs, and
- Allocating water.

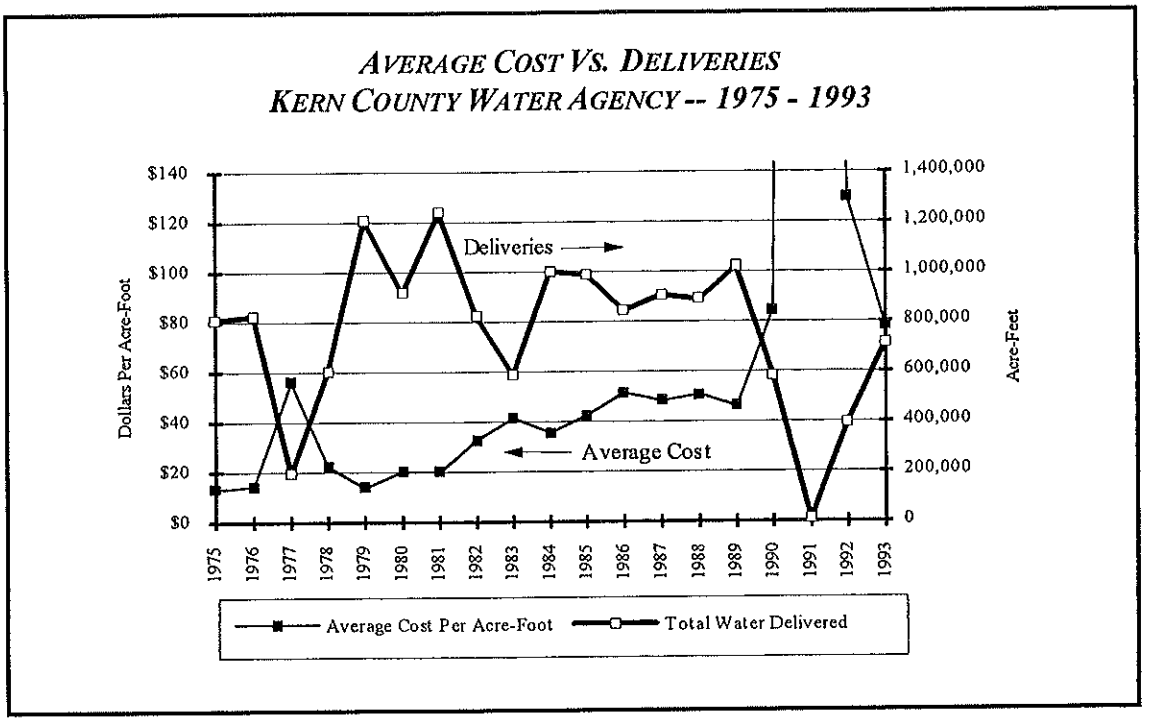
Most of the SWP charges to the contractors do not change with the amount of water the contractors receive. Consequently, any change in the level of deliveries profoundly affects the per acre-foot cost of water. In particular, the practical effect of water shortages is to drive the average cost of water skyward.

The Criticisms

In 1977, the DWR cut water deliveries 70 percent from the prior year's level. This resulted in an over 225 percent increase in the average cost per acre-foot of water. In 1991, the DWR cut water deliveries nearly 80 percent, driving up the average cost per acre-foot of water over 280 percent to $620 per acre-foot. The picture for Kern County Water Agency (KCWA) is even more dramatic. With a meager 8,965 acre-feet delivered in 1991, the per acre-foot cost reached the stratospheric level of $4,285. (See chart on next page.)

The Options

The two options in this section set a fixed per acre-foot price on SWP water. In each case, the price varies depending on the point of delivery, much like the current system. The key difference is that the contractors would pay the same *unit* price regardless of whether they received one acre-foot or their full entitlement.



The two options differ in how they set the per acre-foot price. The first option sets the price equal to the average cost per acre-foot when all contractors receive deliveries of full entitlements. The second option sets the price equal to the average cost per acre-foot assuming average deliveries over the life of the SWP, given current facilities.

Option 9 Set Price Based On Full Entitlements

This option sets the price equal to the average cost per acre-foot assuming delivery of full entitlements. The DWR would calculate each contractor's bill by multiplying the price to per acre-foot by acre-feet of water delivered. The per acre-foot price would apply regardless of how much SWP water the DWR delivered. When deliveries equaled total entitlements to all contractors, SWP revenues would equal SWP costs. If, however, the project did not deliver full entitlements in any given year, the costs would not be fully reimbursed by the contractors. Consequently, another fund would be required to augment the contractors' payments.

Details

The following table illustrates how this option would work in 1994 for the Kern County Water Agency (KCWA) and the Metropolitan Water District of Southern California (MWD). The top portion of the chart shows how the DWR would set the price based on costs at full entitlement. The middle part of the chart shows the how the DWR would calculate these contractors' bills for 1994. The bottom of the chart shows the difference in water bills under the current repayment system and this price at full entitlements option.

1994 Price Per Acre-Foot
Based On Full Entitlements

	KCWA	MWD
Current Costs With Full Entitlement Deliveries		
Total Costs	$60,800,000	$395,000,000
Total Entitlements (acre-feet)	1,018,000	2,011,500
Average Price (per acre-foot)	$59.70	$196.00
Current Costs With Approved Deliveries		
Delivered Costs	$57,700,000	$294,000,000
Approved Deliveries (acre-feet)	509,000	1,005,750
Average Cost (per acre-foot)	$113.00	$292.00
Total Bill Based On Entitlements		
Approved Deliveries (acre-feet)	509,000	1,005,750
Average Price (per acre-foot)	$59.70	$196.00
Total Bill	$30,400,000	$197,000,000
Delivered Cost Vs. Total Bill		
Difference:	$27,300,000	$97,000,000

Revenues from contractor payments would be insufficient to cover SWP costs whenever deliveries were less than entitlements. Consequently, some other source of revenues would have to pick up the difference. Presumably, the state would have to create a "rate stabilization fund" to cover the balance of the SWP costs. Such a "rate stabilization fund" would have to be relatively large. For example, if the SWP delivered 10 percent less than the full entitlement level, the "rate stabilization fund" would need to pick up about 7 percent of the SWP costs. (There is not a direct one percent to one percent reduction because about 30 percent of SWP costs are already on a per unit basis.) The DWR estimates that the current SWP facilities can supply on average about 80 percent of full entitlements over the balance of the project.[26] This means the rate stabilization fund would need to cover on average about 14 percent of the cost of the project, or about $95 million per year. However, in any one year the rate stabilization fund would contribute between $0 and $240 million.

Implications:

This option would have two principle effects. It would stabilize the per acre-foot cost of water to contractors, and it would require a large rate stabilization fund.

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26 The Department of Water Resources, California Water Plan Update, Volume 1, Draft, (Sacramento: The Department, November 1993), p. 310.

PRIORITY FOUR

Priority four money is money the contractors are contractually required to pay, that is in excess of that needed to operate and maintain the SWP, repay the bond holders, and repay the California Water Fund. The DWR expects priority four revenues to start accumulating at a rate of about $44 million per year beginning around fiscal year 1998-99. By the end of the project in 2035, the DWR expects to have accumulated between $1.5 and $2.0 billion in priority four balances.

Average Cost

The key advantage of this option is that it would stabilize per unit cost of water to contractors. This would likely make the farmers annual negotiations with agricultural lenders easier, and would probably have system wide benefits as well. Farmers, for example, might actually reduce their demand for water, since they could avoid 100 percent of the cost of water they forgo. Under the current procedures, farmers only save the variable charge of water they forgo, which amounts to about 25 percent of their bills.

Stabilization Fund

This options would require a large rate stabilization fund. As noted above, the fund would require on average $95 million per year. One source in particular has been mentioned as potential revenue sources -- *priority four* funds. However, priority four funds would generate about $44 million per year -- short of the necessary $95 million.

Bond Holders

This option, by its very nature, would produce a less predictable revenue stream to the SWP than the current system. Consequently, the bond holders are likely to be concerned about the security for the rate stabilization fund. Consequently, bond holders are likely to require detailed joint financial and operational analysis before this option could be authorized. Otherwise, credit rating agencies would likely lower the SWP's credit rating, thereby raising the SWP's financing costs.

POTENTIAL ADDITIONAL FUNDING SOURCES FOR THE SWP

Some options would shift SWP costs from the contractors to the state. The state would therefore need to identify the funding source to cover these costs. Potential funding sources include:

Funding Source	*Annual Yield*	*Current Status*
• General Fund	• $41 billion	• Currently in deficit
• California Water Fund	• $25 million	• Funds Delta flood protection, San Joaquin Drain, and Other Non-SWP facilities
• "Priority Four"	• $44 million	• Begins accruing in 1996-97
• General Obligation Bonds (for capital outlay)	• As necessary	• Outstanding G.O. water bonds total $1.2 billion
• New per acre-foot tax on use of all water	• $34 million for each $1 per acre-foot tax	• Not currently taxed

Option 10 Set Price Based On Expected Deliveries

This option is similar to the previous option. The key difference is that the DWR would allocate costs to contractors and calculate the per acre-foot price based on actual historical and "expected" future deliveries, instead of contractual entitlements. That is, the price would be based on "wet" yield instead of "paper" yield. Consequently, this option would not require annual contributions from a rate stabilization fund.

Like the previous option, the per acre-foot price would apply regardless of the amount of water the contractors received in any year. If actual deliveries equaled expected deliveries to all contractors, the price would cover all costs. To the extent actual deliveries were greater than (or less than) expected deliveries in any given year, this option would generate an annual surplus (or deficit).

This option would require the creation of a "cash flow" fund. Assuming the DWR can accurately estimate "expected" deliveries, this fund would both accumulate and distribute funds, so that in the long run the "cash flow" fund would not require ongoing sources of revenues outside of contractor payments.

Details

The estimates of "expected" deliveries are critical. The DWR would need to run detailed hydrological simulations of the SWP to estimate the average annual yield. The DWR would then use the results to calculated each contractor's "expected" deliveries.

A mechanism for the DWR to routinely reestimate the "expected" delivery estimates would also be necessary. If the "expected" delivery estimates were updated annually, the cost of recalculating them would likely exceed any benefits from improved accuracy. Conversely, reestimating the deliveries less frequently would certainly be less costly to administer, but might allow a poor estimate to stay in effect too long. Poor delivery estimates could cause the rate stabilization fund to acquire too much or not enough funds to remain solvent. Detailed financial and operational studies would likely suggest the appropriate frequency.

Technically, this option could easily be made retroactive to the beginning of the project. Some contractors might end up owing the SWP additional funds. If so, others would be due a rebate.

The following table illustrates how this option would work in 1994 for the KCWA and the MWD. The top portion of the chart shows how the price would be set. The bottom part of the chart shows the effects of charging that price for approved SWP deliveries for 1994.

1994 Price Per Acre-Foot
Based On "Expected" Deliveries

	KCWA	MWD
Current Costs With "Expected" Deliveries		
"Expected" Costs	$51,200,000	$328,000,000
"Expected" Deliveries (acre-feet)	679,000	1,340,000
Average Price (per acre-foot)	$80.00	$245.00
Current Costs With Approved Deliveries		
Delivered Costs	$57,700,000	$294,000,000
Approved Deliveries (acre-feet)	509,000	1,005,750
Average Cost (per acre-foot)	$113.00	$292.00
Total Bill Based On "Expected" Deliveries		
Approved Deliveries (acre-feet)	509,000	1,005,750
Average Price (per acre-foot)	$80.00	$245.00
Total Bill	$40,700,000	$246,000,000
Delivered Cost Vs. Total Bill		
Difference	$17,000,000	$48,000,000

Implications:

The key advantage of this option over the previous one is that this option would not require an outside funding source, except perhaps a start-up loan to establish the "cash flow" fund. Assuming the DWR estimated the expected delivery accurately, the money the fund accumulated and disbursed would, over the years, net to zero. Like the previous option, this option would stabilize the per unit price of water, albeit at a higher level.

OPTIONS THAT PROMOTE ECONOMIC EFFICIENCY

The key objectives of these options are to:

- *Change the price of water to better reflect waters economic value*
- *Shift water to more valuable uses*

One of the tenets of modern economic theory is that all goods and services should be priced and allocated in a manner that maximizes the net benefits to society as a whole. Increasingly, people are suggesting that this tenet should apply to water. For example, comments like "water is a scarce and valuable resource -- so it should be used such that society receives the most benefit from its use" are becoming increasingly common.[27]

Background

Economists use the term *efficient* to mean getting the most output from any given set of inputs. The SWP could improve economic efficiency by adopting two key aspects of competitive markets -- voluntary exchange and marginal-cost pricing.

Voluntary Exchange

Economists argue that voluntary exchanges -- between willing buyers and sellers -- promote economic efficiency.[28] In an exchange between a willing buyer and seller, each receives something they value more than what they gave up. As both the buyer and seller gain as a result of the exchange, the transaction has improved economic efficiency.

For example, suppose that SWP Contractor A is willing to pay $250 per acre-foot for an additional 1,000 acre-feet of SWP water. Suppose, too, that SWP Contractor B is willing to sell 1,000 acre-feet of water for $250 per acre-foot. This means that Contractor A values the additional 1,000 acre-feet of water more than $250 per acre-foot. Similarly, Contractor B values $250 per acre-foot more than the 1,000 acre-feet of water he is willing to sell. If Contractor A is allowed to buy 1,000 acre-feet of water from Contractor B for $250 per acre-foot, both the buyer and seller would receive something they value more than what they gave up. Such a transaction, therefore, would improve the lot of both.

Marginal Cost Pricing

The marginal cost of production is the cost to produce the last (or next) unit of production. When producers price their products equal to the marginal cost of producing

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27 A strong case for a more efficient approach to water is made by: Organization for Economic Cooperation and Development (OECD), Pricing of Water Services, (Paris: OECD, 1987).

28 All other things being equal.

them, the producers are practicing marginal-cost pricing. Under certain conditions,[29] marginal-cost pricing maximizes economic efficiency.

For example, a water resource system that charges the marginal cost for water and sells all its water, should provide more water. This is because the customers have already shown their willingness to pay the cost of providing the additional water. Conversely, if a water resource system charges the marginal cost for water and cannot sell all its water, the system is not supplying water at an economically competitive cost. The water resource system should change its operations accordingly.

The Criticisms

The SWP does not allow contractors to sell or lease their entitlements. The SWP also fails to price the water at the marginal of producing the water. This strongly suggests that the current SWP repayment system might be economically inefficient.

The Options

The two options in this section promote a more efficient allocation of SWP of water. The first option focuses on changing the allocation of entitlements among contractors. The second option changes how contractors are charged for SWP water.

Option 11 Allow SWP Contractors To Buy And Sell Entitlements

This option allows contractors, on a voluntary basis, to sell or lease their entitlements to other SWP contractors at a contractor-negotiated price, as long as the transfer does not adversely affect any non-party contractor.

Details

The price paid by the buyer should have three components:

- The costs of assuming the SWP charges.
- The costs of wheeling the water from the seller to the buyer.
- The premium paid by the buyer to the seller, (could be $0).

The seller would receive both the premium and relief from paying the SWP charges associated with the entitlements sold. The SWP would receive the costs associated with the entitlements and the wheeling charges. The buyer would receive the value of the additional entitlements.

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[29] The conditions are those of perfect competition, including: All products in the market are indistinguishable from each other; each participant in the market, whether buyer or seller, is so small relative to the entire market, that he or she cannot affect the product's price; unrestricted entry and exit into the market of resources, producers, and buyers; all consumers, firms, and resource owners have perfect knowledge of the relevant economic and technological data.

Agriculture-Urban Transfers

The proposed three component price would guarantee that the transaction would not directly increase costs to non-party contractors. However, a sale of agricultural entitlements to an urban contractor could affect the allocation of water to non-party contractors during periods of shortages.[30] To prevent this from occurring, this option would require the entitlements sold to retain their agricultural or urban character after the sale.

"Paper" Entitlements

To further prevent any such transaction from affecting the allocation of water among non-party contractors, contractors could be prevented from selling "paper" entitlements. These are entitlements to water for which the contractor has never requested delivery. For example, Mojave Water Agency (MWA) has annual entitlements to 50,800 acre-feet, yet has never taken delivery of more than 11,000 acre-feet in any year. Without restricting the sale of "paper" entitlements, MWA could sell entitlements totaling 20,000 acre-feet, and still request delivery of 11,000 acre-feet. Yet the contractor buying the entitlements would also request delivery of the 20,000 acre-feet they just bought. Consequently, such a transaction would increase the demand for SWP water. Such an increase in demand could either cause or exacerbate a water shortage. If this were to occur, the sale of the "paper" entitlements could harm non-party contractors.

Transfers To Non-Contractors

Sales of entitlements need not be limited to existing SWP contractors. The SWP could allow water agencies currently outside of the SWP to purchase entitlements. Current contractors could have first right of refusal to any proposed sale of entitlements. If no SWP contractor wanted to purchase the entitlement, or if none could negotiate an acceptable price, non-SWP contractors could be allowed to buy the entitlements.[31]

Implications

By allowing willing buyers and willing sellers to buy and sell entitlements, this option would appear to improve economic efficiency. This is only true if the net benefits from such transaction are greater than any *negative externalities*. Negative externalities arise when the price does not compensate all who are directly "harmed" by the transaction. For example, when a farmer irrigates a field, not all the water is "consumptively" lost. Much of the water either percolates down into a groundwater basin or runs-off the field. Others, then, can reuse this water. Suppose this farmer now sells this water. Those who would otherwise have reused this water have now been harmed because they no longer can reuse this water. Unless the buyer also compensates this latter group for their losses, this water transfer would cause negative third party impacts.

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30 See "Options That Change Short-Term Shortage Provisions" beginning on page 7.

31 Such a sale would need to be contingent upon the DWR executing a SWP contract with the non-SWP contractor.

Distributional Effects

Even if a transaction produces more benefits negative externalities, the transaction might never-the-less adversely affect third parties. For example, suppose a cotton farmer sold water to a brewery, and the farmer then permanently fallowed some land as a result. The cotton seed supplier and many other agricultural suppliers would likely be affected negatively by the water sale. Conversely, hop farmers and others that supply the brewery would be positively affected by the water sale.

When a transaction is among members of the same community, the positive and negative effects can, to an extent, cancel each other out. That is, the community's economy would unlikely be harmed. However, when a transaction is between members of different communities, there can be negative community impacts.

Small transactions, 1-2 percent of the seller's entitlements, are unlikely to cause such negative community impacts. However, as the relative size of the transaction increases, the likelihood of such impacts grows. It is not possible to give a generalized relationship between transfer size and likelihood of negative impacts.

There is probably sufficient demand for entitlement transfers to cause third party impacts. For example, by 2010, the MWD expects it will need to increase its annual supply of water an additional 750,000 to 1,230,000 acre-feet from the SWP, water transfers, and surface and groundwater storage supplies.[32] Assume the MWD decides to acquire 500,000 acre-feet of additional SWP entitlements. If MWD acquired those entitlements solely from agricultural contractors, it would reduce agricultural entitlements by 40 percent. This level of entitlement transfers would likely have a negative effect on local communities. However, some disagree whether this is relevant.

Option 12 Establish Marginal-Cost Pricing

This option replaces the current repayment system with a marginal-cost pricing system.

Details

The Organization for Economic Cooperation and Development (OECD) suggests that the price countries charge for water should be the sum of:

- Marginal Operating Costs and
- Marginal Capacity Costs.[33]

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[32] Metropolitan Water District Of Southern California, "Comprehensive Water Resouce Management Strategies For Southern California", presented to State Senate Agriculture and Water Resources Committee Hearing, February 1, 1994, Tab 1.

[33] Organization for Economic Cooperation and Development (OECD), Pricing of Water Services, (Paris: OECD, 1987), Annex 2

The OECD defines marginal operation costs as those operating costs that vary depending on the quantity of water delivered to the customers. For the SWP, they are the variable OMP&R component of the transportation charge.

The OECD defines marginal capacity costs as the per acre-foot costs associated with the least expensive project that would increase the project's deliveries. Such a project could increase the supply of water or the increase the capacity to move water. The SWP currently adds these costs, once incurred, to the capital components of the Delta water charge and the transportation charge.

If the marginal operating costs and the marginal capacity costs are less than the average cost per acre-foot, the price charged would not raise sufficient revenues to cover all costs. Should this be the case, a fixed charge could be levied on all contractors to make up the revenue shortfall. This charge could be allocated among the contractors in proportion to the contractors' entitlements.

Example

The following table shows how the SWP might price water for KCWA and MWD for 1995 using marginal-cost pricing.

Marginal-Cost Pricing
MWD & KCWA in 1995
(Assumes 2.8 million acre-foot supply)

	KCWA	MWD
Marginal Operating Costs		
Transportation Charges:		
• Minimum OMP&R -- Off Aqueduct (per acre-foot)	$6.05	$51.30
• Variable OMP&R (per acre-foot)	$12.35	$63.95
Total Marginal Operating Costs (per acre-foot)	$18.40	$115.25
Marginal Capacity Costs		
• "Interim" South Delta Water Management Program (per acre-foot)	$60.00	$60.00
Total Price (Per Acre-Foot)	$78.40	$175.25
"Expected" Deliveries (acre-feet)	679,000	1,340,000
Total Marginal Charges	$53,200,000	$235,000,000
Surcharge	$39,800,000	$79,000,000
Total Bill	$93,000,000	$314,000,000
Delivered Charges: Current System	$56,600,000	$464,000,000
Difference	$36,400,000	-$150,000,000
	+64%	-32%

Marginal Operating Costs: As noted above, these costs are the minimum OMP&R component of the transportation charge for off-aqueduct power facilities and the transportation charge, variable OMP&R component of the transportation charge.

Marginal Capacity Costs: The current transportation system was designed and built to deliver 4.2 million acre-feet per year. Since there currently is no need to increase the capacity of the transportation system, there would be no marginal capacity costs for transportation. However, there would be marginal capacity costs for conservation purposes. According the DWR's Draft Bulletin 160-93, the "Interim" South Delta Water Management Program provides the least expensive option at $60 per acre-foot.[34] Consequently this represents the marginal capacity cost.

Surcharge: According to the DWR's Draft Bulletin 160-93, the average yield of SWP with current facilities is 2.8 million acre-feet per year. This means that the expected revenue from the marginal capacity cost is $168 million ($60 per acre-foot x 2.8 million acre-feet = $168 million). However, total fixed charges for the SWP in 1995 will total $332 million. Under this option, then, the balance of SWP costs of $164 million would be distributed among the contractors in proportion to contractors' entitlements.

Total Price: The contractors would pay the marginal-cost price for each acre-foot delivered. The surcharge would be imposed regardless of deliveries. Assuming the SWP delivered a total 2.8 million acre-feet in 1995, this option would charge KCWA's $93 million versus the $56.6 million under the current system. The MWD would pay $314 million under this option versus $464 under the current system.

Implications

As long as the marginal capacity charge for transportation is $0, this option shifts some charges from contractors further from the Delta to contractors closer to the Delta.

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[34] This estimate assumes there would be no new costs for environmental mitigation or restoration in the Delta.

OPTIONS THAT REALLOCATE COSTS FOR THE ENVIRONMENT

The key objectives of these options are to:

- *Shift charges for environmental protection to the general fund*
- *Reduce charges to the SWP contractors*
- *Give environmental interests a more active role in the SWP*

In 1961, the Davis-Dolwig Act was chaptered.[35] In it, the Legislature made the following statement of policy.

> *The Legislature further finds and declares it to be necessary for the general public health and welfare that facilities for the storage, conservation or regulation of water be constructed in a manner consistent with the full utilization of their potential for the enhancement of fish and wildlife and to meet recreational needs; and further finds and declares that the providing for the enhancement of fish and wildlife and for recreation in connection with water storage, conservation, or regulation facilities benefits all of the people of California and that the project construction costs attributable to such enhancement of fish and wildlife and recreation features should be borne by them. (Emphasis added)*[36]

Many contractors feel that recreation and fish and wildlife enhancement are not paying their full share of SWP costs.

Background

The contractors' concerns center on two issues: Cost allocation and environmental laws.

Cost Allocation

The DWR allocates SWP costs among four distinct purposes. These purposes are:

1. Water supply
2. Power generation,
3. Flood control, and
4. Recreation, fish and wildlife enhancement.

The contractors pay all costs allocated to water supply and power generation. The Army Corps of Engineers pays all costs allocated to flood control. The state's General Fund is ultimately responsible for all costs allocated to recreation and fish and wildlife enhancement. To allocate costs among these purposes, the DWR estimates the relative

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35 Statutes of 1961, Chapter 861

36 Water Code §11900

benefits fish and wildlife, for example, received as a result of the SWP. The DWR reestimated these benefits most recently around 1981.

Environmental Laws
When most of the contractors signed the water supply contracts, the environmental movement as we know it today was in its infancy. Since the early 1960's, Congress and the State Legislature have passed many environmental protection laws, including:

- National Environmental Quality Act[37]
- Endangered Species Act[38]
- Safe Drinking Water Act[39]
- California Endangered Species Act[40]
- California Environmental Quality Act of 1970[41]
- California Wild and Scenic Rivers Act of 1972.[42]

In addition, state and federal agencies have also enacted numerous rules and regulations to protect the environment. One consequence of these laws and regulations is that the SWP is now limited in when and how much water it can pump out of the Delta.

The Criticisms

The contractors' identify two criticisms: Cost allocation and environmental laws.

Cost Allocation
The contractors observe that since the early 1980s, the DWR has changed how it operates the SWP to benefit fish and wildlife. It also seems likely to these contractors, that society might value the relative benefits of recreation or fish and wildlife more than in the early 1980s. If the benefits of the SWP to either:

(a) recreation and fish and wildlife enhancement have increased, or
(b) the SWP contractors have decreased,

then these contractors assert the DWR has charged them more than their share of SWP costs.

Environmental Laws
Many contractors feel that when they signed contracts with the state for SWP water, they did so with the understanding that the project would be able to deliver the full 4.2 million acre-feet of water each year without violating any existing laws or regulations. Now, various environmental protection laws and regulations preclude the SWP from delivering

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37 42 USC §4321 et seq.
38 16 USC §1536
39 42 USC §300
40 Fish and Game Code §2050 et seq.
41 Public Resource Code §21000 et seq.
42 Public Resource Code §5093.50 et seq.

the full 4.2 million acre-feet of entitlements. Consequently, from some contractors' perspective, the SWP was over-build. These contractors believe that the government's changing of the rules harmed all contractors. Since the government changed the rules, many contractors feel the government should bear the financial burden.

The Options

This section presents two options for shifting costs from the contractors to recreation and fish and wildlife enhancement. The first option reallocates costs based on current usage of the facilities, but without regard to compensating for "lost" water. The second option specifically estimates the amount of water used for environmental purposes, and formally transfers the underlying entitlements to the environment.

Option 13 Recalculate Recreation & Fish & Wildlife Enhancement Benefits

Under this option, the Legislature would require the DWR to:

- Reallocate costs among purposes,
- Using updated estimates of the benefits each purpose receives from the SWP,
- Based on current operational requirements.

Details

Consistent with the initial contracting principles, the DWR would use the separable costs-remaining benefits method of allocating costs among purposes for each multi-purpose facility. The DWR would be required to consider how the DWR operates the SWP. Currently, for example, virtually all water released from Oroville Dam in critically dry years is used to maintain Delta water quality. Therefore under this option, the DWR would assign fewer benefits to the contractors from Oroville for critically dry years and reduce SWP charges to the contractors accordingly. The DWR would shift these charges to recreation and fish and wildlife enhancement, and ultimately the General Fund.

Implications:

In recalculating the benefits attributed to each purpose, the DWR would likely:

- Increase the benefits assigned to recreation and fish and wildlife enhancement, or
- Reduce the benefits assigned to water supply purposes,
- Or both.

Consequently, the DWR would likely shift costs from the SWP contractors and to the General Fund. It is difficult to say how much the contractors' bills would change. The recalculation would be quite complex and would require much data. However, we can make some gross estimates about the potential magnitude of the shifts. Assume, for example, that one-half of all costs at Oroville currently attributable to water supply would shift to recreation and fish and wildlife enhancement. Under this option, the DWR would reduce the Delta water charge almost $12 per acre-foot, a reduction of nearly 60 percent

from current levels. Such a shift would cost the General Fund an additional $50 million per year.

Option 14 Establish Entitlements For The Environment

Under this option, the Legislature would require the DWR to establish entitlements for the environment. The entitlements would equal that amount of SWP water now unavailable to the contractors as a result of environmental laws and regulations. In particular, this option would:

- Proportionally reduce the contractors' entitlements to reflect the reduced yield caused by environmental regulations, and
- Shift those entitlements to the environment.

Details

To implement this option, the DWR would:

1. Estimate the dependable project yield with current facilities and 1960's environmental restrictions. (At this point the DWR could reduce total entitlements to the estimated dependable project yield by imposing Article 18(b)).
2. Estimate the dependable project yield with current facilities and current environmental restrictions.
3. Define the environment's entitlement as the difference between (1) and (2).
4. Reduce each contractors' entitlements by an amount equal to the percent difference between (1) and (2)
5. Define the environment's point of delivery, for cost allocation purposes, as the point the DWR would have delivered each entitlement to each contractor prior to shifting the entitlements to the environment.
6. Amend Article 18(a) to define how water shortages will affect environmental entitlements.

If necessary, the DWR could repeat this process to reflect any new restrictions on water deliveries as a result of environmental laws.

Under this option, the entitlements assigned to the environment would be administered by the Department of Fish and Game (DFG) or some other state agency. As administrator over the environment's entitlements, the DFG would act like any other SWP contractor, scheduling delivery, etc. For scheduling purposes, the definition of deliveries for the environment could be defined to include both releases from reservoirs and Delta pumping moratoriums.

Implications

This option would change the repayment of SWP. It would not, however, reduce water deliveries. This is because the environmental entitlements represent water the SWP cannot deliver to the contractors anyway.

As the following table shows, this option's effect on project repayment depends on:

- The year the entitlement shift begins,
- The official project yield, and
- The amount of entitlements shifted to the environment.

Environment's Share Of Costs Incurred To Date
Includes Accrued Interest
($ Millions)

First Year Of Entitlement For Environment	Minimum Project Yield			
	4.2 Million Acre-Feet Environment's Entitlements		3.6 Million Acre-Feet Environment's Entitlements	
	500,000 Acre-Feet	1,000,000 Acre-Feet	500,000 Acre-Feet	1,000,000 Acre-Feet
1963	$763	$1,530	$890	$1,780
1978	$538	$1,080	$628	$1,260
1990	$150	$300	$175	$350

Effective Year

The first of the three key assumptions is the first year entitlements shift from the contractors to the environment. There are three logical choices for the first year of the shift:

- 1963 -- the year of the first SWP entitlements;
- 1978 -- the year of water rights decision D-1485, which establish water quality requirements for the Delta; or
- 1990 -- the first year after D-1485 that the DWR reduced deliveries to contractors.

If the first year of the shift is 1978, the environment's share of historical SWP charges would be 3.5 times higher than if the shift began in 1990. If the first year of the shift is 1963, environment's share would be nearly 1.5 times higher that if the shift began in 1978, and about 5 times higher than beginning in 1990.

Official Project Yield

The SWP's official minimum project yield is the next key variable. The DWR could impose Article 18(b) before establishing the environment's entitlements. For example, in calculating the current project yield without environmental restrictions, the DWR might discover the "wet" yield was 600,000 acre-feet lower than the official yield. If the DWR then reduced the official project yield, the environment's share of historical SWP costs would be about 14 percent higher than if the DWR left the official yield at 4.2 million acre-feet.

Entitlement Shift

The final key unknown is the size of the entitlement shift. We "guesstimate" that the DWR would shift between 500,000 acre-feet and 1 million acre-feet from the contractors to the environment. If the DWR shifts 1 million acre-feet, the environment's share of historical SWP charges would be twice that of a 500,000 acre-foot shift.

Total Cost

Under this option, the environment's share of past SWP charges could range from the $150 million - $300 million range to as high as $890 million - $1,780 million. The SWP's annual charges to the environment would be about $80 per acre-foot of entitlements, or about $40 million - $80 million per year. Under existing law, the General Fund would be ultimately responsible for these charges.

Environment & SWP

This option would clearly change the historical relationship between the SWP and environmental interests. The custodian of the environment's entitlements would have a much more direct role in SWP operations. Indeed, the custodian, like SWP contractors, would have a vested interest in the efficient operation of the SWP. Also, if the DFG was the custodian, the environment's SWP charges would likely be funded through the DFG's budget. Since the Legislature annually appropriates funds to the DFG through the budget process, this option could give the Legislature a more direct role in SWP funding.

OPTIONS THAT CHANGE SWP ADMINISTRATION

The key objectives of these options are to:

- *Increase the cost effectiveness of SWP operations*
- *Reallocate costs of DWR to more appropriate funding sources*
- *Increase SWP contractors' role in SWP financial decision making*

Many SWP contractors and other water-interest groups criticize the DWR and it's fiscal control over the SWP. The critics tend to focus on one of three concerns:

- The DWR does not appear to operate the SWP cost effectively -- often spending money on unwanted or unnecessary projects and studies;
- When the DWR makes decisions with which the contractors disagree, the contractors' have no recourse; and
- The DWR's operation of the SWP and the DWR's statewide water planning responsibilities often seem to conflict

Background

The DWR's operations budget, like most state programs, is a current-services budget. In developing each years budget, the Department of Finance (DOF) requires the DWR to identify only changes to the *current level of service* for specific consideration. The DWR proposes these changes in a Budget Change Proposal (BCP). All other changes to the DWR's budget not specifically identified in a BCP are changed as a part of the baseline budget. Changes to the baseline budget often include adjustments for wages, salaries and benefit increases, materials costs increases, and other baseline adjustments.

The contractors pay all reimbursable costs[43] of the SWP. However, they have no formal role in determining how much and on what the DWR spends on the SWP. Indeed, even the Governor and the Legislature have less direct control over the SWP than other state programs. This is because state law continuously appropriates SWP contractor payments to the DWR for the operation of the project.

The Criticisms

Since the contractors have no formal role in SWP operations, cost containment within the SWP is a serious concern. Many contractors cite their favorite examples of how the DWR allegedly wastes money. Often, their examples do not demonstrate that the DWR is wasteful in how it does things. Rather, the examples show DWR spending money on things that the contractors deem unwanted or unnecessary. Nonetheless, many will also admit that the DWR is not the sole reason SWP costs are "high". Some contractors and

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[43] Reimbursable costs are those allocated to water supply and power generating purposes.

other water-interest groups think that the DWR does not run the SWP as efficiently as possible, in part, because the DWR must operate the SWP and protect the state's water resources. Many contractors frequently opine that the SWP is forced to incur costs more rightfully funded by the General Fund.

Contractors frequently cannot determine if charges are appropriate, because the budget is structured clearly. It is difficult for the non-budget technician, for example, to find how and why the DWR or DOF have adjusted the baseline budget. Indeed, even knowledgeable budget technicians can have problems determining whether the level of the current services budget is appropriate, with or without adjustments.

The Options

The next four options attempt to resolve some of these criticisms. The first option gives the contractors and other stake-holders more say in the budget process. The second option includes the contractors in the management and decision making structure of the SWP. The third option "contracts-out" the operation of the SWP. The final option "privatizes" the SWP.

Option 15 Reform DWR/SWP Budget

This option imposes more strict budgetary controls on DWR's SWP budget. There are at least three methods to tighten budgetary controls:

- Zero-base DWR's budget,
- Cap SWP operating costs based on a price index, and
- Require Contractors' approval of all budget change proposals (BCP's).

Details

Each of the three methods to tighten budgetary controls can be implemented alone or in conjunction with the others.

Zero-Base Budgeting

The DOF, in conjunction with the DWR, could zero-base DWR's budget. A *zero-base* budget is where the DOF and DWR would examine all of DWR's activities and determine if they are appropriate. The DOF would first eliminate funding for all unnecessary activities. The DOF would then reexamine all remaining activities to determine the appropriate level of effort and the appropriate funding source. The DOF and DWR would then submit this *zero-based* budget to the Legislature as a part of the annual budget process. The DOF would then establish a fixed schedule to periodically "rebase" the DWR's budget. Many contractors assert that zero-basing DWR's budget would reveal many examples of unnecessary expenditures and inappropriate billings to the contractors.

Cap Operating Costs

The Legislature could cap the SWP's fixed operating costs by limiting annual cost increases to the annual growth in a specific price index. The DWR would have to submit

a BCP to the DOF for approval of any increases above the limit. Such a limit could be defined a number of ways. For example, the cap could be the growth in the annual US Consumer Price Index less one percent. Such a cap could highlight fast growing expenditures that might otherwise escape budgetary scrutiny. The cap could apply to individual cost centers or the total SWP.

Contractors' Approval Of BCP's

The Legislature could make the contractors a more active participant in the budget process. Currently, the DWR briefs the contractors each year on what is in the DWR's proposed budget. Some contractors report the briefing is more of a monologue rather than a dialog. It need not be so one-sided, however. For example, the Legislature could require the DWR to submit all BCP's to the contractors and then formally request the contractors to present their concerns to the appropriate budget committees. The Legislature could also direct the Legislative Analyst's Office (LAO) to specifically consult with the SWP contractors when the LAO develops its annual review of the state budget. The Legislature's budget committees could schedule special hearings on the SWP budget and invite all contractors to testify. The Legislature might also create a SWP Commission, which could make all capital-outlay allocations. There are indeed many variations on this theme.

Implications

Zero-base budgeting can be expensive and time consuming. As an alternative, the state might call for an independent audit of the DWR administration of the SWP. Such an audit might focus, for example, on which DWR charges for the SWP are appropriate. Any examination of the appropriateness of charging practices is likely to uncover instances when the general fund would be the more appropriate funding source.

Option 16 Change The Management Of The SWP

The SWP contractors complain that they do not have any real voice in managing the SWP. This option changes the organizational structure of the SWP to formally include the contractors.

Details

This option changes the SWP in two fundamental ways. First, it splits the SWP from the rest of the DWR. The SWP then becomes a new state entity headed by a chief executive officer (CEO). Second, it creates a board of directors for the SWP. The board of directors, which would include the contractors, would establish and implement the operational policies of this new state entity.

Split-Off The SWP

This option cleanly segregates the DWR's SWP activities from its planning and public safety activities. This is not a trivial step. Distributed support activities -- such as budgeting and accounting, computer systems operations, and personnel management --

must also be divided among the two groups. A zero-base budgeting approach would be particularly helpful in segregating these distributed support activities.

Create SWP Management

A new SWP agency would operate the SWP. A board of directors would manage the SWP. The Legislature could create the board at least two ways. It could create a SWP Commission, or it could authorize the DWR and the contractors to form a joint powers authority (JPA) under which the SWP agency would operate. Both types of organization have advantages and disadvantages.

SWP Commission: To create a SWP Commission, the enabling legislation would:

- Establish the breadth and limits of the commission's authority over the SWP, and
- Define the membership of the commission.

The membership could include not just the SWP contractors, but also representatives of the Legislature, State agencies, business, labor, agriculture, and environmental interests. Typically in such commissions, each commissioner has one vote, although some commissioners could be designated as *ex officio* without voting privileges.

Joint Powers Agreement: Rather than create a SWP Commission, the Legislature could authorize the DWR and contractors to form a JPA. The JPA could take a number of forms. Perhaps the simplest would be for the DWR and the contractors to form the SWP agency. The SWP agency would be responsible for the day to day operations of the project and would consist of the portion of DWR broken apart from the planning and public safety programs. The management agency would be responsible for setting management objectives, financial policies, and operations criteria. Voting rights in the JPA could be defined a number of ways. For example, the DWR could have 25 percent of the vote, and the SWP contractors could have 75 percent distributed among the contractors proportionate with entitlements. In addition, the JPA could be given the power to hire and fire the chief executive officer of the SWP agency.

Implications:

The costs to segregate the SWP from the rest of the DWR are unknown. In addition, productivity and operational efficiencies might decline during the transition period.

This option has potential long-term savings to contractors. Even if this option does not result in any long-term savings, however, it would give the contractors greater authority over SWP decision making. This might be sufficient to justify implementing this option.

Option 17 "Contract-Out" SWP Operations

Critics assert the DWR does not have an economic incentive for to operate the SWP cost-effectively. They argue that the potential to make a profit is the strongest incentive to

operate any organization cost-effectively, and that this applies to the DWR as well. This option puts the right to operate the SWP out to competitive bid.

Details

To implement this option, the state would:

1. Conduct a feasibility study to identify the activities to be contracted out and develop an implementation plan.
2. Place the proposal out to bid and select the winning bidder.
3. Transfer SWP operations from the DWR to the winning bidder.
4. Reorganize (and possibly downsize) the DWR to reflect its new roles and responsibilities.

Feasibility Study

The feasibility study should determine precisely what aspects of the SWP would best be performed by a private entity. It should also describe in detail how the state should transfer of SWP operations to the winning bidder. In particular, the feasibility study should:

- Establish the roles and responsibilities of the SWP contractors, the DWR, and the new SWP operator;
- Define and resolve legal and contractual constraints;
- Identify critical performance measures; and
- Estimate implementation costs and potential savings.

The study should also produce the following documents:

- A detailed implementation plan;
- Proposed language for any necessary law changes and SWP contract amendments; and
- Draft language for key contract provisions.

The state should strongly consider contracting-out for the feasibility study for at least two reasons. First, it would be consistent with the spirit of this option. Second, firms interested in bidding to operate the SWP would likely bid to conduct the feasibility study as well. Consequently, they would have an incentive identify and resolve any obstacles to implementing this option. To ensure that state interests are protected, the Legislature should consider holding hearings on the results of the feasibility study.

Implications:

The SWP would pay the winning bidder its costs to operate the SWP as called for in the winning bid. These operating cost would then be distributed among the contractors using current cost allocation methods. Bids could be higher than current operating costs. Consequently, the DWR should also be allowed to bid on the contract.

If the DWR won the contract, they would be prohibited from charging the SWP more than the contract amount. Should the DWR incur operating cost higher than allowed under the

contract, the Legislature might have to provide the additional funding. However, if the DWR won the contract, they might operate the SWP at a cost lower than the contract amount. Should this occur, the DWR should be allowed to redirect the "profit" to other purposes.

Option 18 "Privatize" The SWP

Some critics of government assert that government does not utilize its assets to its maximum advantage. Private industry, they argue, more effectively uses new and innovative methods to reap financial advantage out of its land and capital investments. This option sells the SWP to a private entity. The proceeds of this option would be used to retire outstanding SWP debt. Proceeds above the cost of retiring debt would be available for water resources management and other state programs.

Details

Like the previous option, this option would be implemented in four major steps. The state would:

1. Conduct a feasibility study to determine which SWP facilities and operations would be sold and develop an implementation plan.
2. Place the proposal out to bid and select the winning bidder.
3. Transfer SWP operations and facilities from the DWR to the winning bidder.
4. Reorganize (and possibly downsize) the DWR to reflect its new roles and responsibilities.

Feasibility Study

The feasibility study would likely be more critical to this option than to the previous option. The feasibility study should determine precisely which SWP facilities and operations would be sold. It should also detail how the transfer of SWP facilities and operations should be accomplished. In particular, the feasibility study should:

- Establish the roles and responsibilities of the SWP contractors, the DWR, and the new SWP operator;
- Define and resolve legal and contractual constraints, including
  1. Bond covenants on outstanding bonds,
  2. Federal tax laws regarding tax exempt bonds,
  3. SWP contracts, and
  4. The Burns-Porter Act; and
- Estimate implementation costs and potential savings.

The study should also produce the following documents:

- A detailed implementation plan;
- Proposed language for any necessary law changes and SWP contract amendments; and
- Draft language for key contract provisions.

The state should strongly consider contracting-out for the feasibility study for at least two reasons. First, it would be consistent with the spirit of this option. Second, firms interested in bidding to operate the SWP would likely bid to conduct the feasibility study as well. Consequently, they would have an incentive identify and resolve any obstacles to implementing this option. To ensure that state interests are protected, the Legislature should consider holding hearings on the results of the feasibility study.

Implications:

This option might not be viable. Covenants on outstanding bonds will require particularly careful examination to ensure the state does not harm the bondholders. In a worse case scenario, a court challenge to the sale of the SWP could result in some of the general obligation bonds losing their tax exempt status. This would have profound implications on the state's credit ratings. Consequently, the Legislature should closely scrutinize the results of the feasibility study before proceeding with this privatization option.

OPTIONS THAT CHANGE TECHNICAL FEATURES OF THE CONTRACTS

The key objectives of these options are to:

- *Delay repayment of SWP charges for contractors*
- *Reduce contractor charges*

The next two options make technical changes to the contracts that would reduce costs to the contractors. The first option reduces annual charges by extending the life of the project. The second option reduces contractor costs by eliminating repayment charges for SWP costs beyond regular operation and maintenance, and repayment of debt.

Option 19 Extend Project to 2050

Under the existing contracts, the contractor will have repaid all SWP charges by 2035. This option extends the repayment period for the SWP to the year 2050.

Details

Extending the project would lower all the contractors' Delta water charges, and agricultural contractors' transportation capital charges. Delta Capital charge would decline about $1.20 per acre-foot of entitlement or 10.6 percent for all contractors[44] Transportation charge, capital component for KCWA, for example, would decline $0.70per acre-foot of entitlement or 8.0 percent. The transportation charge, capital component for M&I contractors would be unchanged. All together, extending the project life to 2035 would reduce annual SWP charges to KCWA by about 3 percent per year, while MWD would see about a 0.5 percent decrease.

Implication

This option shifts a portion of SWP costs from the period 1960-2035 to the period 2036-2050. It also extends all contract provisions to 2050.

Option 20 Eliminate "Priority Four"

Many contractors protest the existence of "priority four" money. Essentially, priority four money is the interest earned on money the SWP has borrowed interest free. This option

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44 Cost estimates were based on a project interest rate of 4.62 percent. To the extent the revenue anticipation notes sell at a higher rate, the savings to the contractors will be slightly less.

changes the contractors' repayment provisions to prevent the SWP from accumulating priority four money.

Details

The term *priority four* derives from the Burns-Porter Act,[45] which established four authorized uses of SWP revenues, and sets them in priority order. These uses are:

1. Payment of reasonable annual operation and maintenance costs for the SWP;
2. Annual debt service on the general obligation bonds issued for the SWP;
3. Transfer to the California Water Fund as reimbursement for any funds used from it for construction of SWP facilities; and
4. Use for acquisition and construction of:
   - the SWP,
   - facilities authorized as a part of the state Central Valley Project, or
   - facilities authorized as a part of the California Water Plan.[46]

Priority four arises because the contractors repay all SWP costs with interest, yet the DWR repays California Water Fund moneys used to finance SWP construction without interest. The DWR estimates that priority four funds will begin accumulating in fiscal year 1998-99, at about $44 million per year, and will total $1.5-$2.0 billion in 2035, the last year of the SWP contracts.[47]

There are at least three alternative ways to change the contractors' repayment provisions to prevent the SWP from accumulating priority four money.

Alternative 1: Recalculate repayment of each facility based on the financing costs of the facility, not the construction cost.

Alternative 2: Rebate "excess" contributions to each contractor in proportion to the amount each contractor paid towards capital costs.

Alternative 3: Include funds borrowed interest free in the calculation of the project interest rate. Then recalculate each contractors' charges based on the new lower interest rate.

Implications

The details of the three options are fairly technical, but each has its advantages and disadvantages.

Alternative 1: Computationally the most difficult, but potentially the most accurate.

Alternative 2: Administratively simple, but potential exists for over or under estimating the size of the rebate.

Alternative 3: Computationally the most elegant. However, when the contractors were faced with growing interest charges on revenue bonds, they chose not to

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45 Chapter 1762, Statutes of 1959.

46 California Water Code §12937

47 Chet Winn, Chief, Division of Fiscal Services, personal conversation, June 10, 1994.

adjust the project interest rate. Instead, they created the water system revenue bond surcharge.

Regardless of the approach, the results should be approximately the same. Chiefly, the State would no longer collect funds in excess of repayment needs.

APPENDIX:
IDENTIFYING THE CRITICISMS

The following is a by-product of our research on criticisms of the SWP's repayment system. It is not the CRB's usual practice to report or interpret the positions of various participants who are engaged in a policy debate. Indeed, it was not our original intent to produce such a document in this investigation either. However, once we identified and verified the views of the various interest groups, we deemed the information valuable. Consequently, we added to our usual role of policy researchers by serving as investigative reporters as well.

The views expressed in this appendix are those of the individual discussants. They do not represent the official views of their organization, nor others in their interest groups. Also, we have made no effort to verify opinions that may be presented as facts. The CRB cautions the reader not to accept as fact any observation by the discussants that we report.

Introduction

Beginning in early May 1994, the author had a series of group and individual meeting with representatives of:

- The Department of Water Resources
- SWP contractors, including both:
  - Urban Contractors, their member agencies and customers
  - Agricultural Contractors, their member agencies and customers
- The financial community, including:
  - The DWR's bond counsel
  - The DWR's financial advisors
- Environmental interest groups
- Other interested groups and individuals

Group Meetings

Some of the meetings included only representatives of one group or another. Other meetings included representatives of more than one interest group. The author structured all the group meetings the same. The author first gave a brief overview of the nature of the study, expected timeline, status of the project, and the ground rules.

There was, in fact, only one ground rule -- the author would not attribute any observations or comments to any specific individual without first receiving approval from that individual. The purpose of the rule was to allow participants to speak freely and not be concerned about any need for self editing.

Then, there was a free-flowing and often vigorous group discussion centered on four basic questions. The questions were:

- What aspects of the SWP financing do you particularly like?
- What aspects of the SWP financing do you particularly dislike?
- What features do you need or want in any SWP financing system?
- What are your specific likes or concerns with declaring the SWP complete?

Each meeting had its own personality. In some meetings, the participants had very distinct opinions about the strengths and weakness of the current financing system and had fairly complete proposed solutions. In other meetings, the participants seemed more interested in recounting the history of perceived injustices than in grappling with potential solutions. In still other meetings, the participants seemed generally satisfied with the current system, or had only vague concerns they had difficulty articulating.[48]

Synthesized Views Of The SWP

As the meetings progressed, it became clear that each interest group had their own unique view of the SWP. Yet through most of the meetings, the participants consistently raised certain themes. We first present a synthesis of the general themes and then present the general views of the individual interest groups.

Major Themes

Throughout the interview process, certain topics and opinions repeatedly appeared. These topics and opinions included:

- Declaring the SWP complete is unnecessary.
- The real issue is the lack of a reliable supply.
- Because of new environmental rules, the government harmed the contractors.
- Agricultural contractors are less able to pay their water bill than urban contractors.
- The DWR does not appear to be frugal nor is the DWR accountable for its actions.
- There are SWP funds, known as "priority four" money, that could be used to help solve financial problems.
- On balance, the SWP has been a tremendous asset to the state.
- The Legislature's role in restructuring SWP repayment needs to be carefully defined.

The next sections describe the essence of these discussions in more detail.

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[48] Each meeting provided the author with new insights into how the SWP financing affects Californians. Each meeting provided a significant contribution to establishing the framework for this study, and the author thanks all who took time to meet with him.

Declaring SWP Complete

The first thing most groups wanted to talk about was the issue of declaring the SWP complete. In most, but not all meetings, there was little initial support for, and much concern with declaring the SWP "complete". Comments generally fell into one of two types:

- Declaring the SWP complete will hinder construction of new facilities and/or impede efforts to improve project yield.
- Declaring the SWP complete will force an Article 18(b) reduction in entitlements.[49]

Typical comments included:

- Declaring project complete makes it look as if we are giving up on project -- that sends bad message.
- You cannot freeze both current project facilities and current project yield.
- Declaring the project complete does not absolve the project from future environmental mitigation
- If there is a SWP II, it may have a lower credit rating than SWP I, since SWP II would have a less dependable yield.
- Because surplus water provisions favor agriculture, agriculture benefits from an article 18(b) redistribution -- at the expense of urban water users.

There was a small group of water activists that supported declaring the project complete. To their mind, such a declaration simply acknowledged reality. Namely, it is highly unlikely that the state will build any new facilities originally authorized by the Burns-Porter Act. So, they argue, we ought to declare the project complete, adjust the project yield to a realistic level, and get on with developing reasonable long term water policies.

As most participants had difficulty immediately seeing benefit to declaring the project complete, they often spent much time musing about the motivation for making such a declaration. Most participants seemed to feel that any benefits that might arise from declaring the project complete could be accomplished through amendments to existing contracts or by statements of legislative intent. For example, if the purpose of declaring the project complete was to allow contractors to decide to participate in a particular new project, the Legislature could direct the DWR to negotiate contract amendments that accomplished that goal.

However, if the goal of declaring the project complete was to remove authorization projects authorized by Burns-Porter, the participants typically were quick to point out that

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[49] Article 18(b) directs how the DWR is to adjust entitlements to reflect permanent reductions in project yield. Under Article 18(b), the DWR would be required to proportionately reduce the annual entitlements and the maximum annual entitlements "... to the extent necessary so that the sum of the revised maximum annual entitlements of all contractors will then equal such reduced minimum project yield ...". Conversely, Article 18(c) allows for the proportional restoration of the reduced entitlements after circumstances justify an upward revision.

changes to Burns-Porter would require a vote of the people, as Burns-Porter specifically prohibited the legislature from making changes in its provision.

However, if the motivation was to bring everyone to the table to begin to work out a consensus solution, most participants felt that this research project was a good starting point.

Lack Of Reliable Supply

Instead of focusing on declaring the project complete, and working out what all that meant, most participants were much more interested in developing a more reliable supply of water. Since most of the contractors' water bill does not vary with actual water deliveries, the practical consequence of the current "administrative" drought is a near doubling of the average cost per acre-foot the contractors pay for water. Even so, many would be willing to pay the higher price *if* there was a guaranteed water supply.

A reliable water supply from SWP is important to each of the major water users. For example:

- Farmers with permanent crops do not have the option of not irrigating for just one year. Such a decision would have ramifications for years.
- Reliability is important to field crops too. It often takes many years to develop a market, but it takes only one year to lose it
- Urban industrial users also need a reliable supply. It is difficult to keep a bottling plant operating when there is no liquid to put in the bottles.
- Urban planning, in some areas, is based on receiving delivery of full entitlements. If the SWP cannot deliver full entitlements in the long run, these local development plans are obsolete.
- Reliability is important to environmental interests too. To the extent the contractors can depend on the SWP supply at what ever level, there will be less pressure on the DWR to circumvent environmental requirements.

Although some contractors would be willing to pay the higher price *if* there was a guaranteed water supply, this is not universally true. For example, contractors along the central coast are currently investing $0.5 billion on a local delivery system based on a promise of full entitlement delivery. If the SWP can only deliver 1/2 entitlements, they will pay around $1,000 per acre-foot, instead of the full entitlement cost of about $500 acre-foot. At $1,000 acre-foot, other water supply options become financially more attractive.

The "People" Harmed The Contractors

In all the meetings with SWP contractors, at least one person made the following argument. When the contractors signed contracts with the state for SWP water, they did so with the understanding that the project would be able to deliver the full 4.2 million acre-feet entitlements without violating any existing laws or regulations. "The people", through Congress, the California Legislature, and voter approved propositions, then

changed the laws and regulations regarding environmental protection. These new environmental protection laws and regulations preclude the SWP from delivering the full 4.2 million acre-feet of entitlements. Consequently, the SWP was overbuilt. "The people's" changing of the rules harmed all contractors. Since "the people" changed the rules, "the people" should bear the financial burden.

Many of the contractors seemed frustrated with having financed a transportation system that has nearly twice the capacity as is currently used. However, even more seemed frustrated with the current use of Oroville Reservoir. From these contractors' perspective, they are paying for a dam and reservoir complex that provides essentially no water to them. In critically dry years, virtually *all* releases from Oroville are to maintain water quality -- none is exported south of the delta. Consequently, from the perspective of many, the contractors are paying for storage they cannot use.

Agriculture's Ability To Pay

The plight of the agricultural contractors was another issue consistently raised. Everyone agreed that some agricultural contractors are having a difficult time financially. However, there was disagreement about the SWP's responsibility for resolving the problems.

Agriculture's Problems

Most participants (including urban water-interests) agreed that farmers are less able to cope financially with higher water prices than urban water users. As the farmers pointed out:

- Farming is a highly leveraged business.
- Farmers operate on thin and unpredictable profit margins.
- Farms typically have few financial reserves.
- Consequently, banks and other lending institutions play a critical role in financing farm operations.

Apparently, some farmers were having serious problems coping with higher water costs before the 1987-92 drought. For example, the Kern County Water Agency (KCWA) provides SWP water to the Berrenda Mesa Water District. This SWP water is Berrenda Mesa's only water supply. Berrenda Mesa reported they started having problems with delinquent water bills in December 1984.

Yet despite the severe problems that rising water charges has apparently caused, those that rely solely on the SWP for water claimed the consequences of receiving zero SWP water in 1991 were worse. They said that lenders now feel that farms that rely solely on the SWP for water do not have a dependable water supply. Therefore, lenders value the land the same as dry range land -- essentially valueless. (Most of the water districts that rely solely on the SWP for water are on the west side of the San Joaquin Valley in Kern County.)

The farm interests offered another example about Berrenda Mesa. The land in their district is prime. They have deep soils and no drainage problems. But, the SWP is their

sole source of water. Buena Vista Water District is just on the other side of Interstate 5 from Berrenda Mesa. There, they have inferior heavy soils and drainage can be a problem. However, they also have multiple water sources. Agricultural land in the Buena Vista Water District sells for around $3,000 per acre -- land in Berrenda Mesa is worth essentially nothing.

The west side farmers, in particular, claim the problems facing agriculture are real and severe. Berrenda Mesa now owns 16 percent of the developed farm land in their district due to defaults -- and the bills for another 7.5 percent of the land are late. Two other member agencies of KCWA related similar problems with delinquencies. It seems that some west side districts in particular are close to going under. They claim all it will take is for one major land holder to default.

The Non-Agriculture Response

It was not that the non-agricultural water-interests denied that some agricultural water users were facing serious problems. Rather, some seemed simply indifferent, others apparently saw agriculture's problems as an opportunity for solving their own water demand problems, and still others simply saw no viable solutions to the problems.

Those who seemed indifferent to agriculture's problems often focus on perceived benefits agriculture received in the early years of the project. For example, they would point out:

- In contracts, agricultural contractors chose options that stretched payment longer than urban contractors.
- Agriculture benefited from urbans carrying "surplus" entitlements through lower costs.
- In contracts, agriculture gets priority on surplus water
- In the early years of operation, agricultural contractors received surplus water at just the cost to pump the water to the point of delivery.
- The surplus water provisions are compensation to the farmers for the agriculture first provisions of 18(a).[50]

Other non-sympathetic participants said that agricultural contractors should approach their water supply problems the same as urban contractors. That is, local districts should solve

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[50] Article 18(a) dictates how the DWR is to reduce requests. Article 18(a) establishes a two-tiered approach to reducing requests. The first round reduces agricultural requests:

(a) "... up to fifty percent (50%) ... of that portion of the contractor's annual entitlement for the respective year ..."; but not more than

(b) "... a total of one hundred percent (100%) [of one year's entitlement] in any series of seven consecutive years ...".

If the first-round cuts are insufficient, any additional cuts are to be made regardless of the use to which the water will be put. Under the second round of cuts, "... the state shall reduce deliveries to each contractor in an amount which bears the same proportion to the total amount of such necessary further reduction that the contractor's annual entitlement bears to the total of the annual entitlements of all contractors for that year ...". However, the DWR "... may apportion on some other basis if such is required to meet minimum demands for domestic supply, fire protection, or sanitation during the year."

problems internally first, through conservation, increased efficiency, reuse, etc., and not expect the other contractors to bail them out.

The second group of urban water-interests saw agriculture's problems as an opportunity for solving their own water demand problems. Their position was, if agriculture cannot afford the water, they could. Indeed, they would be more than happy to relieve agricultural water users of their SWP repayment costs *and* their SWP water. They pointed out that both the Central Utah Project and the Central Valley Project allowed farmers under economic stress to sell entitlements. So why should not the SWP allow the sale or lease of entitlements as well. Also supporting this position were those who advocate what are sometimes called "market based" solutions.

The third group, though sympathetic to agriculture's plight, simply saw no viable solutions to the problems. They observed that since the contractors pay all the costs and receive all the water[51], you can't help one group without harming another.

There was a fourth group of non-agricultural interests, small but contentious. They seemed to have what some agricultural water-interests call an "anti-ag" perspective. Examples of these perspectives include comments such as:

- The state should not provide water to low value crops in the first place.
- Protecting agriculture and the concept "those who benefit -- pay" are incompatible.
- If the whole purpose of this exercise is to shift costs, we should just re-label it as an agricultural bailout and stop the subterfuge.

Agriculture's Reply

The agricultural water-interests frequently anticipated many of the preceding comments. In most group meetings, they volunteered answers to their own rhetorical questions.

To the comments regarding surplus water, and the "agriculture first" provisions of article 18(a), agriculture responses include:

- Farmers buy water in shortage years to make up the shortage, so cost of water to farmers is even higher.

- Farmers can survive by farming half the land, and
- Farmers can "crank up" during periods of surplus water,
- But they cannot hold together the local water supply infrastructure without *some* water.

- Farmers understood the risks of a hydrological drought.
- But no one expected a zero delivery year.
- Nor did anyone expect an "administrative" drought.

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51 "Except for the water we have to give to the fish."

Agriculture's responses to calls for selling/leasing entitlements to SWP water included:

- Kern has adopted policy allowing for temporary (10 year) entitlement transfers -- but numbers just don't work out.
- Transfers are an irritation -- they don't help farmers who want to farm, and they divert attention from solutions that could benefit everyone.

To conclude, farmers stressed:

- Farmers farm to make money.
- And farmers are looking for ways to stay in the SWP.
- But they don't have 10 years to solve the problem.

- Even if you don't like farmers, what about the impact on the business that do business with the farmers -- If the farms dry up, what are they going to do?

The DWR: Frugality & Governance

The issue of the DWR's frugality came up innocently enough. The economic literature suggests that one criticism of full cost recovery financing systems, such as the SWP, is that there is no economic incentive for the utility operator to be frugal.[52] When the author asked if this was a concern, virtually all participants in all meetings agreed that it was. The difference was that contractors tended to be much more enthusiastic in their agreement than the DWR. The discussions in this part of the meetings tended to progress through three general topics:

- Frugality and cost containment;
- The DWR's conflicting role as both SWP operator and guardian of the State's water resources, and
- Lack of SWP grievance process.

For most participants, cost containment was a major issue. Indeed, representatives from the DWR admitted they too were concerned about keeping costs down. Yet it was the contractors that were most vocal in their criticisms. They presented numerous examples of alleged wasteful practices. Often, their examples did not demonstrate that the DWR is wasteful in how it does things. Rather, the examples showed DWR spending money on things that the contractors deem unwanted or unnecessary. Examples of alleged wasteful practices included:

- Staffing levels that only go up, never go down.
- Endless studies that don't resolve problems.
- Planning for projects that go nowhere or produce no water.

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[52] See for example, James C. Bonbright, Albert L. Danielsen, and David R. Kamerschen, Principles of Public Utility Rates, (Arlington Virginia: Public Utilities Reports, Inc., March 1988), Chapter 19.

The DWR vigorously challenged the allegations that the DWR was not frugal. The DWR argued that they operate the SWP as cost effectively as practically possible. The DWR does admit that they sometimes spend money on things the contractors do not want -- studies, right of way protection, etc. However, the DWR maintained that disagreements about spending will always occur and such disagreements do not reflect a general indictment of DWR's frugality.

Many of the participants admitted that not all the high costs are the DWR's fault. For example, there were many comments about the Department of General Services's (DGS) role in the administration of the SWP. In the area of contract administration in particular, there were numerous examples of DGS's apparent inefficiencies.

Most participants seemed to think that of the problem is DWR's dual role as utility operator and vanguard of state's water resources. The contractors in particular would frequently opine that the SWP was forced to carry costs more rightfully funded by the General Fund. Comments reflecting this opinion included:

- Funding for the DWR's guardian role is small compared to their activities.
- The Legislature and the Governor see the SWP as a cash cow.
- The DWR's tendency is to shift costs to SWP and away from the General Fund wherever possible -- for example, $6 million for BDOC [the Bay-Delta Oversight Committee]

The contractors seemed especially concerned because they have no practical recourse to not paying these charges. The SWP contracts provide no grievance resolution process. As some of the contractors said:

- The contractors pay -- period.
- Our (the contractors) only recourse is the courts, and we came very close this year.
- We want an audit with eye to "truly chargeable" costs.

"Priority Four" Money

One topic that came up in most meetings was "priority four" money. The term *priority four* derives from the Burns-Porter Act,[53] which established four authorized uses of SWP revenues, and sets them in priority order. These uses are:

1. Payment of reasonable annual operation and maintenance costs for the SWP;
2. Annual debt service on the general obligation bonds issued for the SWP;
3. Transfer to the California Water Fund as reimbursement for any funds used from it for construction of SWP facilities; and
4. Use for acquisition and construction of:
   - the SWP,
   - facilities authorized as a part of the state Central Valley Project, or
   - facilities authorized as a part of the California Water Plan.[54]

Essentially, priority four money is the interest earned on money the SWP borrowed interest free. It arises because the contractors repay all SWP costs with interest, yet the DWR repays California Water Fund moneys used to finance SWP construction without interest. The DWR estimates that priority four funds will being accumulating in fiscal year 1998-99, and will total $1.5-$2.0 billion in 2035, the last year of the SWP contracts.[55]

Usually, it was the SWP contractors who brought up priority four money. Their issue was that by the end of the SWP contracts, 2035:

- The contractors will have repaid the full costs of constructing and operating the SWP;
- The DWR will own the SWP facilities free and clear; *and*
- The DWR will have $2 billion in the bank.

The contractors seemed to agree that they did not want to let the money build up in some bank account. Instead, they suggested the money should be rebated back to the contractors or otherwise used to the contractors benefit.

SWP Is A Tremendous Asset

Not all the comments regarding the SWP were critical. Indeed, most groups took some time to point out the tremendous benefits the SWP has provided up to this point. Typical comments included:

- The SWP's performance to date has been outstanding.
- The project's capacity is good and can help facilitate transfers in the future.
- The costs of alternative sources of water have increased much faster than SWP.
- The water the SWP made availability has facilitated economic growth.

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53 Chapter 1762, Statutes of 1959.

54 California Water Code §12937

55 Chet Winn, Chief, Division of Fiscal Services, personal conversation, June 10, 1994.

The Legislature's Role

The final issue raised by most groups involved the Legislature's role in changing the SWP. Many participants were inherently reluctant to bring yet another dynamic into the SWP arena. Some suggested it was symptomatic of the problems with the SWP that they were inviting the Legislature's involvement. Yet most seemed to feel there were ways the Legislature could help.

Nonetheless, many participants were quick to point out there were limits on what the Legislature could do. For example, the Legislature would have to place before the voters any changes to the Burns-Porter Act. Also, concerning the SWP contracts, the Burns-Porter Act states "[s]uch contracts shall not be impaired by subsequent acts of the Legislature during the time when any of the bonds authorized herein are outstanding ...".[56] Most participants expressed concern about any changes that would jeopardize the credit rating of the SWP bonds. However, Bond Counsel seemed to think there we many things the Legislature could do that would violate neither Burns-Porter nor bond covenants.

Individual Views

It is unfair to uses broad characterizations to describe how each interest group felt about the SWP and the current financing arrangements. Each member of each group had their own unique view of how things ought to be. Yet there did seem to be broad agreement within each group of the strengths and weaknesses of the current financing system. Without repeating the preceding discussions, we describe in the following sections the broad areas of agreement for each group as well as those issues that the interest groups had not reached consensus.

The DWR

Generally, the DWR finds the current financing system satisfactory. They:

- Have a AA bond rating, which means their creditors are happy;
- Have a reliable revenue stream, which is important given that about fixed costs comprise 70 percent of their total costs; and
- Are comfortable with the administrative and operational requirements of the SWP.

The DWR still supports the original contracting principles. Chiefly,

- Those who benefit should pay, and
- Full cost recovery secured by property tax authority.

As the owner/operator of the SWP, the DWR is often the first to hear various complaints of the current system. The DWR's position is that if there were some grand solution to all the outstanding problems, they would have implemented them.

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[56] California Water Code §12937

The DWR did have some concerns regarding declaring the SWP complete. First, the costs of changing systems should be minimized. This has two distinct implications. All things being equal, it would be *less* costly to implement options that modify the current repayment system than those options that essentially start from scratch. Similarly, it would be *more* costly to implement the changes retroactively to the beginning of the project than to implement the changes from now on.

Second, any changes to the current system must be free from controversies as to proper implementation. This applies to allocation of both costs and water among the current and future water projects. The DWR wants to avoid any appearance of operating of one water project to the damage of the other.

The DWR also vigorously challenged allegations that the DWR was not frugal. The DWR argued that they operate the SWP as cost effectively as practically possible. The DWR does admit that they sometimes spend money on things the contractors do not want -- studies, right of way protection, etc. However, the DWR maintained that disagreements about spending will always occur and such disagreements do not reflect a general indictment of DWR's frugality.

The Urban Contractors

In general, the urban contractors like the SWP. Indeed, some of the urban contractors were quick to point out that *they* have not been complaining about the SWP financing. Most admitted there were some problems with the financing, but typically characterized the problems as relatively minor and not insurmountable.

Some urban contractors point to two principles of contracts as fundamental:

- The contractors pay all costs, and
- All contractors pay an equal price for entitlement water.

These two principles, which they readily affirm, preclude simply shifting costs to urban users or shifting additional water to agriculture. According to these urban contractors, it was unrealistic to ask the people of this state to help solve the contractors' problems through a bond issue. It was also unrealistic to ask urban contractors to bear more of the costs without also giving them more of the water. The urban contractors are willing to help contractors who are in trouble, but they want something back for their efforts.

However, the most significant problem, according the some urban contractors, is the Delta. Until the Delta is "fixed", none of the options for improving yield make sense. The urban contractors want to do what ever is necessary to fix the Delta so they can then go about developing additional water supplies. However, they feel the DWR and agricultural contractors are impediments. Some contractors observe that the DWR seems unwilling to consider giving more water to fish, even though it may remove obstacles to developing additional water. They also observe that agricultural contractors seem unwilling to give additional anything -- water, money, or simply approval for the urbans to go it alone. Consequently, some urban contractors feel stymied.

The Agricultural Contractors

The agricultural contractors and farmers all seemed to agree. The SWP ought to operate under a new principle: You pay for what you get. If you get delivery of full entitlement, you should pay the costs at full entitlement -- if you get half the supply, you should pay half the bill.

Another area of agreement regards timing -- the final water allocations come too late in the year and the initial SWP payment comes too early. Farmers have to begin arranging their financing in December in order to plant in March. However, it is difficult to get lenders to commit funds when the farmers cannot commit to how much water they will have. Even if they do get the financing, it comes after the January due date.

- Cannot afford take-or-pay with zero allocation years in the equation
- Supply announcement is too late & January repayment date is too early

The Environmentalists

Environmentalists tended to focus more on how the SWP develops and allocates water than on specific financial relationships. Their general position was that since clean potable water is a scarce and valuable resource, we should allocate it accordingly. From an economic perspective, this means the SWP should facilitate the shifting of water from less efficient to more efficient uses. Water markets are one way to accomplish this shift, full marginal cost pricing is another. In addition, the SWP ought to consider reducing demand through reuse and conservation in place of developing additional facilities. Finally, if there is going to be some sort of bond measure for water, there may be an opportunity to include funds for "real" environmental restoration and mitigation projects.

The Financial Community

The financial community is concerned about water in California.[57] Consequently, they generally support any actions that improve reliability or affordablility. They are concerned with protecting the security of outstanding bonds. However, as previously noted, there appears to be many things the Legislature could do that would violate neither Burns-Porter nor bond covenants.

If the Legislature declared the project complete, the DWR would have take care in unraveling financing for projects underway but not operational. The specific concern is violating tax laws regarding arbitrage. However, it appears doable.

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[57] On March 21, 1944, Standard and Poor's Credit Week Municipal reported the following to investors in municipal bonds. "[T]he allocation of water supplies for consumption in California remains in gridlock as both federal and state legislators try to achieve a workable solution to the conflicting interests in the Delta ... [The] problems faced by California water suppliers will have a generally negative impact on credit quality for years to come due to the economic impact and rising costs associated with water supply and reliability."

The real issue is how the next phase of the SWP is structured. If it is a separate entity, lots of documentation would have to be recreated. Also, SWP II may have a lower credit rating, since it would have a less dependable yield of water than SWP I.

LETTER 30

LETTER 30

ATTACHMENT C

LETTER 30

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January 10, 2002

To: Robert C. Eaglehorn, General Manager
Castaic Lake Water Agency

From: Counsel

Subject: Today's Court of Appeal Decision in Friends of the Santa Clara River vs. Castaic Lake Water Agency

Further environmental work needs to be done to assure CLWA's March, 1999 acquisition of 41,000 acre feet of State Project water entitlement from Wheeler Ridge-Maricopa Water Storage District.

The Court of Appeal this afternoon found that all challenges to CLWA's environmental documents on the above-specified water entitlement transfer were "without merit," except for the legal implications of the last year's PCL case wherein another Court of Appeal ordered decertification of the Monterey Amendment EIR. Specifically, the Court of Appeal in our current case wrote: "If the PCL/Herring problem had not arisen, we would have affirmed the [Superior Court] judgment in favor of CLWA".

CLWA's 41,000 acre foot water entitlement transfer is now in the hands of the Los Angeles Superior Court, unless CLWA chooses to and receives California Supreme Court acceptance of an Agency appeal from the current Court of Appeal judgment.

It is in the Los Angeles Superior Court's discretion whether to enjoin, reverse, or condition all or portions of CLWA's 41,000 acre foot water entitlement acquisition pending completion of a new and adequate environmental document that does not rely on the Monterey Amendment EIR. In the opinion of the Court of Appeal, CLWA may be able to "cure the PCL problem by awaiting action by the State DWR complying with the PCL decision, then issuing a subsequent EIR, supplement to EIR, or addendum to EIR relying upon a newly certified Monterey Amendment EIR." Of course, as we know, the course suggested in the preceding sentence may be impossible to complete for a period of years, due to the inherent delays involved with DWR's preparation of a new EIR on the Monterey Agreement.

Alternatively, CLWA may choose to create an EIR that does not rely in any way on Monterey Amendment provisions, and then complete the 41,000 acre foot water entitlement transfer outside of Monterey. There are adverse financial implications

to this course of action, and any water transfer outside of Monterey--assuming it might be acceptable to Kern County Water Agency and Wheeler Ridge--could be made subject to agricultural water deficiency provisions in the same manner that the Devils Den's water entitlement transfer was originally made subject to these agricultural water deficiency provisions.

Bottom line, this decision is not a good development; however, it creates an opportunity to preserve the Wheeler Ridge water transfer pending completion of other environmental documents as described above, provided that the Los Angeles Superior Court determines that such a course of action is appropriate under CEQA.

The text of the decision was received at approximately 3 p.m. today, is some 20 pages in length, and will require further analysis. That said, CLWA has essentially been made a victim of the Monterey Amendment environmental deficiencies as first outlined in the year 2000 decision in the PCL case.

ATTACHMENT D

ATTACHMENT D: CLIMATE CHANGE

As DWR itself has repeatedly emphasized, climate change is occurring and will have major consequences for water management in California, including the management of the State Water Project. DWR has clearly acknowledged that climate change is occurring, will have major effects on California's water resources generally and the State Water Project in particular, and must be addressed in any water supply planning study. For example:

- DWR's website contains a page entitled "Climate Change in California," which observes:

> Climate change is already impacting California's water resources. In the future, warmer temperatures, different patterns of precipitation and runoff, and rising sea levels will profoundly affect the ability to manage water supplies and other natural resources. Adapting California's water management systems to climate change presents one of the most significant challenges for the 21st century.
>
> California can improve its flexibility to cope with an uncertain water future by working to reduce water demand, increase water supply, improve water quality, practice resource stewardship and improve operational efficiency. The Department of Water Resources is committed to preparing for the effects of global warming while finding new ways to reduce its contribution to climate change.

See http://www.climatechange.water.ca.gov/. A link takes a viewer to DWR's "Climate Change Fact Sheet," which provides more specific information about climate change consequences.

- DWR's current water plan describes climate change's major consequences for water management:

> [a]s a result of global climate change, California's future hydrologic conditions will likely be different from patterns observed over the last century. Predictions include increased temperature, reductions to Sierra snowpack, earlier snowmelt, and a rise in sea level, although the extent and timing of the changes remain uncertain. The changes could have major implications for water supply, flood management, and ecosystem health…. Managing water resources with climate change could prove different than managing for historic climate variability because climate change could produce hydrologic conditions, variability, and extremes that are different from what current water systems were designed to manage; may occur too rapidly to allow sufficient time and information to permit

> managers to respond appropriately; and may require special efforts or plans to protect against surprises or uncertainties.

CALIFORNIA WATER PLAN UPDATE 2005 at 4-32 to 4-34.

Because of the magnitude of those changes, the Water Plan Update concludes that "[s]tate government must help predict and prepare for the effects of global climate change on our water resources and water management systems." *See* CALIFORNIA WATER PLAN HIGHLIGHTS (2005). DWR has committed that it "will evaluate management responses to potential impacts of global climate change on the State Water Project and California's hydrology" and "will work with climate change experts to develop alternative flow data to help State and regional planners test potential effects of global climate change on different management studies." *Id.* at 5-16. In measuring compliance with that goal, DWR stated that it specifically would use as a performance measure its "[p]rogress in implementing of the plan responding to the impact of global climate change on the management of the State Water Project" and also would specifically consider the "[n]umber of planning studies that evaluate the potential impacts of climate change on the alternative management strategies and infrastructure they consider and select." *Id.*

- In a California Water Plan appendix entitled *Accounting for Climate Change*, DWR's Maurice Roos wrote "the prospects of significant changes warrant examination of how the State's water infrastructure and natural systems can accommodate or adapt to climate changes…." He acknowledged that "many uncertainties remain, primarily on the degree of change to be expected," but concluded that "[r]esponsible planning requires that the California planning community work with climate scientists and others to reduce these uncertainties and to begin to prepare for those impacts that are well understood, already appearing as trends, or likely to appear." The report closed by stating that "[i]t is time to try to quantify the effects of projected climate change on California's water resources. Being aware of potential climate changes should help in preparing better for an uncertain 21st century." *Id.* at 14.

  The body of the report discusses the many anticipated changes, including decreased snowpacks (an impact the report characterized as "relatively certain"; *see id.* at 5, 6 ("All models so far show less snowmelt runoff in the northern Sierra.")) and increased storm intensity. "Warmer air and less snowpack," the report states, "would be expected to raise average stream and estuary water temperatures. This would increase the problem for cold-water fisheries, including salmon and steelhead." Likewise, "[l]ess spring snowmelt could make it more difficult to refill winter reservoir flood control space during late spring and early summer of many years, thus potentially reducing the amount of surface water available during the dry season.

- In July 2006, in response to an executive order from Governor Schwarzenegger, DWR published a report entitled *Progress on Incorporating Climate Change into Management of California's Water Resources* ("Progress Report"). Like the Water Plan Update, Appendix Report, and DWR's website, the Progress Report

acknowledges that climate change is already occurring, is affecting California's hydrology, and will have particularly important effects on water storage projects. For example, the executive summary observes that "California water planners are concerned about climate change and its potential effects on our water resources. Projected increases in air temperatures may lead to changes in the timing, amount and form of precipitation – rain or snow, (and) changes in runoff timing and volume... ." Progress Report at I. After acknowledging California's heavy reliance on the State Water Project, the executive summary states:

> DWR and Reclamation have formed a joint Climate Change Work Team to provide qualitative and quantitative information to managers on potential effects and risks of climate change to California's water resources. The mission of the team is to coordinate with other state and federal agencies on the incorporation of climate change science into California's water resources planning and management. The team will provide and regularly update information for decision-makers on potential impacts and risks of climate change, flexibility of existing facilities to cope with climate change, and available mitigation measures.

Id. In a statement that provides an ironic contrast with DWR's present DEIR, the executive summary closes by assuring the reader that "DWR is working with other agencies and researchers to provide leadership in incorporating climate change impacts and risks into the planning and management of California's precious water resources." *Id.* at VII.

The body of the report contains similar statements. Chapter 2 contains a detailed discussion of the reasons for climate change and expected impacts upon California hydrology. That analysis acknowledges, among other things, that "loss of the State's snowpack will affect the operation of most major multipurpose reservoirs at low and mid-elevations in the Sierra." Progress Report at 2-31; *see also id.* at 6-31 to 6-33 (discussing changing flood risks in the Feather River Basin). It also warns that climate change will increase water temperatures, which in turn will "pose a threat to aquatic species that are sensitive to temperature, including anadromous fish. Increased water temperatures will also cause decreased dissolved oxygen concentrations in water and other water quality changes, and will likely increase production of algae and some aquatic weeds." *Id.* at 2-60. Those changes could lead to significant consequences for reservoir management. *Id.* While the authors make no claim to know exactly how much temperatures will change or exactly where and to what extent the resultant impacts will be felt, the chapter leaves little doubt that warming will occur and that significant environmental consequences will follow.

Chapter 4 of the report is entirely devoted to analyzing climate change effects on the SWP and the Central Valley Project. It notes that historically, planning and design of those projects "assumed an unchanging climate," but cautions that "a changing climate may threaten to destabilize the infrastructure and operations dependent on that assumption." *Id.* at 4-1. The chapter then provides the results of a modeling

analysis of the effects of multiple climate change scenarios upon the CVP and SWP—including discussion of effects upon water temperatures and upon Lake Oroville inflow, outflow, and storage. The authors caution that their analysis is preliminary and (like any modeling analysis) contains uncertainties and simplifying assumptions, but nowhere in the chapter do they suggest that modeling climate change impacts is a pointless exercise. Instead, the chapter and the report as a whole both indicate that DWR is aware that climate change is occurring and must be factored into planning, and that while the tools for engaging in such planning will improve, they already are available and should be put to use. "While there were limitations to our analysis," the authors concluded, "the results were nevertheless significant." *Id.* at 4-49. They also cautioned that "future studies should consider measures to relieve the negative effects of climate change." *Id.* at 4-50.

Many other studies have been conducted that estimate the impacts of climate change on California water resources.[1] These studies include:

Documentation of Inputs to Macroeconomic Assessment of the *2006 Climate Action Team Report to the Governor and Legislature*, Final Version. Posted: March 24, 2006.

Learning From State Action on Climate Change. Pew Center On Global Climate Change, November 2005 Update, reprinted with permission. Posted: December 8, 2005.

Scenarios of Climate Change in California: An Overview. **FINAL** report from California Energy Commission, Public Interest Energy Research (PIER) Program, California Climate Change Center, publication # CEC-500-2005-186-SF, posted: February 27, 2006.

An Assessment of Impacts of Future CO2 and Climate on Agriculture.
FINAL white paper from California Climate Change Center, publication # CEC-500-2005-187-SF, posted: March 15, 2006.

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[1] In addition, The California Climate Change Center, a joint project of the CEC and the University of California, has published a series of reports, most of which identify the importance of addressing water resource impacts on climate change. *See, e.g.*, CALIFORNIA CLIMATE CHANGE CENTER, OUR CHANGING CLIMATE: ASSESSING THE RISKS TO CALIFORNIA (2006), *available at* http://www.climatechange.ca.gov/biennial_reports/2006report/index.html; AMY LYND LUERS AND SUSANNE C. MOSER, PREPARING FOR THE IMPACTS OF CLIMATE CHANGE IN CALIFORNIA: OPPORTUNITIES AND CONSTRAINTS FOR ADAPTATION (2006), *available at* http://www.energy.ca.gov/2005publications/CEC-500-2005-198/CEC-500-2005-198-SF.PDF; *see also* CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY, CLIMATE ACTION TEAM REPORT TO GOVERNOR SCHWARZENEGGER AND THE LEGISLATURE (2006), *available at* http://www.climatechange.ca.gov/climate_action_team/reports/2006-04-03_FINAL_CAT_REPORT.PDF.

Analysis of Climate Effects on Agricultural Systems.,**FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-188-SF, posted: February 27, 2006.

Climate Change: Challenges and Solutions for California Agricultural Landscape. **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-189-SF, posted: February 27, 2006.

Climate Change and Wildfire In and Around California: Fire Modeling and Loss Modeling. **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-190-SF, posted: February 27, 2006.

The Response of Vegetation Distribution, Ecosystem Productivity, and Fire in California to Future Climate Scenarios Simulated by the MC1 Dynamic Vegetation Model. **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-191-SF, posted: February 27, 2006.

Fire and Sustainability: Considerations for California's Altered Future Climate. **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-192-SF, posted: February 27, 2006.

Climate Change Impact on Forest Resources. **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-193-SF, posted: March 16, 2006.

Climate Change Impacts on Water for Agriculture in California: A Case Study in the Sacramento Valley. **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-194-SF, posted: March 15, 2006.

Climate Warming and Water Supply Management in California, **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-195-SF. March 16, 2006.

Predicting the Effect of Climate Change on Wildfire Severity and Outcomes in California: A Preliminary Analysis, **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-196-SF, posted: March 22, 2006.

Public Health-Related Impacts of Climate Change in California, **FINAL** white paper from California Climate Change Center, publication # CEC-500-2005-197-SF, posted: March 22, 2006.

Preparing for the Impacts of Climate Change in California: Opportunities and Constraints for Adaption,

FINAL white paper from California Climate Change Center, publication # CEC-500-2005-198-SF, posted: March 22, 2006.

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ATTACHMENT E

LEXSEE

NATURAL RESOURCES DEFENSE COUNCIL, et al., Plaintiffs, v. DIRK KEMPTHORNE, in his official capacity as Secretary of the Interior, et al., Defendants. CALIFORNIA DEPARTMENT OF WATER RESOURCES, Defendant-Intervenor, STATE WATER CONTRACTORS, Defendant-Intervenor, SAN LUIS & DELTA-MENDOTA WATER AUTHORITY, et al., Defendant-Intervenors.

1:05-cv-1207 OWW GSA

UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF CALIFORNIA

2007 U.S. Dist. LEXIS 91968

December 14, 2007, Decided
December 14, 2007, Filed

PRIOR HISTORY: *NRDC v. Kempthorne, 2007 U.S. Dist. LEXIS 48261 (E.D. Cal., July 3, 2007)*

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For California Trout, Baykeeper & Its Deltakeeper Chapter, Friends of the River, The Bay Institute, all nonprofit organizations, Plaintiffs: Deborah S. Reames, LEAD ATTORNEY, Earthjustice, Oakland, CA; Hamilton Candee, Katherine Scott Poole, Natural Resources Defense Council, San Francisco, CA; Michael Ramsey Sherwood, Earthjustice Legal Defense Fund Incorporated, Oakland, CA; Trent William Orr, Law Office of Trent W. Orr, San Francisco, CA.

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For Kern County Water Agency, Intervenor Defendant: Clifford W. Schulz, Kronick, Moskovitz, Tiedemann & Girard, Sacramento, CA.

JUDGES: Oliver W. Wanger, **[*4]** UNITED STATES DISTRICT JUDGE.

OPINION BY: Oliver W. Wanger

OPINION

FINDINGS OF FACT AND CONCLUSIONS OF LAW RE INTERIM REMEDIES RE: DELTA SMELT ESA REMAND AND RECONSULTATION

I. BACKGROUND

On May 25, 2007, the Court, in a Memorandum Decision and Order addressing Plaintiff's challenge to the 2005 Long-Term Central Valley Operations Criteria and Plan ("OCAP") Biological Opinion ("BiOp"), held that the "2005 OCAP BiOp is unlawful and inadequate," in part because "[t]he Delta Smelt Risk Assessment Matrix ("DSRAM"), as currently structured, does not provide a reasonable degree of certainty that mitigation measures will take place." The Court found that existing take limits established by the BiOp, without further restrictions on the operations of the Central Valley Project ("CVP") and State Water Project ("SWP") (collectively "Projects"), are inadequate to protect the species; that the DSRAM must be made more certain and enforceable; that the BiOp did not use the best available science; that the BiOp failed to adequately find and address the impacts of joint Project operations on the continued survival of the Delta smelt; and failed to adequately consider impacts to the smelt's critical habitat. The Court found **[*5]** that the Biop's no jeopardy finding was arbitrary, capricious, and without rational connection to the status of the species.

The parties then submitted legal memoranda addressing proposed interim remedies. On August 30, 2007, the Court granted Plaintiffs' Motion to Supplement Their Complaint, adding claims that the United States Bureau of Reclamation ("Reclamation") had violated Section 7(a)(2) of the Endangered Species Act, *16 U.S.C. ß 1536(a)(2)*("ESA") because its operation of the CVP in coordination with the State of California Department of Water Resources' ("DWR"), SWP threatens to jeopardize the continued existence and recovery of the Delta smelt and is adversely affecting the Delta smelt's designated critical habitat. [Doc. No. 495].

After taking evidence, considering all the written submissions of the parties, and hearing oral argument, including the parties' written proposals identifying the interim relief, if any, that should be imposed on Reclamation's and DWR's operations of the CVP and SWP until such time as the remand of the 2005 BiOp is completed; [Fed. Def. Ex. 3 (Ex. 2 in evidence); Pl. Ex. 11 (App. 2); Pl. Ex. 4]; on August 31, 2007, the Court issued its oral statement **[*6]** of decision granting a preliminary injunction and remedial order to protect the species pending completion of a new BiOp.

Following the summary judgment order, all parties recognized that an interim remedies hearing was required because the BiOp and Incidental Take Statement as well as the DSRAM were invalidated. Federal Defendants, U.S. Department of the Interior ("Interior"); United States Fish & Wildlife Service ("FWS"); Reclamation; and all Intervenors, DWR; State Water Contractors ("SWC"); San Luis & Delta-Mendota Water Users Authority; Westlands Water District; et al., Defendant-Intervenors, have argued that the 2005 BiOp and Incidental Take Statement should remain in place without vacatur.

Plaintiffs' proposed remedial actions commence with fall actions by September 1, 2007, for the upcoming 2007-2008 water year. By reason of the opinions of scientists and other experts who testified at the evidentiary hearing, the Court has determined that interim remedies should commence by December 25, 2007.

The species was first listed as threatened March 5, 1993. The original BiOp for the OCAP was issued July 30, 2004, and amended February 16, 2005. Both BiOps found no jeopardy to the Delta **[*7]** smelt and its critical habitat. These Biological Opinions concluded the Projects' combined operations did not jeopardize the smelt's survival or cause adverse modification of the smelt's critical habitat. The Delta smelt species has been intensively studied for 12 years. In July 2006, before a ruling on the legality of the 2005 OCAP BiOp was issued, FWS reinitiated consultation on the Delta smelt respecting the

2005 BiOp, implicitly recognizing its legal insufficiency and inadequacy of the No Jeopardy BiOps.

II. FINDINGS OF FACT

A. CURRENT STATUS OF THE DELTA SMELT

1. The Delta smelt (*Hypomesus transpacificus*) was listed as a "threatened" species under the ESA by the FWS on March 5, 1993. *58 Fed. Reg. 12,863 (March 5, 1993)*. The FWS designated critical habitat for the Delta smelt on December 19, 1994, which includes all waters and submerged lands within the Delta, including the CVP and SWP pumping facilities. *59 Fed. Reg. 65,256 (Dec. 19, 1994)*.

2. The FWS recently reviewed the listing status of the Delta smelt and, on March 31, 2004, concluded the species still faces a "high degree of threat" and should remain listed under the ESA. [Pl. Ex. 13].

3. Based on the results of recent surveys, **[*8]** scientists believe that the Delta smelt is at one of the lowest levels of abundance on record. [Fed. Def. Ex. 3 P2; Tr. 615:22-618:8; Tr. 617:18-21; Pl. Ex. 6].

4. It is undisputed that the current status of the Delta smelt is serious. [Tr. 72:19-20] [Tr. 620:4-10]. Some scientists believe that the Delta smelt faces an imminent risk of extinction in the near future. [Tr. 266:16-17].

5. Many scientists opine that the decline of Delta smelt is the result of multiple factors. [Tr. 73:4-16]; [Tr. 299:16-22]. Those factors include: (a) the presence of toxic materials (such as pesticides) in the Delta; (b) an overall reduction in the abundance of the zooplankton that are the food of the Delta smelt; (c) introduction and propagation of invasive species including the Asian Overbite Clam, Corbula (a filter feeder which feeds on some of the same zooplankton that the Delta smelt feeds on); [Tr. 98:22-99:14; 104:16-105:2; 299:16-301:18; 1015:8-17; 1016-1017], another fresh water clam, Corbicula, may also have an adverse impact on food supply; [Tr. 149:11-22; 196:8-17]; the invasive Inland Silverside may prey upon larval Delta smelt. [Tr. 533:20-25]; (d) other unscreened agricultural diversions in **[*9]** the Delta; [Tr. 618:3; 803:17-23; 1005:8-17]; (e) power plant diversions, including for consumptive use and for cooling water that affect turbidity, [Tr. 618:4, 803:17-23]; and (f) modifications to the hydrology of the San Joaquin-Sacramento Delta and Estuary. [Tr. 151:3-9; 299:23-25; 534:6-14; 617:22-618:6; 628:9-19; 701:3-12; 803:17-23].

6. Scientists believe that the decline of the Delta smelt is caused in part by the operations of the CVP and SWP (as well as other water diversions within the Delta) because each Project's operations result in the direct entrainment of Delta smelt at the CVP and SWP export facilities (the Pumps) which they do not survive. [Tr. 82:11-12; 338:19; 628:1-6]. The Projects' operations cause changes in the hydrology of the Delta that adversely affect the Delta smelt. [Tr. 84:6-8; 628:9-12; 73:4-16; 299:16-301:18; 618:24-618:26; Pl. Ex. 13 at p. 21-29; DWR Ex. D P2].

7. The full effects of these factors on the Delta smelt, however, are not fully understood, and there is scientific uncertainty regarding the relative magnitude of the effects. [Tr. 52:3-20; 244:14-19; 303:25-304:3; 819:23-820:5]. In addition, despite research efforts, there is still scientific **[*10]** uncertainty regarding the cause of the recent, serious decline of the Delta smelt, which continues to not be fully understood. [Tr. 805:2-8].

8. A preponderance of the evidence supports the conclusion that the Delta smelt is presently being adversely affected by several environmental factors, including the operations of the CVP and SWP. [Tr. 1682:25-1683:2]. The evidence does not establish that there is a single efficient proximate cause that is solely responsible for the decline of the Delta smelt. [Tr. 1682:14-24].

B. BIOLOGY, LIFE STAGES, AND MOVEMENT OF THE DELTA SMELT

9. The Delta smelt begins its life cycle as an egg. [Tr. 67:21-25]. Most Delta smelt are spawned, as eggs, in the northern Delta, although they are widely distributed throughout the Delta. [Tr. 67:21-25]. Smelt hatch between March and May. [Tr. 312:22-313:7]. After hatching, the larvae of the Delta smelt are carried downstream by rivers and tides, to the confluence of the Sacramento and San Joaquin Rivers and beyond, often as far as Suisun Bay. [Tr. 67:25-68:6; 312:22-313:7]. The Delta smelt spend 6 to 9 months downstream of the Delta, and then gradually begin to migrate upstream again for spawning. [Tr. 68:7-9; 70:6-8; **[*11]** 313:5-7].

10. Even when larval Delta smelt are not detected in surveys or at the CVP and SWP export facility, their presence may be inferred from other factors. [DWR Ex. D P5]. The most successful Delta smelt spawning occurs when water temperatures are in the range of 12 [degree] C to 18 [degree] C. [DWR Ex. D P5]. When water temperatures in the Delta have risen to 12 [degree] C, the presence of larval Delta smelt may be inferred. [Tr. 396:2-5; DWR Ex. D P5]. In addition, the presence of "spent" Delta smelt females in surveys also indicates that spawning has occurred. [Tr. 396:1-2].

C. STATUS OF THE DELTA SMELT

11. The threatened Delta smelt "is undisputedly in jeopardy as to survival and recovery." [SJ Order at 119:2-3]. Experts in fish biology testified that the Delta

smelt is in jeopardy. Plaintiffs' experts Dr. Peter B. Moyle and Dr. Christina Swanson, Federal Defendants' expert Ms. Cay Collette Goude, and Defendant Intervenor State Water Contractor's expert Dr. Charles H. Hanson, all agree that the species is in a critical state at present. [Tr. 72:19-73:1; 85:11-14; 266:16-269:17; 270:6-271:10; 613:23-614:3; 617:18-21; 622:14-623:4; 889:20-890:11; 945:3-10]. San Luis' expert, Dr. **[*12]** Miller, agreed.

12. Population abundance indices have been at record low levels for the past three years. [Tr. 270:25-271:10]. Some experts opined that the species' condition is so precarious that it could become extinct within the year. [Tr. 802:17-23; 1031:5-1032:13].

13. Dr. Miller's 2002 work opining the Delta smelt species had recovered, was substantially criticized by peers. He was accused of using selective data to achieve result-oriented opinions. Dr. Miller offered the absolutely unsupportable and erroneous opinion that within the last five years the Delta smelt species had "recovered."

14. The studies Dr. Miller submitted and the opinions provided in his declarations are unduly limited, do not consider the real life ramifications of conditions in the Delta, and the actual condition of the Delta smelt.

15. On the witness stand, Dr. Miller admitted the critical decline in the species and that it is on the verge of extinction. Dr. Miller now acknowledges that major actions have to be taken. He opined that an immediate food supply study needed to be conducted. He further opined that more than one refuge population should be established to attempt to save the species. The locations **[*13]** of these preserves would be designed to protect against single-event catastrophic elimination of the species.

16. The Court does not find Dr. Miller's opinions on the species persuasive or reliable.

17. The critical habitat of the Delta smelt includes the Sacramento-San Joaquin Delta waters at the confluence of those rivers, as they approach San Francisco Bay, including the Central and Northwest portions of the Delta.

18. The evidence is undisputable that the CVP, operated by the Bureau and the SWP operated by DWR, cause the entrainment and salvage of unknown numbers of Delta smelt through the operation of their respective pumping facilities located in the south Delta pursuant to operations conducted under the 2004 Operations Criteria and Plan ("OCAP"). [Tr. 82:6-84:5; 694:24-695:3]. The number of Delta smelt killed at the pumping facilities is unknown in part because smelt smaller than 20mm in length are not counted and samples of fish larger than 20mm counted in existing surveys are limited. [Tr. 84:24-85:6; 85:19-25; 340:20-341:25; 342:22-343:4; 695:9-20; 696:22-25].

19. Pumping kills Delta smelt by sucking them directly into the pumps; by drawing them into fish "salvage" facilities **[*14]** which collect fish diverted from entering the pumps, a process that kills the smelt; and drawing smelt into the SWP's Clifton Court Forebay from which the fish cannot escape and where they will die even if they are not drawn into the salvage facilities or the pumps. [Tr. 86:11-22; 87:16-25; 337:3-341:11; 628:22-629:6; 1147:18-1148:4]. These losses result from the combination of the Delta smelt's natural migrations up and down the Delta during the smelt's annual life cycle and flow conditions within the Central and South Delta caused in part by the operation of the CVP and SWP pumps. [Tr. 84:6-18]. Pumping-induced negative flows not only pull smelt to the pumps, where they are either killed by the pumps or by the salvage process, the smelt are also drawn into unfavorable habitat where they and their offspring do not survive. [Tr. 82:10-84:20; 95:7-96:3; 97:18-24; 317:10-20; 628:1-6; 631:7-15].

20. The Projects' (CVP and SWP) operations are one of the causes of the Delta smelt's decline. [Tr. 82:6-9; 103:12-16; 104:10-13; 244:16-245:1; 299:16-22; 303:17-24; 354:21-356:6; 617:22-618:3; 685:5-10; 695:4-8; 766:22-767:1; 941:16-21].

21. Delta smelt are more likely to be entrained at the Projects' **[*15]** pumping facilities when smelt are in the general vicinity of those facilities (for example in the Central or South Delta). [Tr. 631:11-15; DWR Ex. D P6]. Delta smelt face less risk of entrainment at the Projects' pumping facilities when they are farther away from those facilities. [Tr. 631:7-10].

D. SURVEYS AND MONITORING FOR DELTA SMELT

22. Scientists rely on surveys conducted in the Delta to monitor the abundance of the Delta smelt. [Pl. Ex. 11 P3]. Those surveys include the Summer Townet, Fall Midwater Trawl, Spring Kodiak Trawl, and 20-Millimeter surveys (collectively "surveys"). [Pl. Ex. 11 P3]. The results of these Surveys are critical to assessing the status of the Delta smelt. [Tr. 73:23-74:8; 297:14-21; 651:15-18].

23. The operators of the CVP and SWP export facilities also monitor for Delta smelt that are entrained in the pumps at those facilities (known as "salvage"). [Tr. 629:7-13]. They do so by taking samples at regular intervals during their operations and counting the number of Delta smelt larger than 20mm found in those samples. [Tr. 629:7-13]. They then estimate the total number of Delta smelt entrained in the pumps by multiplying the number found in the samples by an **[*16]** "expansion"

factor. Delta smelt do not survive the salvage or entrainment process. [Tr. 86:11-22; 87:16-25; 337:3-341:11; 628:22-629:6].

24. It is disputed whether the surveys described above and the monitoring conducted at the CVP and SWP export facilities are insufficient in light of the current low abundance of the Delta smelt. [Tr. 1576:18-22].

E. DATA INADEQUACIES.

25. All parties agree that there is no firm and reliable total population estimate for the Delta smelt and there never has been.

26. No scientist was able to explain how, despite the marshaling of federal, state and private resources, over ten testifying experts presented in this case, and over ten years of study, what is necessary and how long it will take to produce a reliable total population estimate for Delta smelt.

27. Sampling data goes back over twenty-five years. The data is presented in the form of indices. Regression analyses are performed, which produce population "trends."

28. It is unfeasible and imprudent to delay further "study" and gathering of information, since studies have been intensively conducted for the past twelve years. Additionally, the information gathering and analysis process concerning the existence, **[*17]** survival, recovery, and viability of the smelt population has redoubled since the filing of this lawsuit and over 1,500 pages of scientific and engineering analysis of water Projects' operations, water costs, physical resource costs, monetary costs, and other burdens that will be required by the granting of interim protection, were presented for this remedies hearing.

F. MONITORING FREQUENCY

29. At their present lower levels of abundance, an increase in the frequency of the monitoring at the CVP and SWP export facilities will help to ensure that Delta smelt are detected when they are present. [Pl. Ex. 11 P34]. Currently, the monitoring programs at the CVP and SWP export facilities only detect Delta smelt that are 20mm in length or larger. Expanding these monitoring programs to detect Delta smelt smaller than 20mm in length will help to confirm the presence of Delta smelt larvae at the export facilities although their presence may also be inferred from other factors. [Tr. 387:21-24; 427:16-18; 431:23-423:2].

30. Reclamation and DWR will be required to overcome certain technical obstacles to detect Delta smelt between 5mm and 20mm in length at the CVP and SWP export facilities including **[*18]** the acquisition of new equipment to conduct this monitoring and the training of personnel to distinguish between Delta smelt larvae and the larvae of other fish species. [Tr. 653:17-656:12]. It appears fine mesh nets may need to be acquired for this purpose.

31. It is feasible to implement a monitoring program to protect larval Delta smelt. [Tr. 1686:16-22]. The need for larval monitoring was demonstrated by the testimony of Dr. Peter Moyle, who testified that large numbers of larval smelt may be taken at the Projects' pumps to reduce the smelt population significantly, especially when, as now, smelt numbers are critically low. [Tr. 82:20-83:1; 85:4-14]. Dr. Swanson explained that, "given the new science which suggests that, in fact, one of the more important impacts of water project operations may be lethal entrainment of those very small life history stages, I felt it was essential that monitoring for those life stages of Delta smelt at the facilities be implemented." [Tr. 386:23-387:3].

32. Reclamation currently monitors for Delta smelt at the CVP pumping facilities only approximately 8% of the time. [Tr. 385:23-386:1]. More frequent monitoring at regular intervals to detect the presence **[*19]** of Delta smelt will help to gauge more accurately the abundance of smelt near the CVP pumps and the numbers of smelt taken at those facilities. [Pl. Ex. 11 P34; Tr. 386:2-15].

G. PROPOSED INCREASED MONITORING

33. Plaintiffs Recommended Interim Remedial Action Numbers 2 and 3 respectively propose an increase in frequency of sampling for entrainment of fish at the CVP pumping facilities to a minimum of 25% of the time at intervals evenly spaced throughout the day. [Pl. Ex. 4 Appendix]. Remedial Action # 3 proposes monitoring for larval Delta smelt (less than 20mm in length) in the vicinity of the CVP and SWP pumping facilities a minimum of 4 times a day, evenly spaced through each 24-hour period, during early winter to late spring. [Pl. Ex. 4 Appendix]. That monitoring action is proposed to begin when Delta smelt spawning begins as indicated by (1) spring Kodiak survey data on the maturation stage of the Delta smelt or the presence of spent females in the survey or salvage samples; (2) when water temperatures reach 12EC at any Delta monitoring station; or (3) when larval Delta smelt are detected in the 20mm Survey or at the CVP or SWP fish salvage facilities, whichever comes first. Plaintiffs **[*20]** propose the action would end June 15, or a minimum of five days after the last detection of larval or juvenile Delta smelt at either the CVP or SWP facilities, whichever comes last. This monitoring shall cease on June 15 or a minimum of five (5) days after the last detection of larval and juvenile Delta smelt at either the CVP or SWP protective facilities by either the salvage or larval monitoring program, whichever comes last.

34. Remedial action # 2 would commence when (1) there is an increase in Sacramento River flow at Freeport at 25,000 cfs; or (2) there is an increase in San Joaquin River outflow by greater than 10% over 3 days; or (3) Fall Midwater Trawl or Spring Kodiak survey data indicate that Delta smelt are moving upstream of the Sacramento-San Joaquin Confluence and into the Delta; or (4) by January 15, whichever occurs first. Plaintiffs propose the action would end June 15, or a minimum of five days after the last detection of larval or juvenile Delta smelt at either of the CVP area facilities, whichever comes last. [Tr. 1686:7-14, 21-22]. Plaintiffs propose the action would end June 15, or a minimum of five days after the last detection of larval or juvenile Delta smelt **[*21]** at either the CVP or SWP facilities, whichever comes last. This monitoring shall cease on June 15 or a minimum of five (5) days after the last detection of larval and juvenile Delta smelt at either the CVP or SWP protective facilities by either the salvage or larval monitoring program, whichever comes last.

35. Dr. Swanson provided two reasons for increased monitoring: (1) the salvage sampling program at the CVP is less efficient than the SWP sampling program; and (2) the Delta smelt population abundance is currently so low there is a risk of error by infrequent sampling, which misses fish that are actually there by only sampling for a very limited period of time. [Tr. 386:4-12; 385:23-386:1 (documenting existing sampling frequencies at the CVP facilities)]. Dr. Moyle opined that more frequent sampling at the federal pumping facility is essential. [Tr. 82:15-19]. Ms. Goude testified in support of this proposed increased sampling: "There is a concern that some of the surveys are not as robust because of the low numbers of smelt" and "I think [Plaintiff's action 2] would be useful." [Tr. 651:2-24; 652:11].

H. NEGATIVE FLOWS ON OLD AND MIDDLE RIVERS AND ENTRAINMENT EFFECTS

36. The Old and **[*22]** Middle Rivers ("OMR") are tributaries of the San Joaquin River that flow through the South Delta and pass by the Project's pumping facilities. OMR flows are strongly influenced by inflows from the San Joaquin River and by the magnitude of water diversions at the Projects' pumping facilities. [Tr. 491:23-491:15; 316:18-25; Fed. Def. Ex. P4; Pl. Ex. 11 P9 n.1.]. These flows are also influenced by tides, the operation of the Head of Old River Barrier and certain agricultural barriers in the South Delta and other water diversions in the South Delta. [Tr. 492:7-9; 631:16-632:5; Fed. Def. Ex. 1 P4; Fed. Def. Ex. 4 P12]. When OMR flows are upstream, when the flow is in the direction of the Project's pumping facilities (and away from the Confluence of the Sacramento and San Joaquin Rivers), such flows are commonly described as "negative" or "reverse." [DWR Ex. D P4]. Export pumping at the CVP and SWP facilities to south of Delta users, cause flows to be negative on the OMR. Plaintiffs' expert opined the pumps' operations are the chief cause of this impact. [Tr. 84:14-18].

37. Delta smelt are poor swimmers and, when negative flows on the OMR are high, Delta smelt located in the Central and Southern **[*23]** Delta may be captured by those flows and drawn toward the CVP and SWP export facilities, where they are entrained. [Tr. 337:3-11; 351:25-352:5; Pl. Ex. 11 P28]. High negative flows on the OMR may increase the risk that Delta smelt will be entrained at the CVP and SWP export facilities. [Tr. 630:18-22; DWR Ex. D P4].

38. Scientists have demonstrated an approximately linear relationship between negative flows on the OMR and the number of Delta smelt entrained at the CVP and SWP export facilities (although the exact levels of entrainment also depend on other factors, such as the abundance of the Delta smelt). [Tr. 483:14-15; 727:18-22; DWR Ex. D P4, Ex. 1; Pl. Ex. 11 (Fig. 7), at 12]. As the average combined flows on the OMR become more negative, the number of Delta smelt within the zone of confluence of the Projects entrained at the CVP and SWP export facilities increases. [Tr. 566:17-567:2]. The data on the exact mathematical relationship between negative flows and the number of Delta smelt entrained is limited. [Tr. 348:11-16; 406:8-15; 566:20-22]. From available data it also appears that the number of Delta smelt entrained at the CVP and SWP export facilities begins to rise significantly **[*24]** when negative flows on the OMR exceed approximately -5,000 cfs. [Tr. 641:14-642:5; 725:16-17; DWR Ex. D P4; DWR Ex. G P34; SWC Ex. N].

39. Dr. Miller, the San Luis Intervenors' expert's testimony on 2002 smelt abundance figures have been materially questioned in the scientific peer community and the Court finds Dr. Miller's analysis to be unpersuasive. The statistical analysis by Dr. Miller does not prove his opinion that the projects have insignificant influence on the abundance of Delta smelt.

40. Negative OMR flows are lessened by reducing diversions at the Projects' pumping facilities, by increasing releases to the San Joaquin River from the CVP facilities upstream, or by a combination of these. Under certain conditions (including dry conditions, when inflows to the San Joaquin River are low), even stopping all diversions at the CVP and SWP export facilities may not be sufficient to eliminate negative OMR flows. [Tr. 1555:18-23; 1566:11-22]. In such a case, the negative OMR flows can only be eliminated by releasing additional water to the San Joaquin River or by asking other diverters in the South Delta to curtail pumping. [Tr. 1567:4-19]. There is no evidence that any Defendant

[*25] or Intervenor in this case has any control over other South Delta diverters.

41. Flows on the OMR are strongly influenced by inflows from the San Joaquin River and the magnitude of diversions at the CVP and SWP export facilities. [Tr. 491:23-492:15; 316:18-25; Fed. Def. Ex. 1 P4; Pl. Ex. 11 P9 n.1]. Negative flows on the OMR may be reduced by reducing diversions at the CVP and SWP export facilities or by increasing releases to the San Joaquin River from the CVP facilities upstream (or by a combination of such reductions in releases).

I. PROPOSED OMR FLOW RESTRICTIONS TO REDUCE ENTRAINMENT

42. Scientists have concluded that the number of Delta smelt entrained at the Projects' pumping facilities often increases after a winter "pulse flow," i.e., when the combined winter flows on the Sacramento and San Joaquin Rivers increase to about 30,000 cfs, and the Delta smelt begin to move upstream to spawn and pass through the Central Delta, within the hydrological influence of the Projects' pumps. [DWR Ex. D P3; Tr. 368:23-369:8]. Scientists hypothesize that the movement of the Delta smelt may be triggered by the increased turbidity that results from these winter pulse flow events. Turbidity is [*26] a useful indicator of the subsequent entrainment of adult Delta smelt. [DWR Ex. D P3]. A restriction on negative OMR flows during a winter pulse flow event is expected to help to minimize the movement of Delta smelt into the South Delta and thus result in a distribution of the Delta smelt population that reduces the risk of entrainment at the Projects' pumping facilities. [DWR Ex. D P3]. FWS's witness, Ms. Goude, testified that a restriction limiting negative OMR flows to -2,000 cfs during a winter pulse flow event is expected to be protective of the Delta smelt. [Tr. 638:24-639:15; 720:12-14]. Ms. Goude further testified that such a restriction is not necessary during a wet year when high water flows would themselves move the Delta smelt away from the influence of the pumps. [Tr. 639:24-640:13].

43. After a winter pulse flow event, and in those years when no pulse flow occurs, further restrictions on negative OMR flows during the winter are expected to minimize the number of pre-spawning adult Delta smelt entrained at the Projects' pumping facilities and to reduce spawning in the South Delta (where larval Delta smelt are more likely to be entrained at the Projects' pumping facilities). [*27] [DWR Ex. 4 P4; Tr. 638:20-23].

44. During the spring and early summer, larval and juvenile smelt again pass through the Central Delta, within the hydrological influence of the Projects' pumps, as they move downstream to their rearing areas, beyond the Confluence of the Sacramento and San Joaquin Rivers and in Suisun Bay. [DWR Ex. P6]. Scientific studies suggest that smelt have benefitted from pumping curtailments implemented under the Vernalis Adaptive Management Plan ("VAMP") from mid-April to mid-May of each year. [Tr. 304:22-305:11]. Restrictions on negative OMR flows during the spring and early summer are expected to minimize the entrainment of larval and juvenile Delta smelt at the CVP and SWP export facilities. [Tr. 389:2-9; 390:15-20; 391:5-10; 391:22-392:3; 395:9-20; 641:16-19; DWR Ex. D PP5, 6; Pl. Ex. 11 P35]. Such restrictions also help to facilitate the movement of larval and juvenile Delta smelt downstream. [Tr. 395:13-20].

45. In general, Delta smelt face a greater risk of entrainment at CVP and SWP facilities when they are located near those facilities (for example, in the Central or Southern Delta) than when they are located farther away (such as when they are in the [*28] Suisun Bay). [Tr. 631:7-10; 631:11-15; 642:22-23; DWR Ex. D P6]. For that reason, it is appropriate to identify specific target flow for the OMR (within a certain range) at the time when the restriction is to come into effect, based on the best scientific data available at that time, including, but not limited to, survey results, salvage information, results of the "particle tracking model" developed by the DWR, and information on the actual hydrology occurring at the time, which also affects smelt movements.

46. The Delta is a dynamic aquatic environment and flows on the OMR may be affected by the tides and unpredictable natural factors such as high winds, rain events, storm surge, and other meteorological conditions. [Tr. 1494:6-1496:6; Fed. Def. Ex. 2 P41; DWR Ex. G P33]. Some variability in flows on the OMR cannot be avoided, and to allow for that variability, any restriction on those flows should be expressed as a seven-day running average. There is conflict in the testimony regarding the value of use of a shorter averaging period. [Tr. 1499:5-18; 1500:3-19; DWR Ex. J PP30, 32].

J. RESTRICTIONS ON INSTALLATION OF BARRIERS IN DELTA

47. The Head of Old River Barrier, when installed, [*29] directs flows on the San Joaquin River away from the Old River into the Central Delta. [DWR Ex. D P8]. The purpose of the Head of Old River Barrier is to benefit migrating salmon. [Tr. 134:3-12]. This measure tends to increase negative OMR flows which may increase the risk that Delta smelt will be entrained at the Projects' pumping facilities. [Tr. 134:3-12; 400:14-18; 649:7-16; DWR Ex. D P8]. A restriction prohibiting the installation of the head of Old River Barrier until June 15 will allow the San Joaquin River to contribute to more positive OMR flows and minimize the risk that Delta smelt will

be entrained at the Projects' pumping facilities. [Tr. 402:20-23; 408:25-409:7; Pl. Ex. 4 Appendix]. The Barrier diverts salmon away from the pumps; it does not improve flows for them. [Tr. 134:3-12].

48. There are agricultural barriers that when in operation, retain more water in the South Delta (to facilitate agricultural diversions) by using "flap gates." [DWR Ex. D P8]. The flap gates allow water to pass through the barriers on the incoming tide, but prevent it from draining away when the tide ebbs. [DWR Ex. D P8]. In this way, these barriers also tend to increase negative OMR flows. A **[*30]** restriction requiring the flap gates on these agricultural barriers to be tied open will allow this water to contribute to more positive OMR flows. [DWR Ex. D P8]. Plaintiffs' proposed actions 8 and 9 prohibiting the installation of these agricultural barriers until the end of the VAMP measure as prescribed in the Interim Remedial Order.

K. FALL ACTIONS

49. Plaintiffs' proposed fall action to maintain Delta outflow at a minimum of 7,500 cfs or maintain X-2 (or as a fourteen day running average at downstream of 80km, whichever requires less fresh water outflow was not supported by a preponderance of the evidence because: (1) not supported by peer-reviewed analysis; (2) the Delta Smelt Working Group declined to support similar actions put before them; and (3) there is material uncertainty among scientists about the benefit of this action for the Delta smelt in the face of its requirement of a large commitment of water to users in times of summer heat. [Tr. 1691:19-1692:11].

49. The significant quantity of water that would be required for proposed fall actions, approaching 500,000 acre feet ("AF") in an average water year, in light of the scientific dispute and other scientists' rejection **[*31]** of such a plan; the scientific uncertainty; and the low risk reward benefit analysis does not justify imposition of a fall remedial measure.

L. OTHER NEGATIVE EFFECTS ON DELTA SMELT

51. The evidence preponderates to show that the Projects' operations adversely modify the Delta smelt's designated critical habitat, the South and Central Delta waters, by rendering the designated habitat in the South Delta unsafe to use for spawning or migration because of the risk of pumping entrainment at different times to all life stages of the species. [Tr. 89:11-90:11; 94:6-95:3; 589:11-591:8; 686:4-10]. The South Delta represents roughly one-third of the Delta smelt's critical habitat. [Tr. 589:21-25; 591:5-8].

52. The full range of causes of the Delta smelt's current record low population abundance and the relative roles various causes have played in the species are not fully understood. [Tr. 73:4-16; 299:16-300:1; 301:1-18; 303:25-304:3; 617:22-618:6]. However, substantial evidence proves by more than a preponderance that Delta smelt mortality is caused by the Projects' operations. The evidence does not establish that the primary cause of the Delta smelt's decline is lack of adequate food supply, **[*32]** a position advanced by Dr. William J. Miller. [Tr. 1682:3-17].

53. Additional causes, not directly effectuated by CVP and SWP operations, include, but are not limited to, toxicity resulting from pesticides and other toxics in the species' habitat; invasive predatory species, including the Asian Overbite Clam; actions of other diverters in the Delta; and reduction of the food supply of the species, are contributing to its decline.

M. INADEQUACY OF TAKE LIMITS

54. The 2005 BiOp identifies limits on the number of Delta smelt that may be taken at the CVP and SWP export facilities before consultation with FWS must be reinitiated under the ESA. The existing take limits are unrealistically high and may approach the current population numbers of the species as a whole. [Tr. 776:2-777:19; 1213:16-1215:22; 1679:15-18]. The incidental take limits set in the 2005 BiOp are arbitrary and capricious because, in setting those limits based on historical take, FWS did not take into account the most recent uncontested data about record-low Delta smelt abundance. [SJ Order at 92:19-93:1; Tr. 358:4-359:4]. The even higher incidental take limits set in the out-dated 1995 BiOp on the Projects' operations may **[*33]** exceed the species' current population. [Tr. 633:12-644:12; 777:2-3; 1679:15-18].

55. The take limits set out in the 2005 BiOp are significantly more restrictive (allowing the taking of fewer Delta smelt) than the take limits that were identified in the previous biological opinion (issued in 1995). [Tr. 777:10-19]. The latter-issued take limits are not sufficient by themselves in the absence of interim and injunctive relief, to protect the Delta smelt.

N. INADEQUACY OF DSRAM PROCESS TO MITIGATE EFFECTS OF PROJECTS' OPERATIONS

56. The BiOp attempted to remediate the Projects' negative impacts to the jeopardized Delta smelt through the implementation of the DSRAM, a mitigation process that is the central remedial plan for the 2005 BiOp. [Tr. 1681:14-21]. The DSRAM process has been found arbitrary and capricious because it did not provide the reasonable certainty required by the ESA that necessary mitigation measures will be implemented, nor the reasonable assurance the ESA requires that OCAP opera-

tions will not jeopardize the Delta smelt nor adversely modify its critical habitat. [SL Order at 58:12-59:4].

57. Ronald Milligan, manager of Reclamation's CVP Office, testified that the Delta **[*34]** smelt has declined in population abundance in recent years, despite the agency's use of the DSRAM in the last several years attempting to address the Projects' impacts on the species. [Tr. 1559:9-1560:6]. The Water Operations Management Team ("WOMT") which includes representatives from Reclamation and DWR, has declined at times although presented with incontrovertible evidence, to take actions to protect the smelt, that were recommended pursuant to the DSRAM by the Delta Smelt Working Group ("DSWG"), a team of Delta smelt scientists from the Project agencies and the Wildlife Protection Agencies. [Tr. 1552:21-1554:21; 1557:8-23]. Reclamation's and DWR's reliance on the DSRAM process has been unsuccessful, as demonstrated by the record low population abundance indices for the Delta smelt in the past three years. [Tr. 270:25-271:10; 273:24-274:2; 1581:4-1580:2].

O. OTHER MEASURES NECESSARY FOR FEDERAL DEFENDANTS' TO TAKE PENDING THE NEW BIOP

58. Federal Defendants in their opening brief on injunctive relief identified measures that they committed to implement, as necessary to prevent an irreversible or irretrievable commitment of resources under *ESA Section 7(d)* pending completion of a **[*35]** new biological opinion. [Fed. Def. Brief, Doc. 396 at pp. 19-20]. Federal Defendants committed, as of July 9, 2007, that:

1) The Bureau will not execute any long-term water service contracts with CVP contractors until the new BiOp is completed;

2) The Bureau will not implement construction activities and long-term projects in the Delta until the new BiOp is completed, including the South Delta Improvement Project, the Delta Mendota Canal/California Aqueduct Intertie Program, the Lower American River Flow Standards, and the Long Term Environmental Water Account;

3) The Bureau will "not increase exports from the South Delta and will operate Jones Pumping Plant within recent historic limits;" and

4) The Bureau committed resources and staff to the continuing study of pelagic organism decline in the Delta.

59. These measures shall be implemented during the reconsultation period as Federal Defendants admit the measures are necessary to preserve the Delta smelt and its critical habitat.

P. PUBLIC HEALTH, SAFETY AND THE HUMAN ENVIRONMENT

60. Plaintiffs' proposed restrictions on the operations of the CVP and SWP have the ability to deleteriously affect public health, safety, and the human environment **[*36]** in many ways. The Court recognizes it has limited ability to control the impact of its ruling under ESA jurisprudence, particularly economic impacts. Plaintiffs proposed an exception to the implementation of interim injunctive relief and remedial actions where such requirements would threaten public health and safety. The Plaintiffs propose that this limitation be defined by Reclamation's "M&I Shortage Policy," which provides that a public health and safety problem exists "when there is a severely low water supply with the sharing of water supplies for purposes of interior residential, sanitation and fire protection."

61. Although the ESA does not expressly recognize an exception for human health and safety, Plaintiffs have offered and it is prudent to apply a human health and safety exception as part of the relief granted in this case. Risks that will be created by implementation of the interim remedial actions to be imposed, include, but are not limited to:

a. Adverse impacts affecting deliveries of water necessary for water service districts, emergency water supplies, municipal water supplies, and industrial power and related energy sources;

b. Adverse effects on agriculture including, **[*37]** but not limited to, loss of jobs, increased groundwater pumping, fallowed land, and land subsidence.

c. Air pollution resulting from heavier reliance on groundwater pumping and decrease in surface irrigation; and

d. Damage to the structural integrity of CVP or SWP facilities including reservoirs or dams, causing, for example, significant damage to the earthen walls of the San Luis Reservoir, if that reservoir is drawn down too rapidly. [Tr. 1412:24-1413:3; 1414:6-17; 1414:1-5; 1482:15-1483:2].

62. Diversions from CVP and SWP export facilities are also necessary to meet health and safety demands of certain contractors on the upper reach of the Delta-Mendota Canal, where such contractors have few or no alternative sources of water. [Fed. Def. Ex. 4 P5].

III. CONCLUSIONS OF LAW

A. JURISDICTION

1. Jurisdiction in this case exists under *28 U.S.C. ß 1331* (Federal Question); *16 U.S.C. ß 1536 et seq.* (the

ESA); and *5 U.S.C. ß 702 et seq.* (the Administrative Procedure Act).

2. All other Defendant-Intervenors have voluntarily submitted themselves to the Court's jurisdiction by intervening and fully participating in the litigation. The DWR, by its intervention and full participation throughout the pleading **[*38]** phase, dispositive motion proceedings, temporary restraining order proceedings, evidentiary hearing on remedies and by presenting evidence, proposing interim remedies, and providing oral and written arguments as well as additional written legal authorities on the merits of all issues, claims and remedies, that address DWR's joint operation with Reclamation of the CVP and SWP, have waived any jurisdictional objection to the imposition of the interim remedial orders on the DWR. DWR and other parties have reserved the right to address motions to the issues of jurisdiction and efficacy of the most recent supplements to Plaintiffs' complaint.

3. On August 30, 2007, Plaintiffs' motion to supplement their complaint was granted adding claims that Reclamation violated ß7(a)(2) of the Endangered Species Act, *16 U.S.C. ß 1536(a)(2)*. The supplemental complaint claims that Reclamation's and DWR's operation of the CVP and SWP is causing decline in the smelt population and threatens extinction of the species and is causing adverse effects on the Delta smelt's designated critical habitat.

4. Defendant Intervenors reserve the right to challenge the Court's jurisdiction over the new ESA claim. Plaintiffs **[*39]** assert a further claim for violation of *ß7(d)* for irretrievable or irreversible commitments of resources during *ß7* consultation.

5. The summary judgment proceedings and evidentiary hearing were conducted with full participation of DWR (the State of California, and the State Water Contractors, who offered evidence, legal briefing and argument). This conduct also amounts to judicial estoppel against DWR and SWC. The principles of *Fed. R. Civ. P. 15(b)* apply to permit amendment of pleadings, if necessary, to conform to the proof offered by DWR and the SWC.

6. The Federal Defendants, by initiating reconsultation, have acknowledged the invalidity of the 2005 BiOp. They have, pursuant to Court direction, proposed interim remedial measures. The Federal Defendants have agreed to implement stand-by measures that will prevent the irreversible or irretrievable commitment of resources pending completion of a lawful biological opinion. These commitments are listed at Finding of Fact 57., p. 24:15--25:5, and are incorporated into the accompanying Interim Remedial Order.

B. Judicial Non-Intervention

7. The Court will not substitute its judgment for that of any administrative agency. The Court lacks the **[*40]** expertise or background in fish biology, hydrology, hydraulic engineering, water project operations, and related scientific and technical disciplines that are essential to determining how the State and Federal Water Projects should be operated to protect and benefit the public and the species.

C. IMPERILED STATUS OF SPECIES

8. There is general agreement among the biologists and environmental experts who testified as to the current critical condition of the Delta smelt, which is at a historic low and could go extinct within one year, with or without all proposed remedial measures. There is considerable difference of expert opinion as to whether and what remedial proposals are biologically necessary in the interim pending completion of a lawful biological opinion, which are all reasonably supported by available scientific data and information.

9. Jarry Johns, DWR's Deputy Director who is also a member of the Water Operations Management Team, has testified before a Congressional Oversight Committee: "It is DFG's position that actions must be taken to protect as many individual smelt as can be through manipulation of the water projects. Each reproducing organism is important to the survival **[*41]** of the species."

10. Mr. Johns' declaration P 58 explains: The "dramatic drop in juvenile smelt was a great concern to DFG and USFWS this year and highlighted their concern about any further impacts to the reduced population this year."

11. The Delta Smelt Working Group recognized in spring of 2007 that the Delta smelt was "critically imperiled" and that the Projects should seek to achieve "no further entrainment of Delta smelt." Swanson Dec. P 16.

12. The evidence clearly establishes by more than a preponderance that the condition of the Delta smelt has worsened in recent years and that the species is currently in a critical state. Some experts have opined that there may be no way to prevent the extinction of the species. There is a dispute whether the operations of the CVP and SWP export facilities are the principal cause of the decline in the Delta smelt or whether other factors beyond the control of the Projects are the principal cause. Nonetheless, there is no dispute that Project operations are taking Delta smelt through entrainment, salvage, and alteration of Delta hydrology, principally reversal of natural flows.

13. Under the doctrine of concurrent causes, the impact from Project **[*42]** operations is at least a concur-

rent cause which jeopardizes the existence of the Delta smelt and endangers its survival and its critical habitat, which necessitates remedial action. The Court is under a legal and equitable duty to formulate remedial action.

14. The interim remedial order has taken into account all evidence and opinions provided by the multitude of experts who have testified about the scientific issues and made the remedial proposals. This is legally justified by the ESA requirement that the best scientific and commercial data available be brought to bear on the issues presented.

15. Continued operation of the Projects' pumps in the interim period without imposition of a remedial order would not provide the necessary level of protection to prevent further risk to the survival of the Delta smelt.

16. The interim remedial order must be and is based upon the best scientific and commercial data presented by the parties over an extended evidentiary hearing and in extensive written submissions, after oral argument. The interim remedial order is narrowly tailored to impose burdens no greater than reasonably necessary to comply with the ESA. *Nat'l Wildlife Fed'n v. NMFS, 422 F.3d 782, 799-800 (9th Cir. 2005).*

17. **[*43]** A Plaintiff must still demonstrate a likelihood of success on the merits as well as "reasonable likelihood" of irreparable harm for ESA injunctive relief. *National Wildlife Fed'n v. Burlington Northern R.R., 23 F.3d 1508, 1511 (9th Cir. 1994)*; *Nat'l Wildlife Fed. v. Nat'l Marine Fisheries Serv., 422 F.3d 782, 793-94 (9th Cir. 2005).*

18. The extinction of a species and adverse effect on its critical habitat constitute irreparable injury.

19. The Plaintiffs have prevailed in this action to the extent that the BiOp under which Reclamation and DWR are operating the CVP and SWP, the DSRAM, and Incidental Take Limits are unlawful.

20. The evidence described in the Findings of Fact establishes by a preponderance of the evidence that the current operations of the CVP and SWP could result "in irreparable harm" by imminently threatening the continued existence of the Delta smelt and adversely modifying its designated critical habitat.

D. STANDARDS FOR APA INJUNCTIVE RELIEF

21. Agency decisions are reviewed under the Administrative Procedure Act, *5 U.S.C. ß 706(2)(A)* and should be set aside only if the decision is arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law. **[*44]** *Sierra Club v. Marsh, 816 F.2d 1376, 1384 (9th Cir. 1987).* To prove an APA violation, the Plaintiff must show irreparable harm or a balance of hardships tipping in the Plaintiff's favor. For a NEPA claim, a Plaintiff is required to make a traditional showing for injunctive relief. Establishing a procedural violation of NEPA does not compel the issuance of a preliminary injunction. *Fund Animals v. Lujan, 962 F.2d 1391, 1400 (9th Cir. 1992).*

22. "Environmental injury, by its nature, can seldom be adequately remedied by money damages and is often permanent or at least of long duration, i.e., irreparable. If such injury is sufficiently likely, therefore, the balance of harms will usually favor the issuance of an injunction to protect the environment." *Amoco Prod. Co. v. Village of Gambell, AK, 480 U.S. 531, 545, 107 S. Ct. 1396, 94 L. Ed. 2d 542 (1987).* Here, all experts agree that the status of the Delta smelt species is critical and the species could be extinct within one year. Experts have also testified that the species could go extinct with or without any action by the parties.

23. Injunctive relief is intended to be the least intrusive and is not intended to limit the lawful exercise of Agency discretion, competence, **[*45]** and expertise to operate the Projects in compliance with APA and ESA requirements.

E. ESA INJUNCTIVE RELIEF REQUIREMENTS

24. ESA Section 7(a)(2) prohibits agency action that is "likely to jeopardize the continued existence of any listed species or to result in the destruction or adverse modification of its critical habitat. *16 U.S.C. ß 1536(a)(2).*

25. Agency regulations interpret *ß 7(a)(2)* to prohibit any agency action "that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild." *50 C.F.R. ß 402.02*; *National Wildlife Federation v. National Marine Fisheries Service, 481 F.3d 1224, 1235 (9th Cir. 2007).*

26. *Gifford Pinchot Task Force v. United States Fish & Wildlife Service, 378 F.3d 1059, 1070 (9th Cir. 2004),* requires that recovery as well as survival impacts be considered in evaluating adverse modification of critical habitat. Here, the critical habitat for the Delta smelt is the Sacramento-San Joaquin Delta, confluence of the Sacramento and San Joaquin Rivers as they approach the San Francisco Bay, and the tributary system that is contiguous to the North and Central Delta areas where **[*46]** the smelt spawn and through which the species moves to the Suisun Bay where the species remains until the spawning season.

27. The Endangered Species Act mandates that federal agencies take no action that will result in "destruction or adverse modification" of designated critical habi-

tat. *16 U.S.C. ß 1536(a)(2)*. "Destruction or adverse modification" is defined as follows:

> A direct or indirect alteration thatpa preciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining habitat to be critical.

50 C.F.R. ß 402.02.

F. ESA Injunctive Relief Jurisprudence.

28. The remedy for an ESA substantial procedural violation, i.e., a violation that is not technical or de minimis, is an injunction pending compliance with the ESA. *Washington Toxics Coalition v. EPA, 413 F.3d 1024, 1034 (9th Cir. 2005)*.

29. After initiation of consultation required under *ß 7(a)(2) of the ESA*, the Federal agency shall not make any irreversible or irretrievable commitment of resources with respect to the agency action **[*47]** which has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternative measures which would not violate *ß 7(a)(2). Washington Toxics, 413 F.3d at 1034*. ESA consultation was reinitiated on the OCAP BiOp July 6, 2006.

30. *Section 7(d) of the ESA* was enacted to ensure the status quo is maintained during the consultation process to prevent agencies from sinking resources into a project to ensure its completion regardless of impacts on endangered species. *Pac. Rivers Council v. Thomas, 936 F.Supp. 738, 745 (D. Idaho 1996)*. Non-jeopardizing agency actions may continue during the ESA consultation process. *Sierra Club v. Marsh, 816 F.2d 1376, 1389*.

31. In *Tennessee Valley Auth. v. Hill, 437 U.S. 153, 173, 193-95, 98 S. Ct. 2279, 2291, 2301-02, 57 L. Ed. 2d 117 (1978)*, the Supreme Court held that Congress explicitly foreclosed a court's exercise of traditional equitable discretion when faced with a violation of *ß 7 of the ESA. Sierra Club v. Marsh, 816 F.2d 1376, 1383 (9th Cir. 1987)*. The obligation of Federal agencies is to "ensure that any action . . . is not likely to jeopardize the continued existence of any endangered species." *Section 7(a)(2)*. "Congress has spoken in the plainest of **[*48]** words, making it abundantly clear that the balance has been struck in favor of affording endangered species the highest of priorities, thereby adopting a policy which it described as 'institutionalized caution.'" *Sierra Club, 816 F.2d at 1383*.

32. In *TVA v. Hill,* where the threat to the snail darter resulted in injunctive relief against operation of the 100 million dollar Tennessee Valley Authority Dam, the Supreme Court stated: "Our individual appraisal of the wisdom or unwisdom of a particular course consciously selected by the Congress is to be put aside in the process of interpreting a statute. Once the meaning of enactment is discerned and its constitutionality determined, judicial process comes to an end." *TVA, 437 U.S. at 194-195*. Having determined an irreconcilable conflict between CVP and SWP operations and the explicit provisions of *ß 7* of the Endangered Species Act to fashion a remedy, the words of the Supreme Court provide guidance:

> "Our system of government is, after all, a tripartite one, with each branch having certain defined functions delegated to it by the Constitution. While "[i]t is emphatically the province and duty of the judicial department to say what the law **[*49]** is," *Marbury v. Madison, 5 U.S. 137, 1 Cranch 137, 177, 2 L.Ed. 60 (1803)*, it is equally - and emphatically - the exclusive province of the Congress not only to formulate legislative policies and mandate programs and projects, but also to establish their relative priority for the Nation. Once Congress, exercising its delegated powers, has decided the order of priorities in a given area, it is for the Executive to administer the laws and for the courts to enforce them when enforcement is sought."
>
> Here, we are urged to view the Endangered Species Act "reasonably," and hence, shape a remedy "that accords with some modicum of common sense and the public weal." Post, at 302. But is that our function? We have no expert knowledge on the subject of endangered species, much less do we have a mandate from the People to strike a balance of equities on the side of the Teleco Dam. Congress has spoken in the plainest of words, making it abundantly clear that the balancing has been struck in favor of affording endangered species the highest of priorities, thereby adopting a policy which it describes as "institutionalized caution."

33. "In our Constitutional system, the commitment to the separation of powers is **[*50]** too fundamental for

us to preempt Congressional action by judicially decreeing what accords with common sense and the public weal." Our Constitution vests such responsibilities in the political branches. *TVA v. Hill, 437 U.S. at 195.*

34. The language, history and structure of the *ESA* indicates beyond doubt that Congress intended "endangered species be afforded the highest of priorities." *TVA v. Hill, 437 U.S. at 174.* "In Congress's view, projects that jeopardized the continued existence of endangered species threatened incalculable harm: accordingly, it decided that the balance of hardships in the public interest tip heavily in favor of endangered species." *TVA v. Hill, at 187-88, 194-95; Sierra Club v. Marsh, 816 F.2d at 1383; Biodiversity Legal Foundation v. Badgley, 309 F.3d 1166, 1177 (9th Cir. 2002).* The Ninth Circuit has said, "We may not use equities' scales to strike a different balance." *Sierra Club v. Marsh, 816 F.2d at 1383.* In the context of the ESA, "Congress [has] foreclosed the exercise of the usual discretion possessed by a court of equity." *Amoco Prod. Co. v. Village of Gambell, Alaska, 480 U.S. 531, 543 n.9, 544-45, 107 S.Ct. 1396, 94 L. Ed. 2d 542 (1987)*, cited in *Biodiversity Legal Foundation, 309 F.3d at 1178.*

G. **[*51]** EVIDENCE OF ESA VIOLATIONS

35. Direct evidence has established that CVP and SWP pumping and water conveyance operations cause flows in the Old and Middle Sacramento Rivers and easterly of the confluence of the Sacramento and San Joaquin Rivers to flow in opposite directions, which confuses the smelt and causes the fish to be entrained or salvaged at the pumps. Evidence further establishes that export operations from the pumps caused a reduction of flows through the Central Delta westward from the confluence of the Sacramento and San Joaquin Rivers into the Suisun Bay which affects the salinity of the water.

36. D-1641 establishes salinity standards applicable February through June as a establish a benchmark for the isohaline referred to as X2, salinity measured as two parts per thousand, prescribing that X2 be maintained at not more than two parts per thousand at a point a certain number of kilometers from the Golden Gate Bridge and eastward. Evidence has shown that the smelt's tolerance to water salinity declines substantially above the four to five parts per thousand level. Increases in exports from the Bay Delta through the pumps southward cause increasing salinity in the Bay Delta **[*52]** waters and estuary by virtue of lowered volumes of fresh water after export. Only one expert, Dr. Miller, disagreed and his trial opinions ignored that water temperature, water quality, salinity, turbidity, and Project operations, have a direct effect on survival and recovery of the Delta smelt. For reasons stated above, the Court does not find Dr. Miller's analysis sufficiently credible and relevant to cast doubt that Project operations are an actual cause of the decline and potential extinction to the Delta smelt species.

37. *Section 7(d) of the ESA* prohibits an agency from making any irreversible and irretrievable commitment of resources that would foreclose the formulation or implementation of any reasonable and prudent alternative measures to avoid jeopardy to a listed species or adverse modification of its critical habitat pending completion of a valid biological opinion. *16 U.S.C. ß 1536(d).*

38. The Delta smelt is listed as a threatened species. *58 Fed. Reg. 12,863 (Mar. 5, 1993).*

39. The ESA implementation regulations provide that *Section 7(a)(2)*'s "no jeopardy" requirement prohibits any Federal agency action "that reasonably would be expected, directly or indirectly, to reduce **[*53]** appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." *50 C.F.R. ß 402.02.*

40. The ESA implementation regulations define *Section 7(a)(2)*'s requirement that prohibits actions that would destroy or adversely modify the listed species' critical habitat: "*Destructive or adverse modification means a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species.*" *50 C.F.R. ß 402.02* (emphasis in original).

41. The Ninth Circuit rule is that an action that "adversely modifies" a listed species' critical habitat is one that would "threaten a species' recovery even if there remains sufficient critical habitat for the species' survival." *Gifford Pinchot Task Force v. U.S. Fish & Wildlife Service, 378 F.3d 1059, 1070 (9th Cir. 2004).*

42. Operations of the CVP and SWP under the existing OCAP, among other causes, are both increasing risk to the survival and recovery of the Delta smelt and adversely modifying its critical habitat.

43. The Court's Summary Judgment Order found that the 2005 BiOp that covers day-to-day **[*54]** coordinated operations of the CVP and the SWP was unlawful, arbitrary, and capricious. [SJ Order at 118:10-119:27].

44. The DSRAM measures adopted as part of the 2005 BiOp and the take limit have been found insufficient to satisfy ESA requirements. [SJ Order at 58:12-59:4; 92:19-93:1].

45. The existing take limits without remedial measures will not prevent the risk of extinction of the species within the period of time a new lawful biological opinion can be completed. Any injunctive relief should be narrowly tailored to remedy the specific ESA violation.

Nat'l Wildlife Fed'n v. NMFS, 2005 U.S. Dist. LEXIS 39509, Op. at 8 (D. Or. 2005), aff'd, *481 F.3d 1224 (9th Cir. 2007)*.

46. To comply with *ESA Sections 7(a)(2)* there is no requirement that Reclamation or FWS pick the best alternative or the one that would most effectively protect the Delta smelt from jeopardy. *Southwest Center for Biological Diversity v. Bureau of Reclamation, 143 F.3d 515, 523, fn.5 (9th Cir. 1998)*. However, it is not required that an inflexible flow regime be imposed that will expel precious, scarce water resources that will flow out to the Pacific Ocean and cannot be recovered.

47. Because evidence overwhelmingly establishes **[*55]** that Project operations are a cause of the decline of the species, Project operations must be addressed as mandated by the law to protect against extinction of the species and adverse modification of its habitat.

H. Authority for Remand

48. The District Court has broad latitude in fashioning equitable relief when necessary to remedy an established wrong. *NWF v. NMFS, 481 F.3d at 1242*, citing *Alaska Ctr. for the Env't v. Browner, 20 F.3d 981, 986 (9th Cir. 1994)*.

49. Requirements of regular status reports during a remand are permissible. *NWF v. NMFS, 481 F.3d at 1242*; *Telecommunications Research & Action Center v. FCC, 242 U.S. App. D.C. 222, 750 F.2d 70, 81 (D.C. Cir. 1984)*. A status report shall be produced by FWS.

50. The District Court has the discretionary authority to impose a deadline for remand proceedings. *Nat'l Org. of Veterans' Advocates, Inc. v. Sec'y of Veterans Affairs, 260 F.3d 1365, 1381 (Fed. Cir. 2001)*; *NWF v. NMFS, 481 F.3d at 1242*. A deadline for the remand shall be imposed.

51. A court has the power to direct efforts that ensure that the agency complies with the ESA's mandate that agencies "use the best scientific and commercial data available" in their decision-making. *16 U.S.C. ß 1536(a)(2)*. Monitoring **[*56]** will be increased as described in the remedies order.

I. Congressional Intent

52. The plain intent of Congress in enacting the Endangered Species Act was to halt and reverse the trend toward species' extinction, whatever the cost. *TVA, 437 U.S. at 184*. *Section 7* reveals an explicit Congressional decision "to require agencies to afford first priority to the declared national policy of saving endangered species." *TVA at 185*. As the Court in *TVA* expressly stated:

> One might dispute the applicability of these examples to the Teleco Dam by saying that in this case the burden on the public through the loss of millions of unrecoverable dollars would greatly outweigh the loss of the Snail Darter. But neither the Endangered Species Act nor Article III of the Constitution provides Federal Courts with authority to make such fine utilitarian calculations.

53. On the contrary, the plain language of the Act, buttressed by its legislative history shows clearly that Congress viewed the value of endangered species as "incalculable." Quite obviously, it would be difficult for a court to balance the loss of a sum certain, even $ 100 million, against a Congressionally declared "incalculable" value, even assuming **[*57]** we had the power to engage in such a weighing process, which we emphatically do not." *TVA 437 U.S. at 187-188*. As the Supreme Court requires, it is not for the Court to substitute its judgment for that of Congress or the Executive Branch, the Department of the Interior, and the Bureau of Reclamation. The Court has no such scientific competence nor the legal authority. Once the actions of an administrative agency in operating the CVP and a voluntarily appearing State Agency in operating the SWP, violate the ESA by endangering the species to the point where, as the undisputed evidence shows, it is critically imperiled and in imminent threat of extinction, the Court cannot balance hardships nor does it have any discretion, except to apply the mandate of Congress prescribed by the ESA.

54. It is Congress that struck the balance in favor of affording endangered species the highest of priorities. It is up to the political branches of government, not the court, to solve the dilemma and dislocation created by the required application of the law.

J. NARROWLY TAILORED RELIEF

55. A court may make narrowly tailored orders to an agency to take specific steps, subject to the overriding principal that **[*58]** the substance and manner of achieving ESA compliance is ultimately the responsibility and within the jurisdiction of the administrative agencies, subject to the Court's equitable and interstitial role to fashion a remedy for agencies' dereliction of their statutory duties. *NWF v. NMFS, 481 F.3d at 1243*; *FPC v. Transcontinental Gas Pipeline Corp., 423 U.S. 326, 333, 96 S.Ct. 579, 46 L. Ed. 2d 533 (1976)*.

K. Adequacy of Remedy.

56. Any interim remedial prescriptions must (1) not cause jeopardy, i.e., not take action that reasonably

would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species. *50 C.F.R. ß 402.02*; to the Delta smelt; (2) adversely modify its critical habitat; or (3) irreversibly or irretrievably commit resources during the pendency of the reconsultation on and issuance of the BiOp.

L. PUBLIC HEALTH AND SAFETY EXCEPTION

57. It is recognized that any interim remedial order has the potential to create risk to human health and safety. This requires that a discretionary exception be included in the interim remedial order that authorizes and grants **[*59]** discretion to the Federal and State agencies having responsibility for operation of the Projects, to take such measures, in good faith, as are reasonably necessary and appropriate for protection of human health and safety and the environment in accordance with the requirements of law and equity.

58. This exception includes, but is not limited to, supply for emergency water services, and industrial water service for domestic and emergency use.

59. Plaintiffs have expressly offered and recognize that any reduction in water deliveries should be effectuated in accordance with the operating Agencies' standard practice for allocating water during shortages, which recognizes the priority of critical municipal and industrial (M&I) uses.

60. Critical human health and safety needs will receive priority protection. The Plaintiffs have offered and the Court specifically authorizes the Bureau and DWR to implement operational measures different from those required to protect Delta smelt for the purpose of meeting public health and safety needs. The Bureau and DWR have similar definitions of "public health and safety" for water supply delivery and priority of use, including but not limited to, interior **[*60]** residential use, sanitation, and fire protection.

M. LIMITS ON COURT'S AUTHORITY

61. The Court recognizes its own limitations in approaching the scientific and technical issues presented, some of which are fraught with uncertainty. The Court lacks the expertise and authority to take over operation of the Projects, or to supervise or second-guess the decisions of the biological, and other expert staff of the USFWS and DWR and the hydrologists and engineers of the Bureau of Reclamation. It is appropriate for the Court to defer to the expertise of the Projects' operators and Federal Defendants in highly technical operational issues as they concern protection of human health and safety and the environment. The court's role is limited to see that compliance with the requirements of law is achieved.

N. STATUS REPORT AND DEADLINE

62. FWS shall provide the court and parties with a status report on the progress of the biological opinion. FWS's status report shall be filed April 30, 2008.

63. FWS shall complete its consultation and issue its new biological opinion on or before September 12, 2008.

IV. CONCLUSION

To the extent any finding of Fact may be interpreted as a Conclusion of Law or the converse, **[*61]** it is so intended. Based upon these Findings of Fact and Conclusions of Law, the accompanying Interim Remedial Order shall issue.

IT IS SO ORDERED.

Dated: December 14, 2007

/s/ Oliver W. Wanger

UNITED STATES DISTRICT JUDGE

ATTACHMENT F

LEXSEE

NATURAL RESOURCES DEFENSE COUNCIL, et al., Plaintiffs, v. DIRK KEMPTHORNE, in his official capacity as Secretary of the Interior, et al., Defendants, CALIFORNIA DEPARTMENT OF WATER RESOURCES, Defendant-Intervenor, STATE WATER CONTRACTORS Defendant-Intervenor, SAN LUIS & DELTA-MENDOTA WATER AUTHORITY, et al., Defendant-Intervenors,

1:05-CV-01207 OWW (TAG)

UNITED STATES DISTRICT COURT FOR THE EASTERN DISTRICT OF CALIFORNIA

506 F. Supp. 2d 322; 2007 U.S. Dist. LEXIS 42263

May 25, 2007, Decided

SUBSEQUENT HISTORY: Summary judgment granted, in part, summary judgment denied, in part by, Stay granted by *NRDC v. Kempthorne, 2007 U.S. Dist. LEXIS 50987 (E.D. Cal., June 1, 2007)*

PRIOR HISTORY: *NRDC v. Norton, 2006 U.S. Dist. LEXIS 94689 (E.D. Cal., Dec. 29, 2006)*

COUNSEL: [**1] For Natural Resources Defense Council, California Trout, Baykeeper & Its Deltakeeper Chapter, Friends of the River, The Bay Institute, all nonprofit organizations, Plaintiffs: Andrea Arnold Treece, Deborah S. Reames, Michael Ramsey Sherwood, Earthjustice Legal Defense Fund Incorporated, Oakland, CA; Hamilton Candee, Katherine Scott Poole, Natural Resources Defense Council, San Francisco, CA; Trent William Orr, Law Office of Trent W Orr, San Francisco, CA.

For Gale A. Norton, in her official capacity as Secretary of the Interior, Steven A Williams, Defendants: James A Maysonett, LEAD ATTORNEY, Keith W Rizzardi, LEAD ATTORNEY, U.S. Department of Justice, Wildlife and Marine Resources Section, Washington, DC.

For San Luis & Delta-Mendota Water Authority, Westlands Water District, Intervenor Defendants: Daniel Joseph O'Hanlon, LEAD ATTORNEY, Kornick, Moskovitz, Tiedemann & Girard, Sacramento, CA; Jon David Rubin, LEAD ATTORNEY, Diepenbrock Harrison, Sacramento, CA; Brenda Washington Davis, Christian Charles Scheuring, California Farm Bureau Federation, Sacramento, CA.

For California Farm Bureau Federation, Intervenor Defendant: Brenda Washington Davis, Christian Charles [**2] Scheuring, John Robert Hewitt, California Farm Bureau Federation, Sacramento, CA; Christopher H. Buckley, Jr., Gibson Dunn and Crutcher, Washington, DC.

For State Water Contractors, Intervenor Defendant: Gregory K Wilkinson, Best Best & Krieger, LEAD ATTORNEY, Riverside, CA; Christian Charles Scheuring, California Farm Bureau Federation, Sacramento, CA.

For California Department of Water Resources, Intervenor Defendant: Deborah A. Wordham, LEAD ATTORNEY, California Attorney General's Office, Sacramento, CA; Clifford Thomas Lee, California Attorney General's Office, Department of Justice, San Francisco, CA.

For Glenn-Colusa Irrigation District, Intervenor Defendant: Andrew Morrow Hitchings, LEAD ATTORNEY, Somach, Simmons & Dunn, Sacramento, CA; J. Mark Atlas, LEAD ATTORNEY, Frost Krup and Atlas, Willows, CA; Kevin M. O'Brien, LEAD ATTORNEY, Steven Paul Saxton, LEAD ATTORNEY, Downey Brand LLP, Sacramento, CA; Christian Charles Scheuring, California Farm Bureau Federation, Sacramento, CA.

For Natomas Central Mutual Water Company, Pelger Mutual Water Company, Pleasant Grove-Verona Mutual Water Company, Princeton-Codora-Glenn Irrigation District, Provident Irrigation [**3] District, Reclamation District 108, River Garden Farms, Intervenor Defen-

dants: Andrew Morrow Hitchings, Somach, Simmons & Dunn, Sacramento, CA.

For Kern County Water Agency, Intervenor Defendant: Clifford W. Schulz, Kronick, Moskovitz, Tiedemann & Girard, Sacramento, CA.

JUDGES: Oliver W. Wanger, UNITED STATES DISTRICT JUDGE.

OPINION BY: Oliver W. Wanger

OPINION
[*328]

ORDER GRANTING IN PART AND DENYING IN PART PLAINTIFFS' MOTION FOR SUMMARY JUDGMENT (DOC. 231/232)

I. INTRODUCTION

This case concerns the effect on a threatened species of fish, the Delta smelt *(Hypomesus transpacificus)* [1], of the coordinated operation of the federally-managed Central Valley Project ("CVP") and the State of California's State Water Project ("SWP"), among the world's largest water diversion projects. Both projects divert large volumes of water from the California Bay (Sacramento-San Joaquin) Delta ("Delta") and use the Delta to store water.

1 The Delta smelt was listed as a threatened species under the ESA, March 5, 1992, *58 Fed.Reg. 12863.*

[4]** For over thirty years, the projects have been operated pursuant to a series of cooperation agreements. In addition, the projects are subject to ever-evolving statutory, regulatory, contractual, and judicially-imposed requirements. The Long-Term Central Valley Project and State Water Project Operations Criteria and Plan ("2004 OCAP" or "OCAP") surveys how the projects are currently managed in light of these evolving circumstances. At issue in this case is a 2005 [2] biological opinion ("BiOp"), issued by the United States Fish and Wildlife Service ("FWS" or "Service") pursuant to the Endangered Species Act ("ESA"), which concludes that current project operations described in the OCAP and certain planned future actions will not jeopardize the continued existence of the Delta smelt or adversely modify its critical habitat.

2 The biological opinion was first issued in July 2004. Then, after reconsultation, was reissued in February 2005.

The Delta smelt is a small, slender-bodied fish endemic to the Delta. Historically, **[**5]** Delta smelt could be found throughout the Delta. Although abundance data on the smelt indicates that the population has fluctuated wildly in the past, it is undisputed that, overall, the population has declined significantly in recent years, to its lowest reported volume in fall 2004.

In this case, Plaintiffs, a coalition of environmental and sportfishing organizations, challenge the 2005 BiOp's no jeopardy and no adverse modification findings as arbitrary, capricious, and contrary to law under the Administrative Procedure Act, *5 U.S.C. ßß 702 et seq.* Before the court for decision is Plaintiffs' motion for summary judgment. Among other things, Plaintiffs **[*329]** allege that the BiOp fails to consider the best available science, relies upon uncertain (and allegedly inadequate) adaptive management processes to monitor and mitigate the potential impacts of the OCAP, fails to meaningfully analyze whether the 2004 OCAP will jeopardize the continued existence of the Delta smelt, fails to consider the OCAP's impact upon previously designated critical habitat, and fails to address the impacts of the entire project.

Separate opposition briefs were filed by the Federal Defendants **[**6]** (Doc. 242), the Department of Water Resources ("DWR")(Doc. 246), and the State Water Contractors ("SWC") (Doc. 241), along with a final brief filed collectively by San Luis & Delta-Mendota Water Authority, Westlands Water District, and the California Farm Bureau Federation ("the San Luis Parties")(Doc. 247).

II. THE ENDANGERED SPECIES ACT

A recent Ninth Circuit opinion in *National Wildlife Federation v. National Marine Fisheries Service, 481 F.3d 1224 (9th Cir. 2007)*[hereinafter *"NWF v. NMFS"*], succinctly summarizes the relevant provisions of the ESA:

> The ESA requires federal agencies to "insure that any action authorized, funded, or carried out by such agency ... is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of [designated critical] habitat...." *16 U.S.C. ß 1536(a)(2).* The ESA imposes a procedural consultation duty whenever a federal action may affect an ESA-listed species. *Thomas v. Peterson, 753 F.2d 754, 763 (9th Cir.1985).* To that end, the agency planning the action, usually known as **[**7]** the "action agency," must consult with the consulting agency. This process is known as a "*Section 7*" consultation. The process

is usually initiated by a formal written request by the action agency to the consulting agency. After consultation, investigation, and analysis, the consulting agency then prepares a biological opinion. *See generally Ariz. Cattle Growers' Ass'n v. U.S. Fish & Wildlife Serv., 273 F.3d 1229, 1239 (9th Cir.2001)*. In this case, the action agencies are the U.S. Army Corps of Engineers and the Bureau of Reclamation, while the consulting agency is NMFS.

The consulting agency evaluates the effects of the proposed action on the survival of species and any potential destruction or adverse modification of critical habitat in a biological opinion, *16 U.S.C. ß 1536(b)*, based on "the best scientific and commercial data available," *id. ß 1536(a)(2)*. The biological opinion includes a summary of the information upon which the opinion is based, a discussion of the effects of the action on listed species or critical habitat, and the consulting agency's opinion on "whether the action is likely to jeopardize the continued existence **[**8]** of a listed species or result in the destruction or adverse modification of critical habitat...." *50 C.F.R. ß 402.14(h)(3)*. In making its jeopardy determination, the consulting agency evaluates "the current status of the listed species or critical habitat," the "effects of the action," and "cumulative effects." *Id. ß 402.14(g)(2)-(3)*. "Effects of the action" include both direct and indirect effects of an action "that will be added to the environmental baseline." *Id. ß 402.02*. The environmental baseline includes "the past and present impacts of all Federal, State or private actions and other human activities in the action area" and "the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early *section 7* consultation." **[*330]** *Id.* If the biological opinion concludes that jeopardy is not likely and that there will not be adverse modification of critical habitat, or that there is a "reasonable and prudent alternative[]" to the agency action that avoids jeopardy and adverse modification and that the incidental taking of endangered or threatened species will not violate *section 7(a)(2)*, the consulting agency can issue an **[**9]** "Incidental Take Statement" which, if followed, exempts the action agency from the prohibition on takings found in *Section 9 of the ESA. 16 U.S.C. ß 1536(b)(4); ALCOA v. Administrator, Bonneville Power Admin., 175 F.3d 1156, 1159 (9th Cir.1999)*.

***

The issuance of a biological opinion is considered a final agency action, and therefore subject to judicial review. *Bennett v. Spear, 520 U.S. 154, 178, 117 S. Ct. 1154, 137 L. Ed. 2d 281 (1997); Ariz. Cattle Growers' Ass'n, 273 F.3d at 1235*.

*Id. at *2-*3.*

III. FACTUAL BACKGROUND

For over thirty years the state and federal agencies charged with management of the CVP and SWP have operated the projects in an increasingly coordinated manner pursuant to a Coordinated Operating Agreement ("COA"). The COA, which dates to 1986, has evolved over time to reflect, among other things, changing facilities, delivery requirements, and regulatory restrictions. The most recent document surveying how the COA is implemented in light of these evolving circumstances is the 2004 Operating Criteria and Plan ("2004 OCAP" or "OCAP") issued June 30, 2004. (AR 489-728.) [3]

3 All "AR" references are to the administrative record provided by the U.S. Fish and Wildlife Service..

[10] A. Overview of the 2004 OCAP.**

The OCAP begins with a "Purpose of Document" section which states:

> This document has been prepared to serve as a baseline description of the facilities and operating environment of the Central Valley Project (CVP) and State Water Project (SWP). The Central Valley Project - Operations and Criteria Plan (CVP-OCAP) identifies the many factors influencing the physical and institutional conditions and decision-making process under which the project currently operates. Regulatory and legal instruments are explained, alternative operating models and strategies described.

> The immediate objective is to provide operations information for the Endangered Species Act, *Section 7,* consultation. The long range objective is to integrate CVP-OCAP into the proposed Central Valley document. It is envisioned that CVP-OCAP will be used as a reference by technical specialists and policymakers in and outside the Bureau of Reclamation (Reclamation) in understanding how the CVP is operated. The CVP-OCAP includes numeric and nonnumeric criteria and operating strategies. Emphasis is given to explaining the analyses used to develop typical operating plans **[**11]** for simulated hydrologic conditions.
>
> All divisions of CVP are covered by this document, including the Trinity River Division, Shasta and Sacramento Divisions, American River Division and Friant Division.

(AR 506.) [4]

> 4 Whether the 2004 OCAP is a "final agency action" for the purposes of the National Environmental Policy Act is at issue in a related lawsuit, *Pacific Coast Federation of Fishermen's Associations v. Gutierrez,* 1:06-cv-00245 OWW (TAG) *("PCFFA").* This overview of the OCAP does not prejudge the merits of the pending motion to dismiss in *PCFFA.*

The introductory chapter provides an overview of all of the physical components **[*331]** of the CVP and SWP (AR 507-520), as well as all of the relevant legal authorities affecting CVP operations (508-512).

Chapter 2, explains, among other things, that water needs assessments have been performed for each CVP water contractor, to confirm each contractor's past beneficial use in order to anticipate future demands. (AR 521.) Chapter 2 also reviews **[**12]** the 1986 COA and how it is implemented on a daily basis by Reclamation and DWR. (AR 523-25.) Also provided is a detailed overview of the "changes in [the] operations coordination environment since 1986," which include:

> . Changes due to temperature control operations on the Sacramento River;
>
> . Increases in the minimum release requirements on the Trinity River;
>
> . Implementation of CVPIA 3406(b)(2) and Refuge Water Supply contracts;
>
> . Commitments made by the CVP and SWP pursuant to the Bay-Delta Accord and the subsequent implementation of State Water Resources Control Board ("SWRCB") Decision-1641;
>
> . The Monterey Agreement;
>
> . The Operation of the North Bay Aqueduct (which was not included in the 1986 COA).
>
> . The SWP's commitment to make up for 195,000 acre-feet of pumping lost to the CVP due to SWRCB Decision 1485;
>
> . Implementation of the Environmental Water Account; and
>
> . Constraints imposed by various endangered species act listings, including that of the Sacramento River Winter-Run Chinook Salmon, the Sacramento River Spring- Run Chinook Salmon, the Steelhead Trout, and the Delta Smelt (which resulted in the issuance of biological **[**13]** opinions in 1993, 1994, and 1995 concerning CVP/SWP operations and the South Delta Temporary Barriers Biological Opinion in 2001)

(AR 525-28.) The OCAP also reviews the regulatory standards imposed by SWRCB D-1641, which include water quality standards based on the geographic position of the 2-parts-per-thousand isohale (otherwise known as "X2"), a Delta export restriction standard known as the export/inflow (E/I) ratio, minimum Delta outflow requirements, and Sacramento River and San Joaquin River flow standards. (AR 530-537.) In addition to imposing requirements, D-1641 granted the Bureau and DWR permission to use each project's capabilities in a coordinated manner. (AR 537-38.)

This is not a complete overview of the projects' operations covered in the OCAP. Numerous regulatory and operational changes have taken place in recent years. As the OCAP's "Purpose of Document" section explains, the immediate objective of the OCAP is to lay out all such regulatory and other operational information so that *ESA Section 7* consultation can proceed to evaluate how project operations will effect the Delta smelt under various projected future conditions.

B. Applying the ESA to [14] Project Operations.**

Because endangered and/or threatened species, including the Delta smelt, reside in the area affected by the CVP and SWP, the 2004 OCAP, administered on behalf of the federal government by the Bureau of Reclamation ("Bureau"), must comply with various provisions of the ESA. Specifically, prior to authorizing, funding, or carrying out any action, the acting federal agency (in this case, the Bureau) must first consult with FWS and/or NMFS to "insure that [the] action...is not likely to jeopardize the continued existence of any endangered [*332] species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined...to be critical...." *16 U.S.C. ß 1536(a)(2)* [ESA ß 7(a)(2)]. This form of consultation is called "formal consultation," and concludes with the issuance of a biological opinion. *50 C.F.R. ß 402.02.*

Alternatively, under certain circumstances, a federal agency may pursue "early consultation," on behalf of an agency or private party (referred to as a "prospective applicant") who will require formal approval or authorization to undertake a project. *Id.* Early consultation [**15] may be requested when the prospective applicant "has reason to believe that an endangered species or a threatened species may be present in the area affected by this project and that implementation of such action will likely affect such species." *50 C.F.R. ß 402.11(b).* The result of early consultation is a "preliminary biological opinion," the contents of which are "the same as for a biological opinion issued after formal consultation except that the incidental take statement provided with a preliminary biological opinion does not constitute authority to take listed species." *ß 402.11(e).* Subsequently, the preliminary biological opinion may be "confirmed" after the prospective applicant applies to the federal agency for a permit or licence. Once a request for confirmation is received, the FWS must either confirm that the preliminary biological opinion stands as the final biological opinion or must request that the federal agency initiate formal consultation. *ß 402.11(f).*

In this case, the 2004 OCAP BiOp [5] contemplates increases in water diversions and the construction of new facilities in the Delta. (AR 256-271.) The maximum daily diversion rate in Clifton Court Forebay will [**16] increase from 6,680 cubic feet per second (CFS) to 8,500 CFS (27% increase in pumping) and eventually to 10,300 CFS (54% increase). Permanent barriers within the south Delta will be constructed and operated. An intertie between the California Aqueduct and the Delta-Mendota Canal will be constructed and operated. Water deliveries from the American River will be doubled. New deliveries of CVP water to the Freeport Regional Water Project will be made. Water transfers resulting in an annual 200,000 to 600,000 acre-feet increase in Delta exports will result. (AR 256, 339-40, 357-59, 371, 382-83, 465.)

5 The OCAP itself does not plan for increased pumping or the construction or operation of any new facilities, nor does it describe or model flow regimes under any of these future plans. These planned operational changes are set forth in the BA and the BiOp. (See AR 381-423 (describing the effects of those actions included in formal consultation, including re-operation of the Trinity River, increased demands on the American River, operation of the Freeport Regional Water Project ("FRWP"), and operation of an intertie between the Delta-Mendota Canal and the California Aqueduct); AR 357-61 (describing the "items for early consultation," including operation of components of the South Delta Improvement Project, which calls for pumping at Banks to increase to 8500 cfs, operation of permanent barriers in various places within the Delta, the operation of a long term EWA, the use of CVP/SWP capacity to facilitate expanded water transfers, and further integration of CVP/SWP operations.)

[**17] The Bureau submitted some of these operational changes for formal consultation with FWS concerning their impact on the Delta smelt, while other changes were subject only to early consultation:

> This biological opinion covers formal and early consultation for the operations of the CVP and SWP. The formal consultation effects described in this biological opinion cover the proposed 2020 operations of the CVP including the Trinity River Mainstem ROD (Trinity ROD) flows on the Trinity River, the increased [*333] water demands on the American River, the delivery of CVP water to the proposed Freeport Regional Water Project (FRWP), water transfers, the long term Environmental Water Account (EWA), the operation of the Tracy Fish Facility, and the operation of the SWP-CVP intertie. The effects of operations of the SWP are also included in this opinion and include the operations of the North Bay Aqueduct, the Suisun Marsh Salinity Control Gates, the Skinner Fish Facility and water transfers.
>
> Early consultation effects include the effects of operations of components of the South Delta Improvement Program (SDIP). These operations include pump-

> ing of 8500 cubic feet per second (cfs) at the **[**18]** SWP and Banks Pumping Plant (hereafter referred to as 8500 Banks), permanent barrier operations in the South Delta, the long term EWA, water transfers, and CVP and SWP operational integration. There are two separate effects sections in this biological opinion, one for Formal Consultation and one for Early Consultation. In addition, there is an incidental take for formal consultation and a preliminary incidental take for early consultation.

(AR 2, 248.) [6]

> 6 The first step in the consultation process is usually the preparation of a Biological Assessment ("BA") by the action agency (in this case, the Bureau), the purpose of which is to "evaluate the potential effects of the action on listed [] species and designated [] critical habitat and determine whether any such species or habitat are likely to be adversely affected by the action...." *50 C.F.R. ß 402.12(a)*. In this case, the Bureau issued its BA regarding the "Long-Term Central Valley Project and State Water Project Operations and Criteria Plan" on June 30, 2004. (AR 729.) The BA describes the project on which consultation is being held, both early and formal, in much the same terms as are used in the BiOp.

[19] C. History of This Lawsuit.**

On July 30, 2004, FWS issued a Biological Opinion (the "2004 OCAP BiOp"), addressing both formal and early consultation for the above-described OCAP actions. (AR 1.) [7]

> 7 Prior to 2004, the OCAP operated under Biological Opinions issued in 1993 and 1995.

On August 4, 2004, the Ninth Circuit decided *Gifford Pinchot Task Force v. United States Fish & Wildlife Serv., 378 F.3d 1059, 1069 (9th Cir. 2004)*, which held that the FWS's definition of "adverse modification" to critical habitat is an impermissible interpretation of the ESA because it focuses on whether critical habitat modifications would impact the survival of a species, effectively ignoring the statutorily-mandated goal of "recovery." On November 4, 2004, in response to this ruling, the Bureau requested reinitiation of consultation to address critical habitat issues.

Plaintiffs in this case, a coalition of non-profit conservation organizations, filed suit on February 15, 2005, alleging **[**20]** that the 2004 OCAP BiOp was legally inadequate in light of *Gifford Pinchot* and should be invalidated. (Doc. 1.) Plaintiffs named as defendants the Department of the Interior and the FWS. *(Id.)*

On February 16, 2005, FWS issued an amended BiOp (the "2005 OCAP BiOp," "OCAP BiOp," or "BiOp"), which superceded the 2004 OCAP BiOp. (AR 247.) The 2005 OCAP BiOp concludes that the coordinated operation of the SWP and CVP, including the proposed future actions, will not jeopardize the Delta smelt's continued existence. (AR at 469.) Although the BiOp recognizes that existing protective measures may be inadequate, the FWS concluded that certain proposed protective measures, including the EWA and a proposed "adaptive management" **[*334]** protocol would provide adequate protection. *(Id.)*

Since the filing of this complaint, Federal Defendants have reinitiated *ß 7* consultation and contend this case should be dismissed as moot, or stayed for a voluntary remand of the 2005 BiOp without vacatur.

Plaintiffs filed a supplemental complaint on May 20, 2005, challenging the amended BiOp on various grounds. (Doc. 128 pt. 8.)

D. Delta Smelt Abundance.

Smelt once were one of the **[**21]** most common pelagic [8] fish in the Delta, having previously occupied the waters from "Suisun Bay and Montezuma Slough, upstream to at least Verona on the Sacramento River, and Mossdale on the San Joaquin River." (AR 365.) Smelt abundance has "declined irregularly" for at least the past 20 years. (AR 365-67.) FWS relies primarily upon two indices to monitor Delta smelt abundance, calculated from the. Summer Tow Net Survey ("TNS") and the Fall Midwater Trawl ("FMWT"). (AR 366-67, 1022.) The TNS index, which measures the abundance and distribution of juvenile Delta smelt, constitutes "one of the more representative indices because the data have been collected over a wide geographic area (from San Pablo Bay upstream through most of the Delta) for the longest period of time (since 1959)." (AR 370.) Since 1983, except for three years (1986, 1993, and 1994), the TNS has remained consistently lower than ever previously recorded. *(Id.)*

> 8 Pelagic fish live in open water, generally away from vegetation or the bottom. (AR 365.) A significant amount of the smelt's habitat are the Delta waters and waters of surrounding areas.

[22]** The FMWT index, which measures the abundance and distribution of late juveniles and adult Delta smelt from San Pablo Bay to Rio Vista on the Sacramento River and Stockton on the San Joaquin River, is

the second longest running survey (since 1967). The BiOp reviewed the FMWT trends as follows:

> Although this index has fluctuated widely (AR 9201-02, 9222), it has "declined irregularly over the past 20 years." (AR 370-71.) Since 1983, the FMWT has registered more low indices for more consecutive years than previously recorded. Until recently, except for 1991, this index has declined irregularly over the past 20 years. Since 1983, the delta smelt population has exhibited more low fall midwater trawl abundance indices, for more consecutive years, than previously recorded. The 1994 FMWT index of 101.7 is a continuation of this trend. This occurred despite the high 1994 summer townet index for reasons unknown. The 1995 summer townet was a low index value of 319 but resulted in a high FMWT index of 898.7 reflecting the benefits of large transport and habitat maintenance flows with the Bay-Delta Accord in place and a wet year. The abundance index of 128.3 for 1996 represented the fourth **[**23]** lowest on record. The abundance index of 305.6 for 1997 demonstrated that the relative abundance of delta smelt almost tripled over last years results, and delta smelt abundance continued to rise, peaking in 1999 to an abundance index of 863, only to fall back down to the low abundance indexes of 139 for 2002 and 213 for 2003.

(AR at 371.)

The 2004 FMWT index, which was not discussed in the BiOp, was calculated to be 74, the lowest ever recorded. (AR 9202.) (This omission forms the basis of one of Plaintiffs' challenges to the BiOp.) The survey was apparently released in December 2004, and was specifically cited to FWS in February 2005.

[*335] At the hearing on the summary judgment motions, Federal Defendants in substance argued that despite years of study, the abundance data for the annual Delta smelt population is fraught with uncertainties and "not enough is known about the species" to accurately and finitely measure with certainty the project's effects on Delta smelt. FWS maintains the one to two year life expectancy of the smelt also contribute to this lack of certainty.

E. Relationship Between Abundance and Project Operations.

The BiOp cites several reasons **[**24]** for the smelt's decline. First, since the mid 1800s, mining, agricultural use, and levee construction caused the loss of a large portion of smelt habitat. (AR at 365.) Second, recreational boating in the Delta has resulted in the presence and propagation of "predatory non-native fish" and an increase in the rate of smelt erosion resulting from boat wakes. *(Id.)* Third, reduced water quality "from agricultural runoff, effluent discharge and boat effluent has the potential to harm the pelagic larvae and reduce the availability of the planctonic food source." *(Id.* at 366.) Finally, the BiOp acknowledges that "delta smelt have been increasingly subject to entrainment, upstream or reverse flows of waters in the Delta and San Joaquin River, and constriction of low salinity habitat to deepwater river channels of the interior Delta." *(Id.)* The BiOp acknowledges that these final adverse effects are "primarily a result of the steadily increasing proportion of river flow being diverted from the Delta by the Projects, and occasional droughts." *(Id.* (emphasis added).) The BiOp in no way quantifies the contribution of each of these factors to the smelt's decline. The parties **[**25]** dispute the extent to which project operations jeopardize the smelt.

F. Relationship Between Smelt and "X2."

Smelt are euryhaline (tolerant of a wide range of salinities), but generally occur in water with less than 10-12 parts per thousand (ppt) salinity. (AR at 362.) For a large part of its life span, Delta smelt are thought to be associated with the "freshwater edge of the mixing zone," where the salinity is approximately 2 parts per thousand (often referred to as "X2"). (AR at 366.) The summer TNS index increases dramatically whenever X2 is located between Chipps and Roe islands. (*Id.*) Whenever the location of X2 shifts upstream of the confluence of the Sacramento and San Joaquin, either as a result of water diversions or natural conditions, smelt abundance decreases. *(Id.* at 371.)

G. The Concept of "Salvage."

The BiOp's "no jeopardy" conclusion relies on the concept of "salvage," which refers generally to the process of using mechanical devices to screen fish that would otherwise be entrained in project facilities (e.g., pumps) into holding tanks for transport to other parts of the Delta. *(See e.g.,* AR 321.) Unlike many other fish species **[**26]** in the Delta, Delta smelt do not survive the salvage process, "either due to stress and injury from handling, trucking and release, or from predation in or near the salvage facilities, the release sites, or in Clifton Court Forebay." (AR at 413.) As a result, for Delta smelt, FWS uses the terms salvage and entrainment essentially interchangeably. *(See id.* ("To simplify predictions of the dif-

ference in salvage (and by extension entrainment) between model scenarios....") [9]

> 9 The BiOp contradictorily acknowledges that "although salvage is used to index delta smelt take, it does not reliably index delta smelt entrainment." (AR 419.)

Previous BiOps regarding CVP and SWP operations used salvage to set take limits. For example, the 1995 BiOp's incidental [*336] take statement set take exceedence levels for Delta smelt based on "[m]onthly average delta smelt salvage at the Federal and State Fish Facilities from 1980 to 1992 by water year type." (AR at 11765.) Essentially, take limits were set according to how much [**27] salvage had occurred in the past.

More recently, project managers, fisheries officials, and other experts came to the consensus that the salvage approach was insufficient on its own. For example, one DWR biologist noted that the singular focus on historic salvage had problems:

> Higher levels of take are allowed in below normal years merely because this is what the projects "took" historically. However, the population is more condensed in below normal years and possibly more vulnerable to entrainment.

(AR 5532.) Experts advocated (a) further research into the relationship between the position of the Delta smelt and environmental conditions (AR 4881); and (b) the adoption of a flexible management approach, which would allow new information to be "folded back into the operation and conservation strategies." (AR 4870.) The result was a "layered" approach to managing the smelt, made up of more protective take limits than previously imposed along with the implementation of an adaptive management protocol.

I. Revised Take Exceedence Levels Used In the BiOp.

The BiOp includes "hard" take limits, [10] based on historic "salvage density estimates," adjusted to [**28] account for operational constraints under the 2004 OCAP and presumed increased environmental water flows. Separate take limits were established for formal and early consultation purposes.

> 10 These "hard" take limits, as the Defendants and Defendant Intervenors referred to them during oral argument are different from a separate take trigger that is part of the DSRAM process described below.

The revision of the take limits began with historic catch data from periodic samples of salvaged fish. *(See* AR 413.) Data about the volume of water diverted during the collection period is then used to estimate the fish per volume of water diverted. This is referred to as the "salvage density." [11] *(Id.)* Historically, salvage density varied greatly depending on whether the year was wet (above normal), dry (below normal, dry, or critical) year. Wet and dry year data were analyzed separately. *(Id.)* The estimates were then inputted into a computer modeling system, CALSIM II, to estimate take under varying assumptions [**29] about future project operations, including programs designed to improve environmental conditions, such as the Environmental Water Account. (AR 413-14.)

> 11 DWR insisted during oral argument that the data used to run the CALSIM II models was not "salvage" data but was rather "density data." The BiOp is explicit that the models were run using a "salvage density" estimate generated from periodic samplings of salvaged fish.

Several different scenarios or "Studies" were run through CALSIM II and included in the BiOp. For example, Study No. 1 reflects the 1995 regulatory base case, without any changes in project operations and without the addition of any environmental water programs. Study No. 4a estimates a take level for flow conditions planned under the operations subject to final consultation (changes to flows in the Trinity River, future development levels, and the operation of the Freeport Regional Water Project and the Intertie). Study 4a included flow adjustments required by D-1641 and VAMP, along with projected [**30] CVPIA (b)(2) flows, but did not include operation of the EWA. Study No. 5a was similar to 4a, except that it added projected [*337] EWA flows. Separately, in Study No. 5, CALSIM II simulated flow modifications projected to occur as a result of "those projects subject to early consultation," specifically the increased pumping and permanent barriers called for in the planned South Delta Improvement Project ("SDIP"). (AR 374, 414-19; Sommer Decl. P5.) Each modeling scenario was run separately for various water year types (Wet, Above Normal, Below Normal, Dry, and Critically Dry) and independently estimated take at CVP and SWP facilities.

The BiOp based its conclusions for formal consultation on the results of the Study No. 5a, and for early consultation on the results of Study No. 5. The results of the modeling scenarios for Study No. 5a are set forth in several tables at pages 414 through 419 of the AR. The following table summarizes the changes in estimated take for Study No. 5a, for each type of water year, relative to the 1995 base case. In other words, the positive figures

represent the number of additional smelt that will be taken per month under formal consultation relative to the [**31] 1995 base case (Study No. 1) while negative numbers represent how many fewer smelt will be taken per month relative to the 1995 base case. [12]

12 The information contained in these tables was derived by the court from the BiOp but was not presented in this form in the BiOp.

Table 1:

Summary of Results for CVP Salvage Under Study No. 5a

Month	Wet Year	Above Normal Year	Below Normal Year	Dry Year	Critically Dry Year
Adults					
December	-1	-1	-3	-3	-41
January	-13	-13	-12	-10	-98
February	-33	-36	+63	-60	+9
March	+29	-40	-83	-19	+1
Largely Juveniles					
April	0	0	-16	+5	0
May	0	0	-9017	-14469	-11652
June	0	0	0	-2910	0
July	0	+11	+7	-74	0
Net: December-March	-17	-89	-35	+28	-130
Net: April-July	0	+11	-9025	-17448	-11652

Table 2:

Summary of Results for SWP Salvage Under Study No. 5a

Month	Wet Year	Above Normal Year	Below Normal Year	Dry Year	Critically Dry Year
Adults					
December	-6	-6	-16	-15	-11
January	-76	-87	-82	-87	-104
February	+86	-94	0	0	+51
March	+98	+91	+63	0	+2
Largely Juveniles					
April	-60	-77	-365	-144	0
May	-27188	-25933	-31122	-32083	-7269
June	-1096	-129	-53	1267	0
July	0	+282	+318	+493	+175
Net: December-March	+102	-95	-35	-102	-62
Net: April-July	-28346	-25857	-31213	-33000	-7095

[**32] [*338] For the CVP, CALSIM II predicts significant reductions in smelt salvage during the months of December through July in below normal and dry years, when compared to the regulatory base case. [13] However, under certain scenarios, CVP salvage increases during other months of the year relative to the regulatory base case, because pumping is predicted to increase dur-

ing these months to make up for water released from storage for fish protection purposes. For the SWP, salvage stays relatively level for the months of December through March. However, salvage decreases for the months of April through July relative to the regulatory base case.

13 The tables at pages 414 and 419 of the AR do not list the absolute number of smelt estimated to be taken in any given month under the 1995 regulatory base case (Study No. 1). However, the incidental take limits (set forth in the Table 3 below) were based on the absolute numbers of smelt that are projected to be taken under Study No. 5a. For example, the take limit for the month of May in a Critically Dry year, set at 30,500, under the CALSIM II results in a reduction of the 30,500 to 18,921 (representing 11,652 reduction in CVP salvage plus 7,269 reduction in SWP salvage) lower than the 1995 regulatory base case.

[**33] Based on CALSIM II Study 5a, FWS calculated the amount of "combined salvage" (i.e., for both projects) estimated under the formal consultation scenario, for each month, according to water year type. The BiOp rounded the numbers up to the nearest 100 and used those figures to set incidental take limits by water year type. (AR 471-472.)

Table 3:

Incidental Take Limits by Water Year Type

(For Both CVP and SWP)

*4*Water Year Type	Month	Wet or Above Normal	Below Normal, Dry, or Critical
	October	100	100
	November	100	100
	December	700	400
	January	3000	1900
Monthly Incidental Take	February	2300	1700
	March	1300	1300
	April	1000	1100
	May	37800	30500
	June	45300	31700
	July	3500	2500
	August	100	100
	September	100	100

[*339] Because these incidental take levels are based on predictions produced by CALSIM II Study 5a, they do not assume any smelt protection actions under the DSRAM, but do assume continued availability of the EWA water. (AR 374, 471.)

FWS determined that the level of anticipated take "is not likely to result in jeopardy to the smelt because this level of take [**34] is at or below historical levels of take." (AR 474.)

However, the BiOp also acknowledges that "the operations of the Projects under formal consultation as described in the Project Description will result in adverse effects to delta smelt through entrainment at the CVP and SWP and by drawing delta smelt into poorer quality habitat in the south delta." (AR 422 (emphasis added).) The BiOp concludes that "with the inclusion of [certain] conservation measures described [in the BiOp] and the implementation of the [Delta Smelt Risk Assessment Matrix], these adverse effects would be avoided or minimized." *(Id.* (emphasis added).) "[W]ith these conservation measures in place, the re-operation of the Trinity River, the increased level of development on the American River, the Freeport Diversion, the Suisun Marsh Salinity Control Gates, the Barker Slough Diversion, or due to changes to X2...are not expected to result in adverse effects to delta smelt." (AR 423.)

FWS' conclusions admit project operations will result in adverse effects to delta smelt, which are unquantified, and can only be avoided by conservation measures and implementation of the DSRAM.

H. "Conservation [35] Measures."**

The "conservation measures" contemplated are listed in the Summary of Effects section of the BiOp and include: (1) the Environmental Water Account ("EWA"); (2) Central Valley Project Improvement Act (b)(2) water; (3) State Water Resource Control Board's Water Rights Decision 1641; (4) the Vernalis Adaptive Management Plan ("VAMP"); and (5) the DSRAM adaptive management plan. (AR 466-68.)

1. CVPIA(b)(2) Water.

According to the 1992 Central Valley Project Improvement Act, the CVP must "dedicate and manage annually 800,000 acre-feet of Central Valley Project yield for the primary purpose of implementing the fish, wildlife, and habitat restoration purposes and measures authorized by this title; to assist the State of California in its efforts to protect the waters of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; and to help to meet such obligations as may be legally imposed upon the Central Valley Project under State or Federal law following the date of enactment of this title, including but not limited to additional obligations under the Federal Endangered Species Act." Title XXXXIV of the Reclamation Projects Authorization and Adjustment Act of **[**36]** 1992, Pub. L. 102-575, 106 Stat. 4600, 4706 (1992). (*See* AR 372.)

FWS, in consultation with the Bureau and other agencies, may use this "(b)(2) water" to meet Water Quality Control Plan (WQCP) obligations and any other requirements imposed by law after 1992. "For example, (b)(2) water has been used to maintain flows on Clear Creek to provide adequate spawning and rearing habitat for Chinook salmon. Water exports at the CVP have also been reduced using (b)(2) water to reduce entrainment of salmon or **[*340]** delta smelt at the salvage facilities. This ongoing action provides a benefit to delta smelt in most years." (AR 372.)

The base CVP yield committed to fish restoration is fixed by statute and is mandatory. This fixed supply is subject to reduction up to 25% in critically dry years under CVPIA ß 3406(b)(2)(C).

2. Environmental Water Account.

The Environmental Water Account ("EWA") is "an adaptive management tool that aims to protect both fish and water users as it modifies water project operations in the Bay-Delta." (AR 373.)

> The EWA provides water for the protection and recovery of fish beyond that which would be available through the existing baseline of regulatory **[**37]** protection related to project operations. The EWA buys water from willing sellers or diverts surplus water when safe for fish, then banks, stores, transfers and releases it as needed to protect fish and compensate water users for deferred diversions.

(Id.)

The EWA has been used to benefit smelt by allowing for the curtailment of project export pumping during critical time periods. *(Id.)* The EWA could also be used to increase in-stream flows or increase outflows in the Delta, both of which would benefit the smelt. *(Id.)* The EWA is not fixed by statute nor is annual funding assured, and the water supply it provides, though reasonably anticipated, is not immutable.

3. Water Rights Decision 1641.

State Water Resource Control Board Decision 1641 (D-1641) imposes certain minimum flow and water quality objectives upon the projects:

> D-1641 includes specific outflow- requirements throughout the year, specific export restraints in the spring, and export limits based on a percentage of estuary inflow throughout the year. D-1641 obligates the SWP and CVP to comply with the objectives in the 1995 Bay-Delta Plan. The Service issued a biological opinion on the **[**38]** Bay-Delta plan to the Environmental Protection Agency on November 2, 1994. The water quality objectives in the 1995 Bay-Delta Plan and in D-1641 are designed to protect in-Delta agricultural, municipal and industrial, and fishery uses and vary throughout the year and by water year type.... D-1641 will also protect delta smelt by providing transport, habitat and attraction flows.

(AR 373 (citations omitted).)

The D-1641 requirements are mandatory under the projects' operating permits. The water to satisfy D-1641 comes from 3406(b)(2) yield and supplemental sources the Bureau utilizes.

4. Vernalis Adaptive Management Plan (VAMP).

The Vernalis Adaptive Management Plan (VAMP) is an experimental program that had its origin in D-1641. (AR 373.) It provides for flows on the lower San Joaquin River and export curtailments at the projects. *(Id.)*

VAMP's purpose is to "provide pulse flows on the San Joaquin River and improve habitat conditions in the Delta by reducing exports at the CVP and SWP" over a 31 day period in April and May for the benefit of Chinook salmon and Delta smelt. *(Id.)* Currently, water used to reduce exports at the CVP under VAMP is accounted for **[**39]** as CVPIA (b)(2) water. *(Id.)* If export reductions are taken, the EWA is used to supply contractors to make up for the transfers. VAMP flows "allow larval and juvenile smelt to avoid becoming entrained at the export facilities and to move downstream to Suisun Bay." (*Id.*)

[*341] The VAMP water supply is not irrevocably fixed or assured.

I. Delta Smelt Risk Assessment Matrix (DSRAM).

The BiOp's other, primary protection for the smelt is the implementation of a new adaptive management protocol, known as the Delta Smelt Risk Assessment Matrix ("DSRAM"). The DSRAM utilizes a list of trigger criteria to precipitate responses. (AR at 344.) The criteria are:

(1) the previous year's FMWT index;

(2) the risk of smelt entrainment based upon the location of X2;

(3) the estimated duration of the smelt spawning period, based on water temperature;

(4) the presence of spawning female smelt;

(5) the proximity of the smelt to project pumping facilities; and

(6) a salvage trigger for adult and juvenile smelt.

(AR 346.)

1. The DSRAM Process.

If any trigger criteria is met or exceeded, a Delta Smelt Working Group ("DSWG") is convened. The DSWG consists of representatives **[**40]** from FWS, the California Department of Fish and Game, DWR, the United States Environmental Protection Agency, the Bureau, and the California Bay-Delta Authority. (*See* AR 344-45.) The DSWG then recommends corrective actions to a Water Operations Management Team ("WOMT"). *(Id.)* The OCAP BiOp identifies four specific actions that the DSWG and WOMT must consider taking if one or more trigger criteria occur: (1) export reductions at one or both of the projects; (2) changes in the south Delta barrier operations; (3) changes in San Joaquin River flows; and (4) changes in the operation of the Delta cross channel. [14] The DSRAM does not contain defined action criteria, but instead leaves any response wholly to the discretion of the two groups who administer the DSRAM (DSWG and WOMT).

14 The DSRAM also includes a chart illustrating when during the year each of these actions will be available. (AR 346.)

2. DSRAM Implementation.

The BiOp acknowledges although FWS is "confident that use of the DSRAM will **[**41]** reduce the frequency with which actual salvage exceeds the median predicted salvage, the exceedence frequency could be as high as 50%." (AR 471.) There is no analysis of the duration or consequences from such exceedence. The DSRAM provides no operating criteria or action schedule, specifying when mitigation actions must be taken. It is not possible to predict what, how and when DSRAM measures will be implemented.

J. Recent Experience with DSRAM.

DWR offered post-record evidence regarding the manner in which DSRAM has actually been implemented since its inception. This post-record activity could not have been considered by the agency. A motion to strike the proffered evidence was sustained. The offer of proof includes two "fish actions" that were taken in 2005 in response to "triggers" and a third that was planned but avoided when project water increased in early 2006, a wet year. DWR's offer of proof is to show positive experience in operation of the DSRAM.

K. Recent Procedural History.

The Federal Defendants acknowledge that "[s]hortly before the 2005 OCAP BiOP was completed, a fall midwater trawl survey of delta smelt revealed a substantial **[*342]** decline in **[**42]** the population index for the species" to the lowest ever. (Doc. 242-1, at 4.) The Federal Defendants do not concede that the existence of this data renders the BiOp arbitrary and capricious, because "limited analysis of this data existed, and the Service relied on the raw data, and its own professional judgments as the best available scientific and commercial data available." *(Id.)* Nevertheless, "the CALFED agencies have continued to assemble and analyze new data and information." *(Id.)* For example, scientists from CALFED agencies "recently" developed a document based upon the new data: the Interagency Ecological Program Synthesis of 2005 Work to Evaluate the Pelagic Organism Decline (POD) in the Upper San Francisco Estuary (the "IEP POD Synthesis"). This document led the Federal Defendants to conclude that the OCAP for the CVP and SWP may affect Delta smelt in a manner or to an extent not previously considered. (IEP POD Synthesis, Doc. 240, Attachment 1.)

On July 6, 2006, the Bureau requested that the FWS re-initiate consultation concerning the impact of the

OCAP on the Delta smelt. (Doc. 240.) In a July 6, 2006 letter to the FWS, the Bureau acknowledged that "emerging data [**43] indicates an apparent substantial decline in the Delta smelt population index." (Doc. 240-2.)

1. No Dismissal or Stay.

In light of the second re-initiation of consultation, federal defendants sought dismissal on prudential mootness grounds, a voluntarily remand without vacatur, or a stay pending the completion of reconsultation. *(See* Docs. 242-1, 273.) The motion for stay was joined by the DWR (Doc. 277), and various Defendant-Intervenors (Doc. 274). Plaintiffs opposed because Federal Defendants refused to withdraw the challenged BiOp and stated their intent to continue CVP and SWP operations under the disputed BiOp and its incidental take statements during the time period necessary to complete reconsultation, now projected to be July 2008, more than two and one-half water years following the effective date of the disputed BiOp. (*See* Doc. 279.)

Defendants' motion to dismiss on prudential mootness grounds was denied:

> Plaintiffs' concerns have not been fully addressed by the reinitation of consultation. Federal Defendants are relying in part on the challenged BiOps in operating the CVP and intend to continue to do so. The controversy over whether the [**44] BiOps and OCAP should have continued viability is real and substantial and this court could provide relief, in the form of a decision invalidating the BiOps followed by hearings on interim remedies. Under these circumstances, it is not appropriate to deem this case prudentially moot.

(Doc. 301 at 18 (footnotes omitted).)

The motion for voluntary remand without vacatur was denied based on the general standard for vacatur set forth in *NRDC v. United States DOI, 275 F. Supp. 2d 1136, 1143 (C.D. Cal. 2002)*, which considers "the seriousness of the order's deficiencies" and "the disruptive consequences of an interim change that may itself be changed." No evidence or argument was presented regarding the nature of the prejudice that might result from invalidating the BiOp *(id.* at 20), and numerous factual and legal disputes exist regarding the seriousness of the order's deficiencies *(see id.* at 27). The court was left to speculate what consequences to the species would result if injunctive relief were ordered against continued implementation of the disputed BiOp.

The stay motion, based on the primary jurisdiction doctrine, [**45] was denied on the authority of *Lockyer v. Mirant Corp., 398 F.3d 1098, 1109 (9th Cir. 2005)*(a party [*343] seeking a stay "must make out a clear case of hardship or inequity in being required to go forward, if there is even a fair possibility that the stay for which he prays will work damage to someone else."). The order held: "Plaintiffs are entitled to have their complaint decided on the merits, particularly given the fact that Defendants continue to rely on the challenged BiOps as if they were lawfully enacted." (Doc. 301 at 33.) The apparent increasing jeopardy to the smelt by and after February of 2005 militates against further delay while FWS continue "to study" the issue of jeopardy, an exercise that has continued for almost a decade.

IV. POST-RECORD EVIDENTIARY DISPUTES

A. Objections to Declaration of Ted Sommer.

DWR offers the post-record declaration of Ted Sommer, Ph.D, to explain (1) the concept of salvage and its relationship to the take exceedence levels in the BiOp; (2) the operation of DSRAM; (3) and the manner in which DSRAM has been implemented since its inception.

Generally, "the focal point for judicial review should be the administrative [**46] record already in existence, not some new record made initially in the reviewing court." *Camp v. Pitts, 411 U.S. 138, 142, 93 S. Ct. 1241, 36 L. Ed. 2d 106 (1973).* However, the Ninth Circuit recognizes three main exceptions to this rule, allowing courts to consider extra-record evidence:

> (1) if necessary to determine "whether the agency has considered all relevant factors and has explained its decision," (2) "when the agency has relied on documents not in the record," or (3) "when supplementing the record is necessary to explain technical terms or complex subject matter."

Southwest Ctr. for Biological Diversity v. U.S. Forest Service, 100 F.3d 1443, 1450 (9th Cir. 1996). A court may also consider extra-record evidence "when plaintiffs make a showing of agency bad faith." *Nat'l Audubon Soc. v. U.S. Forest Serv., 46 F.3d 1437, 1447 n.9 (9th Cir. 1993).*

DWR maintains that the Sommer declaration explains "technical or complex subject matters" admissible under the exception for evidence "necessary to explain technical or complex subject matters." (Doc. 246-1 at 5-6 n.5.) Plaintiffs move to strike the declaration on the

ground that subject [**47] matters covered by Mr. Sommer are "neither technical nor complex." (Doc. 305 at 4 n.l.) Rather, Plaintiffs contend that the declaration is offered to explain the agency's post-BiOp experience with DSRAM in an effort to counter the Plaintiffs' argument that the DSRAM is wholly discretionary and contains no defined standards or enforceable requirements.

Generally, "post hoc rationalizations of the agency... cannot serve as a sufficient predicate for agency action." *American Textile Mfrs. Institute, Inc., 452 U.S. 490, 539, 101 S. Ct. 2478, 69 L. Ed. 2d 185 (1981)*; *see also Sierra Club v. Bosworth, 199 F. Supp. 2d 971, 986 (N.D. Cal. 2002)*(refusing to consider post hoc explanations that were "neither addressed nor supported by the record"). DWR does not disagree with this general principle, but instead insists that the declaration is offered only to explain complex and technical aspects of the incidental take exceedence levels and the DSRAM.

Paragraphs 11 through 15 of the Sommer Declaration concern the implementation measures taken under the DSRAM after the BiOp issued. There is no basis in the law for the admission of this post-record evidence. DWR does not assert [**48] otherwise. Plaintiffs' motion to strike is **GRANTED** as to paragraphs 11 through 15.

[*344] The information contained in the remainder of the Sommers declaration is drawn directly from the BiOp itself, explaining in plain language how the incidental take limits were set and how DSRAM operates. Although, much of the same information can be found in the BiOp, the subject matters covered are technical and complex and Dr. Sommer's declaration clarifies or explains them. This exception saves the remaining paragraphs of the Sommers declaration to explain the incidental take limits.

The motion to strike is **DENIED IN PART** as to the past record evidence paragraphs only. [15]

> 15 In a footnote at the end of Plaintiffs' motion to strike the Sommer Declaration, Plaintiffs also challenge Federal Defendants' reliance on the declaration of Ann Lubas-Williams, which Federal Defendants filed with their response to Plaintiffs' motion for summary judgment/cross motion to dismiss. *(See* Doc. 242-4.) The Lubas-Williams declaration concerns the implementation of DSRAM and the sources from which DWR plans to obtain water to protect Delta smelt in the near future. Federal defendants relied on her declaration primarily to support their emotion to dismiss or for voluntary remand. No party has relied (upon this declaration in the context of the pending motions; it was not considered by the court. It is unnecessary to rule on this motion to strike.

[49] B. Federal Defendants' Renewed Objections to Previously Admitted Extra-Record Documents.**

The May 13, 2006 memorandum decision admitted certain extra- record documents, for limited purposes (Doc. 219), including Document 10 (a Powerpoint presentation by Michael Dettinger given to the Bay-Delta Authority on December 8, 2004 entitled "Uncertainties & CALFED Planning What Are Current Observations and Models Saying?") for two purposes. First, "for the limited purpose[] of determining whether []FWS failed to adequately consider the climate change issue and the scientific significance of any such failure....;" but not legal opinions. (Doc. 219 at 25.) Second, to the extent appropriate, all twenty two extra record documents presented by Plaintiffs, including Document 10, may be referenced to aid the court's understanding of various technical concepts under the "technical terms and complex subject matter exception." *(Id.* at 32.)

In the footnote to their opposition brief, Federal Defendants renew their objection to consideration of any of the documents under the technical terms and complex subject matter exception. (Doc. 242-1 at 22 n.12.) The May 13, 2006 memorandum decision [**50] notes: "Defendants and Defendant Intervenors suggest that Plaintiff has failed to establish that the existing record is inadequate to explain the technical terms, but point to no authority requiring such a showing." (Doc. 219 at 30.) Federal Defendants now assert: "numerous courts, including the Supreme Court and district courts in this Ninth Circuit, have held that a record may not be supplemented for explanatory purposes unless the existing record has been demonstrated inadequate." (Doc. 242-1 at 22 n.12.), citing an unpublished district court decision, *City of Santa Clarita v. United States DOI, 2005 U.S. Dist. LEXIS 27350, 2005 WL 2972987 at *2 n.3 (C.D. Cal. 2005)*:

> ...Plaintiffs bear the burden of making an initial showing that the administrative record is inadequate for effective judicial review and that one of the exceptions to record review applies. *Animal Defense Council v. Hodel, 840 F.2d 1432, 1436-38* (affirming district court order limiting review to administrative record and prohibiting discovery because plaintiffs did not show record presented was insufficient for review or [*345] that any of the exceptions to record review were applicable)....

[**51] (emphasis added).

A district court decision not cited by Defendants, *Karuk Tribe of Cal v. U.S. Forest Serv., 379 F. Supp. 2d 1071, 1087 (N.D. Cal. 2005)*, reiterated this holding:

> The Ninth Circuit allows a reviewing court to consider extra-record materials in an APA case only under four narrow exceptions: (1) when it needs to determine whether the agency has considered all relevant factors and has explained its decision; (2) when the agency has relied upon documents or materials not included in the record; (3) when it is necessary to explain technical terms or complex matters; and (4) when a plaintiff makes a showing of agency bad faith. *Southwest Center for Biological Diversity v. United States Forest Service, 100 F.3d 1443, 1450 (9th Cir. 1996)*. For extra-record material to be considered, a plaintiff must first make a showing that the record is inadequate. *Animal Defense Council v. Hodel, 840 F.2d 1432, 1437 (9th Cir.1988)* ("The [plaintiff] makes no showing that the district court needed to go outside the administrative record to determine whether the [agency] ignored information"). At the *1088 same time, "[a] [**52] satisfactory explanation of agency action is essential for adequate judicial review, because the focus of judicial review is not on the wisdom of the agency's decision, but on whether the process employed by the agency to reach its decision took into consideration all the relevant facts." *Asarco, Inc. v. U.S. Environmental Protection Agency, 616 F.2d 1153, 1160 (9th Cir.1980)*.

(emphasis added). [16] *Karuk Tribe, and Animal Defense Council v. Hodel, 840 F.2d 1432, 1437 (9th Cir. 1988)*, on which it relies, do stand for the proposition that, before admitting documents under any exception to the general rule against extra-record evidence, a court should require that a plaintiff make an initial showing that the existing record is insufficient. Here, defendants maintain that those documents plaintiffs have referenced to explain complex or technical matters, are "the cart before the horse," because Plaintiffs [*346] have not shown the existing record is inadequate.

16 Federal Defendants also cite *Pension Benefit Guar. Corp. v. LTV Corp., 496 U.S. 633, 654-655, 110 S. Ct. 2668, 110 L. Ed. 2d 579 (1990)*, in which the Supreme Court reasoned: "Here, unlike in *Overton Park,* the Court of Appeals did not suggest that the administrative record was inadequate to enable the court to fulfill its duties under *ß 706*."

Federal Defendants quote *Pension Benefit* entirely out of context. The quoted language is drawn from a part of the opinion addressing the Second Circuit's ruling about the adequacy of procedures used by the defendant agency. Specifically, that court ruled that the agency acted arbitrarily and capriciously because it failed to apprise the plaintiff of the material on which it was to base its decision, never gave plaintiff an adequate opportunity to offer contrary evidence, failed to proceed according to ascertainable standards, and failed to provide plaintiff a statement showing its reasoning. *Id. at 653*. One party claimed that *Overton Park* validated a court's order that an agency undertakes additional procedures. *Id.* The Supreme Court rejected this argument, reasoning that, at most, *Overton Park*"imposes a general "procedural' requirement of sorts by mandating that an agency take whatever steps it needs to provide an explanation that will enable the court to evaluate the agency's rationale at the time of decision." *Id. at 654*. The Supreme Court then distinguished *Overton Park,* reasoning that "[h]ere, unlike in *Overton Park,* the Court of Appeals did not suggest that the administrative record was inadequate to enable the court to fulfill its duties under *ß 706*." *Id. at 655*. This was a specific reference to language in *Overton Park* which criticized the lower courts for relying only on the litigation affidavits, rather than the whole administrative record. *Pension Benefit* sheds absolutely no light on the admissibility of extra-record evidence.

[**53] First, Federal Defendants objection is arguably untimely. They did not cite cases requiring a preliminary showing of insufficiency when the motion to augment was briefed and heard. Nor did Federal Defendants timely move for reconsideration of the May 13, 2006 ruling on the motion to augment. Striking the challenged documents now, would cause prejudice to Plaintiffs, who relied upon these rulings to prepare their dispositive motions.

Even assuming a timely and specific objection, on the merits, Plaintiffs' extra-record documents were properly admitted. Of these twenty-two documents, Plaintiffs' papers only referenced eight: Docs. 9, 10, 11, 12, 13, 20, 21 & 22. With the exception of Documents 12 and 22, all were admitted on multiple grounds. (Documents 12 and

22 were admitted for the limited purpose of explaining technical materials.) The documents and the bases for their admission are as follows:

Document 9: Summary of Annual Joint Meeting of California Bay-Delta Authority and Bay-Delta Public Advisory Committee (December 8-9, 2004).

Admitted "for the limited purpose of determining whether USFWS failed to adequately consider the EWA/CVPIA(b)(2) issue," "for the limited **[**54]** purposes of determining whether USFWS failed to adequately consider the climate change issue and the scientific significance of any such failure...," and, as appropriate, to explain complex and technical matters.

Document 10: Climate Change Uncertainties & CALFED Planning: What Are Current Observations and Models Saying? Powerpoint presentation by Michael Dettinger, U.S. Geological Survey at the Scripps Institute for Oceanography, et al. to Bay-Delta Authority (December 8, 2004).

Admitted "for the limited purposes of determining whether USFWS failed to adequately consider the climate change issue and the scientific significance of any such failure," and as appropriate, to explain complex and technical matters.

Document 11: Summary of Annual Joint Meeting of California Bay-Delta Authority and Bay-Delta Public Advisory Committee (February 9-10, 2005).

Admitted for the limited purpose of showing that USFWS failed to consider relevant Delta smelt population data and its scientific significance," and, as appropriate, to explain complex and technical matters.

Document 12: Letter from H. Candee and K. Poole, NRDC, to S. Thompson re Consultation on OCAP: Significant **[**55]** New Delta Smelt Information, Service (Feb. 14, 2005).

Admitted only to explain, as appropriate, complex and technical matters.

Document 13: Delta smelt abundance trends, Powerpoint presentation by Chuck Armor, DFG, to Bay-Delta Authority

Admitted for the limited purpose of showing that USFWS failed to consider relevant Delta smelt population data and its scientific significance," and, as appropriate, to explain complex and technical matters.

Document 20: Supplemental Biological Opinion on CVP and SWP Operations, April 1, 2004 through March 31, 2006 (Feb. 27, 2004).

Admitted "for the limited purpose of determining whether USFWS failed to adequately consider the EWA/CVPIA(b)(2) issue," and, as appropriate, **[*347]** to explain complex and technical matters.

Document 21: Future Water Availability in the West: Will there be enough? Powerpoint presentation by M. Dettinger to 24th Annual Conference on Water, Climate and Uncertainty: Implications for Western Water Law, Policy, and Management (June 11-13, 2003).

Admitted "for the limited purposes of determining whether USFWS failed to adequately consider the climate change issue and the scientific significance **[**56]** of any such failure...," and, as appropriate, to explain complex and technical matters.

Document 22: Letter from John W. Keys, Bureau, to Hon. George Miller, House of Representatives re Bureau's renewal of CVP water contracts (Dec. 23, 2004).

Admitted only to explain, as appropriate, complex and technical matters.

With the exception of Documents 12 and 22, Plaintiffs were permitted to reference these documents to show whether FWS adequately considered included subject matter to support the BiOp. Although Plaintiffs did not expressly demonstrate that the record was insufficient, a finding of insufficiency can be implied from the rulings admitting the documents. For example, Document 10, the powerpoint presentation regarding "Climate Change Uncertainties & CALFED Planning" presented to the Bay-Delta Authority on December 8, 2004, references climatological information and issues not otherwise discussed in the administrative record, bearing on whether FWS failed to adequately consider the climate change issue. The same reasoning applies to Documents 9, 10, 11, 13, 20 & 21. As for Documents 12 and 22, were which were only admitted under the complex and technical matters exception, **[**57]** no prior showing of insufficiency was made. However, Documents 12 and 22 were only referenced as secondary citations or for context. Even if, any document was admitted in error, no prejudice has resulted.

V. STANDARD OF REVIEW

Summary judgment is appropriate where there are no genuine issues of material fact and the moving party is entitled to judgment as a matter of law. *Fed. R. Civ. Pro. 56(c)*. This is a challenge to the lawfulness of a biological opinion brought under the ESA and the Administrative Procedure Act ("APA"). Agency decisions made under the ESA are governed by the APA, which requires that the agency action be upheld unless it is found to be "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law," or "without observance of procedure required by law." *5 U.S.C. ß 706(2)(A), (D)*. The inquiry is designed to "ensure that

the agency considered all of the relevant factors and that its decision contained no clear error of judgment." *Pac. Coast Fed'n of Fishermen's Ass'ns v. Nat'l Marine Fisheries Serv., 265 F.3d 1028, 1034 (9th Cir. 2001)*. Agency action should only be overturned if the agency has "relied on factors [**58] which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be ascribed to a difference in view or the product of agency expertise." *Id.* In sum, a court must ask "whether the agency considered the relevant factors and articulated a rational connection between the facts found and the choice made." *Id.* "A biological opinion is arbitrary and capricious and will be set aside when it has failed to articulate a satisfactory explanation for its conclusions or when it has entirely failed to consider an important aspect of the problem." [*348] *Greenpeace v. NMFS, 80 F. Supp. 2d 1137, 1147 (W.D. Wash. 2000)*. Alternatively, a biological opinion may also be invalid if it fails to use the best available scientific information as required by *16 U.S.C. ß 1536(a)(2). Id. at 1150.*

As à general rule, a court must defer to the agency on matters within its expertise. *See National Wildlife Federation v. National Marine Fisheries Service, 422 F.3d 782, 798 (9th Cir. 2005).* [**59] However, "[t]he deference accorded an agency's scientific or technical expertise is not unlimited." *Id.* "Deference is not owed when the agency has completely failed to address some factor consideration of which was essential to [making an] informed decision." *Id.* (internal citations and quotations omitted).

A final BiOp is final agency action for judicial review purposes. *American Rivers, infra, 126 F.3d 1118, 1124-25.*

VI. SUMMARY OF PLAINTIFFS' MOTION

Plaintiffs move for summary judgment on the following grounds:

(1) First, the BiOp did not utilize the Best Available Science by: (a) failing to reference the "most recent Delta Smelt abundance data," namely the 2004 Fall Midwater Trawl Data; and (b) failing to consider the possible effects that climate change might have on the smelt's habitat.

(2) Second, the BiOp unlawfully relies upon the DSRAM as a mitigation measure because the DSRAM process is "entirely discretionary, uncertain, and unenforceable." In addition, Plaintiffs allege that Federal Defendants acted arbitrarily and capriciously by relying upon the EWA, CVPIA(b)(2), and/or VAMP programs as water sources necessary to implement [**60] the DSRAM. Plaintiffs allege that Federal Defendants have (a) failed to demonstrate that EWA, CVPIA and/or VAMP will continue to be available over the 20-year term of the BiOp and (b) failed to demonstrate that DSRAM can reliably operate without water assets from those programs.

(3) Third, there is no rational connection between the evidence in the record and the BiOp's "no jeopardy" conclusion. Specifically, Plaintiffs allege (a) that the BiOp's focus on salvage as the measure of harm to the species underestimates project impacts and results in a meaningless take limit; and (b) that the BiOp fails to explain how its no jeopardy conclusion can be justified in light of the identified adverse effects of the project, along with indirect and cumulative effects.

(4) Fourth, the BiOp failed to adequately analyze whether the OCAP's impacts on the Delta smelt's critical habitat are consistent with the smelt's recovery. In addition, the Federal Defendants failed to adequately take into account smelt habitat areas other than defined by X2.

(5) Finally, the BiOp is unlawfully narrow in its scope because it (a) fails to provide a comprehensive analysis of the effects of constructing facilities [**61] required to carry out long term CVP and SWP operations and (b) fails to analyze the impacts of the projects delivering the full amount of water authorized under CVP and SWP water service contracts.

VII. DISCUSSION

A. Threshold Issues.

1. ESA 60-day notice requirement.

The San Luis Parties argue that Plaintiffs have not complied with the ESA's citizen suit notice requirement, *16 U.S.C. ß 1540(g)(2)(A)(I)*, that written notice be given to "the Secretary, and to any alleged violator" at least sixty days in advance of filing suit. Failure to give this notice is a bar to bringing suit under the ESA. *Southwest Ctr. for Biological Diversity* [*349] *v. U.S. Bureau of Reclamation, 143 F.3d 515, 520 (9th Cir. 1998).*

In *American Rivers v. National Marine Fisheries Serv., 126 F.3d 1118, 1124-25 (9th Cir. 1997)*, the Ninth Circuit held that issuance of a biological opinion is a final agency action that is properly pled as a challenge under the APA, rather than as a citizen suit claim under the ESA. Failure to comply with the 60-day notice requirement does not deprive the court of jurisdiction. *Id.*

The San Luis [**62] Parties advocate an approach that ignores *American Rivers,* [7] taken in an unpublished district court opinion, *Pacific Coast Fed' of Fishermen's Ass'ns v. U.S. Bureau of Reclamation, 2006 U.S. Dist.*

LEXIS 36894, 2006 WL 1469390 at 27 n.8 (N.D. Cal. 2006). Pacific Coast Federation declined to apply *American Rivers'* general rule because the injunctive relief the Plaintiffs sought went beyond simply having the biological opinion invalidated. The *Pacific Coast Federation* Plaintiffs sought to have any new biological opinion first reviewed by the court. This requested relief, fell outside the scope of the APA but was "within the scope of the ESA and thus trigger[ed] the notice period requirement." *Id.* Here, the requested relief is invalidation of the BiOp, a remedy undeniably available under the APA. *American Rivers* controls. There was no need to comply with the ESA 60-day notice requirement. The district court has jurisdiction over APA review of the BiOp.

> 17 At least one district court has followed the holding in *American Rivers. See NRDC v. Rodgers, 381 F. Supp. 2d 1212, 1230 (E.D. Cal. 2005).*

[63] 2. Jurisdiction to Review Challenges to Early Consultation and Preliminary Biological Opinion.**

Defendants contend the case is not ripe for decision. The BiOp covers not only current operations, but also a variety of future actions, some subject to formal consultation, others to early consultation:

> This biological opinion covers formal and early consultation for the operations of the CVP and SWP. The formal consultation effects described in this biological opinion cover the proposed 2020 operations of the CVP including the Trinity River Mainstem ROD (Trinity ROD) flows on the Trinity River, the increased water demands on the American River, the delivery of CVP water to the proposed Freeport Regional Water Project (FRWP), water transfers, the long term Environmental Water Account (EWA), the operation of the Tracy Fish Facility, and the operation of the SWP-CVP intertie. The effects of operations of the SWP are also included in this opinion and include the operations of the North Bay Aqueduct, the Suisun Marsh Salinity Control Gates, the Skinner Fish Facility and water transfers.
>
> Early consultation [issues address] the effects of operations of components of the **[**64]** South Delta Improvement Program (SDIP). These operations include pumping of 8500 cubic feet per second (cfs) at the SWP and Banks Pumping Plant (hereafter referred to as 8500 Banks), permanent barrier operations in the South Delta, the long term EWA, water transfers, and CVP and SWP operational integration. There are two separate effects sections in this biological opinion, one for Formal Consultation and one for Early Consultation. In addition, there is an incidental take for formal consultation and a preliminary incidental take for early consultation.

(AR 2, 248.)

The San Luis Parties object that the early consultation portions of the BiOp are not final agency action and any challenges to the early consultation process are not subject to judicial review. Early consultation, **[*350]** by definition, results in only a "preliminary opinion" and in a preliminary incidental take statement that "does not constitute authority to take listed species." *50 C.F.R. ß 402.11(e).* Upon request for "confirmation" of a preliminary biological opinion, FWS will review the proposed action to determine if there have been "significant changes in the action as planned or in the information used during **[**65]** early consultation." *ß 402.11(f).* Within 45 days of such request, FWS must either confirm the preliminary biological opinion or request formal consultation. *Id.*

Plaintiffs concede that they "are not challenging the validity of FWS's early consultation or its preliminary biological opinion regarding certain segregated components of the 2004 OCAP." (Doc. 306 at 37.) Rather, Plaintiffs argue that the portion of the BiOp covering formal consultation is flawed because it fails to examine the full impacts of all aspects of the 2004 OCAP. (Doc. 306 at 37.) Plaintiffs maintain the formal consultation should have covered certain planned actions included in the early consultation that are interdependent with other planned actions not included in either consultation. This claim is cognizable, as it challenges the scope of the formal consultation and the completeness of evaluation of overall OCAP operations on jeopardy to the smelt, not the lawfulness of the early consultation on future actions.

B. The Biological Opinion Unlawfully Relies Upon Uncertain, Unenforceable Mitigation Measures.

The BiOp concludes that the "operations of the Projects under formal consultation...will **[**66]** result in adverse effects to the delta smelt through entrainment at the CVP and SWP facilities and by drawing delta smelt into poorer quality habitat in the south delta. However with the inclusion of the conservation measures described above and the implementation of the DSRAM,

these adverse effects would be avoided or minimized." (AR 467 (emphasis added).) The "conservation measures" mentioned in the BiOp's conclusion are various regulatory mechanisms already in place to "provide protection to delta smelt and/or their habitats," including D-1641, the EWA, CVPIA (b)(2) water, and VAMP. (AR 421-22, 466-67.)

1. Law Governing Mitigation Measures.

Mitigation measures must be "reasonably specific, certain to occur, and capable of implementation; they must be subject to deadlines or otherwise-enforceable obligations; and most important, they must address the threats to the species in a way that satisfies the jeopardy and adverse modification standards." *Ctr. for Biological Diversity v. Rumsfeld, 198 F. Supp. 2d 1139, 1152.(D. Ariz. 2002)*(citing *Sierra Club v. Marsh, 816 F.2d 1376 (9th Cir. 1987))*; *see also NWF v. NMFS, 481 F.3d 1224 at 1231 & n.16* **[**67]** ("Although the record does reflect a general desire to install structural improvements [to benefit fish] where feasible, it does not show a clear, definite commitment of resources for future improvements.").

Plaintiffs allege that, in depending on the DSRAM and the other "conservation measures" to support its no jeopardy conclusion, the BiOp unlawfully relies upon uncertain, unenforceable mitigation measures which do not constitute a clear, definite commitment of resources. Specifically, Plaintiffs argue: (a) the DSRAM process is "entirely discretionary, uncertain, and unenforceable and (b) the biological opinion unjustifiably assumes that the other, currently operational "conservation measures" (e.g., the EWA and CVPIA(b)(2) water) will continue to be available for use by DSRAM in the future.

[*351] 2. The DSRAM is Unlawfully Uncertain and Unenforceable.

All Defendants argue that the DSRAM is an effective adaptive management program that provides the agency the necessary remedial flexibility that makes the BiOp lawful. The BiOp describes the DSRAM as follows:

> The delta smelt risk assessment matrix (DSRAM) consists of month by month criteria which, when **[**68]** exceeded will trigger a meeting of the Delta Smelt Working Group (Working Group). The purpose of the DSRAM is to take actions to protect delta smelt in a proactive manner prior to salvage events....The DSRAM is an adaptive management tool which may be further modified by the Working Group/WOMT as new information becomes available, without undergoing formal reconsultation....Data will be updated at least weekly to determine the need for a meeting.
>
> Should a triggering criterion be met or exceeded, Reclamation and/or DWR will inform the members of the Working Group and the Working Group will determine the need to meet. Any member of the Working Group may set up a meeting of the Working Group at any time. A meeting of the Working Group may consist of an in-person meeting, a conference call, or a discussion by email. If needed, the Working Group will meet prior to the weekly meetings of the DAT and the WOMT and information will be shared with these groups.
>
> Should a meeting of the Working Group prove necessary, the group will decide whether to recommend a change in exports, change in south delta barrier operations, San Joaquin River flows, or a change in delta cross channel **[**69]** operations, and the extent and duration of the potential action. These potential actions are listed in the DSRAM by the months wherein each of these tools generally become available. The group will recommend actions which will be shared with the DAT and forwarded to the WOMT for discussion and potential implementation. This recommendation will include a discussion of the level of concern for delta smelt and will include who participated in the working group discussions. All dissenting opinions and/or discussion points will also be forwarded to the WOMT. The Working Group will meet at least weekly throughout the period in which the triggering criteria are met or exceeded, to determine the need to provide further recommendations to the WOMT.
>
> Notes and findings of Working Group meeting will be submitted to the Service and members of the WOMT for their records. The WOMT will respond to the Working Group's recommendations and the actions taken by the WOMT will be summarized by Reclamation and/or DWR annually and submitted to all WOMT agencies.

> If an action is taken, the Working Group will follow up on the action to attempt to ascertain its effectiveness. An **[**70]** assessment of effectiveness will be attached to the notes from the Working Group's discussion concerning the action.

(AR 344-45 (emphasis added).)

The trigger criteria, which vary slightly from month to month, are set forth in a table (or matrix) at page 100 of the BiOp. (AR 346.) The criteria include: (1) the previous year's fall midwater trawl recovery index; (2) the risk of smelt entrainment based upon the location of X2; (3) the estimated duration of the smelt spawning period based upon water temperature; (4) the presence of spawning female smelt; (5) the proximity of the smelt to the Project pumping facilities; and, (6) a salvage trigger for adult smelt (calculated as the **[*352]** ratio of adult smelt salvage to the FMWT index) and juvenile smelt (set at zero for May and June, the months of the year during which salvage of smelt is highest). (AR 346-49.)

Plaintiffs argue that the DSRAM is not "reasonably specific, certain to occur, and capable of implementation" because: (1) the DSWG has complete discretion over whether to meet and whether to recommend mitigation measures; (2) even if the DSWG meets and recommends mitigation measures, the WOMT group is free to reject any recommendations; **[**71]** (3) there are no standards to measure the effectiveness of actions taken; (4) reconsultation is not required should mitigation measures prove ineffective; and (5) ultimately, no action is ever required.

DWR responds that implementation of the DSRAM process is "mandatory." For example, the incidental take statement requires that the projects shall be implemented "as described" in the BiOp. (AR 475.) Because the BiOp "describes" operation of the DSRAM, DWR asserts that its implementation is made mandatory by the incidental take statement's command that the project shall be implemented "as described;" if a DSRAM triggering criteria is met, the DSWG " will determine the need to meet." (AR 344 (emphasis added).) If circumstances warrant action, the DSWG will recommend fish protection actions and forward those recommendations to the WOMT. (*Id.*) The BiOp provides that the DSWG " will meet at least weekly throughout the period in which the triggering criteria are met or exceeded, to determine the need to provide further recommendations to the WOMT." (*Id.* at 345 (emphasis added).) The WOMT must then "respond" to DSWG's recommendations. (*Id.*) If actions are taken, **[**72]** the DSWG will monitor the action to determine its effectiveness. (*Id.*)

DWR correctly asserts that the DSRAM process must be followed; this does not address Plaintiffs' argument: that the DSRAM process itself does not require any mitigation actions be taken. Nothing in DSRAM requires the DSWG to make action recommendations, whatever the circumstances, and no criteria prescribe when the WOMT must act to effect DSWG's recommendations.

DWR responds that as adaptive management, "DSRAM is intentionally flexible, taking into consideration the uncertainties surrounding delta smelt population abundance and dynamics...[D]elta smelt abundance has fluctuated widely, without a clear explanation why. While experts can monitor trends in delta smelt populations, estimating overall population abundance presently is 'not possible,' nor are the sources of year-to-year variability in abundance well understood." (Doc. 246-1 at 12.) DWR suggests that "hard-wiring" the DSRAM to require specific actions be taken when triggering criteria occur would impair the DSRAM's flexibility. For example, the trigger for salvage of juvenile smelt is set at zero. This trigger was designed not to **[**73]** precipitate a meeting every time that standard is exceeded, but to cause heightened awareness of conditions that might require protective action. (Doc. 246-1, at 12, citing AR at 8217-18.)

The conflict between Defendants' choice of a flexible management approach and Plaintiffs' concern to ensure enforceable protective actions are taken when necessary, highlights the extent to which overly flexible adaptive management may be incompatible with the requirements of the ESA. Commentators recognize that adaptive management schemes do not fit neatly within the ESA's existing regulatory structure. *See J.B. Ruhl,* Taking Adaptive Management Seriously: A Case Study of the Endangered Species Act, *52 U. Kan. L. Rev. 1249, 1284* **[*353]** *(2004)*("The [ESA] as a whole lacks a cohesive adaptive management architecture...."). H. Doremus, *Adaptive Management, The Endangered Species Act, and the Institutional Challenges of "New Age" Environmental Protection, 41 Washburn. L. J. 50, 52 (2000)*("Adaptive Management...runs counter to human nature and the current structure of our management institutions."); ("One key institutional challenge is to combine the flexibility required **[**74]** by adaptive management with the long-term certainty we often seek through our legal and political institutions.") *41 Washburn L. J. at 55.*

The case law sheds little light on how to harmonize these competing objectives. The parties cite no cases applying the "reasonably specific, certain to occur, and capable of implementation" concept (or any closely related doctrine) to mitigation measures employed under an adaptive management protocol. Most cases the parties

cite are either wholly inapplicable or factually distinguishable.

For example, mitigation measures have been found unlawfully uncertain because their implementation was not within the control of the relevant federal agencies. *Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv., 254 F. Supp. 2d 1196, 1213 (D. Ore. 2003)*, invalidated a 2000 biological opinion addressing the effects of the operation of the Federal Columbia River Power System ("FCRPS") on several listed fish species. A 2000 biological opinion concluded that continued operation of the FCRPS would jeopardize several of the species and adversely modify their critical habitat and adapted mitigation measures to avoid jeopardy. The mitigation measures **[**75]** included a variety of short- and long-term state, regional, tribal, and private off-site mitigation actions. The plaintiffs argued that reliance on such "uncertain and vaguely defined actions of third parties to protect and restore salmon habitat," violated the "reasonably certain to occur" standard. *Id. at 1209*. The district court agreed, concluding that the no jeopardy determination unlawfully relied on "non-federal off-site mitigation actions that are not reasonably certain to occur." *Id. at 1214. See also Sierra Club v. Marsh,. 816 F.2d 1376, 1385 (9th Cir. 1987)*(invalidating biological opinion that relied on mitigation measure involving the transfer of 188 acres of marshland from private ownership to a publicly owned wildlife refuge; land remained under private control and subject to easements that rendered the land valueless for mitigation purposes, and private owners and local government indicated intent to increase use of one of the easements); *Or. Natural Desert Ass'n v. Lohn, 485 F. Supp. 2d 1190, 2007 U.S. Dist. LEXIS 28556, 2007 WL 1170629 (D. Ore. 2007)*(setting aside biological opinion in part because it overly relied **[**76]** on the actions of private individuals who had a poor past record of compliance with standards); *Florida Key Deer v. Brown, 364 F. Supp. 2d 1345, 1355-56 (S.D. Fla. 2005)*(setting aside biological opinion that relied on mitigation measures to be implemented by private landowners; nothing compelled the landowners to act and "the record indicate[d] that some landowners entirely disregarded [prior mitigation measures]").

Here, the BiOp's mitigation measures are largely under the control of the action agency (the Bureau), which, operating in concert with the DWR, directly regulates water pumping and releases from upstream reservoirs. *NRDC v. Rodgers, 381 F. Supp. 2d 1212, 1241 (E.D. Cal. 2004)*, does not provide guidance. In that case, plaintiffs contended a BiOp's mitigation measures were not reasonably certain to occur because the action agency had a poor track record of following through on prior commitments. The acknowledging that the agency's track record was "discouraging" district court recognized that the agency had made some **[*354]** progress toward implementing its prior commitments, *id.*, and declined to find that **[**77]** the new commitments were not certain to occur. *Id.* However, the *Rogers* plaintiffs did not attack the efficacy of the mitigation measures themselves, only the likelihood that the agency would not satisfy its commitment to implement them. Here, Plaintiffs challenge the inherent uncertainty and unenforceability of the DSRAM and the other conservation measures.

Plaintiffs cite *American Rivers v. U.S. Army Corps of Engineers, 271 F. Supp. 2d 230, 252 (D.D.C. 2003)*, where, despite the fact that a prior biological opinion required the Corps to implement flow restrictions to mitigate impacts to listed species, the Corps "made it perfectly clear" to the district court "that it ha[d] no intention of ensuring that its future operations will be consistent" with the mitigation requirements. *Id. at 253*. A motion for preliminary injunction was granted: "Plaintiffs will be likely to prove that the 2003 Supplemental BiOp violated the ESA and APA by improperly and unreasonably relying on future actions by the Corps that are virtually certain not to occur." *Id. at 254* (emphasis added). Here, in contrast, there is no such "smoking gun" **[**78]** evidence of the agency's intent to disregard its mitigation responsibilities, just no definite, certain, or enforceable measures.

Center for Biological Diversity v. Rumsfeld, 198 F. Supp. 2d 1139, 1151-53 (D. Ariz. 2002) addressed a biological opinion that concluded the Army's continued operations at Fort Huachuca, Arizona would not cause jeopardy to listed species that relied on flows from the Upper San Pedro River, even though rapid development in the area and uncontrolled groundwater pumping at the Fort posed threats to the species. The "no jeopardy" finding was premised on several required mitigation measures.

First, the Army had to develop and implement an on-base plan to protect and maintain populations of listed species and habitats; *id. at 1148*, even though the on-base plan was not designed to address the underlying problem of diminishing flows in the San Pedro River, *see id. at 1153*. Second, the Army had to develop a regional water resources plan, sufficient to maintain flows in the San Pedro River to sustain the protected species and their habitats. *Id. at 1148*. The biological opinion acknowledged, that **[**79]** the Army had no authority over the implementation of the regional plan and was only required to participate along with other stakeholders. *Id. at 1153*. Third, the Army had to monitor progress and report on the implementation of the various projects. *Id. at 1149*. Fourth, the biological opinion assumed the operation of a water recharge facility designed to temporarily delay the impact of groundwater overdraft, which the

Rumsfeld court acknowledged was "subject to substantial uncertainty." *Id. at 1145.*

Leaving it to the Army and other interested parties to develop a regional water management plan "enables the Army to sidestep any direct responsibility for addressing deficit groundwater pumping," and was "an admission that what is currently on the table as far as mitigation measures is inadequate to support the [] 'no jeopardy' decision." *198 F. Supp. 2d at 1153-54.* [18]

> 18 *Rumsfeld* also found fault with the biological opinion's monitoring plan, characterizing it as a means of delaying the implementation of necessary mitigation measures:
>
> > The Army may not delay identifying the measures necessary to mitigate the effects of its ten-year plan based on the monitoring provisions in the Final BO....
> >
> > The Final BO's monitoring requirements do not measure the success or failure of the on-base and/or regional mitigation measures to reduce the groundwater deficit. It only requires the Army to develop "a monitoring program designed to assess progress," and requires an annual review of the AWRMP, as to which projects have been implemented the past year and which are to be implemented in the coming year. Especially since the Final BO and the AWRMP fail to quantify the remedial value of the proposed projects, simply reporting project implementation is not a meaningful assessment of the success or failure of the mitigation measures in protecting the water umbel, willow flycatcher, and critical habitat from adverse impact. Such an assessment would require systematic monitoring of either San Pedro baseflows or the groundwater aquifer.
>
> *198 F. Supp. 2d at 1154* (internal record citations omitted). No such failure is alleged here. Plaintiffs do not suggest that the monitoring called for by the DSRAM is flawed.

[80]** **[*355]** DWR distinguishes *Rumsfeld*, claiming it is like *Nat'l Wildlife Fed'n v. Nat'l Marine Fisheries Serv., 254 F. Supp. 2d 1196*, where mitigation measures were unlawful because they depended upon third parties without any guarantee that those parties would implement the measures. Here, the DSRAM does not depend on actions by outsiders. *Rumsfeld* further found that the Army's on-base mitigation measures were insufficient because they did not require any measurable goals or an implementation schedule:

> There are no requirements in the Final BO to reduce reliance on groundwater pumping by any particular amount or to achieve any measurable goals with respect to water recharge. There is no date certain implementation requirement. The MOA includes a laundry list of possible mitigation measures related to water conservation and recharge that the Army may implement, but it does not establish which projects have to be undertaken, when, nor what the conservation objectives are for the respective projects. Without such specificity, the mitigation measures in the Final BO are merely suggestions.

Id. at 1153 (emphasis added). *Rumsfeld* stands for the proposition that, at a minimum, a mitigation **[**81]** strategy must have some form of measurable goals, action measures, and a certain implementation schedule; i.e., that mitigation measures must incorporate some definite and certain requirements that ensure needed mitigation measures will be implemented.

Here, the agency's BiOp admits that mitigation measures are essential. The no jeopardy finding is conditioned on conservation measures and the DSRAM. (*See* AR 422.)

DWR's protestations that hard-wiring the DSRAM would cripple its effectiveness ignore the ESA's requirements of reasonable certainty, timetables, and enforceability standards for mitigation measures. The existing DSRAM process provides absolutely no certainty that any needed smelt protection actions will be taken at any time by DSWG or WOMT. The DSRAM is in substance an organizational flow chart that prescribes that certain administrative processes (meetings) will be held whenever a trigger criteria is met or exceeded. Although mitigation measures are identified, no defined mitigation goals are required, nor is any time for implementation prescribed. Incorporating some ascertainable mitigation standards and enforceable mitigation measures is not

[**82] inconsistent with avoiding unduly restrictive "hard-wiring" of the DSRAM.

National Wildlife Federation v. Babbitt, 128 F. Supp. 2d 1274 (E.D. Cal. 2000) ("*NWF v. Babbitt*"), addresses an adaptive management approach that accommodated uncertainty by allowing regulators to apply new information gathered through monitoring to adjust and employ well-defined mitigation measures. There, a Habitat Conservation Plan ("HCP") called for a development fee to be collected on all acreage developed in the Natomas Basin, north of Sacramento, home to a number of endangered species. The HCP also incorporated adaptive management provisions designed [*356] to allow the mitigation fee to be modified if new information justified an adjustment:

> The [HCP] recognizes that the current state of knowledge as to the conservation needs of protected species is imperfect, and that its assumptions as to the amount, location, and pace of development in the Basin and as to the adequacy of the mitigation fee to accommodate increased expenses may prove inaccurate. The Plan addresses these uncertainties through its "adaptive management" provisions, which permit the Plan's conservation strategy [**83] to be adjusted based on new information. The HCP's conservation program can be modified under the adaptive management provisions if: (1) new information results from ongoing research on the GGS or other covered species; (2) recovery strategies under Fish and Wildlife Service recovery plans for the GGS or the Swainson's hawk differ from the measures contemplated by the HCP; (3) certain of the HCP's mitigation measures are shown through monitoring to require modification; or (4) the HCP's required minimum block sizes for reserve lands are shown to require revision. The Plan anticipates that the NBC will make discretionary decisions in future years based upon new information. The NBC will decide, for example, which lands to purchase, depending on a variety of future considerations difficult now to predict, and whether to change the mix of in and out of Basin reserve lands and agricultural as opposed to marsh reserve lands.

Id. at 1281-82. [19]

19 In *NWF v. Babbit*, the district court expressly approved the design of the HCP as a whole, but invalidated the permit issued in connection with the plan on grounds wholly independent from the design of the HCP and/or the adaptive management plan. *See 128 F. Supp. 2d at 1298-99.*

[**84] Here, the adaptive management process has no quantified objectives or required mitigation measures. Although the process must be implemented by holding meetings and making recommendations, nothing requires that any actions ever be taken. [20] The BiOp asks the court to trust the agency to protect the species and its habitat. Notwithstanding any required deference to expertise, the ESA requires more.

20 The only clearly enforceable standard or benchmark in the BiOp is compliance with the BiOp's "hard" take exceedence limits. But, the existence of enforceable take limits does not shield the DSRAM from scrutiny. There is no provision to allow the "hard" take exceedence limits to be adjusted to reflect new information about the species. Moreover, the BiOp expressly recognizes that the take limits alone are not enough to prevent jeopardy, requiring, among other things, implementation of the DSRAM as a reasonable and prudent measure. (*See* AR 475 ("The Project shall be implemented as described.") This is exactly the reason why the DSRAM must be made more certain and enforceable.

[**85] All parties agree that adaptive management can be beneficial and that flexibility is a necessary incident of adaptive management. The law requires that a balance be struck between the dual needs of flexibility and certainty. The DSRAM, as currently structured, does not provide the required reasonable certainty to assure appropriate and necessary mitigation measures will be implemented. The DSRAM does not provide reasonable assurance admitted adverse impacts of the 2004 OCAP will be mitigated. This aspect of the BiOp is arbitrary and capricious and contrary to law. Plaintiffs' motion for summary adjudication as to this claim is **GRANTED**. The agency has not provided a reasonable explanation showing the DSRAM will satisfy ESA requirements to [*357] assure survival and recovery of the Delta smelt.

The Ninth Circuit's *recent NWF v. NMFS* decision suggests that mitigation measures that are not reasonably certain to occur should be excluded from the agency's no jeopardy analysis. *See 481 F.3d 1224 at 1231 n.16.* [21] Because mitigation is insufficiently certain to occur under the DSRAM, the DSRAM cannot cure other shortcomings of the BiOp.

21 As of the date of oral argument, the mandate has not yet issued in *NWF v. NMFS*.

[86] 3. Plaintiffs' Alternative Argument that the BiOp is Arbitrary and Capricious Because DSRAM Depends Upon EWA, VAMP, CVPIA(b)(2) Water, Programs that are Uncertain in Terms of Funding and Effectiveness.**

Plaintiffs maintain that the DSRAM cannot feasibly be implemented without adequate water assets from the EWA, CVPIA(b)(2), and VAMP programs. Plaintiffs allege that Defendants have not demonstrated that adequate assets from these programs will be available during the 20 year term of the BiOp. (See Doc. 306 at 17.)

Plaintiffs correctly observe that the BiOp does not assure that adequate water assets from these programs will be available for future use under DSRAM. The BiOp itself acknowledges that "[a]lthough VAMP and [EWA] have helped to ameliorate these threats, it is unclear how effective these will continue to be over time based on available funding and future demands for water." (AR 367-68.) The BiOp recognizes that the "EWA Agencies envision implementation of a long-term EWA as part of the operation of the Project." (AR 335.) However, the BiOp cannot and does not commit to implement the EWA in the long run. (*Id.*)

The record reveals that the loss of EWA assets **[**87]** will "reduce the ability of the EWA agencies to provide [] fish protections...." (SAR 20.) Plaintiffs refer to statements made by FWS's D. Harlow during an annual joint meeting of CALFED and the Bay-Delta Public Advisory Committee, that a proposal to change CVPIA(b)(2) policy would "change fish protection envisioned in the Record of Decision (ROD)." (Doc. 9 at 4.) At the same time, Mr. Harlow also noted that this would "not necessarily diminish fish protection." (*Id.*) However, he opined that such a change would "necessitate an increase in the size of the EWA." (*Id.*) National Oceanic and Atmospheric Administration ("NOAA") staff questioned FWS's reliance on the EWA in the BiOp, noting that EWA assets would likely be used up for protective actions during the winter, before the peak months for Delta smelt salvage (May and June). (AR 8574.)

Plaintiffs' claim rests in part on the assumption that the EWA, CVPIA(b)(2), and VAMP programs are the only mechanisms by which DSRAM may be implemented. The record does not support this assumption. Under the BiOp, the DSWG is tasked to make recommendations regarding fish protection actions by selecting from a list of "tools for change, **[**88]** " which include: (1) "export reduction[s] at one or both facilities"; (2) "change[s] in barrier operations"; (3) "change[s] in San Joaquin River flows"; and (4) "change[s] [in the] position of cross channel gates." (AR 346 and 348 n.7.) No mention is made of the EWA, CVPIA(b)(2), or VAMP in the DSRAM or its description of the "tools for change." DWR rejoins that, regardless of whether these programs are fully funded and/or remain functional mechanisms to provide water to the Delta, "the burden **[*358]** ....falls on the Projects, not the smelt." (Doc. 246 at 10.)

The EWA is simply a means by which the SWP and CVP can obtain water by purchasing it from willing sellers. (AR 373.) EWA water may be used either to protect fish or to compensate project water users for reduced exports at the project pumps. (*Id.*) If money is unavailable to fund the EWA, Defendants are nonetheless required to prevent smelt take from exceeding permissible take limits.

The BiOp sets forth a three-tier process to supply water to protect the smelt:

> . Tier 1 (Regulatory Baseline). Tier 1 is baseline water and consists of currently existing BOs, water right decisions and orders, CVPIA Section 3406(b)(2) **[**89]** water, and other regulatory actions affecting operations of the CVP and SWP. Also included in Tier 1 are other environmental statutory requirements such as Level 2 refuge water supplies.
>
> . Tier 2 (EWA). Tier 2 is the EWA and provides fish protection actions supplemental to the baseline level of protection (Tier 1). Tier 2 consists of EWA assets, which combined with the benefits of CALFED's ERP, will allow water to be provided for fish actions when needed without reducing deliveries to water users. EWA assets will include purchased (fixed) assets, operational (variable) assets, and other water management tools and agreements to provide for specified level of fish protection. Fixed assets are those water supplies that are purchased by the EWA Agencies. These purchased quantities are approximations and subject to some variability. Operational assets are those water supplies made available through CVP and SWP operational flexibility. Some examples include the flexing of the export-to-inflow ratio standard required [] for meeting Delta water quality and flows, and ERP water resulting from upstream releases pumped at the SWP Banks Pumping Plant. Water management tools provide the **[**90]** ability to convey, store, and manage water that has been secured through other means. Exam-

> ples include dedicated pumping capacity, borrowing, banking, and entering into exchange agreements with water contractors. Chapter 8 of this BA contains a more detailed description of EWA operations, as characterized in the CALSIM II modeling for the CVP OCAP.
>
> . Tier 3 (Additional Assets). In the event the EWA Agencies deem Tiers 1 and 2 levels of protection insufficient to protect at-risk fish species in accordance with the Act, Tier 3 would be initiated. Tier 3 sets in motion a process based upon the commitment and ability of the EWA Agencies to make additional water available, should it be needed. This Tier may consist of additional purchased or operational assets, funding to secure additional assets if needed, or project water if funding or assets are unavailable. It is unlikely that protection beyond those described in Tiers 1 and 2 will be needed to meet requirements of the Act.

(*Id.* at 336-37.) DWR emphasizes that, if all else fails, Tier 3 assets may be brought to bear, which include "additional purchased or operational assets, funding to secure additional assets **[**91]** if needed, or project water if funding or assets are unavailable." (*Id.* (emphasis added).)

There is a difference between the DSRAM's failure to require mitigation actions in response to trigger events, designed to assure the commitment of necessary resources to smelt protection, and the duty to have available or acquire those necessary resources. A court must leave to the agency the application of its expertise and authority to manage the complex hydrologic, legal, financial, physical, and **[*359]** logistical aspects of protecting the delta smelt. Plaintiffs motion for summary adjudication is **DENIED** as to the issue of the insufficiency of the EWA, VAMP, and CVPIA(b)(2) programs.

C. Best Available Science.

The *ß 7* formal consultation process is designed to "insure" that any agency action "is not likely to jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat of such species which is determined...to be critical...." *16 U.S.C. ß 1536(a)(2).* "In fulfilling the requirements of this paragraph each agency shall use the best scientific and commercial **[**92]** data available." *Id.*

An agency has wide discretion to determine what is "the best scientific and commercial data available." *San Luis v. Badgley, 136 F. Supp. 2d 1136, 1151 (E.D. Cal. 2000).* Yet, an agency must make its decision about jeopardy based on the best science available at the time of the decision, and may not defer that jeopardy analysis by promising future studies to assess whether jeopardy is occurring. *Rumsfeld, 198 F. Supp. 2d at 1156.* While uncertainty is not necessarily fatal to an agency decision, *e.g., Greenpeace Action v. Franklin, 14 F.3d 1324, 1337 (9th Cir. 1992)*(" *Greenpeace I*")(upholding agency decision even though there was uncertainty about the effectiveness of management measures because agency premised its decision on a reasonable evaluation of all available data), an agency may not entirely fail to develop appropriate projections where data "was available but [was] simply not analyzed," *Greenpeace v. NMFS, 80 F. Supp. 2d 1137, 1149-50 (W.D. Wash. 2000)* (" *Greenpeace II*")(where agency totally failed to develop any projections regarding population viability, it could not use **[**93]** as an excuse the fact that relevant data had not been analyzed). Here, EWS maintains the necessary data cannot be obtained.

1. Does a "Benefit of the Doubt to the Species" Presumption Apply?

The parties debate at length whether the best available scientific information principle includes a requirement that the agency "give the benefit of the doubt to the species." This language has its origins in the legislative history of the ESA, H.R. Conf. Rep. No. 96-697, 96th Cong., 1st Sess. 12, reprinted in 1979 U.S.C.C.A.N. 2572, 2576:

> *Section 7(b)* of the act requires the fish and wildlife service and the national marine fisheries service to render biological opinions which advise whether or not proposed agency actions would violate *section 7(a)(2).* Courts have given substantial weight to these biological opinions as evidence of an agency's compliance with *section 7(a).* The amendment would not alter this state of the law or lessen in any way an agency's obligation under *section 7(a)(2).*
>
> As currently written, however, the law could be interpreted to force the fish and wildlife service and the national marine fisheries service to issue negative biological opinions whenever **[**94]** the action agency cannot guarantee with certainty that the agency action will not jeopardize the continued existence of the

> listed species or adversely modify its critical habitat. The amendment will permit the wildlife agencies to frame their *section 7(b)* opinions on the best evidence that is available or can be developed during consultation. If the biological opinion is rendered on the basis of inadequate information then the federal agency has a continuing obligation to make a reasonable effort to develop that information.
>
> **[*360]** This language continues to give the benefit of the doubt to the species, and it would continue to place the burden on the action agency to demonstrate to the consulting agency that its action will not violate *section 7(a)(2)*. Furthermore, the language will not absolve federal agencies from the responsibility of cooperating with the wildlife agencies in developing adequate information upon which to base a biological opinion. If a federal agency proceeds with the action in the face of inadequate knowledge or information, the agency does so with the risk that it has not satisfied the standard of *section 7(a)(2)* and that new information might reveal that **[**95]** the agency has not satisfied the standard of *section 7(a)(2)*.

(emphasis added).

In *Conner v. Burford, 848 F.2d 1441, 1454 (9th Cir. 1988)*, the Ninth Circuit applied this "benefit of the doubt" language to hold that FWS violated the ESA by "failing to use the best information available to prepare comprehensive biological opinions considering all stages of the agency action...." At dispute in *Conner* was a biological opinion reviewing the proposed sale of oil and gas leases on National Forest land. The biological opinion analyzed the impact of the "initial lease phase," but failed to address the potential impact of post leasing activities, such as oil and gas development. FWS reasoned that there was "insufficient information available to render a comprehensive biological opinion beyond the initial lease phase," relying instead on "incremental-step consultation." *Id. at 1452*. The Ninth Circuit recognized that "the precise location and extent of future oil and gas activities were unknown at the time," but, "extensive information about the behavior and habitat of the species in the areas covered by the leases was available." *Id. at 1453*. **[**96]** With this information, "FWS could have determined whether post-leasing activities in particular areas were fundamentally incompatible with the continued existence of the species." *Id. at 1454*.

> In light of the ESA requirement that the agencies use the best scientific and commercial data available to insure that protected species are not jeopardized, *16 U.S.C. ß 1536(a)(2)*, the FWS cannot ignore available biological information or fail to develop projections of oil and gas activities which may indicate potential conflicts between development and the preservation of protected species. We hold that the FWS violated the ESA by failing to use the best information available to prepare comprehensive biological opinions considering all stages of the agency action, and thus failing to adequately assess whether the agency action was likely to jeopardize the continued existence of any threatened or endangered species, as required by *section 7(a)(2)*. To hold otherwise would eviscerate Congress' intent to "give the benefit of the doubt to the species."

Id. (emphasis added). *Conner* does not directly support the broader interpretation **[**97]** urged by Plaintiffs, that the agency should err on the side of the species when evaluating uncertain evidence. *Conner* stands for the proposition that an agency cannot abdicate its responsibility to evaluate the impacts of an action on a species by labeling available information "uncertain," because doing so violates Congress' intent that the agencies "give the benefit of the doubt to the species."

Center for Biological Diversity v. Lohn, 296 F. Supp. 2d 1223, 1239 (W.D. Wash. 2003)(rev'd on other grounds,*483 F.3d 984, 2007 WL 1217738 (9th Cir.)*), applied the *Conner* holding in conformity with Plaintiffs' interpretation. *Lohn* addressed the listing under the ESA of a population of orca whales. Despite considerable record evidence suggesting the Orca whales should be considered a **[*361]** separate species, the Orca population had not yet been identified as a separate taxon. NMFS decided not to list the species based on the scientific uncertainty that existed in the field of taxonomy, relying on the fact that the new taxon had not yet been designated. The district court ruled this decision was arbitrary and capricious:

> Give**[**98]** the considerable morphological, behavioral, and genetic evidence that the global Orcinus orca taxon is inaccurate and that residents and tran-

> sients do not belong to the same taxon, the decision not to list the Southern Residents cannot be based upon a lack of consensus in the field of taxonomy regarding the precise, formal taxonomic redefinition of killer whales, particularly when that lack of agreement is compounded by the extreme difficulty in gathering evidence to achieve consensus. The best available science standard gives "the benefit of the doubt to the species." *Conner v. Burford, 848 F.2d 1441, 1454 (9th Cir.1988)* (observing one of the purposes of the best available science standard in review of whether agency action may result in destruction or adverse modification of listed species' habitat pursuant to *16 U.S.C. ß 1536(a)(2)*). To deny listing of a species simply because one scientific field has not caught up with the knowledge in other fields does not give the benefit of the doubt to the species and fails to meet the best available science requirement.

Id. at 1239 (emphasis added). [22]

22 Plaintiffs cite another district court decision that applied the benefit of the doubt language: "To the extent that there is any uncertainty as to what constitutes the best scientific information, Congress intended for the agency to 'give the benefit of the doubt to the species.'" *Ctr. for Biological Diversity v. Bureau of Land Mgmt., 422 F. Supp. 2d 1115, 1127 (N.D. Cal. 2006)*(citing *Conner, 848 F.2d at 1454*). However, that district court did not apply the "benefit of the doubt" concept, in its analysis in any way, let alone as a presumption governing the agency's analysis of scientific information.

Another case Plaintiffs cite, *Rock Creek Alliance v. U.S. Fish & Wildlife Service, 390 F. Supp. 2d 993, 1003 (D. Mont. 2005)*, does not support imposing a "benefit of the doubt" presumption to uncertain scientific evidence:

> Though the agency has discretion to make decisions based in its expertise, the ESA expresses a legislative mandate "to require agencies to afford first priority to the declared national policy of saving endangered species.... Congress has spoken in the plainest of words, making it abundantly clear that the balance has been struck in favor of affording endangered species the highest of priorities, thereby adopting a policy which it described as 'institutionalized caution.'"

Id. (quoting *Tennessee Valley Authority v. Hill, 437 U.S. 153, 185, 98 S. Ct. 2279, 57 L. Ed. 2d 117 (1978)*) However, as in *Center for Biological Diversity*, this language was part of a general discussion of the legal framework; the *Rock Creek* court never applied a benefit of the doubt presumption in the manner Plaintiffs suggest it should be applied here.

[99]** In response, Defendant Intervenors cite *Oceana, Inc. v. Evans, 384 F. Supp. 2d 203 (D.D.C. 2003)*, a challenge to NMFS's choice between two estimates of how much take a particular type of fishing gear would cause. The agency chose the lower estimate, reasoning that it was the "best estimate possible." The plaintiff argued that this estimate failed to give the "benefit of the doubt" to the species. *Id. at 228*. Although the lower estimate was uncertain, the district court reasoned that "the ESA does not require the agency to reject the 'best estimate possible' in favor of a more 'conservative' estimate that, according to the scientists, would be lacking in support." *Id.*

Lohn and *Oceana* appear irreconcilable, but, they can be harmonized. *Lohn* rejected an agency's decision to follow the taxonomy in the face of significant and compelling scientific evidence favoring a different **[*362]** conclusion. To side with the agency under such circumstances would "not give the benefit of the doubt to the species...." *Id. at 1239*. In contrast, *Oceana*, concerned an agency's choice of the "best estimate possible" over a more "conservative" estimate that **[**100]** lacked scientific support. The *Oceana* court refused to ignore the general rule that an agency must choose the best available science, simply because the ESA commands that the agency give the "benefit of the doubt" to the species. Both cases stand for the proposition that the agency must carefully examine the available scientific data and models and rationally choose the most reliable.

2. The BiOp's Failure to Address the 2004 Fall Midwater Trawl Data.

Plaintiffs assert that "one of the most egregious errors in the [BiOp] is its failure to consider available fall 2004 Delta smelt abundance data, which evoked grave concern among agencies involved in smelt management." [23] (Doc. 232 at 5.) On February 9, 2005, FWS and other CALFED members met to discuss Delta smelt abun-

dance. Among other things, participants discussed data from the 2004 fall midwater trawl ("FMWT") survey, which revealed that "estimates of Delta smelt appear to be their lowest since 1964." (Doc. 11 at 5; AR 9199-9200, 9202; Doc. 12.) The February 16, 2005, BiOp, contained no mention of the 2004 FMWT data.

> 23 Defendants and Defendant-Intervenors dispute whether the data "evoked grave concern." The degree of concern is irrelevant to the inquiry, as it is undisputed that the 2004 FMWT data showed the lowest smelt abundance on record.

[101]** Plaintiffs assert that FWS acted arbitrarily, capriciously and unlawfully by "ignoring" the 2004 FMWT data and relying instead on the more favorable abundance data from earlier abundance surveys. (AR 366-67 (noting that the 2003 FMWT results were more favorable than those from 2002, while simultaneously acknowledging that the 2003 summer townet index (1.6) was "well below the pre-decline average of 20.4 in (1959).").) Despite the receipt of the new, even less favorable 2004 FMWT data, FWS made no substantive changes to its jeopardy analysis in the biological opinion and did not use or address the new data in any way, not even to explain why the data was not discussed. At oral argument, the agency maintained that ESA analysis cannot go on forever, that there must be a cutoff.

Plaintiffs note that the low population numbers revealed by the FMWT data were "not unexpected," as smelt abundance had been on a downward trend for at least two years prior. (AR 370-71; 9199-9200, 9202.) One prominent smelt biologist warned at a June 2003 OCAP symposium that managers should expect very low smelt abundance data in the near future and that water exports were a key factor in the population decline, **[**102]** noting that the "cumulative proportion of the population lost to exports relative to abundance" could be as high as 30 percent. (AR 5069.)

Federal Defendants suggest that Plaintiffs' entire argument should be rejected as internally inconsistent. (Doc. 242 at 26-27.) Plaintiffs contend that FWS should have revised the BiOp in light of the 2004 FMWT data and that additional evidence of a downward trend was "not unexpected." These contentions are consistent with the central premise of Plaintiffs' position -- that the 2004 FMWT data reflected a record low abundance (the data showed "estimates of Delta smelt appear to be at their lowest since 1964" (Doc. 11 at 5)); so low that the data should have been addressed in the BiOp, even if the agency already knew that smelt abundance was trending downward.

[*363] The State Water Contractors suggest that Plaintiffs' acknowledgment that the downward trend was "not unexpected," establishes that the BiOp fully recognizes the dire situation of the smelt. (Doc. 241 at 4.) The BiOp reflects that FWS had knowledge that smelt population levels were at extremely low levels, "[s]ince 1983, the delta smelt population has exhibited more low FMWT abundance **[**103]** indices, for more consecutive years, than previously recorded." (AR 367.)

> The results of seven surveys conducted by the Interagency Ecological Program (IEP) corroborate the dramatic decline in delta smelt....According to seven abundance indices designed to record trends in the status of the delta smelt, this species was consistently at low population levels during the last ten years (Stevens et al. 1990). These same indices also show a pronounced decline from historical levels of abundance (Stevens et al. 1990).

(AR at 370.) The State Water Contractors' argument ignores that the 2004 FMWT data evidences record low (the lowest) smelt abundance. Plaintiffs maintain that FWS' acknowledgment of a downward trend is inadequate as it does not address or analyze in survival and recovery terms, that smelt abundance levels had reached the lowest ever recorded.

The State Water Contractors argue that, although the BiOp admits the fact of the smelt's declining population, it does not and cannot explain the cause of the decline, because there is no scientific consensus as to causation. (Doc. 241 at 5.) "Contributing to [this] uncertainty," "is the fact that SWP and **[**104]** CVP operations have been ongoing for decades - a period during which Delta smelt abundance has increased as well as declined." (*Id.* at 6.) The State Water Contractors assert that the DSRAM was adopted in part to protect the smelt while further monitoring and research is carried out to resolve these uncertainties. They conclude that even if the 2004 FMWT data had been addressed in the BiOp, the ultimate opinion reached would not have differed; i.e., that operation of the projects under the 2004 OCAP BiOp would not jeopardize the smelt because, among other things, take will remain at or below historic levels and the DSRAM will protect smelt from salvage at project facilities. [24] But, this is post hoc argument; neither the agency or the biological opinion addressed the 2004 FMWT data and available scientific information opined that Project operations contributed to the decline of the smelt.

> 24 The State Water Contractors maintain that CVP/SWP operations have been on-going for

decades, during which time Delta smelt abundance has fluctuated greatly.

[105]** The cases the parties cite do not answer whether FWS did not have to analyze most recent data because it would not have altered the ultimate conclusion. Some cases suggest that FWS must use all available information to ensure that a biological opinion analyzes the threats to a species in a comprehensive manner. Plaintiffs refer to *Greenpeace II, 80 F. Supp. 2d at 1149-50*, for the proposition that failure to analyze and incorporate available data is fatal to a biological opinion. In that case, NMFS concluded in a biological opinion that the total groundfish catch authorized in the Bering Sea and Gulf of Alaska in a single fishing season (1999) would not jeopardize the endangered Stellar sea lion. NMFS limited the scope of the biological opinion to that single year of fisheries management activities. The district court ruled that the agency should have broadened the scope of the biological opinion to consider the overall fishery management regime, including relevant regulations and specifications. *Id. at 1146-47.* This failure to produce a comprehensive biological opinion **[*364]** permeated all other aspects of the agency's decision. The district court found **[**106]** fault with the BiOp's superficial analysis, emphasizing the agency's failure to address the overall effects of the fisheries upon the sea lion:

> As far as the Court can ascertain, the focus of BiOp2 is limited to analyzing whether the fisheries compete with the sea lion for prey. In particular, BiOp2 focuses on the potential for localized depletions of prey caused by the fisheries. BiOp2 at 90, 112. Even with respect to this limited topic of discussion, meaningful analysis is virtually non-existent. NMFS itself repeatedly concludes in BiOp2 that it simply lacks the information to make any determination one way or the other. See BiOp2 at 111-118. Thus, NMFS's analysis is admittedly incomplete and its conclusions inconclusive. Although inconclusive data does not necessarily render a particular scientific conclusion invalid, the limited scope and quality of analysis that is contained in BiOp2 serves to highlight its overall inadequacy. For example, NMFS relies substantially on its conclusion that many of the target groundfish species are not important sea lion prey, despite uncertain evidence. BiOp2 at 114. That many of the target species may not individually constitute a **[**107]** major prey source, however, does not mean the cumulative impact of these fisheries is insignificant. In other words, limited analysis which suggests the fisheries do not jeopardize the sea lion does not obviate the requirement that NMFS address the full scope of the FMPs in order to ascertain their overall effects.
>
> In sum, BiOp2 is limited in scope, heavy on general background information, and deficient in focused and meaningful discussion and analysis of how these large fisheries, and the complex management measures which regulate them, affect endangered Steller sea lions. That NMFS now finds it necessary to undertake yet another "comprehensive consultation" is a final indication to this Court that BiOp2 is not the broad and in-depth consultation it was purported to be by NMFS, much less coextensive in scope with the FMPs as required under the ESA.
>
> A biological opinion which is not coextensive in scope with the identified agency action necessarily fails to consider important aspects of the problem and is, therefore, arbitrary and capricious. Here, BiOp2 not only fails to consider important aspects of the problem, the analysis it does contain is simply not adequate. **[**108]** Although an agency need not rely on conclusive scientific proof in a biological opinion, its conclusions must be based on "the best scientific and commercial data available." *16 U.S.C. ß 1536(a)(2)*. Thus, an agency " cannot ignore available biological information or fail to develop protections" which may indicate potential conflicts between the proposed action and the preservation of endangered species. *Conner, 848 F.2d at 1454.*

Id. at 1149-50 (emphasis added).

In *Greenpeace II*, NMFS admitted that the information it needed to perform a more comprehensive review was available, but argued that it "could not have been analyzed in the time allowed." *Id. at 1150.* The district court rejected this argument:

> A federal agency...is not "excused from [fulfilling the dictates of the ESA] if, in its judgment, there is insufficient information available to complete a comprehensive opinion and it takes upon itself [a more

> limited analysis]." *Conner, 848 F.2d at 1455*. This is not a situation where NMFS fully addressed the problem based on uncertain scientific data. *See Greenpeace Action v. Franklin, 14 F.3d 1324, 1337 (9th Cir. 1992)*. **[*365]** **[**109]** Rather, NMFS entirely ignored relevant factors and admittedly failed to analyze and develop projections based on information that was available.

Id. at 1150 (emphasis added); *see also Conner, 848 F.2d at 1454* (biological opinion invalidated because agency failed to "use best information available to prepare comprehensive biological opinions considering all stages of agency action").

Plaintiffs analogize this case to *Greenpeace II*, because the agency has ignored available biological information. Here, Plaintiffs complain that FWS failed to incorporate into existing models and analyses that already reflected concern over an overall declining trend in smelt, the most recent survey information, evidencing a more pronounced decline in smelt populations than ever before recorded. In *Greenpeace II*, the agency entirely failed to perform a comprehensive review of threats to the sea lion. The difference in degree is not significant.

Federal Defendants cite *Oceana, 384 F. Supp. 2d 203*, where NMFS concluded that an amendment to the Atlantic Sea Scallop Fishery Management Plan would not jeopardize the protected loggerhead sea **[**110]** turtle, based on a population model that involved a degree of uncertainty, but that the agency determined was the "most reliable method." *Id. at 215*. The *Oceana* plaintiffs did not dispute that the model represented the "best available science," instead arguing that the model was "so ill-suited to the purpose for which it was used, and so fraught with uncertainties," that the agency could not rationally reach its no jeopardy conclusion. *Id. at 218*. The district court upheld the agency's use of the model, reasoning "[t]ime and again courts have upheld agency action based on the 'best available' science, recognizing that some degree of speculation and uncertainty is inherent in agency decisionmaking, even in the precautionary context of the ESA." *Id. at 219*. Though the ESA should not be implemented "haphazardly, on the basis of speculation, *id. at 219*, the model "bears a rational relationship to the reality it purports to represent" and no other alternative model was available, *id. at 221*.

The circumstances here are not analogous to those in *Oceana,* where the plaintiffs admitted that the **[**111]** challenged model was the best, albeit uncertain, available science. Here, Plaintiffs maintain the agency's failure to analyze the most recent smelt population information prevented consideration of the best available, consequential scientific information.

Federal Defendants also rely on *Greenpeace I, 14 F.3d at 1337*, an earlier challenge to a Stellar sea lion biological opinion. The *Greenpeace I* plaintiffs argued that the agency acted arbitrarily and capriciously by approving certain fishery management measures despite uncertainty about the effects of the measures on the sea lion. The Ninth Circuit concluded that the presence of some uncertainty did not violate the best available science requirement in part because that BiOp analyzed all the available data:

> We hold that the Service has fulfilled its substantive duties as well. Despite Greenpeace's assertions to the contrary, the Service supported its conclusions with ample data and analysis. The June biological opinion indicates that the Service, the Alaska Fisheries Science Center, and the National Marine Mammal Laboratory " analyzed all the available data on the Pollock fishery and Steller sea **[**112]** lions" in the Gulf of Alaska. The Service also sought the recommendations of the Steller Sea Lion Recovery Team. The opinion demonstrates that the Service evaluated the spatial and temporal distribution of commercial fishing across the Gulf of Alaska. It **[*366]** then addressed not only the total biomass of pollock in the Gulf and the effects of fishery removals on that biomass, but also the spatial and temporal distribution of pollock across the Gulf. And despite Greenpeace's claims to the contrary, the Service did not ignore hydroacoustic surveys of pollock biomass, but considered and compared them to bottom trawl surveys. Finally, while the Service has repeatedly conceded that it was uncertain about the effectiveness of its management measures, it premised these measures on a reasonable evaluation of available data, not on pure speculation.
>
> The biological opinions indicate that the Service, an expert agency, consulted with other teams of experts to consider all relevant factors pertaining to the effects of the Gulf fishery on the Steller sea lion. And they indicate that the Service did not ignore data, as Greenpeace suggests. The Service's decision to go ahead with the 1991 fishery **[**113]** under the proposed

> restrictions, despite some uncertainty about the effects of commercial pollock fishing on the Steller sea lion, was not a clear error of judgment.

(Emphasis added.) *Id. at 1337.* Here, unlike *Greenpeace I,* FWS failed to analyze all of the available data on the Delta smelt, as the 2004 FMWT data is not mentioned in the BiOp. Nor has FWS resolved uncertainties about the identified causes of the serious decline in Delta smelt abundance by adopting unenforceable management measures.

"Although a decision of less than ideal clarity may be upheld if the agency's path may reasonably be discerned, [a court] cannot infer an agency's reasoning from mere silence. Rather, an agency's action must be upheld, if at all, on the basis articulated by the agency itself." *Pacific Coast Fed'n of Fishermen's Ass'ns v. United States Bureau of Reclamation, 426 F.3d 1082, 1091 (9th Cir. 2005)*(internal citations and quotations omitted). "[W]hen reviewing a biological opinion, [a court may] rely only 'on what the agency actually said'..." *Id.* (quoting *Gifford Pinchot Task Force, 378 F.3d at 1072 & n. 9*). Had FWS examined **[**114]** the FMWT 2004 data in the BiOp, the weight it gave to that data would have been entitled to deference. The agency's silence cannot be afforded deference.

a. The timing of the 2004 FMWT Data relative to the issuance of the BiOp.

Federal Defendants complain the timing of the release of the 2004 FMWT data did not leave enough time to address the data before issuance of the biological opinion. The record shows at, the very latest, the 2004 FMWT data was presented to FWS and other CALFED members on February 9, 2005, less than a week before the February 16, 2005, issuance of the biological opinion. Federal Defendants assert they were not required to rewrite the BiOp at the "eleventh hour." (Doc. 242 at 27).

Although the record shows the 2004 FMWT data was presented at the February 9, 2005 CALFED meeting, it is unclear when FWS first saw this data. Plaintiffs' claim that the data was available in December 2004, is not supported. [25] However, even assuming FWS was not aware of the 2004 FMWT data until February 9, 2005, the agency was not operating under a deadline. As in *Greenpeace II,* where the agency's statutory duty was not excused because the data could not be **[*367]** "analyzed **[**115]** in the time allowed," *80 F. Supp. 2d at 1150,* here, FWS could have delayed releasing the biological opinion until it had reviewed and analyzed the new abundance data, which was especially significant as it showed Delta smelt abundance at its nadir.

> 25 Plaintiffs' record citations, AR 9199--9202, are print-outs of the FMWT data which post date the issuance of the BiOp.

Defendants and Defendant-Intervenors rejoin that the failure of the BiOp to directly address the 2004 FMWT is harmless, because one of the DSRAM's trigger criteria is an index based upon the previous years' FMWT results, calling for any new abundance data to be incorporated into the adaptive management process. However, even if the data were considered later in the DSRAM process, no designated protective actions are required to be taken in response to any of the triggering criteria. [26]

> 26 Abundance data is relevant to aspects of the BiOp that are independent of the DSRAM process. For example, the agency's conclusion that the level of anticipated take "is not likely to result in jeopardy to the smelt because this level of take is at or below historical levels of take" (AR 474), is irrational because no consideration is given to the current decline in smelt abundance nor any explanation provided how the further decline of the smelt does not exacerbate jeopardy to the species' survival and recovery.

[116]** Federal Defendants raise a legitimate concern about having to prolong completion of the BiOp on the eve of its release. In theory, new scientific information could arrive on FWS's doorstep on a daily basis. If FWS was required to consider and address every new piece of information it received prior to publication of its decision, it would be effectively impossible for the agency to complete a biological opinion. But, this is not such a case. The FMWT is a credible and reliable Delta smelt population abundance survey, regularly compiled on an annual basis, and relied upon by the agency in the past. There is no rational reason to ignore such important data. The BiOp places great weight on the FMWT as "the second longest running survey." (AR 366, 370). The agency does not suggest the time of receipt of the 2004 FMWT data was unexpected. The agency's failure to acknowledge and analyze the record low abundance levels revealed by the 2004 FMWT is unreasonable and violated its duty to use the best available scientific information. *16 U.S.C. ß 1536(a)(2).*

Plaintiffs' motion for summary adjudication is **GRANTED** as to this claim.

3. Global Climate Change [117] Evidence.**

Plaintiffs next argue that the BiOp ignored data about Global Climate Change that will adversely affect the Delta smelt and its habitat. (Doc. 232 at 7.) This is potentially significant because the BiOp's conclusions

are based in part on the assumption that the hydrology of the water bodies affected by the OCAP will follow historical patterns for the next 20 years. (AR 375 (explaining that CALSIM II modeling involved making "adjustments to historic water supplies...by imposing future level land use on historical meteorological and hydrologic conditions").)

In a July 28, 2004 comment letter, Plaintiff NRDC directed FWS's attention to several studies on the potential effects of climate change on water supply reliability, urging that the issue be considered in the BiOp. (AR 8552-56.) The comment letter stated:

> The best scientific data available today establishes that global climate change is occurring and will affect western hydrology. At least half a dozen models predict warming in the western United States of several degrees Celsius over the next 100 years (Redmond, 2003). Such sophisticated regional climate models must be considered as part of the **[*368]** FWS' consideration **[**118]** of the best available scientific data.
>
> Unfortunately, the Biological Assessment provided by the Bureau to FWS entirely ignores global climate change and existing climate change models. Instead, the BA projects future project impacts in explicit reliance on seventy-two years of historical records. In effect, the Biological Assessment assumes that neither climate nor hydrology will change. This assumption is not supportable.
>
> In California, a significant percentage of annual precipitation falls as snow in the high Sierra Nevada mountains. Snowpack acts as a form of water storage by melting to release water later in the spring and early summer months (Minton, 2001). The effects of global climate change are expected to have a profound effect on this dynamic. Among other things, more precipitation will occur as rain rather than snow, less water will be released slowly from snowpack "storage" during spring and summer months, and flooding is expected to increase (Wilkinson, 2002; Dettinger, 2003). These developments will make it more difficult to fill the large reservoirs in most years, reducing reservoir yields and will magnify the effect of CVP operations on downstream **[**119]** fishes (Roos, 2001). These developments will also dramatically increase the cost of surface storage relative to other water supply options, such as conservation.
>
> While the precise magnitude of these changes remains uncertain, judgments about the likely range of impacts can and have been made. *See e.g.*, U.S. Global Climate Action Report - 2002; Third National Communication of the United States Under the United Nations Framework Convention on Climate Change at 82, 101 (2002). [FN3]. The Service can and must evaluate how that range of likely impacts would affect CVP operations and impacts, including the Bureau's ability to provide water to contractors while complying with environmental standards. We therefore request that the Service review and consider the work cited above, as well as the background and Dettinger presentation at a recent climate change conference held in Sacramento, June 9-11, 2004 [citation omitted] and climate change reports [citation omitted].

(AR at 8554-55 (emphasis added).)

A second presentation by Michael Dettinger at a December 8-9, 2004 CALFED meeting, attended by FWS staff, concluded that "warming is already underway..."; that this **[**120]** would result in earlier flows, more floods, and drier summers; and that "California water supplies/ecosystems are likely to experience [] changes earliest and most intensely." (Doc. 10 at 18.) Following Dettinger's presentation, members of CALFED noted "the need to reevaluate water storage policies and ERP [Ecosystem Recovery Program] recovery strategies, all of which would be affected by projected climate changes." (Doc. 9 at 3.) The record reflects that extreme water temperatures can have dramatic impacts upon smelt abundance. (AR 8979-80.)

In addition to the specific studies and data cited by NRDC, FWS scientists recognized the issue of climate change warranted further consideration. At a June 2003 symposium entitled "Framing the issues for Environmental and Ecological Effects of Proposed Changes in Water Operations: Science Symposium on the State of Knowledge," a number of questions regarding climate change were raised, including: "How does the proposed operations plan account for the potential effects of climate change (e.g., El Nino or La Nina, long term changes in precipitation and runoff patters, or increases in water temperature)?" (AR at 4839.)

[*369] Plaintiffs argue that, [**121] despite this evidence that climate change could seriously impact the smelt by changing Delta hydrology and temperature, the BiOp "did not so much as mention the probable effects of climate change on the delta smelt, its habitat, or the magnitude of impacts that could be expected from the 2004 OCAP operations, much less analyze those effects." (Doc. 232 at 8.) Defendants and Defendant-Intervenors respond by arguing (1) that the evidence before FWS at the time the BiOp was issued was inconclusive about the impacts of climate change; and (2) that, far from ignoring climate change, the issue is built into the BiOp's analysis through the use of X2 as a proxy for the location and distribution of Delta smelt.

a. *Inconclusive Nature of Available Information Regarding the Impacts of Global Climate Change on Precipitation.*

Federal Defendants and the State Water Contractors characterize Mr. Dettinger's presentation, as reflecting "a great deal of uncertainty that climate change will impact future precipitation." The presentation is entitled "Climate Change Uncertainties and CALFED Planning." (Doc. 10 at 1.) Dettinger acknowledges that, although current climate models "yield consistent [**122] warming scenarios for California" (*id.* at 6), there is no similar consensus regarding the impact of warming on future precipitation (*id.* at 7). Federal Defendants suggest that FWS "responsibly refused to engage in sheer guesswork, and properly declined to speculate as to how global warming might affect delta smelt." (Doc. 242 at 23.) But, the NRDC letter cited a number of studies in addition to Mr. Dettinger's presentations, all of which predict that anticipated climate change will adversely impact future water availability in the Western United States.

At the very least, these studies suggest that climate change will be an "important aspect of the problem" meriting analysis in the BiOp. *Pacific Coast Fed'n, 265 F.3d at 1034.* However, as with the 2004 FMWT data, the climate change issue was not meaningfully discussed in the biological opinion, making it impossible to determine whether the information was rationally discounted because of its inconclusive nature, or arbitrarily ignored. [27]

27 Plaintiffs argue that "[r]egardless of the uncertainty involved in predicting the consequences of climate change, FWS had an obligation under the ESA to address the probable effects on Delta smelt." (Doc. 232 at 7.) In response, the State Water Contractors quote the following passage from *Bennett v. Spear, 520 U.S. 154, 176-177, 117 S. Ct. 1154, 137 L. Ed. 2d 281 (1997)*, in support of the proposition that the ESA intended to preclude exactly this kind of argument:

> The obvious purpose of theer quirement that each agency "use the best scientific and commercial data available" is to ensure that the ESA not be implemented haphazardly, on the basis of speculation or surmise. While this no doubt serves to advance the ESA's overall goal of species preservation, we think it readily apparent that another objective (if not indeed the primary one) is to avoid needless economic dislocation produced by agency officials zealously but unintelligently pursuing their environmental objectives.

But, this passage from *Bennett* was part of a broader discussion holding that persons who are economically burdened by a decision made under the ESA fall within the zone of interests the statute protects for the purposes of standing. *Bennett* sheds little light on the current inquiry -- whether and to what extent the data that was before the FWS regarding climate change should have been considered and addressed in the BiOp.

[**123] **b. *X2 as a Proxy for Climate Change.***

The State Water Contractors argue that the approaches taken in the DSRAM are "more than adequate to deal with the projected impacts of climate change - assuming [*370] they occur." (Doc. 241 at 8.) For example, Plaintiffs' suggestion that climate change will produce earlier flows, more floods, and drier summers is addressed by the DSRAM's X2 trigger. Flow level changes will be reflected in the position of X2. If climate change alters water temperatures, DSRAM also includes a temperature trigger, that monitors the temperature range within which successful. Delta smelt spawning occurs.

The DSRAM offers no assurance that any mitigating fish protection actions will be implemented if the X2 criteria is triggered. That X2 indirectly monitors climate change does not assuage Plaintiffs' concerns that the BiOp has not adequately analyzed the potential impact of climate change on the smelt.

The BiOp does not gauge the potential effect of various climate change scenarios on Delta hydrology. Assuming, *arguendo*, a lawful adaptive management approach, there is no discussion when and how climate

change impacts will be addressed, whether existing [**124] take limits will remain, and the probable impacts on CVP-SWP operations.

FWS acted arbitrarily and capriciously by failing to address the issue of climate change in the BiOp. This absence of any discussion in the BiOp of how to deal with any climate change is a failure to analyze a potentially "important aspect of the problem." [28]

28 There is no basis to determine what weight FWS should ultimately give the climate change issue in its analysis.

Plaintiffs' motion for summary adjudication is **GRANTED** as to this claim.

D. There is No Rational Connection Between the No Jeopardy Finding and the Status of the Species.

Plaintiffs next allege that there is no rational connection between the record evidence and the BiOp's "no jeopardy" conclusion. Plaintiffs first argue that the BiOp's approach to setting take limits is arbitrary and capricious because FWS failed to consider defined take limits in the context of current smelt abundance. Plaintiffs complain that the BiOp does not explain how [**125] its no jeopardy conclusion can be justified in light of the admitted adverse effects of the project, along with indirect and cumulative effects on the species.

In a formal consultation, the ESA requires FWS to "[f]ormulate its biological opinion as to whether the action, taken together with cumulative effects, is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of critical habitat." *50 C.F.R. ß 402.14*; *see also 16 U.S.C. ß 1536(a)(2)*. The phrase "jeopardize the continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." *50 C.F.R. ß 402.02*.

Agency action may be overturned if the agency has "relied on factors which Congress has not intended it to consider, entirely failed to consider an important aspect of the problem, offered an explanation for its decision that runs counter to the evidence before the agency, or is so implausible that it could not be [**126] ascribed to a difference in view or the product of agency expertise." *Pacific Coast Fed'n, 265 F.3d at 1034*. A court must ask "whether the agency considered the relevant factors and articulated a rational connection between the facts found and the choice made." *Id.* The agency must "examine [*371] the relevant data and articulate a satisfactory explanation for its action including a rational connection between the facts found and the choice made." *Motor Vehicle Mfrs. Ass'n v. State Farm Mutual Ins., 463 U.S. 29, 43, 103 S. Ct. 2856, 77 L. Ed. 2d 443 (1983)*.

1. Plaintiffs' Argument that Salvage Underestimates Project Impacts on the Smelt.

Plaintiffs assert that the BiOp's reliance on salvage is arbitrary and capricious because salvage is not a reliable basis for setting Project take limits. Plaintiffs cite record evidence, including statements made by smelt biologists and FWS employees, that salvage does not accurately estimate incidental take of young Delta smelt. (*See* AR 8403, 7578.) The BiOp admits that salvages does not fully account for all smelt losses. (AR 419 ("It should be noted that although salvage is used to index delta smelt take, it does not [**127] reliably index delta smelt entrainment. Furthermore, delta smelt salvage is highly variable at all time scales....).") Plaintiffs have not shown that a better measure of smelt take could have been generated from available data. The agency is entitled to rely on this approach as it appears to be the "best estimate possible," no party has suggested an alternative. *See Oceana, 384 F. Supp. 2d at 228*.

This objection standing alone is insufficient to justify summary adjudication.

2. The BiOp's Approach to Estimating Future Take Without Considering the Smelt's Current Abundance Is Arbitrary and Capricious.

The take limits are based on historic sampling from "salvage density" (number of fish taken per unit of water), which data is adjusted using CALSIM II modeling to reflect water flows anticipated under the circumstances of the final consultation. FWS's no jeopardy determination is based in part on flow modeling for the final consultation scenario that predicted lower than historic salvage levels during critical times. (AR 474 (finding that the level of anticipated take "is not likely to result in jeopardy to the smelt because this level of take is at or [**128] below historical levels of take.")

A close examination of the administrative record reveals that this conclusion relies upon an unsupported irrational assumption not justified by the record, i.e., that maintaining salvage at or below historic salvage levels will ensure that the 2004 OCAP is not likely to jeopardize the continued existence of the Delta smelt. First, by focusing only on how proposed operations will either increase or decrease smelt take, FWS effectively limited its analysis to determining whether the magnitude of the OCAP's impact upon the smelt would be different from the Projects' impact under the regulatory historical baseline. FWS did not analyze how the absolute number of smelt taken during any given period of Project operations will impact overall smelt abundance at the time of the

2005 BiOp or in the future. Nor does the finding the smelt "still persists," even at the lowest recorded abundance levels, have any meaning if the smelt's "persistence" is at a level at or near extinction. Evaluating "persistence" instead of smelt population abundance is irrational, arbitrary, and runs counter to the evidence before the agency.

The Ninth Circuit, in *NWF v. NMFS, 481 F.3d 1224 at 1230*, **[**129]** invalidated a biological opinion in part because it failed to view the agency action "in the present and future human and natural contexts." Here, the BiOp similarly fails to provide a scientific explanation for why it is appropriate to set incidental take without considering the most current smelt population data. This methodology fails to take most **[*372]** recent available natural conditions (i.e., the smelt's current and/or future population abundance) into consideration. For example, if the smelt's population is currently 600,000, it might be justifiable to permit a monthly take of over 30,000. However, if the smelt's current population is only 60,000, allowing 30,000 to be entrained in the pumps in a single month would represent a 50% reduction in smelt population. Even if the 30,000 figure was significantly lower than historic take, Defendant-Intervenors agree "that salvage impacts cannot be accurately identified without a population estimate." (Doc. 247 at 9 n.13.)

DWR asserts that, in setting the take limits, the BiOp took into consideration concerns expressed by experts that using historic information alone would not create an appropriate take limit. (*See* AR 4880, 5532, 5543). **[**130]** The first of the citations offered by DWR, an email sent by FWS's Wim Kimmerer to several individuals at DWR, EPA and elsewhere, states that there was some discussion at FWS about "getting away from take as the principle criterion governing management and recovery of delta smelt." (AR 4880.) The next page of this email goes on to admit that "determining what level of mortality is acceptable or 'safe' is going to be difficult... Ultimately...this should be done through some sort of population model or viability analysis." (AR 4881 (emphasis added).) The other cited communications express similar concerns. (*See* AR 5532, 5543.) It is time to do it, yet FWS continues to profess the smelt population cannot be reliably measured.

DWR argues that, together, the take limits and the DSRAM address these concerns by moving the focus of management away from salvage. However, there is no way to know when or what measures will be taken under the DSRAM, which leaves the existing take limits as the only enforceable measures in the BiOp, [29] while the species heads toward extinction. Using flawed take limits and refusing to quantify smelt population and recent viability trends create substantial **[**131]** doubt about the reliability of the BiOp.

29 There is no recognized mechanism for introducing any population viability data, collected through the adaptive management process, into the setting of the take limits.

Defendants and Defendant-Intervenors suggest that sufficient information was simply not available to accurately determine smelt abundance. [30] Plaintiffs rejoin by referring to an email sent by Zachary Hymanson to Ryan Olah at FWS, with copies to others at concerned federal and state agencies. Mr. Hymanson opined: "I think we are at the point where we should report and use quantified estimates of the total number of individuals at the various life stages monitories. Quantified population and life stage estimates of fishes around the world are routinely made with A LOT less data than we have for delta smelt." (AR 7542 (emphasis in original).)

30 The San Luis Parties mischaracterize Plaintiffs argument as a request for FWS to undertake additional research projects. (Doc. 247.) Defendant Intervenors are correct that FWS is not required to undertake new research, *Greenpeace Action v. Franklin, 14 F.3d 1324, 1335 (9th Cir. 1992)* (agency may proceed despite uncertainty about accuracy of modeling effort); *Southwest Ctr for Biological Diversity, 342 U.S. App. D.C. 58, 215 F. 3d 58, 60 (D.C. Cir. 2000)* (agency could rely on inconclusive data to make decision; not obligated to conduct new independent studies). Plaintiffs do point out that FWS acknowledges in the AR that an accurate determination of non-jeopardy would require knowledge of how many smelt existed, what proportion would be lost due to the projects, and what level of loss would be sustainable. (Doc. 232 at 23 (citing AR 8221).) However, the crux of Plaintiffs' concern is that FWS has not developed such population data and ignored important existing data on abundance in setting the take limits.

[132]** **[*373]** The viability of Delta smelt has been under scrutiny for over ten years. No party has shown that producing a reliable population estimate is scientifically unfeasible. Information does not have to be perfect or infallible for the agency to be required to use it to create a population estimate. *See Greenpeace II, 80 F. Supp. 2d at 1149-50* (finding it unlawful for agency to entirely ignore relevant factor and fail to analyze and develop projections regarding that factor based on information that was available); *see also Conner, 848 F.2d at 1454* (biological opinion invalidated because agency failed to "use best information available to prepare comprehensive biological opinions considering all stages of agency action."). Without population estimates, it is ar-

bitrary for the agency to conclude that project operations will not result in jeopardy simply because the projects will take relatively fewer smelt than they did in the past, in the face of the undisputed fact that the smelt population has been declining steadily in recent years. Failing to incorporate any information about smelt population abundance into the setting of the take limits is a fundamental **[**133]** failure rendering the BiOp arbitrary and capricious.

The San Luis Parties' rationalization of FWS's approach, setting the incidental take limits using a model that does not take current abundance data into consideration, is that historic records reveal "either no, or perhaps a very weak relationship, between juvenile abundance measured by the TNS and adult abundance measured by the FMWT." (Doc. 247 at 5.) This "lack of [a] linear relationship between the two indices, shows that events after the TNS, in late summer and early fall, are probably affecting the number of juveniles that mature into spawners." (Doc. 247 at 6.) From the lack of a linear relationship, San Luis infers that something other than salvage (i.e. entrainment in the pumps) is causing the smelt's decline. [31]

> 31 The Administrative Record reflects various explanations for the lack of a linear relationship between the TNS and the FMWT. (AR 1025-26.) One possible explanation for why the number of spawning age smelt (indexed by the FMWT) seems to be a poor predictor of subsequent offspring (indexed by the TNS) is that there is some environmental factor (not directly related to entrainment at the projects) limiting survivability, inferring that there is a carrying capacity for the population. (*Id.*) Alternatively, some scientists question whether it is proper to try to draw statistical conclusions from the entire 1969-2002 data pool, given that the smelt experienced a precipitous decline in 1981. These scientists have postulated that the data "may reflect two different relationships from two time periods with different delta smelt carrying capacities." (*Id.* at 1026.) One study cited in the AR indicates that food supply may be the limiting factor during this time period. (AR 8976.)

[134]** The BiOp interprets the data differently:

> In a near-annual fish like delta smelt, a strong relationship would be expected between number of spawners present in one year and number of recruits to the population the following year. Instead, the stock-recruit relationship for delta smelt is weak, accounting for about a quarter of the variability in recruitment (Sweetnam and Stevens 1993). This relationship does indicate, however, that factors affecting numbers of spawning adults (e.g., entrainment, toxics, and predation) can have an effect on delta smelt numbers the following year.

(AR at 364 (emphasis added).) [32] Plaintiffs refer to other record evidence creating **[*374]** doubt that salvage is not a statistically reliable indicator of smelt abundance, including high entrainment events in the early 1980s and other "extreme events," including the El Nino of 1982-83, which caused significant declines in smelt abundance. (AR 8979.)

> 32 The San Luis Parties raise numerous questions regarding FWS's conclusion that there is a statistical relationship between the numbers of spawning adults and Delta smelt abundance the following year, criticizing the statistical analyses referenced in the BiOp. (Doc. 247 at 5.) It is unnecessary to adjudicate these issues, as the San Luis Parties have not separately challenged the conclusions reached in the BiOp on this ground nor have they moved for summary judgment on any issue in this case.

[135]** The BiOp acknowledges that salvage can have an impact on smelt abundance (although the statistical relationship is non-linear). It is arbitrary and capricious for FWS to base take limits on a projection of future salvage calculated without considering the most current or future smelt abundance and without reliable smelt population estimate.

Plaintiffs' motion for summary adjudication is **GRANTED** as to this issue. The BiOp's approach to setting incidental take limits is arbitrary and capricious because it fails to incorporate reliable smelt population data and the most recent information regarding smelt abundance.

3. Plaintiffs' Argument That the BiOpFails to Explain How its No Jeopardy Conclusion Can Be Justified in Light of the Identified Adverse Effects of the Project, along with Indirect and Cumulative Effects.

In formulating a biological opinion, the ESA requires FWS to determine "whether the action, taken together with cumulative effects, is likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of critical habitat." *50 C.F.R. ß 402.14* (emphasis added). "Jeopardize the continued existence of" means **[**136]** "to engage in an action that reasonably would be expected, directly or

indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." *50 C.F.R. ß 402.02* (emphasis added).

The BiOp concludes that the 2004 OCAP will have numerous direct and indirect impacts apart from salvage, including habitat loss, increased vulnerability of Delta smelt to predation; and increased vulnerability to adverse temperature effects. (*See* AR 399, 443-44.) Plaintiffs allege that, although the BiOp lists indirect impacts, it fails to explain how they relate to the potential for jeopardy.

Federal Defendants respond to this allegation with a single paragraph, asserting generally that "the biological opinion considers the effects of dozens of project components, each with a multi-layered analysis," and indicating how many times the topics of predation (18), temperature changes (180 references), life cycle impacts (75 references to the term "juveniles") are discussed in the BiOp. (Doc. 242 at 30.) What Federal Defendants do not do is point to those portions of the BiOp which **[**137]** analyze these issues in a way that demonstrates why these indirect impacts will not cause jeopardy or how they relate to survival and recovery of the smelt. A review of the BiOp does not reveal such an analysis.

The State Water Contractors suggest that the DSRAM trigger criteria were designed to address all of the potential impacts identified in the BiOp. (Doc. 241 at 8.) This leaves for future consideration and speculation the impacts events activating DSRAM triggers will have.

a. *Cumulative Impacts.*

Plaintiffs also argue that the BiOp fails to meaningfully address cumulative impacts, "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action **[*375]** subject to consultation." *50 C.F.R. ß 402.02*. The BiOp highlights a number of predicted cumulative effects:

> Any continuing or future non-Federal diversions of water that may entrain adult or larval fish would have cumulative effects to the smelt. Water diversions through intakes serving numerous small, private agricultural lands contribute to these cumulative effects. These diversions also include municipal **[**138]** and industrial uses. State or local levee maintenance may also destroy or adversely modify spawning or rearing habitat and interfere with natural long term habitat-maintaining processes.
>
> Additional cumulative effects result from the impacts of point and non-point source chemical contaminant discharges. These contaminants include but are not limited to selenium and numerous pesticides and herbicides as well as oil and gasoline products associated with discharges related to agricultural and urban activities. Implicated as potential sources of mortality for smelt, these contaminants may adversely affect fish reproductive success and survival rates. Spawning habitat may also be affected if submersed aquatic plants, used a[s] substrates for adhesive egg attachment, are lost due to toxic substances.
>
> Other cumulative effects could include: the dumping of domestic and industrial garbage may present hazards to the fish because they could become trapped in the debris, injure themselves, or ingest the debris; golf courses reduce habitat and introduce pesticides and herbicides into the environment; oil and gas development and production remove habitat and may introduce pollutants into **[**139]** the water; agricultural uses on levees reduce riparian and wetland habitats; and grazing activities may degrade or reduce suitable habitat, which could reduce vegetation in or near waterways.

(AR 468.) There is no quantitative and qualitative analysis of the potential impact of these cumulative effects on the smelt and its habitat, except to identify the causes, the BiOp concludes without explanation, "[t]he cumulative effects of the proposed action [are] not expected to alter the magnitude of cumulative effects on the above described actions upon the critical habitat's conservation function for the smelt." (*Id.*)

The San Luis Parties argue that FWS's no jeopardy conclusion and impacts analysis is "rationally based on its determination that the proposed future changes will not significantly increase the magnitude of the ongoing Project's potential impacts." (Doc. 247 at 9.) This conclusion is the kind of analysis recently rejected by the Ninth Circuit in *NWF v. NMFS*:

> To "jeopardize the 'continued existence of" means "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival **[**140]** and

recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species." *50 CFR ß 402.02*; *16 U.S.C. ß 1536(a)(2)*. NMFS argues that, under this definition, it may satisfy the ESA by comparing the effects of proposed FCRPS operations on listed species to the risk posed by baseline conditions. Only if those effects are "appreciably" worse than baseline conditions must a full jeopardy analysis be made. Under this approach, a listed species could be gradually destroyed, so long as each step on the path to destruction is sufficiently modest. This type of slow slide into oblivion is one of the very ills the ESA seeks to prevent.

[*376] Requiring NMFS to consider the proposed FCRPS operations in their actual context does not, as NMFS argues, effectively expand the "agency action" at issue to include all independent or baseline harms to listed species. Nor does it have the effect of preventing any federal action once background conditions place a species in jeopardy. To "jeopardize"--the action ESA prohibits--means to "expose to loss or injury" or to "imperil." Either of these implies causation, and thus some new risk of **[**141]** harm. Likewise, the suffix "-ize" in "jeopardize" indicates some active change of status: an agency may not "cause [a species] to be or to become" in a state of jeopardy or "subject [a species] to" jeopardy. American Heritage Dictionary of the English Language (4th ed.). Agency action can only "jeopardize" a species' existence if that agency action causes some deterioration in the species' pre-action condition.

Even under the so-called aggregation approach NMFS challenges, then, an agency only "jeopardize[s]" a species if it causes some new jeopardy. An agency may still take action that removes a species from jeopardy entirely, or that lessens the degree of jeopardy. However, an agency may not take action that will tip a species from a state of precarious survival into a state of likely extinction. Likewise, even where baseline conditions already jeopardize a species, an agency may not take action that deepens the jeopardy by causing additional harm.

> Our approach does not require NMFS to include the entire environmental baseline in the "agency action" subject to review. It simply requires that NMFS appropriately consider the effects of its actions "within the context **[**142]** of other existing human activities that impact the listed species." *ALCOA, 175 F.3d at 1162 n. 6* (citing *50 C.F.R. ß 402.02*'s definition of the environmental baseline). This approach is consistent with our instruction (which NMFS does not challenge) that "[tlhe proper baseline analysis is not the proportional share of responsibility the federal agency bears for the decline in the species, but what jeopardy might result from the agency's proposed actions in the present and future human and natural contexts." *Pac. Coast Fed'n, 426 F.3d at 1093* (emphasis added).

481 F.3d 1224 at 1229-1230 (emphasis added) (footnote omitted).

Here, the BiOp does not consider the cumulative effects of any future DSRAM actions, which it relies on to avoid jeopardy, nor does it meaningfully relate the most current abundance of the species to future OCAP operations to assess jeopardy. The BiOp unlawfully fails to adequately analyze indirect and cumulative impacts of the 2004 OCAP. Summary adjudication on this issue is appropriate.

E. Did the BiOp Fail to Adequately Consider Impacts to Critical Habitat

Plaintiffs allege that the BiOp fails **[**143]** to adequately consider critical habitat in two respects. First, by failing to analyze the impacts of the 2004 OCAP on the value of critical habitat for the recovery as opposed to just the survival of the smelt. Second, failure to consider impacts to all of the Delta smelt's critical habitat because it focuses only on X2.

1. Did the BiOp Fail to Consider Whether 2004 OCAP Would Diminish Value of Critical Habitat for Recovery?

The ESA requires FWS to determine whether the 2004 OCAP will destroy or adversely affect Delta smelt critical habitat. *16 U.S.C. ß 1536(a)(2)*. "Destruction or adverse modification of critical **[*377]** habitat" means "a direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but

are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical." *50 C.F.R. ß 402.02*

Initially, the critical habitat analysis was conducted pursuant to agency regulations that defined adverse modification as:

> [A] direct or indirect alteration[**144] that appreciably diminishes the value of critical habitat for **both survival and recovery** of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical.

50 C.F.R. ß 402.02 (emphasis added).

Following the issuance of the 2004 BiOp, the Ninth Circuit invalidated the adverse modification regulation, based on its own interpretation of the regulation's language, "alteration that appreciably diminish the value of critical habitat for both the survival and recovery of a listed species," "reads the 'recovery' goal out of the adverse modification inquiry." *Gifford Pinchot, 378 F.3d at 1069-70.*

The Bureau requested that FWS reinitiate consultation on the 2004 OCAP to ensure compliance with *Gifford Pinchot.* The result was the disputed 2005 BiOp, which expressly states that it does not rely on the invalidated regulation. (AR 248.) Rather, the BiOp "relied on the statutory provisions of the ESA to complete the analysis with respect to critical habitat." (*Id.*) The ESA defines critical habitat as including [**145] "the specific areas ... occupied by the species which are ... essential to the conservation of the species" and the "specific areas outside the geographical area occupied by the species ... that ... are essential for the conservation of the species...." *16 U.S.C. ß 1532(5)(A).* This statutory reference to "conservation" was the premise for the Ninth Circuit's *Gifford Pinchot* reasoning:

> "Conservation" is a much broader concept than mere survival. The ESA's definition of "conservation" speaks to the recovery of a threatened or endangered species. Indeed, in a different section of the ESA, the statute distinguishes between "conservation" and "survival." Requiring consultation only where an action affects the value of critical habitat to both the recovery and survival of a species imposes a higher threshold than the statutory language permits

378 F.3d at 1070 (internal citation omitted).

The 2005 BiOp uses the term "conservation," rather than "survival" and/or "recovery," several times in connection with its critical habitat analysis. In the "Critical Habitat Effects" section, the BiOp states that the "primary constituent [**146] elements essential to conservation of the species will not be affected by the proposed project." (AR 423.) In addition, after discussing critical habitat, including those areas essential to spawning, transport, rearing and migration, the BiOp acknowledges impacts, but explains that after the proposed diversions in the OCAP are implemented "the primary constituent elements [of critical habitat] essential to the conservation of the species still function." (*Id.* at 371.) [33] [*378] What specific effects any DSRAM measures will have on the smelt are not described, nor is there discussion of how the survival and recovery of the smelt will be accomplished.

> 33 Defendant-Intervenors argue that, because of these mentions of "conservation," FWS is entitled to a "presumption of regularity," and the court must assume that agency considered recovery. (Doc. 247 at 12.) In *Gifford Pinchot,* after invalidating the destruction and adverse modification regulation, the Ninth Circuit considered whether it should presume that the agency followed its own regulation that was valid at the time the biological opinion was issued. The Ninth Circuit concluded that, because the agencies must be afforded a "presumption of regularity," a court must assume that the agency followed the then applicable regulation. *Id. at 1072.* Applying this presumption here, given that the agency specifically applied the statute, not the invalid regulation, there is no evidence the agency applied an invalid regulation. However, Defendant-Intervenors' suggestion that the presumption should be applied to validate the BiOp's analysis of recovery is misplaced. The agency still has an obligation to thoroughly consider the issue of recovery and to reach a reasoned conclusion based on the evidence in the administrative record.

[**147] The Ninth circuit explained in *NWF v. NFMS,* that the agency must conduct a "full analysis" of risks to recovery.

> The question before us is not whether, on the merits, recovery risks in fact require a jeopardy finding here, but

> whether, as part of the consultation process, NMFS must conduct a **full analysis** of those risks and their impacts on the listed species' continued existence. Although recovery impacts alone may not often prompt a jeopardy finding, NMFS's analytical omission here may not be dismissed as harmless: the highly precarious status of the listed fishes at issue raises a substantial possibility that considering recovery impacts could change the jeopardy analysis. The only reasonable interpretation of the jeopardy regulation requires NMFS to consider recovery impacts as well as survival.

481 F.3d 1224 at 1230 (emphasis added). [34]

> 34 Although this portion of *NWF v. NMFS* concerned analysis of recovery in the context of the "no jeopardy" determination, as opposed to the "destruction or adverse modification of critical habitat" analysis, the holding is equally applicable to habitat jeopardy.

[148]** Plaintiffs claim that although the BiOp includes generic promises to consider recovery of the smelt, it does not competently analyze nor provide for recovery. Federal Defendants and Defendant Intervenors respond that the BiOp's discussion of critical habitat effects, in conjunction with the BiOp's conclusion that "the smelt's primary constituent elements essential to the conservation of the species [will] still function" (AR 371) under the 2004 OCAP, is a sufficient analysis of the impacts on recovery.

The BiOp's overarching conclusion is that "the smelt's primary constituent elements essential to the conservation of the species [will] still function." In designating critical habitat for a listed species, FWS must "consider those physical and biological features that are essential to the conservation of [the] species and that may require special management considerations or protection." *50 C.F.R. ß 424.12*. The features that must be considered include, but are not limited to, the following:

> 1. Space for individual and population growth, and for normal behavior;
>
> 2. Food, water, air, light, minerals, or other nutritional or physiological requirements;
>
> 3. Cover **[**149]** or shelter;
>
> 4. Sites for breeding, reproduction, rearing of offspring, germination, or seed dispersal; and
>
> 5. Habitats that are protected from disturbance or are representative of the historic geographical and ecological distributions of a species.

Id. The BiOp explained that, in designating critical habitat for the Delta smelt, FWS identified the following primary constituent elements "essential to the conservation of the species":

> **[*379]** Physical habitat, water, river flow, and salinity concentrations required to maintain delta smelt habitat for spawning, larval and juvenile transport, rearing, and adult migration.
>
> ***
>
> Specific areas that have been identified as important delta smelt spawning habitat include Barker, Lindsey, Cache, Prospect, Georgiana, Beaver, Hog, and Sycamore sloughs and the Sacramento River in the Delta, and tributaries of northern Suisun Bay.
>
> Larval and juvenile transport. Adequate river flow is necessary to allow larvae from upstream spawning areas to move to rearing habitat in Suisun Bay and to ensure that rearing habitat is maintained in Suisun Bay. To ensure this, X2 must be located westward of the confluence of the Sacramento-San **[**150]** Joaquin Rivers, located near Collinsville (Confluence), during the period when larvae or juveniles are being transported, according to historical salinity conditions. X2 is important because the "entrapment zone" or zone where particles, nutrients, and plankton are "trapped," leading to an area of high productivity, is associated with its location. Habitat conditions suitable for transport of larvae and juveniles may be needed by the species as early as February 1 and as late as August 31, because the spawning season varies from year to year and may start as early as December and extend until July.
>
> Rearing habitat. An area extending eastward from Carquinez Strait, including Suisun, Grizzly, and Honker bays, Montezuma Slough and its tributary sloughs,

> up the Sacramento River to its confluence with Three Mile Slough, and south along the San Joaquin River including Big Break, defines the specific geographic area critical to the maintenance of suitable rearing habitat. Three Mile Slough represents the approximate location of the most upstream extent of historical tidal incursion. Rearing habitat is vulnerable to impacts of export pumping and salinity intrusion from the beginning of **[**151]** February to the end of August.
>
> Adult migration. Adequate flow and suitable water quality is needed to attract migrating adults in the Sacramento and San Joaquin river channels and their associated tributaries, including Cache and Montezuma sloughs and their tributaries. These areas are vulnerable to physical disturbance and flow disruption during migratory periods.

(AR 368-69.)

The BiOp acknowledges that this Delta smelt critical habitat has been adversely affected by numerous activities, but indicates that the 1994 and 1995 OCAP BiOps "provide a substantial part of the necessary riverine flows and estuarine outflows that allow smelt larvae to move downstream to suitable rearing habitat...outside the influence of marinas, agricultural diversions, and Federal and State pumping plant." (AR 371.) The BiOp also explains that increasing demands for surface water "would likely result in lower delta outflows and increased entrainment," but that the impacts of these demands "have not altered critical habitat's conservation function for the delta smelt, and the smelt's primary constituent elements essential to the conservation of the species still function." (*Id.*) Finally, **[**152]** the BiOp concludes:

> In evaluating the Status of the Species for critical habitat and the Environmental Baseline, while there are current actions that result in adverse effects to delta **[*380]** smelt critical habitat, the primary constituent elements continue to remain functional for the smelt. In the effects section, the Service determined that the primary constituent elements of delta smelt critical habitat would not be affected by the proposed project since there will not be a loss of physical habitat in the delta, river flows will continue to provide habitat, salinity will not be affected by the proposed project, and no breeding habitat will be affected and the sustainability of the food base will not be affected. In the cumulative effects section, we determined that the cumulative effects of the proposed action are not expected to alter the magnitude of future actions' effects on critical habitat's conservation function for the smelt. Based on the analysis in these four areas, it is our conclusion that Critical habitat is not likely to be adversely modified or destroyed as a result of implementing the proposed project.

(AR 469 (emphasis added).)

These conclusions are not **[**153]** supported by most recent smelt data to corroborate that the primary constituent elements of Delta smelt habitat will still function in a manner consistent with conservation (i.e. recovery). The functions and their locations are identified, but impacts upon breeding habitat are not analyzed. Second, although "there will still be water in the Delta....whether the water will be of adequate quality and quantity to allow the delta smelt to recover is an entirely different question." (Doc. 306 at 25.) The BiOp does not analyze the water supply, temperature, and quality under variable conditions with results that demonstrate the impact on smelt, nor is such an analysis found elsewhere in the administrative record. [35]

> 35 There is also merit to Plaintiffs' argument that "[g]iven that the very same sorts of impacts to critical habitat have contributed to the species decline, one might expect FWS to examine carefully how the continuance and magnification of these kinds of impacts could allow for the survival of the species, much less its recovery." (Doc. 306 at 5.)

[154]** The analysis of the predicted movement of X2 is more specific. When X2 is located upstream of Chipps Island, smelt are vulnerable to entrainment and are located in an area that is not ideal for feeding or protection. (*See* AR 424.) FWS opines that smelt reproduce better when X2 remains in a specific area, west of the confluence of the Sacramento and San Joaquin Rivers. That smelt reproduction is increased and the fish may be located where there are better sources of food does not assure that the smelt are on a path to recovery. The DSRAM is to provide the means by which FWS will maintain X2 in the most beneficial location. As the DSRAM is uncertain, speculative, and lacking enforceable action measures, there is no reasonable assurance

that X2 will be maintained in the necessary protective, location.

DSRAM utilizes other trigger criteria, arguably aimed at the recovery of the smelt. (Doc. 241 at 13-14.) One criteria is the "recovery index trigger," derived from the September and October FMWT sampling. (AR 347; Sommer Decl. at P9a.) The number used to trigger the DSWG is 74, the median value of the recovery index for the 1980-2002 period. Whenever the recovery index falls below **[**155]** this median, the DSWG convenes to decide whether to recommend actions. (AR 346-47.) Use of the term "recovery" in the title of the trigger index, suggests that this index will serve to monitor the potential for the smelt population to recover. This title is inaccurate. All that this trigger criteria monitors is whether the abundance of smelt drops below the 1980-2002 median abundance. As smelt have been in decline throughout the period to February 2005, the opinion that maintaining abundance slightly above this median leads to recovery of the smelt is unjustified.

The temperature trigger criterion of 12 - 18 [degrees] C, the range within which the most **[*381]** smelt spawning occurs, is more arguably focused on recovery. (AR 347.) If the number of days falling within the temperature range is 39 days or less by April 15, or 50 days or less by May 1, DSWG is triggered. This trigger is arguably related to the recovery of smelt, because it focuses on spawning. However, no action except a group meeting is required in response to the trigger. Moreover, maximizing the potential for smelt to spawn is only one aspect of recovery. If Project operations and/or other impacts kill more smelt than **[**156]** are produced during spawning, recovery does not occur. The existence of this trigger, alone, does not establish that recovery of smelt was adequately considered or addressed. [36]

> 36 The San Luis Parties correctly note that the CALSIM II models indicate that increased pumping capacity and operational flexibility may actually increase the smelt's prospects vis-a-vis the regulatory baseline. However, that the species will fare better than in the past does not assure that the totality of the OCAP operations are consistent with the smelts recovery

2. The BiOp Does Not Adequately Assess Impacts to All Areas of Critical Habitat.

Plaintiffs also allege that the BiOp arbitrarily ignores impacts to certain areas of critical habitat because it focuses on X2 as a proxy for Delta smelt habitat. Plaintiffs argue that the focus on X2 ignores other areas of designated critical habitat.

The BiOp focuses on the impact project operations have had and will have on the position of X2. Defendants and Defendant-Intervenors **[**157]** argue that critical habitat will be protected, because any impacts to the position of X2 will be addressed by the DSRAM. The State Water Contractors contend that protecting critical habitat outside X2 "makes no sense if they are not the areas in which the fish resides." (Doc. 241 at 17.)

Plaintiffs do not dispute the notion that X2 directly relates to where most smelt are located. Rather, Plaintiffs maintain that critical habitat is not coextensive with X2. The BiOp identifies numerous areas in which smelt occur (AR 362) and acknowledges that X2 "does not necessarily regulate smelt distribution in all years." (*Id.*) Delta smelt critical habitat is defined by physical boundaries:

> California--Areas of all water and all submerged lands below ordinary high water and the entire water column bounded by and contained in Suisun Bay (including the contiguous Grizzly and Honker Bays); the length of Montezuma Slough; and the existing contiguous waters contained within the Delta, as defined by *section 12220, of the State of California's Water Code of 1969* (a complex of bays, dead-end sloughs, channels typically less than 4 meters deep, marshlands, etc.) as follows:
>
> Bounded by **[**158]** a line beginning at the Carquinez Bridge which crosses the Carquinez Strait; thence, northeasterly along the western and northern shoreline of Suisun Bay, including Goodyear, Suisun, Cutoff, First Mallard (Spring Branch), and Montezuma Sloughs; thence, upstream to the intersection of Montezuma Slough with the western boundary of the Delta as delineated in *section 12220 of the State of California's Water Code of 1969*; thence, following the boundary and including all contiguous water bodies contained within the statutory definition of the Delta, to its intersection with the San Joaquin River at its confluence with Suisun Bay; thence, westerly along the south shore of Suisun Bay to the Carquinez Bridge.

59 Fed. Reg. 65,256, 65,277 (Dec. 19, 1994).

Federal Defendants respond that "the agencies have developed an operating **[*382]** and adaptive management system that adequately protects the existing critical

habitat, that reasonably uses X2 as an evaluation tool, and that also ensures that 'additional measures' will be taken in accordance with the DSRAM to affirmatively and proactively manage habitat, as needed." (Doc. 242 at 26.) But, apart from the X2 analyses, Federal Defendants **[**159]** identify no other record evidence that reflects the agency analyzed impacts to critical habitat or that any "additional measures" will be required under DSRAM, as the DSRAM does not require any measure be implemented.

Defendant Intervenors assert that it is unnecessarily costly to accommodate impacts to all of the geographically designated critical habitats because the smelt are not located in the entirety of their critical habitat range all of the time. They argue the focus must be on protecting the habitat occupied by the smelt. Even if more sensible, the law requires that the agency analyze whether project operations will directly or indirectly alter critical habitat in a way that "appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species." *50 C.F.R. ß 402.02.* "Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical." *Id.* The statute defines critical habitat to include both "the specific areas within the geographical area occupied by the species...on which are found those physical or biological **[**160]** features...essential to the conservation of the species" and "specific areas outside the geographical area occupied by the species...upon a determination by the Secretary that such areas are essential for the conservation of the species." *16 U.S.C. ß 1532(5)(A).* The definition of critical habitat is broader than the specific areas of occupation.

Here, the agency defined critical habitat to have a geographic scope. Absent any alterations to the critical habitat designation, the agency must address in the BiOp the full extent of impacts to the currently designated critical habitat, [37] which excluded "already degraded areas." Alternatively, the Delta smelt's critical habitat should be redefined to reflect the actual location of the smelt, if such redesignation would be consistent with law.

> 37 Plaintiffs raise an additional contention why the critical habitat analysis is insufficient; i.e., that the BiOp unlawfully "writes off" areas of critical habitat because they have already been degraded. For example, the BiOp concludes that "[a]n upstream movement of X2 of 0.5 km would not be significant when [X2] is located upstream of the [Sacramento-San Joaquin River] confluence because smelt habitat is already poor and the upstream movement does not result in any substantial additional loss of habitat or increase in adverse effects." (AR 443.) This tissue need not be reached, as the critical habitat analysis is insufficient on other grounds. Federal Defendants are already revising the BiOp to reflect new information and new law.

[161]** This has not been done. Plaintiffs motion for summary adjudication is **GRANTED** as to this issue.

F. Did the BiOp Fail to Address the Impacts of the Whole Project

1. Plaintiffs' Argument That the BiOp Should Have Analyzed the Effects of Constructing the SDIP, Intertie, and FRWP.

Plaintiffs complain that the BiOp's scope is unlawfully narrow because it fails to consider all planned actions. The BiOp includes within its formal consultation, "delivery of CVP water to the proposed Freeport Regional Water Project (FRWP)" as well as the "operation of the SWP-CVP intertie." The BiOp designates as an early consultation issue "operations **[*383]** of components of the South Delta Improvement Program (SDIP)," which include "permanent barrier operations in the South Delta." (AR 248.) The effects of constructing the FRWP, the Intertie, and the permanent barriers are to be covered in separate formal consultations. (AR 256, 339, 341, 421.)

The ESA requires FWS to address impacts associated with the entire agency action. *See Conner, 848 F.2d at 1453-54* (holding that agency violated ESA by choosing not to analyze the effects of all stages of oil and gas activity **[**162]** on federal lands). According to ESA regulations, the effects of an agency action include "direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline." *50 C.F.R. ß 402.02.* "The meaning of 'agency action' is determined as a matter of law by the Court, not by the agency." *Greenpeace II, 80 F. Supp. 2d at 1146* (citing *Pacific Rivers Council v. Thomas, 30 F.3d 1050, 1054 (9th Cir. 1994).*)

The BiOp explains its approach to scope as follows:

> The proposed action is to continue to operate the CVP and SWP in a coordinated manner. In addition to current day operations, several future actions are to be included in this consultation. These actions are: (1) increased flows in the Trinity River, (2) 8500 Banks, (3) permanent barriers operated in the South Delta, (4) an intertie between the California Aque-

> duct (CA) and the Delta-Mendota Canal (DMC), (5) a long-term EWA, (6) delivery of CVP water to the FRWP, and (7) various operational changes that are identified in this project description. **[**163]** Some of these items will be part of early consultation including 8500 Banks, permanent barriers and the long--term EWA. These proposed actions will come online at various times in the future. Thus, the proposed action is continued operation of the Project without these actions, and operations as they come online.
>
> The actions listed in the preceding paragraph are not being implemented at present; however, they are part of the future proposed action on which Reclamation is consulting. Only the operations associated with the proposed activities are addressed in this consultation; i.e., the activities do not include construction of any facilities to implement the actions. All site specific/localized activities of the actions such as construction/screening and any other site specific effects will be addressed in separate action specific *section 7* consultations.

(AR at 256 (emphasis added).) In sum, only those aspects of the 2004 OCAP that will be implemented without further approval were the subject of formal consultation. However, certain other changes that will be effectuated in the future were the subject of early consultation. With respect to future operational changes, **[**164]** including some subject to formal consultation, full implementation will require the construction of specified facilities. The impact of the construction activities themselves will be the subject of separate *ß 7* consultation.

Plaintiffs argue that the BiOp should have addressed the full impacts of construction of the Intertie, Freport diversion, and the SDIP because those projects are within the scope of the agency action as a whole and are "interrelated and interdependent" with the 2004 OCAP. [38]

> 38 The San Luis Parties cite *Gifford Pinchot* in support of the proposition that this is a properly "tiered" biological opinion. In *Gifford Pinchot,* the Ninth Circuit approved for the the tiering of a biological opinion for timber harvests in specified forest areas. The no jeopardy conclusion contained in that biological opinion relied on compliance with a very thorough, overarching forest management plan that was previously approved by the court. *378 F.3d at 1067-68. Gifford Pinchot* allowed the agency to tier its BiOp of a timber harvest with a programmatic forest management plan that provided guidelines regarding the harvesting of timber. *Rodgers, 381 F. Supp. 2d at 1228 n.27*, interpreted the holding narrowly to apply tiering only to cases in which the programmatic opinion was particularly thorough. Tiering of future construction projects is not appropriate here, because the BiOp provides no programmatic guidelines regarding construction activities. However, just because the later projects cannot be "tiered" off the current BiOp does not mean they must be included in the current BiOp. The relevant inquiry is whether the construction projects are interrelated to and/or interdependent upon the BiOp and the 2004 OCAP.

[165]** **[*384]** In response, Federal Defendants cite the Endangered Species Consultation Handbook, which explains, in a hypothetical example, that operation of an existing dam project need not be considered an interrelated or interdependent activity, where the agency action being evaluated in a biological opinion was the addition of a new turbine to an existing dam. [39] (Handbook at 4-25 to 4-29.) Although not cited by the Federal Defendants for this purpose, the Handbook also describes a general approach FWS should use when determining whether certain actions are "interrelated or interdependent," so as to be considered part of the action:

> Interrelated and interdependent actions: Effects of the action under consultation are analyzed together with the effects of other activities that are interrelated to, or interdependent with, that action. An, interrelated activity is an activity that is part of the proposed action and depends on the proposed action for its justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. (Note: the regulations refer to the action under consultation as the "larger action" [*50 CFR ß 402.02*]). **[**166]** ...
>
> As a practical matter, the analysis of whether other activities are interrelated to, or interdependent with, the proposed action under consultation should be conducted by applying a "but for" test. The biologist should ask whether another activity in question would occur "but for" the proposed action under consultation. If the answer is "no," that the activity in question would not occur but for the pro-

> posed action, then the activity is interrelated or interdependent and should be analyzed with the effects of the action. If the answer is "yes," that the activity in question would occur regardless of the proposed action under consultation, then the activity is not interdependent or interrelated and would not be analyzed with the effects of the action under consultation. There will be times when the answer to this question will not be apparent on its face. The biologist should ask follow-up questions to the relevant parties to determine the relationship of the activity to the proposed action under consultation. It is important to remember that interrelated or interdependent activities are measured against the proposed action. That is, the relevant inquiry is whether the **[**167]** activity in question should be analyzed with the effects of the action under consultation because it is interrelated to, or interdependent with, the proposed action. Be careful not to reverse the analysis **[*385]** by analyzing the relationship of the proposed action against the other activity. For example, as cited below, if the proposed action is the addition of a second turbine to an existing dam, the question is whether the dam (the other activity) is interrelated to or interdependent with the proposed action (the addition of the turbine), not the reverse.

Section 7 Handbook at 4-26.

> 39 Federal Defendants correctly point out that the FWS uses as a guidance document the *ESA Section 7* Consultation Handbook (March 1998), available at "http://www.fws.gov/endangered/consultations/s7hndbk/s7hndbk.htm" (last visited Apr. 27, 2006). *See e.g., Oregon Natural Res. Council v. Allen, 476 F.3d 1031, 1039 n.7 (9th Cir. 2007)*; *Ariz. Cattle Growers' Ass'n v. U.S. Fish & Wildlife Serv., 273 F.3d 1229 (9th Cir. 2001)*; .

[168]** Here, applying the Handbook test, the question is whether the other activities (construction and operation of SDIP, Freeport, and the Intertie) are interrelated to or interdependent with the proposed actions subject to formal consultation? The formal consultation, as described in the BiOp, covers

> ...the proposed 2020 operations of the CVP including the Trinity River Mainstem ROD (Trinity ROD) flows on the Trinity River, the increased water demands on the American River, the delivery of CVP water to the proposed Freeport Regional Water Project (FRWP), water transfers, the long term Environmental Water Account (EWA), the operation of the Tracy Fish Facility, and the operation of the SWP-CVP intertie. The effects of operations of the SWP are also included in this opinion and include the operations of the North Bay Aqueduct, the Suisun Marsh Salinity Control Gates, the Skinner Fish Facility and water transfers.

(AR 248 (emphasis added).) The formal consultation admittedly covers delivery of CVP water to the proposed FRWP and operation of the Intertie. But, the BiOp expressly excludes the impacts of construction associated with FRWP or the Intertie:

> Th**[**169]** actions listed in the preceding paragraph [including permanent barriers in the South Delta, an intertie, and the FRWP] are not being implemented at present; however, they are part of the future proposed action on which Reclamation is consulting. Only the operations associated with the proposed activities are addressed in this consultation; i.e., the activities do not include construction of any facilities to implement the actions. All site specific/localized activities of the actions such as construction/screening and any other site specific effects will be addressed in separate action specific *section 7* consultations.

(AR 256 (emphasis added).)

Is there a "but-for" relationship between the 2004 OCAP and the new projects? The FRWP and the Intertie are designed to more effectively distribute CVP and SWP waters. There is no evidence in the record indicating that construction of either project is tied in any way to the pre-approval of delivery of water to the projects. Flow operations could be approved after or simultaneously with the approval of new construction. Under the Handbook test, the construction projects are not considered interdependent and interrelated. **[**170]** These projects may be consulted upon separately. By approving a flow regime before the construction, the Bureau may plann for the possibility that the FRWP will be con-

structed in the future. The entire OCAP BiOp would not need to be revised should the projects be constructed. This is a reasonable approach.

With respect to the SDIP, the BiOp currently excludes both its operation and related construction coverage under the formal consultation. Plaintiffs allege that both should have been covered by the BiOp because they are interrelated with or interdependent on the agency action. Applying the Handbook analysis, the operation and construction of the SDIP (which includes increased pumping at Banks and operation of permanent barriers) will not occur "but for" the approval of the 2004 OCAP for CVP-SWP operations? Each action is independent of the 2004 OCAP. **[*386]** The SDIP is a separate addition that may or may not be constructed. Project operations under the 2004 OCAP in no way depend upon the SDIP. There is no prohibition to addressing the future operation, if and when the construction of the SDIP will occur, in a separate consultation.

Plaintiffs' motion for summary adjudication **[**171]** is **DENIED** as to the future projects issue.

2. Plaintiffs' Argument that the BiOp Failed to Analyze the Impact of Full Contract Deliveries.

A biological opinion must consider the effects of the entire agency action, meaning "all activities or programs of any kind authorized, funded, or carried out," including "the granting of...contracts." *50 C.F.R. ß 402.02.* One of the primary purposes of the 2004 OCAP is to "deliver water supplies to affected water rights holders as well as project contractors." (AR 259.) The Bureau delivers water to numerous parties pursuant to long-term contracts ("CVP Contracts"), some of which were renewed shortly after the BiOp was issued. (AR 4732, 4796, 4855.)

The CALSIM II model incorporated water deliveries into its various flow scenarios, but only performed its analysis based on the effects of delivering between 11 and 89 percent of the full CVP Contract allocations. (*See* AR 1067; see also Doc. 242 at 31 (acknowledging that the agency "did not evaluate the impacts of 100% percent delivery of all contracted waters").) This range of delivery scenarios is based on historic average water deliveries.

Plaintiffs allege that, by failing **[**172]** to evaluate the impact of delivering full amount (100%) of contracted water, the BiOp violates the requirement that the it evaluate the entire agency action. Plaintiffs cite *Rodgers, 381 F. Supp. 2d at 1237-40*, which examined a biological opinion approving long term water contracts in the Friant, Buchanan, and Hidden water units of the CVP. The BiOp only examined the impacts of the amount of historical water deliveries, which amounted to less than half of the water deliveries authorized under the long term water service contracts. *Id. at 1237-38.*

> The Friant long-term contracts cumulatively authorized the Bureau to deliver more than 2.1 million acre-feet of water per year, for twenty-five years. Rather than analyzing the effects of 2.1 million acre-feet of water delivery, FWS explained that its "effects analysis is conducted under the expectation that water will be delivered to CVP service contractors in quantities that approximate historic deliveries (1988 through 1997), as given in Appendix D of the November 21, 2000 programmatic long-term CVP contracts consultation." This assumption was made, the BiOp explained, because "delivery of full **[**173]** contract quantities is unrealistic."

Id. at 1238. Rodgers rejected FWS's approach, reasoning that the "ESA requires that all impacts of agency action-both present and future effects-be addressed in the consultation's jeopardy analysis."

> The fact that it was thought by FWS that "delivery of full contract quantities is unrealistic" and that "deliveries continue to be impacted by existing climate, hydrology, actions and statutes, ... socio-economic factors" does not excuse consulting on the "entire agency action," which was the authorized delivery of over 2.1 million acre-feet of water, and nothing less than that.

Id. at 1239.

Federal defendants assert that the *Rodgers* decision was wrong, arguing that "[a]bsent alternative information that the agency failed to consider, and given the fact that the agency did use the best available information, the *Rodgers* court should **[*387]** have deferred to the agency." (Doc. 242 at 32.) It is not the province of another district court to decide whether *Rodgers* is "wrong." *Rodgers* is distinguishable as it specifically addressed the government authorization of CVP water users' **[**174]** long-term water service contracts. Those contracts authorized 2.1 MAF of water deliveries in total. *Rodgers* found unlawful the biological opinion's limitation in its scope to approximate historic deliveries, instead of the full contract allocations. Here, however, the agency action subject to consultation is not the authorization or merits of the water service contracts, rather, it

is the operation of the CVP and SWP under the OCAP and whether those projected operations will cause jeopardy to the survival and recovery of smelt or smelt habitat. The government is entitled to make reasonable assumptions about the operational volume of water flows, water levels, temperature, and quality based on the historical and projected data in the administrative record. The BiOp explains that the delivery of full water service contract entitlements is expected only when excess water conditions exist, i.e., in a wet water year when sufficient water is available to meet all beneficial needs. (AR 259.) Plaintiffs do not suggest that this assumption is factually impossible. (Nor would it be unreasonable for FWS to model a full (100%) water contract delivery scenario, even if it has not happened [**175] in the past fifteen years.) The agency model for the worst case scenario is indispensable. Analysis of a "best of the best" case in a wet water year is not indispensable, as such "wet" water year conditions do not present any reasonable likelihood of jeopardy, absent an additional showing. However, because such a scenario could eventuate, it is not unlawful for the agency to analyze the effects on the smelt of 100% water contract deliveries. However, the 100% delivery analysis is not required. This is a matter committed to the agency's expertise and discretion.

Plaintiffs motion for summary adjudication is **DENIED** as to this issue.

VIII. CONCLUSION

As the history of the many CVP water cases decided in this court evidences, the duty to defer to the agency's expertise is well recognized and honored, when the agency has acted reasonably and lawfully to discharge its statutory responsibilities. The disputed BiOp depends in material measure for its no jeopardy finding on the DSRAM, which is legally insufficient. The agency's recognition the Delta smelt is increasingly in jeopardy; that its operative BiOp is inadequate, as evidenced by its second initiation of reconsultation [**176] for the 2004 OCAP, now pending, and its insistence that it will nonetheless operate the Projects under the challenged BiOp is unreasonable. The agency could have, but did not, offer a viable protective alternative. Adaptive management is within the agency's discretion to choose and employ, however, the absence of any definite, certain, or enforceable criteria or standards make its use arbitrary and capricious under the totality of the circumstances.

The agency's failure to reasonably estimate the Delta smelt population and to analyze most recent smelt abundance data make the take limits based on historical data unreliable and unreasonable. The Delta smelt is undisputedly in jeopardy as to its survival and recovery. The 2005 BiOp's no jeopardy finding is arbitrary, capricious, and contrary to law.

For all the reasons set forth above, the 2005 OCAP BiOp is unlawful and inadequate on the following grounds:

> (1) The DSRAM, as currently structured, does not provide a reasonable degree of certainty that mitigation actions will take place, even if the [*388] agency retains the discretion to draw upon numerous sources of water, not just the EWA, CVPIA(b)(2), and VAMP programs, to support [**177] fish protection.
>
> (2) The agency failed to utilize the best available scientific information by not addressing the 2004 FMWT data and the issue of climate change.
>
> (3) The BiOp's historical approach to setting take limits fails to consider take in the context of most recent overall species abundance and jeopardy.
>
> (4) The BiOp did not adequately consider impacts to critical habitat by (a) failing to analyze how project operations will impact the value of critical habitat for the recovery of the smelt and (b) failing to consider impacts upon the entire extent of known smelt critical habitat.

The Plaintiffs' motions for summary judgment are GRANTED IN PART AND DENIED IN PART, as delineated above.

Based on the legally flawed BiOp, an appropriate interim remedy must be implemented. All parties agree that it is not prudent to impose a remedy without further input from the parties. A separate remedies hearing will be scheduled within thirty days at the parties' mutual convenience. [40] During oral argument, Federal Defendants and Defendant-Intervenors jointly requested a stay of any order finding the BiOp unlawful to avoid the draconian consequences of operating the [**178] CVP-SWP without a lawful take limit. Affording all parties the opportunity to participate in a remedies hearing will not jeopardize the species or the public interest during interim operation of the projects. Plaintiffs did not object to such an approach.

> 40 The parties stated that they may be able to reach an agreement as to interim remedies, avoiding the need for a remedies hearing.

A Scheduling Conference is set for May 30, 2007, at 8:45 a.m. in Courtroom 3 to afford the parties time for

discussions to set a remedies hearing, and to consider the entry of a stay, if necessary.

Plaintiffs shall submit a form of order on the motions for summary judgment consistent with this decision within five (5) days following service of this decision.

IT IS SO ORDERED.

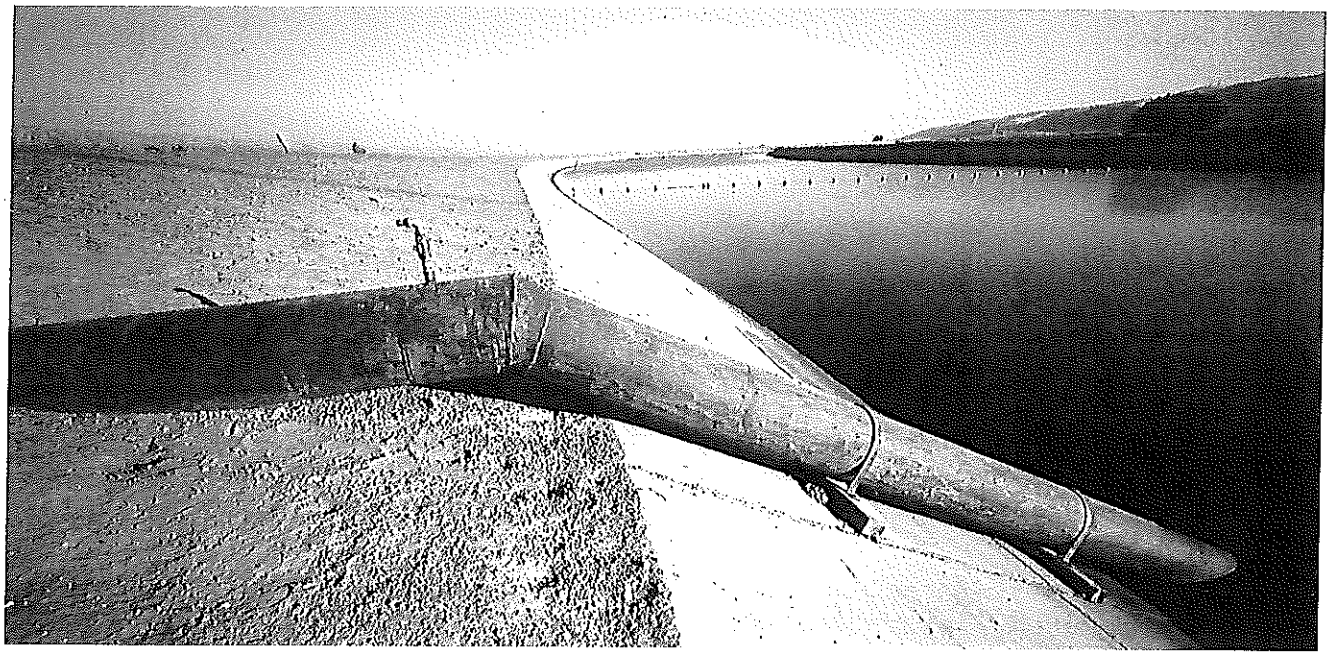
Dated: May 25, 2007

/s/ Oliver W. Wanger

UNITED STATES DISTRICT JUDGE

ATTACHMENT G

LETTER 30



Water Heist

How Corporations Are Cashing In On California's Water

Public Citizen

WATER FOR ALL

CAMPAIGNING TO KEEP WATER AS A PUBLIC TRUST

California Office

December 2003

Public Citizen *is a national, nonprofit consumer advocacy organization founded by Ralph Nader in 1971 to represent consumer interests in Congress, the executive branch and the courts. We fight for openness and democratic accountability in government, for the right of consumers to seek redress in the courts; for clean, safe and sustainable energy sources; for social and economic justice in trade policies; for strong health, safety and environmental protections; and for safe, effective and affordable prescription drugs and health care. We have six divisions and two state offices.*

The California Office *Our campaigns protect the basics for life: food, water and democracy. We fight for safe and sustainable agriculture that provides locally-grown and nutritious food produced in a humane fashion. We advocate for democratic control and protection of public water resources in the face of international corporate strategies to privatize their ownership and distribution. And we continue to highlight how corporate-driven trade policy undermines environmental regulations, labor laws, and the democratic process.*

Public Citizen is campaigning to protect universal access to safe and affordable drinking water by keeping it in public hands. Public Citizen does not believe that citizens benefit from privatization of their water and wastewater systems because the sale of public works to private companies can foster corruption and result in higher rates, inadequate customer service and a loss of local control and accountability.

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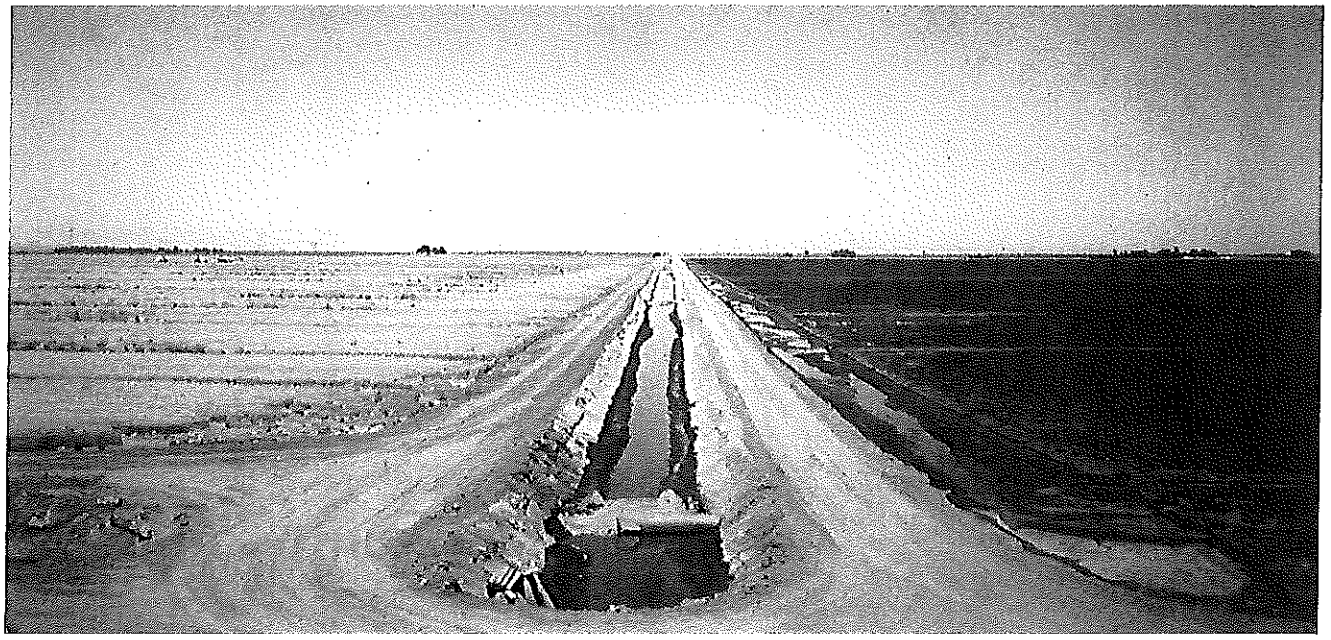


California's Great Central Valley receives between one and ten inches of rain a year. The diverted rivers sent south to be used as irrigation water provide the Midas touch that transforms the desert into the richest agricultural region in the world.

Executive Summary

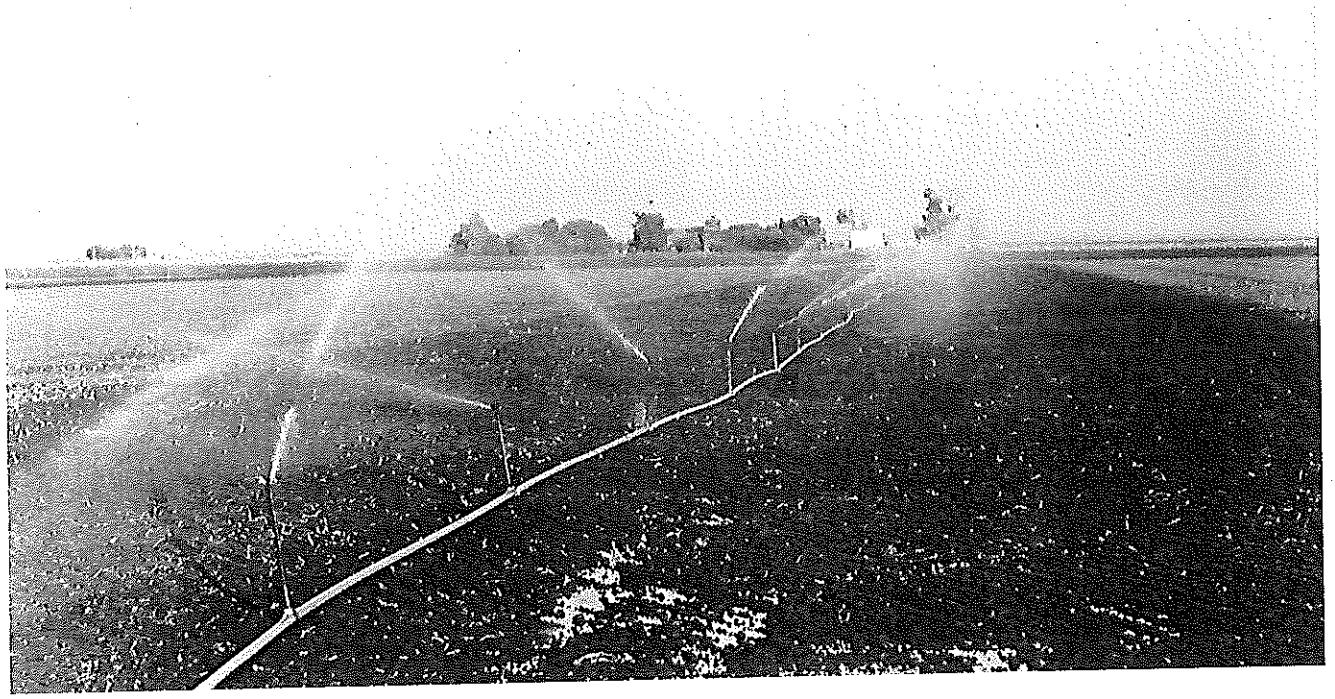
California's Central Valley is one of the largest contiguous swaths of land on earth to have been so completely altered by human activity. Lake beds and wetlands have been drained and planted with cotton and almonds, rivers dammed and diverted over hundreds of miles from their sources, the air filled with such quantities of dust and pesticides as to become the most polluted in the country, and the dry semi-desert floor turned into the most productive agricultural region in the world. Now, after a century of such cosmetology, the Valley is about to get yet another makeover from a boom crop: sprawl.

OVER THE PAST DECADE, a handful of the largest agribusiness and development corporations in the country have been rewriting California water policy in secret meetings to quench their thirst for unabated expansion and privatize the state's water supply. Displaying total disregard for the California State Constitution, representative democracy, and the environmental and social impacts of their actions, these players seek to "game" public water projects—much as Enron "gamed" energy deregulation. Their goal is to siphon as much of California's public water as possible to their corporate farms and "master-planned" cities in the desert while profiting from insider water sales.

In California state law, as laid out in the Constitution and the Water Code, water is a public good, held in trust by the state to ensure the greatest benefit to the public. In *Water Heist: How Corporations Are Cashing In On California's Water* we show how the public trust has been breached by an entrenched water plutocracy. The corporate interests that pervade the water districts that call the shots throughout the state are setting up insider water trading systems to facilitate the ease with which water flows to money. With direct corporate control over vital public water infrastructure—especially massive public water storage facilities—environmental protection and justice, urban renewal and smart growth face a desiccated future where profit rather than need dictates the destiny of California's water.

The abuses continue largely because they occur in closed meetings in hidden forms of government. Public Citizen aims to help cast the light of public scrutiny on the water deals taking place using the state's public water delivery system so that not just the CEOs of California have a voice in determining how our water is managed.

The water plutocracy includes some of the largest private agribusiness and development corporations in the country, who have created obscure and unaccountable water districts that act like "hidden government."



Usurping Democracy: The Monterey Amendments

In 1994, the largest contractors with the California State Water Project (SWP)—the state's largest water delivery system—called the Department of Water Resources (DWR) into a closed meeting. The agreements that the SWP contractors and the state reached in that meeting led to a document known as the Monterey Amendments, named after the city where the meetings took place. These "amendments" to the SWP contracts included denying that the SWP delivers half of what the contractors say it does and effectively deregulating the SWP so that the contractors can sell contracts for precisely the half of the water that doesn't exist. Sound confusing? It is. Welcome to the world of "paper water."

In the same Monterey meetings, the state also agreed to give away an underground water storage facility that DWR spent $74 million purchasing and developing.

State Giveaway of Essential Public Asset: The Kern Water Bank

The Kern Water Bank is an underground water storage facility—the largest of its kind—situated at the southern tip of the Great Central Valley, the region where the state delivers 80 percent of its surface water to industrial agriculture. The water bank is connected to the public canals and aqueducts that pipe water in from the northern, central and southern Sierra Nevada mountain range. The water bank can store about 1 million acre-feet of water and pump out over 200,000 acre-feet a year, according to official project descriptions.

The Kern Water Bank is an integral part of California's public water delivery system. It could store large amounts of water for times of drought or natural disasters such as fires or earthquakes. It could also provide a handful of private corporations with the keys to a virtual "switchyard" for controlling water deals between agribusinesses and real estate developers.

In 1994, DWR gave the Kern Water Bank to the Kern County Water Agency, which immediately signed it over to the Kern Water Bank Authority, a supposedly public entity comprised of a collection of water districts and one private company. The private company involved is a "paper company" with no listed telephone number or address: Westside Mutual Water Company. Westside is owned by perhaps the largest agribusiness in the United States: Paramount Farming Company.

Who's Behind the Kern Water Bank? Roll International Corporation and Paramount Farming Company

Roll International Corporation—a Los Angeles-based holding company—is one of the largest privately owned companies in the world, and everything that Roll owns claims to be the biggest at what it does. Roll International owns the Franklin Mint, Teleflora, and a collection of

agribusinesses—all of which operate in three California counties—including Paramount Citrus, Paramount Farming, and Paramount Farms, Inc. The California Farm Bureau Federation wrote that together "these firms constitute the largest farming company in the United States." Roll is privately owned by Stewart Resnick, a Beverly Hills billionaire and major campaign contributor who gave over $350,000 to the Gray Davis Committee and the anti-recall groups between 2000 and 2003. Governor Davis chose Resnick to co-chair his agriculture-water transition team with the champion of the failed Cadiz groundwater banking scheme, Keith Brackpool.

Although the Kern Water Bank Authority oversees a vital water resource, its staff is tucked away in the offices of Paramount Farming Company, without so much as a sign on the door. Executives from Paramount, who created an almond and pistachio empire over the past two decades, said that they went into the water bank to secure a firm water supply for their crops. Local newspaper articles, however, quote Paramount's vice president, who presides over the water bank's board of directors, as saying "sales from the water bank were contemplated from the time the bank was acquired." In fact, the paper reports, Paramount is particularly interested in selling water to its parent company's home town: Los Angeles. Paramount executives have already had "early talks" with the Los Angeles Department of Water and Power about selling "an as-yet-unspecified amount of water."

The website of Paramount's Los Angeles-based law firm clearly boasts about how the law firm advised Paramount Farming Company to set up a mutual water company (Westside Mutual Water Company) to "own and operate" the Kern Water Bank. Paramount, it seems, has been planning for some time to harvest more than just pistachios and almonds.

Irrigating Sprawl

California's population is expected to grow by 20 million in the next twenty years, and real estate developers are scrambling to get a hold of "secure" water supplies for their sprawling subdivisions. Public Citizen found a water sales contract between WV Acquisitions, a Roll International subsidiary whose president is also president of Paramount Farming Company, and Newhall Land and Farming Company, the largest developer in the state. Newhall has been taking advantage of the 1994 backroom deregulation of the SWP to go shopping for paper water contracts for the new "master-planned" city it plans to build in northern Los Angeles County. Such sales involve water supplies that are far from secure because they are based on allocated state water supplies: that is, paper water. Furthermore, this report raises the essential question: Should corporations like Paramount and Newhall be allowed to profit from buying and selling water that belongs to all Californians?

Usurping Democracy, Again: The Napa Proposition

In July 2003, just months after the seven-year lawsuit challenging the Monterey Amendments by a coalition of environmentalists, public advocates, and one State Water Project contractor was settled, the participants in the Monterey meetings met again, this time in Napa. The agreement that resulted from these meetings—called the Napa Proposition—plans to further integrate the SWP and the federal Central Valley Project (CVP). Such integration will allow landowners, principally in the San Joaquin Valley and Southern California, to trade off the federal project's superior storage capacity and the state project's greater pumping capacity with one goal in mind: to continue pumping water to agribusinesses, developers, and water marketing barons in Southern California, unabated by either federal or state endangered species acts, water quality issues in the Delta, or the unmet needs of communities in the Central Valley that don't have access to clean drinking water.

End Game: Water as Public Trust

California's public water utilities and resources are governed by a plutocracy—a select group of private corporations, individuals, and semi-public and public officials all working in tandem to "game" state water policy. They meet in closed sessions and rewrite public policy, tailoring their edits to the interests of monopoly-like agribusiness corporations and real estate developers. Is this a conspiracy theory? No. It is just business as usual.

The water plutocracy must be replaced with a vibrant water democracy.

Public Citizen strongly advocates returning the State Water Project to broad public use and oversight so that it can benefit all Californians, rather than only a select group of Los Angeles corporations. Water must be maintained as a public good, held in trust for broad and equitable use, *not* a commodity bought and sold by the highest echelons of the corporate elite.

We recommend the following concrete steps for accomplishing this goal:

Return Kern Water Bank to Public Control

Paramount and its Westside Mutual Water Company should never have been allowed to "own and operate the water bank." The privatization of this vital public resource should be reversed.

Repeal the Monterey Amendments

The Monterey Amendments should be repealed and the State Water Project contracts should be rewritten with an eye to water conservation and environmental restoration as well as the original stated purpose of the project: to reallocate California's water resources in an *equitable* manner.

Eliminate Paper Water

The Department of Water Resources continues to maintain on paper that the State Water Project can deliver almost twice as much as nature provides. The water "entitlements" of the twenty-nine State Water Project contractors should be re-drafted to fit the actual capability of the project to deliver.

No Resale of State Water Project Water

The individual contractors that receive state project water should not be allowed to profit from reselling that water, whether it is back to the state Environmental Water Account or to real-estate developers.

Democratize Water and Irrigation Districts

Water and irrigation districts that receive public water deliveries from the SWP should be transparent and accountable to the public. There should be elected, public representatives on the boards of such districts who would represent the non-landowning population affected by water policy decisions made most often in closed meetings.

NATURE PROVIDES ENOUGH WATER for California to meet all of its needs: to sustain water-efficient family farms and industries; to provide safe drinking water to present and future generations; and to restore and maintain California's much-abused environment. Nature provides enough water; that is, unless mismanagement and greed intervene and allow for the state's public water supplies to be manipulated for profit. Too much is at stake to let this water heist continue.

Background: The Monterey Amendments

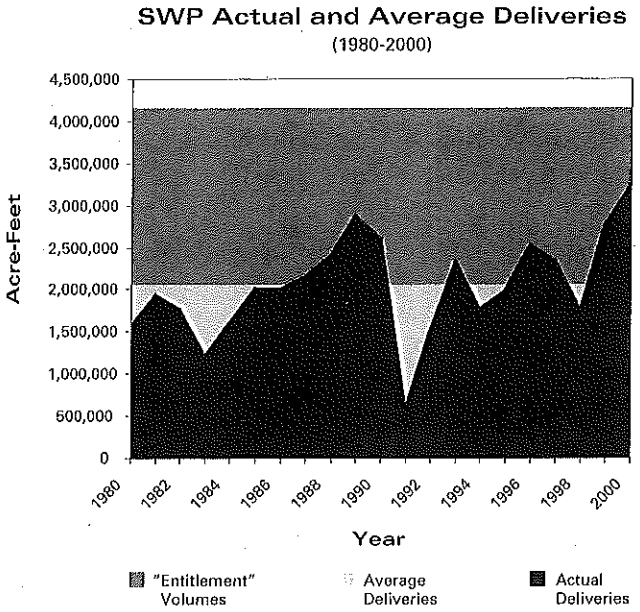
AFTER TWO YEARS of planning and negotiation, in 1988 the Department of Water Resources (DWR) purchased 19,900 acres alongside the Kern River.[1] DWR purchased the property for $31.4 million from Tenneco West Incorporated to build a subsurface reservoir to store State Water Project (SWP) water during years with above average rainfall.[2] On this property DWR first established the Kern Water Bank—an underground reservoir capable of storing a million acre-feet* of water. After conducting in-depth studies on the viability and potential environmental impacts of the project, DWR began putting in extraction pumps and building canals and conveyance facilities to connect the water bank to SWP aqueducts. All told, DWR spent $74 million on the project.[3]

From 1987 through 1992 and again in 1994, California experienced drought years. During the drought DWR significantly cut back deliveries to its agricultural contractors. In 1991 and 1992, DWR operated a Drought Water Bank to pay contractors willing to forgo their water entitlements. DWR then delivered the purchased water to agricultural contractors and urban areas with the strongest demand. The Drought Water Bank was the state's first experiment with water banking.[4]

Following the drought, the Kern County Water Agency (KCWA) was preparing to take DWR to court for cutting back its water deliveries.[5] The state legislature created the KCWA in 1961 under the tutelage of Kern County's corporate farmers to buy SWP water and then sell it to the local districts where the landowners formed the boards of directors. As an intermediary, the Agency spread out the cost of SWP water through a countywide property tax, principally paid by the Bakersfield urban population. Both the intent and the effect of the KCWA were to generate water subsidies for large landowners.[6]

In 1994, rather than call DWR to court, water brokers in Kern County and a select group of other SWP contractors held a series of closed meetings with DWR to rewrite the contracts that govern water allocation for the entire State Water Project.[7]

The backroom deal that resulted—in which participants produced a document known as the Monterey Amendments, named for the city in which the meeting took place—made several fundamental changes to the SWP contracts, all propitious for the agribusiness and real estate interests represented by the attendees of the meetings.[8] The agreement withdrew, for example, a requirement that water allotments be scaled back to fit available supplies in the case of permanent water shortages or the inability of



Source: Department of Water Resources Bulletin 132-90 and Bulletin 132-01.

the project to deliver as originally projected.[9] The SWP contracts for 4.2 million acre-feet of water but can only deliver an average of about 2 million acre-feet annually.[10] This modification permits SWP contractors to buy and sell entitlements to water that does not exist, otherwise known as "paper water."[11] California water historian Norris Hundley describes the Monterey Amendments as "[a]n 'institutional mirage' encouraging the notion that California can somehow find all the water necessary for development into the distant future."[12]

It was also through the Monterey Agreement that DWR first gave the Kern Water Bank to the Kern County Water Agency, who then signed a joint powers agreement—enabling different districts to cooperate in their exercise of common powers—to form the Kern Water Bank Authority (KWBA). The KWBA is a joint powers authority consisting of two water storage districts (Semitropic Water Storage District and Wheeler Ridge-Maricopa Water Storage District), two

An acre-foot is the amount of water necessary to fill an area of one acre to a depth of one foot, or 325,000 gallons. One acre-foot of water is roughly the amount that two families of four consume in one year.

water districts (Dudley Ridge Water District and Tejon-Castac Water District), one special district (Kern County Water Agency), and one private company (Westside Mutual Water Company).

The Third District Court of Appeal ruled that, in 1995, DWR illegally passed off its responsibility under the California Environmental Quality Act of conducting an Environmental Impact Report (EIR) on the potential impacts of the proposed changes to the SWP contracts.[13] The DWR gave the task to the Central Coast Water Authority—one of the participants in the secretive Monterey meetings. The Planning and Conservation League together with the Plumas County Flood Control and Water Conservation District and the Citizen's Planning Association of Santa Barbara County challenged the validity of the EIR and the legality of the Kern property giveaway. The plaintiffs lost in the trial court but won a unanimous favorable ruling from the Third District Court of Appeal. They went into mediated settlement negotiations with DWR and its major contractors, finally reaching an agreement in May 2003.[14]

The Settlement Agreement requires DWR to prepare a new EIR on the Monterey Amendments. It also allows for the Kern Water Bank Authority's continued ownership of the water bank while the new EIR is in process.[15] Throughout the lengthy litigation and negotiation process, however, the changes wrought to California's water infrastructure and water politics continued unabated. Although the environmentalists were hoping to have the whole deal scrapped in court, for the first time in California history the agriculture and real estate magnates behind these deals began setting up a paper water trading system. Moreover, they turned the state's $74 million gift of the Kern Water Bank into "the switchyard for controlling the water market."[16]

Tim Stroshane, editor of the California water journal *Spillway: California Land, Water and People*, called the Monterey deal a "bloodless coup."[17] He wasn't exaggerating. The changes made in the closed meetings usurped participatory democracy and overhauled California's most vital public utility, tailoring it to the demands of agribusiness corporations and developers seeking to create and corner a subsidized water trading system.

The water bank's administration—the Kern Water Bank Authority (KWBA)—is housed in Paramount's corporate office outside of Bakersfield. Paramount's vice-president also serves as chair of the Authority's board. There was no sign for the KWBA anywhere outside or inside the building when Public Citizen visited in July 2003.

The Kern Water Bank

"THINK OF THE BANK OF AMERICA, the way it operates with dollars, that's the way we operate with water," said Jonathan Parker, general manager of the Kern Water Bank Authority (KWBA) in Kern County.[18]

The Kern Water Bank claims to be the largest water banking project in the world. It can store a million acre-feet of water on a long-term basis and provide around 240,000 acre-feet per year for extraction.[19] To put this figure in perspective, 200,000 acre-feet, about 65 billion gallons of water, is the amount of water that would be transferred annually from the Imperial Irrigation District to the San Diego County Water Authority under the much contested deal between the two. The price tag on that deal now stands at $52 million a year.[20]

The water bank is located on the Kern River alluvial fan—the disintegrated rock deposited over thousands of years by the Kern River. According to the KWBA project description, the water bank works like this: "Water rapidly soaks down through the sand to fill in the voids between particles. When it is needed, water is easily recovered by high-flow wells."[21]

"Think of it like a bank," said Mr. Parker. "Participants have water. We're a nonprofit entity. What we do is provide a service. We store water at cost and then take water out of the ground, at cost. They pay us to provide that service in the least expensive manner. We operate only for participants."[22]

In 1994, the California State Legislature approved Assembly Bill 2014. Introduced in the Assembly on March 5, 1993, the bill was amended in the Senate on June 13, 1994, where the original language concerning water rights was entirely deleted and replaced with a single sentence authorizing mutual water companies to enter into joint powers agreements.[23] Also in 1994, DWR, the initial owner and developer of the Kern Water Bank, participated in the closed meetings in Monterey that led the state to transfer the property to the Kern County Water Agency, who called the meetings in Monterey.

The private company involved in the Kern Water Bank is Westside Mutual Water Company. Westside owns 48% of the bank. Westside is not a well-known company; in fact it does not have a listed telephone number or address. When asked about the participation of a private business in the otherwise public agency, the Bank Authority's staff responded that "Westside Mutual Water Company represents land holdings in other districts. They are not that different from a storage district. We don't see any difference in that."[24]

And whose land holdings does Westside represent? "Westside owns land, they represent their land," said Cheryl Harding, the Authority's administrator.[25]

"They're no different from a water district," Mr. Parker added.[26]

Westside Mutual Water Company is wholly owned by and operates exclusively for Paramount Farming Company, one amongst the cluster of agribusiness firms—all privately owned by Roll International Corporation—that together constitute what may be the largest agribusiness company in the United States.[27]

The KWBA staff appeared reluctant to mention the name "Paramount Farming." Such reluctance was peculiar considering where the interview took place: in the conference room of Paramount Farming Company's office on East Lerdo Highway, about 10 miles outside of Bakersfield.[28]

The KWBA leases its office space from Paramount. However, there is no sign either outside or inside the building to announce the offices of this supposedly public entity. Indeed, there is no distinguishing feature between the offices of KWBA employees and those of Paramount employees. Posters and maps published by the KWBA hang on the walls throughout the building. The Authority's geographical information systems (GIS) specialist works off of a lap-top in Paramount's GIS department.

"We lease space from Paramount because we're trying to do stuff on the cheap. We're not empire builders," Ms. Harding said.[29]

"We operate in the public, we serve a board of directors," added Mr. Parker.[30]

Ms. Harding then continued: "The 7 a.m. board meetings go on for a long time. Some people come, find it boring, don't come back. There's no smoking gun, just a meeting."[31]

The Corporate Players behind the Kern Water Bank Authority

KWBA Participant	Westside Mutual Water Company (WMWC)	Wheeler Ridge-Maricopa Water Storage District (WRMWSD)	Dudley Ridge Water District (DRWD)	Tejon-Castac Water District (TCWD)	Kern County Water Agency, Improvement District 4 (KCWA)	Semitropic Water Storage District (SWSD)
Ownership	48.06%	24.03%	9.62%	2.00%	9.62%	6.67%
Corporate Connection	William Phillimore: Chairman, KWBA Board of Directors; President, WMWC; ***Vice President, Paramount Farming Company***	Dennis Mullins: KWBA Board of Directors; WRMWSD Board of Directors; ***Vice President, General Counsel, and Secretary, Tejon Ranch***	Joseph MacIlvaine: President, DRWD Board of Directors; ***President, Paramount Farming Company***	Dennis Mullins: KWBA Board of Directors; President, TCWD Board of Directors; ***Vice President, General Counsel, and Secretary, Tejon Ranch***	See *Hidden Government*, p. 23	***Newhall Land and Farming,*** direct client, with 55,000 acre-feet of water storage capacity

The Kern Water Bank Authority (KWBA) is a joint powers authority consisting of two water storage districts (Semitropic Water Storage District and Wheeler Ridge-Maricopa Water Storage District), two water districts (Dudley Ridge Water District and Tejon-Castac Water District), one special district (Kern County Water Agency), and one private company (Westside Mutual Water Company).

Paramount Farming Company controls over 50 percent of the Kern Water Bank through Westside Mutual Water Company and Dudley Ridge Water District.

Another key player to keep an eye on is Tejon Ranch. Tejon Ranch, with 270,000 acres between Los Angeles and Bakersfield is "the largest contiguous expanse of land under single ownership in California," according to the company's website. Tejon Ranch, initially an agribusiness, plans to build a new town—even bigger than Newhall Ranch—with 24,000 houses, thus ushering in the trend of agriculture bowing to urban sprawl. Tejon's participation in the Kern Water Bank would allow them to store nearly twice as much water as their new town would require annually.

Sources: Kern Water Bank Authority, *Project Description*, Undated; Water Association of Kern County, *Who's Who in Kern County Water*, <http://www.wakc.com/whoswho.htm>; Dudley Ridge Water District, *Board of Directors*, Undated; Tejon Ranch, *Historic Tejon Ranch*, <http://www.tejonranch.com/HistoricTejon/HistoricTejonRanch.html>; and Vic Pollard, "Land not only issue in the mix," *Bakersfield Californian*, 07 June 2003.

Many industrial agriculturists in the Central Valley irrigate their almond orchards through routine flooding.

Who Controls the Kern Water Bank?

Power veils itself. From the mystery of what it does, what it owns, and, above all, who it is, it assumes added strength.

Gray Brechin, *Imperial San Francisco*

INFORMATION AVAILABLE to the public concerning Roll International Corporation is scant.[32] Roll is one of the largest privately owned companies in the world. Roll's 1998 sales were $1.57 billion.[33] Everything that Roll owns claims to be the biggest at what it does. Perhaps the most widely recognized company of the group is the Franklin Mint, "the world's largest direct marketer of collectibles."[34] In addition to the Franklin Mint, Roll International owns Teleflora, the nation's largest wiring service for flowers.[35]

Roll's agribusinesses—all of which operate in three California counties—include Paramount Citrus, the largest grower, packer and marketer of citrus in the country; Paramount Farming, the largest producer of almonds and pistachios in the country; and Paramount Farms, Inc., the largest pistachio processor and second-largest processor of almonds in the world. The California Farm Bureau Federation wrote that together, "these firms constitute the largest farming company in the United States."[36]

Roll International and its holdings such as Paramount Farming Company are Delaware corporations. Some of the perks of incorporating in Delaware include: incorporating without traveling to or living in Delaware; paying an annual corporate franchise tax as low as $50 regardless of income; and not paying a cent in income tax if you don't do business in Delaware.[37] Enron, for example, had 685 subsidiaries incorporated in Delaware.[38]

Roll International is owned and directed by Stewart Resnick. The Resnicks live in Beverly Hills, not Bakersfield. One visitor to the Resnicks' mansion commented that it was "like the Italian embassy but more tasteful."[39]

The Resnicks are active members in Los Angeles society. In the past few years they have received some of LA's highest awards such as the University of California Los Angeles (UCLA) Medal, the Duke Award and the City of Angels Award.[40] They give to numerous charities, universities, art museums and Democratic candidates, donating over $250,000 to the Governor Gray Davis Committee between 2000 and 2002 and $100,000 to anti-recall groups in June and September 2003.[41] In 1998, Davis, then governor-elect, appointed Stewart Resnick as co-chair of his "agriculture and water transition group."[42] Mr. Resnick's fellow co-chair was Keith Brackpool of the botched Cadiz water grab fame.

Paramount Farming Company has more than 5 million trees yielding billions of nuts a year. Growing, processing and marketing as one company, Paramount claims to be the largest vertically integrated supplier of pistachios and

almonds in the world.[43] The company currently has over 50,000 acres of pistachio and almond orchards in production in California. They also have the property holdings—and the plans—to expand into at least another 50,000 acres in the coming years.[44]

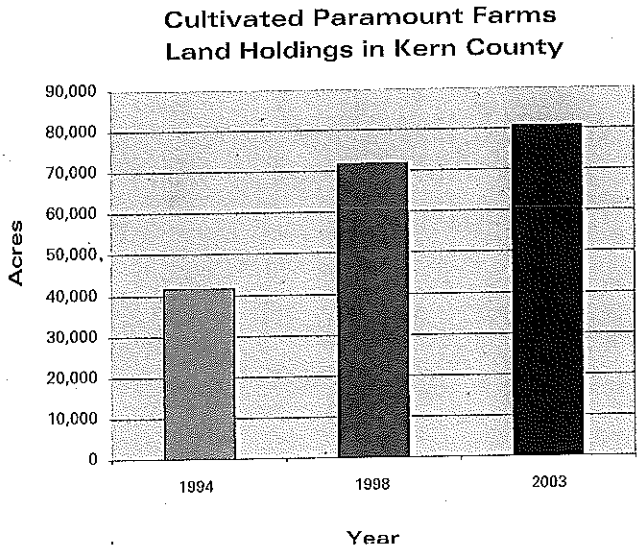
Almonds and pistachios are extremely lucrative crops. The California Farm Bureau Federation ranks almonds among California's top ten most valuable crops, generating $700 million in 2001 and over $1 billion in 2002.[45] Almonds are California's number one export crop, and also the top fruit and vegetable export crop in the United States.[46] Pistachios are not used as ingredients as often as almonds, making their demand significantly lower. Still, California's 2002 pistachio crop was valued at a solid $336 million.[47]

Paramount started buying pistachio, almond and olive orchards in 1986, after agricultural production dropped significantly in Kern County in the early 1980s.[48] Approximately 100,000 acres went out of production in Kern between 1982 and 1984.[49] Paramount and its associated companies, all held by Roll International, continued buying land into the 1987-92 drought that hit California agribusiness particularly hard. Roll purchased 12,000 acres of pistachio and almond orchards from Mobil Oil in 1986 and 77,000 acres of farmland from Texaco's central California agribusinesses in 1987.[50]

In 2000, Paramount bought most of Dole's citrus in California for $55 million, making it "the largest integrated grower, packer, and marketer of fresh citrus in the United States."[51]

In fact, while both the number of farms and agribusinesses and the total acreage of land in agricultural production in California dropped significantly throughout the 1990s, the Paramount group of agribusiness corporations doubled its acreage in cultivation from around 41,000 acres in 1994 to nearly 81,000 in 2003.[52] These figures come from analyzing Paramount's pesticide permits in Kern County alone. Paramount also has land holdings in Kings and Fresno counties.

Paramount has been steadily increasing its acreage and expanding production *against* the trend of the state's overall decrease in both agricultural acreage and production. Between 1992 and 1997 while Paramount was growing, California lost more than 3,500 farms.[53] Between 1998 and 2000, "90,000 acres of California farmland were lost to urbanization."[54]



Paramount has doubled its acreage in production in Kern County over the past ten years.

Source: Kern County Department of Agriculture, http://www.co.kern. ca.us/kernag/ftp/fileindx.html

Paramount's success is certainly a product of its agricultural technology and business organization.[55] Such success would not be possible, however, without water—indeed, enough water to satiate 100,000 plus acres of orchards depending upon year-round irrigation in a semi-desert.

Paramount and the KWBA's staff paint a picture of serious, risk-taking private enterprise saving the Kern Water Bank from the bungling hands of bureaucrats in Sacramento. In interviews they said repeatedly that DWR "couldn't get the project off the ground," and that the community prefers the water bank to be "under local control."[56] Paramount, a Delaware corporation, privately owned by one of the wealthiest residents of Beverly Hills, can hardly be considered "local."

The *Bakersfield Californian* also referred to the Kern Water Bank as a "local" asset. Under the headline, "Kern Water Bank will likely stay with county," the *Californian* describes the Kern Water Bank "property transfer" thusly: "One provision of the Monterey Agreement transferred ownership of the 20,000-acre water banking area along the Kern River bed west of Bakersfield from the state to a consortium of local districts, including KCWA."[57] The *Californian* does not mention Paramount Farming Company even though Paramount's water company, with 48% ownership, easily holds the largest share in the Kern Water Bank and Paramount's Executive Vice President, William D. Phillimore, is Chair of the Kern Water Bank Authority's

board of directors—a position that he is apparently able to carry out from his desk at Paramount.

Compare the *Californian's* take on the water bank acquisition with the following description provided by the Los Angeles law firm that represents both Paramount Farming Company and the Kern Water Bank Authority— Nossaman Guthner Knox & Elliott LLP:

> Paramount Farming Company was a key participant in the Kern Water Bank transaction, and Nossaman advised Paramount on all aspects of this transaction. The Kern Water Bank is a 20,000-acre property west of Bakersfield operated by the Department of Water Resources for groundwater storage. Pursuant to the Monterey Statement of Principles entered into by the Department and State Water Contractors in November 1994, the Department agreed to transfer the property. Nossaman advised Paramount regarding formation of a joint powers authority to own and operate the water bank, a mutual water company through which Paramount participates in the authority, relinquishment of entitlements, water rights, environmental issues and other issues regarding this transaction.[58]

Notice the language of intention: "Nossaman *advised* Paramount regarding the formation of a joint powers authority to *own and operate* the water bank."[59] Nossaman leaves little doubt that Paramount *planned* to acquire and control the Kern Water Bank.

Paramount grows pistachio and almond trees, some 5 million of them. Trees, unlike other crops such as rice or alfalfa, cannot be fallowed. In the semi-desert of the Southern San Joaquin Valley, no almond tree could survive without a constant supply of water. Kern County itself receives an average annual rainfall of less than six inches.[60]

The resource planning manager at Paramount Farming Company explained the motivation behind Paramount's participation in the Bank Authority as follows: "We're in the situation of growing almonds and pistachios without a firm water supply, so we went into the Kern Water Bank to secure a water supply."[61] He emphasized that Paramount's primary interest is in making a long term investment to grow their crops, and that "any sort of water marketing is very much secondary to crops."[62]

Should taxpayers and ratepayers foot the water bill for the self-described largest almond and pistachio producer in the United States to grow permanent specialty crops "without a firm water supply?" Is this the public's investment for a cheap supply of almonds? In 2001, Paramount's president, John McIlvaine, told the American Society of Farm Managers and Rural Appraisers that nearly 80% of California's almonds are exported—mostly to Western Europe and Japan—and that the almond industry is "on the move promoting foreign sales as its production grows larger and larger."[63] In fact, McIlvaine pointed out that California's tree nut exports have risen steadily over the past 15 years, a trend concurrent with Paramount's increase in acreage in production and the state's overall decrease.

Irrigating Sprawl

Water utilities exist primarily to nourish real estate, not people.

Gray Brechin, *Imperial San Francisco*

INTERSTATE-5 IS LITTERED with roadside banners facing the oncoming traffic with messages such as "Food Grows Where Water Flows" and "Farm Water Feeds the Nation." Is Paramount feeding the nation? Which nation?

The *Bakersfield Californian* reported that Paramount is "most interested in selling water to Los Angeles."[64] Though they said that such sales were most likely not going to take place any time too soon, officials from the Los Angeles Department of Water and Power have already "had early talks with representatives of Paramount Farming Co. and other participants in the Kern Water Bank about possible purchase of an as-yet-unspecified amount of water."[65] In an interview with the *Californian*, Paramount's Bill Phillimore said "sales from the water bank were contemplated from the time the bank was acquired by Kern County water agencies in 1995."[66]

Other sales have already taken place. WV Acquisitions, one of Roll International's Delaware corporations, recently sold Newhall Land and Farming Company 5,099 acre-feet of its SWP annual water entitlement.[67] Newhall Land and Farming Company plans to build a "new city" of over 20,000 housing units and 3.58 million square feet of commercial space in bone-dry northwestern Los Angeles County. After years of controversy and lawsuits, the project was recently approved by the LA County Board of Supervisors and the Superior Court.[68]

Newhall has gone on a buying spree where the most cherished item on sale is SWP contract entitlements, or "paper water." These entitlements are contract promises, so to speak, from the state. During wet years, DWR will deliver at best most of the contracted water. During drought years, it might not deliver any at all. This is why the changes to the SWP contracts ironed out in Monterey are so important to the brokers in water: holding the state accountable for its original—undeliverable—contracts enables the contractors to sell "paper water" that won't be missed by their parched crops.

The Third District Court of Appeal that ruled against DWR in the Monterey Amendments case of 2000 declared that "Paper water always was an illusion. 'Entitlements' is a misnomer, for contractors surely cannot be entitled to water nature refuses to provide or the body politic refuses to harvest, store, and deliver. Paper water represents the unfulfilled dreams of those who, steeped in the water culture of the 1960s, created the expectation that 4.23 million acre-feet of water could be delivered by a SWP built to capacity."[69]

Corporations and water agencies are trading in "paper water" as a way of "gaming" the water in California to keep the severely over-stretched public water projects pumping water to the highest bidder. Though the contracts referred to as "paper water" do not correspond to deliverable water quantities—as noted in the Third District Court of Appeals

PCL v DWR decision—they function as a siphon to pull as much water as technologically possible out of the Delta. Real estate development corporations can use "paper water" contracts to get their projects approved without having a secure water supply. Once the projects are built, and the people about to move in, the corporations can use the contracts to demand water deliveries from the state. Such deliveries would most likely come through purchasing water rights from small farmers (potentially driving them off their land), not to mention continuing to neglect existing rural communities without access to safe drinking water and the deteriorating Delta environment.

Newhall is trying to purchase SWP water entitlements from Castaic Lake Water Agency.[70] Castaic, in turn, is attempting to double its SWP water entitlements by purchasing more from such water dealers as the Kern County Water Agency, and its member districts Berrenda Mesa Water District and Belridge Water Storage District.[71] Paramount's president and vice-president are presidents of the boards of directors of Berrenda Mesa and Belridge respectively.[72] Paramount is apparently thus well poised to sell even more "paper water" to the largest prospective developer in California.

Newhall also purchased 55,000 acre-feet of storage capacity in the Semitropic Water Storage District—one of the participants in the Kern Water Bank Authority.

With control over water storage facilities, the largest agribusiness companies like Paramount can hold on to enough water to do the impossible in a severely over-drafted groundwater basin: increase their production *and* sell to developers. Also, with development companies able to buy in directly to the storage facilities as well as purchase "paper water," they can argue before the courts that their water supply is reliable, on paper.

Lynne Plambeck, an activist with the Santa Clarita Organization for Planning the Evironment (SCOPE) and an ardent opponent of the Newhall Ranch project, said that control over storage facilities like the Semitropic Water Storage District and the Kern Water Bank is "a way of controlling water without actually owning water."[73] Private facilities can favor developers over farmers and large corporations over small businesses by charging less to those who store large amounts of water. One company or individual, Ms. Plambeck said, "can take up the storage facility with a lot of water, and then a drought comes along...They can corner the market with no public oversight, just like Enron."[74]

Private storage facilities are not subject to public oversight through laws such as the California Environmental Quality Act (CEQA), Ms. Plambeck said: "When the water goes into storage facilities in the Kern Fan, there is no oversight, no CEQA. The public only has a chance if there is a CEQA process."[75]

And what happens when the water isn't there? With the houses built and the new dwellers moved in, the developers will push for new dams and more pumping of water from the north to save the stranded residents from drought. The losers will be the same: the rural communities in the north and throughout the valley, the tax and ratepayers who ultimately have to pay for it all, and the environment upon which all Californians depend.

Blaming the Environment

IN A SERIES OF ARTICLES written in 2002 on water issues in California, the *Sacramento Bee* profiled Kern County as "the hub of the water trade."[76] Dale Kasler, water correspondent for the *Bee*, reported that Kern water districts generated more than $100 million by selling water to cities throughout the state. In 2001, the Kern County Water Agency bought water from the SWP for $161 an acre-foot and then sold it back to the state's Environmental Water Account (EWA) for $250 an acre-foot, amassing $29 million. Paramount's Westside Mutual Water Company sold water it had previously "banked" in the Kern Water Bank to the EWA in 2000. All told, Kern Water Bank participants sold a total of 72,000 acre-feet to the EWA that year. Jim Nickel sold 10,000 acre-feet to the EWA for a total of $4.6 million, at "an eye-popping $460 an acre-foot."[77] What is even more "eye-popping" is that taxpayers throughout the state foot the bill for these sales.

The Environmental Water Account is a taxpayer-subsidized scheme that enables corporate agriculture to get around state and federal endangered species acts. It was created by CALFED, the state and federal collaborative effort to mitigate the continued devastation of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. CALFED is another step-child of the 1987-1992 drought that inspired the Monterey Amendments.

When the federal or state fisheries notify DWR of "high incidental intake"—when the pumps used to lift the SWP water uphill are sucking up too many endangered species—DWR slows down its pumping and monitors the amount of water *not* being pumped. DWR offers to purchase water from users south of the pumps and then deliver that water to contractors with higher value crops.[78] As a result, the water not pumped from the Delta is said to have been purchased for the environment. "Anytime by law exporters [SWP contractors] would have to stop pumping due to environmental or water quality conditions in the Delta, taxpayers buy replacement water for them," said Michael Jackson, a water attorney with the California Water Network who works with rural counties in Northern California.[79]

According to the chief of water transfers for the DWR, Jerry Johns, the EWA "is an example of a market remedy to help the environment."[80] The Public Policy Institute of California goes even further, saying that "[m]arket growth in the aftermath of the drought has been largely driven by environmental concerns."[81] Indeed, stronger environmental laws and advocacy have driven the largest SWP contractors to finagle market mechanisms to maintain undiminished SWP deliveries (secured by the "no net loss to exports" provisions for the EWA).[82]

The EWA enables market advocates to green-wash water sales. Advocates say that the program may be "a solution for creating more instream flows for endangered fish and habitat."[83] However, this is misleading. Agribusinesses and developers are not turning back water into the Delta. Rather, when their pumping threatens the continued existence of such species as winter-run salmon, the state pays to send them a quick fix.

The Napa Proposition

IN JULY OF THIS YEAR (2003) the Federal Bureau of Reclamation, the California Department of Water Resources (DWR), and representatives from the largest agricultural and urban water districts in California—including the Westlands Water District, the Kern County Water Agency, and the Metropolitan Water District of Southern California—met in Napa in a series of closed, mediated sessions (by the same retired judge who mediated the Monterey meetings in 1994) to, yet again, restructure the state and federal water projects.[84]

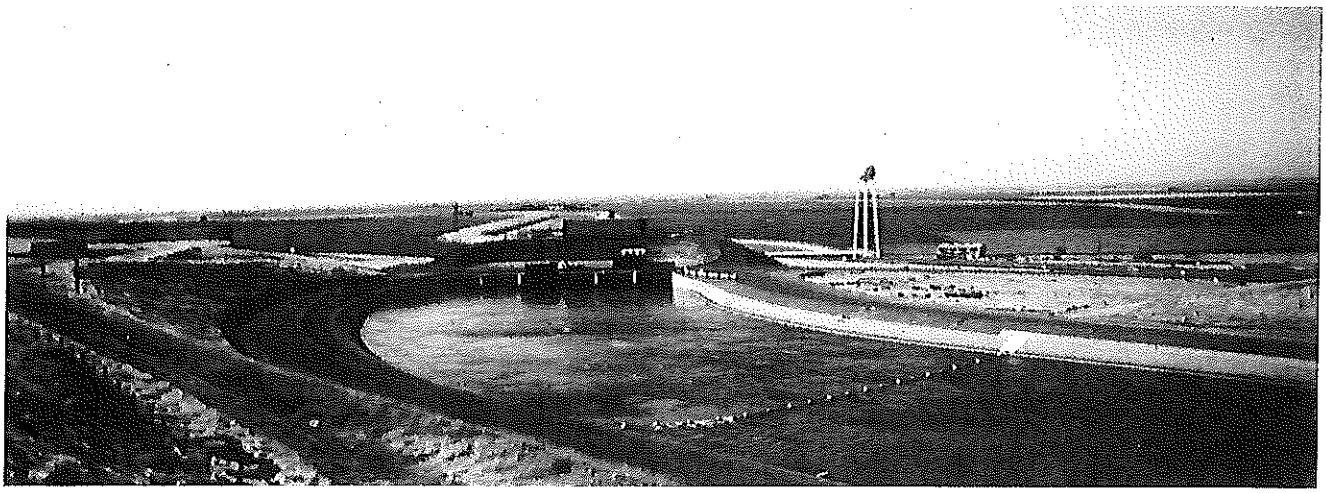
As noted by State Senator Michael Machado in a letter to the Editor of the *San Joaquin Record* on August 27, no "representatives of the Delta, environmentalists or anyone one else outside their small circle" were included in the meetings.[85]

The agreement that resulted from the meetings, called the Napa Proposition, plans to further integrate the SWP and the CVP. Such integration will allow landowners, principally in the San Joaquin Valley and Southern California, to trade off the federal project's superior storage capacity and the state project's greater pumping capacity with one goal in mind: to continue pumping water to agribusinesses, developers and water marketing barons in Southern California, unabated by either federal or state endangered species acts or water quality issues in the Delta.

Giving SWP contractors access to CVP storage capacity violates the later project's federal acreage limitations by enabling landowners, like Paramount, with over 100,000 acres to profit from federally funded infrastructure.

Increasing the SWP's pumping capacity violates the intent of the Delta restoration efforts and the federal and state endangered species acts by manipulating the technology to pump more water south at faster rates, ignoring the long-term effects of such levels of water exports on the environment.

The Napa Proposition would continue and greatly exacerbate the negative impacts of the Monterey Amendments, allowing the SWP and CVP to juggle water to maintain unsustainable exports for unsustainable development, unsustainable industrial agricultural practices and taxpayer-subsidized water sales among the state's largest landowners.



The State Water Project's California Aqueduct is a vital public asset that must be administered as an integral part of California's public utilities for all Californians, not as private property for a few.

Public vs. Private Property

WATER MARKETS, much less insider trading regimes, are incompatible with California's constitutional protection of water as a public trust. The concept of private property that is essential to functioning markets cannot justly be superimposed on the state's public trust doctrine or the taxpayer-funded public water projects that gather, deliver, and store water. The state grants the right to *use* water, not to *own* it.

California state law considers water to be public property, not private. Article 10, Section 2 of the California State Constitution states:

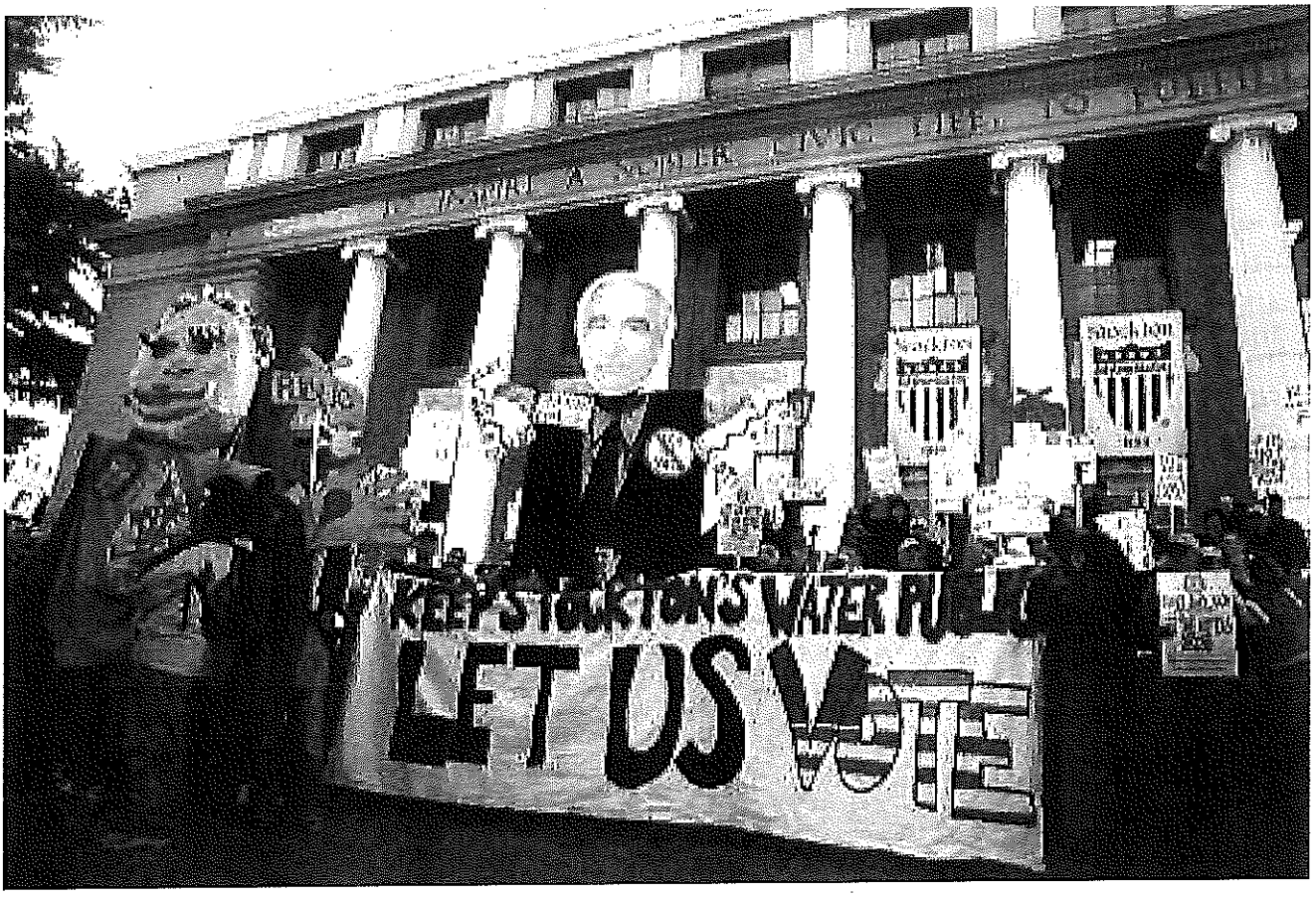
> It is hereby declared that because of the conditions prevailing in this State the general welfare requires that the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare.[86]

The architects of the backroom Monterey and Napa meetings, however, have come up with a way to privatize the state's water resources in violation of the constitution. What advocates are now calling a water market is actually a public rip-off designed by and for large corporations in monopoly-like situations.

Moreover, this "market" both survives and thrives on overstating water supply so as to make millions in profit on "paper water." The imbalance between supply and demand does not stop there: paper water sales allow massive developers like Newhall to create and profit from demands that were previously nonexistent. By building housing developments in the desert where no natural water supply exists, developers will use the "build it and the water will flow" logic to create further unsustainable reliance on water diversion from the north. Thus, far from making "more efficient use of existing supplies through reallocation," the architects of California's water market have rigged a system where water continues to flow to money. This is not efficient, much less just.

Joseph Sax, in his landmark essay *The Public Trust Doctrine in Natural Resource Law: Effective Judicial Intervention*, writes that, of the ideas that underpin the public trust doctrine in American law, the idea with the "greatest historical support holds that certain interests are so intrinsically important to every citizen that their free availability tends to mark the society as one of citizens rather than of serfs. It is thought that to protect those rights, it is necessary to be especially wary lest any particular individual or group acquire the power to control them."[87]

The state's giveaway of the Kern Water Bank and its backroom deregulation of the State Water Project have done just that: given the power to control California's water and the multi-billion dollar public projects that move that water to a particular group of private corporations.



Local and statewide activists and union members fight to keep water utilities under public control in Stockton, CA.

End Game: Time for a Vibrant Water Democracy

PREDICTIONS ESTIMATE that California's population will grow by up to 20 million over the next 20 years. Such growth places strong demands on the state's limited water supplies, and makes the need for a publicly accountable, equitable, and environmentally sustainable system of water distribution all the more imperative. It will be possible to meet the state's water needs, but not if private interests such as Paramount are allowed to control—and profit from—key public water resources like the Kern Water Bank.

Under the public trust doctrine, California's water is held in trust for the people of California, our future generations and the environment. Thus, California's water supplies should be managed with the greatest level of public accountability and oversight to ensure that water is distributed where it is needed most, not where it is most profitable.

California's public water utilities and resources are governed by a plutocracy—a select group of private corporations, individuals, semi-public and public officials all working in tandem to "game" water policy in the state. They meet in closed sessions and rewrite public policy, tailoring their edits to the interests of monopoly-like agribusiness corporations and real estate developers. Is this a conspiracy theory? No. It is just business as usual.

The water plutocracy must be replaced with a vibrant water democracy.

To protect California's water from profiteering:

Return Kern Water Bank to Public Control/ No More Public Giveaways

The Department of Water Resource's decision to give away the Kern Water Bank should be immediately reversed. The state's giveaway of this valuable resource to allegedly "local agencies" was in violation of the public trust doctrine and the California Environmental Quality Act and should never have taken place. Local control of this resource has become tantamount to private corporate control. Paramount and its Westside Mutual Water Company should never have been

allowed to "own and operate the water bank," especially in light of their confessions to Bakersfield reporters that sales from the bank were in their plans from the very beginning. The privatization of this vital public resource should be reversed.

Repeal the Monterey Amendments

The Monterey Amendments—the backroom restructuring of the State Water Project—usurped participatory democracy in California water policy. The "amendments" also perpetuate and gravely exacerbate the environmental detriment and social injustices established by the water plutocracy that has gamed tax and ratepayers for decades to raise agribusiness empires on subsidized water deliveries. The Monterey Amendments should be repealed and the State Water Project contracts should be rewritten with an eye to water conservation and environmental restoration as well as the original stated purpose of the project to reallocate California's water resources in an *equitable* manner.

Eliminate Paper Water

The Department of Water Resources continues to maintain on paper that the State Water Project can deliver almost twice as much as nature provides. After decades in operation, it is clear that the paper contracts do not match reality. The water "entitlements" of the twenty-nine State Water Project contractors should be re-drafted to fit the actual capacity of the project to deliver. Such re-drafting is provided in the original article 18(b) that contractors struck from the contracts in the closed Monterey meetings. Local and regional land-use planning decisions should be re-evaluated to ensure that developments have not been permitted based on water supplies that do not exist.

No Resale of State Water Project Water

The individual contractors that receive state project water should not be allowed to profit from reselling that water, whether it is back to the state Environmental Water Account or to real-estate developers. Furthermore, after decades of overdraft, pollution, and watershed devastation, the California and Federal cooperative venture known as CALFED requires that water quality be restored in the San Joaquin Delta and the rivers that feed into it. Clearly, there is no "surplus" water to be traded among corporations. Paramount and other private interests must not be allowed to hoard water to sell at a later date.

Democratize Water and Irrigation Districts

Water and irrigation districts that receive public water deliveries from the State Water Project (SWP) should be open, transparent, and accountable to the public. Most water and irrigation districts that receive SWP water are controlled by large-landowners driven by their interest in paying as little as they can for as much water as they can get. With the twin goals of expansion and profit, landowners such as Paramount make decisions over public resources without being held publicly accountable. There should be elected, public representatives on the boards of such districts who would represent the non-landowning population affected by water policy decisions made most often in closed sessions and meetings.

The Kern Water Bank's accounting of stored and transferred water—where the water deliveries come from, and where they end up—should be immediately disclosed to the public. All water trades and transfers should be publicly recorded with full disclosure of the financial terms of the agreement, as well as the identities of the buyers and the sellers. All water delivery, storage and transfer deals should be made with full and meaningful participation of the public.

NATURE PROVIDES ENOUGH WATER for California to meet all of its needs: to sustain water-efficient family farms and industries; to provide safe drinking water to present and future generations; and to restore and maintain California's much-abused environment. Nature provides enough water; that is, unless mismanagement and greed intervene and allow for the state's public water supplies to be manipulated for profit. Too much is at stake to let this water heist continue.

Get Involved

About Public Citizen's *Water for All* Campaign

Public Citizen is campaigning to protect universal access to safe and affordable drinking water by keeping it in public hands. Public Citizen does not believe that citizens benefit from privatization of their water and wastewater systems because the sale of public works to private companies can foster corruption and result in rate hikes, inadequate customer service and a loss of local control and accountability.

Public Citizen List Serves

Public Citizen maintains two water-related email lists. The Water for All list focuses on national and international efforts to protect water as a human right and includes action alerts, news articles, reports and the monthly newsletter of the Water for All campaign, Currents. The California Water for All list includes issue updates, campaigns action alerts, and Currents.

To subscribe to the Water For All list, send an email to cmep@citizen.org with "subscribe Waterforall" in the message.

To subscribe to the California Water for All list, send an email to cmep@citizen.org with "subscribe Waterforallca" in the message.

Groups Working on Water Issues in California

Alliance for Democracy
1223 Sequoia Place
Davis, CA 95616
phone 530.758.0726
http://www.theallianceforddemocracy.org

California Water Network
808 Romero Road
Santa Barbara, CA 93108
phone 805.969.0824 fax 805.565.3394

Center for Race, Poverty and the Enviroment
1224 Jefferson St., Suite 25
Delano, CA 93215
phone 661.720.9140 fax 661.720.9483

Community Alliance with Family Farmers (CAFF)
36355 Russell Blvd.
Davis, California
phone 530.756.8518 fax 530.756.7857
http://www.caff.org

Environmental Justice Coalition for Water
1010 11th St., Suite 305
Sacramento, CA 95814
phone 916.341.0612 fax 916.341.0401
www.ejwatercoalition.org

Santa Clarita Organization for Planning the Environment (SCOPE)
P.O. Box 1182
Canyon Country, CA 91386
phone 661.255.6899, extension 2
http://www.scope.org

Sierra Club, Angeles Chapter
3435 Wilshire Blvd., #320
Los Angeles, CA 90010
phone 213.387.4287 fax 213.387.5383
http://angeles.sierraclub.org

United Farm Workers (UFW)
1010 11th St., Suite 305
Sacramento, CA 95814
phone 916.341.0612 fax 916.341.0401

Glossary

Acre-foot An acre-foot of water is the amount of water necessary to fill an area of one acre to a depth of one foot, or about 325,000 gallons. One acre-foot of water is roughly the amount that two families of four consume in one year.

Central Valley Project (CVP) A Federal Bureau of Reclamation water project consisting of 20 dams and reservoirs, 11 power plants, and 500 miles of major canals. The project delivers about 7 million acre-feet of water annually.

Department of Water Resources (DWR) The California state agency that is responsible for managing the State Water Project.

Entitlement Also referred to as "Table A Allotment" in the Monterey Settlement, this is the volume of water contracted to State Water Project purchasers.

Environmental Impact Report (EIR) The study and report that is required under the California Environmental Quality Act for any large public or private infrastructure project as a means to assess the potential effects of the project on the environment.

Environmental Water Account (EWA) A component of the CALFED program, the EWA pays SWP water users when water deliveries are slowed down or reduced so that the SWP pumps decrease the amount of endangered fish species that get caught and killed in them.

Joint Powers Authority The agency created when two or more entities enter into a joint powers agreement. A joint powers agreement allows different (usually) public entities to join together in order to exercise their common powers toward a common objective.

Kern County Water Agency (KCWA) The KCWA was created in 1961 to distribute SWP water to Kern County water districts.

Kern Water Bank The largest underground water storage facility in the world. DWR spent $74 million purchasing the land, studying and developing the Kern Water Bank during the late 1980s-early 1990s. DWR gave the water bank to the KCWA in 1995.

Kern Water Bank Authority (KWBA) A Joint Powers Authority that consists of five water and water storage districts and agencies and one private mutual water company—Westside Mutual Water Company. Westside is in turn owned by Paramount Farming Company. The KWBA was formed immediately after DWR gave away the 20,000 acres that house the Kern Water Bank to the KCWA.

Monterey Amendments In 1994 DWR met in closed meetings with its largest contractors to rewrite the contracts that govern the SWP. At the end of the meetings the participants drafted a list of 14 principles which they called the Monterey Agreement, after the city in which the meetings took place. The changes to the SWP contracts that resulted from the Monterey Agreement are referred to as the Monterey Amendments.

Paper Water The original SWP contracts provided for an annual entitlement amount of surface water to be delivered to contractors upon availability. The SWP has never been able to deliver the contractors' full entitlements. The contractors, however, still treat the future expectations of the past as reality. One result of the Monterey Amendments was to enable contractors to buy and sell their entitlements. Hence, the entitlements, which stretch far beyond actual water deliveries, allow contractors to sell water that only exists on paper.

Roll International Corporation Roll International—a Los Angeles-based holding company, incorporated in Delaware—is one of the largest privately owned companies in the world. Roll International owns the Franklin Mint, Teleflora and a collection of agribusinesses—all of which operate in three California counties—that include Paramount Citrus, Paramount Farming, Paramount Farms, Inc. Paramount Farming is a member of the KWBA and owns 48% of the Kern Water Bank. Paramount also owns land in three of the other water districts and agencies that participate in the KWBA.

State Water Project (SWP) The SWP is a massive state water diversion and delivery project that comprises 662 miles of aqueducts, 19 dams with a combined surface area of more than 50,000 acres, 20 pumping plants, and ten energy plants producing about 6.5 billion kWh of energy annually. By 2000, Californians had paid more than $5 billion to build the project and another $11.9 billion to operate it and finance its debt.

Water Bank Water storage facility that operates like a bank. Participants or customers of the bank "deposit," or recharge, water and later "withdraw," or recover, water from their "account."

Appendix A—Historical Background

Water Flows Uphill to Money

CALIFORNIA IS A SEMI-DESERT. The mineral-rich soil of the Central Valley Region receives an average of 10 inches of rainfall a year, though far less falls in the southern portions of the Valley. Southern California's Imperial Valley receives 1 to 2 inches of rain a year. Yet, California's driest valleys are home to the richest agricultural region in the world.[88]

Step off to the side of Interstate 5 on a summer day, bend under a fence, and in the space of an inch you will see the sand turn into green fields. This is the unmistakable precision of industrial irrigated agriculture. Back on the interstate to the east and west, government-run irrigation systems douse crops with water. And as you proceed south on I-5 you will cross again and again one of the bond-funded arteries that makes this all possible: the State Water Project's California Aqueduct.

In California, agriculture consumes 77 percent of all usable fresh water.[89] Most of the water originates hundreds of miles north in the rivers bridled by the Oroville, Shasta and Trinity Dams. The state and federal projects that control the flow and destination of these rivers pipe and pump the water through a grid of nearly 4,000 miles of dams, aqueducts, canals, and reservoirs into the lands of the largest and wealthiest agribusinesses in the country.

By the 1930s, as a result of massive over-pumping, the earliest agribusinesses lowered the San Joaquin water table, the aquifer underlying the San Joaquin Valley, by as much as one hundred feet. Oak trees died and in places the valley floor itself dropped anywhere from 3 to 30 feet.[90] Fearing that they would run out of water within a matter of years, the largest landowners in the region began to push for publicly funded projects to pump water south from Northern California.

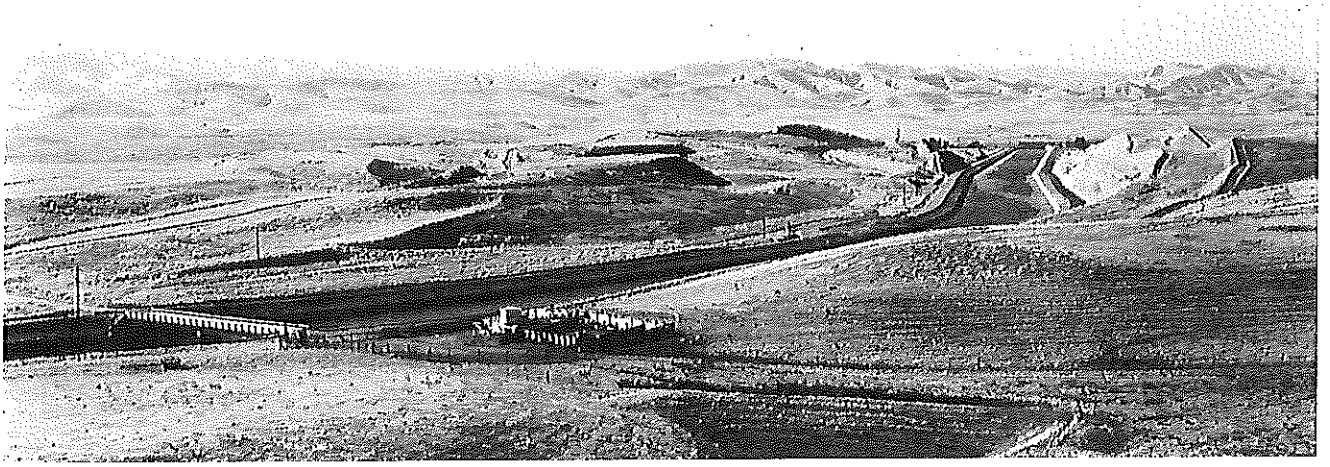
The Central Valley Project (CVP) began as a state initiative but failed for lack of funding until the federal government, and US taxpayers, came to pick it up in 1937. The CVP—the largest and most expensive public works project of its time—pipes some 9 million acre-feet of water from 20 dams and reservoirs to millions of city-dwellers and agribusinesses throughout the Central Valley and the urban San Francisco Bay Area.[91]

The Federal Bureau of Reclamation, the agency that administers the CVP, intended the CVP to break up land monopoly and promote small farms throughout the Central Valley. The project was subject to the 1902 Reclamation Law which put an acreage limitation of 160 acres—increased to 960 acres in 1982—on land eligible to receive CVP water for irrigation.

In 1978, when a federal team of investigators traveled into the largest district receiving CVP water—the Westlands Water District—they discovered that throughout the entire Westlands district there was not a single 160-acre farm. Through sleight of hand, family connections and sheer stubbornness, huge land owners failed to break up their farms and used the CVP water to build agribusiness empires.

California water historian, Norris Hundley, wrote that the CVP failed on both of its objectives: to combat monopoly and promote the family farm. Moreover, the result of the increasing power of landowners, Hundley wrote in *The Great Thirst*, was that "agriculture continued to concentrate in ever fewer hands. The number of farms over a thousand acres increased their combined property from 17.6 million acres in 1920 to 25 million acres in 1945. That trend... accelerated even more dramatically in the decades that followed. Thus did the family farm and local democracy fade from the California countryside."[92]

The California State Water Project (SWP), approved by the legislature in 1959 and by voters in 1960 made even greater



handouts to large growers in the state than the CVP. The state project was not subject to federal Reclamation Law, enabling large growers to expand production and increase acreage without the hassle of token acreage limitations. Moreover, the availability of state water as an alternative to federal water would make the Federal Bureau of Reclamation think twice before harassing the CVP recipients who were in "technical compliance" with the acreage limitations by deeding land to relatives or employees.[93]

The voter-approved bonds enabled the state to undertake the most ambitious water diversion project in history. The only way to get enough voters in Southern California to pass the statewide bond initiative—all assumed that Northern California voters would turn down a project to pay for pumping their water into the hands of Southern California landowners—was to lie about how much it would cost. Governor Pat Brown asserted that the project would cost about a billion dollars less than the estimated cost at the time.[94]

At present, the SWP comprises 662 miles of aqueducts, 19 dams with a combined surface area of more than 50,000 acres, 20 pumping plants requiring more than 60 billion kWh of energy annually, and 10 energy plants producing about 6.5 billion kWh of energy annually.[95] By 2000, Californians had paid more than $5 billion to build the project and another $5 billion to operate it and finance its debt.[96]

The Department of Water Resources (DWR) was created from 52 formerly independent state agencies to oversee the State Water Project and administer the delivery of water to the project's 29 contracting agencies.[97] These agencies range from the City of Yuba, 42 miles north of Sacramento, which had received a total of 10,260 acre-feet by 2000 to the Kern County Water Agency, which had received 26.3 million acre-feet by 2000.[98]

Kern County landowners advocated for both the CVP and the SWP as a way of improving the condition of the groundwater basin. However, with both projects, those very landowners increased the amount of acreage they held in production and thus exacerbated their overdraft of the basin.[99] Overdraft occurs when users pump more water out of the ground than nature can replenish or, in technical jargon, when extraction exceeds recharge. In Kern County, the increased overdraft of aquifers reached over 7 million acre-feet by the late 1970s.[100] According to the last *California Water Plan Update*, overdraft continues now at a pace of one million acre-feet a year.[101]

Marc Reisner, in his indispensable book, *Cadillac Desert*, described the SWP as "one of the country's foremost examples of socialism for the rich."[102] While urban water users bore the bulk of the expenses for the project, the corporate farmers got their water at bargain rates.[103]

In a 1981 report by the California Institute for Rural Studies, Don Villarejo writes that from the first SWP water deliveries in 1968 through to 1980, San Joaquin Valley contractors received 63% of the water delivered—almost entirely for agricultural irrigation—while mostly residential Southern California water users paid 70% of the costs of the project. "It is one of the many ironies of the SWP that those who get the most water pay the least, while those who get the least pay the bulk of the costs."[104] By the mid-1980s Norris Hundley estimates that Southern Californian water users were paying roughly $25 million a year in water subsidies for corporate agriculture in Kern County.[105]

According to DWR's Bulletin 132-01, by December 31, 2000, San Joaquin Area contractors had received 32.6 million acre-feet of water. They paid more than $1.3 billion for that water: an average of $40 an acre-foot. Meanwhile, contractors in Southern California received 22.5 million acre-feet of water

for a price of $6.65 billion. That makes SWP water $295 an acre-foot for Southern California's largely urban users.[106]

Hidden Government

The federal and state water projects propelled the creation of "hidden" forms of government in California: the water districts and agencies through which landowners exercise control over the state's water.[107]

Norris Hundley notes Kern County's legacy of spearheading the effort to create special water districts for the management of the new water supplies coming from the CVP and SWP. In *The Great Thirst*, he writes that bringing back the concept of property-weighted voting—the allocation of votes based on a property owner's total land value—led to the creation of a variety of new water districts, the further concentration of agriculture in ever fewer hands, and the withering of local democracy. Such districts, he writes: "are ordinarily managed by boards of directors made up of a homogeneous, single interest body of people representing the larger water users and guided by a rigid set of goals: maximization of water use at minimum cost with little or no regard for the environment or for the welfare of the people of California."[108]

The Kern County Water Agency (KCWA) , for example, was created by the state legislature in 1961 under the influence of the county's corporate farmers to buy SWP water and then sell it to the local districts where the landowners again formed the boards of directors. As an intermediary, the Agency spread out the cost of the water through a countywide property tax, principally paid by the Bakersfield urban population. Both the intent and the effect of the Agency were to generate water subsidies for large landowners.[109]

The Kern County Water Association—not to be confused with KCWA, the *Agency*—was established and run by the most powerful landowners in the county. It advocated for the creation of the KCWA by the legislature. As Gottlieb and Fitzsimmons note: "The water association had three key goals: subsidies, to keep the price of water low enough to encourage new irrigation; elimination of acreage restrictions, that is, the 160-acre limit imposed—at least in name—on certain federal projects such as the CVP; and creation of a contracting agency on a countywide basis to secure the tax base of the entire county."[110]

The arrival of SWP water through the California Aqueduct set off a "speculative spiral" in Kern County where landowners rushed to expand their acreage and set up water districts to contract for SWP water through the KCWA. "A handful of landowners dominated most of the key water districts affiliated with KCWA, and these districts, in turn, dominated the agency."[111]

KCWA now has 13 member "units" that together contract for an annual total of 1,000,949 acre-feet of SWP water. Agricultural water users hold 88 percent of the contracts while municipal and industrial users hold 12 percent.[112] Corporate farmers in Kern however, have been receiving *more* water than they contract for since the beginning of the SWP, owing to the questionable concept of "surplus" water.

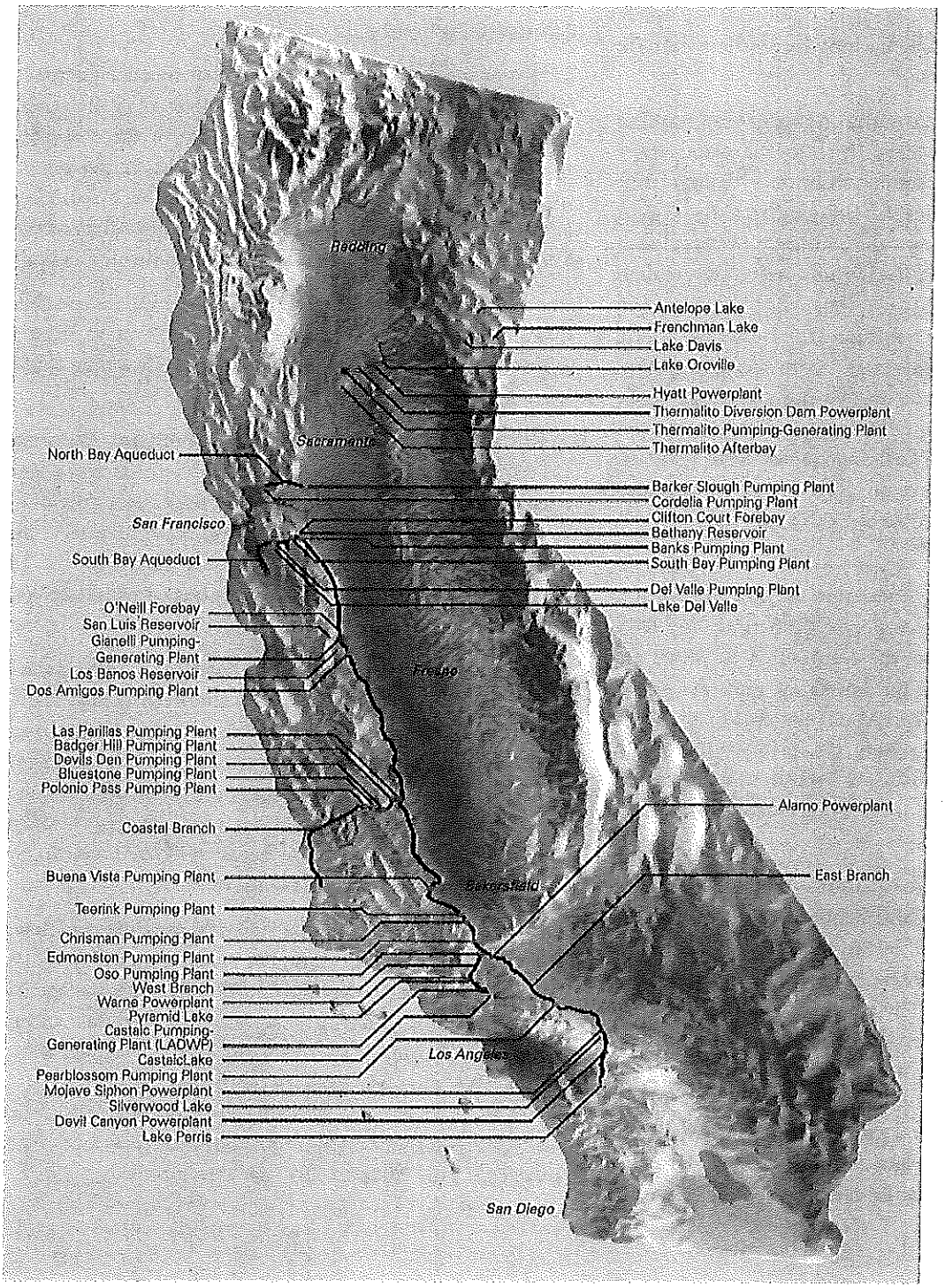
The SWP has never delivered the full 4.1 million acre-feet of water set forth in the original contracts. Average annual deliveries float at around half that amount. How then could there be "surplus" water?

The Metropolitan Water District of Southern California (MWD)—often referred to as The Met—is the largest water agency in California. MWD is a water wholesaler providing "supplemental" water to 27 clients, which in turn serve an area of over 5,000 square miles with a population of 15 million.[113] MWD is also the largest contractor with the SWP, contracting for over 2 million acre-feet of water.

MWD initially opposed the SWP, but signed on four days before the 1959 election.[114] MWD and the Kern County Water Agency came into conflict early on during negotiations over how to distribute the costs of the SWP. The agreement they reached enabled Kern to purchase water at discounted rates. MWD also had to pay for that same water creating "implicit subsidies for the agricultural agency [KCWA] which, by extension, penalized the district [MWD]."[115]

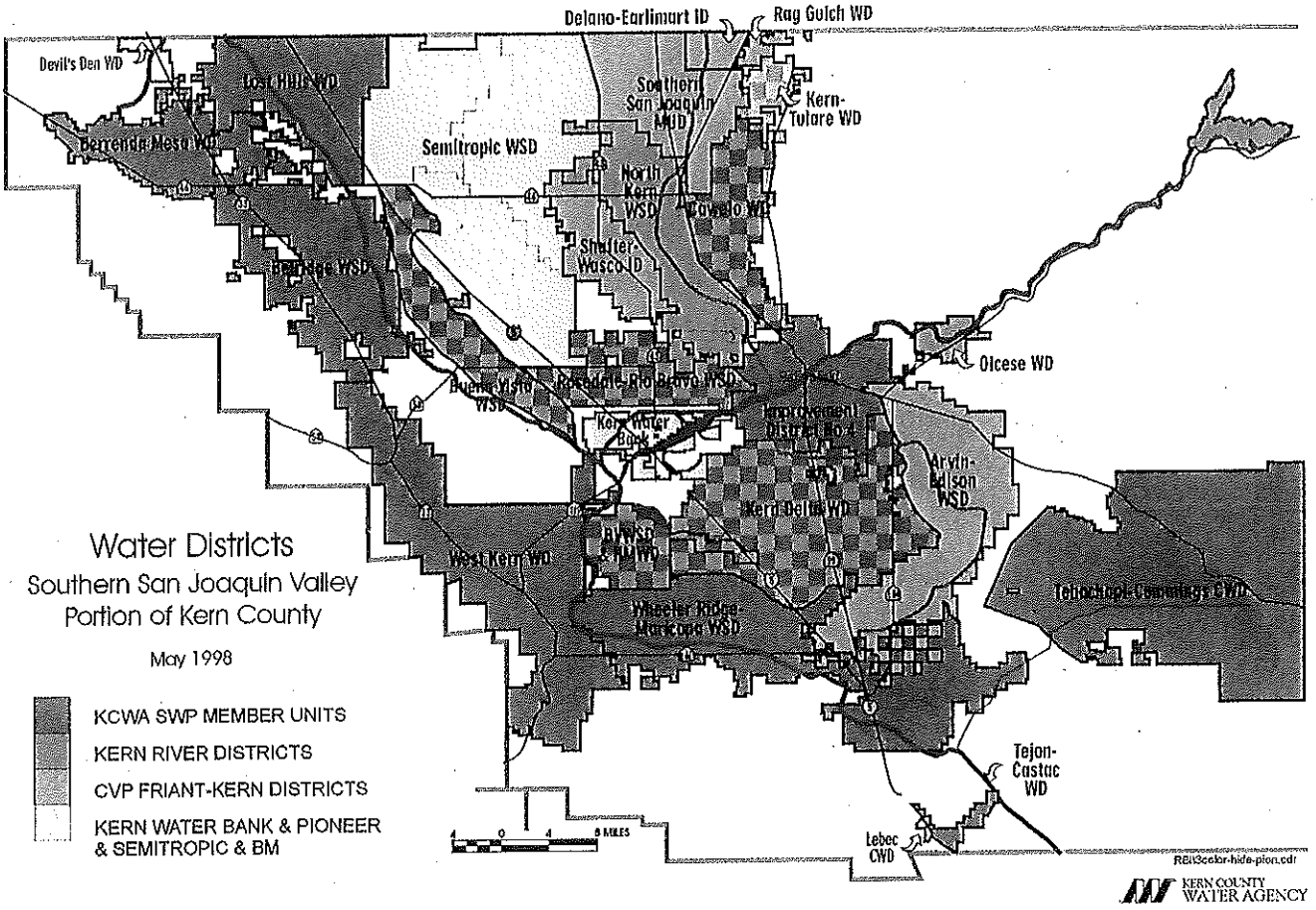
Kern landowners reaped the benefits instantly and have continued to do so ever since. For example, in 1979, KCWA entitlements had increased to 516,300 acre-feet, the agency purchased another 524,247 acre-feet of "surplus water" beyond their contract entitlements. That contracted water cost KCWA member agencies more than $15 million (or about $29 an acre-foot) while the same amount of "surplus water" only cost $2.3 million (or about $4 an acre-foot). This reduced the overall cost to $17 per acre-foot.[116]

Appendix B—Map of State Water Project



The SWP comprises 662 miles of aqueducts, 19 dams with a combined surface area of more than 50,000 acres, 20 pumping plants, and ten energy plants.

Appendix C—Map of Water Districts, Kern County



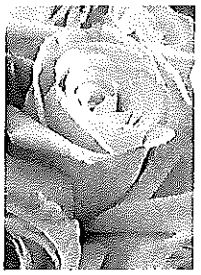
Appendix D—Roll International Corporation Holdings Diagram

Stewart Resnick

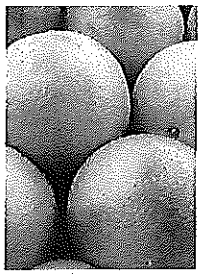
Roll International Corporation

Franklin Mint

Teleflora



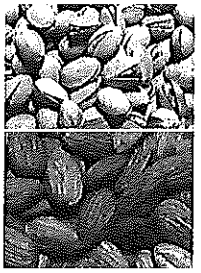
Paramount Citrus



Paramount Farming Company

PARAMOUNT
FARMING COMPANY

Paramount Farms, Inc.



Westside Mutual Water Company

Kern Water Bank Authority, 48%

Endnotes

1 California Department of Water Resources, *Overview, History, and Milestones* <http://www.dwr.water.ca.gov/swp/milestones.cfm> (17 November 2003).

2 California Department of Water Resources, "Management of the California State Water Project," *Bulletin 132-92* (Sacramento: California Department of Water Resources, Dec. 1992) 14-15 and 150-151. Dan Flory, Chief of State Water Project Analysis Office, personal interview, 20 August 2003.

3 Dan Flory, personal interview, 20 August 2003.

4 Josh Newcom and Elizabeth McCarthy, *Layperson's Guide to Water Marketing.* (Sacramento: Water Education Foundation, 2000), 17.

5 James Beck, Assistant General Manager, and Gary Bucher, Water Resources Manager, Kern County Water Agency, personal interview, 29 August 2003.

6 Robert Gottlieb and Margaret Fitzsimmons, *Thirst for Growth: water agencies as hidden government in California* (Tucson: University of Arizona Press, 1991), 94.

7 James Beck and Gary Bucher, personal interview, 29 August 2003.

8 For background information on the Monterey Amendments, see the California Water Network's white paper "The Monterey Agreement—The State Water Project Contracts (SWP)—The Kern Fan Element" (March 2003) and Tim Stroshane, "Monterey Agreement: A Bloodless Coup" *Spillway: California Water, Land and People* 1, no. 2 (2000).

9 This requirement was stated in Article 18(b) of the State Water Project contracts. The Monterey Amendments eliminated Article 18(b) from the contracts. See *Hatch and Parent Law Offices* "Monterey Amendments and White Paper" (September 1995) p.10.

10 *Planning and Conservation League v. Department of Water Resources* (15 September 2000) 83 Cal. App. 4th 892, 912-913 (hereinafter PCL v. DWR).

11 *PCL v. DWR.* Also, see California Water Network's white paper "The Creation of 'Paper Water' & State Water Reliability" (March 2003).

12 Norris Hundley, Jr. *The Great Thirst: Californians and Water: A History* (Berkeley: University of California Press, 2001), 525.

13 PCL v. DWR.

14 The Settlement Agreement may be accessed online at: California Department of Water Resources, *Monterey Agreement Overview,* <http://www.montereyamendments.water.ca.gov> (17 November 2003).

15 *Settlement Agreement by and among Planning and Conservation League, Plumas County Flood Control and Water Conservation District, Citizens Planning Association of Santa Barbara County, Inc. and The State of California Department of Water Resources, Central Coast Water Authority, Kern Water Bank Authority, and those State Water Project Contractors identified herein.* (5 May 2003) 22. Available at <http://www.montereyamendments.water.ca.gov/> (17 November 2003).

16 Carolee Krieger, President of the California Water Network, personal interview, 9 June 2003.

17 Tim Stroshane, "Monterey."

18 Jonathan Parker, General Manager, and Cheryl Harding, Administrator, Kern Water Bank Authority, personal interview, 11 June 2003.

19 Kern Water Bank Authority, "Project Description," (Bakersfield: Kern Water Bank Authority, undated) 2.

20 Michael Gardner, "Imperial-federal dispute could torpedo water deal," *San Diego Union Tribune,* 12 September 2003.

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[111] *Ibid*, 96-97.

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[113] Gottlieb and Fitzsimmons, *Thirst for* Growth, 5.

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[116] *Ibid*, 97.

ATTACHMENT H

Jelle

APR 19 1993

Mr. George R. Baumli, General Manager
State Water Contractors
555 Capitol Mall, Suite 725
Sacramento, California 95814-4502

Dear Mr. Baumli:

In response to your February 24, 1993 letter, we agree with the need to reduce expenditures for the Kern Water Bank program in light of the potential adverse impacts of the endangered species issues in the Delta and the current financial situation of the Contractors. Because of the uncertainty associated with these issues, we have halted all design efforts for the First Stage Kern Fan Element facilities and developed a revised work plan for all other KWB-related activities. The revised plan is based on the primary assumption that present planning efforts will be completed during the 1993-94 and 1994-95 fiscal years, and, only a minimal program to meet Department of Water Resources responsibilities and commitments for the KFE property will be continued after June 30, 1995.

Completion of the Department's present planning efforts for the Kern Water Bank during fiscal years 93-94 and 94-95 will focus on the following four activities:

1. Complete the Habitat Conservation Plan and negotiate a management agreement with the Department of Fish and Game and an implementation agreement with the U.S. Fish and Wildlife Service.

2. Once the water supply impacts of the listing of the Delta smelt as a threatened species are identified, evaluate the KFE for both short-term and long-term feasibility. A long-term plan for development of the KFE will then be prepared or, alternatively, a plan for disposal of the property will be developed. Feasibility evaluations will include short-term and long-term State Water Project programs, water banking for SWP contractors, mitigation banking of threatened and endangered species habitat, interim leases of the land for irrigated agriculture, and other possible land use alternatives that may be developed. If the decision is made to proceed with development of the project, a revised draft EIR will be prepared. Unless it can be demonstrated that the construction of additional facilities is warranted, the

revised draft would only provide for use of the existing KFE and local recharge facilities, and would include future use of the 1990 demonstration projects.

3. Complete the ground water modeling of the KFE and evaluate the potential of the property to accommodate proposals for both SWP and local uses, and complete documentation of the KFE and regional KWB models.

4. Complete an internal DWR analysis and review of the local element prefeasibility studies to allow comparison with the KFE, the Semitropic feasibility analyses, Los Banos Grandes, and other DWR projects. The analyses would use uniform costs and procedures, including the recently developed sequential hydrology methodology for determining water supply benefits.

Because the time and effort required to complete items one and two above cannot be well defined, there is a need to set priorities. Although completion of an internal DWR analysis for the local element prefeasibility studies would be important to the orderly resumption of KWB planning activities, it will have lower priority than activities presented in items one through three above. The local element prefeasibility studies will only be started once the staffing needs for items one and two are fully met and adequate staff is available.

The minimum level of program effort after June 30, 1995 to meet DWR responsibilities and commitments for the KFE property will include the following activities:

A. Internal coordination between related programs within DWR, coordination with KCWA, participation in the Kern County Ground Water Storage Advisory Committee and its Engineering Subcommittee and working groups, and participation in SWC Ground Water Committee efforts will be continued. Coordination activities would also include the review of CESA and FESA environmental documentation of ground water projects related to the KWB, and continuing negotiations for the Water Code Section 11258 KFE contract.

B. Management of the KFE property would be directed toward control of noxious weeds; maintenance of ground cover to prevent wind erosion and dust storms; clean-up of contaminated soils; clean-up of trash; removal and storage of existing pumps, motors, and related equipment; maintenance of roadways to provide continued access to utilities and for land management activities; protection of the property from vandalism, thievery, and trespass; and administration of permits and easements.

C. Activities related to compliance with the ESA permits would include training personnel of DWR, KCWA, and other agents of DWR. This training would focus on the terms and requirements of the permits. Compliance activities would also include the planning and implementation of mitigation measures required under the HCP and the biological surveys and supervision of activities to ensure that land maintenance and La Hacienda operation and maintenance activities are in compliance with the terms of the permits. Mitigation measures to be implemented will include avoidance procedures, fencing, improvement of habitat, creation of habitat, maintenance of habitat, and habitat monitoring activities.

D. Ground water monitoring and reporting will include monthly water-level measurements of the KFE monitoring well network, quarterly sampling of the monitoring well network for minerals, and the preparation of semiannual monitoring reports. In years when significant recharge takes place at the City of Bakersfield facilities, water-level monitoring will be done every two weeks to evaluate mounding and mound dissipation near recharge ponds. When an increase in ground water levels occurs, or when a change in water quality is detected at one of the sampling sites, water quality sampling and testing would be expanded to include pesticides, petroleum products, and other organic compounds. The semiannual reports will include water-level and water quality data, contour maps of the ground water surface, and mapping of known contaminants. An annual report will also be prepared to analyze the impacts of activities by DWR and others on the ground water levels and quality. As a part of this report, the KFE ground water model would be used to determine ground water levels both with and without DWR activities.

E. A program will be continued to maintain the La Hacienda facilities in an operationally ready state, maintain the access roads to the project facilities and monitoring well sites, and control weeds around well sites and along project facilities.

Attached are detailed KWB cost summaries for the Divisions of Planning, Operations and Maintenance, and Land and Right of Way for the remainder of fiscal year 1992-93 and budget estimates for fiscal years 1993-94 and 1994-95. Estimated total expenditures for all KWB-related programs for 1992-93, 1993-94, and 1994-95 are summarized in the following table.

Mr. George R. Baumli, General Manager
APR 19 1993

KERN WATER BANK PROGRAMS
ESTIMATED COSTS

	FY 92-93	FY 93-94	FY 94-95
Operations and Maintenance			
La Hacienda Facility Construction	$1,230,600	$ 0	$ 0
Power Costs	560,100	108,000	108,000
Department Staffing	964,800	512,000	500,000
Operations and Maintenance	378,200	243,600	243,600
Subtotal	3,133,700	863,600	851,600
Land and Right of Way			
Department Staffing	165,000	216,000	197,000
Land Management Contracts	516,200	666,600	474,700
Subtotal	681,200	882,600	671,700
Planning			
Department Staffing	1,735,500	1,262,000	926,000
Contracts	542,000	325,000	570,000
Subtotal	2,277,700	1,587,000	1,496,000
TOTAL	$6,092,600	$3,333,200	$3,019,300

The revised program for KWB is designed to meet the minimum project needs for coordination, maintenance, and compliance with federal and State laws. I would welcome the views of the SWC on the proposed program. If you have any questions about the proposed program or associated costs, please contact Jack Erickson, Program Manager of Kern Water Bank, at (916) 653-9633.

Sincerely,

(sgd) David N. Kennedy

David N. Kennedy
Director

Attachment

Control No. 93-0170

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LETTER 30

STATE OF CALIFORNIA

OFFICE MEMO DATE: February 13, 1996

TO: John Pacheco

FROM: Jack Erickson

SUBJECT: 11258 Negotiations - Wrap Up Report

As I promised, I went through my calendar for and searched my memory for references to our 11258 negotiations.

Don Kurosaka made the first DWR draft of an 11258 Agreement for the entire Kern Water Bank while he was still in planning. I called Don and asked him search his memory. He left Planning in September 1990. He thinks he completed the draft agreement about 3 months before he left. The document was given to SWPAO as a starting point for negotiations.

Scott Jercich spearheaded the first attempt to negotiate a document. This attempt focused on a document that would only cover the Kern Fan Element but could also be used as a reference for preparation of similar agreements for each of the local elements. Strategy meetings started in October of 1991 (by my calendar) and a new DWR draft was developed through these sessions. The face to face negotiations began with an icebreaker session here in Sacramento on February 10, 1992. There was a lot of drought activity at this time and little interest in 11258 negotiations so some time passed before we could schedule the next session. The second session, a big one, was held in Bakersfield on April 13, 1992. This session was a dissertation by Tom Clark on the MOU, what he thought the agreement should be, and an "if we think we must, we will buy it" closing.

Im not sure of all the sequence of the following events but I think it went like this: 1) We completed a draft and sent it to Kern County for comment. 2) Kern County interests held a series of working meetings and returned a draft that represented their interests. We now had two drafts, they were completely different and a meaningful compromise seemed hopeless. If I remember right, they wanted to recharge and extract at their will and not pay for any "stinking mitigation costs". We had a lot of "what do we do now sessions" and tried to get our management to meet with Tom Clark to give use some direction. On October 30, 1992 there was a well attended meeting with Tom Clark, John Silveira, and Dave Shuster -- the shoot out in Sacramento. It was meaningful in that it established that there was a difference of opinion at management level and this was not "just a staff problem". Negotiations died at this point.

In late 1993 I tried to get KCWA and the Kern Fan Group to Collaborate on development of the KFE Ground Water Model. Jim Jenks of KCWA told us they to "go away, they could not wait for us". I wrote a letter, Huntley to Clark, telling them that DWR could not stand behind the model they were using because it wasnt an official DWR release. We had a meeting in Huntleys office in early 1994 (Cant find the date anywhere) with Huntley, Clark, and staff to discuss our differences over the model and other problems. It turned into a typical Tom Clark "lets work together and help each other" session. It was also agreed that, as part of our new attempt at cooperation, would make a sincere effort to resolve the local use issues that were holding up the 11258 agreement. This time we tried to limit discussions to a small group of DWR and KCWA technical staff. My calendar shows two negotiating sessions with the first held on March 16,1994 and the second on April 6, 1994. We made unbelievable progress towards and agreement at the first meeting. After the first meeting the KCWA staff reviewed the issues with Tom and at the second meeting things went back to the old hard line KCWA position. At our next Directors briefing we were instructed to wait for them to make the next move. That was the last of the 11258 negotiation process.

LETTER 30

R-R.

STATE OF CALIFORNIA—THE RESOURCES AGENCY

PETE WILSON, *Governor*

DEPARTMENT OF FISH AND GAME
1416 NINTH STREET
P.O. BOX 944209
SACRAMENTO, CA 94244-2090
(916) 653-4875

July 20, 1995

Mr. Dan Masnada, Executive Director
Central Coast Water Authority
255 Industrial Way
Buellton, California 93427-9565

Dear Mr. Masnada:

The California Department of Fish and Game (DFG) has reviewed the draft Environmental Impact Report (DEIR) for the Implementation of the Monterey Agreement (SCH No. 95023035) prepared by the Central Coast Water Authority (CCWA). The Monterey Agreement is the result of mediated negotiations between the Department of Water Resources (DWR) and the State Water Project (SWP) Contractors to resolve disputes over water supply contracts. To avoid litigation by the SWP Contractors, DWR entered into this agreement which will settle disputes over water allocations and certain operational aspects of the SWP. The stated principal objectives of the Monterey Agreement are:

1. **increase the reliability of existing water supplies for both Urban and Agricultural Contractors,**

2. **stabilize the rate structure to improve the financial viability of the project for all Contractors,**

3. **increase water management flexibility (including but not limited to transfers) for all Contractors, and**

4. **complete the State Water Project.**

The Monterey Agreement contains 14 principles, which if fully implemented will potentially result in significant adverse environmental impacts. The DEIR describes five major program components as those principles having the potential for causing current, tangible, and quantifiable environmental impacts when implemented. These components are:

1. Revisions to the methodology used to allocate water among SWP Contractors (Principles 1,2, and 7).

2. Retirement of 45,000-acre feet (AF) of agricultural entitlement (part of Principle 3).3.

   Transfer by sale, between willing sellers and willing buyers, of 130,000 AF of entitlement from Agricultural Contractors to Urban Contractors (Principle 4).

4. Changes in control of the Kern Fan Element(KEF) of the Kern Water Bank (part of Principle 3).

5. Changes in the manner in which Castaic Lake and Lake Perris terminal reservoirs may be operated (Principle 6).

The DEIR describes variations of these program components under three proposed scenarios and the no action alternative. We have provided comments on these program components and on some other Monterey Agreement principles that we believe could have adverse consequences for fish and wildlife.

We have prepared general comments on the DEIR followed by specific comments referenced to page and paragraph.

GENERAL COMMENTS

Use of Programmatic DEIR and Subsequent California Environmental Quality Act (CEQA) Compliance

The DEIR describes a multi-faceted program that will include implementation actions by a variety of entities including DWR, Kern County Water Agency (KCWA), Metropolitan Water District of Southern California (MWD), and others. We are concerned about the possibility of excessive reliance on this programmatic document as CEQA compliance for many future projects for which the DEIR has provided no specific analysis of impacts. The statement in Paragraph 1.1 on page 1-2 raises the question of what constitutes a "good and detailed analysis of the program" so that "no further environmental documentation would be required" for many subsequent activities. What may be considered adequate analysis for a programmatic document, and thus generate no comment now, may be entirely inadequate if no tiered environmental analysis is planned.

The DEIR indicates in numerous places (three times on page 3-2, three times on page 3-3, four times on page 3-4, etc.) that some of these future actions would be evaluated in future CEQA documents and be subject to California Endangered Species Act (CESA) and Federal Endangered Species Act (ESA) compliance. Although CCWA is the designated lead agency for preparation of the programmatic DEIR, other entities besides CCWA will have the CEQA and CESA responsibilities for potential future actions which

are institutionally enabled by the Monterey Agreement. We recommend inclusion of a table listing probable future actions under this program, who will approve or carry out the actions, who will likely be the lead agency, and the type of site-specific CEQA document most likely appropriate for the circumstances.

Threatened, Endangered, and Candidate Species and CESA and FESA Consultation

Just as the programmatic DEIR does not contain an adequate CEQA analysis for future site-specific actions under the Monterey Agreement, the information presented in the DEIR on the effects of the proposed project on the State- and federally-listed winter-run chinook salmon, delta smelt, Tipton's kangaroo rat, blunt nosed leopard lizard, San Joaquin kit fox, and Federal candidate Sacramento splittail and measures to avoid or offset these effects is not sufficient for the DFG to develop a jeopardy or no-jeopardy finding with regard to Monterey Agreement implementation.

The table we describe above should identify those actions which may affect threatened or endangered species and the agency responsible for initiating CESA consultation with DFG. CCWA should initiate such a consultation for any Monterey Agreement implementation action that could affect listed species and for which no lead agency for subsequent CEQA documentation is identified.

Methodology to Allocate Water Among SWP Contractors

This program component of the Monterey Agreement consists of 3 principles. It states that: 1) allocation of water from existing facilities will be based on entitlements rather than the previously used methodology; 2) water allocations will be in proportion to each Contractor's share of total Contractor entitlements in years when SWP water supplies are less than demands; and 3) the three current categories of excess water [surplus, wet weather, and 12(d)] will be replaced by a single category called interruptible water.

The DEIR does not present an overall picture of likely outcomes that could be expected to occur under this component of the program. Revisions to this allocation methodology could result in larger supplies to agricultural users particularly in dryer years. If those supplies are not transferred to urban users, the net effect of increasing supplies and supply reliability can be accompanied by adverse impacts associated with increased drainage problems and conversion of high value wildlife crops to low wildlife value crops such as vineyards and orchards.

Shifts in the seasonal pattern of demand and deliveries will affect project operations. The DEIR should fully disclose those impacts and offer mitigation to offset or reduce those impacts.

Retirement of 45,000 AF of Agricultural Entitlement

In conjunction with the sale or lease of the Kern Fan Element by DWR to designated Agricultural Contractors, an annual State Water Project entitlement of 45,000 AF will be transferred to DWR and retired. Urban Contractors may be given access to the KFE property and use of its assets subject to approval by the Agricultural Contractors.

The DEIR should describe how frequently the foregone entitlement might be made up from delivery of water in the interruptible supply category. Alternative fates for the 45,000 AF of relinquished entitlement should be considered including use of that as water supplies for alternative wetland habitat in the Tulare Basin to offset impacts associated with contaminated evaporation ponds.

130,000 AF Transfer From Agricultural to Urban Contractors

This principle calls for the permanent sale of 130,000 AF of entitlement from Agricultural Contractors to Urban Contractors (or to non-SWP Contractors). Implementation of this principle has the potential for adverse effects in those jurisdictions both selling and acquiring the entitlement by modifying agricultural practices and accommodating growth, respectively. The DEIR states that this would result in some contractors receiving more water and some receiving less water, but that the cumulative total would remain the same.

A more detailed discussion of potential impacts and mitigation measures based on likely scenarios is warranted. Consideration of adverse effects resulting from a change in cropping patterns is necessary since changes in agricultural land use in the San Joaquin Valley would generally be exempt from CEQA and would not be further evaluated. Substantial environmental benefits would result if water made available for transfers came from districts having highly saline soils and subsurface drainage problems.

The DEIR should explain why three scenarios for Principle 4, the permanent sale of 130,000 AF of annual entitlements from SWP Agricultural Contractors to SWP Urban Contractors or other non-SWP Contractors are depicted. Principle 4 states that Kern County Water Agency is obligated to make available any portion of

the 130,000 AF not offered by other Agricultural Contractors, hence, the only basis for less water being transferred is the lack of willing buyers.

Control of the Kern Fan Element

Principle 3 states, in part, that property comprising the KFE of the Kern Water Bank owned by DWR will be sold or leased on a long-term basis to designated Agricultural Contractors. DFG has worked closely with DWR and other agencies, to develop a draft Habitat Conservation Plan (HCP) for the KFE that addresses the terrestrial impacts of certain proposed activities on the Kern Fan including groundwater recharge and extraction. This plan outlines a conservation strategy to mitigate adverse impacts to the many threatened and endangered species which occupy the area and to provide key contributions to the recovery of these species by the focused management of some Kern Water Bank lands for these species consistent with the water banking activities. None of the three alternative scenarios for KFE development described in the DEIR would achieve the conservation goals of the HCP.

The DEIR fails to adequately discuss how transfer of the facility will impact listed special status wildlife such as the Tipton's kangaroo rat, blunt-nosed leopard lizard, and San Joaquin kit fox. The DEIR needs to explicitly state that prior to any long-term commitment of KFE lands a site-specific CEQA document and management plan will be required. This plan should describe the design and operation of the KFE including both conceptual and specific elements such as the management of breeding and wintering habitat of shorebirds and waterfowl; management of upland habitat for game and nongame species; management of habitat for endangered plant and animal species; mitigation banking opportunities; and consumptive and nonconsumptive recreational uses of the property.

In addition, the DEIR needs to identify the potential sources of water for the KFE and describe the amount of surface area needed to achieve a given quantity of groundwater recharge.

DWR has agreements with DFG committing to the management of certain lands within the KFE in perpetuity as habitat for threatened and endangered species. Habitat management required by these agreements offsets impacts to the species resulting from various past DWR activities on the KFE lands and elsewhere. DWR retains title to these lands, however, these agreements stipulate that DWR shall not sell, lease, or use the mitigation land for other than the designated wildlife purpose without the approval of DFG. The DEIR should clearly indicate that before the sale or

lease of the KFE lands described in Principle 3 can occur, DWR must consult with DFG and reach agreement on how the long-term management of these mitigation lands within the KFE will be continued under new ownership. It should also point out that regardless of any change in ownership of the KFE, the development of facilities of the KFE and the Kern Water Bank as a whole will still require completion of a Habitat Conservation Plan.

Operations of Castaic Lake and Lake Perris Reservoirs

Principle 6 allows SWP Contractors who participate in repayment of the costs of Castaic and Perris reservoirs the opportunity to directly utilize approximately 50 percent of the active storage capacity of these reservoirs in order to optimize water storage and supply operations. The DEIR concludes that no adverse impacts to sensitive species would be expected to occur under implementation of Scenario A, B, or C of the Proposed Action, hence no mitigation measures are suggested.

Scenarios A and C will cause moderate changes in water storage and lake level at both Castaic and Perris reservoirs. Higher than average lake levels will occur under Scenario A, whereas lower than average levels will occur under C. Both of these scenarios have the potential to extirpate existing shoreline trees and shrubs. The DEIR acknowledges that these impacts will occur and states that vegetation would be expected to quickly establish along the new shoreline. We have several concerns with this line of reasoning and believe that there is potential for adverse impacts to sensitive species. There will be a temporary loss of shoreline riparian habitat due to either inundation or desiccation of vegetation, lasting until riparian vegetation with equivalent age, structure, and composition becomes established and matures. This will in turn result in a temporary loss of habitat for migratory and resident avifauna and other wildlife. Loss of riparian vegetation will also be detrimental to fish species occupying the reservoirs that rely on submergent and emergent vegetation for shade, cover and spawning habitat.

One of the conditions of operating the terminal reservoirs is that the contractor-requested withdrawals would be a "loan" that would have to be paid back within 5 years. The changes in lake levels that will occur as a result of storage withdrawal and then filling will make it unlikely that a mature stand of riparian vegetation will develop within this 5- year- time frame.

The DEIR needs to describe mitigation measures for plants, fish and wildlife that may be impacted due to either permanent or temporary losses of habitat. Early consultation is recommended to develop measures to avoid or reduce impacts to fish and wildlife resources.

The DEIR should also fully disclose how reoperation of Perris Reservoir may affect wildlife habitat at Lake Perris and at the San Jacinto Wildlife Area.

Evaluation of Sacramento-San Joaquin Delta and Upstream Effects

The DEIR (Chapter 3, page 3-2) asserts that no significant environmental effects on the Sacramento-San Joaquin Delta or other SWP water sources are anticipated as a result of the Monterey Agreement. This conclusion is not supported by any analysis of operations of Delta facilities or other project facilities north and south of the Delta. It seems obvious that development of groundwater storage facilities, changed operation of southern storage reservoirs, opportunities to transport nonproject water in SWP facilities and to store SWP water in both project and nonproject surface storage facilities both within and outside the service area, the creation of the "interruptible supply" category, and, finally, the reaffirmation by DWR of the commitment to complete the SWP, combine to create substantial potential for program effects in the Delta and upstream. The significance of these effects, either individually or cumulatively, cannot be judged without analysis, none of which is presented in the DEIR.

The DEIR should describe the range of likely actions under this program by DWR and the U.S. Bureau of Reclamation pursuant to the Coordinated Operation Agreement and how these actions will affect the Delta and upstream reservoir operations. An analysis of the potential operational changes affecting the Delta and rivers and reservoirs upstream of the Delta is necessary to produce an adequate cumulative effects analysis pursuant to CEQA and CESA. It is DFG's position that operating conditions permissible under present regulatory standards do not provide optimum conditions for fish and wildlife resources.

The DEIR indicates DWRSIM was used in the analysis, however, beyond the three levels of demand that are identified, the assumptions used in DWRSIM runs are not described. The DEIR must disclose assumptions regarding operation of the Kern Water Bank, south of the Delta reservoirs, and other related project and nonproject facilities in and upstream of the Delta in order for the reader to interpret model results.

The DEIR should fully disclose how Principles 8 and 9 could facilitate increased water deliveries from the Delta and to the water project service areas and how those measures could adversely affect fish and wildlife resources.

Mitigation and Monitoring Programs

The DEIR offers very few specific mitigation measures to avoid, reduce or offset impacts and never specifies who will be responsible for implementing measures that are identified. Identification of mitigation of some site-specific impacts may be appropriately deferred when it is certain that subsequent CEQA analysis will be carried out. When no additional impact analysis and review is likely, as in the case of southern reservoir operations, a commitment to adequate mitigation should be defined in the programmatic EIR. This is particularly important because CCWA has no direct connection to most of the impact-causing actions that could be undertaken pursuant to the principles in the Monterey Agreement.

Growth Inducing Impacts

The DEIR's treatment of growth inducing impacts does not present an objective view of the potential service area impacts and cumulative growth inducing impacts of the proposed project. The DEIR fails to address the program's contribution to potential adverse service area impacts and does not outline a specific plan to offset those impacts. This approach is inconsistent with CEQA guidelines.

The DEIR should describe a process for preparation of mitigation plans or regional multi-species plans and implementation of recommended mitigation measures to offset growth-inducing impacts. These plans should further the goals of the CESA with measures to acquire sensitive habitats and key movement corridors throughout the project service area for listed and candidate species. In the DFG's view, signatories to the Monterey Agreement and the lead agencies should initiate, help fund, and participate in an interagency planning effort with agencies such as the Southern California Association of Governments. This coordinated planning group would implement a comprehensive mitigation plan for affected areas using funds provided by project beneficiaries, perhaps from a surcharge on delivered water or subdivision development fees.

Fisheries Impact Analysis

The DEIR fails to adequately address potentially significant adverse impacts, minimizes the significance of those impacts that are identified and does not substantiate claimed benefits of the project to fishery resources. It also fails to include any substantial discussion of a project alternative which avoids or minimizes fishery impacts.

Cumulative Effects

The DEIR should include a discussion of the cumulative effects of the Interim South Delta Program (ISDP) and the Interim North Delta Program (INDP) proposed by the DWR. The SWP operational effects of the Monterey Agreement and these programs, which will increase the export capability of the SWP, will be different from changes in SWP operations due to the Monterey Agreement alone. Both the ISDP and the INDP are reasonably foreseeable probable future projects with effects that may compound or increase environmental effects of Monterey Agreement implementation.

The DEIR should acknowledge the ongoing CALFED Bay-Delta Program whose task is to develop and implement a long-term solution to environmental and water supply problems related to the Delta. This is relevant to Principle 12 which affirms DWR's obligation to make all reasonable efforts to complete the State Water Project.

Specific Comments

Page 1-3; Figure 1.2-1

This Figure should depict the Coastal Branch Phase II Project and give the estimated date of completion.

Page 1-7; Principle 12

This principle affirms that all reasonable efforts will be made to complete the SWP. The DEIR should describe facilities of the SWP that remain to be built, projected water deliveries and the range of impacts that are expected to occur.

Page 1-8; Table 1.7-1

We believe the Table should be modified to indicate that Principle 8, asserting the right to transport non-Project water in SWP facilities, has potential for future environmental impacts. Actions by DWR in connection with Principle 12 also will have inevitable environmental consequences.

Page 2-4; Section 2.1.3: Kern Water Bank

The implementation of the Kern Water Bank is an integral part of the Monterey Agreement and is described in every scenario for the project. However, a final EIR covering all aspects of the program and its potential impacts on the Delta has never been completed. Such an analysis is essential prior to development and operation of groundwater recharge and extraction facilities.

Page 2-14; Section 2.2.1: Scenario A

In this section and in several other places the text states that impacts can occur to both native and "disturbed" vegetation. The text needs to describe the characteristics of "disturbed" vegetation.

Page 2-15

The use of a program objective of completing the SWP as a criteria to evaluate alternatives to the proposed project is not appropriate, in our opinion, since the proposed project does not accomplish this objective either.

Page 2-15; Section 2.4

The DEIR states that the Monterey Agreement has four major objectives. The DEIR states that because of the complexity of the Monterey Agreement and of the breadth of program goals, it is extremely difficult to identify program alternatives capable of accomplishing all of the program goals. Clearly, achievement of these objectives will result in severe unmitigated impacts to fish and wildlife.

Page 2-16; Last Paragraph

The rationale for rejecting this alternative is allegedly based on a timetable that the program must meet, yet no timetable has been presented.

Page 3-2; Paragraph 4

The program's improved supply reliability should be evaluated for its effects on fish and wildlife resources. Increasing water project reliability can also have the consequence of inducing growth, resulting in expansion of urban, industrial, and residential areas as well as conversion of crops having high wildlife values to crops such as vineyards and orchards with substantially lower values.

Page 3-4; Paragraph 3

The nature of subsequent CEQA documents should be discussed particularly since later in the DEIR it states that impacts are not significant, which suggests that categorical exemptions might be pursued.

Page 3-8, 3-9; Figures 3.6-2 and 3.6-3

It is not clear why the maximum total SWP deliveries (at 3.0- million acre feet demand) would be reduced from the 3-million acre feet (Figure 3.6-2) to approximately 2-million- acre feet with implementation of the 130,000 acre feet entitlement transfer from agricultural to urban users (Figure 3.6-3). The same effect seems apparent in Figures 3.6-4 and 3.6-5 at the 4.12- million acre feet demand level.

Page 3-21

Impacts to nearly 20,000 acres of high value wildlife habitat should be addressed.

Page 3-21; Section 3.6.3

Since, in our view, impacts will likely be significant specific mitigation measures should be identified.

Page 4-24; Upstream Consequences

The statement that the summer and early fall are the periods when diversions from the Delta are most highly constrained is incorrect.

Page 4-29

Discretion for contractors to withdraw water from Castaic Lake and Lake Perris will create storage capacity that will be filled, when possible, by the export of water from the Delta during wet periods (interruptible water). This water would flow toward the Golden Gate in the absence of the Monterey Agreement. This increase in exports could cause an increase in indirect fish losses in the Delta. At this time, no measures are in place to mitigate these impacts.

Page 4-31; Section 4.2.1; First Column; Third Bullet

This Section describes the refill of water that could occur if water was purchased in or above the Delta and its potential to increase pumping rates in given months when the export capabilities are available. Again, this would affect the indirect loss rates that currently occur in the Delta. At this time no measures are in place to mitigate these impacts.

Page 4-31; Section 4.2.2; Second Column; Section on Environmental Consequences

If the KFE is sold or leased to another agency, who will be responsible for completion of the EIR?

Page 4-55; Table 4.4-5; Name Changes

Rainbow trout should be changed from *Salmo* to *Oncorhynchus*, Mississippi silversides should be changed to **Inland silversides.** Brown bullhead should be changed from *Ictalurus* to ***Ameiurus***.

Page 4-57; Second Column; Second Sentence

Mississippi should be replaced with **Inland.**

Page 4-63; First Column

Same comment as page 2-14, about disturbed vegetation.

Page 4-63; Second Column; Scenarios B and C

The words "minimal" and "moderate" do not suggest a level or direction of change. The text should describe, in a quantitative manner, the changes in lake levels and refer the reader back to the appropriate figures showing this information.

Page 4-81; Paragraph 2

This paragraph indicates a habitat conservation plan may be required for development of the KFE property. Such a plan will be required prior to development of ground water recharge and storage facilities on the property.

Page 6-1; Cumulative Effects, paragraphs 1 and 2

Several aspects of the Central Valley Project Improvement Act (CVPIA), such as the land retirement, water acquisition, and water transfer provisions, could have effects similar to those resulting from implementation of several Monterey Agreement principles, including the ones discussed in this chapter. Although it may not be possible to complete a detailed analysis of these interactions, the DEIR should acknowledge that additive impacts of similar aspects of the two programs will occur.

The DEIR should also acknowledge that SWP operations, which must conform with the provisions of the Bay/Delta Accord and the 1995 Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary recently adopted by the State Water Resources Control Board, project operations will not be the same with implementation of the Monterey Agreement as without it.

Page 6-1; Retirement of 45,000 AF of Agricultural Entitlement

The final two sentences in this Section are not at all clear. We recommend they be revised to clarify their meaning.

Page 6-2; Domenigoni Reservoir discussion

While possibly true for recreation impacts, it is not accurate to say that impacts to biological resources at Castaic Lake and Lake Perris will be offset by construction of Domenigoni Reservoir.

This concludes our comments at this time. If you have any questions please contact Mr. Jim White, Environmental Specialist, Department of Fish and Game, 1416 Ninth Street, Room 1341, Sacramento, California, 95814,(916) 653-3540.

Sincerely,

COPY ORIGINAL SIGNED BY JOHN L. TURNER

John Turner, Chief
Environmental Services Division

cc: Resources Agency
Sacramento, California

Mr. Jim White
Department of Fish and Game
Sacramento, California

State Water Resources Control Board
Sacramento, California

Department of Water Resources
Sacramento, California

U.S. Bureau of Reclamation
Sacramento, California

U.S. Fish and Wildlife Service
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Ms. Cindy Chadwick
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ATTACHMENT I

LETTER 30

ENVIRONMENTAL
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THE MONTEREY AGREEMENT PRINCIPLES:
Issues, Concerns, and Opportunities

Joint Interim Hearing of the
Senate Committee on Agriculture and Water Resources and the
Assembly Committee on Water, Parks, and Wildlife

San Jose, California
November 17, 1995

Mr. Chairmen and Members of the Committees:

My name is David Yardas. I am a Water Resources Analyst with the Environmental Defense Fund (EDF) in Oakland. I appreciate the opportunity to speak to you today on the Monterey Agreement, a set of principles agreed to by State Water Project (SWP) contractors and the Department of Water Resources (DWR) in December 1994, about two weeks prior to signing of the Bay/Delta Accord.

I especially want to thank you for responding so quickly to our request last month (in Fresno) for legislative oversight hearings on these Principles, for which a Final Program Environmental Impact Report (EIR) has already been certified (over many objections, including our own), and for which SWP contract amendments are now being implemented. We would further that request today by asking that this hearing serve as the start, not the end, of legislative oversight activities related to the Monterey Agreement principles and implementation process. I make this request for two essential reasons: first, because a large number of valid and important concerns (over and above the few I will focus on today) have been raised by groups and citizens throughout California, and it would be good if you could hear about them directly; and second, because the potential reach of these Principles demands a level of public discourse and dialogue that simply has not occurred to-date.

Let me emphasize at the outset, however, that, notwithstanding our many concerns, EDF does see considerable merit in a number of aspects of the Monterey Agreement principles. We certainly share, for example, the negotiators' stated desire to avoid protracted litigation (though their subsequent handling of the EIR process raises serious questions as to the depth of this desire); we are supportive of efforts to revise water allocation procedures and to enhance market-based transfer opportunities so as to better apportion limited SWP supplies, particularly given the foreseeable mismatch of more than 2 million acre feet between annual "entitlements" and available supplies; and we agree that targeting anticipated "surplus" revenues to specific purposes is almost certainly better than leaving those funds to DWR's general budgetary discretion.

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But we also have a number of concerns. Among them:

1. *The closed-door nature of the Monterey Agreement negotiations.* Not surprisingly, these negotiations resulted in a set of principles featuring a host of direct and indirect agricultural and urban contractor benefits (e.g., water transfers and financial restructuring), as well as many benefits for DWR (e.g., financial resources generally, as well as the authority to construct a new Corporation Yard and Operations Center) while ignoring a host of closely-related environmental issues, concerns, and needs. We are not, of course, opposed to contractor (or even DWR) benefits per-se, but to contractor benefits which (1) will likely lead to adverse environmental consequences or which (2) are provided *to the exclusion of* related environmental benefits. (In the Bay/Delta process, for example, the notion of "equity" for all interests has been an important cornerstone throughout.) Where, we wonder, is the "equity" in these Principles?

2. *The manner in which important and legitimate questions of process and substance were ignored or cursorily dismissed in the rush to complete and certify a deficient Program EIR on the purported implications of implementing the Agreement's principles.* The Monterey Agreement EIR is fast becoming legend for it's blanket dismissal of a host of important issues and concerns. As just one example, EDF's request for detailed information on the assumptions and data which underlie the Agreement's "Payment Management Program" (see item (6), below) received the following response: "This comment raises legal, rather than environmental, issues and is outside the scope of this EIR." Of note, the same comment raised concerns about unmet Category III commitments under the Bay/Delta accord -- a legal, rather than environmental, issue??

3. *Ongoing perpetuation of the myth that DWR will someday "complete" the SWP.* Principle 12 of the Agreement includes "a reaffirmation of DWR's existing contractual obligation to make all reasonable efforts to complete the SWP." The good news here is the Final EIR's "suggestion" (as a "public controversy mitigation measure") that DWR and the contractors *not* include in contract amendments implementing the Agreement's principles any amendments that would incorporate Principle 12. But the overarching problem of unrealistic expectations and commitments remains, as does Principle 12 in the Agreement itself, along with the potential complications of deleting Article 18(b) from the subject water supply contracts (i.e., the only place where the "potential" of non-completion is at least explicitly acknowledged).

4. *The use of individual contract amendments as the principal vehicle through which the Monterey Agreement Principles will be (and are now being) implemented.* This is contrary to the signatories' pledge to work diligently and in good faith towards "a final written agreement" that could, among other matters, be reviewed by all parties of interest (who will now have to examine each and every contract amendment to understand the manner in which these Principles are implemented in fact).

5. *Important unanswered legal, financial, and environmental issues associated with the sale (or lease/option) of the Kern Fan Element (KFE) and related assets of the Kern Water Bank to "designated Agricultural contractors."* This lease/exchange arrangement (some 45,000 AF of unused SWP agricultural entitlements -- a bit more than one percent of the SWP entitlement total --

will also be "retired" as part of the deal) involves about 20,000 acres of fallowed land between Bakersfield and Elk Hills, currently in public ownership. Roughly half of that land is not used (or is unlikely to be used) for groundwater recharge purposes, but is of tremendous value to numerous listed species and serves as a cross-valley corridor for a variety of species of concern. As mitigation for prior SWP impacts and activities, DWR has agreements with the Department of Fish and Game committing to the permanent management of certain KFE lands as habitat for such species, and barring the sale, lease, or use of such lands for other purposes without the approval of DFG. How will these arrangements be handled? With what level of public review? If the handling to-date of Monterey Agreement issues is any guide, it is also highly likely (and highly unfortunate) that a lease/exchange deal will be completed prior to the completion of recovery plans now being developed for species of concern.[1]

6. *Missed opportunities for funding all or part of the state's CVPIA cost-sharing commitments, both the state's and the water contractors' Category III obligations under the Bay/Delta Accord, and long-term Bay/Delta funding overall.* A crucial aspect of the Monterey Agreement is its "financial restructuring" provisions, summarized in Exhibit A to the Agreement as the "State Water Project Payment Management Program." (A modified version of Exhibit A is attached herewith.) While some of the underlying details remain unknown (see, for example, item (2) above), the most noteworthy provisions of the Payment Management Program are as follows:

(a) $14.0 million in 1995 and $7.7 million in 1998 for a "general capital operating fund" within DWR for unspecified purposes to be made available "from bond reserves that are no longer required by bond covenants;"

(b) other "surplus" receipts (reportedly SWP revenues net of expenses, but listed as "Revenues" in Exhibit A) to be distributed approximately as follows:

(i) $3.5-15.5 million per year beginning in 1998 to a SWP "capital resources account" for unspecified purposes;

(ii) $10 million per year beginning in 1997 to a Trust Fund within DWR for use in "stabilizing payments" to SWP agricultural contractors;

(iii) $4m-30.5m per year beginning in 1997 and paid directly to SWP urban contractors for use as they direct; and

---

[1] There is, of course, considerable pressure to conclude such a deal. Among other matters, "no Monterey Amendments will take effect until the Monterey Amendments of both the Kern County Water Agency and the Metropolitan Water District ... have been executed and the State has conveyed to Kern County Water Agency the property which constitutes the Kern Fan Element of the Kern Water Bank...." (Letter conveying proposed Monterey Amendments to Robert B. Almy, Water Resources Planning Manager, Santa Barbara County Water Agency, from David N. Kennedy, Director, DWR, September 29, 1995.) Of note, this letter was sent to Mr. Almy a full month prior to certification of the final EIR.

(iv) additional surplus amounts beginning in 2001 to be retained by DWR after consultation with SWP agricultural and urban contractors (only) or to be distributed first to SWP urban contractors ($2 million/year up to $19.3 million) and then to SWP agricultural (~24.7%) and urban (75.3%) contractors.

The above Payment Management Program is expected to yield substantial savings for SWP contractors (e.g., more than $119 million between 1997 and 2035 for the Central Coast Water Authority alone). Moreover, as illustrated in the attached re-work of Exhibit A, the total estimated "surplus" involves more than $1.95 billion between 1995 and 2035--an average of approximately $48 million annually--even before additional surpluses (as in (b)(iv) above) are taken into account. More than $400 million of this total will go to for SWP "capital resources"--nearly twice the State's long-term obligations under the CVPIA cost sharing agreement. And distributed contractor savings (both agricultural and urban) will total more than $1.5 billion--nearly $37 million per year, on average--or enough to finance a 1996 Bay/Delta revenue bond of $300-$400 million.[2]

In this example, we do not mean to suggest that all contractor savings could or even should be directed to environmental purposes, nor that bond funding is the only way to go. (For many environmental purposes, including supplemental water acquisitions, a secure and sustained source of dedicated annual funds will also be needed.) But in the ongoing search for Category III funds, CVPIA cost sharing funds, and long-term Bay/Delta restoration funds, it is difficult to understand why an environment greatly impacted by SWP development and operations shouldn't share in some significant portion of the Monterey Agreement's anticipated financial benefits. CVP water and power contractors are now contributing directly to Bay/Delta watershed restoration efforts through the CVP Restoration Fund; the Metropolitan Water District of Southern California is contributing directly through it's up-front commitments to Category III; what about other SWP contractors?

The above list of issues and concerns is far from exhaustive, but is indicative of the fact that, whatever their benefit, the Monterey Agreement principles leave many important questions unanswered, and ignore a host of associated environmental concerns and opportunities. Beginning with this hearing, EDF hopes that you will help to ensure that the above issues are addressed and resolved before irrevocable commitments to implement these Principles are made, and opportunities lost, to the detriment of all Californians.

Thank you very much; I would be happy to answer any questions.

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[2] It is our understanding that it is the position of the signers of the Monterey Agreement that the Burns-Porter Act incorporates the revenue bonding authority first established under the state CVP Act in the 1930's. If true, this authority, and at least a portion of these revenues, might be used to secure capital funds for consensus-based projects and programs under Category III immediately, and perhaps as part of an initial phase of longer-term Bay/Delta funding.

Monterey Agreement (Pmt Mgt Pgm)

EDF 17-Nov-95

Monterey Agreement Principles - State Water Project Payment Management Program

(millions of dollars)

	Net Revenue	Capital Resources	Capital Operating Fund	Funds Available	Ag Trust	Urban	Enviro
1995	15.0	0.0	15.0	0.0	0.0	0.0	0.0
1996	7.7	0.0	7.7	0.0	0.0	0.0	0.0
1997	14.0	0.0	0.0	14.0	10.0	4.0	0.0
1998	23.0	6.0	0.0	17.0	10.0	7.0	0.0
1999	38.0	6.0	0.0	32.0	10.0	22.0	0.0
2000	39.0	6.0	0.0	33.0	10.0	23.0	0.0
2001 (a)	45.0	4.5	0.0	40.5	10.0	30.5	0.0
2002 (a)	45.0	4.5	0.0	40.5	10.0	30.5	0.0
2003 (a)	45.0	4.5	0.0	40.5	10.0	30.5	0.0
2004 (a)	45.0	4.5	0.0	40.5	10.0	30.5	0.0
2005 (a)	44.0	3.5	0.0	40.5	10.0	30.5	0.0
2006 (a)	44.0	3.5	0.0	40.5	10.0	30.5	0.0
2007 (a)	45.0	4.5	0.0	40.5	10.0	30.5	0.0
2008 (a)	45.0	4.5	0.0	40.5	10.0	30.5	0.0
2009 (a)	44.0	3.5	0.0	40.5	10.0	30.5	0.0
2010 (a)	45.0	4.5	0.0	40.5	10.0	30.5	0.0
2011 (a)	47.0	6.5	0.0	40.5	10.0	30.5	0.0
2012 (a)	49.0	8.5	0.0	40.5	10.0	30.5	0.0
2013 (a)	48.0	7.5	0.0	40.5	10.0	30.5	0.0
2014 (a)	51.0	10.5	0.0	40.5	10.0	30.5	0.0
2015 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2016 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2017 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2018 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2019 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2020 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2021 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2022 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2023 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2024 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2025 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2026 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2027 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2028 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2029 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2030 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2031 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2032 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2033 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2034 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
2035 (a)	56.0	15.5	0.0	40.5	10.0	30.5	0.0
Sum	1,954.7	418.5	22.7	1,513.5	390.0	1,123.5	-

(a) if Funds Avail > 40.5/yr, Urbans get $2.0/yr up to $19.3 w/bal to Ag (24.7%) and Urban (75.3%)

Monterey Agreement (Pmt Mgt Pgm)

Potential Bond Proceeds based on Ag-Urban disbursements

NPV (1996)	*i*	Net Revenue	Bond Proceeds		Funds Available	Bond Proceeds
25 years	6.0%	505.6	375.0		423.9	314.4
30 years	6.0%	560.6	415.8		463.6	343.8
35 years	6.0%	601.7	446.2		493.3	365.9
40 years	6.0%	632.4	469.0		515.5	382.3

Potential bond proceeds = NPV((source/1.2) [coverage]) - 11% [1% issue, 10% reserve]

Primary Source: Monterey Agreement - Statement of Principles, Exhibit A

ATTACHMENT J

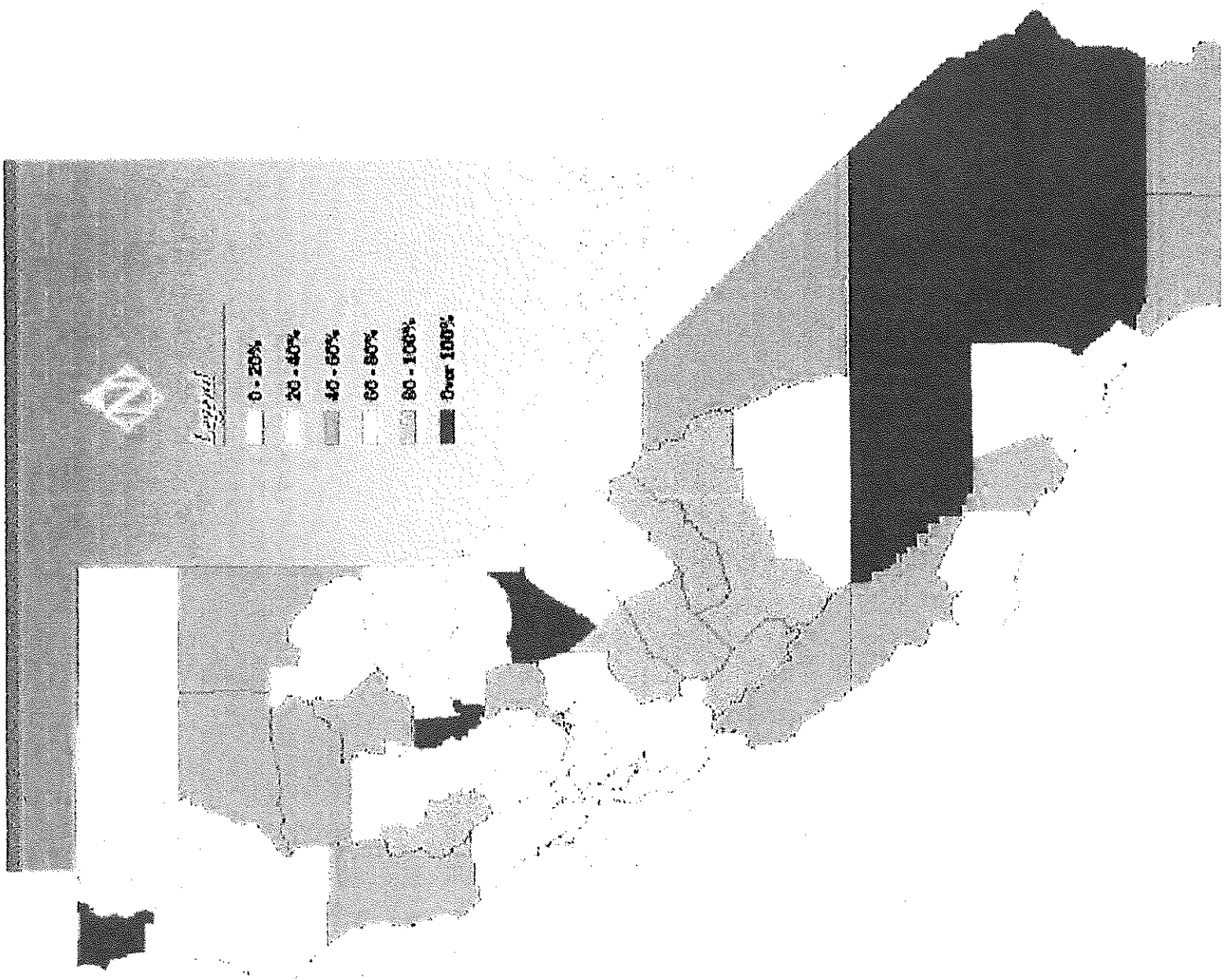
ENSURING RELIABLE WATER SUPPLIES FOR "AVERAGE-INTELLIGENCE" GROWTH

Randele Kanouse
Special Assistant to the General Manager
East Bay Municipal Utility District
Oakland, CA

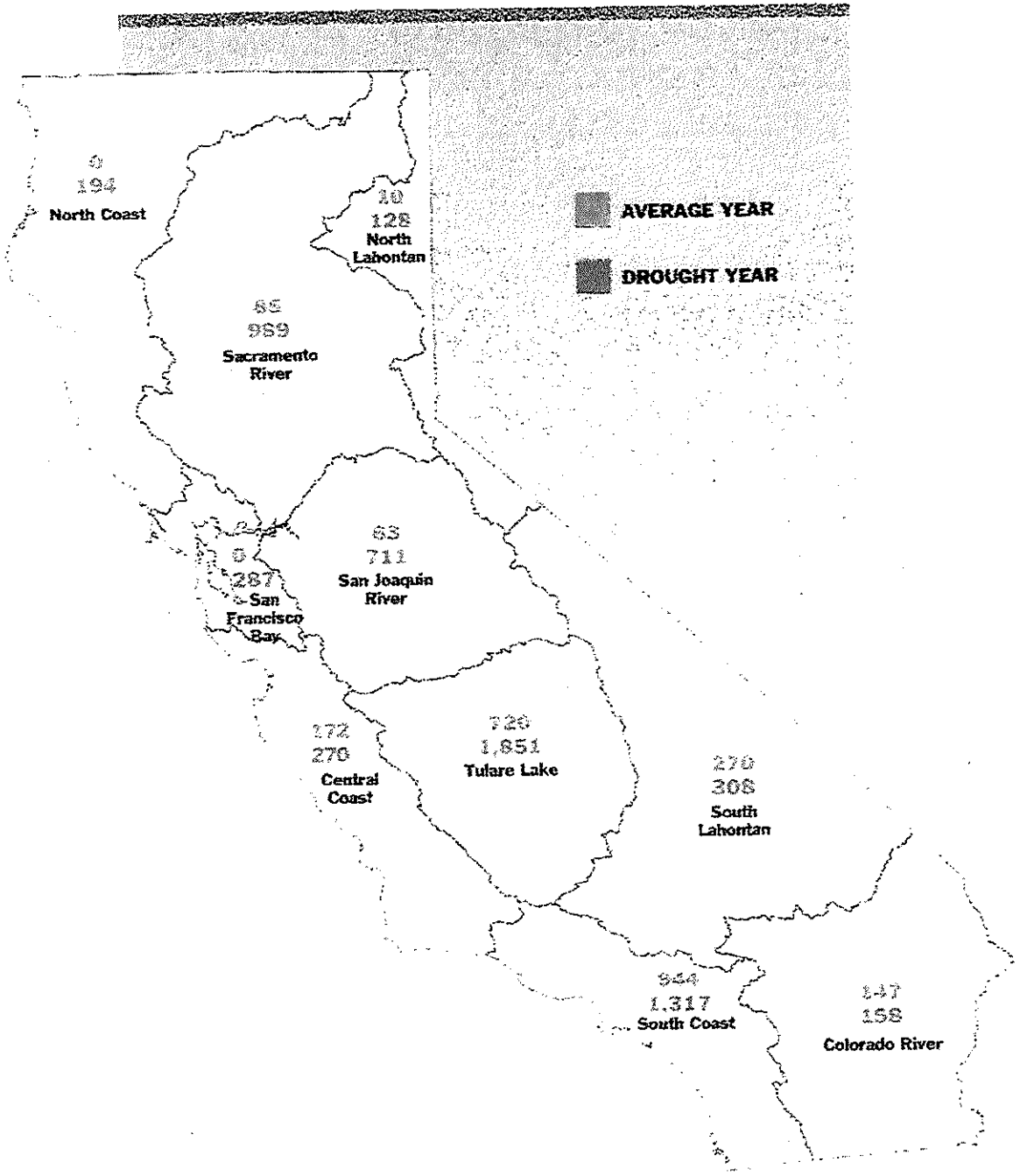
March, 2001

LETTER 30

LETTER 30

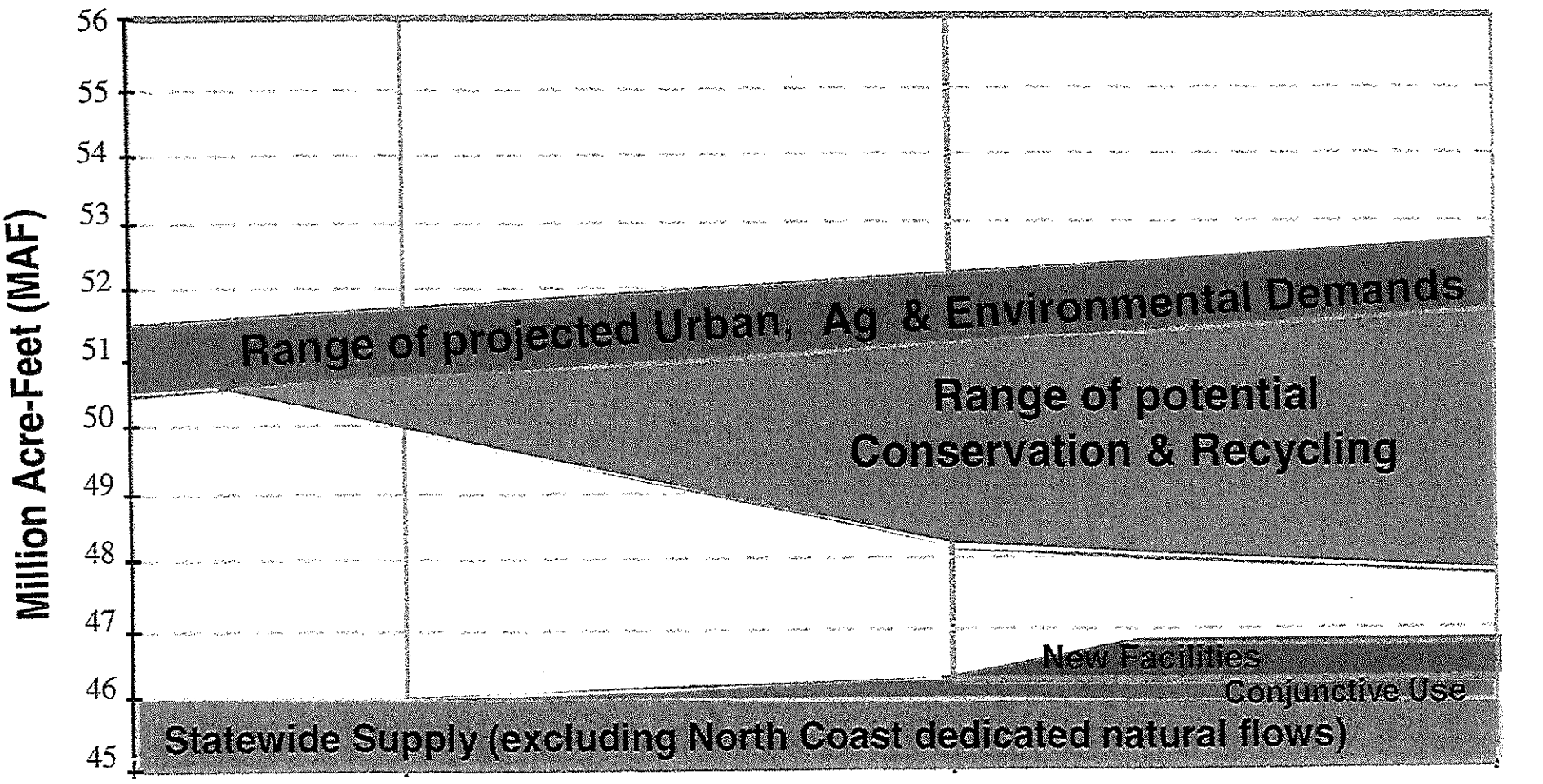


2020 Shortages by Hydrologic Region with Existing Facilities and Programs (taf)



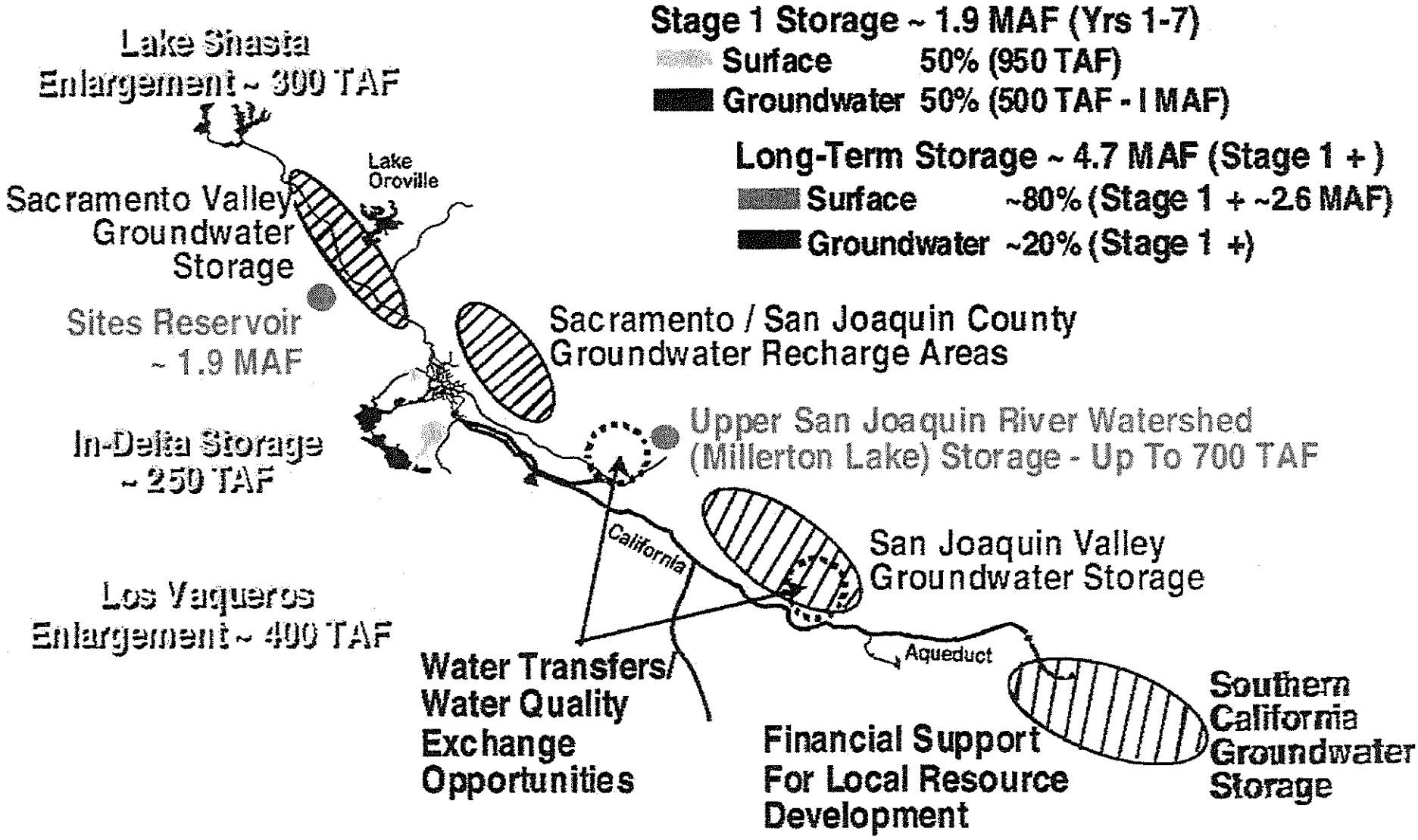
LETTER 30

California Water Supply and Demand Gap During Drought Years

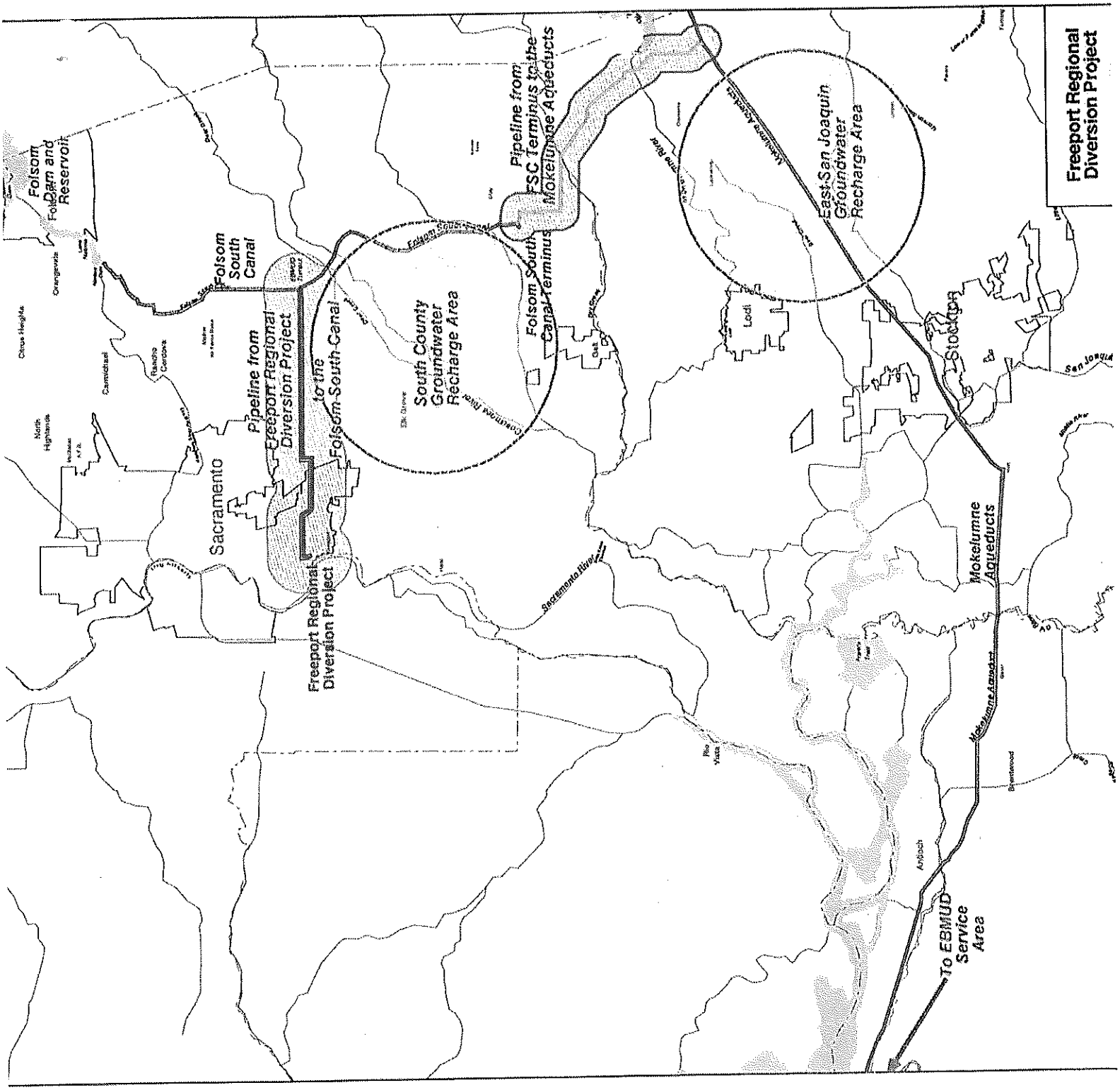


CALFED Phase II Interim Report, March 1998

CALFED's Proposed New Water Projects

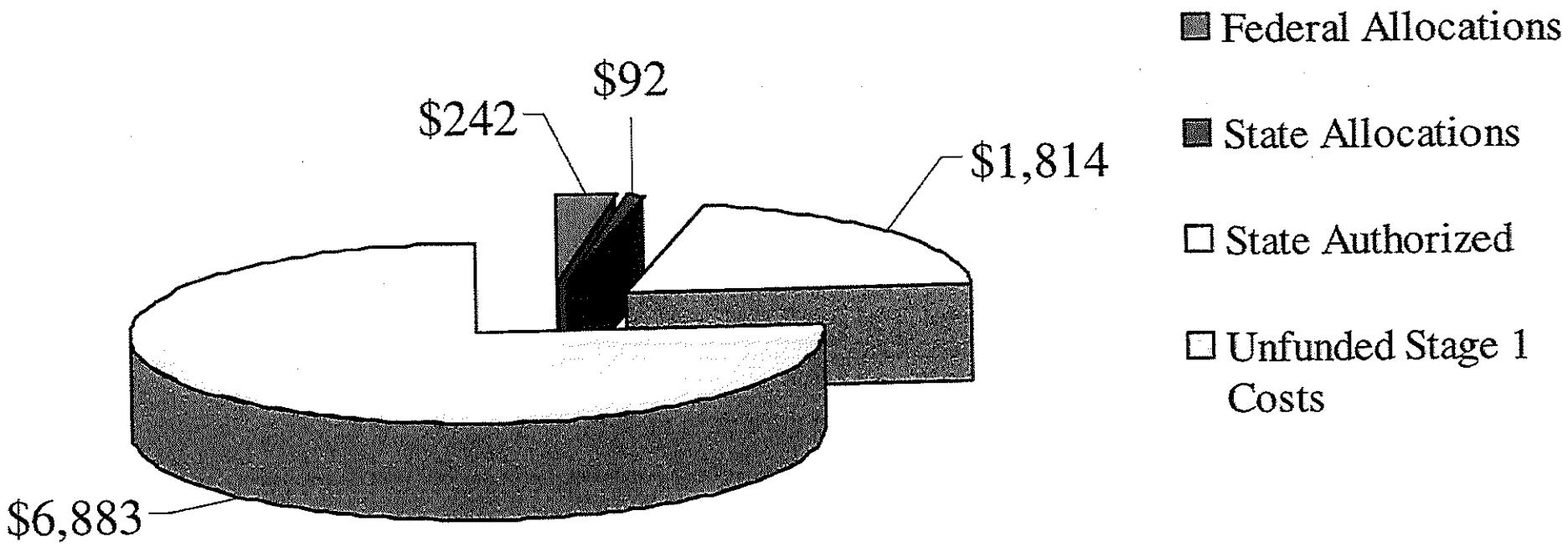


LETTER 30


Freeport Regional Diversion Project
Folsom Dam and Reservoir
Folsom South Canal
Pipeline from Freeport Regional Diversion Project to the Folsom South Canal
South County Groundwater Recharge Area
Pipeline from FSC Terminus to the Mokelumne Aqueducts
Folsom South Canal Terminus
East San Joaquin Groundwater Recharge Area
Sacramento
Freeport Regional Diversion Project
Sacramento River
Mokelumne Aqueducts
To EBMUD Service Area
Folsom South Canal
Folsom Dam and Reservoir
Pipeline from Freeport Regional Diversion Project to the Folsom South Canal
South County Groundwater Recharge Area
Pipeline from FSC Terminus to the Mokelumne Aqueducts
Folsom South Canal Terminus
East San Joaquin Groundwater Recharge Area
Freeport Regional Diversion Project
Sacramento
Sacramento River
Mokelumne Aqueducts
To EBMUD Service Area
Folsom
Citrus Heights
Orangevale
Carmichael
Rancho Cordova
North Highlands
McClellan A.F.B.
Elk Grove
Galt
Lodi
Stockton
Rio Vista
Antioch
Brentwood
Mokelumne Aqueduct
San Joaquin

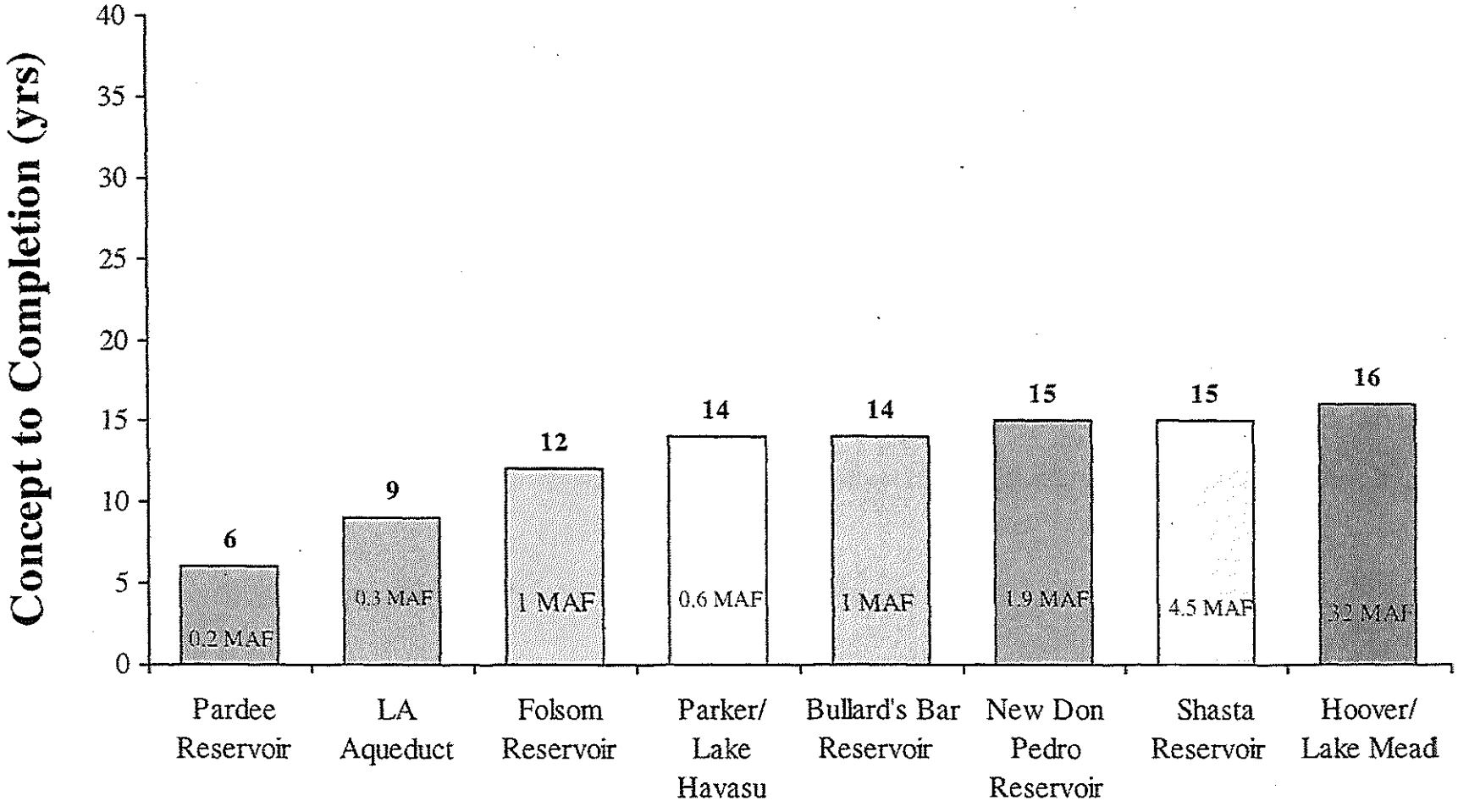
CALFED Funding: The One-Third Rule

(Amounts in millions)



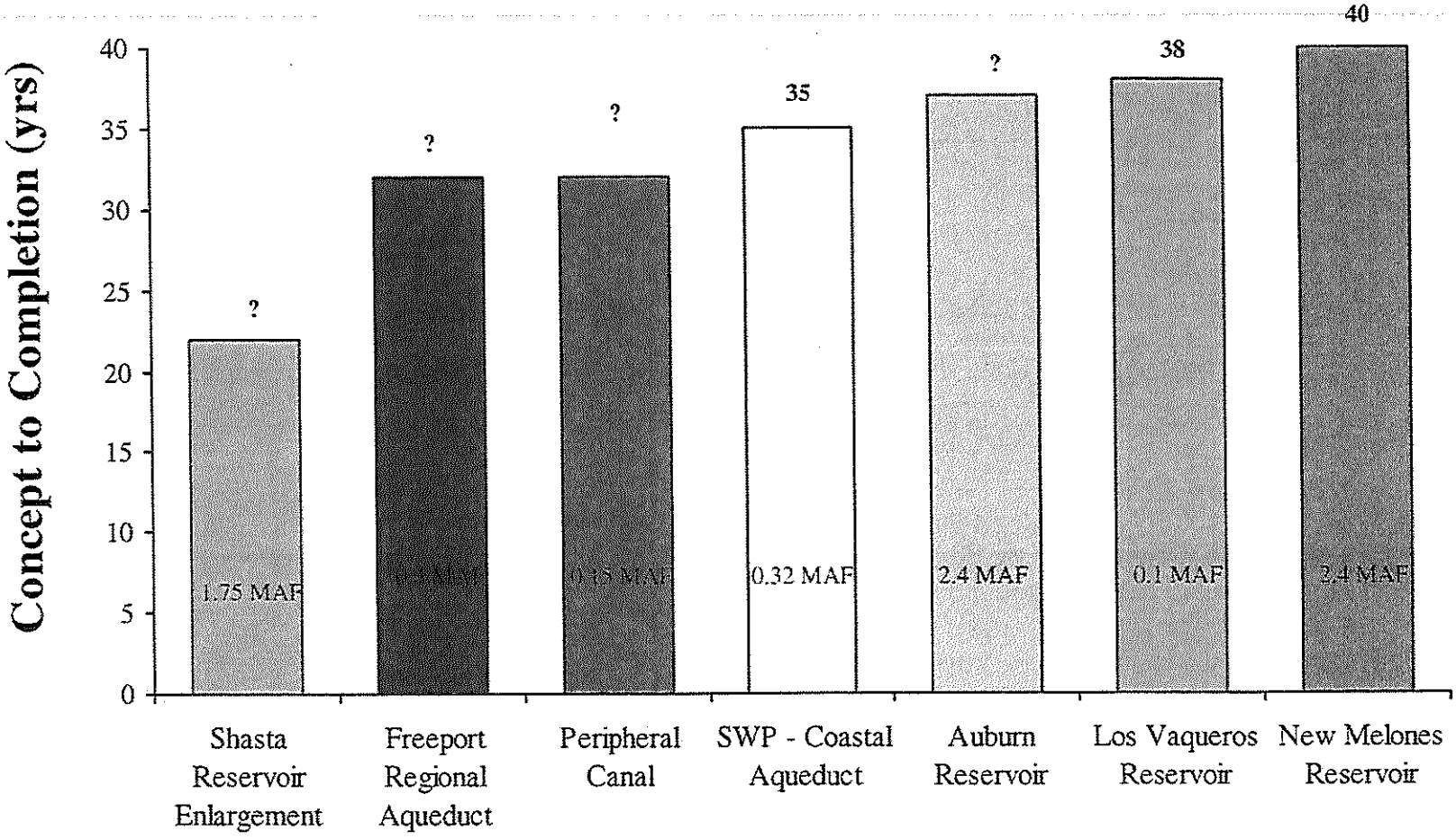
CALFED total Stage 1 costs are estimated at $8.656 billion. CALFED asserts that a third of the Stage 1 costs will be paid by those communities that will benefit from these projects

Pre 1970s Water Projects: Simpler Times



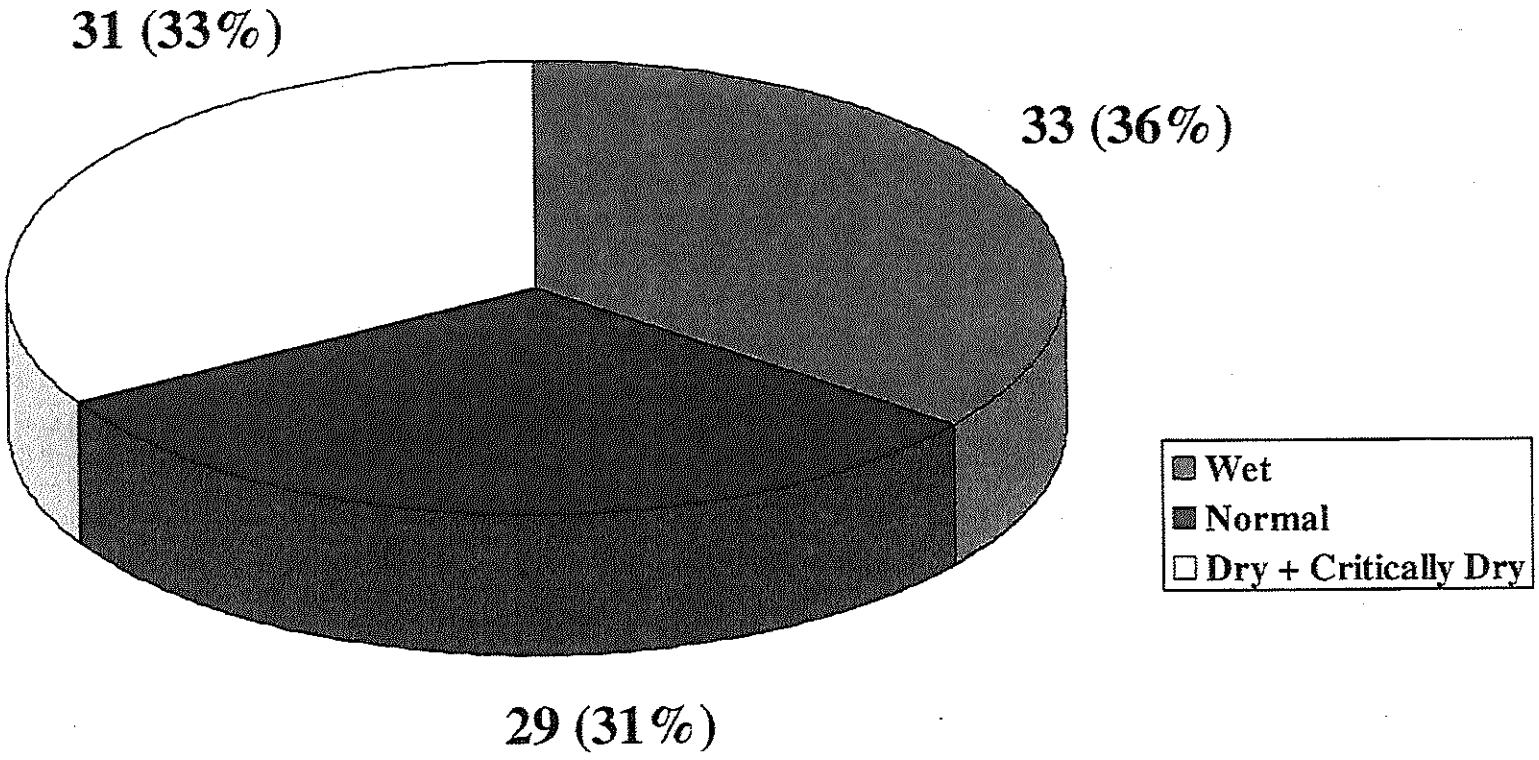
LETTER 30

Post 1970s Water Projects: Triple the Time to Complete



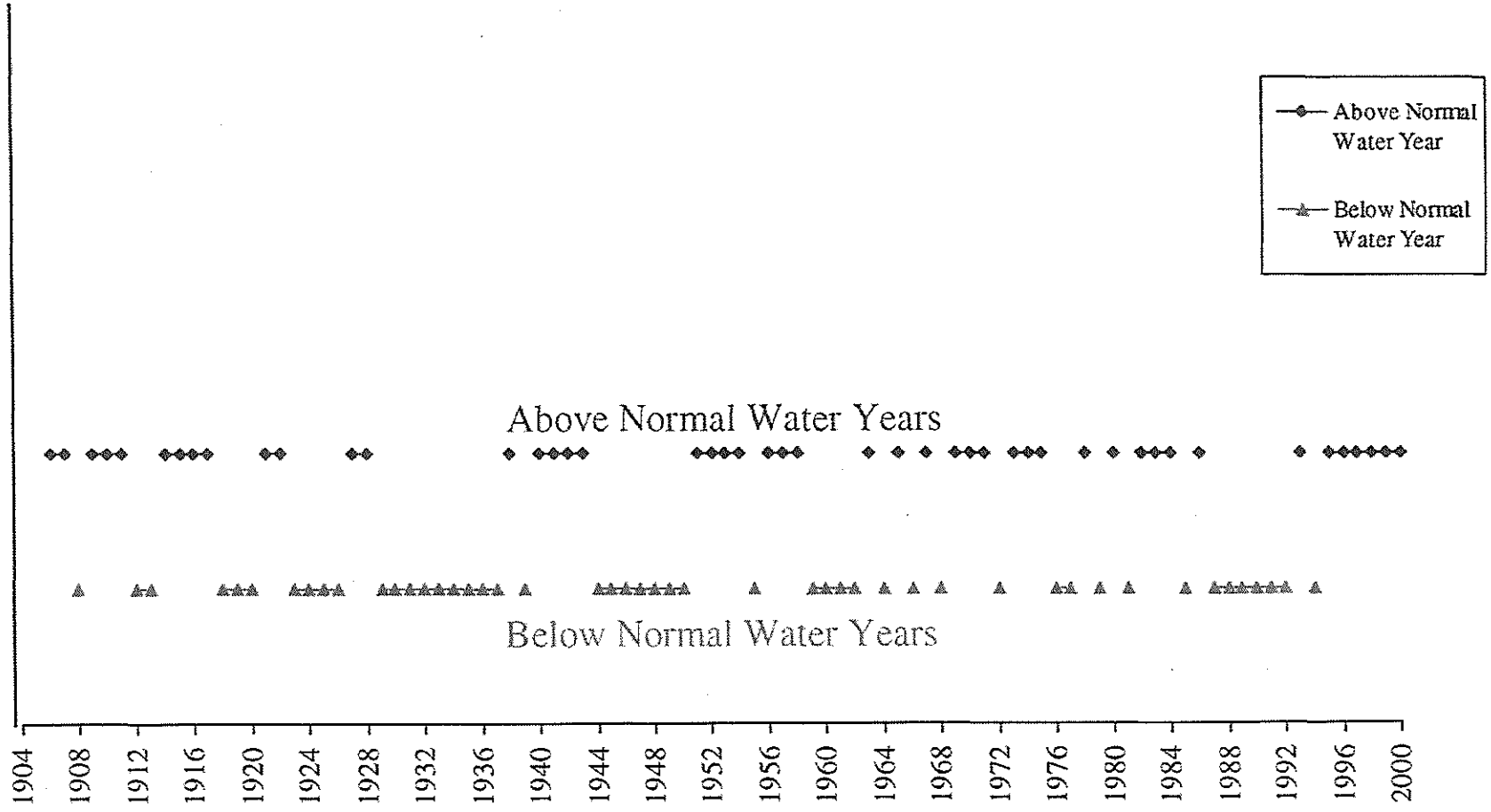
? = Projected in-service date unknown

Floods or Droughts: California Water Years from 1906 to 2000



Source: DWR-CDEC, Historical Sacramento Valley WY Index 1906-2000

Clusters of Below Normal and Above Normal Water Years in California from 1906 to 2000



Source: DWR-CDEC, Historical Sacramento Valley WY Index 1906-2000

LETTER 30

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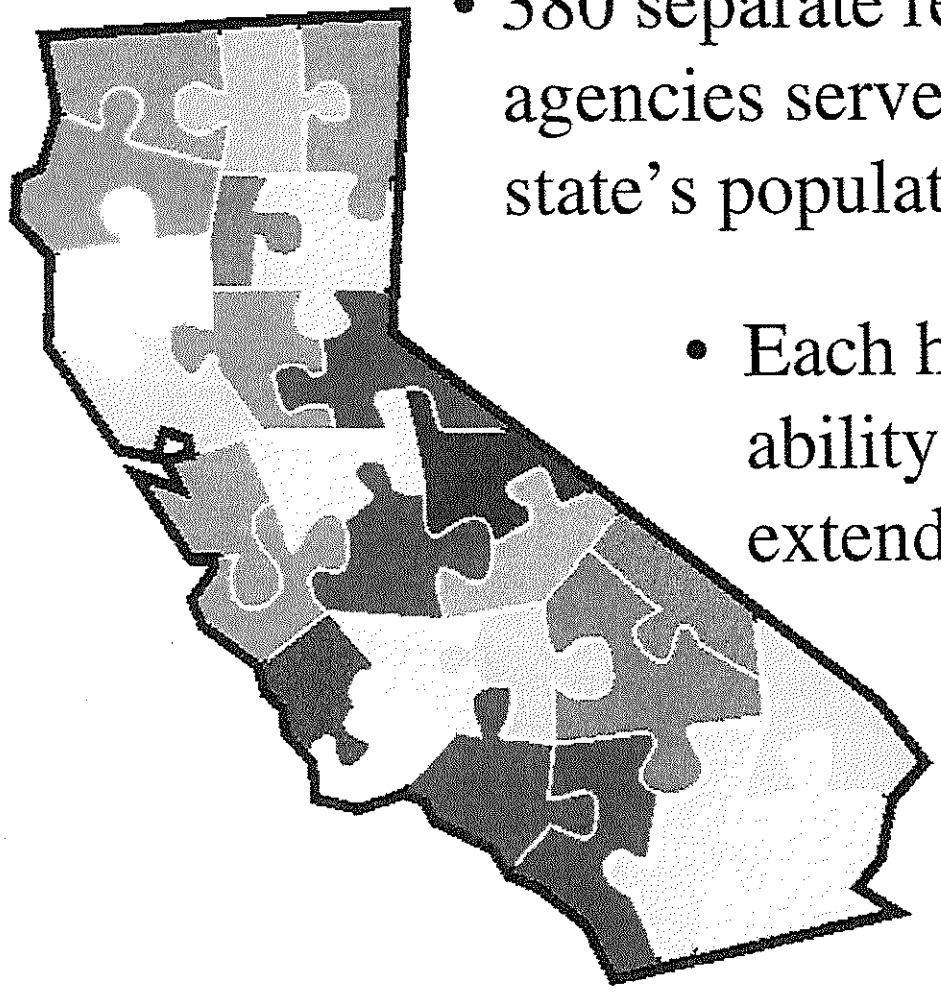
Most Agencies Ration in Response to Severe Drought

- Historically, water users have endured California's frequent multi-year droughts by rationing customers.

- Strengthening conservation programs hardens customer demand and means that future rationing will impose huge costs on existing business and residential customers.

- Water supply availability can differ dramatically from one community to the next because each agency has separate water contracts and/or water rights.

California Water Districts
The Good, the Bad, and the Ugly



- 380 separate retail water agencies serve 86% of the state's population
- Each has a different ability to serve water during extended drought.
- California law does not require sharing water in times of drought.

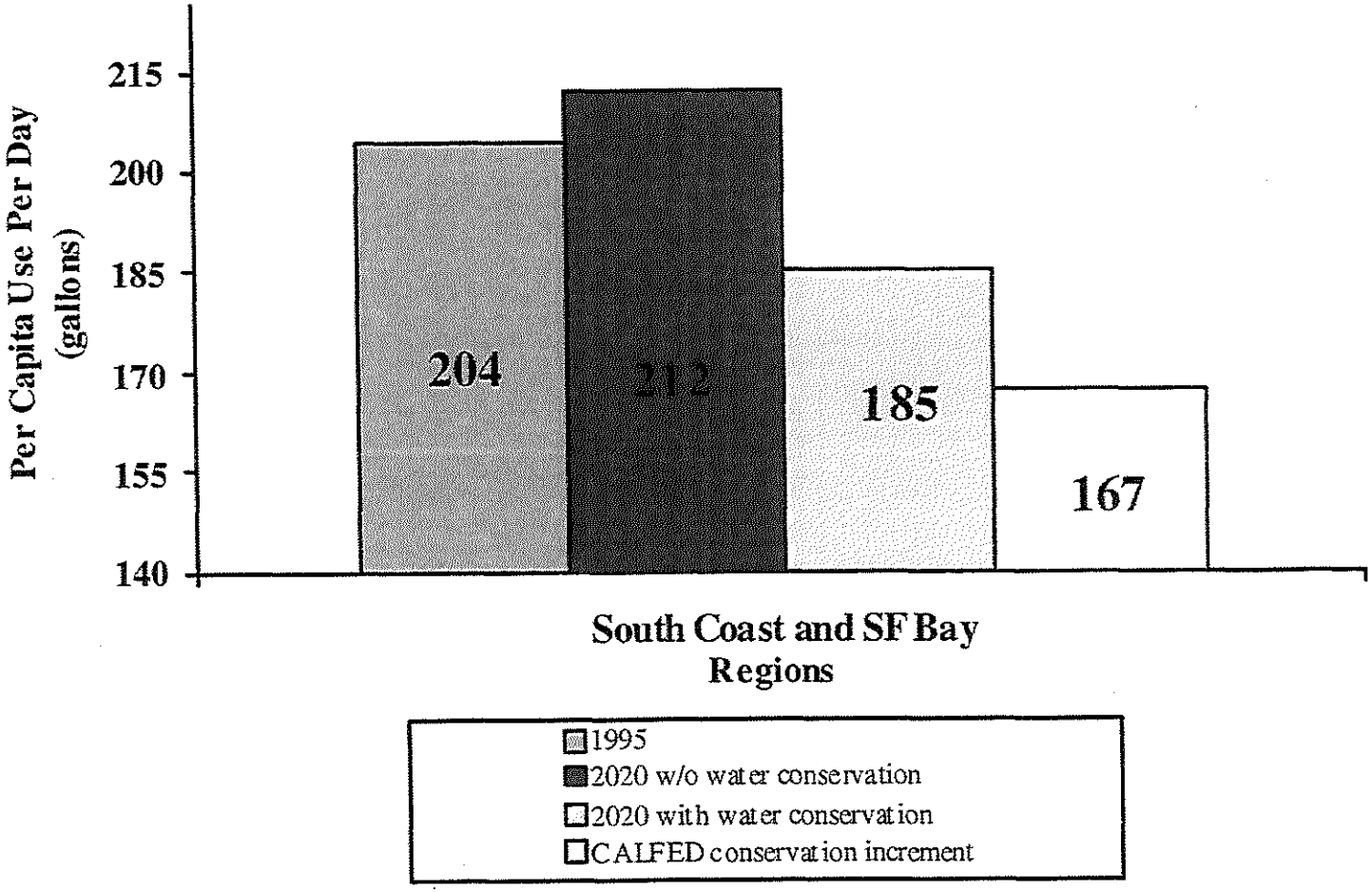
LETTER 30

CALFED Will Achieve Greater Efficiencies

Urban Conservation	**752 TAF**
Ag Conservation	**3,911 TAF**
Urban Recycling	**243 TAF**
Total	**4,906 TAF**

*** Recovered losses with potential for re-routing flows, 2020 projection**

By 2020, Rationing Will Impose Real Costs on Customers



Source: DWR Bulletin 160-98 and CALFED Final PEIR/EIS

LETTER 30

California's Industries Which Depend Upon Reliable Water Supplies

INDUSTRY	VALUE ($ Billions)	JOBS
Aerospace	29	167,700
Agricultural	27	334,000
Bio-Tech	8	50,500
Computer Hardware.	35	176,400
Computer Software	21	104,000
Electronic	24	241,500
Fabricated Metal	8	119,000
Food Processing	50	184,000
Industrial Machinery & Equipment	22	210,000
Petro-Chemical	18	92,600
Recreation/Tourism	61	673,000
Scientific/Medical Instruments	12	173,400
Wine	6	36,000

Sources: 1) California Department of Finance (1996); 2) Department of Trade/Commerce (1996); 3) California Division of Tourism (1998)

LETTER 30

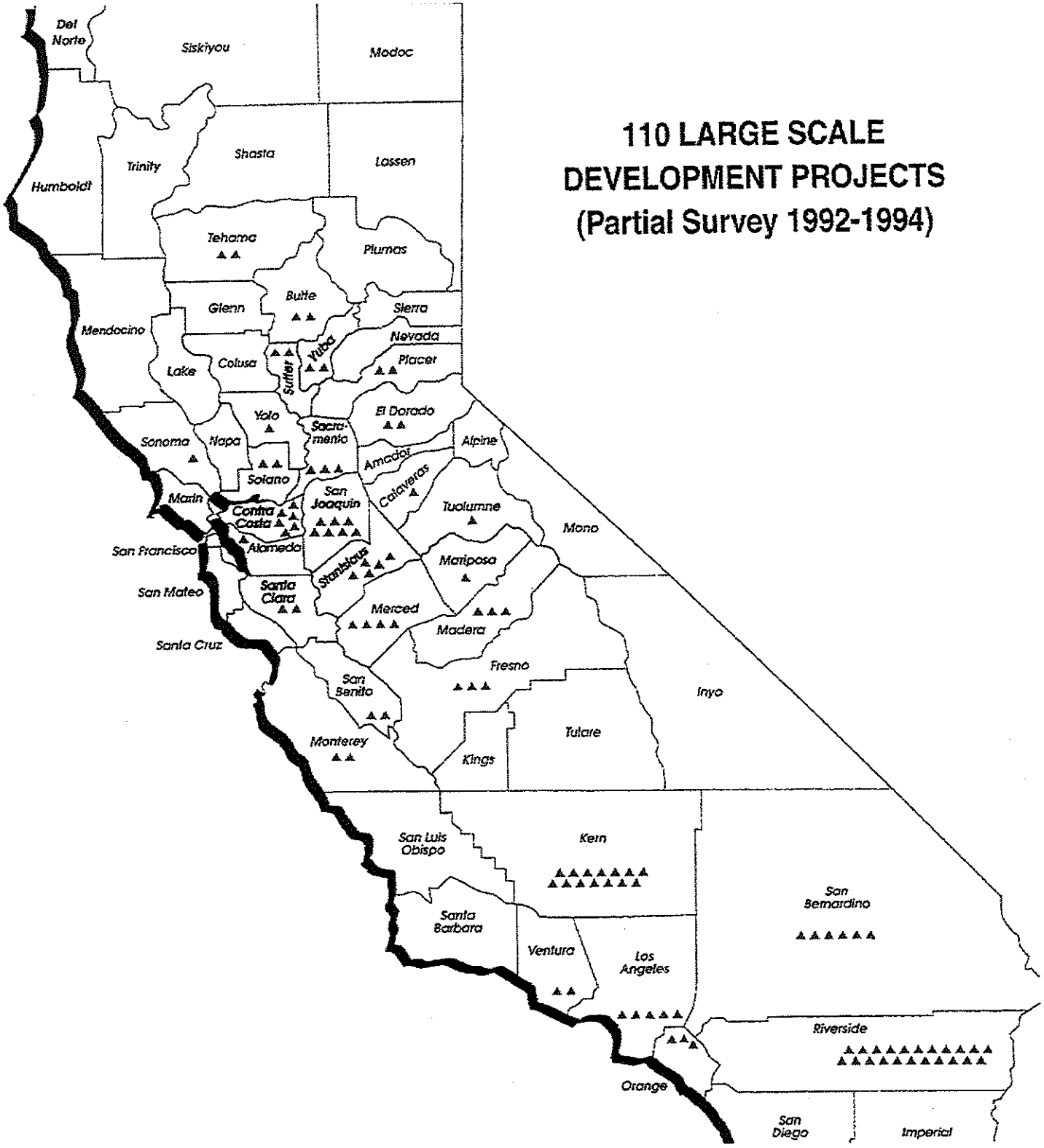
"Build It and the Water Will Follow"

- Historically, water has not been a limiting factor upon land use decision making in California.

- Water utilities were able to develop water supplies to support new development without costly impacts on existing users.

- Until recently, there was no justification for coordinating water and land use planning.

LETTER 30


110 LARGE SCALE
DEVELOPMENT PROJECTS
(Partial Survey 1992-1994)
Del Norte
Siskiyou
Modoc
Humboldt
Trinity
Shasta
Lassen
Tehama
Plumas
Glenn
Butte
Sierra
Mendocino
Nevada
Lake
Colusa
Sutter
Yuba
Placer
Yolo
El Dorado
Sacra-mento
Sonoma
Napa
Alpine
Amador
Solano
Calaveras
Marin
San Joaquin
Tuolumne
Contra Costa
Mono
San Francisco
Alameda
Stanislaus
Mariposa
San Mateo
Santa Clara
Merced
Madera
Santa Cruz
Fresno
San Benito
Inyo
Monterey
Tulare
Kings
San Luis Obispo
Kern
San Bernardino
Santa Barbara
Ventura
Los Angeles
Riverside
Orange
San Diego
Imperial

1995 Legislation (SB 901) Created Early Water and Land Use Planning Linkages

- Retains city/county authority over land use decisions and establishes a "full disclosure" duty regarding water supply.

- Requires water utilities to calculate multiple year drought water supplies and provide this to city/county at the general or specific plan stage.

- Requires water utility and city/county to consider impacts upon existing users during multiple year droughts.

LETTER 30

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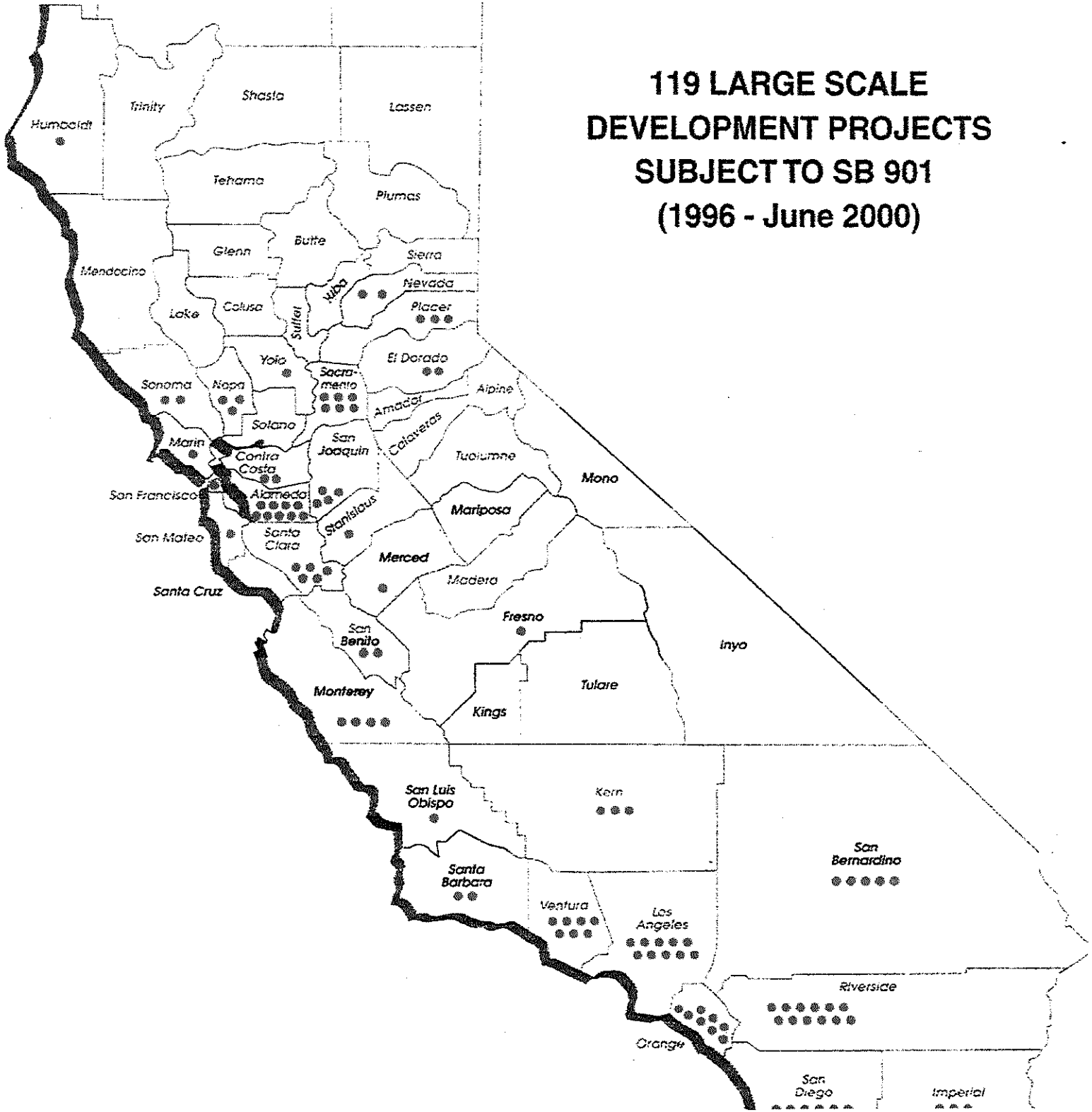
Only 2 Out of 255 Projects (500+ Units) Initiated Since 1996 Have Completed a Thorough Water Supply Assessment

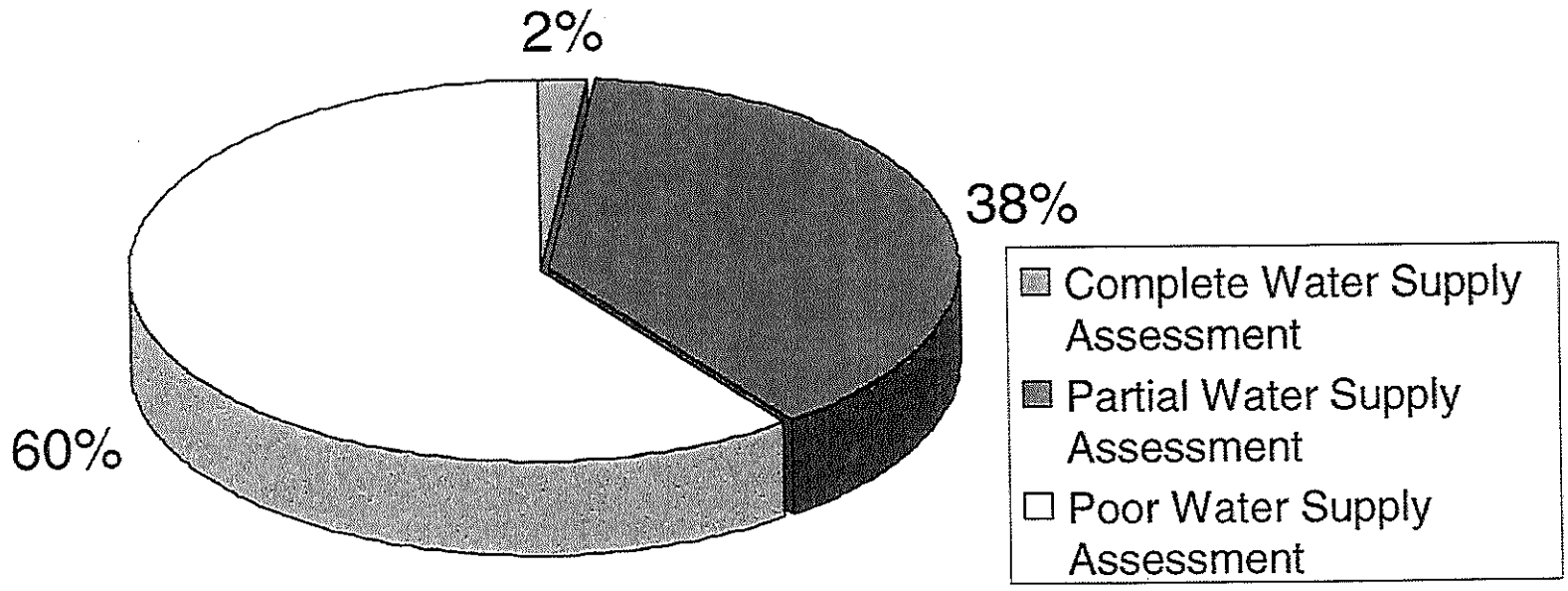
- 117 out of 119 projects subject to SB 901 fail to do a thorough assessment of what happens to existing water customers during extended drought.

- 136 projects of 500 units or greater are exempt from SB 901 because of loopholes in the original statutes and have not completed a thorough water supply assessment.


119 LARGE SCALE
DEVELOPMENT PROJECTS
SUBJECT TO SB 901
(1996 - June 2000)
Humboldt
Trinity
Shasta
Lassen
Tehama
Plumas
Glenn
Butte
Sierra
Mendocino
Nevada
Lake
Colusa
Sutter
Yuba
Placer
Yolo
El Dorado
Sonoma
Napa
Sacra-mento
Alpine
Amador
Solano
Marin
San Joaquin
Calaveras
Contra Costa
Tuolumne
Mono
San Francisco
Alameda
Stanislaus
Mariposa
San Mateo
Santa Clara
Merced
Madera
Santa Cruz
Fresno
San Benito
Inyo
Tulare
Monterey
Kings
San Luis Obispo
Kern
San Bernardino
Santa Barbara
Ventura
Los Angeles
Riverside
Orange
San Diego
Imperial

LETTER 30

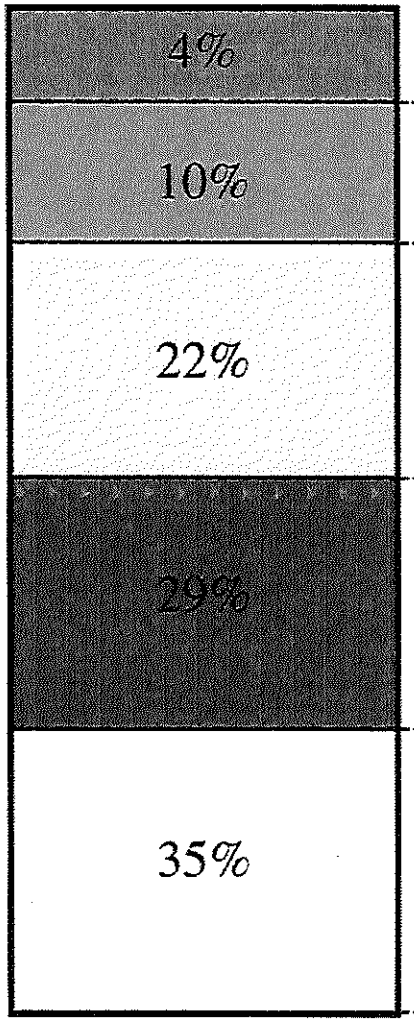
119 Projects Fail to Comply with Existing Law



LETTER 30

Projects That Evaded SB 901 Obligations

136 Large-Scale Development Projects



- Net decrease in housing density
- Lead agency is **not** city or county
- General Plan updates/revisions
- No EIR – project used negative declaration or mitigated negative declaration
- Projects proceeding without a General Plan amendment or a specific plan

LETTER 30

The "Will Serve" Letter Fails to Protect Existing Water Users

- Prior to a city or county issuing building permits, a water utility must issue a "will serve" letter.

- There are no statutory standards for the contents and timing of "will serve" letters.

- Recent court decisions have attempted to provide standards for issuance of "will serve" letters.

The Courts are Taking an Active Role

• Dougherty Valley	Contra Costa Superior Court (1994)
• Redwood Valley	First Appellate District (1995)
• Diablo Grande	Fifth Appellate District (1996)
• Newhall Ranch	Kern County Superior Court (2000)
• Monterey Agreement	Third Appellate District (2000)
• Carmel Valley	Sixth Appellate District (2001)

LETTER 30

Key Provisions of SB 221

- Subdivision map approval would be conditioned upon securing an adequate water supply for a proposed development.

- The needs of existing users and multi-year droughts must be considered when identifying the proposed development's water needs.

- The developer and the land use agency would be authorized to help the water utility secure the needed water supply.

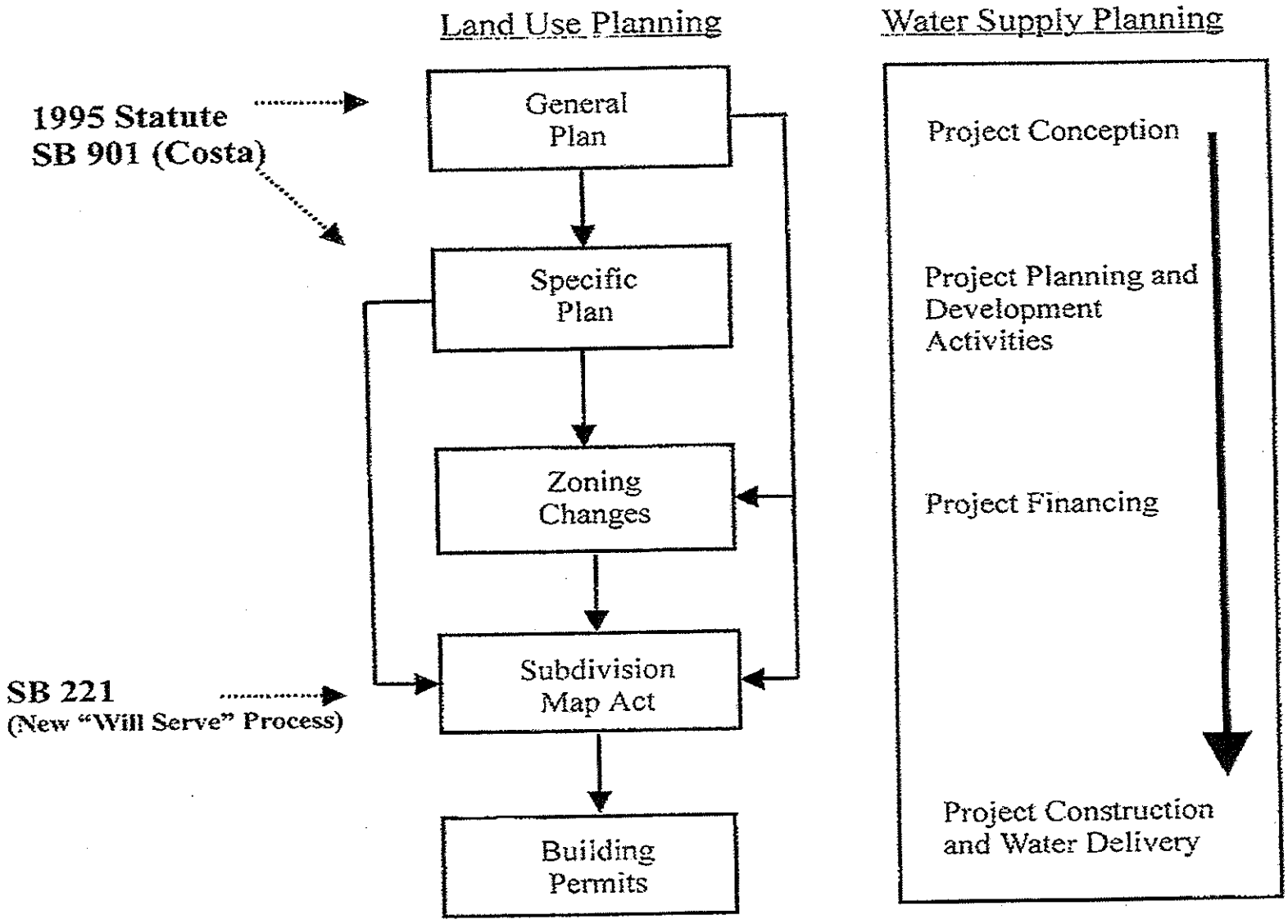
- Infill development projects of no more than 5 acres located within existing urban areas with no wildlife habitat value would be promoted.

Demonstration of Proof That an Adequate Water Supply Exists Under SB 221

As a condition of approval of a tentative map for 200 or more residential units, a written verification that water will be available must be provided, relying on the following "evidence":

- Written contracts or other proof of entitlement to a water supply
- Copies of a capital outlay program for financing the delivery of water
- Securing of applicable federal, state, and local permits for construction of necessary infrastructure
- Any necessary regulatory approvals that are required to convey or deliver water for the project.

Nexus Between 1995 Costa Legislation and SB 221



LETTER 30

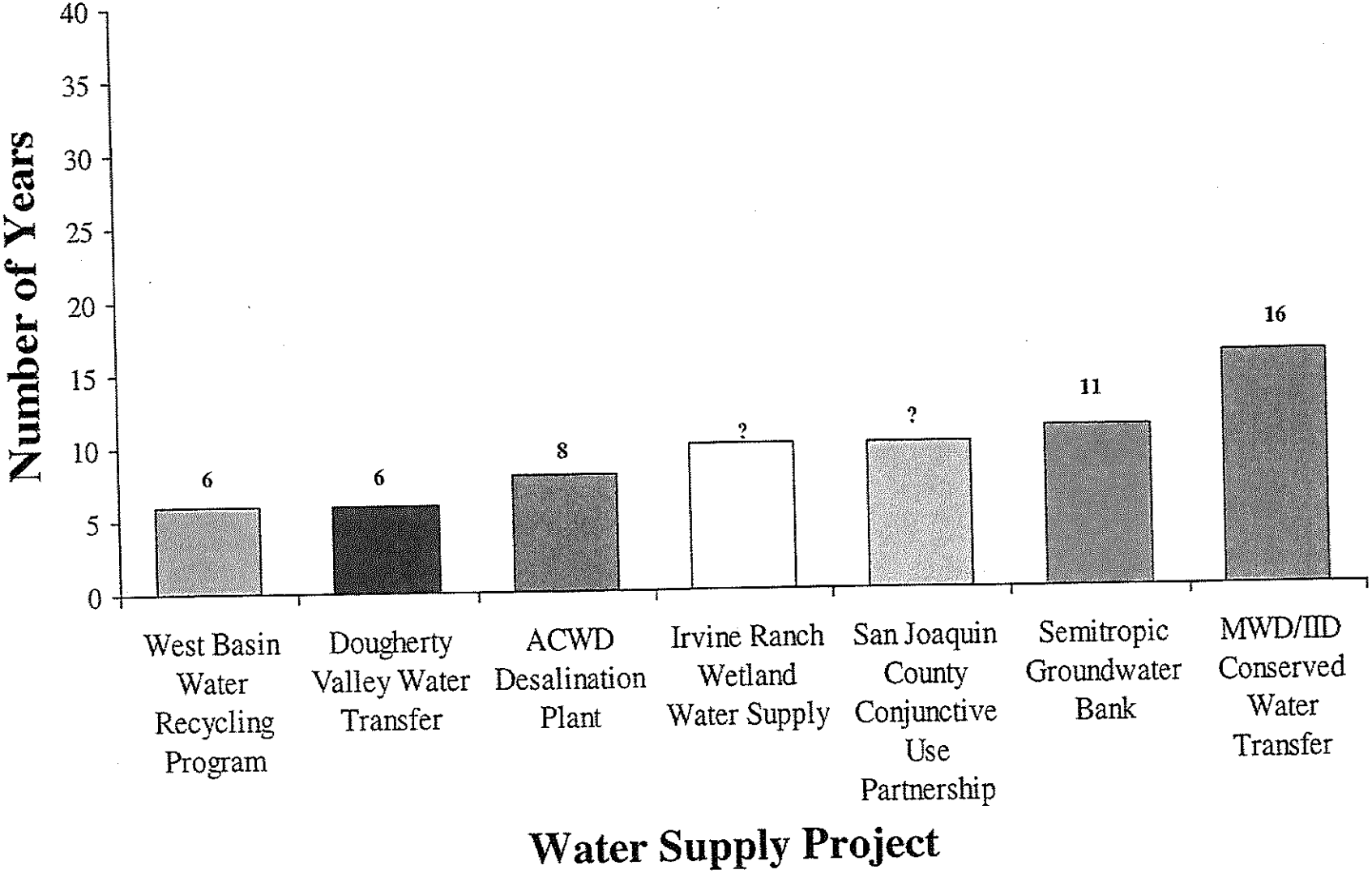
SB 221 Would Create A "Fail-Safe" Mechanism

- 117 (out of 119) large-scale development projects initiated after January 1, 1996 failed to fully comply with SB 901
- 110 large-scale development projects initiated during the early- to mid-1990s were "grandfathered" by SB 901
- 136 large-scale development projects have been initiated after 1/1/96 outside the scope of SB 901
- Hundreds of additional large-scale development projects likely initiated prior to 1996 were also "grandfathered" by SB 901

Linking Water and Land Use Decisions is Vital for California's Future

- The "old water development paradigm" no longer works.
- Early planning linkages will promote broad support for creation of new water supplies.
- A city/county must retain primacy over land use decisions and must consider water availability.
- Affordable housing must be promoted, including through infill development projects.

Water Projects of the 21st Century



? = Projected in-service date unknown

LETTER 30

Urgent Need for More Affordable Housing

- Strengthening the linkage between land use planning and water supply availability affects, and is affected by, the challenge to ensure an adequate stock of affordable housing.

- Affordable housing must be promoted within the context of this planning linkage, including through infill development projects.

- Infill development that advances the efforts to achieve greater quantities of affordable housing units should be promoted through the water supply planning process.

LETTER 30

LETTER 30

Approving New Development Faster Than We Develop New Water Supplies Risks "Rolling Blackouts" in Water Service

- Senator Costa's 1995 legislation was intended to ensure early coordination and linkages between the planning of new development and new water supplies.

- Moving ahead with new development projects faster than we develop the needed water supplies puts existing customers at risk during future droughts.

- Strengthening the linkages between land use and water supply planning helps ensure that our communities can meet current water needs, as well as the water needs of future growth.

ASSEMBLY BILL No. 455

Introduced by Assembly Member Cortese

February 7, 1991

An act to add Section 65958 to the Government Code, relating to development projects, and declaring the urgency thereof, to take effect immediately.

The people of the State of California do enact as follows:

SECTION 1. Section 65958 is added to the Government Code, to read:

65958. No lead agency shall approve a development project unless the applicant identifies a long-term, reliable supply of water to serve the proposed project.

SEC. 2. This act is an urgency statute necessary for the immediate preservation of the public peace, health, or safety within the meaning of Article IV.

LETTER 31

Sage Sweetwood
President Emeritus, Planning and
Conservation League
6344 Palm Dr
Carmichael, CA 95608

Delores Brown
Department of Water Resources
3251 S Street
Sacramento, CA 95816

January 14, 2008

RE: Monterey Plus DEIR Comments

Dear Delores

It was with hope and optimism that I took my seat as a member of the newly created Monterey EIR advisory committee as 2002 transitioned to 2003. Approximately seven years of litigation and settlement talks were complete and then DWR Director Tom Hannigan emphasized that he wanted to make this a model EIR process, characterized by a thorough exploration of the issues and grounded in sound science. I found this to be a welcome change from the private negotiations that led to the dramatic State Water Project (SWP) contract revisions and the subsequent 1995 EIR process. These 'Monterey' contract amendments eliminated the urban preference for drought year water, transferred a one million acre foot underground reservoir from state to quasi-private ownership, changed operating rules to allow for increased water exports from the Delta, transferred agricultural water to suburban districts on the far fringe of urban areas, and relived all water contractor of up to $40 million a year in payments to the SWP capital improvements fund. For reason I still do not understand, this original EIR, that analyzed a major restructuring of the operations of the SWP, was delegated to a small, Santa Barbara based joint powers agency rather than to the California Department of Water Resources. With minimum publicity, this agency produced an inadequate EIR. PCL challenged this EIR; in 2000, the EIR was decertified, and the court tasked DWR with the responsibility for completing and certifying the new EIR; in 2003, a difficult settlement process concluded, and the new SWP EIR began. DWR Director Hannigan played a significant role in the successful conclusion of the settlement, and his opening remarks to the committee were consistent with our expectations. Monthly meetings with spirited debate followed and the outline of the EIR slowly took form.

31-1

While the committee members had substantial differences of opinion, the facilitated discussion led to a number of decisions that, in my opinion, improved a still deficient DEIR. Because PCL viewed CALSIM modeling as an uncalibrated tool that consistently over-projected potential water exports from the Delta, DWR agreed to our compromise of conducting a parallel historical analysis of actual delta exports. This alternative analysis, while more limited than we would like, identified smelt kills directly associated with the project's increased winter pumping. Not surprisingly, CALSIM analysis failed to detect this impact. 31-2

With the unanticipated recall election, the change of administrations and the departure of Director Hannigan, the EIR process drifted, with meetings becoming less frequent and the discussion less detailed. From my perspective, the process lost its search for solutions and became an 'old school' political exercise in defending the status quo and minimizing project impacts. Perhaps the best example of this shift is the framing of the permanent water shortage alternative. 31-3

As the appeals court ruling indicates, the original SWP contracts anticipated the possibility of a long term shortages -- as appears to be the case today. DWR has the contractual authority to reduce –across the board--water contract deliveries to reflect current reality. This approach would avoid chronic shortages by reducing expectations and encouraging water users to plan for lower, but more reliable SWP yields. This would encourage – just as the Delta Vision Task Force recommends -- conservation, reuse and the development of alternative water supplies. The appeals court found the previous EIR to be deficient because it failed to evaluate this alternative. DWR does address this option, but does so with smoke and mirrors. First DWR determines that the SWP contract yield should be reduced from the current 4.2 million acre feet (maf) per year to 1.96 maf. This is reasonable. But in the next step, DWR simply re-labels the water and delivers an amount identical to the original 4.2 maf yield. Thus DWR claims that there is no difference between the project and the long term shortage alternative. This defies common sense and the intent of the appeals court ruling. The purpose of this alternative was to assess the impacts of reducing water exports to a realistic level, not to play a game of accounting slight-of-hand. In playing this accounting game, DWR failed to analyze one of the most likely options available to policy makers today. 31-4

In the last year, the courts have taken control of Delta water deliveries because DWR, as the lead agency, has failed to prudently manage California's precious delta resources. By over promising water exports and ignoring existing environmental laws governing the Delta, the ecosystem plunged into a steep decline. This is the story of killing the goose that laid the golden egg. Because DWR was killing 31-5

the goose, the courts have stepped in and mandated lower pumping levels. Had DWR taken a responsible executive role in 1995 and implemented the long term shortage provision, I doubt the courts would be doing so today; the delta would be healthier and water agencies would not be faced with unexpected cutbacks. Yet, 12 years later, in this SWP EIR, DWR refused to simply study this option, even though they were directed to do so by the courts in 2003. It is ironic that the Governor's Delta Vision Task force has, in less than one year of work, done a better job of framing this issue than DWR has done in 12 years. This EIR will not comply with CEQA, or common sense, until DWR performs a proper analysis of the long term shortage alternative.

31-5 (con't.)

Furthermore, this EIR fails to explore other viable alternatives to the Monterey Plus project. The current set of alternatives fails to explore any option that de-emphasizes increased Delta exports and instead emphasize both conservation and the development of regional supplies. Since the costs of stabilizing the Delta for water transport will be in the multiple billions of dollars, it makes public policy sense to look at options that meet California's water needs in other ways. In fact, if sea level rise continues to trend to the high side estimates, it may be impossible from a practical point of view to harden the Delta for exports, and substantial export reductions may become the new reality. Weather this worst case scenario comes to pass or not, its probability of occurrence is too high to ignore. Would any Californian vote to spend billions of dollars on Delta improvements, knowing that a rising sea level would eliminate their water transport value? I think not. Yet who is educating the public and the policy makers? This Project is pushing the State down this path of an armored Delta strategy without examining other viable options. I urge DWR to take a step back and rethink its approach to this EIR. The goal should not be to shuffle paperwork to satisfy a court order; the goal should be to find a solution to California's water needs that will protect the environment and be resilient in the face of climate change. The current DEIR fails this test.

31-6

The Governor's Delta Vision Task Force has recently developed a set of recommendations that are consistent with the comments we have made throughout this EIR process. The full documents is available at

http://deltavision.ca.gov/BlueRibbonTaskForce/FinalVision/Delta_Vision_Final.pdf

Recommendation #4

California's water supply is limited and must be managed with significantly higher efficiency to be adequate for its future population, growing economy, and vital environment.

31-7

It is possible to achieve our co-equal goals [*The Delta ecosystem and a reliable water supply for California are the primary, co-equal goals for sustainable management of the Delta]*, but only if we Californians change our policies and our habits of water use. There is no unlimited supply of cheap water in California. Greater conservation, increased regional self-sufficiency in water supplies, more conjunctive uses, integrated water system management and demand management, and new technologies will all be essential. In addition, the State of California should encourage equitable access to higher quality water sources and seek to reduce conflict among water users for diversion from the highest water quality locations. As the vision is achieved, all areas of California have increased regional self-sufficiency, and water conservation is the ethic underlying water policy. Additional, alternative ways to move water among areas of the state are being developed. A revitalized ecosystem at critical times requires reduced diversions or changes in the patterns or timing of those diversions, upstream, within the Delta, and exported from the Delta.

Recommendation #6

The goals of conservation, efficiency, and sustainable use must drive California water policies. We must start by requiring and investing in water use efficiency by all users throughout the state. The fastest ways to address the growing demands for water are to conserve and to increase the efficiency of the water supply system. These efforts can start almost immediately. Vigorous conservation efforts are essential as far as we can see into the future. Some areas of California and some sectors of the California economy are already leaders in water use efficiency measures such as conservation and recycling. Because competition for California's limited water resources is growing, we must continue these efforts and be innovative in our pursuit of efficiency. Water use efficiency will continue to be a primary way that we meet increased demand. In the future, we must broaden our definition of efficient water use to include other ways of getting the most utility out of our groundwater and surface water resources and water management systems:

31-7 (con't.)

Increase levels of urban and agricultural water use efficiency;
Increase recycled municipal water and expand its uses;
Change water facility operations to improve efficiency;
Facilitate environmentally, economically, and socially sound transfers to avoid regional shortages; and
Reduce and eliminate groundwater overdraft.

As the vision is achieved, water use efficiency and conservation practices in California are among the best in the world, relying on a combination

> of building standards, best management practices, and pricing to ensure the most effective use of water resources.

Similar language is found in the State Water Plan, published by DWR as Bulletin 160. In those documents, DWR estimates that up to 6.5 maf of water can be generated through conservation, reuse, and conjunctive use. This contrasts with the SPW yield of 1.96 maf as projected by DWR. Even though DRW promotes conservation/reuse/conjunctive use in their own planning documents, they have refused our repeated requests to explore any such alternatives in this EIR. The findings of the Delta Vision Task Force re-enforce the relevance of exploring these options so that policy makers can make well informed decisions. Furthermore, the Delta Vision Task Force goes on to say that an EIR that fails to take this statewide perspective will not provide adequate policy guidance to decision makers.

> Unless policy-makers clearly call for a statewide perspective, a CEQA process on conveyance and storage projects will not examine crucial elements of these decisions that are identified in this vision. Analytic processes focused just on proposed projects are unlikely to reveal the full economic impacts or life cycle costs of water system improvements. They are also unlikely to address all Delta ecosystem problems. The analyses needed must go beyond conveyance, storage, and project mitigation and assess how the full set of policy choices from this vision will serve California for 70 to 100 years. In final policymaking, the specifics of conveyance and storage can be expected to be less than half of what is needed to meet the charge to the Delta Vision Blue Ribbon Task Force found in Executive Order S-17-06. (Page 14)

31-7 (con't.)

As the Delta Vision Task Force reports, California's water system is currently in crisis. Solutions to this problem will be extremely difficult and will cost billions of dollars. The Monterey Plus amendments made changes that profoundly alter the operation of the State Water Project. We have no way of knowing whether these changes are more or less environmentally harmful than other alternative that have been discussed for years, and have been re-enforced by the Governor's Task Force as recently as Dec. 2008, but have not been examined by this EIR. The Monterey Plus project needs to be evaluated against other credible alternatives that may achieve superior results with less environmental impact.

Climate change and rising sea level also may have profound differential impacts on the project and other conservation based or dispersed regional development alternatives. The current EIR's analysis of climate change was tacked on at the end of the process, only after our repeated requests that climate

31-8

change be integrated into the basic analysis. DWR resisted any climate change assessment, but finally included the superficial chapter in the DEIR. DWR and others have conducted more sophisticated climate change analyses that consider such factors as sea level rise, reduced snow pack, and increased rainfall variability. DWR should conduct an integrated climate change analysis of the project and of alternatives that are based on conservation and/or dispersed regional development alternatives. This analysis will give policy makers the required information to make sound decisions that will protect our environment and preserve a reliable water supply for California.

31-8 (con't.)

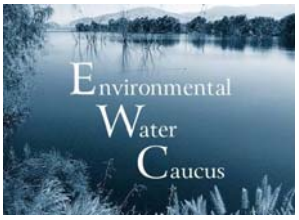
I urge DWR to stand up strong against the political winds of narrow special interests and revise this EIR so that it will become a meaningful tool for policy makers and the public alike.

31-9

Respectfully,

Sage Sweetwood
President Emeritus, Planning and Conservation League

LETTER 32



California Sportfishing Protection Alliance

Friends of the Santa Clara River

Southern California Watershed Alliance

January 14, 2008

Ms. Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
3251 S Street
Sacramento, CA 95816

Via email: delores@water.ca.gov

RE: Comments on the Draft Environmental Impact Report for the Monterey Amendments to the State Water Project (including Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement - SCH#: 2003011118

Dear Ms. Brown:

The undersigned organizations submit the following comments on the Draft Environmental Impact Report for the Monterey Plus (DEIR).

The proposed project in the DEIR would represent a major change to the State Water Project contracts which govern the operation of State Water Project (SWP). We urge DWR carefully to consider the implications for California's environment, citizens, and economy before finalizing a decision on the Monterey Amendments. Already, the interim implementation of the Monterey Amendments has contributed to significant environmental

32-1

degradation in the Bay Delta Estuary and reduced water reliability for residents in Southern California.

Since the interim implementation of the Monterey Amendments in 1996, the Bay Delta Estuary has fallen into a critical decline with several species, including the delta smelt, at historic low abundance. Increases in SWP pumping have been identified as a primary contributor to this decline. Such impacts were in part the result of the increased winter and the spring export of Article 21 and turnback pool. Provisions of the Monterey Amendments have in part facilitated these increased exports from the Bay Delta Estuary and the resulting environmental degradation.

32-1 (con't.)

In addition, elimination of Article 18 (b) (the permanent shortage provision) has perpetuated the reliance on paper water. By eliminating of Article 18(b), DWR would also be giving up a critical safety valve that allows SWP entitlements to be cut back in light of changing climate conditions and/or regulatory constraints imposed to restore the Bay Delta ecosystem. Elimination of the urban preference for SWP water delivery, contained in Article 18(b), has also contributed to reduced water reliability for millions of Californians.

DWR has many alternatives to the proposed Monterey Amendments. For instance, DWR could assist SWP contractors in aggressively implementing the 3.1 million acre feet of urban water conservation and the 1.4 million acre feet of recycled water potential identified in the California Water Plan. Such implementation would increase water reliability of SWP contractors while avoiding the environmental impacts associated with the Monterey Amendments.

32-2

We strongly urge DWR to reject the Monterey Amendments as proposed in the DEIR, and to adopt an alternative that can better serve California.

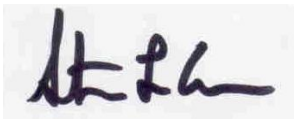
32-3

Sincerely,

Gary Patton, Executive Director
Planning and Conservation League

Lynn Barris
Butte Environmental Council

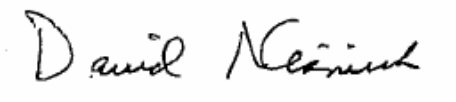
Ron Bottorf
Friends of the Santa Clara River



Steve Evans, Conservation Director
Friends of the River

Zeke Grader, Executive Director
Pacific Coast Federation of Fishermen's Associations

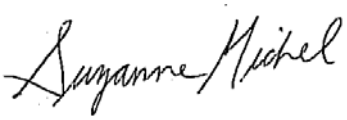
Bill Jennings, Executive Director
California Sportfishing Protection Alliance



David Nesmith, Facilitator
Environmental Water Caucus

Conner Everts
Desal Response Group

Wenonah Hauter, Executive Director
Food and Water Watch



Suzanne Michel
Southern California Watershed Alliance

LETTER 33

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January 9, 2008

Delores Brown
California Dept. of Water Resources
Chief, Office of Environmental Compliance
901 "P" Street
Sacramento, California 95814

Re: Draft EIR: Monterey Amendment to the State Water Project Contracts, etc. ... Volume I...SCH #2003011118

Dear Ms. Brown:

Until recently the undersigned was a part owner of several hundred acres in the Southern San Joaquin Valley and has, for over 30 years, been actively participating in the environmental enhancement and restoration of that part of California. I have observed first hand on numerous occasions the operation of the Kern Water Bank under the Kern Water Bank Authority since the mid-1990s.

I have been consistently impressed by the attention paid by the Kern Water Bank Authority to sensitive habitat and special-status terrestrial biological resources at the Kern Fan in furtherance of the Kern Water Bank Habitat Conservation Plan/Natural Community Conservation Plan (executed October 2, 1997). They have conscientiously avoided significant adverse impacts on these resources, and have enhanced not only the biological diversity of the area, but the numbers of all species, both of special concern and otherwise, by virtue of their activities. They have consistently been willing to provide opportunities to residents of Kern County and others to view and appreciate the species and habitats which they have been protecting and enhancing.

33-1

While I cannot support it with hard data, it is quite logical that the mitigation of spikes in the water supply of the Southern San Joaquin provided by the Water Bank, both on site and elsewhere in the farming community, has enabled populations of many species to remain much more stable, thereby minimizing the "boom and bust" population cycles for the benefit of all concerned.

In closing, I would ask that anyone viewing the operations of the Kern Fan Element over the past 20 years, divided almost equally between operations being taxpayer funded and operations being user funded, to consider the differences in results. Not only has society gotten a great deal more bang for the buck under the current operation structure, but the wildlife so important to the area has fared far

better as well. I urge you to retain the status quo for operational authority of the Kern Fan Element in the hands of the Kern Water Bank Authority. 33-1 (con't.)

Sincerely,

William K. Rogers

WKR/wlr

Through the Monterey Agreement, DWR first gave the Kern Water Bank to the Kern County Water Agency. The Kern Water Bank is a 19,900 acre underground reservoir capable of storing a million acre-feet of water complete with canals, extraction pumps, and conveyance facilities to connect the water bank to the State Water Project aqueducts. The underground reservoir water bank enabled State Water Project water, floodwater, and other waters to be stored during years when water was more available and extracted and delivered during years of drought and DWR cutbacks of State Water Project water. The purpose of this transfer of public property to Kern County was twofold. One, to force Kern County to give up a fixed portion of its share of State Water Entitlement for purchase by municipal users only; and secondly, as discussed in documents, to make it available "generally" to Kern water agency farmers to dampen the affect of water cutbacks in the future. Farmers unlike urban users are particularly vulnerable to water curtailments.

The Kern County Water agency agreed to allocate the Kern Water Bank to the various farming water districts in Kern County and one district in Kings County. The Kern County Water Agency signed a joint powers agreement—which enabled various Kern County Water Districts to cooperate in their exercise of common powers—under the Kern Water Bank Authority umbrella. The result was that the Kern Water Bank Authority was formed of two water storage districts (Semitropic Water Storage District and Wheeler Ridge-Maricopa Water Storage District), two water districts (Dudley Ridge Water District and Tejon-Castac Water District), one special district (Kern County Water Agency), and one private company (Westside Mutual Water Company). Westside Mutual Water Company is a holding of Roll International Corporation. Roll International Corporation also holds complete ownership of Paramount Citrus, the largest grower, packer, and marketer of citrus in the country; Paramount Farming, the largest producer of almonds and pistachios in the country; and Paramount Farms, Inc., the largest pistachio processor and the second largest almond processor in the world. Roll International Corporation is owned and directed by Stewart and Linda Resnick. Westside Mutual Water Company is wholly owned by and exclusively for Paramount Farming Company; thus, privately held be the Resnicks'. 34-1

Paramount's success would not be possible without water—indeed enough water to satiate over 100,000 plus acres of permanent orchard crops with year-round irrigation in a semi-desert. In today's environment the Kern Water Bank can hardly be considered "local" and/or under "local" control. Paramount Farming Company through Paramount's water company owns 48.06%, easily the largest share of the Kern Water Bank. Through Dudley Ridge Water District, Paramount's farming entity owns an additional 8.66% of the Kern Water Bank. The Dudley Ridge share prohibits the district from ever venturing into this water bank area except for the benefit of Paramount. The State of California could have hardly foreseen that a private individual would own, control, and monopolize such a valuable public asset. The situation as it exists today seems to "game" the State of California's water policy. Meeting in "closed sessions", rewriting public policies, tailoring their edits to the interests of monopoly-like agribusiness corporations.

The Kern Water Bank was nominally offered to some of the many water districts such as

Lost Hills, Berrenda Mesa, and Belridge; to a few that had not true underground water and hence this could balance the water supply to the many varied farming interests at the time. Unfortunately Paramount had a significant interest in all these districts and in most cases they held controlling Board seats. Paramount controlled the information and influenced the Boards of those very districts to allow these districts to give their rights to the Kern Water Bank to Paramount through a bogusly named "Westside Mutual Water Company". Bogus, in that this company is wholly owned by Paramount but named something different to disguise the intent as much as possible.

34-1 (con't.)

Within the EIR the impacts of this asset not being placed as intended must be analyzed. While one may argue that at the time this result was not in need of study because it was not intended and was not likely to happen; the facts now show that it has happened. If the benefits of the 20,000 acre Kern Water Bank was intended for the broad ownership of the various water districts that it was originally allocated to, then possibly the soon-to-be revised Monterey Agreement must assure that the Kern Water Bank should be returned to the various water districts for public agency use with public agency oversight so it can benefit all the water users of these districts rather than a few. This water bank must be maintained for broad and equitable use as intended or the consequences of single control must be properly studied. If one assumes the voting and voting influence in the intended water districts was improper and against the tenements any contemplated environmental documents then conditions must be made to undue the unlawful acquisition of the Kern Water Bank by one private entity.

34-2

The following concrete steps are recommended for accomplishing this goal: 1. Return the Kern Water Bank to the various water districts as intended for public agency control, oversight, and operation. This will have no effect on the various public districts that now own a minority portion of the Kern Water Bank. Paramount and it's Westside Mutual Water Company should never been allowed to own and monopolize the water bank by using their land owner voting powers to monopolize seats on the boards, and then as directors, voting this asset for acquisition to a company controlled by Paramount. This in itself may be a violation of the Political Reform Act, but the impact must be studied thoroughly if this is what the intent was. The privatization of this vital public resource should be reversed. 2. Water and irrigation districts that receive water deliveries from the State Water Project should be public and transparent. No editing water policy decisions during "closed session" meetings. Any closed session should be monitored appropriately by the Kern County Water Agency for the purpose of ensuring equitable allocation of water for beneficial use to ALL WATER USERS and any transfer of a public asset to one water user should require Kern County Water Agency approval. 3. Presently, Westside Mutual Water Company is allowed to recolor regulated water for sale or transfer by making paper transfers of the water through the Kern Water Bank. This is a benefit that is not allowed for other farmers in the districts that Paramount controls. This gives them a special monopoly power to the detriment of other water users. This should be allowed for all users of these water districts regardless of their minority voting status in these districts.

34-3

The Kern Water Bank was granted to Kern County in exchange for the county agreeing to allow transfer of water out of its borders for municipal use elsewhere. The asset was intended to broadly assist the various water districts and be equitably allocated within the districts. The monopolization is unfair to the process and must be studied or the allocation should be done in a manner as intended. In addition, two cases, one in Federal Court and one in Superior court in Bakersfield can further review the monopolistic and improper allocation of waters by Paramount's power of voting. The information on the cases is located on internet access: United States District Court Eastern District Of California, Case No. 1:05-CV-00603-OWW-SMS. Superior Court Of California, Count Of Kern Metropolitan Division-Unlimited, Case No. S-1500-CV 259407 SPC.
Thank you for the opportunity to comment.

Sandridge Partners

34-4

LETTER 35

SCOPE

Santa Clarita Organization for Planning and the Environment

TO PROMOTE, PROTECT AND PRESERVE THE ENVIRONMENT, ECOLOGY
AND QUALITY OF LIFE IN THE SANTA CLARITA VALLEY

POST OFFICE BOX 1182, SANTA CLARITA, CA 91386

1-14-08

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
Email: delores@water.ca.gov
(916) 651-9560

Re: Comments on the Monterey Plus EIR State Clearing House #2003011118
Submitted via email

Dear Ms. Brown:

Santa Clarita Organization for Planning and the Environment is a California non-profit planning and conservation group serving the high growth Santa Clarita Valley in Northern Los Angeles County since 1987. State Water Project water is supplied to the Santa Clarita Valley by Castaic Lake Water Agency (CLWA), a state water contractor that is a signatory to the Monterey Agreement. The General Manager of CLWA, Dan Masnada, now president of the State Water Contractors, was General Manager of Central Coast Water Agency at the time it decided to become the subsequently unauthorized lead agency for the now decertified Monterey EIR. Prior to that time, he was General Manager of the Valencia Water Co., wholly owned subsidiary of a company that was one of the largest developers in California, Newhall Land and Farming Co., developers of the 21,000 unit Newhall Ranch project, now owned by Lennar Corp. and associated companies. Newhall Land and Farming owned large tracts of land in the Santa Clarita Valley and Central Coast area that would benefit financially from the approval of the changes sought in the Monterey Agreement. 35-1

Comments on the Public Process

We would first like to comment on the public scoping process. While we appreciated the Dept. of Water Resource's effort to provide local scoping venues, there were many problems that would have impeded most public participants from attending, at least at the Ventura location. (We cannot comment on venue problems elsewhere). The hearing location was extremely difficult to locate on the DWR's website. The hearing was held in a large government complex, closed except for the jail and meeting location. The complex was dark. There were no signs directing attendees to the location of the basement room in this large complex that appeared to be closed. Lastly, the meeting that was supposed to last from 6-8PM closed down at 7PM, so any member of the public that thought the meeting would last until 8pm, found a closed facility. Such a process did not support good public outreach for this CEQA process. 35-2

Comments on the DEIR – Growth Inducement

Our Valley and the watershed of the Santa Clara River is greatly impacted by the growth enabled by the largest transfer allowed under the Monterey Agreement, the 41,000AF transferred to Castaic Lake WA. In addition, the Monterey Amendment allowed a change in the ratio of water for urban and agricultural purposes, i.e. article 18a, changing the deliveries to equal amounts instead of the prior "Urban Preference" ratio of 80/20 %. This change specifically benefited CLWA because their state 35-3

water project "Devil's Den" agricultural water acquisition of 12,500AF, formally subject to 18a did not allow sufficient reliability on which to approve housing. After Monterey, it did.

Additionally, the changes to Article 21 water and the change to allow storage outside the contractor's service area granted by the Monterey Agreement, allowed CLWA to bank an enormous amount of water in the Semitropic Water Storage Project, acquired as a result of the transfer of the Kern Fan Element. This also acted as a growth inducement in the Santa Clarita Valley because CLWA now evaluates its reliability at a higher amount, some 72%, rather than a more prudent, 50%, due to the back up storage in these water banking projects.[1]

35-3 (con't.)

Changed pumping regimes in the Delta have caused serious impacts to endangered fish species as identified in the DEIR in Chapter 7.3, Biological Resources. Those changes also enabled CLWA to take Article 21 water for storage[2] that in turn produced serious growth inducing impacts to the Santa Clarita Valley and in particular, the Santa Clara River by purporting to increase water supply reliability of SWP water and thus increase water supply.

35-4

Further, the DEIR states that eliminating the 18b declaration of a water shortage had no effect on growth
inducement. In fact, local non-profit entities including SCOPE have had to initiate numerous legal challenges in an attempt to see that water supply and in particular, the State Water Supply reliability is accurately represented to decision-makers.[3] Many of these legal challenges are still in process.[4] Such ambiguity in local environmental documents would be greatly decreased by re-instatement of Article 18b. And in turn, local planning agencies would not be able to rely on exaggerated figures or mis-understandings of existing water supplies. There would be little possibility of over-stating supplies for the purposes of complying with SB 610 and SB 221. Elimination of Article 18b has allowed approvals that would not otherwise have occurred without strong water conservation and efficiency requirements, and might not have occurred at all, had the public and the decision makers had a clear understanding of State Water Reliability and availability.

35-5

The Santa Clara River is the last mostly unchannelized river in Los Angeles County and home to an array of endangered species. Since 1999, an enormous number of units have been approved along its tributaries and primary reaches, enabled by the Monterey Agreement. These projects include the 2500 unit West Creek Project, the 1100 unit Tesoro del Valle project and the 2000 unit Valencia II project on San Francisquito Creek in the City and County areas; the 2000 unit Valencia I project, the 1100 unit Riverpark project, the 500 unit Soledad project along the main stem of the Santa Clara River in the City of Santa Clarita; the 21,000 unit Newhall Specific Plan and the 500 unit Spring Canyon Project on the main stem of the River in the County area. Other projects affecting tributaries and relying on the Monterey Agreement for their water source in the City and County areas are the huge Gate King industrial project, the Valencia Industrial Center expansion, the 500 unit Golden Valley project, the 2000 unit Fair Oaks Ranch project. (All unit numbers are rounded up or down to the nearest 100 units for the sake of simplicity. Exact numbers can be supplied upon request). We did not include projects under 500 units in the list, but those projects cumulatively total at least another 1000 units. These approvals total some 10,000 units, 31,000 with the additional approval of the

35-6

[1] See Santa Clarita Valley Water Supply Report, and CLWA 2008 Water Supply Update, attached

[2] Ref Agreement between DWR and Semitropic Water Storage District, signed May 1995; Agreement between CLWA and Semitropic Water Storage District, 2002 and 2004. All these contracts were overseen and approved by the Dept. of Water Resources and are on file in their offices. We hereby incorporate them by reference in this comment letter.

[3] *SCOPE v. County of Los Angeles*, 2003 (*SCOPE I*), *California Oak Foundation v. City of Santa Clarita, 2004*

[4] *Sierra Club v. City of Santa Clarita*, filed 2005 against the Riverpark Approval, *C-Win v. Castaic Lake Water Agency*, filed 2005 against CLWA's Urban Water Management Plan, etc.

21,000 unit Newhall Ranch Specific Plan now in tract map review, plus numerous large industrial projects. Another 4500 hundred units are in the review process (North Lake and Tick Cyn.) in addition to other smaller projects.[5]

35-6 (con't.)

Therefore, we believe it is obvious that the Monterey Agreement has had enormous growth inducing impacts on the Santa Clarita Valley by enabling this auto-oriented urban sprawl form of land use to continue. These projects have created enormous traffic problems and some of the worst air pollution in the nation in a federal non-attainment zone for ozone and particulate matter. They have hardscaped recharge areas and tributaries to the Santa Clara River that serves as one on the main sources of local ground water. They have enabled building in the flood plain of the river where many of the projects occur. They have created enormous water quality problems.

The projects enabled by the Monterey agreement have impacted California Species of Special Concern, including the unarmored three-spined stickleback fish by eliminating its habitat and creating water quality problems that affect its survival. Another CESA species of special concern, the white-tailed kite has experienced destruction of nesting sites. Endangered migratory birds such as the willow flycatcher and least bell's vireo have also experienced loss of habitat and nesting areas. Threatened bird species including hawks and falcons are affected. The endangered arroyo toad and red-legged frog, the threatened California pond turtle, three-striped garter snake and black-eared jackrabbit are all threatened by growth that is directly attributable to the water transferred to the Santa Clarita Valley by means of the Monterey Settlement. These biological impacts are of course in addition to those incurred by species in the Sacrament/San Joaquin Delta area.

Because of the additional and ready availability of the Monterey Agreement transfer water that is causing such substantial impacts to the Sacramento Delta, the growth described above occurred in Southern California without requirements for drought tolerant landscape ordinances, recycled water infrastructure and protection of local re-charge areas. It enabled the building industry to make vast short-term profits while deferring the long-term costs of such irresponsible growth behavior to future taxpayers.

35-7

Information to allow assessment of these growth-inducing impacts is readily available through the County of Los Angeles and the City of Santa Clarita. Had the Dept. of Water Resources wanted to comply with the California Environmental Quality Act in a good faith effort to disclose growth inducing impacts, such information, including EIRs for the above listed projects are readily available on the County Regional Planning and the City of Santa Clarita websites and are detailed in many of the Castaic Lake Water Agency project EIRs. Those EIRs detail impacts to traffic, air quality and endangered species by the named projects. The water sections of those EIRs also all specifically state their reliance on the State Water project Monterey Transfer as a source of the water supply for the projects.

Such information is also undoubtedly readily available for other transfer areas. ***We therefore request that the DEIR be re-circulated to include such information as required by the California Environmental Quality Act.*** We believe such an action is imperative for the health and well being of the State of California and for the protection of wildlife which the State holds in the Public Trust for all Californians.

Much of the economic well being, as well as the physical well being of the population, depend on a healthy Delta. The Governor's Blue Ribbon Task Force, referenced by the Monterey Plus EIR, along with several recent Court decisions, including the Wanger Federal Court decision on Dec. 17th, 2007

[5] Several excerpts including the water supply chapters from these EIRs were submitted in a separate reference material packet

and the decision setting aside the CalFed Record of Decision, all indicate that withdrawals from the Sacramento Delta must be reduced. Yet the interim operation of the Monterey Amendment, without benefit of a certified EIR that would have addressed these issues and hopefully provided mitigation or solutions to the problems, was allowed to proceed. This action has had serious negative consequences, including failure in the receiving areas to make planning decisions that would conserve and reduce water usage. After all, there was plenty of water, so such conservation reforms and land use planning to preserve local sources wasn't really necessary with such a cheap and abundant source of additional water.

35-7 (con't.)

Conclusion

It is SCOPE's firm belief that we must change land use planning in the state of California if we are to provide water for a healthy economy and healthy communities, both human and wildlife, in the future. We cannot continue to use water from Northern California to pave over our local recharge areas and destroy our local water resources.

Such a change could be brought about by the careful examination of growth inducing impacts in the Monterey Plus EIR. We urge the Dept. of Water Resources, acting on behalf of all Californians, to take this action.

The Department should also develop an alternative that re-instates article 18b and a no project alternative that addresses whether there is a need for this project after all available water efficiency measures are instituted.

35-8

Sincerely,

Lynne A. Plambeck

Lynne Plambeck
President

Attachments:
1. Excerpts from Santa Clarita Valley Water Supply Report, 2007
2. CLWA 2006 Water Supply Planning Update

LETTER 36

SIERRA CLUB
CALIFORNIA

January 14, 2008

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
Email: delores@water.ca.gov
(916) 651-9560

Re: Comments on the Monterey Plus EIR State Clearing House #2003011118

Dear Ms. Brown:

Sierra Club California appreciates with an opportunity to comment on the Draft Monterey Plus EIR (DEIR). This project is of statewide significance to California's water supply and delivery system.

As the DEIR accurately describes, this document was released as a result of litigation and a settlement that set aside the original Monterey EIR. The settlement and Court Order provided that a new EIR be produced that will provide a more complete disclosure of impacts from changes to contracts known as the Monterey Amendments. These changes relate to the manner in which the state water supply from the Sacramento Delta and its delivery system are to be managed. Although the release of this document was in response to a Court Order and Settlement in 2003, the Dept. of Water Resources (DWR) did not release the DEIR to the public until October of 2007. This remarkable delay has allowed the State to continue in a regrettable status quo posture that may be the chief cause of the current crisis surrounding the Delta Smelt. The change in pumping regimes promulgated by this project and proceeding without a certified EIR, allowed extensive increased pumping at a time that would affect Smelt migration. This occurred without the benefit of mitigation measures resulting from a final certified document. Such measures might very well have immediately identified and ameliorated the problem, thus avoiding the current crisis. 36-1

The DEIR analysis is not based on an appropriate baseline

It is essential that this environmental document begin by addressing the issues from the starting point of a correct baseline. The baseline included in the DEIR does not provide an accurate basis for comparison of impacts. The baseline does not accurately reflect pre-Monterey contract provisions that set limitations for contractors, and thus does not accurately reflect demands or capacity to accept SWP water under those pre-Monterey contracts. 36-2

It is already settled in California case law, that the baseline must accurately represent the conditions present before the initiation of the proposed project. (*Save our Peninsula v. Monterey County*) Although the document discloses delivery scenarios prior to 1995, it doesn't accurately describe the environmental setting. This environmental document seems to begin with a baseline period of the project itself, in or before 2000. The baseline should reflect the conditions present in the Sacramento Delta and other affected areas as of the release of the project proposal in 1995. That information is readily available by

accessing the original documents and comments. We request that the DEIR be changed to reflect these conditions so that appropriate safeguards and mitigation can be incorporated into the final document.

With the proper baseline in place, the DWR must acknowledge that circumstances have changed substantially from the time of the initial project proposal. Increased pumping that has occurred as a result of allowing water to be stored outside of a contractor's service area, thus increasing demand for Article 21 "unscheduled water deliveries" and substantially changing Delta pumping regimes, has caused substantial impacts to endangered species. It has also induced growth in Southern California in areas where such growth otherwise would lack a viable water supply. The DEIR should disclose, mitigate and develop alternatives for avoidance of pumping scenarios that impact endangered Delta fish species issues. Under the current project, such impacts in the Delta will continue to occur. It must include and analyze supply reductions that will occur as a result of the recent court decisions (see below) as an alternative to the proposed project.

36-2 (con't.)

Purpose of Project

"Thus to fulfill the intent and purpose of the project, it is essential that all the above objectives [as listed on page 4-1 and 4-2] be achieved."[1] Such a project purpose defeats the purposes of CEQA because it defines the project in such a way that any alternatives will not meet the project objectives and are therefore infeasible.

Sierra Club California does not concur with DWR's assessment that either the settlement agreement or this new environmental document should allow all transfers to stay in place and be final. First, not all transfers, i.e. in particular, the 41,000 AF transfer to the Castaic Lake Water (CLWA) were deemed final by the settlement agreement. The CLWA transfer in particular was ***not*** included on Attachment E of the Monterey Settlement, the list of projects deemed to be final by the Agreement. This transfer is also the largest and potentially the most devastating to the environment, especially due to the growth inducing impacts in the receiving area of Santa Clarita, California. Further, if no changes to the project are intended or can be made, why did the Court order a new environmental report? Certainly, the Court and Plaintiffs envisioned a process that would address the failures and /or inaccuracies of disclosure in the original document. Otherwise, this EIR process is merely a sham meant to paper the subject rather than a good faith effort to actually address and correct the problems. Such a sham is not the intent or the purpose of CEQA compliance. We believe that this statement prejudices the review process and discourages public comment since one must ultimately wonder why he or she would spend time commenting on a lengthy document and participating in a process where no change will occur.

36-3

Second, the DWR has itself argued before the Superior Court in the County of Los Angeles (*C-Win v. Castaic Lake Water Agency*) in verified and sworn testimony [2] that it *does* have the right to adjust the Monterey water delivery contracts based on new circumstances. Therefore, this EIR can and should include mitigation and alternatives that address all issues of controversy even though they may be outside the concept of the original project agreement.

36-4

To infer that the project must proceed as described prejudices the direction of comments and suggestions that the DWR may receive to improve both the project and the EIR. We therefore believe that this document must be re-circulated with this prejudicial statement deleted.

Project Description

36-5

[1] DEIR at page 4-2

[2] included as separately submitted reference material

Sierra Club California believes that increased water supply and pumping is also a clear goal of the Monterey Amendment and should be so stated. The fact that this increase will occur is clearly noted as impact 10-1-2 "The proposed project will increase pumping in the Sacramento-San Joaquin Delta".[3] This goal is very controversial, and when admitted forthrightly, will probably require disclosure of impacts not currently discussed in the EIR. A clear statement of the project description and objectives is essential to enable the public to make informed comments on the project and for potential impacts to be addressed.

36-5 (con't.)

Discussion of Article 53 in section 4.4.2 does not make it clear that the permanent retirement of 45,000AF of water by Kern County was water that they never received anyway. It is a classic example of "paper water" manipulations that appear to make some change, but in reality, don't really exist. In this case, one might be lead to believe that fields were fallowed or other reductions in water usage occurred when in fact nothing occurred other than a reduction in some accounting figures on paper.

36-6

Articles 18a and b

The Sierra Club is particularly concerned about the changes to article 18a and b. The DEIR accurately represents that these changes were an area of controversy in the original document and continue to be so. We believe that Article 18a, the elimination of the "Urban Preference" must be re-evaluated in light of new circumstances including the Dec. 17th Federal Court Wanger Decision[4] that substantially curtails Delta pumping in an effort to reduce impacts to the endangered Delta Smelt. Elimination of this preference affects, in particular, large urban users such as the Metropolitan Water District, Antelope Valley East Kern WA and others by reducing the overall ratio of water they will receive and increasing that ratio to Agricultural buyers. This change impacts the ability of these large urban areas to deal with drought or other water supply reduction scenarios (levee breaks, salt water intrusion, water cutbacks due to endangered species issues), by substantially reducing the water they will receive in such events. Although urban areas can institute water conservation measures, in the end we believe that society and government will undoubtedly not cut off water to large urban areas. Therefore, elimination of this article creates a false assurance to farmers, encouraging them to plant long term corps such as orchards rather than annual row crops[5], the loss of which would not be so financially devastating.

36-7

We believe that the DEIR should address the question of financial responsibility should DWR not be able to follow through on its commitment in the Monterey Agreement to supply the increased ratio of 50% of the water to farmers, thus destroying orchards. Since DWR may be creating a substantial liability for the people of the state of California by eliminating the "Urban Preference", the DEIR should analyze the potential financial impact of eliminating this preference in the project changes to Article 18a. We understand that CEQA does not require disclosure or evaluation of financial impacts, but given the state's current fiscal emergency just declared by The Governor (Jan 10th, 2008), such an analysis is prudent.

36-8

With the elimination of Article 18b, DWR gave up its ability to declare permanent shortages and cut back entitlements accordingly. It appears now that permanent shortages are indeed occurring or will occur in the near future due to pumping reductions to protect endangered species and the impacts of global warming. The easiest way for all stakeholders concerned to understand that there will be less water coming from the Delta is to invoke Article 18b and reduce the contractors' entitlements. This is a clear, unambiguous way of ensuring that local planning authorities understand how much water is available to them and will ensure accurate disclosure for SB 610 and SB 221 Water Planning compliance.

36-9

The EIR argues that no growth inducing factors were created by the elimination of this provision. In fact, numerous projects in the Santa Clarita, Antelope Valley and San Bernardino areas have been approved on

36-10

[3] DEIR at ES-54
[4] *ibid., note 2*
[5] Acknowledged by DWR as occurring in "Summary of Impacts" 10.1-3, page ES55

the false expectations that this water will always be available at the entitled amount. Such expectations are apparent in the 2nd Appellate Court case decisions *in SCOPE v. County of Los Angeles,* 2003 (*SCOPE I*) and *California Oak Foundation v. City of Santa Clarita*, as well as the numerous additional legal challenges brought in these areas against local agencies for not recognizing the limitations of the State Water Supply. They continue to be apparent as recently as January 10th 2008 when the Los Angeles County Planning Commission approved another approximately 2000 units based on an over stated supply of State Project Water.[6]

We concur with Planning and Conservation League's statement that "it is reasonable to assume invocation of Article 18 (b) would result in altered demand for SWP water, and in particular Article 21 water. For instance, if the minimum yield of the SWP were to be explicitly reported at 1.9 maf, and if Article 21 (g) (1) were still in place therefore indicating the very unreliable nature of such water, decision makers would have a clear understanding that the minimum yield is reliable, while other deliveries from the SWP are unreliable. In such case, municipal water agencies would be legally and contractually restricted from relying on water in excess of the estimated minimum yield of water for development, as well as for prolonged supplies. "

36-10 (con't.)

Overstatement of these supplies in EIRs for housing projects due to the elimination of Article 18b is a serious problem resulting in poor to non-existent local water supply planning. Without a recognition that state water supplies are not available to the extant reflected in the contracted amount, local jurisdictions do not require needed conservation measures, drought tolerant landscaping ordinances or funding for recycled water and protection of local re-charge areas.

DWR argues in the EIR that the "Reliability Report", required by the settlement Agreement, adequately addresses this issue. But that document is not codified into law, is released only every three years, and has not been timely produced in the past. Further, it does not include an analysis of climate change on the California water supply. It is widely believed that the effects of climate change in California will included reduced snowfall in the Sierras and thus reducing and/or changing the timing of water available for distribution by the State Water Project.

36-11

We believe that Article 18b must be re-instated in light of the many local project EIRs that rely on this source of information for making their water supply decisions.[7] Additionally, as a required mitigation measure, DWR should promulgate and support legislation to permanently mandate a timely "Water Reliability Report", or mandate that it become a budget line item for DWR and incorporate it as a requirement in their strategic planning and agency guidelines.

36-12

Failure to Address Identified Impacts to the Endangered Delta Smelt

In an attempt to protect the Delta Smelt fish species as required by the Endangered Species Act, the recent Federal Court Wanger Decision[8] invalidating the biological opinion for this species has just required a substantial reduction in the allocation of state water supply. This reduction, made in an attempt to avoid species entrainment by the Delta pumps, is a significant constraint for the SWP. Although the DWR cites a 2007 biological report, thus indicating that they must have been aware of these constraints, and DWR's own Chief of Project Operations Planning Branch, John Leahigh submitted sworn testimony[9] asserting this impact, the DEIR fails to incorporate this information. The testimony of Mr. Leahigh stated in

36-13

[6] See attached news article regarding the approval of the first phase of the Newhall Ranch project in addition to the 500 unit Spring Canyon project the same day, and reference water supply as indicated in the Castaic Lake Water Agency Urban Water Management Plan 2005.

[7] See separately submitted reference material containing excerpts from local projects EIRs

[8] *NRDC v. Kempthorne,* Dec. 17th, 2007 attachment to separately submitted material

[9] Declaration of John Leahigh, *NRDC v. Kempthorne,* Aug. 21st, 2007, attachment to separately submitted material

particular that under the interim remedy actions proposed by the United States Fish and Wildlife Service (USFWS), SWP 2008 deliveries would be reduced anywhere between 8% (91,000 AF) to 27% (305,000 AF) from a baseline delivery of 1.15 MAFY in a dry year; and from between 8% (252,000 AF) and 31% (305,000) from a baseline of 3 MAFY in an average year. 36-13 (con't.)

The DEIR fails to respond to the requirements of this decision in alternatives analysis or recognize this significant decision in Section 6.3 (Changes in SWP Operations Since 1995 Unrelated to the Proposed Project). 36-14

The Delta Smelt Recovery Index and Salvage Tables found in chapter 7.3 all end in 2004. These tables should be updated to indicate the continued recent decline in the species. But even with only the current information, it is obvious that the Smelt population has declined precipitously during this interim implementation of the Monterey Agreement. This interim implementation included 400,000 additional acre-feet pumped into storage in the Kern Water Bank. Such flows previously supported aquatic life.

The DEIR identifies impacts to endangered fish species as being potentially significant, but indicates on page 7.3-72 that the Environmental Water Account will serve as one program that would mitigate this impact. The DEIR should disclose the financial inadequacy of this program to supply needed water to the environment in the past, or a table indicating past shortfalls. It is settled Appellate case law that a program or infrastructure that cannot be funded, may not be offered up as mitigation. The seminal case on the impropriety of relying upon such "wishful" mitigation is *Federation of Hillside & Canyon Associations v. City of Los Angeles* (2000) 83 Cal. App. 4th 1252, finding a violation of CEQA for relying on highly uncertain funding to insure actual implementation of the mitigation. 36-15

The Delta Smelt and other pelagic fish species are part of California's wildlife protected for the benefit of all Californians under the Public Trust Doctrine. Failure to provide adequate water supply and water quality for these species or actions that advance extinction by reversal of river flows and entrainment in pumps, constitute a violation of the Public Trust for all Californians. We therefore request that the DEIR address Public Trust rights and obligations in the DEIR. This should include disclosure of any water rights received from the State Water Resources Control Board allowing pumping from the Sacramento and San Joaquin Rivers and any of their tributaries. Permits should indicate permitted quantities of water to be pumped from those rivers and the dates when those permits were issued.

Analysis of Public Trust rights should also include the affects on water temperature (a judicially confirmed water quality parameter) that occur as a result of changes in reservoir management required to support the Monterey Amendments. Such changes may affect pelagic fish species by interrupting their spawning and migration activities, since these activities require an identified range of cold water temperature that may not be present in reservoirs lowered to accommodate altered pumping regimes as envisioned by the Monterey Amendments. These issues must be addressed in the DEIR. 36-16

Kern Water Bank

The goal of the State Dept. of Water Resources is to see that all citizens have enough water to drink, dispose of wastes and supply industry and agriculture. In contrast to this goal, the transfer of the Kern Water Bank has resulted in the potential privatization of our water resources. In contrast, large businesses, including agriculture, are legally bound to increase the near term profits of their stockholders. This could mean selling water that was used for irrigation to developers of suburban sprawl; see attached report "Taking Water from Taxpayers".[10]. 36-17

The Kern County Water Agency should not manage the KWB because the Agency is controlled by large agricultural businesses that could also divert water from irrigation to urban sprawl or their own private

[10] Released by Environmental Working Group, February, 2005

interests. We rely on information provided in a report produced by "Public Citizen" entitled "Water Heist" attached to these comments and also available on their website at www.citizen.org/california . We request that the DEIR address the issue of privatization and loss of public control over water storage areas that has lead, in effect, to ownership of a publicly held resource by private business interests. This report indicates that if the Kern Water Bank were given to the directors of the Kern Water Bank Authority, Paramount Farms would own 48% of the Kern Water Bank and Dennis Mullins of Tejon Ranch Corporation would represent Wheeler Ridge Maricopa Water Storage District which would own 24% of the Kern Water Bank.

As the Kern Water Bank and other facilities are made to store more water, endangered species habitat within them will be reduced. The EIR should discuss how water conservation could minimize this impact. We appreciate the mitigation in Table ES 1, 7.4-3; but they do not address replacing dry land with ponds. Table ES 1, 7.5-3 mentions conversion of 1200 acres of the Kern Fan Element dry land into ponds. I hope the third and last sentence of mitigation measure 7.4-2 of Table ES 1, summary p 27, says that this loss should be mitigated at least by off site habitat for fully protected, endangered and threatened species. Most Habitat Conservation Plans replace one acre of current habitat with three acres of off site mitigation. 36-17 (con't.)

The twenty thousand-acre Kern Water Bank (KWB) surrounds the 2800-acre City of Bakersfield Recharge Area. Bakersfield has sprawled to these 22,800 acres. Today's children are deprived of contact with land that approaches its natural state. It is well that the Kern Water Bank Authority allows several supervised walks a year on these lands. If the public owns the KWB, we might find a way for unsupervised kids to explore nature on their own in this area. The EIR should consider the effect such additional opportunity would have on inner city youth. We request that such opportunities be considered as additional mitigation for this project, should it be approved.

Project Alternatives

Although the DEIR purports to take into consideration various documents including the work of the Delta Vision Blue Ribbon Task Force[11], it does not seem to incorporate the ideas from those documents. Recommendation #7 of that document states "A revitalized Delta ecosystem will require reduced diversions, or changes in patterns and timing of diversions, upstream, within the Delta, and exported from the Delta at critical times."

The Task Force further states "The vision's recommendations are designed to be implemented together as an integrated solution and then work together in an interdependent fashion to achieve success." 36-18

Since it is obvious that the increased withdrawals from the Delta and the timing of those withdrawals may well be at odds with the requirements of the Delta Vision Task Force solution, we request that this DEIR develop an alternative that would ensure consistency with recommendation #7 of the Delta Vision Task Force.

Additionally, since the operations modeled in the DEIR are not legal under the Federal Court Wanger decision[12], and will alter the way the proposed project can be implemented, an alternative that addresses and incorporates the pumping regime developed by DWR to comply with the Court order should be developed. Further, the interim remedy imposed by the court restricts winter and spring SWP pumping in the Delta. Such restrictions will impact deliveries of Article 21 water, as well as Turnback Pool transfers. Any conclusions included in the DEIR regarding deliveries of Article 21, Turnback Pool water and other water deliveries in the winter and spring are now inaccurate and should be included in a new alternative that addresses this decision. 36-19

[11] Listed as a reference document in DWR meeting handouts. It can be accessed at www.deltavision.ca.gov and is hereby incorporated by reference

[12] Referenced and detailed above

Last, Sierra Club California requests that a "no project" alternative be analyzed that addresses the amount of water and energy saved by substituting water efficiency, conservation, water recycling and additional local recharge projects for the proposed project. An estimate of gains from water conservation is already documented in the Governor's Blue Ribbon Task Force material as well as readily available from other sources. Increased energy usage and costs can be calculated from the additional proposed pumping amounts that would occur from this project or existing costs already incurred by DWR, also information that is readily available.

36-19 (con't.)

Conclusion

Sierra Club California believes that this document has serious deficiencies in light of current court decisions, and that additional alternatives and mitigation should be incorporated into a supplemental document for re-circulation.

36-20

Sincerely,

Jim Metropulos
Legislative Representative

Attachments:
1. "Planners Approve Landmark's EIR", Parimal M. Rohit, Newhall Signal, 1-10-08
2. "Water Heist", John Gibler, report released by Public Citizen
3. "Taking Water from Taxpayers", released by Environmental Working Group, 2005

The Signal

Original source: http://www.the-signal.com/?module=displaystory&story_id=52676&format=html

Planners Approve Landmark's EIR

Orginally printed on Thursday January 10, 2008

By Parimal M. Rohit
Signal Staff Reporter

LOS ANGELES - The Newhall Ranch development moved forward Wednesday when the final Environmental Impact Report for Landmark Village was unanimously approved by the County Regional Planning Commission, despite protests and testimony from local environmentalists and residents.

With the approval, Newhall Land and Farming Co.'s first phase of the Valencia-sized Newhall Ranch community will now be heard by the county Board of Supervisors.

"This is not the end of this," said Pat Modugno, Regional Planning Commissioner of Supervisorial District 5, which includes the Santa Clarita Valley. "It still goes to the Board of Supervisors. The ultimate decision is reached across the street (by the county Supervisors.)

The consent hearing was the final step for Newhall Land in front of the Regional Planning Commission before shifting its case to the Board of Supervisors. Newhall Ranch is approximately 12,000 acres in size and extends from the Santa Clarita Valley to the Ventura County line. The proposed project includes an elementary school, retail center and housing.

Landmark Village is the first phase of the planned Newhall Ranch project, located just west of Interstate 5 along Highway 126 and adjacent to the Chiquita Canyon Landfill.

At the heart of Wednesday's hearing was the questions of whether there was substantially new evidence for the commission to reconsider approval of the final EIR.

Sam Dea, Supervising Regional Planner with the Department of Regional Planning, presented the consent item to the commission and said there was no substantial change in evidence - since the commission last reviewed the matter - to warrant a denial of the report or a public hearing on the issue.

Opponents of the project disagreed with Dea, stating that there indeed was substantial information justifying removal of the final EIR from the consent agenda.

Lynne Plambeck, president of the Santa Clarita Organization for Planning and the Environment, was the leading voice in opposition.

Specifically, she pointed out that several conditions of the Newhall Ranch Specific Plan were not complied with, especially with respect to water.

"We strongly disagree with Mr. Dea that there is no new substantial information," Plambeck said. "There is no additional water for this project. That is huge."

She requested the commission reconsider approving the final EIR so that all parties may have a study session with water companies in the Santa Clarita Valley to look into how to resolve the water issues.

Conversely, Newhall Land stated it has done all it can to ensure the area will have sufficient water.

"As part of our Newhall Ranch Specific Plan approval, we made sure there was sufficient water for dry times and wet times," Newhall Land spokeswoman Marlee Lauffer said. "The way we are meeting water needs will not require any additional pumping or state water."
Lauffer added that Newhall Land also purchased water from other sources and will be banking the water so it is available for dry years, and will also have an extensive water reclamation and recycling center.
"We have gone through many years of hearings on the specific plan," she added. "On Landmark Village itself, we circulated the EIR for over a year and we had two extensive public hearings in front of the commission already."

In response to the issues brought up by the project's opponents, Lauffer pointed out that many of their concerns were already brought up and addressed in previous public hearings, stating: "There were no new issues. All of their concerns were already addressed previously and they have been thoroughly considered. There already has been extensive discussion about the issues they have brought up."

Another issue was whether members of the public were able to speak at the meeting. Opponents of the project were concerned that their voices would not be heard, due to the fact that the final consideration of the Environmental Impact Report was not a public hearing.

"This is the only opportunity we have to talk to you as individuals," Plambeck said, expressing her concern that the public would not be able to speak at the hearing. In preparation, Plambeck and those with her coordinated a potential protest at the meeting by using blue duct tape to cover their mouths, symbolizing that their voices might not be heard by the commission.

However, the commissioners were quick to point out that while public hearing for the Environmental Impact Report was closed in February 2007, public comment would still be heard and placed on the record. Any public comment would not affect the commission's final decision, though.

"The material presented today is just for public record," said County Counsel Patricia Tegart. "The public comment for this matter is closed and does not affect the commission's decision."
Plambeck was pleased that the public was able to speak, but is not entirely pleased with the commission's decision.

"We have the opportunity to do it the right way, and we are destroying it," she said. "It's discouraging. If we can just work with our environment in a more sustainable manner, it would be great.
"I think everyone was glad that we had the opportunity to speak, but I think the commissioners could not do anything and they were not going to listen."

As the matter moves to the Board of Supervisors for consideration, there is no timeline for when the matter will be heard.

According to Supervisor Michael Antonovich's office, there will be ample public notice when the matter reaches the board and there will also be another opportunity for the public to be heard.

"We're hopeful that we will get board approval," Lauffer said. "We are confident that we are consistent with the Specific Plan for Landmark Village."

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Taking from the Taxpayers

How the Bush Administration Gave Subsidy-Rich California Farmers a $17 Million Christmas Bonus

Published February 10, 2005

Taking from the Taxpayers

For decades taxpayers have provided subsidized water to California farmers at rates far below fair market value. When the amount of cheap water delivered to farmers was reduced during the severe drought of the early '90s to protect two species of endangered fish, a group of San Joaquin Valley water districts representing some of the nation's biggest farming operations sued the government for "taking" what they claimed was their private property.

But an Environmental Working Group (EWG) investigation of state and federal data found that from 1995 to 2003, those same farms received a total of $248 million in federal farm subsidies. And since 2001, the water district representing nearly all of those farms made almost $40 million in profit by selling subsidized water back to the taxpayers at market rates.

Which of the following was the Bush Administration's response to the lawsuit?

(a) The farmers didn't own the water in the first place — it belongs to the public.

(b) Why do rich farmers who already get big taxpayer subsidies deserve even more?

(c) OK, here's another $17 million.

On Dec. 21, 2004, the Administration announced it would settle the lawsuit by paying the water districts $16.7 million for "taking" the water. It was not only a tidy Christmas bonus for a group of farmers that includes the world's biggest cotton grower and a Beverly Hills mail-order tycoon who owns the largest farm operation in the country. The decision, over the objections of California officials from both parties and the Administration's own fisheries management agency, also represented a radical extension of the right-wing "Wise Use" ideology that regards environmental protections as unconstitutional infringements on property rights.

The Tulare Lake case, as it is known, marks the first time that restrictions imposed under the federal Endangered Species Act have been interpreted as a government taking of private property without "just compensation," which is prohibited by the Fifth Amendment. It opens the floodgates for lawsuits involving much larger claims: A similar case seeking $100 million in compensation for farmers in Northern California and Oregon will be heard in federal court Feb. 14, 2005. It also threatens California's ability to balance fairly the competing needs of agriculture, cities and the environment for increasingly scarce and expensive water.

Applying the takings doctrine to the Tulare Lake case requires the suspension of reality, because the water districts sued for the loss of "property" that exists only on paper — cut-rate contracts to buy an unspecified amount of water that fluctuates from year to year, depending on how much is available. The case exposes the political hypocrisy of farmers who rail against environmental protections but are happy to accept government subsidies and government-approved water trading schemes allowing them to profit from selling a public resource they don't own. Finally, it is more evidence that crop and water subsidies, intended to help small family farmers, have become inequitable corporate welfare programs for big agribusinesses.

Under state law, water districts don't have to make public the names of farms they serve. EWG used mapping software and state pesticide use data to identify farms in the districts that sued, and matched the names against our Farm Subsidies Database, which lists recipients of federal crop subsidies from 1995 to 2003. We also accessed publicly available state data on the profits the water districts made from 2001 to 2004, under trading schemes that allow them to sell water they don't use back to the state for fish and wildlife restoration.

The farmers' take from the taxpayers dwarfs the Tulare Lake settlement. Of the farms sharing in the settlement, the top 20 alone took in $121 million in crop subsidies from 1995 to 2003. One company, cotton giant J. G. Boswell Co., got $24 million in federal farm subsidies. The sheer size of these farmers' reliance on subsidies raises loudly the question of who is really doing the taking — the government, which cut water deliveries to protect public resources, or the farmers, who believe they're entitled to crop payments and cheap water?

Boswell, the world's largest cotton producer with about 150,000 acres in the Tulare Lake Basin Water District and 18,000 acres in three other districts, is an extreme example that shows how far the federal farm subsidy system goes to benefit growers of a few favored commodities. Not only did Boswell receive $17.3 million in crop subsidies from 1995 to 2003, but another $6.6 million under a subsidy called Step 2.

Step 2 gives money to companies that, like Boswell, process cotton for export, to help them buy U.S.-grown cotton. This incentive is necessary because American cotton is much more expensive than cotton grown elsewhere around the world. Why? Because of the crop subsidies provided to American cotton farmers, which artificially push the price of U.S. cotton above world market levels.

Boswell's home town of Corcoran, Kings County, is the state's epicenter of rich farms that get huge farm subsidies. Of the 20 Tulare Lake settlement recipients who got the most in crop subsidies, eight are in Corcoran or neighboring Stratford. Collectively they received more than $62.8 million in federal farm subsidies from 1995 to 2003.

TABLE: Top 20 Subsidy Recipients

Farm/Farmer Name	City/State	Total Farm Subsidies Received (1995-2003)
1: J G Boswell Company	Corcoran, CA	$23,919,679
2: Dublin Farms	Corcoran, CA	$11,913,936
3: Hansen Ranches	Corcoran, CA	$8,616,787
4: C.J. Ritchie Farms	Visalia, CA	$8,225,657
5: Buttonwillow Land & Cattle Company	Buttonwillow, CA	$8,135,045
6: Starrh & Starrh Cotton Growers	Shafter, CA	$7,991,530
7: Westfarmers	Visalia, CA	$6,670,547
8: Gilkey 5	Corcoran, CA	$5,588,236
9: Chicca Twin	Buttonwillow, CA	$4,897,759
10: Wheeler Farms	Bakersfield, CA	$3,972,321
11: Torigiani Farms	Buttonwillow, CA	$3,501,218
12: The Phoenix Farming Company	Corcoran, CA	$3,441,472
13: Four B'S Farms	Corcoran, CA	$3,432,123
14: Gilkey Enterprises	Corcoran, CA	$3,121,774
15: Harry Banducci & Sons	Bakersfield, CA	$3,107,042
16: Houchin Brothers	Buttonwillow, CA	$3,074,525
17: Fred Palla Farms	Buttonwillow, CA	$2,928,370
18: Newton Farms	Stratford, CA	$2,789,606
19: Cauzza Brothers	Buttonwillow, CA	$2,735,111
20: Toretta Farms	Buttonwillow, CA	$2,722,339
Total subsidies for top 20 recipients		**$120,785,076**

Source: [34]

The big Corcoran cotton farms are in the Tulare Lake Basin Water District, which resold no excess water for profit from 2001 to 2004. That prize went to the other main plaintiff in the case, the Kern County Water Agency (KCWA), which serves a consortium of 14

smaller water districts around Bakersfield. Of the 20 settlement recipients receiving the most crop subsidies, the dozen served by the Agency received a total of more than $57.9 million from 1995 to 2003. State records show that in those years KCWA also made $36.8 million in profit from reselling subsidized water back to the state for efforts to restore fish and wildlife habitat in the San Francisco Bay-Delta.

Kern County Water Agency has made $38.6 million selling water to the Environmental Water Account

Year	Acre-feet sold	Profit from sales
2001	20,000	$6,317,200
2002	97,400	$12,399,494
2003	125,000	$14,482,500
2004	35,000	$5,418,700
Total:	**277,400**	**$38,617,894**

Source: [38]

A closer look at the KCWA reveals even more layers of schemes and sweetheart deals that let rich farmers sharing in the settlement feed at the public trough.

The KCWA and three of the water districts it serves own part of a huge underground storage facility called the Kern Water Bank. Most of the remaining interest belongs to the Westside Mutual Water Co. a paper company owned by its only customer, Paramount Farming Co., which with its sibling Paramount Citrus comprises the largest farm operation in the country. Paramount is owned by Stewart Resnick, one of the richest people in Los Angeles and owner of the Franklin Mint.

From 1995 to 2003, Paramount received $576,000 in federal crop subsidies. Paramount has acreage in both the State Water Project and the federal government's much larger Central Valley Project (CVP). EWG's December 2004 investigation of the CVP estimated that in 2002 alone, Paramount received federal water subsidies worth more than $1.5 million at the market rate for new agricultural water supplies.

Paramount created Westside to resell part of its SWP contractual allotment — excess water that exists only on paper — to developers who want to turn farmland into planned communities called Tejon Ranch and Newhall Ranch. A top Tejon Ranch executive is a director of the Kern Water Bank, and Newhall's farm operations are served by one of the water districts that owns the bank. From 1995 to 2003, Tejon and Newhall together got more than $1 million in federal crop subsidies.

The complexity of the corporate connections, subsidy systems and trading schemes make it impossible to say just who is getting how much from the Bush Administration takings settlement. But it is clear that it is far from being just compensation for hard-working

farmers whose survival depends on secure water supplies. It is another corporate welfare program for rich agribusinesses who take all they can from the taxpayers and never get enough.

Who Owns The Water

First authorized in 1960, California's State Water Project (SWP) is now the largest state-built agricultural water delivery project in the country, with 660 miles of aqueducts and pipelines carrying water to 23 million residents and 750,000 acres of farmland annually. [1] On average, the Project carries about 2.2 million acre-feet of water each year to 29 long-term contractors, mostly located in Southern California. But as rainfall varies widely from year to year, so do SWP water supplies. Some years the SWP may carry almost twice as much water, while in other years only half as much will flow down the Project's canals. [2]

Municipal water agencies and farmers have long been forced to adjust to these whims of nature. But as California's population continues to grow while its water supplies remain finite, the battles over this increasingly scarce resource have intensified. At the center of this conflict lies the issue of how the state can balance the needs of agriculture, municipalities, and California's fish and wildlife — all of which depend on a steady flow of water for survival. Now, an opinion by the Court of Federal Claims in Washington, D.C., and the acceptance of that opinion by the Bush Administration threatens to take away the state's power to distribute water as it sees fit. Even more ominously, the settlement undermines a basic tenet of California water law: Water is a public good that belongs to the people.

The case, *Tulare Lake Basin Water Storage District v. United States*, involves a set of powerful water districts in California's San Joaquin Valley that sued the federal government after the State Water Project cut their contracted water deliveries during the severe drought of the early 1990s. [3] The two primary plaintiffs in the case, Tulare Lake Basin Water Storage District and Kern County Water Agency, claim that their water supplies were reduced by a total of 58,820 and 319,420 acre-feet, respectively, during the period 1992 through 1994. (An acre-foot is the amount of water needed to cover one acre to a depth of one foot.) The issue was not simply that the water districts were given less water than promised in their contract — the contracts do not guarantee delivery of any specific amount of water. The issue was why the state Department of Water Resources (DWR), the agency that manages the SWP, made the cutbacks: to protect two endangered fish species.

Under the federal Endangered Species Act (ESA), government agencies must ensure that their actions are "not likely to jeopardize the continued existence" of any endangered or threatened species listed under the Act. [4] Beginning in 1992, the National Marine Fisheries Service and the U.S. Fish and Wildlife Service issued several opinions concluding that the operations of the SWP were threatening the survival of two endangered fish species, Delta smelt and Chinook salmon. [5, 50, 51] The agencies

identified a number of major stressors to the fish, including altered water temperature, impaired passage, and decreased spawning and rearing habitat. Since all of these problems stemmed primarily from inadequate stream flows, it was clear that DWR needed to leave more water in the Delta to meet its statutory requirements and protect the endangered fish populations. This meant less water available to irrigate crops.

Several SWP water contractors, representing about 240 farmers in the San Joaquin Valley, cried foul. †1 The farmers claimed that they had a property right to the water, that the federal government had "taken" this property, and they were therefore owed compensation. Their arguments were made under the Fifth Amendment of the U.S. Constitution, which prohibits the government from taking private property without "just compensation". In April 2001, U.S. Court of Federal Claims Judge John P. Wiese ruled in the farmers' favor, marking the first time that a court has said that restrictions imposed under the Endangered Species Act amounted to a Fifth Amendment taking of private property. [6]

The Tulare case involved a challenge to a regulatory action, but the Court broke from federal and state precedent, treating the claim as a physical taking. The Fifth Amendment takings doctrine says that the government must pay for certain limitations or impositions on private property. Takings cases are generally categorized in one of two ways: a physical taking of private property, or a regulatory taking. A physical taking involves a permanent physical occupation or acquisition of real property, and must be compensated in all circumstances. [7] A regulatory taking involves a government action that restricts an owner's use of private property, and is only compensable in certain circumstances. [8] The Tulare court's finding that the Endangered Species Act regulation constituted a physical taking contradicts the Supreme Court's holding that a physical taking does not occur when the government regulates the use of property:

The longstanding distinction between acquisitions of property for the public use, on the one hand, and regulations prohibiting private uses, on the other, makes it inappropriate to treat cases involving physical takings as controlling precedents for the evaluation of a claim that there has been a 'regulatory taking,' and vice versa.[8]

Other federal courts have applied this concept specifically in the context of wildlife regulations. [49] California has followed this precedent, finding that wildlife regulations that curtail use are not constitutional takings: "The federal and state governments may regulate and protect rare species on private lands without, *ipso facto*, triggering a constitutional taking of private property." [9] Overall, says Georgetown University water law expert John Echeverria, "[t]akings claims based on protecting endangered species have failed with a striking consistency." [48]

The Tulare ruling was troubling for a number of reasons. First, all state and federal water contracts contain language protecting the state and federal governments from liability for "any damage, direct or indirect, arising from shortages in the amount of water to be made available for delivery . . . caused by drought . . . or any other cause beyond its control." [10] Clearly, this includes the need to protect a highly threatened fishery from devastation

during a severe drought. This was exactly the reasoning a federal appeals court used in 1995 when it denied a similar claim involving the same two endangered fish species. †2 [11] Judge Wiese decided that although the state was immune from liability because it was party to the contracts, the federal government was not immune because it did not have a contractual relationship.

Another troubling aspect of Judge Wiese's decision was his conclusion that the contracts conferred to the districts "a right to the exclusive use of prescribed quantities of water." The fact is that the SWP and the water districts it serves have signed contracts for more water than is available. Collectively, the existing SWP water supply contracts allocate "entitlements" of more than 4 million acre-feet (maf) of water each year. But almost half of this is "paper water," as a state appeals court said in a 2000 ruling:

The SWP cannot deliver 4.23 maf of water annually. The entitlements represent nothing more than hopes, expectations, water futures or . . . 'paper water.' Actual, reliable water supply from the SWP is more in the vicinity of 2 to 2.5 maf of water annually. . . . Paper water always was an illusion. "Entitlements" is a misnomer, for contractors surely cannot be entitled to water nature refuses to provide . . . Paper water represents the unfulfilled dreams of those who . . . created the expectation that 4.23 maf of water could be delivered by a SWP built to capacity. [12]

The bottom line is that much of the SWP water that districts are "entitled" to by contract is only wishful thinking. Streams and rivers across California would have to go totally dry, and then some, before this much water could be delivered to SWP farmers in all but the wettest of years. Even if all of the contracted water actually existed, the most confounding part of Judge Wiese's ruling is his failure or refusal to realize that under the state Constitution, the water districts and their members could not own it.

Water is a communal resource with an overriding public value. The state claims ownership of all water within its borders on behalf of the people of California. †3 If you own a piece of land you can legally prevent people from entering it. But if the land borders a river, you can't stop people from swimming or traveling down the river. If you have oceanfront property, your property rights stop at the high water line. Below that line, anyone can walk on "your" beach or swim in "your" ocean.

In California, therefore, the water in a river or stream cannot be privately owned. It is held in trust for the common good under the centuries-old "public trust doctrine." In 1983, the California Supreme Court said "the core of the public trust doctrine is the state's authority as sovereign to exercise a continuous supervision and control over the navigable waters of the state and the lands underlying these waters." [13] The Court said the public trust doctrine obligated state agencies and courts to "consider the effect of . . . [water] diversions upon interests protected by the public trust." [14]

"Water rights" do not confer ownership, but the legal right to use a quantity of water. As a California appeals court said in 1986: "Unlike real property rights . . . water rights are limited and uncertain." [15] Under the state Constitution it is illegal to "waste" water, to

put it to an "unreasonable use," or employ an "unreasonable method of diversion of water." [16] What is considered reasonable depends on the circumstances. In 1935, the state Supreme Court said:

What is a beneficial use, of course, depends upon the facts and circumstances of each case. What may be a reasonable beneficial use, where water is present in excess of all needs, would not be a reasonable beneficial use in an area of great scarcity and great need. What is a beneficial use at one time may, because of changed conditions, becomes a waste of water at a later time. [17]

When the State Water Project was approved in 1960, the rights to all water it would carry were explicitly given to the Department of Water Resources. [18] Although the Tulare and Kern water districts asserted that they had a property right to the water specified in their contracts, the fact is that they only had a contractual arrangement for the delivery of some amount of this publicly held, public resource. In the Tulare Lake case, Judge Wiese ignored this fact and ruled that any limitations imposed on the districts' use of the resource must be compensated. He awarded the farmers $23 million in compensation. [19]

With that much money at stake plus the dangerous precedent the ruling sets, you'd think the federal government would appeal the decision to a higher court. But in late 2004, word spread that the Bush Administration planned to settle the case. California officials from both parties urged the White House not to make that mistake.

The state Water Resources Control Board, representing Gov. Arnold Schwarzenegger's administration, sent a letter to Bush Administration officials stating that if allowed to stand, the Tulare Lake decision "could fundamentally change the way that water resources are managed in California, to the serious detriment of California taxpayers and resources users." [20] Senator Diane Feinstein sent a letter to Attorney General John Ashcroft and Interior Secretary Gale Norton, stating that the ruling was a "mistake that will establish a precedent that could require the public to pay tens of millions of dollars to water users in many cases where even a small portion of their anticipated deliveries are needed to protect endangered salmon or other fish." [21] California Attorney General Bill Lockyer also urged the government not to settle, and several officials urged Bush to transfer the case to the California Supreme Court. [22]

Earlier, the Bush Administration's own water-law experts at the National Oceanic and Atmospheric Agency (NOAA), which is responsible for protecting endangered salmon runs, also objected. A March 2004 letter from NOAA's general counsel to the Justice Department, obtained by EWG, said Wiese's ruling was already making it more difficult to enforce the Endangered Species Act. The letter said the lawyers for the water districts, who were also handling other water "takings" cases, were already arguing that the Tulare ruling "now require[s] the United States to compensate federal permit applicants up front for any claimed interests in water or land" affected by enforcement of the Act. They said the failure to appeal Wiese's ruling "immeasurably increased" the likelihood that the other lawsuits would succeed. [23]

Nevertheless, five days before Christmas, the Bush Administration settled with the farmers for $16.7 million. Although the Administration said explicitly that the settlement was not meant to set a precedent, if the reasoning behind Judge Wiese's ruling is accepted by future courts, California's ability to protect its streams, rivers and fisheries will be seriously undermined. That is the clear intent of the real driving force behind the lawsuit: the Washington, D.C. law firm of Marzulla and Marzulla, who represented the water districts.

Roger and Nancie Marzulla are husband and wife, long-time "Wise Use" advocates who have made careers fighting environmental protections. Both worked in the Reagan Justice Department: Roger as assistant attorney general in charge of the Environment and Natural Resources Division, Nancie as a special assistant and litigator in the Civil Rights Division. Roger Marzulla was the chief architect of an executive order signed by President Reagan in 1988 that sought to expand the definition of "takings" by federal agencies. [24, 25] Both were also attorneys with the Mountain States Legal Foundation, a far-right wing group founded by beer baron Joseph Coors and the group's first president, James Watt, Reagan's notoriously anti-environmental Interior secretary. Roger Marzulla succeeded Watt as the second president of Mountain States, while Nancie worked as one of the group's attorneys on takings and other cases.

In 1991, the Marzullas founded Defenders of Property Rights, for which Nancie still serves as president and chief counsel, and Roger as board chairman. Defenders promotes takings laws as a strategy to make laws and regulations protecting the environment prohibitively expensive by requiring payments to private landowners whose property is affected by them [26]. Interior Secretary Gale Norton was legal advisor to Defenders of Property Rights until she was picked to join President Bush's cabinet. (Norton also started out at Mountain States, and her career has frequently been intertwined with the Marzullas.)

In 1998, the Marzullas opened their Washington practice, specializing in property rights and takings cases. In 2001, Marzulla & Marzulla filed a $1 billion takings lawsuit — since reduced to $100 million — against the government in the Court of Federal Claims on behalf of farmers and irrigation districts in the Klamath River Basin in Oregon and Northern California. The suit challenges the Bureau of Reclamation's 2001 restrictions on the release of irrigation water from Klamath Lake — referred to as water banking — to maintain lake levels for the protection of endangered sucker fish and threatened Coho salmon. [25, 27, 28]

In November 2003, while representing the Klamath Basin irrigation districts and irrigators at a public meeting, Roger Marzulla compared the Bureau of Reclamation's tactics to those of Adolf Hitler in persuading the Allies to allow him to invade Czechoslovakia. Asked if it was legal for the Bureau to tell farmers they must give up some of their allotted water, or face getting none at all, Marzulla replied: "I think [the] water bank is a desperate effort by [the Bureau] compared [sic] to Hitler. . . . If you take Czechoslovakia, and say if we give you this, will you go along with it?" [29]

The next hearing in the Klamath case before the Federal Claims Court is scheduled for Feb. 14, 2005. [30] In March, a hearing is scheduled in a $500 million takings lawsuit filed by the Marzullas on behalf of the City of Stockton, San Joaquin County and the Stockton East Water District over the federal government's alleged failure to deliver water from New Melones Reservoir. [31] And the Marzullas are preparing another takings lawsuit, seeking millions in compensation for farmers whose water deliveries were reduced to protect steelhead salmon. [32, 33] In these cases, the Marzullas stand to earn millions of dollars in attorneys' fees from their takings suits. For the Tulare Lake case, the couple took about $2 million from the settlement for their efforts.

Footnotes

†1 — Press reports indicated the water districts represented about 240 farmers. From examining the state pesticide use database, it is clear that many of these farmers operate more than one farm. EWG's figure for the total number of farms served by the Tulare Lake Basin Water Storage District and the Kern County Water Agency is 339 farms. We excluded those farms that had less than 50 acres in either water district.

†2 — The federal water service contract in question in the O'Neil case provides that the government shall not be held liable for "any damage, direct or indirect, arising from a shortage on account of errors in operation, drought, or any other causes."

†3 — See Civil Code 1410, which dates back to 1911.

Federal Farm Subsidies

According to EWG's Farm Subsidies Database, which lists all recipients of all Department of Agriculture (USDA) commodity price supports and other farm aid programs, from 1995 to 2003 taxpayers paid out more than $131 billion to U.S. farmers. That's enough to buy outright one-quarter of all the farms in the 302 leading agricultural counties— land, barns, farmhouses and all. Despite the popular myth that these cash payments go to help struggling family farms, EWG's analyses have shown repeatedly that the great majority of the taxpayers' money actually ends up in the pockets of large agribusiness. [34]

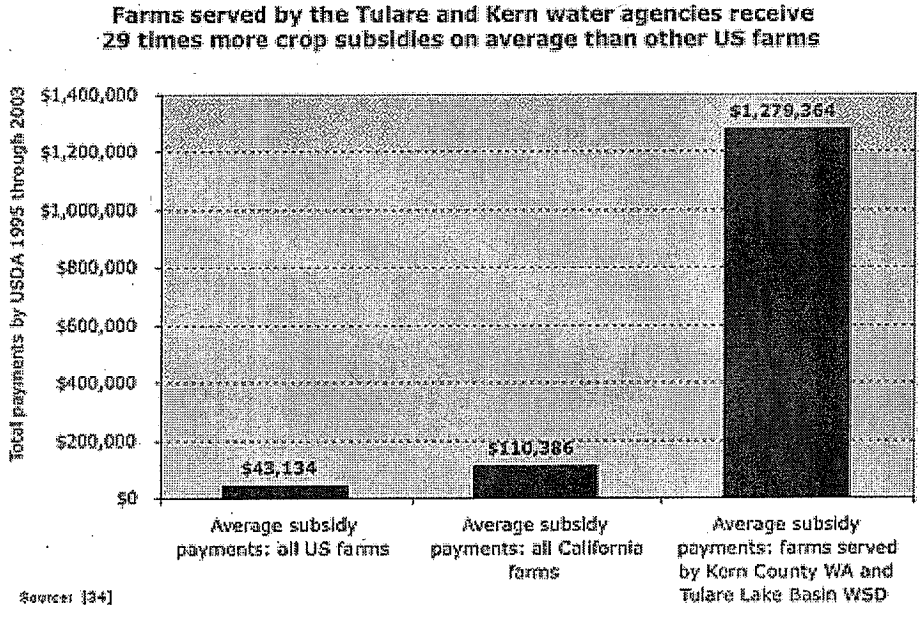
Far fewer farms in California receive these subsidies than in other states — in 2002, one-third of all U.S. farms got some sort of USDA payment, while only 9 percent of California farms did. This discrepancy is largely because most California farmers grow the 'wrong' things: Most subsidies are given to only a handful of staple crops, such as corn and soybeans, which are not grown extensively in California. The farmers served by the Tulare Lake Basin Water Storage District and the Kern County Water Agency, however, are another story.

Although water districts by law don't have to make public their records, EWG extracted the names and addresses of the farms in these two districts from state pesticide use data.

We then matched them with the names and addresses of farms that got cash payments from the USDA. We found that most of the farmers who sued the federal government over minor restrictions on water deliveries have already been getting a huge windfall in federal crop subsidies. From 1995 to 2003, 57 percent of the 339 farms served by the Tulare Lake and Kern County water agencies got some sort of subsidy check, with the total reaching a staggering $248,196,636.

The average payment to those California farms in that period was more than 29 times higher than the national average: $1,279,364 vs. $43,134 per farm. Subsidy checks to California farms tend to be higher than the national average (although fewer California farms receive subsidies), because California farms are bigger. But even when you consider the average payment California farms received, it is striking how much more the farmers in the Tulare and Kern County water agencies are getting.

The 194 farmers in these two water districts are less than half of 1 percent of the total number of California farms receiving crop subsidies, but collectively they received 5 percent of the total USDA payments to farms in the state. The average payment going to the Tulare Lake and Kern County farmers from 1995 and 2003 was almost 12 times higher than the average payment to farms in the rest of the state: $1,279,364 vs. $110,386. The bottom line is that the Tulare Lake and Kern County farmers were already taking much more from the taxpayers than most farmers in California — but the Bush Administration decided they were entitled to another $16.7 million.



Nor were most of these payments going to help struggling family farmers stay on the land. The top subsidy recipient was J.G. Boswell Co. of Corcoran, in Kings County. Boswell is the world's largest cotton grower, a dominant position that $23.9 million in

USDA payments between 1995 and 2003 must help in maintaining. Boswell is an extreme example of how far federal farm programs go to help growers of select commodities: Not only did Boswell receive $17.3 million in crop subsidies, but got another $6.6 million under a subsidy called Step 2.

The Step 2 program gives money to U.S. companies that mill cotton into thread and cloth for export, to help them buy U.S.-grown cotton. This financial incentive is necessary because American cotton is much more expensive than cotton grown elsewhere around the world. Why? Because of the crop subsidies provided to American cotton farmers, which artificially push the price of U.S. cotton above world market levels. As both a cotton grower and a miller, Boswell's farm operation can use its crop subsidies to ensure it makes a profit from growing cotton. Then its milling operation can tap the Step 2 program to lower its cost to buy more raw cotton for milling and export.

TABLE: Top 20 Subsidy Recipients

Farm/Farmer Name	City/State	Total Farm Subsidies Received (1995-2003)
1: J G Boswell Company	Corcoran, CA	$23,919,679
2: Dublin Farms	Corcoran, CA	$11,913,936
3: Hansen Ranches	Corcoran, CA	$8,616,787
4: C.J. Ritchie Farms	Visalia, CA	$8,225,657
5: Buttonwillow Land & Cattle Company	Buttonwillow, CA	$8,135,045
6: Starrh & Starrh Cotton Growers	Shafter, CA	$7,991,530
7: Westfarmers	Visalia, CA	$6,670,547
8: Gilkey 5	Corcoran, CA	$5,588,236
9: Chicca Twin	Buttonwillow, CA	$4,897,759
10: Wheeler Farms	Bakersfield, CA	$3,972,321
11: Torigiani Farms	Buttonwillow, CA	$3,501,218
12: The Phoenix Farming Company	Corcoran, CA	$3,441,472
13: Four B'S Farms	Corcoran, CA	$3,432,123
14: Gilkey Enterprises	Corcoran, CA	$3,121,774
15: Harry Banducci & Sons	Bakersfield, CA	$3,107,042
16: Houchin Brothers	Buttonwillow, CA	$3,074,525
17: Fred Palla Farms	Buttonwillow, CA	$2,928,370
18: Newton Farms	Stratford, CA	$2,789,606
19: Cauzza Brothers	Buttonwillow, CA	$2,735,111
20: Toretta Farms	Buttonwillow, CA	$2,722,339

Total subsidies for top 20 recipients	**$120,785,076**

Source: [34]

The next largest crop subsidy recipient among the farms that sued is Dublin Farms, also of Corcoran. Dublin Farms planted more than 9,000 acres of cotton and wheat in 2002 and got almost $12 million in USDA cash payments from 1995 to 2003. Corcoran, a dusty town of about 15,000, is the Beverly Hills of California farms that get crop subsidies: Other local members of the multimillion-dollar subsidy club are Hansen Ranches ($8.6 million), Gilkey 5 Farms ($5.6 million), Phoenix Farming Co. ($3.4 million), Four Bs Farms ($3.4 million) and Gilkey Enterprises ($3.1 million; exact connection to Gilkey 5 unknown). Each of these farms will share in the Tulare Lake settlement.

Farms in the water districts served by the Kern County Water Agency don't get individual USDA checks quite as large as their Tulare Lake neighbors, but they make it up in numbers. Led by C.J. Ritchie of Lost Hills and the Buttonwillow Land & Cattle Co., each with more than $8 million in crop subsidies from 1995 to 2003, no less than 58 KCWA farms got USDA payments of at least $1 million each.

Overall, 67 farms in the Tulare Lake and Kern County districts — more than one third — received checks totaling more than $1 million during this period. More than 100 farms got payments worth at least $500,000 — roughly $55,500 a year, more than the median household income in California in 2003 ($49,300), and 50 percent more than the median income in Tulare County ($36,343). [35]

Our database of farms sharing the settlement lists 145 farms which received no crop subsidies, but the number is almost certainly lower. We found many instances of names in the Farm Subsidy Database that appeared to match names of the farms we extracted from state pesticide use reports. But if we could not be certain that the farms were identical, we did not include those subsidies in our analysis.

Reselling Subsidized Water

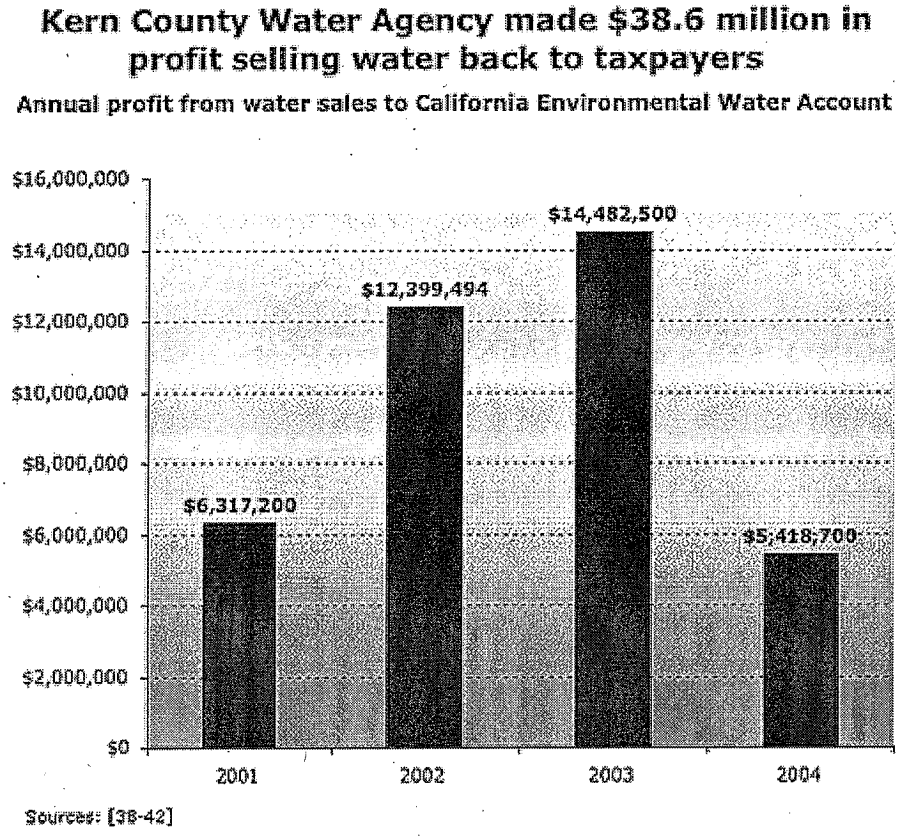
Once the home of a vibrant fishery, today the watershed of the Sacramento and San Joaquin rivers is one of the most artificially controlled hydrological systems in the world: Both rivers have been dammed, as have all but one of their major tributaries. [36] The water from these vast river drainages eventually flows into the West Coast's largest estuarine ecosystem — the San Francisco Bay-Delta Estuary, which has also been extensively altered by human activity.

In the Delta, two massive pumping facilities extract water and funnel it into the largest federally-run water delivery system in the country and the largest state-run delivery system: the federal Central Valley Project (CVP) and the State Water Project (SWP), respectively. At certain times of the year when the SWP and the CVP are exporting high

levels of water from the Delta, the San Joaquin River actually reverses its flow between its confluence with the Sacramento River and the pumps. The river actually flows upstream. As if these extreme disruptions of the natural fish and wildlife habitat weren't enough, the pumps themselves kill millions of fish each year. [36]

By the early 1980s, federal scientists realized that fish populations in the Delta and throughout the watershed were crashing — in large part because of the export of millions of acre-feet of water to the SWP and CVP. From 1987 to 1992, a severer drought exacerbated this already dire situation and ultimately forced the California Department of Water Resources to limit its agricultural water deliveries. It was also clear that a much more ambitious plan was needed to restore ecosystem health in the Bay and Delta. A joint state-federal agency known as CALFED was created to develop and implement this plan, which included a controversial program known as the Environmental Water Account (EWA).

The EWA, which has been in operation since 2000, is like a virtual water district where the customers are fish. EWA buys water from willing sellers within the CVP and SWP at market rates to use for environmental purposes, such as improving water quality in a particular section of river or helping to restore threatened fish species such as salmon and smelt. The idea was to provide a mechanism to protect fish without affecting agricultural water supplies. It was also hoped that the prospect of reselling their unused water would encourage conservation by farmers. The success of the EWA in accomplishing this goal is debatable: The program has been hampered by a limited budget and inadequate water supply. [37] One thing is clear: The EWA is a highly effective mechanism for water districts that get cheap irrigation water to make a bundle off of taxpayers.



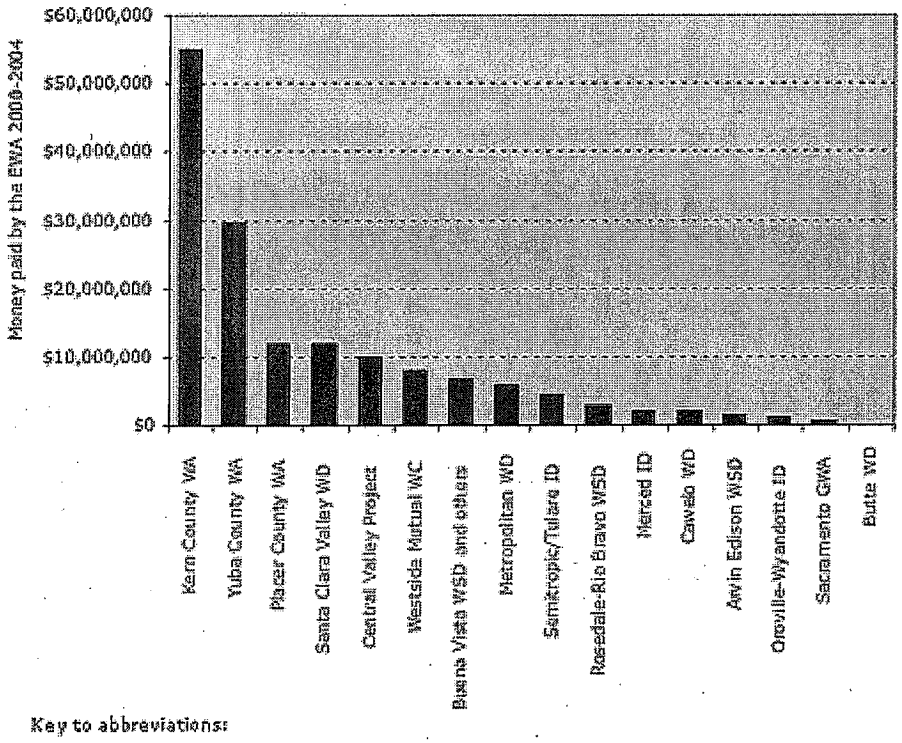
As the EWA is a publicly funded entity, the government is essentially selling SWP and CVP water to farmers at very low prices, then buying it back later at much higher rates to replace water that never left the river in the first place. Since the EWA has been in operation, it has purchased water from 16 different water agencies. But one has profited far more than any other: the Kern County Water Agency. KCWA is the largest agricultural water contractor in the SWP. It serves 14 different water districts †1 within the San Joaquin Valley and receives, on average, 84 percent of the irrigation water delivered by the SWP each year. [38]

Between 2001 and 2004, KCWA paid an average of $63.40 per acre-foot †2 (af) for its SWP water. [38-42] This amounts to a subsidy of at least $100 an acre-foot, given that the California Department of Water Resources and the Federal Bureau of Reclamation recently estimated that if a new dam were built on the upper San Joaquin River, the irrigation water it would deliver would cost a minimum of $170.42 per af †3. [43] But the KCWA is getting an even better deal: It is allowed to sell part of its water back to the taxpayers via the EWA at rates as much as 7 times higher than what it paid.

From 2001-2004, KCWA sold 277,400 af of water to the EWA at an average price of $198 per af, for a total of $54.9 million. The Agency's *profit* was $38.6 million — an average of $9.6 million per year. [38-42] Overall, KCWA has received more than one-third of the total expenditures by the EWA, and by far more money of any other

individual water agency. [38] KCWA has perfected a scam in which taxpayers subsidize its below-market purchase of a public resource (water), then must pay much more to buy the water back in an attempt to restore another public resource (fish). Perhaps the most outrageous part of the scheme is that the Bay-Delta needs restoration largely because of the diversion of subsidized agricultural water and the runoff of pesticides and other toxic agricultural chemicals.

Kern County Water Agency has received more than one-third of all payments from the Environmental Water Account



Key to abbreviations:

GWA	Ground Water Authority
ID	Irrigation District
WA	Water Agency
WC	Water Company
WD	Water District
WSD	Water Storage District

Source: [38]

Besides resales to the EWA, from 1995 to 2004 the Kern County Water Agency sold another 456,092 acre-feet of water to other water districts, and the Tulare Lake Basin district sold 76,941 acre-feet to other districts. Prices and profits for those sales are details hidden from the public by state law, so it is impossible to know how much profit these water agencies made on such transactions. [44] In 2002, The Sacramento Bee estimated that just three water districts that are part of KCWA in recent years had made more than $128 million from sales to municipalities. [45]

But in Kern County there is potentially even more profit to be made from reselling subsidized water — even if that water exists only on paper.

According to a 2003 investigation by the taxpayer watchdog group Public Citizen, the KCWA and three of the water districts it serves own 42 percent of the Kern Water Bank, a huge underground storage facility that can store about 1 million acre-feet of water. [46] The state spent $74 million to develop the water bank, then in 1994 turned it over to the KCWA after secret meetings produced the so-called Monterey Agreement. This was a pact between the state, big farmers and developers based on the hope that someday, by building new dams and reservoirs, the State Water Project will be able to deliver all of the 4.2 million acre-feet specified in its contracts. As noted previously, half of the amount contracted for currently exists only on paper.

Another 48 percent of the water bank is owned by the Westside Mutual Water Co., a paper entity owned, operated and housed in the Bakersfield offices of its only customer, Paramount Farming Co. According to the California Farm Bureau, Paramount Farming and its corporate siblings, Paramount Citrus and Paramount Farming, Inc., comprise the largest farm company in the United States. [46] From 1995 to 2003, Paramount received $576,000 in USDA crop subsidies.

Paramount is part of Roll International Corp., a holding company privately owned by Stewart Resnick of Beverly Hills, one of the richest people in Los Angeles with an estimated net worth of $740 million. [47] Through Roll International, Resnick also owns the Franklin Mint, mail-order marketers of kitschy commemorative memorabilia, and Teleflora, a national floral delivery service.

Public Citizen documented that Westside MWC was created by Paramount Farming in hopes of reselling some of its non-existent SWP allocation to the Los Angeles Department of Water and Power. (Fans of the film Chinatown need no reminder of the LA water department's dark history of water grabs.) However, the labyrinthian connections of corporate interests with ties to the Kern County Water Bank point to other potential customers: Developers who want to turn former and current farmland between Bakersfield and Los Angeles into sprawling new towns called Tejon Ranch and Newhall Ranch.

Dennis Mullins, vice president and general counsel of Tejon Ranch, is on the board of directors both of the Kern County Water Bank and two of the water districts that own it — districts that will share in the Tulare Lake settlement. Another of the water districts that will receive part of the settlement and is a part-owner of the water bank already delivers water to Newhall Land & Farming, developers of Newhall Ranch. And Public Citizen uncovered a water sales contract between Newhall and a company owned by Paramount's corporate parent, Roll International. It doesn't take a conspiracy theorist to guess that an ultimate goal of the water districts that control the water bank is to turn paper water from the SWP into real water they can sell to developers at a profit.

Until then, they have their share of $16.7 million to see them through.

Footnotes

†1 — Berrenda Mesa Water District, Lost Hills Water District, Belridge Water Storage District, Semitropic Water Storage District, Cawelo Water District, Kern County Water Improvement District #4, Rosedale-Rio Bravo Water Storage District, Buena Vista Water Storage District, Kern Delta Water District, Henry Miller Water District, West Kern Water District, Wheeler Ridge-Maricopa Water Storage District, Tehachapi-Cummings County Water District, and Tejon-Castaic Water District.

†2 — An acre-foot is the amount of water needed to cover an acre of land one foot deep, or 325,851 gallons.

†3 — This is a highly conservative cost estimate because it does not include the costs for road construction, relocations of existing facilities, environmental mitigation, land acquisition, reservoir cleaning, or interest.

Full List of Subsidy Recipients

Farms that will share in the "takings" settlement receive millions of dollars in federal farm subsidies

Farm/Farmer	City/State	Total Farm Subsidy Payments 1995-2003
J G Boswell Co.	Corcoran, CA	$23,919,679
Dublin Farms	Corcoran, CA	$11,913,936
Hansen Ranches	Corcoran, CA	$8,616,787
C.J. Ritchie Farms	Lost Hills, CA	$8,225,657
Buttonwillow Land & Cattle Co.	Buttonwillow, CA	$8,135,045
Starrh & Starrh Cotton Growers	Shafter, CA	$7,991,530
Westfarmers	Visalia, CA	$6,670,547
Gilkey 5	Corcoran, CA	$5,588,236
Chicca Twin	Buttonwillow, CA	$4,897,759
Wheeler Farms	Bakersfield, CA	$3,972,321
Torigiani Farms	Buttonwillow, CA	$3,501,218
Phoenix Farming Co., The	Corcoran, CA	$3,441,472
Four B's Farms	Corcoran, CA	$3,432,123
Gilkey Enterprises	Corcoran, CA	$3,121,774
Harry Banducci & Sons	Bakersfield, CA	$3,107,042
Houchin Brothers	Buttonwillow, CA	$3,074,525

Fred Palla Farms	Buttonwillow, CA	$2,928,370
Newton Farms	Stratford, CA	$2,789,606
Cauzza Bros.	Buttonwillow, CA	$2,735,111
Toretta Farms	Buttonwillow, CA	$2,722,339
Palla Rosa Farms	Bakersfield, CA	$2,618,773
Cerro Farms	Bakersfield, CA	$2,579,032
Gardiner Farms	Bakersfield, CA	$2,437,694
John Crump	Bakersfield, CA	$2,419,064
Carmel Partners	Wasco, CA	$2,415,896
Parsons Farms	Buttonwillow, CA	$2,378,740
Joe Fanucchi & Sons - South	Arvin, CA	$2,373,069
Roy & George Fanucchi	Shafter, CA	$2,239,553
Belluomini Farms	Buttonwillow, CA	$2,132,648
John Romanini & Sons	Buttonwillow, CA	$2,099,618
Westlake Farms,inc.	Stratford, CA	$2,087,842
Triple B Farms	Bakersfield, CA	$2,038,721
K. Barnard & Sons	Bakersfield, CA	$2,036,862
R & G Farms	Bakersfield, CA	$2,024,910
Bidart Brothers	Bakersfield, CA	$1,969,727
Elk Grove Ranch	Buttonwillow, CA	$1,949,892
Mario Buoni & Sons	Bakersfield, CA	$1,916,568
Destefani Farms	Bakersfield, CA	$1,890,467
Pierucci Farms	Bakersfield, CA	$1,862,257
Four D Farming	Bakersfield, CA	$1,746,082
Kosareff Farms	Buttonwillow, CA	$1,729,592
Banducci & Son	Buttonwillow, CA	$1,701,794
Costerisan Farms	Bakersfield, CA	$1,699,019
Greenlee Farms	Bakersfield, CA	$1,661,342
Franceschi & Son Farms	Buttonwillow, CA	$1,654,879
Mckittrick Ranches	Bakersfield, CA	$1,643,347
J. D. & K. Farms	Bakersfield, CA	$1,586,447
M & M Farms	Bakersfield, CA	$1,555,196
Houchin Ranch 7	Buttonwillow, CA	$1,404,873
R & B Farms	Shafter, CA	$1,390,184
Vandborg Farms	Lamont, CA	$1,371,686

Stenderup Ag Partners	Bakersfield, CA	$1,365,299
Bel-An Farms	Bakersfield, CA	$1,352,067
Don Schulte Farms	Bakersfield, CA	$1,346,920
J. S. A. Company	Bakersfield, CA	$1,309,070
S & S Farms	Bakersfield, CA	$1,281,286
K. M. Farms	Bakersfield, CA	$1,223,326
Aldo Antongiovanni & Son	Buttonwillow, CA	$1,207,421
Rodney Palla Farms	Bakersfield, CA	$1,158,711
Julian Pierucci & Son	Buttonwillow, CA	$1,152,363
Tillema Farms	Bakersfield, CA	$1,140,038
Walter Delfino	Buttonwillow, CA	$1,133,066
Kootstra Dairy Farm	Bakersfield, CA	$1,132,834
Palla Farms	Bakersfield, CA	$1,107,257
D J Farms	Taft, CA	$1,064,193
SRB Farms	Lost Hills, CA	$1,059,308
Bryan Bone Farms	Bakersfield, CA	$1,009,524
E.w. Suorez Farms, Inc.	Bakersfield, CA	$985,490
A. J. Torrigiani & Sons	Buttonwillow, CA	$962,685
George Borba & Son Dairy	Chino, CA	$956,241
Joseph A. Eyraud & Sons, Inc.	Bakersfield, CA	$946,319
Ralph And Greg Palla	Bakersfield, CA	$939,599
Maple Farms	Bakersfield, CA	$938,451
Don Valpredo Farms	Bakersfield, CA	$928,341
Kophamer & Kophamer	Bakersfield, CA	$925,571
H 3 Ranch	Buttonwillow, CA	$912,029
Progresive Associates Group	Bakersfield, CA	$892,055
Bloemhof Katoen Boerderij	Wasco, CA	$880,413
Baggiani & Isola	Buttonwillow, CA	$809,892
A.J.B. Ranch	Bakersfield, CA	$760,804
H. V. Farms, Inc.	Bakersfield, CA	$744,742
G. and M. Farms	Buttonwillow, CA	$744,448
David Torgiani Farms	Buttonwillow, CA	$717,088
Frank & Daniel Fugitt	Bakersfield, CA	$711,737
Tri-fanucchi Farms, Inc.	Arvin, CA	$708,932
Parker Farms	Bakersfield, CA	$697,886

Albert & Lilly Ghilarducci Frm	Buttonwillow, CA	$666,461
R. M. Mettler (Metco)	Bakersfield, CA	$666,037
Arthur Ghilarducci	Buttonwillow, CA	$657,120
J & W Farming	Bakersfield, CA	$656,033
Wilgenburg Dairy Farm	Bakersfield, CA	$648,230
John A. Miller Farms	Wasco, CA	$635,211
Shaen Magan Family Trust	Bass Lake, CA	$632,237
Roy & Jelsey Romanini Farms	Buttonwillow, CA	$631,052
Rudy Angone	Bakersfield, CA	$626,223
Giannelli Farms	Bakersfield, CA	$617,458
Suburu Farms	Bakersfield, CA	$600,950
V & C Farms	Bakersfield, CA	$596,186
Mettler Ag/David Mettler	Bakersfield, CA	$590,745
Tejon Ranch/Laval Farms	Lebec, CA	$589,180
A. Cattani & Son	Bakersfield, CA	$581,051
Paramount Farming Co.-Eastside	Bakersfield, CA	$576,597
Val-Ridge Farms	Bakersfield, CA	$571,428
4-B Farms	Buttonwillow, CA	$548,543
E. H. A. Farms	Bakersfield, CA	$541,570
R & M Jelmini Farms	Bakersfield, CA	$541,567
Howard Frick Farms	Bakersfield, CA	$534,920
MNA Trust	Bakersfield, CA	$532,446
Riverbend Dairy #2	Tulare, CA	$525,654
V.B. Zaninovich & Sons, Inc.	Richgrove, CA	$503,529
Costamagna Bros	Bakersfield, CA	$493,987
Thomson Land Company	Bakersfield, CA	$493,338
Opal Fry & Son	Bakersfield,, CA	$486,395
Bonanza Farms	Bakersfield, CA	$450,528
Tut Bros. Farms	Watsonville, CA	$440,501
Sierra Victor Ranch Company	Delano, CA	$439,525
Community Recycling	Lamont, CA	$433,937
Bloemhof Ag Ent	Wasco, CA	$430,593
Wm. Bolthouse, Inc.	Bakersfield, CA	$429,176
Jarrard Farms	Bakersfield, CA	$423,897
Nikkel Bros. Farms	Bakersfield, CA	$418,157

R & K Farms	Buttonwillow, CA	$412,156
Gino Buoni	Bakersfield, CA	$411,552
Fanucchi Enterprises	Arvin, CA	$390,274
Munger Farms	Delano, CA	$389,504
Munger Investments	Delano, CA	$389,504
Richard Clasen	Bakersfield, CA	$386,584
H. Spitzer & Sons Inc.	Lamont, CA	$381,161
Jimmie Icardo Farms, Inc.	Bakersfield, CA	$373,932
Del Papa Farms	Bakersfield, CA	$370,950
Cappello Farms, Inc./Oak Flat	Bakersfield, CA	$346,223
Feed Resources LLC	Bakersfield, CA	$327,988
Mitchell Farms	Bakersfield, CA	$324,321
Carlos Gomez	Bakersfield, CA	$320,333
Sam Andrews Sons	Bakersfield, CA	$309,541
Corotto Co., Inc.	Edison, CA	$304,453
Tehachapi Vineyards	Ceres, CA	$300,646
Richline Farms	Bakersfield, CA	$265,268
Kingsburg Citrus Ranch	Mcfarland, CA	$253,253
Royal Farms	Fresno, CA	$244,996
Sunview Vineyards Of CA., Inc.	Mcfarland, CA	$236,025
Wheeler Ridge Farming Co.	Rancho Cucamonga, CA	$233,187
Walker Fry Ranch	Bakersfield, CA	$233,063
Trinity Farms, Inc.	Bakersfield, CA	$232,710
M.A.D. Farms	?, CA	$221,527
Dosanjh Bros. Farm	Bakersfield, CA	$212,655
Sandhill Farms	Arvin, CA	$205,090
Bhogal Farms	Bakersfield, CA	$199,152
Ray-lee Company	Bakersfield, CA	$198,577
Poso Creek Ranch	Delano, CA	$197,440
Gar Mcleod & Sons	Bakersfield, CA	$187,540
Banducci Farms	Bakersfield, CA	$186,025
Norman Shepherd	Buttonwillow, CA	$179,067
Bapu Farming Co. LLC	Madera, CA	$174,583
Paul Coombs & Sons	Bakersfield, CA	$169,611
7 K Ranch	Bakersfield, CA	$165,950

Joel Suburu	Bakersfield, CA	$165,409
San Raphael Fruits, Corp.	Rolling Hills Estate, CA	$157,229
Agriswiss, Inc.	Mcfarland, CA	$135,840
M & E Farms	Bakersfield, CA	$134,303
M. J . B. Farms	Delano, CA	$125,758
Kirschenmann Farms	Lamont, CA	$123,776
Harold Fleishauer & Son	Bakersfield, CA	$119,064
Baroncini Bros.	Bakersfield, CA	$117,089
John S. Antongiovanni Jr.	Bakersfield, CA	$111,133
Larsons Dairyland	Bakersfield, CA	$109,817
I & I Farms Inc., Frank Icardo	Lamont, CA	$107,882
Jack Schweikart	Bakersfield, CA	$105,582
Mc Carthy Family Farms	Corcoran, CA	$99,986
Affentranger & Sons	Bakersfield, CA	$99,902
Anthony Vineyards	Bakersfield, CA	$79,563
California Pistachio	Bakersfield, CA	$78,269
Roden Farms	Shandon, CA	$76,700
Frank Garone, Jr.	Bakersfield, CA	$75,384
Miersma Family Dairy	Chino, CA	$75,278
Rich Mar Farms	Bakersfield, CA	$73,116
Andrewsag Inc.	Bakersfield, CA	$73,072
Norman Etchison	Bakersfield, CA	$54,752
Golden State Vinters, Inc.	Fresno, CA	$46,106
Cal Farm Invest	Bakersfield, CA	$45,065
Mark Johnson	Bakersfield, CA	$43,586
Amaretto Orchards c/o Ag Wise	Bakersfield, CA	$36,318
J.F. & S. Farms	Bakersfield, CA	$35,408
Tom Sandrini	Bakersfield, CA	$33,453
7th Standard Ranch	Shafter, CA	$30,601
King-pak Farms	Lamont, CA	$19,981
Michael Hat	Manteca, CA	$15,232
Louis Riccomini & Sons	Bakersfield, CA	$11,088
Kundert Brothers Farms	Edison, CA	$10,821
Andrew Brancato	Bakersfield, CA	$8,206
Holmes Ag. Management	Fresno, CA	$5,152

Sunset Farms	Bakersfield, CA	$3,299
Bloemhof Land & Farming	Wasco, CA	$1,568
Primex	Fresno, CA	$288
Blackwell Land Co.	Bakersfield, CA	$0
Sun Pacific Farming-mcfarland	Bakersfield, CA	$0
Castle Rock Farming & Transprt	Delano, CA	$0
Sun Pacific Farming - Maricopa	Bakersfield, CA	$0
Badger Farming	Exeter, CA	$0
Castillo Farms	Los Angeles, CA	$0
Malibu Vineyards	Delano, CA	$0
Maricopa Nursery Corp.	Manhattan Beach, CA	$0
Don Cox	Bakersfield, CA	$0
Old West Farming DBA Sunmet 51	Fresno, CA	$0
Maricopa	Ceres, CA	$0
Mid State Lab Test Farm	Bakersfield, CA	$0
S And H Farms	Gonzales, CA	$0
Southlake Ranch	Delano, CA	$0
Paramount Farms-Belridge Ranch	Mckittrick, CA	$0
Bel Lehr Organics	Edison, CA	$0
Foxtail Farms	Bakersfield, CA	$0
Nalbandian	Lamont, CA	$0
Paramount Citrus	Delano, CA	$0
Western Ag Specialists	Sanger, CA	$0
Betty Magan	Bass Lake, CA	$0
Islam Farms	Bakersfield, CA	$0
Romero Farms	Bakersfield, CA	$0
Ron Fanucchi Farming	Bakersfield, CA	$0
Old River Sod	Bakersfield, CA	$0
Twinland	Wasco, CA	$0
Del Monte Fresh Produce	Sanger, CA	$0
Sunshine Farms	Fresno, CA	$0
Willow Ridge Ranch	Shafter, CA	$0
Maricopa Slope Ranch	Delano, CA	$0
Singh, Jagtar	Fresno, CA	$0
Kern Ridge Growers	Arvin, CA	$0

G & G Farms	Bakersfield, CA	$0
Ben Lapadula	Bass Lake, CA	$0
Key Farm	Arvin, CA	$0
Paragon Seed Inc.	Salinas, CA	$0
Rancho Alexander	Mcfarland, CA	$0
Stephen Pavich & Sons	Lindsay, CA	$0
Tulare Lake Farming Co.	Corcoran, CA	$0
Giumarra Vineyards	Bakersfield, CA	$0
Hure Brothers	Delano, CA	$0
Thomas Miles	Bakersfield, CA	$0
Grimmway Enterprises	Bakersfield, CA	$0
Kindig Bros.	Bakersfield, CA	$0
Giannetto Citrus	Terra Bella, CA	$0
Yaksitch Farms	Lamont, CA	$0
John J. Kovacevich & Sons	Arvin, CA	$0
Superior Almonds	Porterville, CA	$0
Vignolo-Delmart Farms	Shafter, CA	$0
Bushnell Farm	Buttonwillow, CA	$0
Hill Maricopa Ranch	Arvin, CA	$0
Raaviz Farms	Fresno, CA	$0
7th Standard Ranch Co.	Bakersfield, CA	$0
Norag Co.	Bakersfield, CA	$0
Bidart Farms	Chino, CA	$0
Klein Management Inc.	Bakersfield, CA	$0
Alborz Farms, LLC	Fresno, CA	$0
Hankins Farms, Inc.	Wasco, CA	$0
Lester E. Stout	Bakersfield, CA	$0
Richard Enns	Bakersfield, CA	$0
Cal-Organic Vegetable Co.	Bakersfield, CA	$0
Greenwood Farms	Buttonwillow, CA	$0
Dynamic Farms	Scotts Bluff, NE	$0
Etchegaray Farms	Earlimart, CA	$0
Loma Ranch	Los Angeles, CA	$0
FMP Vineyards Llc	Bakersfield, CA	$0
Jack S. Thomson Farming Co.	Bakersfield, CA	$0

Covenant Farms	Bakersfield, CA	$0
Sun Pacific Farming (tomato)	Exeter, CA	$0
Sun Pacific Farming Co.	Bakersfield, CA	$0
Ugo Antongiovanni Farms	Bakersfield, CA	$0
D'Best Produce Co. Llc	Fresno, CA	$0
Sherwood 209- Sun Valley Assoc	Visalia, CA	$0
Delano Farms Company	Delano, CA	$0
Dennis & Peter Frick, Inc.	Bakersfield, CA	$0
H. P. Anderson and Son	Tulare, CA	$0
Webster Pistachios	Kettleman City, CA	$0
Garry Richardson Farms	Bakersfield, CA	$0
Rainbow Ranches, Inc.	Bakersfield, CA	$0
Famoso Vineyards	Delano, CA	$0
Double G Farms	Buttonwillow, CA	$0
C.S. Sidhu Farms	Bakersfield, CA	$0
I.N.A. Farm Corp.	Bakersfield, CA	$0
Paramount Farming W Valley/DR	Lost Hills, CA	$0
Gless Ranch, Inc.	Riverside, CA	$0
Kirk Elholm Farms	Wasco, CA	$0
Uni-CA	Bakersfield, CA	$0
Dole Fresh Fruit Co. - Rch Lma	Bakersfield, CA	$0
South Valley Farms	Wasco, CA	$0
Eduardo Garcia Farm	Earlimart, CA	$0
Stan Voth Farms	Wasco, CA	$0
Sunworld Inc.DBA Superior Farm	Bakersfield, CA	$0
Robert S. Andrews	Bakersfield, CA	$0
Rancho Esteli	Visalia, CA	$0
A & P Ranch	Lost Hills, CA	$0
Shafter Ranch	Lathrop, CA	$0
Carreon Farms	Bakersfield, CA	$0
Tony Guerrero	Arvin, CA	$0
Lederhos Farms	Bakersfield, CA	$0
B J Farms	Bakersfield, CA	$0
Superior Sod	Tehachapi, CA	$0
Ag. Management Associates, Inc.	Bakersfield, CA	$0

Jack Reed Farming	Edison, CA	$0
Jim Hronis & Sons-Grapes Only	Delano, CA	$0
Dushmesh Farms, Inc.	Bakersfield, CA	$0
D. M. Camp	Bakersfield, CA	$0
Universal Farming #105	Redondo Beach, CA	$0
Slaydeco	Bakersfield, CA	$0
Four Star Fruit, Inc.	Delano, CA	$0
Ballantine Produce Co., Inc	Sanger, CA	$0
Don Laux Farm Management	Porterville, CA	$0
Gorgin Farms	Fresno, CA	$0
Lucas Brothers	Visalia, CA	$0
Grimmway Organics	Bakersfield, CA	$0
Aldo Angone Farming	Bakersfield, CA	$0
Don And Alfred Palla	Bakersfield, CA	$0
Doaba Farming Co., Inc.	Bakersfield, CA	$0
James Tazioli	Buttonwillow, CA	$0
Elex Farms, Inc.	Fresno, CA	$0
John Allen Farms	Bakersfield, CA	$0
Poochigian Farms	Bakersfield, CA	$0
Kenny Mc Clanahan Farms	Bakersfield, CA	$0
Hein Ranch Company	Visalia, CA	$0
Redbank-Malaga/Minda Corp	Lindsay, CA	$0
Hall Farming	Arvin, CA	$0
Agro Farming	Arvin, CA	$0
Kern Oil & Refining Co.	Delano, CA	$0
Pioneer Nursery	Visalia, CA	$0
Hay Brothers	Bakersfield, CA	$0
South West 320 Fruit Co.	Visalia, CA	$0
Desert Ranch	Wasco, CA	$0
Fred Starrh Farms	Shafter, CA	$0
Smith & Sons/Smith & Smith	Bakersfield, CA	$0
G. T. S. Farms	Bakersfield, CA	$0
Agtoprof, Inc.	Shafter, CA	$0
Farmland Management Service	Delano, CA	$0
Chaparral, Inc.	Fresno, CA	$0

RWB Ranch & Tejon	Lindsay, CA	$0
Lloyd Unruh Farms	Bakersfield, CA	$0
Blair Farms	Buttonwillow, CA	$0
Norman Efird Farms	Bakersfield, CA	$0
Doug Kaiser Farms	Bakersfield, CA	$0
J. H. Farms	Escondido, CA	$0
Triple Y	Delano, CA	$0
Dewar Farms	Bakersfield, CA	$0

Farmer Detail

No farmer specified, please return to this page and select a farmer

Expert Sources

These experts on water law are familiar with EWG's report and are prepared to comment to the news media.

Hamilton Candee
Natural Resources Defense Council, San Francisco
(415) 875-6100
hcandee@nrdc.org

Hal Candee, a senior attorney with NRDC's Western Water Project, has been working for two decades to reform California water policy. Currently he is closely monitoring the contract renewal negotiations between the Bureau of Reclamation and CVP water districts.

John Leshy,
University of California, Hastings College of Law
(415) 565-4726
leshyj@uchastings.edu

Leshy is Harry D. Sunderland Distinguished Professor of Real Property Law at Hastings College of Law. In 1993 President Clinton appointed him to be Solicitor (General Counsel) of the Interior Department where, following Senate confirmation, he served under Secretary Bruce Babbitt until the end of the Administration, the second longest tenure of any Solicitor in the Department's 155 year history.

Lloyd G. Carter
Save Our Streams
(559) 304-5412

As a journalist in the 1980s, Lloyd Carter reported extensively on the environmental disaster caused by CVP runoff to the Kesterson National Wildlife Refuge. He is a former lecturer in water law at San Joaquin College of Law in Fresno and a well-known local advocate.

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[9] Tahoe-Sierra (Echeverria at 356).

[10] Tulare, 49 Fed. Cl. at 320

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[16] California Constitution, Art X, 2.

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EWG News Release

OAKLAND, Calif. — The Bush Administration is paying some of the biggest and richest agribusinesses in America $17 million for cutbacks in their taxpayer-subsidized water supply. But an Environmental Working Group (EWG) investigation found that these same California agribusinesses — including the world's biggest cotton producer and the largest farm in America — already get hundreds of millions of tax dollars from other federal farm subsidy programs.

The Administration's decision to pay off corporate megafarms in the San Joaquin Valley, over the objections of California officials from both parties and the government's own water-law experts, is not just another story of a wasteful federal handout to big agribusinesses.

It sets a dangerous precedent for similar cases, including a $100 million claim by farmers in the Klamath Basin on the California-Oregon border that will be heard next week. And it represents a radical extension of a right-wing ideology that regards environmental protections as illegal incursions on private property rights. The farmers claim the cutbacks were a government "taking" of their property, but EWG's findings raise the question: Who is really doing the taking?

"It's hard to say which is more outrageous: the claim by these large and profitable agribusinesses that they own the water — which under the state Constitution belongs to the people — or the Bush Administration going along with the scam," said Renee Sharp, an EWG senior analyst. "It amounts to paying the farmers not to take more of our water, while they're already getting millions of our tax dollars to support their businesses."

EWG's report, Taking From the Taxpayers, available at www.ewg.org, details that from 1995 to 2003, farmers sharing in the water settlement received about $250 million in

direct payments from federal crop subsidies and other programs. What's more, since 2001 the Kern County water agency serving almost all of those agribusinesses made about $40 million in profit by selling subsidized water back to California taxpayers at market rates.

The budget proposed this week by the Bush Administatration budget includes cuts in crop subsidies. Farm interests have already begun fighting the proposal by claiming it threatens their livelihood. But EWG's report shows that for many California agribusinesses who are reselling their subsidized water, crop payments are only one way they are underwritten by the taxpayers.

"This $17 million payoff is being spun by the agriculture lobby and property-rights movement as just compensation for struggling family farmers whose rights were trampled on," said EWG Vice President Bill Walker. "What is really is more corporate welfare for big agribusinesses who always have their hands out and never seem to get enough."

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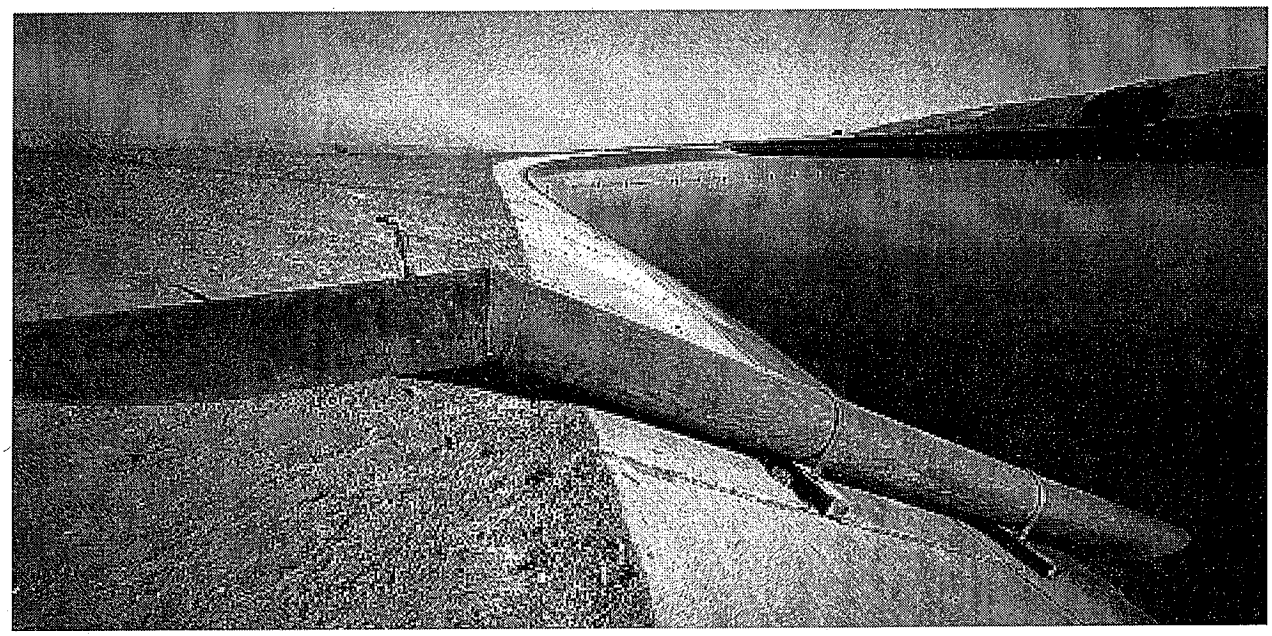

Water Heist

How Corporations Are Cashing In On California's Water

Public Citizen

WATER FOR ALL
CAMPAIGNING TO KEEP WATER AS A PUBLIC TRUST

California Office

December 2003

LETTER 36

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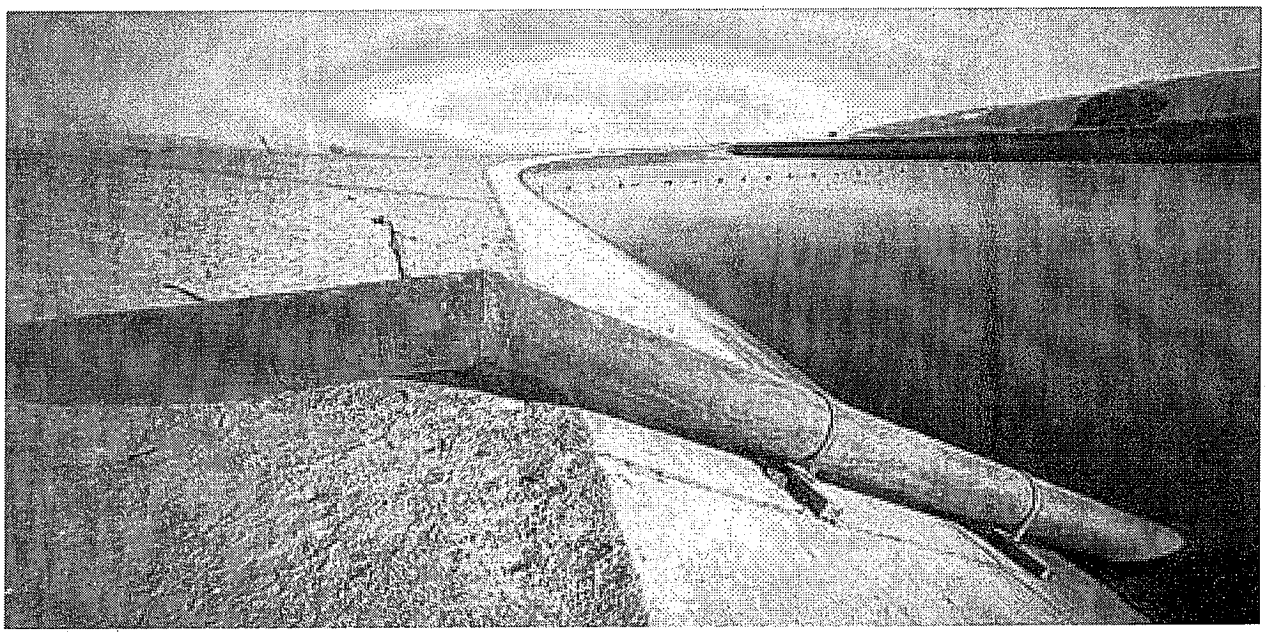

Water Heist

How Corporations Are Cashing In On California's Water

Public Citizen

WATER FOR ALL

CAMPAIGNING TO KEEP WATER AS A PUBLIC TRUST

California Office

December 2003

Public Citizen *is a national, nonprofit consumer advocacy organization founded by Ralph Nader in 1971 to represent consumer interests in Congress, the executive branch and the courts. We fight for openness and democratic accountability in government, for the right of consumers to seek redress in the courts; for clean, safe and sustainable energy sources; for social and economic justice in trade policies; for strong health, safety and environmental protections; and for safe, effective and affordable prescription drugs and health care. We have six divisions and two state offices.*

The California Office *Our campaigns protect the basics for life: food, water and democracy. We fight for safe and sustainable agriculture that provides locally-grown and nutritious food produced in a humane fashion. We advocate for democratic control and protection of public water resources in the face of international corporate strategies to privatize their ownership and distribution. And we continue to highlight how corporate-driven trade policy undermines environmental regulations, labor laws, and the democratic process.*

Public Citizen is campaigning to protect universal access to safe and affordable drinking water by keeping it in public hands. Public Citizen does not believe that citizens benefit from privatization of their water and wastewater systems because the sale of public works to private companies can foster corruption and result in higher rates, inadequate customer service and a loss of local control and accountability.

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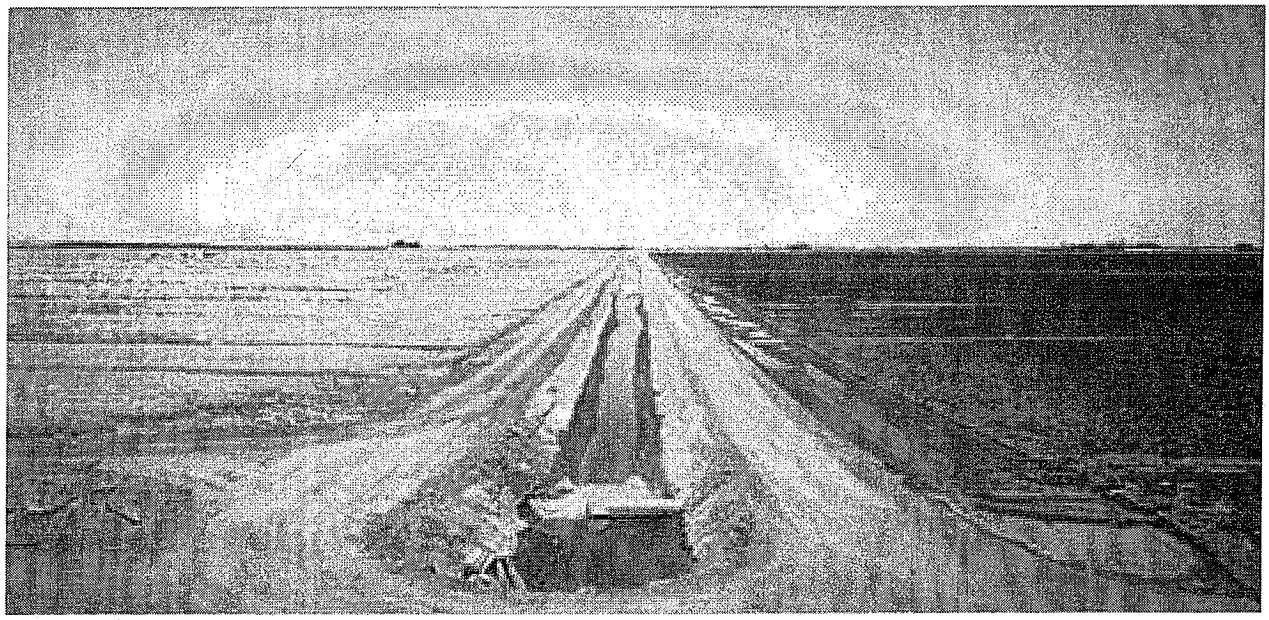


California's Great Central Valley receives between one and ten inches of rain a year. The diverted rivers sent south to be used as irrigation water provide the Midas touch that transforms the desert into the richest agricultural region in the world.

Executive Summary

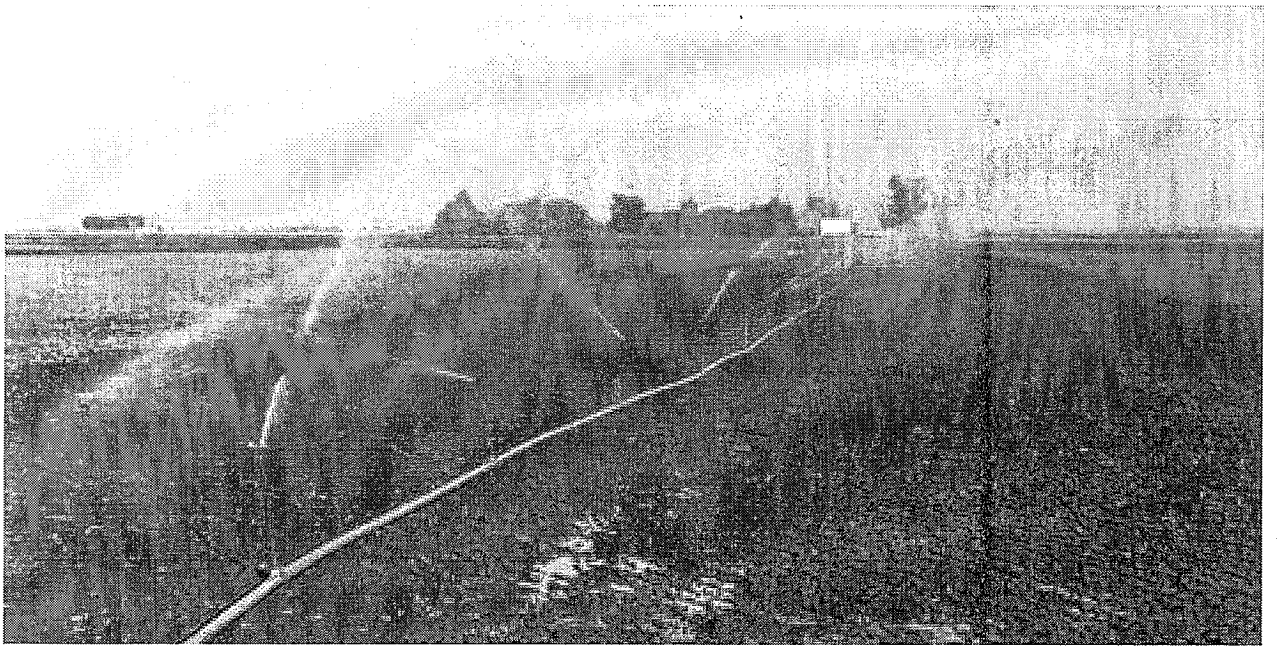
California's Central Valley is one of the largest contiguous swaths of land on earth to have been so completely altered by human activity. Lake beds and wetlands have been drained and planted with cotton and almonds, rivers dammed and diverted over hundreds of miles from their sources, the air filled with such quantities of dust and pesticides as to become the most polluted in the country, and the dry semi-desert floor turned into the most productive agricultural region in the world. Now, after a century of such cosmetology, the Valley is about to get yet another makeover from a boom crop: sprawl.

OVER THE PAST DECADE, a handful of the largest agribusiness and development corporations in the country have been rewriting California water policy in secret meetings to quench their thirst for unabated expansion and privatize the state's water supply. Displaying total disregard for the California State Constitution, representative democracy, and the environmental and social impacts of their actions, these players seek to "game" public water projects—much as Enron "gamed" energy deregulation. Their goal is to siphon as much of California's public water as possible to their corporate farms and "master-planned" cities in the desert while profiting from insider water sales.

In California state law, as laid out in the Constitution and the Water Code, water is a public good, held in trust by the state to ensure the greatest benefit to the public. In *Water Heist: How Corporations Are Cashing In On California's Water* we show how the public trust has been breached by an entrenched water plutocracy. The corporate interests that pervade the water districts that call the shots throughout the state are setting up insider water trading systems to facilitate the ease with which water flows to money. With direct corporate control over vital public water infrastructure—especially massive public water storage facilities—environmental protection and justice, urban renewal and smart growth face a desiccated future where profit rather than need dictates the destiny of California's water.

The abuses continue largely because they occur in closed meetings in hidden forms of government. Public Citizen aims to help cast the light of public scrutiny on the water deals taking place using the state's public water delivery system so that not just the CEOs of California have a voice in determining how our water is managed.

The water plutocracy includes some of the largest private agribusiness and development corporations in the country, who have created obscure and unaccountable water districts that act like "hidden government."



Usurping Democracy: The Monterey Amendments

In 1994, the largest contractors with the California State Water Project (SWP)—the state's largest water delivery system—called the Department of Water Resources (DWR) into a closed meeting. The agreements that the SWP contractors and the state reached in that meeting led to a document known as the Monterey Amendments, named after the city where the meetings took place. These "amendments" to the SWP contracts included denying that the SWP delivers half of what the contractors say it does and effectively deregulating the SWP so that the contractors can sell contracts for precisely the half of the water that doesn't exist. Sound confusing? It is. Welcome to the world of "paper water."

In the same Monterey meetings, the state also agreed to give away an underground water storage facility that DWR spent $74 million purchasing and developing.

State Giveaway of Essential Public Asset: The Kern Water Bank

The Kern Water Bank is an underground water storage facility—the largest of its kind—situated at the southern tip of the Great Central Valley, the region where the state delivers 80 percent of its surface water to industrial agriculture. The water bank is connected to the public canals and aqueducts that pipe water in from the northern, central and southern Sierra Nevada mountain range. The water bank can store about 1 million acre-feet of water and pump out over 200,000 acre-feet a year, according to official project descriptions.

The Kern Water Bank is an integral part of California's public water delivery system. It could store large amounts of water for times of drought or natural disasters such as fires or earthquakes. It could also provide a handful of private corporations with the keys to a virtual "switchyard" for controlling water deals between agribusinesses and real estate developers.

In 1994, DWR gave the Kern Water Bank to the Kern County Water Agency, which immediately signed it over to the Kern Water Bank Authority, a supposedly public entity comprised of a collection of water districts and one private company. The private company involved is a "paper company" with no listed telephone number or address: Westside Mutual Water Company. Westside is owned by perhaps the largest agribusiness in the United States: Paramount Farming Company.

Who's Behind the Kern Water Bank? Roll International Corporation and Paramount Farming Company

Roll International Corporation—a Los Angeles-based holding company—is one of the largest privately owned companies in the world, and everything that Roll owns claims to be the biggest at what it does. Roll International owns the Franklin Mint, Teleflora, and a collection of

agribusinesses—all of which operate in three California counties—including Paramount Citrus, Paramount Farming, and Paramount Farms, Inc. The California Farm Bureau Federation wrote that together "these firms constitute the largest farming company in the United States." Roll is privately owned by Stewart Resnick, a Beverly Hills billionaire and major campaign contributor who gave over $350,000 to the Gray Davis Committee and the anti-recall groups between 2000 and 2003. Governor Davis chose Resnick to co-chair his agriculture-water transition team with the champion of the failed Cadiz groundwater banking scheme, Keith Brackpool.

Although the Kern Water Bank Authority oversees a vital water resource, its staff is tucked away in the offices of Paramount Farming Company, without so much as a sign on the door. Executives from Paramount, who created an almond and pistachio empire over the past two decades, said that they went into the water bank to secure a firm water supply for their crops. Local newspaper articles, however, quote Paramount's vice president, who presides over the water bank's board of directors, as saying "sales from the water bank were contemplated from the time the bank was acquired." In fact, the paper reports, Paramount is particularly interested in selling water to its parent company's home town: Los Angeles. Paramount executives have already had "early talks" with the Los Angeles Department of Water and Power about selling "an as-yet-unspecified amount of water."

The website of Paramount's Los Angeles-based law firm clearly boasts about how the law firm advised Paramount Farming Company to set up a mutual water company (Westside Mutual Water Company) to "own and operate" the Kern Water Bank. Paramount, it seems, has been planning for some time to harvest more than just pistachios and almonds.

Irrigating Sprawl

California's population is expected to grow by 20 million in the next twenty years, and real estate developers are scrambling to get a hold of "secure" water supplies for their sprawling subdivisions. Public Citizen found a water sales contract between WV Acquisitions, a Roll International subsidiary whose president is also president of Paramount Farming Company, and Newhall Land and Farming Company, the largest developer in the state. Newhall has been taking advantage of the 1994 backroom deregulation of the SWP to go shopping for paper water contracts for the new "master-planned" city it plans to build in northern Los Angeles County. Such sales involve water supplies that are far from secure because they are based on allocated state water supplies: that is, paper water. Furthermore, this report raises the essential question: Should corporations like Paramount and Newhall be allowed to profit from buying and selling water that belongs to all Californians?

Usurping Democracy, Again: The Napa Proposition

In July 2003, just months after the seven-year lawsuit challenging the Monterey Amendments by a coalition of environmentalists, public advocates, and one State Water Project contractor was settled, the participants in the Monterey meetings met again, this time in Napa. The agreement that resulted from these meetings—called the Napa Proposition—plans to further integrate the SWP and the federal Central Valley Project (CVP). Such integration will allow landowners, principally in the San Joaquin Valley and Southern California, to trade off the federal project's superior storage capacity and the state project's greater pumping capacity with one goal in mind: to continue pumping water to agribusinesses, developers, and water marketing barons in Southern California, unabated by either federal or state endangered species acts, water quality issues in the Delta, or the unmet needs of communities in the Central Valley that don't have access to clean drinking water.

End Game: Water as Public Trust

California's public water utilities and resources are governed by a plutocracy—a select group of private corporations, individuals, and semi-public and public officials all working in tandem to "game" state water policy. They meet in closed sessions and rewrite public policy, tailoring their edits to the interests of monopoly-like agribusiness corporations and real estate developers. Is this a conspiracy theory? No. It is just business as usual.

The water plutocracy must be replaced with a vibrant water democracy.

Public Citizen strongly advocates returning the State Water Project to broad public use and oversight so that it can benefit all Californians, rather than only a select group of Los Angeles corporations. Water must be maintained as a public good, held in trust for broad and equitable use, *not* a commodity bought and sold by the highest echelons of the corporate elite.

We recommend the following concrete steps for accomplishing this goal:

Return Kern Water Bank to Public Control

Paramount and its Westside Mutual Water Company should never have been allowed to "own and operate the water bank." The privatization of this vital public resource should be reversed.

Repeal the Monterey Amendments

The Monterey Amendments should be repealed and the State Water Project contracts should be rewritten with an eye to water conservation and environmental restoration as well as the original stated purpose of the project: to reallocate California's water resources in an *equitable* manner.

Eliminate Paper Water

The Department of Water Resources continues to maintain on paper that the State Water Project can deliver almost twice as much as nature provides. The water "entitlements" of the twenty-nine State Water Project contractors should be re-drafted to fit the actual capability of the project to deliver.

No Resale of State Water Project Water

The individual contractors that receive state project water should not be allowed to profit from reselling that water, whether it is back to the state Environmental Water Account or to real-estate developers.

Democratize Water and Irrigation Districts

Water and irrigation districts that receive public water deliveries from the SWP should be transparent and accountable to the public. There should be elected, public representatives on the boards of such districts who would represent the non-landowning population affected by water policy decisions made most often in closed meetings.

NATURE PROVIDES ENOUGH WATER for California to meet all of its needs: to sustain water-efficient family farms and industries; to provide safe drinking water to present and future generations; and to restore and maintain California's much-abused environment. Nature provides enough water; that is, unless mismanagement and greed intervene and allow for the state's public water supplies to be manipulated for profit. Too much is at stake to let this water heist continue.

Background: The Monterey Amendments

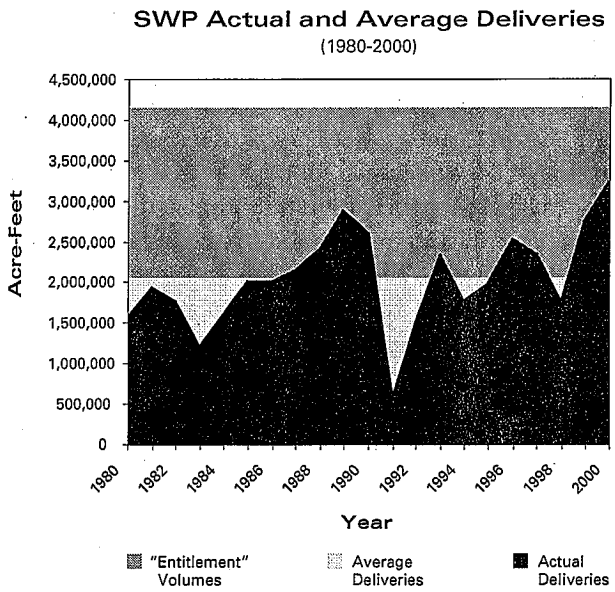
AFTER TWO YEARS of planning and negotiation, in 1988 the Department of Water Resources (DWR) purchased 19,900 acres alongside the Kern River.[1] DWR purchased the property for $31.4 million from Tenneco West Incorporated to build a subsurface reservoir to store State Water Project (SWP) water during years with above average rainfall.[2] On this property DWR first established the Kern Water Bank—an underground reservoir capable of storing a million acre-feet* of water. After conducting in-depth studies on the viability and potential environmental impacts of the project, DWR began putting in extraction pumps and building canals and conveyance facilities to connect the water bank to SWP aqueducts. All told, DWR spent $74 million on the project.[3]

From 1987 through 1992 and again in 1994, California experienced drought years. During the drought DWR significantly cut back deliveries to its agricultural contractors. In 1991 and 1992, DWR operated a Drought Water Bank to pay contractors willing to forgo their water entitlements. DWR then delivered the purchased water to agricultural contractors and urban areas with the strongest demand. The Drought Water Bank was the state's first experiment with water banking.[4]

Following the drought, the Kern County Water Agency (KCWA) was preparing to take DWR to court for cutting back its water deliveries.[5] The state legislature created the KCWA in 1961 under the tutelage of Kern County's corporate farmers to buy SWP water and then sell it to the local districts where the landowners formed the boards of directors. As an intermediary, the Agency spread out the cost of SWP water through a countywide property tax, principally paid by the Bakersfield urban population. Both the intent and the effect of the KCWA were to generate water subsidies for large landowners.[6]

In 1994, rather than call DWR to court, water brokers in Kern County and a select group of other SWP contractors held a series of closed meetings with DWR to rewrite the contracts that govern water allocation for the entire State Water Project.[7]

The backroom deal that resulted—in which participants produced a document known as the Monterey Amendments, named for the city in which the meeting took place—made several fundamental changes to the SWP contracts, all propitious for the agribusiness and real estate interests represented by the attendees of the meetings.[8] The agreement withdrew, for example, a requirement that water allotments be scaled back to fit available supplies in the case of permanent water shortages or the inability of



Source: Department of Water Resources Bulletin 132-90 and Bulletin 132-01.

the project to deliver as originally projected.[9] The SWP contracts for 4.2 million acre-feet of water but can only deliver an average of about 2 million acre-feet annually.[10] This modification permits SWP contractors to buy and sell entitlements to water that does not exist, otherwise known as "paper water."[11] California water historian Norris Hundley describes the Monterey Amendments as "[a]n 'institutional mirage' encouraging the notion that California can somehow find all the water necessary for development into the distant future."[12]

It was also through the Monterey Agreement that DWR first gave the Kern Water Bank to the Kern County Water Agency, who then signed a joint powers agreement—enabling different districts to cooperate in their exercise of common powers—to form the Kern Water Bank Authority (KWBA). The KWBA is a joint powers authority consisting of two water storage districts (Semitropic Water Storage District and Wheeler Ridge-Maricopa Water Storage District), two

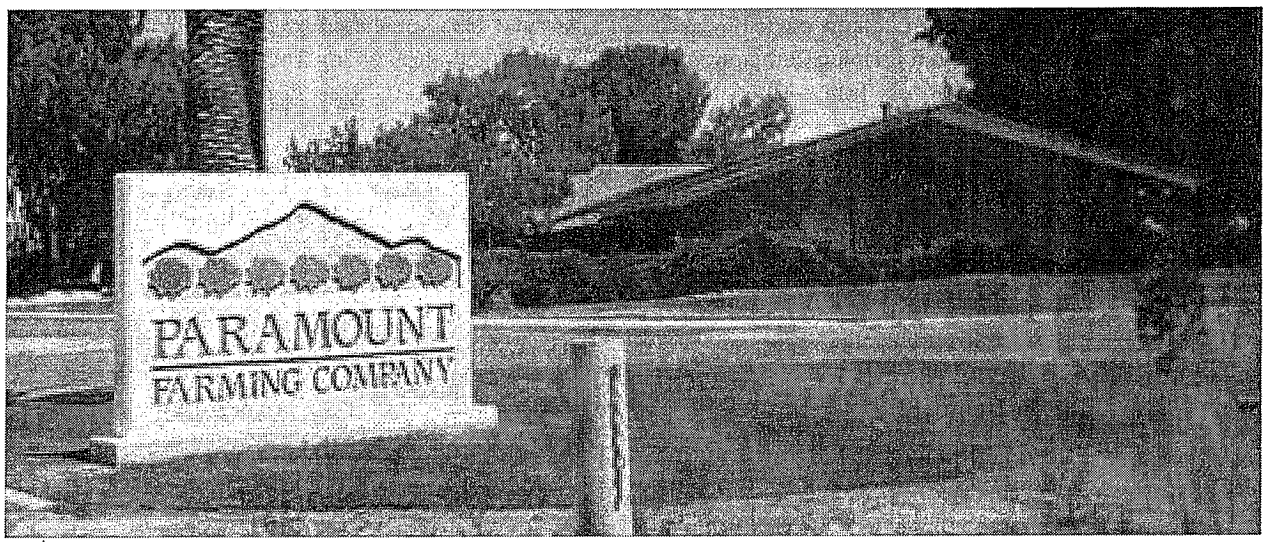
An acre-foot is the amount of water necessary to fill an area of one acre to a depth of one foot, or 325,000 gallons. One acre-foot of water is roughly the amount that two families of four consume in one year.

water districts (Dudley Ridge Water District and Tejon-Castac Water District), one special district (Kern County Water Agency), and one private company (Westside Mutual Water Company).

The Third District Court of Appeal ruled that, in 1995, DWR illegally passed off its responsibility under the California Environmental Quality Act of conducting an Environmental Impact Report (EIR) on the potential impacts of the proposed changes to the SWP contracts.[13] The DWR gave the task to the Central Coast Water Authority—one of the participants in the secretive Monterey meetings. The Planning and Conservation League together with the Plumas County Flood Control and Water Conservation District and the Citizen's Planning Association of Santa Barbara County challenged the validity of the EIR and the legality of the Kern property giveaway. The plaintiffs lost in the trial court but won a unanimous favorable ruling from the Third District Court of Appeal. They went into mediated settlement negotiations with DWR and its major contractors, finally reaching an agreement in May 2003.[14]

The Settlement Agreement requires DWR to prepare a new EIR on the Monterey Amendments. It also allows for the Kern Water Bank Authority's continued ownership of the water bank while the new EIR is in process.[15] Throughout the lengthy litigation and negotiation process, however, the changes wrought to California's water infrastructure and water politics continued unabated. Although the environmentalists were hoping to have the whole deal scrapped in court, for the first time in California history the agriculture and real estate magnates behind these deals began setting up a paper water trading system. Moreover, they turned the state's $74 million gift of the Kern Water Bank into "the switchyard for controlling the water market."[16]

Tim Stroshane, editor of the California water journal *Spillway: California Land, Water and People*, called the Monterey deal a "bloodless coup."[17] He wasn't exaggerating. The changes made in the closed meetings usurped participatory democracy and overhauled California's most vital public utility, tailoring it to the demands of agribusiness corporations and developers seeking to create and corner a subsidized water trading system.



The water bank's administration—the Kern Water Bank Authority (KWBA)—is housed in Paramount's corporate office outside of Bakersfield. Paramount's vice-president also serves as chair of the Authority's board. There was no sign for the KWBA anywhere outside or inside the building when Public Citizen visited in July 2003.

The Kern Water Bank

"THINK OF THE BANK OF AMERICA, the way it operates with dollars, that's the way we operate with water," said Jonathan Parker, general manager of the Kern Water Bank Authority (KWBA) in Kern County.[18]

The Kern Water Bank claims to be the largest water banking project in the world. It can store a million acre-feet of water on a long-term basis and provide around 240,000 acre-feet per year for extraction.[19] To put this figure in perspective, 200,000 acre-feet, about 65 billion gallons of water, is the amount of water that would be transferred annually from the Imperial Irrigation District to the San Diego County Water Authority under the much contested deal between the two. The price tag on that deal now stands at $52 million a year.[20]

The water bank is located on the Kern River alluvial fan—the disintegrated rock deposited over thousands of years by the Kern River. According to the KWBA project description, the water bank works like this: "Water rapidly soaks down through the sand to fill in the voids between particles. When it is needed, water is easily recovered by high-flow wells."[21]

"Think of it like a bank," said Mr. Parker. "Participants have water. We're a nonprofit entity. What we do is provide a service. We store water at cost and then take water out of the ground, at cost. They pay us to provide that service in the least expensive manner. We operate only for participants."[22]

In 1994, the California State Legislature approved Assembly Bill 2014. Introduced in the Assembly on March 5, 1993, the bill was amended in the Senate on June 13, 1994, where the original language concerning water rights was entirely deleted and replaced with a single sentence authorizing mutual water companies to enter into joint powers agreements.[23] Also in 1994, DWR, the initial owner and developer of the Kern Water Bank, participated in the closed meetings in Monterey that led the state to transfer the property to the Kern County Water Agency, who called the meetings in Monterey.

The private company involved in the Kern Water Bank is Westside Mutual Water Company. Westside owns 48% of the bank. Westside is not a well-known company; in fact it does not have a listed telephone number or address. When asked about the participation of a private business in the otherwise public agency, the Bank Authority's staff responded that "Westside Mutual Water Company represents land holdings in other districts. They are not that different from a storage district. We don't see any difference in that."[24]

And whose land holdings does Westside represent? "Westside owns land, they represent their land," said Cheryl Harding, the Authority's administrator.[25]

"They're no different from a water district," Mr. Parker added.[26]

Westside Mutual Water Company is wholly owned by and operates exclusively for Paramount Farming Company, one amongst the cluster of agribusiness firms—all privately owned by Roll International Corporation—that together constitute what may be the largest agribusiness company in the United States.[27]

The KWBA staff appeared reluctant to mention the name "Paramount Farming." Such reluctance was peculiar considering where the interview took place: in the conference room of Paramount Farming Company's office on East Lerdo Highway, about 10 miles outside of Bakersfield.[28]

The KWBA leases its office space from Paramount. However, there is no sign either outside or inside the building to announce the offices of this supposedly public entity. Indeed, there is no distinguishing feature between the offices of KWBA employees and those of Paramount employees. Posters and maps published by the KWBA hang on the walls throughout the building. The Authority's geographical information systems (GIS) specialist works off of a lap-top in Paramount's GIS department.

"We lease space from Paramount because we're trying to do stuff on the cheap. We're not empire builders," Ms. Harding said.[29]

"We operate in the public, we serve a board of directors," added Mr. Parker.[30]

Ms. Harding then continued: "The 7 a.m. board meetings go on for a long time. Some people come, find it boring, don't come back. There's no smoking gun, just a meeting."[31]

The Corporate Players behind the Kern Water Bank Authority

KWBA Participant	Westside Mutual Water Company (WMWC)	Wheeler Ridge-Maricopa Water Storage District (WRMWSD)	Dudley Ridge Water District (DRWD)	Tejon-Castac Water District (TCWD)	Kern County Water Agency, Improvement District 4 (KCWA)	Semitropic Water Storage District (SWSD)
Ownership	48.06%	24.03%	9.62%	2.00%	9.62%	6.67%
Corporate Connection	William Phillimore: Chairman, KWBA Board of Directors; President, WMWC; ***Vice President, Paramount Farming Company***	Dennis Mullins: KWBA Board of Directors; WRMWSD Board of Directors; ***Vice President, General Counsel, and Secretary, Tejon Ranch***	Joseph MacIlvaine: President, DRWD Board of Directors; ***President, Paramount Farming Company***	Dennis Mullins: KWBA Board of Directors; President, TCWD Board of Directors; ***Vice President, General Counsel, and Secretary, Tejon Ranch***	See *Hidden Government*, p. 23	***Newhall Land and Farming,*** direct client, with 55,000 acre-feet of water storage capacity

The Kern Water Bank Authority (KWBA) is a joint powers authority consisting of two water storage districts (Semitropic Water Storage District and Wheeler Ridge-Maricopa Water Storage District), two water districts (Dudley Ridge Water District and Tejon-Castac Water District), one special district (Kern County Water Agency), and one private company (Westside Mutual Water Company).

Paramount Farming Company controls over 50 percent of the Kern Water Bank through Westside Mutual Water Company and Dudley Ridge Water District.

Another key player to keep an eye on is Tejon Ranch. Tejon Ranch, with 270,000 acres between Los Angeles and Bakersfield is "the largest contiguous expanse of land under single ownership in California," according to the company's website. Tejon Ranch, initially an agribusiness, plans to build a new town—even bigger than Newhall Ranch—with 24,000 houses, thus ushering in the trend of agriculture bowing to urban sprawl. Tejon's participation in the Kern Water Bank would allow them to store nearly twice as much water as their new town would require annually.

Sources: Kern Water Bank Authority, *Project Description*, Undated; Water Association of Kern County, *Who's Who in Kern County Water*, <http://www.wakc.com/whoswho.htm>; Dudley Ridge Water District, *Board of Directors*, Undated; Tejon Ranch, *Historic Tejon Ranch*, <http://www.tejonranch.com/HistoricTejon/HistoricTejonRanch.html>; and Vic Pollard, "Land not only issue in the mix," *Bakersfield Californian*, 07 June 2003.

Many industrial agriculturists in the Central Valley irrigate their almond orchards through routine flooding.

Who Controls the Kern Water Bank?

Power veils itself. From the mystery of what it does, what it owns, and, above all, who it is, it assumes added strength.

Gray Brechin, *Imperial San Francisco*

INFORMATION AVAILABLE to the public concerning Roll International Corporation is scant.[32] Roll is one of the largest privately owned companies in the world. Roll's 1998 sales were $1.57 billion.[33] Everything that Roll owns claims to be the biggest at what it does. Perhaps the most widely recognized company of the group is the Franklin Mint, "the world's largest direct marketer of collectibles."[34] In addition to the Franklin Mint, Roll International owns Teleflora, the nation's largest wiring service for flowers.[35]

Roll's agribusinesses—all of which operate in three California counties—include Paramount Citrus, the largest grower, packer and marketer of citrus in the country; Paramount Farming, the largest producer of almonds and pistachios in the country; and Paramount Farms, Inc., the largest pistachio processor and second-largest processor of almonds in the world. The California Farm Bureau Federation wrote that together, "these firms constitute the largest farming company in the United States."[36]

Roll International and its holdings such as Paramount Farming Company are Delaware corporations. Some of the perks of incorporating in Delaware include: incorporating without traveling to or living in Delaware; paying an annual corporate franchise tax as low as $50 regardless of income; and not paying a cent in income tax if you don't do business in Delaware.[37] Enron, for example, had 685 subsidiaries incorporated in Delaware.[38]

Roll International is owned and directed by Stewart Resnick. The Resnicks live in Beverly Hills, not Bakersfield. One visitor to the Resnicks' mansion commented that it was "like the Italian embassy but more tasteful."[39]

The Resnicks are active members in Los Angeles society. In the past few years they have received some of LA's highest awards such as the University of California Los Angeles (UCLA) Medal, the Duke Award and the City of Angels Award.[40] They give to numerous charities, universities, art museums and Democratic candidates, donating over $250,000 to the Governor Gray Davis Committee between 2000 and 2002 and $100,000 to anti-recall groups in June and September 2003.[41] In 1998, Davis, then governor-elect, appointed Stewart Resnick as co-chair of his "agriculture and water transition group."[42] Mr. Resnick's fellow co-chair was Keith Brackpool of the botched Cadiz water grab fame.

Paramount Farming Company has more than 5 million trees yielding billions of nuts a year. Growing, processing and marketing as one company, Paramount claims to be the largest vertically integrated supplier of pistachios and

almonds in the world.[43] The company currently has over 50,000 acres of pistachio and almond orchards in production in California. They also have the property holdings—and the plans—to expand into at least another 50,000 acres in the coming years.[44]

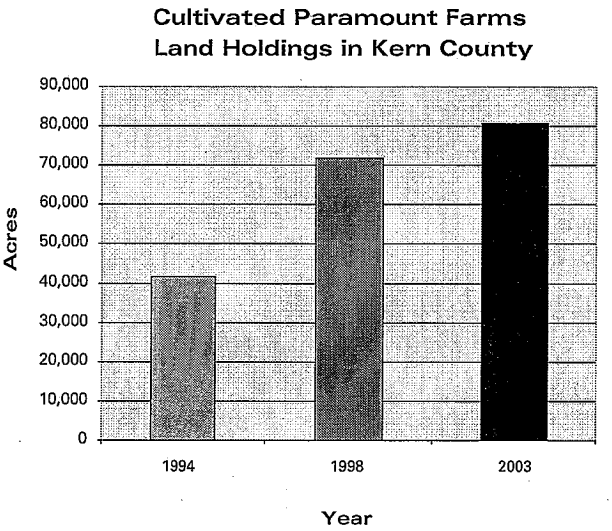
Almonds and pistachios are extremely lucrative crops. The California Farm Bureau Federation ranks almonds among California's top ten most valuable crops, generating $700 million in 2001 and over $1 billion in 2002.[45] Almonds are California's number one export crop, and also the top fruit and vegetable export crop in the United States.[46] Pistachios are not used as ingredients as often as almonds, making their demand significantly lower. Still, California's 2002 pistachio crop was valued at a solid $336 million.[47]

Paramount started buying pistachio, almond and olive orchards in 1986, after agricultural production dropped significantly in Kern County in the early 1980s.[48] Approximately 100,000 acres went out of production in Kern between 1982 and 1984.[49] Paramount and its associated companies, all held by Roll International, continued buying land into the 1987-92 drought that hit California agribusiness particularly hard. Roll purchased 12,000 acres of pistachio and almond orchards from Mobil Oil in 1986 and 77,000 acres of farmland from Texaco's central California agribusinesses in 1987.[50]

In 2000, Paramount bought most of Dole's citrus in California for $55 million, making it "the largest integrated grower, packer, and marketer of fresh citrus in the United States."[51]

In fact, while both the number of farms and agribusinesses and the total acreage of land in agricultural production in California dropped significantly throughout the 1990s, the Paramount group of agribusiness corporations doubled its acreage in cultivation from around 41,000 acres in 1994 to nearly 81,000 in 2003.[52] These figures come from analyzing Paramount's pesticide permits in Kern County alone. Paramount also has land holdings in Kings and Fresno counties.

Paramount has been steadily increasing its acreage and expanding production *against* the trend of the state's overall decrease in both agricultural acreage and production. Between 1992 and 1997 while Paramount was growing, California lost more than 3,500 farms.[53] Between 1998 and 2000, "90,000 acres of California farmland were lost to urbanization."[54]



Paramount has doubled its acreage in production in Kern County over the past ten years.

Source: Kern County Department of Agriculture, http://www.co.kern. ca.us/kernag/ftp/fileindx.html

Paramount's success is certainly a product of its agricultural technology and business organization.[55] Such success would not be possible, however, without water—indeed, enough water to satiate 100,000 plus acres of orchards depending upon year-round irrigation in a semi-desert.

Paramount and the KWBA's staff paint a picture of serious, risk-taking private enterprise saving the Kern Water Bank from the bungling hands of bureaucrats in Sacramento. In interviews they said repeatedly that DWR "couldn't get the project off the ground," and that the community prefers the water bank to be "under local control."[56] Paramount, a Delaware corporation, privately owned by one of the wealthiest residents of Beverly Hills, can hardly be considered "local."

The *Bakersfield Californian* also referred to the Kern Water Bank as a "local" asset. Under the headline, "Kern Water Bank will likely stay with county," the *Californian* describes the Kern Water Bank "property transfer" thusly: "One provision of the Monterey Agreement transferred ownership of the 20,000-acre water banking area along the Kern River bed west of Bakersfield from the state to a consortium of local districts, including KCWA."[57] The *Californian* does not mention Paramount Farming Company even though Paramount's water company, with 48% ownership, easily holds the largest share in the Kern Water Bank and Paramount's Executive Vice President, William D. Phillimore, is Chair of the Kern Water Bank Authority's

board of directors—a position that he is apparently able to carry out from his desk at Paramount.

Compare the *Californian's* take on the water bank acquisition with the following description provided by the Los Angeles law firm that represents both Paramount Farming Company and the Kern Water Bank Authority— Nossaman Guthner Knox & Elliott LLP:

> Paramount Farming Company was a key participant in the Kern Water Bank transaction, and Nossaman advised Paramount on all aspects of this transaction. The Kern Water Bank is a 20,000-acre property west of Bakersfield operated by the Department of Water Resources for groundwater storage. Pursuant to the Monterey Statement of Principles entered into by the Department and State Water Contractors in November 1994, the Department agreed to transfer the property. Nossaman advised Paramount regarding formation of a joint powers authority to own and operate the water bank, a mutual water company through which Paramount participates in the authority, relinquishment of entitlements, water rights, environmental issues and other issues regarding this transaction.[58]

Notice the language of intention: "Nossaman *advised* Paramount regarding the formation of a joint powers authority to *own and operate* the water bank."[59] Nossaman leaves little doubt that Paramount *planned* to acquire and control the Kern Water Bank.

Paramount grows pistachio and almond trees, some 5 million of them. Trees, unlike other crops such as rice or alfalfa, cannot be fallowed. In the semi-desert of the Southern San Joaquin Valley, no almond tree could survive without a constant supply of water. Kern County itself receives an average annual rainfall of less than six inches.[60]

The resource planning manager at Paramount Farming Company explained the motivation behind Paramount's participation in the Bank Authority as follows: "We're in the situation of growing almonds and pistachios without a firm water supply, so we went into the Kern Water Bank to secure a water supply."[61] He emphasized that Paramount's primary interest is in making a long term investment to grow their crops, and that "any sort of water marketing is very much secondary to crops."[62]

Should taxpayers and ratepayers foot the water bill for the self-described largest almond and pistachio producer in the United States to grow permanent specialty crops "without a firm water supply?" Is this the public's investment for a cheap supply of almonds? In 2001, Paramount's president, John McIlvaine, told the American Society of Farm Managers and Rural Appraisers that nearly 80% of California's almonds are exported—mostly to Western Europe and Japan—and that the almond industry is "on the move promoting foreign sales as its production grows larger and larger."[63] In fact, McIlvaine pointed out that California's tree nut exports have risen steadily over the past 15 years, a trend concurrent with Paramount's increase in acreage in production and the state's overall decrease.

Irrigating Sprawl

Water utilities exist primarily to nourish real estate, not people.

Gray Brechin, *Imperial San Francisco*

INTERSTATE-5 IS LITTERED with roadside banners facing the oncoming traffic with messages such as "Food Grows Where Water Flows" and "Farm Water Feeds the Nation." Is Paramount feeding the nation? Which nation?

The *Bakersfield Californian* reported that Paramount is "most interested in selling water to Los Angeles."[64] Though they said that such sales were most likely not going to take place any time too soon, officials from the Los Angeles Department of Water and Power have already "had early talks with representatives of Paramount Farming Co. and other participants in the Kern Water Bank about possible purchase of an as-yet-unspecified amount of water."[65] In an interview with the *Californian*, Paramount's Bill Phillimore said "sales from the water bank were contemplated from the time the bank was acquired by Kern County water agencies in 1995."[66]

Other sales have already taken place. WV Acquisitions, one of Roll International's Delaware corporations, recently sold Newhall Land and Farming Company 5,099 acre-feet of its SWP annual water entitlement.[67] Newhall Land and Farming Company plans to build a "new city" of over 20,000 housing units and 3.58 million square feet of commercial space in bone-dry northwestern Los Angeles County. After years of controversy and lawsuits, the project was recently approved by the LA County Board of Supervisors and the Superior Court.[68]

Newhall has gone on a buying spree where the most cherished item on sale is SWP contract entitlements, or "paper water." These entitlements are contract promises, so to speak, from the state. During wet years, DWR will deliver at best most of the contracted water. During drought years, it might not deliver any at all. This is why the changes to the SWP contracts ironed out in Monterey are so important to the brokers in water: holding the state accountable for its original—undeliverable—contracts enables the contractors to sell "paper water" that won't be missed by their parched crops.

The Third District Court of Appeal that ruled against DWR in the Monterey Amendments case of 2000 declared that "Paper water always was an illusion. 'Entitlements' is a misnomer, for contractors surely cannot be entitled to water nature refuses to provide or the body politic refuses to harvest, store, and deliver. Paper water represents the unfulfilled dreams of those who, steeped in the water culture of the 1960s, created the expectation that 4.23 million acre-feet of water could be delivered by a SWP built to capacity."[69]

Corporations and water agencies are trading in "paper water" as a way of "gaming" the water in California to keep the severely over-stretched public water projects pumping water to the highest bidder. Though the contracts referred to as "paper water" do not correspond to deliverable water quantities—as noted in the Third District Court of Appeals

PCL v DWR decision—they function as a siphon to pull as much water as technologically possible out of the Delta. Real estate development corporations can use "paper water" contracts to get their projects approved without having a secure water supply. Once the projects are built, and the people about to move in, the corporations can use the contracts to demand water deliveries from the state. Such deliveries would most likely come through purchasing water rights from small farmers (potentially driving them off their land), not to mention continuing to neglect existing rural communities without access to safe drinking water and the deteriorating Delta environment.

Newhall is trying to purchase SWP water entitlements from Castaic Lake Water Agency.[70] Castaic, in turn, is attempting to double its SWP water entitlements by purchasing more from such water dealers as the Kern County Water Agency, and its member districts Berrenda Mesa Water District and Belridge Water Storage District.[71] Paramount's president and vice-president are presidents of the boards of directors of Berrenda Mesa and Belridge respectively.[72] Paramount is apparently thus well poised to sell even more "paper water" to the largest prospective developer in California.

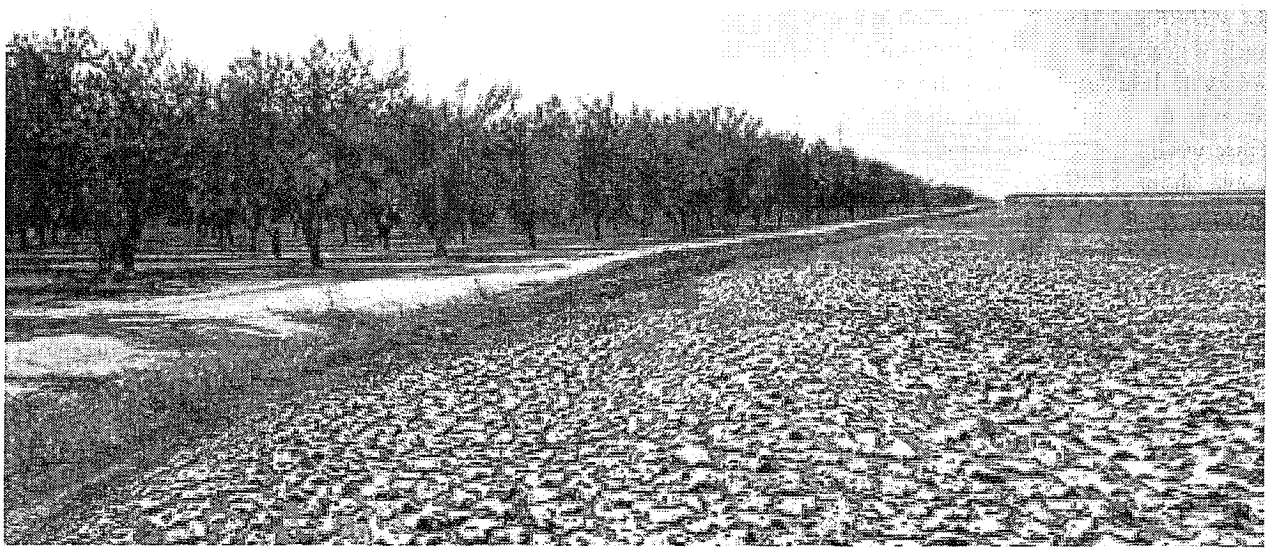
Newhall also purchased 55,000 acre-feet of storage capacity in the Semitropic Water Storage District—one of the participants in the Kern Water Bank Authority.

With control over water storage facilities, the largest agribusiness companies like Paramount can hold on to enough water to do the impossible in a severely over-drafted groundwater basin: increase their production *and* sell to developers. Also, with development companies able to buy in directly to the storage facilities as well as purchase "paper water," they can argue before the courts that their water supply is reliable, on paper.

Lynne Plambeck, an activist with the Santa Clarita Organization for Planning the Evironment (SCOPE) and an ardent opponent of the Newhall Ranch project, said that control over storage facilities like the Semitropic Water Storage District and the Kern Water Bank is "a way of controlling water without actually owning water."[73] Private facilities can favor developers over farmers and large corporations over small businesses by charging less to those who store large amounts of water. One company or individual, Ms. Plambeck said, "can take up the storage facility with a lot of water, and then a drought comes along...They can corner the market with no public oversight, just like Enron."[74]

Private storage facilities are not subject to public oversight through laws such as the California Environmental Quality Act (CEQA), Ms. Plambeck said: "When the water goes into storage facilities in the Kern Fan, there is no oversight, no CEQA. The public only has a chance if there is a CEQA process."[75]

And what happens when the water isn't there? With the houses built and the new dwellers moved in, the developers will push for new dams and more pumping of water from the north to save the stranded residents from drought. The losers will be the same: the rural communities in the north and throughout the valley, the tax and ratepayers who ultimately have to pay for it all, and the environment upon which all Californians depend.



Blaming the Environment

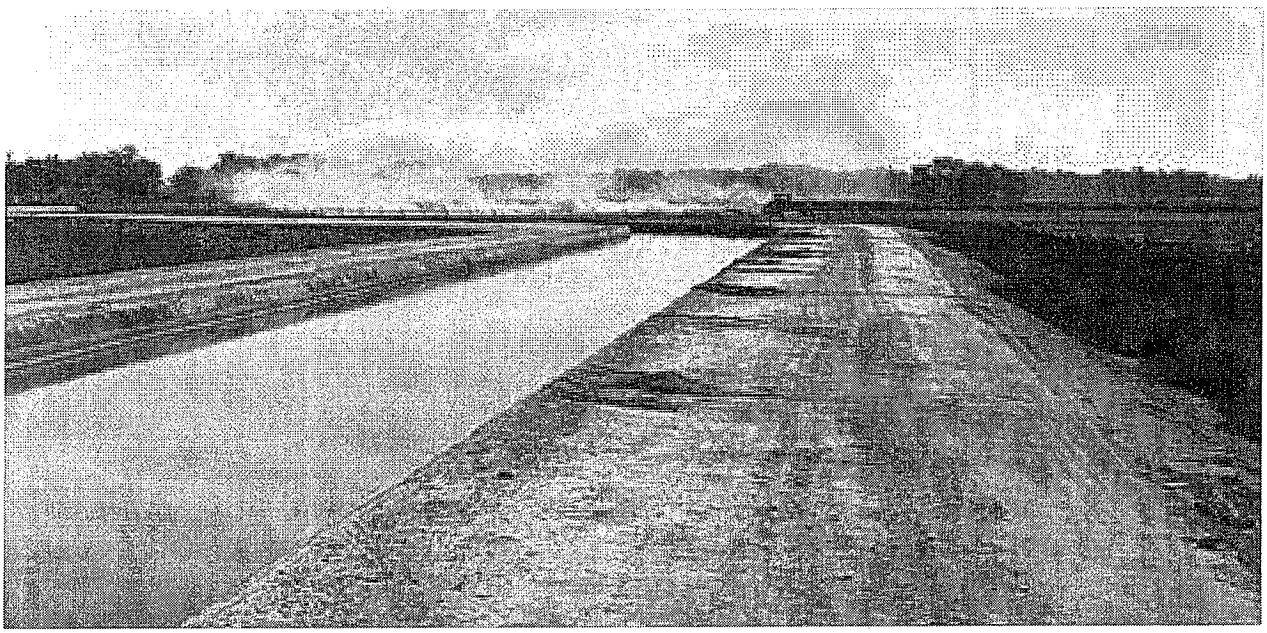
IN A SERIES OF ARTICLES written in 2002 on water issues in California, the *Sacramento Bee* profiled Kern County as "the hub of the water trade."[76] Dale Kasler, water correspondent for the *Bee*, reported that Kern water districts generated more than $100 million by selling water to cities throughout the state. In 2001, the Kern County Water Agency bought water from the SWP for $161 an acre-foot and then sold it back to the state's Environmental Water Account (EWA) for $250 an acre-foot, amassing $29 million. Paramount's Westside Mutual Water Company sold water it had previously "banked" in the Kern Water Bank to the EWA in 2000. All told, Kern Water Bank participants sold a total of 72,000 acre-feet to the EWA that year. Jim Nickel sold 10,000 acre-feet to the EWA for a total of $4.6 million, at "an eye-popping $460 an acre-foot."[77] What is even more "eye-popping" is that taxpayers throughout the state foot the bill for these sales.

The Environmental Water Account is a taxpayer-subsidized scheme that enables corporate agriculture to get around state and federal endangered species acts. It was created by CALFED, the state and federal collaborative effort to mitigate the continued devastation of the San Francisco Bay/Sacramento-San Joaquin Delta Estuary. CALFED is another step-child of the 1987-1992 drought that inspired the Monterey Amendments.

When the federal or state fisheries notify DWR of "high incidental intake"—when the pumps used to lift the SWP water uphill are sucking up too many endangered species—DWR slows down its pumping and monitors the amount of water *not* being pumped. DWR offers to purchase water from users south of the pumps and then deliver that water to contractors with higher value crops.[78] As a result, the water not pumped from the Delta is said to have been purchased for the environment. "Anytime by law exporters [SWP contractors] would have to stop pumping due to environmental or water quality conditions in the Delta, taxpayers buy replacement water for them," said Michael Jackson, a water attorney with the California Water Network who works with rural counties in Northern California.[79]

According to the chief of water transfers for the DWR, Jerry Johns, the EWA "is an example of a market remedy to help the environment."[80] The Public Policy Institute of California goes even further, saying that "[m]arket growth in the aftermath of the drought has been largely driven by environmental concerns."[81] Indeed, stronger environmental laws and advocacy have driven the largest SWP contractors to finagle market mechanisms to maintain undiminished SWP deliveries (secured by the "no net loss to exports" provisions for the EWA).[82]

The EWA enables market advocates to green-wash water sales. Advocates say that the program may be "a solution for creating more instream flows for endangered fish and habitat."[83] However, this is misleading. Agribusinesses and developers are not turning back water into the Delta. Rather, when their pumping threatens the continued existence of such species as winter-run salmon, the state pays to send them a quick fix.



The Napa Proposition

IN JULY OF THIS YEAR (2003) the Federal Bureau of Reclamation, the California Department of Water Resources (DWR), and representatives from the largest agricultural and urban water districts in California—including the Westlands Water District, the Kern County Water Agency, and the Metropolitan Water District of Southern California—met in Napa in a series of closed, mediated sessions (by the same retired judge who mediated the Monterey meetings in 1994) to, yet again, restructure the state and federal water projects.[84]

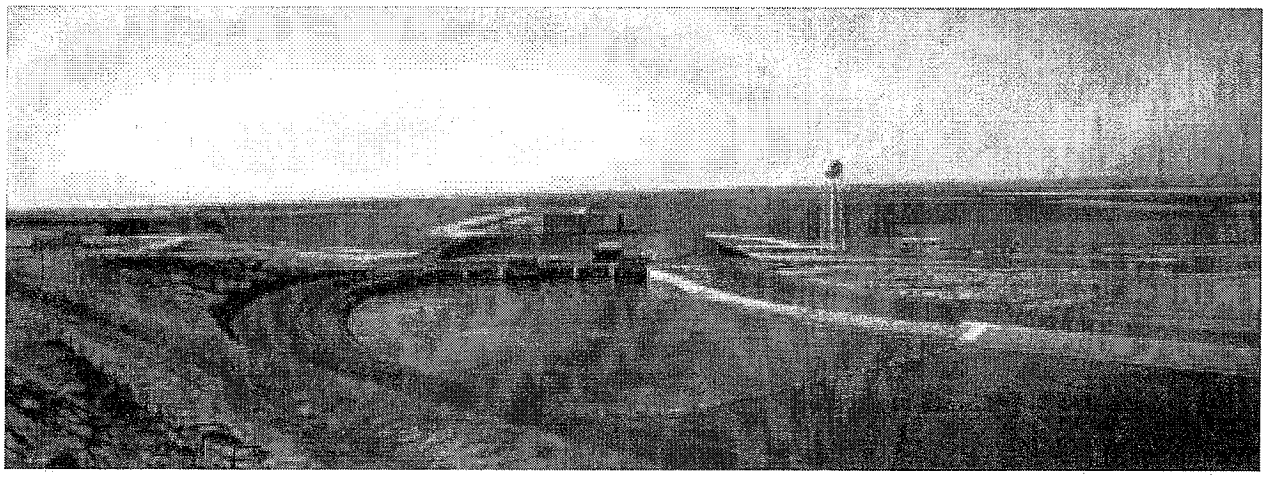
As noted by State Senator Michael Machado in a letter to the Editor of the *San Joaquin Record* on August 27, no "representatives of the Delta, environmentalists or anyone one else outside their small circle" were included in the meetings.[85]

The agreement that resulted from the meetings, called the Napa Proposition, plans to further integrate the SWP and the CVP. Such integration will allow landowners, principally in the San Joaquin Valley and Southern California, to trade off the federal project's superior storage capacity and the state project's greater pumping capacity with one goal in mind: to continue pumping water to agribusinesses, developers and water marketing barons in Southern California, unabated by either federal or state endangered species acts or water quality issues in the Delta.

Giving SWP contractors access to CVP storage capacity violates the later project's federal acreage limitations by enabling landowners, like Paramount, with over 100,000 acres to profit from federally funded infrastructure.

Increasing the SWP's pumping capacity violates the intent of the Delta restoration efforts and the federal and state endangered species acts by manipulating the technology to pump more water south at faster rates, ignoring the long-term effects of such levels of water exports on the environment.

The Napa Proposition would continue and greatly exacerbate the negative impacts of the Monterey Amendments, allowing the SWP and CVP to juggle water to maintain unsustainable exports for unsustainable development, unsustainable industrial agricultural practices and taxpayer-subsidized water sales among the state's largest landowners.



The State Water Project's California Aqueduct is a vital public asset that must be administered as an integral part of California's public utilities for all Californians, not as private property for a few.

Public vs. Private Property

WATER MARKETS, much less insider trading regimes, are incompatible with California's constitutional protection of water as a public trust. The concept of private property that is essential to functioning markets cannot justly be superimposed on the state's public trust doctrine or the taxpayer-funded public water projects that gather, deliver, and store water. The state grants the right to *use* water, not to *own* it.

California state law considers water to be public property, not private. Article 10, Section 2 of the California State Constitution states:

> It is hereby declared that because of the conditions prevailing in this State the general welfare requires that the water resources of the State be put to beneficial use to the fullest extent of which they are capable, and that the waste or unreasonable use or unreasonable method of use of water be prevented, and that the conservation of such waters is to be exercised with a view to the reasonable and beneficial use thereof in the interest of the people and for the public welfare.[86]

The architects of the backroom Monterey and Napa meetings, however, have come up with a way to privatize the state's water resources in violation of the constitution. What advocates are now calling a water market is actually a public rip-off designed by and for large corporations in monopoly-like situations.

Moreover, this "market" both survives and thrives on overstating water supply so as to make millions in profit on "paper water." The imbalance between supply and demand does not stop there: paper water sales allow massive developers like Newhall to create and profit from demands that were previously nonexistent. By building housing developments in the desert where no natural water supply exists, developers will use the "build it and the water will flow" logic to create further unsustainable reliance on water diversion from the north. Thus, far from making "more efficient use of existing supplies through reallocation," the architects of California's water market have rigged a system where water continues to flow to money. This is not efficient, much less just.

Joseph Sax, in his landmark essay *The Public Trust Doctrine in Natural Resource Law: Effective Judicial Intervention*, writes that, of the ideas that underpin the public trust doctrine in American law, the idea with the "greatest historical support holds that certain interests are so intrinsically important to every citizen that their free availability tends to mark the society as one of citizens rather than of serfs. It is thought that to protect those rights, it is necessary to be especially wary lest any particular individual or group acquire the power to control them."[87]

The state's giveaway of the Kern Water Bank and its backroom deregulation of the State Water Project have done just that: given the power to control California's water and the multi-billion dollar public projects that move that water to a particular group of private corporations.

Local and statewide activists and union members fight to keep water utilities under public control in Stockton, CA.

End Game: Time for a Vibrant Water Democracy

PREDICTIONS ESTIMATE that California's population will grow by up to 20 million over the next 20 years. Such growth places strong demands on the state's limited water supplies, and makes the need for a publicly accountable, equitable, and environmentally sustainable system of water distribution all the more imperative. It will be possible to meet the state's water needs, but not if private interests such as Paramount are allowed to control—and profit from—key public water resources like the Kern Water Bank.

Under the public trust doctrine, California's water is held in trust for the people of California, our future generations and the environment. Thus, California's water supplies should be managed with the greatest level of public accountability and oversight to ensure that water is distributed where it is needed most, not where it is most profitable.

California's public water utilities and resources are governed by a plutocracy—a select group of private corporations, individuals, semi-public and public officials all working in tandem to "game" water policy in the state. They meet in closed sessions and rewrite public policy, tailoring their edits to the interests of monopoly-like agribusiness corporations and real estate developers. Is this a conspiracy theory? No. It is just business as usual.

The water plutocracy must be replaced with a vibrant water democracy.

To protect California's water from profiteering:

Return Kern Water Bank to Public Control/ No More Public Giveaways

The Department of Water Resource's decision to give away the Kern Water Bank should be immediately reversed. The state's giveaway of this valuable resource to allegedly "local agencies" was in violation of the public trust doctrine and the California Environmental Quality Act and should never have taken place. Local control of this resource has become tantamount to private corporate control. Paramount and its Westside Mutual Water Company should never have been

allowed to "own and operate the water bank," especially in light of their confessions to Bakersfield reporters that sales from the bank were in their plans from the very beginning. The privatization of this vital public resource should be reversed.

Repeal the Monterey Amendments

The Monterey Amendments—the backroom restructuring of the State Water Project—usurped participatory democracy in California water policy. The "amendments" also perpetuate and gravely exacerbate the environmental detriment and social injustices established by the water plutocracy that has gamed tax and ratepayers for decades to raise agribusiness empires on subsidized water deliveries. The Monterey Amendments should be repealed and the State Water Project contracts should be rewritten with an eye to water conservation and environmental restoration as well as the original stated purpose of the project to reallocate California's water resources in an *equitable* manner.

Eliminate Paper Water

The Department of Water Resources continues to maintain on paper that the State Water Project can deliver almost twice as much as nature provides. After decades in operation, it is clear that the paper contracts do not match reality. The water "entitlements" of the twenty-nine State Water Project contractors should be re-drafted to fit the actual capacity of the project to deliver. Such re-drafting is provided in the original article 18(b) that contractors struck from the contracts in the closed Monterey meetings. Local and regional land-use planning decisions should be re-evaluated to ensure that developments have not been permitted based on water supplies that do not exist.

No Resale of State Water Project Water

The individual contractors that receive state project water should not be allowed to profit from reselling that water, whether it is back to the state Environmental Water Account or to real-estate developers. Furthermore, after decades of overdraft, pollution, and watershed devastation, the California and Federal cooperative venture known as CALFED requires that water quality be restored in the San Joaquin Delta and the rivers that feed into it. Clearly, there is no "surplus" water to be traded among corporations. Paramount and other private interests must not be allowed to hoard water to sell at a later date.

Democratize Water and Irrigation Districts

Water and irrigation districts that receive public water deliveries from the State Water Project (SWP) should be open, transparent, and accountable to the public. Most water and irrigation districts that receive SWP water are controlled by large-landowners driven by their interest in paying as little as they can for as much water as they can get. With the twin goals of expansion and profit, landowners such as Paramount make decisions over public resources without being held publicly accountable. There should be elected, public representatives on the boards of such districts who would represent the non-landowning population affected by water policy decisions made most often in closed sessions and meetings.

The Kern Water Bank's accounting of stored and transferred water—where the water deliveries come from, and where they end up—should be immediately disclosed to the public. All water trades and transfers should be publicly recorded with full disclosure of the financial terms of the agreement, as well as the identities of the buyers and the sellers. All water delivery, storage and transfer deals should be made with full and meaningful participation of the public.

NATURE PROVIDES ENOUGH WATER for California to meet all of its needs: to sustain water-efficient family farms and industries; to provide safe drinking water to present and future generations; and to restore and maintain California's much-abused environment. Nature provides enough water; that is, unless mismanagement and greed intervene and allow for the state's public water supplies to be manipulated for profit. Too much is at stake to let this water heist continue.

Get Involved

About Public Citizen's *Water for All* Campaign

Public Citizen is campaigning to protect universal access to safe and affordable drinking water by keeping it in public hands. Public Citizen does not believe that citizens benefit from privatization of their water and wastewater systems because the sale of public works to private companies can foster corruption and result in rate hikes, inadequate customer service and a loss of local control and accountability.

Public Citizen List Serves

Public Citizen maintains two water-related email lists. The Water for All list focuses on national and international efforts to protect water as a human right and includes action alerts, news articles, reports and the monthly newsletter of the Water for All campaign, Currents. The California Water for All list includes issue updates, campaigns action alerts, and Currents.

To subscribe to the Water For All list, send an email to cmep@citizen.org with "subscribe Waterforall" in the message.

To subscribe to the California Water for All list, send an email to cmep@citizen.org with "subscribe Waterforallca" in the message.

Groups Working on Water Issues in California

Alliance for Democracy
1223 Sequoia Place
Davis, CA 95616
phone 530.758.0726
http://www.thealliancefordemocracy.org

California Water Network
808 Romero Road
Santa Barbara, CA 93108
phone 805.969.0824 fax 805.565.3394

Center for Race, Poverty and the Enviroment
1224 Jefferson St., Suite 25
Delano, CA 93215
phone 661.720.9140 fax 661.720.9483

Community Alliance with Family Farmers (CAFF)
36355 Russell Blvd.
Davis, California
phone 530.756.8518 fax 530.756.7857
http://www.caff.org

Environmental Justice Coalition for Water
1010 11th St., Suite 305
Sacramento, CA 95814
phone 916.341.0612 fax 916.341.0401
www.ejwatercoalition.org

Santa Clarita Organization for Planning the Environment (SCOPE)
P.O. Box 1182
Canyon Country, CA 91386
phone 661.255.6899, extension 2
http://www.scope.org

Sierra Club, Angeles Chapter
3435 Wilshire Blvd., #320
Los Angeles, CA 90010
phone 213.387.4287 fax 213.387.5383
http://angeles.sierraclub.org

United Farm Workers (UFW)
1010 11th St., Suite 305
Sacramento, CA 95814
phone 916.341.0612 fax 916.341.0401

Glossary

Acre-foot An acre-foot of water is the amount of water necessary to fill an area of one acre to a depth of one foot, or about 325,000 gallons. One acre-foot of water is roughly the amount that two families of four consume in one year.

Central Valley Project (CVP) A Federal Bureau of Reclamation water project consisting of 20 dams and reservoirs, 11 power plants, and 500 miles of major canals. The project delivers about 7 million acre-feet of water annually.

Department of Water Resources (DWR) The California state agency that is responsible for managing the State Water Project.

Entitlement Also referred to as "Table A Allotment" in the Monterey Settlement, this is the volume of water contracted to State Water Project purchasers.

Environmental Impact Report (EIR) The study and report that is required under the California Environmental Quality Act for any large public or private infrastructure project as a means to assess the potential effects of the project on the environment.

Environmental Water Account (EWA) A component of the CALFED program, the EWA pays SWP water users when water deliveries are slowed down or reduced so that the SWP pumps decrease the amount of endangered fish species that get caught and killed in them.

Joint Powers Authority The agency created when two or more entities enter into a joint powers agreement. A joint powers agreement allows different (usually) public entities to join together in order to exercise their common powers toward a common objective.

Kern County Water Agency (KCWA) The KCWA was created in 1961 to distribute SWP water to Kern County water districts.

Kern Water Bank The largest underground water storage facility in the world. DWR spent $74 million purchasing the land, studying and developing the Kern Water Bank during the late 1980s-early 1990s. DWR gave the water bank to the KCWA in 1995.

Kern Water Bank Authority (KWBA) A Joint Powers Authority that consists of five water and water storage districts and agencies and one private mutual water company—Westside Mutual Water Company. Westside is in turn owned by Paramount Farming Company. The KWBA was formed immediately after DWR gave away the 20,000 acres that house the Kern Water Bank to the KCWA.

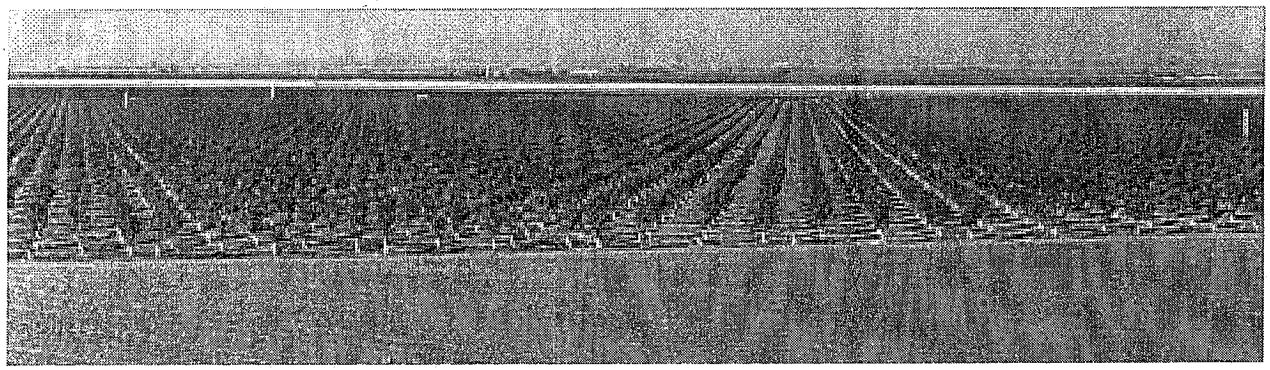
Monterey Amendments In 1994 DWR met in closed meetings with its largest contractors to rewrite the contracts that govern the SWP. At the end of the meetings the participants drafted a list of 14 principles which they called the Monterey Agreement, after the city in which the meetings took place. The changes to the SWP contracts that resulted from the Monterey Agreement are referred to as the Monterey Amendments.

Paper Water The original SWP contracts provided for an annual entitlement amount of surface water to be delivered to contractors upon availability. The SWP has never been able to deliver the contractors' full entitlements. The contractors, however, still treat the future expectations of the past as reality. One result of the Monterey Amendments was to enable contractors to buy and sell their entitlements. Hence, the entitlements, which stretch far beyond actual water deliveries, allow contractors to sell water that only exists on paper.

Roll International Corporation Roll International—a Los Angeles-based holding company, incorporated in Delaware—is one of the largest privately owned companies in the world. Roll International owns the Franklin Mint, Teleflora and a collection of agribusinesses—all of which operate in three California counties—that include Paramount Citrus, Paramount Farming, Paramount Farms, Inc. Paramount Farming is a member of the KWBA and owns 48% of the Kern Water Bank. Paramount also owns land in three of the other water districts and agencies that participate in the KWBA.

State Water Project (SWP) The SWP is a massive state water diversion and delivery project that comprises 662 miles of aqueducts, 19 dams with a combined surface area of more than 50,000 acres, 20 pumping plants, and ten energy plants producing about 6.5 billion kWh of energy annually. By 2000, Californians had paid more than $5 billion to build the project and another $11.9 billion to operate it and finance its debt.

Water Bank Water storage facility that operates like a bank. Participants or customers of the bank "deposit," or recharge, water and later "withdraw," or recover, water from their "account."



Appendix A—Historical Background

Water Flows Uphill to Money

CALIFORNIA IS A SEMI-DESERT. The mineral-rich soil of the Central Valley Region receives an average of 10 inches of rainfall a year, though far less falls in the southern portions of the Valley. Southern California's Imperial Valley receives 1 to 2 inches of rain a year. Yet, California's driest valleys are home to the richest agricultural region in the world.[88]

Step off to the side of Interstate 5 on a summer day, bend under a fence, and in the space of an inch you will see the sand turn into green fields. This is the unmistakable precision of industrial irrigated agriculture. Back on the interstate to the east and west, government-run irrigation systems douse crops with water. And as you proceed south on I-5 you will cross again and again one of the bond-funded arteries that makes this all possible: the State Water Project's California Aqueduct.

In California, agriculture consumes 77 percent of all usable fresh water.[89] Most of the water originates hundreds of miles north in the rivers bridled by the Oroville, Shasta and Trinity Dams. The state and federal projects that control the flow and destination of these rivers pipe and pump the water through a grid of nearly 4,000 miles of dams, aqueducts, canals, and reservoirs into the lands of the largest and wealthiest agribusinesses in the country.

By the 1930s, as a result of massive over-pumping, the earliest agribusinesses lowered the San Joaquin water table, the aquifer underlying the San Joaquin Valley, by as much as one hundred feet. Oak trees died and in places the valley floor itself dropped anywhere from 3 to 30 feet.[90] Fearing that they would run out of water within a matter of years, the largest landowners in the region began to push for publicly funded projects to pump water south from Northern California.

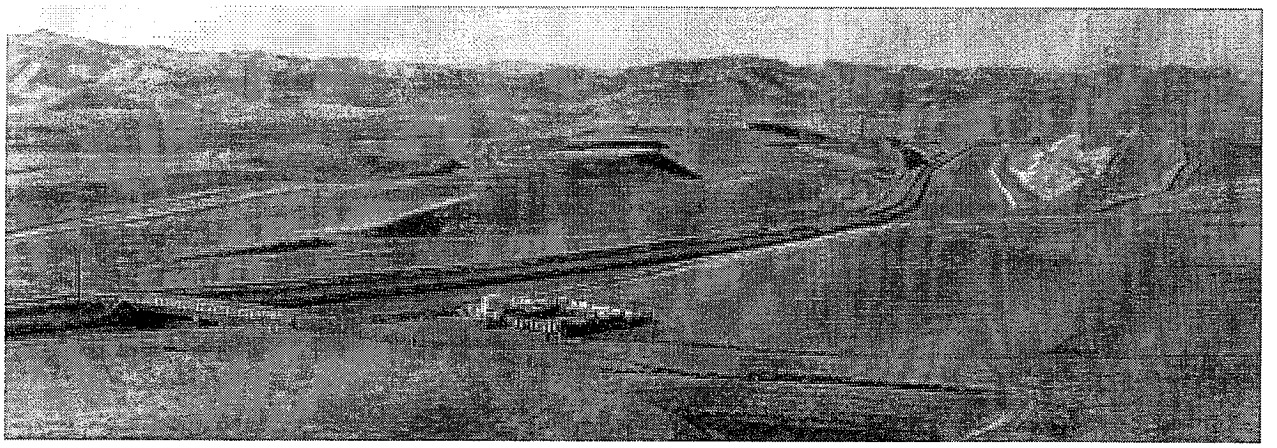
The Central Valley Project (CVP) began as a state initiative but failed for lack of funding until the federal government, and US taxpayers, came to pick it up in 1937. The CVP—the largest and most expensive public works project of its time—pipes some 9 million acre-feet of water from 20 dams and reservoirs to millions of city-dwellers and agribusinesses throughout the Central Valley and the urban San Francisco Bay Area.[91]

The Federal Bureau of Reclamation, the agency that administers the CVP, intended the CVP to break up land monopoly and promote small farms throughout the Central Valley. The project was subject to the 1902 Reclamation Law which put an acreage limitation of 160 acres—increased to 960 acres in 1982—on land eligible to receive CVP water for irrigation.

In 1978, when a federal team of investigators traveled into the largest district receiving CVP water—the Westlands Water District—they discovered that throughout the entire Westlands district there was not a single 160-acre farm. Through sleight of hand, family connections and sheer stubbornness, huge land owners failed to break up their farms and used the CVP water to build agribusiness empires.

California water historian, Norris Hundley, wrote that the CVP failed on both of its objectives: to combat monopoly and promote the family farm. Moreover, the result of the increasing power of landowners, Hundley wrote in *The Great Thirst*, was that "agriculture continued to concentrate in ever fewer hands. The number of farms over a thousand acres increased their combined property from 17.6 million acres in 1920 to 25 million acres in 1945. That trend... accelerated even more dramatically in the decades that followed. Thus did the family farm and local democracy fade from the California countryside."[92]

The California State Water Project (SWP), approved by the legislature in 1959 and by voters in 1960 made even greater



handouts to large growers in the state than the CVP. The state project was not subject to federal Reclamation Law, enabling large growers to expand production and increase acreage without the hassle of token acreage limitations. Moreover, the availability of state water as an alternative to federal water would make the Federal Bureau of Reclamation think twice before harassing the CVP recipients who were in "technical compliance" with the acreage limitations by deeding land to relatives or employees.[93]

The voter-approved bonds enabled the state to undertake the most ambitious water diversion project in history. The only way to get enough voters in Southern California to pass the statewide bond initiative—all assumed that Northern California voters would turn down a project to pay for pumping their water into the hands of Southern California landowners—was to lie about how much it would cost. Governor Pat Brown asserted that the project would cost about a billion dollars less than the estimated cost at the time.[94]

At present, the SWP comprises 662 miles of aqueducts, 19 dams with a combined surface area of more than 50,000 acres, 20 pumping plants requiring more than 60 billion kWh of energy annually, and 10 energy plants producing about 6.5 billion kWh of energy annually.[95] By 2000, Californians had paid more than $5 billion to build the project and another $5 billion to operate it and finance its debt.[96]

The Department of Water Resources (DWR) was created from 52 formerly independent state agencies to oversee the State Water Project and administer the delivery of water to the project's 29 contracting agencies.[97] These agencies range from the City of Yuba, 42 miles north of Sacramento, which had received a total of 10,260 acre-feet by 2000 to the Kern County Water Agency, which had received 26.3 million acre-feet by 2000.[98]

Kern County landowners advocated for both the CVP and the SWP as a way of improving the condition of the groundwater basin. However, with both projects, those very landowners increased the amount of acreage they held in production and thus exacerbated their overdraft of the basin.[99] Overdraft occurs when users pump more water out of the ground than nature can replenish or, in technical jargon, when extraction exceeds recharge. In Kern County, the increased overdraft of aquifers reached over 7 million acre-feet by the late 1970s.[100] According to the last *California Water Plan Update*, overdraft continues now at a pace of one million acre-feet a year.[101]

Marc Reisner, in his indispensable book, *Cadillac Desert*, described the SWP as "one of the country's foremost examples of socialism for the rich."[102] While urban water users bore the bulk of the expenses for the project, the corporate farmers got their water at bargain rates.[103]

In a 1981 report by the California Institute for Rural Studies, Don Villarejo writes that from the first SWP water deliveries in 1968 through to 1980, San Joaquin Valley contractors received 63% of the water delivered—almost entirely for agricultural irrigation—while mostly residential Southern California water users paid 70% of the costs of the project. "It is one of the many ironies of the SWP that those who get the most water pay the least, while those who get the least pay the bulk of the costs."[104] By the mid-1980s Norris Hundley estimates that Southern Californian water users were paying roughly $25 million a year in water subsidies for corporate agriculture in Kern County.[105]

According to DWR's Bulletin 132-01, by December 31, 2000, San Joaquin Area contractors had received 32.6 million acre-feet of water. They paid more than $1.3 billion for that water: an average of $40 an acre-foot. Meanwhile, contractors in Southern California received 22.5 million acre-feet of water

for a price of $6.65 billion. That makes SWP water $295 an acre-foot for Southern California's largely urban users.[106]

Hidden Government

The federal and state water projects propelled the creation of "hidden" forms of government in California: the water districts and agencies through which landowners exercise control over the state's water.[107]

Norris Hundley notes Kern County's legacy of spearheading the effort to create special water districts for the management of the new water supplies coming from the CVP and SWP. In *The Great Thirst*, he writes that bringing back the concept of property-weighted voting—the allocation of votes based on a property owner's total land value—led to the creation of a variety of new water districts, the further concentration of agriculture in ever fewer hands, and the withering of local democracy. Such districts, he writes: "are ordinarily managed by boards of directors made up of a homogeneous, single interest body of people representing the larger water users and guided by a rigid set of goals: maximization of water use at minimum cost with little or no regard for the environment or for the welfare of the people of California."[108]

The Kern County Water Agency (KCWA) , for example, was created by the state legislature in 1961 under the influence of the county's corporate farmers to buy SWP water and then sell it to the local districts where the landowners again formed the boards of directors. As an intermediary, the Agency spread out the cost of the water through a countywide property tax, principally paid by the Bakersfield urban population. Both the intent and the effect of the Agency were to generate water subsidies for large landowners.[109]

The Kern County Water Association—not to be confused with KCWA, the *Agency*—was established and run by the most powerful landowners in the county. It advocated for the creation of the KCWA by the legislature. As Gottlieb and Fitzsimmons note: "The water association had three key goals: subsidies, to keep the price of water low enough to encourage new irrigation; elimination of acreage restrictions, that is, the 160-acre limit imposed—at least in name—on certain federal projects such as the CVP; and creation of a contracting agency on a countywide basis to secure the tax base of the entire county."[110]

The arrival of SWP water through the California Aqueduct set off a "speculative spiral" in Kern County where landowners rushed to expand their acreage and set up water districts to contract for SWP water through the KCWA. "A handful of landowners dominated most of the key water districts affiliated with KCWA, and these districts, in turn, dominated the agency."[111]

KCWA now has 13 member "units" that together contract for an annual total of 1,000,949 acre-feet of SWP water. Agricultural water users hold 88 percent of the contracts while municipal and industrial users hold 12 percent.[112] Corporate farmers in Kern however, have been receiving *more* water than they contract for since the beginning of the SWP, owing to the questionable concept of "surplus" water.

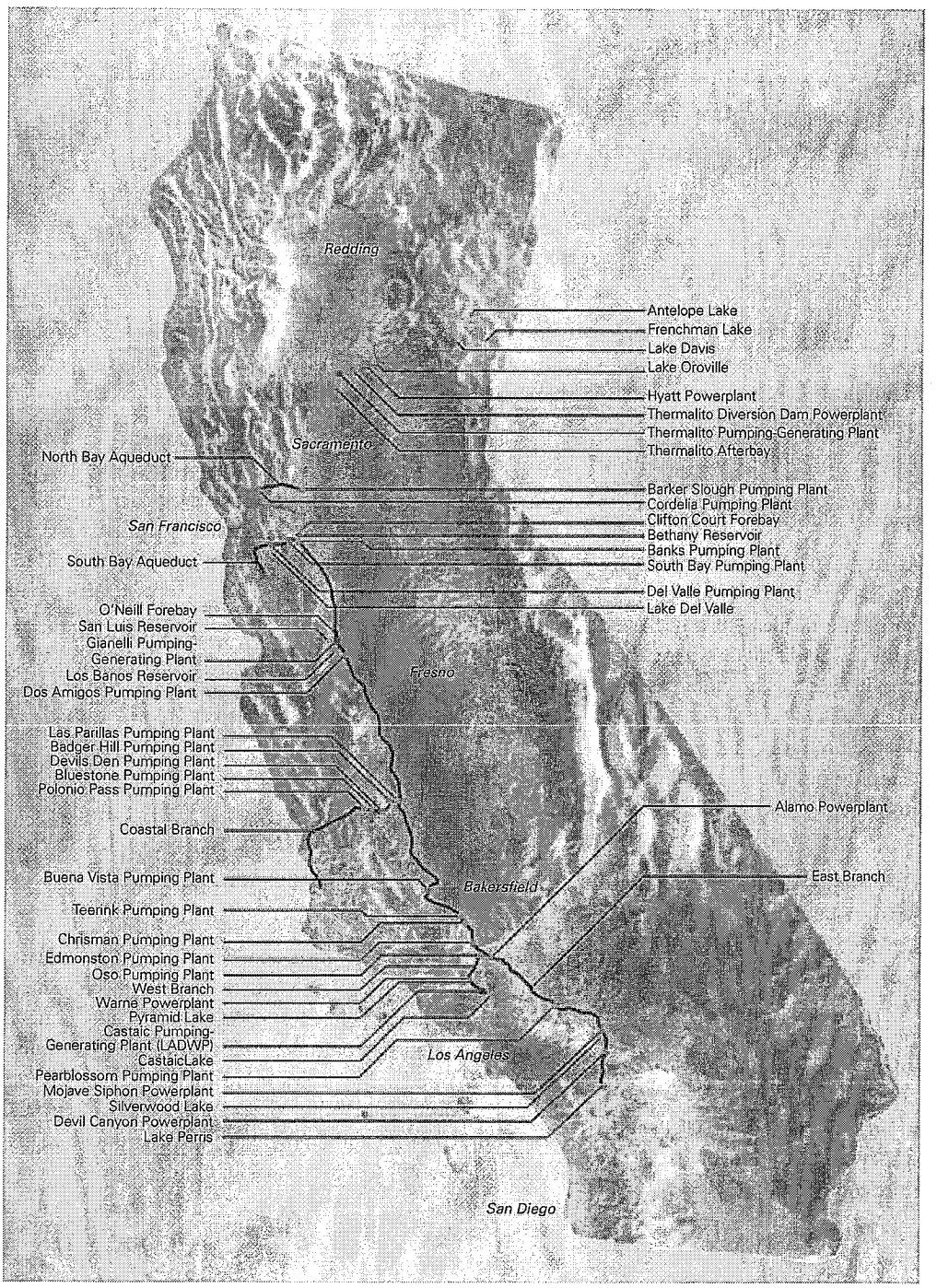
The SWP has never delivered the full 4.1 million acre-feet of water set forth in the original contracts. Average annual deliveries float at around half that amount. How then could there be "surplus" water?

The Metropolitan Water District of Southern California (MWD)—often referred to as The Met—is the largest water agency in California. MWD is a water wholesaler providing "supplemental" water to 27 clients, which in turn serve an area of over 5,000 square miles with a population of 15 million.[113] MWD is also the largest contractor with the SWP, contracting for over 2 million acre-feet of water.

MWD initially opposed the SWP, but signed on four days before the 1959 election.[114] MWD and the Kern County Water Agency came into conflict early on during negotiations over how to distribute the costs of the SWP. The agreement they reached enabled Kern to purchase water at discounted rates. MWD also had to pay for that same water creating "implicit subsidies for the agricultural agency [KCWA] which, by extension, penalized the district [MWD]."[115]

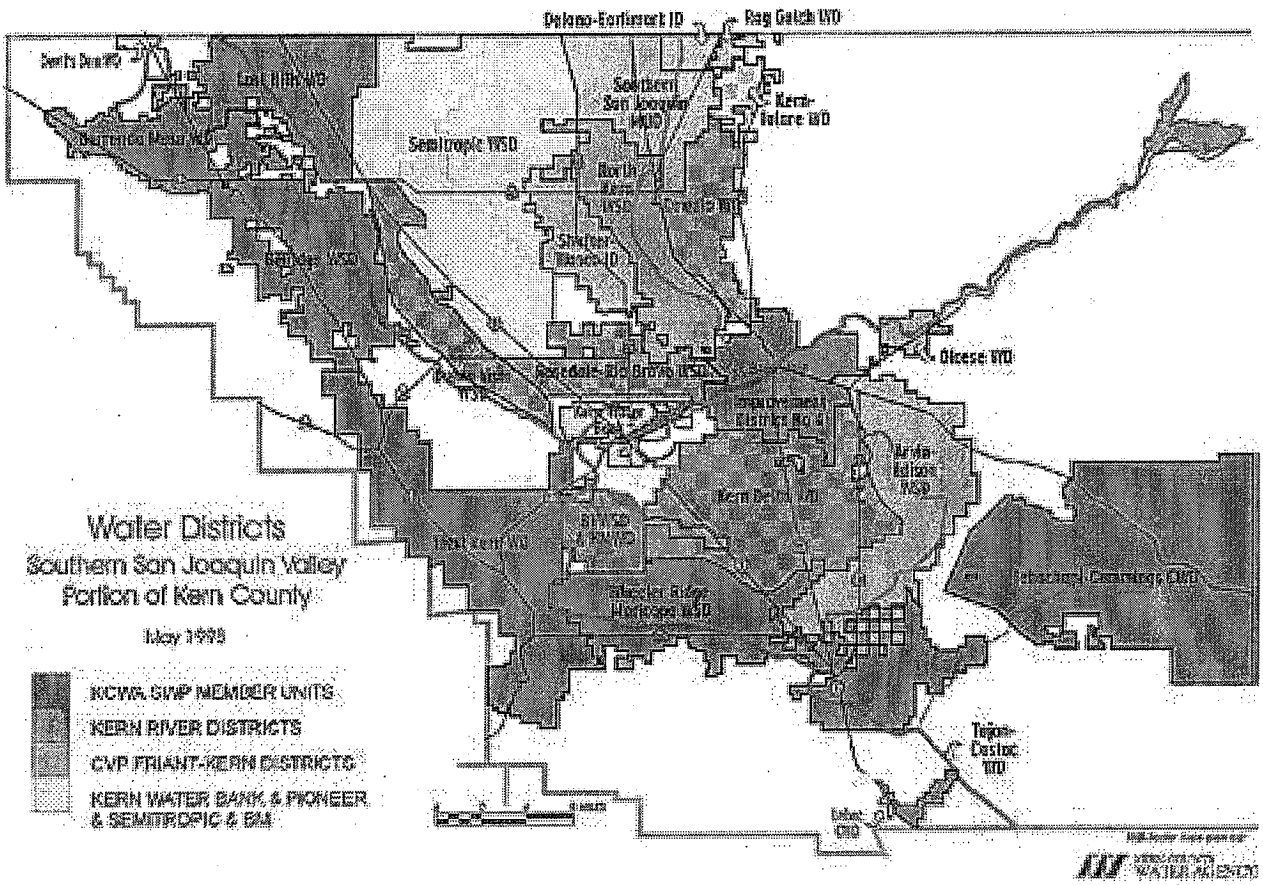
Kern landowners reaped the benefits instantly and have continued to do so ever since. For example, in 1979, KCWA entitlements had increased to 516,300 acre-feet, the agency purchased another 524,247 acre-feet of "surplus water" beyond their contract entitlements. That contracted water cost KCWA member agencies more than $15 million (or about $29 an acre-foot) while the same amount of "surplus water" only cost $2.3 million (or about $4 an acre-foot). This reduced the overall cost to $17 per acre-foot.[116]

Appendix B—Map of State Water Project

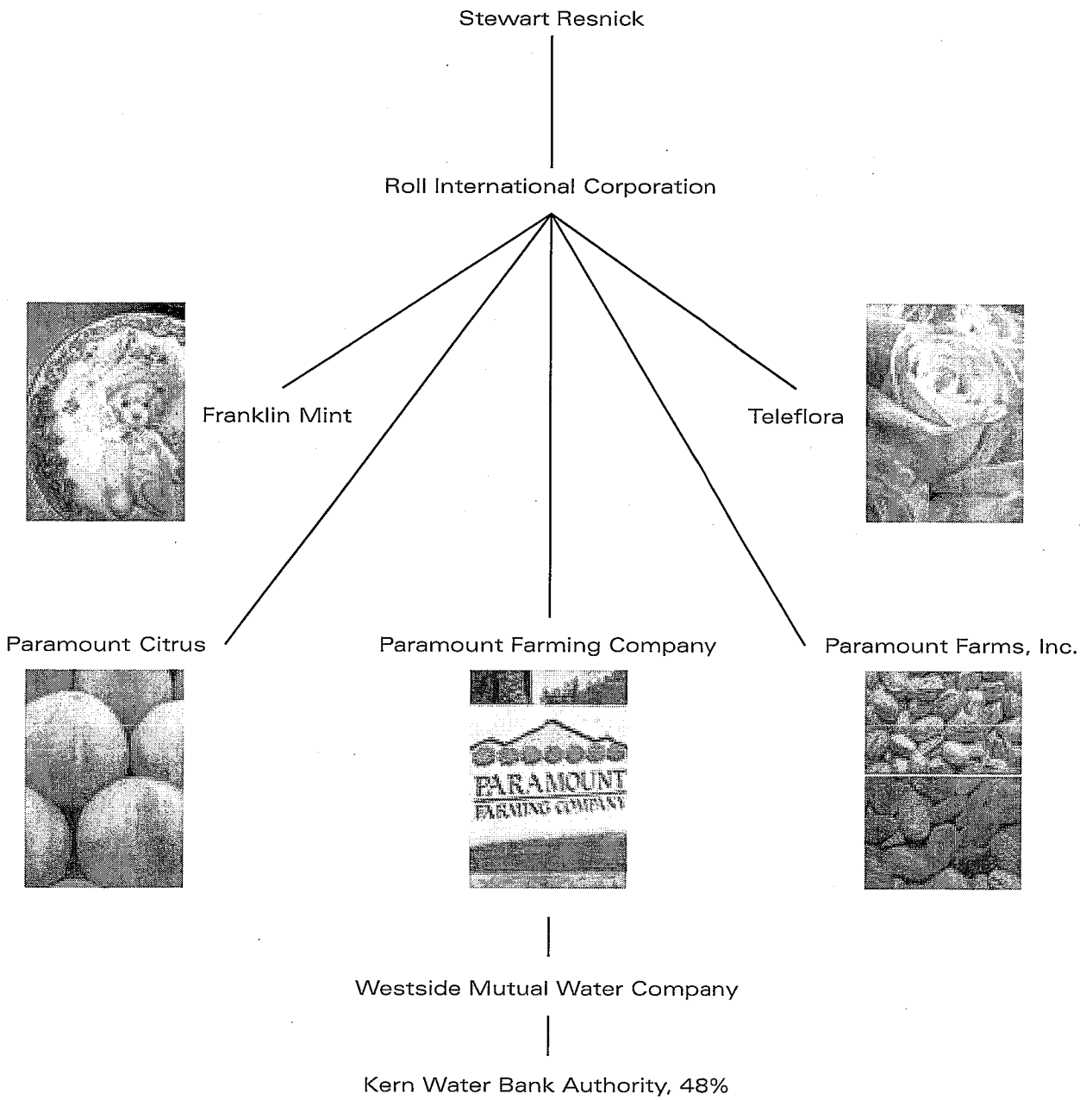


The SWP comprises 662 miles of aqueducts, 19 dams with a combined surface area of more than 50,000 acres, 20 pumping plants, and ten energy plants.

Appendix C—Map of Water Districts, Kern County



Appendix D—Roll International Corporation Holdings Diagram



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[84] See Mike Taugher, "Water proposal pumps it south," *Contra Costa Times*, 7 August 2003 <http://www.bayarea.com/mld/cctimes/living/science/6478006.htm> (17 November 2003). On participants in the meetings: Tom Glover, Deputy Director of California Department of Water Resources, personal interview, 11 August 2003; Jeff McCracken, U.S. Bureau of Reclamation, personal interview, 8 August 2003; Dan Nelson, San Luis Delta Water Authority, personal interview, 16 September 2003; John Coburn, State Water Contractors, personal interview, 16 September 2003 .

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[86] Available online at: <http://www.leginfo.ca.gov/.const/.article_10> (17 November 2003).

[87] Joseph Sax, "The Public Trust Doctrine in Natural Resource Law: Effective Judicial Intervention," *Michigan Law Review* 68 (January 1970): 484.

[88] Kenneth W. Umbach, "A Statistical Tour of California's Great Central Valley" *California Research* Bureau August 1997. Online at: http:www.library.ca.gov/CRB/97/09/#Heading1 (last accessed 17 November 2003). For information and stunning visual images on the Central Valley and the impacts of water diversion projects discussed in this report, see Jon Else's PBS Documentary *Cadillac Desert. Program 3: The Mercy of Nature.*

[89] Hundley, *Great Thirst*, 9, also fn.11, 568.

[90] Hundley, *Great Thirst*, 239 and Devin Galloway and Francis S. Riley "San Joaquin Valley, California: Largest human alteration of the Earth's surface" in Devin Galloway *et. al.* eds. *Land Subsidence in the United States* U.S. Geological Survey Circular 1182 available online at: <http://water.usgs.gov/pubs/circ/circ1182/pdf/06SanJoaquinValley.pdf> (17 November 2003) and CALFED Bay Delta Program *Final Programmatic EIS/EIR* (Sacramento: CALFED Bay Delta Program, July 2000) 5.4-12.

[91] Hundley, *Great Thirst*, 257-258.

[92] Hundley, *Great Thirst*, 241.

[93] Hundley, *Great Thirst*, 276.

[94] See the interview with Pat Brown in: Malca Chall. *California Water Issues, 1950-1966.* (Berkeley: Bancroft Library Oral History Program, 1981). Marc Reisner wrote: "'Lie' is a strong word, but in this case it is advised, because one day Pat Brown would all but admit it himself." See: Marc Reisner. *Cadillac Desert: The American West and Its Disappearing Water* Revised and Updated. (New York: Penguin Books, 1993) 351.

[95] California Department of Water Resources, "Management of the California State Water Project," *Bulletin 132-01* (Sacramento: California Department of Water Resources, 2001) and State of California Resources Agency, *The California State Water Project*, Undated.

[96] Department of Water Resources, *Bulletin 132-01*, Ch. 14.

[97] Hundley, *Great Thirst*, 280.

[98] Department of Water Resources, *Bulletin 132-01*, 12.

[99] Gottleib and Fitzsimmons, *Thirst for* Growth, 93.

[100] Hundley, *Great Thirst*, 297.

[101] California Department of Water Resources, "California Water Plan Update," *Bulletin 160-98* (Sacramento: California Department of Water Resources, 1998) Ch. 3.

[102] Reisner, *Cadillac Desert*, 334.

[103] Hundley, *Great Thirst*, 295-297.

[104] Villarejo, *New Lands*, 2.

[105] Hundley, *Great Thirst*, 297.

[106] Department of Water Resources, *Bulletin 132-01*, p.12

[107] See Gottlieb and Fitzsimmons, *Thirst for* Growth.

[108] Hundley, *Great Thirst*, 536.

[109] Gottlieb and Fitzsimmons, *Thirst for* Growth, 94.

[110] *Ibid*, 94.

[111] *Ibid*, 96-97.

[112] Kern County Water Agency, *Annual Report 2000*, 10.

[113] Gottlieb and Fitzsimmons, *Thirst for* Growth, 5.

[114] Hundley, *Great Thirst*, 290.

[115] Gottlieb and Fitzsimmons, *Thirst for* Growth, 16.

[116] *Ibid*, 97.

LETTER 36

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telephone 510.663.0888 fax 510.663.8569

www.citizen.org/california
jgibler@citizen.org

LETTER 37

TULARE BASIN WETLANDS ASSOCIATION

TBWA

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www.tulare-wetlands.org

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January 9, 2008

Delores Brown
California Dept. of Water Resources
Chief, Office of Environmental Compliance
901 "P" Street
Sacramento, CA 95814

Re: Draft EIR: Monterey Amendment to the State Water Project Contracts, etc. … Volume I…SCH #2003011118

Dear Ms. Brown:

The Tulare Basin Wetlands Association (TBWA) is an association of over 40 owners of private wetlands in the Southern San Joaquin Valley. TBWA was formed as a not-for-profit corporation expressly for the purpose of seeking affordable water supplies for the wetlands we sustain.

We have watched with interest the development and operation on the Kern Fan. Some of us have had the opportunity to visit the Kern Fan as administered by the Kern Water Bank Authority and have been very impressed with the habitat development on the land. Further, we have noticed a correlation between an improved fall flight of waterfowl and shorebirds in years when the wetland habitat on the Water Bank is extensive. We believe this correlation to be more than accidental, and that having the resource in the area for migratory birds and local wildlife is a benefit to all.

We urge you to continue the status quo at the Kern Fan, and believe that its operation has and will continue to enhance the water directly and indirectly available for many habitat interests in the Southern San Joaquin. This becomes more apparent every year as it becomes more and more difficult for us to maintain the few remaining wetlands in the area.

Thank you for this opportunity to address thoughts to you.

Sincerely,

C. Jeff Thomson
Chairman, TBWA

37-1

MEMBERS

Adelaide
Alpaugh TBWA
Beverly Hills
Bostic
Bowman
Burbank
Central City
Dee See
Donald Duck
Double L
El Cinco
El Pato Loca
Escondito
Four Eighty
Garces 8 Ball
Great Ocean
Goose Lake
Hanford
Lawrence
Los Alamos
Norwood
Old Tulare
Pasuza
Phesant
Pintail
Pintail Slough
Pond 16 GB
Poso Creek
Rancho Visalia
Santura
Spooneyville
Tugboat
Tule Pond
West Side
White
Widgeon
Wild Goose
Wild Wings
Wingmaster

Wetland Friends of TBWA
Kern NWR
Pixley NWR
Kern Water Bank
Semi tropic-
Goose Lake

LETTER 38

12/27/07

Delores Brown,
Chief Office of Environmental Compliance
California Department of Water Resources
P.O. Box 942836
Sacramento CA 94236

Dear Ms. Brown,

I write today in regards to proposed Monterey amendments to the state water plan. I urge you to oppose the following proposals.

1. Allowing private interests to take over the water bank.
2. Transferring costs associated to taxpayers but allowing rebates for large agencies.

38-1

I fell that opposition to these proposals is the best course of action to manage and maintain existing water supplies within the area.

Sincerely,

Robin Lopez-Armstrong

LETTER 39

12-30-07

Dolores Brown, Chief
Office of Environmental Compliance
Cal. Dept of Water Resources

Dear Ms. Brown:

I strongly oppose the adoption of water contract amendments being considered by the Dept of Water Resources. These amendments are essentially a scam to give away a significant portion of California's water, including the Kern Water Bank, one of the largest water-storage facilities in Ca. This would enhance water supplies for many cities & short payment to households & farms.

Please reject these amendments & implement a realistic assessment of the safe yield of water from the Delta, etc. California deserve better alternatives to these dubious amendments. DWR must do decrease demand or source water resources by aggressively promoting water conservation.

Sincerely,

Julia Cato

Julia A. Cato
2431 Jefferson Ave., Apt., E.
Berkeley, CA 94703

39-1

LETTER 40

January 3, 2008

Delores Brown
Chief Office of Environmental Compliance
California Department of Water Resources
P. O. Box 942836
Sacramento, CA 94236

36-1 ~~36-1~~ 36-1 36-1

Dear Delores Brown,

Do not adopt the DEIR for the latest Monterey Amendments to the State Water Project. 40-1

We are opposed to: 40-2

1. Giving away the Kern Water Bank to private interests. The Kern Water Bank must be managed by the state for the benefit of all citizens.

2. Eliminating protection for urban water users. Drought safeguards for urban areas need to be protected, but with qualifications. Water conservation needs to be promoted. 40-3

3. Encouraging the over-pumping of delta water in the winter and spring months, which has already, under the provisional use of the Monterey Amendments, contributed to the massive decline of the Delta Smelt and other bay delta fish populations. 40-4

4. Transferring millions of dollars in costs to taxpayers, while rebating millions to individual water agencies 40-5

Sincerely,

Carole A. Clum
Peter Clum

Carole & Peter Clum
45638 South Fork Drive
Three Rivers, CA 93271

Dixie Coutant.txt

From: dixie@coutant.com
Sent: Wednesday, December 12, 2007 6:03 PM
To: Brown, Delores
Subject: Environmental Impact Report - Monterey Draft

Dear Mr. Lester A. Snow

As a concerned citizen, I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report. Implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary. 41-1 41-2

When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water. 41-3

I urge DWR to adopt a more responsible alternative for California.

I urge you to implement an alternative that better serves California. 41-4

Thank you.
Thank you,

Dixie Coutant
248 San Gabriel Court
Sierra Madre, CA 91024

LETTER 42

Dee Brown, Environmental Specialist
901 "P" Street, 4th floor
Sacramento, CA 95814

Subject: Monterey Agreement EIR

Having access to but the first volume of the document, I may be commenting on topics covered in volume two. Perhaps, that document consists of all acronyms, if the first volume trend continued that is a standard, If a term is used rarely, an acronym be not necessary or appropriate other than to make the user feel "in" while actually being a fool. 42-1

Much of the brouhaha concerning the document is of a policy matter rather than environmental and I will only discuss policy in so far as it has environmental impacts, saving my rants for the use of acronyms. Actually, the baseline of the original document shows how it has become dated do to changes in the environment and water supply and quality. I would suggest that the agreement is part project and part programmatic. As both baselines will change, as will their interactivity, it would appear beneficial to have more updating. Could there be a sunset, or rather a tie in with the state water plan (Bulletin 160)? The Water Bank< which will receive much of my emphasis, must surely be a vital part of the Integrated Regional Water Plan. Unfortunately there is a hold out agency to doing an Integrated plan-Integration even being a disliked term with our local schools. Also, DWR staff should not see this as an onerous increase in workload, but as a chance to truly initiate adaptive management. 42-2 42-3

There will be a decrease in anticipated water deliveries as snowpack decreases 42-4

There will be an increase in pumping and other energy costs 42-5

Population will have impacts 42-6

An example of a situation that did not exist when the Accords were reached is a health and safety issue. There was no West Nile Virus when the agreement was made which resulted in delays in control of the mosquitoes while it was argued who had the financial responsibility. for vector control. Arguably, there is possibly a nexus between the postponed spraying and the fact that the kern area has more West Nile cases that the rest of the State combined. I see updates as better for mitigation which is preferable to litigation.

There are already introductions of exotic species and many of them will continue to be noxious. Could not regional planning aid in control of those occurrences which impact health and safety as well as those impacting efficiency? A local ranch converted to water bank was the Tumbleweed Farms, a term not romantic but descriptive; Some even feel this is a native species. Russian Thistle? Also, there is aquatic weed such as arundo and hyacinth being grown in the county park on the river. By the time of the next Water Plan, they should be totally out of control. Good for County employment, especially kinfolk, but not so good for water transport, Tamarisk, gleefully a product of the DWR, I will later discuss. 42-7

Growth inducing impacts
As you may remember, I was on the advisory group to the kern water bank when it was under DWR control. Speaking of acronyms, it was then that I found out what DWR stood for- delays while rewriting. I feel this delay syndrome may impact opposition to growth. At the time I was an advisor, the Sierra Cult, (this term is an evaluation , not a typo of which there are in abundance) whished to develop the ten section oil field. As the ten section is one of the last bastions of an endangered species, it can be assumed that the Sierra cult will continue in its program of species endangerment. Current operators have voiced opposition to development in this area which is a virtual inholding. Would the DWR be as vocal?
If the water bank is operated by the State, would it cave in to political pressure from LA? The Southland area is quite profligate in water use and conservation measures as severe tiered pricing, reuse, etc are not prone to general acceptance. Note even AB 320, regarding landscaping, was a committee drag out during a drought, but it was never enforced when water returned. Water taken from ag for urban use will allow for municipal abilities to serve with resultant sprawl. Option 5 is a preferred mitigation as it will force urban areas to bite the bullet eventually.
When the Accords were instigated, much of the area was in row crops. As water prices have increasedthere has been a conversion to specialty crops, While these crops may be not considered as a basic need, with World Trade Organization etc protesting subsidies they may be here to stay. However out of basin transfers need not be mandated;
Would the DWR pay in lieu fees? Tax base loss often encourages counties to zone for dollars. The County of Kern, being one of the nations top bureaucracies when measuring bureaucrats to populace, will zone for development anyway.
Could the water bank be grazed for not only weed control, but also for Williamson act subventions? Would subventions apply if the area was cropped to aid infiltration and weed control?

42-8

Recreation
In the Document, there is discussion of Castaic Lake and Perris but Kern does not seem to exist. There was to be hunting on the water bank but this has not occurred for waterfowl. How much has to do with the incompetents of Fish & Game in Fresno, who state it can't be done, contrary to Fish and Game in Sacramento, who state it can easily be done. Fresno is not a location to attract competent outdoorsy types. These are the people who declared the DWR weed patch and reservoir at Huron a wildlife area.

It can be assumed that if the State operated the Water Bank, they would have the adjoining State Park involved with disastrous results. One only has to see the Grasslands State Park to verify this. Also the Parks operate many water related facilities, poorly and without cost effectiveness. Self guided tours are not Parks forte when the objective is to show a profit for use elsewhere. Could State parks keep the water bank up when they are notorious for inability to get their own toilets to flush. It is the misappropriation and waste of watershed funds with the Park system that will continue to be a major cause of a diminished water supply.

42-9

The lack of waterfowl hunting has been a complaint of the local duck clubs. Their claim is that the Water Bank being a sanctuary impacts hunting and their income. The clubs are adjuncts to local farming operations, and while I cannot speak for them, I am impressed with the success of hunting benefits to wildlife and air quality in the rice growing areas which is a win-win situation. Would it not be beneficial to give first rights to water to the wildlife friendly water users?

- this would be an incentive for participation in easement programs such as the proposed Tulare Basin Wildlife Management Area
- their could be some recharge in areas not on the Corcoran clay
- As State agencies, such as Caltrans, are already purchasing easements on land they transferred, wouldn't water preference be part of their mitigation?
- At the least, this proposal would determine if the protest over the Agreement is driven by environmental or transfer, of water or title, issues.
- Feral cats, ferrets etc which are destructive of wildlife, yet beloved of the CSUB environmental club, should be eliminated. Shallow moats may be required here as they are in Davis

42-9 (con't.)

Air Quality

The document discusses air quality as a product of construction. As a resident, let me assure the Department that the southern San Joaquin Valley's air rating is not solely from project construction.

The switch to permanent crops should lessen air pollution especially during the mandated plow down which occurs during Santa Ana wind time. Nut harvest is blamed for dust, but does this dust originate in row crops or fallow lands. Can palliatives be tested on these crops? Does the concept of fallowing contribute to deterioration of air quality and the carbon sequestration come to nil when the fallowed lands are again cropped or weeds eliminated?

There is a program to replace diesel operated pumps, but they do wear out and the air situation returns. The current local water community is to be commended for going solar. Were these lands to revert to the State, does the DWR have any plans to develop solar on Its lands before the incentives run out or the sun extinguishes?

42-10

There is a problem with agricultural waste burning being an inconvenience. More generation using watershed biomass as well as orchard and vineyard fuels would help the energy shortage. As I noted in my oral statements, on stream storage and hydro is a ways off- if possible.

Is there going to be a consideration of tying water availability to air quality mitigation? Is it even feasible?

Remember in the Kern area dust has a nostalgic attraction to our transplanted Mid-south heritage. Dust can also be a safety issue for the area has a number one listing for fatal pile ups which occurred during a dust storm at plow down.

Solid Waste. The current operators have contracted private security. Would the State have it? There is already some problem with the Water Bank being seen as the West Side Sanitary Landfill. Would other agencies do any better? With a shortage of underpaid wardens, could they do environmental/cultural resource patrolling and prevent poaching?

42-11

Downstream Impacts and social Justice
The raison d'etre for water banking was to replenish the local water table as the pumping costs rise exponentially to water table drop. Out of basin transfers ignore this fact, and it becomes an EJ issue. Some transfers are to the north in actuality.

- How does one determine that the water being sent out is not from the lcal water bank or has migrated from it?
- Metro Bakersfield pays a subsidy through Benefit Zone #7; will loss of the benefits result in a rebate of the subsidy?
- If minorities are laid off from farm labor due to fallowing, who will make tham whole?

42-12

Preferred mitigations
Supply
Watershed restoration
Brackish water desal at the Delta of at the turnouts
Eliminate saltcedar from DWR properties and its 4 ' of ETR

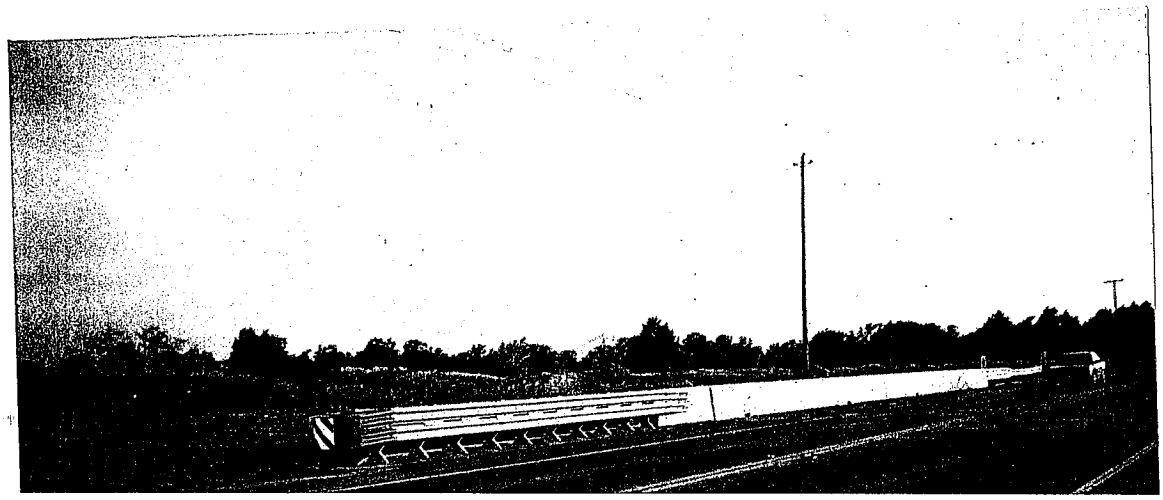
Other
No out of basin transfers
Participation in area wide mitigation
Participation in area wide planning an process.

42-13

Sincerely

Dennis Fox

Dennis Fox
918 Blossom
Bakersfield CA 93306



LETTER 43

Ann M. Gallon

3340 Jenkins Road • Bakersfield CA 93314 • 661-589-7796 • amgallon@atg1.com

January 14, 2008

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources
3251 S Street
Sacramento CA 95816

Delivered via Email: delores@water.ca.gov

Dear Ms. Brown:

RE: State Water Project Draft EIR, Monterey Amendments, Kern Water Bank, etc.

I would like to put in writing some of my comments delivered at the 12/5/07 Public Hearing.

I am concerned about the privatization of water across America. The People of California should hold ownership of our water – not corporations. By coincidence, the movie *Chinatown* is airing on television tonight. 43-1

The Kern Water Bank has been handed off through layers of bureaucracy to what is essentially a bunch of "water districts" set up and controlled by employees of large corporations (including Paramount Farms with a 48% interest in the Kern Water Bank, plus smaller percents controlled by Tejon Ranch and Newhall Land & Farming) who likely answer to their owners and stockholders, not to the People of California. There is a lack of transparency in their decisions, and the structure of the water districts seems to place them outside CEQA review. 43-2

Though they deny it, I believe that the Monterey Amendments allowed these corporate controlled "water districts" to trade *paper water* (Table A amounts). 43-3

Transfers, or trading, of water runs up the price (profit). This is like a red flag reminder of the energy transfers between power traders that ran up costs and contributed to California's energy crisis. 43-4

Water is a fundamental environmental and societal need. Water supply must be realistically measured, conserved, protected and equitably distributed. To protect California's water: 43-5

- The Monterey Amendments should be repealed and water contracts rewritten
- Paper water (Table A amounts) should be eliminated
- Water contractors should not be allowed to profit from reselling water
- Kern Water Bank should be returned to control of the People of California

Thank you for the opportunity to comment.

Sincerely yours,

Ann M. Gallon

Wayde Hunter.txt

From: WHunter01@aol.com [mailto:WHunter01@aol.com]
Sent: Tuesday, December 11, 2007 7:32 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a past Environmental Affairs Commissioner for the City of Los Angeles where I learned several years ago that the watertable in the San Fernando Valley where I live has been drained to supplement supplies until now it is over 100-feet below normal. While the DWP has said they would recharge it in wetter times (that was 2 years ago) it has not happened and I believe that changed weather patterns (caused by global warming or not) will prevent this and ultimately force us into depending on future supplies from the Delta. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report. 44-1

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary. 44-2

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water. 44-3

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California. 44-4

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

I urge you to implement an alternative that better serves California. 44-5

Wayde Hunter
12354 El Oro Way
Granada Hills, CA 91344

Peggy Kennedy.txt

From: Peggy Kennedy [krauskennedy1@comcast.net]
Sent: Friday, November 30, 2007 5:03 PM
To: Brown, Delores
Subject: Don't Adopt the Monterey Amendments

Dear Chief Brown:

Please do all in your power not to amend the State Water Project with the “Monterey Amendments” originally negotiated in the mid-1990’s. These amendments would jeopardize the sustainability of water resources throughout the state. The Department of Water Resources must continue to be responsible for determining the reliable safe yield of water that can be pumped from northern California and the Bay Delta estuary. The DWR much continue to oversee and operate the Kern Water Bank rather than hand it over to another entity. These amendments would weaken or eliminate urban safeguards for water in droughts and shortages and would eliminate the prohibition on the use of surplus Delta water for permanent development. Please, for the safe of all of us who live in California and love our State, follow the water policy that sunsets the Monterey Amendments.

45-1

45-2

45-3

Yours truly,

Peggy Kennedy

LETTER 46

12/27/07

Dear Ms. Dolores Brown,

I am writing to express opposition to the adoption of water-contract amendments currently being considered by the Dept of Water Resources. These amendments amount to a huge boondoggle which would give away a significant portion of California's water, including the state-owned Kern Water Bank, one of the largest water-storage facilities in California. This would threaten the reliability + availability of adequate water supplies for many cities throughout Southern + Central California; + shift the burden of payment to the ratepayers, driving up residents' water bills.

Please reject these amendments + instead implement requirements for a realistic assessment of the safe yield of water from the Delta + other areas of California. Californians need + deserve

46-1

46-2

46-3

46-4

better alternatives to these dubious amendments. The DWR also must decrease demand on scarce water resources, especially Delta water, by aggressive promotion + implementation of residential water conservation, agricultural water conservation, + water recycling programs.

47-4 (con't.)

Sincerely,
Kathleen Labriola

Ms. Kathleen Labriola
1714 9th Street
Berkeley CA 94710-1837

Mary Ann Lockhart.txt

From: Brown, Delores
Sent: Monday, January 14, 2008 9:17 AM
To: Cross, Monica
Subject: FW: comments on Monterey agreements revision Delores Brown, Chief Office Of Environmental Compliance, California Department Of Water Resources.

Delores Brown

Department of Water Resources

Office of Environmental Compliance

901 P Street

Sacramento, CA 95814

916 651-9560 (Work)

916 651-9563 (FAX)

delores@water.ca.gov

From: Mary Ann Lockhart [mailto:jmal@frazmtn.com]
Sent: Sunday, January 13, 2008 5:44 PM
To: Brown, Delores
Subject: comments on Monterey agreements revision Delores Brown, Chief Office Of Environmental Compliance, California Department Of Water Resources.

To Delores Brown, Chief  Office Of Environmental Compliance,  California Department Of Water Resources.

January 13, 2008

To all it may concern:

Thank you for your attention to these comments.

47-1

Conservation of water is the first area that needs attention. According to the U.S. Geological Survey, individual Californians use 40% less water today than they did 30 years ago, a truly remarkable achievement that has received far too little attention. This approach , if truly addressed and helpfully implemented with incentives to individuals, can produce amazing results. The more we can

conserve, the less need we have for building huge, expensive dams that are environmentally damaging.

Protection for urban water users but with strong qualifications.

Those water companies that are energetically promoting water conservation should be given credit for their efforts when decisions are being made as to size of water allocations in drought years. Activities that merit credit should include metering of water use with adjusted pay rates…one rate up to basic amount, increased charges per gallons used above base rate, etc…, promoting and actually produced xeriscaping (no lawns), incentives to promote installation of water saving appliances, etc. etc. Those companies and the communities they serve that are doing nothing to encourage conservation should be penalized for not doing so. 47-1 (con't.)

Another major concern relates to proposed new housing developments. First: This question must be answered: Is a particular project really necessary and truly meeting a need for more housing? Are proposed developments really designed to provide basic housing or are they designed to be third or fourth houses for the wealthy? The latter should be last on the list for protected water supplies.

Emphasis should be on infill housing proposals carefully screened as to the local needs for the type of housing being provided with detailed and scientifically verified water sources as well as strict requirements for water conservation in all aspects. 47-2

Many water deals for housing developments appear to be made by water companies making deals with the developers in order to get money to run their companies. The deals are closed without adequate, scientific analysis as to what quantities and quality of water supply are available. Impacts on neighboring areas when water is offered to sell are not considered. This happens when two or three people are enough to start water company. Finding solutions to the effects of this law must be scrutinized and action taken to rectify its consequences.

It has been reported that more and more ground water is being presented as a major source of water. But the reliability of geological reports on how much water is truly available immediately and would be available over the long run is truly suspect. Some reports seem to be based on the idea that water supply is bound by property lines, not recognizing the flow and spread of water as dictated by nature. Water companies seem willing to say they have extra water to sell but with little basic, sound scientific work to prove it. Paper water abounds and when the time comes to provide all the water, particularly in times of drought, there will be none to provide. 47-3

Selling of water by water companies to developers rather than using water to grow crops should be very carefullyanalyzed. Allowing water companies to make profits on water that is underpriced in the first place as it comes from the feds is incredible. What are those water companies doing with the money gained by selling water? That is a question that needs to be answered in full. We need to have this investigated very thoroughly and new controls put into practice, controls that are developed by neutral experienced water specialists.

Water needs of agriculture must be carefully considered. We do not want to send all the water to urban areas because we do need water for agriculture which provides us with much needed foodstuffs. Ag interests should be encouraged to grow only foodstuff products; leave the cotton to the south. All means of conserving water in ag projects must be experimented with and the information quickly forwarded on to the farmers. It was very impressive to have visited a farm that was growing grapes. They had been watering between every row every day. They experimented by watering every other row every other day. The growing results were more than adequate. The farmer also reported that the need for control of mold growth was 47-4

much reduced, an unexpected side benefit. 47-4 (con't.)

Water for preserving endangered species must be put willingly and adequately in the equation for water use and not just because it is the law. Remember that preserving endangered species relates to preserving human species. Just one example: protection of habitat protects lands that can be directly connected to human needs as often these protections serve to also protect the water sources in quality and quantity that provide water for all living things and that includes us. 47-5

Control of water supplies should never be privatized. One example: The Kern Water Bank is California's largest ground-water storage facility; it must be managed by the state for the benefit of all citizens. Currently it is under the management of private interests. 45% of the KWB authority is controlled by Westside Mutual Water Company, a private company set up by Paramount Farming, and 24% of the KWB is under management of a water district controlled by Tejon Ranch. The legal rules that allow this to happen should be changed. Water is a necessity for all and should not be in the hands of those who wish to control it for profit. 47-6

There is much more to be said but my final word is this: the negotiations of these new amendments to the Monterey Agreements should have been more fully discussed publicly. Secrecy makes a public very suspicious particularly when so many moneyed private interests appear to be wanting to control the spigots. 47-7

Thank you for your consideratiion of these comments.

Sincerely

Mary Ann Lockhart

PO GG

Frazier Park, CA

93222.

residential address:

16016 Zurich

Pine Mountain Club

93222

Telephone: 661.242.0432

LETTER 48

Ms. Brown:

12/29/07

DWR should reject proposed water-contract amendments which would eliminate drought safeguards for urban areas. Instead, DWR should provide a realistic assessment of the safe yield of water from the Delta. DWR should help communities reduce water demand from the Delta and increase drought water reliability by more urban water conservation, energy efficiency, agricultural water conservation, and water recycling and re-use.

The Nature Conservancy
Protecting nature. Preserving life.
Mr Edward Mainland
1017 Bel Marin Keys Blvd
Novato, CA 94949

48-1

Jocelyne Mainland.txt

From: Edward Mainland [mailto:emainland@comcast.net]
Sent: Sunday, December 30, 2007 4:27 PM
To: Brown, Delores
Subject: Stop State Give-Away of Water Resources

for Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resources Sacramento, CA

Ms. Brown:

We hope you'll spurn so-called "Monterey amendments" which would give away one of the largest water-storage facilities in the state and eliminate drought safeguards for urban areas in California. DWR should reject these amendments and instead decrease demand for Delta water through the myriad possible conservation measures for cities and agriculture that we know work but somehow don't get implemented by DWR and the rest of government and private customers. 49-1

Jocelyne C. Mainland
Marin County, CA

Jeanne Michaels.txt

From: jeannemic@aol.com [mailto:jeannemic@aol.com]
Sent: Thursday, December 13, 2007 3:58 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by: 50-1

* Providing a realistic assessment of the safe yield of water from Delta.

Jeanne Michaels
3068 C Via Serena No.
LAGUNA WOODS, CA 92653

Eileen Murphy.txt

From: Murphyeile@aol.com
Sent: Friday, December 07, 2007 2:39 PM
To: Brown, Delores
Subject: please stop the Monterey Amendments from being implemented permanently

these are the facys as I know them."In 1994, the Department of Water Resources (DWR) secretly negotiated a behind closed doors deal with water interests to alter the allocation of California water by amending the State Water Project (SWP) contracts. As part of that deal, which led to the so-called "Monterey Amendments," the State agreed to eliminate drought assurances for urban areas, and to give away State owned water storage facilities. The State also agreed to provisions that have contributed to the current crisis in the Delta. A successful lawsuit by the Planning and Conservation League and two other plaintiff groups resulted in a decision in 1995 that required DWR to analyze the impact of the proposed Monterey Amendments in a new Environmental Impact Report, and to issue a new decision based on that EIR analysis. On October 19, 2007, DWR released a new Draft EIR (DEIR), and announced that it planned to implement the Monterey Amendments on a permanent basis. " 51-1

Water must not be something that can be traded. Water is a necessity of life and must be available to everyone. I am protesting the Monterey Amendments being implemented on a permanent basis.

Sincerely

Eileen Murphy

201 21st Street

HB CA 92648

Check out AOL Money & Finance's list of the hottest products and top money wasters of 2007.

Yuko Nakajima.txt

From: yn24@uclink.berkeley.edu [mailto:yn24@uclink.berkeley.edu]
Sent: Thursday, December 13, 2007 7:26 AM
To: Brown, Delores
Subject: Misguided Draft Monterey Plus EIR

Dear Mr. Lester A. Snow

As a concerned Californian I want the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report. Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary. 52-1 52-2

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is would be recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water. 52-3

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

- Providing a realistic assessment of the safe yield of water from Delta.

- Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California. 52-4

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state. 52-5

We urge you to implement an alternative that better serves California.

Yuko Nakajima
63 Oakvale Ave.
Berkeley, CA 94705

LETTER 53

30 Dec. 2007

Dear Ms. Brown:

I am writing to express opposition to the adoption of water-contract amendments currently being considered by the Dept. of Water Resources.

These amendments amount to a huge boondoggle which would give away a significant portion of California's water, including the state-owned Kern Water Bank, one of the largest water-storage facilities in California. This would threaten the reliability & availability of adequate water supplies for many cities throughout southern & central California, & shift the burden of payment to the ratepayers, driving up residents' water bills. 53-1

Please reject these amendments & instead implement requirements for a realistic assessment of the safe yield of water from the delta & other areas of California. 53-2

The DWR also must decrease demand on scarce water resources, esp. Delta water. 53-3

Sincerely,
Teresa Paris 53-4

Ms. Teresa Paris
2700 Prince St Apt 2
Berkeley, CA 94705-2627

LETTER 54

January 3, 2008

ATTN: Delores Brown
Chief Office of Environmental Compliance
California Department of Water Resources
P.O. Box 942836
Sacramento, CA 94236

RE: Proposed DWR Adoption of Draft Environmental Impact Report for the Latest Proposed Monterey Amendments to the State Water Project

Dear Ms. Brown:

We are writing to OPPOSE permanent adoption of the Monterey Amendments to the State Water Project because these amendments clearly oppose the public interest and are extremely detrimental to the health and safety of the public and the environment. 54-1

1. The DWR and SWP must not eliminate contract provisons that provide drought safeguards for urban areas. DWR's own analysis has shown that in dry years urban water users may find their water deliveries reduced by a quarter if the Monterey Amendments are adopted. Water companies that strongly promote water conservation should get credit for their successful efforts when water allocations decisions are being made in drought years. 54-2

2. We are outraged that the Monterey Amendments would give away the Kern Water Bank to private interests; this must not happen. As our state's largest groundwater storage facility, this vital resource must be managed by the state for the benefit of all our citizens; it must not be allowed to be controlled by private interests for their own gain at the expense of the public. 54-3

3. We also oppose the Monterey Amendments because they eliminate the requirement for DWR to determine the realistic yield of the SWP; this makes rational water allocation and delivery impossible. California is already suffering hugely from the effects of relying on "paper water," including the destruction by over-pumping of the absolutely irreplaceable resource of the Bay-Delta. 54-4

4. We further oppose the Monterey Amendments because they would transfer millions of dollars in costs to taxpayers, while rebating millions of dollars to individual water agencies. 54-5

We are appalled that DWR would consider adopting these proposed amendments when they are so contrary to the good of California. Our state is already facing a horrendous water crisis. Please do not make it worse by permanently adopting the abominable Monterey Amendments. Thank you for acting in the public interest. 54-6

Sincerely,

Greg + Laurie Schwaller

Greg and Laurie Schwaller
43857 South Fork Drive
Three Rivers, CA 93271

Glenn Shellcross.txt

From: Glenn Shellcross [gshellcross@earthlink.net]
Sent: Sunday, December 09, 2007 5:07 PM
To: Brown, Delores
Subject: Fw: Department of Water Resources Hearing in Bakersfield

Surely, this is not being seriously considered! Please protect our Kern Water Bank. 55-1

Glenn Shellcross

LETTER 56

From: ARVE SJOVOLD [mailto:arveva@verizon.net]
Sent: Thursday, February 14, 2008 2:07 PM
To: Brown, Delores
Subject: Additional comments on the EIR

Dear Delores: Attached is a recent analysis I performed for some citizens in Santa Barbara County regarding a proposed development, which was intended to be solely supported by SWP water. I believe it is a very good example of how local planners are seduced by "paper water." What I show is that the local case planner analyzed was not a correct interpretation of SWP reliability according to the information documented in DWR's Reliability Report. I would like to ask that it be made a part of the EIR record even though the deadline for comments has lapsed. DWR may at its discretion want to respond.

56-1

Sincerely,

Arve R. Sjovold
186 Sierra Vista
Santa Barbara, CA 93108

**AN ANALYSIS OF THE WATER SUPPLY
FOR THE PROPOSED DEVELOPMENT OF
ENGLISH-JOSEPH PROPERTY INVESTMENTS
Pursuant to
NEGATIVE DECLARATION, KEY SITE 11
07DVP-00000, 07CUP-00000-00058
05SPP-00000-00002**

By: Arve R. Sjovold
February 12, 2008

The Negative Declaration states that the development shall be supplied with water via a purchase from the City of Santa Maria to be delivered to Golden State Water, thence to the development. The amount being transferred from Santa Maria to Golden State is 500 acre-feet of Santa Maria's State Water Project (SWP) entitlement, which according to the Negative Declaration, is reckoned at 75% of the face value of the entitlement as the reliable supply. This is offered as the finding that the development will not tap the Santa Maria Groundwater Basin as required by Santa Barbara County's policies. The Negative Declaration also implies that this transferred SWP water will be the sole source of water for the development. This finding cannot be sustained according to the data in the State Department of Water Resources (DWR) Reliability Report. (the latest version is the 2007 version, which is just now being released and which I have not seen yet. The 2005 version is the most recent one available to me.)

The 2005 Reliability Report clearly states what percentages of entitlements are reliably available to State Water Contractors under several hydrologic conditions. The condition that applies to any one State Water Contractor depends on that contractor's (here Golden State or Santa Maria) other sources. Since it is stated that the SWP delivery is the sole source for the Negative Declaration's evaluations, then conditions of drought cited in the Reliability Report apply since there is no other source to offset reductions in deliveries due to drought conditions. The 2005 report identifies several drought conditions and the deliveries that can be expected. The conditions cited are: the driest year of record, 2 consecutive dry years, 4 consecutive years, and 6 consecutive years. The corresponding percentages of entitlement delivery are:

1 year	4 to 5%
2 years	40 to 48%
4 years	32 to 37%
6 years	37 to 42%

None of these is close to the 75% asserted in the Negative Declaration.

What this means is that a development predicated on 75% will experience severe restrictions on deliveries for any of the drought conditions, which are not that unexceptional in the record. It is noteworthy that if no groundwater is ever to be tapped for this development, the correct condition is the single dry year for which the restricted

delivery is 4 to 5%. Clearly, this would not be allowed to happen so where will the water come from?

Santa Maria, the originating source of the SWP transfer, may elect to pass on more of its own reserved SWP supplies, which it can do because it has groundwater rights it can rely on. However, this would in effect be a tapping of the groundwater basin to support this development and it would be at the expense of the citizens of Santa Maria, which contracted for SWP water to improve the quality of their supply. Thus, under this possibility there would be impact on the citizens of Santa Maria. It is also noteworthy in this regard that for a 6 year drought Santa Maria will not have sufficient SWP entitlement to assure itself of enough SWP deliveries to meet normal demand without drawing on the groundwater. To the degree that Santa Maria sells off entitlement t makes this potential predicament worse.

The Negative Declaration has wrongly stated what the reliable supplies will be for this development. And for realistic scenarios, should this development go to fruition, the Negative Declaration has not evaluated the impacts on Santa Maria's supplies.

Since the development has no alternative sources of supply it must either reduce the scale of the development significantly or arrange to buy substantially more SWP entitlement form Santa Maria. An EIR would be the appropriate document to explore and evaluate the water supply scenarios and their attendant impacts.

It should be noted at this time that the just released 2007 Reliability Report will show reduce delivery percentages for almost all conditions in recognition of the current court mandated restrictions on project pumping in the Delta. The evaluations for this development should be based on the 2007 report.

LETTER 57

December 4, 2007

Delores Brown, Chief
Office of Environmental Compliance
California Department of Water Resource
Post Office Box 942836
Sacramento, CA 94236-0001

Dear Chief Brown,

I oppose the proposed SWP Amendments that would fundamentally change how the State Water Project (SWP) delivers water to 23 million Californians. These would:

- Eliminate the common-sense provision requiring DWR to determine the realistic water yield of the SWP. Without knowing the actual safe yield of the SWP, DWR has and will continue to promise to deliver paper water, (water which actually does not exist in the real world). Already, the promise of paper water has resulted in over-reliance and over-pumping on Delta water, inevitable cutbacks in water supplies, and ultimately decreased water supply reliability. 57-1
- Encourage the over-pumping of Delta water in the winter and spring months, which has already, under the provisional use of the Monterey Amendments, contributed to the massive decline of the Delta smelt and other Bay Delta fish populations. 57-2
- Eliminate contract provisions that provide drought safeguards for urban areas. DWR's own analysis shows that in dry years like 2001, water supplies for homes and businesses in urban areas will be reduced by over 400,000 acre-feet, (a reduction of 26% of total urban water deliveries from the SWP). 57-3
- Give away the State owned Kern Water Bank, one of the largest water storage facilities in the California. 57-4
- Transfer millions of dollars in costs to taxpayers, while rebating millions to individual water agencies. 57-5

I believe such changes would be seriously detrimental to the public interest.

K Martin Stevenson
845 Norma Way
Santa Barbara, CA 93111-1106

Diane Straus.txt

From: dianestraus@sbcglobal.net
Sent: Wednesday, December 12, 2007 5:41 PM
To: Brown, Delores
Subject: Monterey Plus Environmental Impact Report Needed

Dear Mr. Lester A. Snow

As a concerned citizen of California, I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report. 58-1

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary. 58-2

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. 58-3

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California. 58-4

Diane Straus
210 Hillcrest Road
Berkeley, CA 94705

LETTER 60

Recycled Paper

Jan 9. 2008

Delores Brown, Chief
Office of Environmental Compliance
California Dept of Water Resources
901 P St.
Sacramento, CA 95814

Dear DWR,

Please reject the proposed amendments in the draft EIR and instead provide a realistic assessment of the safe yield of water from the Delta. 59-1

In addition, please assist communities in decreasing demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation and water recycling. 59-2

Sincerely,

Dennis Thomas
147 St. Germain
Pleasant Hill, CA 94523

Juana Torres.txt

From: jmtorres@clunet.edu [mailto:jmtorres@clunet.edu]
Sent: Tuesday, December 11, 2007 4:23 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I live in the San Fernando Valley and am a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report. 60-1

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary. 60-2 60-3

I urge you to implement an alternative that better serves California. 60-4

Thank you for your time.

Juana Torres
6600 Wilbur Ave. #101
Resead, CA 91335

Randall Tyers.txt

From: tyersome@nature.berkeley.edu [mailto:tyersome@nature.berkeley.edu]
Sent: Wednesday, December 12, 2007 10:20 AM
To: Brown, Delores
Subject: Ill-advised Draft Monterey Plus EIR

Dear Mr. Lester A. Snow

As a concerned citizen of California I request that the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report. Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary. 61-1 61-2

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is would be recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water. 61-3

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

. Providing a realistic assessment of the safe yield of water from Delta.

. Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California. 61-4

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California. 61-5

Randall Tyers
63 Oakvale Ave.
Berkeley, CA 94705-2403

Sent from my GoodLink synchronized handheld (www.good.com)

-----Original Message-----
From: Arthur D Unger [mailto:alunger@juno.com]
Sent: Monday, January 14, 2008 02:33 PM Pacific Standard Time
To: Brown, Delores
Subject: Comments on the EIR on the Monterey Amendment to the State Water Project

Delores Brown,
Chief
Office of Environmental Compliance
California Department of Water Resources

The attachment and the below text are identical.

Here are my comments on the <http://www.des.water.ca.gov/mitigation_restoration_branch/rpmi_section/projects/EIR_index.cfm> Draft Environmental Impact Report on the Monterey Amendment to the State Water Project Contracts (Including Kern Water Bank Transfer) and Associated Actions as Part of a Settlement Agreement (Monterey Plus)

These are the times that try California's soul. The summer water supply is depleted by early melting in the Sierra due to global warming. The endangered fish of the San Joaquin-Sacramento Delta command us not to look there for water. Certainly then, this EIR must become a guide to water conservation. 62-1

CLIMATE CHANGE

This is one of the first water EIRs to be decided after the affects of Climate Change on California's water supply have been widely recognized. Effects of climate change on the state's water are:

1 increased temperatures which might increase crop water demand and will increase evaporation of any water stored on the surface, such as dams.

2 early melting of the Sierra snows that feed our rivers and supply our fisheries and crops. 62-2

These effects, plus our soaring population, compel us to manage California water for the benefit of our entire population.

Saving energy is one of the benefits of reducing agricultural water use. I should say how much energy pumping water from the Delta to San Joaquin Valley crops takes and how much ambulatory air pollutants and global warming gas is produced by generating that energy; I know it is a significant amount and the EIR must supply the numbers.

62-2 (con't.)

URBAN SAFEGUARDS

62-3

Urban safeguards are needed to insure water to flush toilets and provide drinking water. The EIR asks urban areas to store water from the Delta in wet years for use in dry years. The EIR does not show that pumping water in wetter years will not harm Delta smelt or that there are enough wet years to build a surplus.

62-4

URBAN WATER CONSERVATION

62-5

Urban safeguards must not permit watering of non edible crops like lawns or non permeable ground like driveways. Just as we need compact housing to reduce air pollution and global warming, we must no longer allow sprawling development to tap into the California Aqueduct or other sources of water needed to grow our food.

Many San Joaquin Valley developments are built around shallow enclosures of water; many have a surface area of several acres. The EIR should determine the amount of water they now use and the amount they would use if they were devoted to xeric plants or native plants that use little water. Maintenance cost of this land should also be known; I think cactus is easy to maintain and has striking flowers.

62-6

During a recent drought restaurants asked customers if they wanted water and if they did, whether or not they wanted ice in their water. How much water and energy did that save? If that number is not available, the EIR should make an estimate. Of course the public may not be as convinced that global warming and drought are as much of an emergency now as they were in those dry years.

62-7

AGRICULTURAL WATER CONSERVATION

62-8

Four fifths of California’s water is used by agriculture. Since some of our crops, such as Almonds, are exported, we can say our farmers

export a significant amount of California's water. Since they export water for profit, farmers have an even bigger responsibility to conserve water.

We can save water by not retiring farm land that produces the most food, fiber and jobs per unit water. That occurs when developers offer farmers more money for their land than they can earn from farming it. That land is then retired from farming and devoted to suburban sprawl. We should build on the work of Gordon Nipp of the Kern Kaweah Chapter of the Sierra Club. He and his lawyer have negotiated with developers so that the developers have agreed to mitigation for taking farmland for development. The developers pay a fee for each acre they develop and each successive buyer of anything built on that land also pays. The Sequoia Riverlands Trust receives that money and hopes to buy easements on large blocks of farmland whose owners agree never to develop their farmland.

The salt laden land in the San Joaquin valley mostly results from the high saline water table in the low areas of the Valley which allows saline water to move to the soil surface, evaporate and concentrate the salts. If a drainage system had been designed and included when the Valley was first irrigated, the salinity problem could have been managed. We have now added so much salt with irrigation water that some farm land requires too much water to push the salt down below the root level and thus produce a profitable crop. That land should be retired from farming.

Claude & Jim Phene are in the business of installing Subsurface Drip Irrigation (SDI). They claim deep drip irrigation can reduce the use of water by California agriculture by 2.4 million acre feet (MAF) a year. They think almost any crop can be on drip. The water lines should be too deep for gophers to access them. They can be reached at <mailto:claudejp@quixnet.net> claudejp@quixnet.net and <mailto:c.phene@sbcglobal.net> c.phene@sbcglobal.net . They are preparing a publication to support their claim. The EIR should estimate how much water can be conserved by Subsurface Drip Irrigation.

62-8 (con't.)

Limiting flooding and storing water by building dams evaporates water. The USA Corps of Engineers may agree that each acre of surface of Isabella Reservoir on the Kern River evaporates over five acre-feet in an average year. The EIR should state the evaporative loss from each of the dams in and around the Central Valley. This loss should be compared to the evaporation when water runs down a river into underground storage, as at the Kern Water Bank. Is this the time to compare the energy to store and recover underground water with the energy to build and use a dam?

62-9

The EIR should discuss using tier pricing to encourage cities and agriculture to conserve water. 62-10

KERN FAN ELEMENT PROPERTY

Legislation should prevent undeveloped land that is suitable for water recharge from being used for anything else.

The goal of the state is to see that all citizens have enough water to drink, dispose of wastes and supply industries such as agriculture. In contrast large businesses, including agriculture, are legally bound to increase the near term profits of their stock holders. This could mean selling water that was used for irrigation to developers of suburban sprawl; see below Kern Valley Sun article. The Kern County Water Agency should not manage the KWB because the Agency is controlled by large agricultural businesses that could also divert water from irrigation to urban sprawl. My information on this comes from a report by “Public Citizen” that they call “Water Heist” <http://www.citizen.org/california> www.citizen.org/california . The EIR should verify this report by talking to those I mention or using business records. Water Heist says that if the Kern Water Bank was given to the directors of the Kern Water Bank Authority, Paramount Farms would own 48% of the Kern Water Bank and Dennis Mullins formally of Tejon Ranch Corporation would represent Wheeler Ridge Maricopa Water Storage District which would own 24% of the Kern Water Bank. 62-11

Is the storage capacity of the Kern Water Bank one million acre feet, as I have often heard the Kern County Water Agency say years ago, or is it more, as some have said?

As the Kern Water Bank and other facilities are made to store more water, endangered species habitat within them will be reduced. The EIR should discuss how water conservation can minimize this impact. I appreciate the mitigations of Table ES 1, 7.4-3; but, they do not address replacing dry land with ponds. Table ES 1, 7.5-3 mentions conversion of 1200 acres of the Kern Fan Element dry land into ponds. I hope the third and last sentence of mitigation measure 7.4-2 of Table ES 1, summary p 27, says that this loss should be mitigated at least by off site habitat for fully protected, endangered and threatened species. Most Habitat Conservation Plans replace one acre of current habitat with three acres of off site mitigation.

The twenty thousand acre Kern Water Bank (KWB) surrounds the 2800 acre City of Bakersfield Recharge Area. Bakersfield has sprawled to these 22,800 acres. Today’s children are deprived of contact with land that

approaches its natural state. It is well that the Kern Water Bank Authority allows several supervised walks a year on these lands. If the KWB is owned by the public, we might find a way for unsupervised kids to explore nature on their own in this hazardous area. The EIR should consider the effect this opportunity would have on inner city youth.

62-11 (con't.)

Thank you for the opportunity to comment,

Arthur Unger 661 323 5569

Valerie Cassity

Kern Valley Sun

Jan. 17, 2007

Two water districts in Bakersfield have been negotiating a deal with a Santa Clarita agency to sell water for future housing development there. The deal will send 11,000 acre feet of Kern County's water per year to the Castaic Lake Water Agency to be distributed to approximately 11,000 new homes in the rapidly growing suburb. Even though the agencies are in the process of negotiating contracts and no money has been exchanged yet, all parties involved say it's pretty much a "done deal."

According to the Assistant Manger of Bakersfield's Buena Vista Water Storage District Dan Bartel a recharge project was developed in 2002 as a way to take Kern River high flow water, flood water we would otherwise lose, and recharge it in the water table. Buena Vista purchased "a couple hundred acres" of property in the western Bakersfield area at $35,000 an acre, and built infrastructure, including recharge pumps and weir structures, for additional millions of dollars in order to generate revenue which will be used to buy other supplies to support the program. According to Bartel, the project is set up to store and recover water and market it to different customers, both wholesale and retail. "We've been in the process of negotiating various water sales out of the project," he said.

"[The recharge project] is a pretty good program because it only takes water that has flooded Tulare Lake, and captures the water instead of letting it leave the county or causing flooding. We use it in a sales program to Castaic Lake instead, which generates revenue so that we can bring more water in and build infrastructure to help enhance the future need for water," explained Hal Crossley, Manager of Rosedale-Rio Bravo Water Storage District.

The water being sold by Buena Vista Water Storage District, along with Rosedale-Rio Bravo Water District, will get to Santa Clarita indirectly. When the high flow water comes down the canyon it will be recharged into the groundwater basin using the new groundwater storage facilities built by the two water districts. According to Bartel, the Kern County water agencies won't deliver the water directly to Castaic; it will be put into the groundwater basin and stored. The farmers will then pump their contractually allotted water out of the groundwater basin and deliver it to their crops, while the water that would have been delivered to them from the state aqueduct will be sold to Santa Clarita. "It's not like water is going down the river and flowing to Santa Clarita," said Bartel, adding, "There is no danger for the water running out for the farmers; we have to put the water into the groundwater basin before we sell it."

Despite those assurances, Dan Masnada, General Manager of Castaic Lake Water Agency (CLWA) says that even in drought years, his company will be contractually assured of the 11,000 acre feet of water per year whether the farmers get to water their crops or not, but he feels confident that the Kern County water agencies will be able to handle any natural fluctuations in water supply and still deliver the water to Santa Clarita. "Drought years will be made up by stored water and Buena Vista is taking the appropriate actions to ensure that the supply is there for us each year," he said.

But some people are not convinced that the project will be harmless. The California Water Impact Network (CWIN) filed a lawsuit against the proposed water project last month in Los Angeles Superior Court. CWIN's suit was filed to protect Kern County farmers and the Santa Clarita Valley watershed, which the organization believes will be damaged if the water in question is used to support urban sprawl.

CWIN's lawsuit calls into question whether the water promised to CLWA actually exists, or if it is "paper water," which is the difference between the actual amount of water and that which exists in theory. "We are convinced that these 11,000 acre feet is paper water. The farmers are going to be shorted by that water if it doesn't exist and if it is taken away from them. If you build homes, the water will be taken for that purpose before it is given to agricultural purposes. There are a lot of developments being planned for the Santa Clarita area and they are all based on paper water," said Dorothy Green, board Secretary for CWIN and founding President of Heal the Bay.

CLWA, a public water agency that services an area of 195 square miles in Los Angeles and Ventura Counties, as well as being the water wholesaler that provides about half of the water that Santa Clarita households and businesses use, is no stranger to litigation against its projects. In fact, since the dawning of the new millennium, the agency has spent $6.4 million fighting litigation from environmental groups.

"The fact of the matter is the Santa Clarita area is an area of high growth and we have been trying to do our job to meet the demands, but there are certain entities who feel that stopping the water will stop the growth. Worst case scenario for CLWA is that we would have to redo the Environmental Impact Report or amend it because we didn't fully address the environmental impacts," commented Masnada.

But CWIN, along with some Kern County residents, fear that this deal could leave the Kern River in the predicament that the Owens Valley has faced after selling water to Los Angeles; dry riverbeds and a washed-out economy as a result. Even though officials at CLWA, Rosedale-Rio Bravo, and Buena Vista water districts assure the public that this is not the case, it is always a possibility in the current climate where water is quickly becoming the most sought after commodity in the country.

CWIN alleges that the water for the deal between the two Kern County water agencies and CLWA is not coming from the State water table, as stated, but from the Kern River, which is already fully allocated. “This is a prime example of trying to use water rights more than once,” said Carolee Krieger, President of CWIN, “The major issue is the appropriation of the Kern River. We’re trying to determine whose water has been appropriated and how much can be appropriated without destroying the environment of Kern County.” Krieger is also concerned about the critical issue of global warming and how that will affect water supply in the future, explaining that most of California’s water is stored in snow pack, and when it melts earlier than expected the amount of resulting water cannot be reliably estimated.

Fortune Magazine calls water the oil of the 21st century; "The precious commodity that determines the wealth of nations," and the Central Intelligence Agency has reported that by 2015, access to drinking water could be a major source of international conflict around the world. In 2003, then-U.S. Environmental Protection Agency Chief Christie Whitman warned that water quality would be "the biggest environmental issue we face in the 21st century."

Although the sale of Kern River water should not have a noticeable effect to the amount of water that is available to Bakersfield residents any time soon, it is an issue that should be paid close attention to as our state becomes more populated and the water supply is split between development and farming.

“The precedent is long established for municipalities to move waters from their original point of use to another point of use. The only long term protection for [Kern County] is to pursue well planned working landscape conservation easements tying the existing surface water rights to the properties,” said Bob Robinson, Upper Kern Watershed Coordinator for the Mojave Desert & Mountain RC&D.

LETTER 63

Patricia Wormington .txt

From: Pat Wormington [mailto:airecrew@netzero.net]
Sent: Tuesday, January 08, 2008 11:01 AM Pacific Standard Time
To: Brown, Delores
Subject: Comments: Monterey Amendments Draft EIR

Patricia A. Wormington
7370 County Road A23
Beckwourth, CA 96129
January 4, 2008

Department of Water Resources
901 P Street
Sacramento, CA 95814

Comments: Monterey Amendments Draft EIR

Dear Department of Water Resources;

I am writing this letter in the largest valley in the Sierra, Sierra Valley, which is also said to be the largest sub-alpine valley on the North American Continent.

It has been brought to my attention that your agency intends to adopt a water policy that has no bearing on the current state of our water supply in California. An ill conceived plan made behind closed doors in 1994 that will serve to enrich a few with California taxpayers footing the bill. We have had enough of these schemes over the last few years. The Savings and Loan debacle that enriched the few who bailed out early with the loot, at our expense. Then the Enron power scheme that drained the pockets of Californian's. Then the Mortgage fiasco. And now DWR thinks Californian's will roll over for another scheme, selling off the Kern Water Bank and the selling off and privatization of Municipal Water Supplies. Household budgets are already stretched thin with gas prices pushing up the price of everything we buy. 63-1 63-2

Our Government is supposed to be for the "Common Good." Not the enrichment of a few. Greed has Ruled the Day for too long!

Basing water policy on "paper water" instead of the real lack of water in California is insane. California's water policy should be based on real water, or the lack of it. Not a plan conceived in 1994, but a plan based on current water availability, our best science, and the Global Warming factor in 2008 and beyond. The governor's plan to build more dams and wipe out the fishery, the food chain of many species, is not realistic either. The rehabilitation of meadows and valleys to store as much water as possible underground is cheaper and conserves our precious water without the evaporation factor. Conservation and population control is also a must for this beautiful State if wildlife is to survive. 63-3 63-4

I happen to know first hand about the lack of snow pack in the Sierra, 2007. I was above 13,000 feet on the John Muir Trail in July. I did not walk across one snow patch in 230 miles. Half of the springs were dry South of Mr. Whitney. Mt. Rainier had more water than the entire state of California. We are currently getting bailed out of our drought conditions by this series of storms. But there will be dry years in the future equal to, or worse than 2007. With California's uncontrolled population growth the demand for water will only get more intense.

In closing, we need a realistic plan based on current water conditions. The Monterey Plus Environmental Impact Report should not be approved. Please reject this plan. As a native Californian for 59 years, I know we can do better and must do better to maintain the health of our ecosystems and open landscapes, landscapes that developers want to fill with houses including the flood plain in Sierra Valley. We must conserve our farmland and support local farmers. 63-5

Sincerely,

Patricia A. Wormington
Sierra Valley
Feather River Watershed

cc

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DEPARTMENT OF WATER RESOURCES

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IN RE THE MATTER OF:

MONTEREY AMENDMENT

PUBLIC HEARING

NOVEMBER 29, 2007
3:00 p.m.
COUNTY BUILDING
520 MAIN STREET
SUPERVISORS BOARDROOM #308
QUINCY, CALIFORNIA

REPORTED BY: AMY JO TREVINO, CCR #825, CSR #5296, RPR

A P P E A R A N C E S

DEPARTMENT OF WATER RESOURCES:

MARK ANDERSON
BARBARA McDONNELL
DELORES BROWN
MARAIS YEE

SPEAKERS:
JAMES BROBEK
MICHAEL JACKSON
BARBARA HENNIGAN
ALLISON DVORAK
STEVEE DUBER

MR. ANDERSON: Okay, the first speaker we have is James Brobek.

MR. BROBEK: Good afternoon and thanks so much for traveling up here to this beautiful watershed that supplies much of the water for the State Water Project. My name is James Brobek, I'm a water policy analyst for Butte Environmental Council, represents over eight hundred members located in the Sacramento River watershed. I'm also on the Water Advisory Committee and the Butte County Department of Water Resource Conservation, though I'm not here officially representing them. I am here representing Butte Environmental Council today.

The Monterey Amendment to the EIR fails to analyze or disclose impacts to the environmental economy of Butte County that are likely to occur as a result of the increased water exports that are enabled by the Monterey Amendment. The environmental review for the Sacramento Valley Integrative Regional Water Management Plan and the Sacramento Valley Water Management Agreement, the phase eight settlements has not occurred and yet these two water management plans are key to the continued operation in the Deltas and operation of the Monterey Agreement.

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Unfortunately, the draft fails to identify the relationship between these Northern California water management schemes and the Delta exports. This analysis should be done in

the final environmental impact report. In fact by our analysis the environmental review for these two plans in Sacramento valley should be done prior to the Monterey Amendment.

64-2 (con't.)

We are concerned that growth inducing impacts associated with the increased water supply have been inadequately analyzed. And this analysis should be done in the final environmental impact report.

64-3

The settlement agreements between agricultural and urban contractors that remove water shortage provisions create incentives for contractors to replace annual crops with permanent crops. This will reduce flexibility and increase demands to develop drought water supplies, such as conjunctive use of the Sacramento valley ground water as well as deeper draining of the Oroville Reservoir.

64-4

The Butte County is the host of the Oroville Reservoir. When this reservoir was built in Butte County, Butte County was promised that this would be a great boom to the economy of Butte County. However, a recent analysis done by the Department of Water Resources as well as Butte County indicate that it costs Butte County at least $10 million and much more likely $20 million to host this reservoir because of the lack of recreational opportunities and the increase cost of law enforcement and infrastructure that is required by Butte County to maintain access to the reservoir.

64-5

More aggressive operation of the Oroville Reservoir

will result in increased financial hardships to Butte County. For those people who did come up Highway 70 and went over the bridge over the Oroville Reservoir, I'm sure that you notice that it was difficult to even see the water in the reservoir as the reservoir returns to its more river like structure. So we hope that the final will actually analyze some of the impacts to the economy of Butte County associated with the more aggressive operation of the Oroville Reservoir that will be necessary during drought conditions where the decrease flexibility that is inherent in the installation of permanent crops where temporary crops are currently existing.

64-5 (con't.)

In Butte County we rely upon, the large majority of the people and the economy and the environment in Butte County rely on a healthy Aquifer system. We live on top of a tilted Aquifer system. The regional area interfaces the creeks along the foothills of the Sierra Cascade Range during much of the year of this Aquifer system actually feeds the larger creeks rather than, the creeks don't drain into as much as the Aquifer drains into the creeks when the Aquifer is in a charged condition.

64-6

The creeks in Butte County support the last populations of Wild Run Salmon in Butte County and Tehema County. Both of these interface this Aquifer that is being targeted by water marketers to be developed to meet state water supply. And if this Aquifer is more aggressively drained there

is concern that the creeks will become losing creeks, perhaps even going underground as several of the small creeks in Butte County have already done and thereby decreasing habitat spawning and rearing habitat fish, the last native drawn fish in the Sacramento Valley. Unfortunately, the native drawn fish in San Joaquin Valley have already been impacted in the spawning area because the continuity between the ground water and surface water has been disrupted.

We are very concerned that this will occur. Unfortunately, the draft environmental impact report fails to analyze this. And we expect to see some detailed analysis of the potential for this if the ground water in Butte County is developed as a ground water bank to meet the Monterey, the amendment demands that we expect during dry periods.

64-6 (con't.)

The draft environmental impact report failed to analyze and consider the impacts to the Aquifer in the Sacramento Valley that are being targeted by the water marketers as a so-called new source of water to meet demand resulting from continued and expected exports enabled by the Monterey Amendment.

Independent peer review research will be necessary prior to considering any transfers or conjunctive use of the ground water in the Sacramento Valley. The ground water section of the Monterey Amendment failed to analyze at all the areas that, the source areas that are being considered as

sources of water to meet the demand that this project will inevitably result in, and we expect to see analysis done in the final EIR because so many contractors in the valley marketers have identified the Tuscan Formation Aquifer which underlies Butte County, Tehama County, Colusa County and Glenn County as a key factor in meeting state water supply in the future and yet it's not even mentioned in the draft report.

Independent peer review research is necessary prior to developing this. And this would include all the WHEY that is W-H-E-Y acronym for a water model parameter such as water inputs, water outputs, aquatic species, economic and terrestrial links.

64-6 (con't.)

We would like to know how impacts to areas of origin will be monitored. Who will gather the data and report the possible impacts to the economy and the environment of Butte County. One of the grave concerns in Butte County as the ground water is moving toward integrated into the state water supply, because demands precipitated from this agreement would be the dewatering of the root zones underneath our residual hard wood growths, our native plants. We still have beautiful growths of Valley Oaks and Sycamores that are valued for the humans that live in Butte County and Tehama County for their beauty, for their recreational availability and of course, these residual harbor strands are extremely important to the habitat to the creatures that have lived here for a millennium.

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We would like to know what the adaptive mitigation measures would be available to those who live in Butte County who rely on this ground water and to the environment that relies on the ground water, if the ground water is tapped as it was during the mid '90s as a drought water bank by the State of California and it's likely to occur again should this agreement go through and increase exports through the Delta are allowed to continue.

64-8 (con't.)

We would like to see some detailed analysis on both how climate change impacts will be factored into adaptive management and some analysis of the pallial climatological record of the areas of origin. It's rare to see any mention of the mega droughts that have occurred in the watersheds that feed the demand in California. These are droughts that have occurred in the past 1200 years. There has been two droughts that have occurred that lasted well over a hundred years and we think that analysis of how the state will deal with these droughts, how impact areas of origin will be mitigated need to be part of the final environmental impact report. Thank you.

64-9

MS. McDONNELL: Thank you very much.

MR. ANDERSON: Next speaker card we have is for Michael B. Jackson.

MR. JACKSON: My name is Michael B. Jackson, I am here for two groups today. One is the California Sports, Fish and Protection Alliance, which is a nonprofit that works in water

64-10

quality and in fishers management and has been active in the Delta for the last 25 years.

The other group that I am representing today is the California Water Impact Network, CWIN, which is a more recent group 5013C, that has been organized to deal with the transfer of water to north and south, from north to south through the San Francisco Bay Delta, pretty much as a result of the last Monterey Agreement.

Those of us who followed those amendments closely realized that the changes in the contracts have been, are immense and both groups believe and I will now simply go through the information that in at least ten areas and more, which we will try to bring to you at the other public hearings. I am a member of the board of directors of both organizations. I happen to live here in Quincy. Thank you very much for coming, it saved me a long trip. I don't have to go to Bakersfield, I don't have to go to Ventura, I don't have to go to Sacramento. It's a real delight.

The problems with the new Monterey plus EIR are in my opinion greater than the original problems with the original Monterey Agreement EIR. And they stem from some of the same things that the court recognized when he sent this project back to DWR after finding that DWR had failed in explaining to the public and to the decision makers prior to the decision the full ramifications of the contract amendments.

64-10 (con't.)

I am going to talk in terms of a couple of the contract amendments. This is not to be exhaustive, there will be more information about the other amendments presented in writing and presented at the other hearings, but we believe that it was important at this first meeting to try to get some of these issues out on the table so that you will fully understand it, and we also believe that we would have more opportunities to talk here because it would be less people. You will probably be pretty jammed up at the rest of the meetings, and so I appreciate you bearing with me for the two hours you have set aside for Plumas County. 64-10 (con't.)

The first problem that we found when we took a look at the draft EIR is that the proposed project description is too narrow. It is ambiguous, it is changing depending on which of the elements you are discussing. And in order to give you a little specifics in that regard I would say that there is an overlying theme in your project description that is there but not really disclosed to the public if you haven't spent the last 25 years working on California water. And that is that the change in Articles 18A and 18B, the change in Article 21 in regard to surplus water, the change in Article 56, the illegal sale of the Kern Fan or transfer of the Kern Fan by DWR to Kern County Water Agency and through Kern County Water Agency the next day to a private corporation managed by Stuart Resinic (phon) from Paramount Farming has resulted in the violation of 64-11 64-12

the water code, a violation of the original state water project bonds and is outside of DWR's authority to do.

It is our understanding at CWIN and CSPA that the court ordered you folks to take a look at disclosing the real impacts of the Monterey contract changes, and we don't define you have done that. You have narrowly circumscribed what you believe your project description is to include, it's just not accurate. This is a much bigger project than is disclosed. This is a much more important project than is disclosed. And this project is part of a cumulative package Monterey, CalFed, the Delta Accord, the Sacramento Valley Water Management Plan known as Phase 8, and a number of other transfer programs that have taken place that under the new, the operation of the new contract provisions that would not have been allowed under the old provisions. And we would suggest to you that you take a look at your project description and try to actually point out what was legal under the old contracts and what has been enabled under the new contracts so that you yourselves have some idea of how this links with all of the other things that are going on in the Delta.

An important part of that then moves into the second inadequacy in the document beyond the project description, which is the environmental setting in the Delta. There is reference in a number of the sections of the Monterey plus EIR draft to the pelagic fish crash in the Delta. In between the

64-12 (con't.)

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time that you did the original Monterey Agreement and today the environmental setting in the Delta has completely changed. The pelagic fish crash has numbers as low for the endangered Delta smelt as has ever been seen in history. Judge Wanger in response to a lawsuit about the biological opinions found very clearly that there was too much water going out in the winter, going into the ponds in the winter. And yet that is what Monterey enabled. It would not have been possible for DWR to destroy the pelagic fishery without Monterey and yet you can go through this full document and not see any analysis of that. It's as if Monterey's refusal to, as the court told you to recognize that your water entitlements were nothing more than a hope and a wish and a prayer didn't make any effect on the people who wrote this document at all.

64-14 (con't.)

There are certainly straw man alternatives that are insufficient to carry out what the judge told you to do, and I presume that will be addressed later but I am sort of pleading with you to try to take the bull by the horns and actually put it into the final environmental document and really do some analysis of what role the Monterey contract amendments play in the destruction of the pelagic fishery in the Delta.

64-15

For those of us who were around at that time and who are still around, it is clear that the combination of Monterey Amendment changes shifted pumping into the winter period in an attempt to get Article 21 water, and that's exactly the period

64-16

where the mothers of the Delta smelt were creamed. Now, when fish who have children in the thousands, if not hundreds of thousands of kids in eggs, if you want to kill them, particularly a species like the Delta smelt that is, lives only a year, the way you kill them is to get the mothers before they reproduce. And we believe that Monterey encouraged that, and it encouraged it by changing Article 21 to allow surplus water to be picked up at no cost and not attach to table A. So it was basically a way to collect surplus water, turns out to the damage of the estuary in December, January, February, March while retaining in your reservoirs the ability to move your stored water out of Oroville in the summer. And that change in the operational system and the delivery system brought about by Monterey is probably the smoking gun in regard to the pelagic fish crash, and we would certainly appreciate you going back and taking another look at that, because we don't find any analysis of that whatsoever, the effect of the time shifts, the effect of the availability of water, and the increases that resulted on the Delta estuary from the years 1996 to last year.

64-16 (con't.)

The third problem that we find with the EIR at this point is that there really is, there are no real alternatives here. I mean basically you are arguing with yourselves about whether alternative number five is even feasible. So we have a suggestion for a feasible alternative and that suggestion is that you actually don't change the contracts, you exercise 18B,

64-17

that you withdraw the amendment of Article 21, that you reclaim the Kern Fan that was illegally transferred to Kern and that you operate that Kern Fan if you are going to do conjunctive use for the benefit of all of the people in California rather than for the benefit of Paramount Farms.

64-17 (con't.)

Your mitigation in the alternatives of the EWA and a later biological opinion is illegal under the law. You cannot defer mitigations, you cannot pass them off to something that will be taken care of later.

64-18

It's particularly important because of the problem created by your treatment in Chapter Five of the base line. This is the most confusing, and I would say misleading document that has been my experience to read in California, and I read the CalFed and I have read the OCAB document and this one is without question the most confusing base line I have ever seen. There seem to be three base lines. Those base lines are 1995 pre Monterey with an export of about 1.8 million acre feet as a maximum possible, and then you would compare the Monterey contract changes to that situation in a normal base line program. However, because Monterey was rejected the first time and because the litigation took some time and because there has been an endless process of rewriting this document, we have now reached the point where you now have a 2003 base line which allows you to mask all of the increase in pumping allowed by the Monterey Amendment contract changes from 1.8 million acre

64-19

feet to 3.2 acre feet, and it is reflected in Chapter Five in your own 2003 base line.

Well, as you can imagine, if you compare what you are doing today, what you are enabling today by reapproval of the project, you are comparing it to a 3.2 million acre export out of the Delta with the time shift that I talked about earlier from summer to winter and the only impacts that are reflected are those over and above 3.2 million acre feet. That's not what the court told you to do. The court told you to take a look at exercising the original contract provisions, 18A and 18B, and I see no analysis of what would have happened if you had done that, that is not obscured by this second 2003 base line discussion. It absolutely cannot be followed, I don't believe. So could you please rewrite that in a way that is comprehensible to any decision maker or any member of the public. I have been working on this problem for 25 years and this document is almost impossible to follow in regard to the base line.

Then there is a third base line and that is the base line as if you didn't do anything in the Monterey Agreement but you allowed demand to creep up to 2020, and then you satisfied it. So, in other words, in a document in which the court told you that your entitlement water supply was mostly hope and wishes and dreams, paper water is the phrase they repeatedly used. You have now set up a straw man alternative of a 2020

64-19 (con't.)

base line in which 4.2 million acre feet of water gets used and said well, see how much better the Monterey is than what would have happened without it, which is simply misleading and hopefully not intentional.

64-19 (con't.)

The fifth problem is that you have used a scientific tool that is the best tool you could use for water routing, and that's CALSIM 2, but you have misused it in that you have used it for impact analysis. Now, there have been peer reviews of CALSIM, which we will put into the record in the final written information, but which are on websites that the DWR has, peer reviews say you can't use CALSIM 2 for impact analysis, because it's an export operational model that is hard wired to treat every environmental impact the same, does it meet state regulations, if so, all other water above that goes to the pumps, and that's true in every alternative.

64-20

So, in other words, your alternatives are set up so that they all result in as this document says, no impact and it is done by manipulating the concept of CALSIM in areas in which the peer review of CalFed and CALSIM's own model say is not an appropriate use of the tool.

The problem with that is that if you treat in your modeling everything as satisfied by meeting state law, the environment can never get better, so you have created a floor conformance with the regulations that is the same no matter how you run CalFed on any alternative. And so you have also

created a floor that is a ceiling and the Delta ecosystem is trying to live between a floor and a ceiling that are exactly the same number.

The next problem is that CALSIM 2 also is a model that is hard wired to determine that there is never a shortage of water. What CALSIM 2 does and it really is apparent in this document, is that it comes to the conclusion that there is an infinite amount of source water in the Sacramento Valley, and listening to the Butte Environmental Council they are right on about that, when your modeling document relies in order to meet export of 4.2 million or 3.2 or 1.8 or wherever the base line is, as long as you can take ground water, your computer thinks it can, it masks every damage to the source area and in this particular circumstance results in what has happened with the running of the Monterey Agreement.

In the 19, before it went into effect the average export from the Delta was 1.86 million acre feet and it's displayed as such in your document. By 2003 exports under the new Monterey contract were 3.2 million acre feet. And by last year as you well know the exports were the highest in history 3.7 million acre feet and the estuaries, environmental health was at the lowest ever seen and those two things are connected but they are not revealed as connected in this document.

Now, the way they do that --

MR. ANDERSON: Mr. Jackson, if I could just quickly

64-20
(con't.)

interject, we do have other speakers and in the spirit of providing everyone approximately equal time, maybe we could go to the next speaker and then if there is time at the end we could return to yours.

MR. JACKSON: I think that makes a lot of sense.

MS. McDONNELL: Thank you.

MR. JACKSON: I was going to go last just to sop up the time.

MR. ANDERSON: I was trying to divvy up the time.

MR. JACKSON: That will be just fine.

MR. ANDERSON: Next speaker card here is Barbara Hennigan.

MS. HENNIGAN: I also appreciate you making this trip up here, I hope you had a good drive. My name is Barbara Hennigan, I'm the executive director of the Butte/Sutter basin area ground water users, which is an organization formed primarily to protect the Lower Tuscan Aquifer. We have approximately a hundred families as members both agricultural and domestic well owners, approximately 20,000 acres of orchards represented and what we consider that our constituency are the 99 percent of the people living over the Lower Tuscan Aquifer who are not members of water districts. And that becomes important when as stated here the reliance on environmental water account as a mitigation measure, because of the way that plays out in the Sacramento, in the lower Tuscan

64-21

region. People, landowners in water districts with surface rights sell their surface water to the environmental water account and pump ground water instead, which of course, they have historically never done.

In the Lower Tuscan Aquifer 37 percent of it is over lain by Butte County, 31 percent of it is over lain by Tehama County, and those two counties also provide what we now believe is the recharge zone for the lower Tuscan. According to the last ten years of the farm crop reports more than 50 percent of Butte County's agricultural income comes from orchards and almost 70 percent of Tehama County's agricultural income is from orchards. And orchards are on ground water for a variety of reasons.

64-21 (con't.)

My husband's family started farming in Butte County raising almonds in 1918 and so we have a long family historical memory of both water use, cultivation practices and stream flows.

The early orchards, the trees were planted very far apart so they could capture rain water over a large area to keep the trees alive. With irrigation the orchards are now planted in close rows and the reason that irrigation water is important, that ground water is important is for the water quality because most of the orchards are now on solid set sprinklers. Almonds were brought to Butte County by John Bidwell, he looked at similar climate areas and brought in

trees and plants that he thought would grow there. And so the sprinkler system allows the farmer to very carefully meter water to a plant that, a tree that cannot stand to have wet roots.

The other purpose for having ground water and pumping and sprinkler systems is for frost control. So very little flood irrigation goes on and a lot of our orchards are doing, are on integrated pest management systems to protect the environment and the water quality.

The reliance on the State Environmental Water Account as a mitigation endangers all of those orchards, all of that family, those are mostly family farms. We have very little corporate farming in Sacramento Valley. I would also point out that in the crop per drop theory the almond orchards in the Sacramento Valley are more productive. They use less water to produce crops than do orchards that are now being planted in the San Joaquin where they have only three inches of rain. They must apply up to seven acre feet of water per acre. In the Sacramento Valley where we have 26 inches of rain, we only need to apply two and a half to three acre feet of irrigation water to bring in the crop.

We are very concerned that changes of the Monterey Amendment to the state water, contractors will end up with a much heavier use of the Lower Tuscan Aquifer. North of the Sutter buttes we look at the area around Davis where the ground

64-21 (con't.)

water has been pulled down to the point where it is no longer feasible for Davis and Woodland to use ground water for their municipal supplies. They are now moving to Sacramento River water because of the water quality. We know that underlining that aquifer is you know, miles of brine from the ancient seas that once filled the Sacramento Valley. So the understanding of how thick that lens of fresh water is, is of deep concern to us.

64-21 (con't.)

Last year at this time we were visiting an area in Northern Oregon-Southern Washington where the local people had just learned that every year they had been pumping out 10,000 years of recharge. One generation got to put in big center pivot irrigation systems and sell a lot of wheat, but it is over. Half a million years it will be as good as new but we do not know what the recharge of the lower Tuscan is. Because I have a historical memory, we do know that it is being pulled down. Rock Creek once ran year round through my husband's family's ranch, there was an Indian village on it that Chico State anthropologists said was continuously inhabited for 3,000 years. It was surrounded by piles of fresh water muscle shells and the piles that were deep enough that certain areas of the orchard had to be treated differently because of the residual from the shells.

64-22

The family talks about pitch forking salmon out for canning but almost no one is alive who can remember when Rock

Creek ran year round. It has become a seasonal stream and it would be, we see that the same possibility for big Chico Creek, for Butte Creek and these are the creeks that cross the recharge zone, this is the source of recharge for the Lower Tuscan Aquifer.

So for the issues of protecting the water quality, protecting the stream flow in the Sacramento, one of the things that we have learned is that the Sacramento River becomes a permanently losing stream at the Sutter buttes. When I first started looking at the water issues that point was at Grimes south of the buttes, now it is at Princeton, moving north of the buttes. As the Sacramento becomes a losing stream farther and farther north because of loss of the Lower Tuscan Aquifer, that means that it, there will be less water that the rest of the State relies on.

64-22 (con't.)

One of the things that we are very aware of up here is the fact that the State relies on not merely the water quantity from the Sacramento and Feather Rivers, but also the water quality, and the most important thing you can be doing is protecting that water quality and this document needs to address protection of the water quality, protection of the connectiveness of the aquifers that are still viable and still connected to the environment that filters the water that goes into the rivers. It's a whole area that needs to be addressed, and when I go to the state water meetings I find a lot of

64-23

64-24

people in the southern part of the state who complain that their constituents don't know where their water comes from, and I am sitting around with a lot of people who know where the water comes from but don't know anything about the region that actually produces the water.

I think a more useful approach to dealing with the water issues would be to identify areas that are net producers of water and net consumers of water, and while to the rest of the state it appears that the Sacramento Hydrologic Region is a net producer of water, we know that from the Sutter buttes south it is a net consumer of water.

So ironically at a time when the State is going to be needing more water, the area that physically produces that water is going to be getting smaller and that needs to be addressed in this document.

So I am very concerned that this is a chance to have a really good analysis of the effect of all of these water transfer plans and that need to be done with a view towards what is, what is the best long term for the state, and of course, up here we believe the best thing that could happen is that you turn the north state into a giant sponge that funding for flood meadows at one of the last water plan meetings, someone said that we need to start thinking about saving water higher and higher in the water sheds, and I see this as a process of merely, you know, milking the cow and we hope that

64-24 (con't.)

you don't kill the cow. And thank you for your time.

MS. McDONNELL: Thank you.

MS. HENNIGAN: And we will be submitting written comments.

MR. ANDERSON: Thank you. The next speaker card in front of me is Allison Dvorak.

MS. DVORAK: Hello, I'm Allison Dvorak State Water Contractors. We are an association of 27 of the 29 entities that contract with the State for statewide project water supply. Thank you for the opportunity to comment here. My comments will be very brief, but I basically just want to cover what the Monterey Amendment is and what it does, just background kind of what you gave in your presentation the amendment developed after it became apparent that the State Water Project was not going to be able to deliver supply as was originally envisioned in the 1960s when the contracts were developed. Restrictions due to then unforeseen environmental conditions and concerns and regulations, as well as hydrology led to severe statewide project water supply cut backs in the early 1990s and that resulted in disputes between agricultural and urban contractors about how the limited supplies should be allocated.

The Monterey Amendment addresses these disputes about the water allocations, additionally allows flexible management of the limited state water project supply and it provides

64-24 (con't.)

64-25

funding for the local projects in the contractor surface areas, and since the amendment is really about updating the contracts to flexibly manage the supply and reflect the current liberal conditions the environment impact as shown in the environmental impact report are less than significant in almost all resource categories. Additionally, the Monterey Amendment provides the flexibility that has allowed the State Water Project to weather the recent drought in the past year without the hardships that have been previously seen in the 1990s.

64-25 (con't.)

And that's the extent of my comments. We will be submitting formal written comments by the deadline. Thank you.

MR. ANDERSON: Thank you. I don't have anymore speaker cards in front of me. Are there others in attendance that would like to comment? There is not, I guess we can return to Mr. Jackson.

MR. JACKSON: Thank you. I appreciate you letting me come back because I had just gotten to Chapter Six. The Monterey Amendment of the original contracts of the State Water Project ought to be reassessed completely by DWR contractors.

64-26

It is clear from looking at Chapter Six, page 621 you have a wonderful table that demonstrates the difference between the old contracts and the new contracts. And the year I would like to highlight is 2001, which is the year in which the withdrawal of the original contract provision 18A is likely, was in that year the urban water users lost 412,000 acre feet of water that

64-27

they would have gotten under the old contracts.

MS. McDONNELL: Would you reference that table again, please?

MR. JACKSON: Sure, it's on page 621, and on page 622 there is the corresponding table which is that in the year 2001 ag got an increased delivery of in that year of 412,000 acre feet. And so basically over the ten-year period that is reflected in the tables ag's take out of the Delta was 400,000 acre feet more than it would have been under the old contracts.

64-27 (con't.)

Now, I would like to see an analysis based upon that table that compares last year and this year and what you can expect out of the Wanger decision. I mean which is a regulatory drought, as I hear it explained by all of the people in the urban areas. But the idea that, the description of your project is that you want to reconcile the disagreements between ag and urban may be a very good one, but the reconciliation is completely different now than it was in 1995 and it is just not reflected in the document.

64-28

I would expect that if you do address the substantial change, I mean 412,000 acre feet is getting fairly close to what the metropolitan lost on the Colorado with the QSA in terms of their surplus water. This is a huge section of their water.

Now, we would expect that they are going to try to

defend that situation by saying well, yeah, but we got more water in the winter and therefore it was a good contract change. And I would like to see that examination in the document.

64-28 (con't.)

To take a real look at whether or not under today's existing circumstances with the pelagic fish crash, global warming and almost no water in Lake Oroville. If you do go down 70, take a look, that's the lowest I have seen it with one exception and that was at the end of 1977. Shasta, because of the change in the joint point of diversion which needs to be dealt with if you are using the state pumps and in the Monterey Amendment to move now federal water, Shasta is below what was considered for years and years the absolute bottom that you could go to and still keep salmon alive on the Sacramento River, which was 1.9 million acre feet. And if I read the DWR reports, I didn't read them this morning, I read them two days ago and it was 1.8 million and all of that was water moved under the new Monterey purposes.

64-29

Now, it ought to be disclosed in here what you mean when you say "conjunctive use," because there is no water in Southern California that is new to put into the ground. There is no water in the San Joaquin that is new to put into the ground. If you are going to run those conjunctive use projects as reflected by the current land owner you will have to have a source of water and it is undisclosed in this document. There

64-30

is absolutely no way to understand where that water comes from particularly given the fact that the courts are ordering DWR to slow down.

Now, we believe that if you examine carefully the changes in the contracts that you will find that the conjunctive use programs, part of the Tim Quinn's (phon) tool kit, the aqua executive director, are reliant on a new source of water. I mean you have got to fill those ground water holes somewhere or they are reliant on increased pumping from the state water in the Delta, which is the only one that has capacity.

So I don't find any discussion of any of the negative side of the conjunctive use programs that were enabled by the changes in the contracts.

64-30 (con't.)

Now, since I am here for Fisheries Group I probably ought to talk about the fish. In Chapter Seven, 7.3 fish, when you get to the bottom of it you find that DWR rightfully finds that the Monterey Amendment changes could have a significant impact on the pelagic fish. Well, since you did the Monterey Agreement changes for the last seven or eight years I guess we could change that and say did cause the damage to the pelagic fish. I think you ought to be straightforward about that. Your operation in the change in Monterey caused some part of the collapse and I think you ought to look at that because it's not there.

64-31

And the mitigation that takes it to less than significant was very well pointed out by a speaker before me, it's the EWA. Well, the EWA as you pointed out is going to be gone in a year. It didn't work. It has never been adequately funded. It is considered by the environmental community to be a joke and there is no discussion of the scientific dispute over the EWA, it is just assumed to take the damage that the pelagic fishery that we all know is there from great damage to no impact, and the EWA simply can't do that. I mean we are talking about millions, well at least one million extra water enabled by Monterey and a EWA is a mitigation that has never been more useful than three hundred thousand and usually doesn't have that much water. 64-32

The cumulative impacts of this project are not adequately explained to the public. And I don't think because they are not in the draft environmental document I don't think there is any way Lester Snow is going to know about it until he makes a decision to go forward. I think a decision maker like Mr. Snow deserves the best information he can get and here in terms of cumulative impacts, the analysis leaves out a number of the cumulative impacts. The Napa program, South Delta Improvement Program, the biological opinions being found inadequate, the violation of the water quality laws by DWR and the bureau and the Delta that have resulted in the State Board issuing cease and desist orders, all of those overlying 64-33

effects. The relationships between Monterey, the Delta Accord and CalFed which have resulted in the damage in the Delta are not displayed as one full package of impacts.

In terms of the alternatives, yes, the court did order an analysis of what would happen if you just stayed with the same contracts and actually followed the law, which would be this year the net would be getting 400,000 acre feet more than it was getting last year, because of the protection of the 18A. And 18B would satisfy what DWR has been ordered to do by two courts in my personal experience. You may have been ordered to do it by other courts in cases that I wasn't in, but you were ordered to take a look at exercising 18B by the Third District Court of Appeals in PCL versus DWR, but in RCRC versus DWR, or the CalFed problematic documents, the Third District Court of Appeal again pointed out that DWR had failed in the CalFed problematic document because they did not analyze an alternative that reduced exports and found alternative water sources to make up for the impacts to the contractors. And those are everywhere, you don't have to go to the Delta. Those can be found in Bulletin 160, the Governor's own water plan, DWR's own water plan, 160.05, 3.1 million acre feet of water that can be easily found in the demand areas that can reduce demand quicker than we can build supply without killing the Delta, and I don't see any of that displayed as an alternative anywhere.

64-33 (con't.)

64-34

And it is kind of funny that you have been ordered twice by the Third District Court of Appeals, who is going to hear this case and who I am trying to make a record for, here you go again. You have not looked at an alternative to reduce exports.

64-34 (con't.)

Okay, the last one that I would like to deal with is that you have taken a look at Plumas County in terms of regions, thank you very much, and found that with wonderful water shed programs that we are all trying to work on here any impacts here from a result of the settlement agreement or anything else are less than significant, and I would argue that they are beneficial, and I agree with you every bit on that, and I believe that you should reflect that in your document as you rewrite it with what would, what will happen when global warming, because those of us who live here see the snow pack going away. I mean by 2050, your own documents, which are the most conservative, I guess I would say radical way of looking at it, but the least damage to the water supply by 2050 is 25 percent of the existing water supply.

If DWR looked at an alternative that would actually restore these meadows up here and became people who were actually trying to take care of sustaining the State Water Project, that snow pack or a lot of it as it declines can be put into ground water here without any impact that is negative to anybody, and then it trickles out to you and sustains your

64-35

water supply. But we can't afford to do this. So any reliance on Plumas County to try to catch the snow pack so that it doesn't enter Lake Oroville and have to be flushed in March because you are worried about another storm coming in. We can hold it underground up here and not lose it as evaporation. We can mitigate, which is what we are trying to do here.

The declining snow pack in the face of global warming, and I would like to see you actually take a look at that while you are doing the rest of these.

64-35 (con't.)

I want to thank the three of you, I mean I know I have tried your patience here and I have talked an awful lot, but Monterey is in many ways the last chance for the pelagic fish. If your decision maker accepts the Monterey contract changes what basically happens is the rest of California gets sacrificed in a way that is unnecessary. All of the money that is going to be put into attempts to get more water, and there isn't any in Northern California, is going to result in stranded assets.

The original Monterey contracts were brilliant and they are much better than the new amendment, and I don't see any side by side analysis of the old contract provisions given today's circumstance with the new contract, provisions given today's circumstance, and I think that the document must show that no matter how narrow you describe your purpose and need, to use one term, or your project description to use another

64-36

one, and how much you mask the base line and how much you use CALSIM for impact analysis when the peer review folks have told you it's not for that and doesn't work for that. So thank you very much.

64-36 (con't.)

MR. ANDERSON: If anyone else would like additional time to speak or to provide additional comments would you come to the podium and state your name, please?

MR. DUBER: Yes, my name is Stevee Duber, D-U-B-E-R. I live at High Sierra Rural Alliance. I am just coming up to speed on this, but I would just like to add a few comments to what Mr. Jackson said and encourage you to look at the impacts to Sierra County as well as the lower water shed in Plumas County, because this will also have impacts on that part of the Feather River Basin that is in Sierra County and the possibilities of enhancing water storage as Mr. Jackson spoke. Thank you.

64-37

MR. ANDERSON: Okay, if there are no additional comments at this time then we would like to formally close the public hearing and again, thank you all for coming and participating today.

STATE OF CALIFORNIA)
) SS.
COUNTY OF PLUMAS)

I, AMY JO TREVINO, CERTIFIED COURT REPORTER OF THE STATE OF CALIFORNIA, IN AND FOR THE COUNTY OF PLUMAS, HEREBY CERTIFY:

THAT I WAS PRESENT AT THE TIMES AND PLACES HEREIN SET FORTH AND THAT I REPORTED IN SHORTHAND NOTES THE PROCEEDINGS HAD; THAT I THEREAFTER TRANSCRIBED MY SAID SHORTHAND NOTES INTO TYPING, THE FOREGOING BEING A FULL, TRUE AND CORRECT TRANSCRIPTION THEREOF, AND A FULL, TRUE AND CORRECT TRANSCRIPTION OF THE PROCEEDINGS HAD.

_____

AMY JO TREVINO, CA #5296

(Pages 1-34, incl.)

DRAFT EIR FOR MONTEREY AMENDMENTS

--oOo--

REPORTER'S TRANSCRIPT OF PROCEEDINGS

MONDAY, DECEMBER 3, 2007

1:00 p.m.

Held at:

Bonderson Building

901 P Street, Hearing Room 102-A

Sacramento, California 95814

Reported by:
LAURIE D. LERDA, CSR
CSR NO. 3649
Job No. 58304

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E X H I B I T S

DRAFT EIR FOR MONTEREY AMENDMENTS

(No Exhibits Were Marked.)

BE IT REMEMBERED, that on Monday, December 3, 2007, commencing at the hour of 1:00 p.m. thereof, at the offices of Bonderson Building, 901 P Street, Hearing Room 102-A, Sacramento, California, before me, LAURIE D. LERDA, a Certified Shorthand Reporter in and for the County of Sacramento, State of California, duly authorized to administer oaths and affirmations, the following proceedings were had:

--oOo--

MS. QUAN: I want to emphasize that at this point in the process we're looking for comments and concerns about the environmental impact alternatives and proposed mitigation measures. We're not here to respond or to address these comments right now. The first speaker will be is it Adam Snow or Scroll?

THE WITNESS: Scow.

MS. QUAN: Scow, excuse me.

MR. SCOW: Hello. Thank you.

My name is Adam Scow. I'm the California organizer with the group called Food and Water Watch. We're a national public interest organization very concerned about water and protecting water as a public resource.

Overall we're very disappointed with this 65-1

Draft Environmental Impact Report and there's a lot of reasons, but I will just touch on a few. Others here will touch on other problems that we support their concerns about.

The first problem we see is the transfer and the privatization of the Kern Water Bank, a public asset that was built and paid for by the state which is now being considered for a transfer to a private interest, a special interest.

We think that's a direct violation of the Public Trust Doctrine and doesn't serve the most benefit -- doesn't allow the state or DWR to manage the water in a most beneficial way for all of our residents, so we'd like to see that changed.

65-1 (con't.)

Secondly, we think that the EIR should be modified to reflect how much water can be actually delivered by nature. The contract should be recalculated to fit how much water the State Water Project can actually deliver and given that we're entering a period of climate change we think that's all the more important.

65-2

And also we're disappointed that the Draft EIR does a really inadequate job of analyzing alternatives including repealing these amendments wholesale. So, I just wanted to express those

65-3

comments and thanks for the opportunity.

MS. QUAN: Thank you.

Next speaker is Mindy McIntyre.

Ms. McINTYRE: Hello, Mindy McIntyre for the Planning and Conservation League and as original plaintiffs in the negotiation and participants in the EIR committee. I know that you've heard a lot of our comments in the past and we're likely to write down extensive comments as well, so I'm not going to go over things that we've already said in the past, only very very briefly talk about three things that we would appreciate seeing or made more clear in the final EIR. 65-4

The first is what will be done with the EIR after its final and what will the impact on the original amendments be. What is DWR intending to do with the EIR? Is it to be used as a decisional document or will it just be an approval of the original contract? I think that we made that point before, and we would appreciate that being clarified for the rest of the public.

The other issue that I see with the EIR coming out when it has come out which we're happy that it is out is the Ranger decision and the fact that the modeling in the EIR does not reflect the 65-5

biological opinions and other lawsuits that have come down which will affect the operation of SWP. I think that does have implication for, for instance, the urban preference and the impact to urban areas.

As we know Ranger's decision will primarily affect winter and springtime pumping that is time when surplus water was available to make up for water lost in dry years.

So, does DWR anticipate including those types of modeling in the final document as well as including new information on climate change.

IPPC has just put out another document and we do have better information on climate change and again that will affect the amount of water available for storage in the Delta as well as impacts to Delta species who depend on cold water pools and certain temperatures in the Delta, so those are things that need to be included in the final EIR.

Finally, with regard to the alternatives, again we made those points before and I don't intend to fully make them here, just to say that if Article 18 B were implemented then it would be clear what water in California is reliable and which water in California is not reliable and should not be used.

The fact that there is an SWP reliability in

65-5 (con't.)

65-6

65-7

the report doesn't really do that. It doesn't make clear that Article 21 shouldn't be used for development.

And developments in California are depending on Article 21 water and that is why there is a significant impact with the Monterey Amendments and we urge you to evaluate that in the final EIR.

65-7 (con't.)

Thank you.

MS. QUAN: Thank you.

Next speaker is Terry Erlewine.

MR. ERLEWINE: I'm Terry Erlewine.

I represent the State Water Contractors who are representing of the 27 of the 29 contractors that buy water from the State Water Project.

We support the Monterey Amendment and the Monterey plus EIR that have come out. We think that the environmental evaluation in there is appropriate. In fact, looks like in some cases it may be overstated, but we think that this is a fair response to the request by the Court and it's a good way to proceed.

65-8

I think it's useful to think back to what the Monterey Amendment does. It does not affect the total amount of water that's available to the contractors. The State Water Project is operating

subject to regulatory standards in the Delta that indicate or that determine how much water is available. What the Monterey Amendment does is it resolves some long-running disputes over how the contract would be implemented, how the shortages, the ag first shortage policy would actually be in place, and so it does a good job of doing that.

It also makes the State Water Project a little bit more -- it provides the tools for managing State Water Project local agency and it allows more funding for local agencies to make investments.

So, we think that the Monterey Amendment is a -- the EIR is adequate and we think that the project should go ahead.

65-8 (con't.)

MS. QUAN: Thank you.

Next speaker Soren Jespersen.

MR. JESPERSEN: Hello.

My name is Soren Jespersen. I'm with the Friends of the River in Sacramento. We represent about five thousand people throughout the state.

Like Mindy and Adam said we have some serious concerns about the proposed contract amendments, but unlike Mindy I'm going to go ahead and state them here again despite the fact you may have heard them before.

65-9

We're concerned that the contract amendments would eliminate important drought safeguards for water users. Without these assurances it's likely that in times of drought urban users will be forced to go out in the open market and buy water at what some might say are inflated prices. This could likely trickle down to the ratepayers which we're concerned about. 65-10

We're also really alarmed that DWR would consider to give away the Kern Water Bank to local interests. This facility was developed at a cost of 120 million or so the cost to taxpayers and as such as the state controlled entity it's operated under DWR's mission to serve the interest -- to serve the public interest. By transferring this to a private interest it would no longer be under that mandate essentially. We're concerned about that. 65-11

We're also concerned that the proposed amendments would promote water management practices that would continue to harm the environment particularly the recently newsworthy Delta.

The amendments would encourage contractors to request maximum amounts of water at all times of the year including spring and winter months which would likely continue to degrade the fisheries in the 65-12

Delta. We believe that or we think the DWR should improve the EIR to show that or basically to acknowledge that things have changed since 1994, its been thirteen years. ESA concerns as well as concerns about climate change have changed in the past thirteen years. DWR in its own in the EIR admits that climate change may reduce reliability of the Delta by 25 percent in dry years. This should cause DWR to pause before it considers adopting these changes that will likely encourage even greater reliance on the Delta.

And finally rather than adopt the amendments as proposed we think the DWR should fully analyze an alternative that's maintaining the urban drought safeguard, provide the reassessment of the capacity of the State Water Project utilizing the Kern Water Bank for drought mitigation and environmental restoration and establishes other incentives to reduce the amount on the Delta.

If DWR still decides to move forward with this with the amendments that EIR should condition implementation of the amendments on a package of mitigation measures designed to address the impact anticipated to result from the amendments.

Thank you.

65-12 (con't.)

65-13

65-14

65-15

65-16

MS. QUAN: Thank you. Are there --

David Nesmith.

MR. NESMITH: David Nesmith with the Environmental Water Caucus.

We're a group of several environmental fishing groups statewide and we deal with water policy statewide. 65-17

We have a couple of concerns that probably have been stated by other caucus members or will be in the hearings coming up, but I want to emphasize them.

The farmers should study much more thoroughly how much water has transferred from a water drought reliability and unreliable supply into an annually used water supply as a result of the amendments. 65-18

We believe that with the urban preference and the use of surplus water that there has been a tremendous increase in shall we say drought hardening on the part of the State Water Project because of the use of water from the Delta for stock supply every year and that it makes the State Water Project contractors much more vulnerable in shortage years. 65-19

And let's be clear, there are going to be more and more shortage years because of climate 65-20

change, droughts, and because of the impacts that the state and federal water projects have had on the resource in the Delta.

65-20 (con't.)

One of the places I urge you to look in the final Environmental Impact Report is the way in which the Kern Water Bank has been used.

Since the Monterey Amendment, we believe that the Kern Water Bank has been used for supply much more than for the state approved intention for it when it was owned by the state or developed by the state as a reliability and drought supply.

65-21

State Water Project Amendments that are under consideration in this environmental document we believe have had a tremendously negative impact on the Delta resources especially the fish.

The State Water Project has broken records almost every year since the year 2000 in volumes of water exported. Much of that water there's been a tremendous increase in the amount of surplus water, Article 21 water that has been delivered in those years to urban water users as a perhaps trade-off for the loss of the urban preference. We believe that that should be studied how much additional water has come out of the Delta for the State Water Project contractors that is surplus water and has that had an

65-22

impact on the resource in the Delta, the aquatic resource. The operation criteria and plan that is used as a mitigation for this project is now being redone because it was found to be deficient by the courts.

We urge that this project be -- take cognizance of the fact that the new operation criteria and plan will not even be out at the point of which your project is scheduled to be complete.

65-22 (con't.)

Thank you.

MS. QUAN: Thank you.

Are there any other comments today?

Then I want to emphasize that the -- that written comments are due to the DWR by close of business by Monday, January 14th.

This completes the official public hearing.

Thank you for coming today.

(Whereupon the hearing concluded at 1:33 p.m.)

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STATE OF CALIFORNIA)
) ss
COUNTY OF SACRAMENTO)

I, LAURIE D. LERDA, a Certified Shorthand Reporter in and for the County of Sacramento, State of California certify that the foregoing proceedings in the within-entitled cause were reported by me; that said proceeding was taken at the time and place therein named; and that the proceedings were reported by me, a duly Certified Shorthand Reporter, and was thereafter transcribed, under my direction, by computer-assisted transcription;

I further certify that I am not of counsel for either or any of the parties to said proceedings, nor in any way interested in the outcome of the case named in said caption.

IN WITNESS WHEREOF, I have hereunto set my hand this 14th day of December, 2007.

_____
LAURIE D. LERDA
Certified Shorthand
Reporter 3649
County of Sacramento
State of California

CALIFORNIA DEPARTMENT OF WATER RESOURCES

PUBLIC HEARING

MONTEREY AMENDMENT DRAFT EIR

TO THE STATE WATER PROJECTS

December 4, 2007

800 South Victoria Avenue
Lower Plaza Assembly Room
Ventura, CA

MS. QUAN: Welcome to the California Department of Water Resources Public Hearing for the Draft EIR on the Monterey Amendment to the State Water Project Contracts.

I'd like to thank you for coming tonight. We appreciate your taking the time to attend.

I am Nancy Quan, Chief of the State Water Project Water Rights Program in the State Water Project Analysis Office.

Next to me is Barbara McDonnell, Chief of DWR's Division of Environmental Services.

And on the end of the table is Delores Brown, Chief of the Office of Environmental Compliance within the Division of Environmental Services.

This public hearing is conducting as part of the CEQA record and is intended to facilitate DWR's receipt of comments on the Monterey Plus DEIR.

The purpose of this meeting is to receive public comments. And we have a tape recorder tonight. We originally had scheduled a court reporter, which was unable to attend. So your comments are being taped tonight.

We also will be having another meeting tomorrow night in Bakersfield which you could attend, which we will have a court reporter in that meeting. But

tonight's meeting is being taped.

Please register to comment by filling out a speaker card, which you can pick up at the registration table. And you submit the card to a staff member sitting up front here, or to us.

Delores, do you want to begin?

MS. BROWN: Good evening. And once again, welcome. We want to go through a few slides here to set the stage for the project. I'm going to go to the first half, and Barbara will take the second half.

The Department prepared the Draft EIR for the Monterey Plus project to satisfy the requirements of CEQA. This Draft is a disclosure document that evaluates the potential environmental effects of the proposed project and its alternatives, identifies potential significant environmental effects, and proposes mitigation measures.

Once again, we are here today to allow the public an opportunity to comment on the Draft EIR. The transcript or the tape recording of this meeting will become a part of the final EIR. Next slide, please.

The principle State Water Project facilities potentially affected by the project are Lake Oroville on the Feather River, the Banks Pumping Plant in the Delta, the California Aqueduct, San Luis Reservoir,

and the two terminal reservoirs, Castaic Lake and Lake Perris.

The State Water Project supplies 24 million -- supplies water to over 24 million Californians, and irrigates 750,000 acre feet -- acres of land in the SWP service areas from Plumas to San Diego. The SWP is primarily paid for by water agencies.

In the late 1960s 29 public water agencies signed contracts to receive State Water Project water. The original contract specified how much water contractors would receive, their Table A amounts in any given year based on hydrology.

The contract specified that agriculture would encounter the first cutbacks during a drought, and that contractors would pay certain costs whether they received deliver or not. Next slide, please.

The Monterey Amendment is a result of several discussions between the agriculture and M&I contractors that began during extended dry periods in the late 1980s and early 1990s. Some farmers received on SWP water in some years, and reduced supplies in others, while still paying for the project, while M&I contractors argue that cutbacks should be based on full contractual Table A amounts and not requested amounts.

Contractors' discussions about the contract language interpretation continued into 1994, and eventually led to consensus of 14 principles known as the Monterey Agreement. The agreement would be eventually used to modify the contracts.

An EIR was completed and certified on the Monterey Agreement in 1995. The resulting Monterey Amendment was made part of the long-term water supply contracts.

After the EIR was certified, Planning and Conservation, the Citizens Planning Association of Santa Barbara County and Plumas County Flood Control and Water Conservation District challenged the adequacy of the EIR.

In 2000 the court ruled that DWR should prepare a new EIR, and instructed the contractors, the plaintiffs and the Department to execute a Settlement Agreement. In anticipation of a Settlement Agreement happening, the Department issued a Notice of Preparation in January 2003. The Settlement Agreement was eventually signed in May of 2003.

The proposed project for the new EIR is an analysis of the Monterey Amendment and a Settlement Agreement. As part of the Settlement Agreement, the Department was allowed to continue to operate the

project under the Monterey Amendment while preparing the new EIR.

The Monterey Amendment has six objectives that were defined in the EIR, the Draft EIR. The key provisions of the Monterey Amendment are:

The transfer of 130,000 acre feet of Table A amount from agriculture to cities;

The permanent retirement of 45,000 acre feet of Table A amount;

The transfer of the Kern Water Bank to local agencies;

The removal of the permanent water shortage provision, article 18(b), from the contracts;

Facilitation of water supply management practices, including storage outside the Delta. Excuse me, storage outside the contractors' service area;

Carryover storage in San Luis Reservoir;

Provisions for flexible storage in Castaic Lake and Lake Perris for Metropolitan Water District, Ventura Flood Control and Water Conservation District, and Castaic Lake Water Agency;

And the establishment of a turn back pool.

The Settlement Agreement has five objectives. The primary provisions of the Settlement Agreement

are:

Improved dissemination of information of SWP reliability;

More public review of proposed contract amendments;

Funding for a watershed forum;

And watershed restoration in Plumas County.

The proposed project eliminated the initial agricultural use cutbacks. It specified that all project water would now be allocated in proportion to annual Table A amounts. It provided more unscheduled water to M&I contractors in wet years. It added water supply management practices that improved delivery reliability. And it allowed the development of locally owned Kern Water Bank.

At this point Barbara will take over and describe the alternatives and impacts.

MS. O'DONNELL: Next slide. Thank you. Okay. In this EIR we have evaluated five alternatives in addition to the proposed project. We have four of them are variations of a no project alternative, and then we have an alternative five.

The no project alternative one, in no project alternative one, none of the provisions of the Monterey Agreement or the Settlement Agreement are

implemented. DWR would continue to work with the Kern County water agencies to develop and use the Kern fed element to increase State Water Project reliability. None of the significant impacts of the proposed project would occur, and none of the objectives would be met.

Under no project alternative two, between the years 1996 and 2003, all Table A transfers and retirements under the proposed project would have occurred and would not be undone. Water would be allocated in accordance with Monterey Amendment allocation, all water supply practices carried out between 1996 and 2003 would be included.

After 2003 no further Monterey-related transfers or retirements of Table A would be approved. Water would be allocated in accordance with pre-Monterey Amendment long-term water supply contracts. Water supply management practices would be discontinued, but outside service area storage would continue using facilities that were in place in 2003.

No new Monterey-related outside service area storage would occur. And between 1996 and 2003 this no project alternative would have the same environmental effects as the proposed project, but in the future it would have environmental impacts similar

to but less than those of the proposed project.

The next two alternatives are variations of the court-ordered no project alternative. Under both of them DWR would continue to administer State Water Project water allocations in accordance with the pre-Monterey Amendment longer-term water supply contracts. None of the elements of the proposed project would be implemented.

A permanent water shortage may have been declared and article 18(b) of the long-term water supply contracts may have been invoked. None of the environmental impacts of the proposed project would have occurred under the two court-ordered no project alternatives.

They may have met some of the proposed project objectives with regards to disputes over allocations between agriculture and M&I contractors.

Okay. In alternative five, we would implement all the provisions of the Monterey Amendment and the Settlement Agreement with the exception of the water supply management practices. Alternative five would avoid potential significant adverse effects of the proposed project's groundwater banks in Central Valley, potential significant effects on Delta outflow, and on environmental resources at Castaic

Lake and Lake Perris.

Although alternative five would meet some of the proposed project objectives, it would not meet other objectives, and would leave a significant number of M&I users with less water and no additional benefits.

Okay. Next slide. Now I'm going to briefly go over the environmental impacts of the proposed project. And I'm going to do this by geographic area starting in Plumas County, where the watershed forum is investigating several watershed restoration projects.

Overall the effects are beneficial environmentally, with minor and mitigable adverse environmental impacts related to construction. However, overall the projects would have a less than significant residual adverse impact.

In the southern San Joaquin Valley, mitigation for impacts when constructing and operating the Kern Water Bank were detailed in a Kern Water Bank Authority Habitat Conservation Plan. And these are summarized in appendix E of this Draft EIR.

The impacts result from construction of the percolation ponds and other groundwater facilities, and there are potentially adverse effects on terrestrial biological resources and cultural

resources and some other minor construction impacts. Mitigation measures were included in the Habitat Conservation Plan which minimized adverse effects to less than significant levels.

In addition, the water supply management practices would encourage the construction of new percolation ponds and other groundwater facilities in Kern County, and could result in minor short-term adverse construction impacts. Again, these could be potential adverse impacts on terrestrial biological resources and cultural resources. Any new groundwater banks would be subject to CEQA review and development of appropriate mitigation measures.

Other potential impacts in Kern and Kings County relate to a trend toward replacing annual crops with permanent crops, which the project might accelerate. This could have an effect on available foraging habitat for Swainson's Hawk, which is a state-protected species. However, we evaluated this impact in great detail and determined that it was a less than significant impact on the Swainson Hawk.

At Castaic Lake and Lake Perris, right here in your neighborhood, we determined that flexible storage practices may lower water levels beyond the levels that occurred pre-Monterey Amendment, and this results

in potentially significant and unavoidable impacts on terrestrial resources, soils, air quality, and recreation.

In the Sacramento/San Joaquin Delta, the proposed project would result in increased diversions from the Delta in certain months of certain years. Between 2003 and 2020 we estimate that there is a potential to increase on average 50,000 acre feet per year of diversions from the Delta. Of this 50,000, we estimate 38,000 could be diverted when sensitive fish species would be at risk.

The environmental water account has provided mitigation for these adverse effects since 2008 and well on through 2008. However, this could still be a potentially significant impact on fisheries.

Operations of the State Water Project are currently the subject of a court remedy, and that's designed to prevent harm to Delta smelt. Also, the Department is involved as an applicant in an ongoing re-consultation on our operations with the Fish and Wildlife Services and NOAA Fisheries to address impacts of project operations in the Delta and upstream.

The Draft EIR proposes mitigation for Delta fisheries impacts and that is by extending the

environmental water account or an environmental water account-like program within the context of the operational court order or future biological opinions.

The environmental water account enables pumping curtailment at times to reduce impacts to sensitive fish species, and compensates the contractors for losses of water due to these fish actions. We have evaluated that this would result in a less than significant residual impact on Delta fisheries.

We have also evaluated growth-inducing impacts of the proposed project. The water transfer between agricultural contractors and urban contractors could support at a maximum an additional 360 to 560,000 urban residents in the Bay Area and Southern California. There may be secondary environmental impacts of this growth. These impacts were addressed in individual CEQA documents related to permanent water transfers and to local growth plans.

And again, the next steps are proposed. The comment period is January 14th, at which time we will then respond to comments and prepare and certify a Final EIR by July of 2008.

MS. QUAN: Right now we are looking for comments/ concerns about the environmental impacts, alternatives, and proposed mitigation measures. So

far we have three cards here for three speakers. Are there any elected officials or representatives here tonight to speak? If not, then we'll start with the speakers. Carolee Kreger, please. And you can speak at the podium over there.

MS. O'DONNELL: Yeah. I think that mic is on.

MS. QUAN: Yeah, that mic is on already.

MS. KREGER: Good evening. And thank you for the opportunity to express our concerns regarding the project.

The amendments change the contracts in several fundamental ways, all of them bad for the environment and bad for the State's ability to manage our water resources in the public interest. 66-1

If this new Draft EIR is formally approved by DWR, it would eliminate the requirement that agriculture take the first hit during times of drought before urban areas, leaving urban areas vulnerable.

It would hand over the State-owned Kern Water Bank, the largest groundwater storage facility in California, to a coalition of interests dominated by private corporations, despite state laws that prohibit just such a transfer. This would effectively privatize the major storage facility and make the State Water Project less reliable for everyone else. 66-2

It would eliminate the original contract requirement that DWR must determine the realistic yield of the State Water Project and limit contract deliveries to that amount. This is article 18(b). Instead, the proposed contract amount would allow DWR to continue promising to deliver water that does not exist, paper water which has been used to fuel unwise development all over California.

It would allow DWR to continue over-pumping from the Delta in the winter and spring months, which has already under the provision use of the Monterey Amendments contributed to the near extinction of the Delta smelt and other Bay Delta fish populations.

It would allow new transfer -- the new transfer rules allow contractors to sell water outside their service areas. This begins the privatization of the State Water Project.

66-2 (con't.)

The sum total of the amendments means a loss of accountability to the State. Changing the so-called surplus article 221 -- excuse me. Changing the so-called surplus article 21 water to interruptable water is allowing water marketing, where contractors and developers are counting on this non-permanent water for building homes and businesses, not a sustainable practice. The amendments remove the clause that

66-3

specifically states that permanent economics like new houses are not supposed to be founded on article 21 surplus water.

CWN is preparing extensive comments on this Draft EIR to be submitted to DWR I guess now in mid-January pointing out its many problems. However, given past experience, we have every reason to believe that our concerns will be largely ignored, and that DWR will adopt a final EIR that is very close to the original.

At this time I would like to incorporate the Declaration of John Lehigh in support of the California Department of Water Resources proposed interim remedy dated August 21st, 2007. Mr. Lehigh concludes that:

"To meet the requirements of the State Water Resources Control Board decision D1641, the State Water Project and the Central Valley Project would have to reduce pumping exports considerably."

I have an attachment here to hand to you.

Mr. Lehigh assumed that both the State Water Project and the Central Valley Project are equally responsible for meeting the objectives of D1641. If this is taken literally, the State Water Project would have to reduce exports by 220 to 440,000 acre feet a year in dry years, and by 825,000 acre feet up to 1.16

66-3 (con't.)

66-4

66-5

million acre feet in average years.

This is very significant since the average actual deliveries of the State Water Project from 1990 through 2004 was just 2.0 million acre feet. So the State Water -- we are very much -- you know, very doubtful that the State Water Project reliability is going to be anywhere close, given the court order by Judge Wanger, and given the fact of global warming, you know, given all of the factors. So we're very concerned about that.

I would also like to include in the record here my letter to DWR Director Lester Snow of May 31st, 2007. It's attachment two. And it comes with all the attachments that I sent to Director Snow.

This letter goes into great detail about our above-stated concerns. Related to this letter is a press release that CWN put out in conjunction with this letter to Director Snow, and this is attachment three. I hereby incorporate all other comments opposing this Draft EIR in its present form.

Thank you very much for this opportunity to comment. Here's all the documents.

MS. QUAN: Thank you. Next speaker is Dorothy Green.

MS. GREEN: Yes. Good evening everybody. We're

66-5 (con't.)

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66-7

delighted that you've come to hear comments on this EIR. I am here representing just myself. I belong to several organizations, but I'm not representing any of them tonight.

The State Water Project has a very interesting history. It was originally designed to deliver over 4.2 million acre feet of water, but yet it was never built out. And only half of it has been built. But yet, the push is on to deliver all of it, whether or not the Delta can withstand it, whether the environment or the state can withstand that much water removal from our ecosystems. It clearly cannot. 66-8

And with the promise of delivering all of that water that came with the original contracts, there were also promises that the very big problems of groundwater overdraft in the Central Valley were to be dealt with. That a good part of that water was supposed to originally go to correct the big groundwater overdrafts in the San Joaquin Valley and have never been done. Which leads you to question all kinds of promises that have been made by the State. 66-9

We've got a project that can deliver on average only half, or has been historically been able to deliver only half of the contracts. And a good chunk of what the State Water Project was supposed to have

been done has never been accomplished.

I find it very interesting that it has taken like five years for DWR to write this new EIR. And I appreciate the difficulty with which you're dealing with the political pressures that have been placed upon you. Because it is clear that when you look at this whole proposal of what the changes to the contracts are going to do is essentially to give control of the whole State Water Project to the giant agribusiness and development interests in the state, to the detriment of the existing population, and to the detriment of the environment. There just isn't enough water to go around.

And now with the Judge Wanger decision reducing even further the amount of water that can be pumped out of the Delta, it's clear a whole new tack on meeting the state's water needs has to be taken, which I'll talk about a little bit further.

The Kern Water Bank is an obscenity. It should never have been given away by the State to private businesses. Paramount Farming is now managing this. It's a private big giant agriculture -- I think the biggest grower in the state. This should have stayed in public ownership, should have remained in public hands.

66-9 (con't.)

66-10

66-11

Any kind of mitigation to the Delta that does not include leaving more water in it is not going to work. The Delta is crashing because so much water is already taken out of it. And yet, this whole proposal is only to figure out ways of taking even more water out, and converting what water can be taken out of the system into the free market so that people can profit, individuals, especially the big agribusiness interests, can profit from marketing that water.

66-12

66-13

And the push to privatize our water resources is unconscionable. Water belongs to all of us. It is in the public trust that water has to remain managed and controlled by the public, by the State.

The best way to meet our water needs is spelled out in the book that I've written and that I've just published called "Managing Water: Avoiding Crisis in California". And what needs to happen is we just really have to learn how to use the water that we've got a lot more efficiently. A lot more efficiently.

66-14

The City of Los Angeles has grown by a million people over the last 25, 30 years, and yet, its water use has remained essentially the same. The rest of the state has got to begin to emulate that.

There are water agencies in Southern California, county sanitation districts, for example, LA County

Sanitation District, that has been reclaiming and reusing a tremendous amount of wastewater. The State has just begun really to emulate what's happening, or what county sanitation districts has been doing since 1929.

Tertiary-treated water has been spread and allowed to soak into the groundwater and is pumped up down aquifer into the drinking water supply thoroughly cleansed by the soil finishing that cleansing job. It's a tremendous amount of water that can be reused.

We've just begun to really look at conservation, and especially landscaping, to revert back to the kind of landscape materials that are native to California. And there's growing interest in doing so, certainly here in Southern California, in looking toward totally changing, totally reforming our landscape materials and reverting back to our native plants.

You know, the history of farming -- excuse me. The history of gardening in California is really very strange. It consists of finding the most exotic plants from the farthest corners of the world and importing them to Southern California and growing them because you can grow almost anything here if you add water. And there is a growing movement now to change that whole philosophy and to look again toward natives

66-14 (con't.)

and to other plants that have grown in Mediterranean climates similar to our own.

And there's also a growing movement in Southern California now to capture storm water and get it into the ground where it falls so that it can be added to our drinking water supply. The Los Angeles and San Gabriel Rivers Watershed Council has been leading a study, first of all, to determine that if we're going to take urban runoff, urban slobber as some people like to call it, and put it into the ground, if we're going to wash the skies clear of the smog and put that into the ground, what is going to be the impact on groundwater quality.

66-14 (con't.)

That question has now been pretty well answered. Water quality really does improve as it goes through the soil. The water, by the time it gets to the aquifer, is a lot cleaner than when it falls from the sky.

And now the Watershed Council is looking to figure out how to retrofit whole neighborhoods so that when there is a storm, there is no runoff. All the water is captured and gotten into the ground in one way or another.

These are just some of the kinds of things that need to happen in the state of California to really

make a difference so that we don't have to draw on the Delta anywhere near as much.

There's a water agency in the Chino area, the -- I'll think of the name of it in a minute.

FROM THE AUDIENCE: Inland Empire Utility Agency.

MS. KREGER: Thank you. Inland Empire Utility Agency that is working now to be able to go as many as four years of dry years without a drop of imported water. These are just some of the things that are happening here in Southern California to use our existing resources much more efficiently and effectively.

This is the future of California water. Not pulling more water out of the Delta, not privatizing what water we have, and not giving it over to big ag and the developers to manage on our behalf. Thank you.

66-14 (con't.)

MS. QUAN: Thank you. Next speaker, Dan Masnada.

MR. MASNADA: Good evening. Dan Masnada. I'm the General Manager of the Castaic Lake Water Agency. We're one of the 29 State Water Project Contractors. I've also had the privilege to be the Executive Director of the Central Coast Water Authority representing Santa Barbara as a State water contractor. And my successor, Bill Brennan, is here

66-15

as well.

First of all, I'd like to mention that the Monterey Amendments to the State water contracts simply provide greater flexibility in managing a limited supply, one that in total is less than the amount that the State Water Project contractors signed up for back in the early '60s.

And what I'd like to do is just speak to some of the benefits of Monterey, using specific examples that I've -- specific examples from Central Coast Water Authority and from Castaic Lake Water Agency.

At CCWA, I was there when the Department constructed the coastal branch project, and we at CCWA constructed the facilities that treated and delivered State Project water to San Luis Obispo and Santa Barbara Counties.

With the implementation of Monterey -- well, at that time the facilities under the contract had to be sized for the Table A amount that we were taking delivery of. Regardless of whether part of it included paper water, wet water, whatever the contract amount was, the facilities had to be sized for that.

The one benefit of Monterey is that -- the one example I like to cite is Goleta Water District. Even before Monterey was executed, Goleta elected to retain

66-15 (con't.)

a Table A amount over and above the contract amount that was held for by it Central Coast Water Authority, and which was included in the sizing of the State Water Project facilities.

Prior to Monterey, that 4500 acre feet, or specifically, a portion of that 4500 acre feet could not be delivered in years of less than 100 percent allocation. Even in a 50 percent allocation year, under the then existing State Water Project contract, Goleta could only take delivery of 50 percent of the contract amount it held with CCWA. It could not take delivery of any of the 4500 acre feet, although capacity existed in the system. Monterey allowed Goleta Water District to utilize that 4500 acre feet to supplement deliveries of its contract amount.

66-15 (con't.)

At Castaic Lake Water Agency, one of the benefits of Monterey was the making available of 133,000 acre feet of Table A amount from the agricultural entities to the municipal entities, or the M&I entities, as part of balancing the elimination of article 18(b).

Castaic Lake -- well, and as you well know, transfers are touted by the environmental community as being the most environmentally benign way of meeting new demand, or one of the most environmentally --

SEVERAL VOICES FROM THE AUDIENCE: No.

MR. MASNADA: Excuse me. I didn't interrupt you. Let me finish my statement.

But in any event, as you may know, Castaic Lake serves a high growth area. And we were able, again, under Monterey to acquire 41,000 acre feet of the 133,000 acre feet to meet demands in our system without having to expand the State Water Project, without having to add any additional facilities other than local facilities.

Flex storage was mentioned earlier. Castaic Lake Water Agency is a beneficiary of flex storage. This coming year, in spite of a 25 percent allocation, flex storage will assist us in meeting demands during 2008.

Groundwater banking, also another practice that's touted by the environmental community, would not have been possible in a number of instances, at last with respect to State Water, outside of our service area without Monterey.

Castaic has banked over 100,000 acre feet of water, which will allow it to meet demands in future dry years when there are shortages in the project.

Also, one thing I do want to correct. It was mentioned earlier that selling water outside of one's service area was not allowed under the original contracts. That's incorrect. I believe the

66-15 (con't.)

66-16

Department would agree that it was allowed under the original contracts. Monterey did facilitate in certain respects. But Castaic Lake Water Agency was the first entity to acquire state water outside of its service area and deliver it to -- and expand its Table A amount in the acquisition of Devil's Den Water District.

66-16 (con't.)

Oh, the Wanger court ruling was mentioned earlier. Actually, Monterey helps address the impacts of the recent Wanger court ruling and the Alameda County Court ruling. As bad as those rulings were, they would have been much worse absent Monterey being in place.

Our world has changed significantly since the '60s. The State Water contracts were 75-year contracts executed in the early '60s. They predated CEQA. This effort here is, as I believe the original EIR was intended, to address the requirements under CEQA.

66-17

But in any event, the Monterey Agreements were the first major overhaul of the State Water contract in the then 35-year life. Essentially at the midpoint of the State Water contracts. They were an attempt -- the Monterey Amendments were an attempt to recognize the realities of today's world to better serve us as

customers of the State Water Project. Undoing Monterey would have disastrous water supply, economic and environmental consequences. Thank you. 66-17 (con't.)

MS. QUAN: Mary Lou Cotton, please.

MS. COTTON: My name is Mary Lou Cotton, and I'm tonight representing the State Water Contractors, 27 public agencies that have contracts for State Water Project Table A amount, and whose residents, farmers and customers pay all of the capital and O&M costs of the State Water Project.

The State Water Contractors support the Monterey Amendment for many reasons, among which are the following:

The Monterey Amendment makes the State Water Project more flexible in managing limited supplies. The amended water management provisions permit banking of water and underground water storage during wet periods for later years during dry times, and improve opportunities to get more use out of existing SWP facilities. 66-18

The added flexibility provided by the Monterey Amendment has allowed the SWP contractors to weather the most recent drought without enduring the substantial hardships of the drought that occurred in the early 1990s despite increased water demands since

that time.

The State Water Contractors feel that the Monterey Amendment DEIR which was drafted with the advisory collaboration of DWR, the State Water Contractors, Planning and Conservation League, Citizens Planning Association of Santa Barbara, and Plumas County Flood Control and Water Conservation District, adequately describes the environmental effects of the amendment.

The exhaustive analysis in the EIR shows that there have been no significant environmental impacts resulting from the Monterey Amendments from 1996 through today.

Moving into the future, the EIR shows that future environmental impacts from the Monterey Amendments in almost all resource categories are at less than significant levels.

Thank you for accepting these comments.

66-18 (con't.)

MS. QUAN: Thank you. Are there any other speakers tonight? Okay. I want to emphasize that written comments are due to DWR by close of business on Monday, January 14th, 2008. This completes the official public hearing. Thank you for coming.

(Off the record.)

MS. PLAMBECK: Is there a time limit?

MS. QUAN: Since there are no speakers after you, you could speak a few minutes longer than the other speakers.

MS. PLAMBECK: Okay. All right.

MS. QUAN: The next speaker is Lynn Plambeck.

MS. PLAMBECK: Okay. I'm here representing Santa Clarita Organization for Planning and the Environment. And I would first like to put on the record that there are no signs directing anyone to this being a public meeting. There's a very dark parking lot out there, and it was very difficult to find.

And I'm discouraged to have arrived 6:40, having to leave work early tonight to arrive even at this time, and find that the meeting was going to be closed down. It concerns me that a public hearing doesn't remain open for the full time period in case other people would not be able to get off of work right away to come and make comments. 66-19

We will be submitting extensive written comments on this issue. But I would like to express my concern in the change of the amendments. It's really important that the EIR look more closely at the changes in article A and B, particularly in light of the drought that we are currently experiencing, and the Wanger decision in the Delta. I don't think the 66-20

EIR really considered the Wanger decision.

I also don't think the EIR has considered to the fullest extent possible the changes that will result from global warming. And it's maybe time, just as the Colorado River water law was looked at again, it's maybe time to look at this again.

And I would like to suggest that possibly you reevaluate, in the EIR have an alternative that puts the urban preference back in. The reason is, I'm from an area that's relying almost entire -- well, about 50 percent on State Water. And most new development in the future will have to rely on State Water.

So if we are going to be building on State Water, then we can't really -- we have to have the urban preference back. Either that or it has to be reflected in your reliability report that there may be severe cutbacks.

I think in my area where we're looking at projects like the New Whole Ranch Project, 21,000 units, and about 30,000 units in addition to that, all basically relying on imported water supply, not having an urban preference could be really a disaster for the area. And I think that the growth section of the EIR did not really address the amount of massive growth.

I was interested to go to the San Gabriel Valley

66-20 (con't.)
66-21
66-22
66-23
66-24

and see a report that they are only relying on 30,000 acre feet in the San Gabriel Valley, to my understanding of what was presented there. And yet, in Santa Clarita we're looking at an entitlement of 95,000, which is far in excess of what our local supplies could provide as a backup.

66-24 (con't.)

So, in addition, the EIR should address the article 21 water that is being transferred to the Kern area because the difference in when that water is taken is what may have caused impacts to the Delta smelt.

If you look at the charts of water production since 2000, where much of that water was transferred into the Kern area to be stored, there was massive amounts of water removed from the Delta at a time when the Delta smelt were probably near the pumps.

And if that's the scenario that we're going to be using in the future, you really have to address those impacts. And I didn't see that in the EIR. And maybe it's -- maybe I haven't reviewed everything thoroughly enough, the biology section. But I didn't see that in there currently.

Also -- well, I guess that's all. Anyway, thank you for letting me speak.

66-25

MS. QUAN: Thank you.

TRANSCRIBER'S CERTIFICATE

STATE OF CALIFORNIA)
) ss.
COUNTY OF SOLANO)

This is to certify that I transcribed the foregoing pages 1 through 33, consisting of the public meeting for Monterey Plus Project Draft EIR held in Ventura, California, on December 4, 2007, to the best of my ability from a cassette tape.

I have subscribed this certificate at Dixon, California, this 17th of December, 2007.

_____
Leisa M. Miller
Transcriber

RE:)
)
The Monterey Amendment to the)
State Water Project contracts)
(including Kern Water Bank)
transfer) and associated)
actions as part of a)
settlement agreement (Monterey)
Plus) SCH: 2003011118.)
_____)

REPORTER'S TRANCRIPT OF HEARING

Wednesday, December 5, 2007

Bakersfield, California

Reported by: Cindee L. LeFevre, CSR No. 7974

Bakersfield, California

Wednesday, December 5, 2007; 6:27 p.m.

Kern County Board of Supervisors Chambers

MS. QUAN: Right now, we are looking for comments and concerns about the environmental impacts, alternatives, and proposed mitigation measures.

So I am going to go ahead and call each speaker in the order we received their card.

The first speaker is Steve Torigiani.

MR. TORIGIANI: My comments are more responsive in nature, so can I defer?

MS. QUAN: Okay. The next person is Curtis Creel. I have to warn you there is a step. So watch out about that.

MR. CREEL: Thank you, Nancy.

I have some general comments that I would like to make on behalf of the Kern County Water Agency.

Let me first introduce myself. I am Curtis Creel. I am the Water Resource Manager for the Kern County Water Agency. 67-1

First of all, what I would like to say is why do we have the Monterey Amendment? The original contracts for the State Water Project that date back from 1960 envisioned a world very different from what we see today.

It envisioned a complete State Water Project that

would have the capability of delivering 4.2 million acre feet of water to the 29 state water contractors throughout the state almost every single year, but by the late eighties, with rising concerns from environmental issues, increasing stringent environmental relations, and a State Water Project that was never completed as originally envisioned, what became apparent was that that project would not be able to meet all the needs of its contractors in all the years.

And of course, the drought of '87 through the '92, the second critical period in that century, led to a significant supply curtailment.

As you noted earlier, agricultural contractors were cut to zero allocation in 1991 in accordance with the ag first provision, shortage provision; however, they still had to pay their full cost of the fixed share of the fixed cost.

The urban contractors received only 30 percent allocation.

We had thousands of acres of agricultural plans that were followed, and mandatory ration was imposed to many urban users.

It became obvious that the State Water Project did not perform as envisioned in 1960, and more flexible ways of operating the system were needed to be considered and

67-1
(con't.)

contemplated.

So what does it really do for us?

It settles, as you pointed out, disputes between all the contractors regarding allocations. The amended water allocation provision eliminates the add for shortage and puts all contractors on an equal basis.

Now, having said that, it's important to step back and say that also agricultural contractors have a right to surplus water first over the urban contractors, and it also puts on an uneven keel all of the contractors.

So now, the M&I contractors have an opportunity to gain access to additional supplies of Department 21 water that can be made available by the system at the same time that agricultural users can utilize the supplies.

It also makes the State Water Project more flexible in managing amended water management provisions, promoted banking water, which you pointed out in areas outside of individual contractor service areas, although DWR had already allowed that for the Metropolitan Water District, and it increased funding for local investment by providing a means to stabilize rates for all the contractors.

Now, I would like to talk just briefly about a couple of the specific comments.

First of all, there has been some concern raised

67-1 (con't.)

67-2

about the transfer of Kern Water Bank from the Department of Water Resources to local operation, and I think it's been perceived as a giveaway by the Department of Water Resources, and that could be no further from the truth than what actually occurred.

First, as you pointed out, the Monterey Amendment called for 45,000 thousand acre feet of fallowing within Kern County. Given the value of that water, that is approximately $45,000,000.00 worth of contract right for water that was let go by Kern County agricultural water districts, meaning that more water would be available for all contractors.

Second, Kern County also facilitated transfers of 130,000 acre feet of Table A contract amounts from agricultural water users to municipal and industrial water users within other state water contractors as well as making that available for M&I use within Kern County.

67-2 (con't.)

The second comment is concerns about the disproportionate sharing of -- the shortages between agriculture and M&I, the concerns about M&I now taking a proportionate cut with agriculture.

Again, it's important to realize that 130,000 acre feet of contract right increased the ability of other State Water Project contractors to actually have a more reliable supply of water by having greater contract right for

67-3

contract.

Finally, looking at the effects of the environmental water account, I realize that one of the things that you have been looking at is providing a program to offset the effects of increased diversions out of the Delta.

It would be interesting to compare the increases that have been facilitated by the Monterey Agreement as compared to just having State Water Project contractors increase their called upon State Water Project water to full contract amounts of 4.2 million acre feet, which, frankly, most of them are now seeing that effect.

The Metropolitan Water District had its demand for State Water Project water increased dramatically after supplies from the Colorado River were reduced.

So the point being, there are factors that go beyond the Monterey Amendment that have greater effects on the environment within the beltway.

The Environmental Water Account was envisioned as a program to help improve conditions not necessarily related to the Monterey Amendment, but just generally related to the operation of the Central Valley Project and State Water Project.

As such, even if the Monterey Amendment or Monterey provisions did not exist, we would probably still

67-3 (con't.)

67-4

have some sort of a program that would address the other factors that are affecting conditions in the Delta.

67-4 (con't.)

That's all I have. Thank you.

MS. QUAN: Thank you. The next speaker is John Parker.

MR. PARKER: I would like to respond to the questions later.

MS. QUAN: Okay. The next speaker is Renee Nelson.

MS. NELSON: Renee, R-e-n-e-e; Nelson, N-e-l-s-o-n. I am from Clean Water and Air Matter, CWAM.

Unfortunately, I am not up to speed on this, nor this environmental document. I just have one comment, and, like the others, I would like to continue to listen, and I'll review and submit written comments.

Excuse me. In the court order of the Project Alternatives 3 and 4, in the written statement, you have a permanent water shortage "would" have been declared in Article 18(b), yet in your verbal testimony, Barbara -- and I didn't catch your last name -- you said, "may." Is that "may" or "would." I think there's a big difference between those two, and if that could be clarified.

67-5

MS. McDONNELL: Okay. Sure.

MS. NELSON: The rest, I am sure, is in the documents, and I will leave it at that. Thank you.

MS. QUAN: Thank you. Florn Core is the next speaker.

MR. CORE: Good evening. My name is Florn Core. I am the Water Resources Manager for the City of Bakersfield. I don't have anything in writing to turn in yet; however, we will be making comments by the deadline, the January 14th deadline. Our comments will center around the provisions that were lost to M&I users for the priority. 67-6

The City of Bakersfield has lost that priority.

Other issues we will be discussing will also involve the local control of the Kern (unintelligible). We're not sure that is working the way it should be, and we will be making comments in that respect.

MS. QUAN: Thank you.

MR. CORE: Thank you.

MS. QUAN: Thank you. Next speaker, Ann Goudin.

MS. GOUDIN: My name is Ann Goudin. I am speaking as a private citizen, resident of the County of Kern.

I live just outside the City in one of those county areas.

My major concern is the privatization of water across the United States, and here, I am concerned about the Kern Water Bank seeing it as a giveaway. 67-7

It was built with $34,000,000.00 of State funds, and then the Department of Water Resources gave it to the

Kern Water Agency, and they immediately signed it over to the Kern Water Bank Authority.

So I looked up to see who that was, and I have been reading about it in our local Bakersfield Californian paper too.

The corporate players in that are -- 58 percent is Paramount Farms, which is a privately-owned company, owned by Sue Resnick out of Beverly Hills, and about 26 percent is backed by Tejon Ranch, and then Newhall Land & Farming also.

That concerns me. I am wondering if a huge corporation like Paramount and Newhall Land & Farming should be allowed to profit from buying and selling water.

And I read about the "paper water". Is that titled Table A water? It doesn't seem right to be trading "paper water" that may or may not become available.

And it appears that they have been wanting to sell water to -- Paramount has wanted to sell water to L.A. Metropolitan Water District since they signed on to the Monterey Agreement.

I think, environmentally, we should be concerned about the water being used to protect farm land and the needs of our urban communities.

Trading back and forth is good when there is a need. When there is excess water in one part of the state, it's okay to send it to another part, but trading back and

67-7 (con't.)

67-8

67-9

67-10

forth with "paper water" doesn't seem right.

And I understand that Tejon Ranch now is saying they have water available to build a new city, but do they really have that water, or is it "paper water," and if decisions are made to build a new city based on water, if they tell everybody we have got water, but they really don't, that's an environmental impact of great proportion.

67-10 (con't.)

So I think the Monterey Amendment should all be repealed and we should start over. Water should not be this complicated.

The State should be able to manage their water. It shouldn't be in the hands of private corporations. I think they should be -- the Monterey Amendment should be repealed or rewritten. All over California, we should equitably distribute the water.

We should always consider water conservation and environmental protection. I am wondering if when these corporations and this water district, the Westside Mutual Water Company, if they are making decisions, how open and transparent are these to the public.

67-11

I think we should eliminate the whole concept of Table A amounts, "paper water," and I think we should forbid folks with those contracts to profit from selling water.

I saw some prices. Is it an acre foot for $100.00 that was then transferred. It comes back and somebody pays

200 an acre foot, and then all of a sudden, Jim Nikkel in Bakersfield is getting $400.00 for the same. It sounds like a scheme, and it sounds like what happened in California when we had our energy crisis and our power, our energy, was being traded out of the state and back in, and Gray Davis got into these long-term contracts, and we know where that ended.

67-11 (con't.)

So if the Kern County Water Bank and the Westside District sells water, "paper water," to Tejon, and they build a community, what about a drought then.

67-12

Then they're going to come back to the State, we need more dams, and the people in the cities have to give up their water or ration their water so we can have water for this new city we built.

I think already some of these major real estate developers are pushing for more dams around the state. We have got a dam problem here in Kern County with Lake Isabella's dam. We need to fix that before we build more dams, but unfortunately, our representative, Jean Fuller, is beating the drum to build more dams in California.

So I am very concerned about water issues in California being decided by corporations behind closed doors.

Thank you for the opportunity to speak.

67-13

MS. QUAN: The next speaker is Harry Love.

MR. LOVE: Thank you very much. I am representing the Kern Audubon Society, and the Kern Audubon Society represents over 400 members in Kern County. I am a member of the conservation committee, and we are very concerned with the issues tonight.

I would like to read for the record what was sent in November by our conservation chair who could not make it tonight, but I would like to read the letter for the record, put it in the oral testimony, and if it has not been received, I will also mail it again so it will be in the written record. 67-14

It was dated November 30th of this year. It reads the following: The Kern Audobon Society would like to comment on the Monterey Amendments to the State Water Project contracts. We ask that the comments be made part of the official record.

The Kern Audubon Society strongly opposes the proposed amendments. We are concerned if the amendments are adopted permanently, they would have profound negative consequences on the health of California's environment.

First and foremost, we oppose the giveaway of private interest of the Kern Water Bank, which is created and developed to the cost of several million dollars of public dollars. 67-15

The Kern County Water Bank is an important public

resource that should remain in public ownership.

67-15 (con't.)

Second, we are concerned that the amendments would enable the increase transfer of water from northern California to the south and from agriculture to urban use without sufficient public oversight and accountability.

67-16

Third, we are concerned that the amendments would end the prohibition of using water surplus from the Delta for permanent development.

These surpluses will be needed to meet demand in drought years and provide adequate water for wildlife and fish. They should not be used for further sprawl in development that would destroy wildlife habitat, while having uncertain future water supply.

67-17

Finally, we are particularly concerned that the amendments would eliminate the requirement that the Department of Water Resources determine the reliable, safe yield of water that can be pumped from the San Francisco Bay, slash, Sacramento Delta estuary.

67-18

The amendment would open the Bay Delta ecosystem to a level they are pumping that are environmentally unsustainable. The Bay Delta has already been severely overpumped for the past few years with the result that populations have declined.

67-19

We urge that the amendments not be implemented. Signed Douglas Dodd, conservation chair. Thank you very

67-20

much.

67-20 (con't.)

MS. QUAN: Thank you very much.

The next speaker is Conner Everts.

MR. EVERTS: Thank you very much. My name is Conner, C-o-n-n-e-r; last name, E-v-e-r-t-s.

I just brought these up, and I am not going to take them home. I hope they are available on DVD.

This is the EIR we are talking about and these are the dependencies we are talking about.

I really admire the citizens of Bakersfield that have come forward here. I was in Ventura last night where I grew up (unintelligible).

I would like to say a little bit about the process, talk in general about the EIR, and then I am submitting more comprehensive comments writtenly.

67-21

But because this is a somewhat arcane and obscure piece of greater water policy; nevertheless, the amount of effort that is seen in the weight of the paper here really demands a different kind of, I think, outreach and inclusion of the public if you are really going to be having these hearings for the true value they can have.

We had a handful of people yesterday. No one from the Ventura area. I know you were in Quincy and Sacramento. I heard it was pretty quiet in Quincy as well where, actually, they are impacted because they are the source of

the water.

In Ventura, ironically, I sat on the Casitas Municipal Water District, and I was there from '92 to '96 as the token environmentalist, and at that time, the Monterey agreements came forward to us.

We were in a situation, not only did we pay for our State water allocation. We had no way of physically getting the allocation. We tried to give it back to the Bureau of Reclamation, and when the State water contractors wouldn't let us do that, we saw no point in signing on to the Monterey Agreement or any value for an agency that was removed from that.

Ironically, by not getting State water, we actually were forced to live within our means, and I think that is what the whole State of California has to do.

So I hope you have hearings, unlike Ventura, that actually, people can find, that aren't in the basement of the county building or here where we try to vocalize -- I realize mistakes were made, but nevertheless, if you want public input, you have to work at it, and at that point, if I gave a workshop to dispute people on this little reaction, I would start over, and I suggest you do that.

Nevertheless, I want to make some comments.

When the State Water Project first went in, the contracts that were made, not everybody signed up, but it

67-21 (con't.)

didn't mean there was ever going to be the water.

Then, it wasn't an environmental concern, but it was the reality that the State water supply was limited, and we built on that and we continue to build on that. Knowing there isn't enough water, we will build out. Taking the rivers of, you know, the Eel River to the north, to the north coast, and other areas would not have solved the problems we are having now, and on top of that, the climate change and global warming extremes we have seen.

I live in Southern California where we have had the two driest winters on record by far in the last six years. Also, as far as that, we have had the wettest winter on record.

What it forced us to do because of the long drought, the smart agencies got on board and implemented programs where they don't have to rely on board water by doing extensive conservation, by making ultimately full use of reclaimed water, by making use of urban runoff, which actually, we capture in Santa Monica and re-use onsite for irrigation, storm water runoff, and better management of our groundwater.

I was one of seven groundwater agencies in the State of California mandated by the legislature in the Ojai basin, a little tiny one. Very interesting to watch because of how it worked. We went from drought to flood and then

67-21
(con't.)

back to drought, as happens here in California.

We really need to deal with our groundwater resources properly, and we waste and continue to abuse the surface water that comes from other watersheds.

Until we really get a clear view of that, it's inappropriate to move forward with the Monterey Agreements. You know, I guess everyone knows that it's listed as Monterey because that's where the Aqua meeting was.

The line between privatization, which are the guts for water, the people I work with, Water Watch, have a whole program against that, but it becomes a pretty fine line because the public agencies lack transparency, and they go behind closed doors and have these meetings, and I think that is one of the real issues that brought forward people from across the state to challenge them, and successfully, they did challenge them. We can't continue to work like that.

I don't see a great deal of difference in this EIR than the original one. I know attempts have been made. The Environmental Water Account, which I participated in through Cal-Fed, has not been a success.

So to put another layer of expectation on that wouldn't work as well.

There are serious concerns about the State not taking it's full responsibility and privatization of not

67-21 (con't.)

only the State Water Project through the state contractors, but specifically, the Kern Water Bank.

The fallowing makes sense when the land is being fallowed and can't be farmed anyway. We are seeing that in other areas as well.

What we really have to recognize is times have changed, as was said earlier, and we have to respect those changes, and climate change and other elements have to be part of CEQA if we are going to be serious about this project.

The rest of my comments, I will put in written. Thank you for this opportunity again.

67-21 (con't.)

MS. QUAN: Thank you very much. The next speaker, Rick Iger.

MR. IGER: My name is Rick Iger, I-g-e-r. I am chief engineer with the Kern County Water Agency, and I was involved with the development of the Kern Water Bank when DWR was investigating building it as a part of the component of the State Water Project.

I just wanted to give a little bit of historical perspective as to what was going on around the time that the Monterey Agreement was being negotiated.

As mentioned earlier in your comments and discussed in the draft EIR, the Department was recognizing that there were going to be certain problems with the Kern

67-22

Water Bank property being developed as a component of the State Water Project, and some of those problems that they have identified, one was mentioned earlier, the ability to move water through the Delta itself, the State doing it outside of the water that was already allocated through Table A.

There was some concern about how that would be done and how much water would be available to be moved, and as part of that, the cost of the project of being able to store water for later use during droughts was going to get very expensive based on the model studies that were done at the time.

67-22 (con't.)

The other one was DWR itself had a fear that there was local use of the Kern Water Bank property that was going to be required as far as the Water Code section that allowed the State to develop a project in Kern County, and through negotiating that agreement with the Kern County Water Agency, it became clear to the Department that a certain part of the property would be set aside to allow local use during times when, say, the Kern River was running at high flows, and that water could be saved and stored for residents in Kern County and the economy of Kern County.

DWR had a fear that that might interfere with the ability of the Department to store water when it had water available.

67-23

The other one was the endangered species concern on the property. DWR was going through a lot of effort to try to document the endangered species and had come up with a habitat conservation plan of their own.

The Kern Water Bank authority was able to do that through the structure that they put together, but the Department had been working on that for years and still had not put anything in place.

One of the things I also wanted to mention was the water bank property was acquired to be a component of the State Water Project, and the cost of that were paid for by the State water contractors and the cost of stubbing the property to build projects. So it wasn't really a general fund, state general fund-type project. It was a project to be a component of the State facilities to supply the water supply. Thank you very much.

67-23 (con't.)

MS. QUAN: Thank you. The next speaker is Arthur Unger.

MR. UNGER: Good evening. I am Arthur Unger, U-n-g-e-r, and I commonly come to this microphone to represent the Sierra Club. We will have official comments, but tonight will just represent me.

67-24

First place, this is one of the first water documents that has come out since everybody has accepted global warming, not just the Sierra Club, and one wonders if

67-25

that is in the document itself.

Secondly, we need urban safeguards to make sure that there is enough water to flush toilets and provide drinking water, but we must not let urban safeguard -- we must not waste water on non-edible crops, such as lawns and/or spread water on non-permeable ground like driveways.

Just as we need compact housing to reduce air pollution and global warming, we must no longer allow sprawling development to tap into the California Aqueduct or other sources of water needed to grow food.

Four-fifths of California water is used by agriculture, and I didn't get to Governor Brown's documents about how many gallons of water go into a quart of milk or a pound of beef, but I suspect that a document that was trying to conserve California water would wonder if we couldn't import our beef from pastures where it rains.

Here in Bakersfield, through the wisdom of the Kern County Supervisors and the City Council, we have retired farm land that produces the most food, fiber, and jobs per unit of water, even if some farmers get money from selling that land rather than farming it.

Suburban -- anyway, here, our chapter of the Sierra Club, led by Gordon Nipp, has established fees that farms pay for the right to develop their land -- they pay a fee for the right to develop their land, and we hope in that

67-25 (con't.)

67-26

way to preserve some farm land that use water most efficiently.

The Kern Water Bank, plus the 2800-acre city recharge area that assists in the east and central part of the Kern Water Bank -- and I have a little map -- can provide a place for city kids to see endangered species.

The EIR for the Kern Water Bank didn't have much public input, but we would like to see that reversed.

It is said that the agricultural community -- excuse me. It says the agricultural community put 45,000 acre feet of water into the Kern Water Bank. Is that per year, and where does it come from, how do they transport it, or is it just "paper water"?

We think that the Kern Water Bank should be run by the State. Not by these private corporations whose obligation is not to provide water for all of us but to make money for the corporation.

If I were a shareholder, as many people are, that is what I am looking for.

There is such a thing as drip irrigation, which I am hoping the document, the EIR, will discuss. Jim Fien, who I will refer to in my written comments, sell that stuff, and they claim they can get a crop with vastly less water than our farmers are doing it.

It feels funny if water is scarce to be running

67-26 (con't.)

67-27

67-28

67-29

down the freeway in Kern County and seeing it sprayed up in the air when it's 100 degrees. You wonder how many of those drops get to the ground.

We may be limiting -- we may be building dams if we want to evaporate water. The Corp of Engineers, I believe, says that seven feet of water evaporate from every square foot. That is seven cubic feet of water evaporate from every square foot of Lake Isabella and a typical dam. We can do better than that.

67-29 (con't.)

We ought to have legislation that prevents undeveloped land that can store water underground from any other use, but here in Kern, we built some houses on that kind of land.

We hope that tier pricing will be used to encourage urban dwellers and agriculture to conserve water.

Thank you.

MS. QUAN: Thank you very much.

The next speaker is Dennis Fox. Well, this is our last speaker card. Are there any other speakers who want to speak tonight? Okay. I will call on you.

MR. FOX: Okay. Fox, F-o-x.

MS. QUAN: Excuse me.

MR. FOX: You know, like don't leave around a hen house.

MS. QUAN: Okay.

MR. FOX: I have (unintelligible) who was known as Kit.

Anyway, around here, I have several things. Only one locally. That is on the water bank.

I was on the water bank advisory for the City, and one of the things on there was supposed to be a recreation element. Generally, the State may have one.

Now, apparently, the Fish and Game in Fresno didn't get on board because there is no -- I was thinking particularly hunting because of the steady revenue that comes in from duck stamps and stuff like that. They say they have too many environmental things to read up there, which may be true, but the State and Fish and Game, etc., say we could do it and there's no problem. So it seems to be a problem with the State. 67-30

It's also -- that's an economic issue, because see, what's happened since they flooded the rice fields in Sacramento and the economic benefits of hunters to close wells in all those other towns.

The next thing is I don't think generally what Mr. Creole talked about wasn't looked at before, and it has to do with houses.

I keep thinking about 1910 in Boise, Idaho where 1500 percent of the Boise River was committed. Not 100 percent. 1500. I keep thinking that we are going to have a

problem with that.

And I was wondering, the water that is borrowed, like, doesn't get to Castaic and Perris Lake, if that has to be made up and then the groundwater has to be pumped out, to be pumped over, and things have been concentrated. That is pumping costs. That is what I am getting at.

The major thing about pumping cost is we're a little short of power plants and even small hydro, large hydro, nuke, anything, but it's going -- it's getting so expensive. You can have the water, but how are you going to pay for the pumping if we ever get the water.

One of the plans I have always been fascinated with are some of the ones of the Sac river, Concord, etc., which put a lot of -- got a big increase and a big increase in auto water, which that and the other factors have not been looked at in the Delta.

Only thing that has been looked at the Delta has been -- you want me to wait until you change your cassette?

MR. HENDRICK: No, that's fine.

MR. FOX: The thing that is -- vectors. Rather, everybody just looks at pumping, and I don't think pumping is the magic bullet, the villain du jour, the only thing that has an impact on the Delta.

One of the things when you think about that is the water when it comes down from there is it might have a

67-30 (con't.)

67-31

67-32

67-33

little biological pollution, and the thing about health, which are appropriate to EIR's, and downstream effects of pollution, as what's coming downstream, as in weeds, spawns of mussels. The one I am talking about, nobody is looking at, is causing problem in the Delta maybe. I think it's going to be on a State water basis, because if you take care of it in Merced County, the stuff is floating past and it's floating into another county.

And I think the amounts of water that was estimated, I believe that we're going to have a problem, and that is not as much water as the watershed (unintelligible) for Cal-Feds, and I call it cow-fed because watershed work got to be a milk for things that had little to do with the watersheds.

67-33 (con't.)

Visitor centers are nice. Parks are nice. They don't produce water. Watersheds produce the water, and they have got to be -- (unintelligible). We now have watersheds. It might be nice to contact the people that work with the watersheds, which have been not been looked at, especially in a lot of these things with the Forest Service, Bureau of Land Management, the resource districts, and watershed coordinators even, you know.

And what has happened is you are getting less water. You are getting less water since the Monterey, and you are going to get less.

The reason is high fuel load, global warming, they have laid off less fire fighters under that administration, and if this continues, they got -- when they privatize, you can't -- they got rid of all these similar firefighters along with it as well as put them out on unemployment, so we could get the national debt up there where it belongs.

So anyway, the last thing, you have had -- the fires were forest, but not too much. Now, we have the emotional issue of spare that tree. Let it burn down. We have -- most of it is kind of a quasi-cultish, not really religion, about cutting the trees and thinning the forest, and so you do not get fires now. You get concentrations. Forest used to be thinned by fires. Now they get demolished by concentration.

67-33 (con't.)

1425 is my C-span number.

Anyway, you have got a crusting of the soils, the soils cannot produce, then you get runoff, sheet runoff, and when you get runoff, that goes down and fills up the reservoirs.

The other thing is the only thing that comes back is brush. Brush uses water. It doesn't produce water. So that's what these do down the line. But I think those things, if there is focus, you are going to have problems with the environmental community. They would rather see it black than see trees. So -- at least that's what I see, so

(unintelligible). Thank you.

MS. QUAN: Thank you. John Parker?

MR. PARKER: John Parker, general manager of the Kern Water Bank.

Excuse me. I wanted to answer of some of the questions or issues that were brought up earlier.

There was some statements made, and I want to clarify some of them. And first of all, I would like to invite some of you here that have made some comments to solicit us. We would like to -- we are an open agency, public agency, and we would love to show you what the water bank is all about.

Some statements were made, and I am not going -- I can't remember the names of the people that made them, but I want to clarify some things.

First of all, the Kern Water Bank was a giveaway. As mentioned earlier, 45,0000 acre feet of water were a direct result of transfer to water bank. The value of that at the time was estimated to be about 45 million dollars.

Another statement was made that Paramount Farms owns 58 percent of the Water Bank. Westside Mutual, which is owned by Paramount Farms, owns 48 percent of the Water Bank. That Tejon Ranch owns 26 percent; Tejon Ranch owns two percent. Newhall Land and Farm has nothing to do with it. They are not participants in Kern Water Bank.

67-33 (con't.)

67-34

Another statement was made that Paramount wants to sell water to the Metropolitan Water District. There is a -- Appendix E of the EIR goes into great detail about all the water transactions that occur, and I would encourage you to look at that. It details the transactions that have occurred, and I would note that no water has been sold to the Metropolitan Water District.

67-34 (con't.)

Another question that was brought up was trading "paper water," selling water they don't have, and I just wanted to let you know the way the water became -- we have a memorandum of understanding with the surrounding entities, and the participants have to deliver water into the water bank and only can recover from the water bank what they put in the ground. They can't take more out. There's no "paper water." It's real water, and that's tracked by the Kern County water agency as well as us.

67-35

There was talk about closed transactions and things like that. I just wanted to state Kern Water Bank is a public entity. We are placed under the Brown Act. We have public board meetings the third Monday at 7 a.m., and the public is welcome to those meetings, and we encourage you to come if you have questions about the Kern County Water Bank.

Also, any of the documents that come out of the Kern County Water Bank Authority, as soon as they're

67-36

approved and signed, are public documents. So any documents you wanted to look at, you could come to us, and we would be more than happy to provide that to you.

The recreation elements. There was mention of a recreation element and an educational element. As far as recreation goes, we do allow public hunts. They go through the California Department of Fish and Game.

They have hunt and dunk hunts when conditions are appropriate for that. Obviously, there is not going to be any duck hunt because there is no water.

As far as the educational element, we do tours of the water bank all the time. We are looking into finding grant money to build an educational center out there. Some of our board members are very keen on building an educational center where we can bring people there. Right now, we just have a few trees in the area and some tables, but we do tours maybe three times a month. People come from as far from China. We have got some school students coming in January. We brought some kids from Kern High School District. And again, the board of directors is very keen on educational activities.

I think that about covers it. If you have any questions, I would be happy to answer them.

MS. QUAN: Thank you very much.

MR. PARKER: There was a question about Dudley

67-36
(con't.)

Ridge. They are a public entity. They have public meetings.

MS. GOUDIN: Who controls them?

MR. PARKER: Dudley Ridge has different farmers involved in it. Paramount Farming owns Dudley Ridge. The Jackson family owns Dudley Ridge. These are the only two I know about, but if you want to find out who is involved on their board --

MS. GOUDIN: I show (unintelligible).

MR. PARKER: Through Dudley Ridge, well, they don't have that kind -- Paramount Farms has got Westside Mutual Water Company, and the other is Dudley Ridge.

AUDIENCE: Joe (unintelligible)

MR. PARKER: Well, but they're part of the districts in Kern County, other water districts in Kern County, as well.

MS. QUAN: You can have this conversation after the meeting. We are conducting a meeting right now.

Steve Torigiani.

MR. TORIGIANI: Torigiani. Steve Torigiani for Kern Water Bank Authority.

I, like John, wanted to address the Kern Water Bank, and I think there is some statements that have been made that are flat-out inaccurate and other things that people have the wrong impression about the Kern Water Bank.

67-37

One that has been mentioned is about the Kern Water Bank land being given to either the Kern County Water Agency or Kern Water Bank Authority. As John pointed out, that is not accurate. Forty-five thousand acre feet of State Water Project entitlement was retired, and the value of that is $150,000,000.00. Perhaps more. So in no sense of the word was that a gift.

But I know Curtis Creel accused the Department of saying it was a gift, but I will have to correct him because I know the Department doesn't think it's a gift in any sense of the word either.

The other thing that was mentioned and this impression, at least this is the impression that I got, that the State spent, I don't know, 70-something million dollars -- I don't know if that is correct or not -- to construct the water bank.

The fact of the matter is whatever was spent, the State found that it was not feasible, and this is all detailed in Appendix E to the EIR. They found it was not feasible for the State to construct the water bank, and, in fact, it was the Kern County Water Bank Authority that invested millions of dollars to construct an actual operating functioning water bank.

So it -- I just don't think that's at all accurate, and in fact, it's, perhaps, a good thing because

67-37 (con't.)

the State found it was not feasible to spend any more money on the Kern County Water Bank.

The other notion I detected from the comments is that the Kern County Water Bank transfers in some sense of the word interim, and the Kern Water Bank Authority entered into a settlement agreement, along with any other environmental group that chose to contest the Kern Water Bank transfer, and they agreed, everyone agreed, in the settlement agreement that the title to the Kern Water Bank would remain with the Kern Water Bank authority, which, as John pointed out, it's not resting the Kern Water Bank in private hands. It's a public entity. Their meetings are not conducted behind closed doors. They're subject to the Brown Act.

67-37 (con't.)

And the other point that was made is I keep hearing about this "paper water." As John pointed out, we are talking about real water that's put under the ground, and then it's taken out. It's not "paper water." In fact, I think in connection with that comment was some angst about we have all these dams, and we don't need any more dams.

67-38

Well, one of the reasons that even the environmental community has supported water banks like the Kern Water Bank is because that, to some extent, alleviates the need to build dams.

And finally, there was some comments about urban

67-39

sprawl. And, you know, I would just point out that when the Kern Water Bank Authority took the property and entered into the settlement agreement, it could have developed part of that property. It gave up the right to do that in the settlement agreement.

And, in fact, consistent with that, even the City of Bakersfield wanted to include the property in its sphere of influence, that it was expanded recently, and we said that is not a consistent with our -- the Kern Water Bank Authority's ownership of the Kern Water Bank.

It's supposed to remain a water bank, and indeed, even though we agree with most of the impact analysis and the EIR, we are going to make some comments like the others have mentioned more formally and in writing.

One of the things that you could ask yourself is since the state said it was not feasible to construct a water bank, if the water bank had not been constructed by the Kern Water Bank Authority, it may well have been developed in the recent, you know, housing development that occurred in the last few years.

And I think in large part, that did not occur because the Kern Water Bank Authority has operated the water bank in accordance with environmental permits and have been good stewards of the environment, and I think the EIR recognizes that, including appropriately, there are no

67-39 (con't.)

mitigated significant impacts because of the Water Bank. 67-39 (con't.)

So that's my comments. Thank you.

MS. QUAN: Thank you. Are there any other speakers tonight?

Okay. I just want to remind everyone that written comments are due by close of business on January 14th. The address is on the agenda, Delores Brown's address, and this concludes our official meeting. Thank you for coming.

(7:24 p.m.)

---oo0oo---

STATE OF CALIFORNIA)
) ss.
COUNTY OF KERN)

I, Cindee L. LeFevre, hereby certify that I, an Official Reporter, was present and took down correctly in stenotypy, to the best of my ability, all the testimony and proceedings in the foregoing-entitled matter on December 5, 2007; and I further certify that the annexed and foregoing is a full, true, and correct statement of such testimony.

Dated at Bakersfield, California, on December 27, 2007.

_____

Cindee L. LeFevre, CSR No. 7974

Form Letter Comments Received by email

From: ldpbinca@hotmail.com
Sent: Monday, December 17, 2007 9:51 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Lisane Drouin
312 Torino Drive, #4
San Carlos, CA 94070

From: ellen.hamilton5@verizon.net
Sent: Monday, December 17, 2007 4:23 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Ellen Hamilton
7005 Scripps Crescent St.
Goleta, CA 93117

From: hughslehman@hotmail.com
Sent: Monday, December 17, 2007 2:54 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Hugh Lehman
22550 LaRochelle Dr.
Santa Clarita, CA 91350-1309

From: jsw3@pacbell.net
Sent: Monday, December 17, 2007 12:23 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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John and Sandra Warren
150 Scenic Street
Santa Cruz, CA 95060

From: kimffloyd@verizon.net
Sent: Monday, December 17, 2007 11:25 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Kim Floyd
5375 Shirley J Lane
Wrightwood, CA 92397-0422

From: larrys@popstar.com
Sent: Monday, December 17, 2007 11:26 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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LARRY SCHLESSINGER
3401 Clay St. #504
San Francicso, CA 94118

From: robertdwheeler@verizon.net
Sent: Monday, December 17, 2007 10:31 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Robert Wheeler
29071 Calle del Buho
Murrieta, CA 92563

From: ken.meer@verizon.net
Sent: Monday, December 17, 2007 10:03 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Kenneth A. Meersand
110 34th Street
Apt. 2
Hermosa Beach, CA 90254

From: jjet65@yahoo.com
Sent: Monday, December 17, 2007 7:52 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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John Swan

2907 Corte Celeste
Carlsbad, CA 92009

From: cspier@hughes.net
Sent: Monday, December 17, 2007 1:39 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Carolyn Spier
PO Box 1029
Weimar, CA 95736

From: nicky@mindspring.com
Sent: Sunday, December 16, 2007 9:46 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Nick Pilch
634 San Carlos Ave.
Albany, CA 94706

From: peter_m@mindspring.com
Sent: Sunday, December 16, 2007 6:14 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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peter robbins
11718 goshen
los angeles, CA 90049

From: jsmurray24@dslextreme.com
Sent: Sunday, December 16, 2007 6:10 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Joan Murray
1049 Glenhaven Dr.
Pacific Palisades, CA 90272

From: jandkannecone@yahoo.com
Sent: Sunday, December 16, 2007 5:13 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Kristi Annecone
1683 Almond Blossom Lane
San Jose , CA 95124

From: helenkoules@hotmail.com
Sent: Sunday, December 16, 2007 2:38 PM

To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Helen Koules
6107 Terryhill Drive
La Jolla, CA 92037

From: joeyb1925@yahoo.com
Sent: Sunday, December 16, 2007 1:05 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Joseph Buchbinder
16031 Londelius Street
North Hills, CA 91343

From: dppencil@sbcglobal.net
Sent: Sunday, December 16, 2007 10:27 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water

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We urge you to implement an alternative that better serves California.

Don Petersen
7004 Via Quito
Pleasanton, CA 94566

From: rubeng56@hotmail.com
Sent: Sunday, December 16, 2007 9:07 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Ruben Gomez

5654 Murietta Avenue
Van Nuys, CA 91401

From: dolorespollock@earthlink.net
Sent: Sunday, December 16, 2007 7:33 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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dolores pollock
5553 camino cerralvo
Santa Barbara, CA 93111

From: billkathd1@copper.net
Sent: Saturday, December 15, 2007 8:19 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Mr and Mrs William Dimitri
4135 Illinois St., Apt. 8
San Diego, CA 92104-1919

From: steve_robey@technologist.com
Sent: Saturday, December 15, 2007 6:09 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Steve Robey
548 Wildcat Canyon Road
Berkeley, CA 94708

From: ecely@earthlink.net
Sent: Saturday, December 15, 2007 4:23 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Ernest Ely
801 Baker St. #8
San Francisco, CA 94115

From: marie.bob@verizon.net
Sent: Saturday, December 15, 2007 4:00 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Marie Mark
304 Via El Cuadro
Santa Barbara, CA 93111

From: mensch51@earthlink.net
Sent: Saturday, December 15, 2007 3:54 PM

To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Gregg Lichtenstein
12265 Rue Cheaumont
San Diego, CA 92131

From: ksand1126@yahoo.com
Sent: Saturday, December 15, 2007 2:50 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Karen Sanders
532 Nathanson Creek Lane
Sonoma, CA 95476

From: Clea@its.caltech.edu
Sent: Saturday, December 15, 2007 10:43 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Clea Wright
285 S. Sierra Madre Blvd., #K
Pasadena, CA 91107-4891

From: jrdcraig@lmi.net
Sent: Saturday, December 15, 2007 10:13 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Julia Craig

2337 Parker St. #7
Berkeley, CA 94704-2841

From: countessbasey@yahoo.com
Sent: Saturday, December 15, 2007 9:58 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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basey klopp
411 longfellow ave.
hermosa beach, CA 90254

From: chuckbinckley@mac.com
Sent: Saturday, December 15, 2007 9:07 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Charles Binckley
304 Washington Ave.
Richmond, CA 94801

From: hobo17pollie@yahoo.com
Sent: Saturday, December 15, 2007 8:34 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Les Roberts
1134 East Lansing Way
Fresno, CA 93704

From: asutphin@hotmail.com
Sent: Saturday, December 15, 2007 8:23 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Andrew Sutphin
22727 Mariano Street
Woodland Hills, CA 91367-6129

From: tnturner@sbcglobal.net
Sent: Saturday, December 15, 2007 7:09 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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todd turner
23311 la crescenta
MISSION VIEJO, ca 92691

From: JBMORGEN1@AOL.COM
Sent: Friday, December 14, 2007 9:40 PM

To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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JOHN B. MORGEN
44325 CAMINO LAVANDA
LA QUNITA, CA 92253

From: rshoeschler@hotmail.com
Sent: Friday, December 14, 2007 8:42 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Rebecca Hoeschler
328 East Imperial Avenue, Number 5
328 East Imperial Avenue
El Segundo, CA 90245

From: weldon-j@sbcglobal.net
Sent: Friday, December 14, 2007 8:32 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Weldon H Jackson
2789 Bardy Road
Santa Rosa, CA 95404-8477

From: jbrgray@verizon.net
Sent: Friday, December 14, 2007 6:47 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Jimmie Gray
40492 Marsha Ct.
Hemet, CA 92544

From: gulmer@mcn.org
Sent: Friday, December 14, 2007 6:34 PM
To: Brown, Delores
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If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Gene Ulmer
360 N.McPherson St.
Fort Bragg, CA 95437-3518

From: willowwoman@earthlink.net
Sent: Friday, December 14, 2007 5:19 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

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I also strongly suggest that development be restricted. Areas suffering from a water shortage needs to curtail new construction. Obviously, there is already a water shortage with the people already living there...i.e. San Diego County. Common sense.

Elena Rudich
1847 Wedgewood Ave.
Upland, CA 91784

From: walkercreations@verizon.net
Sent: Friday, December 14, 2007 3:40 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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We urge you to implement an alternative that better serves California.

David Walker
907 Vista Del Rio
Santa Maria, CA 93458

From: catstanley@hotmail.com
Sent: Friday, December 14, 2007 3:39 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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We urge you to implement an alternative that better serves California.

Catherine Stanley
3145 Bakula wy.
Sacramento, CA 95864

From: jgarrett@opto22.com
Sent: Friday, December 14, 2007 3:07 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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We urge you to implement an alternative that better serves California.

John Garrett
32851 Alderbrook Rd
Wildomar, CA 92595

From: skazz999W@netscape.net
Sent: Friday, December 14, 2007 1:24 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Philip Ratcliff
15 Foster Ct.
Cloverdale, CA 95425

From: sarron7903@sbcglobal.net
Sent: Friday, December 14, 2007 1:23 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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SHEILA MOHAMMED
655 TANAGER RD
LIVERMORE, CA 94551-7921

From: lee@calnative.com
Sent: Friday, December 14, 2007 12:27 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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We urge you to implement an alternative that better serves California.

Lee Klein
6701 W 87th Place
Los Angeles, CA 90045

From: Patrick.Aldrich@martekpower.com
Sent: Friday, December 14, 2007 12:13 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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We urge you to implement an alternative that better serves California.

Patrick Aldrich
1120 Whitecliff Rd
Thousand Oaks, CA 91360

From: alexpinkerton@yahoo.com

Sent: Friday, December 14, 2007 9:36 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Alex Garmon
11237 Carmel Creek Road
#7
San Diego, CA 92130

From: julieandrews06@comcast.net
Sent: Friday, December 14, 2007 7:50 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Elizabeth Shirey
7711 River Landing Drive
Sacramento, CA 95831

From: valeriell1@aol.com
Sent: Friday, December 14, 2007 12:21 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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valerie Lezin
2558 Aiken Avenue
Los Angeles, CA 90064

From: lsartor@inreach.com
Sent: Thursday, December 13, 2007 11:37 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Linda Sartor
7899 St. Helena Rd.
Santa Rosa, CA 95404-8601

From: tierno23@yahoo.com
Sent: Thursday, December 13, 2007 10:17 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Kermit Cuff
338 Mariposa Ave. #2
Mountain View, CA 94041

From: mmmarkus@earthlink.net
Sent: Thursday, December 13, 2007 10:01 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Mary Markus
10462 Ramona Way
Garden Grove, CA 92840-2044

From: johncordes@yahoo.com
Sent: Thursday, December 13, 2007 9:58 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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John Cordes
550 E Arbor Ave
Sunnyvale, CA 94085-3767

From: nanaho.kamei@gmail.com
Sent: Thursday, December 13, 2007 9:43 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Nanaho Kamei
1190 Arlington Lane
San Jose, CA 95129

From: crockerbuckle@mindspring.com
Sent: Thursday, December 13, 2007 9:33 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Nancy Arbuckle
524 Nimitz Ave.
Redwood City, CA 94061-4228

From: itramirez@yahoo.com
Sent: Thursday, December 13, 2007 8:42 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Irma T. Ramirez
734 Morton Way
Santa Rosa, CA 95404

From: d.l.shepard@sbcglobal.net
Sent: Thursday, December 13, 2007 8:18 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Douglas Shepard
23331 Buckland Lane
Lake Forest, CA 92630

From: rkurz@hotmail.com
Sent: Thursday, December 13, 2007 6:58 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Robert Kurz
23256 Arelo Ct
Laguna Niguel, CA 92677

From: bull@jett.net
Sent: Thursday, December 13, 2007 6:11 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Jo Ann Toro
8724 Simmons Rd
Redding, CA 96001

From: sfwathen@ucdavis.edu
Sent: Thursday, December 13, 2007 11:06 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

With global warming happening, we can't afford to take risks with our water supplies and the Delta. Therefore, I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Stephen Wathen
611 Lessley Pl.
.
Davis, CA 95616

From: kkbpol@breathsense.com
Sent: Thursday, December 13, 2007 5:33 PM
To: Brown, Delores

Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Kurt Bigler
2953 Hillegass Avenue
Berkeley, CA 94705

From: joej1@sbcglobal.net
Sent: Thursday, December 13, 2007 1:59 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is

recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Joe St.Clair
676 N 12th Sreet # 11
Grover Beach, CA 93433-1430

From: jstrandb@gmail.com
Sent: Thursday, December 13, 2007 8:58 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water

conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

John Strandberg
6532 Pinehaven Road
Oakland, CA 94611

From: chrislewis6057@yahoo.com
Sent: Thursday, December 13, 2007 11:29 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Christopher Lewis
2502 Abonado Place
Rowland Heights, CA 91748

From: jvsgoingcyber@yahoo.com
Sent: Thursday, December 13, 2007 11:27 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Jeffrey Vandenburgh
1606 S. Westgate Avenue
Los Angeles, CA 90025

From: cheryltaylor8@yahoo.com
Sent: Thursday, December 13, 2007 11:05 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Cheryl Taylor
41410 Juniper St
Unit 19-22
Murrieta, CA 92562

From: sphatfield@altrionet.com
Sent: Thursday, December 13, 2007 10:43 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced

and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Daryl and Sylvia Hatfield
161 N. Canyon Blvd.
Monrovia, CA 91016

From: colombano@sbcglobal.net
Sent: Thursday, December 13, 2007 9:58 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban

water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Alan Colombano
2502 Overhill Lane
Davis, CA 95616

From: bgoodell@mcn.org
Sent: Thursday, December 13, 2007 9:41 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

For the benefit of my family and future generations, I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopts these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities of all species. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Barbara Goodell
P.O. Box 74
Boonville, , CA 95415

From: MandrO@SacCounty.net
Sent: Thursday, December 13, 2007 10:17 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Olga Mandrussow
2627 U Street, Apt. 9
Sacramento, CA 95818-1837

From: sam@energy-solution.com
Sent: Thursday, December 13, 2007 8:32 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Sam Cohen
3741 Balfour Ave
Oakland, CA 94610

From: lefisher2@earthlink.net
Sent: Thursday, December 13, 2007 9:29 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water

will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Lana Fisher
4322 1/2 Montgomery Street
oakland, CA 94611

From: lydeeyah@yahoo.com
Sent: Thursday, December 13, 2007 7:53 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I encouraage DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban

water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Lydia Bernard
3499 East Bayshore Road, #138
Redwood City, CA 94063

From: connerleyj@yahoo.com
Sent: Thursday, December 13, 2007 7:44 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

John Connerley

630 Black Butte Drive
Mount Shasta, CA 96067

From: rt06email-user@yahoo.com
Sent: Thursday, December 13, 2007 7:21 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Richard Tietz
10 Old Millstone Lane
Lafayette, CA 94549

From: scotterman@charter.net
Sent: Thursday, December 13, 2007 6:47 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department

of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Scott Stellar
937 Patria Circle
Atascadero, CA 93422-6893

From: kumarvedantham@yahoo.com
Sent: Thursday, December 13, 2007 5:44 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can

help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

kumar vedantham
1336 Carrison Street
Berkeley, CA 94702

From: mlbooz@calnatives.com
Sent: Thursday, December 13, 2007 5:42 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the

water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Martha Booz
3823 Valley Lane
El Sobrante, CA 94803-3118

From: enaceccyy218@yahoo.com
Sent: Thursday, December 13, 2007 1:10 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Ena Silva Villacorta
3063 STANHOPE WAY
SACRAMENTO, CA 95833

From: vvmikpd02@sneakemail.com

Sent: Thursday, December 13, 2007 12:25 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Eric Heit
189 Baurer Circle
Dept 100
Folsom, CA 95630-6785

From: cntslnts@yahoo.com
Sent: Wednesday, December 12, 2007 8:42 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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andrea valenzuela
345 military east
benicia, CA 94510

From: raulcfreitas@hotmail.com
Sent: Wednesday, December 12, 2007 10:11 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Raul Freitas
21 Libra Drive
Novato, CA 94947

From: Vickilee10@sbcglobal.net
Sent: Wednesday, December 12, 2007 10:11 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Vicki Lee
16401 San Pablo Avenue
Space 206
San Pablo, CA 94806

From: tjohnst@hotmail.com
Sent: Wednesday, December 12, 2007 9:58 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Timothy Johnston
825 Fell Street, Apt. 1
San Francisco, CA 94117

From: cjstrobel@sbcglobal.net
Sent: Wednesday, December 12, 2007 9:54 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Calvin Strobel
282 Beech Ave
Santa Rosa, CA 95409

From: volkerfrank@yahoo.com
Sent: Wednesday, December 12, 2007 9:31 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Volker Frank
Lawton Ave
Oakland, CA 94618

From: gridgaines@yahoo.com
Sent: Wednesday, December 12, 2007 9:30 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Ingrid Gaines Brennan
552 Ebbtide Circle
Port Hueneme, CA 93041

From: lbibayoff@care2.com
Sent: Wednesday, December 12, 2007 9:10 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Larry Bibayoff
5431 Shennecock Way
Sacramento, CA 95835

From: princessjoy27@hotmail.com
Sent: Wednesday, December 12, 2007 9:08 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Christina Manos
508 E Micheltorena Street
Santa Barbara, CA 93103

From: lbarbosa@garlic.com
Sent: Wednesday, December 12, 2007 8:49 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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linda barbosa
16989 sorrel way
morgan hill, CA 95037

From: CyrilBouteille@yahoo.com
Sent: Wednesday, December 12, 2007 8:46 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Cyril Bouteille
960 Bonita Ave
Suite 1
Mountain View, CA 94040

From: njefferis@cox.net
Sent: Wednesday, December 12, 2007 8:31 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Nancy Jefferis
2927 Fourth Ave Apt 305
San Diego, CA 92103

From: edmaguire@mac.com
Sent: Wednesday, December 12, 2007 8:25 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Ed Maguire
21410 Ventura Boulevard
Woodland Hills, CA 91364-2008

From: adamdfoster1@yahoo.com
Sent: Wednesday, December 12, 2007 8:13 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Adam Foster
323 N. Sierra Bonita Ave.
Los Angeles, CA 90036

From: htstrauss@aol.com
Sent: Wednesday, December 12, 2007 8:12 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Howard Strauss
3836 Bentley Ave., #2
Culver City, CA 90232

From: cmbucoy@yahoo.com
Sent: Wednesday, December 12, 2007 7:58 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Chelsea Bucoy
49 St. Michael's Ct
Daly City, CA 94015

From: persia@foothill.net
Sent: Wednesday, December 12, 2007 7:56 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Persia Woolley
10645 Barnett Valley Rd
Sebastopol, CA 95472

From: lpsmrts@yahoo.com
Sent: Wednesday, December 12, 2007 7:46 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Daniel Youpa
303 Park Circle
Marina, CA 93933

From: dannynor@cruzio.com
Sent: Wednesday, December 12, 2007 7:20 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

kathy Haber
114 Shelter Lagoon Dr.
114 Shelter Lagoon Dr.
Santa Cruz, CA 95060

From: jyarbro2003@yahoo.com
Sent: Wednesday, December 12, 2007 6:48 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

Jim Yarbrough
4102 Greenwood St.
Newbury Park, CA 91320

From: Don@Alterconsulting.net
Sent: Wednesday, December 12, 2007 5:45 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Donald Alter
998 Euclid Ave.
Berkeley, CA 94708

From: phytophinder@sbcglobal.net
Sent: Wednesday, December 12, 2007 6:29 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Mitchell Alford
6435 Orange Ave #15B
Sacramento, CA 95823-3278

From: gaucho_brett@yahoo.com
Sent: Wednesday, December 12, 2007 6:27 PM

To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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We urge you to implement an alternative that better serves California.

Brett Buyan
516 E. Aliso St.
Ojai, CA 93023

From: jloree@hotmail.com
Sent: Wednesday, December 12, 2007 6:23 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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We urge you to implement an alternative that better serves California.

Joe Loree
2159 Acton St.
Berkeley, CA 94702

From: rtwohey@hotmail.com
Sent: Wednesday, December 12, 2007 6:06 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Ryan Twohey
636 E St
Martinez, CA 94553

From: esteecohen@sbcglobal.net
Sent: Wednesday, December 12, 2007 10:47 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Estee Cohen
1521 Castec Drive
Sacramento, CA 95864

From: evearch@earthlink.net
Sent: Wednesday, December 12, 2007 5:57 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Eve Reynolds
5858 Lemp Ave.

North Hollywood, CA 91601

From: ritaaina@sbcglobal.net
Sent: Wednesday, December 12, 2007 5:54 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Rita Webber
457 Acacia
Bakersfield, CA 93305

From: dannychia@yahoo.com
Sent: Wednesday, December 12, 2007 4:56 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Dan Chia
3914 7th Ave.
sacramento, CA 95817

From: dotys4@cox.net
Sent: Wednesday, December 12, 2007 4:57 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Gregory Doty
6153 Arrowroot Lane
Rancho Palos Verdes, CA 90275

From: afgetsalocal1@yahoo.com
Sent: Wednesday, December 12, 2007 5:25 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Brian & Rita Cohen
3852 E Alamos Ave Apt #125
Fresno, CA 93726

From: LisaSchechter@aol.com
Sent: Wednesday, December 12, 2007 5:12 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Lisa Schechter
2034 Kelton Avenue
Los Angeles, CA 90025

From: markd_s@yahoo.com
Sent: Wednesday, December 12, 2007 5:12 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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We urge you to implement an alternative that better serves California.

Mark Schneider
11682 Brookshire Ave.
Garden Grove, CA 92840

From: bettyjunek@yahoo.com
Sent: Wednesday, December 12, 2007 4:36 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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We urge you to implement an alternative that better serves California.

Elizabeth King
11661 Hi Ridge Road
Lakeside, CA 92040

From: rsdispose2@comcast.net
Sent: Wednesday, December 12, 2007 4:30 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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* Being realistic in assessing the safe yield of water from Delta.

* Helping communities decrease demand from the Delta and increase their drought water reliability by aggressively implementing urban water conservation, agricultural water conservation, and water recycling and other innovative techniques. The State's own water plan demonstrates that efficient use and recycling in urban areas could provide about 4.5 million acre feet of water for California.

If DWR adopts these proposed amendments and avoids its responsibility to the water users of California, DWR will shift a great burden to the public and local communities. Even more importantly, DWR will ensure that the Bay Delta Estuary continues to degrade while drought water reliability decreases across the state.

As a concerned citizen I urge you to implement an alternative that better serves California.

Rita Summers
PO Box 646
Pacific Grove, CA 93950

From: marlafilipponi@comcast.net
Sent: Wednesday, December 12, 2007 4:46 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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We urge you to implement an alternative that better serves California.

Just as conservation should be a key tool used to help us become more energy independent, water CONSERVATION should be viewed as a primary means to help alleviate this water situation. I urge aggressive action in this area.

marla filipponi

38 vineyard drive
san rafael, CA 94901

From: jmaffei@ruthchek.com
Sent: Wednesday, December 12, 2007 3:58 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

A clean environment is very important to me.

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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J Maffei
148 Hermosa Avenue
Oakland, CA 94618

From: karolinasmom@yahoo.com
Sent: Wednesday, December 12, 2007 4:25 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Nancy Perkins
913 Woodland Ave
Woodland, CA 95695

From: suzanne_roland@Yahoo.com
Sent: Wednesday, December 12, 2007 3:32 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

M. Suzanne Roland
179 Palm Avenue
Marina, CA 93933

From: srsandy@sonic.net
Sent: Wednesday, December 12, 2007 9:11 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

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We urge you to implement an alternative that better serves California.

Sandra Peterson
1540 W 3rd St.
Santa Rosa, CA 95401

From: kmr@elitemail.org
Sent: Wednesday, December 12, 2007 3:53 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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We urge you to implement an alternative that better serves California.

Kristen Marie Robins
25 Rio Robles EAST Unit 435

San Jose, CA 95134-1665

From: pbsinc2201@earthlink.net
Sent: Wednesday, December 12, 2007 2:44 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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We urge you to implement an alternative that better serves California.

Larry Hanson
2201 Via Saldivar
Glendale, CA 91208

From: johnbcobb@cox.net
Sent: Wednesday, December 12, 2007 2:44 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft

Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

john cobb
1863 port kimberly
newport beach, CA 92660

From: Thamar@snowcrest.net
Sent: Wednesday, December 12, 2007 3:03 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

It has been known for many years that water is the gold of the 21st century. It has been predicted that wars will be fought over it. Therefore, our wise use and allocation of it becomes of supreme importance.

As a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is

recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

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* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

It is imperative that our water systems be cleaned up and restored to potability. There will not long remain sources of clean water.

We urge you to implement an alternative that better serves California. Thank you.

Thamar Wherrit
1917 Wyehka Way
Mt. Shasta, CA 96067

From: erichiss@sbcglobal.net
Sent: Wednesday, December 12, 2007 2:25 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

Eric Hiss
3997 Clayton Ave.
Los Angeles, CA 90027

From: johngannon@mac.com
Sent: Wednesday, December 12, 2007 2:39 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

john gannon
1401 Douglas Street #10
Los Angeles
la, CA 90026

From: leventhald@yahoo.com
Sent: Wednesday, December 12, 2007 2:27 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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We urge you to implement an alternative that better serves California.

David Leventhal
20 Melrose Court
San Mateo, CA 94402

From: tomhazelleaf@yahoo.com
Sent: Wednesday, December 12, 2007 2:27 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

The Department of Water Resources should reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would put at risk water supply reliability and lead to more damage to the Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

The DWR should adopt a more responsible alternative . It can help regions across the state prepare for dry times and reduce reliance on Delta water by:

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* Helping communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan shows that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

Tom Hazelleaf
4656 Fir Avenue
Seal Beach, CA 90740

From: bobb.mack@hklaw.com
Sent: Wednesday, December 12, 2007 1:54 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

bobbette mack
7007 latijera blvd.
los angeles, CA 90045

From: edithblack@comcast.net
Sent: Wednesday, December 12, 2007 2:08 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

Edith Black
50 La Encinal
Orinda, CA 94563

From: jessicadridgeway@yahoo.com
Sent: Wednesday, December 12, 2007 1:13 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Jessica Ridgeway
4115 Trout Gulch Rd

Aptos, CA 95003

From: last3lives@aol.com
Sent: Wednesday, December 12, 2007 1:01 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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We urge you to implement an alternative that better serves California.

Joy Smathers
3540 El Ricon Way
Sacramento, CA 95864

From: Linda.flores@fox.com
Sent: Wednesday, December 12, 2007 12:04 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Linda Flores-Cierzan
26810 Cuatro Milpas Street
Santa Clarita, CA 91354

From: heather@imagesrising.com
Sent: Wednesday, December 12, 2007 12:00 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Heather Rhine
1645 Mar West St. #2
Tiburon, CA 94920

From: dickroeth@netscape.net
Sent: Wednesday, December 12, 2007 12:06 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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If DWR adopts these proposed amendments and avoids its responsibly to the water users of California, DWR will have shifted a great burden to the public and local communities. Even more importantly, DWR will be ensuring the continued degradation of the Bay Delta Estuary while decreasing drought water reliability across the state.

I urge you to implement an alternative that better serves California.

Richard Roether
P O Box 5905
Pasadena, CA 91117

From: btzjenk@webtv.net
Sent: Wednesday, December 12, 2007 1:15 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Bruce Jenkins
907 Tanager Ct
Sunnyvale, CA 94087

From: jtdenton@earthlink.net
Sent: Wednesday, December 12, 2007 1:20 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

I can't imagine Governor Schwarzenegger would support this. We urge you to implement an alternative that better serves California.

John Denton
325 Via Montanosa
Encinitas, CA 92024

From: tsuzin@sbcglobal.net
Sent: Wednesday, December 12, 2007 11:48 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department

of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Susan Thompson
PO Box 1105
El Segundo, CA 90245

From: emily0806@juno.com
Sent: Wednesday, December 12, 2007 12:59 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Emily Hollander
1738 4th Ave.
Oakland, CA 94606

From: magpie310@hotmail.com
Sent: Wednesday, December 12, 2007 12:55 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

karen Thompson
6547 Claremont Ave.
Richmond, CA 94805

From: johnjuly@yahoo.com
Sent: Wednesday, December 12, 2007 12:59 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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John Sefton
20462 Rose Canyon Road
Trabuco Canyon, CA 92678

From: happeemark@yahoo.com
Sent: Wednesday, December 12, 2007 12:59 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Mark Feldman
137 Winchester Dr
Santa Rosa, CA 95401

From: dale@starstream.net
Sent: Wednesday, December 12, 2007 12:44 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Dale Peterson
1052 Magnolia Lane
Lincoln, CA 95648

From: christine.freytag@l-3com.com
Sent: Wednesday, December 12, 2007 11:57 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Christine Freytag
519 Charro
Nipomo, CA 93444

From: campgirl1@sbcglobal.net
Sent: Wednesday, December 12, 2007 11:35 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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water reliability across the state.

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Sandi Miller
1346 E. Chestnut
Orange, CA 92867

From: footdrmike@yahoo.com
Sent: Wednesday, December 12, 2007 11:39 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Michael Alvaro
18832 SAN FELIPE ST.
Fountain Valley, CA 92708

From: ejb93528@yahoo.com
Sent: Wednesday, December 12, 2007 11:29 AM

To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Joann Barbee
805 W. 2nd St.
Red Mountain, CA 93558

From: mathes77@msn.com
Sent: Wednesday, December 12, 2007 8:16 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Mollie F Mathes
27080 Blue Hill Dr
Sun City, CA 92586-3102

From: khcdancer@yahoo.com
Sent: Wednesday, December 12, 2007 8:13 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Karen Clark
PO Box 1473
Ventura, CA 93002

From: llyerly@prodigy.net
Sent: Wednesday, December 12, 2007 11:22 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Linda Joy Lyerly
825 Munevar Rd.
Cardiff by the Sea, CA 92007

From: josecull@aol.com
Sent: Wednesday, December 12, 2007 11:09 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Joseph Cullen
985 1/2 14th St.
San Francisco, CA 94114

From: fwegscheider@fullerton.edu
Sent: Wednesday, December 12, 2007 10:40 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Frank Wegscheider
207 San Anselmo Ln.
Placentia, CA 92870

From: sr0581@hotmail.com
Sent: Wednesday, December 12, 2007 10:31 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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sanjay ramrakha
437 winslow st
crockett, CA 94525

From: noj@west.net
Sent: Wednesday, December 12, 2007 9:39 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Jon Leslie
744 Elko Ave
Ventura, CA 93004-2231

From: activist@cruzio.com
Sent: Wednesday, December 12, 2007 11:12 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Martha Schwartz
130 Tree Frog Lane

Santa Cruz, CA 95060

From: mphillip@sbcglobal.net
Sent: Wednesday, December 12, 2007 11:07 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Michael Phillips
502 Park View Ave
Grover Beach, CA 93433

From: osuzi@hotmail.com
Sent: Wednesday, December 12, 2007 11:00 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Susan Orozco-Neu
3458 Lee Street
Los Angeles, CA 90023

From: allaur@comcast.net
Sent: Wednesday, December 12, 2007 10:15 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Alex Forman
11 Redwood Drive
San Rafael, CA 94901

From: LVK524@yahoo.com
Sent: Wednesday, December 12, 2007 10:13 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Leslie VanKeuren
4310 Finley Ave.
Apt. 7
Los Angeles, CA 90027

From: jcrewsf@yahoo.com
Sent: Wednesday, December 12, 2007 10:09 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Julie Crew
3911 22nd Street
San Francisco, CA 94114

From: jrmscdme@pacbell.net
Sent: Wednesday, December 12, 2007 10:09 AM

To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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I urge you to implement an alternative that better serves California.

John Manning
339 Frederick St
San Francisco, CA 94117-3913

From: meghan_laurs@yahoo.com
Sent: Wednesday, December 12, 2007 10:02 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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We urge you to implement an alternative that better serves California.

Meghan Laurs
1611 Summit Ave
Cardiff, CA 92007

From: bdipert@pacbell.net
Sent: Wednesday, December 12, 2007 9:12 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Brian Dipert
5000 V Street
Sacramento, CA 95817

From: elileon1@yahoo.com
Sent: Wednesday, December 12, 2007 9:28 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Eli Leon
5663 Dover St
Oakland, CA 94609

From: ylbackus@pacbell.net
Sent: Wednesday, December 12, 2007 9:24 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Lee Backus
5357 Maricopa Dr.
Simi Valley, CA 93063

From: lakelly2@mindspring.com
Sent: Wednesday, December 12, 2007 8:58 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Lee Anna Kelly
120 Evelyn Way
San Francisco, CA 94127

From: witchywoman@earthlink.net
Sent: Wednesday, December 12, 2007 8:57 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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karen gruber
3361 avocado vista lane
fallbrook, CA 92028

From: mkarp_845@yahoo.com
Sent: Wednesday, December 12, 2007 8:58 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Michael Karp
P.O. Box 1653
Big Bear Lake, CA 92315

From: chiehru@yahoo.com
Sent: Wednesday, December 12, 2007 8:31 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Chieh-Ru Chu
11126 Barman Ave
Culver City, CA 90230

From: eduggan@cdfa.ca.gov
Sent: Wednesday, December 12, 2007 8:27 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Eric Duggan
2321 River Plaza Dr 27
Sacramento , CA 95833

From: stwhite51@sbcglobal.net
Sent: Wednesday, December 12, 2007 8:19 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Steven White
POB 790
Moss Beach, CA 94038

From: healey_shannon@hotmail.com
Sent: Wednesday, December 12, 2007 8:30 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Shannon Healey
900 Fremont St #2
Menlo Park, CA 94025

From: helenlmms@juno.com
Sent: Wednesday, December 12, 2007 7:55 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Helen Lembeck
3270 Holly Way
Chula Vista, CA 91910-3217

From: michael_lauran@yahoo.com
Sent: Wednesday, December 12, 2007 7:39 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Michael Lauran
915 York Street
San Francisco, CA 94110

From: loublumberg@imperialcounty.net
Sent: Wednesday, December 12, 2007 7:47 AM
To: Brown, Delores

Subject: Draft Monterey Plus Environmental Impact Report

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Louis Blumberg
1638 So. 23rd Street
El Centro, CA 92243-9411

From: ghlatta3@comcast.net
Sent: Wednesday, December 12, 2007 7:43 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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George Latta
3802 South Kent Street
Visalia, CA 93277

From: georgeedwardskid@yahoo.com
Sent: Wednesday, December 12, 2007 7:36 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Sue Smith
8687 Falmouth Ave.
#104
Playa Del Rey, CA 90293

From: Rbssj@earthlink.net
Sent: Wednesday, December 12, 2007 7:37 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Susan hardin

846 Cahuenga Blvd.
L.A., CA 90038

From: Artelizabeth@sunset.net
Sent: Wednesday, December 12, 2007 7:26 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Elizabeth Kuiper
1126 Bidwell Ave.
Chico, CA 95926

From: jch286p@msn.com
Sent: Tuesday, December 11, 2007 9:09 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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John C. Higuera
286 PRINCETON Dr
Costa Mesa, CA 92626

From: nancya0624@aol.com
Sent: Tuesday, December 11, 2007 8:14 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban

water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Nancy Hiestand
526 South Campus Way
Davis, CA 95616-3523

From: andronetta@douglass.com
Sent: Tuesday, December 11, 2007 8:14 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Andronetta Douglass
4214 Green Ave
Los Alamitos, CA 90720-3505

From: mrlgsl@aol.com
Sent: Tuesday, December 11, 2007 7:31 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Margaret Lomax
7 Rolling Place Ct.
Rio Vista, CA 94571

From: k_gagomiros@hotmail.com
Sent: Tuesday, December 11, 2007 7:28 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Keith Gagomiros
821 F Street
Sacramento, CA 95814

From: cspenger@usamedia.tv
Sent: Tuesday, December 11, 2007 3:45 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Constance Spenger
120 Olivia Lane
Big Pine, CA 93513

From: jsf2k@yahoo.com
Sent: Wednesday, December 12, 2007 6:55 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Jonathan Fisch
12021 Wilshire Blvd.
Suite 140
Los Angeles, CA 90025

From: laurakares@yahoo.com
Sent: Wednesday, December 12, 2007 6:47 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Laura Kares
1005 Morro Ct
Roseville, CA 95661

From: maritimus49@yahoo.com
Sent: Wednesday, December 12, 2007 6:45 AM

To: Brown, Delores
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Bruce Bennett
1001 Bridgeway #185
Sausalito, CA 94965

From: in_tules@yahoo.com
Sent: Wednesday, December 12, 2007 6:43 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Linda MacKay
P.O Box 569
Lebec, CA 93243

From: hajarian@hotmail.com
Sent: Wednesday, December 12, 2007 6:31 AM
To: Brown, Delores
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Michelle Hajarian
114 Amelia Way
Novato, CA 94949

From: ketojin@cox.net
Sent: Wednesday, December 12, 2007 6:20 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Jeff Herman

805 N. Cleveland Street
Unit B
Oceanside, CA 92054

From: sacheart@comcast.net
Sent: Wednesday, December 12, 2007 6:04 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Allison Spreadborough
4811 Alturas Way
Sacramento, CA 95822

From: clcalhoun@pacbell.net
Sent: Wednesday, December 12, 2007 5:54 AM
To: Brown, Delores
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Charles Calhoun
331 San Fernando Way
San Francisco, CA 94127-1913

From: joyceburk@earthlink.net
Sent: Wednesday, December 12, 2007 5:53 AM
To: Brown, Delores
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Joyce Burk
P.O. Box 106
Barstow, CA 92312

From: hschling@hankschlinger.com
Sent: Wednesday, December 12, 2007 5:43 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Hank Schlinger
708 Country Club Dr.
Burbank, CA 91501

From: kduckert@aol.com
Sent: Wednesday, December 12, 2007 5:32 AM
To: Brown, Delores
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Ken Duckert
91 Grandview Place
Walnut Creek, CA 94595

From: lcs5779@sbcglobal.net
Sent: Wednesday, December 12, 2007 4:22 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Dennis Ledden
14941 Trinidad Drive
Rancho Murieta, CA 95683

From: ra.davis@cox.net
Sent: Wednesday, December 12, 2007 4:10 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Robert Davis
4978 35th Street
San Diego, CA 92116

From: jeannesloane@yahoo.com
Sent: Wednesday, December 12, 2007 4:06 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Jeanne Sloane
747 Cindy Lane
Petaluma, CA 94952

From: Jottow2@yahoo.com
Sent: Wednesday, December 12, 2007 4:01 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Joe Otto
3210 Bayshore Dr.
Westlake Village, CA 91361

From: kevinbran@yahoo.com
Sent: Wednesday, December 12, 2007 3:53 AM
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I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Kevin Branstetter
901 N Pleasant Ave
Lodi, CA 95240

From: deerandolph@yahoo.com
Sent: Wednesday, December 12, 2007 3:20 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

Dee Randolph
12059 Andy Mtn. Rd.
Yankee Hill, CA 95965-0500

From: dindamcp4@yahoo.com
Sent: Wednesday, December 12, 2007 1:40 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

Dinda Evans
POB 178695
SAN DIEGO, CA 92177

From: xyamuchax@care2.com
Sent: Wednesday, December 12, 2007 1:12 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Jason Bowman
2674 Woodridge Court # 1
Placerville, Ca 95667-4036

From: nanaapple@peoplepc.com
Sent: Wednesday, December 12, 2007 12:55 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. (I received this information in an e-mail from the Sierra Club. I don't know the particulars of this proposal, but trust the Sierra Club. I am also very concerned about water conservation. Fresh water is a resource that is at risk. We need to be much more careful in how we use it. We have been spendthrift with this most necessary resource. Thank you. The rest of the letter is as written by the Sierra Club.) I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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We urge you to implement an alternative that better serves California.

Betty Vierra
91 Nandina Drive
Aptos, CA 95003

From: kn_bui@yahoo.com
Sent: Tuesday, December 11, 2007 11:36 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

Khoi Bui
11816 Norfolk Pl.
Dubin, CA 94568-1080

From: louisgem2@yahoo.com
Sent: Tuesday, December 11, 2007 11:29 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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Louis Cangemi
4322 Berryman Ave. #4
Los Angeles, CA 90066

From: bradbuethe@earthlink.net
Sent: Tuesday, December 11, 2007 11:28 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Brad Buethe
4351-A 17th Street
San Francisco, CA 94114

From: anders17@ix.netcom.com
Sent: Tuesday, December 11, 2007 11:26 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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John H Anderson
4042 Albatross, Apt 38
San Diego, CA 92103

From: sthita@yahoo.com
Sent: Tuesday, December 11, 2007 11:23 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Stephen Mallory
2902 Unicornio St
Carlsbad, CA 92009

From: garybardo@comcast.net
Sent: Tuesday, December 11, 2007 11:19 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Gary Boren
501 Guerrero #6
San Francisco, CA 94110-1046

From: gardenbeekeeper@yahoo.com
Sent: Tuesday, December 11, 2007 11:15 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Will Yeager
1407 Venice Blvd.
Venice, CA 90291

From: bluwizz@sonic.net
Sent: Tuesday, December 11, 2007 11:14 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Keith Hall
Box 711
Guerneville, CA 95446-0711

From: bbispo@sbcglobal.net
Sent: Tuesday, December 11, 2007 11:06 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Betty Bispo
1601 Canyonwood Ct. #12
Walnut Creek, CA 94595

From: MAYBURRITO@GOOFBUSTER.COM
Sent: Tuesday, December 11, 2007 10:59 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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JOHN MAYBURY
1302 ROSITA ROAD
PACIFICA, CA 94044

From: rosenquist@foothill.net
Sent: Tuesday, December 11, 2007 10:56 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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David and Jeanne Rosenquist
P.O. Box 37
78 Horseshoe Bend
Gold Run, CA 95717

From: canbowring@yahoo.com
Sent: Tuesday, December 11, 2007 10:56 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Candy Bowman
2674 Woodridge Court # 1
Placerville, CA 95667

From: zurfer2000@yahoo.com
Sent: Tuesday, December 11, 2007 10:46 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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Philip Zurfluh
1137 Waterloo St.
Los Angeles, CA 90026

From: jeannine.linder@sbcglobal.net
Sent: Tuesday, December 11, 2007 10:45 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Jeannine Linder
****
Simi Valley, CA 93065

From: it-works@comcast.net
Sent: Tuesday, December 11, 2007 10:38 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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James Fish
19980 Meadowlark Drive
Castro Valley, CA 94546-4411

From: belindabvale@yahoo.com
Sent: Tuesday, December 11, 2007 10:31 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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We urge you to implement an alternative that better serves California.

Belinda Higuera
2122 Hill Rd.
Mount Shasta, CA 96067

From: ecofriend@yahoo.com
Sent: Tuesday, December 11, 2007 10:25 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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Kamal Prasad
4683 Quigg Dr #322
Santa Rosa, CA 95409

From: slevymuse@aol.com
Sent: Tuesday, December 11, 2007 10:25 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Simon Levy
5060 Fountain Ave
Los Angeles, CA 90029

From: stump1@sbcglobal.net
Sent: Tuesday, December 11, 2007 10:20 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Bob Schneider
2432 Riverside Dr
Santa Ana, CA 92706

From: goford@sbcglobal.net
Sent: Tuesday, December 11, 2007 10:20 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Elaine Gorman
234 N. Conejo Ave.
Modesto, CA 95354

From: diane.wittig@comcast.net
Sent: Tuesday, December 11, 2007 10:10 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Diane Wittig
21 Roohr Court
Chico, CA 95928

From: a_meiling@hotmail.com
Sent: Tuesday, December 11, 2007 10:09 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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meiling albert
950 el camino ave
vacaville, CA 95688

From: richard@infinitefunctions.com
Sent: Tuesday, December 11, 2007 10:05 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Richard Harvey
2430 Geneseo Rd
Paso Robles, CA 93446

From: sierraclub@pluginfilters.com
Sent: Tuesday, December 11, 2007 9:53 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Thomas Carlino
549 Quail Bush Ct
San Jose, CA 95117

From: bendcook@comcast.net
Sent: Tuesday, December 11, 2007 9:51 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Patricia Bender
P.O. Box 414
Fair Oaks, CA 95628

From: freeker@sbcglobal.net
Sent: Tuesday, December 11, 2007 9:49 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Mikal Baker
986 C St.
Arcata, CA 95521

From: gaby@dv8.net
Sent: Tuesday, December 11, 2007 9:44 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Gabriella Turek
112 N Michigan Ave #12
Pasadena, CA 91106-1858

From: eherrin@pacbell.net
Sent: Tuesday, December 11, 2007 9:40 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Roy & Eileen Herrin
6424 Almond Ave
Orangevale, CA 95662

From: nssmith@earthlink.net
Sent: Tuesday, December 11, 2007 9:38 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Nancy Smith
785 Montrose Ave.
Palo Alto, CA 94303

From: agrantz@pacbell.net
Sent: Tuesday, December 11, 2007 9:35 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Arthur Grantz
930 van Auken Circle
Palo Alto, CA 94303

From: artsbtrav@aol.com
Sent: Tuesday, December 11, 2007 9:34 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Arthur J Denk
32 E. Islay St
Sn Barbara, CA 93101

From: edhasson@sbcglobal.net
Sent: Tuesday, December 11, 2007 9:28 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Ed Hasson
161 Espana Way
Windsor, CA 95492

From: jlance@hughes.net
Sent: Tuesday, December 11, 2007 9:19 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Jennifer Lance
P.O. Box 139
Hyampom, CA 96046

From: auntiekath1@MSN.COM
Sent: Tuesday, December 11, 2007 9:14 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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KATHLEEN MARTIN
4271 Autumn Gold
Banning, CA 92220

From: dtokugawa@comcast.net
Sent: Tuesday, December 11, 2007 9:13 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Diane Tokugawa
1256 Spruce St.
Berkeley, CA 94709

From: elzantho1@aol.com
Sent: Tuesday, December 11, 2007 9:10 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Elizabeth Anthony
P.O. Box 506
San Jacinto, CA 92581

From: roblands@comcast.net
Sent: Tuesday, December 11, 2007 9:03 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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We urge you to implement an alternative that better serves California.

David Roberts
1294 Kennady Lane
Sacramento, CA 95822

From: swovem@cox.net
Sent: Tuesday, December 11, 2007 8:59 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Maury Swoveland
23761 Saint Elena
Mission Viejo, CA 92691-3604

From: dj_kt@hotmail.com
Sent: Tuesday, December 11, 2007 8:59 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Katherine Pollard
1141 Shattuck Ave.
Berkeley, CA 94707

From: dstjulien@sbcglobal.net
Sent: Tuesday, December 11, 2007 8:51 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Deborah St. Julien
4570 Kingspark Drive
San Jose, CA 95136-2323

From: wkerfoot@phillipsco.com
Sent: Tuesday, December 11, 2007 1:41 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Wendy Kerfoot
1123 GLENDON COURT
South Pasadena, CA 91030

From: john.holtzclaw@sierraclub.org
Sent: Tuesday, December 11, 2007 1:44 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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John Holtzclaw
1508 Taylor
San Francisco, CA 94133

From: dali_fan@worldnet.att.net
Sent: Tuesday, December 11, 2007 1:32 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Rosemary Nelson
3548 Cody Way
Sacramento, CA 95864

From: tmstrutner@hotmail.com
Sent: Tuesday, December 11, 2007 1:35 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Tricia Strutner
15781 Rica Vista Way
San Jose, CA 95127

From: sas@alumni.brown.edu
Sent: Tuesday, December 11, 2007 1:47 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Stephanie Reyes
225 E. Santa Inez Ave #5
San Mateo, CA 94401

From: kdschmitt3@hotmail.com
Sent: Tuesday, December 11, 2007 8:51 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Richard Schmitt
27750 Cornell
Hemet, CA 92544-8225

From: diane-cantwell@pacbell.net
Sent: Tuesday, December 11, 2007 8:50 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Diane Cantwell
505 Belmont Avenue
Los Angeles, CA 90026-41232

From: cskincc@aol.com
Sent: Tuesday, December 11, 2007 8:47 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Charlotte Cohen
68628 J street
Cathedral-City, CA 92234

From: lweismehl@hotmail.com
Sent: Tuesday, December 11, 2007 8:44 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Land Weismehl
1326-41st Avenue
San Francisco, CA 94122-1207

From: lauracarmel@aol.com
Sent: Tuesday, December 11, 2007 8:42 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Laura Pavloff
P.O. Box 296
Big Sur, CA 93920

From: BRLW@pacbell.net
Sent: Tuesday, December 11, 2007 8:42 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Beth Wilcoxen
8832 BOLD RULER WAY
FAIR OAKS, CA 95628

From: jcox2002@hotmail.com
Sent: Tuesday, December 11, 2007 8:39 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Jane Forbes
202 Merced Avenue
Santa Cruz, CA 95060

From: hagmeier60@hotmail.com
Sent: Tuesday, December 11, 2007 8:28 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Clarence Hagmeier
Rt. 4 box 905C
Forks of Salmon, CA 96031

From: smjllast4@cox.net
Sent: Tuesday, December 11, 2007 8:28 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Margaret Lastra
5548 Cathedral Oaks Rd
Santa Barbara, CA 93111

From: renatamullen@sbcglobal.net
Sent: Tuesday, December 11, 2007 8:24 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Renata Mullen
805 Wallea Drive
Menlo Park, CA 94025

From: jreel@pacbell.net
Sent: Tuesday, December 11, 2007 8:14 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Joseph Reel
PO Box 51066
Pacific Grove, CA 93950

From: sk8nbike@pacbell.net
Sent: Tuesday, December 11, 2007 8:07 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Judith BUTTS
1036 Sladky Ave
Mountain View, CA 94040

From: barrystelling@sbcglobal.net
Sent: Tuesday, December 11, 2007 8:00 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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barry stelling
540 boyes bl
sonoma, CA 95476-3749

From: joan463@earthlink.net
Sent: Tuesday, December 11, 2007 7:58 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Joan C. Bush
351 Chestnut Hill Ct. #22
Thousand Oaks, CA 91360

From: libraj@comcast.net
Sent: Tuesday, December 11, 2007 7:57 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Janice Foss
622 Richmond St.
El Cerrito, CA 94530-3213

From: starpaws@earthlink.net
Sent: Tuesday, December 11, 2007 7:57 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Deborah Harvey
243 Chapman Drive
Corte Madera, CA 94925

From: seaandmts2@yahoo.com
Sent: Tuesday, December 11, 2007 7:55 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Barbara Wishingrad
PO Box 22506
Santa Barbara, CA 93121

From: hannahsf@yahoo.com
Sent: Tuesday, December 11, 2007 7:54 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Hannah Denmark
818 Alabama St
San Francisco, CA 94110

From: ian@noahfamily.org
Sent: Tuesday, December 11, 2007 7:50 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Ian Noah
939 S. Dunsmuir Ave.
Los Angeles, CA 90036

From: arlet402@yahoo.com
Sent: Tuesday, December 11, 2007 7:46 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Arlet Argel
11413 214th Street
Lakewood, CA 90715

From: lessa@stanfordalumni.org
Sent: Tuesday, December 11, 2007 7:43 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Eva Heninwolf
2696 Eaton Avenue
San Carlos, CA 94070

From: jeanine619@baymoon.com
Sent: Tuesday, December 11, 2007 7:37 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Jeanine Sande
564 Cuesta Dr.
Aptos, CA 95003

From: Betts2021@aol.com
Sent: Tuesday, December 11, 2007 7:34 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Betts Harley
2021 Irvine Ave.
Costa Mesa, CA 92627

From: eileenmurphymd@comcast.net
Sent: Tuesday, December 11, 2007 7:32 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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eileen murphy
3058 Lopez Road
Pebble Beach, CA 93953

From: rmharman@auros.org
Sent: Tuesday, December 11, 2007 7:27 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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R Michael Harman
556 Cambridge Ave
Palo Alto, CA 94306

From: celia552@cox.net
Sent: Tuesday, December 11, 2007 7:24 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Celia Kutcher
34681 Calle los Robles
Capistrano Beach, CA 92624

From: joebraus@charter.net
Sent: Tuesday, December 11, 2007 7:22 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Joseph Braus
234 N. Cordova St., #2
Burbank, CA 91505

From: rahjur@charter.net
Sent: Tuesday, December 11, 2007 7:21 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Roger Euchler
535 West 4th Street, Sweet #305
Long Beach, CA 90802-2197

From: rclappo@jps.net
Sent: Tuesday, December 11, 2007 7:20 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Robert Lappo
10237 Fernglen Ave.
Apt. #203
Tujunga, CA 91042-2275

From: vegieteri@yahoo.com
Sent: Tuesday, December 11, 2007 7:20 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Teri Gwarek
14940 minneola ct.
tustin, CA 92780

From: onesequoia@earthlink.net
Sent: Tuesday, December 11, 2007 12:08 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Richard Larimore
716 N. Ontario St.
Burbank , CA 91505

From: dovehill@wildmail.com
Sent: Tuesday, December 11, 2007 12:06 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Nicole Macaluso
6311 El Montevideo
PO Box 1318
Rancho Santa Fe, CA 92067-1318

From: gcook69833@aol.com
Sent: Tuesday, December 11, 2007 12:07 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Geoffrey Cook
P.O. Box 4233
Berkeley, CA 94704

From: mermaidlaguna@aol.com
Sent: Tuesday, December 11, 2007 12:13 PM

To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

Stop allowing agribusiness to get water cheaply and then waste it by not montioring their usage (i.e. not quickly finding and mending leaks in the sprinkler systems).

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

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* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Susaan Aram
1361 Terrace Way
Laguna Beach, CA 92651

From: jeffrey.pugh@sbcglobal.net
Sent: Tuesday, December 11, 2007 7:13 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Jeffrey Pugh
12215 Fredericksburg Drive
Saratoga, CA 95070

From: petek@accesscom.com
Sent: Tuesday, December 11, 2007 6:58 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Peter Klosterman
779 Kingston Ave. Apt. 14
Piedmont, CA 94611

From: skmorris1@sbcglobal.net
Sent: Tuesday, December 11, 2007 6:55 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

Plese reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State increases the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be required to provide more people with less water.

Please adopt a more responsible alternative for California. DWR can help the many regions in the state to prepare for dry times and to reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities to decrease demand from the Delta and increase drought water reliability through aggressive urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The State's water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopts these proposed amendments and avoids its responsibly to the water users of California, it will have shifted a burden to the public and to local communities. DWR will ensure the continued degradation of the Bay Delta Estuary while decreasing drought water reliability across the state.

Please implement an better alternative to serve California.

Sharon Morris
23693 Glenbrook Lane
Hayward, CA 94541-4458

From: zefflaw1@aol.com
Sent: Tuesday, December 11, 2007 6:51 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

David Zeff
650 Chapman Drive
Corte Madera, CA 94925

From: sgiglio127@comcast.net
Sent: Tuesday, December 11, 2007 3:25 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

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We urge you to implement an alternative that better serves California.

SHARON GIGLIO
7329 Baker Lane
Sebastopol, CA 95472

From: msowell@vom.com
Sent: Tuesday, December 11, 2007 3:29 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is

recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Malcolm Sowell
6505 Sonoma Mtn Rd.
Santa Rosa, CA 95404

From: alicemichiko@yahoo.com
Sent: Tuesday, December 11, 2007 3:24 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

* Providing a realistic assessment of the safe yield of water from Delta.

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continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

michiko shinmoto
806 e acacia ave unit cg
glendale, CA 91205

From: LAnnD4animals@charter.net
Sent: Tuesday, December 11, 2007 3:28 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

We are among the millions of Californians who are very concerned about the future of our water supply.
I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

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If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Lou Anna Denison
6931 E 11 TH St
Long Beach, CA 90815

From: skierulff@aol.com
Sent: Tuesday, December 11, 2007 6:49 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

Stephen Kierulff
3418 Grand View Blvd
Los Angeles, CA 90066-1902

From: ketchula@hotmail.com
Sent: Tuesday, December 11, 2007 6:46 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments

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We urge you to implement an alternative that better serves California.

Linda Arreola
2937 Adkins Ave
Los Angeles, CA 90032

From: john.hope@shifting-paradigms.net
Sent: Tuesday, December 11, 2007 6:45 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

John Hope
345 Church St.
San Francisco, CA 94114-1765

From: tortoise48@netscape.net
Sent: Tuesday, December 11, 2007 6:45 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

John Hagopian
1405 Blake St.
Berkeley, CA 94702

From: jdmcmillan@gmail.com
Sent: Tuesday, December 11, 2007 6:44 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

JD McMillan
1228 Delaware, Apt. K
Berkeley, CA 94702

From: wwpf4@comcast.net
Sent: Tuesday, December 11, 2007 6:41 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Paul Foster
5500 Ludwig Ave
El Cerrito, CA 94530

From: greenwood@greencafe.com
Sent: Tuesday, December 11, 2007 6:40 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

Karin Greenwood
P.O. Box 540
Idyllwild, CA 92549

From: ndscott52@hotmail.com
Sent: Tuesday, December 11, 2007 6:38 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

Nangela SCOTT
3565 CHESTNUT DRIVE
Norco, CA 92860

From: paulkemp@hotmail.com
Sent: Tuesday, December 11, 2007 6:32 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

Paul Kemp
12827 Sunburst Trail
Chino Hills, CA 91709

From: pelefan@earthlink.net
Sent: Tuesday, December 11, 2007 6:32 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Maggie Picker
25884 Iris Ave
Unit B
Moreno Valley, CA 92551

From: Ms.Marsha-V-L@PacBell.Net
Sent: Tuesday, December 11, 2007 6:31 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

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We urge you to implement an alternative that better serves California.

Ms. Marsha Lowry
1070 Mitchell Way
El Sobrante, CA 94803-1023

From: largsmith@comcast.net
Sent: Tuesday, December 11, 2007 6:27 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

When are you people going to start acting in a responsible manner; when we the citizens rise up and cut off your heads like the French citizens did to their leaders?

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

Lawrence Smith
958 Arguello Dr
San Leandro, CA 94578

From: ajlarue@pacbell.net
Sent: Tuesday, December 11, 2007 6:25 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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We urge you to implement an alternative that better serves California.

alfred larue
711 g ave
Coronado, CA 92118

From: jduvall@earthlink.net
Sent: Tuesday, December 11, 2007 6:17 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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We urge you to implement an alternative that better serves California.

Julie DuVall
3733 Antelope Creek Dr.
Ontario, CA 91761

From: reefster2@aol.com
Sent: Tuesday, December 11, 2007 6:15 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Gary Reese
440 Camino Flora Vista
San Clemente, CA 92673

From: genekostruba@comcast.net
Sent: Tuesday, December 11, 2007 6:13 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Gene Kostruba
468 Sierra Vista Ave. #15
Mountain View, CA 94043

From: jessicaduttlinger@hotmail.com
Sent: Tuesday, December 11, 2007 6:11 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Jessica Duttlinger
45 Poppy Lane
Berkeley, CA 94708

From: sygreens@aol.com
Sent: Tuesday, December 11, 2007 6:06 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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We urge you to implement an alternative that better serves California.

susan zalon
3424 marina dr.
santa barbara, CA 93110

From: sfcraft@hotmail.com
Sent: Tuesday, December 11, 2007 6:05 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Susan Craft
20581 Suburbia Ln.
Huntington Beach, CA 92646

From: goggins@cal.berkeley.edu
Sent: Tuesday, December 11, 2007 2:44 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Alan Goggins
18456 Vernon Court
Castro Valley, CA 94546-2230

From: jon.fish@sbcglobal.net
Sent: Tuesday, December 11, 2007 2:43 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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We urge you to implement an alternative that better serves California.

Jon Fish
21806 Mayan Dr
Chatsworth, CA 91311

From: robertrhein@prodigy.net
Sent: Tuesday, December 11, 2007 2:45 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Robert Rhein
10376 El Honcho Place
San Diego, CA 92124

From: dce005@yahoo.com
Sent: Tuesday, December 11, 2007 6:03 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Douglas Estes
629 Arguello Blvd.

Apt# 303
San Francisco, CA 94118

From: jsmarr@ucsd.edu
Sent: Tuesday, December 11, 2007 5:47 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Janet Smarr
1397 Caminito Halago
La Jolla, CA 92037

From: bpmilligan@sbcglobal.net
Sent: Tuesday, December 11, 2007 6:00 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Barbara Milligan
883 Balboa Lane
Foster City, CA 94404

From: caroline@elite.net
Sent: Tuesday, December 11, 2007 5:58 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Caroline Kreide
1038 Robinson Dr.
Merced, CA 95340

From: offstage@earthlink.net
Sent: Tuesday, December 11, 2007 5:56 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Ellen Koivisto
1556 Great Hwy #101
SF, CA 94122

From: sandyandsue@yahoo.com
Sent: Tuesday, December 11, 2007 5:28 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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RobRoy McGregor
11619 Remington St.
Lake View Terrace, CA 91342

From: graywaggle@mac.com
Sent: Tuesday, December 11, 2007 5:42 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Juliet Lamont
2249 Glen Ave.
Berkeley, CA 94709

From: w_bogdan@yahoo.com
Sent: Tuesday, December 11, 2007 5:29 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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William Bogdan
1408 palomino
upland, CA 91786

From: flowupstream@sbcglobal.net
Sent: Tuesday, December 11, 2007 5:28 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from

Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Kip Lambel
1495 N. College
Fresno, CA 93728

From: ajgravel29@yahoo.com
Sent: Tuesday, December 11, 2007 5:37 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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A. Joan Gravel
2039 Trevino Ave.
Oceanside, CA 92056

From: petermandell@comcast.net
Sent: Tuesday, December 11, 2007 5:36 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Peter Mandell
1345 20th Ave #11
San Francisco, CA 94122

From: johnessman@comcast.net
Sent: Tuesday, December 11, 2007 5:35 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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John Essman
P O Box 1381
Healdsburg, CA 95448

From: chhaprahiya@yahoo.com
Sent: Tuesday, December 11, 2007 5:12 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Arvind Kumar
2927 Glen Craig Ct
San Jose, CA 95148

From: marcomel@sonic.net
Sent: Tuesday, December 11, 2007 4:37 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Mark Mellander
1424 Freestone Flat Road
Freestone, CA 95472

From: talewand2@yahoo.com
Sent: Tuesday, December 11, 2007 3:47 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Todd Lewandowski

2705 Fressia Ct
Pleasanton, CA 94588

From: mark.santarelli@sbcglobal.net
Sent: Tuesday, December 11, 2007 3:48 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Mark Santarelli
2937 Adkins Ave.
Los Angeles, CA 90032

From: sweetjust@yahoo.com
Sent: Tuesday, December 11, 2007 2:12 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Shawn OO
912 Windsor St.

Santa Cruz, CA 95062

From: edeland@sisqtel.net
Sent: Tuesday, December 11, 2007 2:13 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Elizabeth Deland
P.O. Box 69
Klamath River, CA 96050

From: weishaus@sbcglobal.net
Sent: Tuesday, December 11, 2007 2:08 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Kent Weishaus
255 South Grand Ave. # 1214
Los Angeles, CA 90012

From: bobkopelman@hotmail.com
Sent: Tuesday, December 11, 2007 2:13 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

This letter has been prepared by the Sierra Club, but it expresses my own sentiments perfectly.
Therefore I send it as is:

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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Bob Kopelman
321 Cypress Drive
Fairfax, CA 94930

From: barriemason@yahoo.com
Sent: Tuesday, December 11, 2007 2:08 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Barrie Mason
2310 Cross Ave
Santa Rosa, CA 95401

From: lexx6@comcast.net

Sent: Tuesday, December 11, 2007 2:06 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Alexis Bartlo
638 Woodside Way
Woodside, CA 94062

From: vince@hearstcastle.com
Sent: Tuesday, December 11, 2007 2:03 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Vince Cukrov
9140 Balboa Ave.
San Simeon, CA 93452-9731

From: jhzimmer@pacbell.net
Sent: Tuesday, December 11, 2007 2:07 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Joan H Zimmer
750 Oddstad Blvd Apt 106
Pacifica, CA 94044

From: monica@vom.com
Sent: Tuesday, December 11, 2007 2:03 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Monica Steensma
481 Brazil Street
Sonoma, CA 95476

From: lancewilliamson@juno.com
Sent: Tuesday, December 11, 2007 5:15 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

Is this really the stealth perversion that it appears?

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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Lance Williamson
P.O.Box 4012
Carlsbad, CA 92008

From: evanskristina1@yahoo.com

Sent: Tuesday, December 11, 2007 1:35 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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We urge you to implement an alternative that better serves California. STOP KILLING AQUATIC ANIMALS BY LESSENING AND DISRUPTING NATURAL HABITAT!

Kristina Evans
Drake Ave.
Biggs, CA 95917

From: elecmon@sonic.net
Sent: Tuesday, December 11, 2007 1:43 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Gabriel Graubner
7899 St. Helena Rd.
Santa Rosa, CA 95404

From: kylin@chutney.org
Sent: Tuesday, December 11, 2007 1:38 PM
To: Brown, Delores
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By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Kylin O'Brien
2400 8th Ave
Oakland, CA 94606

From: winnaustin@comcast.net
Sent: Tuesday, December 11, 2007 5:04 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

G. Austin Smith
4370 Faulkner Dr
Fremont, CA 94536

From: dickens@att.net
Sent: Tuesday, December 11, 2007 5:03 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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We urge you to implement an alternative that better serves California.

Bart Dickens
208 Barrranca
Santa Barbara, CA 93109

From: timandrhon@mac.com
Sent: Tuesday, December 11, 2007 4:59 PM
To: Brown, Delores

Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Rhonda Lawrence
14030 Drexel Dr.
Magalia, CA 95954

From: fosterstudio@sbcglobal.net
Sent: Tuesday, December 11, 2007 4:58 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report. This project appears to be shortsighted, ill thought out, and not in the best interest of the residents of California.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

Linda Foster
113 W. Palo Alto Ave.
Fresno, CA 93704-1310

From: lyn711@pacbell.net
Sent: Tuesday, December 11, 2007 4:52 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Marilyn Rietzel
4850 Denny Avenue
North Hollywood, CA 91601

From: billgreninger@yahoo.com
Sent: Tuesday, December 11, 2007 4:09 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Edward greninger
8614 Allenwood Rd
Los Angeles,, CA 90046 - 1020

From: rahicks@charter.net
Sent: Tuesday, December 11, 2007 4:40 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Robert Hicks
2999 E. Ocean Blvd. Unit 1740
Long Beach, CA 90803

From: mwollman@calpoly.edu
Sent: Tuesday, December 11, 2007 4:05 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Michael Wollman
217 Westmont Avenue
San Luis Obispo, CA 93405

From: npkelly@netzero.net
Sent: Tuesday, December 11, 2007 4:42 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Nancy Kelly
1624 E. Hedges Ave.
Fresno, CA 93728

From: rsscpa@earthlink.net
Sent: Tuesday, December 11, 2007 4:25 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Rob Seltzer
9595 Wilshire Blvd, Suite 1020
Beverly Hills, CA 90212

From: julieowen3@hotmail.com
Sent: Tuesday, December 11, 2007 4:34 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Julie Owen
571 Santa Barbara Rd

Berkeley, CA 94707

From: ljlilly10@sbcglobal.net
Sent: Tuesday, December 11, 2007 4:23 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Laura Lilly
34280 Tupelo St.
Fremont, CA 94555

From: dicalder@earthlink.net
Sent: Tuesday, December 11, 2007 3:06 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Diane Calder
3993 Blackbird Way
Calabasas, CA 91302

From: owlsnest@hughes.net
Sent: Tuesday, December 11, 2007 3:04 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Marcia Johnson
1460 Big Cedar Lane
Sebastopol, CA 95472

From: andrewaldrich@hotmail.com
Sent: Tuesday, December 11, 2007 3:10 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Andrew Aldrich
2625 Pleasant St, Apt 19
Oakland, CA 94602

From: redwinecarl@hotmail.com
Sent: Tuesday, December 11, 2007 3:04 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Carl Fagerskog
280 Tawnee Way
Crescent City, CA 95531-5143

From: gay@neuro.fsu.edu
Sent: Tuesday, December 11, 2007 3:55 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Alice Howard
1763 Fearn Avenue
Los Osos, CA 93402

From: blue11clouds@yahoo.com
Sent: Tuesday, December 11, 2007 3:59 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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June Whitney
2130 Smith Ln. #44
Fortuna, CA 95540

From: beiseman@hotmail.com
Sent: Tuesday, December 11, 2007 3:09 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Betty Eiseman
1654 Strandway Court
Westlake Village, CA 91361

From: tarahui@hotmail.com
Sent: Tuesday, December 11, 2007 3:12 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the

water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Tara Hui
238 Wilde Ave
San Francisco, CA 94134

From: inor@earthlink.net
Sent: Tuesday, December 11, 2007 1:08 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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We urge you to implement an alternative that better serves California.

R. Zierikzee
845 Euclid Ave #4
San Francisco, CA CA

From: 4lochs@comcast.net
Sent: Tuesday, December 11, 2007 1:12 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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jan lochner
3710 Hicks Road
Sebastopol, CA 95472 -2420

From: sanfiv@yahoo.com
Sent: Tuesday, December 11, 2007 4:32 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Valerie Sanfilippo
3246 Ashford St. #M
San Diego, CA 92111-5039

From: COBERT127@MSN.COM
Sent: Tuesday, December 11, 2007 4:33 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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CATHIE OBERT
9016 el cajon way #4
Sacramento, CA 95826

From: rustydusty61@yahoo.com
Sent: Tuesday, December 11, 2007 4:27 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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elizabeth espinosa
621 e sunset dr n
redlands, CA 92373

From: sierraclubaction@andrewwilder.com
Sent: Tuesday, December 11, 2007 2:44 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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Andrew Wilder
8707 Falmouth Ave.
Unit 326
Playa Del Rey, CA 90293

From: scarlett389@sbcglobal.net
Sent: Tuesday, December 11, 2007 2:45 PM
To: Brown, Delores

Subject: Draft Monterey Plus Environmental Impact Report

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Gayle Ohara
1207 Herbazal St
Sonoma, CA 95476

From: thomasaldridge95112@yahoo.com
Sent: Tuesday, December 11, 2007 2:39 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

Its time to stop draining the Delta to the point that there are more endangered species and the water quality of the Delta is endangered - including San Francisco Bay!! Its time to start thinking about teaching the people in LA to stop wasting water and to teach the farmers to grow crops that do not demand billions of gallons of water for crops that should not be grown in Califonria!!!!We cannot continuea to do business as usual which is draining all the rivers of our state and killing the Delta!! Our leaders need courage to make the hard decisions which lead to saving water and to teaching conservation.We need real honest and

courageous people and not people who are shaking in their boots afraid they will lose votes or make some farmers and some people in LA unhappy!!!!I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

thomas aldridge
296 s 13 st
san jose, CA 95112

From: itsEdh@softcom.net
Sent: Tuesday, December 11, 2007 4:16 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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Edh Stanley
5206 Sitton Way
S'o, CA 95823

From: cosmicdance@prodigy.net
Sent: Tuesday, December 11, 2007 4:13 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Jacqueline Lasahn
1514 Sequoia Avenue
Richmond, CA 94805-1665

From: tim_barrington@hotmail.com
Sent: Tuesday, December 11, 2007 3:23 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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Tim Barrington
777 S. Mathilda. #125

Sunnyvale, CA 94087

From: Fawnzie10@aol.com
Sent: Tuesday, December 11, 2007 4:03 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Fawn Caldwell
16214 Spangler Peak Rd
Ramona, CA 92065

From: billstratton@hotmail.com
Sent: Tuesday, December 11, 2007 4:02 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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William Stratton
pob 932
Point Arena, CA 95468

From: lizryan@cruzio.com
Sent: Tuesday, December 11, 2007 3:55 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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elizabeth ryan
222 beachview ave
santa cruz, CA 95060

From: klmacuga@hotmail.com
Sent: Tuesday, December 11, 2007 3:44 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Kristen Macuga
1020 Olive St.
Santa Barbara, CA 93101

From: holisticgardener@hotmail.com
Sent: Tuesday, December 11, 2007 3:44 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Connie Beck
1077 Vista Madera Ln
El Cajon, CA 92019

From: KIRSTIN.BKA@SBCGLOBAL.NET
Sent: Tuesday, December 11, 2007 3:43 PM

To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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KIRSTIN FLYNN
1041 ARLINGTON WAY
MARTINEZ, CA 94553

From: dleitzel@firstam.com
Sent: Tuesday, December 11, 2007 12:15 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Denise Leitzel
1845 Lehigh Drive
Davis, CA 95616

From: pyjn@sbcglobal.net
Sent: Tuesday, December 11, 2007 12:06 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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I urge you to implement an alternative that better serves California. Water conservation and recycling are key!

P Johansen
708 Appaloosa Dr.
Walnut Creek, CA 94596

From: tmcabeer@hotmail.com
Sent: Tuesday, December 11, 2007 12:09 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Thais Turner
5613 Laguna Oaks Drive
Elk Grove, CA 95758

From: scotti@fotografia-LA.com
Sent: Tuesday, December 11, 2007 12:06 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

O. Bisogno Scotti
5078 Lemon Grove Avenue
Los Angeles, CA 90029

From: K-BARRETT@UNCLEMILTON.COM
Sent: Tuesday, December 11, 2007 12:09 PM
To: Brown, Delores

Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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KATHLEEN BARRETT
600 BARRINGTON CT.
NEWBURY PARK, CA 91320

From: tpost123@hotmail.com
Sent: Tuesday, December 11, 2007 3:16 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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We urge you to implement an alternative that better serves California.

Thomas Post
555A Greenwich Street
San Francisco, CA 94133

From: jlpoxon@netscape.net
Sent: Tuesday, December 11, 2007 2:59 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Judith Poxon
2708 Matheson Way
Sacramento, CA 95864

From: ddorenz@jps.net
Sent: Tuesday, December 11, 2007 3:02 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Dorothea Dorenz
1200 Neilson St. B
Berkeley, CA 94706

From: jackmahrt@email.com
Sent: Tuesday, December 11, 2007 2:50 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Jack Mahrt
209 Roosevelt Street
Coalinga, CA 93210

From: dmpenn2@comcast.net
Sent: Tuesday, December 11, 2007 2:49 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Daniel Penn
1048 Slate Drive
Santa Rosa, CA 95405

From: timroy@cox.net
Sent: Tuesday, December 11, 2007 2:52 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Maureen Roy
624 S. Kalmia St.
Escondido, CA 92025

From: mizuno53@hotmail.com
Sent: Tuesday, December 11, 2007 2:52 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Danny DeTora
7747 Greenback Ln Apt 513
Citrus Heights, CA 95610

From: tonyac@iname.com
Sent: Tuesday, December 11, 2007 2:21 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Tonya Cockrell

46 Rue Du Chateau
Aliso Viejo, CA 92656

From: mihail_naumovski@msn.com
Sent: Tuesday, December 11, 2007 2:28 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Mihail Naumovski
1601 Earl Warren Dr #M200
Long Beach , CA 90815

From: ajtomaui@yahoo.com
Sent: Tuesday, December 11, 2007 2:25 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Audrey Johnson
317 Pebble Beach Lane
azusa, CA 91711

From: cmessenger@sbcglobal.net
Sent: Tuesday, December 11, 2007 1:21 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Cathie Messenger
245 Fischer Avenue
Suite A-1
Costa Mesa, CA 92626

From: htlambie@hotmail.com
Sent: Tuesday, December 11, 2007 1:23 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Helen Goldstein
1026 Winding Ridge Ct.
Santa Rosa, CA 95404

From: kimberlyjannarone@hotmail.com
Sent: Tuesday, December 11, 2007 1:28 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Kimberly Jannarone
257 High Street

Apt 3
Santa Cruz, CA 95060

From: mark@consumerwatchdog.org
Sent: Tuesday, December 11, 2007 11:25 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Mark Reback
10305 1/2 Ilona Ave
Los Angeles, CA 90064

From: khmail@earthlink.net
Sent: Tuesday, December 11, 2007 11:26 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Ken Hedges
8153 Cinderella Pl.
Lemon Grove, CA 91945

From: laelmontgomery@aol.com
Sent: Tuesday, December 11, 2007 11:20 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Lael Montgomery
13678 McNally Road
Valley Center, CA 92082

From: tmiller@eluxury.com
Sent: Tuesday, December 11, 2007 11:24 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Thomas Miller
26 Normandy Lane
Orinda, CA 94563

From: dissaeva@deloitte.com
Sent: Tuesday, December 11, 2007 11:29 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Dessi Issaeva
301 Poplar Ave
#1

Mill Valley, CA 94941

From: redt@surewest.net
Sent: Tuesday, December 11, 2007 11:22 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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We urge you to implement an alternative that better serves California.

Red Taylor
100 Southern Cross Court
Roseville, CA 95747

From: sandoval@gseis.ucla.edu
Sent: Tuesday, December 11, 2007 11:25 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Bill Sandoval
6163 Buena Vista Ter
Los Angeles, CA 90042

From: comfychr@pacbell.net
Sent: Tuesday, December 11, 2007 11:26 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Ramsey Dau
1105 N. Coast Hwy. #C
Laguna Beach, CA 92627

From: lindakm@ix.netcom.com
Sent: Tuesday, December 11, 2007 11:24 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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We urge you to implement an alternative that better serves California.

Linda Mendonsa
519 Thistle Circle
Martinez, CA 94553

From: nghall2000@aol.com
Sent: Tuesday, December 11, 2007 11:30 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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We urge you to implement an alternative that better serves California.

Natalie Hall
4956 Rubio Ave.
Encino, CA 91436

From: tdmusic@earthlink.net
Sent: Tuesday, December 11, 2007 1:08 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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We urge you to implement an alternative that better serves California.

l steven
2002 Bakers
Los Angeles, CA 90024

From: kastanis@prodigy.net
Sent: Tuesday, December 11, 2007 1:07 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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David Kastanis
1240 Westridge Drive
Portola Valley, CA 94028-7343

From: bburt4885@earthlink.net
Sent: Tuesday, December 11, 2007 1:06 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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B. Burt
P.O. Box 4885
Covina, CA 91723

From: crt@5cats.org
Sent: Tuesday, December 11, 2007 1:11 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Carolyn Thomas
2916 32nd St.
San Diego, CA 92104

From: viciousbee@hotmail.com
Sent: Tuesday, December 11, 2007 2:46 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Jennifer P Bell
1 Jib St #103
Marina del Rey, CA 90292

From: connieeconomou@comcast.net
Sent: Tuesday, December 11, 2007 2:21 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Constantina Economou
10 Panoramic Way
Berkeley, CA 94704

From: wlsell@yahoo.com
Sent: Tuesday, December 11, 2007 2:18 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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William Sell
411 Catalpa Rd
Arcadia, CA 91007

From: rangerdave@mynvw.com
Sent: Tuesday, December 11, 2007 2:23 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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dave garcia
3573 via las lupes
oroville, CA 95965

From: bobfuray@yahoo.com
Sent: Tuesday, December 11, 2007 2:33 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Robert Furay
4709 Golf View Ct
Santa Rosa, CA 95405

From: abrinker@yahoo.com
Sent: Tuesday, December 11, 2007 2:31 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Aaron Brinkerhoff
15 Gloria Drive
San Rafael, CA 94901

From: asluft@hughes.net
Sent: Tuesday, December 11, 2007 2:31 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Sue Luft
4561 Almond Drive
Templeton, CA 93465

From: gregor@pixar.com
Sent: Tuesday, December 11, 2007 1:34 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Greg Snyder
21 Ray Ct.
San Rafael, CA 94901

From: pookiecat3@cox.net
Sent: Tuesday, December 11, 2007 2:15 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Patricia Kelly
28229 Nebrija
Mission Viejo, CA 92692

From: linda@lindanicholas.com
Sent: Tuesday, December 11, 2007 2:12 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

Whoa, this is a big issue. I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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Linda Nicholas
24015 Sag Harbor Ct
Valencia, CA 91355

From: Mirthfully@aol.com
Sent: Tuesday, December 11, 2007 2:04 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Susan Bredau
5409 Radford Avenue
Valley Village, CA 91607

From: mpowergiacoletti@prodigy.net
Sent: Tuesday, December 11, 2007 2:00 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department

of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

mary Giacoletti
9349 Jasper Way
San Simeon, CA 93452

From: beverlyscaff@comcast.net
Sent: Tuesday, December 11, 2007 1:48 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Beverly Scaff
2449 Pine Knoll Dr. #2
Walnut Creek, CA 94595-2192

From: rorylewis@earthlink.net
Sent: Tuesday, December 11, 2007 1:58 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Aurora Lewis
22734 Bassett St.
West Hills, CA 91307

From: nzarchin@aol.com
Sent: Tuesday, December 11, 2007 1:57 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Natalie Zarchin
8259 Terrace Dr
El Cerrito, CA 94530-3063

From: TerryT1011@aol.com
Sent: Tuesday, December 11, 2007 1:56 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Terry Trumbull
Environmental Studies Dept.
San Jose State University
San Jose, CA 95192-0115

From: laura.herndon@disney.com
Sent: Tuesday, December 11, 2007 1:53 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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We urge you to implement an alternative that better serves California.

Laura Herndon
125 N. Brighton St. #231
Burbank, CA 91506

From: foothillbldg@sbcglobal.net
Sent: Tuesday, December 11, 2007 1:49 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Dean Price
494 Ellis St.
Pasadena, CA 91105

From: sadonovan@igc.org
Sent: Tuesday, December 11, 2007 11:49 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Sharon Donovan
1300 Mar West
Apt. 3
Tiburon, CA 94920

From: abaum@clarefoundation.org
Sent: Tuesday, December 11, 2007 11:51 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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We urge you to implement an alternative that better serves California.

Anna Baum
4264 Lincoln Avenue
Culver City, CA 90232

From: claudiagibson@hotmail.com
Sent: Tuesday, December 11, 2007 1:31 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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claudia gibson
169 cascade drive
fairfax, CA 94930

From: sofbal22@hotmail.com
Sent: Tuesday, December 11, 2007 1:30 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Maria Villescas
15721 Bernardo Hts Pkwy
Ste B-179
San Diego, CA 92128

From: harijot2@earthlink.net
Sent: Tuesday, December 11, 2007 1:25 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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We urge you to implement an alternative that better serves California.

Harijot Khalsa
1945 Preuss Rd.
Los Angeles, CA 90034

From: ygolban@yahoo.com
Sent: Tuesday, December 11, 2007 1:25 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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water reliability across the state.

We urge you to implement an alternative that better serves California.

Yasaman Golban
1900 Eddy St. #17
San Francisco, CA 94115

From: brian_sipp@yahoo.com
Sent: Tuesday, December 11, 2007 1:03 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Brian Sipp
8148 Monte Park Ave
Fair Oaks, CA 95628

From: jhshelljr@aol.com
Sent: Tuesday, December 11, 2007 12:42 PM
To: Brown, Delores

Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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John Shell, Jr.
16647 Jersey St.
Granada Hills, CA 91344

From: freddecliff@juno.com
Sent: Tuesday, December 11, 2007 1:05 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Faye Reddecliff
25-A Myrtle Court
Petaluma, CA 94952

From: penguin@earthlink.net
Sent: Tuesday, December 11, 2007 12:41 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

As Co-Chair of Sierra Club California Air Quality Committee and a person committed to a healthy environment, I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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Let's use some common sense.

Bill Haller
6551 Densmore Avenue
Van Nuys, CA 91406

From: rhrice@ucdavis.edu
Sent: Tuesday, December 11, 2007 12:38 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Robert Rice
1007 Burr Street
Davis, CA 95616

From: pfearey@earthlink.net
Sent: Tuesday, December 11, 2007 12:40 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Patricia Fearey
20 Irwin Way, #738
Orinda, CA 94563

From: ken10@comcast.net
Sent: Tuesday, December 11, 2007 12:43 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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Kenneth Sobieraj
116 Walford Dr.
Moraga, CA 94556

From: deborah.rssc@sbcglobal.net
Sent: Tuesday, December 11, 2007 12:40 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is

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I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

deborah pendrey
309 riverside rd
oak view, CA 93022

From: eric@tilenius.com
Sent: Tuesday, December 11, 2007 12:40 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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Eric TILENIUS
30 Drayton Rd
Hillsborough, CA 94010-7233

From: jpizzo@redshift.com
Sent: Tuesday, December 11, 2007 1:17 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Julie Pizzo
PO Box 2134
Monterey, CA 93942

From: JtheFerg@pacbell.net
Sent: Tuesday, December 11, 2007 1:03 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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John A. Ferguson
1151 Walnut St
Berkeley, CA 94707

From: Jim.Feichtl@freight.fedex.com
Sent: Tuesday, December 11, 2007 11:20 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

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of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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James Feichtl
2036 Lyon Avenue
Belmont, CA 94002

From: lamplitr@ix.netcom.com
Sent: Tuesday, December 11, 2007 11:21 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Chuck Kelly
PO Box 30065
Long Beach, CA 90803

From: joe_kraynik@hp.com
Sent: Tuesday, December 11, 2007 11:23 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Joe Kraynik
1735 Foxridge Circle
Auburn, CA 95603

From: marian.cruz2903@sbcglobal.net
Sent: Tuesday, December 11, 2007 1:02 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Marian Cruz
661 4th St.
Hollister, CA 95023

From: rutkowski@terraworld.net
Sent: Tuesday, December 11, 2007 1:01 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Robert Rutkowski
2527 Faxon Court
Topeka, KS 66605-2086

From: clarkbeck@redshift.com
Sent: Tuesday, December 11, 2007 12:58 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Gudrun Beck
23765 Spectacular Bid Lane
Monterey, CA 93940

From: SLFMail@aol.com
Sent: Tuesday, December 11, 2007 12:50 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Sharon Frederick
2128 I Street
Sacramento, CA 95816

From: smacias@worldnet.att.net
Sent: Tuesday, December 11, 2007 12:50 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Susan Macias
117 1/2 Grand Avenue
Long Beach, CA 90803

From: mariposa34@sbcglobal.net
Sent: Tuesday, December 11, 2007 12:34 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Francisco Diaz
1434 Mariposa Street
Richmond, CA 94804

From: wmmccall@juno.com
Sent: Tuesday, December 11, 2007 12:34 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Wm. McCall
944 West Arcadia Avenue, #8
Arcadia, CA 91007

From: peter@robinett.us
Sent: Tuesday, December 11, 2007 12:36 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Peter Robinett
485 Cotton St.
Menlo Park, CA 94025

From: unclelarbo@yahoo.com
Sent: Tuesday, December 11, 2007 12:31 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Larry Brandenburg
13540 Collins Street
Van Nuys, CA 91401

From: graemek@astound.net
Sent: Tuesday, December 11, 2007 12:38 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California who frequently visits the Delta but who also has seen the wealth of wildlife this watery wonderland supports (permanent and transitory/migration). I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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Graeme Kinsey
1317 Sussex Way
Concord, CA 94521

From: erik.nye@gmail.com
Sent: Tuesday, December 11, 2007 12:35 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Erik Nye
2590 Greenvalley Rd.
Los Angeles, CA 90046

From: umzta@yahoo.com
Sent: Tuesday, December 11, 2007 12:46 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Heather Warren
6981 Ballena Way Unit 15
Carlsbad, CA 92009

From: wendyk@pon.net
Sent: Tuesday, December 11, 2007 12:46 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a farmer and native Californian. It is time to recognize our limited and overtaxed water supplies and implement strict limits to water use. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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Wendy Krupnick
4993 B. Occidental Rd.
Santa Rosa, CA 95401

From: billl5@prodigy.net
Sent: Tuesday, December 11, 2007 12:39 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public

and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Bill Leikam
530 Kendall Ave
Palo Alto , CA 94306

From: petera@ucr.edu
Sent: Tuesday, December 11, 2007 12:39 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Peter Arensburger
117 East Campus View Drive
Riverside, CA 92507-4002

From: nancyheck1@aol.com
Sent: Tuesday, December 11, 2007 12:33 PM

To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Nancy Heck
822 Speed Street
Santa Maria, CA 93454

From: acmwc@comcast.net
Sent: Tuesday, December 11, 2007 11:49 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while

inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

linda petrulias
23 silvia drive
cazadero, CA 95421

From: agsantacruz@sbcglobal.net
Sent: Tuesday, December 11, 2007 11:48 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would create irreparable damage to the ecosystem of the fragile Bay Delta Estuary.

The proposed project eliminates drought safeguards for the Delta and, while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

As a concerned, long time California resident,I urge DWR to adopt a responsible policy that recognizes that we must reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water

conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopts the proposed amendments and avoids its responsibly to the water users of California, DWR will shift a great burden to the public and local communities. DWR will ensure the continued degradation of the Bay Delta Estuary while decreasing drought water reliability across the state.

I urge you to implement the alternatives described above to limit water consumption and robbing water from one area to please another area.

Aldo Giacchino
1005 Pelton Avenue
Santa Cruz, CA 95060

From: claude.mcdonald@mindspring.com
Sent: Tuesday, December 11, 2007 12:29 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Claude McDonald
6633 Mt. Forest Dr
San Jose, CA 95120

From: sids_wolf@yahoo.fr
Sent: Tuesday, December 11, 2007 11:44 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Cedric Stroehnisch
917 Euclid Ave
Long Beach, CA 90804-5210

From: ricardo_maria@peoplepc.com
Sent: Tuesday, December 11, 2007 12:27 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

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We urge you to implement an alternative that better serves California.

Richard Vielbig
4161 Helen Lane
Auburn, CA 95602-9638

From: daisy44@comcast.net
Sent: Tuesday, December 11, 2007 12:28 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water

will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Sharon Salisbury
116 W. Blithedale
Mill Valley, CA 94941

From: m9663116@sbcglobal.net
Sent: Tuesday, December 11, 2007 12:28 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

We am writing as concerned citizens of California. We urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Ensuring a realistic assessment of the safe yield of water from Delta;

* Assisting communities in decreasing demand from the Delta and increasing drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The State's own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopts these proposed amendments and avoids its responsibly to the water users of California, DWR will shift a great burden to the public and local communities.

But, DWR has the opportunity to instead ensure that the degradation of the Bay Delta Estuary will decrease along with improving our ability to improve water reliability across the state during times of drought and climate change.

We urge you to implement an alternative that uses your ability to better serve this great state of the western United States.

Linda and Lance Millspaugh
22353 Mountain Drive
Twain Harte, CA 95383

From: wendylox@pacbell.net
Sent: Tuesday, December 11, 2007 12:27 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

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We urge you to implement an alternative that better serves California.

Wendy Lockwood
150 Allen Ave
Glendale, CA 91201

From: chris_kneedler@hotmail.com
Sent: Tuesday, December 11, 2007 12:25 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Chris Kneedler
1220 El Toro Way
Sacramento, CA 95864

From: susieee@aol.com
Sent: Tuesday, December 11, 2007 12:24 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department

of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

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We urge you to implement an alternative that better serves California.

Susan Ellis
26329 W. Plata Lane
Calabasas, CA 91302

From: jmiranda@dgsllp.com
Sent: Tuesday, December 11, 2007 12:24 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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I urge DWR to adopt a more responsible alternative for California. DWR can

help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

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We urge you to implement an alternative that better serves California.

Jennifer Miranda
3581 Quimby Street
San Diego, CA 92106

From: jglittle64@alumni.rice.edu
Sent: Tuesday, December 11, 2007 12:20 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the

water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

James Little
560 Kingsley Avenue
Palo Alto, CA 94301

From: shirslow@yahoo.com
Sent: Tuesday, December 11, 2007 12:19 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

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We urge you to implement an alternative that better serves California.

shirley boucher
1911 glenn place
davis, CA 95616

From: sltrainum@comcast.net

Sent: Tuesday, December 11, 2007 12:18 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

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We urge you to implement an alternative that better serves California.

Thomas Trainum
830 Pulteney Place
Windsor, CA 95492

From: gretapeck@msn.com
Sent: Tuesday, December 11, 2007 12:06 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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We urge you to implement an alternative that better serves California.

Greta Peck
10800 San Marcos Rd.
Atascadero, CA 93422

From: rossbudge@hotmail.com
Sent: Tuesday, December 11, 2007 12:05 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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We urge you to implement an alternative that better serves California.

Ross Budge
3960 Hawk St. Apt.3
San Diego, CA 92103

From: leoashton@sbcglobal.net
Sent: Tuesday, December 11, 2007 11:33 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

Leo Ashton
834 San Juan Dr
Sunnyvale, CA 94085

From: 2001barry@comcast.net
Sent: Tuesday, December 11, 2007 11:43 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

Dwight Barry
3185 Contra Loma Blvd
#201A
Antioch, CA 94509-5484

From: stevedowning@cox.net
Sent: Tuesday, December 11, 2007 11:35 AM

To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Steve Downing
2316 Edgewater Way
Santa Barbara, CA 93109

From: ellenh90@hotmail.com
Sent: Tuesday, December 11, 2007 11:38 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Ellen Hellman
315 Montana Ave.
Apt. 211
Santa Monica, CA 90403

From: Shamilton@stevehamiltonlaw.com
Sent: Tuesday, December 11, 2007 12:17 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Steven Hamilton
406 W. Via Vaquero
San Dimas, CA 91773

From: anhamilton@ucdavis.edu
Sent: Tuesday, December 11, 2007 11:35 AM
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Andrew Hamilton
2128 Bueno Drive Apt. 27
Davis, CA 95616

From: eplinda@aol.com
Sent: Tuesday, December 11, 2007 12:16 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Linda Bagneschi Dorrance
19 Alhambra Court
Novato, CA 94949

From: marinelldaniel@hotmail.com
Sent: Tuesday, December 11, 2007 12:16 PM
To: Brown, Delores
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Marinell Daniel
4070 La Colina Road
El Sobrante, CA 94803

From: richhubie@comcast.net
Sent: Tuesday, December 11, 2007 12:15 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Richard Hubacek
43300 Little River Airport Rd.
Sp.123
Little River, CA 95456

From: ckrupp@calpoly.edu
Sent: Tuesday, December 11, 2007 12:12 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Catharine Krupp
654 Islay St
San Luis Obispo, CA 93401

From: perpetua99@gmail.com
Sent: Tuesday, December 11, 2007 12:02 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Carol Cetrone
427 N Commonwealth Av

Los Angeles, CA 90004

From: sani.golriz@gmail.com
Sent: Tuesday, December 11, 2007 12:01 PM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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sani golriz
8450 whale watch way
la jolla, CA 92037

From: gdobosh@yahoo.com
Sent: Tuesday, December 11, 2007 12:01 PM
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George Dobosh
468 West Montecito ave.
Sierra Madre, CA 91024

From: odsevil3@earthlink.net
Sent: Tuesday, December 11, 2007 12:00 PM
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Olga Sevilla
7050 Shoup Ave. # 162
Canoga Park, CA 91303

From: lneustadt@lagunablanca.org
Sent: Tuesday, December 11, 2007 11:58 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Landon Neustadt
2006 Grand Ave #B
Santa Barbara, CA 993103

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Sent: Tuesday, December 11, 2007 11:58 AM
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Pamela Adams
1493 Morningside Drive
Laguna Beach, CA 92651-2810

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Roger Lasich
3819 Milton Terrace
Fremont, CA 94555

From: gypsywoman5@hotmail.com
Sent: Tuesday, December 11, 2007 11:57 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Margaret McMillan
263 Pine Avenue
Brea, CA 928215541

From: lee@cashleeper.com
Sent: Tuesday, December 11, 2007 11:55 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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lee pettenger
21 Diamond J Road
pobox 675
Seiad Valley, CA 96086

From: ericaliu@att.net
Sent: Tuesday, December 11, 2007 11:53 AM
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erica liu
9648 nadine st
temple city, CA 91780

From: markehrlich@hotmail.com
Sent: Tuesday, December 11, 2007 11:53 AM
To: Brown, Delores
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Mark Ehrlich
1340 N. Crescent Heights Blvd.
Apt. 9
West Hollywood, CA 90046

From: roberth@simonwolf.org
Sent: Tuesday, December 11, 2007 11:53 AM
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Robert Herrera
10200 Lilac Lane
Chatsworth, CA 91311

From: neuro__@hotmail.com
Sent: Tuesday, December 11, 2007 11:50 AM
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* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought water reliability across the state.

We urge you to implement an alternative that better serves California.

Nils Tikkanen
171 Marine Parade Apt 3
Santa Cruz, CA 95062

From: bwarwick@softcom.net
Sent: Tuesday, December 11, 2007 11:50 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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Catherine Warwick
11747 Giusti Road
Herald, CA 95638

From: tsourmany@sbcglobal.net
Sent: Tuesday, December 11, 2007 11:50 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Tony Sourmany
441 Buena Vista East #6
San Francisco, CA 94117

From: tigger100@comcast.net
Sent: Tuesday, December 11, 2007 11:49 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

AS a concerned citizen of California I am writing to urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

The proposed project would eliminate drought safeguards inflate the expectation of Delta water deliveries. The State is thereby recklessly increasing the demand for Delta water, and leaving communities high and dry during drought years.

I urge DWR to:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assist communities decrease water demand through education, conservation, recycling and reuse of waste water and run-off water, improved agricultural watering methods, desalinization,and other innovative techniques.

The currently proposed amendments will permit DWR to avoid its responsibly to the water users of California, who intended the State Water Project to be used for municipal water supplies as it principal use. The adoption of these amendments will place a huge burden on the public and local communities.

Of additional significance is the fact that DWR will ensure the continued degradation of the Bay Delta Estuary while decreasing drought water reliability across the state.

Moral, and social conscience and good government management demand that you submit and implement an alternative amendment that better serves the majority of the people and the environmental concerns of the State of California.

Catherine Moseley
36835 Lexington AV
Madera, CA 93636

From: rgwatson@pacbell.net
Sent: Tuesday, December 11, 2007 11:13 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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richard watson
501 via casitas #321
greenbrae, CA 94904

From: johnc@skyhighway.com
Sent: Tuesday, December 11, 2007 11:10 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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John Caletti
218 Brookside Ave
Santa Cruz, CA 95060

From: kamchic@jps.net
Sent: Tuesday, December 11, 2007 11:14 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Marian Lotz
P.O.Box 556
North San Juan, CA 95960

From: sekfmn@pacbell.net
Sent: Tuesday, December 11, 2007 11:07 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Stan Kaufman MD
144 Idora Avenue
San Francisco, CA 94127

From: gregg@L-Force.com
Sent: Tuesday, December 11, 2007 11:10 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Gregg Peterson
2215R Market Street #265
San Francisco, CA 94114

From: BrianP@fox.com
Sent: Tuesday, December 11, 2007 11:07 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Brian D. Pope
128 South Hayworth Avenue #5
Los Angeles, CA 90048-3620

From: Sprietsma29@netscape.net
Sent: Tuesday, December 11, 2007 11:43 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Leo Sprietsma, OFM
Mission Santa Barbara
2201 Laguna St.
Santa Barbara, CA 93105

From: Powers5500@aol.com
Sent: Tuesday, December 11, 2007 11:42 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Scott McKay
853 Laurel Street
Alameda, CA 94501

From: kkbluerose@hotmail.com
Sent: Tuesday, December 11, 2007 11:42 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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K Krupinski
4664 Rosewood Ave
la, CA 90004

From: dsharee@earthlink.net
Sent: Tuesday, December 11, 2007 11:42 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Donna Sharee
459 Naples Street
San Francisco, CA 94112

From: susancrawford@mac.com
Sent: Tuesday, December 11, 2007 11:41 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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susan Crawford
49 Divisadero Street
San Francisco, CA 94117

From: devesi@bullsroar.net
Sent: Tuesday, December 11, 2007 11:40 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Gail Herson
32422 Via Antibes
Dana Point, CA 92629

From: john@symphonyconsult.com
Sent: Tuesday, December 11, 2007 11:36 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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john holton
1635 corte via
los altos, CA 94024

From: adeane@earthlink.net
Sent: Tuesday, December 11, 2007 11:36 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Alan Deane
1600 E Broadway Apt 5
Glendale, CA 91205

From: rolandsalvato@hotmail.com
Sent: Tuesday, December 11, 2007 11:36 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Roland Salvato
2934 Larkin Street
San Francisco, CA 94109

From: weitzs@earthlink.net
Sent: Tuesday, December 11, 2007 11:35 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Stephen Weitz
2757 Best Ave
Oakland, CA 94619

From: cairns@hsc.usc.edu
Sent: Tuesday, December 11, 2007 11:34 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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If DWR adopt these proposed amendments and avoids its responsibly to the water users of California, DWR will shifted a great burden to the public and local communities. Even more importantly, DWR will ensure the continued degradation of the Bay Delta Estuary while decrease drought

water reliability across the state.

We urge you to implement an alternative that better serves California.

maureen cairns
4058 tujunga #j
studio city, CA 91604

From: karenbearson@comcast.net
Sent: Tuesday, December 11, 2007 11:33 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

* Providing a realistic assessment of the safe yield of water from Delta.

* Assisting communities decrease demand from the Delta and increase drought water reliability through aggressive implementation of urban water conservation, agricultural water conservation, water recycling and other innovative techniques. The States own water plan demonstrates that urban water use efficiency and water recycling could provide about 4.5 million acre feet of water for California.

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We urge you to implement an alternative that better serves California.

Karen Bearson
5730 Shepard Avenue
Sacramento, CA 95819

From: driehart@earthlink.net
Sent: Tuesday, December 11, 2007 11:33 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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We urge you to implement an alternative that better serves California.

dale riehart
86 south park st
san francisco, CA 94107

From: fluteplayer@earthlink.net
Sent: Tuesday, December 11, 2007 11:32 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

Rick KEMENESI
1524 E. Rio Verde Dr.
West Covina, CA 91791

From: will@aialosangeles.org
Sent: Tuesday, December 11, 2007 11:20 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Will Wright
1036 Coronado Terrace
Los Angeles, CA 90026

From: energy@healthdetectives.com
Sent: Tuesday, December 11, 2007 11:19 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

sondra Becchetti
121 Kestrel Ct.

Brisbane, CA 94005

From: boltje@ucsc.edu
Sent: Tuesday, December 11, 2007 11:22 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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We urge you to implement an alternative that better serves California.

Robert Boltje
137 Hagar Court
Santa Cruz, CA 95064

From: caryn@lmi.net
Sent: Tuesday, December 11, 2007 11:20 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department

of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

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We urge you to implement an alternative that better serves California.

Caryn Graves
1642 Curtis St.
Berkeley, CA 94702

From: amrsb@worldnet.att.net
Sent: Tuesday, December 11, 2007 11:20 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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We urge you to implement an alternative that better serves California.

rich schwartz
1676 tacoma ave
berkeley, CA 94707

From: dsilverla@earthlink.net
Sent: Tuesday, December 11, 2007 11:19 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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We urge you to implement an alternative that better serves California.

Dan Silver
1422 N Sweetzer Ave. #401
Los Angeles, CA 90069

From: mshirey@comcast.net
Sent: Tuesday, December 11, 2007 11:31 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California regarding the proposed water project outlined in the Draft Monterey Plus Environmental Impact Report. I am totally opposed to this project.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

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We urge you to implement an alternative that better serves California.

Marilyn Shirey
7711 River Landing Drive
Sacramento, CA 95831

From: paul.martin@msnyuhealth.org
Sent: Tuesday, December 11, 2007 11:19 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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We urge you to implement an alternative that better serves California.

paul martin
1309 Marinette Rd
pacific palisades, CA 90272

From: musical22@comcast.net
Sent: Tuesday, December 11, 2007 11:20 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on Delta water by:

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We urge you to implement an alternative that better serves California.

Evelyn Fulwiler
P.O.Box 731
Moss Beach, CA 94038

From: susanne.olson@csun.edu
Sent: Tuesday, December 11, 2007 11:18 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

I urge DWR to adopt a more responsible alternative for California. DWR can help regions across the state prepare for dry times and reduce reliance on

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We urge you to implement an alternative that better serves California.

Susanne Olson
2225 Ben Lomond Drive
Los Angeles, CA 90027-2904

From: gmallimson@mindspring.com
Sent: Tuesday, December 11, 2007 11:31 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report. I believe that the proposed amendments are destructive. They are not just destructive today, but are disastrous to future generations who may face emergency rationing of water due to global warming.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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We urge you to implement an alternative that better serves California.

Gail Mallimson
2130 23rd St.
San Francisco, CA 94107

From: summersj@saccounty.net
Sent: Tuesday, December 11, 2007 11:28 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

Permanent implementation of the State Water Project contract amendments would endanger water supply reliability and encourage further damage to the fragile Bay Delta Estuary.

By adopting the proposed project and eliminating drought safeguards while inflating the expectation of Delta water deliveries, the State is recklessly increasing the demand for Delta water. When laws are enforced and dry years occur, those communities that trusted DWRs promise of water will be left with serving more people with less water.

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We urge you to implement an alternative that better serves California.

Jan Summers
2311 River Plaza Drive; 15A

Sacramento, CA 95833

From: mmoore3508@msn.com
Sent: Tuesday, December 11, 2007 11:21 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Mary K. Moore
7760 Condalia Ave.
Yucca Valley, CA 92284

From: yodeler@sfbaysc.org
Sent: Tuesday, December 11, 2007 11:19 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Donald Forman
2139 Grant St., Apt. 1
Berkeley, CA 94702

From: dgoosey@hotmail.com
Sent: Tuesday, December 11, 2007 11:17 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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Doug Goosey
6916 Purpleridge
Rancho Palos Verdes, CA 90275

From: scottfree1@charter.net
Sent: Tuesday, December 11, 2007 11:15 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Follow Up Flag: Follow up
Flag Status: Completed

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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We urge you to implement an alternative that better serves California.

Dan Field
476 Warwick St.
Cambria, CA 93428

From: pechka@cox.net
Sent: Tuesday, December 11, 2007 11:15 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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Rochelle La Frinere
783 Goetschl St.
San Diego, CA 92114-6723

From: wedwards62@gmail.com
Sent: Tuesday, December 11, 2007 11:15 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

Dear Mr. Lester A. Snow

I am writing as a concerned citizen of California. I urge the Department of Water Resources to reject the proposed project outlined in the Draft Monterey Plus Environmental Impact Report.

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Walter Edwards
4145 Shadow Lane
Apt 1122
Santa Rosa, CA 95405-5261

From: rayrodney@comcast.net
Sent: Tuesday, December 11, 2007 11:15 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Ray Rodney
58 Redwood Road
Fairfax, CA 94930

From: joellen@youngcanine.com
Sent: Tuesday, December 11, 2007 11:12 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Jo Ellen Young
10752 Garfield Ave.
Culver City, CA 90230

From: dalehiker@comcast.net
Sent: Tuesday, December 11, 2007 11:11 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Dale Stocking
808 Bristol Avenue
Stockton, CA 95204

From: david.minger@verizonwireless.com
Sent: Tuesday, December 11, 2007 11:11 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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David Minger
4120-B Hacienda Drive
Pleasanton, CA 94568

From: Denise.Buttrey@ONgroup.com
Sent: Tuesday, December 11, 2007 11:11 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Denise Buttrey
3025 Bayshore Ave
Ventura, CA 93001

From: teo@cheesemans.com
Sent: Tuesday, December 11, 2007 11:10 AM
To: Brown, Delores
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Ted Cheeseman
20800 Kittredge Rd
Saratoga, CA 95070

From: mdn@umail.ucsb.edu
Sent: Tuesday, December 11, 2007 11:09 AM
To: Brown, Delores
Subject: Draft Monterey Plus Environmental Impact Report

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Mark Novak
414 W. Ortega St.
Santa Barbara, CA 93101

From: happykampas@cruzio.com
Sent: Tuesday, December 11, 2007 11:09 AM
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Jan Kampa
3120 Hardin Way
Soquel, CA 95073

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John Birk
33 Sleepy Hollow Lane
Ladera Ranch, CA 92694

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carin chapin
612 arroyo seco
santa cruz, ca 95060

From: cmbigger@cox.net
Sent: Tuesday, December 11, 2007 11:09 AM
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Carolyn Bigger
848 Hacienda Dr.
El Cajon, CA 92020

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Brooke Bryant
109 N. Mansfield Ave.
Los Angeles, CA 90036